2331/NQM/2021

केंद्रीय भूमि जल बोर्ड

भारत सरकार

जल शक्ति मंत्रालय

जल संसाधन, नदी विकास और गंगा संरक्षण विभाग

CENTRAL GROUND WATER BOARD

Government of India

Ministry of Jal Shakti

Department of Water Resources,

River Development & Ganga Rejuvenation

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLAN

BEED DISTRICT, MAHARASHTRA

AAP 2019-20

मध्यक्षेत्र, नागपुर

Central Region, Nagpur

मार्च 2021 /March 2021

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLAN BEED DISTRICT, MAHARASHTRA

CONTRIBUTORS

Principal Authors		
Abhay Nivasarkar	:	Junior Hydrogeologist/ Scientist-D
Sandip Bhowal	:	Senior Technical Assistant (Hg)
Supervision & Guidance		
Dr. P. K. Jain Umesh S. Balpande	: :	Head of Office Senior Hydrogeologist/ Scientist-D
Hydrogeology, GIS maps and Management Plan		Ms Nilofar Khan Sc B Shri S B Paradkar Draftman Gr I
Abhay Nivasarkar	:	Junior Hydrogeologist/ Scientist-D
Sandip Bhowal	:	Senior Technical Assistant (Hg)
Groundwater Exploration		
Dr P K Jain		Regional Director
Chemical Analysis		
Dr. Devsharan Verma	:	Scientist B (Chemist)
Dr. Rajni Kant Sharma	:	Scientist B (Chemist)
T. Dinesh Kumar	:	Assistant Chemist

BEED DISTRICT AT A GLANCE

1. GENERAL INFORMATION			
	Geographical Area	:	10693 Sq. km.
	Administrative Divisions (2011)	:	Blocks-11; Beed, Ashti, Patoda, Shirur Kasar, Georai, Ambajogai, Wadwani, Kaij, Dharur, Parali, Majalgaon
	Villages (Census 2011)	:	1357Nos.
	Population (Census 2011)	:	25.85 lakh
	Rainfall 2018	:	505.1mm
	Normal rainfall	:	666.6 mm
	Long term rainfall Trend (1999-2019)	:	Falling trend 2.75 mm/year
2. GEOMORPHOLOGY AND DRAINAGE			
	Major Physiographic unit	:	Lowland Beed, Part of Godawari highland Beed, Part of Balaghat Plateau and Sina basin
	Major Drainage	:	Manjra and Sina Rivers
3. LAND USE (2012-13) *(sources: mahasdb.maharashtra.gov.in/district Report)*			
	Forest Area	:	281 Sq. km. (0.54 %)
	Cultivable Area	:	3952Sq. km. (96.58 %)
	Net Area Sown	:	3676 Sq. km. (85.53 %)
	Area Sown more than Once		274.86 Sq. Km. (2.62 %)
4.	SOIL TYPE	:	Rocky and thin layered soils except on the bank of Godawari and Sina rivers
5. PRINCIPAL CROPS (2017)			
	Food grain	:	3757 sq. km.
	Pulses	:	2205 sq. km.
	Cereals	:	3110.75 sq. km.
	Oil Seeds	:	2293 sq. km.
	Sugarcane	:	360 sq. km.
	Cotton	:	3537.05 sq. km.
6.	HORTICULTURAL CROPS		
	Mango	:	40.48 sq. km.
	Grapes	:	23.9 sq. km.
	Citrus fruit	:	1.16 sq. km.
	Banana	:	2.53 sq. km.
	Others	:	54.79 sq. km.
7. IRRIGATION BY DIFFERENT SOURCES (2013-14)-Nos. / Potential Created (ha)/ Potential utilized (ha)			
	Dug wells	:	42151/135056/128799
	Tube wells/Bore wells	:	7476/18051/17525
	Surface Flow Schemes	:	1674/9787/5421
	Lift Irrigation Schemes		1190/2982/2822
	Net Irrigated Area	:	1545.67 sq. km.

8. GROUND WATER MONITORING WELLS (As on March 2019)			
	Dug wells	:	47
	Piezometers	:	02
9. GEOLOGY			
	Recent	:	Alluvium (River Alluvium)
	Upper Cretaceous-Lower Eocene	:	Deccan Traps Basalt
10. HYDROGEOLOGY			
	Major Water Bearing Formation		Deccan Traps: Basalt weathered, amygdaloidal, fractured and jointed. Under phreatic, semi-confined to confined conditions
	Depth to water level in Shallow Aquifer		
	Pre-monsoon Depth to Water Level (May-2018)	:	9.95 mbgl (Mauj Beed, Block) and 32m Kolegaon Govorai block)
	Post-monsoon Depth to Water Level (Nov.-2018)	:	0.8 (Nandur Phata, Beed block) and 9.20 mbgl Sautaa, Patoda Block)
	Depth to water level in Deeper Aquifer		
	Pre- monsoon Depth to Water Level (May-2018)	:	11 to 98.1 mbgl
	Post-monsoon Depth to Water Level (Nov.-2018)	:	6 to 32 mbgl
	Water level Trend (2010-19)		
	Pre- monsoon Water Level Trend (2009-2018)	:	Rise: Negligible to 0.48m/year
			Fall: 0.03to 0.8 m/year
	Post-monsoon Water Level Trend (2009-2018)	:	Rise: Negligible
			Fall: 0.02 to 1.4 m/year
11. GROUND WATER EXPLORATION (As on March 2019)			
			Basalt
	Wells Drilled	:	EW-52, OW-11 and Pz -5 Total -68
	Depth Range	:	31.0 to 50 mbgl 18 to 200.0 mbgl
	Discharge	:	Traces to 19.66 lps
	Drawdown	:	2.16 to 21.82 m
	Transmissivity	:	10 to 62.00 m^2/day
	Storativity	:	1.0x10-4 to 5.5x10-5
12. GROUND WATER QUALITY			
	Good and suitable for drinking and irrigation purposes		
	Type of Water	:	Ca-HCO_3 and Ca-Cl
13. DYNAMIC GROUND WATER RESOURCES- (2013)			
	Net Annual Ground Water Availability	:	1302.27MCM
	Total Draft (Irrigation + Domestic+ Industrial)	:	703.50 MCM

	Projected Demand (Domestic + Industrial)	:	97.92 MCM
	Stage of Ground Water Development	:	54.02 %
	Category		Safe
14.	MAJOR GROUND WATER PROBLEMS AND ISSUES Major part of the district classified as drought prone areas. It is coupled with water level decline in major parts of the district. Ground water quality is adversely affected by nitrate contamination in 50% ground water samples. Thus, all the wells used for water supply should be first analysed for nitrate and if the content is found beyond permissible limits then the ground water may be used for other than drinking purpose. . Adequate sanitary protection to the wells may be provided to control the nitrate contamination.		
15.	Aquifer Management Plan		
	Supply side Management	:	Proposed AR structures: 325 Percolation tanks and 942 Check dams Expected augmentation of 92.42 MCM/year
	Demand side Management	:	301.67sq. km. area proposed for drip irrigation for sugarcane area. Expected saving of 171.95 MCM/year
	Expected Benefits	:	The Stage of ground water development gets reduced from 58.51% to 43.22%. Balance ground water resources available 31.85 MCM.
	Development Plan		Proposed 20,282 dugwells and 3380 borewells. These can provide assured irrigation to about 520.04 sq.km area.

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLAN BEED DISTRICT, MAHARASHTRA

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

AQUIFER MAPS AND GROUND WATER MANAGEMENT PLAN BEED DISTRICT, MAHARASHTRA

1. INTRODUCTION

National Aquifer Mapping (NAQUIM) has been taken up in XII five-year plan by CGWB to carry out detailed hydrogeological investigation on 1:50,000 scale. 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 geologic, geophysical, hydrologic and chemical analyses is applied to characterize the quantity, quality and sustainability of ground water in aquifers.

The vagaries of rainfall, inherent heterogeneity & poor sustainability of hard rock 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 "**traditional groundwater development concept**" to "**modern ground water 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 Beed 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

1.1 About the Area

Beed is one of the districts of Marathwada region of Maharashtra. It is flanked by Aurangabad and Jalna districts in the north, Parbhani in the east, Latur in the south east, Osmanabad in in south and Ahmadnagar district in the west and southwest. It is bounded by north latitude 18°28' and 19°28' and east longitude between 74°48' and 76°45'. The district headquarters is located at Beed Town. The total area of the district is 10693 Sq. km. and falls in parts of survey of India degree sheets 47 I,47 J, 47M, 47 N, 56 A &. It is located about 610 meters AMSL (Figure 1. 1)

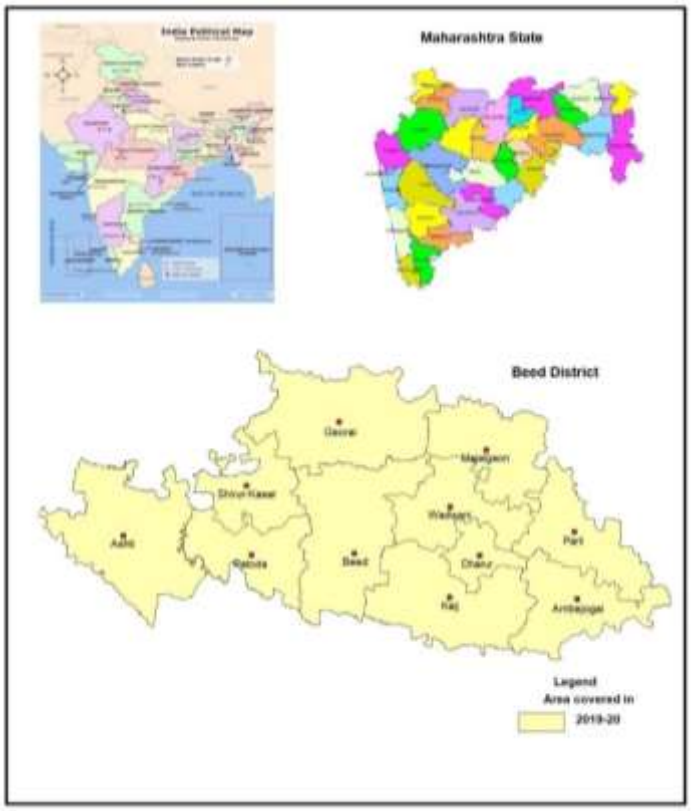


Figure 1.1: Index map, Beed District

For administrative purpose, the district has been divided in 11 talukas viz., Beed, Georai, Patoda, Ashti, Shirur (Kasar), Ambajogai, Kaij, Majalgaon, Dharur, Parli (Vaijnath) and Wadwani. It has a total population of 2,028,461 as per 2011 Census. The district has 06 towns, 11 blocks/11 panchayat samitis and 1357 villages. A major part of the district comes under Godavari basin. Godavari, Manjra and Sina are the major rivers that drain the district along with their tributaries (Figure 1.2).

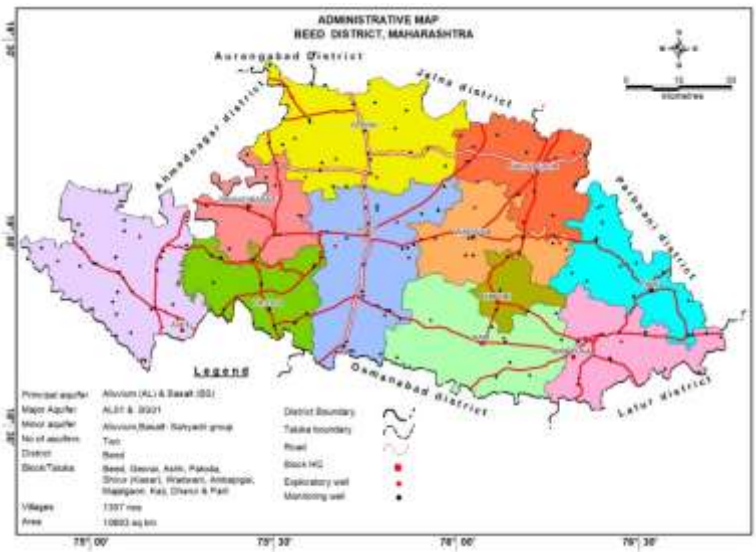


Figure 1.2: Administrative Map of Beed District

Central Ground Water Board has taken up several studies in the district since 1972 to 2000 including Systematic Hydrogeological Survey, Reappraisal Hydrogeological Studies Ground Water Exploration activities. The data generated have been shared with the Central, State agencies as well as with the stake holders in the form of reports, maps etc.

In the Deccan Trap Basalt area of the district, 52 exploratory wells (EW), 11 observation wells (OW) and 5 Piezometer (PZ) were drilled. The depth of the wells ranged from 18.00 to 200.20 meters below ground level (m bgl). The discharge from these wells varied from Traces to 19.66 litres per second (lps), and 20 wells (29%) were found to be high yielding with discharge > 3 lps. The static water levels ranged from 3.11 to > 100 m bgl. The aquifer zones were encountered in the depth range of 5 m bgl to 195 m bgl, thus indicating the presence of water bearing zones even at deeper depths beyond 100 m bgl.

In addition to this, 8 piezometers have been drilled through outsourcing in 1997-98 under HP-I, whereas 10 wells have been drilled under accelerated ground water exploration programme through outsourcing in 2004-05. Apart from above studies, ground water exploration in the hard rock areas of the district occupied by Deccan Trap Basalt has also been taken up in various phases since 1995. *(District Brochure, Beed)*

Beed district is yet to be taken up under NAQUIM study. The report is based on NNHS data and exploratory well data and data provided by different State agencies.

Ground water exploration in the district has been taken up in different phases since 1977-78. During 1977-78 under Sina-Man Project 9 EW and 6 OW were drilled while in 1994-95, 5 EW were drilled to study the post-Killari earthquake effect on ground water scenario in the district. Furthermore, during 1998, 12 Pzs were drilled under Hydrology Project and from 2001 to 2003, 34 EW and 5 OW were drilled under GW Exploration Programme.

To establish the geometry, disposition and potential of aquifers, ground water exploration down to the depth of 200 mbgl has been taken up where the data gap exists and accordingly 17 exploratory wells and 6 observation wells have been constructed during the years 2016-17 and 2018-19. A total of 52 EWs, 11 OWs and 5 piezometers have been constructed till March 2019**.**Salient Features of Ground Water Exploration are given in **Annexure-I** and details of exploration under NAQUIM are given in **Annexure-II**.

To assess the ground water regime, 48existing ground water monitoring stations were being monitored 4 times in a year. Based on data gap analysis additional 122Key Observation Wells (KOWs) are taken into account from GSDA to acquire micro level hydrogeological data to decipher the water level scenario, sub-surface lithological disposition and hydrogeological setup of shallow aquifer (Aquifer-I). The details of KOWs and GWM wells are given in **Annexure-III**. Locations of existing ground water monitoring stations and exploratory wells are shown in **Fig.1.3**

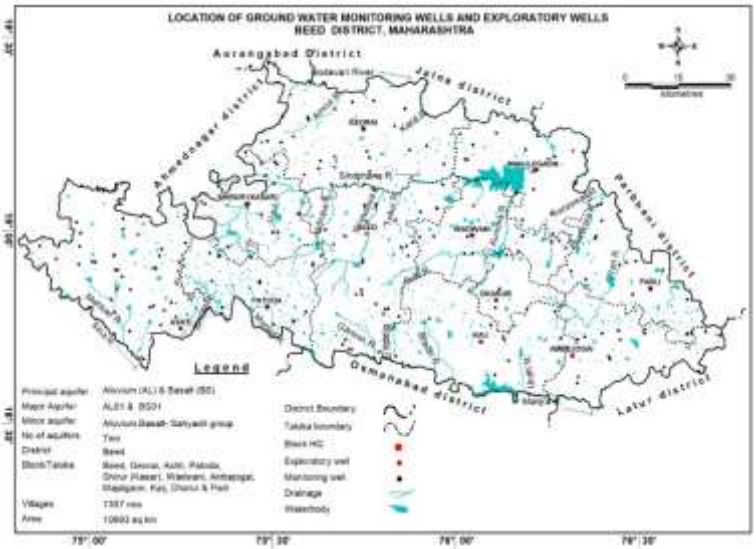


Figure 1.3: Locations of Existing Exploratory and Ground Water Monitoring Wells

1.2 Geomorphology, Drainage and Soil Types

The district can be broadly divided into 3 physiographic units namely: Lowland Beed, Highland Beed and Sina basin.

Lowland Beed is the low-lying northern part comprising a part of Godavari valley and is also known as Gangathari. It has a general elevation ranging from 400 metre above mean sea level (m amsl) in the east to 500 m amsl in the west with number of residual hills reaching upto 600 m amsl. Highland Beed occupies the southern part forming a part of Balaghat Plateau. This dissected series of hills extending from west to east divides the district into two parts. Sina basin is low lying undulating area southwest and west of Highland Beed comprising almost whole of Ashti taluka. It is interspersed with many low lying residual hills. The district is drained by Godavari, Manjra and Sina rivers and their tributaries. Godavari River flows from west to east along the northern boundary of the district. Manjra River starts from the mountains of Patoda taluka and flows west to east forming the southern boundary of the district. Sina River flows along the south-western boundary of the district.

The geomorphology of the area is shown in **Fig. 1.4 and** Drainage map is shown in **Fig. 1.5.**

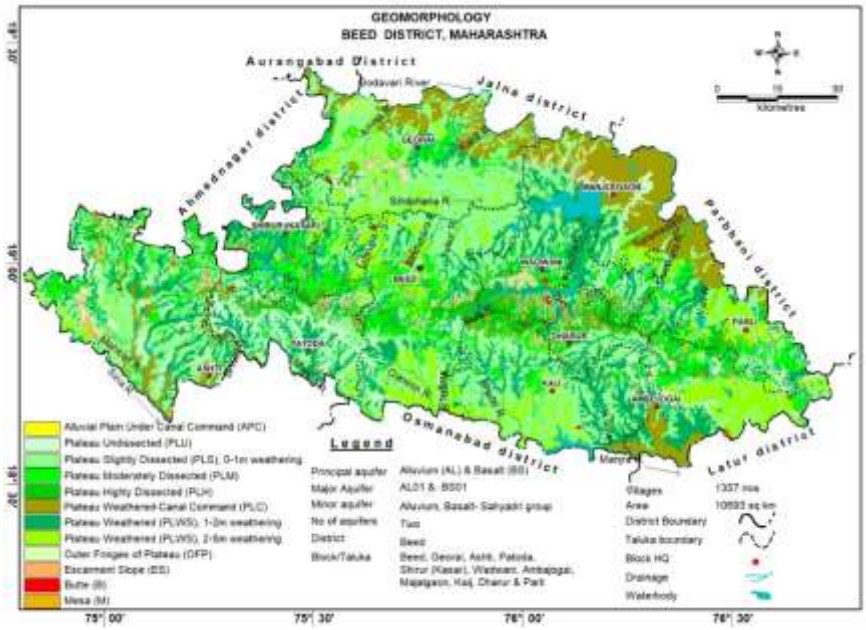


Figure 1.4: Geomorphology, Beed District

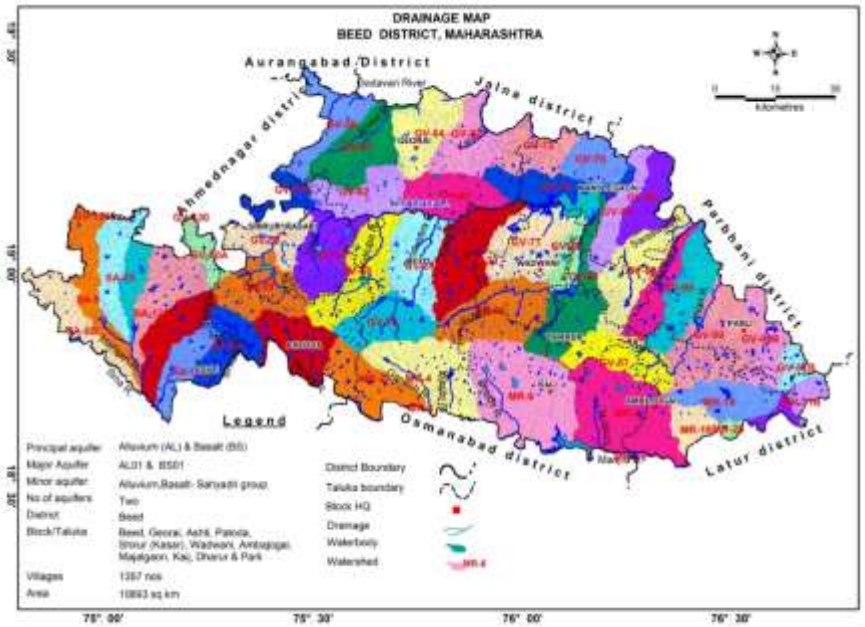


Figure 1.5: Drainage Map, Beed District

Soil plays a very important role in the agricultural activities and forest growth of the area. The fertility of the soil from agricultural point of view depends upon the texture and structure which controls the retaining and transmitting capacity of the soil to hold the moisture content and various nutrients such as nitrogen, phosphorous and potassium present in the parent rock. The process of formation of the soil in the area is influenced by the climate, geology, vegetation, and topography.

The soil of the district is basically derived from Deccan Trap Basalt. Soils found are mainly clayey, loam and gravelly type. In the district, rocky and thin

layered soils are observed in major part of the district except on the banks of Godavari and Sindphana Rivers, where dark brown to black and clayey loamy to loamy soils are observed. The nutrient levels in almost all the soils are low.

Clayey Shallow Soil (0 to 10 cm) and Clayey Moderately Deep Soil (25 to 50 cm) occur in major parts of the district. These soils are light brown to dark grey in colour and clayey in texture. Clayey deep Soils (50 to 100 cm) and clayey very deep Soils (> 100 cm) are found in parts of river canals present in the block. They are dark brown to dark grey in colour. The colour of these soils varies from dark grey brown to very dark grey. They are clayey in texture. Major part of the district is covered with clayey soil (80%) & gravelly clay loam clay (10%). Remaining part of the district is covered by Rocky Land (10%). The thematic map of soil distribution in the district is shown in **Fig. 1.6**. Depth of soil is more in the vicinity of main drainages and shallow away from river channels.

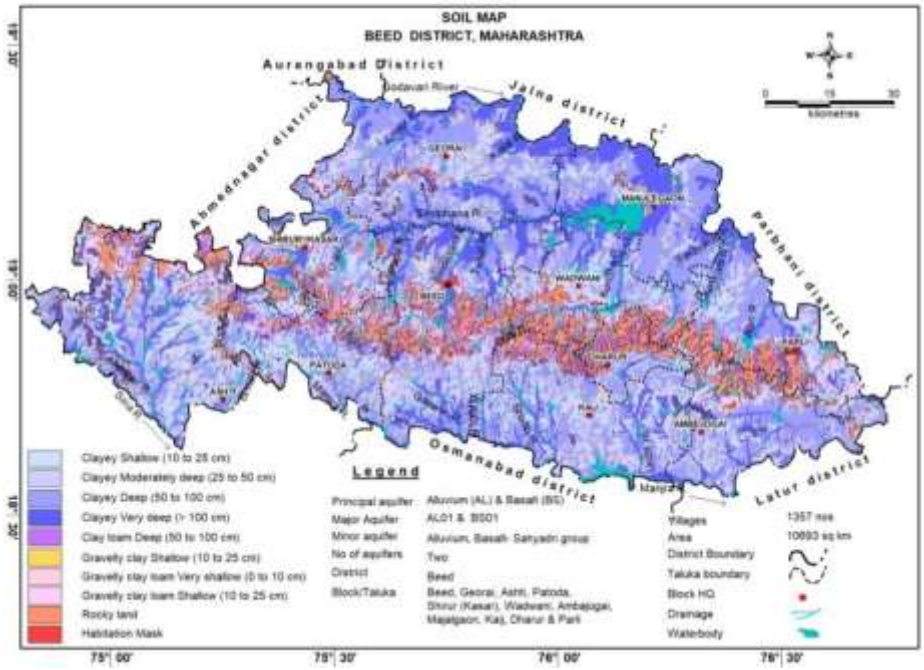


Figure 1.6: Soils, Beed District

1.3 Climate and Rainfall

The climate of the district is characterized by a hot summer and a general dryness throughout the year except during the south west monsoon season, which is from June to September while October and November constitute the post-monsoon season. The winter season commences towards the end of November when temperatures begin to fall rapidly. December is the coldest month and the mean minimum temperature during winter is 8.5°C. From the beginning of March, the daily temperature increases continuously. May is the hottest month with the mean maximum temperature of 42.5°C. With the onset of the south-west monsoon by the second week of June, the temperature falls appreciably.

The normal rainfall of the district is 743.5 mm. The isohyet map of the district is depicted in Figure 1.7. North Western part of the district receives rainfall between 650 to 750 mm/year particularly in parts of Shirur Block. The Northern part of the district in parts of Georai block rainfall between 700 to 800 mm/year is observed. In the central part of the district heavy rainfall is encountered between rainfalls between 700 to 850 mm/year in parts of Beed block, Wadwani & Dharur block. Southern to South Western part of the district observes rainfall between 600 to 750 mm/year in parts of Kaij, Patoda & Ashti Blocks.The South eastern part of the district receives higher rainfall compared to the other parts i.e., greater than 750 mm/year in Ambejogai and parts of Parli blocks. The number of rainy days varying between 26 to 59 days. Common dry spells last for 2 to 10 weeks. Delayed onset and early cessation of S-W monsoon is quite common. Rest of the district falls in Central Plateau (Beed, Wadwani blocks) assured rainfall zone and is characterized by rainfall of 700 to 850 mm/year.

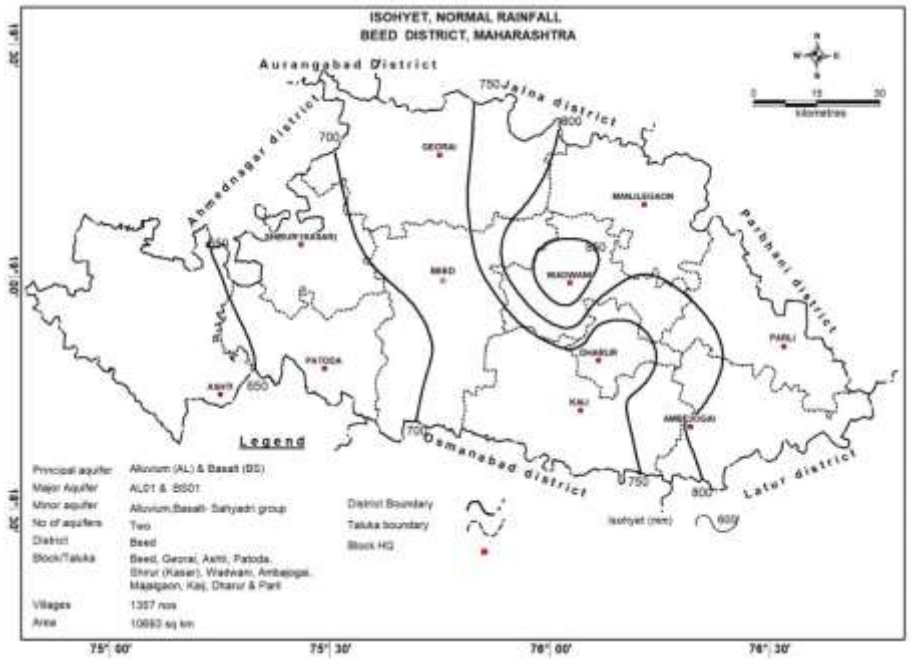


Figure 1.7: Isohyet map of Beed District

Annual rainfall data for the period 1999-2019 has been analysed and presented in table 1.1. Fig. 1.8 show the variation of data with time. The minimum rainfall occurred in 2018 (342.03 mm) and maximum rainfall in 2010 (962.01 mm). The rainfall trend analysis shows a falling trend @ 2.5 mm/year.

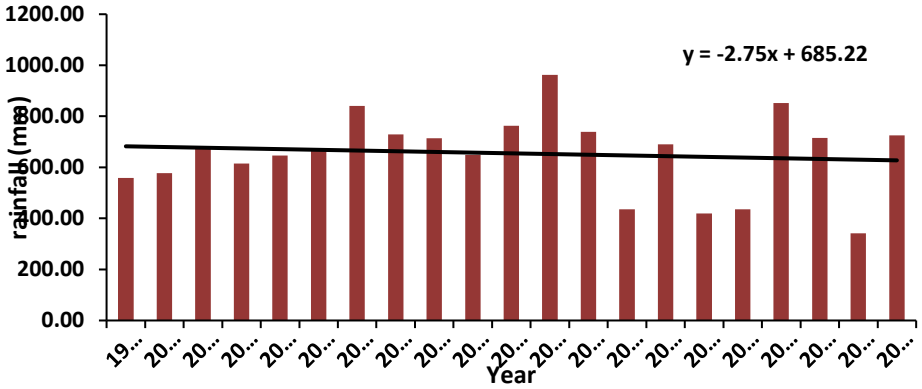


Figure 1.8: Annual Rainfall Pattern (1999-2019)

Table 1 1: Long Term Rainfall Analysis (1999 to 2019) of Beed District

Year	Annual Rainfall (mm)	Normal Rainfall (mm)	Departure	No. of Rainy Days	Category
1999	558.46	743.5	-24.89	28	NORMAL
2000	577.82	743.5	-22.28	28	NORMAL
2001	674.87	743.5	-9.23	35	NORMAL
2002	615.08	743.5	-17.27	30	NORMAL
2003	646.14	743.5	-13.10	39	NORMAL
2004	671.68	743.5	-9.66	38	NORMAL
2005	840.15	743.5	13.00	41	NORMAL
2006	729.14	743.5	-1.93	38	NORMAL
2007	713.55	743.5	-4.03	38	NORMAL
2008	648.62	743.5	-12.76	35	NORMAL
2009	762.73	743.5	2.59	42	NORMAL
2010	962.01	743.5	29.39	53	EXCESS
2011	739.64	743.5	-0.52	39	NORMAL
2012	435.10	743.5	-41.48	34	MODERATE
2013	690.14	743.5	-7.18	51	NORMAL
2014	418.75	743.5	-43.68	31	MODERATE
2015	435.17	743.5	-41.47	38	MODERATE
2016	852.23	743.5	14.62	47	NORMAL
2017	714.88	743.5	-3.85	44	NORMAL
2018	342.03	743.5	-54.00	26	SEVERE
2019	725.34	743.5	-2.44	59	NORMAL

The annual data for the period 1999–2019 has also been subjected to statistical analysis and the results are presented below. annual rainfall from the normal rainfall, expressed in terms of percentage, varied from -54 to 29 percent.

No. of Years	21
Mean	654.93 (mm)
Median	674.87 (mm)
Standard Dev.	153.79 (mm)
Coefficient of variation	23.48%
Linear Regression:	

Slope	-2.75
Intercept	685.22 mm
Equation of trend line	y = -2.75x + 685.22

The departure percent analysed denotes the rainfall variation pattern occurred during the period 1999-2019. The area experienced 1 time (4.76%) excess rainfall, 16 times (76.19%) normal rainfall, 1 time (4.76%) severe rainfall and 3 times (14.29%) moderate drought conditions as given below. The coefficient of variation of the annual rainfall from the mean rainfall has been observed to be 23.5%

Category	Number of Years	%of Total Years
Departures		
Positive	4	19.05
Negative	17	80.95
Droughts		
Moderate	3	14.29
Severe	1	4.76
Acute	0	0.00
Normal & excess r/f		
Normal	16	76.19
Excess	1	4.76
Rainfall Departure: Excess: > +25; Normal: +25 To -25; Moderate: -25 To -50; Severe: -50 To -75; Acute: < -75		

The block wise annual rainfall data (1999-2019) of Beed district is shown in Table 1.2. Based on rainfall data analysis it is observed that Annual rainfall varies from 492.2 (Shirur Kasar block) to 763.48 mm (Ambejogai block). The Normal annual rainfall in the district varies between 638.1 mm in Ashtiblock and 874.2 mm in Vadvani block.

Table 1.2: Block wise Annual rainfall data (2010-2019)

(in mm)

Block	Normal Rainfall (mm)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Rainfall (mm)
Beed	706.4	817	980	423.8	688.2	468.3	433.5	751.5	697.4	358.9	854.1	647.27
Patoda	688.7	840	616	289.1	631.7	438.3	405.9	925.8	833.3	331.6	619.7	593.14
Ashti	638.1	959	533	259.1	480.3	397.4	400.3	655.1	767.8	304.9	581.9	533.88

Block	Normal Rainfall (mm)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Rainfall (mm)
Gevari	734.6	897	726	267.4	557.1	317.5	263.7	699.3	562.2	292	831.7	541.39
Majalgaon	813.5	1138	705	497.3	860.4	421.5	515.5	1026.7	689.4	350.8	831.8	703.64
Ambejogai	800.4	1012	1009	673.2	869.7	531.7	548.3	1015.4	815.8	448.7	711	763.48
Kej	714.8	1020	743	436.2	651.8	389	394.1	902.8	839.9	408.1	658	644.29
Parali	806.8	1056	563	652.4	843.2	362.2	512.4	856.8	597.4	385.6	788.4	661.74
Dharur	714.8	1163	869	541.8	616.4	350.3	338	856.9	688.1	262.7	564.7	625.1
Vadavani	874.2	1034	858	497	931	539	640	1036.5	762.5	397.1	704.6	739.97
Shirur Kasar	686.2	646	534	248.8	461.7	391	335.2	647.7	609.9	221.9	832.8	492.9
District Avg.	743.5	962.0	739.6	435.1	690.1	418.7	435.2	852.2	714.9	342.0	725.3	631.52

1.4 Geology

Geologically, Basalt (Deccan traps) is the major rock formation in the district. A major part of the district is underlain by a sequence of basaltic lava flows while alluvium occupies along the major Drainages. The Deccan Trap has succession of flows in the elevation range and are normally horizontally disposed over a wide stretch and give rise to tableland type of topography also known as plateau. These flows occur in layered sequence ranging in thickness from few centimeters to tens of meters. Each individual flow is massive at the bottom and vesicular/amygdaloidal towards the top. The flows are separated from each other by marker horizon known as bole bed. The generalized geological sequence of the area is given in Table 1.3 and the Geological Map of the district is depicted in Figure 1.9.

Table 1.3: Generalized Geological sequence Beed district

Geological Period	Age	Stratigraphic unit	Formation	Lithology	Nature and Characteristics
	Recent			Alluvium	
68-62 Million years ago	Upper Cretaceous to Eocene	Deccan trap (Sahyadri Group)	Mahabaleshwar formation	Basalt hard, massive, vesicular, amygdaloidal varieties with inter-trappeans	Dark massive, fine grained and non-porphyritic rock, can be broken into blocks, hard and compact
			Purandargarh formation/ Buldhana Formation		Dark, Massive, fine to medium grained, non-porphyritic, sparsely porphyritic hard and compact

			Diveghat Formation/Chikhli Formation		Dark, Massive, fine to medium grained, sparsely to moderately porphyritic hard and compact
			Indrayani Formation/Ajanta Formation		Dark grey, Massive, fine to medium grained, non-porphyritic, sparsely porphyritic hard and compact
68-62 Million years ago	Upper Cretaceous to Paleosene	Deccan trap (Sahyadri Group	Upper Ratangarh formation	Basalt hard, massive, vesicular, amygdaloidal varieties with inter-trappeans	Dark fine to medium grained and prone to weathering

(GSI: DRM FIRST EDITION 2000)

Alluvium:

Alluvium occupies along the major Drainages belongs to recent times.

Deccan trap basalt:

Major part of the district is occupied by Deccan trap basaltic lava flows of Upper Cretaceous to Eocene. The Deccan Trap of Sahyadri group (68-62 million years ago) of upper Cretaceous to Eocene times is divided into four groups Lower Indrayani, Diveghat, and Purandargarh & Mahabaleshwar formations. Each individual lava flow consists of lower massive part becoming vesicular /amygdaloidal towards top, ranges in their individual thickness from a few centimetres to tens of meters. The vesicles are invariably found filled with secondary minerals. The flows have wide variation in colour and texture especially when they are amygdaloidal in nature with secondary mineral infillings such as Zeolites, Calcite, and Agate and Chalcedony etc. The red /green/black bole beds constituting the marker horizons separating the two flows were discontinuous and generally inconsistent.

The Diveghat formation mainly occurs in the northwestern part and as an isolated patch in the western part comprises of Aa flows. The rock is generally dark massive fine grained and sparsely to moderately porphyritic. The Purandargarh formation overlies the Diveghat Formation and is well exposed around Bhum, Pathrur and southwest of Tuljapur. It comprises of Aa flows. The rocks of this

formation are dark grey, fine grained and sparsely to moderately porphyritic. The youngest sequence of lava flows incudes the Mahabaleshwar formation and is extensively developed in the area between Tuljapur in the south and Kalamb in the north comprises of Aa lava. The rock is dark grey fine grained and moderately to highly porphyritic in nature.

The Deccan Trap of Sahyadri group (68-62 million years ago) of upper Cretaceous to Paleocene times is divided into Upper Ratangarh Formation consisting of Basalt hard, massive, vesicular, amygdaloidal varieties with inter-trappeans with Dark fine to medium grained and prone to weathering.

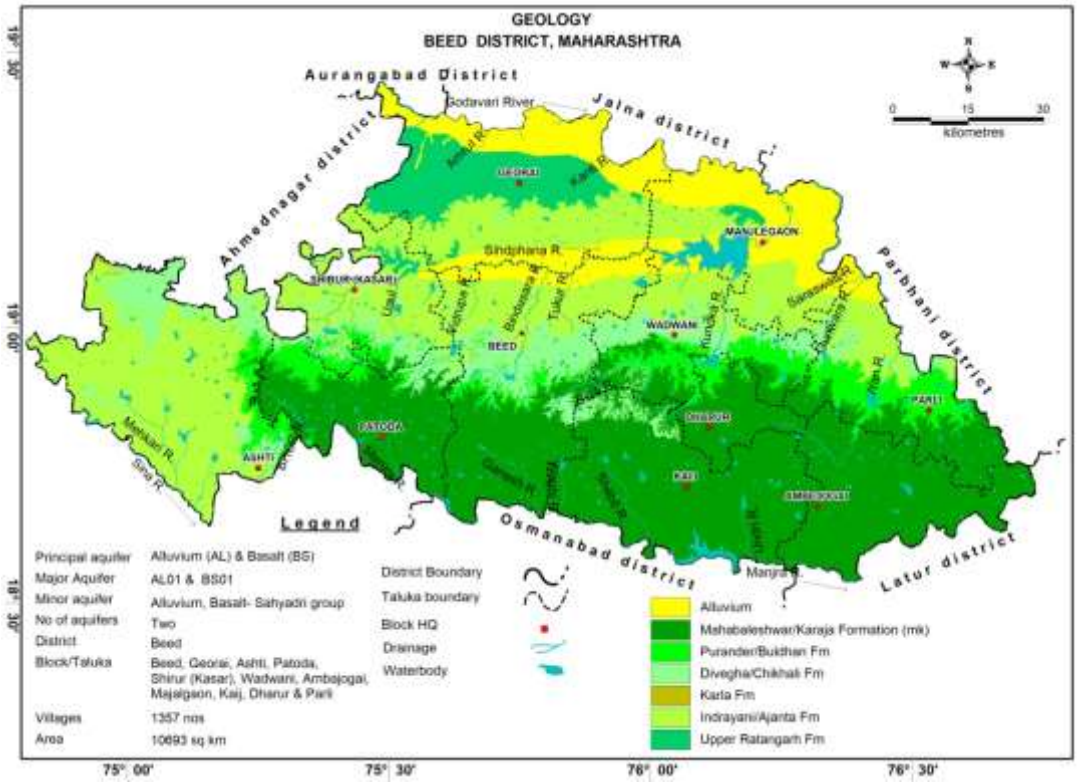


Figure 1.9: Geological Map, Beed district

2. HYDROGEOLOGY

The major part of the district is constituted by a sequence of basaltic lava flows (Deccan Trap) and alluvium occupies a small portion. The alluvium cosisting of clay, Silt, Sand and Gravel occur along the course of major rivers. The thickness of alluvium varies up to few meters. The alluvium lies directly over the Basaltic lava flows. A map depicting hydrogeology of Beed district is presented in **Fig. 2.1.**

Groundwater occurrence and movement in the area is influenced by its rock formations. The Groundwater potential of the area depends upon porosity and permeability (both primary and secondary) of rock formations. The entire district is underlain by the Basaltic lava flows of upper Cretaceous to lower Eocene age. The shallow Alluvial formation of Recent age occurs as narrow stretch along the major rivers flowing in the area, but it does not play much important role from ground water point of view.

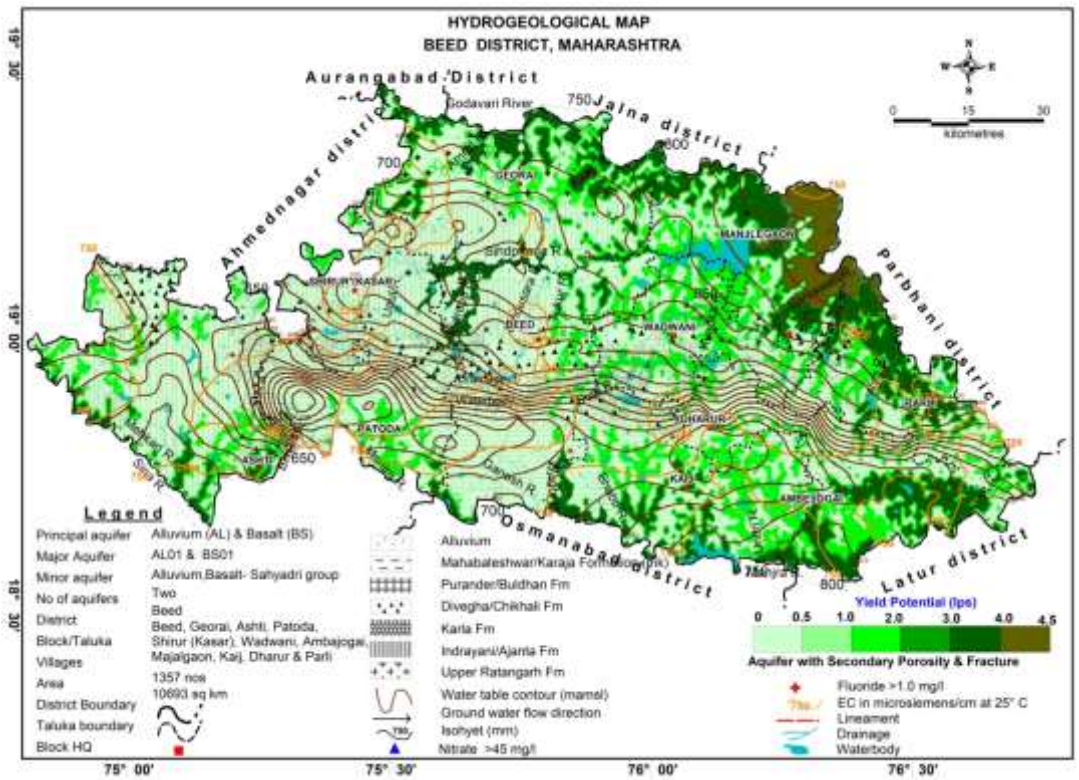


Figure 2.1: Hydrogeology, Beed District

Deccan Traps occurs as Basaltic lava flows, which are around 280 m thick, normally horizontally disposed over a wide stretch and give rise to table type of topography on weathering known as plateau. These flows occur in layered sequence ranging in thickness from few metres to 55 m. Flows are represented by massive portion at bottom and vesicular portion at top and are separated from each other by marker bed known as bole bed. Ground water in Deccan Trap Basalt occurs under phreatic and semi-confined conditions. The weathered and fractured trap occurring in topographic lows forms the main aquifer. The alluvium occurs as small patches

along banks, flood plains and meander of main rivers in which groundwater occurs under Phreatic and semi-confined conditions.

Deccan basalts are hydrogeologically in-homogeneous rocks. The weathered and jointed /fractured parts of the rock constitute the zone of ground water storage and flow. The existence of multiple aquifers is characteristic of basalt and is indicative of wide variation in the joint/fracture pattern and intensity. The yield of wells is a function of permeability and transmissivity of aquifer and it depends upon the degree of weathering, intensity of joints/fractures and topographic setting of the aquifer. Due to wide variation in secondary openings, the potential areas for ground water are generally local. In general Ground water occurs under phreatic/unconfined to semi-confined conditions in basalts. Shallow Aquifer is generally tapped by the dug wells and average depth of dug wells ranging between 6.10 to 26.10 m and yield varies up to 100 m^3/day. The deeper Aquifer is being tapped by bore wells with depth ranging from 38 to 195.60 m. However, the maximum numbers of bore wells are limited up to 60 m depth. The yield ranges up to 2.5 lps. Potential Aquifer are generally encountered at the contact of two flows.

Water Table Contour

Based on the data, a premonsoon water table contour map has been prepared and presented in **figure 2.2**. The map depicts occurrence and movement of ground water in predominantly the basaltic areas. The ground water flow lines are marked to show the direction of ground water flow. The elevation of water table ranges from 393 to 720 m amsl and generally follows the topography. In general, the ground water movement is towards the Sina River towards south-west, towards Manjra River in south and Godavari River towards North. Though there is a hydraulic continuity between the trappean units, still due to the heterogeneous nature of the rock formation constituting the aquifer, there is wide variation in the water table gradient. The ground water movement is generally slow in the alluvial areas with high permeable zones and in the areas of convergent ground water flow. Such areas have been demarcated as ground water potential zones. In area of low permeability, the water table contours are closely spaced indicating steep gradient.

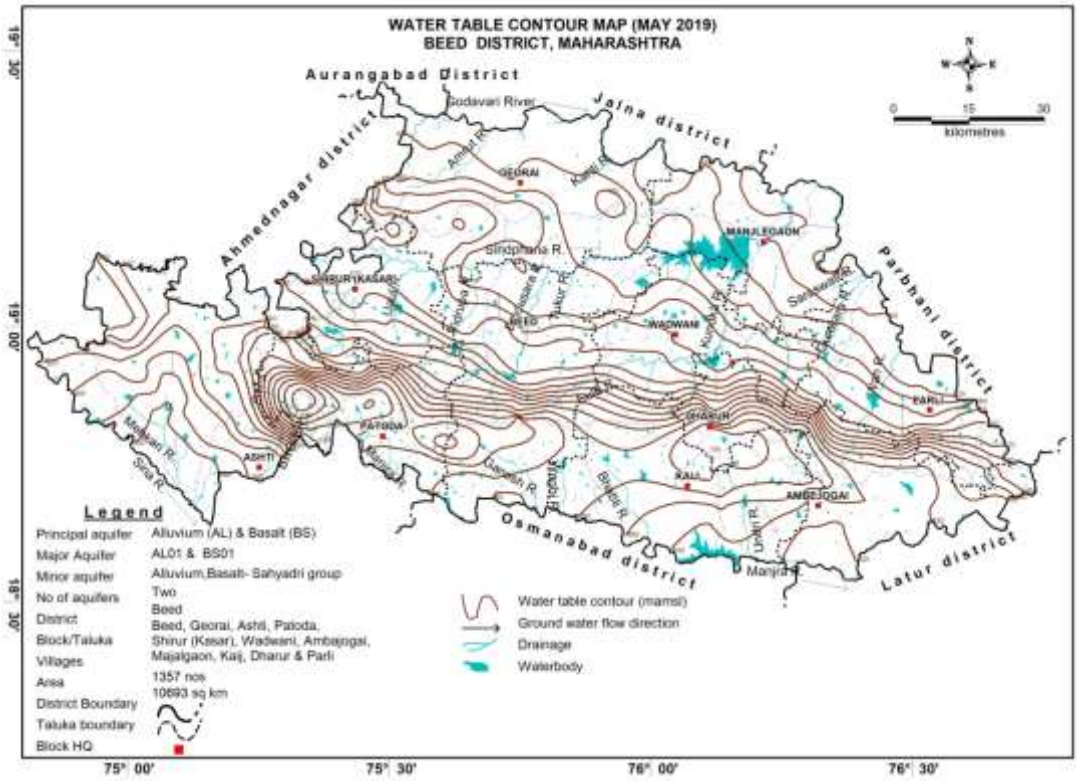


Figure 2.2: Water Table Contour, Beed district

2.1 Major Aquifer Systems

Basalt formations constitutes the principal aquifers in the district (**Fig. 2.3).** Based on the ground water exploration carried out in the district and the data generated so far, aquifer wise characteristics have been delineated and are shown in **Table 2.1.** The aquifer units found in each of the formation are given below:

Alluvium

The alluvium in the district is found as very shallow sandy horizons along the rivers. Its depth is generally within 10m with thickness of granular zone varying from 5 to 8 m. The water levels are generally between 5 and 10 m.

Basalt

The basaltic aquifer can be categorised into two parts, Aquifer I and Aquifer II.

Aquifer-I: The Aquifer-I in Basalt formation occurs as weathered/fractured basalt with thickness varying from 18 to 34 m. The yield of the wells in this aquifer is up to 100 m^3/day. Depth of occurrence of Aquifer-I is depicted in **Fig. 2.4** and yield in the **Fig. 2.5.**

Aquifer- II: Aquifer-II in Basalt formation is observed in the depth range of 38 to 195.60 mbgl with water levels of 3.11 to 100 mbgl and thickness of fractured zone varying from 0.5 to 10 m. The aquifer-II is exploited mainly by borewells and yield of the aquifer generally varies up to 2.5 lps. Depth of occurrence of Aquifer -II is depicted in **Fig. 2.6** and yield in the **Fig. 2.7.**

Table 2.1: Aquifer Characteristic of Major aquifers of Beed district

Major Aquifer	Basalt	
Type of Aquifer	Aquifer-I	Aquifer-II
Formation	Weathered/Fractured Basalt	Jointed/Fractured Basalt
Depth to bottom of Aquifer (mbgl)	18 to 34	38 to 195.6
Weathered/ Fractures zones encountered (mbgl)	up to 34	up to 195.6
Weathered/Fractured rocks thickness (m)	0.5 to 10	0.5 to 03
SWL (mbgl)	0.6 to 28	3.11 to 100.0
Transmissivity (m2/day)	10 to 62	0.079 to 547.42
Specific Yield/ Storativity (Sy/S)	0.02	1.0x10-4 to 5.5x10-5
Yield	up to 100 m3/day	up to19.66 lps
Sustainability	1 to 4 hrs	1 to 5 hrs

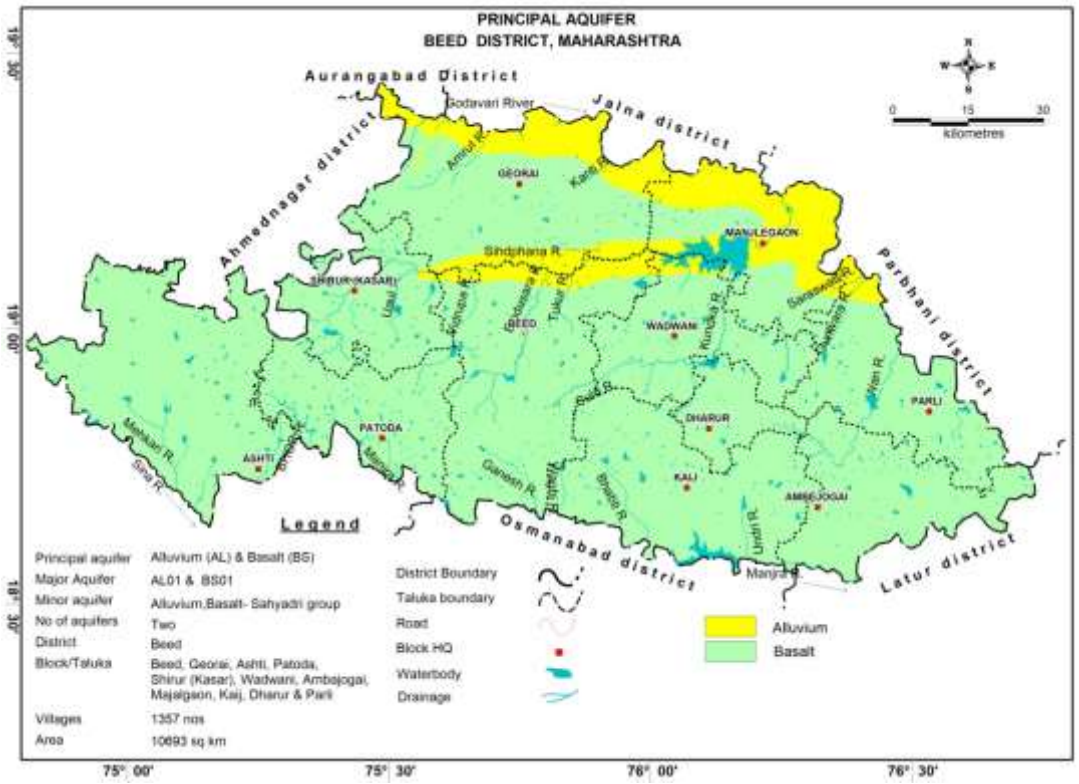


Figure 2.3: Major Aquifers, Beed district

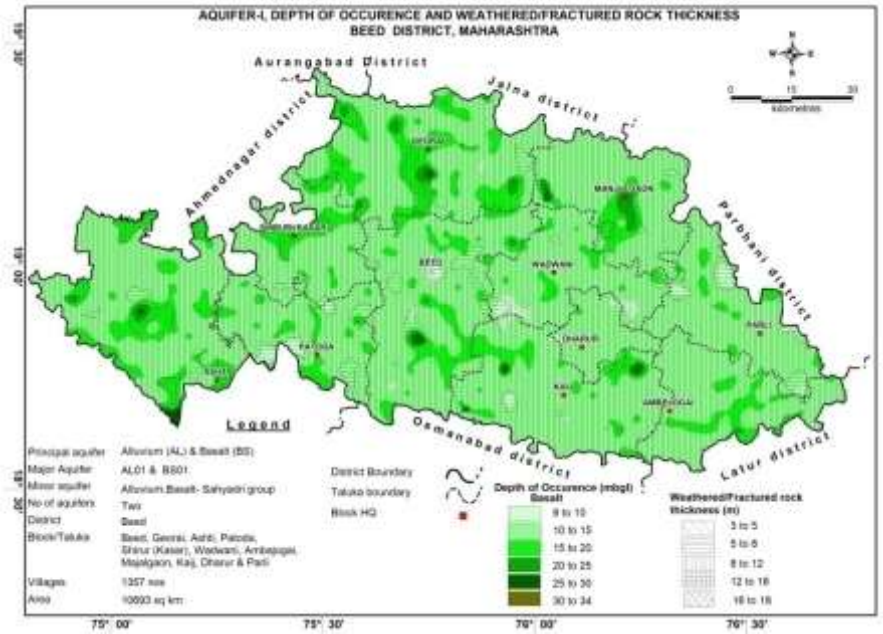


Figure 2.4: Depth of Occurrence and Granular Zone/ Fractured rock thickness-Aquifer-I

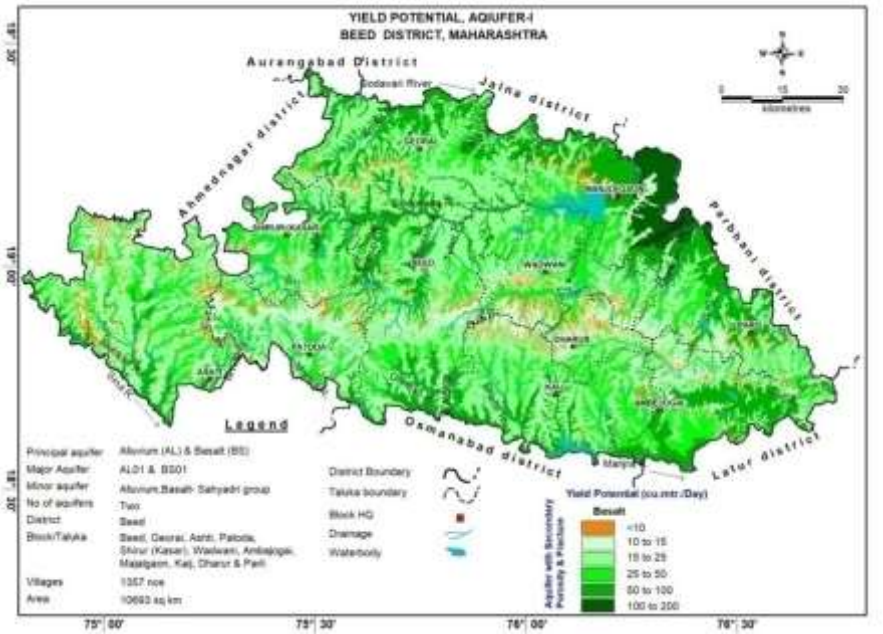


Figure 2.5: Yield Potential Aquifer-I

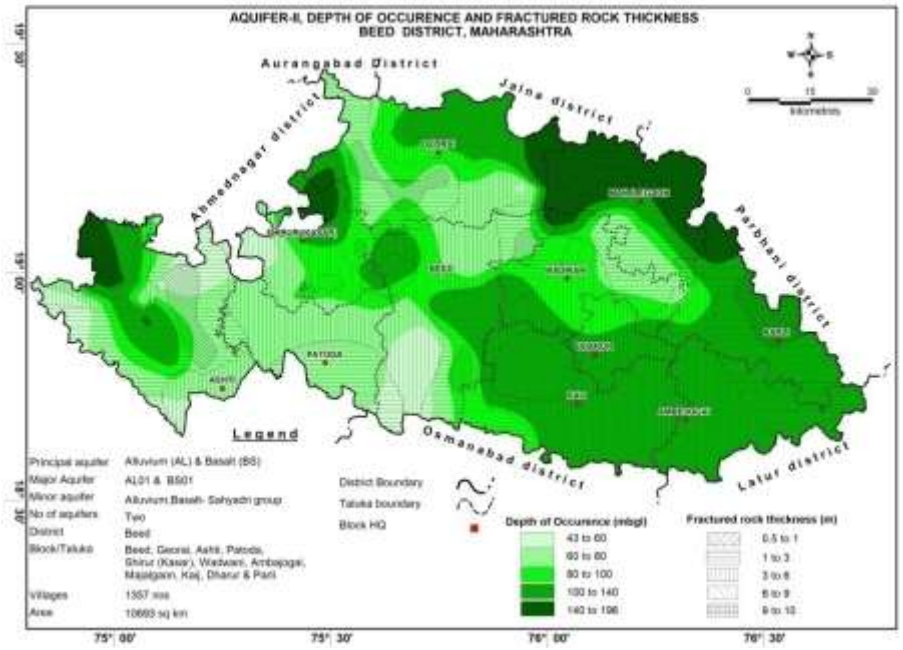


Figure 2.6: Depth of Occurrence and Fractured rock thickness-Aquifer-II

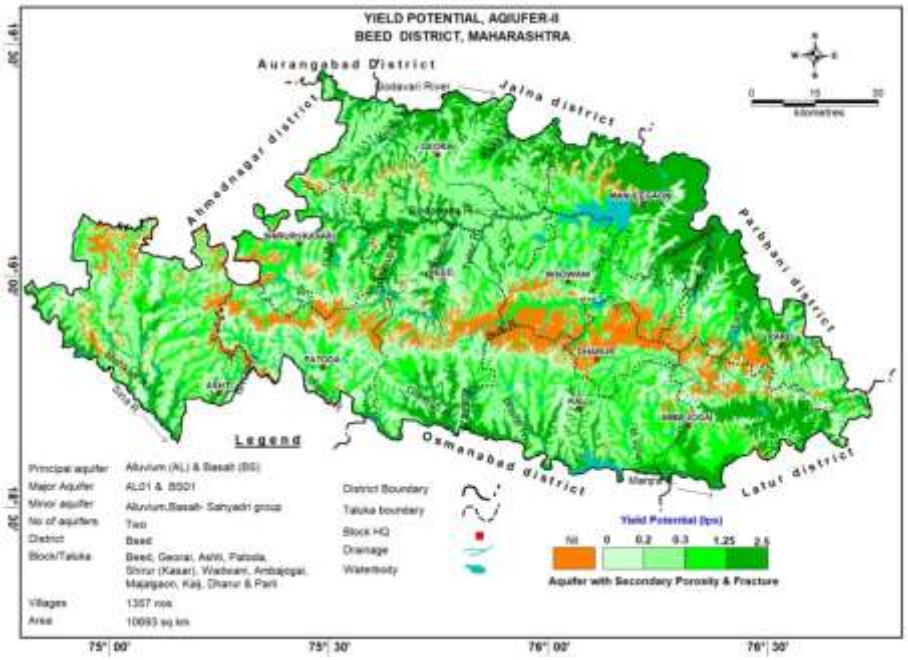


Figure 2.7: Yield Potential, Aquifer-II

2.2 Aquifer Parameters

Aquifer parameters have been obtained from ground water exploration carried out in the district as well as from the pumping tests carried out on dug wells in Basalt formation. The transmissivity of shallow basaltic aquifers in the district is generally observed to be varying from10 to 62.00 m^2/day in hard rock area (Basalt). Specific capacity of well also gives an idea about the productivity of the well and is controlled by diameter and depth. In basaltic formation the specific capacity of dug wells is generally less than 200 lpm/m of drawdown with an average of 100 lpm/m of drawdown.

2.3 3-D And 2-D Aquifer Disposition

Based on the existing data, aquifer disposition in 3D, Fence diagram, 3D Bar diagram, various hydrogeological sections have been prepared along section lines to understand the subsurface disposition of aquifer systems shown in **Fig. 2.8 to 2.13**.

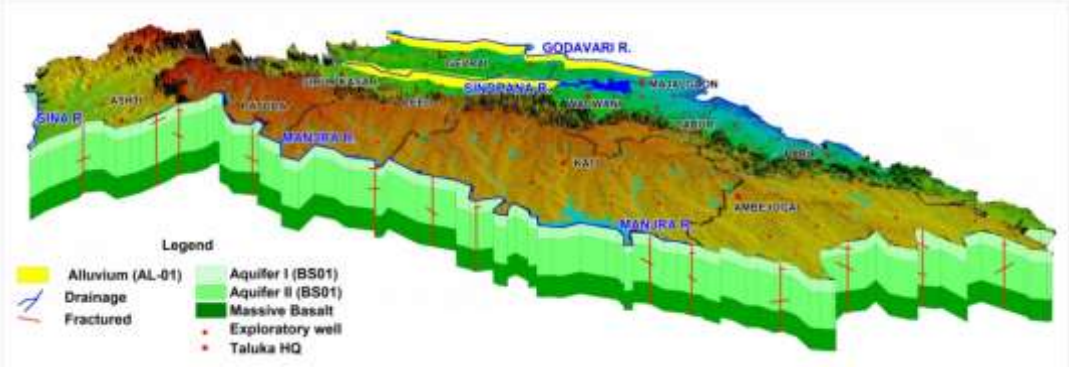


Figure 2.8: 3D Aquifer Disposition, Beed District

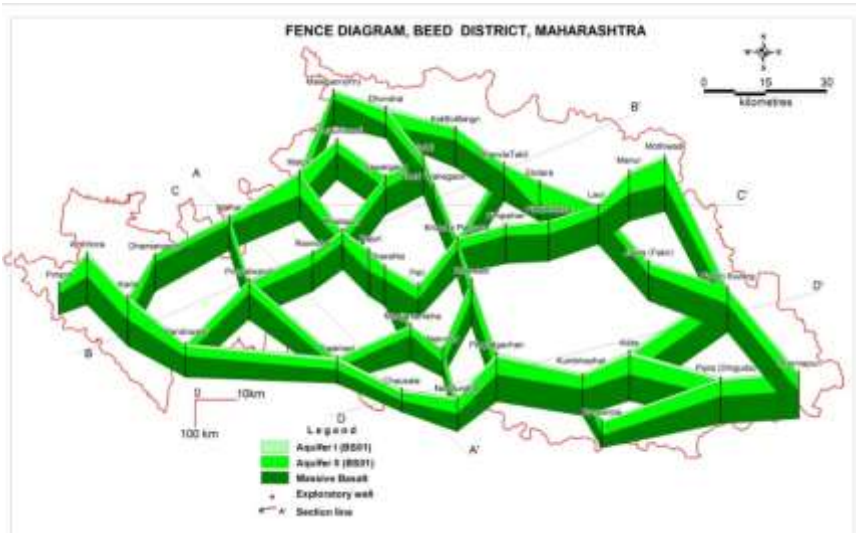


Figure 2.9: 3D Fence Diagram, Beed District

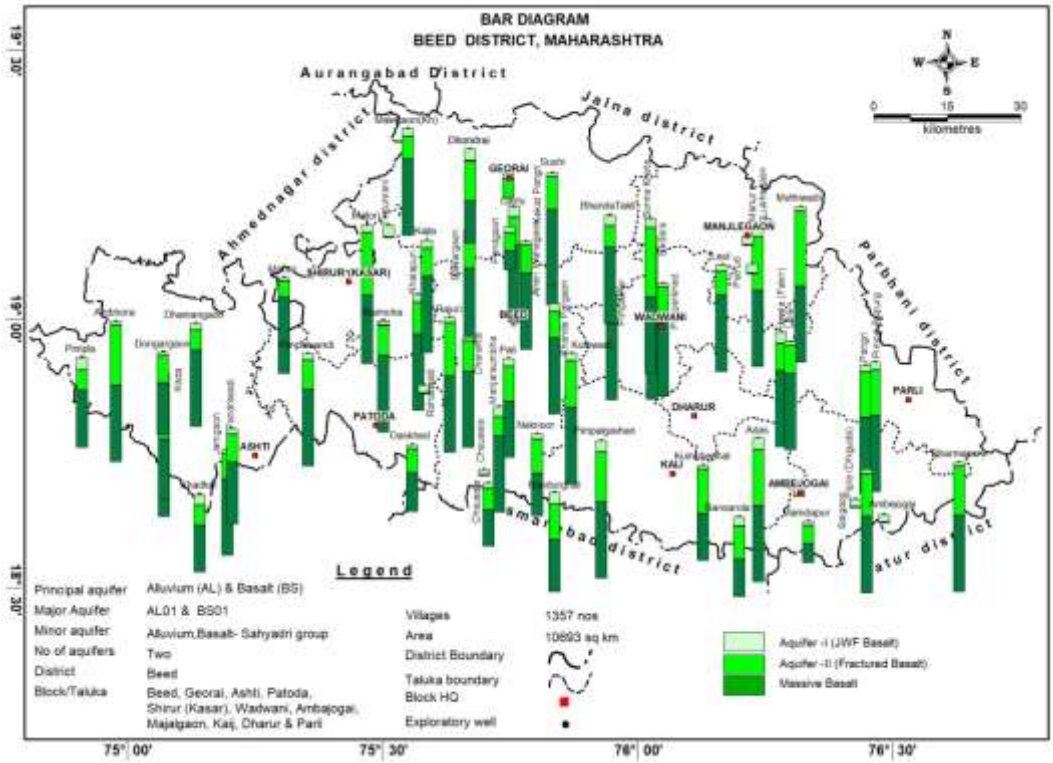


Figure 2.10: 3D Bar Diagram, Beed District

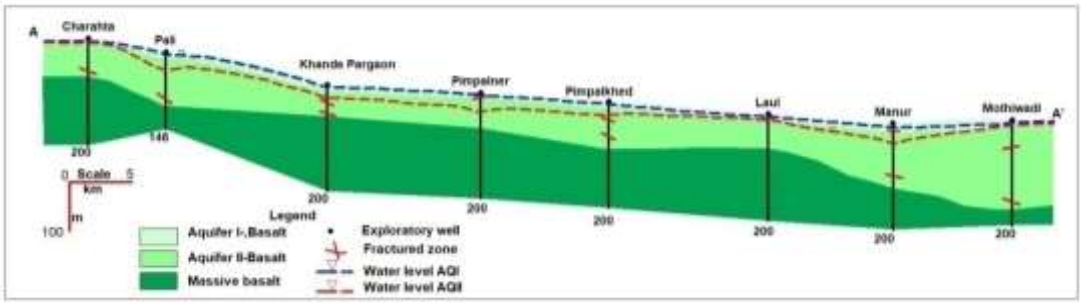


Figure 2.11: Lithological section (A-A')

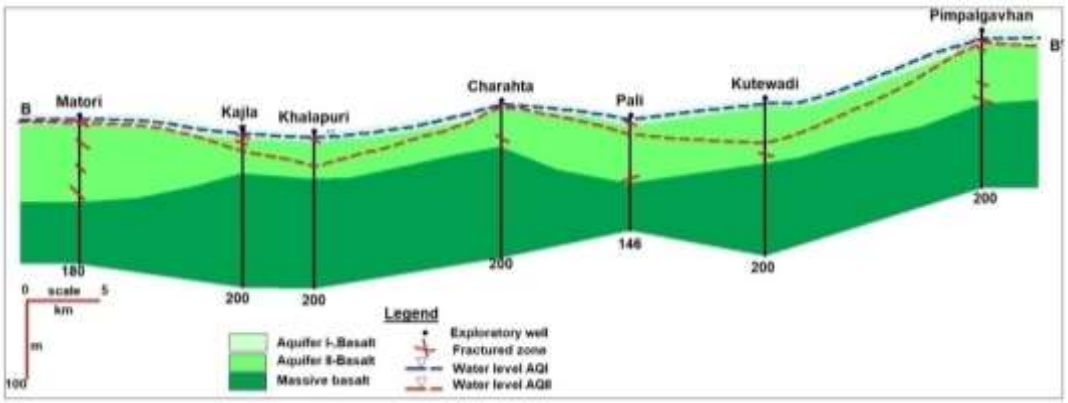


Figure 2.12: Lithological section (B-B')

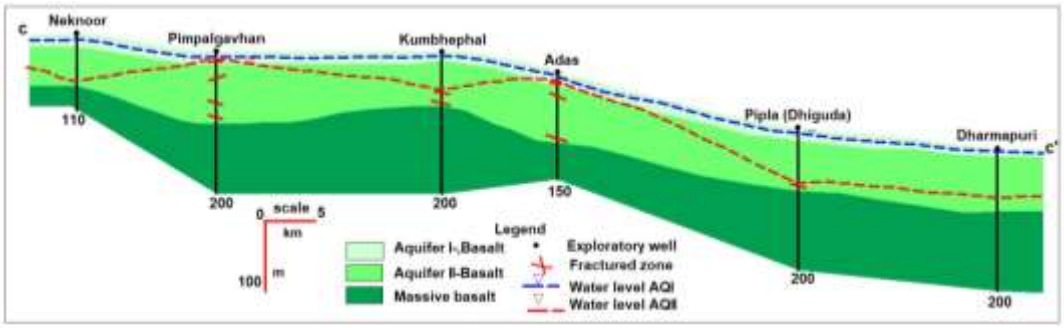


Figure 2.13: Lithological section (C-C')

3. WATER LEVEL SCENARIO

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

Central Ground Water Board periodically monitors 48 Ground Water monitoring wells in Beed district, four times a year, i.e., in May (Pre-monsoon), August, November (Post-monsoon) and January. Apart from this data, data obtained from GSDA has also been used for preparation of depth to water level maps of the district. Based on data gap analysis additional 122 Key Observation Wells (KOWs) are taken into account from GSDA to acquire micro level hydrogeological data to decipher the water level scenario, sub-surface lithological disposition and hydrogeological setup of shallow aquifer (Aquifer-I). Pre-monsoon and post monsoon water level data are given in **Annexure-III**.

The depth to water levels in Beed district during May 2019 were found ranging between 4.90 (Sonna Kotta, Wadwani block) and 24.32 mbgl (Manur, Shirur Kasarblock). Shallow water levels within 2-5 mbgl are observed in majority in all throughout the district. Water levels between 5 to10 mbgl have been observed in major part of the District. The depth to water level between 10 to 20 mbgl has been observed as isolated patches in Shirur Kasar, Georai, Majlegaon, Wadwani, Kaij, Parli, Ambejogai, Darur, Beedand Ashti blocks of Beed district. Deeper water levels of more than 20 mbgl are observed in tiny isolated patches in Shirur Kasar, Ambejogai, Darur, Beedand Ashtiblocks of the Beed district. The premonsoon depth to water level map is depicted in **Fig. 3.1.**

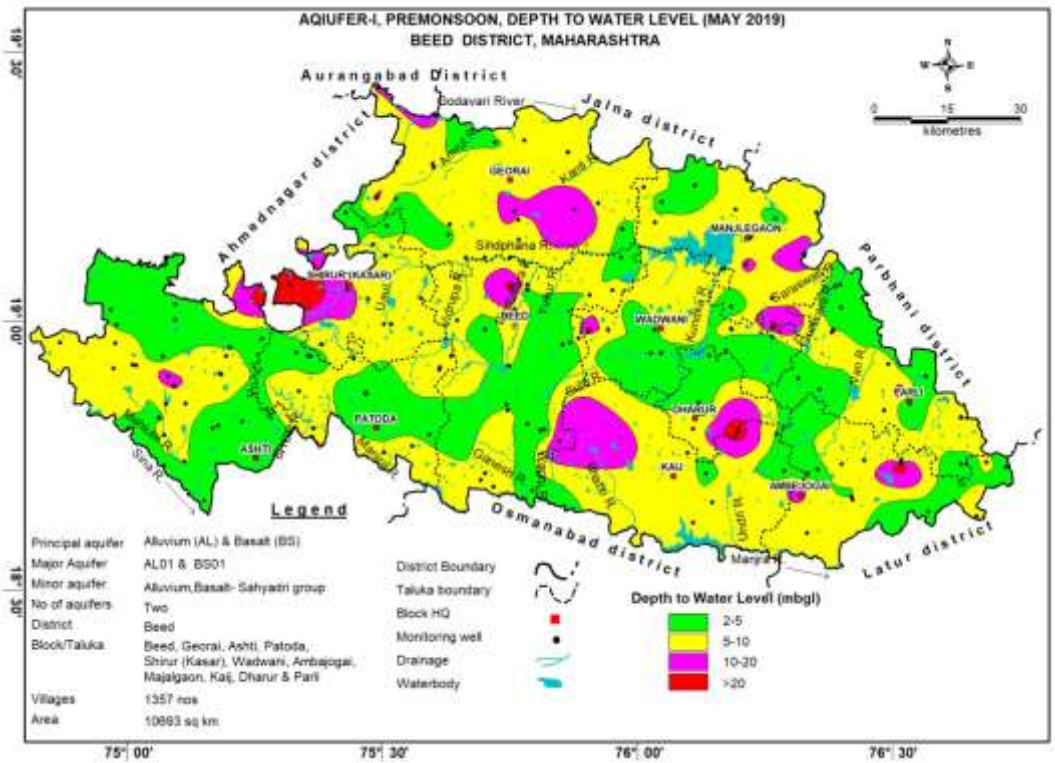


Figure 3.1 : DTWL, Shallow Aquifer (May 2019)

The depth to water levels in Beed district during Nov. 2019 were found ranging between 0.1 (Kinhi, Ashti block & Darur-1, Darur block) and 18.00 mbgl (Shirur, Shirur

Kasar block). Shallow water level less than 2 mbgl has been observed in Shirur Kasar, Georai, Majlegaon, Wadwani, Kaij, Parli, Ambejogai, Darur, Beed and Ashti blocks of Beed district; Water level between2-5 mbgl has been observed in major parts of the district in Shirur Kasar, Georai, Majlegaon, Wadwani, Kaij, Parli, Ambejogai, Darur, Beed and Ashti blocks of Beed district; Water levels between 5 and 10 mbgl are observed in isolated patches in Shirur Kasar, Ambejogai, Darur, Beed, Georai, Parli, Ambejogai, Kaij, Wadwani, Beed and Ashti blocks of the Beed district.The depth to water level between 10 to 20 mbgl has been observed in isolated patchesover the entire districtin Shirur Kasar, Ambejogai, Beed, Georai, Kaij, Beed and Ashti blocks of the Beed district. Spatial variation in post monsoon depth to water levels is shown in **Fig. 3.2.**

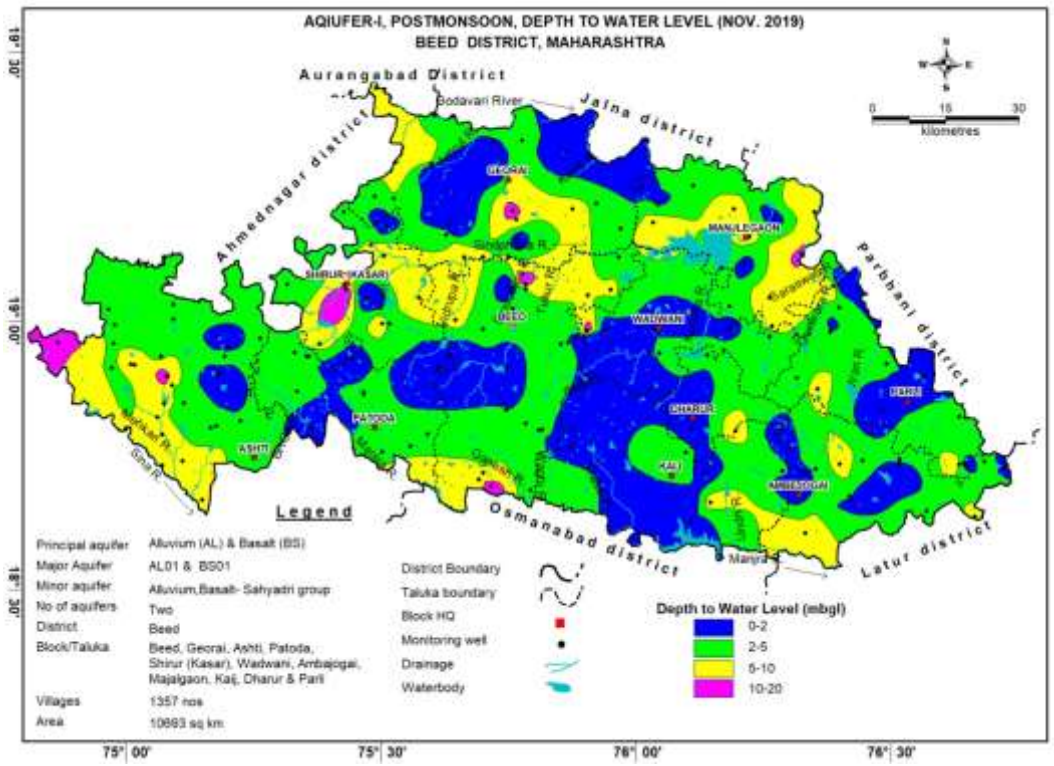


Figure 3.2: DTWL, Shallow Aquifer (Nov. 2018)

3.2 Depth to Water Level (Aquifer-Ii/ Deeper Aquifer)

Total 52 exploratory wells', 11 Observation well and 5 Peizometer's data has been used for preparation of depth to water level maps of the district. The pre-monsoon (May 2019) depth to water level in Beed District ranges from 3.11 (Malegaon Kh, Georai block) to 90.05 mbgl (Dharmapuri, Parli block). The depth to water level < 10 mbgl is seen in Parts of Georai Block along the northern boundary of block and as isolated very small patch in Beed Block. BlocksThe depth to water level between 10 and 20 mbgl has been observed in parts of Georai, Shirur Kasar and Beed blocks of the district. Water level between 20 and 30 mbgl has been observed in major parts of Ashti, Patoda, Majegaon, Shirur Kasar and Beed blocks. The depth to water level between 30 and 40 mbgl has been observed in parts of Ashti, Patoda, Majegaon, Shirur Kasar and Beed blocks. The deeper water level between 40 to 50 mbgl has been observed in Ashti, Patoda, Majegaon, Beed, Darur and Wadwani blocks. The deepest

water level (>50 mbgl) has been observed in parts of Parli, Ambejogai, Darur, Wadwani, Kaij, Patoda, Beed, Georai, Shirur Kasar blocks. This may be due to low potential of the aquifers in the district. The pre monsoon depth to water level for Aquifer -II is given in **Fig. 3.3.**

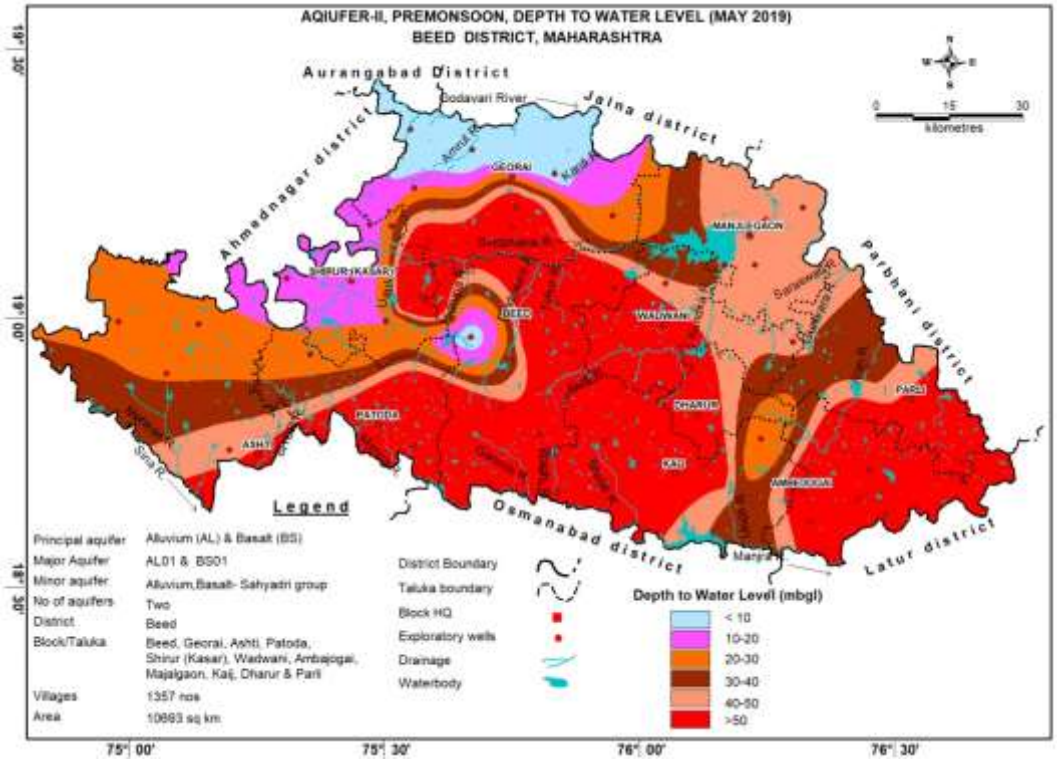


Figure 3.3: DTWL, Deeper Aquifer/Aquifer II (May 2019)

The post-monsoon (Nov. 2019) depth to water level in the district ranges from 3.40 (Kada, Beed block) to 60.00 mbgl (Paulachiwadi, Georai block). Depth to water level < 5 mbgl is observed in parts of Ashti, Shirur Kasar, Georai, Kaij & Ambejogai Blocks. Depth to water level between 5 and 10 mbgl are observed in the major parts of Patoda, Beed Majlegaon, Ashti, Shirur Kasar, Georai, Kaij and Ambejogai Blocks. The major parts of the district show water level between 10 and 20 mbgl in parts of Majlegaon, Beed, Kaij, Darur, Parli, Kaij, Georai, Ashti and Ambejogai Blocks. Water level between 20 and 30 mbgl are observed as isolated patches in Georai, Parli, Ambejogai, Wadwani and Beed blocks.The water level between 30 and 40 mbgl are observed in isolated parts of Wadwani, Beed, Georai and Shirur Kasar blocks. The deepest water level > 40 mbgl is seen in parts of Wadwani, Beed and Georai Blocks of the district. The post monsoon depth to water level for Aquifer- II is given in **Fig. 3.4.**

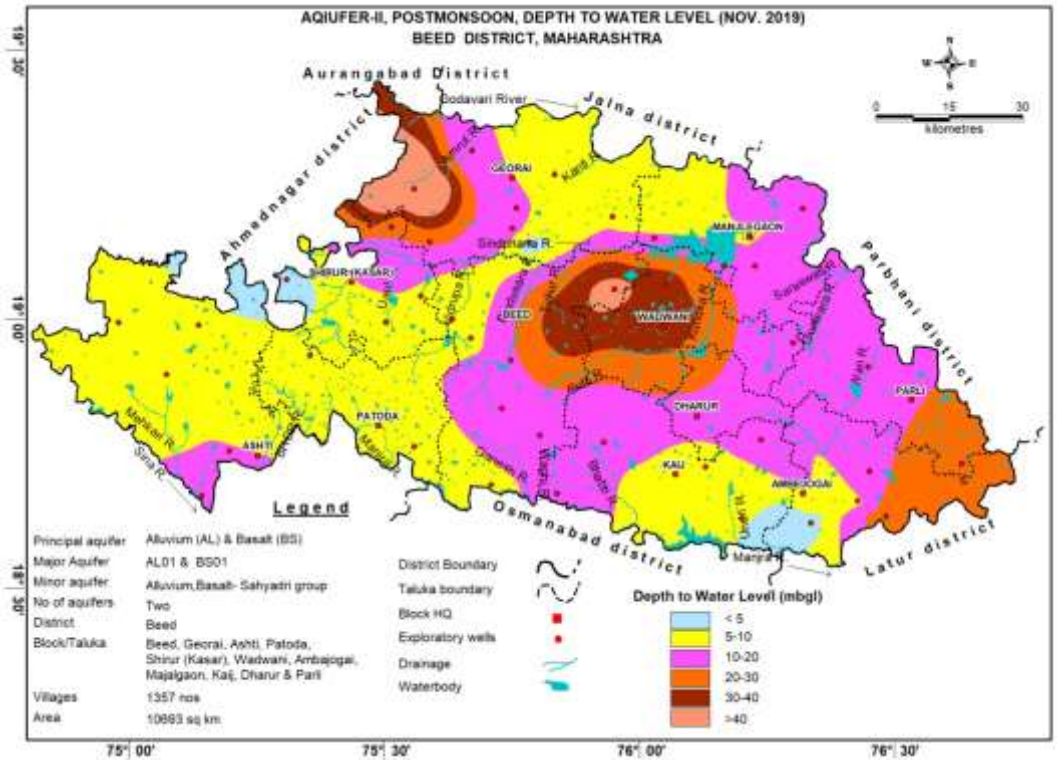


Figure 3.4: DTWL, Deeper Aquifer/Aquifer II (Nov. 2019)

3.3 Water Level Trend (2010-2019)

During pre-monsoon period, rising water level trend has been recorded at 11 stations ranging from 0.03 (Talni, Ambejogai block) to 0.41 m/year (Waghluj, Ashti block) while falling trend was observed in 19 stations varying from 0.052 (Patoda, Patoda block) to 1.51 m/year (Manur, Shirur Kasar block).

During pre-monsoon period, declining water level trend 0.00-0.20 m/year is observed in major part of the district in all blocks covering 35% of the area. Significant declining water level trend 0.20-0.40 m/year has been observed in major part of the district in all blocks covering45%of the area. Significant declining water level trend 0.40-0.60 m/year has been observed in parts of Ashti, Shirur Kasar, Georai, Manjlegaon, Kaij, Ambejogai and Parli blocks of the Beed District. Significant declining water level trend>0.60 m/year is observed in parts of Kaij, Manjalgaon, Wadwani, Shirur Kasar and Ashti blocks.Rise in water level trend between 0.00-0.20 m/year has been observed in parts of Ashti, Georai, Beed, Manjalgaon, Parli and Ambejogai blocks.Rise in water level trend between 0.20-0.40 m/year has been observed in parts of Ashti, Georai, Beed, Manjalgaon, Parli and Ambejogai blocks. Significant Rise in water level trend between 0.40-0.60 m/year has been observed in parts of Manjalgaon blocks **(Fig.3.5)**

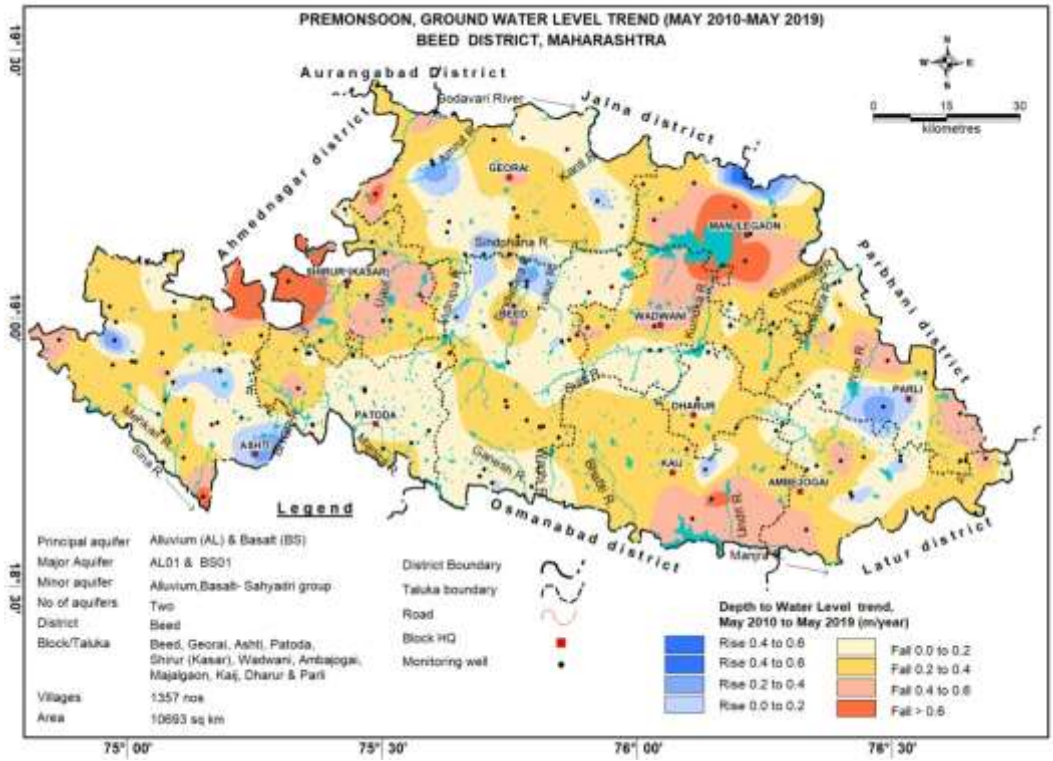


Figure 3.5: Pre-monsoon Decadal Trend (2010-19)

During post monsoon period, rise in water level trend has been recorded at 16 stations and it ranges between 0.00745 m/year (Patoda, Patoda block) to 1.84m/year (Ghosapuri, Beed block) while falling trend was observed at 23 stations varying from 0.0081m/year (Kumbhephal, Kaij block) to 0.625 m/year (Khadkhat, Ashti block).

Rising water level trend has been observed 0.00-0.60 m/year has been observed in Ashti Beed, Georai, Kaij, Wadwani, Darur blocks. Significant decline, more than 0.20 m/year has been observed 69 % of the area covering major parts of all the blocks. (Fig 3.6) These declines may be due to the exploitation of ground water or low and erratic rainfall received in these areas. Water level trend data (2010-19) of (GWM wells) observation wells of CGWB is given in Annexure-IV.

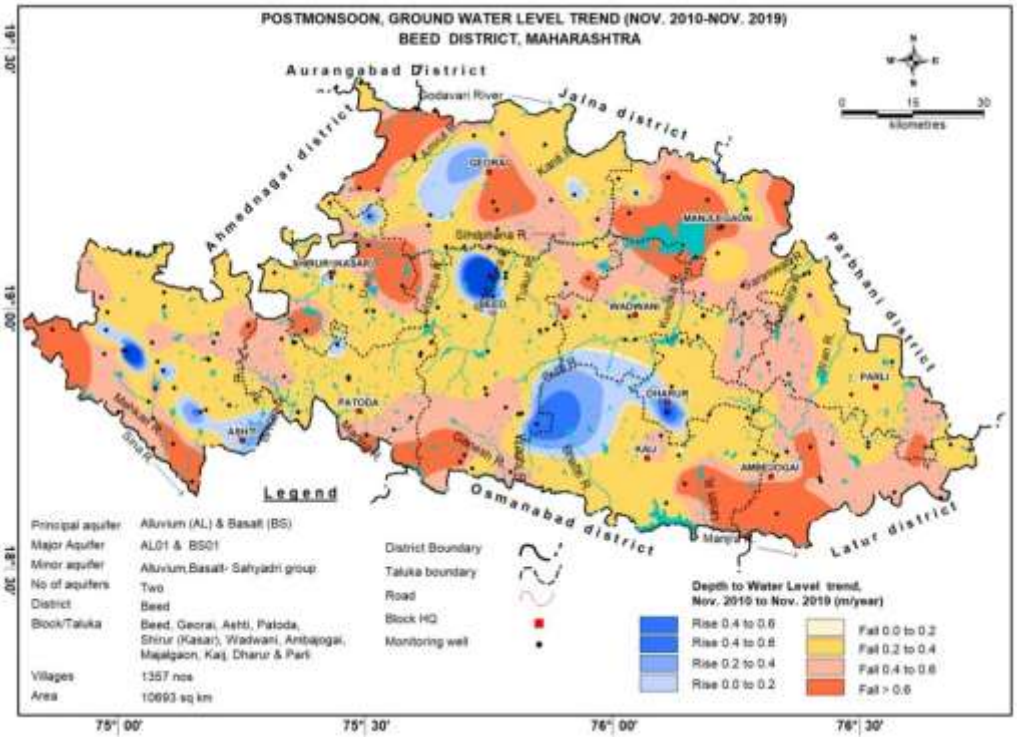
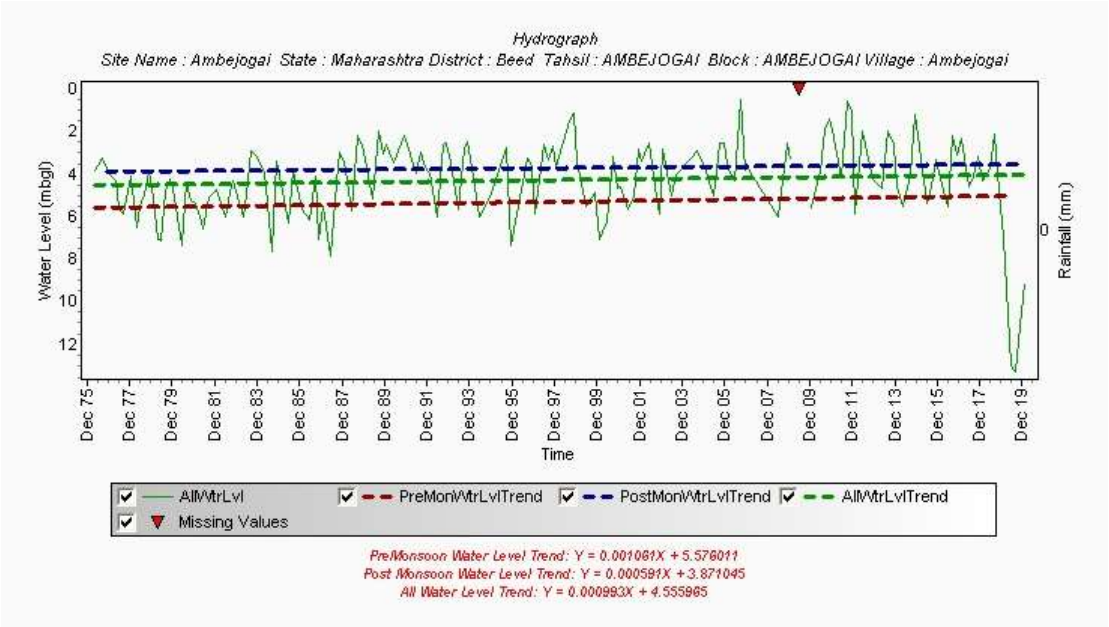


Figure 3.6 : Postmonsoon Decadal Trend (2010-19)

3.4 Hydrograph Analysis

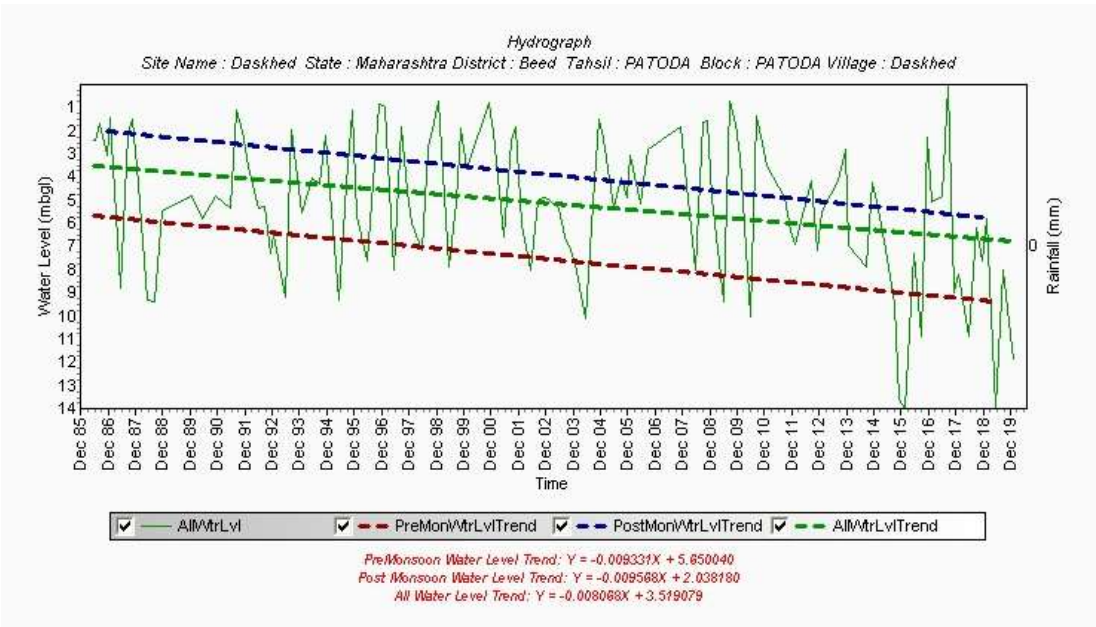
The variation in short term and long-term water level trends may be due to variation in natural recharge due to rainfall and withdrawal of groundwater for various agricultural activities, domestic requirements, and industrial needs. The analysis of hydrographs shows that the annual rising limbs in hydrographs 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. However, continuous increase in the groundwater draft is indicated by the recessionary limb. The figure 3.7 shows selected hydrographs (time series) of water levels.

Hydrograph (2010-19), village Ambjogai , Ambajogai Block, Beed District



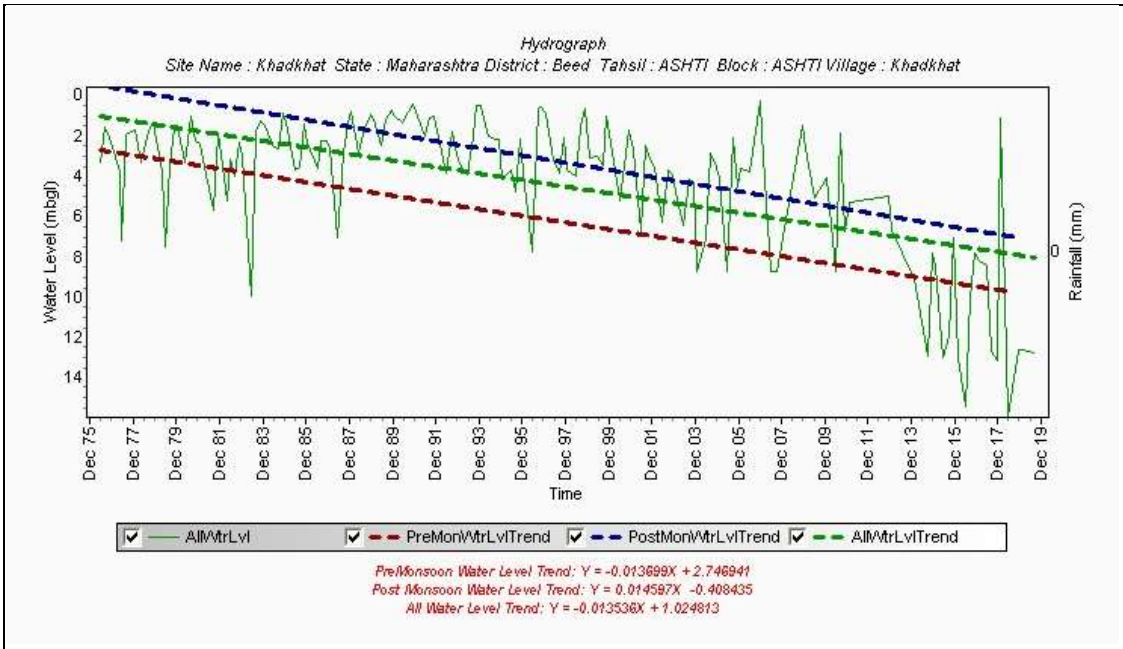
Pre monsoon Water level trend showing rising trend @ 0.012 m/year and post monsoon Water level trend showing Rising trend @ 0.007 m/ year.

Hydrograph (2010-19), village Dakhed , Patoda Block, Beed District



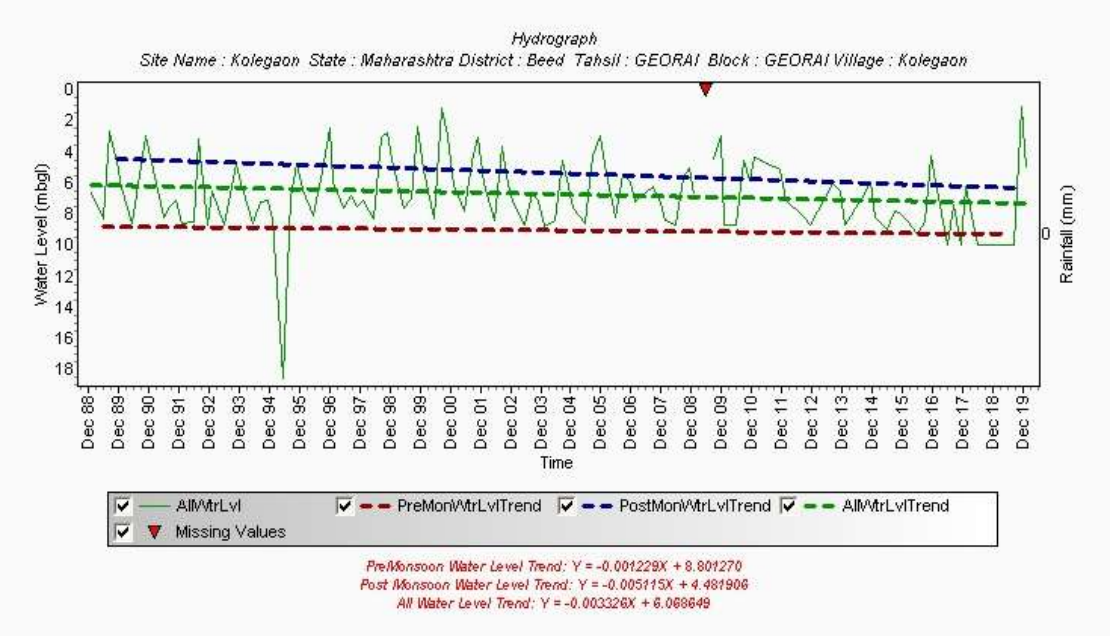
Pre monsoon depth to water level trend showing declining trend @ 0.11 m/year and post monsoon Water level trend showing declining trend @ 0.11 m/ year .

Hydrograph (1975-2019), villageKhadkat,Ashti Block, Beed District



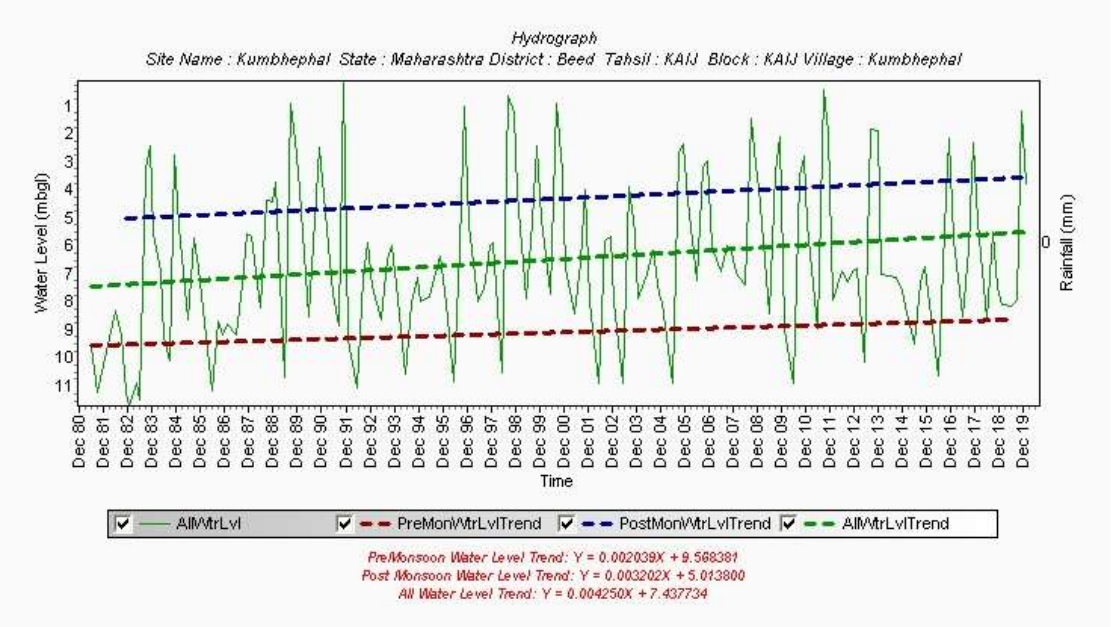
Pre monsoon Water level trend showing declining trend @ 0.16 m/year and post monsoon Water level trend showing Rising trend @ 0.17 m/ year

Hydrograph (2010-19), village Kolegaon ,Georai, Beed Block, Beed District



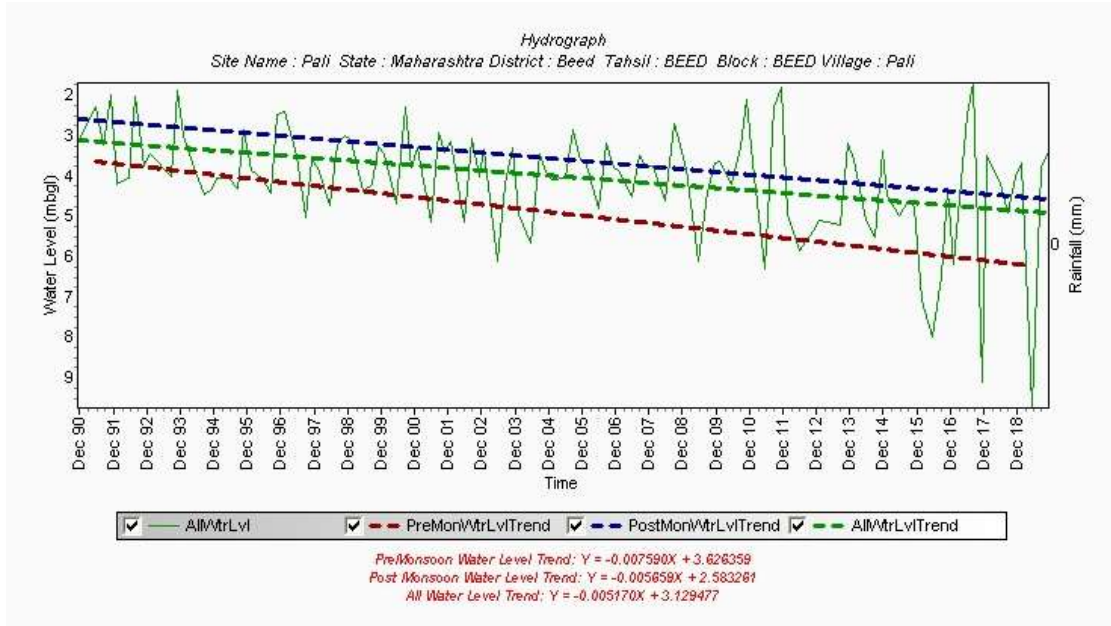
Pre monsoon Water level trend showing declining trend @ 0.014 m/year and post monsoon Water level trend showing declining trend @ 0.061 m/ year.

Hydrograph (2010-19), village Kumbhephal, Kaij Block, Beed District



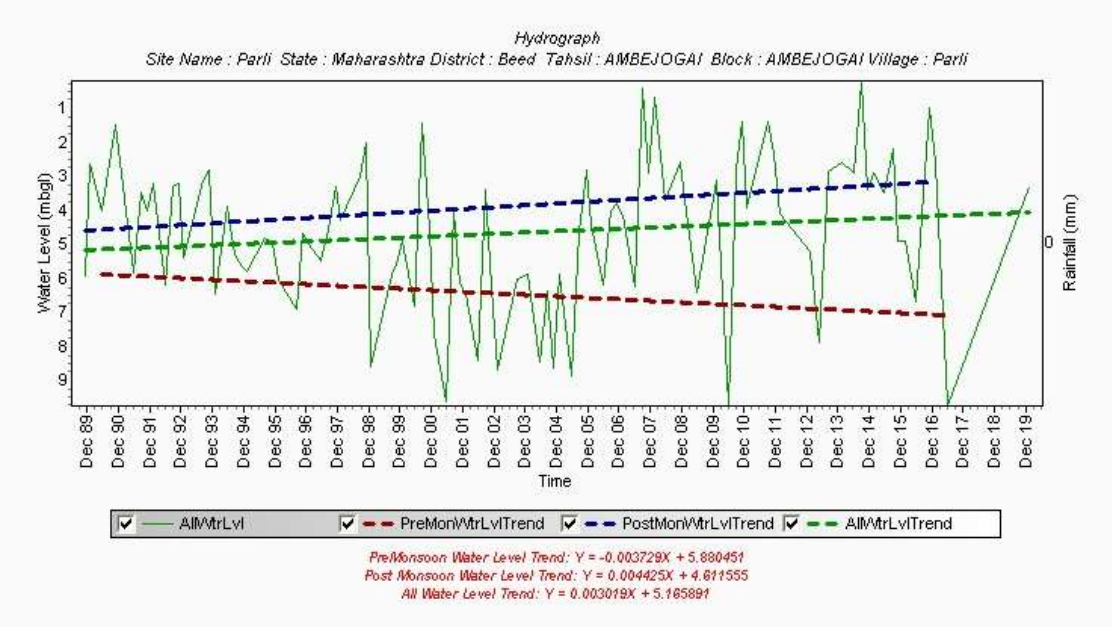
Pre monsoon Water level trend showing Rising trend @ 0.050 m/year and post monsoon Water level trend showing Rising trend @ 0.038 m/ year .

Hydrograph (2010-19), village Pali, Beed, Block, Beed District



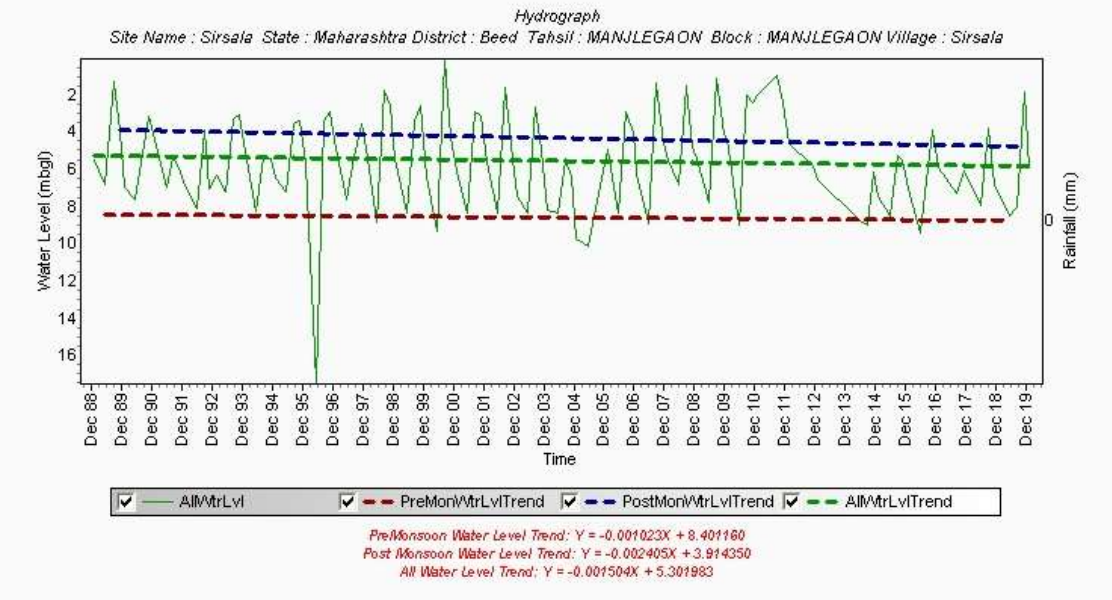
Pre monsoon Water level trend showing Falling trend @ 0.091 m/year and post monsoon Water level trend showing falling trend @ 0.067 m/ year .

Hydrograph (2010-19), village Parli Ambajogai , Beed, Block, Beed District



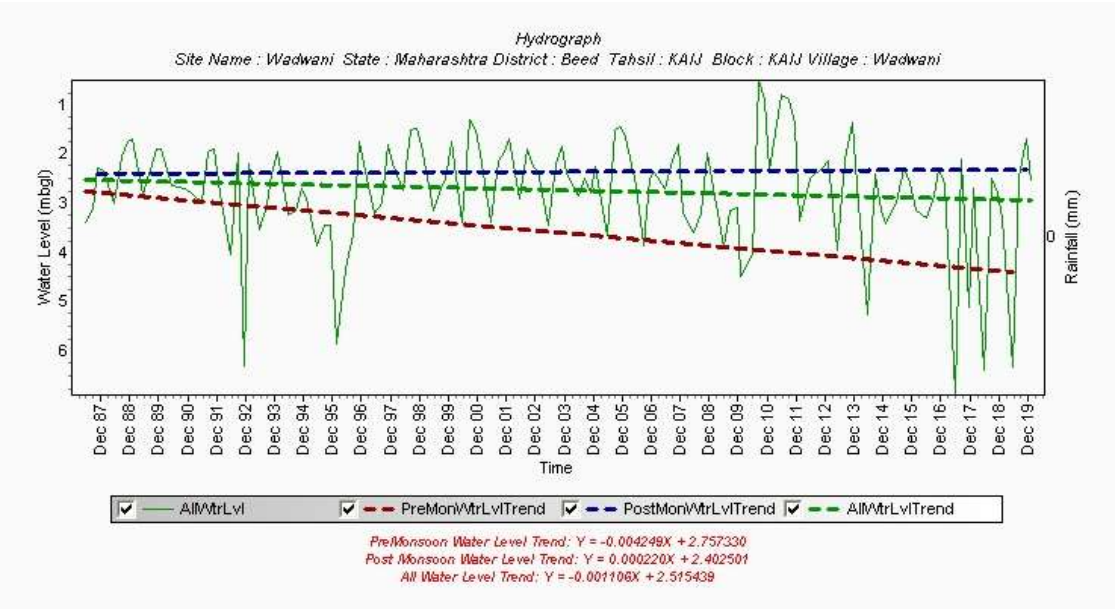
Pre monsoon Water level trend showing Falling trend @ 0.044 m/year and post monsoon Water level trend showing Rising trend @ 0..05 m/ year .

Hydrograph (2010-19), village Sirsala Manjhalgaon , Beed, Block, Beed District



Pre monsoon Water level trend showing Falling trend @ 0.012m/year and post monsoon Water level trend showing falling trend @ 0.028 m/ year .

Hydrograph (2010-19), village Wadwani Wadwani , Beed, Block, Beed District



Pre monsoon Water level trend showing Falling trend @ 0.05 m/year and post monsoon Water level trend showing Rising trend @ 0.002 m/ year .

Figure 3.7: Hydrographs of water level monitoring stations of different Blocks of Beed district (2010-19)

4. GROUND WATER QUALITY

Ground 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 and identified additional locations. Ground water quality data of 174 monitoring wells of CGWB and GSDA representing shallow aquifer have been utilised to decipher the quality scenario of shallow aquifer. 119 exploratory wells- tubewells/borewells data of CGWB and GSDA representing deeper aquifer have been utilised to decipher the quality scenario of deeper aquifer. The aquifer wise concentrations of different chemical constituents present in ground water are given in Table 4.1. The details of chemical analysis are given in Annexure V and VI.

Table 4.1: Aquifer wise ranges of chemical constituents in Beed district

Constituents	Shallow aquifer		Deeper aquifer	
	Min	Max	Min	Max
pH	7.2	10.0	7.1	9.52
EC	248	7517	260	2990
TDS	131	3960	125	2208
TH	51	2478	35	1340
Calcium	10	368	2	445
Magnesium	6	426	1.22	89
Potassium	0.04	142	0.3	35
Sodium	3.48	536	8	450
Bicarbonate	45	2688	18.3	780
Chloride	11	944	7	676
Sulphate	0.50	232	4	821
Nitrate	BDL	380	BDL	330
Fluoride	0.01	3.01	BDL	4.4
Iron	-	-	BDL	0.5

***BDL- below detection limit**

4.1 Electrical Conductivity (EC)

Distribution of Electrical Conductivity in Shallow Aquifer:

The EC in shallow aquifer varies between 223 (Dabi, Parli block) and 3738µS/cm (Waghbet, Parli block). Out of 174 samples collected from dug wells, 11 samples are having EC more than 2250 µS/cm. EC >2250 µS/cm has been observed in 320.79 sq. km. area as Isolated patches in parts of Ashti, Shirur Kasar, Beed, darur Wadwani, Kaij block and Parli block. The ground water is potable in major part of district. The distribution of electrical conductivity in shallow aquifers is shown in **Fig. 4.1** and analytical data is presented in Table 4.2.

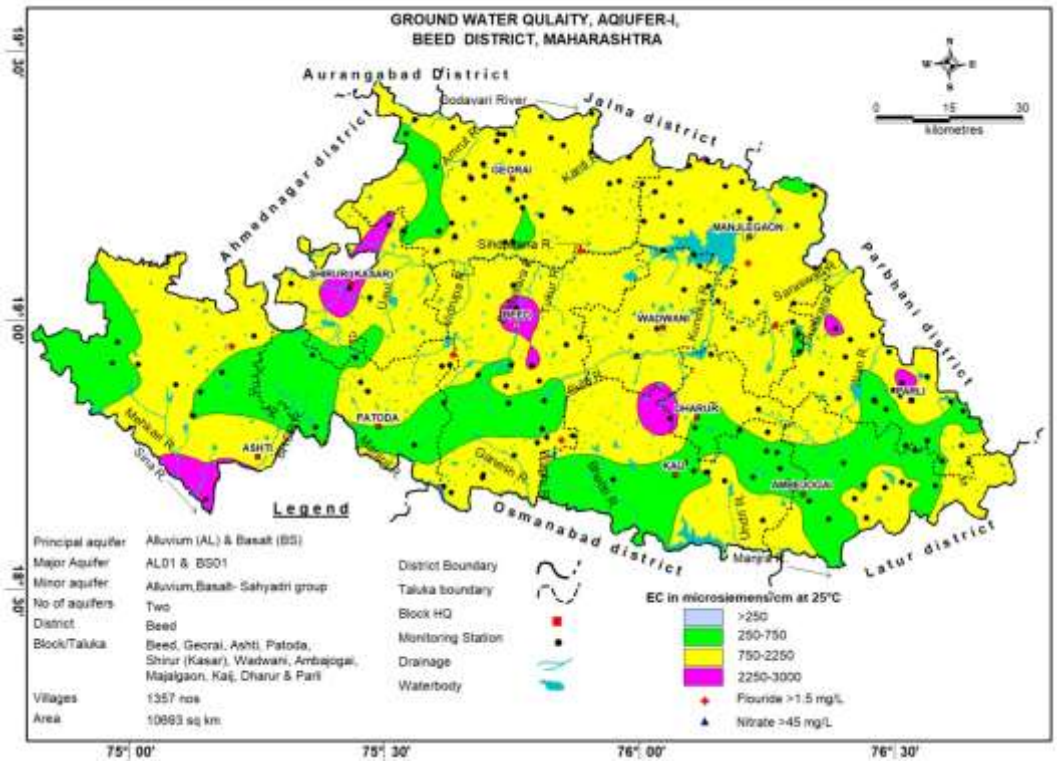
Distribution of Electrical Conductivity in Deeper Aquifer:

The EC in deep aquifer varies between 355 (Pimpla, Ashti block) and 2540µS/cm (Dondrai, Georaiblock). Out of 119 samples collected from tube wells/bore wells, only 2 samples are having EC more than 2250 µS/cm. The ground water is

potable in major parts of the district. The distribution of electrical conductivity in deeper aquifers is shown in **Fig. 4.2** and analytical data is presented in Table 4.2.

Table 4.2: Aquifer wise Electrical conductivity analytical data

S.No.	EC	shallow aquifer		Deeper Aquifer	
	(µS/cm)	No. of samples	% of samples	No. of samples	% of samples
1	< 250	1	0.57	0	0
2	>250-750	48	27.58	38	31.93
3	>750-2250	114	65.51	79	66.38
4	>2250-3000	8	4.59	2	1.68
5	>-3000-5000	3	1.72	0	0
6	>5000	0	0	0	0
Total samples		174	100	119	100



(EC >2250 µS/cm in 320.79 sq. km. area)

Figure 4.1: Ground Water Quality, Aquifer-I

Nitrate:

Nitrogen in the form of dissolved nitrate, is a nutrient for vegetation and an essential element to all life. The major contribution in ground water is from sewage, waste disposal, nitrate fertilizer and decaying of organic matter. From shallow aquifer, 174 samples were analysed; out of these 4 water samples show the nitrate concentrations exceeding the desirable limit of 45 mg/l. In Beed district nitrate concentration varies between 0.50 mg/l (Chumbali, Patoda & Bhatumba, Kaij) to 51.20

mg/l (Bhojgaon, Georai block). As per BIS (2012) the desirable limit is 45 mg/l. The high concentration of Nitrate may be due to domestic waste and sewage effected pollution in the urban and rural parts of district.

Table 4.3: Concentration of NO3 above 45 ppm and their percentage Shallow aquifer

Village	Taluka	NO3 (ppm)	Total Samples collected
Georai	Bhojgaon	51	170 samples showing values less then permissible limit, whereas 04 sample shows value between 46 to 51 ppm,
Wadwani	Khadki	49	
Wadwani	Pimplettaka	46	
Georai	Dharwanta	46	
Percentage of sample above Permissible limit %	2.29	04	174

Table 4.4: Concentration of NO3 Shallow aquifer and deeper aquifer

S .No.	NO3	Shallow aquifer		Deeper Aquifer	
	45 ppm)	No. of samples	% of samples	No. of samples	% of samples
1	<45	170	97.70	79	66.38
2	>45	4	2.29	40	33.61
3	Total	174	100	119	100

In deeper aquifer, 119 wells were analysed, out of these 40 water samples show nitrate concentration exceeding the desirable limit of 45 mg/l. In deeper Aquifer nitrate concentration ranges from 0.00 mg/l (Pimpla, Ashti Block) to 296 mg/l (Kekatpangri and Aherwahegaon Georai block). The deeper aquifer is also affected by nitrate contamination; it may be due to percolation of nitrate contaminants from the ground surface as there are no other reasons for nitrate contamination in deeper aquifers. Aquifer wise nitrate concentration is given in Table 4.3.

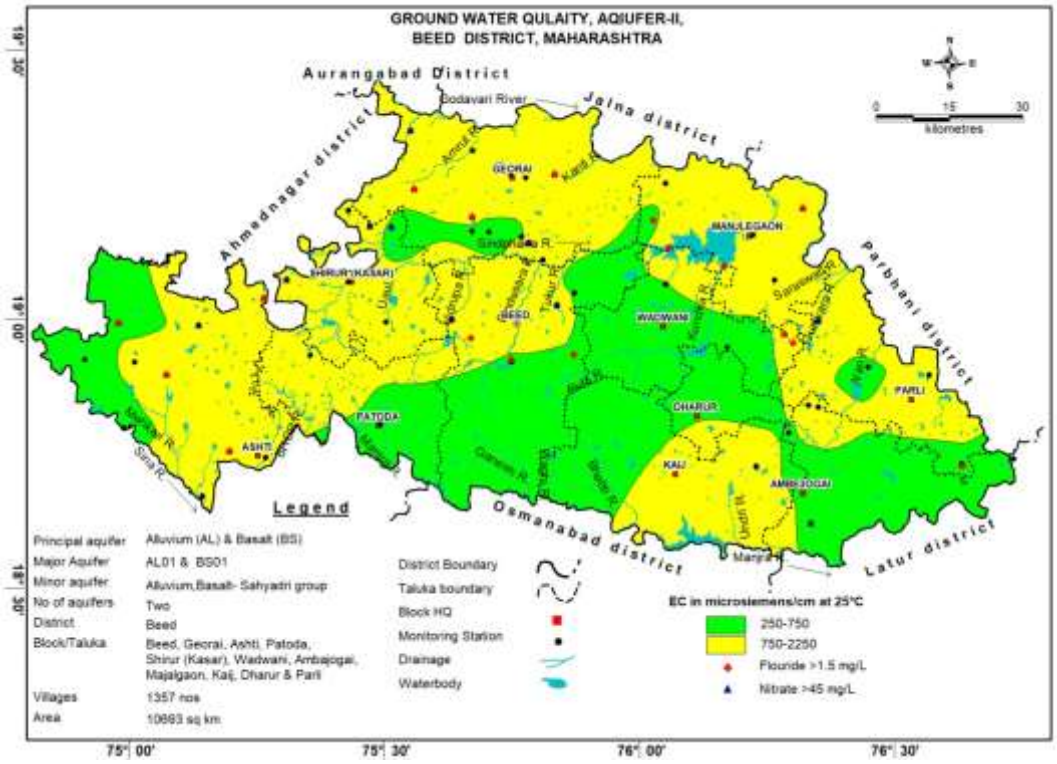


Figure 4.2: Ground Water Quality, Aquifer-II

Fluoride:

In shallow aquifer, concentration of fluoride ranges from 0.003 mg/l (Sadola, Kaij Block) to 4.36 mg/l (Nandur Phata, Beed Block). Out of 174 samples analyzed, only 6 samples show fluoride concentration more than 1.5 mg/l. In Deeper Aquifer, Concentration of fluoride ranges from 0.00 mg/l (Georai and Dondrai, Georai Block) to17.60 mg/l (Kutewadi, Beed Block). Out of 119 samples analyzed, only 33 samples show fluoride concentration more than 1.5 mg/l. The Fluoride Concentration may be due to the geogenic reasons. Aquifer wise fluoride concentration is given in Table 4.5.

Table 4.5: Aquifer wise Fluoride concentration

S. No.	F	Shallow aquifer		Deeper Aquifer	
	1.5 ppm	No. of samples	% of samples	No. of samples	% of samples
1	<1.5	168	96.55	86	72.26
2	>1.5	6	3.44	33	27.73
3	Total	174	100	119	100

4.2 Suitability of Ground Water for Drinking Purpose

In shallow aquifer, 0.57 % samples are having TDS more than maximum permissible limit (MPL) and 37.93 % 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 1.15% of samples have pH values > MPL; 8.62% of samples have TDS values > MPL;0.57% of samples have Ca values > MPL; 4.02% of samples have Mg values > MPL; 2.30% of samples have NO_3values > MPL; 3.45 % of samples have values > MPL; the parameters

like, $SO_4$and Cl are within maximum permissible limit. The water from such area is not fit for drinking purpose if directly consumed without treatment. Concentration of Chemical constituents in shallow Aquifer is given in **Table 4.6.**

Table 4.6: 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	-	174	-	-	172	98.85	2	1.15
TDS	500	2000	174	107	61.49	66	37.93	1	0.57
TH	300	600	174	86	49.43	73	41.95	15	8.62
Ca (mg/L)	75	200	174	143	82.18	30	17.24	1	0.57
Mg (mg/L)	30	100	174	71	40.80	64	36.78	7	4.02
Cl (mg/L)	250	1000	174	159	91.38	15	8.62	0	0.00
SO_4 (mg/L)	200	400	174	173	99.43	1	0.57	0	0.00
NO_3 (mg/L)	45	No relaxation	174	170	97.70	0	0.00	4	2.30
F(mg/L)	1.50	No relaxation	174	168	96.55	0	0.00	6	3.45

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

In Deeper aquifer, no samples are having TDS more than maximum permissible limit (MPL) and 57.14 % 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 9.24% of samples have pH values > MPL; 0% of samples have TDS values > MPL; 0.84% of samples have Ca values > MPL; 0% of samples have Mg values > MPL; 33.61% of samples have NO3 values > MPL; 27.73 % of samples have F values > MPL; 9.24% of samples have Cl values > MPL; 2.52% of samples have SO4 values > MPL. Concentration of Chemical constituents in Deeper Aquifer is given in **Table 4.7.**

Table 4.7: 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	-	119	-	-	108	90.76	11	9.24
TDS	500	2000	119	51	42.86	68	57.14	0	0.00
TH	300	600	119	74	62.18	19	15.97	5	4.20
Ca (mg/L)	75	200	119	143	120.17	30	25.21	1	0.84
Mg (mg/L)	30	100	119	119	100.00	0	0.00	0	0.00
Cl (mg/L)	250	1000	119	77	64.71	31	26.05	11	9.24

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	%
SO4 (mg/L)	200	400	119	97	81.51	19	15.97	3	2.52
NO3 (mg/L)	45	No relaxation	119	78	65.55	0	0.00	40	33.61
F (mg/L)	1	1.5	119	51	42.86	30	25.21	33	27.73

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

4.3 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 Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the most important quality criteria, which assess the water quality and its suitability for irrigation.

Electrical Conductivity (EC)

The concentration 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 4.8 and details are as follows: -

Low Salinity Water (EC: < 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 4.8 Classification of Ground water for Irrigation based on EC values.

S. No	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	1	0.57	0	0
2	Medium Salinity Water	>250-750	48	27.57	38	31.93
3	High Salinity Water	>750-2250	114	65.71	79	66.38
4	Very High Salinity	> 2250	11	6.32	2	1.68

	Water					
Total			174	100	119	100

In shallow aquifer, maximum numbers of samples fall under the category of medium (48 samples) to high (114 samples) salinity type of water. In deeper aquifer, maximum numbers of samples fall under the category of medium (38 samples) to high (79 samples) salinity type of water. The areas where very high salinity prevails (>2250 µS/cm) ground water can be used for irrigation for very high salt tolerant crops and with proper soil and crop management practices.

Sodium Adsorption Ratio (SAR)

Excess of sodium in water render it unsuitable for irrigation on soil containing exchangeable Calcium and Magnesium ions. Soil containing exchangeable Calcium and Magnesium takes up sodium of irrigation water in exchange for Calcium and Magnesium, 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.

In shallow aquifer, out of 47 samples (CGWB) analysed and all samples are having SAR value less than 10. In deeper aquifer, out of 119 samples analysed and all samples are having SAR value less than 10. The classification of ground water samples based on SAR values for its suitability for irrigation purpose is shown in Table 4.9.

Table 4.9: Classification of Ground water for Irrigation based on SAR values.

Characteristics	Quality	SAR value							
	Total Number of GW samples	< 10		10-18		18-26		> 26	
		Good		Good to Permissible		Doubtful		Bad (Unsuitable)	
		No	%	No	%	No	%	No	%
Shallow Aquifer	47	47	100	-	-	-	-	-	-
Deeper Aquifer	119	119	100	-	-	-	-	-	-
Total	166	166	100	-	-	-	-	-	-

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 4.10.

Table 4.10: 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	%	No	%	No	%
Shallow Aquifer	47	35	77.77	12	22.22	-	-
Deeper Aquifer	119	119	100	-	-	-	-
Total	166	154	92.77	12	0.72	-	-

In shallow aquifer, it is observed that out of 47 samples (CGWB), 12 sample shows RSC values more than 1.25 meq/L indicating that the ground water of the area is not suitable for irrigation ranging from 1.32 meq/L (Anandgaon, Shirur kasar Block) to 7.82 meq/L (Sheri Bk, Ashti) while in deeper aquifer, out of 119 samples no samples show value more than 1.25 meq/L.

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 Beed district based on GEC-97 methodology. Block wise ground water resources are given in Table 5.1, and graphical representations of the resources on the map are shown in **Figure-5.1**.

Ground Water Resource estimation was carried out for 10693.00 sq. km. area out of which 1042.27sq. km. is under command and 9309.78sq. km. is non-command. About 340.95 sq. km. area is hilly and this is not considered for resource estimation. As per the estimation, the net annual ground water availability comes to be 1193.24MCM. The gross draft for all uses is estimated at 717.73MCM with irrigation sector being the major consumer having a draft of 675.96MCM. The domestic and industrial water requirements are worked at 41.77MCM. The net ground water availability for future irrigation is estimated at 395.90 MCM. Stage of ground water development varies from 36.77 % (Parli) to 69.49% (Kaij & Patoda). The overall stage of ground water development for the district is 58.51%. Block wise assessments indicate that Beed district falls under "Safe" category.

Table 5.1: Ground water resources, Aquifer-I (Shallow aquifer), Beed district (2017)

Administrative Unit	Net Annual Ground Water Availability (ha.m)	Existing Gross Ground Water Draft for irrigation (ha.m)	Existing Gross Ground Water Draft for domestic and industrial water supply (ha.m)	Existing Gross Ground Water Draft for All uses (ha.m)	Provision for domestic and industrial requirement/ supply to 2025 (ha.m)	Net Ground Water Availability for future irrigation development (ha.m)	Stage of Ground Water Development (%) /Category
Ambejogai	9656.76	4796.45	341.18	5137.60	1426.48	4271.53	53.20/SAFE
Ashti	15986.22	9328.33	752.11	10080.44	1271.93	5425.35	63.05/SAFE
Beed	14479.42	9128.86	588.86	9717.72	2365.92	2363.15	67.11/SAFE
Dharur	2735.40	1321.90	70.17	1392.07	198.42	1126.53	50.89/SAFE
Gevrai	17630.30	11491.18	626.79	12117.97	1495.06	4585.34	68.73/SAFE
Kaij	12974.89	8699.45	317.00	9016.45	1136.55	3738.89	69.49/SAFE
Majalgaon	11832.70	6100.80	353.15	6453.95	1092.60	4962.22	54.54/SAFE
Parli	10919.44	3768.37	246.74	4015.11	1170.82	5426.41	36.77/SAFE
Patoda	7990.92	5246.33	306.79	5553.13	615.87	2120.10	69.49/SAFE
Shirur Ka	6751.04	3635.37	289.95	3925.32	418.55	2680.47	58.14/SAFE
Wadvani	8367.77	4079.35	284.54	4363.89	945.30	2890.95	52.15/SAFE
Total	119324.86	67596.39	4177.29	71773.64	12137.51	39590.95	58.51/SAFE

5.2 Ground Water Resources – Aquifer-II

The ground water resources of Aquifer-II (Basalt) were also assessed to have the correct quantification of resources so that proper management strategy can be framed. The total resources of aquifer-II have been estimated as 37.97 MCM. Block wise summarized Ground Water Resources of Aquifer-II are given in **Table 5.2.**

Table 5.2: Ground Water Resources of Aquifer-II (Deeper aquifer)

Block	Aquifer	Area (Sqkm)	Mean Thickness (m)	Fracture Position	PZ Head (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource within confining Aquifer (mcm)	Total Resources (MCM)
Ambejogai	Basalt Aq-II	924.96	4.33	63.00	4.35	0.002	0.0004	21.70	8.01	29.71
Ashti	Basalt Aq-II	1478.93	3.92	41.23	15.9	0.002	0.0003	11.24	11.59	22.83
Beed	Basalt Aq-II	1397.94	3.71	31.54	17.99	0.002	0.0006	11.37	10.37	21.74
Dharur	Basalt Aq-II	287.55	3.75	29.71	20.24	0.002	0.0006	1.63	2.16	3.79
Gevrai	Basalt Aq-II	1482.23	3.08	29.48	12.77	0.002	0.0004	9.91	9.13	19.04
Kaij	Basalt Aq-II	1331.86	4.50	46.22	23.36	0.002	0.0003	9.13	11.99	21.12
Majalgaon	Basalt Aq-II	922.46	3.25	62.79	20.83	0.002	0.0004	15.48	6.00	21.48
Parli	Basalt Aq-II	676.51	1.50	55.20	10.5	0.002	0.0005	15.12	2.03	17.15
Patoda	Basalt Aq-II	779.99	4.50	79.50	5.61	0.002	0.0004	23.05	7.02	30.07
Shirur Ka	Basalt Aq-II	649.44	3.88	39.01	13.48	0.002	0.0003	4.97	5.04	10.01
Wadvani	Basalt Aq-II	761.13	3.00	42.96	17.5	0.002	0.0004	7.75	4.57	12.32
Grand Total		6625.01	3.55	48.11	10.78	0.020	0.0004	131.36	77.90	209.26

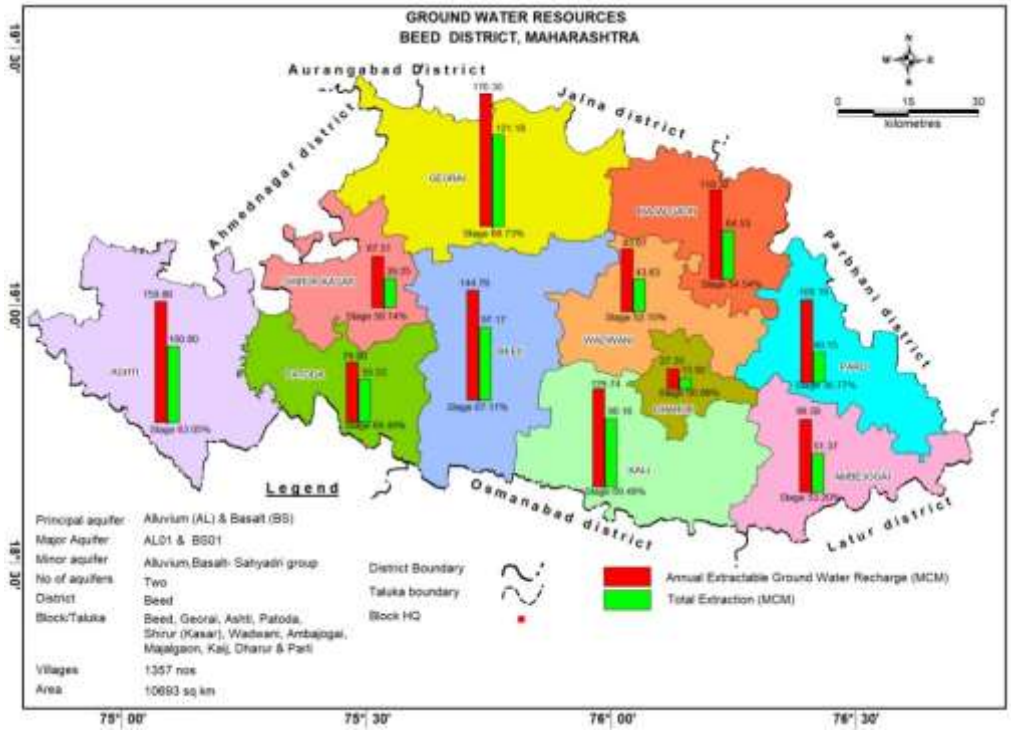
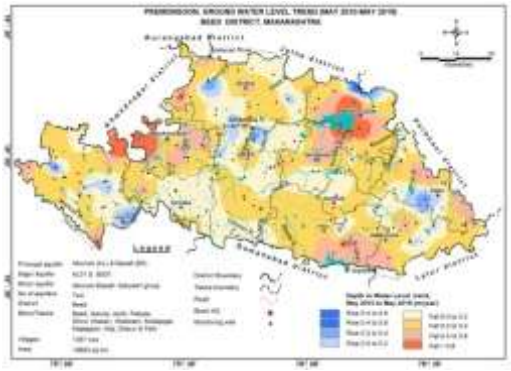


Figure 5.1: Ground Water Resources (2017), Beed district

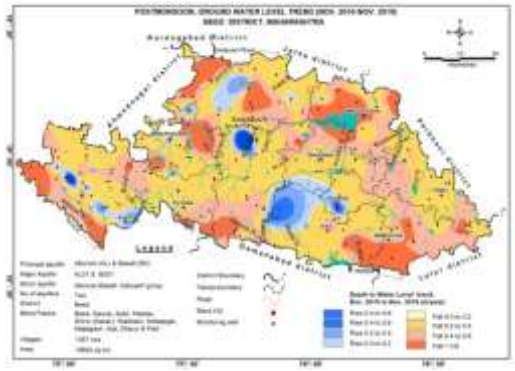
6. GROUND WATER RELATED ISSUES

6.1 Declining Water Level trend

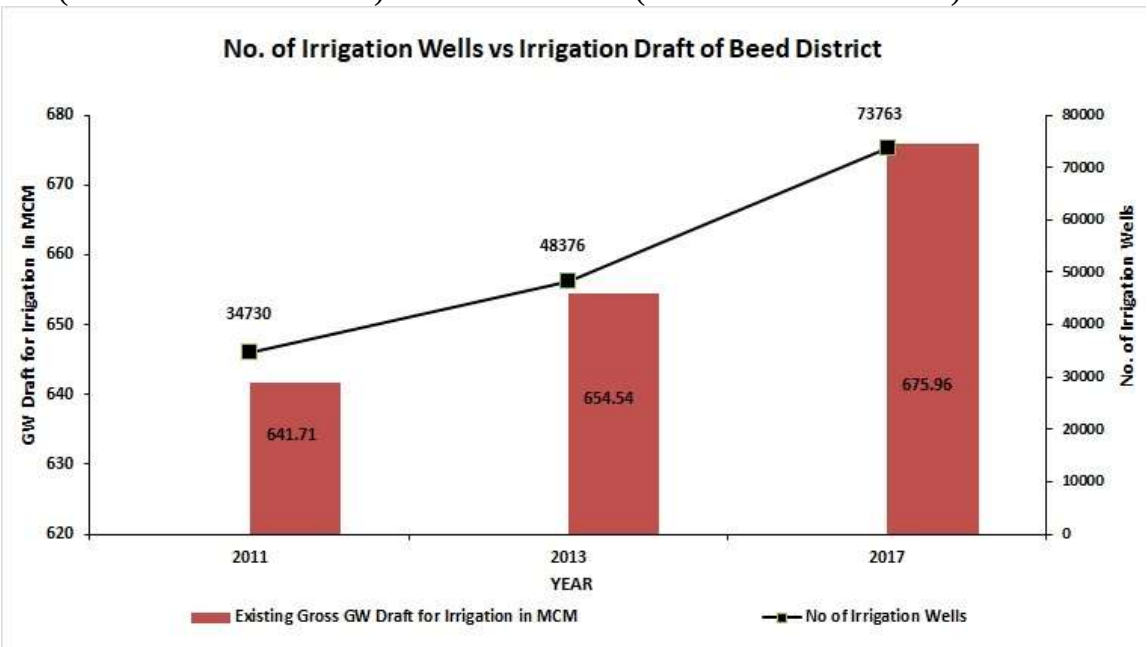
The ground water exploitation has resulted in decline of water levels over the period of time. In pre monsoon season, decline of more than 0.20 m/year has been observed in 3312sq. km., i.e., 50 % of the area covering major parts of Ashti, Shirur Kasar, Georai, Manjlegaon, Kaij, Ambejogai, Wadwani, Majalgaon, Ambejogai and Parli blocks of the Beed District and Isolated parts in Darur block. In post monsoon season, decline of more than 0.20 m/year has been observed 4571 sq. km. i.e., 69 % of the area covering in major parts of Ashti, Shirur Kasar, , Beed, Georai, Manjlegaon, Kaij, Ambejogai, Wadwani, Majalgaon, Ambejogai and Parli blocks of the Beed District and Isolated parts in Darur block. The decline may be because the area has experienced increased irrigation draft from 641.71 MCM (2011) to 675.96MCM (2017) and number of irrigation wells from 34730 (2011) to 73763 (2017), in addition to this has received continuously less annual rainfall than the normal rainfall between the period from 2010-2019.



Pre monsoon Fall @>0.2/year in 3312 Sq. km. (50% area of the District)



Post monsoon Fall@>0.2/year in 4571 Sq. km. (69% area of the District)



6.2 Rainfall and Droughts

The short-term rainfall analysis for the period 2010-2019 indicates that average rainfall of Beed District is 631.52 mm and Normal rainfall of the districts is 743.50 mm. **The rainfall analysis for last ten years is showing deficient rainfall/ Moderate drought condition in the years 2012, 2014, 2015 and 2018.**It is observed that the District experiences low and deficient rainfall with frequent droughts.

Table 6.1: Decadal Rainfall and drought analysis of Beed district

YEAR	ANNUAL	NORMAL	DEPARTURE	No of Rainy days	CATEGORY
2010	962	743.5	29.39	53	EXCESS
2011	739.6	743.5	-0.52	39	NORMAL
2012	435.1	743.5	-41.48	34	MODERATE
2013	690.1	743.5	-7.18	51	NORMAL
2014	418.7	743.5	-43.68	31	MODERATE
2015	435.2	743.5	-41.47	38	MODERATE
2016	852.2	743.5	14.62	47	NORMAL
2017	714.9	743.5	-3.85	44	NORMAL
2018	342	743.5	-54.00	26	SEVERE
2019	725.3	743.5	-2.44	59	NORMAL

6.3 Sustainability:

A major part of the district is occupied by basaltic rock formation that inherently consist of limited extent of porous and pervious zone; predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also absence of primary porosity and also, low rainfall results in poor sustainability of the aquifers. However, the erratic nature of existing joints/fractures pattern results in highly varying yield capacities of the aquifers in the area. In the area, depth of potential aquifers is generally restricted up to 30 m. The potential of the fracture zones reduces substantially below 100 m depth. This causes reduction in the well yield drastically during the summers. About 70% of area of the district is having low yield potential (<1 lps).

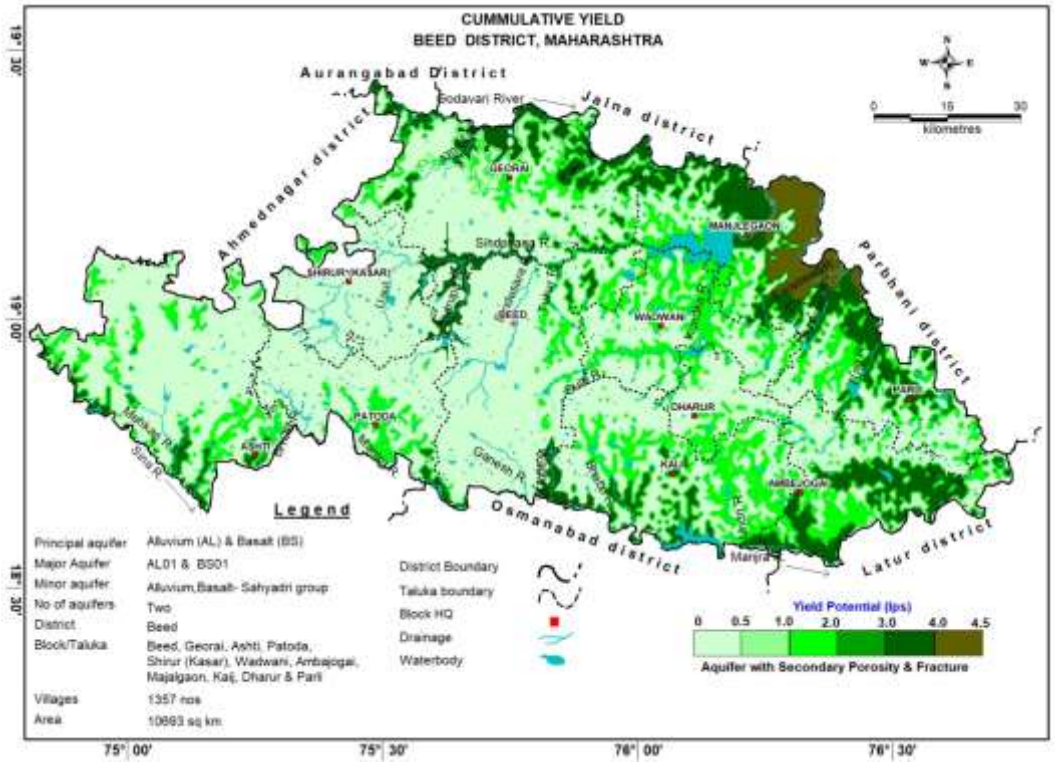


Figure 6.1: Cumulative yield Potential

6.4 Exploitation of Ground Water Resources

Stage of ground water development has increased over the period of time from 2011 to 2017 in

The stage of ground water development of Beed District has increased over the period of time from 2011 to 2017 from 51.14% to 61.88% **(fig. 6.2).** This increase in stage of ground water development is conspicuously seen in Ashti, Beed, Gevrai, Kaij and Patoda Blocks. The main reason for ground water excessive draft is for irrigation purpose. The draft has increased from 2011 to 2017 in respect net recharge**.** Also, the gap between the availability of ground water and draft is reducing over the period from 2011 to 2017. This provides very limited scope for ground water development particularly in irrigation sector.

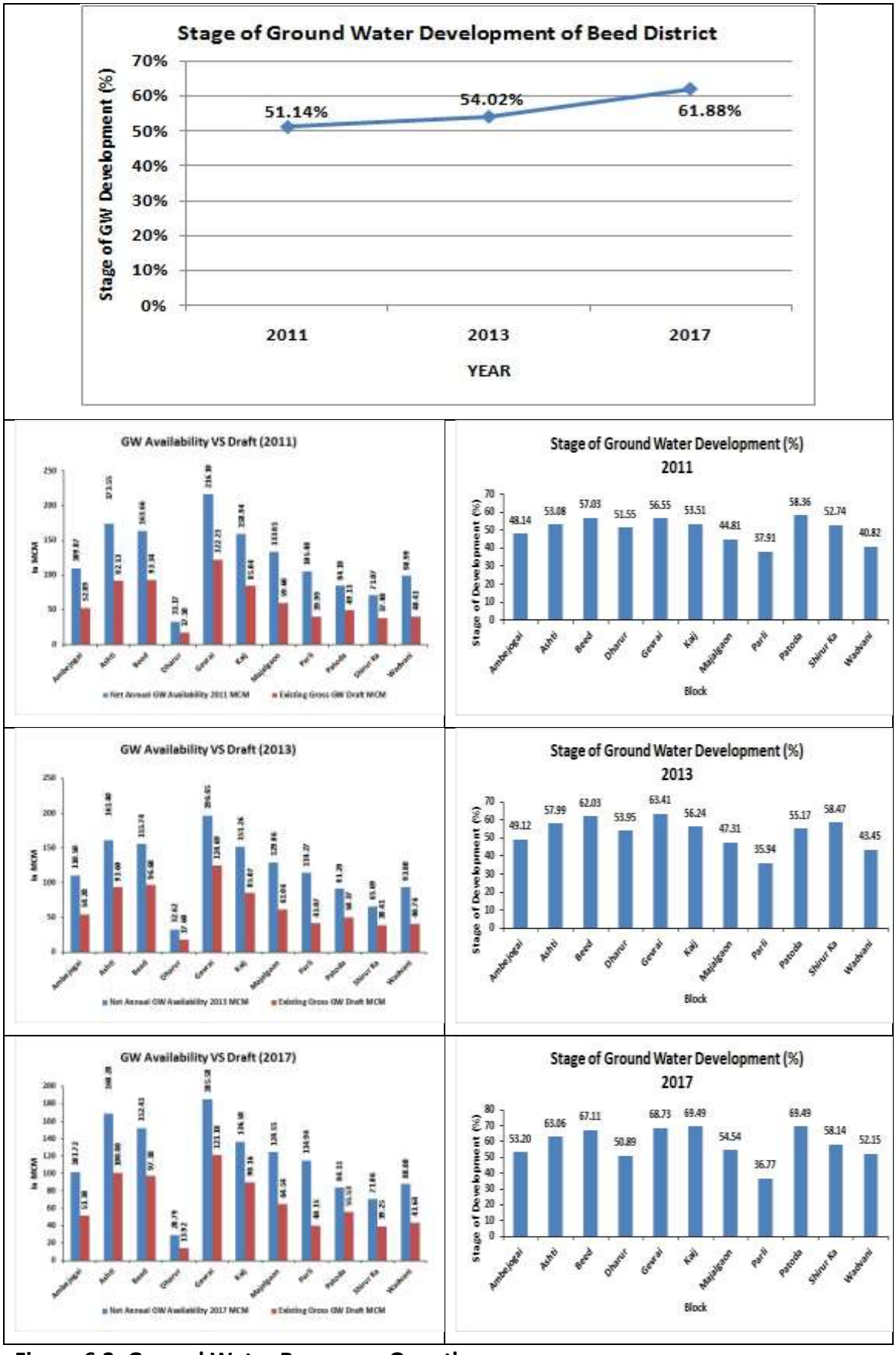


Figure 6.2: Ground Water Resources Over the years

7. GROUND WATER MANAGEMENT PLAN

The management plan has been proposed to manage the ground water resources 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 by utilization 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 5 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 recharge (sq. km.)	Unsaturated Volume (MCM)
Ambejogai	924.96	84.82	169.64
Ashti	1478.93	538.17	1076.34
Beed	1397.94	725.74	1451.48
Dharur	287.55	109.9	219.8
Gevrai	1482.23	851.28	1702.56
Kaij	1331.86	261.09	522.18
Majalgaon	922.46	634.46	1268.92
Parli	676.51	85.29	170.58
Patoda	779.99	109.17	218.34
Shirur Ka	649.44	618.65	1237.3
Wadvani	761.13	62.76	125.52
Grand Total	10693	4081.33	8162.66

The total unsaturated volume available for artificial recharge is 8162.66 MCM ranging from 125.52 MCM in Wadvani block to 1702.56 MCM in Gevrai block. The surplus runoff available for recharge is only 92.42 MCM. This surplus can be used for construction of suitable artificial recharge structures as shown in Table 7.2 and details also given in **Annexures VII and VIII.** The total number of Percolation tanks and Check Dams that can be constructed is 325 and 924, respectively. The number of feasible artificial recharge structures was calculated by considering 0.20 MCM per percolation tanks and 0.03 MCM per check dam. With these structures, about 69.32 MCM of water can be recharged annually. The tentative location of these structures is shown in figure 7.1. However, location and type of structures can be changed as per local conditions.

Table 7.2: Proposed Artificial Recharge Structures

Block	Volume of unsaturated granular zone (MCM)	Recharge Potential (MCM)	Surface water requirement @ 75% efficiency (MCM)	Availability of Surplus surface runoff (MCM)	No. of PT (100 TCM * 2 Fillings = 200 TCM)	N0. of CD (10 TCM * 3 Fillings = 300 TCM)	Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)
Ambejogai	169.64	3.39	2.54	1.92	7	19	1.44
Ashti	1076.34	21.53	16.15	12.19	43	122	9.14
Beed	1451.48	29.03	21.77	16.43	58	164	12.32
Dharur	219.80	4.40	3.30	2.49	9	25	1.87
Gevrai	1702.56	34.05	25.54	19.28	67	193	14.46
Kaij	522.18	10.44	7.83	5.91	21	59	4.43
Majalgaon	1268.92	25.38	19.03	14.37	50	144	10.78
Parli	170.58	3.41	2.56	1.93	7	19	1.45
Patoda	218.34	4.37	3.28	2.47	9	25	1.85
Shirur Ka	1237.30	24.75	18.56	14.01	49	140	10.51
Wadvani	125.52	2.51	1.88	1.42	5	14	1.07
TOTAL	**8162.66**	**163.26**	**122.44**	**92.42**	**325**	**924**	**69.32**

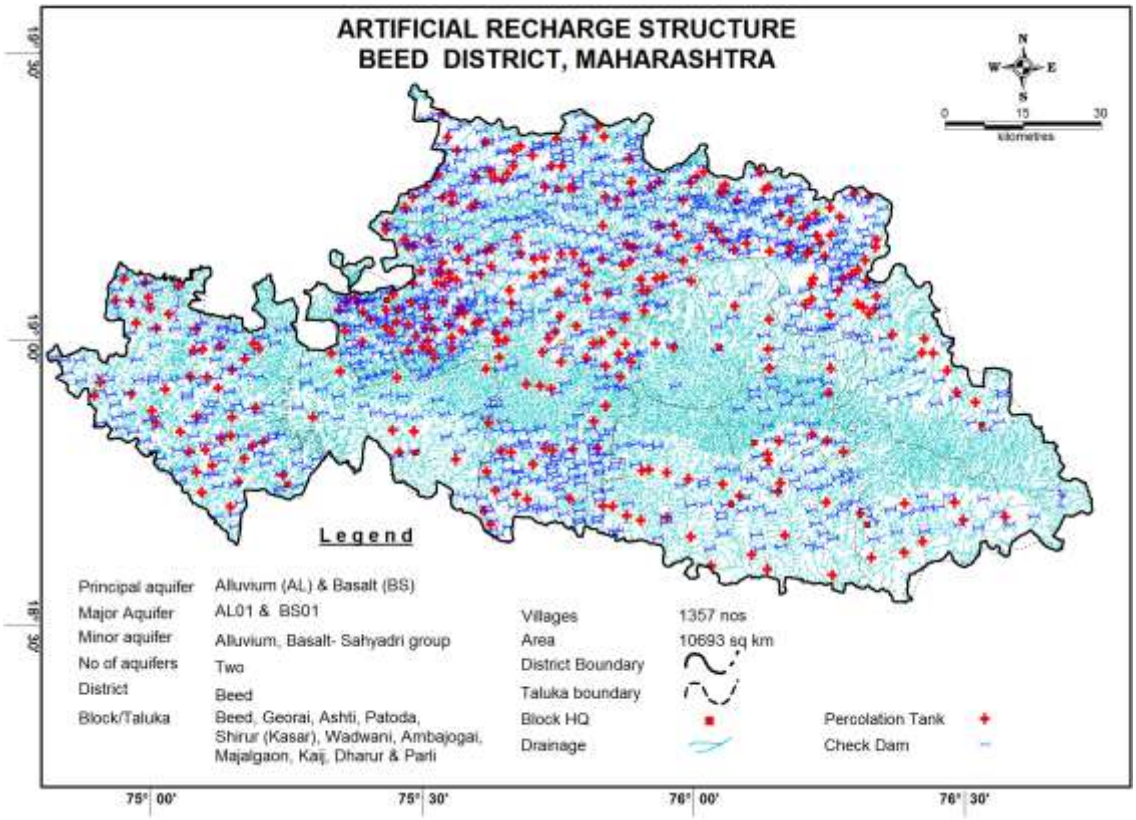


Figure 7.1: Location of Proposed Artificial Recharge structures

The rainwater harvesting in urban areas can be adopted in 25% of the household with 50 m^2 roof area. A total of 15.206 MCM potential can be generated by taking 80% runoff coefficient.

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 (Sugarcane/Citrus/Banana/Cotton) or change in cropping pattern or both are required to save water.

In the district, micro-irrigation techniques, like drip irrigation techniques are proposed to be adopted in about 301.67 Sq. km. area under sugarcane cultivation in all the blocks This would save a total of 171.95 MCM of ground water (Table.7.3). Change in cropping patterns is not proposed in any of the blocks. **Fig 7.2** depicts the proposed demand side interventions.

Table 7.3: Demand side interventions.

Taluka	Sugarcane Area proposed to be covered under drip (sq.km)	Sugarcane Volume of Water expected to be saved with drip irrigation @.57m (MCM)
Ambejogai	43.65	24.88
Ashti	18.78	10.70
Beed	15.71	8.95
Dharur	3	1.71
Gevrai	111.34	63.46
Kaij	24.46	13.94
Majalgaon	13.4	7.64
Parli	6	3.42
Patoda	6.33	3.61
Shirur Ka	28.92	16.48
Wadvani	30.08	17.15
TOTAL	**301.67**	**171.95**

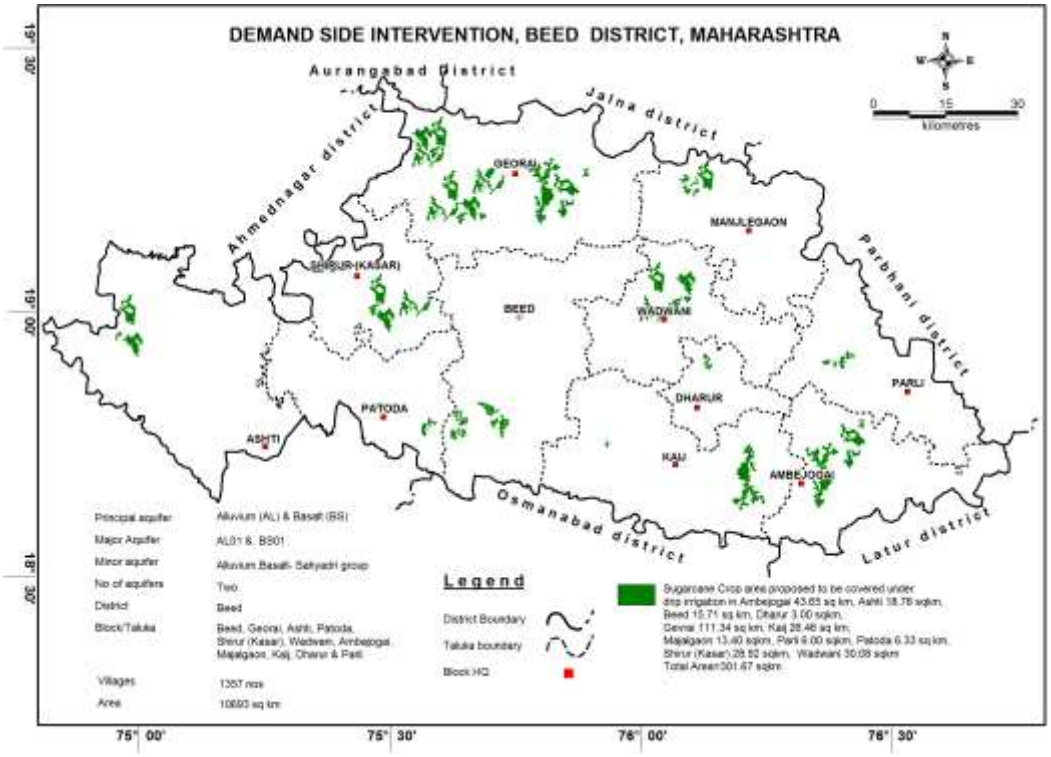


Figure 7.2: Demand Side Intervention

7.3 Expected Benefits

The impact of implementation of groundwater management plans on the groundwater system in the district is evaluated and the outcome shows significant improvement in groundwater scenario in all blocks (Table 7.4).

Table 7.4: Expected benefits after management options

Taluka	Total volume of water expected to be recharged/ conserved by AR (MCM)	Total GW resource available After Supply side Interventions (MCM)	Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.57 m	Total GW Draft after Demand side measures (MCM)	Stage of GWD after Supply and demand side interventions (%)	Balance GWR available for GW Development after Stage of GWD is brought to 70% (MCM)
Ambejogai	1.44	98.01	24.88	26.49	27.03	42.11
Ashti	9.14	169.00	10.70	90.10	53.31	28.21
Beed	12.32	157.1	8.95	88.22	56.15	21.76
Dharur	1.87	29.22	1.71	12.21	41.79	8.24
Gevrai	14.46	190.76	63.46	57.71	30.25	75.83
Kaij	4.43	134.2	13.94	76.22	56.81	17.70
Majalgaon	10.78	129.11	7.64	56.89	44.07	33.48
Parli	1.45	110.6	3.42	36.73	33.20	40.72
Patoda	1.85	81.76	3.61	51.92	63.51	5.30
Shirur Kasar	10.51	78.02	16.48	22.77	29.18	31.85
Wadwani	1.07	84.75	17.15	26.48	31.26	32.83
Total	**69.32**	**1262.56**	**171.95**	**545.73**	**43.22**	**338.03**

The total ground water resource available after supply side management would be 1262.56 MCM and the total ground water draft after demand side management would be 545.73 MCM. The Stage of ground water development gets reduced from 58.51% to 43.22%. Balance ground water resources available to bring stage of ground water development to 70% would be 31.85 MCM.

7.4 Development Plan

The ground water development plan has been proposed with the view of developing the additional ground water resources available after supply side interventions to bring the stage of ground water development up to 70%. Additional ground water available can be used for providing assured irrigation to 520.04 sq.km area. About 90% of additional ground water resources can be used for constructing dugwells and 10 for borewells. This can be achieved by constructing 20282 dugwells (@.1.5 ha.m per dugwell) and 3380 borewells (@.1.0 ha.m per borewell). The block-wise details are given in table 7.5. The tentative location of areas suggested for further ground water development is shown in Figure 7.3.

Table 7.5: Development Plan

Taluka	Ground Water Resources Available for Development to Bring Stage of GWD to 70% (MCM)	Additional Area proposed to be brought under assured GW irrigation. (sq.km.)	Proposed no. of DW (@ 1.5 ham for 90% of GWR Available)	Proposed no. of BW* (@ 1.0 ham for 10% of GWR Available)
Ambejogai	42.11	64.79	2527	421
Ashti	28.21	43.39	1692	282
Beed	21.76	33.48	1306	218
Dharur	8.24	12.68	495	82
Gevrai	75.83	116.66	4550	758
Kaij	17.7	27.24	1062	177
Majalgaon	33.48	51.5	2009	335
Parli	40.72	62.64	2443	407
Patoda	5.3	8.16	318	53
Shirur Kasar	31.85	48.99	1911	318
Wadwani	32.83	50.51	1970	328
Total	338.03	520.04	20282	3380

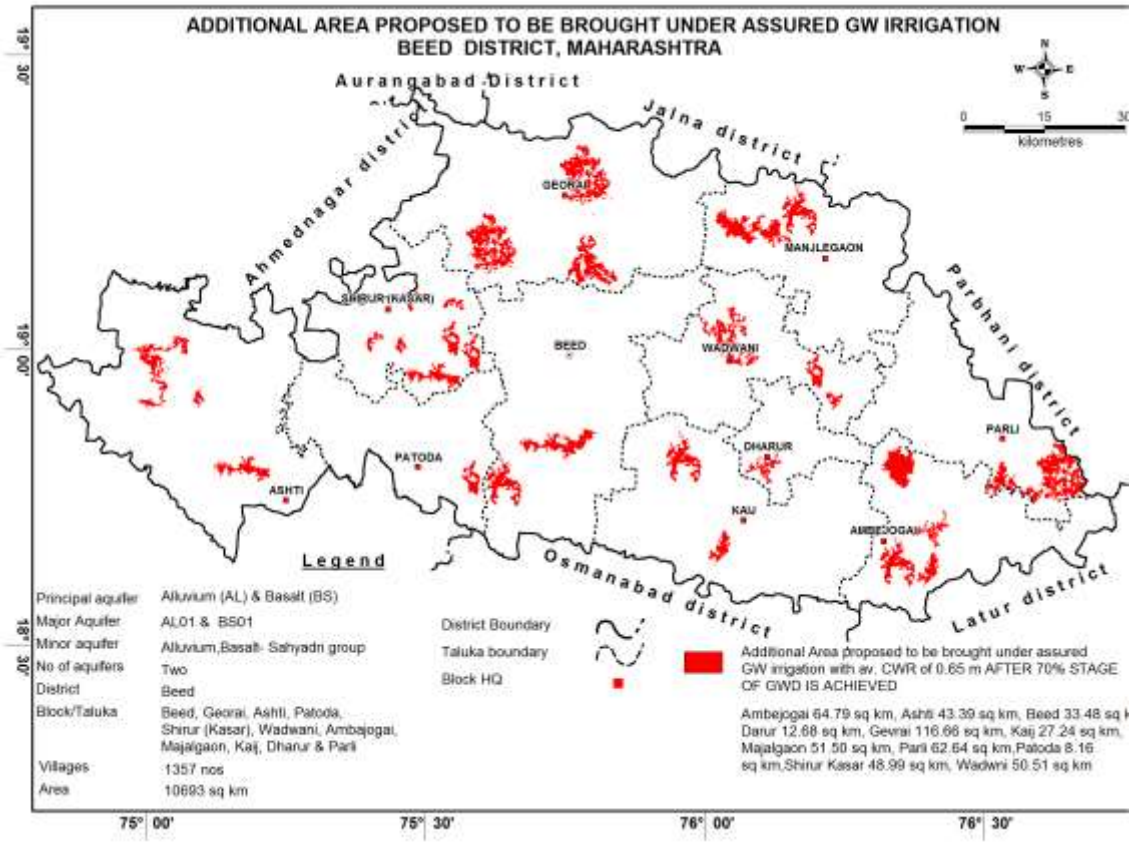


Figure 7.3: Additional area Proposed to be bought under Assured GW irrigation

8. SUM UP

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 Beed district.

The Beed district covering an area of about 10693 sq. km. with 340.95 sq. km. being hilly area. The stage of ground water development of the district is 58.51 %. The area has witnessed relatively high exploitation of ground water resource, declining water level, low rainfall and drought and low yield potential of aquifers. Declining water level trend of more than 0.20 m/year has been observed in 3312sq. km. (50% area of the total area) during pre-monsoon (2010-19). Declining water level trend of more than 0.20 m/year has been observed in 4571 sq.km (69% area of the total area) during post monsoon (2010-19). These declines may be due to less rainfall or exploitation of ground water resources more than the annual recharge in these areas.

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.

As a part of Supply side Management, a total 325 Percolation tanks and 924 Check dams are proposed. These structures would augment ground water resources to the tune of 92.42 MCM/year. As a part of Demand side Management, micro-irrigation techniques are proposed to be adopted in 301.67 Sq. km. area thereby saving a total of 171.95 MCM/year.

The total ground water resource available after supply side management would be 1262.56 MCM and the total ground water draft after demand side management would be 545.73 MCM. The Stage of ground water development gets reduced from 58.51% to 43.22%. Balance ground water resources available to bring stage of ground water development to 70% would be 31.85 MCM.

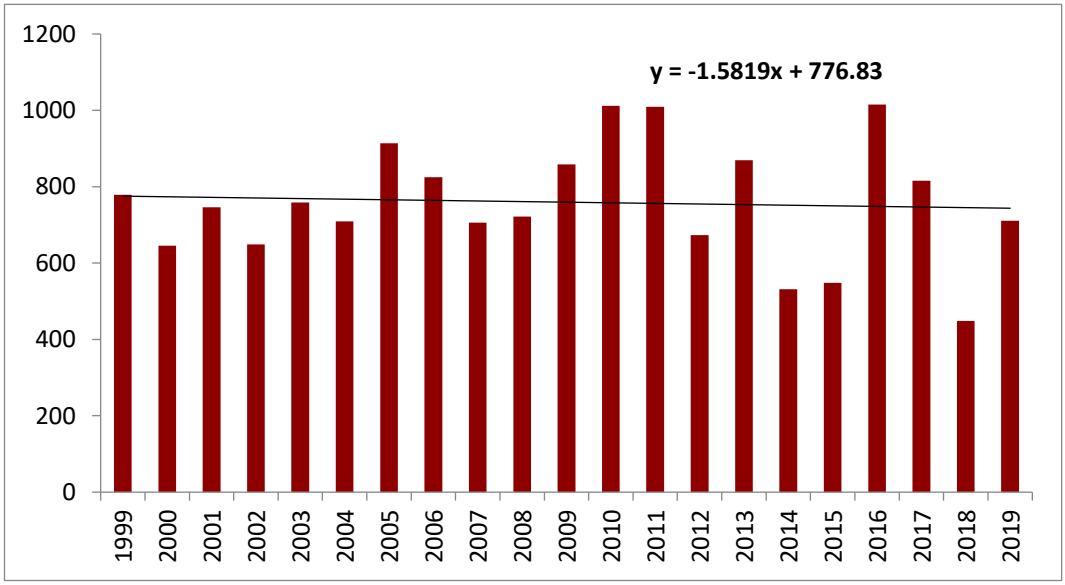
As part of development plan, it is proposed to construct 20,282 dugwells and 3380 borewells. These can provide assured irrigation to about 520.04 sq.km area.

These interventions also need to be supported by regulations for deeper aquifer and hence it is recommended to regulate/ban deeper tube wells/bore wells 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. Also, IEC activities and capacity building activities needs to be aggressively propagated to establish the institutional framework for participatory ground water management.

9. AQUIFER MAPS AND GROUND WATER MANAGEMENT PLAN,

1. AMBEJOGAI BLOCK
2. ASHTI BLOCK
3. BEED BLOCK
4. DHARUR BLOCK
5. GEVRAI BLOCK
6. KAIJ BLOCK
7. MAJALGAON BLOCK
8. PARLI BLOCK
9. PATODA BLOCK
10. SHIRUR KASARKASAR BLOCK
11. WADWANI BLOCK

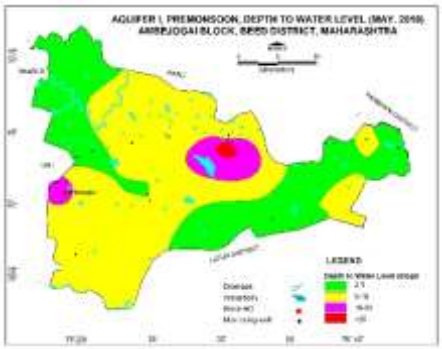
9.1 AMBEJOGAI BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**AMBEJOGAI**	
Geographical Area (Sq. km.)	924.96	
Hilly Area (Sq. km.)	26.36	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,35,670	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall (mm)	742.00	
Annual Rainfall (2019) (mm)	711	
Decadal Average Annual Rainfall (2010-19) (mm)	763.5	
Long Term Rainfall Analysis (1999-2019)	Falling Trend -1.5819 mm/year Probability of Normal and Excess Rainfall 71.43 % & 14.29 % Probability of Droughts -: 14.29% Moderate	
Rainfall Trend Analysis (1999 to 2019)		
		
EQUATION OF TREND LINE y = -1.5819x+776.83		
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Manjra river flows on southern boundary of the district	
Hydrology ***(Reference DSA Year: June 2016-17)***	Major project	NIL

		Medium project	**Completed:** KadaKadi, Kambli, Ruti, Mehkari PROJECTS covering area of 90.48 sq km with Storage capacity (Ten lakh Cubic meter) of 49.17
		Small project	**Completed:** small irrigation projects covering area of 34.17 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		924.96Sq. km.	
Forest Area		436.4Sq. km.	
Cultivable Area		329.54 Sq. km.	
Net Sown Area		280.24 Sq. km.	
Double Cropped Area		49.30 Sq. km.	
Area under Irrigation	Surface Water	0.80 Sq. km.	
	Ground Water	0.32 Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	173.06
		Pulses	43.89
		Gram	377.11
		Soyabean	539.50
		Cotton	50.84
		Sugarcane	43.65
Horticultural Crops		Mango	6.00
		Citrus fruits	2.06
		Grapes	0.30
		Banana	0.27
		Vegetables	7.86
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water level between 2-5mbgl has been observed in east and west part of the block covering 231 sq km area, whereas water levels between 5-10mbgl has been observed in major part of the block covering about 646 sq. km. area. Whereas water levels between 10-20mbgl has been observed in central part of the block as patches covering about 92 sq. km. area. Whereas water levels >20mbgl has been			Water level between 0-2 mbgl is seen in east, central. North and west part of the block covering 139 sq km; Water level between 2-5mbgl has been observed in major part of the block covering 646 sq km area; whereas water levels between 5-10mbgl has been observed in south-west to south, central part of the block covering about 139 sq. km. area.

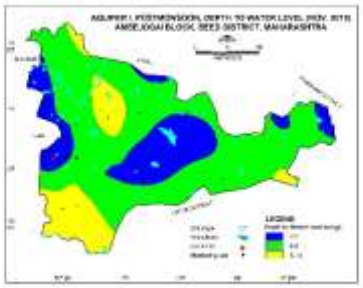
observed in 37 sq km area.

Pre-Monsoon Water Level (May 2019)



WL>20mbgl37 sq. km.

Post-Monsoon Water Level (Nov. 2019)

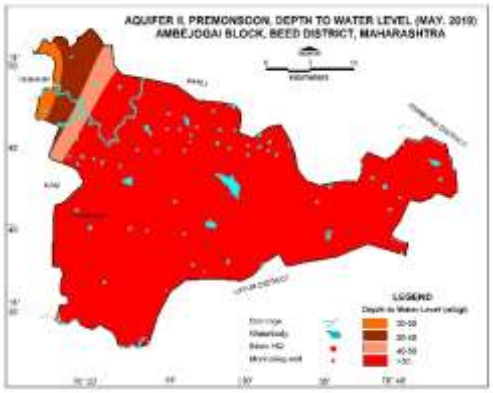


WL>5mbgl139 sq. km.

1.6.2. Aquifer-II/Deeper Aquifer

Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 20 to 30 mbgl are observed in west half of the block covering 46 sq km area; water levels between 30-40mbgl have been observed in west half of the block covering about 74 sq. km. area of the block. Water levels between 40-50mbgl have been observed in west half of the block covering about 70 sq. km. area of the block. Water levels >50mbgl have been observed in major part of the block covering about 766 sq. km. area of the block.	Water levels less than 5mbgl are observed in south-western part of the block covering 73 sq km area. Water levels between 5-10mbgl have been observed in south-west part of the block covering 231 sq km area. Water levels between 10-20mbgl have been observed in major part of the block covering 415 sq km area. whereas more than 20 mbgl has been observed as isolated patch in north eastern part of the block and cover 277 sq. km. area.

Pre-Monsoon Water Level (May 2019)



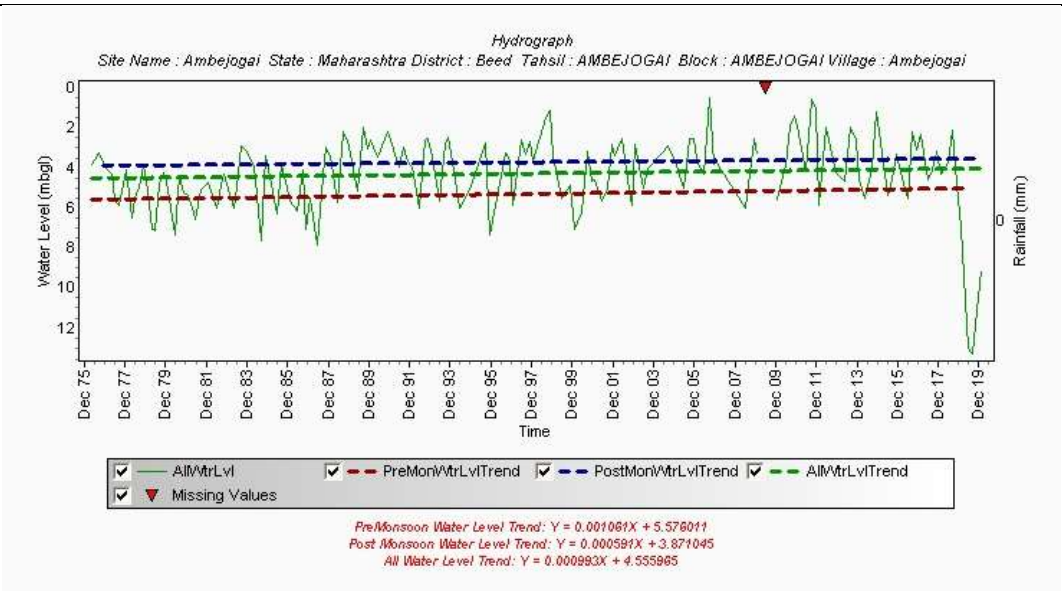
WL>50mbgl766 sq. km.

Post-Monsoon Water Level (Nov.-2019)

WL>20mbgl277 sq. km.

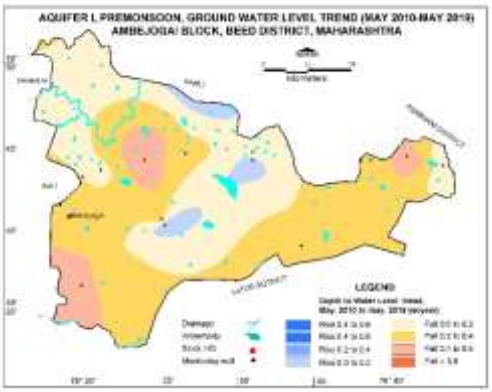
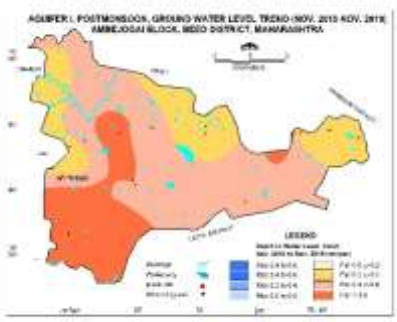
1.7. Hydrograph

Site Name: Ambejogai State: Maharashtra District: BEED Tehsil: AMBEJOGAI Block: : BEED Village : Ambejogai



Hydrograph shows Pre-monsoon rising water level trend @ 0.012732 m/year and Post monsoon rising water level trend @ 0.45888 m/year

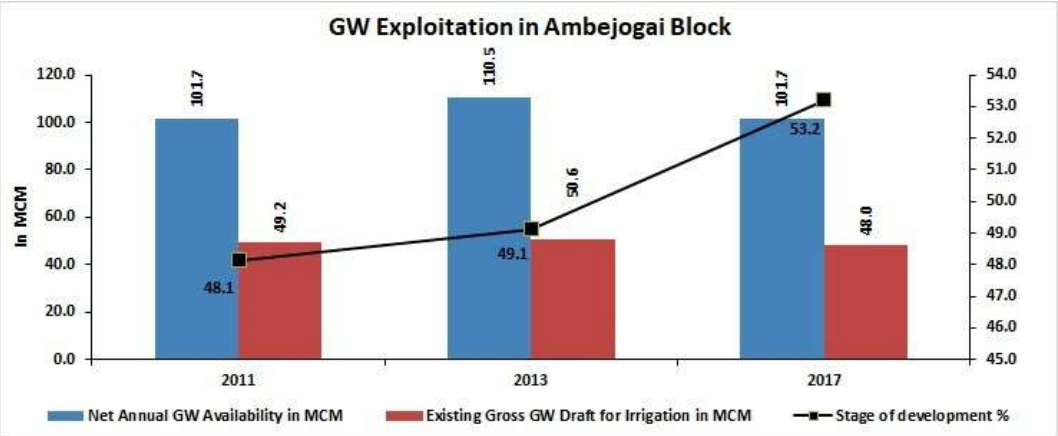
1.8. Water Level Trend (2010-19)

Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.0344149to 0.047143m/year Falling 0.09391to 0.5596263m/year	Falling 0.0107576to 0.89333m/year
Decline in water level up to 0.2 m/year has been observed in central and north, north-west parts of the block covering 369 sq km while rise in water level up to 0.2 m/year has been observed in isolated patches in northern and eastern parts of the block covering 55 sq km area. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 462 sq. km. area.	Declining water level trend more than 0.2 m/year and up to 0.60m/year has been observed in entire part of the block covering 924sq km area.
Pre-Monsoon Water Level Trend (2010-19)  **Declining trend @>0.2 m/year 462 sq. km.**	**Post-Monsoon Water Level Trend (2010-19)**  **Declining trend @>0.2 m/year 924 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 48.10% to 49.10% and afterwards again increased during 2013 to 2017 from 49.10% to 53.20% in Ambejogai block of Beed District**.** Further, the net ground water availability increased during 2011 to 2013 from 101.70 MCM to 110.70 MCM again decreased from 110.70 MCM to 101.70 MCM during 2013 to 2017. Whereas the draft for irrigation first increased during 2011 to 2013 from 49.20 MCM to 50.60 MCM and again decreased from 50.60 MCM to 48.00 MCM during 2013 to 2017.



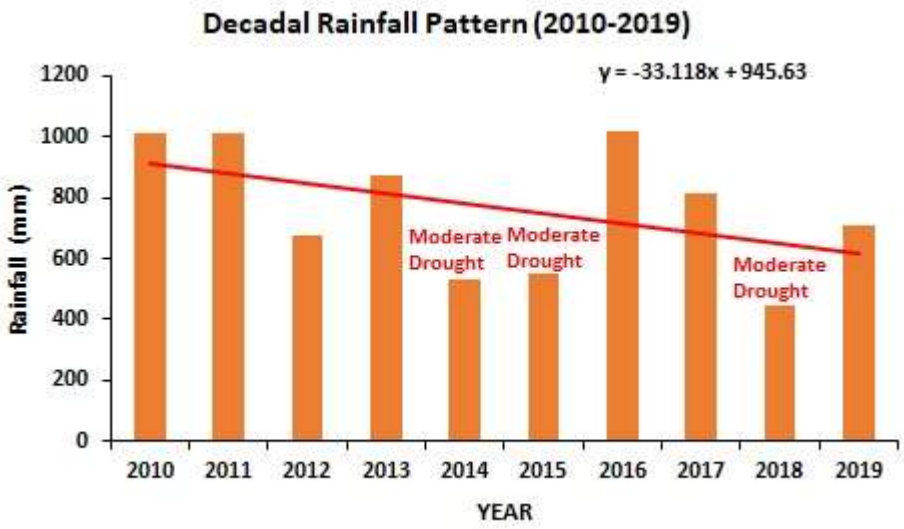
Declining water level Trend : -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 462 sq. km. covering about 50% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 924 sq. km. covering about 100 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of AMBEJOGAI block is 742.00mm, and also indicates a falling rainfall trend @ -1.5819 mm/year with probability of 14.29% Moderate drought.

Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 763.50mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.

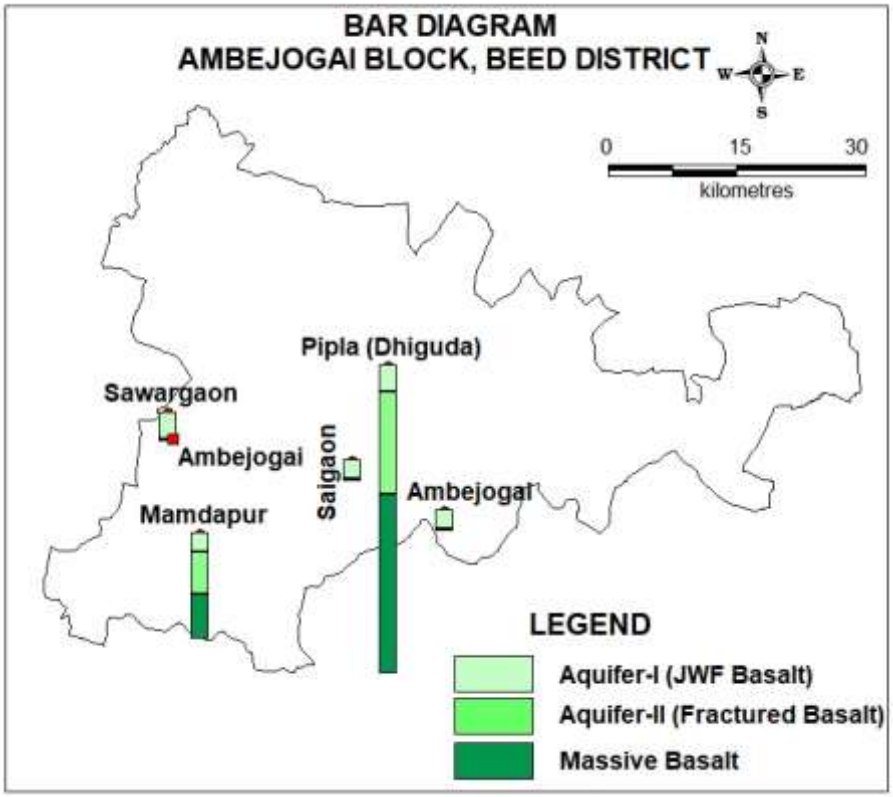


Low yielding Aquifer resulting poor sustainability:

Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 45% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

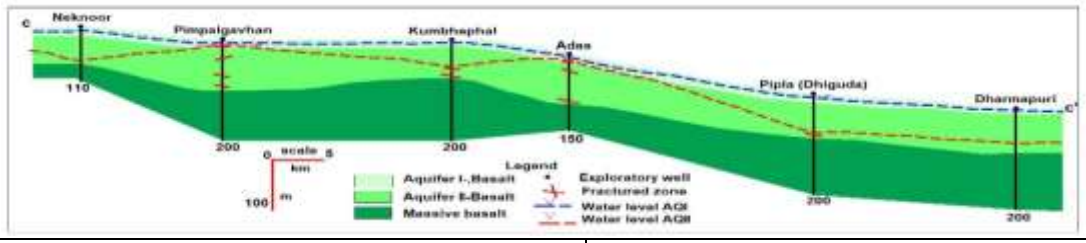
3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II

3.2. Lithological disposition

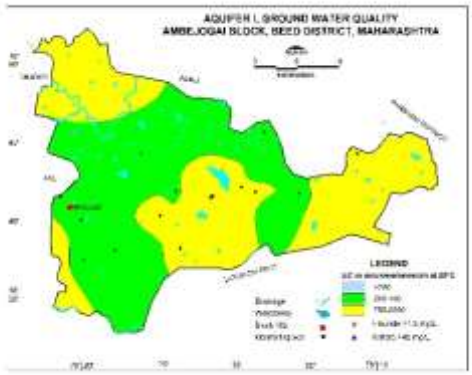


3.3. Cross Section

Section CC'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 16	47 to 114
Weathered/Fractured zones encountered (mbgl)	10 to 12	42 to 114
Weathered/Fractured rocks thickness (m)	8 to 13	3.00 to 5.00
SWL (mbgl)	6.80 to 20.39	4.35 to 100
Specific yield/Storativity (S)	0.020 to0.024	7.6 x 10-4 to 7.4 x 10-4
Transmissivity (T)	15.00 to 70.50 m^2/day	15.00 to 110.00 m^2/day
Yield	1 to 165 m^3/day	up to to 2.50 lps
Sustainability	2 to 4 hrs	1 to 5 hrs
4. GROUND WATER QUALITY		
4.1 Aquifer-I/ Shallow Aquifer		
EC values 250-750 µS/cm are observed in major parts of the block and EC values between 750 to 2250 µS/cm are observed in central, eastern and western part of the block. Ground water is suitable for all purposes		
4.2 Aquifer II/Deeper Aquifer		
EC values 250-750 µS/cm are observed in major parts of the block and EC values between 750 to 2250 µS/cm are observed in north western part of the block. Ground water is suitable for all purposes except Mamdapur village where Nitrate value is 55 mg/L.		
Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**	



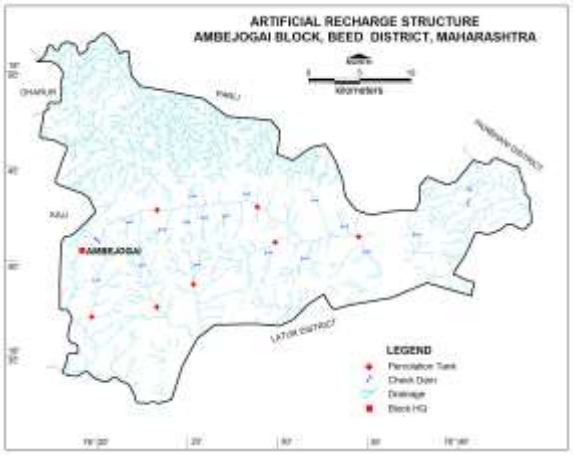
5. GROUND WATER RESOURCE	
5.1 Aquifer-I/ Shallow Aquifer	
Ground Water Recharge Worthy Area (Sq. km.)	898.60
Total Annual Ground Water Recharge (MCM)	101.72
Natural Discharge (MCM)	5.15
Net Annual Ground Water Availability (MCM)	96.57
Existing Gross Ground Water Draft for irrigation (MCM)	47.96
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	3.41
Existing Gross Ground Water Draft for All uses (MCM)	51.37
Provision for domestic and industrial requirement supply to 2025(MCM)	14.26
Net Ground Water Availability for future irrigation development (MCM)	42.71
Stage of Ground Water Development (%)	53.20
Category	**SAFE**
5.2 Aquifer-II/Deeper Aquifer	
Semi confined/Confined Aquifer (Basalt)	

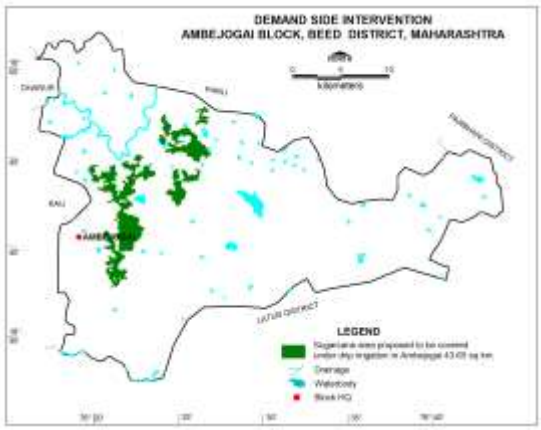
Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer) (m)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource with in confining Aquifer (mcm)	Total Resources (MCM)
Ambejogai	Basalt Aq-II	924.96	4.00	6.65	0.020	0.0004	2.46	1.48	3.94

6.0. GROUND WATER RESOURCE MANAGEMENT	
Available Resource (MCM)	96.57
Gross Annual Draft (MCM)	51.37
6.1. Supply Side Management	

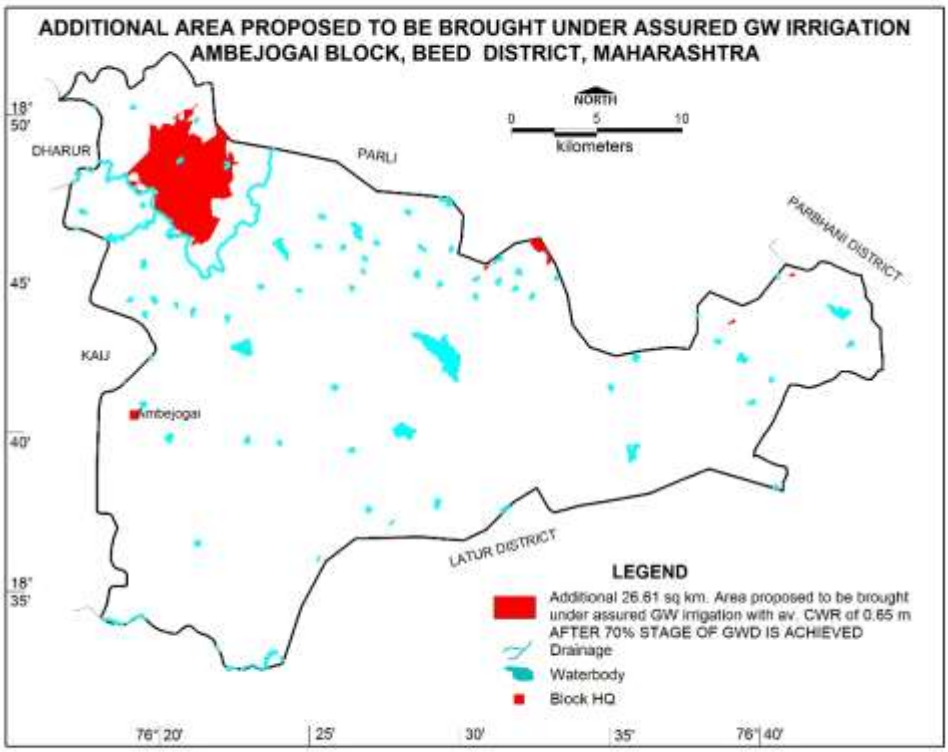
SUPPLY (MCM)		
Agricultural Supply -GW	47.96	
Agricultural Supply -SW	57.72	
Domestic Supply - GW	3.41	
Domestic Supply - SW	0.85	
Total Supply	**109.94**	
Area of Block (Sq. km.)	924.96	
Area suitable for Artificial recharge (Sq. km.)	84.82	
Type of Formation	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. km.)	84.82	
Volume of Unsaturated Zone (MCM)	169.64	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub Surface Storage Space available for Artificial Recharge (MCM)	3.3928	
Surplus water Available (MCM)	1.92	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	7	19
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	1.008525	0.43
Proposed Structures		
RTRWH Structures – Urban Areas		
Households to be covered (25% with 50 m^2area)	55,113	
Total RWH potential (MCM)	2.205	
Rainwater harvested / recharged @ 80% runoff co-efficient	1.764 Economically not viable & Not Recommended	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane crop area (43.65), about 1 sqkm area is ground water irrigated, 100% ground water irrigated (1 sqkm) proposed to be covered under Drip (sq.km.)	43.65	
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.57 m	24.88	
Water Saving micro Irrigation technique(MCM)	24.88	
Total Irrigated Area		

Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	96.57
Additional GW resources available after implementing above measures (MCM)	1.44
Ground Water Availability after Supply side Intervention (MCM)	98.01
Existing Ground Water Draft for All Purposes (MCM)	51.37
Saving of Ground Water through demand side intervention (MCM)	24.88
GW draft after Demand side interventions (MCM)	26.49
Present stage of Ground Water Development (%)	53.20
Stage of Ground Water Development after interventions (%)	27.03
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 53.20% to 27.03%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	42.11
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	2527
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	421
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.	64.79
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Double Cropped Area proposed for drip Irrigation**





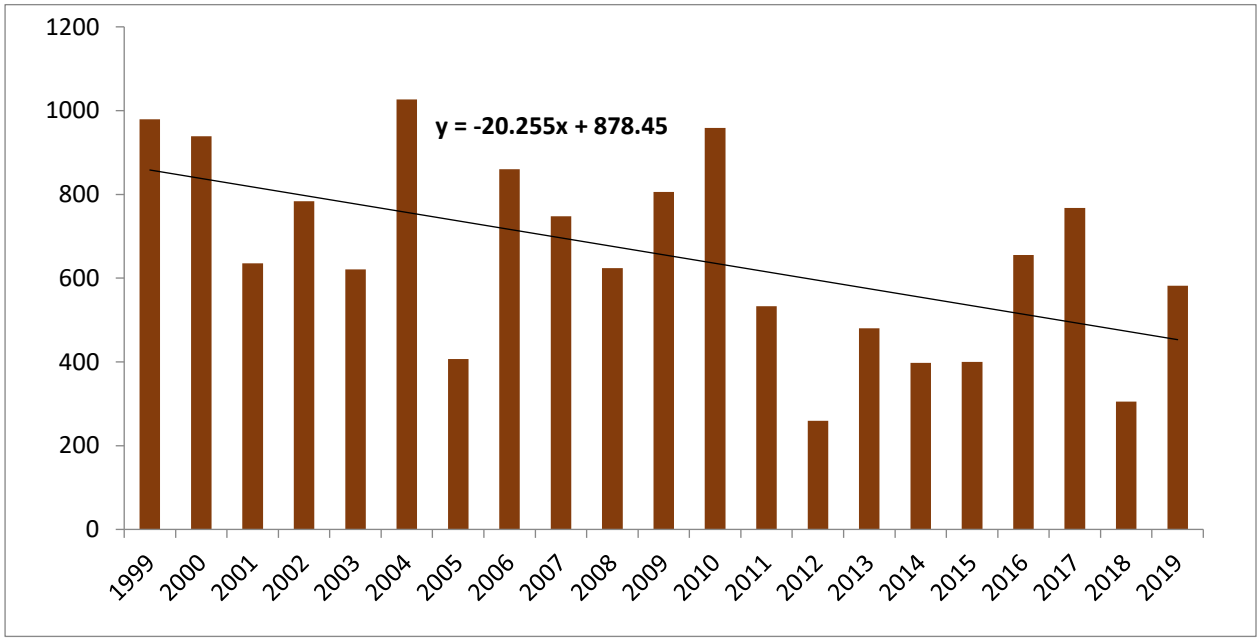
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**



9.2 ASHTI BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**ASHTI**	
Geographical Area (Sq. km.)	1478.93Sq. km.	
Hilly Area (Sq. km.)	42.49Sq. km.	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,06,666	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	638.1mm	
Annual Rainfall (2019)	581.9mm	
Decadal Average Annual Rainfall (2010-19)	533.88mm	
Long Term Rainfall Analysis (1999-2019)	Falling Trend 20.255 mm/year Probability of Normal and Excess Rainfall 47.62% &28.57% Probability of Droughts -: 14.29% Moderateand9.52 %Severe	

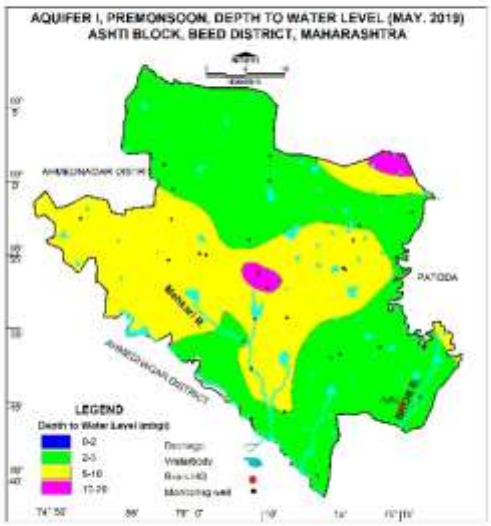
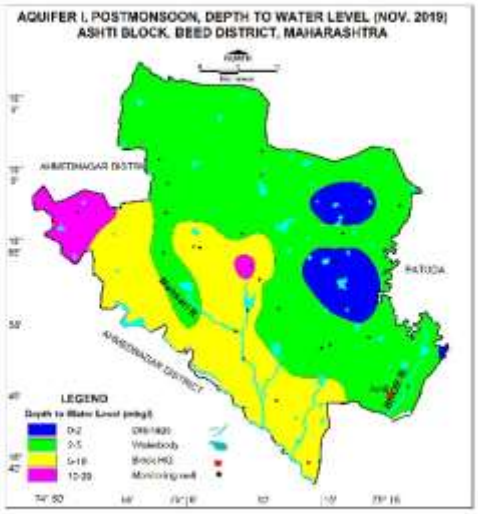
Rainfall Trend Analysis (1999 to 2019)



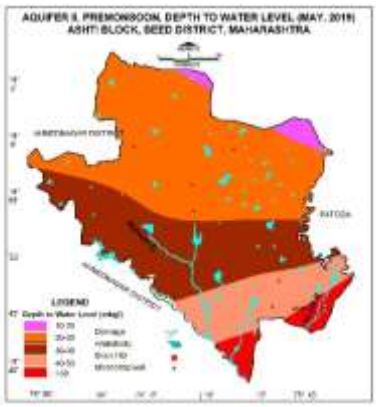
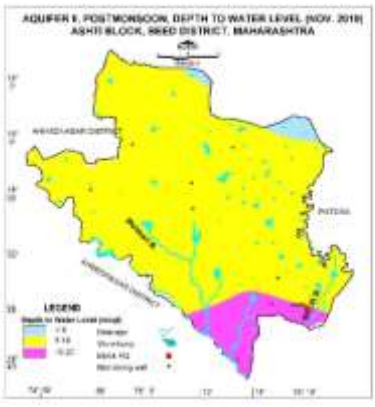
EQUATION OF TREND LINE y = -20.255x+878.45

1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Mehekri river and Sina river and Their tributaries	
Hydrology ***(Reference DSA Year: June 2016-17)***	Major project	**Nil**

		Medium project	**Completed:** NIL
		Small project	**Completed:** small irrigation projects covering area o 216.13sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		1478.93Sq. km.	
Forest Area		27.00Sq. km.	
Cultivable Area		636.10Sq. km.	
Net Sown Area		63610Sq. km.	
Double Cropped Area		0 Sq. km.	
Area under Irrigation	Surface Water	32.17Sq. km.	
	Ground Water	59.69Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	677.03
		Pulses	415.97
		Gram	138.65
		Soyabean	41.18
		Cotton	237.53
		Sugarcane	18.78
Horticultural Crops		Mango	3.35
		Citrus fruits	2.55
		Grapes	0.06
		Banana	0.16
		Vegetables	4.82
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water level between 2-5mbgl has been observed in major part of the block covering 887 sq km area, whereas water levels between 5-10mbgl has been observed in west and central part of the block covering about 546 sq. km. area. whereas water levels between 10-20mbgl has been observed in east and central part of the block as patches covering about 44 sq. km. area.			Water level between 0-2 mbgl is seen in east part of th block covering 148 sq km; Water level between 2-5mbg has been observed in major part of the block covering 81 sq km area, whereas water levels between 5-10mbgl ha been observed in south-west to south-east part of th block covering about 517 sq. km. area. Whereas wate levels between 10-20mbgl has been observed in west par of the block as patches covering about 118 sq. km. area.

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>10 mbgl44 sq. km.	**WL>10 mbgl118 sq. km.**

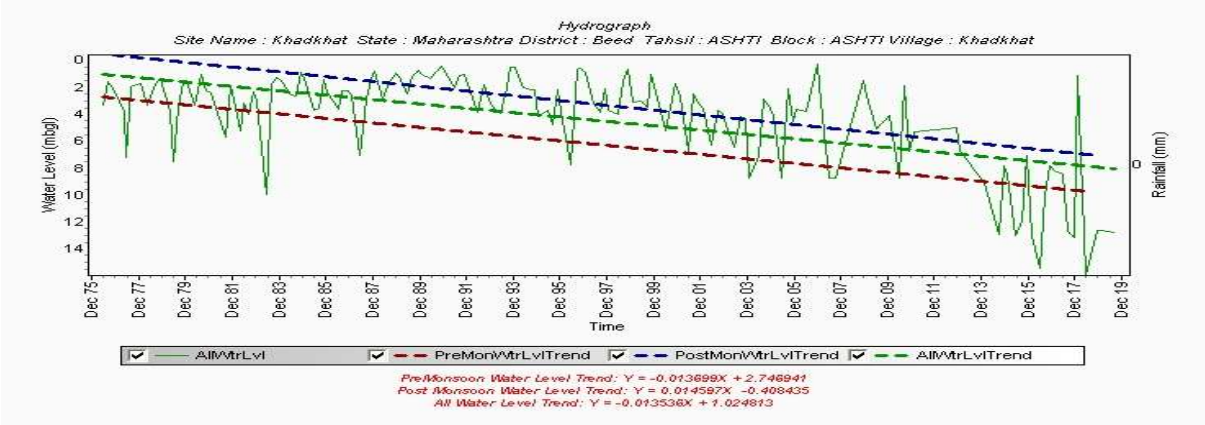
1.6.2. Aquifer-II/Deeper Aquifer

Pre-Monsoon (May-2019)	Post-Monsoon (November-2019)
water levels between 10-20mbgl has been observed in east and north part of the block as patches covering about 74 sq. km. area.Water levels between 20 to 30 mbgl are observed in major part of the block covering area 739 sq km; water levels between 30-40mbgl have been observed in western to eastern half of the block covering about 295 sq. km. area of the block. water levels between 40-50mbgl have been observed in western to eastern half of the block covering about 221 sq. km. area of the block, whereas water levels> 50 mbgl is seen in south part of the block covering 118 sq km of the area.	Water levels less than 5mbgl are observed in norther part of the block covering about 69 sq. km. area. Wate levels between 5 to 10mbgl have been observed in majo part of the block covering about 130 sq. km. area whera more than 10mbgl has been observed as isolated patch i south eastern part of the block and cover 137 sq. km area.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**
	

WL>50mbgl118 sq. km.	WL>10mbgl137 sq. km.

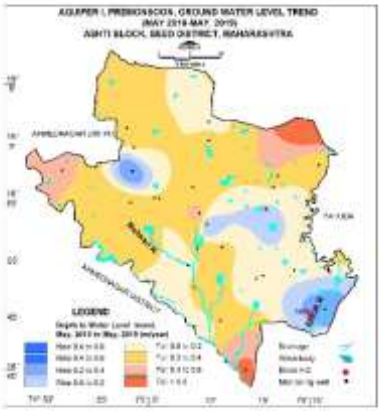
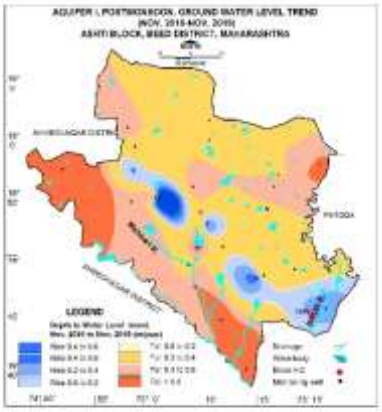
1.7. Hydrograph

Site Name: Khadkhat State: Maharashtra District: BEED Tehsil: Ashti Block: : BEED Village: Khadkhat



Hydrograph shows Pre-monsoon falling water level trend @ 1.09296 m/year and Post monsoon falling water level trend @ 0.814896 m/year

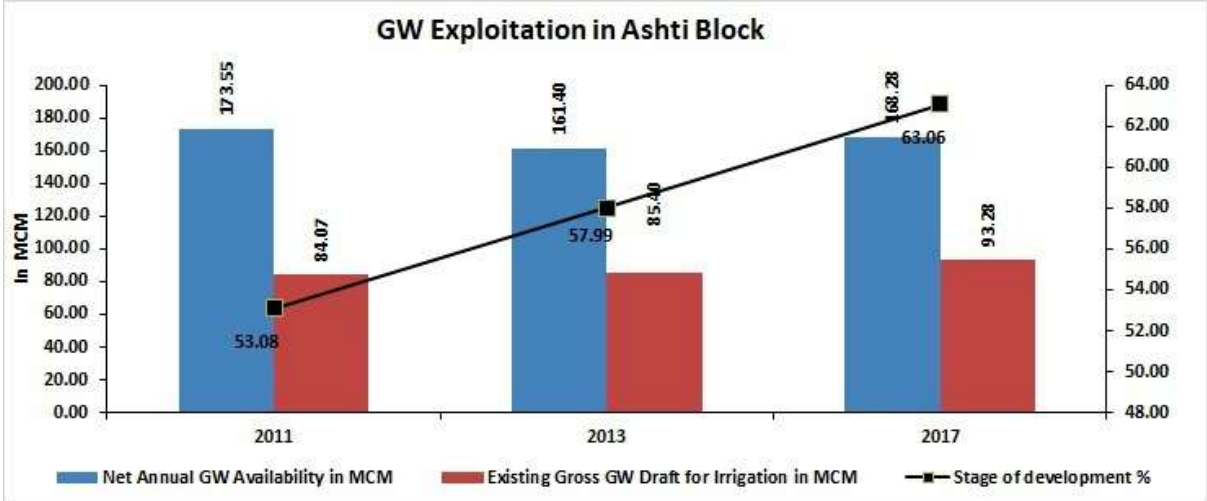
1.8. Water Level Trend (2010-19)

Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.198571 to 0.414186 m/year Falling 0.04839 to 0.6252577 m/year	Rising 0.2916667 to 1.13057 m/year Falling 0.12691 to 0.8597006 m/year
Decline in water level up to 0.2 m/year has been observed in eastern and north, south parts of the block covering 443 sq km area while rise in water level up to 0.4 m/year has been observed in isolated patches in north-western and south-eastern and central parts of the block covering 117 sq km area. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 887 sq. km. area.	Declining water level trend up to 0.2 m/year has bee observed in west central part of the block while rise i water level up to 0.4 m/year has been observed in isolate patch in western to eastern part of block covering 192 s km area. Decline more than 0.2 m/year has been observe in major part of the block covering 1301sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**
	
Declining trend @>0.2 m/year 887 sq. km.	**Declining trend @>0.2 m/year 1301 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 53.08% to 57.99% and afterwards agai increased during 2013 to 2017 from 57.99% to 63.06% in Ashti block of Beed District**.** Further, the net ground wate availability decreased during 2011 to 2013 from 173.55 MCM to 161.40 MCM again further increased from 161.40 MCM t 168.28 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 84.07 MCM to 85.4 MCM and again increased from 85.40 MCM to 93.28 MCM during 2013 to 2017.



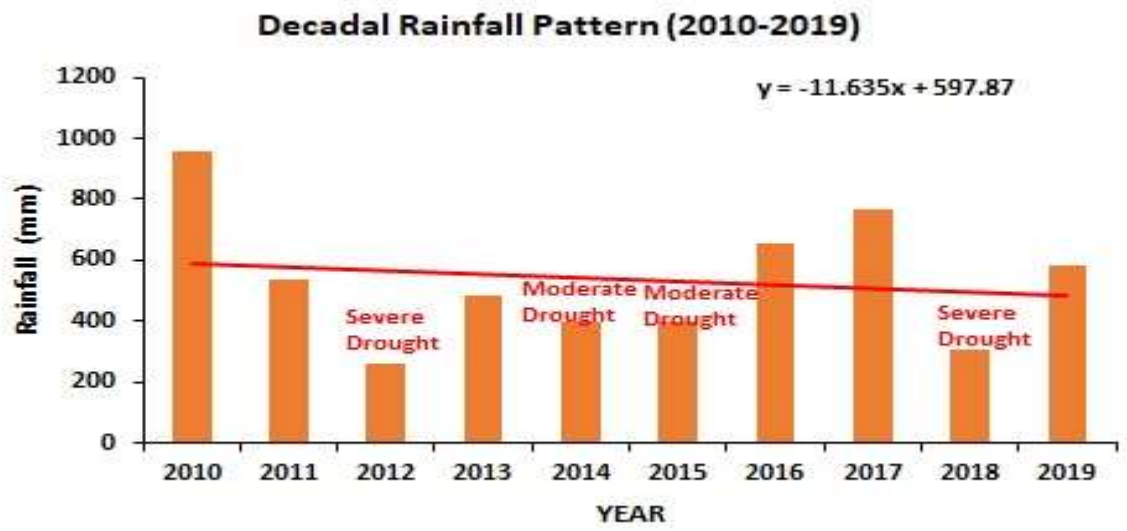
Declining water level Trend: -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 887 sq. km. covering abou 60% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 1301 sq. km. coverin about 88 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of Ashti block is 638.1 mm and also indicates a falling rainfall trend @ -20.255 mm/year with probability of 14.29% Moderate and 9.52 %Sever drought.

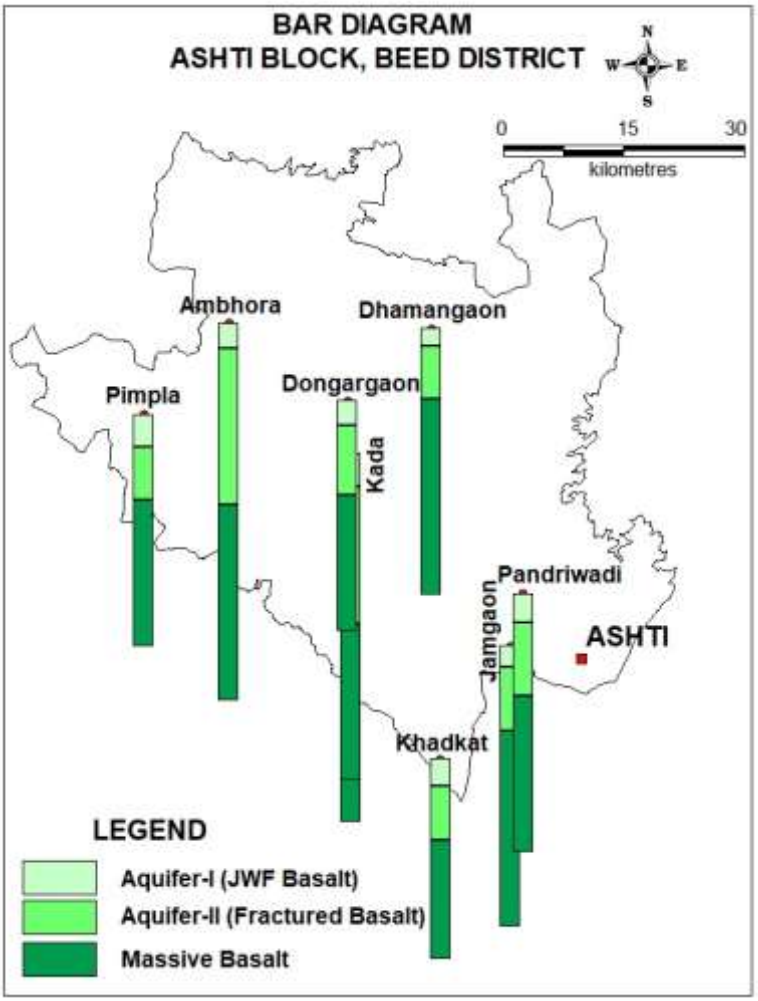
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 533.88 mm The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate severe droughts.



Low yielding Aquifer resulting poor sustainability:

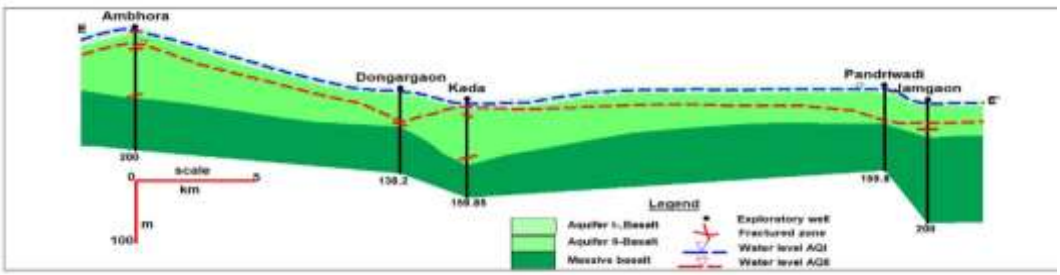
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailin erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 71% area o the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	



3.3. Cross Section

Section EE'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 16	54 to 159
Weathered/Fractured zones encountered (mbgl)	10 to 33	35 to 159
Weathered/Fractured rocks thickness (m)	8 to 13	0.50 to 10.00
SWL (mbgl)	7.07 to 16.52	3.40 to 46.82

Specific yield/Storativity (S)	0.020 to0.026	3.35 x10^{-4} to 3.65 x10^{-5}
Transmissivity (T)	15.00 to 70.50 m^2/day	0.079 to 834.00 m^2/day
Yield	1 to 261 m^3/day	0.14 to 5.80 lps
Sustainability	2 to 4 hrs	1 to 5 hrs

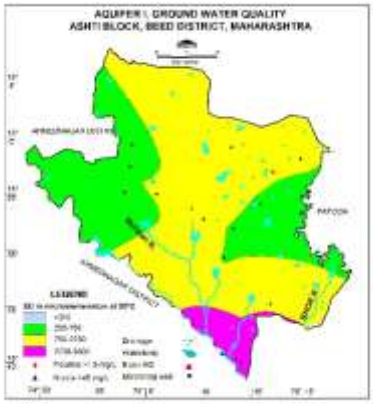
4. GROUND WATER QUALITY

4.1 Aquifer-I/ Shallow Aquifer

EC values between 250-750 µS/cm are observed in east and west parts of the block and EC values between 750 to 225 µS/cm are observed in major part of the block while 2250-3000 µS/cm are observed in south part of the block. Ground wate is suitable for all purposes except Doithana village where Fluoride value is 1.51 mg/L

4.2 Aquifer II/Deeper Aquifer

EC values between 250-750 µS/cm are observed in south-west and west parts of the block and EC values between 750 t 2250 µS/cm are observed in major part of the block. Ground water is suitable for all purposes except Garhi, Ambora KadaJamgaon where Fluoride and Nitrate values are above 1.50 mg/L and 45 mg/L respectively.

Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**
	

5. GROUND WATER RESOURCE

5.1 Aquifer-I/ Shallow Aquifer

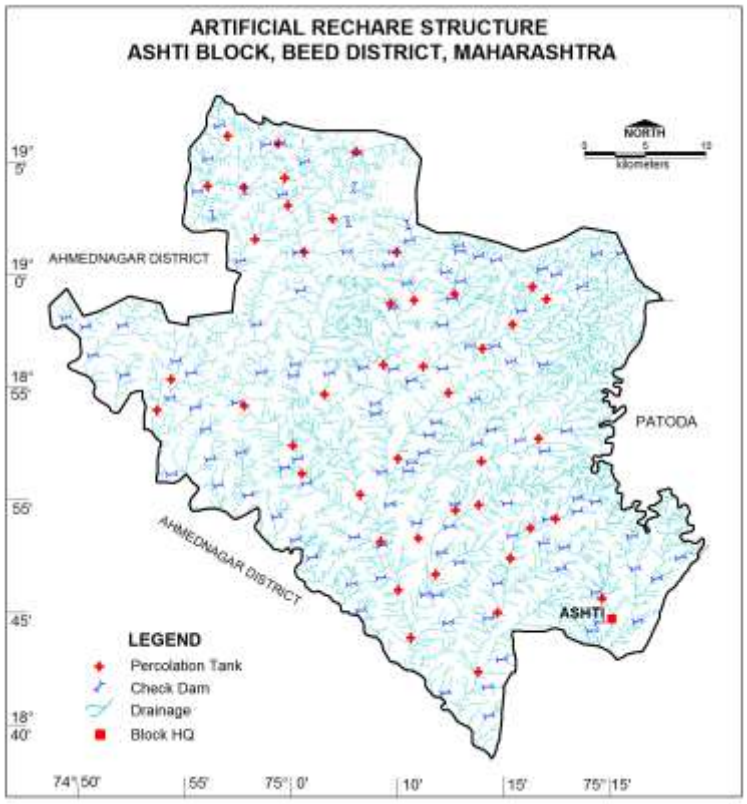
Ground Water Recharge Worthy Area (Sq. km.)	1436.44
Total Annual Ground Water Recharge (MCM)	168.27
Natural Discharge (MCM)	8.41
Net Annual Ground Water Availability (MCM)	159.86
Existing Gross Ground Water Draft for irrigation (MCM)	93.28
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	7.52
Existing Gross Ground Water Draft for All uses (MCM)	100.80
Provision for domestic and industrial requirement supply to 2025(MCM)	12.71
Net Ground Water Availability for future irrigation development (MCM)	54.25
Stage of Ground Water Development (%)	63.06
Category	**SAFE**

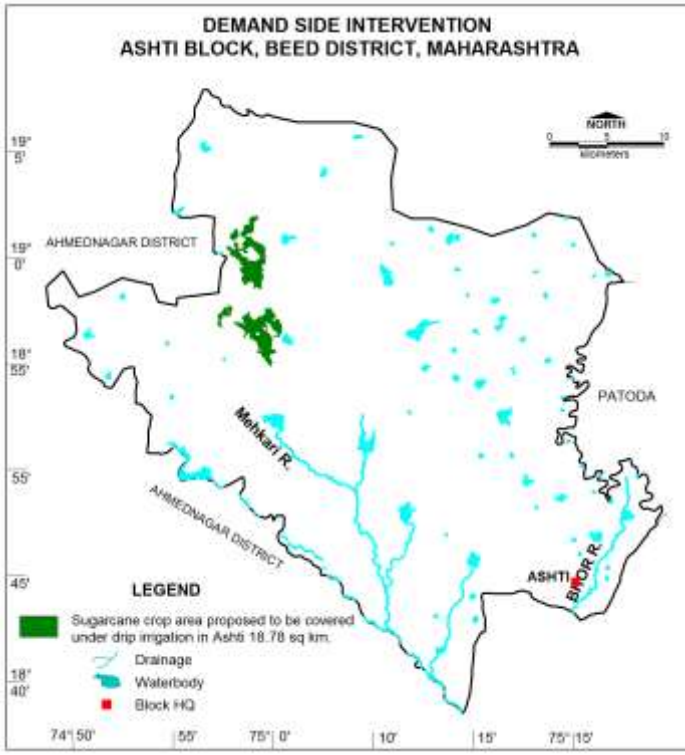
5.2 Aquifer-II/Deeper Aquifer

Semi confined/Confined Aquifer (Basalt)									
Block	**Aquifer**	**Area (Sqkm)**	**Mean Aquifer Thickness (m)**	**Peizometric head above (Confining Layer)**	**Average of Sy**	**Average of S**	**Resources above confining layer (mcm)**	**Resource with in confining Aquifer (mcm)**	**Total Resources (MCM)**
Ashti	Basalt Aq-II	1478.93	3.92	1.4	0.020	0.0003	0.62	1.74	2.36

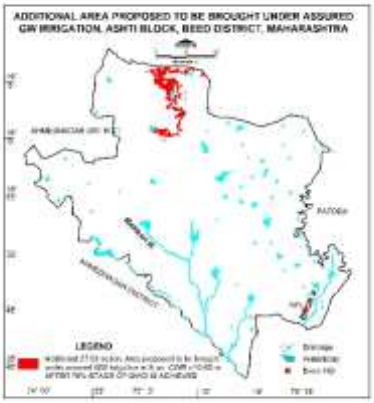
6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	159.90	
Gross Annual Draft (MCM)	100.8	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	93.28	
Agricultural Supply -SW	69.04	
Domestic Supply - GW	7.52	
Domestic Supply - SW	1.88	
Total Supply	171.72	
Area of Block (Sq. Km.)	1478.93	
Potential Area suitable for recharge (Sq. Km)	538.17	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)	538.17	
Volume of Unsaturated Zone	1076.34	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	21.53	
Surplus water Available (MCM)	12.19	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	43	122
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	6.39975	2.74
Proposed Structures	Economically not viable & Not Recommended	
RTRWH Structures – Urban Areas		
Households to be covered (25% with 50 m^2area)	53,112	
Total RWH potential (MCM)	1.694	
Rainwater harvested / recharged @ 80% runoff co-efficient	1.355 Economically not viable & Not Recommended	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane crop area (67.80), about 1 sqkm area is ground water irrigated ,100% ground water irrigated (1 sqkm) proposed to be covered under Drip (sq.km.)	18.78	

Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	10.7046
Water Saving micro Irrigation technique (MCM)	10.7046
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	159.86
Additional GW resources available after implementing above measures (MCM)	9.14
Ground Water Availability after Supply side Intervention (MCM)	168.995
Existing Ground Water Draft for All Purposes (MCM)	100.8
Saving of Ground Water through demand side intervention (MCM)	10.70
GW draft after Demand side interventions (MCM)	90.10
Present stage of Ground Water Development (%)	63.06
Stage of Ground Water Development after interventions (%)	53.31
Other Interventions Proposed if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 63.06% to 59.41%	
6.4. Development Plan	
Volume of water available available for GWD to 70% (MCM)	28.21
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	1692
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	282
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.	43.39
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Double Cropped Area proposed for drip Irrigation**





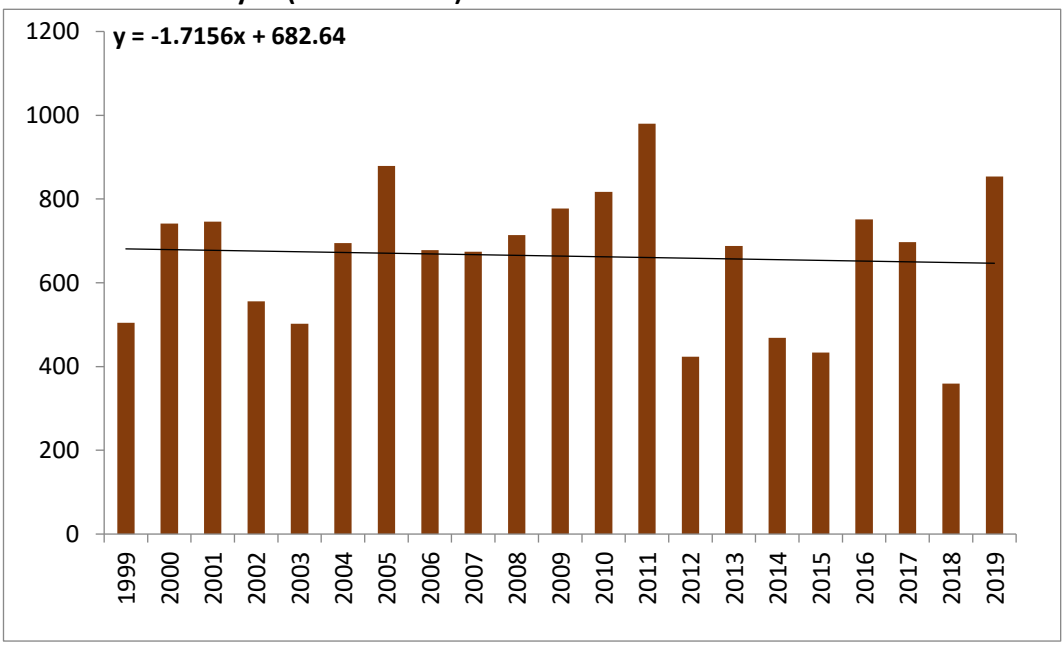
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**



9.3 BEED BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**BEED**	
Geographical Area (Sq. km.)	924.96Sq. km.	
Hilly Area (Sq. km.)	50.15Sq. km.	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	3,93,282	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	706.40 mm	
Annual Rainfall (2019)	854.10mm	
Decadal Average Annual Rainfall (2010-19)	647.27mm	
Long Term Rainfall Analysis (1999-2019)	Falling Trend 1.7156 mm/year Probability of Normal and Excess Rainfall 61.90% & 4.76% Probability of Droughts -: 33.33% Moderate	

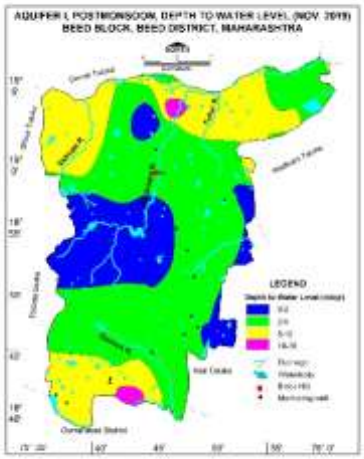
Rainfall Trend Analysis (1999 to 2019)

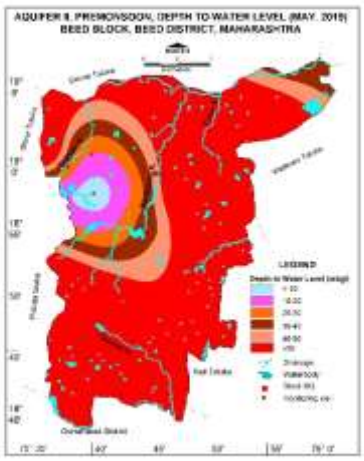
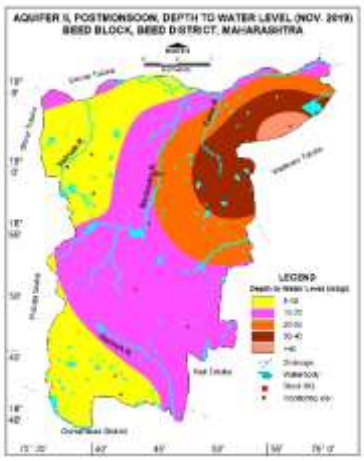


EQUATION OF TREND LINE y = **-1.7156x + 682.64**

1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Bendusara river &Damri river and Their tributaries	
Hydrology	Major	**Nil**

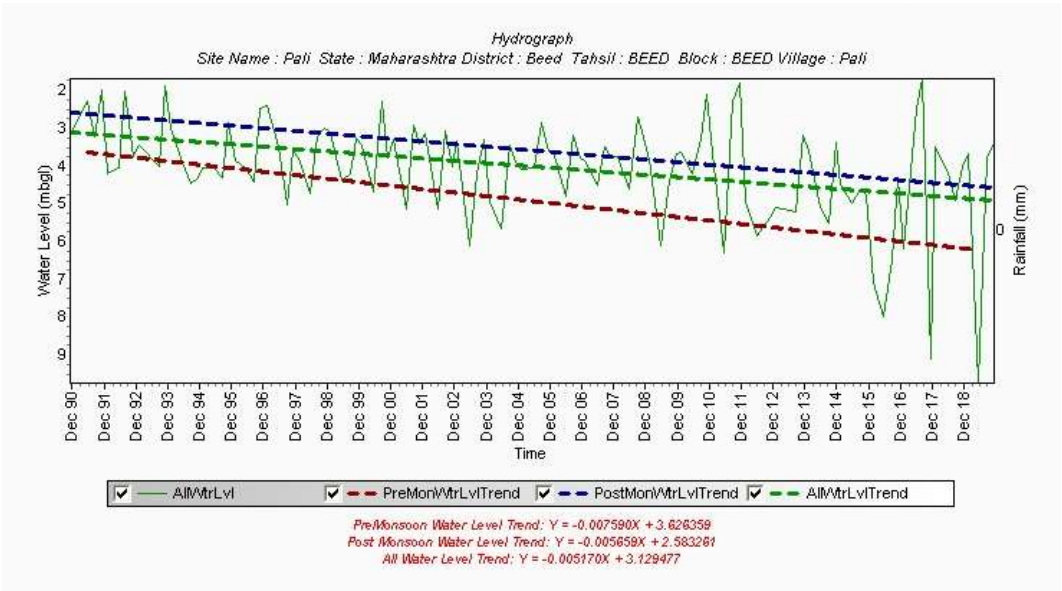
(*Reference DSA Year: June 2016-17)*	project	
	Medium project	**Completed:**01 medium irrigation project at Bindusara generating a gross irrigation Potential of 7.90 **(Ten lakh Cubic meter)** ha out of 1288 ha area.
	Small project	**Completed:** small irrigation projects covering area of 202.66 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern		
Geographical Area		924.96Sq. km.
Forest Area		54.92Sq. km.
Cultivable Area		167.90Sq. km.
Net Sown Area		132.29Sq. km.
Double Cropped Area		35.61Sq. km.
Area under Irrigation	Surface Water	89.53Sq. km.
	Ground Water	14.30Sq. km.
Principal Crops *(Reference year 2019)*	**Crop Type**	**Area (Sq. km.)**
	Cereals	491.81
	Pulses	105.51
	Gram	140.13
	Soyabean	139.97
	Cotton	732.86
	Sugarcane	25.71
Horticultural Crops	Mango	8.80
	Citrus fruits	2.34
	Grapes	0.25
	Banana	0.33
	Vegetables	4.95
1.6. Water Level Behaviour		
1.6.1. Aquifer-I/Shallow Aquifer		
Pre-Monsoon (May-2019)		**Post-Monsoon (November-2019)**
Water level between 2 to 5mbgl has been observed in major part of the block covering an area of 172 sq km; Water level between 5-10mbgl has been observed in south-west to central to south-east as a continuous patch part of the block covering an area of 72 sq km; whereas water levels between10-20mbgl have been observed in isolated patch in south part of the block covering about 43 sq. km. area. whereas water levels>20 mbgl have been observed in		Water level between0-2mbgl has been observed in east, west central part of the block covering an area of 184 sq km; Water level between2-5 mbgl has been observed in major part of the block covering an area of 554 sq km; Water level between 5 to 10 mbgl has been observed in south , east, west part of the block covering an area of 175 sq km. while Water level > 10 mbgl has been observed in isolated patch at north ana south part of the block covering an area of 46 sq km.

isolated patch in south part of the block covering about 23 sq km.	
Pre-Monsoon Water Level (May 2019) **WL>10 mbgl 272 sq. km.**	**Post-Monsoon Water Level (Nov. 2019)**  **WL>10 mbgl46 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels less than 10 mbgl observed at west part of the block; Water levels between 10-20 mbgl observed at west part of the block, Water levels between 20 to 30 mbgl are observed at west part of the block; Water levels between 30 to 40 mbgl are observed at east, west part of the block; while the entire block is seen to observe water level >50 mbgl covering an area of 720 sq km	Water levels between 5-10mbgl observed at north-west , south-east part of the block, Water levels between 10-20mbgl are observed at major part of the block; Water levels between 20 to 30 mbgl are observed at east part of the block;Water levels between 30 to 40 mbgl are observed at east part of the block; while the entire block is seen to observe water level >40 mbgl covering an area of 74 sq km
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**

	
WL>50mbgl720 sq. km.	**WL>40mbgl74 sq. km.**

1.7. Hydrograph

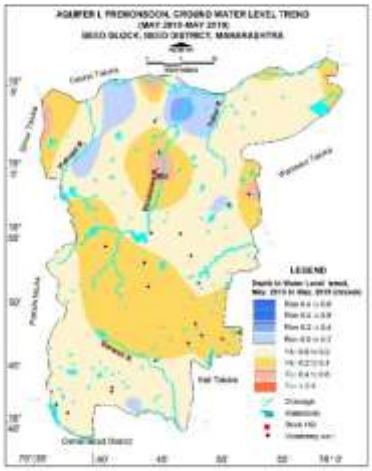
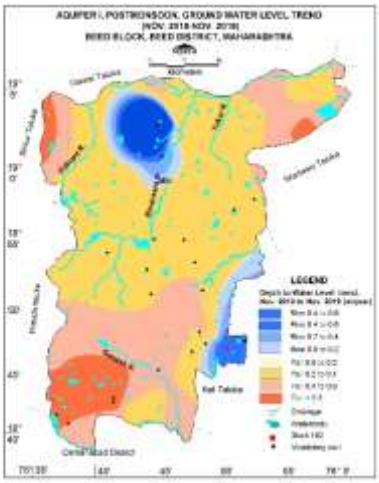
Site Name: Pali State: Maharashtra District: BEED Tehsil: BEED Block: : BEED Village: Pali



Hydrograph shows Pre-monsoon falling water level trend @ 0.09108 m/year and Post monsoon falling water level trend @ 0.067908 m/year

1.8. Water Level Trend (2010-19)

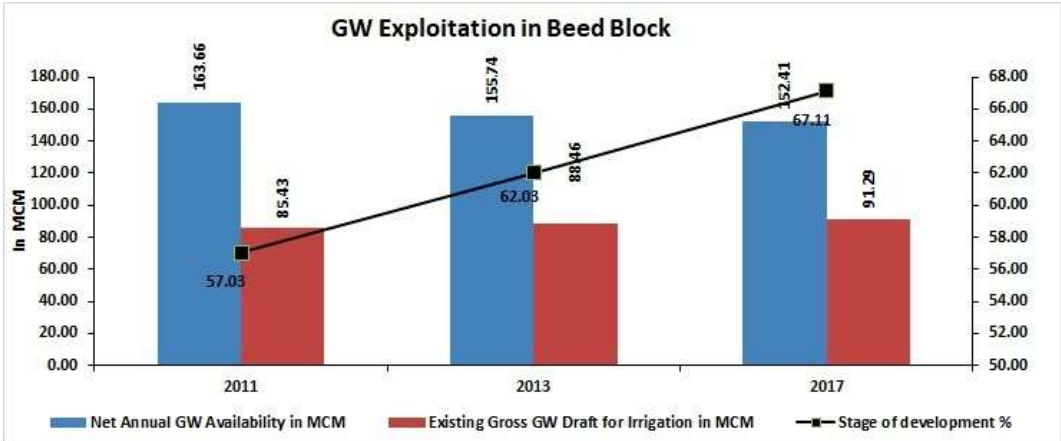
Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.000303to 0.31704m/year Falling 0.12166to 1.65 m/year	Rising 0.421429to 1.84m/year Falling 0.09745to 0.69879m/year
Decline in water level up to 0.2 m/year has been observed in major parts of the block while rise in water level up to 0.4 m/year has been observed in isolated patches in northern parts of the block. Declining trend more than 0.2 m/year has been observed in c part entral,	Declining water level trend up to 0.2 m/year has been observed in north part of the block while rise in water level up to 0.6 m/year has been observed in north part of block. Decline more than 0.2 m/year has been observed in major part of the block covering 785sq km area.

north-west of the block covering about 277 sq. km. area.	
Pre-Monsoon Water Level Trend (2010-19)  **Declining trend @>0.2 m/year 277 sq. km.**	**Post-Monsoon Water Level Trend (2010-19)**  **Declining trend @>0.2 m/year 785 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 57.03% to 62.03% and afterwards again increased during 2013 to 2017 from 62.03% to 67.11% in Beed block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 163.66 MCM to 155.74 MCM again further also decreased from 155.74 MCM to 152.41 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 85.43 MCM to 88.46 MCM and again further increased from 88.46 MCM to 91.29 MCM during 2013 to 2017.



Declining water level Trend : -

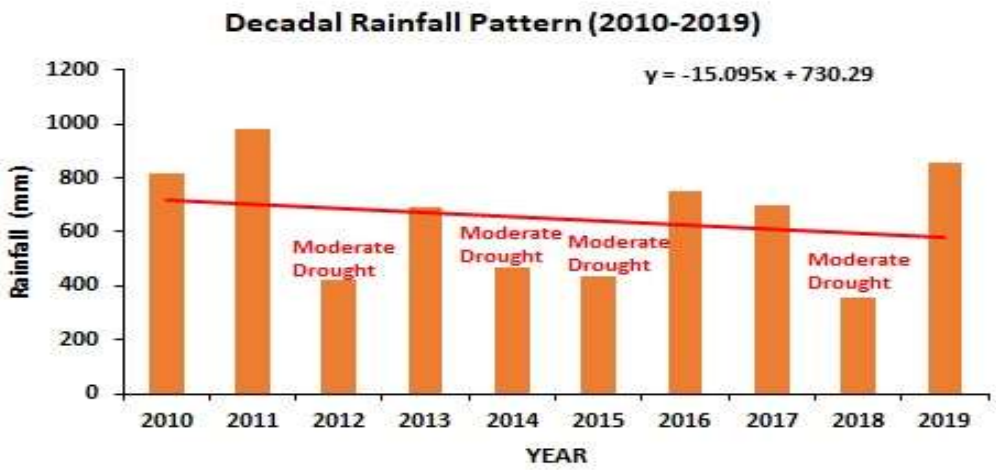
- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 277 sq. km. covering about 30 % area of the block.

- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 785 sq. km. covering about 85 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of BEED block is 706.40 mm, and also indicates a falling rainfall trend @ -1.7156 mm/year with 33.33% probability of moderate drought.

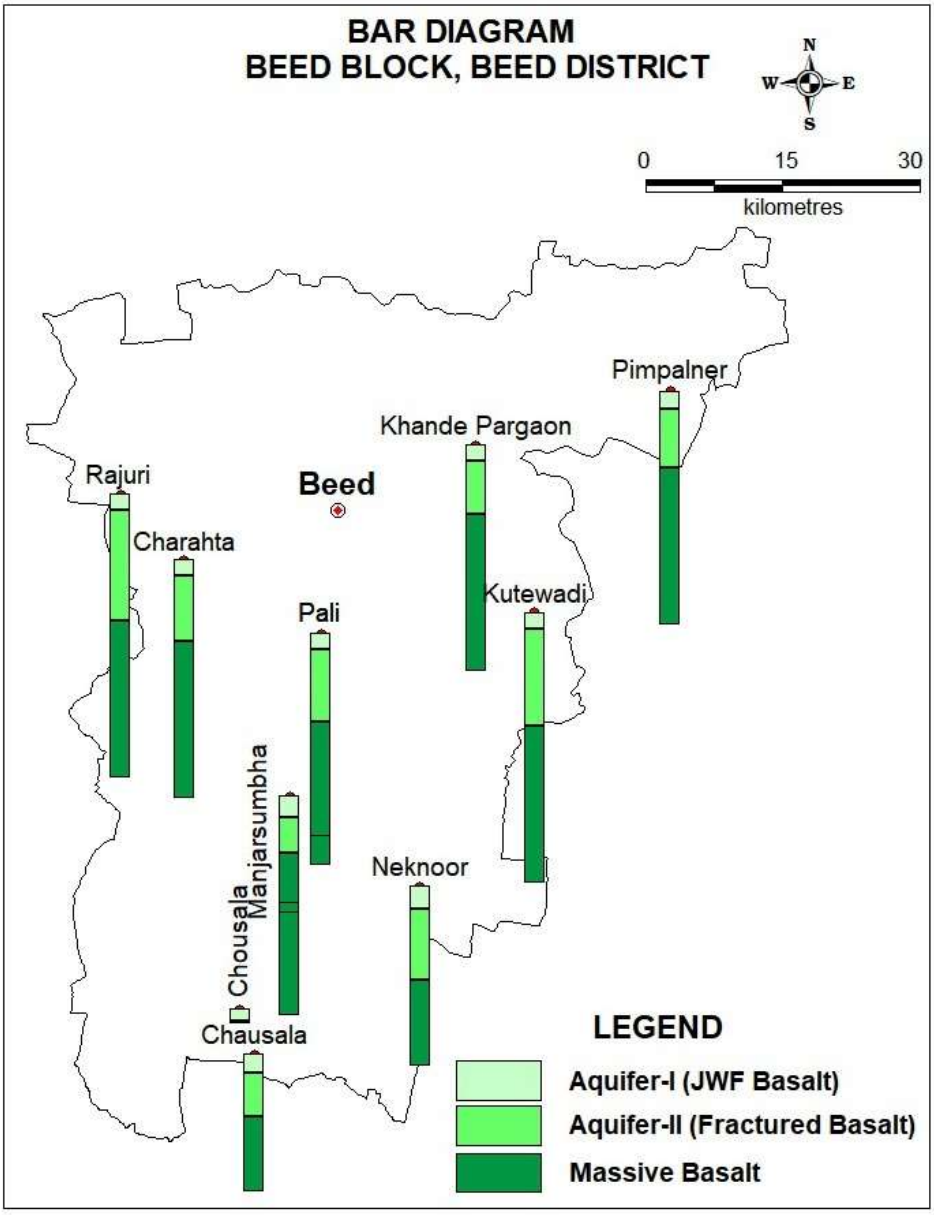
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 854.10 mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate droughts.



Low yielding Aquifer resulting poor sustainability:

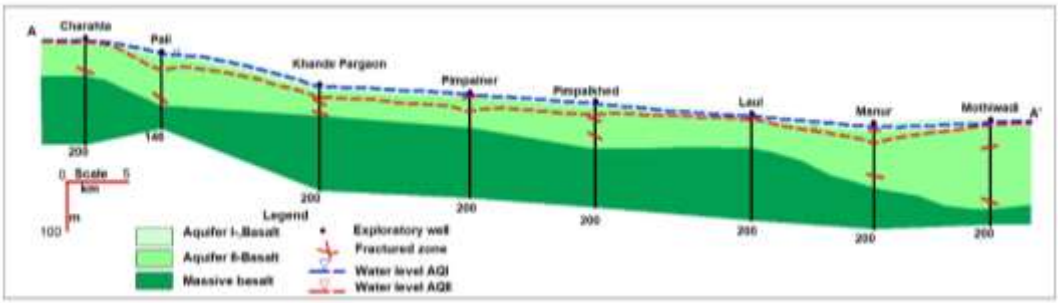
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 51% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	

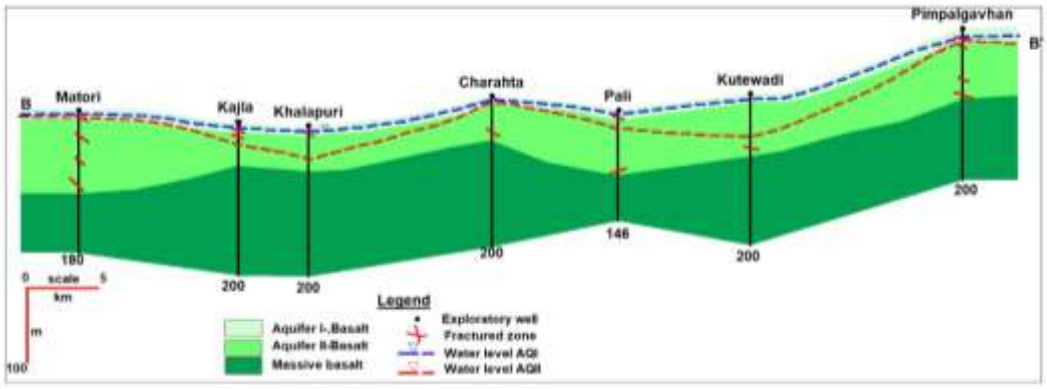


3.3. Cross Section

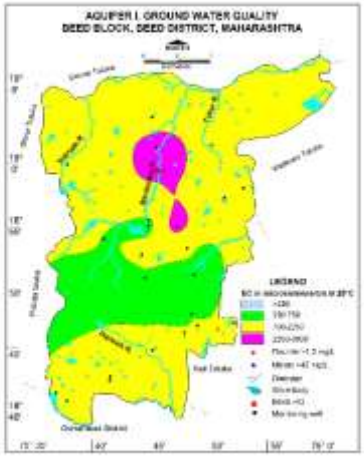
Section AA'

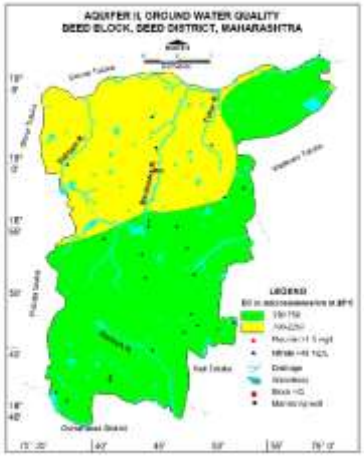


Section BB'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 34	43 to 140
Weathered/Fractured zones encountered (mbgl)	10 to 33	36 to 140
Weathered/Fractured rocks thickness (m)	6 to 12	0.50 to 7.00
SWL (mbgl)	6.68 to 19.90	6.80 to 100
Specific yield/Storativity (S)	0.020 to0.022	6.15×10^{-4} to 6.35×10^{-5}
Transmissivity (T)	15.00 to 70.50 m^2/day	1.10 to 62.47m^2/day
Yield	1 to 300 m^3/day	0.14 to 4.50 lps
Sustainability	2 to 4 hrs	1 to 5 hrs
4. GROUND WATER QUALITY		
4.1 Aquifer-I/ Shallow Aquifer		
EC values between250-750 µS/cm are observed in central parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, while EC values between 2250-3000 µS/cm are observed in central part as isolated patch Ground water is suitable for all purposes except Adgaon, NandurPhata where Fluoride values are 1.95 mg/L, 4.36mg/L respectively.		
4.2 Aquifer II/Deeper Aquifer		
EC values between250-750 µS/cm are observed in south parts of the block and EC values between 750 to 2250 µS/cm are observed in north part of the block. Ground water is suitable for all purposes except Pali, Chatara and Kutewadi where Fluoride values are 3.85 mg/L, 6.13 mg/L, 17.60mg/L respectively and Rajuri, Pali and Khande pangaon where Nitrate values are 102 mg/L, 124 mg/L, 149 mg/L respectively		
Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**	





5. GROUND WATER RESOURCE	
5.1 Aquifer-I/ Shallow Aquifer	
Ground Water Recharge Worthy Area (Sq. km.)	1347.79
Total Annual Ground Water Recharge (MCM)	152.41
Natural Discharge (MCM)	7.62
Net Annual Ground Water Availability (MCM)	144.79
Existing Gross Ground Water Draft for irrigation (MCM)	91.28
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	5.88
Existing Gross Ground Water Draft for All uses (MCM)	97.17
Provision for domestic and industrial requirement supply to 2025(MCM)	23.65
Net Ground Water Availability for future irrigation development (MCM)	23.63
Stage of Ground Water Development (%)	67.11
Category	**SAFE**

5.2 Aquifer-II/Deeper Aquifer

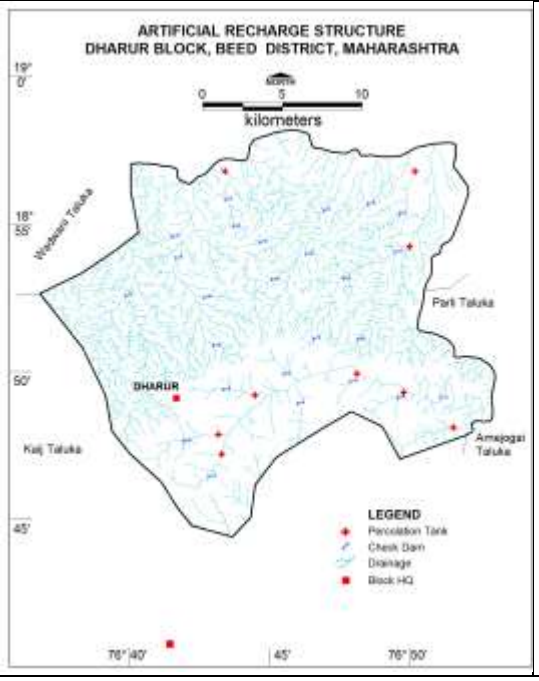
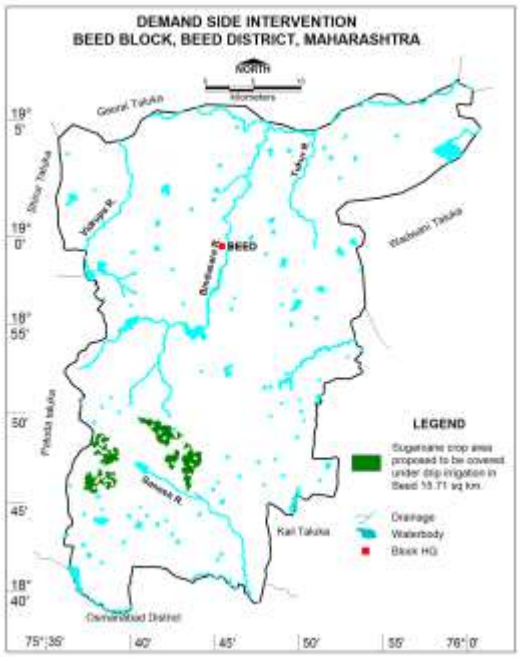
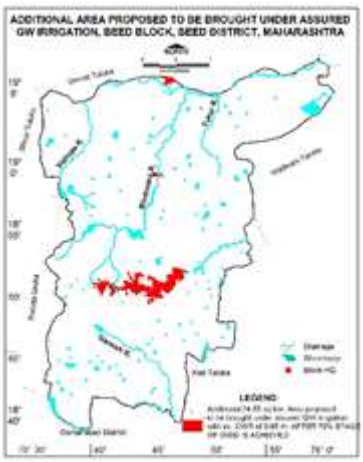
Semi confined/Confined Aquifer (Basalt)

Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource with in confining	Total Resources (MCM)

								Aquifer (mcm)	
Beed	Basalt Aq-II	1397.94	3.71	2.76	0.020	0.0006	2.31	3.11	5.43

6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	144.79	
Gross Annual Draft (MCM)	97.17	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	91.28	
Agricultural Supply -SW	5.61	
Domestic Supply - GW	5.88	
Domestic Supply - SW	1.47	
Total Supply	104.24	
Area of Block (Sq. Km.)	1397.94	
Potential Area suitable for recharge (Sq. Km)	725.74	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)	725.74	
Volume of Unsaturated Zone	1451.48	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	29.03	
Surplus water Available (MCM)	16.43	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	58	164
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	8.62575	3.70
Proposed Structures	Economically not viable & Not Recommended	
RTRWH Structures – Urban Areas		
Households to be covered (25% with 50 m^2area)	99,251	
Total RWH potential (MCM)	3.504	
Rainwater harvested / recharged @ 80% runoff co-efficient	2.803 Economically not viable & Not Recommended	
6.2. Demand Side Management		
Micro irrigation techniques		

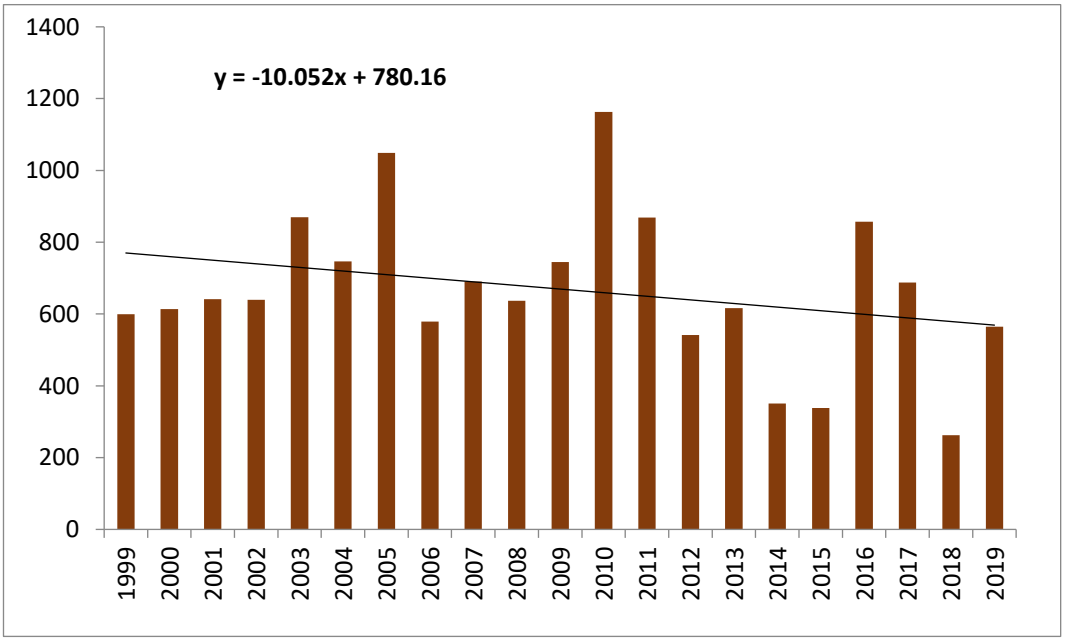
Sugarcane crop area (15.71), about 4 sqkm area is ground water irrigated ,100% ground water irrigated (4 sqkm) proposed to be covered under Drip (sq.km.)	15.71
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	8.95
Cotton crop area (732.86), about 20 sqkm area is ground water irrigated, 100 % ground water irrigated (20sqkm) proposed to be covered under Drip (sq.km.)	8.95
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	144.79
Additional GW resources available after implementing above measures (MCM)	12.32
Ground Water Availability after Supply side Intervention (MCM)	157.11
Existing Ground Water Draft for All Purposes (MCM)	97.17
Saving of Ground Water through demand side intervention (MCM)	8.95
GW draft after Demand side interventions (MCM)	88.22
Present stage of Ground Water Development (%)	67.11
Stage of Ground Water Development after interventions (%)	56.15
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 67.11% to 56.15%	
6.4. Development Plan	
Volume of water available available for GWD to 70% (MCM)	21.76
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	1306
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	218

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.	33.48
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Crop Area proposed for drip Irrigation**
	
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION** 	

9.4 DHARUR BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**DHARUR**	
Geographical Area (Sq. km.)	287.55	
Hilly Area (Sq. km.)	51.79	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	62,231	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall (mm)	732	
Annual Rainfall (2019) (mm)	564.7	
Decadal Average Annual Rainfall (2010-19) (mm)	625.1	
Long Term Rainfall Analysis (1999-2019)	Falling Trend -10.052 mm/year Probability of Normal and Excess Rainfall 76.19 % & 9.52 % Probability of Droughts -: 4.76 % Moderate and 9.52 %Severe	

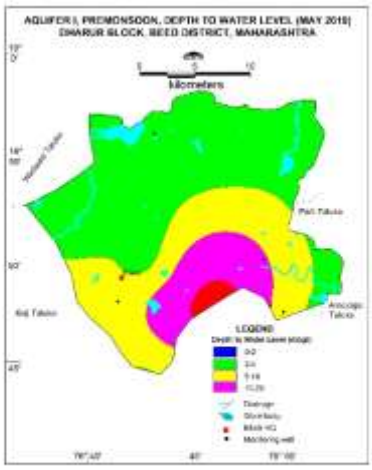
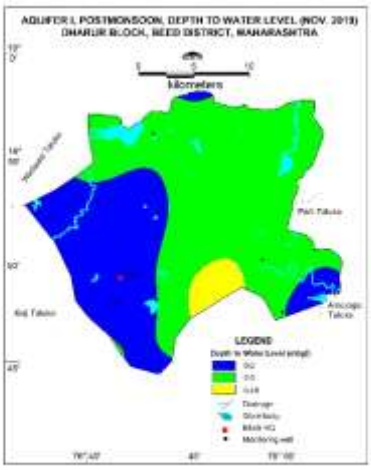
Rainfall Trend Analysis (1999 to 2019)



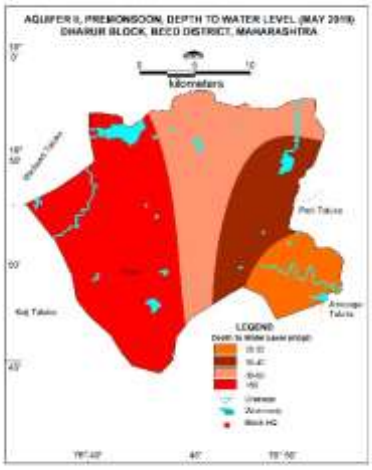
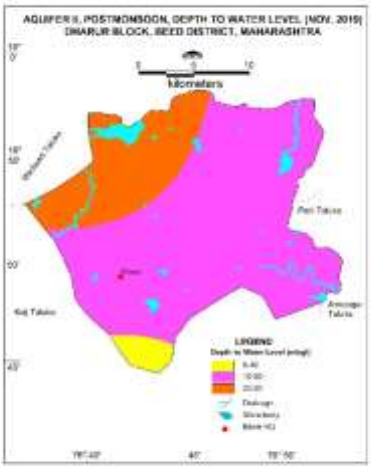
***EQUATION OF TREND LINE y =* -10.052x+780.16**

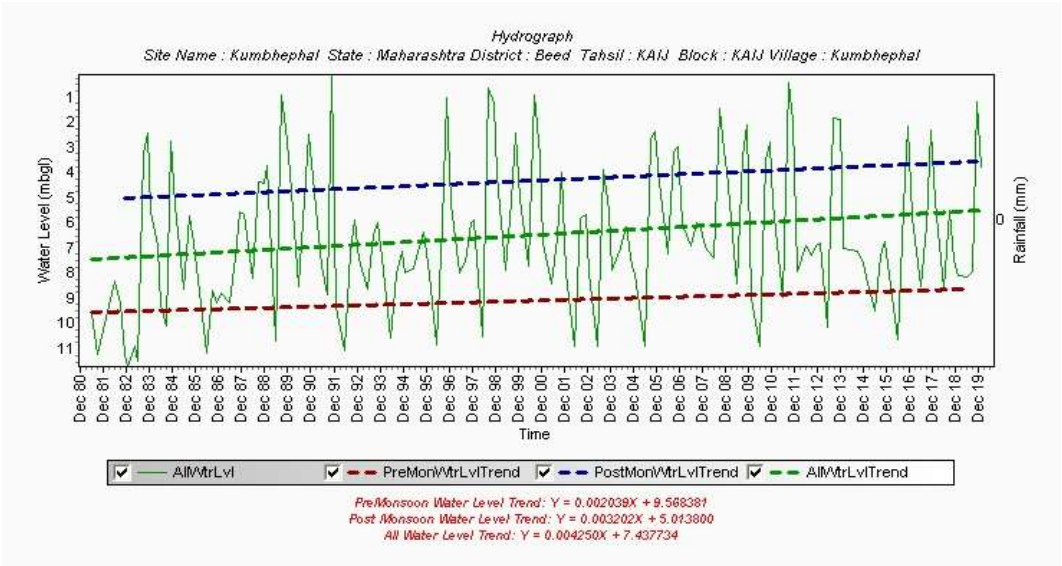
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Kundka river flows along the block boundary	
Hydrology (***Reference DSA Year: June 2016-***	Major project	NIL

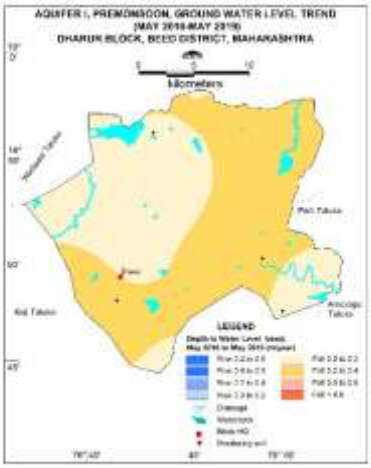
17)		Medium project	**Completed:** Saraswati project projects covering area of 12.30sq km with Storage capacity (Ten lakh Cubic meter) of 6.21
		Small project	**Completed:** small irrigation projects covering area of 19.84 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		287.55Sq. km.	
Forest Area		30.79Sq. km.	
Cultivable Area		197.69 Sq. km.	
Net Sown Area		188.69 Sq. km.	
Double Cropped Area		9.00 Sq. km.	
Area under Irrigation	Surface Water	23.70 Sq. km.	
	Ground Water	8.50 Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	137.84
		Pulses	22.18
		Gram	39.00
		Soyabean	74.65
		Cotton	236.50
		Sugarcane	22.86
Horticultural Crops		Mango	2.35
		Citrus fruits	1.95
		Grapes	0.00
		Banana	0.15
		Vegetables	3.43
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)		**Post-Monsoon (November-2019)**	
Water level between 2 to 5mbgl has been observed in major part of the block covering an area of 172 sq km; Water level between 5-10mbgl has been observed in south-west to central to south-east as a continuous patch part of the block covering an area of 72 sq km; whereas water levels between10-20mbgl have been observed in isolated patch in south part of the block covering about 43 sq. km. area. whereas water levels>20 mbgl have been observed in isolated patch in south part of the block covering about 23 sq km.		Water level between0-2mbgl has been observed in east, west central part of the block covering an area of 101 sq km; Water level between2-5 mbgl has been observed in major part of the block covering an area of 167 sq km; Water level between 5 to 10 mbgl has been observed in south part of the block covering an area of 25 sq km.	

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>10 mbgl23 sq. km.	**WL>5mbgl43 sq. km.**

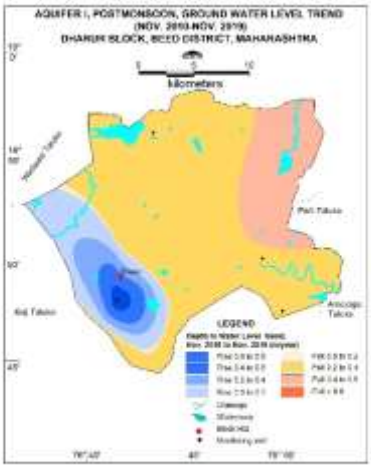
1.6.2. Aquifer-II/Deeper Aquifer

Pre-Monsoon (May-2019)	Post-Monsoon (November-2019)
Water levels between 20 to 30 mbgl are observed in east half of the block; Water levels between 30 to 40 mbgl are observed in east half of the block; Water levels between 40 to 50 mbgl are observed in north, central. south half of the block; water levels more than 50 mbgl have been observed in major part of the block covering about 144 sq. km. area of the block.	Water levels between 5-10mbgl are observed in south part of the block; Water levels between 10-20mbgl are observed in major part of the block; Water levels >20mbgl are observed in south part of the block covering about 27 sq. km. area of the block.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**
	

WL>50mbgl144 sq. km.	WL> 20 mbgl27 sq. km.
1.7. Hydrograph **Site Name: Kumbhephal State: Maharashtra District: BEED Tehsil: DARUR Block: : BEED Village: Kumbhephal**  	
Hydrograph shows Pre-monsoon rising water level trend @ 0.024468 m/year and Post monsoon rising water level trend @ 0.03824 m/year	
1.8. Water Level Trend (2010-19)	
Pre-Monsoon trend Falling 0.20232to 0.53176m/year	**Post-Monsoon trend** Rising 0.073 to 0.676071m/year Falling 0.35836to 0.47601m/year
Decline in water level up to 0.2 m/year has been observed in eastern and western parts of the block covering 114 sq km area. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 172 sq. km. area.	Declining water level trend up to 0.2 m/year has been observed in south-west part of the block covering 15 sq km area, while rise in water level up to 0.6 m/year has been observed in west partof block covering 55 sq km area. Decline more than 0.2 m/year has been observed in major part of the block covering 229sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**



Declining trend @>0.2 m/year 172 sq. km.

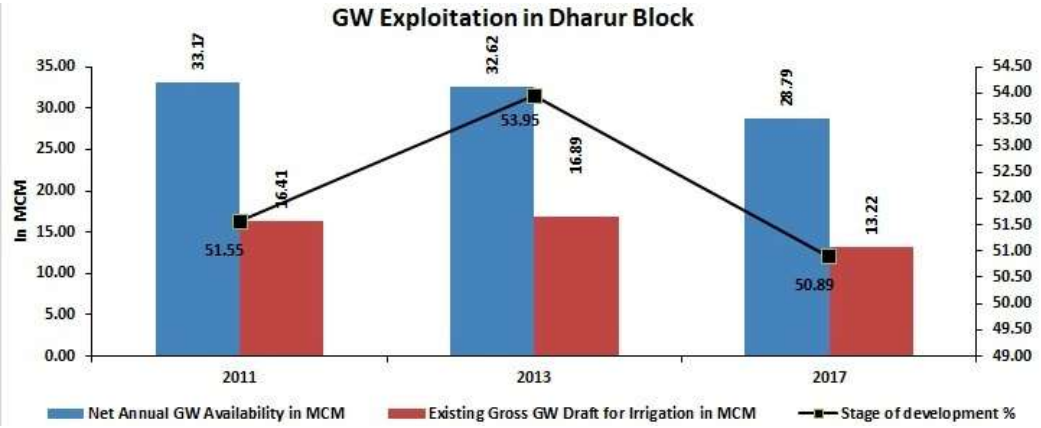


Declining trend @>0.2 m/year 229 sq. km.

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 51.55% to 53.95% and afterwards decreased during 2013 to 2017 from 53.95% to 50.89% in Darur block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 33.17 MCM to 32.62 MCM again futher decreased from 32.62 MCM to 28.79 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 16.41 MCM to 16.89 MCM and but decreased from 16.89 MCM to 13.22 MCM during 2013 to 2017.



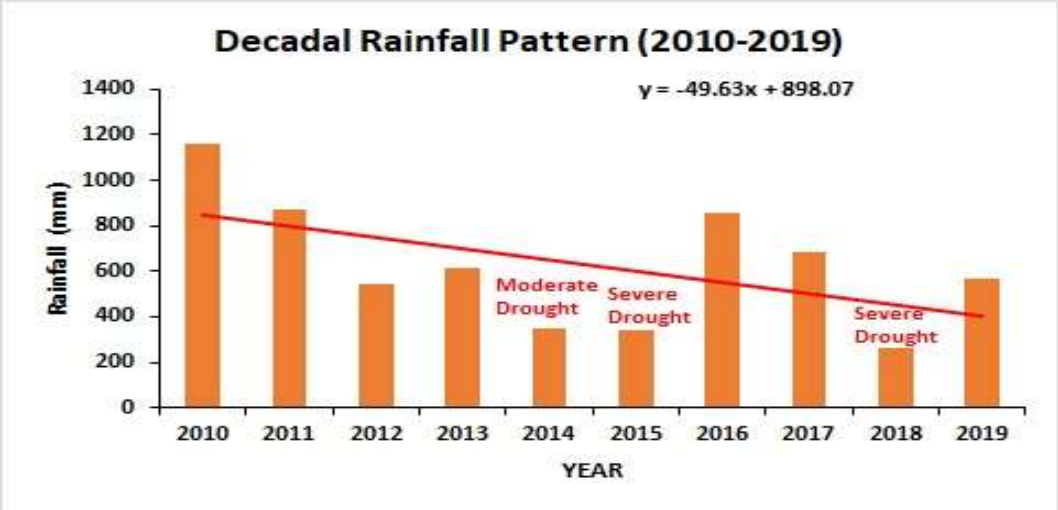
Declining water level Trend : -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 172 sq. km. covering about 60% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 229 sq. km. covering about 80 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of DARUR block is 732.00mm, and also indicates a falling rainfall trend @ 10.052 mm/year with probability of 4.76 % Moderate and 9.52 %Severe drought.

Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 625.10mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



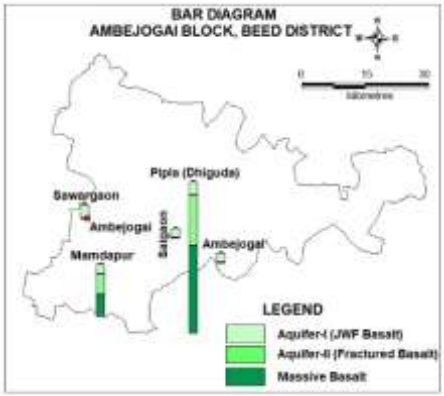
Low yielding Aquifer resulting poor sustainability:

Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 60% area of the block has low yield potential (< 0.30 lps) and can sustain pumping only for 0.5-1hrs.

3. AQUIFER DISPOSITION

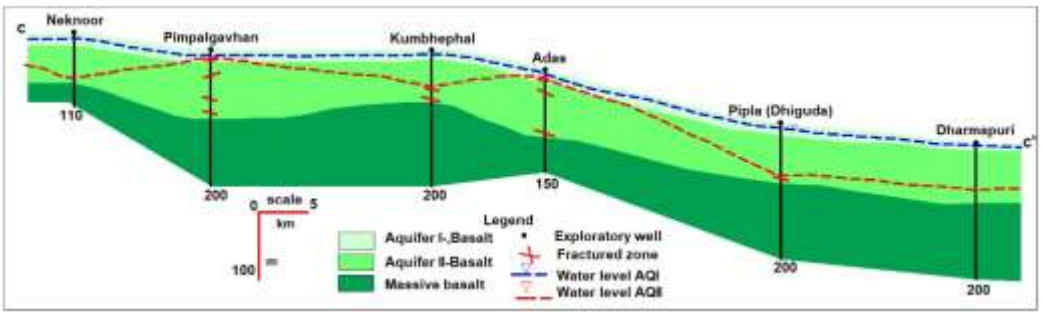
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II

3.2. Lithological disposition

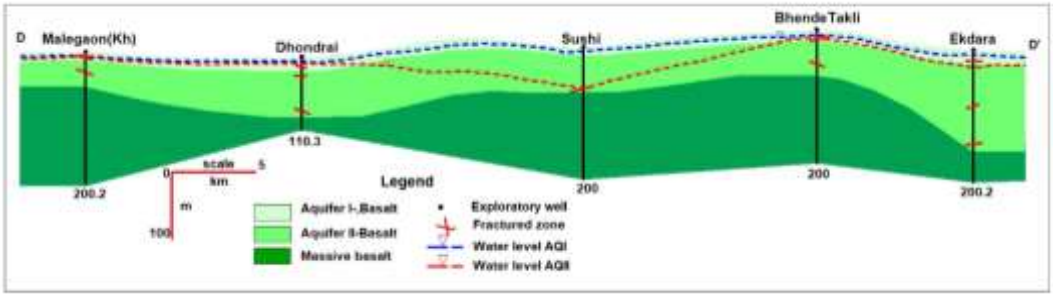


3.3. Cross Section

Section CC'



Section DD'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 16	43 to 140
Weathered/Fractured zones encountered (mbgl)	10 to 33	36 to 140
Weathered/Fractured rocks thickness (m)	8 to 12	0.50 to 1.00
SWL (mbgl)	6.68 to 14.62	6.80 to 100
Specific yield/Storativity (S)	0.020 to0.026	3.35 x10^{-4} to 3.65 x10^{-5}
Transmissivity (T)	15.00 to 70.50 m^2/day	1.10 to 62.47m^2/day
Yield	4 to 300 m^3/day	0.14 to 1.25 lps
Sustainability	1 to 2 hrs	1 to 2 hrs

4. GROUND WATER QUALITY

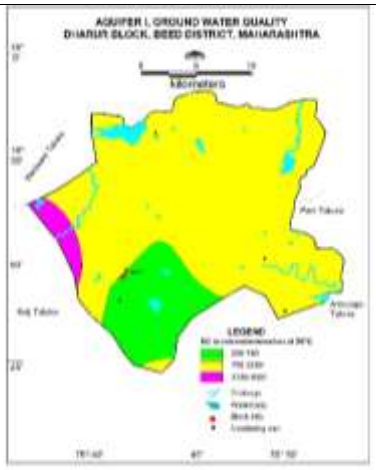
4.1 Aquifer-I/ Shallow Aquifer

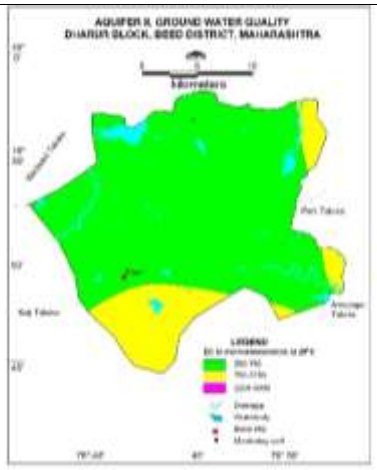
EC values 250-750 µS/cm are observed in southern parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, while EC values between 2250-3000 µS/cm are observed in south-west part of the block. Ground water is suitable for all purposes.

4.2 Aquifer II/Deeper Aquifer

EC values 250-750 µS/cm are observed in major parts of the block and EC values between 750 to 2250 µS/cm are observed in southern part of the block. Ground water is suitable for all purposes.

Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**





5. GROUND WATER RESOURCE	
5.1 Aquifer-I/ Shallow Aquifer	
Ground Water Recharge Worthy Area (Sq. km.)	235.76
Total Annual Ground Water Recharge (MCM)	28.79
Natural Discharge (MCM)	1.43
Net Annual Ground Water Availability (MCM)	27.35
Existing Gross Ground Water Draft for irrigation (MCM)	13.21
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	0.70
Existing Gross Ground Water Draft for All uses (MCM)	13.92
Provision for domestic and industrial requirement supply to 2025(MCM)	1.98
Net Ground Water Availability for future irrigation development (MCM)	11.26
Stage of Ground Water Development (%)	50.89
Category	**SAFE**

5.2 Aquifer-II/Deeper Aquifer

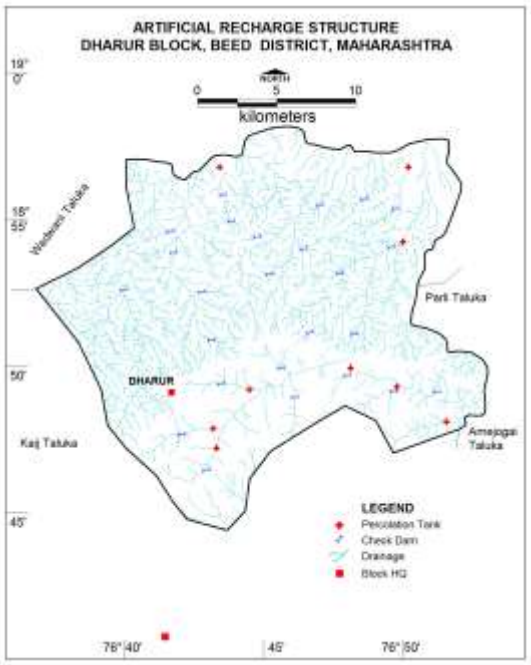
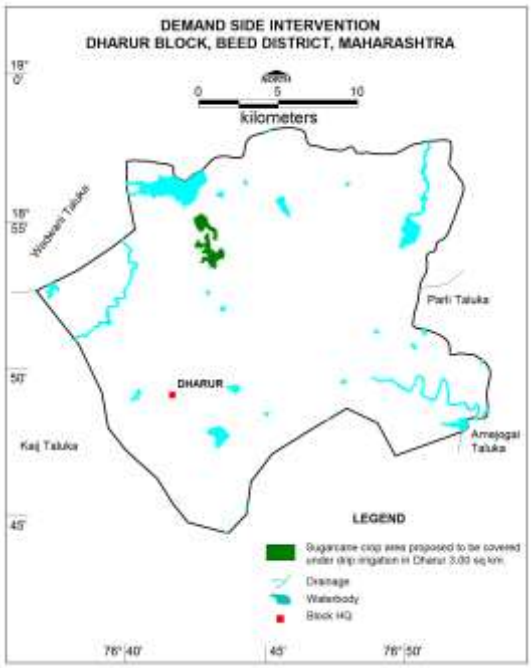
Semi confined/Confined Aquifer (Basalt)

Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource within confining Aquifer (mcm)	Total Resources (MCM)
Dharur	Basalt Aq-II	287.55	3.75	9.05	0.020	0.0006	0.00	2.16	2.16

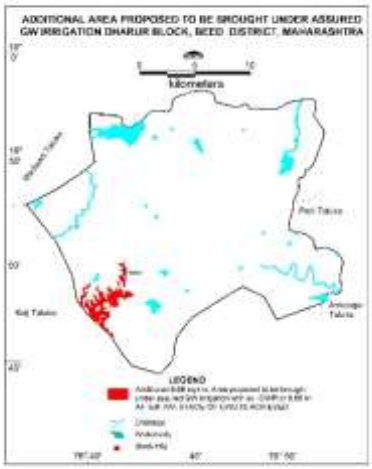
6.0. GROUND WATER RESOURCE MANAGEMENT	
Available Resource (MCM)	27.35

Gross Annual Draft (MCM)	13.92	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	13.21	
Agricultural Supply -SW	15.41	
Domestic Supply - GW	0.7	
Domestic Supply - SW	0.18	
Total Supply	29.49	
Area of Block (Sq. Km.)	287.55	
Potential Area suitable for recharge(Sq. Km)	109.9	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge(WL >5mbgl) (Sq. Km.)	109.9	
Volume of Unsaturated Zone	219.8	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	4.396	
Surplus water Available (MCM)	2.49	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	9	25
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	1.306725	0.56
Proposed Structures	Economically not viable & Not Recommended	
RTRWH Structures – Urban Areas		
Households to be covered (25% with 50 m2area)	25,274	
Total RWH potential (MCM)	0.902	
Rainwater harvested / recharged @ 80% runoff co-efficient	0.722 Economically not viable & Not Recommended	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane crop area (29) ,about 1 sqkm area is ground water irrigated ,100% ground water irrigated (1 sqkm) proposed to be covered under Drip (sq.km.)	3	

Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.4 m	1.71
Water Saving micro Irrigation technique (MCM)	1.71
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	27.35
Additional GW resources available after implementing above measures (MCM)	1.87
Ground Water Availability after Supply side Intervention (MCM)	29.22
Existing Ground Water Draft for All Purposes (MCM)	13.92
Saving of Ground Water through demand side intervention (MCM)	1.71
GW draft after Demand side interventions (MCM)	12.21
Present stage of Ground Water Development (%)	50.90
Stage of Ground Water Development after interventions (%)	41.79
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 50.90% to 41.79%	
6.4. Development Plan	
Volume of water available available for GWD to 70% (MCM)	8.24
Proposed Number of DW (@ 1.5 ham for 90% of GWR Available)	495
Proposed Number of BW (@ 1 ham for 10% of GWR Available)	82
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.	12.68
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Cropped Area proposed for drip**

	Irrigation
	

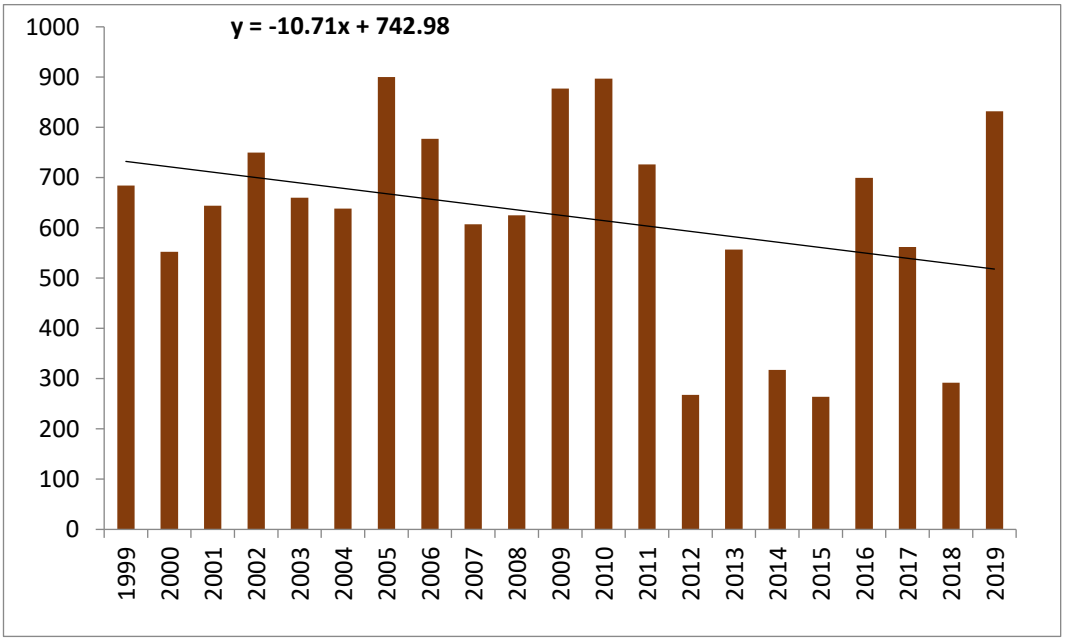
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**



9.5 GEORAI BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**GEORAI**	
Geographical Area (Sq. km.)	1482.23 Sq. km.	
Hilly Area (Sq. km.)	3.02Sq. km.	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,62,540	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	734.6	
Annual Rainfall (2019)	831.7	
Decadal Average Annual Rainfall (2010-19)	541.39	
Long Term Rainfall Analysis (1999-2019)	Falling Trend 10.71 mm/year Probability of Normal and Excess Rainfall 80.95 % & 0% Probability of Droughts -: 19.05 %Severe	

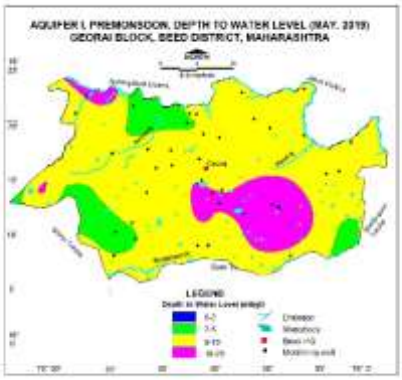
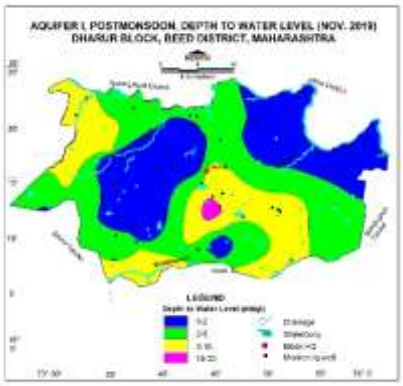
Rainfall Trend Analysis (1999 to 2019)



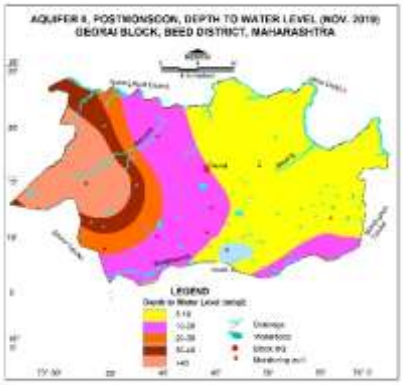
EQUATION OF TREND LINE y = -10.71x+742.98

1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Godavari river forming northern boundary and Their tributaries	
Hydrology (***Reference DSA Year: June 2016-17)***	Major project	**Nil**

		Medium project	**Completed:** NIL
		Small project	**Completed:** small irrigation projects covering area of 56.79 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		1482.23 Sq. km.	
Forest Area		19.91 Sq. km.	
Cultivable Area		379.65 Sq. km.	
Net Sown Area		334.16Sq. km.	
Double Cropped Area		45.49Sq. km.	
Area under Irrigation	Surface Water	48.21Sq. km.	
	Ground Water	1.26 Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	347.15
		Pulses	62.92
		Gram	128.00
		Soyabean	74.21
		Cotton	739.54
		Sugarcane	111.34
Horticultural Crops		Mango	1.80
		Citrus fruits	1.90
		Grapes	0.01
		Banana	0.15
		Vegetables	5.50
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water level between 2 to 5mbgl has been observed in north, south-east, south-west part of the block covering an area of 222 sq km; Water level between 5-10mbgl has been observed in major part of the block covering an area of 1112 sq km; whereas water levels more than 10mbgl have been observed in isolated patch in central part of the block covering about 148 sq. km. area.			Water level between0-2mbgl has been observed in east, west central part of the block covering an area of 370 sq km; Water level between2-5 mbgl has been observed in major part of the block covering an area of 667 sq km; Water level between 5 to 10 mbgl has been observed in west, south central part of the block covering an area of 275 sq km. while Water level between 10 to 20 mbgl has been observed in central part as isolated patch of the block covering an area of 76 sq km

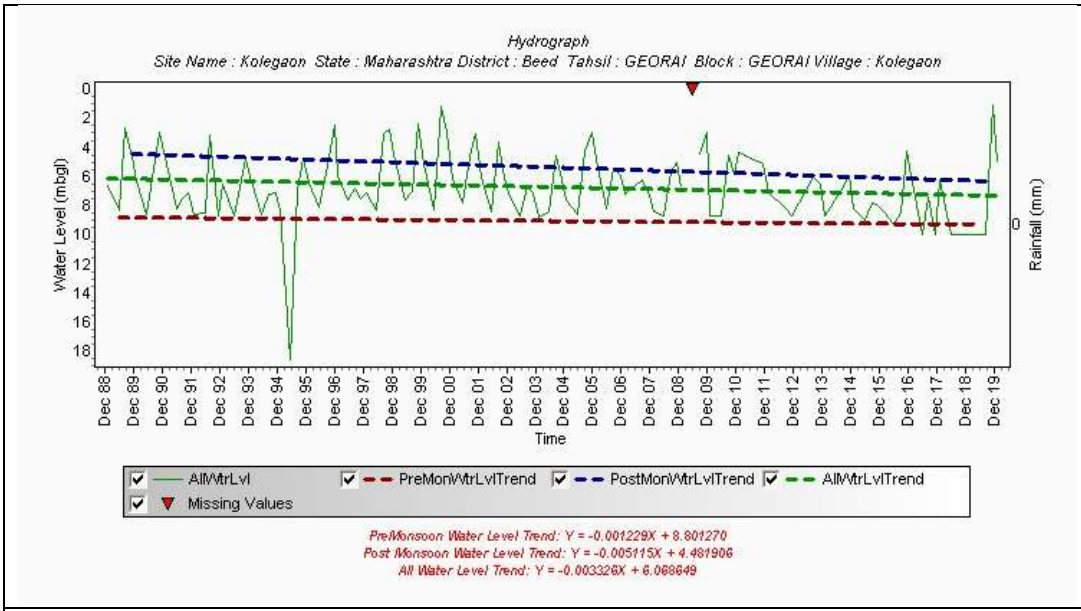
Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>10 mbgl148 sq. km.	**WL>10 mbgl 76 sq. km.**

1.6.2. Aquifer-II/Deeper Aquifer

Pre-Monsoon (May-2019)	Post-Monsoon (November-2019)
Water levels less than 10mbgl is seen in entire north and central part of the block; Water levels between 10-20 mbgl are observed in west to east as a continuous patch; while Water levels between 20-30mbgl are observed west to east as a continuous patch;while Water levels between 30-40mbglare observed west to east as a continuous patch in the block; water levels more than 40 mbgl have been observed in south half of the block covering about 518 sq. km. area of the block.	Water levels between 5-10mbgl are observed in major part of the block; Water levels between 10-20 mbgl are observed in north to south as a continuous patch; while Water levels between 20-30mbgl are observed north to south as a continuous patch;while Water levels between 30-40mbgl are observed west to south as a continuous patch in the block; water levels more than 40 mbgl have been observed in west half of the block covering about 296 sq. km. area of the block.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**
	
WL>50mbgl518 sq. km.	**WL>40mbgl296 sq. km.**

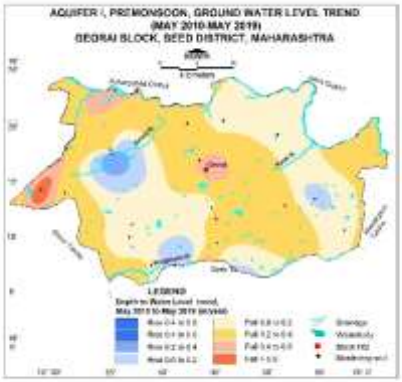
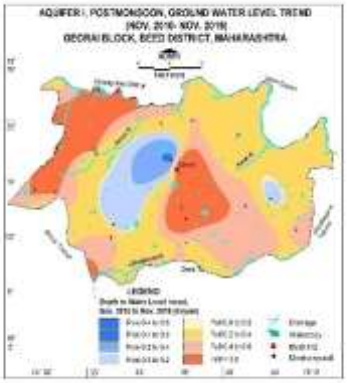
1.7. Hydrograph

Site Name: Kolegaon State: Maharashtra District: BEED Tehsil: Georai Block: : BEED Village: Kolegaon



Hydrograph shows Pre-monsoon falling water level trend @ -13.1152 m/year and Post monsoon falling water level trend @ -0.6138 m/year

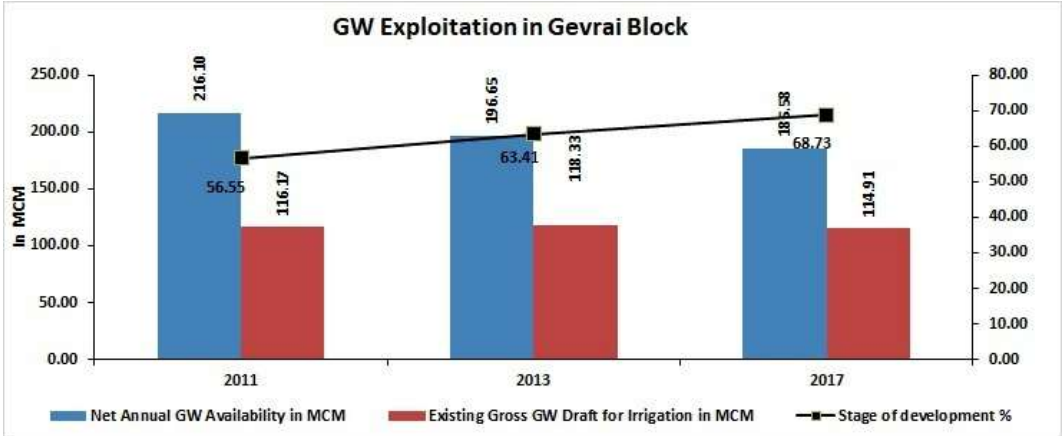
1.8. Water Level Trend (2010-19)

Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.053986to 0.307123m/year Falling 0.14681to 0.69621m/year	Rising 0.042303to 0.057534m/year Falling 0.06636to 0.92792m/year
Decline in water level up to 0.2 m/year has been observed in south-west and east, north parts of the block while rise in water level up to 0.4 m/year has been observed in isolated patches in western parts of the block. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 741 sq. km. area.	Declining water level trend up to 0.2 m/year has been observed in west central part of the block while rise in water level up to 0.4 m/year has been observed in isolated patch in western part of block. Decline more than 0.2 m/year has been observed in major part of the block covering 1215sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**
	
Declining trend @>0.2 m/year 741 sq. km.	**Declining trend @>0.2 m/year 1215 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 56.55% to 63.41% and afterwards decreased during 2013 to 2017 from 63.41% to 68.73% in Georai block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 216.10 MCM to 196.65 MCM again futher decreased from 196.65 MCM to 185.58 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 116.17 MCM to 118.33 MCM and but decreased from 118.33 MCM to 114.91 MCM during 2013 to 2017.



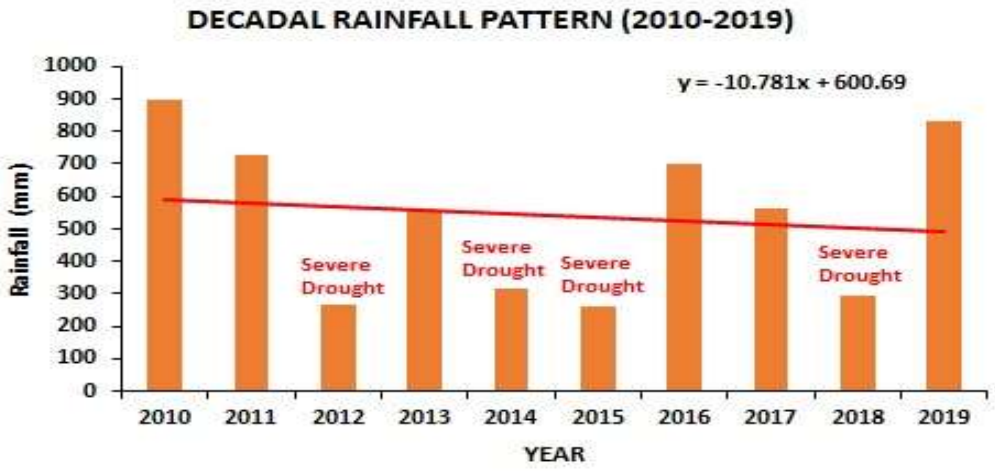
Declining water level Trend : -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 741 sq. km. covering about 50% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 1415 sq. km. covering about 82 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of Georai block is 734.60mm, and also indicates a falling rainfall trend @ -10.71 mm/year with probability of 19.05 %Severe drought.

Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 541.39mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



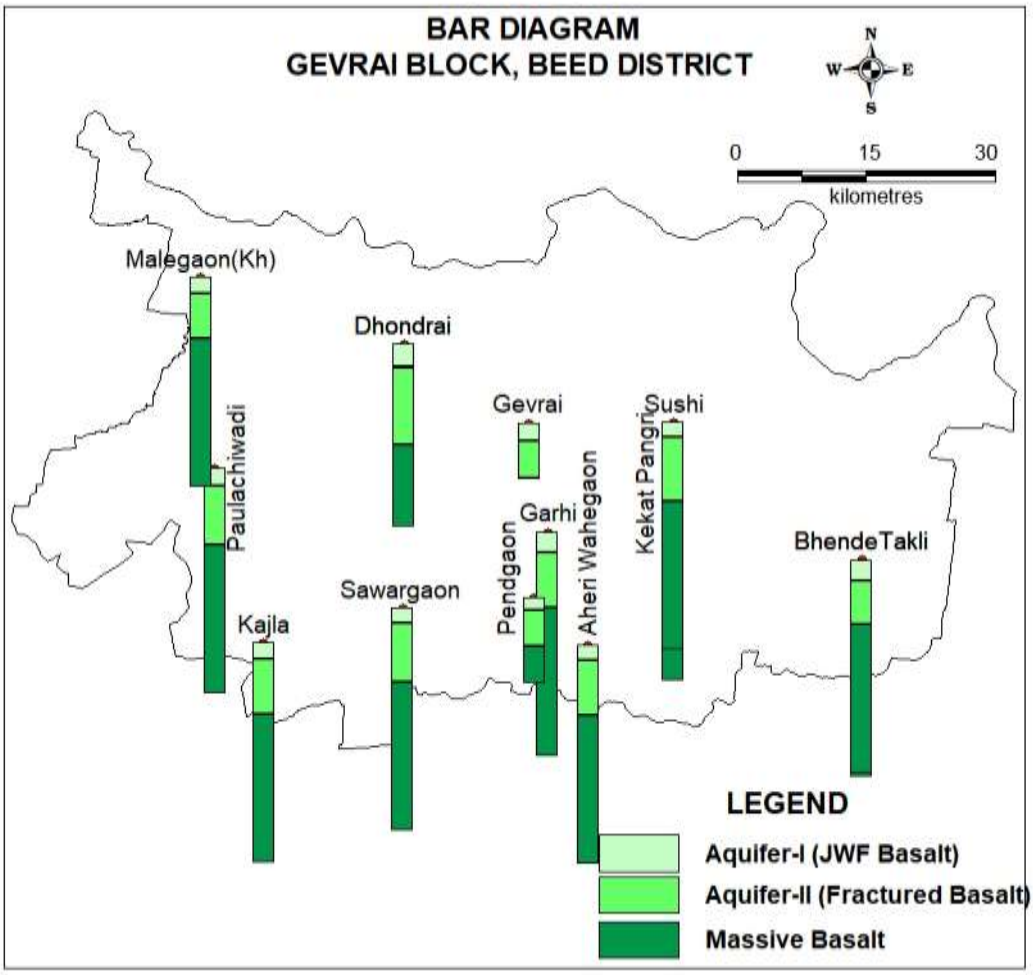
Low yielding Aquifer resulting poor sustainability:

Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 70% area of the block has low yield potential (<0.30lps) and can sustain pumping only for 0.5-1-hrs.

3. AQUIFER DISPOSITION

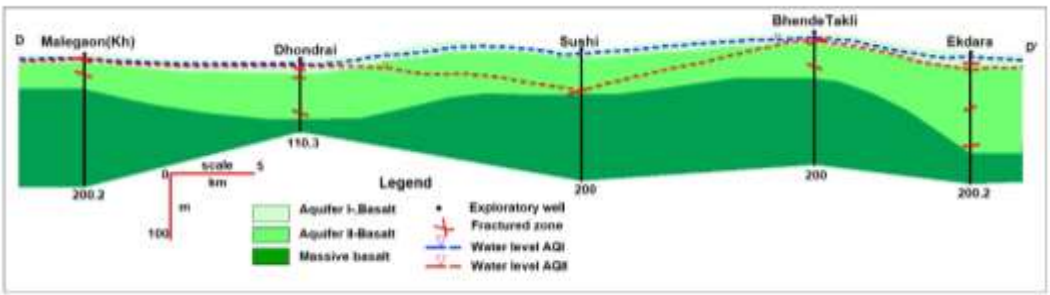
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II

3.2. Lithological disposition



3.3. Cross Section

Section DD'



3.4. Basic Aquifer Characteristics	

Major Aquifers	Basalt (Deccan Traps)	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 34	58.10 to 126
Weathered/Fractured zones encountered (mbgl)	10 to 34	35 to 126
Weathered/Fractured rocks thickness (m)	8 to 13	0.50 to 8.00
SWL (mbgl)	9.98 to 17.62	3.11 to 60
Specific yield/Storativity (S)	0.020 to0.026	4.11 x10^{-4} to 4.65 x10^{-4}
Transmissivity (T)	11.00 to 45.50 m^2/day	0.69 to 547.62 m^2/day
Yield	4 to 200 m^3/day	0.14 to 17.92 lps
Sustainability	2 to 4 hrs	1 to 5 hrs

4. GROUND WATER QUALITY

4.1 Aquifer-I/ Shallow Aquifer

EC values between250-750 µS/cm are observed in west and south parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, while EC values between 2250-3000 µS/cm are observed in central part. Ground water is suitable for all purposes.

4.2 Aquifer II/Deeper Aquifer

EC values between250-750 µS/cm are observed in east, west and south parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block. Ground water is suitable for all purposes.

Phreatic Aquifer (Aquifer-I)	Semi confined/Confined Aquifer (Aquifer II)
	

5. GROUND WATER RESOURCE

5.1 Aquifer-I/ Shallow Aquifer

Ground Water Recharge Worthy Area (Sq. km.)	1479.21
Total Annual Ground Water Recharge (MCM)	185.58
Natural Discharge (MCM)	9.27
Net Annual Ground Water Availability (MCM)	176.30
Existing Gross Ground Water Draft for	114.91

irrigation (MCM)	
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	6.26
Existing Gross Ground Water Draft for All uses (MCM)	121.18
Provision for domestic and industrial requirement supply to 2025(MCM)	14.95
Net Ground Water Availability for future irrigation development (MCM)	45.85
Stage of Ground Water Development (%)	68.73
Category	**SAFE**

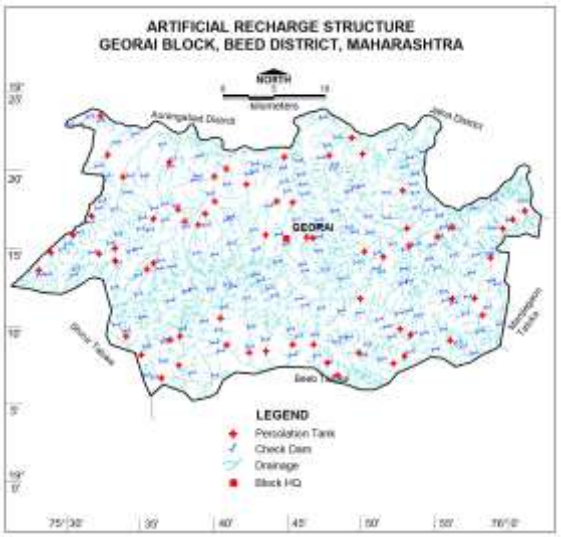
5.2 Aquifer-II/Deeper Aquifer

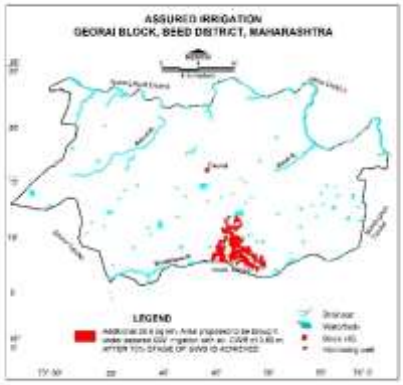
Semi confined/Confined Aquifer (Basalt)

Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource within confining Aquifer (mcm)	Total Resources (MCM)
Gevrai	Basalt Aq-II	1482.23	3.08	7.71	0.020	0.0004	4.57	1.83	6.40

6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	176.3	
Gross Annual Draft (MCM)	121.17	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	114.91	
Agricultural Supply -SW	187.005	
Domestic Supply - GW	6.26	
Domestic Supply - SW	1.57	
Total Supply	309.74	
Area of Block (Sq. Km.)	1482.23	
Potential Area suitable for recharge(Sq. Km)	851.28	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge(WL >5mbgl) (Sq. Km.)	851.28	
Volume of Unsaturated Zone	1702.56	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	34.0512	
Surplus water Available (MCM)	19.28	
Proposed Structures	Percolation	Check Dam (Av. Gross

	Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	67	193
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	10.122	4.34
RTRWH Structures – Urban Areas	Economically not viable & Not Recommended	
Households to be covered (25% with 50 m2 area)	68,429	
Total RWH potential (MCM)	2.511	
Rainwater harvested / recharged @ 80% runoff co-efficient	2.009 Economically not viable & Not Recommended	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane crop area (111.34 sq km) ,100% ground water irrigated proposed to be covered under Drip (sq.km.)	111.34	
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	63.4638	
Water Saving micro Irrigation technique(MCM)	63.4638	
Total Irrigated Area		
Proposed Cropping Pattern change	Nil	
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil	
Water Saving by use of Sprinklers (MCM)	Nil	
6.3. EXPECTED BENEFITS		
Net Ground Water Availability (MCM)	176.3	
Additional GW resources available after implementing above measures (MCM)	14.46	
Ground Water Availability after Supply side Intervention (MCM)	190.76	
Existing Ground Water Draft for All Purposes (MCM)	121.17	
Saving of Ground Water through demand side intervention (MCM)	63.46	
GW draft after Demand side interventions (MCM)	57.71	
Present stage of Ground Water Development (%)	68.73	

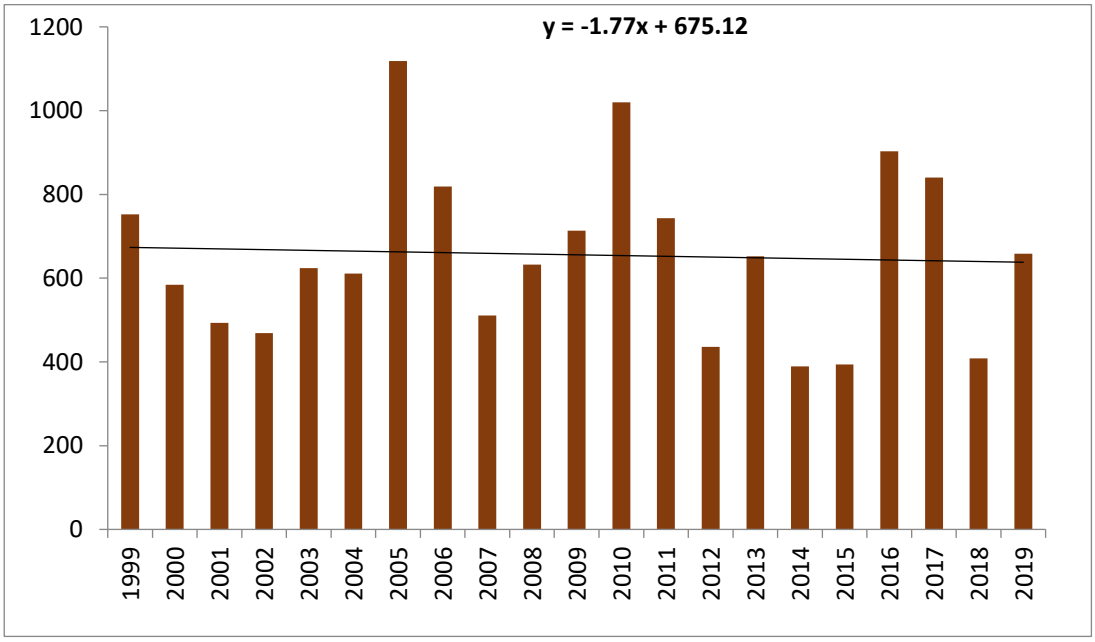
Stage of Ground Water Development after interventions (%)	30.25
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 68.73% to 30.25%	
6.4. Development Plan	
Volume of water available available for GWD to 70% (MCM)	75.83
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	4550
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	758
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.	116.66
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Cropped Area proposed for drip Irrigation**
	
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**	


ASSURED IRRIGATION
GEORAI BLOCK, BEED DISTRICT, MAHARASHTRA
LEGEND

9.6 KEJ BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**KEJ**	
Geographical Area (Sq. km.)	1331.86	
Hilly Area (Sq. km.)	11.56	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,26,612	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall (mm)	723	
Annual Rainfall (2019) (mm)	658	
Decadal Average Annual Rainfall (2010-19) (mm)	644.29	
Long Term Rainfall Analysis (1999-2019)	Falling Trend -1.77 mm/year Probability of Normal and Excess Rainfall 61.90 % & 0 % Probability of Droughts -: 52.38 % Moderateand14.29%Severe	

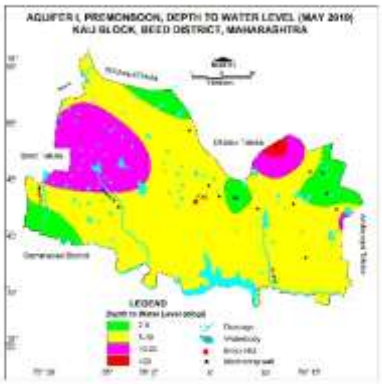
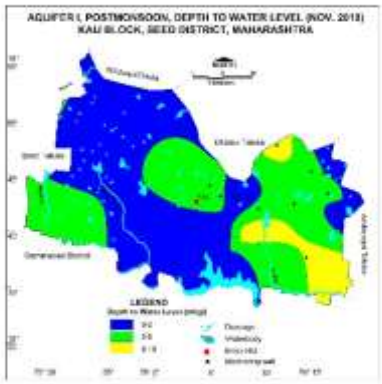
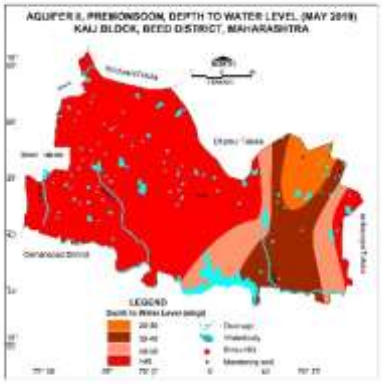
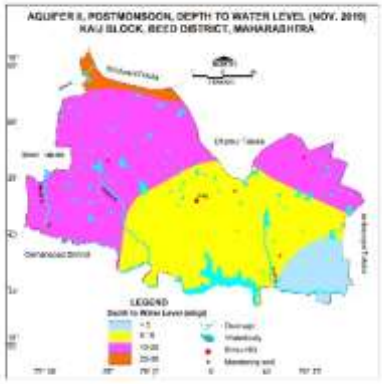
Rainfall Trend Analysis (1999 to 2019)



EQUATION OF TREND LINE y = -1.77x+675.12

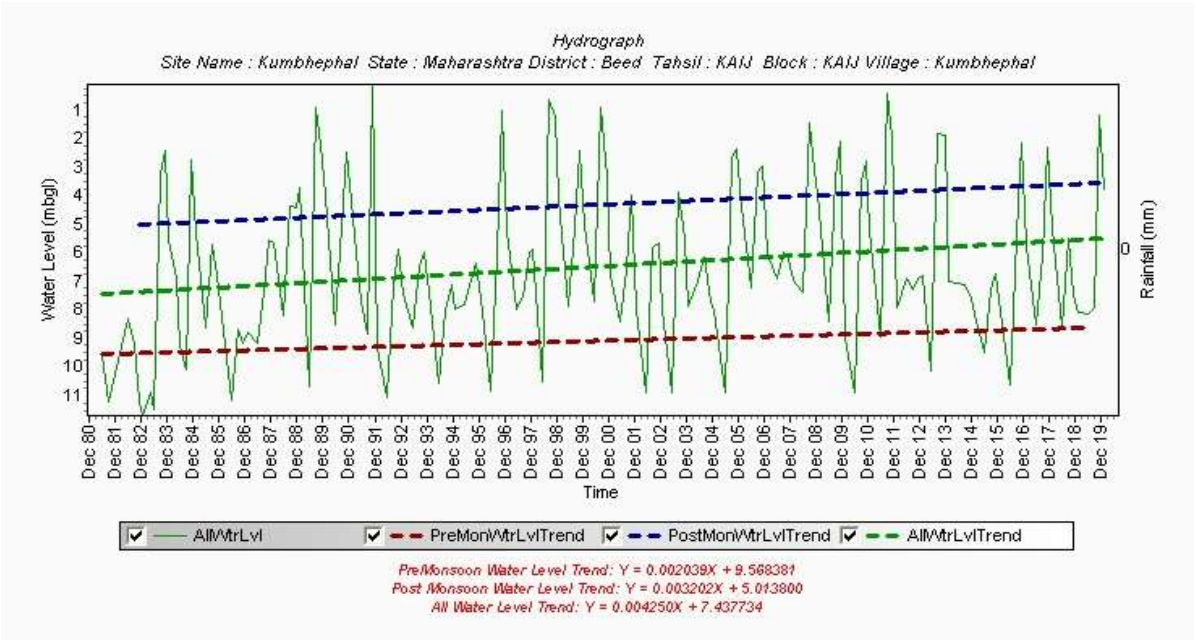
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Manjra **river flows on southern boundary** **Undri river tributary of Manjra**	
Hydrology ***(Reference DSA Year: June 2016-17)***	Major project	Manjra Project covering area of 141.89 sq km with Storage capacity (Ten lakh Cubic meter) of 224.93

		Medium project	**Completed:**Waghebabhulgaon Project projects covering area of 7.69 sq km with Storage capacity (Ten lakh Cubic meter) of 17.00
		Small project	**Completed:** small irrigation projects covering area of 47.30 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		1331.86Sq. km.	
Forest Area		31.21 Sq. km.	
Cultivable Area		489.57 Sq. km.	
Net Sown Area		487.37Sq. km.	
Double Cropped Area		2.20 Sq. km.	
Area under Irrigation	Surface Water	317.66 Sq. km.	
	Ground Water	27.68 Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	238.65
		Pulses	112.25
		Gram	155.30
		Soyabean	358.57
		Cotton	311.45
		Sugarcane	24.46
Horticultural Crops		Mango	6.68
		Citrus fruits	2.10
		Grapes	0.27
		Banana	0.30
		Vegetables	4.80
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water level between2-5 mbgl has been observed in north-west, central and south part of the block covering an area of 150 sq km; Water level between 5 to 10 mbgl has been observed in major part of the block covering an area of 997 sq km; Water level between 10-20mbgl has been observed in east and west part of the block covering an area of 199 sq km; whereas water levels more than 20mbgl have been observed in isolated patch in north part of the block covering about 58 sq. km. area.			Water level between0-2mbgl has been observed in major part of the block covering an area of 838 sq km; Water level between2-5 mbgl has been observed in patch in north, east, west, central, and south part of the block covering an area of 399 sq km; Water level between 5 to 10 mbgl has been observed in east part of the block covering an area of 122 sq km.

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>20 mbgl58 sq. km.	**WL>10 mbgl 76 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 20 to 30 mbgl are observed in eastern half of the block covering an area of 133sq km; water levels between 30-40mbgl have been observed in eastern half of the block covering about 270 sq. km. area of the block. Water levels between 40-50mbgl are observed in eastern half of the block covering an area of 143 sq km; Water levels between >50mbgl are observed in major part of the block covering an area of 931 sq km;	Water levels less than 5mbgl are observed in south-east part of the block covering an area of 159 sq km. Water levels between 5-10 mbgl have been observed in major part of the block whereas Water levels between 10-20 mbgl has been observed in western and east part of the block and cover 598 sq. km. area. Water level >20 mbgl is seen in north-west part covering 99 sq km.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**
	
WL> 50 mbgl931 sq. km.	**WL> 20 mbgl99 sq. km.**

1.7. Hydrograph

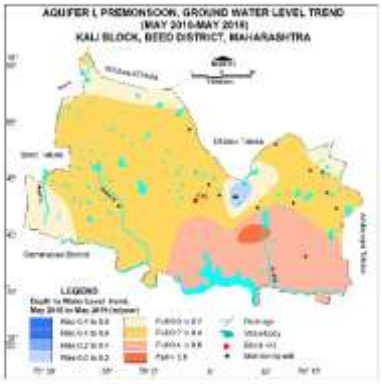
Site Name: Kumbhephal State: Maharashtra District: BEED Tehsil: KEJ Block: : BEED Village: Kumbhephal



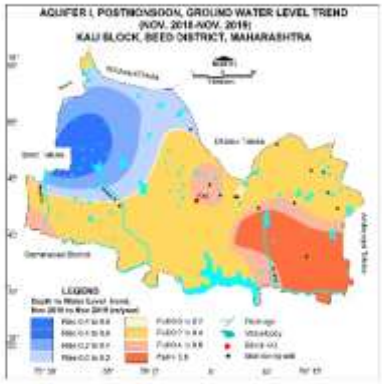
Hydrograph shows Pre-monsoon rising water level trend @ 0.024468 m/year and Post monsoon rising water level trend @ 0.03824 m/year

1.8. Water Level Trend (2010-19)

Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.0016 to 0.106324m/year Falling 0.12254to 0.65278m/year	Rising 0.073 to 0.622 m/year Falling 0.00818to 0.89091m/year
Decline in water level up to 0.2 m/year has been observed in eastern and north western, northern parts of the block covering an area of 179 sq km, while rise in water level up to 0.2 m/year has been observed in isolated patches in northern parts of the block covering an area of 65 sq km. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 1197 sq. km. area.	Declining water level trend up to 0.2 m/year has been observed in west part of the block covering an area of 66 sq km, while rise in water level up to 0.6 m/year has been observed in continuous patch in western part of block covering an area of 332 sq km. Decline more than 0.2 m/year has been observed in major part of the block covering 998sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**



Declining trend @>0.2 m/year 1197 sq. km.

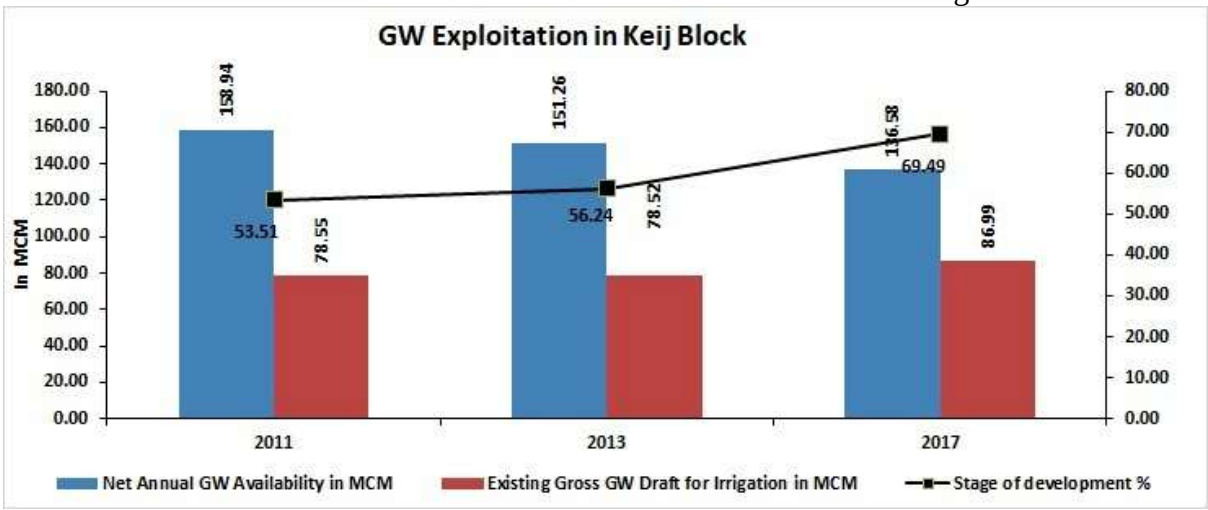


Declining trend @>0.2 m/year 998 sq. km.

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 53.51% to 56.24% and afterwards again increased during 2013 to 2017 from 56.24% to 69.49% in Keij block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 158.94 MCM to 151.26 MCM again further decreased from 151.26 MCM to 136.58 MCM during 2013 to 2017. Whereas the draft for irrigation decreased during 2011 to 2013 from 78.55 MCM to 78.52 MCM and hence further increased from 78.52 MCM to 86.99 MCM during 2013 to 2017.



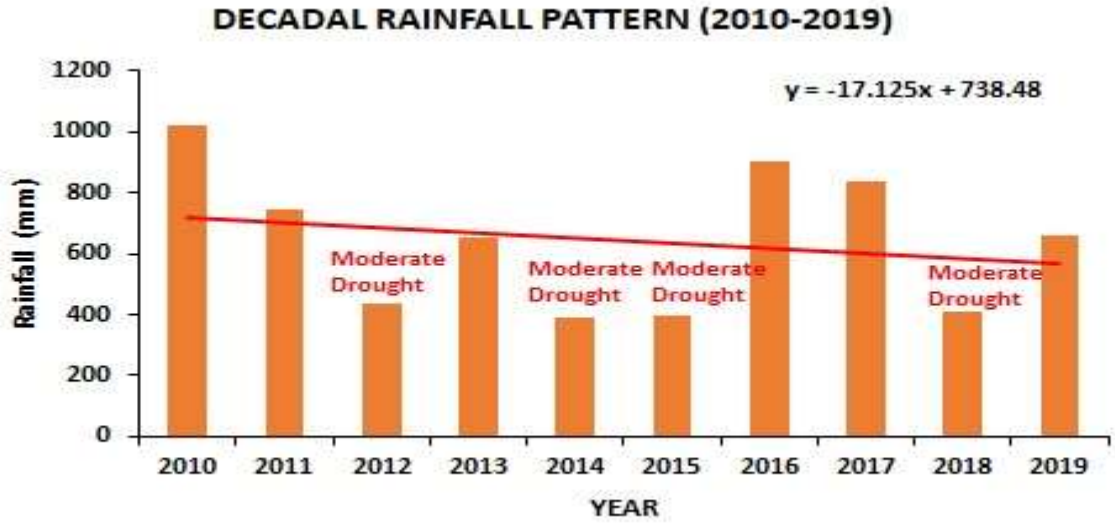
Declining water level Trend: -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 1197 sq. km. covering about 90% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 998 sq. km. covering about 75 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of KEJ block is 723.00mm, and also indicates a falling rainfall trend @ -1.77 mm/year with probability of 52.38 % Moderate and 14.29%Severe drought.

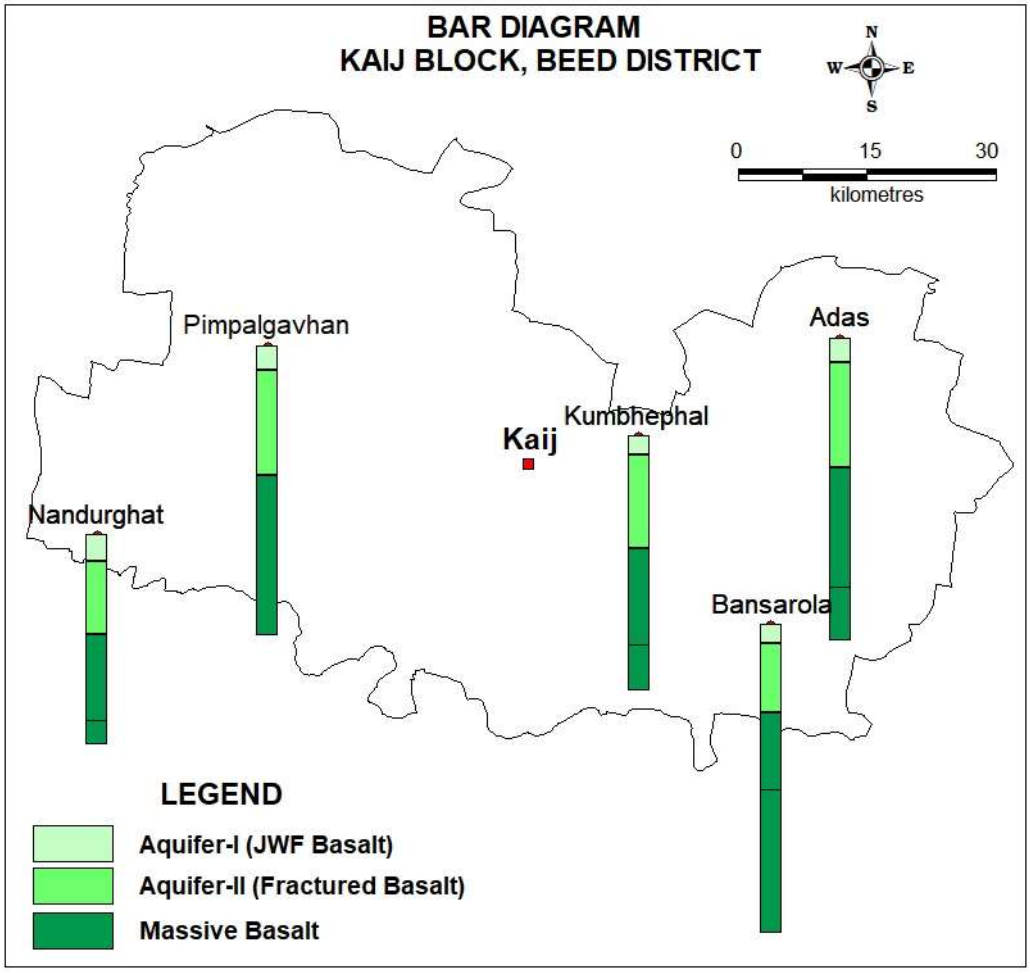
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 644.29mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

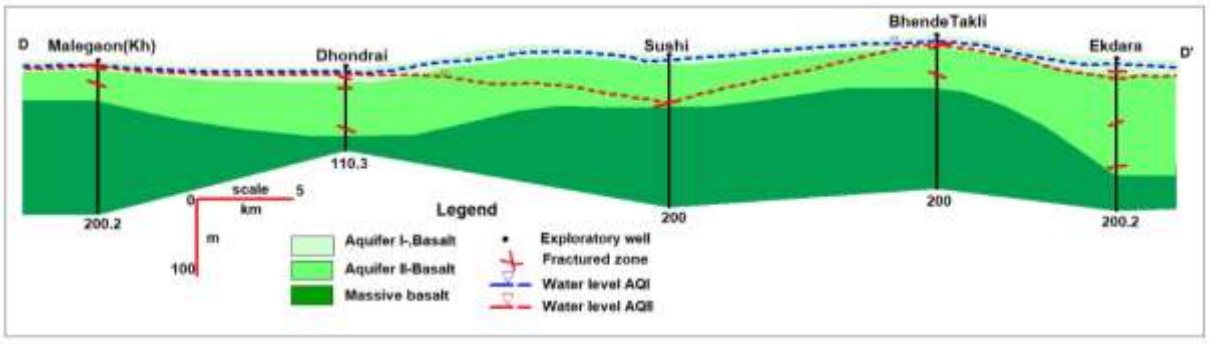
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 75% area of the block has low yield potential (<0.30lps) and can sustain pumping only for 0.5-1hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	



3.3. Cross Section

Section DD'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	12 to 34	86 to 162
Weathered/Fractured zones encountered (mbgl)	10 to 16	35 to 162

Weathered/Fractured rocks thickness (m)	5 to 12	0.50 to 9.00
SWL (mbgl)	7.05 to 20.52	6.90 to 63.93
Specific yield/Storativity (S)	0.020 to0.024	3.35 x10^{-4} to 3.65 x10^{-5}
Transmissivity (T)	15.00 to 70.50 m^2/day	0.69 to 100 m^2/day
Yield	1 to 414 m^3/day	0.14 to 19.66 lps
Sustainability	2 to 3 hrs	1 to 2 hrs

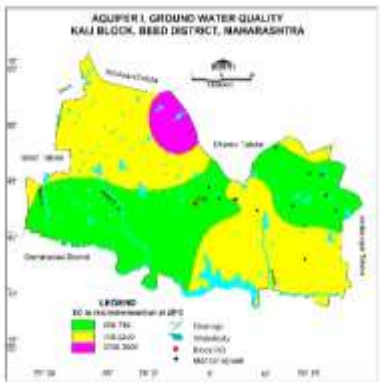
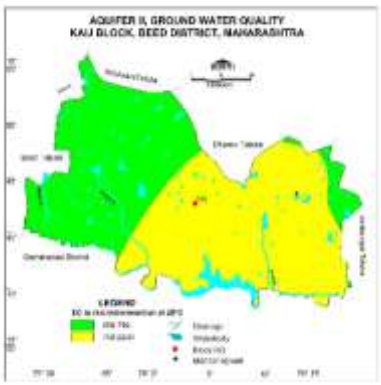
4. GROUND WATER QUALITY

4.1 Aquifer-I/ Shallow Aquifer

EC values between250-750 µS/cm are observed in east, west and central parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, while EC values between 2250-3000 µS/cm are observed in northern part. Ground water is suitable for all purposes.

4.2 Aquifer II/Deeper Aquifer

EC values between250-750 µS/cm are observed in east, west and central parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block. Ground water is suitable for all purposes.

Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**
	

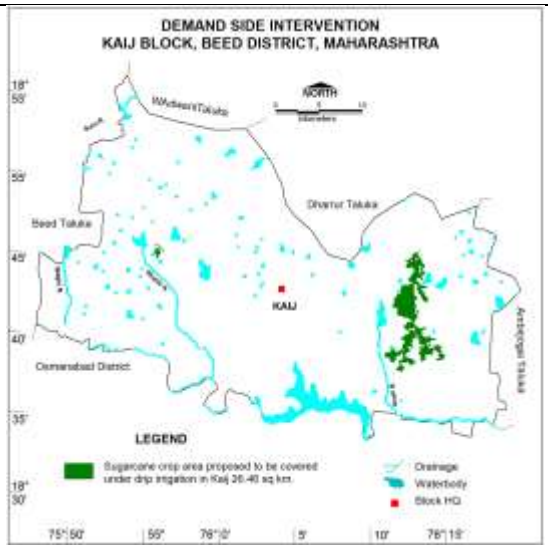
5. GROUND WATER RESOURCE

5.1 Aquifer-I/ Shallow Aquifer

Ground Water Recharge Worthy Area (Sq. km.)	1320.30
Total Annual Ground Water Recharge (MCM)	136.57
Natural Discharge (MCM)	6.82
Net Annual Ground Water Availability (MCM)	129.75
Existing Gross Ground Water Draft for irrigation (MCM)	86.99
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	3.17
Existing Gross Ground Water Draft for All uses (MCM)	90.16
Provision for domestic and industrial requirement supply to 2025(MCM)	11.36
Net Ground Water Availability for future irrigation development (MCM)	37.38

Stage of Ground Water Development (%)					69.49				
Category					**SAFE**				
5.2 Aquifer-II/Deeper Aquifer									
Semi confined/Confined Aquifer (Basalt)									
Block	**Aquifer**	**Area (Sqkm)**	**Mean Aquifer Thickness (m)**	**Peizometric head above (Confining Layer)**	**Average of Sy**	**Average of S**	**Resources above confining layer (mcm)**	**Resource with in confining Aquifer (mcm)**	**Total Resources (MCM)**
Kaij	Basalt Aq-II	1331.86	4.50	1.31	0.020	0.0003	0.52	1.80	2.32
6.0. GROUND WATER RESOURCE MANAGEMENT									
Available Resource (MCM)					129.80				
Gross Annual Draft (MCM)					90.16				
6.1. Supply Side Management									
SUPPLY (MCM)									
Agricultural Supply -GW					86.99				
Agricultural Supply -SW					6.7925				
Domestic Supply - GW					3.17				
Domestic Supply - SW					0.79				
Total Supply					97.75				
Area of Block (Sq. Km.)					1331.86				
Potential Area suitable for recharge (Sq. Km)					261.09				
Type of Aquifer					Hard Rock				
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)					261.09				
Volume of Unsaturated Zone					522.18				
Thickness of unsaturated zone 3 m below ground level (m)					2				
Average Specific Yield					0.02				
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)					10.4436				
Surplus Available (MCM)					5.91				
Proposed Structures					Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)		Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)		
Number of Structures					21		59		
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)					3.10275		1.33		
RTRWH Structures – Urban Areas					Economically not viable & Not Recommended				
Households to be covered (25% with 50 m2 area)					52,655				
Total RWH potential (MCM)					1.880				
Rainwater harvested / recharged @ 80% runoff co-efficient					1.504				

6.2. Demand Side Management	
Micro irrigation techniques	
Sugarcane area (24.46 sq km) ,100 % ground water irrigated proposed to be covered under Drip (sq.km.)	24.46
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE-0.40 m	13.94
Water Saving micro Irrigation technique (MCM)	13.94
Proposed Cropping Pattern change	
Irrigated area under Water Intensive Crop (ha)	Not proposed
Water Saving by Change in Cropping Pattern	Nil
Alternate Sources	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	129.80
Additional GW resources available after implementing above measures (MCM)	4.43
Ground Water Availability after Supply side Intervention (MCM)	134.20
Existing Ground Water Draft for All Purposes (MCM)	90.16
Saving of Ground Water through demand side intervention (MCM)	13.94
GW draft after Demand side interventions (MCM)	76.22
Present stage of Ground Water Development (%)	69.49
Stage of Ground Water Development after interventions (%)	56.81
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 69.49% to 56.81%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	17.70
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	1062
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	177
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.	27.24
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Double Crop and Cotton Crop Area proposed for drip Irrigation**

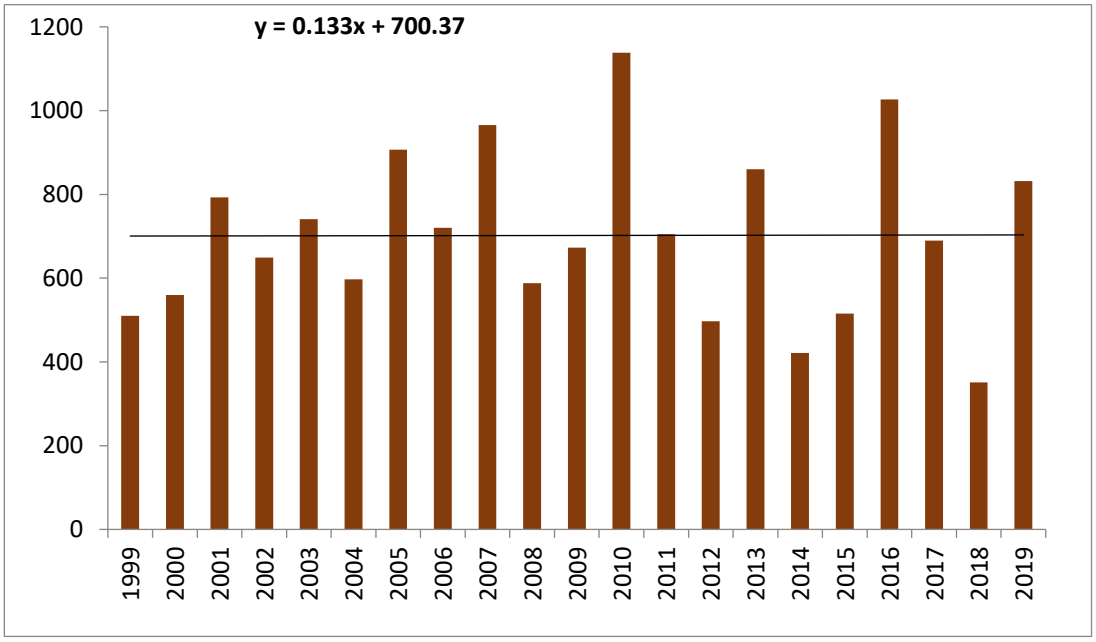


***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**

9.7 MAJALGAON BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**MAJALGAON**	
Geographical Area (Sq. km.)	922.46Sq. km.	
Hilly Area (Sq. km.)	1.50Sq. km.	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,14,997	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	719	
Annual Rainfall (2019)	831.8	
Decadal Average Annual Rainfall (2010-19)	703.64	
Long Term Rainfall Analysis (1999-2019)	Rising Trend 0.1337 mm/year Probability of Normal and Excess Rainfall 52.38 % & 9.52% Probability of Droughts -: 33.33% Moderate 4.76 %Severe	

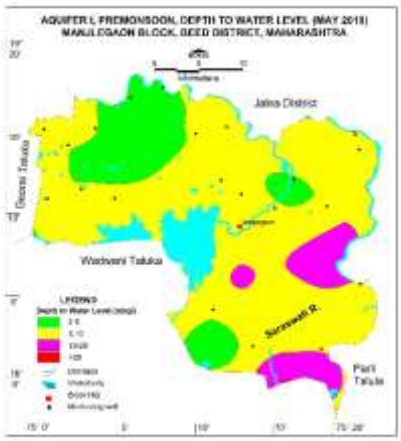
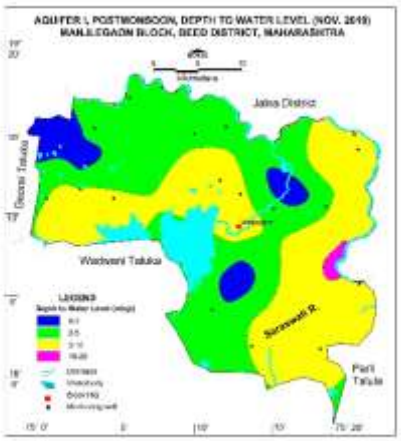
Rainfall Trend Analysis (1999 to 2019)



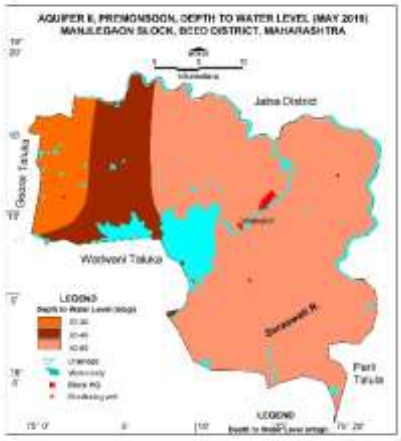
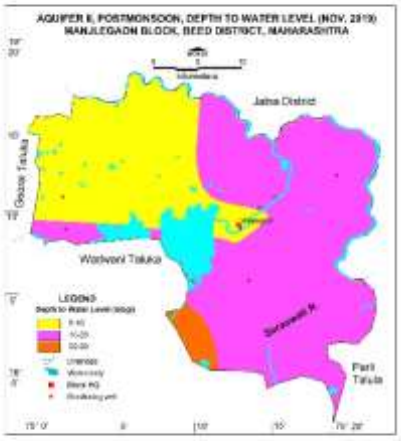
***EQUATION OF TREND LINE y* = 0.133x+700.37**

1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Sindhphana river Kundkariver and Their tributaries	
Hydrology	Major project	**Maljalgaon Project** covering area of 39220 sq km.

(*Reference DSA Year: June 2016-17)*		With **Storage capacity (Ten lakh Cubic meter) of** 454.00
	Medium project	**Completed:** Kundlika project covering area of 1797sq km. With **Storage capacity (Ten lakh Cubic meter) of** 35.61
	Small project	**Completed:** small irrigation projects covering area of 17.04 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern		
Geographical Area		922.46Sq. km.
Forest Area		3.75Sq. km.
Cultivable Area		452.85 Sq. km.
Net Sown Area		434.86 Sq. km.
Double Cropped Area		176.88 Sq. km.
Area under Irrigation	Surface Water	176.88 Sq. km.
	Ground Water	90.84 Sq. km.
Principal Crops *(Reference year 2019)*	**Crop Type**	**Area (Sq. km.)**
	Cereals	164.53
	Pulses	61.22
	Gram	97.82
	Soyabean	233.43
	Cotton	378.73
	Sugarcane	134.4
Horticultural Crops	Mango	1.70
	Citrus fruits	2.12
	Grapes	0.00
	Banana	0.22
	Vegetables	5.45
1.6. Water Level Behaviour		
1.6.1. Aquifer-I/Shallow Aquifer		
Pre-Monsoon (May-2019)		**Post-Monsoon (November-2019)**
Water level between2-5 mbgl has been observed in north-west, central and south part of the block covering an area of 184 sq km; Water level between 5 to 10 mbgl has been observed in major part of the block covering an area of 663 sq km; Water level between 10-20mbgl has been observed in east and south part of the block covering an area of 93 sq km; whereas water levels more than 20mbgl have been observed in isolated patch in central part of the block covering about 20 sq. km. area.		Water level between0-2mbgl has been observed in patches in north, central and west part of the block covering an area of 128 sq km; Water level between2-5 mbgl has been observed in continuous patch in north, central and south part of the block covering an area of 507 sq km; Water level between 5 to 10 mbgl has been observed in west, south, east part of the block covering an area of 322 sq km. whereas water levels more than 10mbgl have been observed in isolated patch in central part of the block covering about 76 sq. km. area.

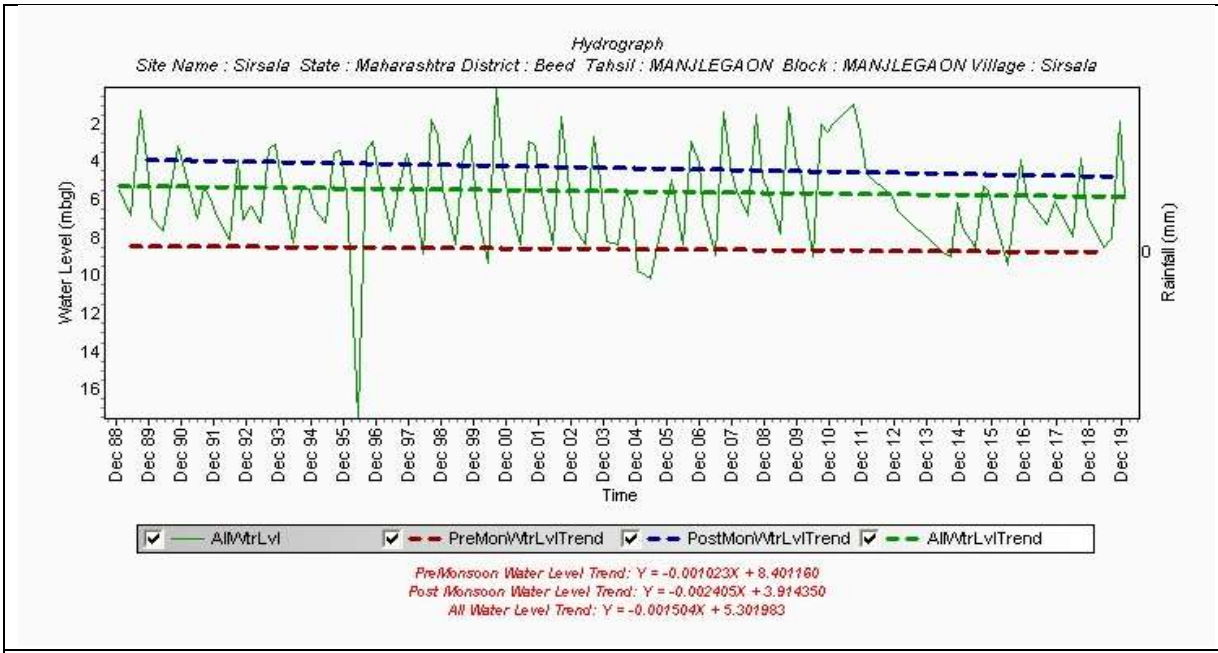
Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>20 mbgl 20 sq. km.	**WL>10 mbgl 76 sq. km.**

1.6.2. Aquifer-II/Deeper Aquifer

Pre-Monsoon (May-2019)	Post-Monsoon (November-2019)
Water levels between 20 to 30 mbgl are observed in west half of the block covering an area of 130 sq km area; Water levels between 30-40mbgl are observed in west-central half of the block covering an area of 138 sq km area; water levels more than 40 mbgl have been observed in major part of the block covering about 645 sq. km. area of the block.	Water levels between 5-10mbgl are observed in west half of the block covering an area of 414 sq km area; Water levels between 10-20mbgl are observed in major part of the block covering an area of 461 sq km area; water levels more than 20 mbgl have been observed in south part of the block covering about 73 sq. km. area of the block.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**
	
WL> 40 mbgl 645 sq. km.	**WL> 20 mbgl73 sq. km.**

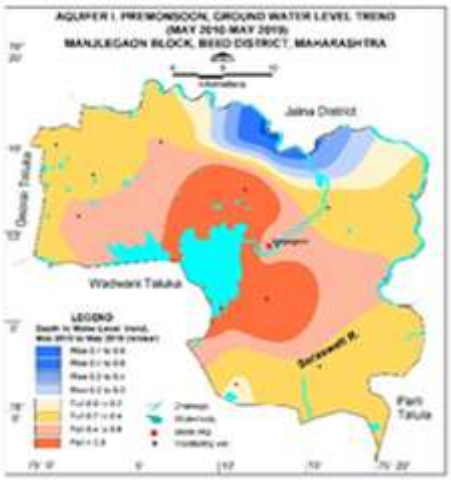
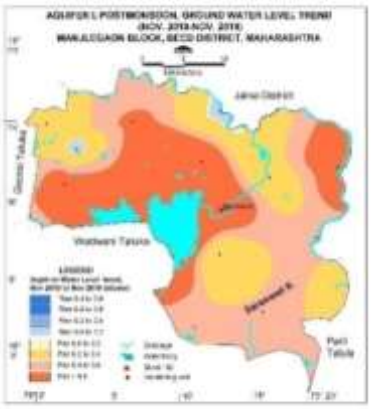
1.7. Hydrograph

Site Name: Sirsala State: Maharashtra District: BEED Tehsil: MAJALGAON Block: : BEED Village: sirsala



Hydrograph shows Pre-monsoon falling water level trend @ -0.012276 m/year and Post monsoon falling water level trend @ -7.3656 m/year

1.8. Water Level Trend (2010-19)

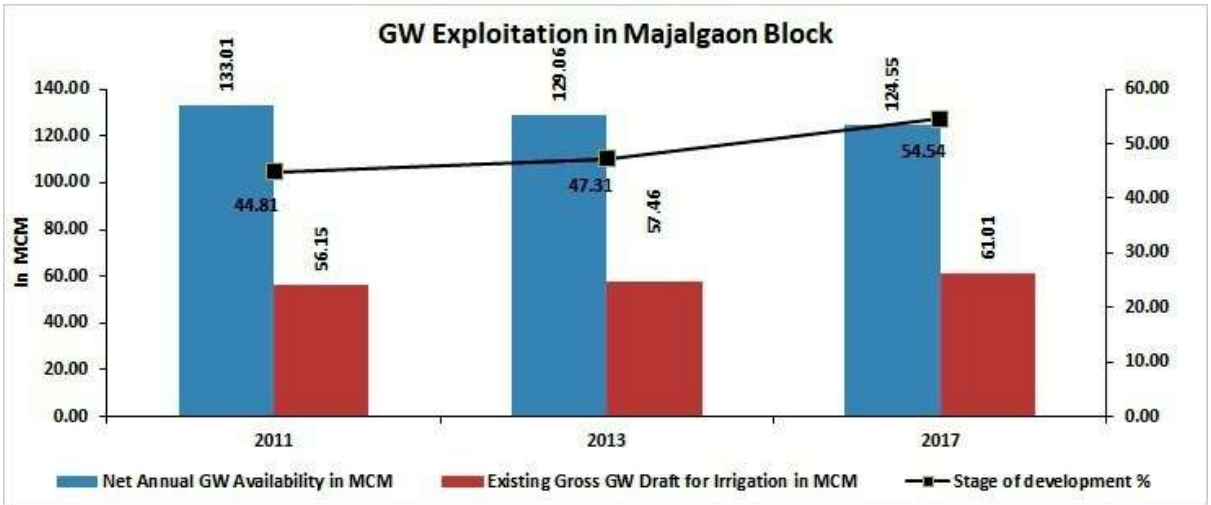
Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.0016 to 0.622489m/year Falling 0.18827to 0.94929m/year	Rising 0.0019 to 0.074848m/year Falling 0.08393to 0.95515m/year
Decline in water level up to 0.2 m/year has been observed in eastern and north parts of the block covering an area of 78 sq km, while rise in water level up to 0.6 m/year has been observed in continuous patches in northern and eastern parts of the block covering an area of 119 sq km. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 783 sq. km. area.	Declining water level trend up to 0.2 m/year has been observed in north part of the block covering an area of 18 sq km, while rise in water level up to 0.2 m/year has been observed in isolated patch in north and central west part of block covering an area of 35 sq km,. Decline more than 0.2 m/year has been observed in major part of the block covering 869sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**
	

Declining trend @>0.2 m/year 738 sq. km.	Declining trend @>0.2 m/year 869 sq. km.

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 44.81% to 47.31% and afterwards again increased during 2013 to 2017 from 47.31% to 54.54% in Majalgaon block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 133.01 MCM to 129.06 MCM again further decreased from 129.06 MCM to 124.55 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 56.15 MCM to 57.46 MCM and hence further increased from 57.46 MCM to 61.01 MCM during 2013 to 2017.



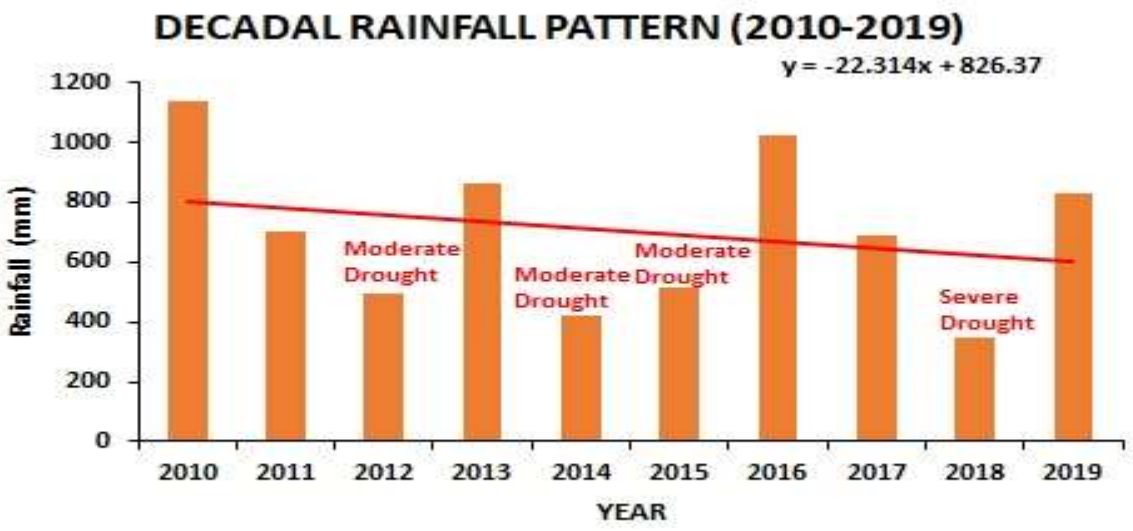
Declining water level Trend: -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 738 sq. km. covering about 80% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 869 sq. km. covering about 95 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of MAJALGAON block is 719.00mm, and also indicates a rising rainfall trend @ 0.1337 mm/year with probability of 33.33% Moderate 4.76 %Severe drought.

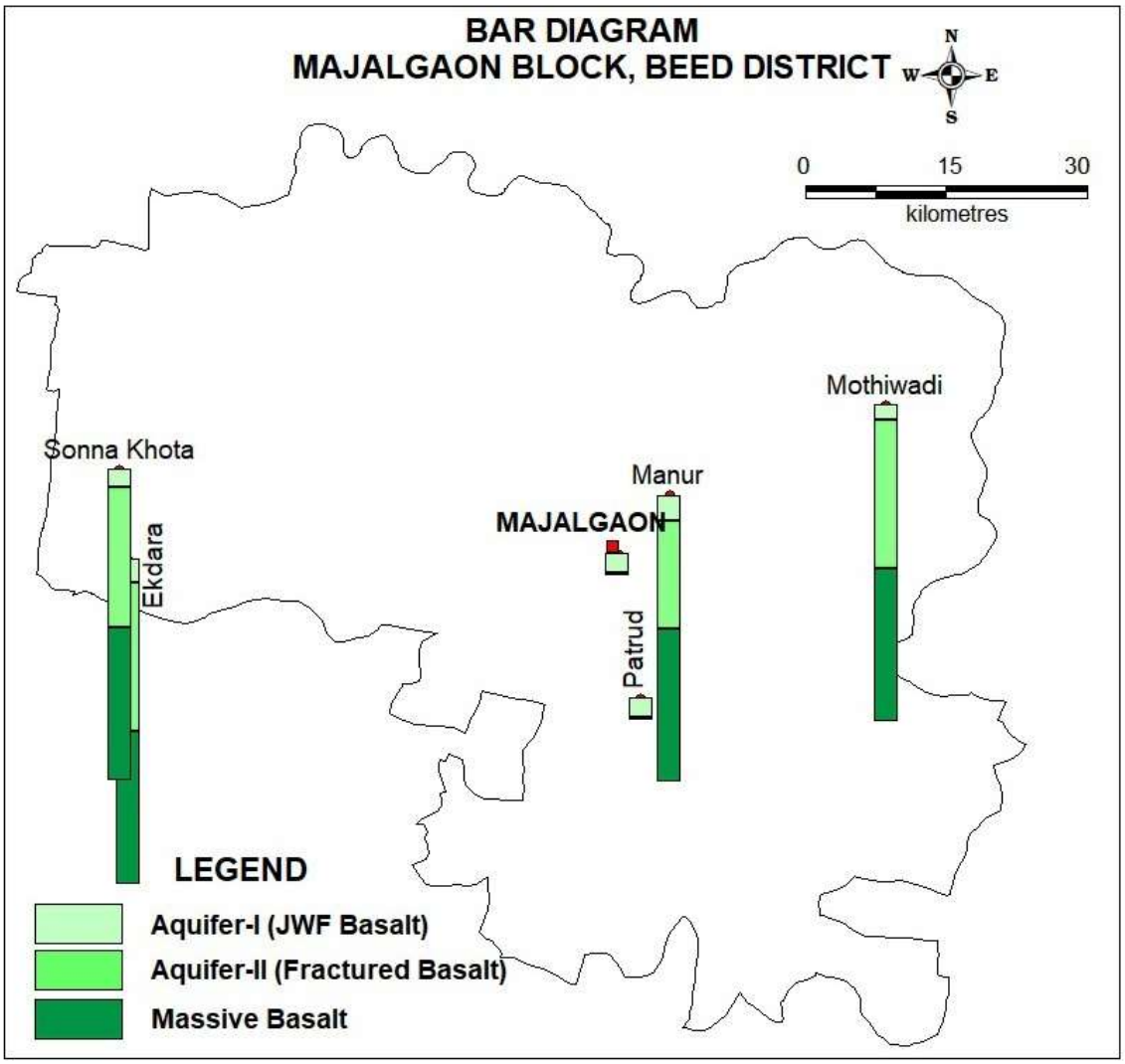
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 703.64mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

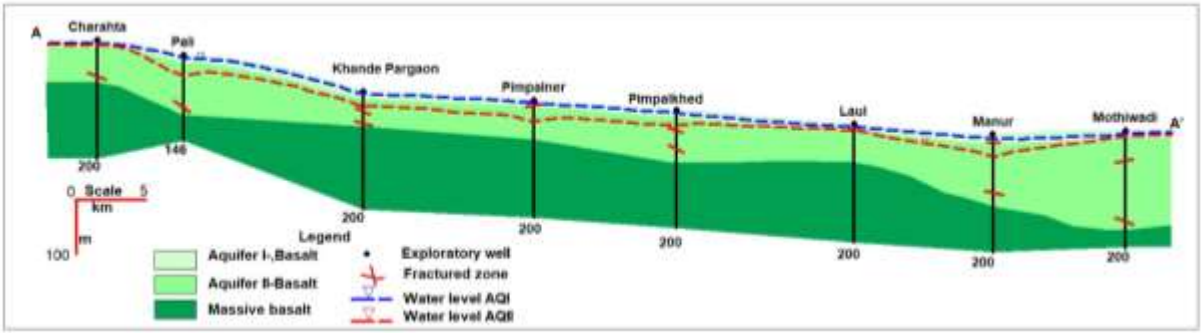
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 25% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	

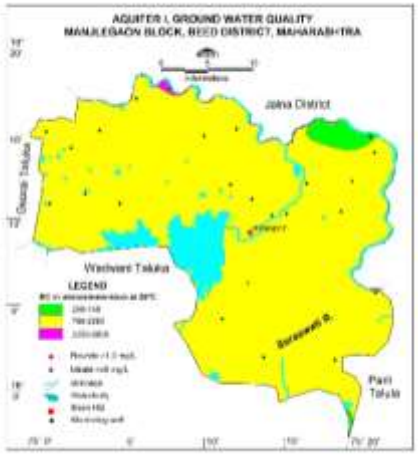
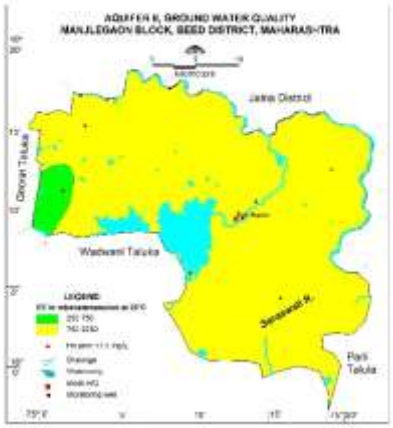


3.3. Cross Section

Section AA'

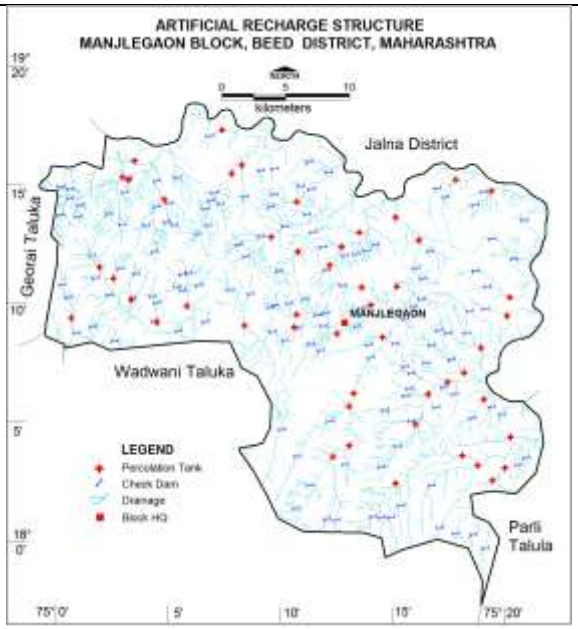
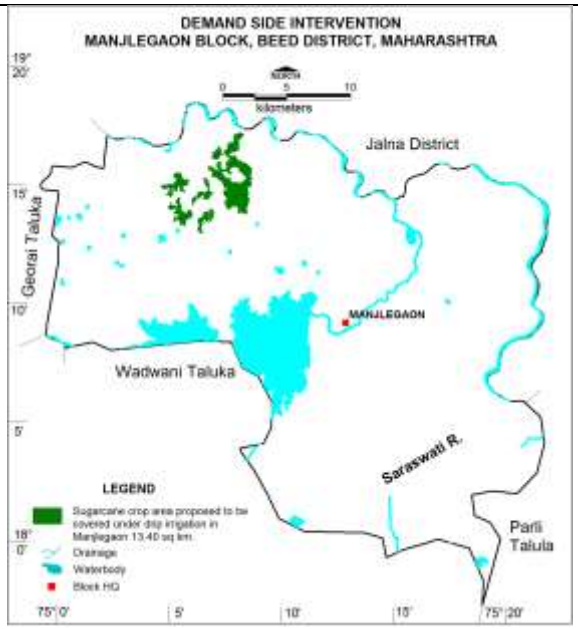
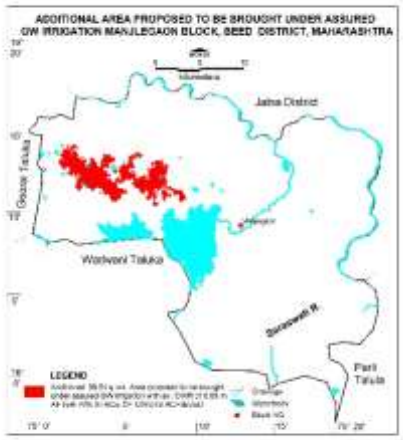


3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	12 to 31.85	63.70 to 195.70

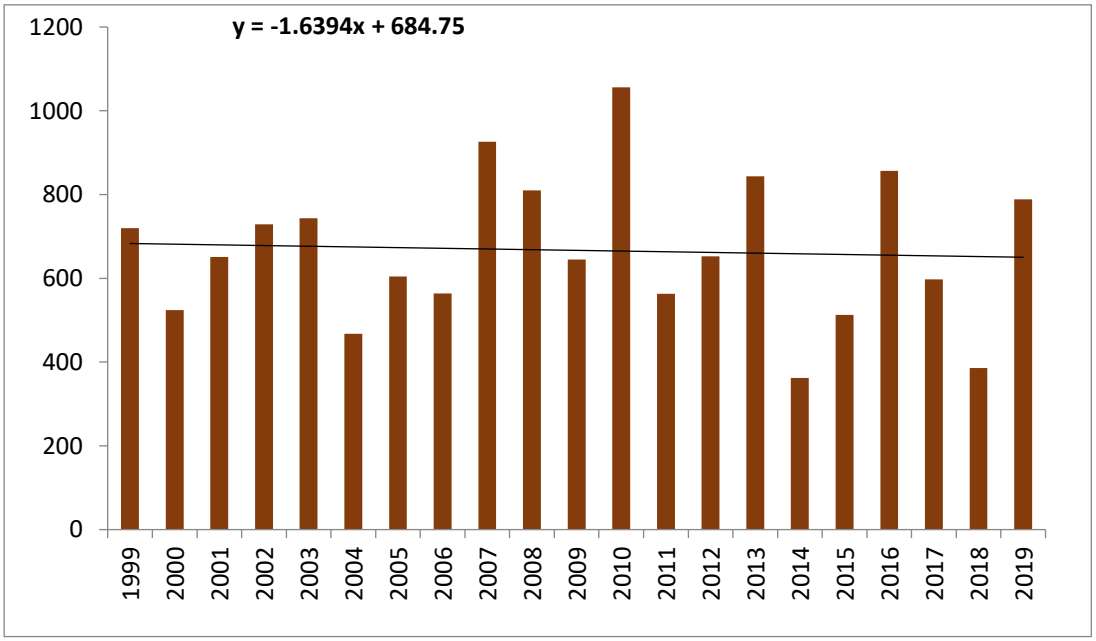
Weathered/Fractured zones encountered (mbgl)	10 to 12	61.50 to 195.60
Weathered/Fractured rocks thickness (m)	8 to 12	2.00 to 5.00
SWL (mbgl)	8.26 to 20.00	14.10 to 50.00
Specific yield/Storativity (S)	0.020 to0.022	3.35 x10^{-4} to 3.65 x10^{-4}
Transmissivity (T)	10.00 to 50.50 m^2/day	10.00 to 80 m^2/day
Yield	2 to 227 m^3/day	0.14 to 4.43 lps
Sustainability	2 to 4 hrs	1 to 5 hrs
4. GROUND WATER QUALITY		
4.1 Aquifer-I/ Shallow Aquifer		
EC values between250-750 µS/cm are observed in northern parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, while EC values between 2250-3000 µS/cm are observed in northern fringe. Ground water is suitable for all purposes.		
4.2 Aquifer II/Deeper Aquifer		
EC values between250-750 µS/cm are observed in western parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block,. Ground water is suitable for all purposes.		
Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**	
		
5. GROUND WATER RESOURCE		
5.1 Aquifer-I/ Shallow Aquifer		
Ground Water Recharge Worthy Area (Sq. km.)	920.96	
Total Annual Ground Water Recharge (MCM)	124.55	
Natural Discharge (MCM)	6.22	
Net Annual Ground Water Availability (MCM)	118.33	
Existing Gross Ground Water Draft for irrigation (MCM)	61.00	
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	3.53	
Existing Gross Ground Water Draft for All uses (MCM)	64.54	

Provision for domestic and industrial requirement supply to 2025(MCM)					10.92				
Net Ground Water Availability for future irrigation development (MCM)					49.62				
Stage of Ground Water Development (%)					54.54				
Category					**SAFE**				
5.2 Aquifer-II/Deeper Aquifer									
Semi confined/Confined Aquifer (Basalt)									
Block	**Aquifer**	**Area (Sqkm)**	**Mean Aquifer Thickness (m)**	**Peizometric head above (Confining Layer)**	**Average of Sy**	**Average of S**	**Resources above confining layer (mcm)**	**Resource with in confining Aquifer (mcm)**	**Total Resources (MCM)**
Majalgaon	Basalt Aq-II	922.46	3.25	2.58	0.020	0.0004	0.95	1.20	2.15
6.0. GROUND WATER RESOURCE MANAGEMENT									
Available Resource (MCM)					118.33				
Gross Annual Draft (MCM)					64.54				
6.1. Supply Side Management									
SUPPLY (MCM)									
Agricultural Supply -GW					61				
Agricultural Supply -SW					298.5515				
Domestic Supply - GW					3.53				
Domestic Supply - SW					0.88				
Total Supply					363.96				
Area of Block (Sq. Km.)					922.46				
Potential Area suitable for recharge (Sq. Km)					634.46				
Type of Aquifer					Hard Rock				
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)					634.46				
Volume of Unsaturated Zone					1268.92				
Thickness of unsaturated zone 3 m below ground level (m)					2				
Average Specific Yield					0.02				
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)					25.3784				
Surplus water Available (MCM)					14.37				
Proposed Structures					Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)		Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)		
Number of Structures					50		144		
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)					7.54425		3.23		
RTRWH Structures – Urban Areas					Economically not viable & Not				

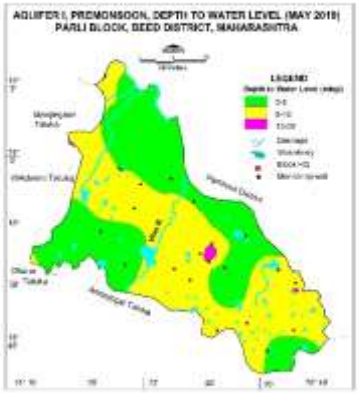
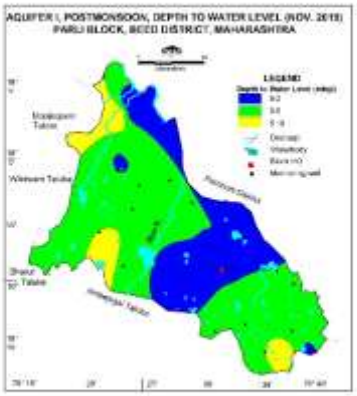
	Recommended
Households to be covered (25% with 50 m^2area)	53,602
Total RWH potential (MCM)	2.179
Rainwater harvested / recharged @ 80% runoff co-efficient	1.743
6.2. Demand Side Management	
Micro irrigation techniques	
Sugarcane crop area (70.70), about sqkm area is ground water irrigated ,100% ground water irrigated (1 sqkm)proposed to be covered under Drip (sq.km.)	13.4
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	7.638
Water Saving micro Irrigation technique (MCM)	7.638
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	118.33
Additional GW resources available after implementing above measures (MCM)	10.78
Ground Water Availability after Supply side Intervention (MCM)	129.11
Existing Ground Water Draft for All Purposes (MCM)	64.54
Saving of Ground Water through demand side intervention (MCM)	7.64
GW draft after Demand side interventions (MCM)	56.89
Present stage of Ground Water Development (%)	54.54
Stage of Ground Water Development after interventions (%)	44.07
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 54.54% to 44.07%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	33.48
Proposed Number of DW (@ 1.5 ham for 90% of GWR Available)	2009
Proposed Number of BW (@ 1 ham for 10% of GWR Available)	335

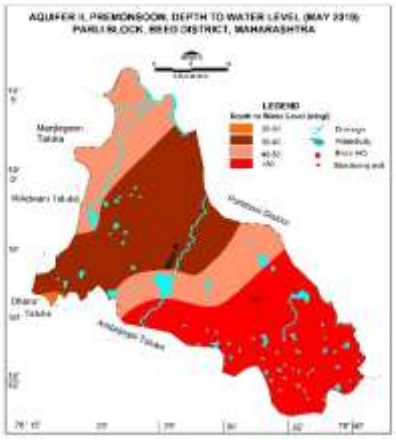
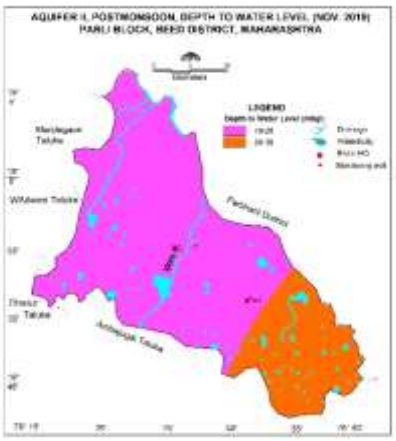
Additional Area (sq.km.) proposed to be brought under assured GW irrigation with av. CWR of 0.65 m AFTER 70% STAGE OF GWD IS ACHIEVED.	51.50
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Cropped Area proposed for drip Irrigation**
	
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION** 	

PARLI BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**PARLI**	
Geographical Area (Sq. km.)	676.51	
Hilly Area (Sq. km.)	41.25	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	2,34,987	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall (mm)	742	
Annual Rainfall (2019) (mm)	788.4	
Decadal Average Annual Rainfall (2010-19) (mm)	661.74	
Long Term Rainfall Analysis (1999-2019)	Falling Trend -1.639 mm/year Probability of Normal and Excess Rainfall 57.14 % & 4.76 % Probability of Droughts -: 28.57% Moderate and 9.52%Severe	
Rainfall Trend Analysis (1999 to 2019)		
		
***EQUATION OF TREND LINE y* = -1.6394x+684.75**		
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Wan river Gunwara river both are tributary of Godawari.	
Hydrology	Major	Manjra Project covering area of 141.89 sq km with

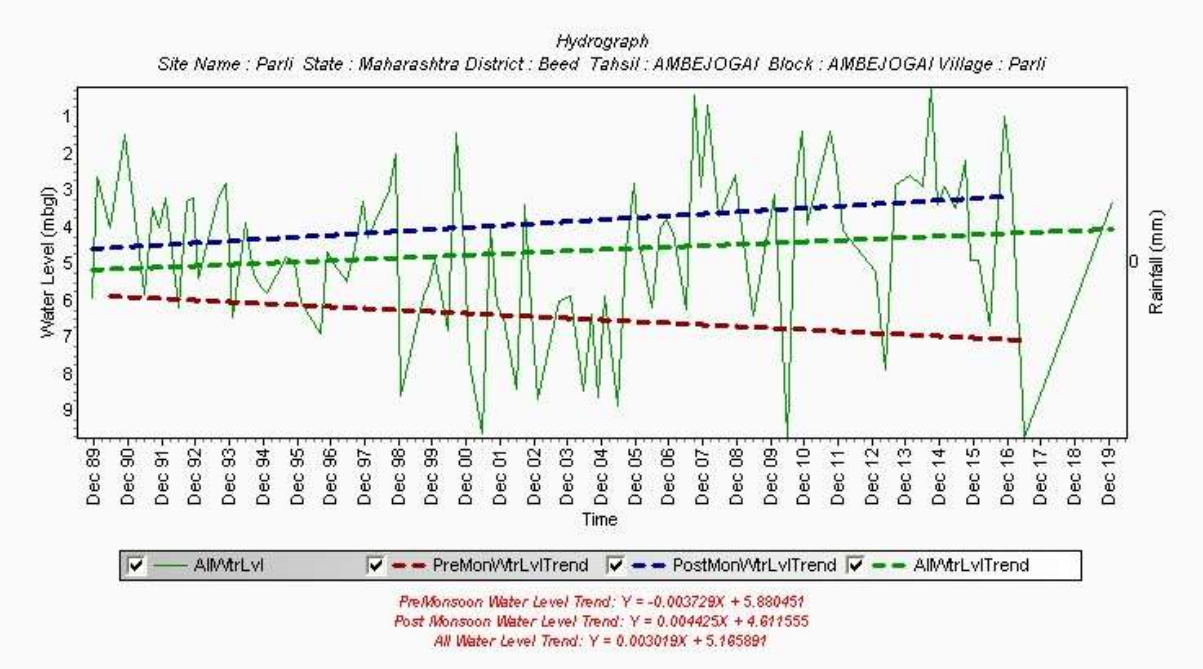
(*Reference DSA Year: June 2016-17)*	project	Storage capacity (Ten lakh Cubic mete) of 224.93
	Medium project	**Completed:** Bodhegaon Project , Wan project Borna projects covering area of 122.85 sq km with Storage capacity (Ten lakh Cubic meter) of 17.69
	Small project	**Completed:** small irrigation projects covering area of 31.69 sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern		
Geographical Area	922.46Sq. km.	
Forest Area	4.37Sq. km.	
Cultivable Area	412.35Sq. km.	
Net Sown Area	400.05Sq. km.	
Double Cropped Area	12.30 Sq. km.	
Area under Irrigation – Surface Water	148.97 Sq. km.	
Area under Irrigation – Ground Water	81.11Sq. km.	
Principal Crops *(Reference year 2019)*	**Crop Type**	**Area (Sq. km.)**
	Cereals	166.85
	Pulses	39.19
	Gram	82.63
	Soyabean	260.77
	Cotton	194.68
	Sugarcane	60.37
Horticultural Crops	Mango	1.80
	Citrus fruits	2.15
	Grapes	0.27
	Banana	0.32
	Vegetables	7.78
1.6. Water Level Behaviour		
1.6.1. Aquifer-I/Shallow Aquifer		
Pre-Monsoon (May-2019)		**Post-Monsoon (November-2019)**
Water level between2-5 mbgl has been observed in continuous patch in north, central and south part of the block covering an area of 322 sq km; Water level between 5 to 10 mbgl has been observed in major part of the block covering an area of 590 sq km; whereas water levels more than 10 mbgl have been observed in isolated patch in central part of the block covering about 20 sq. km. area.		Water level between0-2mbgl has been observed in continuous patch in north, central part of the block covering an area of 277 sq km; Water level between2-5 mbgl has been observed in continuous patch in north, central and south part of the block covering an area of 553 sq km; Water level between 5 to 10 mbgl has been observed in west, south, east part of the block covering an area of 92 sq km.

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>10 mbgl 20 sq. km.	**WL>5mbgl92 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 20 to 30 mbgl are observed in southern tip of the block covering about 18 sq. km. area of the block; water levels between 30-40mbgl are observed in central half of the block covering about 276 sq. km. area of the block. Water levels between 40-50mbgl are observed in west and east central half of the block covering about 181 sq. km. area of the block. Water levels >50mbgl are observed in east half of the block covering about 414 sq. km. area of the block.	Water levels between 10 to 20 mbgl have been observed in major part of the block cover 737 sq. km. area; whereas more than 20 mbgl has been observed as continuous patch in eastern part of the block and cover 185 sq. km. area.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**

	
WL> 50 mbgl414 sq. km.	**WL> 20 mbgl185 sq. km.**

1.7. Hydrograph

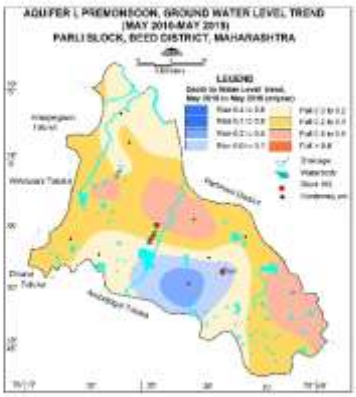
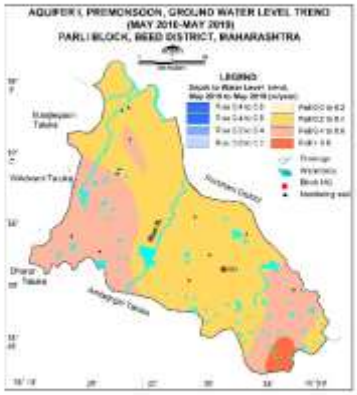
Site Name: Parli State: Maharashtra District: BEED Tehsil: PARLI Block: : BEED Village: Parli



Hydrograph shows Pre-monsoon falling water level trend @ 0.044748 m/year and Post monsoon rising water level trend @ 0.0531 m/year

1.8. Water Level Trend (2010-19)

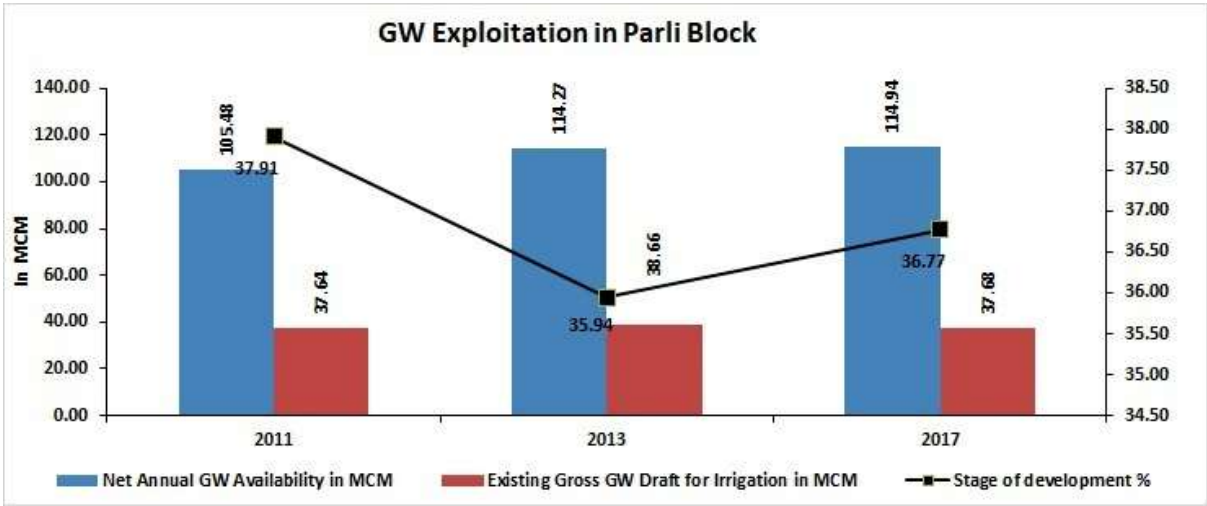
Pre-Monsoon trend	**Post-Monsoon trend**
Rising 0.076623to 0.302623m/year Falling 0.00027to 0.52884m/year	Falling 0.1242to 0.57152m/year
Decline in water level up to 0.2 m/year has been observed in south and north parts of the block covering an area of 231sq km, while rise in water level up to 0.4 m/year has been observed in	Declining water level trend more than 0.2 m/year has been observed in entire part of the block covering 922sq km area.

southern parts of the block covering an area of 138 sq km; Declining trend more than 0.2 m/year has been observed in major part of the block covering about 461 sq. km. area.	
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**
	
Declining trend @>0.2 m/year 461 sq. km.	**Declining trend @>0.2 m/year 922 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has decreased during 2011 to 2013 from 37.91% to 35.94% and afterwards again increased during 2013 to 2017 from 35.94% to 36.77% in Parli block of Beed District**.** Further, the net ground water availability increased during 2011 to 2013 from 105.48 MCM to 114.27 MCM again further increased from 114.27 MCM to 114.94 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 37.64 MCM to 38.66 MCM and hence further decreased from 38.66 MCM to 37.68 MCM during 2013 to 2017.



Declining water level Trend : -

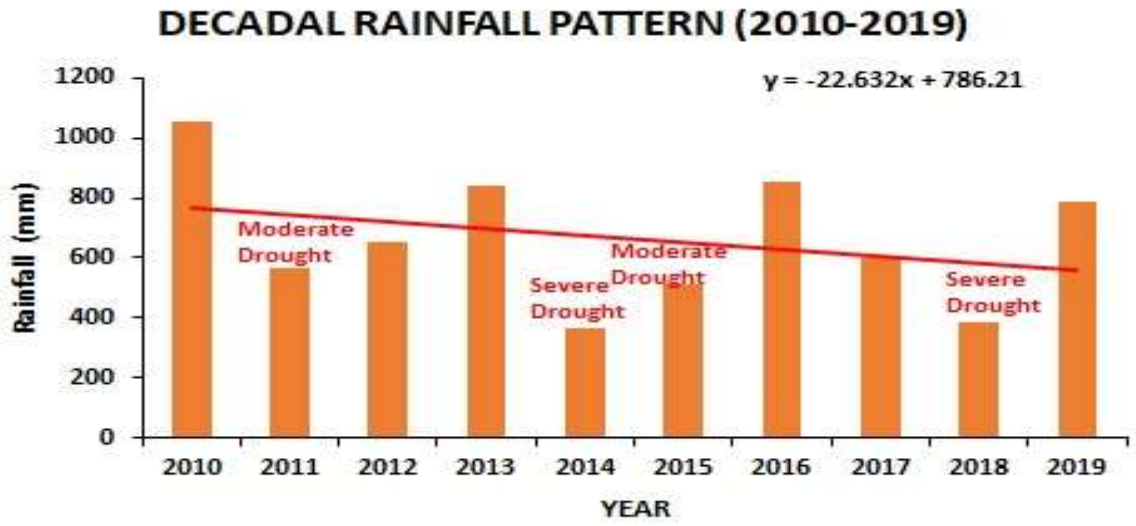
- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 461 sq. km. covering about 50% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 922

sq. km. covering about 100 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of PARLI block is 742mm, and also indicates a falling rainfall trend @ -1.639 mm/year with probability of 28.57% Moderate and 9.52%Severedrought.

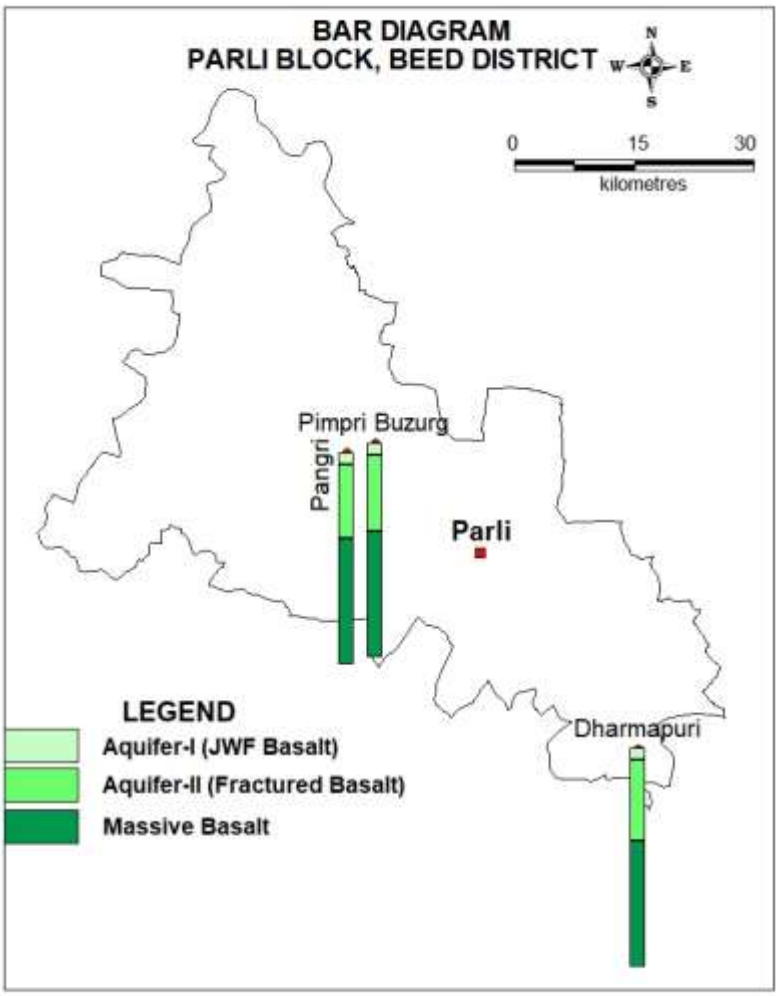
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 661.74mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

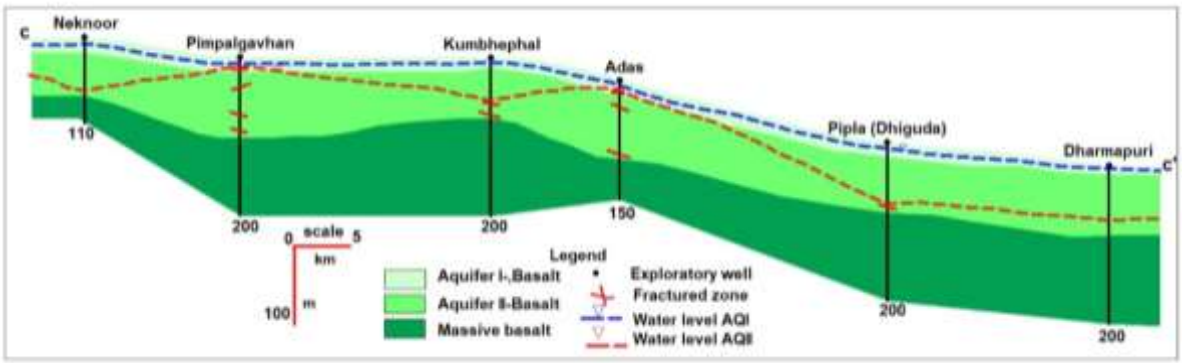
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 50% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	



3.3. Cross Section

Section CC'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	9 to 19	118.30 to 127.40

Weathered/Fractured zones encountered (mbgl)	5.50 to 16	116.60 to 127.40
Weathered/Fractured rocks thickness (m)	5 to 12	0.50 to 2.00
SWL (mbgl)	6.15 to 16.43	37.40 to 90.05
Specific yield/Storativity (S)	0.020 to0.024	4.15×10^{-4} to 3.95×10^{-5}
Transmissivity (T)	10.00 to 40.50 m^2/day	0.69 to 36.63 m^2/day
Yield	4 to 240 m^3/day	0 to 2.50 lps
Sustainability	2 to 4 hrs	1 to 5 hrs

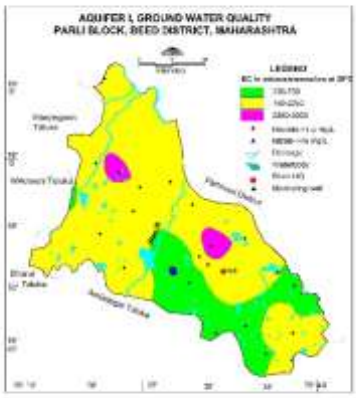
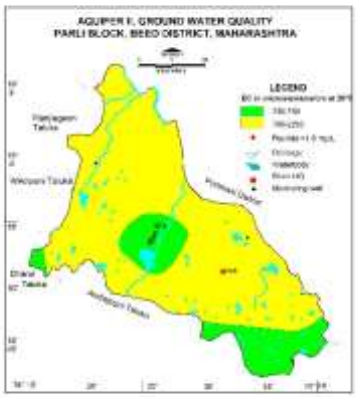
4. GROUND WATER QUALITY

4.1 Aquifer-I/ Shallow Aquifer

EC values between 250-750 µS/cm are observed in west and central parts of the blocks as small patches and EC values between 750 to 2250 µS/cm are observed in major part of the block; whereas EC values between 2250-3000 µS/cm are observed in south and east parts of the block. Ground water is suitable for all purposes.

4.2 Aquifer II/Deeper Aquifer

EC values between 250-750 µS/cm are observed in west and central parts of the blocks as patches and EC values between 750 to 2250 µS/cm are observed in major part of the block. Ground water is suitable for all purposes.

Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**
	

5. GROUND WATER RESOURCE

5.1 Aquifer-I/ Shallow Aquifer

Ground Water Recharge Worthy Area (Sq. km.)	635.26
Total Annual Ground Water Recharge (MCM)	114.94
Natural Discharge (MCM)	5.74
Net Annual Ground Water Availability (MCM)	109.19
Existing Gross Ground Water Draft for irrigation (MCM)	37.68
Existing Gross Ground Water Draft for domestic	2.46

and industrial water supply (MCM)	
Existing Gross Ground Water Draft for All uses (MCM)	40.15
Provision for domestic and industrial requirement supply to 2025(MCM)	11.70
Net Ground Water Availability for future irrigation development (MCM)	54.26
Stage of Ground Water Development (%)	36.77
Category	**SAFE**

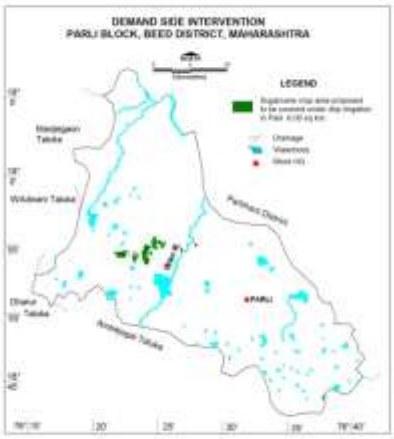
5.2 Aquifer-II/Deeper Aquifer

Semi confined/Confined Aquifer (Basalt)

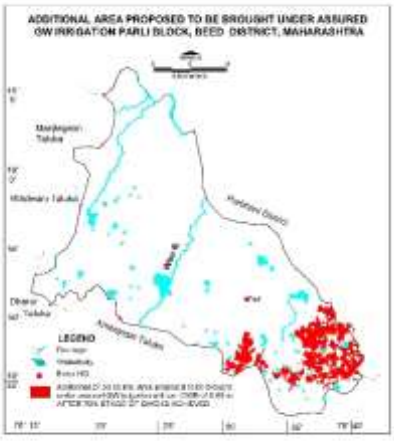
Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource with in confining Aquifer (mcm)	Total Resources (MCM)
Parli	Basalt Aq-II	676.51	1.50	52.22	0.020	0.0005	0.00	2.03	2.03

6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	109.20	
Gross Annual Draft (MCM)	40.15	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	37.68	
Agricultural Supply -SW	100.6655	
Domestic Supply - GW	2.46	
Domestic Supply - SW	0.62	
Total Supply	141.42	
Area of Block (Sq. Km.)	676.51	
Potential Area suitable for recharge(Sq. Km)	85.29	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge(WL >5mbgl) (Sq. Km.)	85.29	
Volume of Unsaturated Zone	170.58	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	3.4116	
Surplus water Available (MCM)	1.93	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	7	19

Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	1.01325	0.43
RTRWH Structures – Urban Areas	Economically not viable & Not Recommended	
Households to be covered (25% with 50 m2 area)	57,806	
Total RWH potential (MCM)	2.330	
Rainwater harvested / recharged @ 80% runoff co-efficient	1.864	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane crop area(48 sq km)100% ground water irrigated proposed to be covered under Drip (sq.km.)	6	
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	3.42	
Water Saving micro Irrigation technique(MCM)	3.42	
Total Irrigated Area		
Proposed Cropping Pattern change	Nil	
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil	
Water Saving by use of Sprinklers (MCM)	Nil	
6.3. EXPECTED BENEFITS		
Net Ground Water Availability (MCM)	109.20	
Additional GW resources available after implementing above measures (MCM)	1.45	
Ground Water Availability after Supply side Intervention (MCM)	110.64	
Existing Ground Water Draft for All Purposes (MCM)	40.15	
Saving of Ground Water through demand side intervention (MCM)	3.42	
GW draft after Demand side interventions (MCM)	36.73	
Present stage of Ground Water Development (%)	36.77	
Stage of Ground Water Development after interventions (%)	33.20	
Other Interventions Proposed, if any		
Alternate Water Sources Available	Nil	
Regulatory Measures	Nil	
Recommendation		
Ground water development is recommended to bring the stage of ground water development from 36.77% to 33.20%		
6.4. Development Plan		
Volume of water available for GWD to 70% (MCM)	40.72	

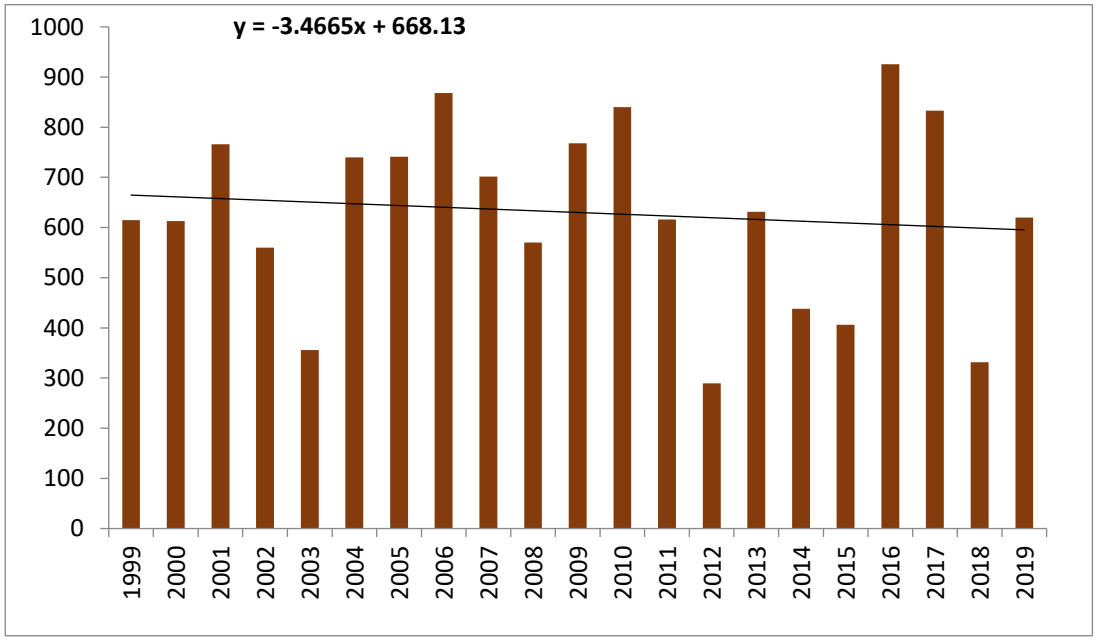
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	2443
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	407
Additional Area (sq.km.) proposed to be brought under assured GW irrigation with av. CWR of 0.65 m AFTER 70% STAGE OF GWD IS ACHIEVED.	62.64
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Area proposed for drip Irrigation**
	

***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**



9.8 PATODA BLOCK, BEED DISTRICT, MAHARASHTRA

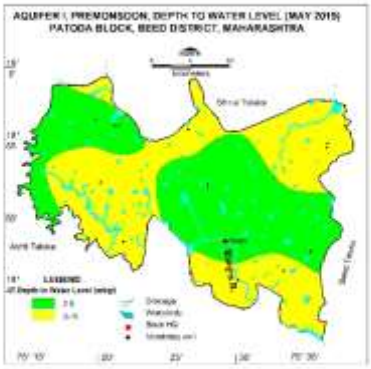
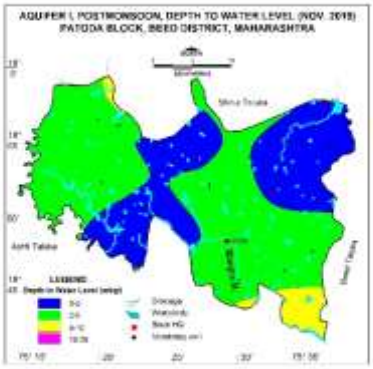
1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**PATODA**	
Geographical Area (Sq. km.)	779.99Sq. km.	
Hilly Area (Sq. km.)	56.22Sq. km.	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	95,738	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	686mm	
Annual Rainfall (2019)	832mm	
Decadal Average Annual Rainfall (2010-19)	492mm	
Long Term Rainfall Analysis (1999-2019)	Falling Trend 3.4665 mm/year Probability of Normal and Excess Rainfall 66.67 % & 9.52 % Probability of Droughts -: 14.29% Moderateand9.52 %Severe	
Rainfall Trend Analysis (1999 to 2019)		

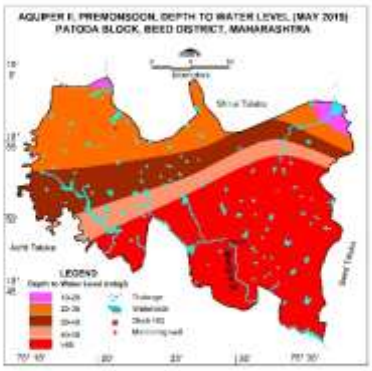


EQUATION OF TREND LINE y = -3.4665+668.13

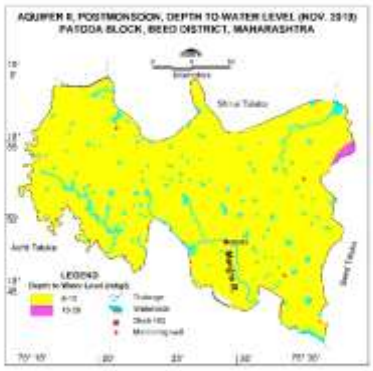
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Manjra river and Their tributaries	
Hydrology ***(Reference DSA Year: June 2016-17)***	Major project	**Nil**

		Medium project	**Completed:** Mahasavangi And Ghatshilapargaon projects covering area of 2956sq km with Storage capacity (Ten lakh Cubic meter) of 13.49
		Small project	**Completed:** small irrigation projects covering area of 189.94sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		779.99Sq. km.	
Forest Area		38.89Sq. km.	
Cultivable Area		385.05Sq. km.	
Net Sown Area		335.05Sq. km.	
Double Cropped Area		50.00Sq. km.	
Area under Irrigation	Surface Water	37.94Sq. km.	
	Ground Water	70.30Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	370.25
		Pulses	121.6
		Gram	25.00
		Soyabean	165.00
		Cotton	142.00
		Sugarcane	6.33
Horticultural Crops		Mango	4.50
		Citrus fruits	2.65
		Grapes	0.00
		Banana	0.20
		Vegetables	3.95
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water levels between 2-5 mbgl are observed in almost entire eastern and western part of the block covering an area of 390 sq km; whereas Water levels between 5-10 mbgl are observed in south and north covering an area of only 380 sq km.			Water level between 0-2 mbgl are observed in central and east parts of the block covering an area of 234 sq km; Water levels between 2-5 mbgl are observed in major parts of the block as a continuous patch covering an area of 468 sq km; Water levels between 5-10 mbgl are observed in north and south fringes of the block as a patch covering an area of 70 sq km;

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>5mbgl380 sq. km.	**WL>10 mbgl 76 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 10-20mbgl are observed in eastern and northern fringe of the block covering an area of 39 sq km; Water levels between 20-30 mbgl are observed in west, north and east parts of the block covering an area of 218 sq km; Water levels between 30-40 mbgl are observed in west, central and east parts of the block as a continuous patch covering an area of 140 sqkm; Water levels between 40-50 mbgl are observed in west, central and east parts of the block as a continuous patch covering an area of 128 sqkm; water levels more than 50 mbgl have been observed in entire south and south east half of the block covering about 389 sq. km. area of the block.	Water levels between 5-10 mbgl are observed in almost entire part of the block covering an area of 756 sq km; whereas Water levels between 10-20 mbgl are observed in eastern fringe covering an area of only 24 sq km.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**



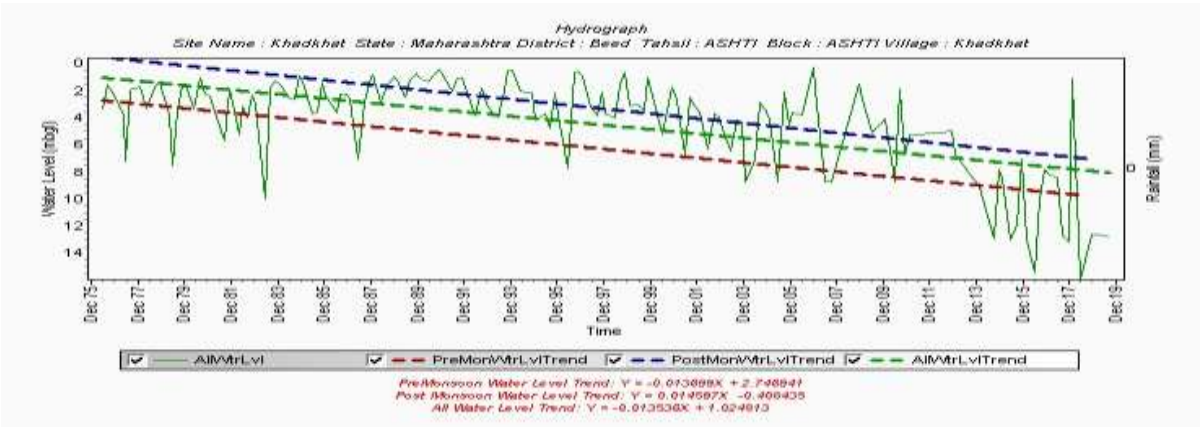
WL>50 mbgl389 sq. km.



WL>10 mbgl24 sq. km.

1.7. Hydrograph

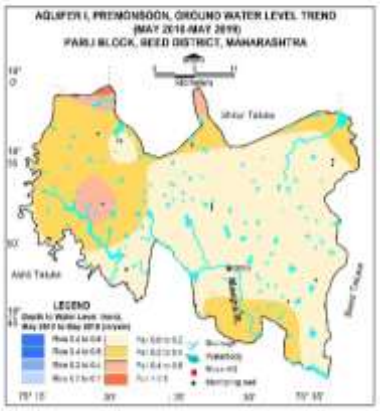
Site Name: Khadkhat State: Maharashtra District: BEED Tehsil: PATODA Block: : BEED Village: Khadkhat



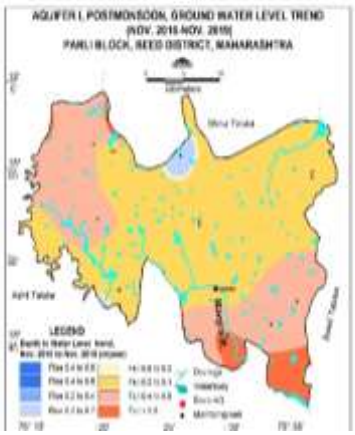
Hydrograph shows Pre-monsoon falling water level trend @ 1.09296 m/year and Post monsoon falling water level trend @ 0.814896 m/year

1.8. Water Level Trend (2010-19)

Pre-Monsoon trend	**Post-Monsoon trend**
Falling 0.05281to 0.29286m/year	Rising 0.007455to 0.054286m/year Falling -0.05202to -0.52m/year
Decline in water level up to 0.2 m/year has been observed in major parts of the block covering an area of 546 sq km; Declining trend more than 0.2 m/year has been observed in western, north-western, south and east part of the block covering about 234 sq. km. area.	Rise in water level up to 0.2 m/year has been observed in isolated patch in northern part of block covering an area of 63 sq km; Declining water level more than 0.2 m/year has been observed in major part of the block covering 717sq km area.
Pre-Monsoon Water Level Trend (2010-19)	**Post-Monsoon Water Level Trend (2010-19)**



Declining trend @>0.2 m/year 234 sq. km.

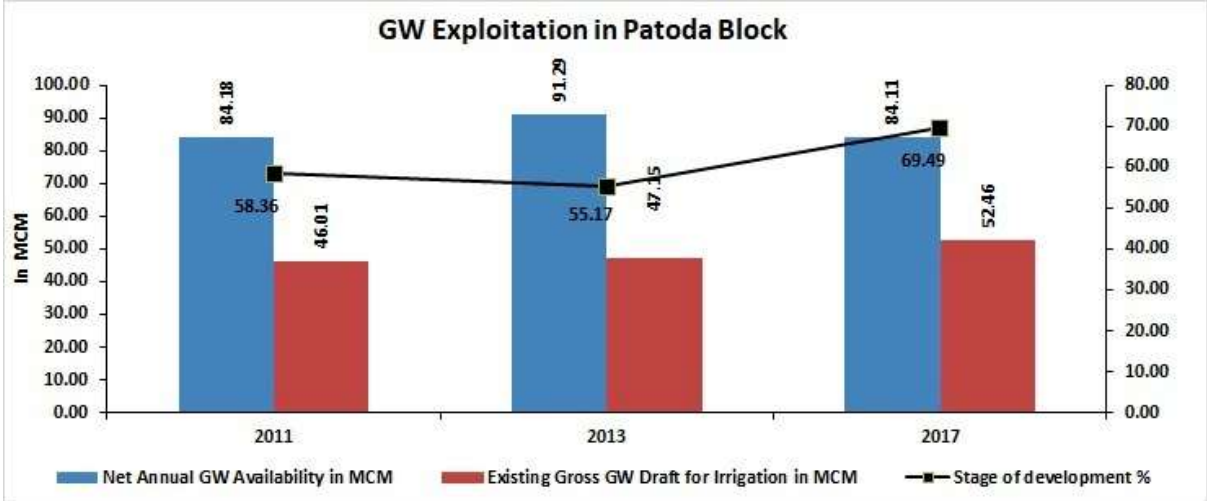


Declining trend @>0.2 m/year 717 sq. km.

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has decreased during 2011 to 2013 from 58.36% to 55.17% and afterwards again increased during 2013 to 2017 from 55.17% to 69.49% in Patoda block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 84.18 MCM to 91.29 MCM again further decreased from 91.29 MCM to 84.11 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 46.01 MCM to 47.15 MCM and hence further increased from 47.15 MCM to 52.46 MCM during 2013 to 2017.



Declining water level Trend: -

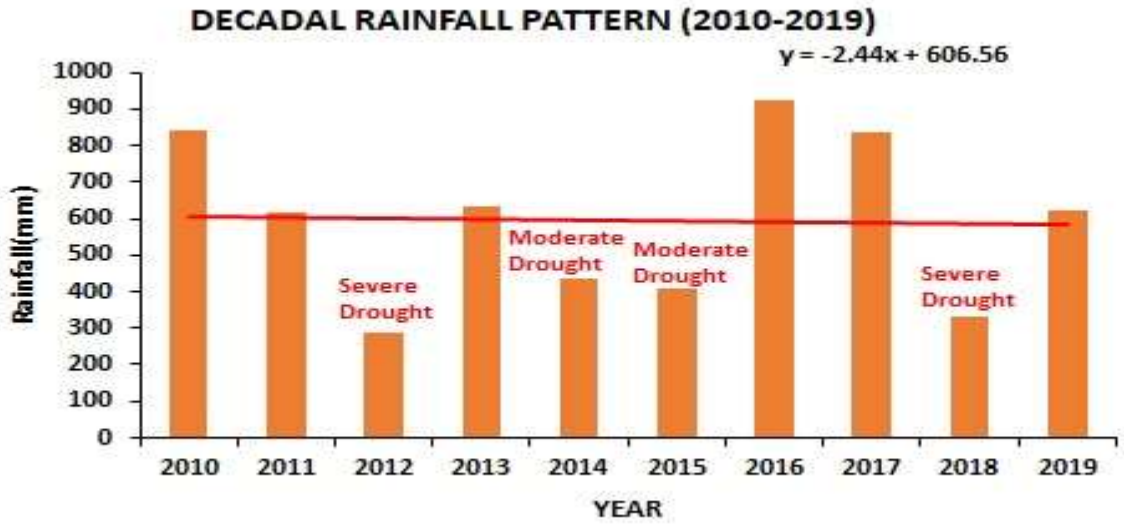
- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 234 sq. km. covering about 30% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 717 sq. km. covering about 92 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of PATODA block is 686mm, and also indicates a falling rainfall trend @ -3.4665 mm/year with probability of 14.29% Moderate and 9.52 %Severe drought.

Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average

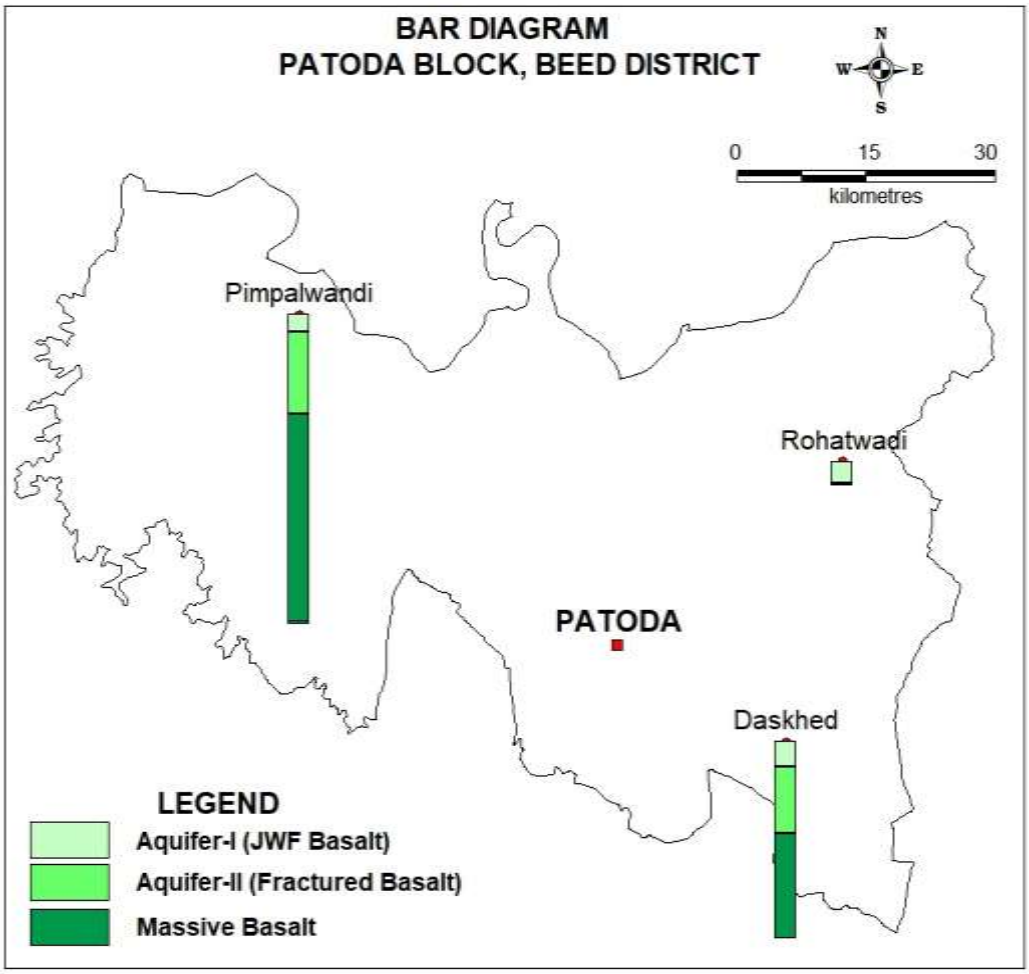
rainfall is 492mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

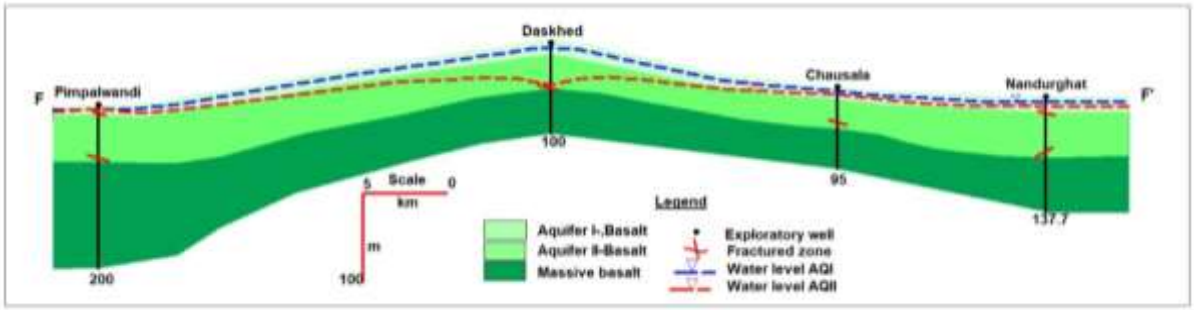
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 51% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	



3.3. Cross Section

Section FF'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	9 to 19	79 to 80
Weathered/Fractured zones encountered (mbgl)	9 to 16	43 to 80
Weathered/Fractured rocks thickness (m)	5 to 12	3.00 to 6.00

SWL (mbgl)	5.97 to 15.99	5.60 to 5.62
Specific yield/Storativity (S)	0.020 to0.025	4.45 x10^{-4} to 4.65 x10^{-5}
Transmissivity (T)	11.00 to 50.50 m^2/day	7.00 to 22.00 m^2/day
Yield	4 to 176 m^3/day	0 to 3.17 lps
Sustainability	2 to 4 hrs	1 to 5 hrs

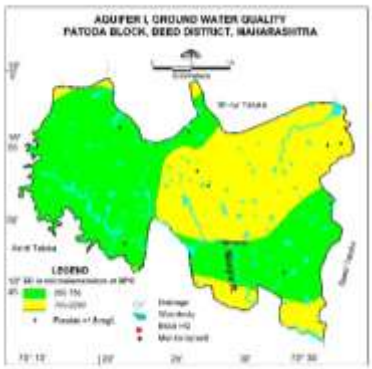
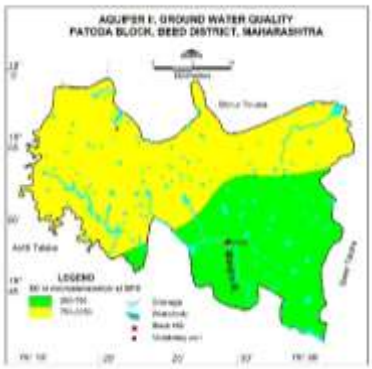
4. GROUND WATER QUALITY

4.1 Aquifer-I/ Shallow Aquifer

EC values between250-750 µS/cm are observed in west, east, northern and southern parts of the block and EC values between 750 to 2250 µS/cm are observed in north and east part of the block. Ground water is suitable for all purposes.

4.2 Aquifer II/Deeper Aquifer

EC values between250-750 µS/cm are observed in east and southern parts of the block and EC values between 750 to 2250 µS/cm are observed in north and west part of the block. Ground water is suitable for all purposes.

Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**
	

5. GROUND WATER RESOURCE

Ground Water Recharge Worthy Area (Sq. km.)	723.77
Total Annual Ground Water Recharge (MCM)	84.11
Natural Discharge (MCM)	4.20
Net Annual Ground Water Availability (MCM)	79.91
Existing Gross Ground Water Draft for irrigation (MCM)	52.46
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	3.06
Existing Gross Ground Water Draft for All uses (MCM)	55.53
Provision for domestic and industrial requirement supply to 2025(MCM)	6.15
Net Ground Water Availability for future irrigation development (MCM)	21.20
Stage of Ground Water Development (%)	69.49

Category	**SAFE**

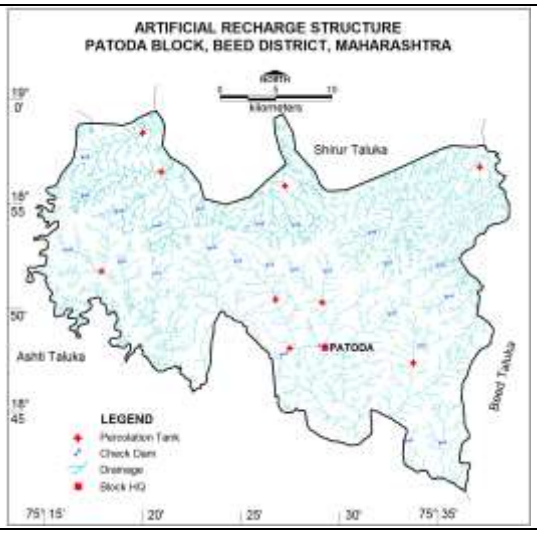
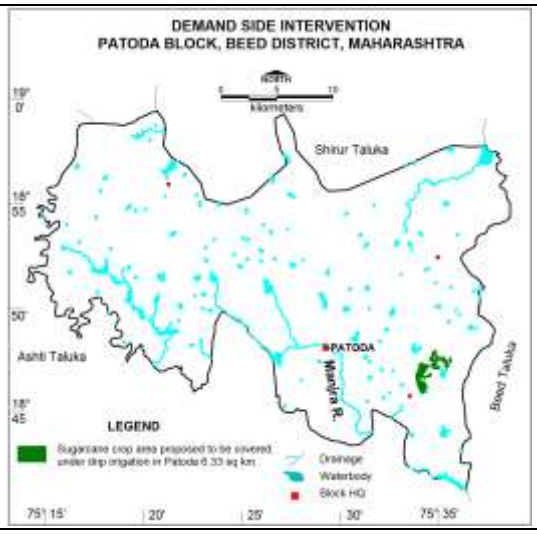
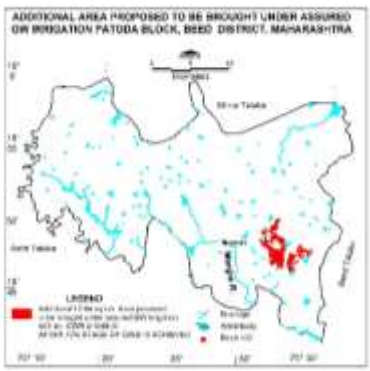
5.2 Aquifer-II/Deeper Aquifer

Semi confined/Confined Aquifer (Basalt)

Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource with in confining Aquifer (mcm)	Total Resources (MCM)
Patoda	Basalt Aq-II	779.99	4.50	12.89	0.020	0.0004	4.02	1.40	5.43

6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	79.91	
Gross Annual Draft (MCM)	55.53	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	52.46	
Agricultural Supply -SW	37.94	
Domestic Supply - GW	3.06	
Domestic Supply - SW	0.77	
Total Supply	94.23	
Area of Block (Sq. Km.)	779.99	
Potential Area suitable for recharge (Sq. Km)	109.17	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)	109.17	
Volume of Unsaturated Zone	218.34	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	4.3668	
Surplus water Available (MCM)	2.47	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	9	25
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	1.29675	0.56
RTRWH Structures – Urban Areas	Economically not viable & Not Recommended	
Households to be covered (25% with 50 m2 area)	25,612	
Total RWH potential (MCM)	0.881	

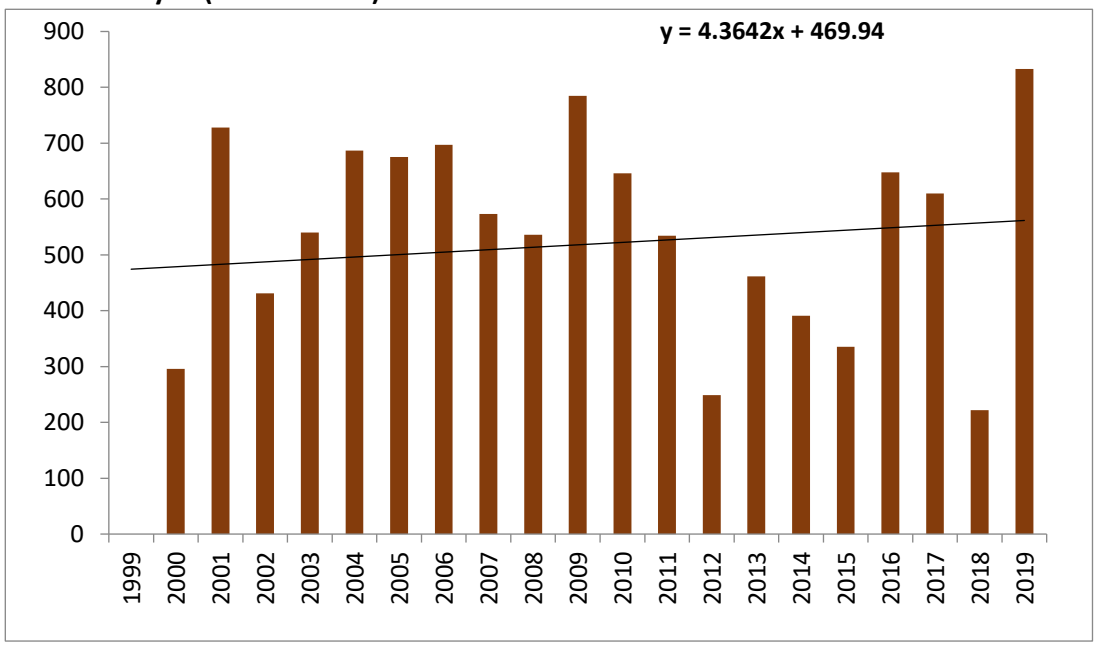
Rainwater harvested / recharged @ 80% runoff co-efficient	0.705
6.2. Demand Side Management	
Micro irrigation techniques	
Sugarcane area (6.33sq km) ,100 % ground water irrigated proposed to be covered under Drip (sq.km.)	6.33
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.40 m	3.61
Water Saving micro-Irrigation technique (MCM)	3.61
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	79.91
Additional GW resources available after implementing above measures (MCM)	1.85
Ground Water Availability after Supply side Intervention (MCM)	8176
Existing Ground Water Draft for All Purposes (MCM)	55.53
Saving of Ground Water through demand side intervention (MCM)	3.61
GW draft after Demand side interventions (MCM)	51.92
Present stage of Ground Water Development (%)	69.50
Stage of Ground Water Development after interventions (%)	63.51
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 69.50% to 63.51%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	5.30
Proposed Number of DW (@ 1.5 ham for 90% of GWR Available)	318
Proposed Number of BW (@ 1 ham for 10% of GWR Available)	53

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.	8.16
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Cropped Area proposed for drip Irrigation**
	
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION** 	

9.9 SHIRUR KASAR BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES	
1.1 Introduction	
Block Name	**SHIRUR KASAR**
Geographical Area (Sq. km.)	649.44
Hilly Area (Sq. km.)	35.37
Poor Ground Quality Area (Sq. km.)	Nil
Population (2011)	95,738
Climate	Sub-Tropical
1.2 Rainfall Analysis	
Normal Rainfall (mm)	686.2
Annual Rainfall (2019) (mm)	832.8
Decadal Average Annual Rainfall (2010-19) (mm)	492.9
Long Term Rainfall Analysis (1999-2019)	Rising Trend 4.3642 mm/year Probability of Normal and Excess Rainfall 61.90 % & 0 % Probability of Droughts -: 14.29% Moderate and 19.05 %Severe and 4.76% Acute

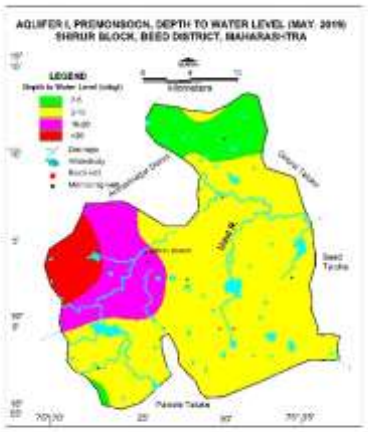
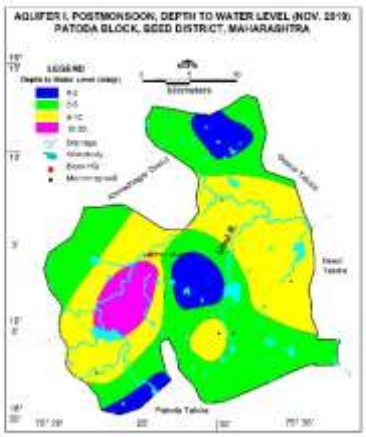
Rainfall Trend Analysis (1999 to 2019)



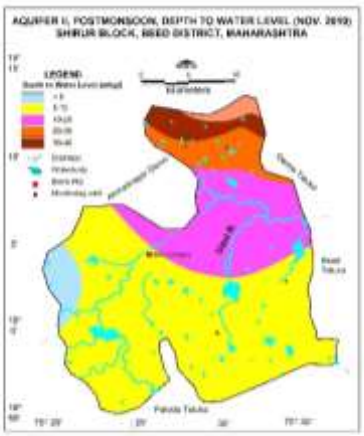
EQUATION OF TREND LINE y = **4.3642x+469.94**

1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Sindhphana river and Their tributaries	
Hydrology	Major project	**Nil**

(*Reference DSA Year: June 2016-17)*	Medium project	**Completed:** Sindhfal Project projects covering area of 1782sq km with Storage capacity (Ten lakh Cubic meter) of 12.59
	Small project	**Completed:** small irrigation projects covering area of 100.41sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern		
Geographical Area	649.44Sq. km.	
Forest Area	22.90Sq. km.	
Cultivable Area	401.46Sq. km.	
Net Sown Area	384.61 Sq. km.	
Double Cropped Area	16.85 Sq. km.	
Area under Irrigation – Surface Water	32.53Sq. km.	
Area under Irrigation – Ground Water	42.89Sq. km.	
Principal Crops *(Reference year 2019)*	**Crop Type**	**Area (Sq. km.)**
	Cereals	239.28
	Pulses	58.31
	Gram	50.55
	Soyabean	23.49
	Cotton	291.92
	Sugarcane	28.92
Horticultural Crops	Mango	2.20
	Citrus fruits	2.15
	Grapes	0.00
	Banana	0.18
	Vegetables	3.95
1.6. Water Level Behaviour		
1.6.1. Aquifer-I/Shallow Aquifer		
Pre-Monsoon (May-2019)		**Post-Monsoon (November-2019)**
Water levels 2- 5 mbgl is seen in northern part of the block covering 131 sq km area; whereas water level between 5-10 mbgl is seen in major part of the block covering an area of 450 sq km; whereas water level between 10 to 20 mbgl are observed in western half of the block covering an area of 125 sq km; water levels >20 mbgl have been observed in seen in western part covering 70 sq km.		Water level between 0-2mbgl is seen in north and central covering 94 sq km; whereas Water levels 2- 5 mbgl is seen in major part of the block covering 377 sq km area; whereas water level between 5-10 mbgl is seen in north, south, east west part of the block covering an area of 190 sq km; water levels >10 mbgl have been observed in in western part covering 63 sq km.

Pre-Monsoon Water Level (May 2019)	Post-Monsoon Water Level (Nov. 2019)
	
WL>20 mbgl 70 sq. km.	**WL>10 mbgl 63 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 10 to 20 mbgl are observed in western, north and southern half of the block covering an area of 325 sq km; water levels between 20 to 30 mbgl have been observed in north to south as a continuous patch covering 129 sq km; whereas water level between 30 to 40 mbgl is seen in north to south as a thin continuous patch covering 34 sq km; whereas water level between 40 to 50 mbgl is seen in north to south as a thin continuous patch covering 33 sq km; water level > 50 mbgl is seen in eastern half of the block covering about 162 sq. km. area of the block.	Water levels < 5 mbgl is seen in western part of the block covering 519 sq km area; whereas water level between 5-10 mbgl is seen in major part of the block covering an area of 421 sq km; whereas water level between 10 to 20 mbgl are observed in north half of the block covering an area of 130 sq km; water levels between 20 to 30 mbgl have been observed in north covering 60 sq km; whereas water level between > 30mbgl is seen in north covering 64 sq km.
Pre-Monsoon Water Level (May 2019)	**Post-Monsoon Water Level (Nov.-2019)**

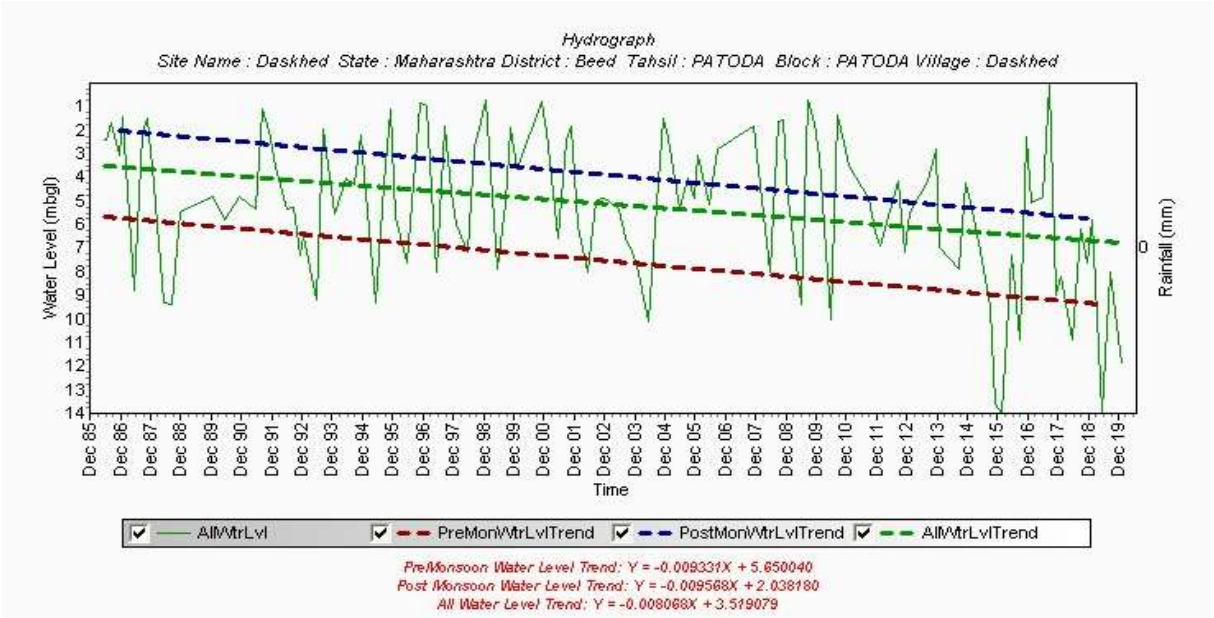
WL> 50mbgl 162 sq. km.



WL> 30 mbgl 64 sq. km.

1.7. Hydrograph

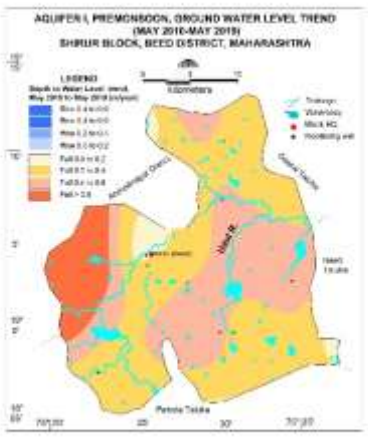
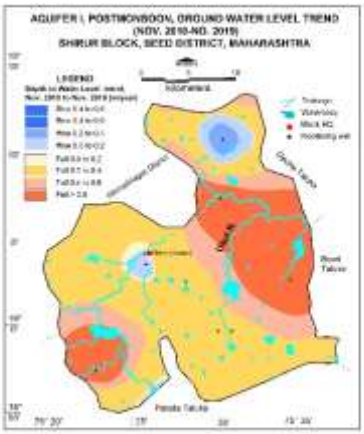
Site Name: DASKHED State: Maharashtra District: BEED Tehsil: PATODA Block: : BEED Village: DASKHED



Hydrograph shows Pre-monsoon falling water level trend @ 0.111972 m/year and Post monsoon falling water level trend @ 0.114861 m/year

1.8. Water Level Trend (2010-19)

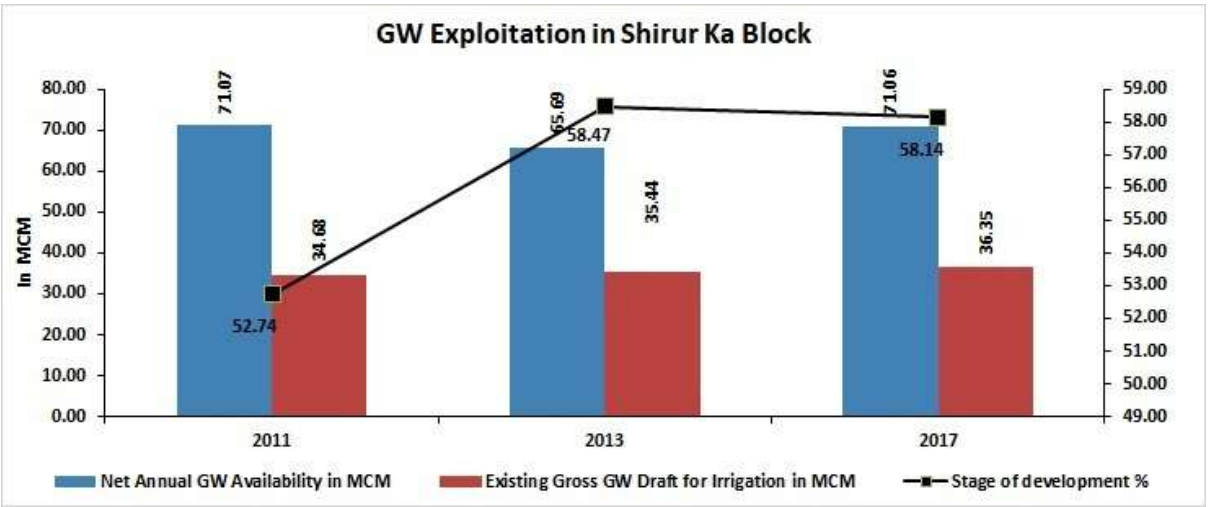
Pre-Monsoon trend	**Post-Monsoon trend**
Falling 0.10812 to 1.51879 m/year	Rising 0.073 to 0.422 m/year Falling 0.00438 to 0.84212 m/year
Decline in water level up to 0.2 m/year has been observed in western and north western parts of the block. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 584 sq. km. area.	Declining water level trend up to 0.2 m/year has been observed in west central part of the block while rise in water level up to 0.40 m/year has been observed in isolated patch in western and northern part of block covering an area of 97 sq km. Decline more than 0.2 m/year has been observed in major part of the block covering 539sq km area.

Pre-Monsoon Water Level Trend (2010-19)	Post-Monsoon Water Level Trend (2010-19)
	
Declining trend @>0.2 m/year 584 sq. km.	**Declining trend @>0.2 m/year 539 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 52.74% to 58.47% and afterwards again decreased during 2013 to 2017 from 58.47% to 58.14% in SHIRUR KASAR block of Beed District**.** Further, the net ground water availability decreased during 2011 to 2013 from 71.07 MCM to 65.69 MCM again further increased from 65.69 MCM to 71.06 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 34.68 MCM to 35.44 MCM and hence further increased from 35.44 MCM to 36.35 MCM during 2013 to 2017.



Declining water level Trend: -

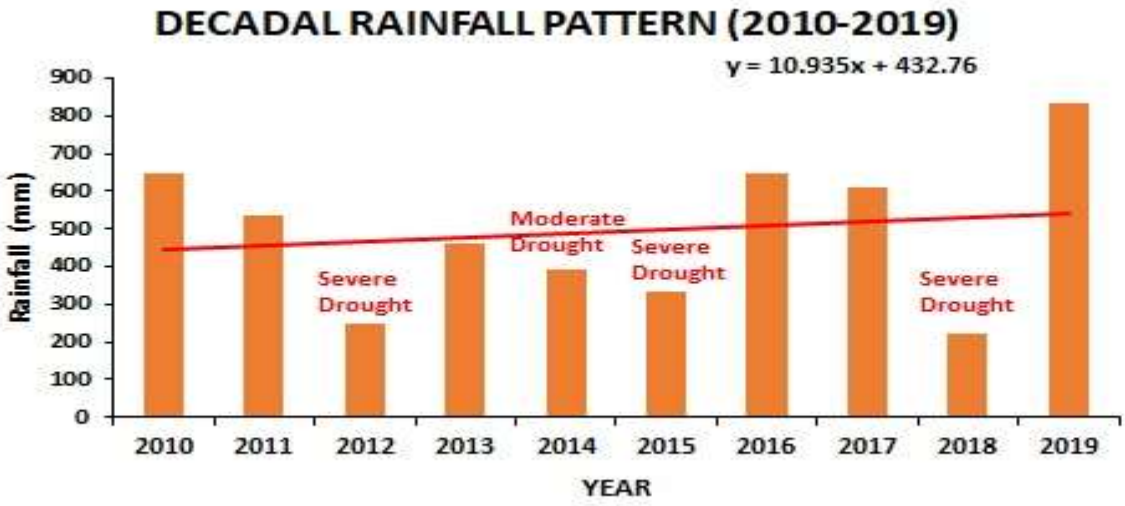
- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 584 sq. km. covering about 90% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 539 sq. km. covering about 83 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of

SHIRUR KASAR block is 686.20mm, and also indicates a Rising rainfall trend @ 4.3642 mm/year with probability of 14.29% Moderate and 19.05 %Severe and 4.76% Acute drought.

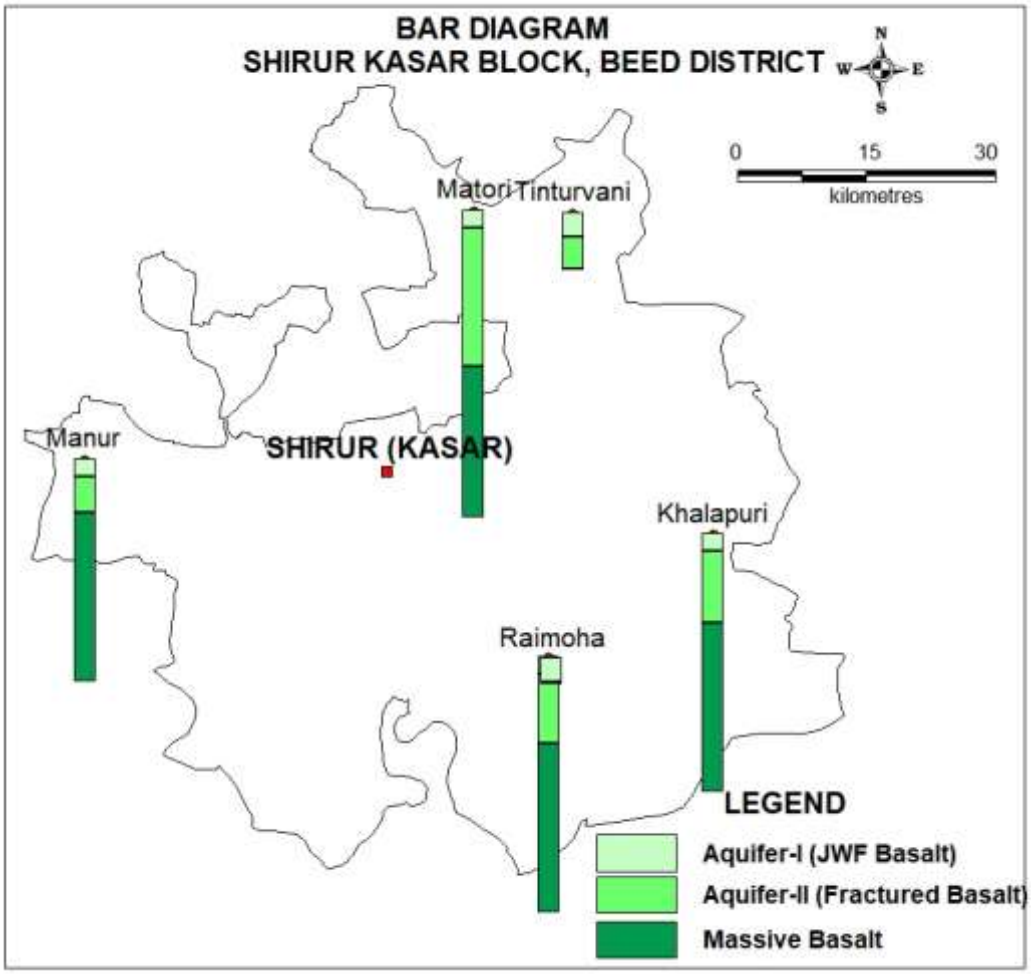
Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 492.90mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

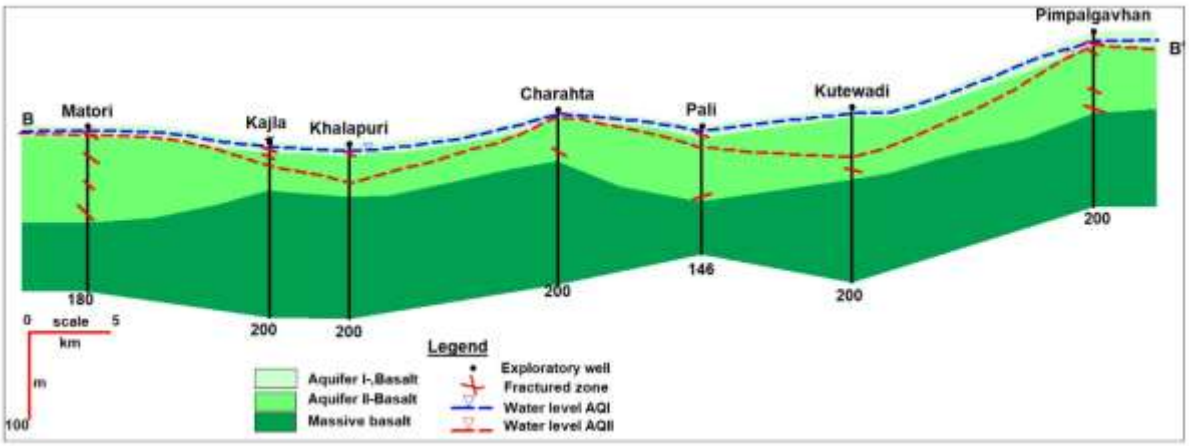
Limited extent of porous and pervious zone, because of predominance of secondary porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 80% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION	
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II
3.2. Lithological disposition	

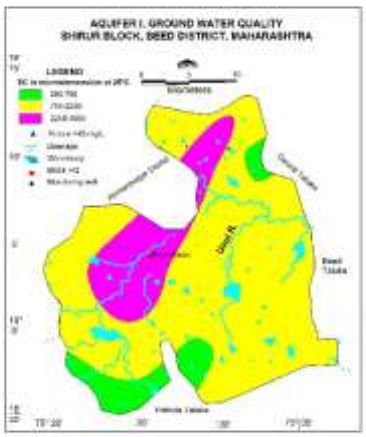
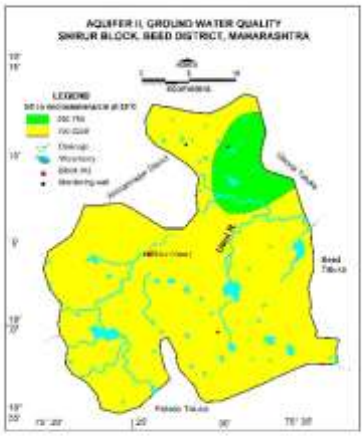


3.3. Cross Section

Section BB'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer (Phreatic/Semi confined/Confined)	Aquifer-I (Phreatic)	Aquifer-II (Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	9 to 21.80	43 to165

Weathered/Fractured zones encountered (mbgl)	10 to 16	39 to 165
Weathered/Fractured rocks thickness (m)	8 to 13	0.50 to 6.00
SWL (mbgl)	6.12 to 24.32	4.10 to 100.00
Specific yield/Storativity (S)	0.020 to0.026	3.15×10^{-5} to 3.55×10^{-6}
Transmissivity (T)	15.00 to 70.50 m^2/day	0.18 to 2.071 m^2/day
Yield	3 to 200 m^3/day	0.14 to 1.44 lps
Sustainability	2 to 4 hrs	1 to 5 hrs
4. GROUND WATER QUALITY		
4.1 Aquifer-I/ Shallow Aquifer		
EC values between 250-750 µS/cm are observed in southern and eastern parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block, whereas EC values > 2250 µS/cm are observed in northern and central part of the block. Ground water is suitable for all purposes.		
4.2 Aquifer II/Deeper Aquifer		
EC values between 250-750 µS/cm are observed in northern part of the block and EC value between 750 to 2250 µS/cm is observed in entire block. Ground water is suitable for all purposes.		
Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**	
		
5. GROUND WATER RESOURCE		
5.1 Aquifer-I/ Shallow Aquifer		
Ground Water Recharge Worthy Area (Sq. km.)	614.07	
Total Annual Ground Water Recharge (MCM)	71.06	
Natural Discharge (MCM)	3.55	
Net Annual Ground Water Availability (MCM)	67.51	
Existing Gross Ground Water Draft for irrigation (MCM)	36.35	
Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	2.89	

Existing Gross Ground Water Draft for All uses (MCM)	39.25
Provision for domestic and industrial requirement supply to 2025(MCM)	4.18
Net Ground Water Availability for future irrigation development (MCM)	26.80
Stage of Ground Water Development (%)	58.14
Category	**SAFE**

5.2 Aquifer-II/Deeper Aquifer

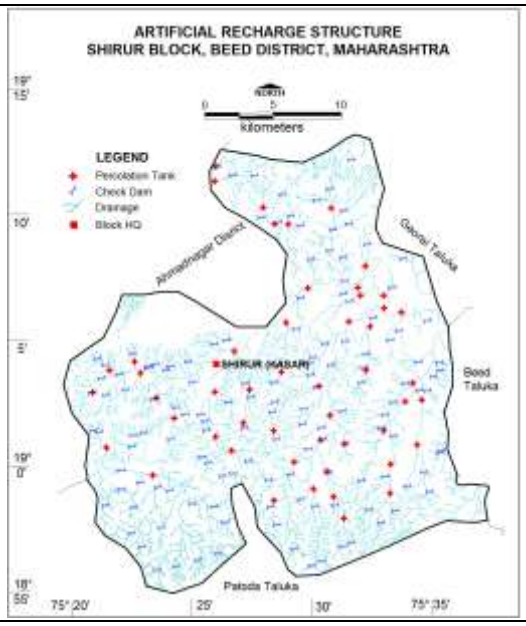
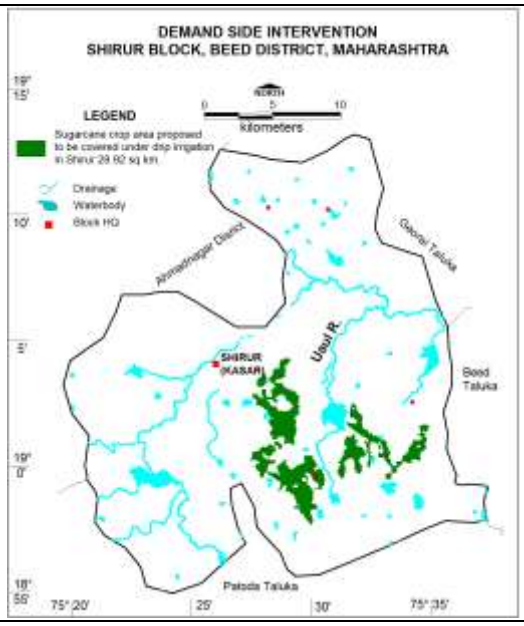
Semi confined/Confined Aquifer (Basalt)

Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource with in confining Aquifer (mcm)	Total Resources (MCM)
SHIRUR KASAR	Basalt Aq-II	649.44	3.88	2.25	0.020	0.0003	0.44	0.76	1.19

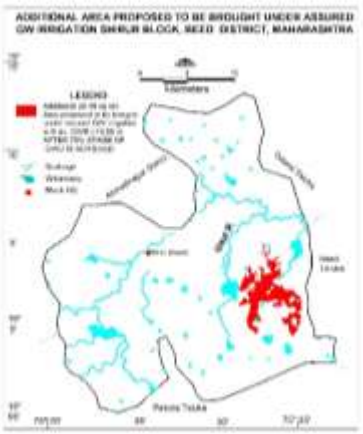
6.0. GROUND WATER RESOURCE MANAGEMENT

Available Resource (MCM)	67.51	
Gross Annual Draft (MCM)	39.25	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	36.35	
Agricultural Supply -SW	21.1445	
Domestic Supply - GW	2.89	
Domestic Supply - SW	0.72	
Total Supply	61.11	
Area of Block (Sq. Km.)	649.44	
Potential Area suitable for recharge (Sq. Km)	618.65	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)	618.65	
Volume of Unsaturated Zone	1237.3	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	24.746	
Surplus water Available (MCM)	14.01	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200 TCM)	Check Dam (Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM)
Number of Structures	49	140
Volume of Water expected to be conserved /	7.35525	3.15

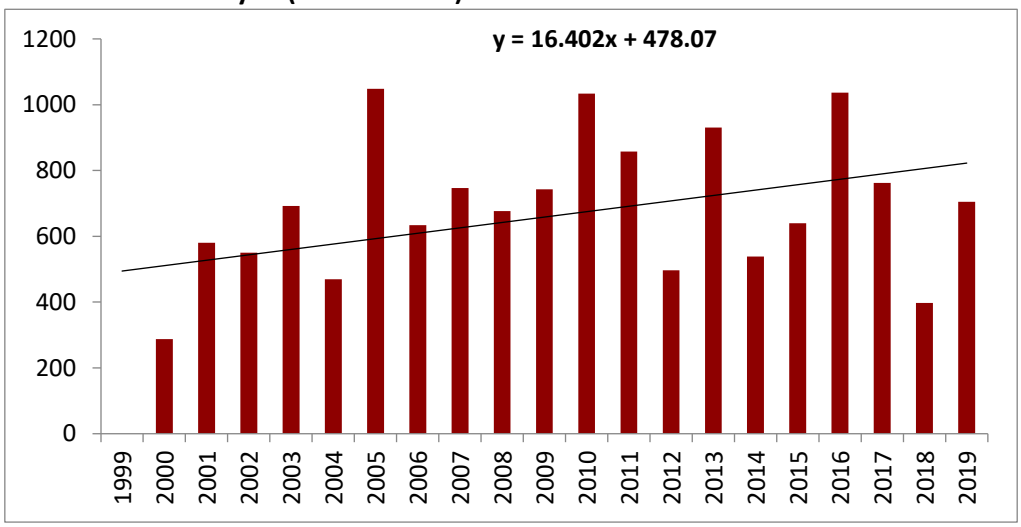
recharged @ 75% efficiency (MCM)	
RTRWH Structures – Urban Areas	Economically not viable & Not Recommended
Households to be covered (25% with 50 m2 area)	26,642
Total RWH potential (MCM)	0.914
Rainwater harvested / recharged @ 80% runoff co-efficient	0.731
6.2. Demand Side Management	
Micro irrigation techniques	
Sugarcane area (28.92), 100% ground water irrigated proposed to be covered under Drip (sq.km.)	28.92
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE-0.40 m	16.48
Water Saving micro Irrigation technique (MCM)	16.48
Total Irrigated Area	
Proposed Cropping Pattern change	Nil
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil
Water Saving by use of Sprinklers (MCM)	Nil
6.3. EXPECTED BENEFITS	
Net Ground Water Availability (MCM)	67.51
Additional GW resources available after implementing above measures (MCM)	10.51
Ground Water Availability after Supply side Intervention (MCM)	78.02
Existing Ground Water Draft for All Purposes (MCM)	39.25
Saving of Ground Water through demand side intervention (MCM)	16.48
GW draft after Demand side interventions (MCM)	22.77
Present stage of Ground Water Development (%)	58.14
Stage of Ground Water Development after interventions (%)	29.18
Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 58.14% to 29.18%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	31.85
Proposed Number of DW(@ 1.5 ham for 90% of GWR Available)	1911
Proposed Number of BW(@ 1 ham for 10% of GWR Available)	318

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.	48.99
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Area proposed for drip Irrigation**
	

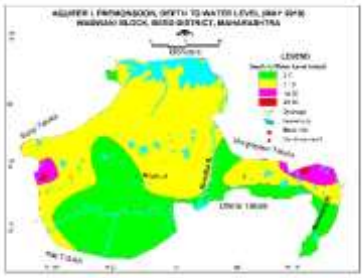
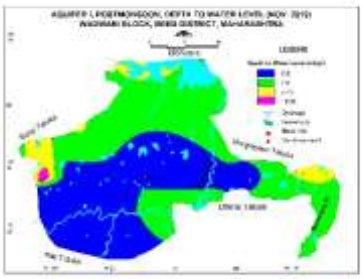
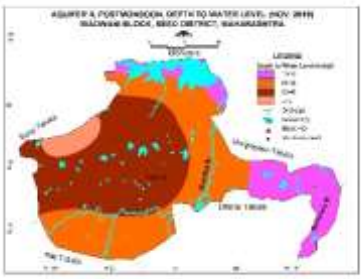
***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**

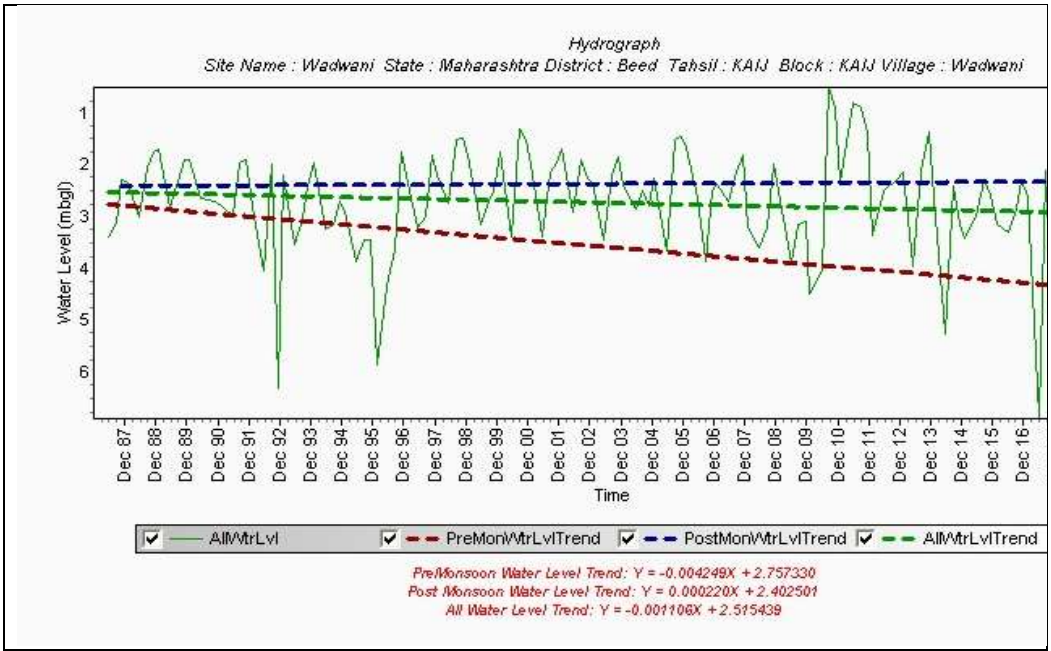


9.10 WADWANI BLOCK, BEED DISTRICT, MAHARASHTRA

1. SALIENT FEATURES		
1.1 Introduction		
Block Name	**WADWANI**	
Geographical Area (Sq. km.)	761.13	
Hilly Area (Sq. km.)	21.24	
Poor Ground Quality Area (Sq. km.)	Nil	
Population (2011)	1,24,829	
Climate	Sub-Tropical	
1.2 Rainfall Analysis		
Normal Rainfall	719	
Annual Rainfall (2019)	704	
Decadal Average Annual Rainfall (2010-19)	740	
Long Term Rainfall Analysis (1999-2019)	Rising Trend 16.402 mm/year Probability of Normal and Excess Rainfall 52.38 % Probability of Droughts -: 33.33% Moderate 4.76 %Severe 9.52% Acute	
Rainfall Trend Analysis (1999 to 2019)		
		
***EQUATION OF TREND LINE y* = 16.402x+478.07**		
1.3. Geomorphology, Soil & Geology		
Major Geomorphic Unit	Moderately and highly dissected Plateau	
Soil	Clayey soil	
Geology	Deccan Traps (Basalt) Age: Late Cretaceous to Eocene	
1.4. Hydrology & Drainage		
Drainage	Kundka river tributary of Sindhphana river	
Hydrology (***Reference DSA Year: June 2016-17)***	Major project	NIL
	Medium project	**NIL**

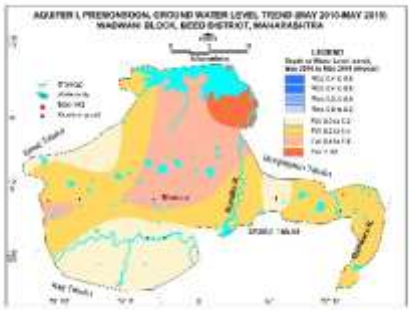
		Small project	**Completed:** small irrigation projects covering area of 15.42sq km.
1.5. Land Use, Agriculture, Irrigation & Cropping Pattern			
Geographical Area		761.13Sq. km.	
Forest Area		7.99 Sq. km.	
Cultivable Area		99.84 Sq. km.	
Net Sown Area		62.84 Sq. km.	
Double Cropped Area		37.00 Sq. km.	
Area under Irrigation	Surface Water	20.10 Sq. km.	
	Ground Water	8.30 Sq. km.	
Principal Crops *(Reference year 2019)*		**Crop Type**	**Area (Sq. km.)**
		Cereals	104.3
		Pulses	13.21
		Gram	11.04
		Soyabean	22.10
		Cotton	221.00
		Sugarcane	30.08
Horticultural Crops		Mango	1.30
		Citrus fruits	1.93
		Grapes	0.00
		Banana	0.25
		Vegetables	2.30
1.6. Water Level Behaviour			
1.6.1. Aquifer-I/Shallow Aquifer			
Pre-Monsoon (May-2019)			**Post-Monsoon (November-2019)**
Water level between2-5 mbgl has been observed in south and eastern part of the block covering an area of 304 sq km; Water level between 5 to 10 mbgl has been observed in major part of the block covering an area of 380.80 sq km; whereas water levels between 10-20 mbgl have been observed in eastern and western part of the block covering about 61 sq. km. area; whereas water levels between 20-30 mbgl have been observed as isolated patch in eastern part covering an area of 15 sq			Water level between0-2mbgl has been observed in south and eastern part of the block covering an area of 379 sq km; Water level between2-5 mbgl has been observed in south and eastern part of the block covering an area of 298 sq km; water levels between 5 to 10 mbgl have been observed in eastern and western part of the block covering about 58 sq. km. area; parts of the block covering about 76 sq. km. area, whereas water levels between

km.	20-30 mbgl have been observed as isolated patch in western part covering an area of 12 sq km.
Pre-Monsoon Water Level (May 2019)  **WL>20 mbgl 15 sq. km.**	**Post-Monsoon Water Level (Nov. 2019)**  **WL>20 mbgl 12 sq. km.**
1.6.2. Aquifer-II/Deeper Aquifer	
Pre-Monsoon (May-2019)	**Post-Monsoon (November-2019)**
Water levels between 30 to 40 mbgl are observed in northern and eastern half of the block covering an area of 114 sq km; Water levels between 40 to 50 mbgl are observed in central and eastern half of the block covering an area of 152 sq km; water levels more than 50 mbgl have been observed in major half of the block covering about 457 sq. km. area of the block.	Water level between 10-20 mbgl is observed in north and east parts of the block covering about 115 sq km area; Water level between 20-30 mbgl is observed in about 304 sq km area seen in central and southern part of the block; Water levels between 30 to 40 mbgl are observed in major half of the block covering an area of 343 sq km; Water levels > 40 mbgl are observed in western half of the block covering an area of 77 sq km;
Pre-Monsoon Water Level (May 2019)  **WL> 50 mbgl 457 sq. km.**	**Post-Monsoon Water Level (Nov.-2019)**  **WL> 40 mbgl 77 sq. km.**
1.7. Hydrograph **Site Name: WADWANI State: Maharashtra District: BEED Tehsil: WADWANI Block: : BEED Village: WADWANI**	



Hydrograph shows Pre-monsoon falling water level trend @ -.050988 m/year and Post monsoon rising water level trend @ 88.3878 m/year

1.8. Water Level Trend (2010-19)

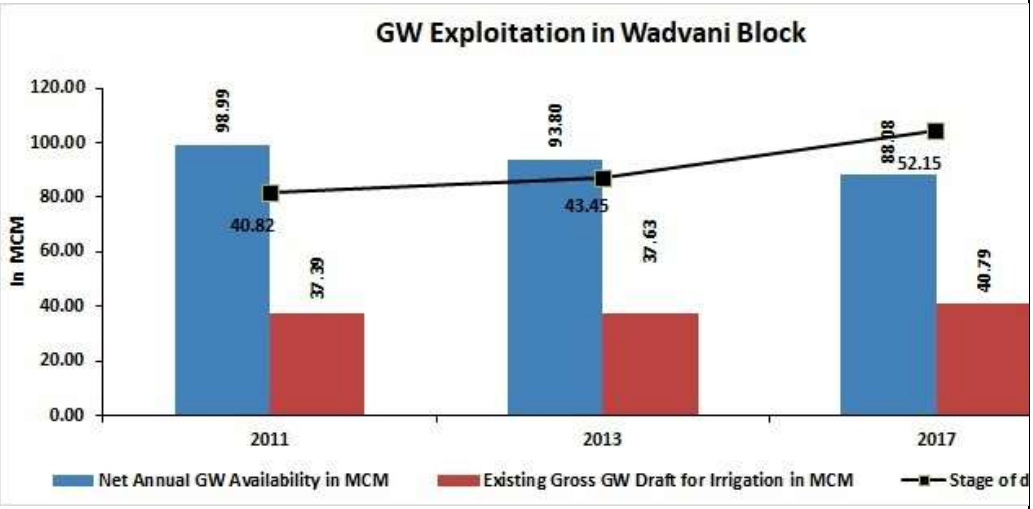
Pre-Monsoon trend	**Post-Monsoon trend**
Decline in water level up to 0.2 m/year has been observed in south and east parts of the block covering an area of 229 sq km. Declining trend more than 0.2 m/year has been observed in major part of the block covering about 532 sq. km. area.	Rising Water level Trend up to 0.20 m/year is observed in south of the block covering 114 sq km; Declining trend more than 0.2 m/year has been observed in major part of the block covering about 647 sq. km. area.
Pre-Monsoon Water Level Trend (2010-19)  **Declining trend @>0.2 m/year 532 sq. km.**	**Post-Monsoon Water Level Trend (2010-19)**  **Declining trend @>0.2 m/year 647 sq. km.**

2. Ground Water Issues

Exploitation of Ground Water: -

The stage of ground water development has increased during 2011 to 2013 from 40.82% to 43.45% and afterwards again increased during 2013 to 2017 from 43.45% to 52.15% in Wadvani block of Beed District**.** Further, the net ground water

availability decreased during 2011 to 2013 from 98.99 MCM to 93.80 MCM again further decreased from 93.80 MCM to 88.08 MCM during 2013 to 2017. Whereas the draft for irrigation increased during 2011 to 2013 from 37.39 MCM to 37.63 MCM and hence further increased from 37.63 MCM to 40.79 MCM during 2013 to 2017.



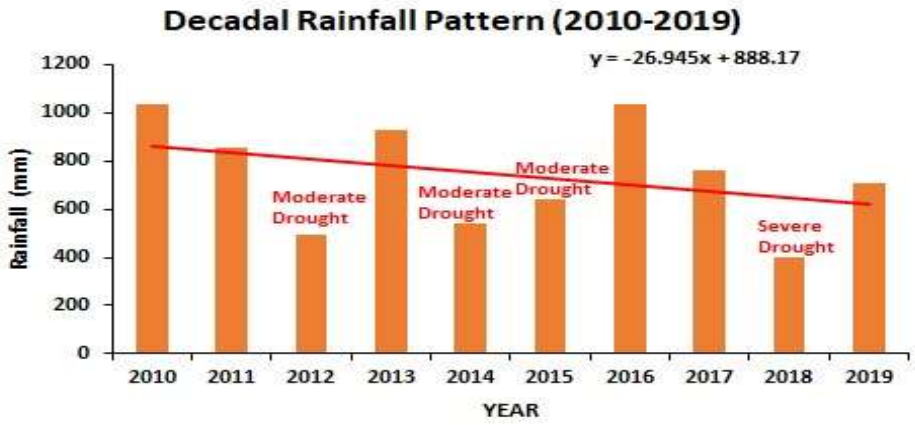
Declining water level Trend: -

- Pre monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 532 sq. km. covering about 69% area of the block.
- Post monsoon (2010-19): decline in water level trend more than 0.2 m/year is observed in about 647 sq. km. covering about 85 % area of the block.

Low rainfall and Droughts:

The long-term rainfall analysis for the period 1999-2019 indicates that normal rainfall of WADWANI block is 719.00mm, and also indicates a rising rainfall trend @ 16.402 mm/year with probability of 33.33% Moderate 4.76 %Severe 9.52% Acute drought.

Based on the short-term rainfall data from 2010-2019 for the block, the analysis indicates that average rainfall is 740mm. The rainfall from last ten years shows that the area continuously experienced low and declining rainfall but with moderate& severe droughts.



Low yielding Aquifer resulting poor sustainability:

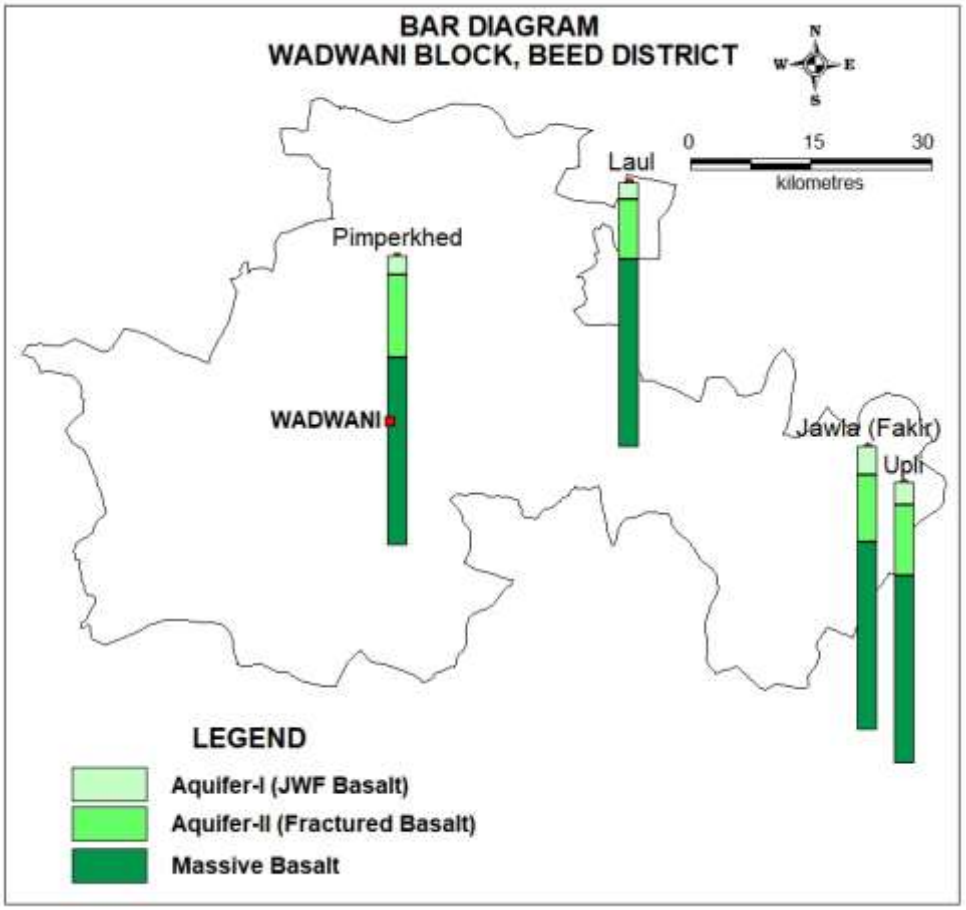
Limited extent of porous and pervious zone, because of predominance of secondary

porosity that has evolved from prevailing erratic joint pattern and also the absence of primary porosity, results in poor sustainability of the aquifers. About 48% area of the block has low yield potential (< 1.25 lps) and can sustain pumping only for 1-1.5 hrs.

3. AQUIFER DISPOSITION

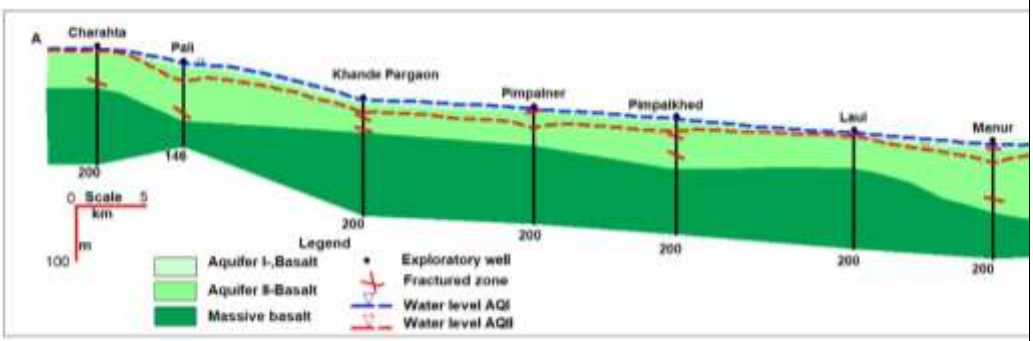
3.1. Number of Aquifers	Basalt –Aquifer-I, Aquifer-II

3.2. Lithological disposition

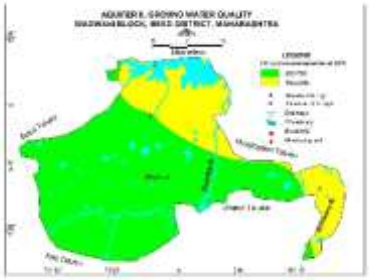


3.3. Cross Section

Section AA'



3.4. Basic Aquifer Characteristics		
Major Aquifers	**Basalt (Deccan Traps)**	
Type of Aquifer	Aquifer-I (Phreatic)	Aquifer-II

(Phreatic/Semi confined/Confined)		(Semiconfined/confined)
Depth to bottom of Aquifer (mbgl)	10 to 16	71 to182
Weathered/Fractured zones encountered (mbgl)	10 to 16	36 to 182
Weathered/Fractured rocks thickness (m)	8 to 12	1.00 to 3.00
SWL (mbgl)	4.90 to 15.81	33.90 to 41.10
Specific yield/Storativity (S)	0.020 to 0.024	3.35 $x10^{-4}$ to 3.65 $x10^{-5}$
Transmissivity (T)	15.00 to 70.50 m^2/day	up to 108.00 m^2/day
Yield	2 to 200 m^3/day	0.14 to 1.25 lps
Sustainability	2 to 4 hrs	1 to 5 hrs
4. GROUND WATER QUALITY		
4.1 Aquifer-I/ Shallow Aquifer		
EC values between250-750 µS/cm are observed in eastern parts of the block and EC values between 750 to 2250 µS/cm are observed in major part of the block; whereas EC values between >2250 µS/cm are observed in southern tip of the block as a very tiny isolated patch; Ground water is suitable for all purposes.		
4.2 Aquifer II/Deeper Aquifer		
EC up between250-750 µS/cm are observed in major part of the block and EC values between 750 to 2250 µS/cm is observed in north and east part of the block. Ground water is suitable for all purposes.		
Phreatic Aquifer (Aquifer-I)	**Semi confined/Confined Aquifer (Aquifer II)**	
		
5. GROUND WATER RESOURCE		
5.1 Aquifer-I/ Shallow Aquifer		
Ground Water Recharge Worthy Area (Sq. km.)	739.89	
Total Annual Ground Water Recharge (MCM)	88.08	
Natural Discharge (MCM)	4.40	
Net Annual Ground Water Availability (MCM)	83.68	
Existing Gross Ground Water Draft for irrigation (MCM)	43.64	

Existing Gross Ground Water Draft for domestic and industrial water supply (MCM)	2.84
Existing Gross Ground Water Draft for All uses (MCM)	43.64
Provision for domestic and industrial requirement supply to 2025(MCM)	9.45
Net Ground Water Availability for future irrigation development (MCM)	28.90
Stage of Ground Water Development (%)	52.15
Category	**SAFE**

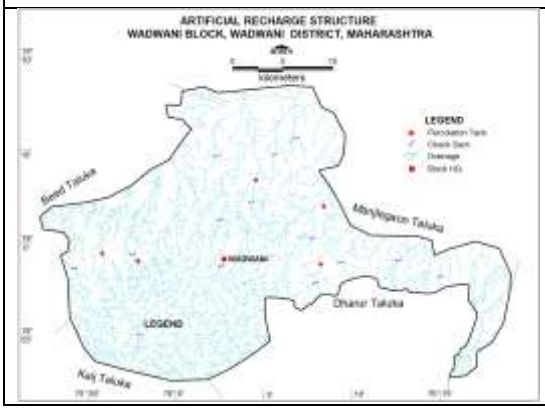
5.2 Aquifer-II/Deeper Aquifer

Semi confined/Confined Aquifer (Basalt)

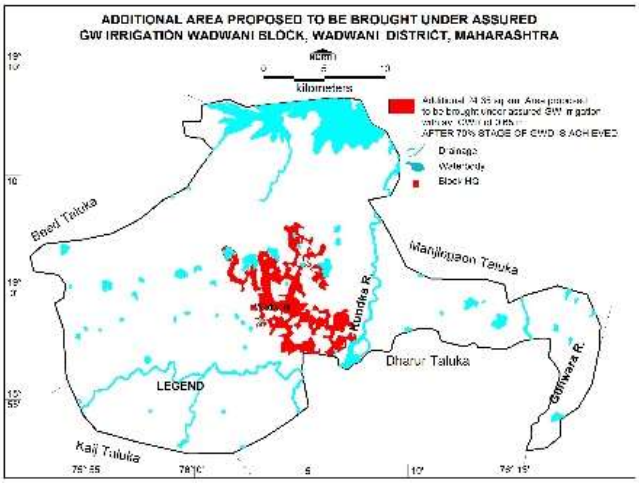
Block	Aquifer	Area (Sqkm)	Mean Aquifer Thickness (m)	Peizometric head above (Confining Layer)	Average of Sy	Average of S	Resources above confining layer (mcm)	Resource within confining Aquifer (mcm)	Total Resources (MCM)
Wadvani	Basalt Aq-II	761.13	3.00	19.41	0.020	0.0004	0.00	4.57	4.57

6.0. GROUND WATER RESOURCE MANAGEMENT		
Available Resource (MCM)	83.68	
Gross Annual Draft (MCM)	43.64	
6.1. Supply Side Management		
SUPPLY (MCM)		
Agricultural Supply -GW	40.79	
Agricultural Supply -SW	37.94	
Domestic Supply - GW	2.84	
Domestic Supply - SW	0.71	
Total Supply	82.28	
Area of Block (Sq. Km.)	761.13	
Potential Area suitable for recharge (Sq. Km)	62.76	
Type of Aquifer	Hard Rock	
Area feasible for Artificial Recharge (WL >5mbgl) (Sq. Km.)	62.76	
Volume of Unsaturated Zone	125.52	
Thickness of unsaturated zone 3 m below ground level (m)	2	
Average Specific Yield	0.02	
Volume of Sub surface Storage Space available for Artificial Recharge (MCM)	2.5104	
Surplus water Available (MCM)	1.42	
Proposed Structures	Percolation Tank (Av. Gross Capacity-100 TCM*2 fillings = 200	Check Dam (Av. Gross Capacity-10

	TCM)	TCM * 3 fillings = 30 TCM)
Number of Structures	5	14
Volume of Water expected to be conserved / recharged @ 75% efficiency (MCM)	0.7455	0.32
RTRWH Structures – Urban Areas	Economically not viable & Not Recommended	
Households to be covered (25% with 50 m2 area)	183	
Total RWH potential (MCM)	0.008	
Rainwater harvested / recharged @ 80% runoff co-efficient	0.006	
6.2. Demand Side Management		
Micro irrigation techniques		
Sugarcane area: About 30.08 sqkm area is Ground water irrigated ,100% ground water irrigated (30.08 sqkm) proposed to be covered under Drip (sq.km.)	30.08	
Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.57 m	17.1456	
Water Saving micro-Irrigation technique (MCM)	17.1456	
Total Irrigated Area		
Proposed Cropping Pattern change	Nil	
Irrigation Area (ha) proposed for irrigation through Sprinkler	Nil	
Water Saving by use of Sprinklers (MCM)	Nil	
6.3. EXPECTED BENEFITS		
Net Ground Water Availability (MCM)	83.68	
Additional GW resources available after implementing above measures (MCM)	1.07	
Ground Water Availability after Supply side Intervention (MCM)	84.75	
Existing Ground Water Draft for All Purposes (MCM)	43.64	
Saving of Ground Water through demand side intervention (MCM)	17.15	
GW draft after Demand side interventions (MCM)	26.48	
Present stage of Ground Water Development (%)	52.15	
Stage of Ground Water Development after interventions (%)	31.26	

Other Interventions Proposed, if any	
Alternate Water Sources Available	Nil
Regulatory Measures	Nil
Recommendation	
Ground water development is recommended to bring the stage of ground water development from 52.15% to 31.26%	
6.4. Development Plan	
Volume of water available for GWD to 70% (MCM)	32.83
Proposed Number of DW (@ 1.5 ham for 90% of GWR Available)	1970
Proposed Number of BW (@ 1 ham for 10% of GWR Available)	328
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.	50.51
Supply Side Interventions	**Demand Side Interventions**
Proposed locations for AR structures	**Sugarcane Cropped Area proposed for drip Irrigation**
	

***EXPECTED BENEFITS*: ADDITIONAL AREA PROPOSED TO BE BOUGHT UNDER ASSURED GW IRRIGATION**



ANNEXURES

Annexure I: Salient Features of Ground Water Exploration, BEED District

S. No.	Taluka	Wells			Depth (m bgl)	SWL (m bgl)	Discharge (lps)	Drawdown (m)	Zones (m bgl)
		EW	OW	PZ					
	Ambejogai	1	-	2	31.75 - 200.00	4.35 -10.20	Traces – 0.14	-	20-42
	Ashti	9	2	-	122.10 -200.00	3.40 – 46.82	0.38 – 5.80	-	5 – 159
	Beed	7	3	-	65.65 – 200.00	6.80 - >100.00	Traces – 5.90	2.16 – 23.50	18 - 125
	Dharur	1	1	-	150.00 – 200.00	13.46 – 20.50	1.05 – 4.43	-	15.70 – 146.90
	Gevrai	10	1	2	18.00 – 200.00	3.11 - >60.00	Traces – 17.92	11.87 – 21.82	9 - 125
	Kaij	5	3	-	110.00 – 200.00	6.90 – 63.53	0.16 – 19.66	-	27.00 – 131.00
	Majalgaon	5	-	-	18.00 – 200.20	14.10 – 50.00	3.17 – 4.43	-	16 – 195
	Parli	3	-	-	200.20	37.40 – 90.10	-	-	18 - 127
	Patoda	3	1	-	95.00 – 200.00	5.60 – > 100	0.14 - 3.17	-	15 - 80
	Shirur	5	-	1	38.00 -200.00	4.10 - >100	Traces – 2.43	13.40	6 – 165
	Wadvani	3	-	-	200.20	41.10	-	-	8 - 182
	Total	52	11	5	18.00 – 200.20	3.11 - >100	Traces – 19.66	2.16 – 21.82	5 - 195

Annexure II: Details of GW exploration under NAQUIM in BEED district

Sl. No	Block	Village	Type of Well	Latitude	Longitude	Year	Depth Drilled (m)	Depth of casing (mbgl)	Aquifer zones encountered (mbgl)	Aquifer	SWL (mbgl)	Discharge (lps)
1	Ashti	Pandriwadi	EW	18.7925	75.20583333	1979-80	159.85	3.85		Basalt	-	-
2	Ashti	Dongargaon	EW	18.93472222	75.07	1979-80	138.2	4.25	64 -71	Basalt	-	-
3	Ashti	Pimpla	EW	18.92444444	74.91166667	1979-80	150.4	-	5 -33 ,51 -54	Basalt	-	-
4	Ambejogai	Sawargaon	PZ	18.69083333	76.31666667	1996-97	31.75	-	19.5 -	F Basalt	10.15	-
5	Ambejogai	Mamdapur	PZ	18.62083333	76.335	1996-97	50	-	42 -	F Basalt	4.35	-
6	Georai	Gevrai	PZ	19.26583333	75.74666667	1996-97	-	-		VB	-	-
7	Georai	Dhondrai	PZ	19.31083333	75.67166667	1996-97	-	-		VB	-	-
8	Shirur-Kasar	Tinturvani	PZ	19.16944444	75.5125	1996-97	38	-	25 -37.5		21.5	-
9	Majalgaon	Ekdara	EW	19.13	76.05722222	2004-05	200.2	5.6	30 -31.8 ,88.75 -91	F MB	30.2	4.43
10	Majalgaon	Lukhegaon	EW	19.18194444	76.2525	2004-05	18	-		Basaltic Boulder	-	3.17
11	Majalgaon	Mothiwadi	EW	19.20361111	76.32	2004-05	200.2	5.6	56.6 -59, 193.4 -195.6	F MB & F VB	14.1	3.77
12	Wadwani	Laul	EW	19.09666667	76.16527778	2004-05	200.2	5.6	15.95 -18, 61.5 -63.7	VB	18.2	-
13	Majalgaon	Manur	EW	19.17111111	76.23666667	2004-05	200.2	5.8	29.6 -31.85, 138.8 -141	VB	50	-
14	Majalgaon	Sonna Khota	EW	19.18194444	76.02583333	2004-05	200.2	17.18	20.5 -22.75, 179.25 -182	VB	-	-
15	Parli	Dharmapuri	EW	18.73	76.63111111	2004-05	200.2	5.85	125 -127.4		90.05	-
16	Parli	Pangri	EW	18.91	76.4477	2004-05	200.2	9.75	18 -19 , 116.6 -118.3		37.4	-

Sl. No	Block	Village	Type of Well	Latitude	Longitude	Year	Depth Drilled (m)	Depth of casing (mbgl)	Aquifer zones encountered (mbgl)	Aquifer	SWL (mbgl)	Discharge (lps)
17	Parli	Pimpri Buzurg	EW	18.91555556	76.46611111	2004-05	200.2	5.5			-	-
18	Wadwani	Jawla (Fakir)	EW	18.97138889	76.2825	2004-05	200.2	5.5	8.5 -11.4 , 28 -29.6		-	-
19	Wadwani	Upli	EW	18.95388889	76.30055556	2004-05	200.2	5.5	36 -38 ,72 -75		41.1	-
20	Georai	Aheri Wahegaon	EW	19.14027778	75.78194444	2007-08	200	1.5			3.5	3.17
21	Georai	BhendeTakli	EW	19.18833333	75.67083333	2007-08	200	6.1			21.4	3.17
22	Georai	Dhondrai	EW	19.31083333	75.67166667	2007-08	110.3	5.6			4.11	17.92
23	Ashti	Garhi	EW	19.0375	75.2625	2007-08	200	5.6		VB	60	
24	Georai	Kajla	EW	19.14166667	75.5875	2007-08	200	13.2			50	
25	Georai	Kekat Pangri	EW	19.26666667	75.83333333	2007-08	200	5.6			7.15	0.78
26	Beed	Khande Pargaon	EW	19.025	75.8375	2007-08	200	5.6			32.1	1.37
27	Beed	Kutewadi	EW	18.93333333	75.87083333	2007-08	200	5.6			100	1.37
28	Georai	Malegaon(Kh)	EW	19.34861111	75.55	2007-08	200	13.2			3.11	3.17
29	Shirur-Kasar	Matori	EW	19.17083333	75.47083333	2007-08	18	4			16.35	0.14
30	Georai	Paulachiwadi	EW	19.24027778	75.55833333	2007-08	200	1			60	
31	Beed	Pimpalner	EW	19.05416667	75.95	2007-08	200	5.6			42	
32	Wadwani	Pimperkhed	EW	19.0625	76.05	2007-08	200	5.6			33.9	1.37
33	Georai	Sawargaon	EW	19.16111111	75.67083333	2007-08	200	1				
34	Georai	Sushi	EW	19.26666667	75.83333333	2007-08	200	5.6				
35	Ashti	Ambhora	EW	18.99166667	74.97777778	2008-09	200	6.1		VB	25	3.74
36	Beed	Charahta	EW	18.96305556	75.66888889	2008-09	200	6.1		VB	6.8	0.14

Sl. No	Block	Village	Type of Well	Latitude	Longitude	Year	Depth Drilled (m)	Depth of casing (mbgl)	Aquifer zones encountered (mbgl)	Aquifer	SWL (mbgl)	Discharge (lps)
37	Ashti	Dhamangaon	EW	18.9875	75.13472222	2008-09	200	6.1		VB	5.35	0.38
38	Ashti	Kada	EW	18.89583333	75.07222222	2008-09	200	18.3		VB	3.4	4.42
39	Ashti	Kada	EW	18.89583333	75.07222222	2008-09	159.1	18.3		VB	9.9	0.78
40	Ashti	Khadkat	EW	18.67083333	75.14166667	2008-09	122.1	6.1		VB	11.2	0.78
41	Shirur-Kasar	Khalapuri	EW	19.04166667	75.57083333	2008-09	200	6.1		VB	100	
42	Shirur-Kasar	Manur	EW	19.07194444	75.3075	2008-09	200	6.1		VB	4.1	1.44
43	Beed	Pali	EW	18.9225	75.74777778	2008-09	146	6.1		VB	14.8	5.9
44	Patoda	Pimpalwandi	EW	18.93194444	75.35416667	2008-09	200	6.1		VB	5.62	3.17
45	Shirur-Kasar	Raimoha	EW	18.99305556	75.50166667	2008-09	200	6.1		VB	20	0.14
46	Beed	Rajuri	EW	18.99916667	75.63222222	2008-09	200	10		VB	6.86	2.43
47	Georai	BhendeTakli	OW	19.18833333	75.67083333	2007-08	200	6.1			8.13	0.14
48	Ashti	Ambhora-OW1	OW	18.99166667	74.97777778	2008-09	200	6.1		VB	27.5	5.8
49	Ashti	Ambhora-OW2	OW	18.99166667	74.97777778	2008-09	200	6.1		VB	28.95	0.78
50	Beed	Pali	OW	18.9225	75.74777778	2008-09	146	3.6		VB	57.15	2.8
51	Patoda	Pimpalwandi	OW	18.93194444	75.35416667	2008-09	200	6.1		VB	5.6	3.17
52	Patoda	Daskhed	EW	18.7625	75.55833333	2009-10	101		62.0-64.0	Jointed Vesicular Basalt	>100	0.14
53	Ashti	Jamgaon	EW	18.75416667	75.19583333	2009-10	200		58.4-64.5	Fractured Vesicular Basalt	46.82	1.37
54	Beed	Neknoor	EW	18.78333333	75.80416667	2009-10	110		No Zones	No Zones	Dry	-

Sl. No	Block	Village	Type of Well	Latitude	Longitude	Year	Depth Drilled (m)	Depth of casing (mbgl)	Aquifer zones encountered (mbgl)	Aquifer	SWL (mbgl)	Discharge (lps)
55	Beed	Chausala	EW	18.69166667	75.70833333	2009-10	95		52.3-55.40	Fractured Vesicular Basalt	9.06	3.17
56	Beed	Manjarsumbha	EW	18.83333333	75.72916667	2009-10	200		25.0-28.0 ,36.0-41.0,48.0-51.0	Fractured Massive Basalt	24.9	3.77
57	Beed	Manjarsumbha	OW-I	18.83333333	75.72916667	2009-10	65.5		31.0-34.0	Fractured Vesicular Basalt	8.1	3.17
58	Beed	Manjarsumbha	OW-II	18.83333333	75.72916667	2009-10	65.5		40.1-43.2	Fractured Vesicular Basalt	8.22	3.17
59	Kaij	Nandurghat	OW	18.675	75.8375	2009-10	110.3		31.00-34.00	Fractured Basalt	6.9	0.14
60	Kaij	Nandurghat	EW	18.675	75.8375	2009-10	137.7(Cement Sealing up to 109 m.		31.00-34.10,88.90-92.00	Fractured Weathered Basalt	15.61	0.78
61	Kaij	Pimpalgavhan	EW	18.77083333	75.92916667	2009-10	200		27.0-31.00,40.1-43.20,101.1-104.2 ,128.6-131.6	Fractured Weathered Basalt	13.95	0.38
62	Kaij	Kumbhephal	EW	18.725	76.12916667	2009-10	122.5		9.0-12.00,112.0-116.	Highly Fractured Basalt	7.36	9.84
63	Kaij	Kumbhephal	OW	18.725	76.12916667	2009-10	200		73.70-76.70,92.00-95.00	Vesicular Basalt	63.53	0.14

Sl. No	Block	Village	Type of Well	Latitude	Longitude	Year	Depth Drilled (m)	Depth of casing (mbgl)	Aquifer zones encountered (mbgl)	Aquifer	SWL (mbgl)	Discharge (lps)
64	Ashti	Adas	EW	18.775	75.2375	2009-10	200		15.70-18.80,27.10-31.00 ,46.20-49.30,143.80-146.90	Vesicular Basalt	13.46	4.43
65	Ashti	Adas	OW	18.775	75.2375	2009-10	150		27.90-31.00,128.60-131.60	Vesicular Basalt	20.5	1.05
66	Kaij	Bansarola	EW	18.62916667	76.2	2009-10	98.1(Cement sealing up to 97 m.		21.80-24.90,82.80-85.90	Highly Fractured Vesicular Basalt	34.5	19.66
67	Kaij	Bansarola	OW	18.62916667	76.2	2009-10	200		52.30-55.40,159.10-162.10	Vesicular Basalt	34.5	0.38
68	Ambejogai	Pipla (Dhiguda)	EW	18.71666667	76.45	2010-11	200	6.1	100.30-113.30	WB	>100	Traces

Annexure III :Details of GW monitoring wells in BEED district (CGWB & GSDA)

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
1	Saigaon-1	Ambejogai	FMB	11	6	0.6	1	10.54	2.5
2	Ambejogai	Ambejogai	FMB	6.1	6.5	0.75	0.5	12.99	10.5
3	Talni	Ambejogai	FMB	20.4		0.75	1	20.39	1.1
4	Patoda	AMBEJOGAI	VB	11.5			0.5	10.4	10.7
5	Bardapur	AMBEJOGAI	FMB	11.7			0.5	11.1	9.3
6	Talegaon ghat	AMBEJOGAI	FMB	10.1			1	8.125	5.9
7	Pokhri	AMBEJOGAI	FMB	10.35			0.5	9.5125	7.9
8	Lokhandi sawargaon	AMBEJOGAI	FMB	9.8			0.5	6.8	2
9	Chanai	AMBEJOGAI	FMB	9.8			0.5	8.85	6
10	Jodwadi	AMBEJOGAI	FMB	9			0.5	7.7	4.2
11	Kagnewadi	AMBEJOGAI	VB	13.7			1	11.075	6.3
12	Pimpla dhaigude	AMBEJOGAI	FMB	13.5			0.5	11.425	7.9
13	Ghat Nandur	AMBEJOGAI	FMB	12.4			0.5	11.275	8.3
14	Khadkhat	Ashti	FMB	16	2	0.7	1		
15	Ashti	Ashti	FMB	14.7	3.15	0.7	0.25		5.1
16	Sheri Bk	Ashti	FMB	15	5.5	1	0.5	14.99	9.1
17	Kinhi	Ashti	VB	15	5.2	1.65	0.5	13.68	0.01
18	Dhanora-1	Ashti	VB	15.1	5.3	0.3	0.5		
19	Doithana	Ashti	VB	9.08	3.37	0.69	0.5	9	2.7
20	Waghluj	Ashti	FMB	13	3.1	0.5	1	12.99	8.6

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
21	Hingni	ASHTI	FMB	10			0.5	8.35	9.2
22	Takalsing	ASHTI	VB	14			0.5	9.775	11.5
23	Chinchpur	ASHTI	FMB	10.7			0.5	7.95	7.2
24	Shirala	ASHTI	FMB	12.5			1	11.9	10.1
25	Ashti	ASHTI	VB	14			0.25	7.75	5.4
26	Hajipur	ASHTI	FMB	13			0.5	7.075	4.7
27	Nanda	ASHTI	VB	15.6			1	9.475	9.5
28	Nimgaon choba	ASHTI	VB	16			0.5	10.65	11
29	Jalgaon	ASHTI	VB	12.65				11.2375	7
30	Kada	ASHTI	FMB	21				16.525	15.1
31	Kinni	ASHTI	FMB	14.1				10.325	6
32	Kuntephal	ASHTI	VB	13.45				10.5625	8.6
33	Dhanora	ASHTI	VB	14.2				11.05	10.2
34	Dongargaon	ASHTI	VB	9				8.625	8.5
35	Bavi	ASHTI	FMB	20				12.375	6.5
36	Loni	ASHTI	FMB	18.3				11.65	14.9
37	Hatola	ASHTI	FMB	12.2				7.45	6
38	Ambhora	ASHTI		15.4				9.25	7
39	Pimpri ghat	ASHTI		12.5				8.725	7.5
40	Salewadgaon	ASHTI	WB	11				9.1	7.5
41	Deolali	ASHTI	FB	8.5				8.025	7.2

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
42	Chousala_Pz	Beed	FB	30				11.82	9.1
43	Nandur Phata	Beed		16.5	8.75	0.6		18.5	3.9
44	Manjar Sumbha-1	Beed		10.5	3.8	0.1			4.9
45	Kapildhar	Beed	WFB	8.6	2.4	1		7.92	1.5
46	Pali	Beed	FB	8	0.9	0.2		9.74	3.4
47	Mauj	Beed		9.96	3.32	0.8		10.99	1.5
48	Jirewadi-1	Beed		16	3.45	0.8		13.13	6.11
49	Ghosapuri	Beed		20	8.5	0.5		19.9	2.9
50	Palsingan	BEED		12				7.925	6.8
51	Hingni bk	BEED		16.3				12.775	15.7
52	Chausala	BEED	FMB	14.5				10.8875	11.8
53	Limbaganesh	BEED		7.35				6.6875	5.4
54	Neknoor	BEED	FMB	9				8.3	8.2
55	Manjarsumba	BEED		13.05				10.8	8.5
56	Jarud	BEED		7.95				6.8125	6.3
57	Pimpla	BEED		15.38				8.425	6.2
58	Kakadhira	BEED		11.4				7.85	6
59	Rajuri bk.	BEED		14				11.5	10.3
60	Ieet	BEED		10				9.775	9.1
61	Pimpalner	BEED		12				10.075	9.3
62	Namalgaon/kamkheda	BEED		12.05				8.6125	8

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
63	Loladgaon	BEED	FB	18				13.225	15.1
64	Nathapur	BEED		9.5				9.15	8.1
65	Dharur-1	Dharur	WFB	13	6.5	0.4		12.9	0.01
66	Gaundara	Dharur		10.5	9.5	0.7		9.54	0
67	Dharur	DHARUR		23.8				14.625	5.7
68	Bodkha	DHARUR		9.3				6.675	5.2
69	Kolegaon	Georai		10	1.11	0.97		9.99	1.1
70	Bhend Takli	Georai		13.98	2.9	0		13.97	0
71	Georai-1	Georai		15	6.4	0.8		14.52	2.7
72	Umapur	Georai		10.92	3.75	1.35			2.2
73	Nagjhera	Georai		15	8.5	0.6		9.32	4.1
74	Hirapur	GEORAI		13.5				13.375	13
75	Aher Chincholi	GEORAI		15.4				10.9375	9.1
76	Pargaon Japti	GEORAI		16				11.025	9.4
77	Padalsinghi	GEORAI	WFB	17.25				12.3375	2.2
78	Kolgaon	GEORAI	FB	9.5				8.8	6.7
79	Ranjani	GEORAI	FMB	14.3				14	13.1
80	Gadhi	GEORAI		16.25				15.6375	14.3
81	Sirasdevi Phata	GEORAI	WFB	20				17.325	9.8
82	Hiwarwadi	GEORAI		10				9.675	8.7
83	Chaklamba	GEORAI		19				14.925	5.7

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
84	Georai	GEORAI		14.1				11.9	5.4
85	Agarnandur	GEORAI	FB	15.1				14.225	13.7
86	Umapur	GEORAI		9.95				9.875	9.95
87	Mahar takli	GEORAI		13				12.825	12.3
88	Talwada	GEORAI		14.4				10.6625	1.25
89	Shidod	GEORAI		15				11.875	6
90	Rakshsbhavan	GEORAI		15.1				7.9875	5.95
91	Surlegaon	GEORAI	FB	17.5				15.1	7.9
92	Aapegaon	GEORAI	VB	16			0.5	14.625	12.2
93	Lokhandi Sawargaon-1	Kaij	FMB	16	6.5	1	0.5	15.95	1.5
94	Kumbhephal	Kaij	FMB	10.88	2.5	0.65	1	8.13	1.2
95	Waguli	Kaij	FMB	21	13.7	0.5	1	20.52	10.2
96	Yousufwadgaon	KAIJ	FMB	28.9			0.5	13.6	2.4
97	Khadkat	KAIJ	FMB	15.3			0.5	14.075	10.4
98	Umrai	KAIJ	FMB	7.9			0.5	7.05	5
99	Tambva	KAIJ	FMB	14			0.5	11.275	6.9
100	Sonawala	KAIJ	VB	12.85			1	9.65	3.1
101	Dindrur-1	Majalgaon	VB	20	6.8	0.6	0.5	20	10.1
102	Patrud-1	Majalgaon	FMB	15	6	1	0.5	14.91	3.1
103	Nitrud	MANJLEGAON	FMB	9.25			0.5	8.2625	5.3
104	Bellura/longaon	MANJLEGAON	VB	12.9			0.5	12.725	12.9

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
105	Lahul	MANJLEGAON	FMB	13.65				11.9125	6.7
106	Shuklatirth nimgaon	MANJLEGAON	VB	18.4				16.125	13.7
107	Majalgaon	MANJLEGAON	VB	12.88				12.2075	10.35
108	Shringarwadi	MANJLEGAON	VB	10.9				10.9	10.9
109	Talkhed	MANJLEGAON	FMB	9.95				9.95	9.95
110	Roshanpuri	MANJLEGAON	FMB	11				9.1	3.4
111	Chottewadi	MANJLEGAON	FMB	12.5				12.4	12.5
112	Kesapuri	MANJLEGAON	FMB	13.8				11.625	11.2
113	Warola	MANJLEGAON	FMB	10.7				8.5	3.3
114	Takarvan	MANJLEGAON	FMB	14.5				11.825	3.8
115	Waghora I I	MANJLEGAON	FMB	9				8.4125	6.65
116	Sadola	MANJLEGAON	FMB	18.2				12.275	6.2
117	Dharmapuri	Parli	FMB	6.2	4.4	0.6		6.15	1.4
118	Kanerwadi	Parli	VB	11.38		0.55		12.15	0.4
119	Parli	Parli	FMB	9.75	7.5	0.4			
120	Parali	Parli	FMB	15.5	6.5	1		15.43	0.2
121	Sirsala	Parli	FMB	10	2.86	0.65		8.5	1.9
122	Dharmapuri	PARLI	FMB	13				8.6	9.8
123	Parli Vaijanath	PARLI	FMB	10				7.525	4.2
124	Bodhegaon	PARLI	FMB	9.75				8.4625	9.5
125	Moha	PARLI	FMB	8.3				7.775	7.8

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
126	Wadgaon Dadhari	PARLI	VB	10.55				7.275	1.5
127	Kautali	PARLI	FMB	15				10.15	5.8
128	Shirsala	PARLI	VB	18.05				11.875	7.5
129	Pimpri Bk	PARLI	FMB	9				7.275	8.1
130	Jalgavan	PARLI	FMB	10.7				9.075	10.7
131	Kasarwadi	PARLI	VB	13.9				8.875	3.8
132	Daskhed	Patoda	VB	14	4	0		13.99	0
133	Sautada	Patoda	FMB	16	3	1.1		15.99	1
134	Patoda	Patoda	FMB	8.5	2.4	0.65		7.02	4
135	Naygaon	Patoda	FMB	15	2.3	0		14.99	1.1
136	Dongar Kini-1	Patoda	FMB	11	10.2	0.4	0.75	10.99	2.3
137	Pimpalwandi	Patoda	VB	8.6	3.69	0.85	0.25	8.59	2.9
138	Pithi	Patoda	VB	11.41	2.9	0.59	0.5		2.1
139	Pargaon ghumra	PATODA	VB	13			0.35	11.925	8.7
140	Vidyakinhi	PATODA	AB	6.35			0.5	6.2875	6.1
141	Sautada	PATODA	FMB	10.6			1	5.975	1.1
142	Patoda	PATODA	VB	8.2			0.5	7.05	5.3
143	Chumbli	PATODA	FMB	10.4			0.5	8.475	6.9
144	Suppa	PATODA	FMB	16			0.5	11.575	6
145	Naigaon	PATODA	FMB	14.32			0.25	9.1	2.3
146	Pimpalwandi	PATODA	FMB	9			0.5	6.35	6.4

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
147	Amalner	PATODA	FMB	8.15			0.25	7.7625	6.9
148	Anandgaon	Shirur-Kasar	FMB	11.75	1.8	0.95	0	11.75	0.5
149	Sirur	Shirur-Kasar	FMB	18	6	0.6	0.25	17.9	18
150	Manur	Shirur-Kasar	FMB	24.33		0.63	0.5	24.32	5.4
151	Tintarvani-1	Shirur-Kasar	FMB	8	5.9	0.7	0.75	7.99	2.7
152	Khopti	SHIRUR-KASAR	FMB	12.2			1	11.2375	11.3
153	Wadali	SHIRUR-KASAR	FMB	22			1.25	20.35	15.8
154	Dagadwadi Raimoha	SHIRUR-KASAR	FMB	17.75			1.5	13.825	12.8
155	Sirasmarg	SHIRUR-KASAR	FMB	10.9			1.75	10.125	7.8
156	Kahalpuri	SHIRUR-KASAR	FMB	13.8			2	13.175	11.7
157	Shirur	SHIRUR-KASAR	FMB	16.5			2.25	14.7	10.4
158	Nandaveli	SHIRUR-KASAR	FMB	15			-2.5	14.375	12.7
159	Borgaon Chakla	SHIRUR-KASAR	FMB	12.2			2.75	10.975	9.3
160	Maturi	SHIRUR-KASAR	FMB	10.5			3	9.525	6.6
161	Ghogas Pargaon	SHIRUR-KASAR	FMB	6.5			3.25	6.125	5
162	Wadwani	Wadwani	FMB	7	0.84	0.35	3.5	6.33	1.7
163	Telgaon	Wadwani	FMB	26.1	3.1	0.81	3.75	15.81	1.2
164	Bavi	WADWANI	FMB	10.3			4	6.575	2.6
165	Sonna Kotta	WADWANI	FMB	6.5			4.25	4.9	2.5
166	Chinchwan	WADWANI	FMB	13.55			-4.5	8.575	7.2
167	Deodahiphal	WADWANI	FMB	11			4.75	8.925	7.3

Well no	Village	Block	AQUIFER	Depth (M)	Diameter(M)	MP (MAGL)	SOIL THICKNESS	D.T.W. May 2019	D.T.W. Nov 2019
								(Mbgl)	(Mbgl)
168	Ghatsawali	WADWANI	FMB	25.3			5	11.5	3.2
169	Telgaon Bk	WADWANI	FMB	9.65			5.25	6.5	5.9
170	Wadwani	WADWANI	FMB	13.65			5.5	10.65	3.3

Annexure IV: Long term ground Water trend (2010-2019)

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
1	Saigaon-1	Ambejogai	BEED	0.047143			-0.4717391
2	Ambejogai	Ambejogai	BEED		-0.571697		-0.6475152
3	Talni	Ambejogai	BEED	0.0344149			-0.3450833
4	Patoda	AMBEJOGAI	BEED		-0.4141414		-0.89333
5	Bardapur	AMBEJOGAI	BEED		-0.3256364		-0.54758
6	Talegaon ghat	AMBEJOGAI	BEED		-0.3118485		-0.49273
7	Pokhri	AMBEJOGAI	BEED		-0.32548		-0.6357576
8	Lokhandi sawargaon	AMBEJOGAI	BEED		-0.1985657		-0.11152
9	Chanai	AMBEJOGAI	BEED		-0.1640606		-0.5754545
10	Jodwadi	AMBEJOGAI	BEED		-0.16208		-0.1136364
11	Kagnewadi	AMBEJOGAI	BEED		-0.5596263		-0.3618182
12	Pimpla dhaigude	AMBEJOGAI	BEED		-0.2508384		-0.44485
13	Ghat Nandur	AMBEJOGAI	BEED		-0.09391		-0.0107576
14	Khadkhat	Ashti	BEED		-0.6252577		-0.8597006
15	Ashti	Ashti	BEED			0.4722541	
16	Sheri Bk	Ashti	BEED	0.198571		0.3274286	
17	Kinhi	Ashti	BEED	0.3942857			-0.41047
18	Dhanora-1	Ashti	BEED			1.13057	
19	Doithana	Ashti	BEED		-0.3785897		-0.3684879
20	Waghluj	Ashti	BEED	0.414186		0.228571	
21	Hingni	ASHTI	BEED		-0.055903		-0.44794

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
22	Takalsing	ASHTI	BEED		-0.243303		-0.80061
23	Chinchpur	ASHTI	BEED	0.2947677		0.2916667	
24	Shirala	ASHTI	BEED	-0.3465859	-0.3465859		-0.6015152
25	Ashti	ASHTI	BEED		-0.11224		-0.36727
26	Hajipur	ASHTI	BEED		-0.10419		-0.2
27	Nanda	ASHTI	BEED		-0.04839		-0.28725
28	Nimgaon choba	ASHTI	BEED		-0.34259		-0.67364
29	Jalgaon	ASHTI	BEED		-0.22486		-0.12691
30	Kada	ASHTI	BEED		-0.44647		-0.31321
31	Kinni	ASHTI	BEED		-0.30367		-0.32
32	Kuntephal	ASHTI	BEED		-0.31939		-0.55061
33	Dhanora	ASHTI	BEED		-0.21085		-0.57212
34	Dongargaon	ASHTI	BEED		-0.25276		-0.49212
35	Bavi	ASHTI	BEED		-0.21688		-0.51515
36	Loni	ASHTI	BEED		-0.41129		-0.89879
37	Hatola	ASHTI	BEED		-0.22721		-0.62455
38	Ambhora	ASHTI	BEED		-0.21067		-0.35788
39	Pimpri ghat	ASHTI	BEED		-0.29163		-0.32121
40	Salewadgaon	ASHTI	BEED		-0.35984		-0.42455
41	Deolali	ASHTI	BEED		-0.14088		-0.28121
42	Chousala_Pz	Beed	BEED				
43	Nandur Phata	Beed	BEED			0.582143	

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
44	Manjar Sumbha-1	Beed	BEED				-0.23676
45	Kapildhar	Beed	BEED				
46	Pali	Beed	BEED		-0.15633		-0.30624
47	Mauj	Beed	BEED		-0.54863		-0.09745
48	Jirewadi-1	Beed	BEED		-0.42714	0.421429	
49	Ghosapuri	Beed	BEED			1.84	
50	Palsingan	BEED	BEED		-0.15108		-0.48939
51	Hingni bk	BEED	BEED	0.017869			-0.2325
52	Chausala	BEED	BEED		-0.12166		-0.69879
53	Limbaganesh	BEED	BEED		-0.21003		-0.44909
54	Neknoor	BEED	BEED		-0.285		-0.57273
55	Manjarsumba	BEED	BEED		-0.39169		-0.39708
56	Jarud	BEED	BEED	0.014672			-0.30897
57	Pimpla	BEED	BEED		-0.16759		-0.44364
58	Kakadhira	BEED	BEED		-0.15881		-0.38848
59	Rajuri bk.	BEED	BEED	0.030053			-0.31879
60	Ieet	BEED	BEED		-0.1772		-0.41455
61	Pimpalner	BEED	BEED	0.000303			-0.67152
62	Namalgaon/kamkheda	BEED	BEED		-0.02195		-0.17545
63	Loladgaon	BEED	BEED	0.31704			-0.20606
64	Nathapur	BEED	BEED		-0.17453		-0.31442
65	Dharur-1	Dharur	BEED			0.676071	

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
66	Gaundara	Dharur	BEED				
67	Dharur	DHARUR	BEED		-0.53176		-0.47601
68	Bodkha	DHARUR	BEED		-0.20232		-0.35836
69	Kolegaon	Georai	BEED		-0.16725	0.042303	
70	Bhend Takli	Georai	BEED	0.053986		0.057534	
71	Georai-1	Georai	BEED		-0.4	0.425143	
72	Umapur	Georai	BEED	0.307123			-0.12848
73	Nagjhera	Georai	BEED				
74	Hirapur	GEORAI	BEED		-0.18771		-0.24576
75	Aher Chincholi	GEORAI	BEED	0.180359			-0.09455
76	Pargaon Japti	GEORAI	BEED		-0.54381		-0.56806
77	Padalsinghi	GEORAI	BEED		-0.24592		-0.3675
78	Kolgaon	GEORAI	BEED		-0.14681		-0.43545
79	Ranjani	GEORAI	BEED		-0.42075		-0.92792
80	Gadhi	GEORAI	BEED		-0.16411		-0.82455
81	Sirasdevi Phata	GEORAI	BEED		-0.29904		-0.57604
82	Hiwarwadi	GEORAI	BEED		-0.30575		-0.60364
83	Chaklamba	GEORAI	BEED		-0.69621		-0.63606
84	Georai	GEORAI	BEED		-0.55631		-0.75182
85	Agarnandur	GEORAI	BEED		-0.39155		-0.84515
86	Umapur	GEORAI	BEED		-0.2592		-0.73879
87	Mahar takli	GEORAI	BEED		-0.39361		-0.88788

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
88	Talwada	GEORAI	BEED		-0.18142		-0.06636
89	Shidod	GEORAI	BEED		-0.1709		-0.40424
90	Rakshsbhavan	GEORAI	BEED		-0.40137		-0.71593
91	Surlegaon	GEORAI	BEED		-0.42677		-0.6597
92	Aapegaon	GEORAI	BEED		-0.28373		-0.13027
93	Lokhandi Sawargaon-1	Kaij	BEED				
94	Kumbhephal	Kaij	BEED	0.106324			-0.00818
95	Waguli	Kaij	BEED		-0.27807		-0.36786
96	Yousufwadgaon	KAIJ	BEED		-0.45242		-0.2497
97	Khadkat	KAIJ	BEED		-0.65278		-0.89091
98	Umrai	KAIJ	BEED		-0.25919		-0.19879
99	Tambva	KAIJ	BEED		-0.37503		-0.54667
100	Sonawala	KAIJ	BEED		-0.12254		-0.21758
101	Dindrur-1	Majalgaon	BEED				
102	Patrud-1	Majalgaon	BEED		-0.94929		-0.08393
103	Nitrud	MANJLEGAON	BEED		-0.18827		-0.45303
104	Bellura/longaon	MANJLEGAON	BEED		-0.37043		-0.44333
105	Lahul	MANJLEGAON	BEED		-0.70997		-0.77121
106	Shuklatirth nimgaon	MANJLEGAON	BEED		-0.41814		-0.45394
107	Majalgaon	MANJLEGAON	BEED		-0.5084		-0.95515
108	Shringarwadi	MANJLEGAON	BEED		-0.29599		-0.59576
109	Talkhed	MANJLEGAON	BEED		-0.57481		-0.89313

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
110	Roshanpuri	MANJLEGAON	BEED		-0.33992		-0.18879
111	Chottewadi	MANJLEGAON	BEED		-0.24207		-0.74515
112	Kesapuri	MANJLEGAON	BEED		-0.87563		-0.94242
113	Warola	MANJLEGAON	BEED		-0.29639	0.074848	
114	Takarvan	MANJLEGAON	BEED		-0.26094		-0.24636
115	Waghora I I	MANJLEGAON	BEED		-0.40594		-0.65091
116	Sadola	MANJLEGAON	BEED	0.622489			0.041667
117	Dharmapuri	Parli	BEED		-0.1875		-0.1242
118	Kanerwadi	Parli	BEED	0.302623			-0.25655
119	Parli	Parli	BEED	0.243243			-0.17634
120	Parali	Parli	BEED				
121	Sirsala	Parli	BEED	0.076623			-0.15438
122	Dharmapuri	PARLI	BEED		-0.33146		-0.67507
123	Parli Vaijanath	PARLI	BEED		-0.14753		-0.19182
124	Bodhegaon	PARLI	BEED		-0.08589		-0.43646
125	Moha	PARLI	BEED		-0.27336		-0.57152
126	Wadgaon Dadhari	PARLI	BEED		-0.24671		-0.24727
127	Kautali	PARLI	BEED		-0.52884		-0.31091
128	Shirsala	PARLI	BEED		-0.43083		-0.45939
129	Pimpri Bk	PARLI	BEED		-0.30882		-0.50606
130	Jalgavan	PARLI	BEED		-0.15323		-0.20212
131	Kasarwadi	PARLI	BEED		-0.00027		-0.12909

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
132	Daskhed	Patoda	BEED		-0.19843		-0.48833
133	Sautada	Patoda	BEED				
134	Patoda	Patoda	BEED		-0.05281	0.007455	
135	Naygaon	Patoda	BEED				
136	Dongar Kini-1	Patoda	BEED			0.054286	
137	Pimpalwandi	Patoda	BEED		-0.21306	0.008662	
138	Pithi	Patoda	BEED		-0.29286		-0.05202
139	Pargaon ghumra	PATODA	BEED		-0.23326		-0.60667
140	Vidyakinhi	PATODA	BEED		-0.09819		-0.52
141	Sautada	PATODA	BEED		-0.06676		-0.06606
142	Patoda	PATODA	BEED		-0.08274		-0.29485
143	Chumbli	PATODA	BEED		-0.05977		-0.41303
144	Suppa	PATODA	BEED		-0.44359		-0.47758
145	Naigaon	PATODA	BEED		-0.14894		-0.20576
146	Pimpalwandi	PATODA	BEED	0.000505			-0.23121
147	Amalner	PATODA	BEED		-0.28539		-0.4303
148	Anandgaon	Shirur-Kasar	BEED				-0.32371
149	Sirur	Shirur-Kasar	BEED		-0.324		0.052326
150	Manur	Shirur-Kasar	BEED		-1.51879		-0.20539
151	Tintarvani-1	Shirur-Kasar	BEED			0.33	
152	Khopti	SHIRUR-KASAR	BEED		-0.35645		-0.84212
153	Wadali	SHIRUR-KASAR	BEED		-0.37073		-0.74121

L No	Villages	Block	District	Pre monsoon (m/year)		Post monsoon (m/year)	
				Rising	Falling	Rising	Falling
154	Dagadwadi Raimoha	SHIRUR-KASAR	BEED		-0.50284		-0.37939
155	Sirasmarg	SHIRUR-KASAR	BEED		-0.28011		-0.33354
156	Kahalpuri	SHIRUR-KASAR	BEED		-0.48668		-0.78182
157	Shirur	SHIRUR-KASAR	BEED		-0.10812		-0.00438
158	Nandaveli	SHIRUR-KASAR	BEED		-0.40807		-0.72
159	Borgaon Chakla	SHIRUR-KASAR	BEED		-0.37045		-0.59697
160	Maturi	SHIRUR-KASAR	BEED		-0.1268		-0.44333
161	Ghogas Pargaon	SHIRUR-KASAR	BEED		-0.17088		-0.37091
162	Wadwani	Wadwani	BEED		-0.46897		-0.2017
163	Telgaon	Wadwani	BEED		-0.14729		-0.07133
164	Bavi	WADWANI	BEED		-0.12656		-0.1303
165	Sonna Kotta	WADWANI	BEED		-0.03785		-0.05727
166	Chinchwan	WADWANI	BEED		-0.08989		-0.12727
167	Deodahiphal	WADWANI	BEED		-0.29492		-0.42364
168	Ghatsawali	WADWANI	BEED		-0.39085		-0.22909
169	Telgaon Bk	WADWANI	BEED		-0.22021		-0.52606
170	Wadwani	WADWANI	BEED		-0.47699		-0.33455

Annexure V: Chemical analysis of ground water samples, Shallow aquifers (AQ-I)

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
1	AMBAJOGAI	RADI	7.12	480	266	160	40	NA					52	32	3.1	0.3	0	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
2	AMBAJOGAI	NANDGAON	7.28	806	286	160	40	NA					60	52.18	5.2	0.5	0.48	-	-
3	AMBAJOGAI	MURAMBI	7.32	786	298	240	24	NA					50	29.12	5.1	0.8	0.08	-	-
4	AMBAJOGAI	SANGAON	7.04	408	242	100	10	21.87					20	38	2.6	0.2	0.2	-	-
5	AMBAJOGAI	KUMBEPHAL	7.22	394	249	126	20	19.44					30	24	2.24	0.1	0.22	-	-
6	AMBAJOGAI	UMRAI	7.53	389	215	104	40	NA					30	20.1	2.2	0.57	0.28	-	-
7	AMBAJOGAI	KENDREWADI	7.3	355	266	130	24	NA					22	20	2.2	0.2	0.06	-	-
8	AMBAJOGAI	TELGHANA	7.22	400	276	107	28	NA					36	26.1	2.12	0.06	0.2	-	-
9	AMBAJOGAI	RAJEWADI	7.26	988	387	310	10	NA					80	64.11	6.28	0.26	0.18	-	-
10	AMBAJOGAI	CHOUTHEWADI	7.36	786	395	240	14	54.9					42	50	5.1	0.6	0.52	-	-
11	AMBAJOGAI	DHAVDI	7.35	482	354	210	36	NA					64	31.1	3.24	0.26	0.18	-	-
12	AMBAJOGAI	GITTA	7.13	655	291	200	34	NA					42	40.18	4.2	0.4	0.07	-	-
13	AMBAJOGAI	JAVALGAON	7.72	2277	1210	680	30	NA					80	84.18	43.22	1.2	0	-	-
14	AMBAJOGAI	SONVALA	7.3	1120	343	320	10	NA					20	18.26	6.18	0.17	0	-	-
15	Ambejogai	Ambejogai	8	418	221	183.6	55.1901 6	10.936 8	18	8.28	0	148.687	53.3522 5	31	8	0.18	-	0.24122 67	-0.19699 42
16	AMBEJOGAI	Dharmapuri	7.8	1288	684	499.8	108.336 24	54.684	17	17.33	0	493.642	110.426 75	2	16	0.08	-	0.10607 71	-4.05911 52
17	AMBEJOGAI	Saigaon-1	7.8	870	461	331.5	65.4105 6	40.101 6	47	2.67	0	362.797	78.1672 5	18	40	0.12	-	0.36873 01	-1.73969 21
18	ASHTI	Doithana	8.1	1109	588	453.9	42.9256 8	82.633 6	80	0.77	0	529.327 5	78.1672 5	32	40	1.51	-	0.56596 49	-0.77623 06
19	ASHTI	Kinhi	8.2	427	226	153	36.7934 4	14.582 4	29	0.42	0	190.32	16.1297 5	22	3	0.37	-	0.33024 12	-0.52863 11

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
20	Ashti	Waghluj	8	721	382	300.9	53.1460 8	40.101 6	39	0.91	0	368.745	40.9447 5	17	17	0.63	-	0.30596 75	-1.64221 26
21	Ashti	Sheri Bk	8.1	2247	1191	744.6	163.526 4	80.203 2	195	1.8	0	1022.97	165.019 75	162	40	0.07	-	1.41801 74	7.82056 64
22	Ashti	Khadkhat	7.8	3122	1661	1239.3	204.408	173.77 36	124	57.91	0	1106.23 5	460.318 25	59	40	0.86	-	0.66512 92	1.68937 07
23	Ashti	Dhanora-1	8.1	777	411	295.8	47.0138 4	42.532	62	6.81	0	368.745	48.3892 5	45	11	0.87	-	0.51850 26	-0.72021 47
24	Ashti	Kasari	8	728	385	306	57.2342 4	38.886 4	43	0.82	0	362.797 5	38.4632 5	24	19	1.27	-	0.38661 38	0.09429 98
25	ASHTI	HATOLA	7.5	816	403.21	48	52	NA					139	8.618	13.514	0.478	0.0326	-	-
26	Beed	Mauj	8	825	437	306	55.1901 6	40.101 6	55	1.18	0	374.692 5	60.7967 5	33	40	1.32	-	0.35337 11	-5.31871 79
27	Beed	Pali	7.9	645	341	249.9	47.0138 4	31.595 2	37	0.62	0	315.217 5	33.5002 5	0.5	18	0.31	-	0.32398 13	-1.00353 99
28	Beed	Manjar Sumbha-1	8	406	215	173.4	34.7493 6	20.658 4	21	0.71	0	190.32	13.6482 5	31	10	0.35	-	0.18361 36	-3.06861 7
29	Beed	Nandur Phata	8.1	876	463	300.9	61.3224	35.240 8	56	0.91	0	249.795	152.612 25	20	18	4.36	-	0.53178 36	-1.15181 6
30	Beed	Jirewadi-1	8	2699	1429	928.2	85.8513 6	170.12 8	190	20.74	0	1034.86 5	303.983 75	120	39	0.07	-	0.98876 6	-0.50638 19
31	Beed	Ghosapuri	7.9	1747	925	795.6	153.306	98.431 2	45	3.08	0	672.067 5	246.909 25	41	40	0.37	-	0.29034 09	-0.34870 41
32	Beed	Kapildhar	8.2	666	352	224.4	61.3224	17.012 8	62	0.85	0	297.375	40.9447 5	40	4	0.14	-	0.70642 05	1.23000 19

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
33	Beed	Chausala	7.7	797	423	321.3	77.67504	30.38	23	0.68	0	344.955	38.46325	29	38	0.12	-	0.2203946	0.5018529
34	BEED	WADHAVANA	8.15	1160	536	264	132	10					90	92	8.64	1.18	0.52	-	-
35	BEED	ANDHAPURI GHAT	8.49	809.23077	356	140	46	22					82	21	5.52	0.72	0.26	-	-
36	BEED	SANAPWADI	8.01	447.69231	168	64	33	7.5					32	29	2.33	0.1	0.21	-	-
37	BEED	KARZANI	8.18	940	368	212	48	39					64	29	4.11	0.28	0.36	-	-
38	BEED	WANGI	8.4	2518.4615	696	720	64	159					88	88	8.84	0.28	0.37	-	-
39	BEED	MAUJWADI	8.89	909.23077	333	124	36	21					60	56	3.77	1	0.07	-	-
40	BEED	AADGAON	8.22	1226.1538	797	524	43	44					160	57.99	3.89	1.95	0.34	-	-
41	BEED	BELKHANDI PATODA	8.06	1440	496	392	8	93					90	36	0.5	0.27	0.36	-	-
42	BEED	CHAKARWADI	8.06	861.53846	321	164	20	34					42	30	3.11	0.77	0.04	-	-
43	BEED	CHOUSALA	8.09	1061.5385	394	212	11	48					82	37	2.92	0.77	0.3	-	-
44	BEED	DHAVJYACHIWADI	8.03	738.46154	362	192	27	15					56	31	3.97	0.31	0.03	-	-
45	BEED	LONI GHAT	7.78	1004.6154	405	224	38	45					44	50	7.11	0.62	0.17	-	-
46	BEED	PANDHARYACHI WADI	8.39	1589.2308	824	500	110	94					146	20	10.11	0.11	0.01	-	-
47	BEED	SOMNATH WADI	8.05	567.69231	369	160	25	32					70	30	4.25	0.34	0.32	-	-
48	BEED	KAREGAVAN	7.64	903.07692	587	400	105	71					98	78	7.99	0.43	0.09	-	-
49	Dharur	Dharur-1	8	514	272	163.2	44.9697	12.152	47	0.62	0	184.3725	38.46325	16	37	1.29	-	0.3054563	-8.178082
50	Dharur	Gaundara	8.1	826	438	290.7	71.5428	26.7344	62	0.92	0	368.745	53.35225	23	38	0.1	-	0.5879761	0.783769

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
51	DHARUR	MUNGI	7.1	681	298	168	16	12					130	18	13.68	0.059	0.08	-	-
52	DHARUR	KUNDI	7.1	592	366	260	12	9					100	14	21.4	1.1	0.07	-	-
53	DHARUR	RUI	7.3	1569	768	320	29	22					210	27	21.6	0.31	0.1	-	-
54	DHARUR	ASARADHOH	7.6	1569	690	548	58	44					275	52	41.8	0.146	0.4	-	-
55	GEORAI	Umapur	7.9	663	351	270.3	57.23424	30.38	23	0.67	0	303.3225	26.05575	0	40	1.25	-	0.172439	-3.4444908
56	Georai	Kolegaon	7.9	809	429	321.3	67.45464	36.456	38	0.82	0	434.1675	28.53725	16	41	0.77	-	0.3199753	0.4440558
57	GEORAI	Georai-1	8	1631	863	622.2	112.4244	81.4184	98	1.16	0	725.595	145.16775	51	39	1.26	-	0.7621295	4.0705864
58	GEORAI	Nagjhera	7.9	1388	736	530.4	89.93952	72.912	69	13.33	0	553.1175	157.57525	54	8	0.33	-	0.5226867	0.8216763
59	Georai	Shirsadevi	8.4	813	431	270.3	36.79344	42.532	51	4.34	0	404.43	21.09275	20	39	1.41	-	0.553936	2.6186515
60	GEORAI	DHARWANTA	7.3	1453	516	485	15	9					117	11	46.2	0.78	0.14	-	-
61	GEORAI	TAKALGAON	7.6	631	444	396	39	32					102	36	32.96	0.078	0.06	-	-
62	GEORAI	HIRAPUR	7.6	1144	531	306	102	NA					58	164.75	41.26	0.38	0.01	-	-
63	GEORAI	KAJALA	7.6	457	247	126	26	22					46	24	9.78	0.28	0.04	-	-
64	GEORAI	RANJANI	7.1	745	650	326	32	30					54	28	10.25	0.32	0.07	-	-
65	GEORAI	GADHI	7.4	1258	648	330	31	30					230	30	43.8	0.2448	0.4	-	-
66	GEORAI	SUSHI	7.5	1246	674	310	28	30					240	26	24.78	1.3	0.6	-	-
67	GEORAI	VADGAON DHOK	7.6	1590	569	804	102	NA					116	90.17	12.15	1.1	0.06	-	-
68	GEORAI	SELU	7.1	1077	475	324	98	NA					104	57.53	19.2	0.96	0.03	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
69	GEORAI	KOMALWADI	7.8	2323	1061	540	64	54					330	60	39.88	1.3	0.023	-	-
70	GEORAI	GAUNDGAON	7.4	726	317	186	42	NA					96	36.07	24.25	0.25	0.01	-	-
71	GEORAI	BHOJGAON	7.8	1969	870	554	52	47					310	50	51.2	1.1	0.007	-	-
72	GEORAI	RAMPURI	7.5	786	392	168	16	12					140	14	20.38	1.1	0.012	-	-
73	GEORAI	KOLHER	7.1	852	591	280	76	NA					126	29.83	20.12	0.15	0.01	-	-
74	GEORAI	TALWADA	7.6	1170	533	520	55	41					104	52	22.1	0.24	0.01	-	-
75	GEORAI	KHAMGAON	7.5	1020	486	303	16	8					176	13	32.25	0.35	0.12	-	-
76	GEORAI	KATCHINCHOLI	7.5	1465	529	376	102	NA					158	49.26	25.15	0.78	0.01	-	-
77	GEORAI	BORGAON THADI	6.9	846	447	230	22	12					140	17	41.18	1.1	0.022	-	-
78	GEORAI	ANTARWALI BUDRUK	7.2	787	479	346	32	29					102	30	12.6	0.25	0.01	-	-
79	GEORAI	BANGALI PIMPALA	7.4	1023	466	326	118	NA					144	89.07	12.5	0.95	0.04	-	-
80	GEORAI	CHOPDYCHIWADI	7.4	753	435	200	24	20					160	21	21.4	0.778	0.3	-	-
81	GEORAI	KAJLYCHIWADI	7.4	1307	644	320	28	24					240	30	39.6	1	0.018	-	-
82	GEORAI	MALEGAON (B)	7.1	420	451	200	68	NA					46	168.28	38.15	0.99	0.04	-	-
83	GEORAI	NEW NAGZARI	7.6	934	510	112	102	NA					172	56.12	20.16	0.15	0.02	-	-
84	GEORAI	NIPANI JAWALAKA	7.4	800	473	200	18	10					140	16	24.63	1.48	0.2	-	-
85	GEORAI	PANCHALESWAR	7.4	873	349	256	25	20					126	22	11.48	0.16	0.02	-	-
86	GEORAI	PATHARWALA (B)	7.1	1479	814	598	96	NA					204	194.14	12.16	0.15	0.05	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
87	GEORAI	RAJAPIMPARI	7.6	763	473	362	96	NA					86	44.23	18.16	0.68	0.02	-	-
88	GEORAI	RAJAPUR	7.4	792	503.69	400	80	NA					80	151.59	26.15	0.35	0.01	-	-
89	KAIJ	Kumbhephal	7.4	1317	698	606.9	116.51256	75.3424	33	6.12	0	612.5925	105.46375	46	40	0.13	-	0.2358684	0.7804772
90	Kaij	Waguli	8.1	698	370	265.2	40.8816	38.8864	38	0.72	0	315.2175	26.05575	16	38	1.03	-	0.3250827	-1.297534
91	Kaij	Lokhandi Sawargaon-1	7.9	658	344	249.9	87.89544	7.2912	51	0.68	0	309.27	43.42625	19	39	0.16	-	0.6353648	2.0209522
92	Kaij	Kalegaon	8	592	314	249.9	65.41056	20.6584	17	2.53	0	255.7425	38.46325	22	20	0.25	-	0.2610628	2.1856411
93	KEAJ	SATEPHAL	8.46	630.76923	410	192	68	54					90	33	3.11	0.009	0.29	-	-
94	KEAJ	BHATUMBA	8.46	975.38462	422	200	14	45					118	23	0.5	0.53	0.08	-	-
95	KEAJ	HOL	8.38	390.76923	254	108	33	13					42	2.26	2.28	0.63	0.17	-	-
96	KEAJ	PISEGAON	8.28	456.92308	297	164	56	2					44	2.02	2.61	0.5	0.04	-	-
97	KEAJ	JOLA	8.05	898.46154	335	172	43	31					36	38	0.72	0.07	0.37	-	-
98	KEAJ	KUMBHEPHAL	8	604.61538	393	56	24	8					172	45	2.22	0.36	0.03	-	-
99	KEAJ	SADOLA	7.85	867.69231	321	184	52	32					82	47	8.36	0.003	0.24	-	-
100	KEAJ	DAKEPHAL	8.05	564.61538	367	180	44	33					110	56	2.19	0.04	0.07	-	-
101	Majalgaon	Dindrur-1	8.2	1532	811	469.2	96.07176	54.684	112	2.45	0	588.8025	112.90825	82	36	2.28	-	0.9380382	2.9065356
102	MAJALGAON	NITRUD	7.5	1569	454	366	22	16					200	19	12.6	1.3	0.3	-	-
103	MAJALGAON	RAMPIMPALGAON	7.3	1184	601	320	29	21					210	27	21.6	0.31	0.1	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
104	MAJALGAON	MANUR	7.6	1338	620	350	34	30					240	30	16.2	0.46	0.022	-	-
105	MAJALGAON	SHAHAPUR MAJARA	7.4	1569	496	320	27	24					230	28	29.2	0.526	0.2	-	-
106	MAJALGAON	NAGADAGAON	7.4	1180	687	320	27	24					230	28	29.2	0.526	0.2	-	-
107	MAJALGAON	TALEWADI	7.4	891	443	260	19	14					110	27	20.9	0.343	0.1	-	-
108	MAJALGAON	WAROLA	7.4	1415	680	340	30	28					270	32	36.8	1.4	0.4	-	-
109	MAJALGAON	BHATAWADAGAON	7.2	892	535	520	40	36					170	44	20.6	0.2225	0.3	-	-
110	MAJALGAON	CHOTEWADI	7.4	1400	641	329	29	28					290	30	21.8	1.4	0.014	-	-
111	MAJALGAON	GOVINDAWADI	7.6	807	367	195	19	15					170	17	16.4	1.3	0.3	-	-
112	MAJALGAON	HIVARA(BRU)	7.4	1569	594	322	29	28					290	30	21.8	1.4	0.014	-	-
113	MAJALGAON	KALEGAON THANDI	7.6	2323	996	480	60	55					380	58	36.4	1.3	0.024	-	-
114	MAJALGAON	N PIMPALGAON	7.1	830	319	200	20	15					110	18	9.95	0.22	0.02	-	-
115	MAJALGAON	PIPRI (KHURD)	7.6	1569	689	360	32	30					260	35	37.77	0.3856	0.1	-	-
116	MAJALGAON	SARVARPIMGAON	8.1	630	392	240	26	22					80	24	20.12	0.324	0.48	-	-
117	MAJALGAON	SHEMPAYTAKLI	7.5	758	446	223	22	17					130	20	41.5	0.046	0.2	-	-
118	MAJALGAON	SHINDEWADI(PA)	7.6	1300	614	350	34	31					240	30	16.2	0.588	0.022	-	-
119	MAJALGAON	SOMATHANA	7.4	1180	534	320	27	24					230	28	29.2	0.526	0.2	-	-
120	MAJALGAON	SURDI(NAJIK)	7.2	1076	509	436	32	26					160	30	25.6	1.5	0.3	-	-
121	MAJALGAON	TAKARAWAN	7.4	1053	524	285	26	20					175	24	30.7	1.2	0.29	-	-
122	MAJALGAON	TALAKHED	7.6	1553	633	410	40	32					260	38	42.6	1.4	0.3	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
123	MAJALGAON	WAGI	7.2	930	480	230	22	17					165	20	24.28	1.2	0.07	-	-
124	MANJLEGAON	Telgaon	8.2	860	455	295.8	89.93952	17.0128	62	0.32	0	356.85	95.53775	36	5	1.21	-	0.7496323	2.6127955
125	MANJLEGAON	Patrud-1	7.8	882	467	351.9	61.3224	47.3928	42	1.18	0	434.1675	38.46325	13	39	1.51	-	0.3342335	-0.3539339
126	Parli	Kanerwadi	7.9	471	249	163.2	40.8816	14.5824	22	2.62	0	190.32	23.57425	18	6	0.22	-	0.2264755	-1.3446278
127	Parli	Sirsala	7.4	2369	1254	872.1	71.5428	165.2672	121	11.12	0	791.0175	336.24325	26	38	0.02	-	0.5709093	-8.2850305
128	Parli	Parli	7.8	1324	703	540.6	106.29216	65.6208	59	3.15	0	535.275	130.27875	80	22	0.22	-	0.401921	-1.4207592
129	PARLI	PIMPRI	7.32	711	341	180	12	40.82					26	64	6.29	0.22	0.02	-	-
130	PARLI	NAGDARA	7.1	688	400	160	18	34.5					28	24	4.5	0	0	-	-
131	PARLI	NANDAGAUL	7.12	397	324	180	10	17.01					20	34	2.24	0.18	0.24	-	-
132	PARLI	HALAMB	7.51	1415	762	420	24	96.23					46	73.58	43.44	0.17	0	-	-
133	PARLI	MAINDWADI	7.79	2600	1357	720	70	157.95					84	108	32.18	0.69	0.36	-	-
134	PARLI	SARADGAON	7.2	417	336	90	20	17.01					34	26	2.1	0.26	0.29	-	-
135	PARLI	NANDNAJ	7.24	790	271	145	10	NA					20	74	5.1	0.26	0.19	-	-
136	PARLI	MANDEKHEL	7.7	1738	634	528	44	NA					58	90.22	12.31	0.12	0	-	-
137	PARLI	MANDVA	7.34	542	292	160	14	30.61					28	36	3.89	0	0.1	-	-
138	PARLI	TOKWADI	7.22	862	420	200	40	38.88					82	52	8.24	0.52	0.08	-	-
139	PARLI	INJEGAON	7.18	1166	387	320	10	NA					34	28.1	11.24	0.02	0.6	-	-
140	PARLI	DIGRAS	7.42	1040	481	300	26	66.58					38	32	6.14	0.07	0.62	-	-

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
141	PARLI	ANANDWADI	7.08	495	297	100	14	20.89					22	60	2.4	0	0	-	-
142	PARLI	BRAMHWADI	7.28	966	360	300	42	NA					80	60.24	6.2	0.6	0.6	-	-
143	PARLI	DABI	7.33	223	280	84	26	14.09					30	62	4.17	0.07	0	-	-
144	PARLI	JAIGAON	7.22	778	348	200	24	42.76					36	38	5.19	0.1	0.06	-	-
145	PARLI	KANDEE	7.95	2046	1041	602	18	NA					34	102	43.41	0.32	0.1	-	-
146	PARLI	KAUDGAON SA	7.08	1142	289	320	20	NA					36	20.1	7.2	0.16	0.07	-	-
147	PARLI	LENDEWADI	9.21	635	392	210	26	44.71					36	102	3.29	0	0.24	-	-
148	PARLI	MALNATHPUR	7.29	825	324	270	18	61.24					22	24	5.28	0.12	0.18	-	-
149	PARLI	WADGAON DA.	8.01	1738	529	320	36	69					84	37.92	42.97	0	0	-	-
150	PARLI	WAGHALA	8.18	1954	477	528	20	NA					62	24.16	22.1	0	0.07	-	-
151	PARLI	WAGHBET	8.01	3738	2430	878	94	NA					198	108	42.48	0.46	0.12	-	-
152	Patoda	Pithi	8.1	967	512	367.2	55.19016	54.684	72	0.97	0	463.905	85.61175	38	36	2.25	-	0.5695512	0.0434688
153	PATODA	Pimpalwandi	8.5	538	285	209.1	34.74936	29.1648	38	0.68	17.55	220.0575	43.42625	22	14	0.6	-	0.3922412	-0.2482793
154	PATODA	Daskhed	7.8	523	277	239.7	40.8816	32.8104	13	0.61	0	243.8475	31.01875	0	39	0.2	-	0.1069922	-2.9872902
155	PATODA	Patoda	7.5	1412	748	581.4	75.63096	93.5704	57	1.46	0	648.2775	112.90825	25	39	0.04	-	0.3872348	0.3753702
156	PATODA	Dongar Kini-1	8.1	664	352	265.2	51.102	32.8104	39	0.62	0	315.2175	40.94475	45	16	0.21	-	0.3702081	-0.0835428
157	Patoda	Naygaon	7.7	1298	687	469.2	71.5428	69.2664	93	1.16	0	594.75	102.98225	31	33	0.22	-	0.7131063	1.7020298
158	Patoda	Sautada	7.9	622	330	265.2	65.41056	24.304	22	3.17	0	315.2175	26.05575	14	24	0.3	-	0.2708117	2.0444432

SN	Block	Village	PH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	CI	SO4	NO3	F	Fe	SAR	RSC
				µs/cm	Mg/l														
159	PATODA	CHUMBALI	7.4	940	609	388	82	50					210	7.541	0.5	0.029	0.018	-	-
160	Shirur-Kasar	Manur	8.1	1198	635	453.9	73.58688	64.4056	86	1.19	0	588.8025	85.61175	50	41	1.19	-	0.6810186	2.1065451
161	Shirur-Kasar	Sirur	7.9	3452	1831	1693.2	118.55664	332.9648	10	10.48	0	1480.9275	241.94625	270	17	0.31	-	0.0394091	-6.1872594
162	Shirur-Kasar	Tintarvani-1	8.1	2380	1262	826.2	153.306	105.7224	121	5.16	0	743.4375	299.02075	72	39	0.34	-	0.7608666	0.2210574
163	Shirur-Kasar	Anandgaon	8.2	795	421	260.1	73.58688	18.228	51	0.85	0	315.2175	45.90775	40	36	0.28	-	0.5656221	1.3204421
164	Wadwani	Wadwani	7.4	833	441	311.1	67.45464	34.0256	50	0.93	0	362.7975	78.16725	26	11	0.58	-	0.3750012	-2.4636932
165	WADWANI	KAWADGAON	7.1	1240	497	280	28	22					190	25	18.56	1.5	0.1	-	-
166	WADWANI	SONNAKHOTA	7.2	1341	878	385	35	23					324	42	24.51	0.165	0.003	-	-
167	WADWANI	PUSRA	7.2	1010	596	240	42	39					224	45	39.11	0.245	0.04	-	-
168	WADWANI	PARDI	7.2	838	390	205	20	14					155	18	21.7	0.147	0.1	-	-
169	WADWANI	DEVGAON	7.8	1300	682	390	28	20					170	26	43.45	0.336	0.2	-	-
170	WADWANI	KHADKI	7.4	1600	697	420	47	25					240	49	49.4	0.142	0.005	-	-
171	WADWANI	CHINCHALA	7.4	1292	472	420	48	41					110	40	44.18	0.553	0.1	-	-
172	WADWANI	KHALWATLIM GAON	7.5	853	408	220	22	17					120	20	41.5	0.046	0.2	-	-
173	WADWANI	PIMPLETTAKA	7.3	1760	777	451	40	30					310	28	46.38	0.258	0.012	-	-
174	WADWANI	WADAWANI	7.5	923	420	270	26	22					100	24	21.36	0.216	0.007	-	-

Annexure VI: Chemical analysis of ground water samples, deeper aquifers (AQ-II)

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
1	Ambejogai	Bhauthana.	Borewell	8.7	737	479	210	32	31.6	82.8	1.8	5.2	110.5	148	38	4.54	0.88	0.1
2	Ambejogai	Kangnewadi.	Borewell	6.5	563	360	216	32	33	23	55	0	208	46	25	19	1	0.2
3	Ambejogai	Mamdapur	Exploration	8.25	730	385	165	60	4	92	3	0	244	50	50	55	0	0
4	Ambejogai	Sawargaon	Exploration	8.1	670	400	150	56	2	81	5	0	153	89	50	40	0	0
5	Ambejogai	Mamdapur	PZ	8.3	730	385	165	60	4	92	3	0	244	50	50	55	NA	0
6	Ashti	Ambhora	Exploration	8.5	570	322	NA	125	38	7	67	1	18	165	71	6	1.28	30
7	Ashti	Ashta [h.n.]	Borewell	8.14	763	496	316	64	37.9	46.9	3.6	3	229	88	48	14.8	1.18	0.1
8	Ashti	Dhamangaon	Exploration	8.3	780	437	NA	260	56	29	58	2	18	214	64	55	1	47
9	Ashti	Dhanora.	Borewell	8.79	860	559	268	36.8	42.8	84.3	5.1	15.7	140	140	49	9.1	1.3	0.1
10	Ashti	Garhi	Exploration	7.4	1850	1099	NA	240	90	4	331	1.2	Nil	79	398	230	1.65	4
11	Ashti	Jamgaon	Exploration	8.2	820	522	NA	85	30	2	139	3	Nil	67	142	153	7.6	12
12	Ashti	Kada	Exploration	8.2	1540	842	NA	575	106	75	87	4.8	Nil	305	255	129	0.66	32
13	Ashti	Khadkat	Exploration	8.2	1620	1000	NA	475	146	27	150	5	Nil	189	284	98	0.91	195
14	Ashti	Pimpla	Exploration	7.45	355	355	167.5	41.08	15.81	75.9	3.51	0	335.56	26.59	23.53	0	0.89	0
15	Ashti	Pimpri Ghumri	Borewell	8.3	548	356	256	44.8	35	30	3.9	3.8	204.1	44	56	4.7	1.15	0.1
16	Ashti	Pimpla	EW	7.5	625	355	168	41	16	76	3.5	0	336	27	24	NA	0.89	0
17	Ashti	Garhi	EW	7.4	1850	1099	240	90	4	331	1.2	0	79	398	230	4	1.65	0
18	Ashti	Dhamangaon	NM	8.3	780	437	260	56	29	58	2	18	214	64	55	47	1	0
19	Ashti	Ambora	HP	8.5	1130	630	465	86	61	40	1	30	244	152	15	123	0.46	0
20	Ashti	Ambora	OW-III	8.2	500	293	45	16	1	94	0.2	0	55	131	6	14	2.88	0
21	Ashti	Ambora	OW-II	8.8	530	309	55	18	2	95	0.2	12	122	89	4	25	2.67	0

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
22	Ashti	Ambora	OW-I	8.2	730	420	130	42	6	105	0.5	0	262	71	12	51	1.01	0
23	Ashti	Ambora	EW	8.4	720	396	265	52	33	41	2	24	220	64	8	61	0.77	0
24	Ashti	Ambora	EW	8.5	570	322	125	38	7	67	1	18	165	71	6	30	1.28	0
25	Ashti	Kada	OW	8.1	1270	677	460	90	57	76	2	0	329	223	12	52	0.7	0
26	Ashti	Kada	OW	7.7	780	479	130	44	5	115	7	0	55	131	144	0.1	5.4	0
27	Ashti	Kada	EW	8.2	1540	842	575	106	75	87	4.8	0	305	255	129	32	0.66	0
28	Ashti	Jamgaon	PT-APT	8	960	540	310	40	51	73	3	0	214	124	95	47	0.46	0
29	Ashti	Jamgaon	PT-SDT	8	940	519	295	48	43	71	2.5	0	262	103	89	31	0.63	0
30	Ashti	Jamgaon	PYT	8.2	960	596	175	54	10	129	3	0	98	156	170	19	6.3	0
31	Ashti	Jamgaon	EW	8.2	820	522	85	30	2	139	3	0	67	142	153	12	7.6	0
32	Ashti	Khadkat	EW	7.6	1940	1203	635	168	52	143	9	0	250	280	156	269	1.26	0
33	Ashti	Khadkat	EW	8.2	1700	1056	480	148	27	166	7	0	201	280	130	196	1.48	0
34	Ashti	Khadkat	EW	8.2	1620	1000	475	146	27	150	5	0	189	284	98	195	0.91	0
35	Ashti	Kada	EW	8.2	1690	942	615	104	86	104	2	0	250	291	192	37	0.63	0
36	Beed	Khande Pargaon	Exploration	7.7	1650	970	NA	440	118	35	161	13	Nil	445	146	125	0.54	149
37	Beed	Kutewadi	Exploration	8	620	360	NA	30	10	1	126	5	Nil	104	92	44	17.6	12
38	Beed	Mhalsapur	Borewell	8.7	682	436	176	24	28.2	94	1	14.9	316.8	50	28	5	0.69	0.2
39	Beed	Pali	Exploration	8.5	550	305	NA	105	16	16	76	1.5	24	171	28	32	0.42	26
40	Beed	Pali	Borewell	7.9	697	446	272	48	36.9	24	2	1.9	254.1	44	22	7	0.9	0.1
41	Beed	Pali	Exploration	7.8	820	512	NA	40	14	1	162	10	Nil	122	128	124	6.13	7
42	Beed	Rajuri	Exploration	8.5	1430	798	NA	240	24	44	213	5	36	506	110	10	1.03	102
43	Beed	Khande Pargaon	EW	7.7	1650	970	440	118	35	161	13	0	445	146	125	149	0.54	0

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
44	Beed	Khande Pargaon	PYT	7.6	2100	1269	360	86	35	299	24	0	451	142	214	243	0.42	0
45	Beed	Rajuri	EW	8.5	1430	798	240	24	44	213	5	36	506	110	10	102	1.03	0
46	Beed	Charata	EW	7.35	1550	970	165	60	4	269	9	0	55	309	280	7.6	3.85	0
47	Beed	Charata	EW	8.1	790	480	45	12	4	153	9	0	134	128	98	4	6.7	0
48	Beed	Kutewadi	PYT	7.3	580	342	35	12	1	112	5	0	98	96	42	7	17.2	0
49	Beed	Kutewadi	EW	8	620	360	30	10	1	126	5	0	104	92	44	12	17.6	0
50	Beed	Pali	OW	7.5	820	452	125	46	2	123	8.5	0	342	71	24	5.6	1.19	0
51	Beed	Pali	OW	7.8	820	512	40	14	1	162	10	0	122	128	124	7	6.13	0
52	Beed	Pali	EW	8.5	550	305	105	16	16	76	1.5	24	171	28	32	26	0.42	0
53	Dharur	Kari.	Borewell	8.6	462	296	52	23	11	58	1	4.8	127	35	29	1	1.26	0.2
54	Georai	Aheri Wahegaon	Exploration	7.8	1800	1136	NA	235	82	7	284	8	Nil	451	82	150	1.41	296
55	Georai	BhendeTakli	Exploration	7.9	590	350	NA	80	26	4	96	6	Nil	213	36	25	1.1	50
56	Georai	BhendeTakli	Exploration	7.5	1320	778	NA	140	50	4	237	2	Nil	159	273	125	2.48	5
57	Georai	Dhondrai	Exploration	7.6	450	246	NA	145	32	16	35	0.3	Nil	110	57	41	0.26	10
58	Georai	Dhondrai	Exploration	8.4	2540	1615	520	72	83	345	3	6	116	223	800	25	0	0
59	Georai	Gevrai	Exploration	8.4	2100	1250	30	40	49	345	5	9	250	258	300	19	0	0
60	Georai	Gogaspargaon	Borewell	8.2	1058	677	196	67.2	6.8	112	1	0	141.5	214	84	7	1.18	0
61	Georai	Kekat Pangri	Exploration	7.5	2200	1265	NA	270	102	4	378	1	Nil	79	476	254	1.74	9
62	Georai	Madalmohi	Borewell	8.4	439	281	160	21.2	26	34	1	3.6	152.3	34	21	18	0.64	0.1
63	Georai	Malegaon(Kh)	Exploration	7.5	1600	868	NA	335	38	58	212	0.9	Nil	354	107	254	0.8	20
64	Georai	Padalsinghi	Borewell	8.43	572	372	180	41.6	18.5	42.4	1.2	2.2	85.7	76	30	15	1.09	0.1
65	Georai	Paulachiwadi	Exploration	7.9	890	496	NA	130	14	23	132	4	Nil	177	153	76	2.34	5

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
66	Georai	Tagadgaon	Borewell	8.2	1890	1229	628	142.4	66.1	196	1.4	0	200.1	370	165	43	1.38	0.1
67	Georai	DhoNArai	PZ	8.4	2540	1615	520	72	83	345	3	6	116	223	800	25	NA	0
68	Georai	Gevrai	PZ	8.4	2100	1250	30	40	49	345	5	9	250	258	300	19	NA	0
69	Georai	Sawargaon	PZ	8.1	670	400	150	56	2	81	5	0	153	89	50	40	NA	0
70	Georai	Malegaon (Kh)	EW	7.5	1600	868	335	38	58	212	0.9	0	354	107	254	20	0.8	0
71	Georai	DoNArai	EW	7.6	450	246	145	32	16	35	0.3	0	110	57	41	10	0.26	0
72	Georai	Kekatpangri	EW	7.8	1800	1136	235	82	7	284	8	0	451	82	150	296	1.41	0
73	Georai	Kekat Pangri	EW	7.5	2200	1265	270	102	4	378	1	0	79	476	254	9	1.74	0
74	Georai	Paulachiwadi	EW	7.9	890	496	130	14	23	132	4	0	177	153	76	5	2.34	0
75	Georai	BheNAtakli	PYT	7.8	780	416	310	104	12	29	4	0	354	32	32	25	0.7	0
76	Georai	BheNAtakli	OW	7.9	590	350	80	26	4	96	6	0	213	36	25	50	1.1	0
77	Georai	BheNAtakli	PYT	7.6	1000	584	105	18	15	178	3	0	171	192	74	16	2.7	0
78	Georai	BheNAtakli	EW	7.5	1320	778	140	50	4	237	2	0	159	273	125	5	2.48	0
79	Georai	Aherwahegaon	EW	7.8	1800	1136	235	82	7	284	8	0	451	82	150	296	1.41	0
80	Georai	Fardapur	EW	7.7	910	540	185	62	7	119	7	0	128	163	108	8.4	0.85	0
81	Kaij	Malegaon	Borewell	8.85	845	549	271	24	51.3	98.1	1.5	23.6	160.1	154	51	1.11	1.01	0.2
82	Majalgaon	Khamgaon	Borewell	8.5	852	545	228	16	45.7	73	1	28.8	126.9	140	42	16	0.2	0.2
83	Majalgaon	Longaon Camp	Borewell	7.5	1049	671	392	76.8	48.6	59	1	0	256.2	100	46	29	1.2	0.2
84	Majalgaon	Majalgaon	Borewell	8.1	1247	798	92	8	17.5	220	1	0	591.7	40	37	5	1	0.2
85	Majalgaon	Waghora	Borewell	7.9	928	594	332	48	51.5	55	2	0	287.9	96	52	7	1.4	0.2
86	Majalgaon	Mothiwadi	EW	8.2	1100	660	140	40	10	180	1.5	0	98	195	162	13	9.2	0
87	Majalgaon	Moshiwadi	EW	7.9	1650	1017	565	78	90	130	2	0	128	216	285	150	2	0

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
88	Majalgaon	Sonna Khota	EW	8.2	660	393	130	30	13	92	2.5	0	153	85	58	31	4.9	0
89	Majalgaon	Ekdara	EW	8.3	1350	815	235	52	26	195	1.4	0	140	184	252	29	5.3	0
90	Majalgaon	Ekdara	EW	8.4	1130	683	270	44	39	137	1	24	98	145	200	40	3.6	0
91	Majalgaon	Ekdara	EW	8.3	1350	815	235	52	26	195	1.4	0	140	184	252	29	5.3	0
92	Majalgaon	Manur	EW	7.8	1000	540	355	80	38	61	8.5	0	390	85	11	60	0.58	0
93	Parali	Sangam	Borewell	8.5	1683	1077	440	77.2	60	96	65	76.8	136.6	128	83	46	0.8	0.3
94	Parli	Wadgaon [d]	Borewell	7.9	1290	826	200	61.2	11.4	172	5	0	170.8	228	166	3.5	1.26	0.1
95	Parli	Pangri	EW	8.2	600	334	65	10	10	100	2.1	0	159	67	51	14	0.79	0
96	Parli	Dharmapuri	EW	8.1	470	330	100	16	15	64	1	0	79	67	50	33	4.7	0
97	Parli	Dhamangaon	NM	8.3	850	470	290	64	32	61	2	36	238	67	40	47	0.92	0
98	Patoda	Amalner	Borewell	8.9	839	537	216	19.2	40.8	62	48	86.4	34.2	120	42	9	0.64	0.3
99	Patoda	Patoda	Borewell	8.74	690	449	184	44.8	17.5	47	16	6.3	121.5	90	18	11.3	0.63	0.2
100	Patoda	Pimpalwandi	PYT	7.8	1030	597	110	42	1	176	17	0	201	170	86	4	0.6	0
101	Patoda	Pimpalwandi	EW	7.3	1700	1013	205	80	1	286	17	0	67	376	211	8	0.73	0
102	Shirur kasar	Shirur	Borewell	6.8	1080	691	232	59	19.9	98	0	15	53	180	201	1	1.4	0.1
103	Shirur-Kasar	Matori	Exploration	7.2	1650	961	NA	645	172	52	75	7.6	Nil	317	231	70	0.22	195
104	Shirur-Kasar	Raimoha	Exploration	8.1	970	523	NA	255	44	35	103	1.5	24	378	92	13	0.79	45
105	Shirur-Kasar	Tinturvani	Exploration	8.23	610	360	105	20	13	92	2	3	153	64	17	70	0	0
106	Shirur-Kasar	Tinturvani	PZ	8.2	610	360	105	20	13	92	2	3	153	64	17	70	NA	0
107	Shirur-Kasar	Matori	PYT	7.1	1750	982	675	188	50	72	7.5	0	421	234	68	152	0.36	0
108	Shirur-Kasar	Matori	EW	7.2	1650	961	645	172	52	75	7.6	0	317	231	70	195	0.22	0
109	Shirur-Kasar	Manur	EW	7.7	970	518	370	80	41	45	5	0	384	82	12	60	0.56	0

SN	Block	Village	Type	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	Fe
					µs/cm	(mg/L)												
110	Shirur-Kasar	Raimoha	EW	8.1	970	523	255	44	35	103	1.5	24	378	92	13	45	0.79	0
111	Wadwani	Pimperkhed	Exploration	7.9	800	460	NA	120	36	7	123	6	Nil	171	163	18	1.22	20
112	Wadwani	Laul	EW	8.7	1600	981	145	26	19	310	1.7	66	214	128	300	21	1.84	0
113	Wadwani	Laul	EW	8.1	1670	1009	160	26	23	305	1.7	0	348	142	315	19	2.9	0
114	Wadwani	Javla	EW	8.3	800	477	140	28	17	114	2.5	0	116	128	53	72	4.4	0
115	Wadwani	Upali	EW	8.2	1000	594	145	44	9	145	1.8	0	122	160	150	14	9.2	0
116	Wadwani	Pimpalwadi	OW	8.7	700	393	95	30	5	117	0.3	18	201	92	12	17	1.05	0
117	Wadwani	Pimpalwadi	OW	8.7	700	400	80	24	5	124	0.2	18	189	67	64	2.1	1.25	0
118	Wadwani	Pimpalkhed	PYT	7.7	700	424	80	26	4	119	4	0	98	131	54	36	1.2	0
119	Wadwani	Pimpalkhed	EW	7.9	800	460	120	36	7	123	6	0	171	163	18	20	1.22	0

S.No	Taluka	Village
1	Muggaon	Patoda
2	Dhangar Jaulka	Patoda
3	Nalwandi	Patoda
4	Kotan	Patoda
5	Pimpalwandi	Patoda
6	Patoda	Patoda
7	Ukhanda Pitti	Patoda
8	Daskhed	Patoda
9	Malegaon Chakla	Shirur (Kasar)
10	Ghogas Paregaon	Shirur (Kasar)
11	Maturi	Shirur (Kasar)
12	Nimgaon Mayamba	Shirur (Kasar)
13	Gazipur	Shirur (Kasar)
14	Nandewali	Shirur (Kasar)
15	Rale Sangavi	Shirur (Kasar)
16	Maturi	Shirur (Kasar)
17	Maturi	Shirur (Kasar)
18	Maturi	Shirur (Kasar)
19	Gazipur	Shirur (Kasar)
20	Gazipur	Shirur (Kasar)
21	Shirur	Shirur (Kasar)
22	Shirur	Shirur (Kasar)
23	Bargatwadi	Shirur (Kasar)

S.No	Taluka	Village
24	Mangewadi (n.v.)	Shirur (Kasar)
25	Pimpalner	Shirur (Kasar)
26	Rupur	Shirur (Kasar)
27	K. Dhanora	Shirur (Kasar)
28	Limba	Shirur (Kasar)
29	Shirapurgat	Shirur (Kasar)
30	Taradgavhan	Shirur (Kasar)
31	Kanhobachiwadi	Shirur (Kasar)
32	Limba	Shirur (Kasar)
33	Hingewadi	Shirur (Kasar)
34	Khokermoha	Shirur (Kasar)
35	Raimoha	Shirur (Kasar)
36	Raimoha	Shirur (Kasar)
37	Dhangarwadi	Shirur (Kasar)
38	Kholyachiwadi	Shirur (Kasar)
39	Tagadgaon	Shirur (Kasar)
40	Padali	Shirur (Kasar)
41	Malegaon Bk.	Georai
42	Borgaon Bk.	Georai
43	Gaikwad Jalgaon	Georai
44	Dhondrai	Georai
45	Gangawadi(n.v.)	Georai
46	Agar Nandur	Georai

S.No	Taluka	Village
47	Daithan	Georai
48	Antarvali Bk.	Georai
49	Gangawadi	Georai
50	Dhondrai	Georai
51	Umapur	Georai
52	Khalegaon	Georai
53	Dhumegaon	Georai
54	Ardhapimpri	Georai
55	Chaklamba	Georai
56	Mahandula	Georai
57	Hiwarwadi	Georai
58	Shekta	Georai
59	Pimpla	Georai
60	Bhat Antarwali	Georai
61	Bhojgaon	Georai
62	Kolher	Georai
63	Bagpimpalgaon	Georai
64	Pangulgaon	Georai
65	Thakar Adgaon	Georai
66	Bhatepuri	Georai
67	Georai (rural)	Georai
68	Itkur	Georai
69	Hirapur	Georai
70	Takalgaon	Georai
71	Khadki	Georai

S.No	Taluka	Village
72	Kolgaon	Georai
73	Ukhadpimpri	Georai
74	Sakshal Pimpri	Georai
75	Fulsangvi	Georai
76	Jodwadi	Georai
77	Aher Vahegaon	Georai
78	Irgaon	Georai
79	Irgaon	Georai
80	Aurangpur Kukada	Georai
81	Adgaon	Georai
82	Ardhmasla	Georai
83	Digrass	Georai
84	Kherda Bk.	Georai
85	Takalgavhan Tarf Talkhed	Georai
86	Sindphana Chincholi	Georai
87	Kherda Bk.	Georai
88	Jategaon	Georai
89	Jategaon	Georai
90	Golegaon	Georai
91	Takarwan	Georai
92	Babultara	Georai
93	Tape Nimgaon	Georai
94	Malegaon Majra	Georai
95	Pokhari	Georai

S.No	Taluka	Village
96	Ankota	Georai
97	Mategaon	Georai
98	Chaklamba	Georai
99	Surlegaon	Georai
100	Manyarwadi	Georai
101	Bhojgaon	Georai
102	Georai (rural)	Georai
103	Sirasdevi	Georai
104	Hiwarwadi	Georai
105	Adgaon	Georai
106	Digrass	Georai
107	Waghora	Manjlegaon
108	Sultanpur	Manjlegaon
109	Kalegaon Thadi	Manjlegaon
110	Surdi Najik	Manjlegaon
111	Kaudgaon Thadi	Manjlegaon
112	Talkhed	Manjlegaon
113	Jadid Jawala	Manjlegaon
114	Shahapur Majara	Manjlegaon
115	Mangrul	Manjlegaon
116	Mangrul	Manjlegaon
117	Renapuri	Manjlegaon
118	Phule Pimpalgaon	Manjlegaon
119	Sadola	Manjlegaon
120	Kesapuri	Manjlegaon

S.No	Taluka	Village
121	Kedar Sangvi	Manjlegaon
122	Kedar Sangvi	Manjlegaon
123	Patrud	Manjlegaon
124	Nakhalgaon	Manjlegaon
125	Patrud	Manjlegaon
126	Longaon	Manjlegaon
127	Mogra	Manjlegaon
128	Sonna Thadi	Manjlegaon
129	Surumgaon	Manjlegaon
130	Abegaon	Manjlegaon
131	Manjrath	Manjlegaon
132	Manurwadi	Manjlegaon
133	Belura	Manjlegaon
134	Ekburjiwadi (n.v.)	Manjlegaon
135	Mogra	Manjlegaon
136	Shuklatirth Nimgaon	Manjlegaon
137	Telgaon Kh.	Manjlegaon
138	Salegaon	Manjlegaon
139	Mogra	Manjlegaon
140	Salegaon	Manjlegaon
141	Sarwar Pimpalgaon	Manjlegaon
142	Pokhari	Wadwani
143	Chinchola	Wadwani
144	Nitrud	Wadwani
145	Pimpalner	Bid

S.No	Taluka	Village
146	Babhalwadi	Bid
147	Bedukwadi	Bid
148	Limbarui	Bid
149	Sandarwan	Bid
150	Maujyachiwadi	Bid
151	Dawargaon Bk.	Bid
152	Loni (shahajanpur)	Bid
153	Rajkapur	Bid
154	Kalegaon Haveli	Bid
155	Bramhagaon	Bid
156	Juj Gavhan	Bid
157	Nalwandi	Bid
158	Nalwandi	Bid
159	Nagpur Bk.	Bid
160	Aurangpur	Bid
161	Namalgaon	Bid
162	Pargaon Japti	Bid
163	Kamkheda	Bid
164	Pargaon Siras	Bid
165	Rajuri Bk.(navgan)	Bid
166	Rajuri Bk.(navgan)	Bid
167	Murshadpur (rajuri)	Bid
168	Limbarui	Bid
169	Umrad Jagir	Bid
170	Tippatwadi	Bid

S.No	Taluka	Village
171	Tippatwadi	Bid
172	Shidode	Bid
173	BID	Bid
174	Bid (rural)	Bid
175	Antharvan Pimpri	Bid
176	Borkhed	Bid
177	Ghargaon	Bid
178	Pothra	Bid
179	Wadhavana	Bid
180	Lonighat	Bid
181	Neknoor	Bid
182	Khardewadi	Bid
183	Chaudaswadi	Bid
184	Safepur	Bid
185	Mulukwadi	Bid
186	Limba Ganesh	Bid
187	Mahajanwadi	Bid
188	Wangaon	Bid
189	Babhal Khunta	Bid
190	Bid (rural)	Bid
191	Pirachiwadi	Bid
192	Pali	Bid
193	Mandav Jali	Bid
194	Devla Bk.	Bid
195	Dhekan Moha	Bid

S.No	Taluka	Village
196	Pali	Bid
197	Charahata	Bid
198	Hiwara Phadi	Bid
199	Sanapwadi	Bid
200	Somnathwadi	Bid
201	Bid (rural)	Bid
202	Shivni	Bid
203	Dhotra	Bid
204	Sangvi (s)	Kaij
205	Massajog	Kaij
206	Massajog	Kaij
207	Umri	Kaij
208	Kaij	Kaij
209	Pisegaon	Kaij
210	Bankaranja	Kaij
211	Kekat Sarni	Kaij
212	Hol	Kaij
213	Water Body	Kaij
214	Rameshwarwadi	Kaij
215	Dhotra	Kaij
216	Shirurghat	Kaij
217	Naholi	Kaij
218	Sarukwadi	Kaij
219	Yusuf Wadgaon	Kaij
220	Paithan	Kaij

S.No	Taluka	Village
221	Dhanora	Kaij
222	Bhalgaon	Kaij
223	Mangwadgaon	Kaij
224	Daithana Radi	Ambejogai
225	Pus	Ambejogai
226	Mamdapur	Ambejogai
227	Saygaon	Ambejogai
228	Takli Deshmukh	Parli
229	Lonarwadi	Parli
230	Takli Acharya	Parli
231	Sirsala	Parli
232	Tandalwadi	Dharur
233	Undri	Dharur
234	Amla	Dharur
235	Kolpimpri	Dharur
236	Hingani Bk	Dharur
237	Kari	Dharur
238	Pimpalgaon Ghat	Ashti
239	Deulgaon Ghat	Ashti
240	Daulawadgaon	Ashti
241	Chinchewadi	Ashti
242	Bandkhel	Ashti
243	Ambewadi	Ashti
244	Shedala	Ashti
245	Underkhel	Ashti

S.No	Taluka	Village
246	Gahukhel	Ashti
247	Karkhel Kh.	Ashti
248	Sumbhewadi	Ashti
249	Pimpla	Ashti
250	Khuntephal Pundi	Ashti
251	Pundi	Ashti
252	Kanadi Kh.	Ashti
253	Nimgaon Chaubha	Ashti
254	Kerul	Ashti
255	Sakhalwadi (n.v.)	Ashti
256	Shiral	Ashti
257	Dongargan	Ashti
258	Limbodi	Ashti
259	Dadegaon	Ashti
260	Kelsangvi	Ashti
261	Pimpri Ashti	Ashti
262	Chikhali	Ashti
263	Hanumantgaon	Ashti
264	Hajipur	Ashti
265	Walunj	Ashti
266	Balewadi	Ashti
267	Ashta	Ashti
268	Kasari	Ashti
269	ASHTI	Ashti
270	Hingni	Ashti

S.No	Taluka	Village
271	Mandva	Ashti
272	Patan	Ashti
273	Beed-sangvi	Ashti
274	ASHTI	Ashti
275	Sabadkhed	Ashti
276	Dhamangaon	Ashti
277	Karkhel Bk.	Ashti
278	Surudi	Ashti
279	Sangvi Patan	Ashti
280	Dadegaon	Ashti
281	Deolali	Ashti
282	Ambejogai (rural)	Ambejogai
283	Jawalgaon	Ambejogai
284	Pimpri	Ambejogai
285	Umbrayachiwadi (n.v.)	Dharur
286	Asardhav	Dharur
287	Chichkhandi	Dharur
288	Hanumant Pimpri	Kaij
289	Ghalatwadi	Manjlegaon
290	Shimpetakli	Manjlegaon
291	Rajegaon	Manjlegaon
292	Surdi Najik	Manjlegaon
293	Manjrath	Manjlegaon
294	Manur	Manjlegaon
295	Mogra	Manjlegaon

S.No	Taluka	Village
296	Jiwanpur	Manjlegaon
297	Ekburjiwadi (n.v.)	Manjlegaon
298	Patrud	Manjlegaon
299	Manjlegaon (rural)	Manjlegaon
300	Manurwadi	Manjlegaon
301	Sands Chincholi	Manjlegaon
302	Manjlegaon (rural)	Manjlegaon
303	Kaudgaon Sabla	Parli
304	Takli Acharya	Parli
305	Kauthali	Parli
306	Patoda	Patoda
307	Loni	Shirur (Kasar)
308	Warni	Shirur (Kasar)
309	Warni	Shirur (Kasar)
310	Vighanwadi	Shirur (Kasar)
311	Nagaryachiwadi (n.v.)	Shirur (Kasar)

S.No	Taluka	Village
312	Bawi	Shirur (Kasar)
313	Zapewadi	Shirur (Kasar)
314	Jamb	Shirur (Kasar)
315	Khalapuri	Shirur (Kasar)
316	Khokermoha	Shirur (Kasar)
317	Raimoha	Shirur (Kasar)
318	Raimoha	Shirur (Kasar)
319	Raimoha	Shirur (Kasar)
320	Vighanwadi	Shirur (Kasar)
321	Dhangarwadi	Shirur (Kasar)
322	Aurangpur	Shirur (Kasar)
323	Ghugewadi	Shirur (Kasar)
324	Mahindrawadi (n.v.)	Shirur (Kasar)
325	Sonnakhota	Wadwani
326	Lonwal	Wadwani

Annexure VIIII: Location of Proposed Percolation Tanks

S. No	VILLAGE	TALUKA
1	Muggaon	Patoda
2	Dhangar Jaulka	Patoda
3	Nalwandi	Patoda
4	Kotan	Patoda
5	Pimpalwandi	Patoda
6	Patoda	Patoda
7	Ukhanda Pitti	Patoda
8	Daskhed	Patoda
9	Malegaon Chakla	Shirur (Kasar)
10	Ghogas Paregaon	Shirur (Kasar)
11	Maturi	Shirur (Kasar)
12	Nimgaon Mayamba	Shirur (Kasar)
13	Gazipur	Shirur (Kasar)
14	Nandewali	Shirur (Kasar)
15	Rale Sangavi	Shirur (Kasar)
16	Maturi	Shirur (Kasar)
17	Maturi	Shirur (Kasar)
18	Maturi	Shirur (Kasar)
19	Gazipur	Shirur (Kasar)
20	Gazipur	Shirur (Kasar)
21	Shirur	Shirur (Kasar)
22	Shirur	Shirur (Kasar)
23	Bargatwadi	Shirur (Kasar)

S. No	VILLAGE	TALUKA
24	Mangewadi (n.v.)	Shirur (Kasar)
25	Pimpalner	Shirur (Kasar)
26	Rupur	Shirur (Kasar)
27	K. Dhanora	Shirur (Kasar)
28	Limba	Shirur (Kasar)
29	Shirapurgat	Shirur (Kasar)
30	Taradgavhan	Shirur (Kasar)
31	Kanhobachiwadi	Shirur (Kasar)
32	Limba	Shirur (Kasar)
33	Hingewadi	Shirur (Kasar)
34	Khokermoha	Shirur (Kasar)
35	Raimoha	Shirur (Kasar)
36	Raimoha	Shirur (Kasar)
37	Dhangarwadi	Shirur (Kasar)
38	Kholyachiwadi	Shirur (Kasar)
39	Tagadgaon	Shirur (Kasar)
40	Padali	Shirur (Kasar)
41	Malegaon Bk.	Georai
42	Borgaon Bk.	Georai
43	Gaikwad Jalgaon	Georai
44	Dhondrai	Georai
45	Gangawadi(n.v.)	Georai
46	Agar Nandur	Georai

S. No	VILLAGE	TALUKA
47	Daithan	Georai
48	Antarvali Bk.	Georai
49	Gangawadi	Georai
50	Dhondrai	Georai
51	Umapur	Georai
52	Khalegaon	Georai
53	Dhumegaon	Georai
54	Ardhapimpri	Georai
55	Chaklamba	Georai
56	Mahandula	Georai
57	Hiwarwadi	Georai
58	Shekta	Georai
59	Pimpla	Georai
60	Bhat Antarwali	Georai
61	Bhojgaon	Georai
62	Kolher	Georai
63	Bagpimpalgaon	Georai
64	Pangulgaon	Georai
65	Thakar Adgaon	Georai
66	Bhatepuri	Georai
67	Georai (rural)	Georai
68	Itkur	Georai
69	Hirapur	Georai
70	Takalgaon	Georai
71	Khadki	Georai

S. No	VILLAGE	TALUKA
72	Kolgaon	Georai
73	Ukhadpimpri	Georai
74	Sakshal Pimpri	Georai
75	Fulsangvi	Georai
76	Jodwadi	Georai
77	Aher Vahegaon	Georai
78	Irgaon	Georai
79	Irgaon	Georai
80	Aurangpur Kukada	Georai
81	Adgaon	Georai
82	Ardhmasla	Georai
83	Digrass	Georai
84	Kherda Bk.	Georai
85	Takalgavhan Tarf Talkhed	Georai
86	Sindphana Chincholi	Georai
87	Kherda Bk.	Georai
88	Jategaon	Georai
89	Jategaon	Georai
90	Golegaon	Georai
91	Takarwan	Georai
92	Babultara	Georai
93	Tape Nimgaon	Georai
94	Malegaon Majra	Georai
95	Pokhari	Georai

S. No	VILLAGE	TALUKA
96	Ankota	Georai
97	Mategaon	Georai
98	Chaklamba	Georai
99	Surlegaon	Georai
100	Manyarwadi	Georai
101	Bhojgaon	Georai
102	Georai (rural)	Georai
103	Sirasdevi	Georai
104	Hiwarwadi	Georai
105	Adgaon	Georai
106	Digrass	Georai
107	Waghora	Manjlegaon
108	Sultanpur	Manjlegaon
109	Kalegaon Thadi	Manjlegaon
110	Surdi Najik	Manjlegaon
111	Kaudgaon Thadi	Manjlegaon
112	Talkhed	Manjlegaon
113	Jadid Jawala	Manjlegaon
114	Shahapur Majara	Manjlegaon
115	Mangrul	Manjlegaon
116	Mangrul	Manjlegaon
117	Renapuri	Manjlegaon
118	Phule Pimpalgaon	Manjlegaon
119	Sadola	Manjlegaon
120	Kesapuri	Manjlegaon

S. No	VILLAGE	TALUKA
121	Kedar Sangvi	Manjlegaon
122	Kedar Sangvi	Manjlegaon
123	Patrud	Manjlegaon
124	Nakhalgaon	Manjlegaon
125	Patrud	Manjlegaon
126	Longaon	Manjlegaon
127	Mogra	Manjlegaon
128	Sonna Thadi	Manjlegaon
129	Surumgaon	Manjlegaon
130	Abegaon	Manjlegaon
131	Manjrath	Manjlegaon
132	Manurwadi	Manjlegaon
133	Belura	Manjlegaon
134	Ekburjiwadi (n.v.)	Manjlegaon
135	Mogra	Manjlegaon
136	Shuklatirth Nimgaon	Manjlegaon
137	Telgaon Kh.	Manjlegaon
138	Salegaon	Manjlegaon
139	Mogra	Manjlegaon
140	Salegaon	Manjlegaon
141	Sarwar Pimpalgaon	Manjlegaon
142	Pokhari	Wadwani
143	Chinchola	Wadwani
144	Nitrud	Wadwani
145	Pimpalner	Bid

S. No	VILLAGE	TALUKA
146	Babhalwadi	Bid
147	Bedukwadi	Bid
148	Limbarui	Bid
149	Sandarwan	Bid
150	Maujyachiwadi	Bid
151	Dawargaon Bk.	Bid
152	Loni (shahajanpur)	Bid
153	Rajkapur	Bid
154	Kalegaon Haveli	Bid
155	Bramhagaon	Bid
156	Juj Gavhan	Bid
157	Nalwandi	Bid
158	Nalwandi	Bid
159	Nagpur Bk.	Bid
160	Aurangpur	Bid
161	Namalgaon	Bid
162	Pargaon Japti	Bid
163	Kamkheda	Bid
164	Pargaon Siras	Bid
165	Rajuri Bk.(navgan)	Bid
166	Rajuri Bk.(navgan)	Bid
167	Murshadpur (rajuri)	Bid
168	Limbarui	Bid
169	Umrad Jagir	Bid
170	Tippatwadi	Bid

S. No	VILLAGE	TALUKA
171	Tippatwadi	Bid
172	Shidode	Bid
173	BID	Bid
174	Bid (rural)	Bid
175	Antharvan Pimpri	Bid
176	Borkhed	Bid
177	Ghargaon	Bid
178	Pothra	Bid
179	Wadhavana	Bid
180	Lonighat	Bid
181	Neknoor	Bid
182	Khardewadi	Bid
183	Chaudaswadi	Bid
184	Safepur	Bid
185	Mulukwadi	Bid
186	Limba Ganesh	Bid
187	Mahajanwadi	Bid
188	Wangaon	Bid
189	Babhal Khunta	Bid
190	Bid (rural)	Bid
191	Pirachiwadi	Bid
192	Pali	Bid
193	Mandav Jali	Bid
194	Devla Bk.	Bid
195	Dhekan Moha	Bid

S. No	VILLAGE	TALUKA
196	Pali	Bid
197	Charahata	Bid
198	Hiwara Phadi	Bid
199	Sanapwadi	Bid
200	Somnathwadi	Bid
201	Bid (rural)	Bid
202	Shivni	Bid
203	Dhotra	Bid
204	Sangvi (s)	Kaij
205	Massajog	Kaij
206	Massajog	Kaij
207	Umri	Kaij
208	Kaij	Kaij
209	Pisegaon	Kaij
210	Bankaranja	Kaij
211	Kekat Sarni	Kaij
212	Hol	Kaij
213	Water Body	Kaij
214	Rameshwarwadi	Kaij
215	Dhotra	Kaij
216	Shirurghat	Kaij
217	Naholi	Kaij
218	Sarukwadi	Kaij
219	Yusuf Wadgaon	Kaij
220	Paithan	Kaij

S. No	VILLAGE	TALUKA
221	Dhanora	Kaij
222	Bhalgaon	Kaij
223	Mangwadgaon	Kaij
224	Daithana Radi	Ambejogai
225	Pus	Ambejogai
226	Mamdapur	Ambejogai
227	Saygaon	Ambejogai
228	Takli Deshmukh	Parli
229	Lonarwadi	Parli
230	Takli Acharya	Parli
231	Sirsala	Parli
232	Tandalwadi	Dharur
233	Undri	Dharur
234	Amla	Dharur
235	Kolpimpri	Dharur
236	Hingani Bk	Dharur
237	Kari	Dharur
238	Pimpalgaon Ghat	Ashti
239	Deulgaon Ghat	Ashti
240	Daulawadgaon	Ashti
241	Chinchewadi	Ashti
242	Bandkhel	Ashti
243	Ambewadi	Ashti
244	Shedala	Ashti
245	Underkhel	Ashti

S. No	VILLAGE	TALUKA
246	Gahukhel	Ashti
247	Karkhel Kh.	Ashti
248	Sumbhewadi	Ashti
249	Pimpla	Ashti
250	Khuntephal Pundi	Ashti
251	Pundi	Ashti
252	Kanadi Kh.	Ashti
253	Nimgaon Chaubha	Ashti
254	Kerul	Ashti
255	Sakhalwadi (n.v.)	Ashti
256	Shiral	Ashti
257	Dongargan	Ashti
258	Limbodi	Ashti
259	Dadegaon	Ashti
260	Kelsangvi	Ashti
261	Pimpri Ashti	Ashti
262	Chikhali	Ashti
263	Hanumantgaon	Ashti
264	Hajipur	Ashti
265	Walunj	Ashti
266	Balewadi	Ashti
267	Ashta	Ashti
268	Kasari	Ashti
269	ASHTI	Ashti
270	Hingni	Ashti

S. No	VILLAGE	TALUKA
271	Mandva	Ashti
272	Patan	Ashti
273	Beed-sangvi	Ashti
274	ASHTI	Ashti
275	Sabadkhed	Ashti
276	Dhamangaon	Ashti
277	Karkhel Bk.	Ashti
278	Surudi	Ashti
279	Sangvi Patan	Ashti
280	Dadegaon	Ashti
281	Deolali	Ashti
282	Ambejogai (rural)	Ambejogai
283	Jawalgaon	Ambejogai
284	Pimpri	Ambejogai
285	Umbrayachiwadi (n.v.)	Dharur
286	Asardhav	Dharur
287	Chichkhandi	Dharur
288	Hanumant Pimpri	Kaij
289	Ghalatwadi	Manjlegaon
290	Shimpetakli	Manjlegaon
291	Rajegaon	Manjlegaon
292	Surdi Najik	Manjlegaon
293	Manjrath	Manjlegaon
294	Manur	Manjlegaon
295	Mogra	Manjlegaon

S. No	VILLAGE	TALUKA
296	Jiwanpur	Manjlegaon
297	Ekburjiwadi (n.v.)	Manjlegaon
298	Patrud	Manjlegaon
299	Manjlegaon (rural)	Manjlegaon
300	Manurwadi	Manjlegaon
301	Sands Chincholi	Manjlegaon
302	Manjlegaon (rural)	Manjlegaon
303	Kaudgaon Sabla	Parli
304	Takli Acharya	Parli
305	Kauthali	Parli
306	Patoda	Patoda
307	Loni	Shirur (Kasar)
308	Warni	Shirur (Kasar)
309	Warni	Shirur (Kasar)
310	Vighanwadi	Shirur (Kasar)
311	Nagaryachiwadi (n.v.)	Shirur (Kasar)
312	Bawi	Shirur (Kasar)
313	Zapewadi	Shirur (Kasar)
314	Jamb	Shirur (Kasar)
315	Khalapuri	Shirur (Kasar)
316	Khokermoha	Shirur (Kasar)
317	Raimoha	Shirur (Kasar)
318	Raimoha	Shirur (Kasar)
319	Raimoha	Shirur (Kasar)
320	Vighanwadi	Shirur (Kasar)

S. No	VILLAGE	TALUKA
321	Dhangarwadi	Shirur (Kasar)
322	Aurangpur	Shirur (Kasar)
323	Ghugewadi	Shirur (Kasar)
324	Mahindrawadi (n.v.)	Shirur (Kasar)
325	Sonnakhota	Wadwani
326	Lonwal	Wadwani

Annexure VIIIIII: Location of Proposed Check Dams

S. No.	Village	Taluka
1	Ambejogai	AMBEJOGAI
2	Ambejogai	AMBEJOGAI
3	Ambejogai	AMBEJOGAI
4	Ambejogai	AMBEJOGAI
5	Ambejogai	AMBEJOGAI
6	Ambejogai	AMBEJOGAI
7	Ambejogai	AMBEJOGAI
8	Ambejogai	AMBEJOGAI
9	Ambejogai	AMBEJOGAI
10	Ambejogai	AMBEJOGAI
11	Ambejogai	AMBEJOGAI
12	Ambejogai	AMBEJOGAI
13	Ambejogai	AMBEJOGAI
14	Ambejogai	AMBEJOGAI
15	Ambejogai	AMBEJOGAI
16	Ambejogai	AMBEJOGAI
17	Ashti	ASHTI
18	Ashti	ASHTI
19	Ashti	ASHTI
20	Ashti	ASHTI
21	Ashti	ASHTI

S. No.	Village	Taluka
22	Ashti	ASHTI
23	Ashti	ASHTI
24	Ashti	ASHTI
25	Ashti	ASHTI
26	Ashti	ASHTI
27	Ashti	ASHTI
28	Ashti	ASHTI
29	Ashti	ASHTI
30	Ashti	ASHTI
31	Ashti	ASHTI
32	Ashti	ASHTI
33	Ashti	ASHTI
34	Ashti	ASHTI
35	Ashti	ASHTI
36	Ashti	ASHTI
37	Ashti	ASHTI
38	Ashti	ASHTI
39	Ashti	ASHTI
40	Ashti	ASHTI
41	Ashti	ASHTI
42	Ashti	ASHTI

S. No.	Village	Taluka
43	Ashti	ASHTI
44	Ashti	ASHTI
45	Ashti	ASHTI
46	Ashti	ASHTI
47	Ashti	ASHTI
48	Ashti	ASHTI
49	Ashti	ASHTI
50	Ashti	ASHTI
51	Ashti	ASHTI
52	Ashti	ASHTI
53	Ashti	ASHTI
54	Ashti	ASHTI
55	Ashti	ASHTI
56	Ashti	ASHTI
57	Ashti	ASHTI
58	Ashti	ASHTI
59	Ashti	ASHTI
60	Ashti	ASHTI
61	Ashti	ASHTI
62	Ashti	ASHTI
63	Ashti	ASHTI
64	Ashti	ASHTI
65	Ashti	ASHTI
66	Ashti	ASHTI
67	Ashti	ASHTI

S. No.	Village	Taluka
68	Ashti	ASHTI
69	Ashti	ASHTI
70	Ashti	ASHTI
71	Ashti	ASHTI
72	Ashti	ASHTI
73	Ashti	ASHTI
74	Ashti	ASHTI
75	Ashti	ASHTI
76	Ashti	ASHTI
77	Ashti	ASHTI
78	Ashti	ASHTI
79	Ashti	ASHTI
80	Ashti	ASHTI
81	Ashti	ASHTI
82	Ashti	ASHTI
83	Ashti	ASHTI
84	Ashti	ASHTI
85	Ashti	ASHTI
86	Ashti	ASHTI
87	Ashti	ASHTI
88	Ashti	ASHTI
89	Ashti	ASHTI
90	Ashti	ASHTI
91	Ashti	ASHTI
92	Ashti	ASHTI

S. No.	Village	Taluka
93	Ashti	ASHTI
94	Ashti	ASHTI
95	Ashti	ASHTI
96	Ashti	ASHTI
97	Ashti	ASHTI
98	Ashti	ASHTI
99	Ashti	ASHTI
100	Ashti	ASHTI
101	Ashti	ASHTI
102	Ashti	ASHTI
103	Ashti	ASHTI
104	Ashti	ASHTI
105	Ashti	ASHTI
106	Ashti	ASHTI
107	Ashti	ASHTI
108	Ashti	ASHTI
109	Ashti	ASHTI
110	Ashti	ASHTI
111	Ashti	ASHTI
112	Ashti	ASHTI
113	Ashti	ASHTI
114	Ashti	ASHTI
115	Ashti	ASHTI
116	Ashti	ASHTI
117	Ashti	ASHTI

S. No.	Village	Taluka
118	Ashti	ASHTI
119	Ashti	ASHTI
120	Ashti	ASHTI
121	Ashti	ASHTI
122	Ashti	ASHTI
123	Ashti	ASHTI
124	Ashti	ASHTI
125	Ashti	ASHTI
126	Ashti	ASHTI
127	Ashti	ASHTI
128	Patoda	PATODA
129	Patoda	PATODA
130	Patoda	PATODA
131	Patoda	PATODA
132	Patoda	PATODA
133	Patoda	PATODA
134	Patoda	PATODA
135	Patoda	PATODA
136	Patoda	PATODA
137	Patoda	PATODA
138	Patoda	PATODA
139	Patoda	PATODA
140	Patoda	PATODA
141	Patoda	PATODA
142	Patoda	PATODA

S. No.	Village	Taluka
143	Patoda	PATODA
144	Patoda	PATODA
145	Patoda	PATODA
146	Patoda	PATODA
147	Patoda	PATODA
148	Patoda	PATODA
149	Patoda	PATODA
150	Patoda	PATODA
151	Bid	BID
152	Bid	BID
153	Bid	BID
154	Bid	BID
155	Bid	BID
156	Bid	BID
157	Bid	BID
158	Bid	BID
159	Bid	BID
160	Bid	BID
161	Bid	BID
162	Bid	BID
163	Bid	BID
164	Bid	WADWANI
165	Bid	WADWANI
166	Bid	BID
167	Bid	BID

S. No.	Village	Taluka
168	Bid	BID
169	Bid	BID
170	Bid	BID
171	Bid	BID
172	Bid	BID
173	Bid	BID
174	Bid	BID
175	Bid	BID
176	Bid	BID
177	Bid	BID
178	Bid	BID
179	Bid	BID
180	Bid	BID
181	Bid	BID
182	Bid	BID
183	Bid	BID
184	Bid	BID
185	Bid	BID
186	Bid	BID
187	Bid	BID
188	Bid	BID
189	Bid	BID
190	Bid	BID
191	Bid	BID
192	Bid	BID

S. No.	Village	Taluka
193	Bid	BID
194	Bid	BID
195	Bid	BID
196	Bid	BID
197	Bid	BID
198	Bid	BID
199	Bid	BID
200	Bid	BID
201	Bid	BID
202	Bid	BID
203	Bid	BID
204	Bid	BID
205	Bid	BID
206	Bid	BID
207	Bid	BID
208	Bid	BID
209	Bid	BID
210	Bid	BID
211	Bid	BID
212	Bid	BID
213	Bid	BID
214	Bid	BID
215	Bid	BID
216	Bid	BID
217	Bid	BID

S. No.	Village	Taluka
218	Bid	BID
219	Bid	BID
220	Bid	BID
221	Bid	BID
222	Bid	BID
223	Bid	BID
224	Bid	BID
225	Bid	BID
226	Bid	BID
227	Bid	KAIJ
228	Bid	BID
229	Bid	KAIJ
230	Bid	KAIJ
231	Bid	BID
232	Bid	BID
233	Bid	BID
234	Bid	BID
235	Bid	BID
236	Bid	BID
237	Bid	BID
238	Bid	BID
239	Bid	BID
240	Bid	BID
241	Bid	BID
242	Bid	BID

S. No.	Village	Taluka
243	Bid	BID
244	Bid	BID
245	Bid	BID
246	Bid	BID
247	Bid	BID
248	Patoda	PATODA
249	Patoda	PATODA
250	Bid	BID
251	Bid	BID
252	Bid	BID
253	Bid	BID
254	Bid	BID
255	Bid	BID
256	Bid	BID
257	Bid	BID
258	Bid	BID
259	Bid	BID
260	Bid	BID
261	Bid	BID
262	Bid	BID
263	Bid	BID
264	Bid	BID
265	Bid	BID
266	Bid	BID
267	Bid	KAIJ

S. No.	Village	Taluka
268	Bid	BID
269	Bid	BID
270	Bid	BID
271	Bid	BID
272	Bid	BID
273	Bid	BID
274	Bid	BID
275	Bid	WADWANI
276	Bid	WADWANI
277	Bid	BID
278	Bid	BID
279	Bid	BID
280	Bid	BID
281	Bid	BID
282	Bid	WADWANI
283	Bid	WADWANI
284	Bid	BID
285	Bid	BID
286	Bid	KAIJ
287	Bid	BID
288	Bid	KAIJ
289	Bid	KAIJ
290	Bid	BID
291	Bid	BID
292	Bid	BID

S. No.	Village	Taluka
293	Bid	BID
294	Bid	BID
295	Bid	BID
296	Bid	BID
297	Bid	BID
298	Bid	BID
299	Bid	BID
300	Bid	BID
301	Bid	BID
302	Bid	KAIJ
303	Bid	BID
304	Bid	BID
305	Bid	BID
306	Bid	BID
307	Bid	BID
308	Bid	BID
309	Bid	BID
310	Bid	BID
311	Bid	BID
312	Bid	BID
313	Bid	BID
314	Bid	WADWANI
315	Bid	WADWANI
316	Bid	BID
317	Kaij	KAIJ

S. No.	Village	Taluka
318	Kaij	KAIJ
319	Kaij	KAIJ
320	Kaij	KAIJ
321	Kaij	DHARUR
322	Kaij	KAIJ
323	Kaij	KAIJ
324	Kaij	KAIJ
325	Kaij	KAIJ
326	Kaij	KAIJ
327	Kaij	KAIJ
328	Kaij	KAIJ
329	Kaij	KAIJ
330	Kaij	KAIJ
331	Kaij	KAIJ
332	Kaij	KAIJ
333	Kaij	KAIJ
334	Kaij	KAIJ
335	Kaij	KAIJ
336	Kaij	KAIJ
337	Kaij	KAIJ
338	Kaij	KAIJ
339	Kaij	KAIJ
340	Kaij	KAIJ
341	Kaij	KAIJ
342	Kaij	KAIJ

S. No.	Village	Taluka
343	Kaij	KAIJ
344	Kaij	KAIJ
345	Kaij	KAIJ
346	Kaij	KAIJ
347	Kaij	KAIJ
348	Kaij	KAIJ
349	Kaij	KAIJ
350	Kaij	KAIJ
351	Kaij	KAIJ
352	Kaij	KAIJ
353	Kaij	KAIJ
354	Kaij	KAIJ
355	Kaij	KAIJ
356	Kaij	KAIJ
357	Kaij	KAIJ
358	Kaij	KAIJ
359	Kaij	KAIJ
360	Kaij	KAIJ
361	Kaij	KAIJ
362	Kaij	KAIJ
363	Kaij	KAIJ
364	Kaij	KAIJ
365	Kaij	AMBEJOGAI
366	Kaij	AMBEJOGAI
367	Kaij	AMBEJOGAI

S. No.	Village	Taluka
368	Kaij	AMBEJOGAI
369	Kaij	AMBEJOGAI
370	Kaij	KAIJ
371	Kaij	KAIJ
372	Kaij	KAIJ
373	Kaij	KAIJ
374	Kaij	KAIJ
375	Kaij	KAIJ
376	Kaij	KAIJ
377	Kaij	KAIJ
378	Dharur	DHARUR
379	Dharur	DHARUR
380	Dharur	DHARUR
381	Dharur	KAIJ
382	Dharur	DHARUR
383	Dharur	DHARUR
384	Dharur	DHARUR
385	Dharur	DHARUR
386	Dharur	DHARUR
387	Dharur	DHARUR
388	Dharur	WADWANI
389	Dharur	DHARUR
390	Dharur	DHARUR
391	Dharur	DHARUR
392	Dharur	DHARUR

S. No.	Village	Taluka
393	Manjlegaon	MANJLEGAON
394	Manjlegaon	MANJLEGAON
395	Manjlegaon	MANJLEGAON
396	Manjlegaon	MANJLEGAON
397	Manjlegaon	MANJLEGAON
398	Manjlegaon	MANJLEGAON
399	Manjlegaon	MANJLEGAON
400	Manjlegaon	MANJLEGAON
401	Manjlegaon	MANJLEGAON
402	Manjlegaon	MANJLEGAON
403	Manjlegaon	MANJLEGAON
404	Manjlegaon	MANJLEGAON
405	Manjlegaon	MANJLEGAON
406	Manjlegaon	MANJLEGAON
407	Manjlegaon	MANJLEGAON
408	Manjlegaon	MANJLEGAON
409	Manjlegaon	MANJLEGAON
410	Manjlegaon	MANJLEGAON
411	Manjlegaon	MANJLEGAON
412	Manjlegaon	MANJLEGAON
413	Manjlegaon	MANJLEGAON
414	Manjlegaon	MANJLEGAON
415	Manjlegaon	MANJLEGAON
416	Manjlegaon	MANJLEGAON
417	Manjlegaon	MANJLEGAON

S. No.	Village	Taluka
418	Manjlegaon	MANJLEGAON
419	Manjlegaon	MANJLEGAON
420	Manjlegaon	MANJLEGAON
421	Manjlegaon	MANJLEGAON
422	Manjlegaon	MANJLEGAON
423	Manjlegaon	MANJLEGAON
424	Manjlegaon	MANJLEGAON
425	Manjlegaon	MANJLEGAON
426	Manjlegaon	MANJLEGAON
427	Manjlegaon	MANJLEGAON
428	Manjlegaon	MANJLEGAON
429	Manjlegaon	MANJLEGAON
430	Manjlegaon	MANJLEGAON
431	Manjlegaon	MANJLEGAON
432	Manjlegaon	MANJLEGAON
433	Manjlegaon	MANJLEGAON
434	Manjlegaon	MANJLEGAON
435	Manjlegaon	MANJLEGAON
436	Manjlegaon	MANJLEGAON
437	Manjlegaon	MANJLEGAON
438	Manjlegaon	MANJLEGAON
439	Manjlegaon	MANJLEGAON
440	Manjlegaon	MANJLEGAON
441	Manjlegaon	MANJLEGAON
442	Manjlegaon	MANJLEGAON

S. No.	Village	Taluka
443	Manjlegaon	MANJLEGAON
444	Manjlegaon	MANJLEGAON
445	Manjlegaon	MANJLEGAON
446	Manjlegaon	MANJLEGAON
447	Manjlegaon	MANJLEGAON
448	Manjlegaon	MANJLEGAON
449	Manjlegaon	MANJLEGAON
450	Manjlegaon	MANJLEGAON
451	Manjlegaon	MANJLEGAON
452	Manjlegaon	MANJLEGAON
453	Manjlegaon	MANJLEGAON
454	Manjlegaon	MANJLEGAON
455	Manjlegaon	MANJLEGAON
456	Manjlegaon	PARLI
457	Manjlegaon	MANJLEGAON
458	Manjlegaon	MANJLEGAON
459	Manjlegaon	MANJLEGAON
460	Manjlegaon	MANJLEGAON
461	Manjlegaon	MANJLEGAON
462	Manjlegaon	MANJLEGAON
463	Manjlegaon	MANJLEGAON
464	Manjlegaon	MANJLEGAON
465	Manjlegaon	MANJLEGAON
466	Manjlegaon	MANJLEGAON
467	Manjlegaon	MANJLEGAON

S. No.	Village	Taluka
468	Manjlegaon	MANJLEGAON
469	Manjlegaon	MANJLEGAON
470	Manjlegaon	MANJLEGAON
471	Manjlegaon	MANJLEGAON
472	Manjlegaon	MANJLEGAON
473	Manjlegaon	MANJLEGAON
474	Manjlegaon	MANJLEGAON
475	Manjlegaon	MANJLEGAON
476	Manjlegaon	MANJLEGAON
477	Manjlegaon	MANJLEGAON
478	Manjlegaon	MANJLEGAON
479	Manjlegaon	MANJLEGAON
480	Manjlegaon	MANJLEGAON
481	Manjlegaon	MANJLEGAON
482	Manjlegaon	MANJLEGAON
483	Manjlegaon	MANJLEGAON
484	Manjlegaon	MANJLEGAON
485	Manjlegaon	MANJLEGAON
486	Manjlegaon	MANJLEGAON
487	Manjlegaon	MANJLEGAON
488	Parli	PARLI
489	Parli	PARLI
490	Parli	PARLI
491	Parli	PARLI
492	Parli	PARLI

S. No.	Village	Taluka
493	Parli	PARLI
494	Parli	PARLI
495	Parli	PARLI
496	Parli	PARLI
497	Parli	PARLI
498	Parli	PARLI
499	Parli	PARLI
500	Parli	PARLI
501	Parli	PARLI
502	Parli	PARLI
503	Parli	PARLI
504	Parli	PARLI
505	Parli	PARLI
506	Wadwani	WADWANI
507	Wadwani	WADWANI
508	Wadwani	WADWANI
509	Wadwani	WADWANI
510	Wadwani	WADWANI
511	Wadwani	WADWANI
512	Wadwani	WADWANI
513	Wadwani	WADWANI
514	Wadwani	WADWANI
515	Wadwani	WADWANI
516	Wadwani	WADWANI
517	Wadwani	WADWANI

S. No.	Village	Taluka
518	Shirur (Kasar)	SHIRUR (KASAR)
519	Shirur (Kasar)	SHIRUR (KASAR)
520	Shirur (Kasar)	SHIRUR (KASAR)
521	Shirur (Kasar)	SHIRUR (KASAR)
522	Shirur (Kasar)	SHIRUR (KASAR)
523	Shirur (Kasar)	PATODA
524	Shirur (Kasar)	PATODA
525	Shirur (Kasar)	PATODA
526	Shirur (Kasar)	SHIRUR (KASAR)
527	Shirur (Kasar)	SHIRUR (KASAR)
528	Shirur (Kasar)	SHIRUR (KASAR)
529	Shirur (Kasar)	SHIRUR (KASAR)
530	Shirur (Kasar)	SHIRUR (KASAR)
531	Shirur (Kasar)	SHIRUR (KASAR)
532	Shirur (Kasar)	SHIRUR (KASAR)
533	Shirur (Kasar)	SHIRUR (KASAR)
534	Shirur (Kasar)	SHIRUR (KASAR)
535	Shirur (Kasar)	SHIRUR (KASAR)
536	Shirur (Kasar)	SHIRUR (KASAR)
537	Shirur (Kasar)	SHIRUR (KASAR)
538	Shirur (Kasar)	SHIRUR (KASAR)
539	Shirur (Kasar)	SHIRUR (KASAR)
540	Shirur (Kasar)	SHIRUR (KASAR)
541	Shirur (Kasar)	SHIRUR (KASAR)
542	Shirur (Kasar)	SHIRUR (KASAR)

S. No.	Village	Taluka
543	Shirur (Kasar)	SHIRUR (KASAR)
544	Shirur (Kasar)	SHIRUR (KASAR)
545	Shirur (Kasar)	BID
546	Shirur (Kasar)	SHIRUR (KASAR)
547	Shirur (Kasar)	SHIRUR (KASAR)
548	Shirur (Kasar)	SHIRUR (KASAR)
549	Shirur (Kasar)	SHIRUR (KASAR)
550	Shirur (Kasar)	SHIRUR (KASAR)
551	Shirur (Kasar)	SHIRUR (KASAR)
552	Shirur (Kasar)	SHIRUR (KASAR)
553	Shirur (Kasar)	SHIRUR (KASAR)
554	Shirur (Kasar)	SHIRUR (KASAR)
555	Shirur (Kasar)	SHIRUR (KASAR)
556	Shirur (Kasar)	SHIRUR (KASAR)
557	Shirur (Kasar)	SHIRUR (KASAR)
558	Shirur (Kasar)	SHIRUR (KASAR)
559	Shirur (Kasar)	SHIRUR (KASAR)
560	Shirur (Kasar)	SHIRUR (KASAR)
561	Shirur (Kasar)	SHIRUR (KASAR)
562	Shirur (Kasar)	SHIRUR (KASAR)
563	Shirur (Kasar)	SHIRUR (KASAR)
564	Shirur (Kasar)	SHIRUR (KASAR)
565	Shirur (Kasar)	SHIRUR (KASAR)
566	Shirur (Kasar)	SHIRUR (KASAR)
567	Shirur (Kasar)	SHIRUR (KASAR)

S. No.	Village	Taluka
568	Shirur (Kasar)	SHIRUR (KASAR)
569	Shirur (Kasar)	BID
570	Shirur (Kasar)	SHIRUR (KASAR)
571	Shirur (Kasar)	SHIRUR (KASAR)
572	Shirur (Kasar)	SHIRUR (KASAR)
573	Shirur (Kasar)	SHIRUR (KASAR)
574	Shirur (Kasar)	SHIRUR (KASAR)
575	Shirur (Kasar)	SHIRUR (KASAR)
576	Shirur (Kasar)	SHIRUR (KASAR)
577	Shirur (Kasar)	SHIRUR (KASAR)
578	Shirur (Kasar)	SHIRUR (KASAR)
579	Shirur (Kasar)	SHIRUR (KASAR)
580	Shirur (Kasar)	SHIRUR (KASAR)
581	Shirur (Kasar)	SHIRUR (KASAR)
582	Shirur (Kasar)	SHIRUR (KASAR)
583	Shirur (Kasar)	SHIRUR (KASAR)
584	Shirur (Kasar)	SHIRUR (KASAR)
585	Shirur (Kasar)	SHIRUR (KASAR)
586	Shirur (Kasar)	SHIRUR (KASAR)
587	Shirur (Kasar)	SHIRUR (KASAR)
588	Shirur (Kasar)	SHIRUR (KASAR)
589	Shirur (Kasar)	SHIRUR (KASAR)
590	Shirur (Kasar)	SHIRUR (KASAR)
591	Shirur (Kasar)	SHIRUR (KASAR)
592	Shirur (Kasar)	SHIRUR (KASAR)

S. No.	Village	Taluka
593	Shirur (Kasar)	SHIRUR (KASAR)
594	Shirur (Kasar)	SHIRUR (KASAR)
595	Shirur (Kasar)	SHIRUR (KASAR)
596	Shirur (Kasar)	SHIRUR (KASAR)
597	Shirur (Kasar)	SHIRUR (KASAR)
598	Shirur (Kasar)	SHIRUR (KASAR)
599	Shirur (Kasar)	SHIRUR (KASAR)
600	Shirur (Kasar)	SHIRUR (KASAR)
601	Shirur (Kasar)	SHIRUR (KASAR)
602	Shirur (Kasar)	SHIRUR (KASAR)
603	Shirur (Kasar)	SHIRUR (KASAR)
604	Shirur (Kasar)	SHIRUR (KASAR)
605	Shirur (Kasar)	SHIRUR (KASAR)
606	Shirur (Kasar)	SHIRUR (KASAR)
607	Shirur (Kasar)	SHIRUR (KASAR)
608	Shirur (Kasar)	SHIRUR (KASAR)
609	Shirur (Kasar)	SHIRUR (KASAR)
610	Shirur (Kasar)	SHIRUR (KASAR)
611	Shirur (Kasar)	SHIRUR (KASAR)
612	Shirur (Kasar)	SHIRUR (KASAR)
613	Shirur (Kasar)	SHIRUR (KASAR)
614	Shirur (Kasar)	SHIRUR (KASAR)
615	Shirur (Kasar)	SHIRUR (KASAR)
616	Georai	GEORAI
617	Georai	GEORAI

S. No.	Village	Taluka
618	Georai	GEORAI
619	Georai	GEORAI
620	Georai	GEORAI
621	Georai	GEORAI
622	Georai	GEORAI
623	Georai	GEORAI
624	Georai	GEORAI
625	Georai	GEORAI
626	Georai	GEORAI
627	Georai	GEORAI
628	Georai	GEORAI
629	Georai	GEORAI
630	Georai	GEORAI
631	Georai	GEORAI
632	Georai	GEORAI
633	Georai	GEORAI
634	Georai	GEORAI
635	Georai	GEORAI
636	Georai	GEORAI
637	Georai	GEORAI
638	Georai	GEORAI
639	Georai	SHIRUR (KASAR)
640	Georai	GEORAI
641	Georai	GEORAI
642	Georai	GEORAI

S. No.	Village	Taluka
643	Georai	GEORAI
644	Georai	GEORAI
645	Georai	GEORAI
646	Georai	GEORAI
647	Georai	GEORAI
648	Georai	GEORAI
649	Georai	GEORAI
650	Georai	GEORAI
651	Georai	GEORAI
652	Georai	GEORAI
653	Georai	GEORAI
654	Georai	GEORAI
655	Georai	GEORAI
656	Georai	GEORAI
657	Georai	GEORAI
658	Georai	GEORAI
659	Georai	GEORAI
660	Georai	GEORAI
661	Georai	GEORAI
662	Georai	GEORAI
663	Georai	GEORAI
664	Georai	GEORAI
665	Georai	GEORAI
666	Georai	GEORAI
667	Georai	GEORAI

S. No.	Village	Taluka
668	Georai	GEORAI
669	Georai	GEORAI
670	Georai	GEORAI
671	Georai	GEORAI
672	Georai	GEORAI
673	Georai	GEORAI
674	Georai	SHIRUR (KASAR)
675	Georai	GEORAI
676	Georai	GEORAI
677	Georai	GEORAI
678	Georai	GEORAI
679	Georai	SHIRUR (KASAR)
680	Georai	GEORAI
681	Georai	GEORAI
682	Georai	GEORAI
683	Georai	GEORAI
684	Georai	GEORAI
685	Georai	GEORAI
686	Georai	GEORAI
687	Georai	GEORAI
688	Georai	GEORAI
689	Georai	GEORAI
690	Georai	GEORAI
691	Georai	GEORAI
692	Georai	GEORAI

S. No.	Village	Taluka
693	Georai	GEORAI
694	Georai	GEORAI
695	Georai	GEORAI
696	Georai	GEORAI
697	Georai	GEORAI
698	Georai	GEORAI
699	Georai	GEORAI
700	Georai	GEORAI
701	Georai	GEORAI
702	Georai	GEORAI
703	Georai	GEORAI
704	Georai	GEORAI
705	Georai	GEORAI
706	Georai	GEORAI
707	Georai	GEORAI
708	Georai	GEORAI
709	Georai	GEORAI
710	Georai	GEORAI
711	Georai	GEORAI
712	Georai	GEORAI
713	Georai	GEORAI
714	Georai	GEORAI
715	Georai	GEORAI
716	Georai	GEORAI
717	Georai	GEORAI

S. No.	Village	Taluka
718	Georai	MANJLEGAON
719	Georai	GEORAI
720	Georai	GEORAI
721	Georai	GEORAI
722	Georai	GEORAI
723	Georai	GEORAI
724	Georai	GEORAI
725	Georai	GEORAI
726	Georai	GEORAI
727	Georai	GEORAI
728	Georai	GEORAI
729	Georai	GEORAI
730	Georai	GEORAI
731	Georai	GEORAI
732	Georai	GEORAI
733	Georai	GEORAI
734	Georai	GEORAI
735	Georai	GEORAI
736	Georai	GEORAI
737	Georai	GEORAI
738	Georai	GEORAI
739	Georai	GEORAI
740	Georai	GEORAI
741	Georai	GEORAI
742	Georai	GEORAI

S. No.	Village	Taluka
743	Georai	GEORAI
744	Georai	GEORAI
745	Georai	GEORAI
746	Georai	GEORAI
747	Georai	GEORAI
748	Georai	GEORAI
749	Georai	GEORAI
750	Georai	GEORAI
751	Georai	GEORAI
752	Georai	GEORAI
753	Georai	GEORAI
754	Georai	GEORAI
755	Georai	GEORAI
756	Georai	GEORAI
757	Georai	GEORAI
758	Georai	GEORAI
759	Georai	GEORAI
760	Georai	GEORAI
761	Georai	GEORAI
762	Georai	GEORAI
763	Georai	GEORAI
764	Georai	GEORAI
765	Georai	GEORAI
766	Georai	GEORAI
767	Georai	MANJLEGAON

S. No.	Village	Taluka
768	Georai	BID
769	Georai	GEORAI
770	Georai	BID
771	Georai	GEORAI
772	Georai	GEORAI
773	Georai	GEORAI
774	Georai	GEORAI
775	Georai	GEORAI
776	Georai	GEORAI
777	Georai	GEORAI
778	Georai	GEORAI
779	Georai	GEORAI
780	Georai	GEORAI
781	Georai	GEORAI
782	Georai	GEORAI
783	Georai	GEORAI
784	Georai	GEORAI
785	Georai	GEORAI
786	Georai	BID
787	Georai	GEORAI
788	Georai	GEORAI
789	Georai	GEORAI
790	Georai	GEORAI
791	Georai	GEORAI
792	Georai	GEORAI

S. No.	Village	Taluka
793	Georai	GEORAI
794	Georai	BID
795	Georai	GEORAI
796	Georai	GEORAI
797	Georai	GEORAI
798	Georai	GEORAI
799	Georai	GEORAI
800	Georai	GEORAI
801	Georai	SHIRUR (KASAR)
802	Georai	GEORAI
803	Georai	GEORAI
804	Georai	GEORAI
805	Georai	GEORAI
806	Georai	GEORAI
807	Georai	GEORAI
808	Georai	GEORAI
809	Georai	GEORAI
810	Georai	GEORAI
811	Georai	GEORAI
812	Georai	GEORAI
813	Georai	GEORAI
814	Ashti	ASHTI
815	Ashti	ASHTI
816	Ashti	ASHTI
817	Ashti	ASHTI

S. No.	Village	Taluka
818	Ashti	ASHTI
819	Ashti	ASHTI
820	Ashti	ASHTI
821	Ashti	ASHTI
822	Ashti	ASHTI
823	Ashti	ASHTI
824	Ashti	ASHTI
825	Ambejogai	AMBEJOGAI
826	Ambejogai	AMBEJOGAI
827	Ambejogai	AMBEJOGAI
828	Dharur	DHARUR
829	Dharur	DHARUR
830	Dharur	WADWANI
831	Dharur	WADWANI
832	Dharur	WADWANI
833	Dharur	WADWANI
834	Dharur	DHARUR
835	Dharur	DHARUR
836	Dharur	WADWANI
837	Dharur	WADWANI
838	Georai	GEORAI
839	Georai	GEORAI
840	Georai	GEORAI
841	Georai	GEORAI
842	Georai	GEORAI

S. No.	Village	Taluka
843	Georai	GEORAI
844	Georai	GEORAI
845	Manjlegaon	WADWANI
846	Manjlegaon	MANJLEGAON
847	Manjlegaon	MANJLEGAON
848	Manjlegaon	MANJLEGAON
849	Manjlegaon	MANJLEGAON
850	Manjlegaon	MANJLEGAON
851	Manjlegaon	MANJLEGAON
852	Manjlegaon	MANJLEGAON
853	Manjlegaon	MANJLEGAON
854	Manjlegaon	MANJLEGAON
855	Manjlegaon	MANJLEGAON
856	Manjlegaon	MANJLEGAON
857	Manjlegaon	MANJLEGAON
858	Manjlegaon	MANJLEGAON
859	Manjlegaon	MANJLEGAON
860	Manjlegaon	MANJLEGAON
861	Manjlegaon	MANJLEGAON
862	Manjlegaon	MANJLEGAON
863	Manjlegaon	MANJLEGAON
864	Manjlegaon	MANJLEGAON
865	Manjlegaon	MANJLEGAON
866	Manjlegaon	MANJLEGAON
867	Manjlegaon	MANJLEGAON

S. No.	Village	Taluka
868	Manjlegaon	MANJLEGAON
869	Manjlegaon	MANJLEGAON
870	Manjlegaon	MANJLEGAON
871	Manjlegaon	MANJLEGAON
872	Manjlegaon	MANJLEGAON
873	Manjlegaon	MANJLEGAON
874	Manjlegaon	MANJLEGAON
875	Manjlegaon	MANJLEGAON
876	Manjlegaon	MANJLEGAON
877	Manjlegaon	MANJLEGAON
878	Manjlegaon	MANJLEGAON
879	Manjlegaon	MANJLEGAON
880	Manjlegaon	MANJLEGAON
881	Manjlegaon	MANJLEGAON
882	Manjlegaon	MANJLEGAON
883	Manjlegaon	MANJLEGAON
884	Manjlegaon	MANJLEGAON
885	Manjlegaon	MANJLEGAON
886	Manjlegaon	MANJLEGAON
887	Manjlegaon	MANJLEGAON
888	Manjlegaon	MANJLEGAON
889	Manjlegaon	MANJLEGAON
890	Manjlegaon	MANJLEGAON
891	Manjlegaon	MANJLEGAON
892	Manjlegaon	MANJLEGAON

S. No.	Village	Taluka
893	Manjlegaon	MANJLEGAON
894	Parli	DHARUR
895	Shirur (Kasar)	SHIRUR (KASAR)
896	Shirur (Kasar)	SHIRUR (KASAR)
897	Shirur (Kasar)	SHIRUR (KASAR)
898	Shirur (Kasar)	SHIRUR (KASAR)
899	Shirur (Kasar)	SHIRUR (KASAR)
900	Shirur (Kasar)	SHIRUR (KASAR)
901	Shirur (Kasar)	SHIRUR (KASAR)
902	Shirur (Kasar)	SHIRUR (KASAR)
903	Shirur (Kasar)	SHIRUR (KASAR)
904	Shirur (Kasar)	SHIRUR (KASAR)
905	Shirur (Kasar)	PATODA
906	Shirur (Kasar)	SHIRUR (KASAR)
907	Shirur (Kasar)	SHIRUR (KASAR)
908	Shirur (Kasar)	SHIRUR (KASAR)
909	Shirur (Kasar)	SHIRUR (KASAR)
910	Shirur (Kasar)	SHIRUR (KASAR)
911	Shirur (Kasar)	SHIRUR (KASAR)
912	Shirur (Kasar)	SHIRUR (KASAR)
913	Shirur (Kasar)	SHIRUR (KASAR)
914	Shirur (Kasar)	SHIRUR (KASAR)
915	Shirur (Kasar)	SHIRUR (KASAR)

S. No.	Village	Taluka
916	Shirur (Kasar)	SHIRUR (KASAR)
917	Shirur (Kasar)	SHIRUR (KASAR)
918	Shirur (Kasar)	SHIRUR (KASAR)
919	Shirur (Kasar)	SHIRUR (KASAR)
920	Shirur (Kasar)	SHIRUR (KASAR)
921	Shirur (Kasar)	SHIRUR (KASAR)
922	Shirur (Kasar)	SHIRUR (KASAR)
923	Shirur (Kasar)	SHIRUR (KASAR)
924	Shirur (Kasar)	SHIRUR (KASAR)
925	Shirur (Kasar)	SHIRUR (KASAR)
926	Shirur (Kasar)	SHIRUR (KASAR)
927	Shirur (Kasar)	SHIRUR (KASAR)
928	Shirur (Kasar)	SHIRUR (KASAR)
929	Shirur (Kasar)	SHIRUR (KASAR)
930	Shirur (Kasar)	SHIRUR (KASAR)
931	Shirur (Kasar)	SHIRUR (KASAR)
932	Shirur (Kasar)	SHIRUR (KASAR)
933	Shirur (Kasar)	SHIRUR (KASAR)
934	Shirur (Kasar)	SHIRUR (KASAR)
935	Shirur (Kasar)	SHIRUR (KASAR)
936	Shirur (Kasar)	SHIRUR (KASAR)
937	Wadwani	WADWANI
938	Wadwani	WADWANI