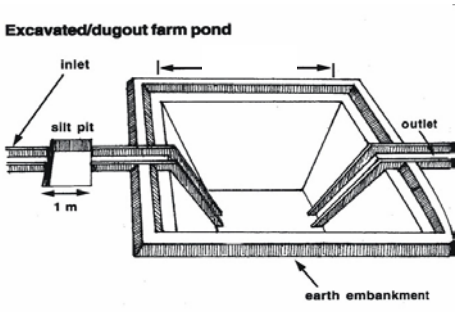
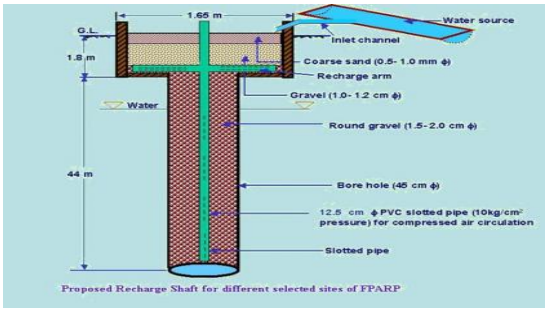
CENTRAL GROUND WATER BOARD

MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF JAHAZPUR BLOCK, DISTRICT BHILWARA, RAJASTHAN

Western Region, Jaipur
April 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF JAHAZPUR BLOCK, DISTRICT BHILWARA

Plan at a Glance

1.	**Area of the Jahazpur Block**	**1089.70 sq. km.**
2.	**Area identified for Artificial Recharge**	**865.87 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**46.5904 MCM**
	Annual Ground Water Draft	**61.8033 MCM**
	Stage of Ground Water Development	**132.65%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge** **Volume of water available for conservation by other interventions**	**20.6721 MCM** **9.007 MCM** **11.62 MCM**
5.	**Volume of unsaturated aquifer zone available for recharge**	**25.846 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tank **Water Conservation** Farm pond	 **114 shafts in 67 Nos. of existing village ponds** **28** **232 Nos.**
	Expected Annual GW recharge	**6.305 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**8.13 MCM**
	Total recharge/ saving of ground water	**14.435 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Water conservation measures Piezometer construction Operation and maintenance	**39.421 crore** 14.164 crore 23.20 crore 0.18 crore 1.877 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF JAHAZPUR BLOCK, DISTRICT BHILWARA

INTRODUCTION

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

The **Jahazpur Block, district Bhilwara** is one of the over exploited blocks of Rajasthan and is under severe stress, as evident from the stage of ground water development, which has attained an alarming level of **132.65%.** In view of over exploitation of ground water resources in the block, ground water resources in the area are under continuous depletion. Thus there is urgent need for taking up suitable water management interventions based on integrated approach, which on one hand includes augmentation of ground water resources through appropriate techniques, and on the other hand requires the adoption of suitable water conservation measures, such as ensuring water use efficiency through creation of additional water storage facility, maintenance/ renovation of existing water bodies etc. Water awareness and capacity building of the stakeholders are also the important attributes of water management interventions as envisaged in the National Water Policy.

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

As per directions of Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India and in pursuance to letter no 16-24/M(SML)/CGWB/ARP- OE Blocks/2015-6957, dated 13.7.2015 & 3.8.2015 & letter no 39(43)/TC/CHN/CGWB/2015-7929,dated 4.9.2015 from Central Headquarters, Central Ground Water Board, **the preparation of Artificial Recharge and Rainwater harvesting Plan for the Over exploited blocks in the State of Rajasthan has been taken up** on priority by the Western Region, Central Ground Water Board, Jaipur. Each Plan discusses the broad framework of ground water situation in the block, status of water availability (both surface and ground water), identification of feasible areas for interventions, feasibility of artificial recharge and other water conservation structures,

their design considerations, numbers and cost estimates. The expected outcomes of the proposed interventions have also been elucidated in the report

The GIS layers used in the Plan include administrative (upto village level), Hydrogeology, Depth to Water level (pre and post monsoon), geomorphic, drainage, water bodies and the map of tentative locations of proposed interventions.

Methodology:

As per Ground Water Department, Government of Rajasthan direction the basin wise availability of surplus run off is calculated after taking into account 75 % dependability on the rain water for all uses. In furtherance, the sub basins with surplus run off available for recharge were taken into consideration. The block area falling in particular sub basin was taken into account and a proportionate area of the sub-basin draining the block was calculated. Based on this area of sub-basin draining the block, proportionate surplus run off, in the block by the sub basin, for recharge was calculated. Thus was calculated the final amount of surplus run off available for recharge in particular block by one particular sub-basin. The available run off was considered for Recharge through Recharge Shaft (@ 0.03 MCM) and Percolation tank (@ 0.2 MCM). If after allocating water for Recharge through Recharge Shaft, large amount of surface run off was left then the Water conservation through Farm Ponds, along with recharge through Percolation Tanks, was also taken into account. Besides the available run off the Average Water Level for the time span of ten years (Nov., 2005 to Nov. 2014) and the Decadal Water Level trend (Nov., 2005 to Nov. 2014) were also taken into account. The blocks showing average water level more than 5 m bgl and declining water level trend were considered suitable for Artificial Recharge Plan.

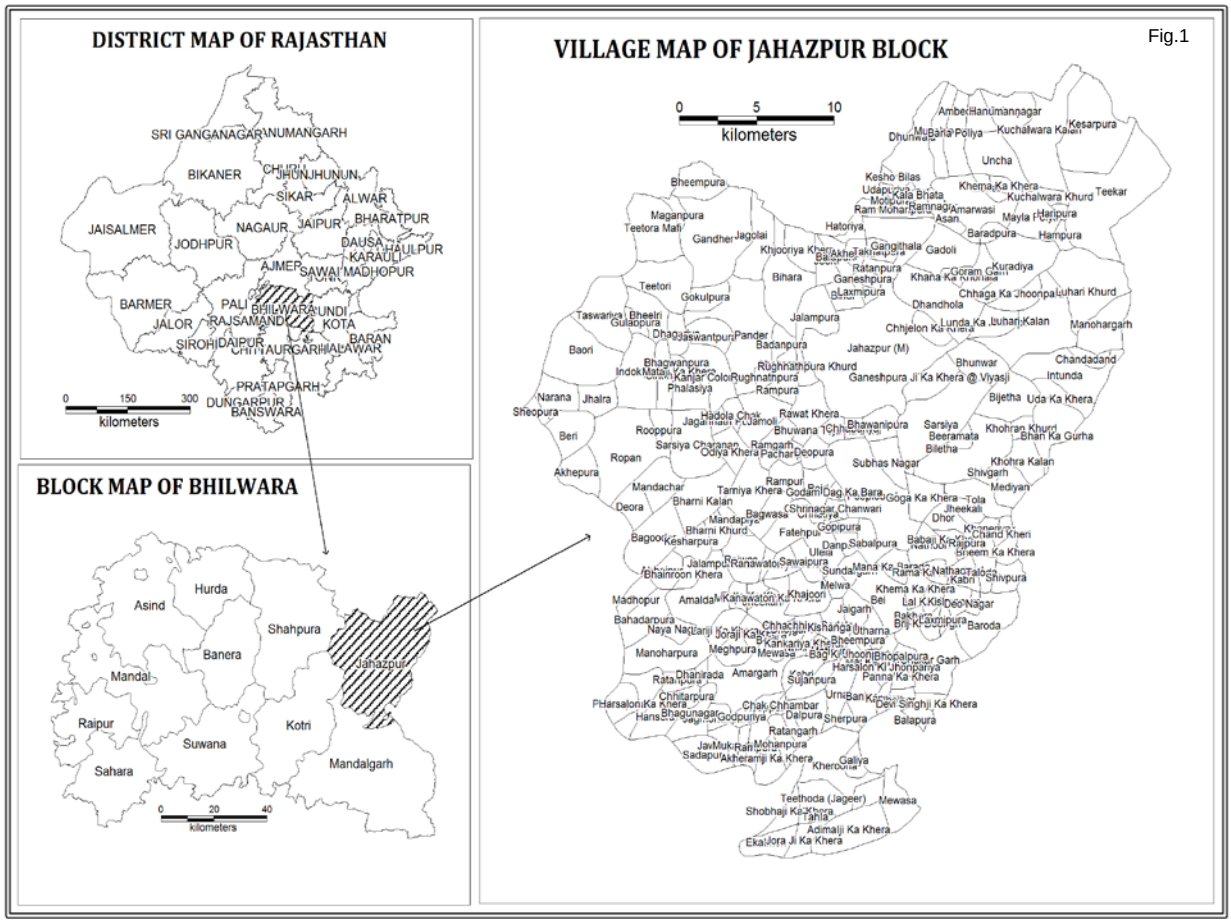
Location of the block

Jahazpur Block of Bhilwara district falls under Over-Exploited category. It covers an area of 1089.70 Sq.Km. and falls in eastern part of Bhilwara district. It is located between North latitudes 25°21’ & 25°47’ and East longitudes 75°03’ & 75°28’. The total rural population of the Block is 196872 persons as per the 2011 census. It is comprised of 101350 males and 95532 females. Location map is shown in fig 1.

Source wise Irrigated Area

Out of total area of 1089.70 sq. km., an area of 142.96 (13.12%) falls under irrigation. The dug wells/ Tubewells are the main source of irrigation in Jahazpur Block. An area of 0.66 sq.km. falls under canal irrigation and an area of 21.91 sq.km. is irrigated through ponds. The wells irrigate area totaling to 119.58 sq.km. in the Block.

Fig: 1



Physiography & Drainage

Physiographically, the block is characterized by presence of buried pediments and intermontane valley of denudation origin. The minimum and maximum elevation of Block is 304.8 m and 528.3 m, respectively. The map showing various geomorphic units is presented in **fig 2**.

Fig: 2

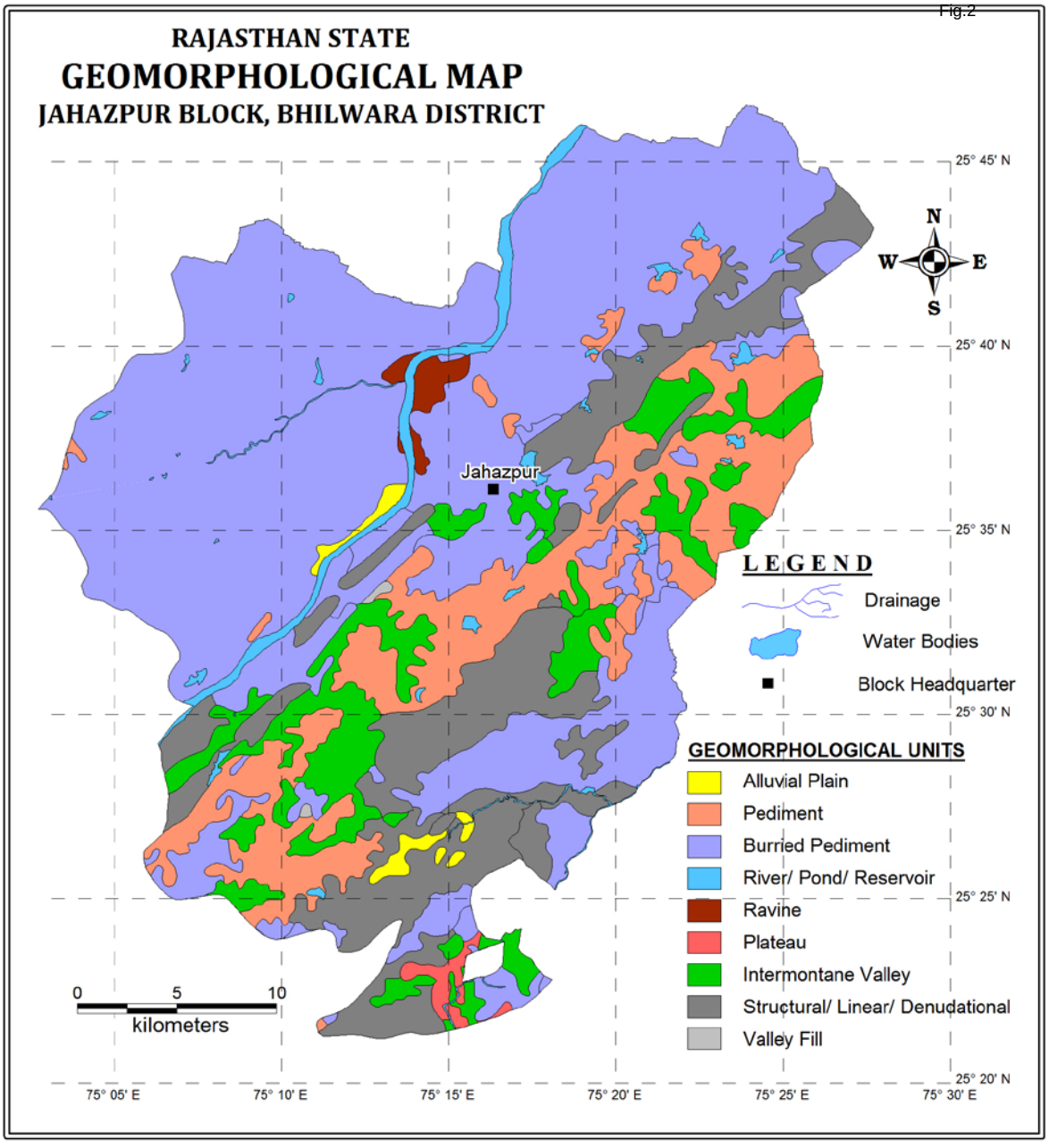
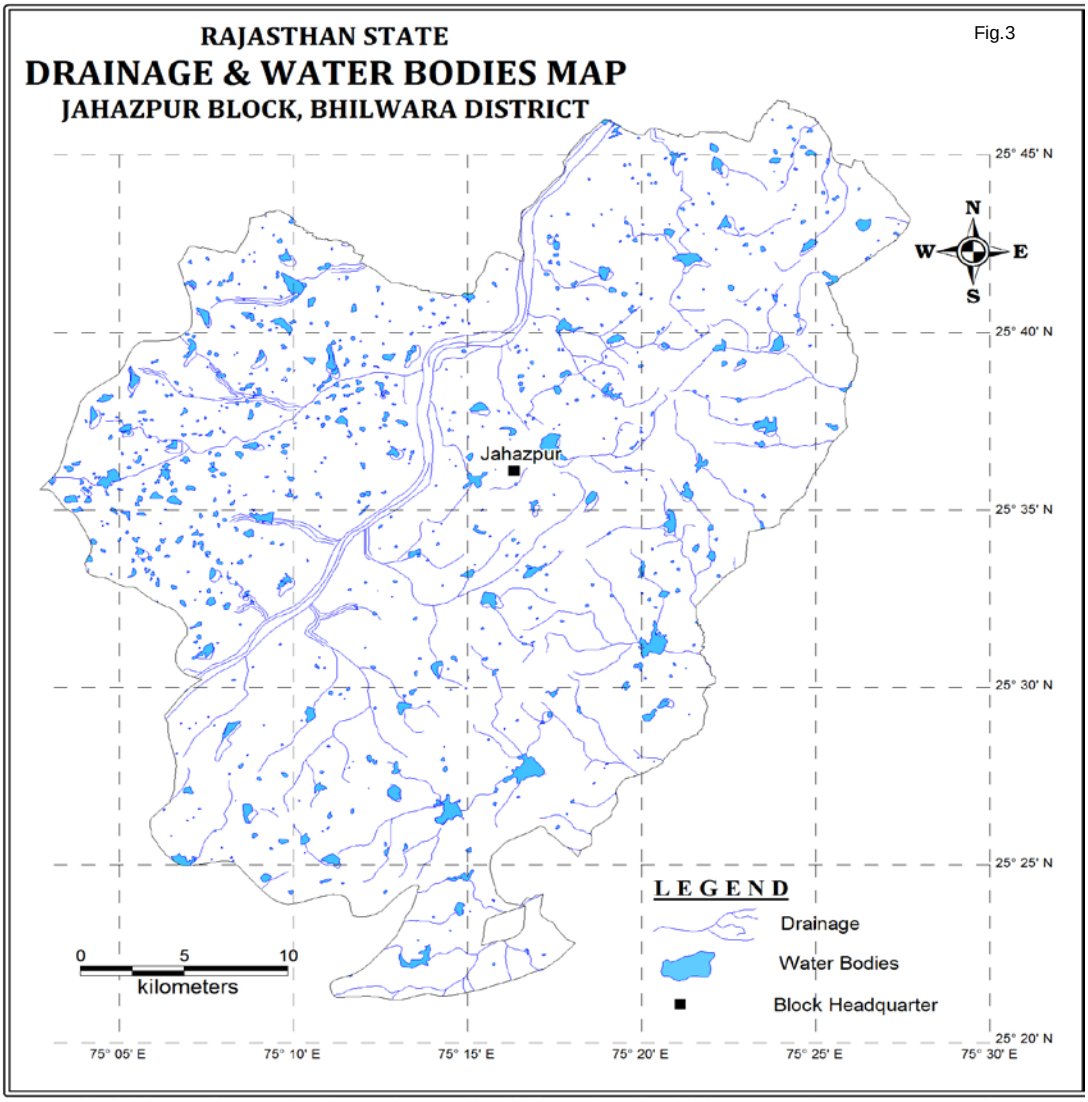


Fig.2
RAJASTHAN STATE
GEOMORPHOLOGICAL MAP
JAHAZPUR BLOCK, BHILWARA DISTRICT
25° 45' N
25° 40' N
25° 35' N
25° 30' N
25° 25' N
25° 20' N
75° 05' E
75° 10' E
75° 15' E
75° 20' E
75° 25' E
75° 30' E
N
W
E
S
Jahazpur
0
5
10
kilometers
LEGEND
Drainage
Water Bodies
Block Headquarter
GEOMORPHOLOGICAL UNITS
Alluvial Plain
Pediment
Burried Pediment
River/ Pond/ Reservoir
Ravine
Plateau
Intermontane Valley
Structural/ Linear/ Denudational
Valley Fill

There is no perennial river flowing in this Block. It is drained by Banas river. The major part of block falls under Banas river basin except some eastern part that falls under Chambal basin. The map showing drainage and water bodies in the Jahazpur block are shown in **fig 3**.

Fig:3



Rainfall

The climate of the block is semi arid. The Normal annual rainfall of block is 759.50 mm (IMD, 1901-70). The available data of rainfall indicates that larger part of annual rainfall is received through SW monsoon during July to September.

Hydrogeology of the Area

The major water bearing formations in the Block are gneiss and schist of Bhilwara Supergroup, overlain by thin cover of alluvium. Out of total geographical area of 1089.70 Sq. Km, an area of 865.87 Sq. Km. (79.46%) forms aquifer system (potential zone) in the block and remaining 223.83 Sq. Km.(20.54%) area is represented by hills. Ground water occurs under unconfined to semi-confined condition. Extent, size, opening and inter-connection of joints, fissures and other plains of structural weakness control occurrence & movement of ground water. Muscovite schist often grades into gneiss. These have well-developed foliation and irregular joints and are intruded by granite, pegmatite and quartz veins. The contact between these intrusives and schists provides good channel for ground water circulation. In general yield of wells tapping Gneiss & Schist ranges from 0.29 to 0.58 lps.

Ground Water Level

As per Average decadal depth to water level (from November, 2005 to November, 2014), the block majorly falls in water level range 2-5 and 5-10
m bgl range. **(Fig 4)**

The average decadal depth to water level is 15.59 mbgl for Pre monsoon & 10.17 mbgl for Post monsoon. In general, the depth to water level is between 10 & 20 mbgl in major part of Block. The Map showing Depth to water level for May, 2014 and November, 2014 is shown in **Fig 5 & 6.**

Fig: 4

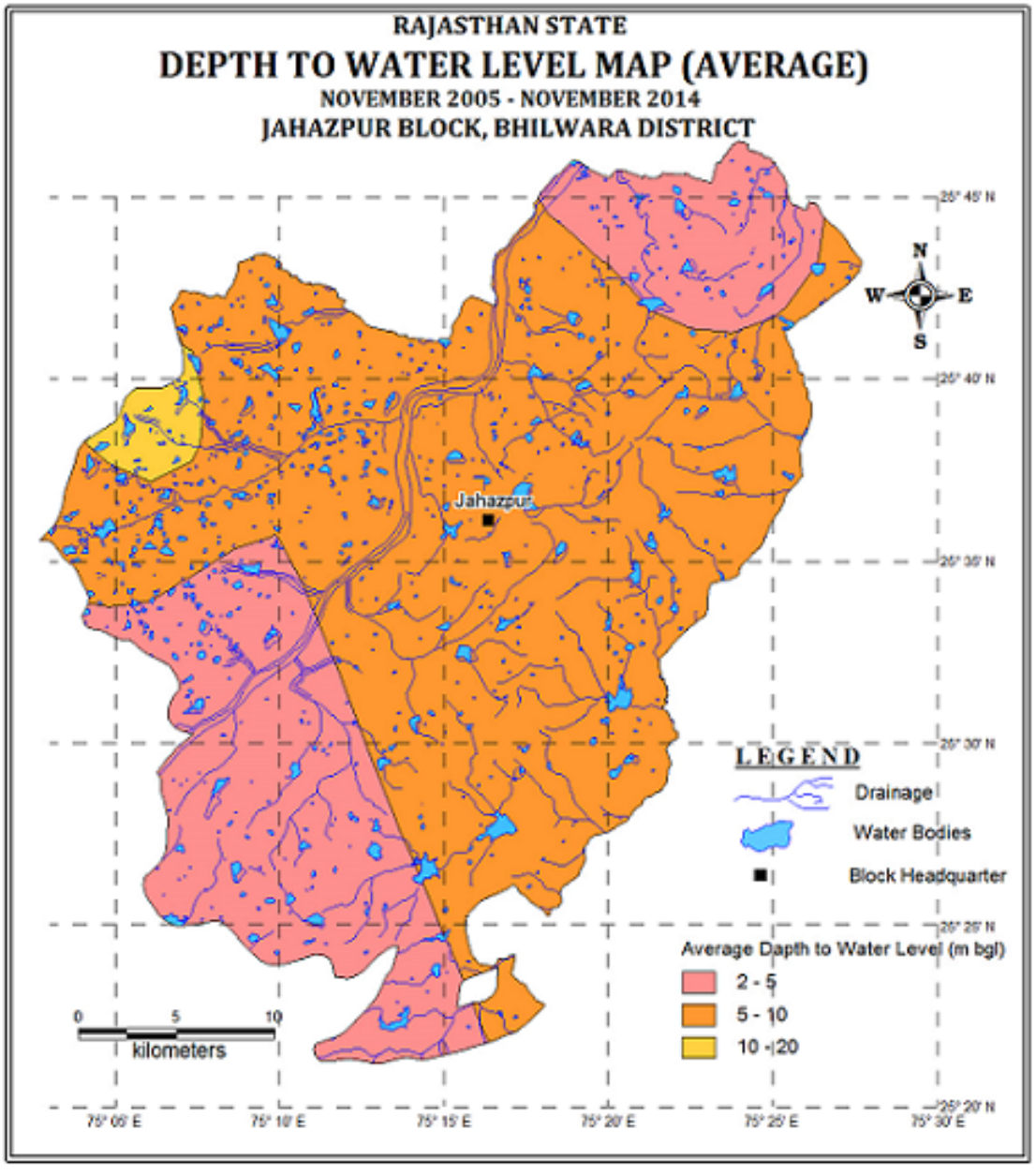

RAJASTHAN STATE
DEPTH TO WATER LEVEL MAP (AVERAGE)
NOVEMBER 2005 - NOVEMBER 2014
JAHAZPUR BLOCK, BHILWARA DISTRICT
N
W
E
S
Jahazpur
LEGEND
Drainage
Water Bodies
Block Headquarter
Average Dapth to Water Level (m bgl)
2 - 5
5 - 10
10 - 20
0
5
10
kilometers
25° 45' N
25° 40' N
25° 35' N
25° 30' N
25° 25' N
25° 20' N
75° 05' E
75° 10' E
75° 15' E
75° 20' E
75° 25' E
75° 30' E

Fig: 5

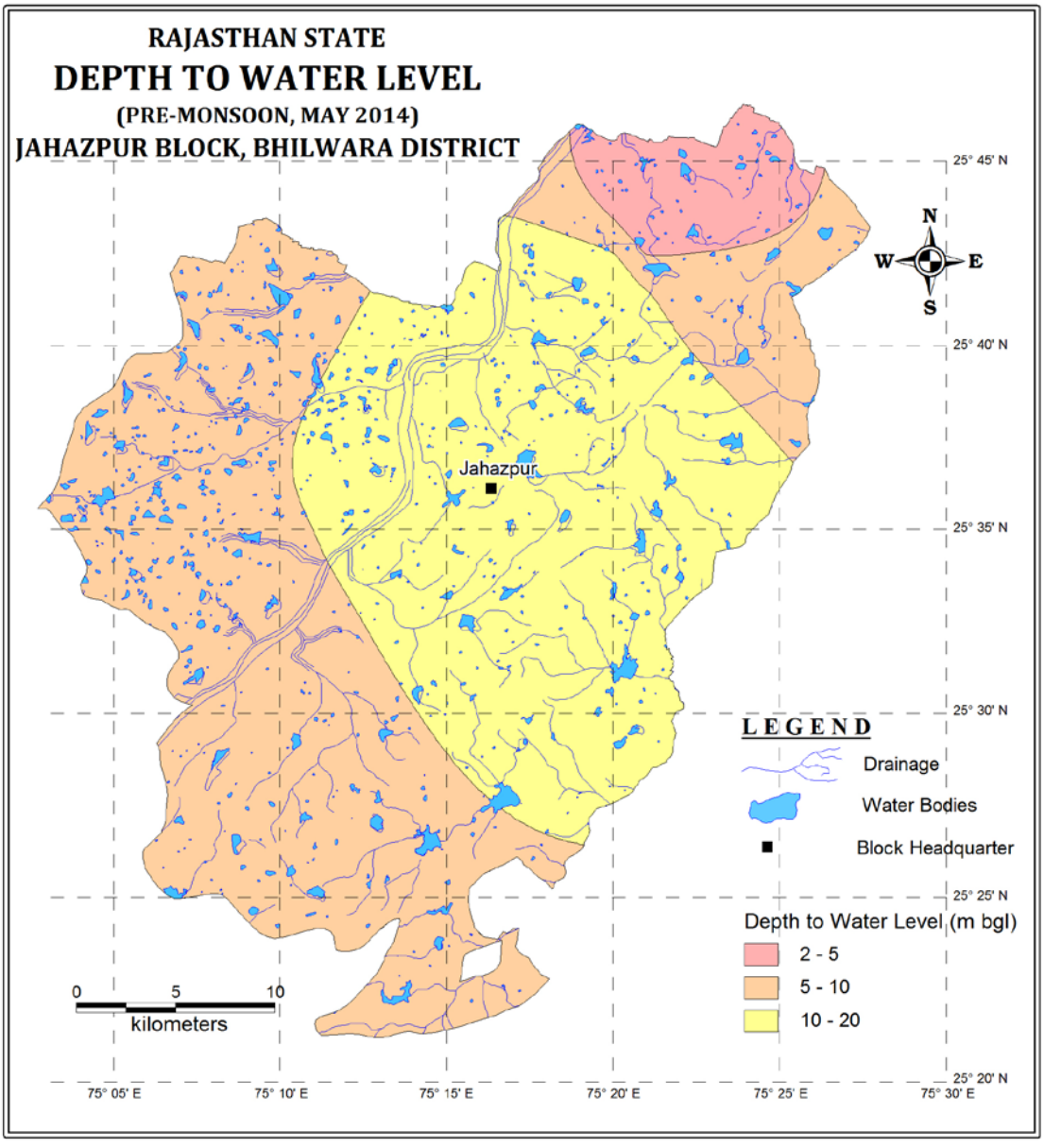
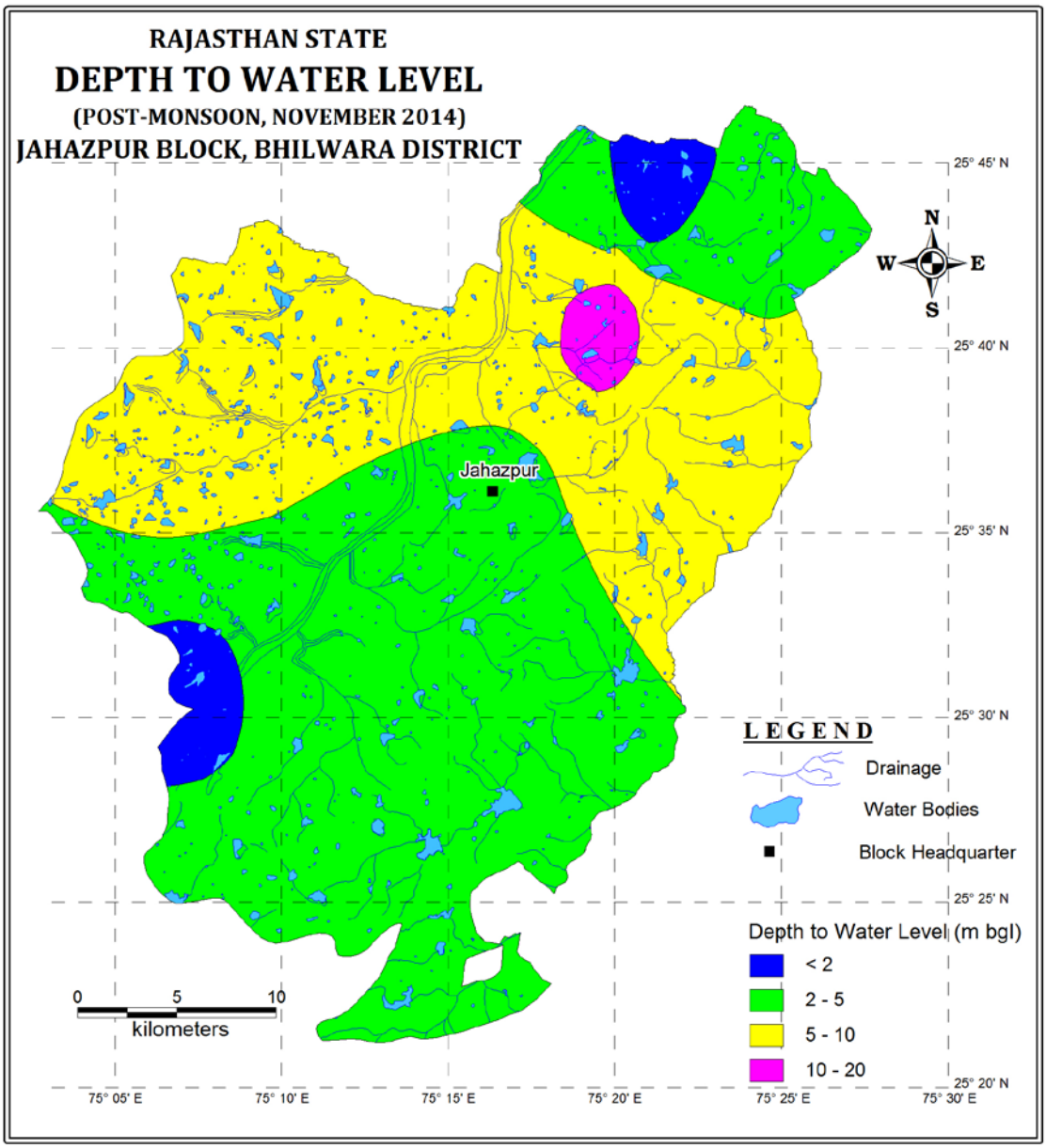

RAJASTHAN STATE
DEPTH TO WATER LEVEL
(PRE-MONSOON, MAY 2014)
JAHAZPUR BLOCK, BHILWARA DISTRICT
Jahazpur
N
W
E
S
25° 45' N
25° 40' N
25° 35' N
25° 30' N
25° 25' N
25° 20' N
75° 05' E
75° 10' E
75° 15' E
75° 20' E
75° 25' E
75° 30' E
0
5
10
kilometers
LEGEND
Drainage
Water Bodies
Block Headquarter
Depth to Water Level (m bgl)
2 - 5
5 - 10
10 - 20

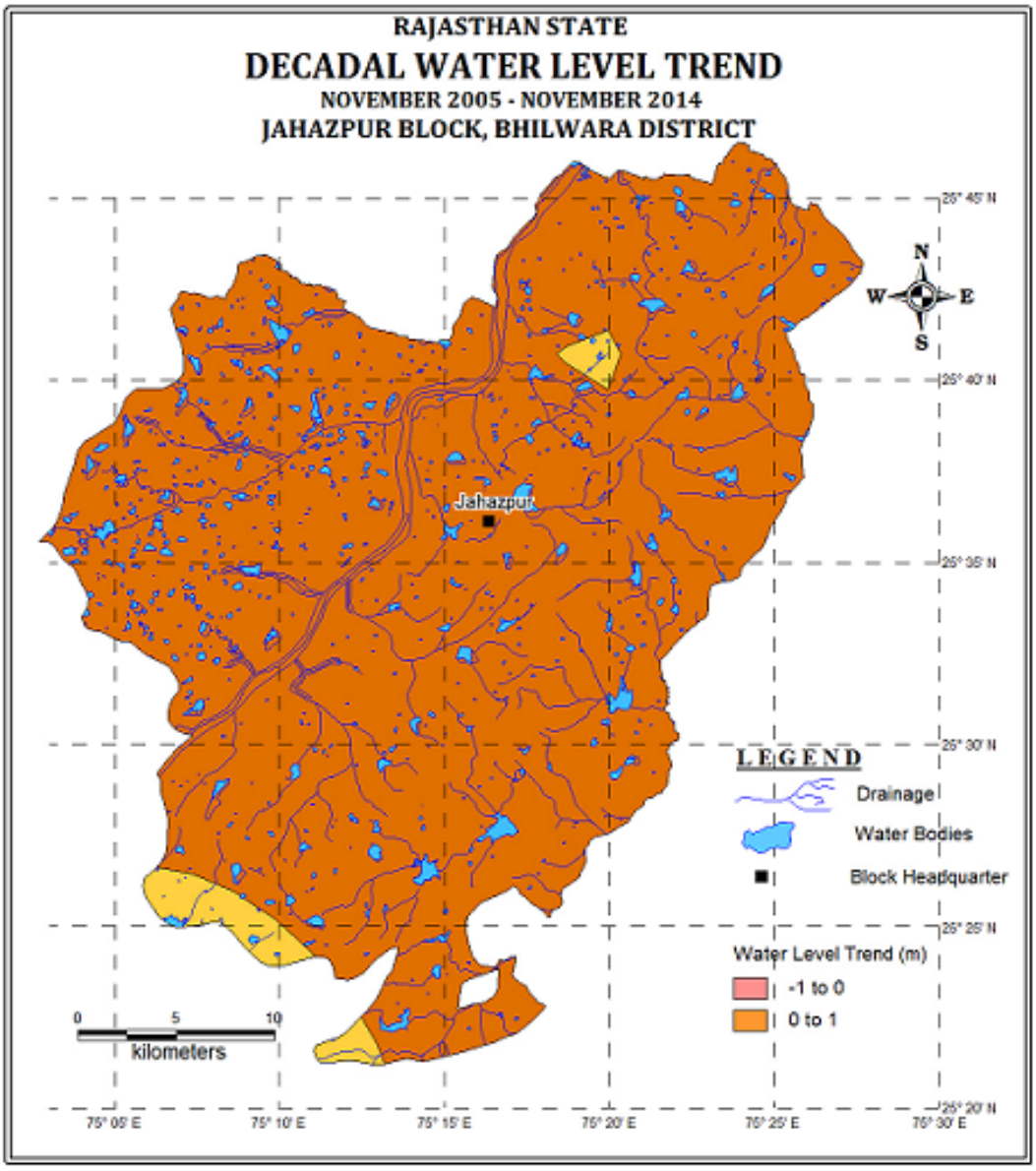
Fig: 6



Water Level Trend: All the hydrographs are showing declining water level trends over last 10 years. Water level trend shows average decline of 0.27 m/year during pre monsoon and 0.12 m/year during post monsoon.

As per the Decadal Water level trend (from November, 2005 to November, 2014), the declining trend is visible in the block. The fall in the range of 0 to 1 m/ year in ground water level is prevalent in the block. The map of Decadal Water Level Trend is shown in fig. 7

Fig: 7



Subsurface Hydrogeology

As inferred from borehole data of the Jahazpur Block; Schist, Phyllite & Gneiss form the aquifers. However, the ground water in these only occurs in shallow weathered parts or fractures due to absence of primary porosity. The depth of drilling ranges from 22.9 to 196.7 mbgl and the average discharge ranges from 0.33 to 13.83 lps. The quality of ground water in the block is affected by high salinity & fluoride contamination.

Dynamic Ground Water Resource

The status of ground water resources of the block is presented in table 1. The annual Net Ground water Availability in the block is 4659.04ham and Annual Ground water draft is 6180.33ham. Stage of Ground water development has reached 132.65%.

Table 1: Ground Water Availability, Utilization and Stage of Development Jahazpur Block, Bhilwara District (As on 31.3.2011)

Natural Discharge During Non Monsoon Period	517.67 ham
Net Annual Ground Water Availability	4659.04 ham
Annual Ground Water Draft	6180.33 ham
Net Ground water Availability for Future Irrigation Use	0 ham
Stage of Ground Water Development	132.65%
Source: Ground Water Resource Assessment 31.03.2011	

Need for artificial recharge and water conservation plan

The present artificial recharge and water conservation Plan aims to mitigate the problems of continuous decline in water levels over the area through techniques of artificial recharge utilizing surplus rainwater based on scientific manner for optimal results. The broad scope of the recharge plan is as follows:

- Establishing efficacy of integrated approach through various artificial recharge and water conservation techniques. Intervention is proposed in cluster mode basis wherever feasible to have a better impact.
- Enhancing water use efficiency for controlling excessive ground water draft, especially for irrigation purposes.
- Ensuring sustainability of ground water abstraction structures and improvement in quality of ground water.

Surface water availability

As per the studies carried out by Water Resources Department, Govt of Rajasthan there is hardly any surplus water available for further development at 75% dependability. However, after taking into account the availability of source water in the basins of Rivers flowing in the State proportionate amount of surplus runoff available in particular block by particular sub basin was calculated.

Accordingly about 20.6721 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Surface water availability, allocation and number of structures are presented in table 2.

Table 2: Source water for artificial recharge and number of recharge structure

District	District code	Block	Block code	Area of Block (Sq.km.)	Potential area suitable for recharge (Sq.km.)	Type of Aquifer	Area feasible for artificial recharge (Sq km)	Sp Yield	Average DTW (mbgl) NOV 2013
BHILWARA	RJ07	**JAHAZPUR**	RJ0704	1089.700	865.870	hard rock	865.870	0.015	4.990

Table 2 (contd): Source water for artificial recharge and number of recharge structure

Thickness of unsaturated zone 3 m below ground level (m)	Volume of sub surface storage space available for artificial recharge (MCM)	Sub Basin	Surplus available in the block (in Mm3)	Surplus water used in Recharge Shaft (RS)	No. of RS (0.03 MCM/RS)	Remaining Surplus water for Percolation tank (PT)	No. of PT (0.2 MCM/ PT)	Remaining Surplus water for Farm Pond (FP)	No. of FP (0.05 MCM/ FP)
1.990	25.846	Banas	4.6273	2.04	68	2.5873	13	0	0
		Mej	16.0448	1.38	46	3	15	11.62	232

Feasible Artificial Recharge and water conservation structures

A wide spectrum of techniques is in vougue, which are being implemented to recharge the ground water reservoir, conserve the utilizable rainfall and enhance the water use efficiency. Based on prevailing field conditions, out of total block area of 1089.70sq km practically 865.87sq km area is feasible for implementing recharge measures. Based on available information about the area such as ground water scenario, hydrogeology, hydrology, topography, rainfall pattern, drainage, soil cover, utilizable rainfall etc. scope for various interventions has been studied and assessment of suitable areas, tentative design and costs of structures has been worked out in the present plan.

Identification of feasible areas

Jahazpur block is having ground water level between 2 to 5 and 5 to 10m below ground level and as per dynamic ground water resource estimation, the block is over exploited with stage of ground water development at 132.65%. The Jahazpur block is feasible for

recharge due to presence of permeable zone above water table, favorable land slope and availability of water from rainfall.

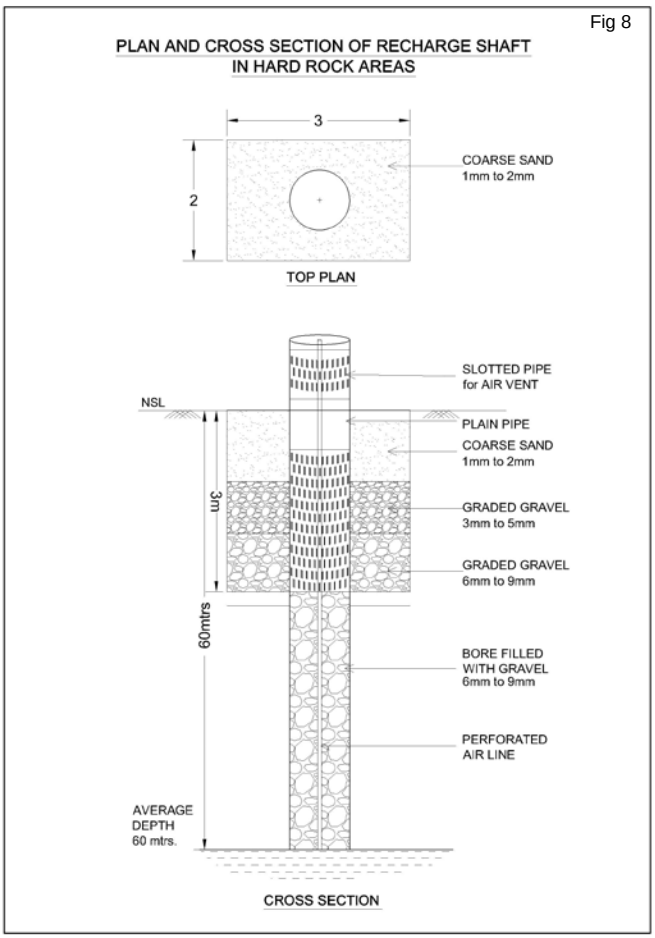
Generally the Artificial recharge structures suitable in this type of area are Check dams/ Anicuts/ Percolation tanks and Recharge Shafts/ Recharge wells. Since the ground water levels are quite deep in the block, the structures like ani-cuts and Check dams are not suitable and also their construction is regulated. Considering this aspect the proposal for Recharge Shaft/ Recharge wells and Percolation tanks have been firmed up in the present Plan as the most suitable structures in Jahazpur block.

Details of Ground Water Recharge Measures

Existing Village Pond with recharge shaft/wells

Almost all the villages in the State of Rajasthan have one or two village ponds & other ponds. With time, these ponds get silted & hardly any water percolates downward. Also, any excess water coming into the pond goes away as a run off due to limited storage capacity. This surplus runoff can very well be utilized for recharging the ground water and also for enhancing conservation of water that can be further used for irrigation, thereby saving ground water withdrawal. Since natural recharge from these ponds is limited due to siltation and ground water levels are deep, the most effective ground water structure considered under the Plan is Recharge Shaft/ Recharge well constructed within the pond itself.
The above mentioned recharge well has been designed in a manner that maximum surplus water would likely to be utilized for recharge as well as sufficient water is retained in the pond for local use.

Fig 8



The model design of recharge well has been worked out in consultation with Ground Water Department, Government of Rajasthan and presented in Fig 8. The major features required are:

1. The well should have sufficient diameter for recharge- 10 to 12 inch diameter well with bottom screen/ opening just above the highest ground water level.

2. The well should have screen/ opening at the top, which should be at least 1.5m above the bed level of the pond.
3. The upper opening should be surrounded with filter pack comprising graded filter media of medium, coarse sand & gravel, so that the Recharge well does not get silted.

The opening for inflow to the well has been proposed at 1.5m above Bed level of pond. This is necessary to ensure that the pond retains sufficient water for use by local consumers. However, this may necessitate further deepening of pond itself so that the pond is 3-4 m deep. A Single well as discussed above would be suitable for a pond upto area of about 5ha. Therefore, more number of such Recharge wells is envisaged for larger ponds.

Tentative location for recharge shaft and percolation tanks

The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 9 and Table 3. The plan proposes construction of 114 recharges shafts/ wells in 67 identified existing village ponds at an estimated cost of 296.4 lacs. The block also has area with shallow water level (<5 m), which is not recommended for artificial recharge.

Table 3: Tentative locations of village for village pond with recharge shaft

S No.	Village	Long	Lat	Pond area (ha)	Formation	No of Shafts	Unit cost (Rs in lac)	Total cost (Rs in lac)
1	Gandher	75.167	25.683	5.117	Hard_rock	1	2.60	2.60
2	Pander	75.193	25.653	4.935	Hard_rock	1	2.60	2.60
3	Sawaipura	75.235	25.508	23.896	Hard_rock	2	2.60	5.20
4	Indokiya	75.127	25.619	4.916	Hard_rock	1	2.60	2.60
5	Baori	75.071	25.628	18.059	Hard_rock	2	2.60	5.20
6	Narana	75.059	25.603	8.336	Hard_rock	1	2.60	2.60
7	Beri	75.068	25.588	6.541	Hard_rock	1	2.60	2.60
8	Indokiya	75.105	25.604	6.235	Hard_rock	1	2.60	2.60
9	Narana	75.063	25.605	5.526	Hard_rock	1	2.60	2.60
10	Baori	75.086	25.622	14.794	Hard_rock	1	2.60	2.60
11	Sheopura	75.060	25.589	19.186	Hard_rock	2	2.60	5.20
12	Baori	75.092	25.607	7.046	Hard_rock	1	2.60	2.60
13	Beri	75.063	25.584	7.095	Hard_rock	1	2.60	2.60
14	Indokiya	75.115	25.607	9.013	Hard_rock	1	2.60	2.60
15	Teetori	75.118	25.660	23.685	Hard_rock	2	2.60	5.20
16	Sheopura	75.051	25.597	4.832	Hard_rock	1	2.60	2.60
17	Ulela	75.243	25.514	5.201	Hard_rock	1	2.60	2.60
18	Deopura	75.225	25.563	14.098	Hard_rock	2	2.60	5.20
19	Peeploond	75.250	25.554	14.555	Hard_rock	2	2.60	5.20
20	Gadoli	75.328	25.677	6.107	Hard_rock	1	2.60	2.60
21	Baori	75.077	25.636	17.430	Hard_rock	2	2.60	5.20
22	Indokiya	75.128	25.602	7.923	Hard_rock	1	2.60	2.60

23	Indokiya	75.108	25.614	13.799	Hard_rock	2	2.60	5.20
24	Indokiya	75.130	25.609	4.402	Hard_rock	1	2.60	2.60
25	Teetora Mafi	75.144	25.676	5.366	Hard_rock	1	2.60	2.60
26	Pander	75.179	25.640	5.074	Hard_rock	1	2.60	2.60
27	Pander	75.186	25.637	5.231	Hard_rock	1	2.60	2.60
28	Gangithala	75.300	25.689	5.234	Hard_rock	1	2.60	2.60
29	Mayla Polya	75.376	25.688	6.359	Hard_rock	1	2.60	2.60
30	Khana Ka Khohala	75.321	25.664	21.984	Hard_rock	2	2.60	5.20
31	Bihara	75.223	25.657	4.501	Hard_rock	1	2.60	2.60
32	Baori	75.088	25.620	4.444	Hard_rock	1	2.60	2.60
33	Pander	75.198	25.643	4.408	Hard_rock	1	2.60	2.60
34	Kanjar Colony	75.166	25.598	4.799	Hard_rock	1	2.60	2.60
35	Khajoori	75.224	25.498	5.941	Hard_rock	1	2.60	2.60
36	Bihara	75.224	25.659	5.414	Hard_rock	1	2.60	2.60
37	Ropan	75.129	25.581	5.209	Hard_rock	1	2.60	2.60
38	Sundargarh	75.263	25.507	5.249	Hard_rock	1	2.60	2.60
39	Bheelri	75.132	25.646	7.517	Hard_rock	1	2.60	2.60
40	Dhagariya	75.146	25.642	7.790	Hard_rock	1	2.60	2.60
41	Teetori	75.151	25.670	4.962	Hard_rock	1	2.60	2.60
42	Ropan	75.110	25.588	19.059	Hard_rock	2	2.60	5.20
43	Ropan	75.101	25.590	12.699	Hard_rock	2	2.60	5.20
44	Jhalra	75.105	25.600	16.812	Hard_rock	2	2.60	5.20
45	Beri	75.086	25.582	8.048	Hard_rock	1	2.60	2.60
46	Beri	75.081	25.583	5.769	Hard_rock	1	2.60	2.60
47	Jhalra	75.093	25.588	5.701	Hard_rock	1	2.60	2.60
48	Indokiya	75.117	25.594	8.125	Hard_rock	1	2.60	2.60
49	Udapuriya	75.292	25.707	9.729	Hard_rock	1	2.60	2.60
50	Gadoli	75.325	25.685	4.958	Hard_rock	1	2.60	2.60
51	Goram Garh	75.345	25.661	6.666	Hard_rock	1	2.60	2.60
52	Gadoli	75.319	25.687	7.599	Hard_rock	1	2.60	2.60
53	Asan	75.316	25.694	24.152	Hard_rock	4	2.60	10.40
54	Nathadand	75.332	25.510	9.380	Hard_rock	4	2.60	10.40
55	Sherpura	75.251	25.423	4.412	Hard_rock	2	2.60	5.20
56	Baroda	75.344	25.493	14.631	Hard_rock	4	2.60	10.40
57	Kabri	75.326	25.501	9.834	Hard_rock	4	2.60	10.40
58	Bei	75.289	25.487	4.626	Hard_rock	2	2.60	5.20
59	Tola	75.344	25.544	11.897	Hard_rock	4	2.60	10.40
60	Deo Nagar	75.337	25.487	20.572	Hard_rock	4	2.60	10.40
61	Teekar	75.397	25.683	5.631	Hard_rock	2	2.60	5.20
62	Chhaga Ka Jhoonpara	75.373	25.652	4.956	Hard_rock	2	2.60	5.20
63	Kuradiya	75.370	25.661	20.104	Hard_rock	4	2.60	10.40
64	Bei	75.290	25.497	9.334	Hard_rock	4	2.60	10.40
65	Teekar	75.424	25.692	22.426	Hard_rock	4	2.60	10.40
66	Lal Ka Khera	75.303	25.489	5.014	Hard_rock	2	2.60	5.20
67	Bijetha	75.362	25.605	22.004	Hard_rock	4	2.60	10.40
				Total		114		296.4

2. Percolation tanks

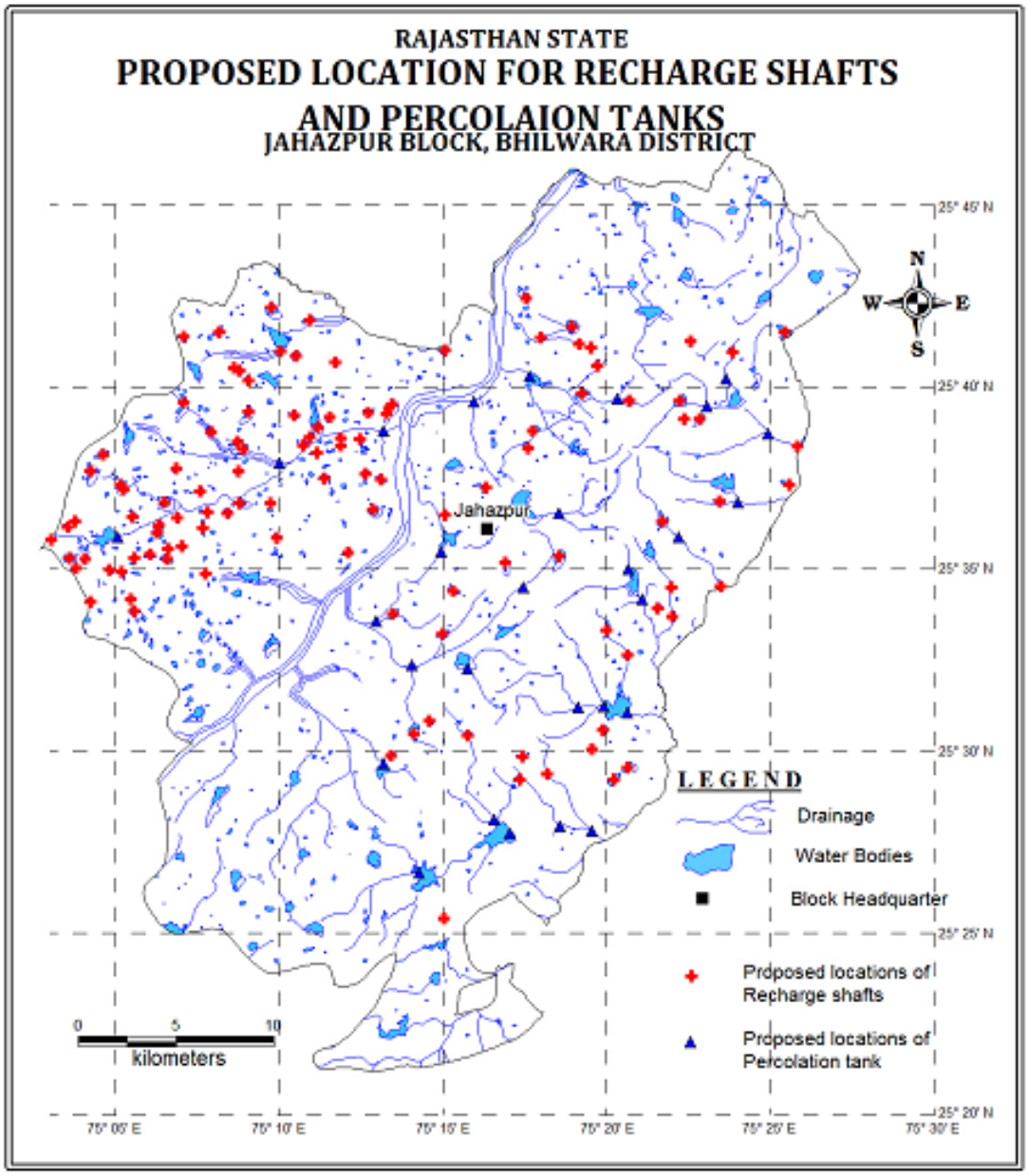
Percolation tanks are among the most common runoff harvesting structures in India. A percolation tank can be defined as an artificiallly created surface water body submerging a highly permeable land area so that the surface runoff is made percolate and recharge the ground water storage. These are not provide with sluices or outlests for discharging water from tank for irrigation or other purposes. They may, however, be provided with arrangements for spilling away the surplus water that may enter the tank so as to avoid over-topping of the tank bund. It is possible to have more than one percolation tank in a catchment if sufficient surplus runoff is available and the site characxterisitcs favor recahrge through such structures. Under the plan, 28 Nos. percolation tanks (200mx200mx1.5m) in the vicinity of respective villages. Location of percolation tanks is given in Fig 9 and Table 4.

Table 4: Tentative location of village proposed for percolation tank

SN	District	Block	Village	Longitude	Latitude
1.	Bhilwara	Jahazpur	Jaswantpura	75.167	25.632
2.	Bhilwara	Jahazpur	Rampur	75.216	25.559
3.	Bhilwara	Jahazpur	Ganeshpura	75.266	25.660
4.	Bhilwara	Jahazpur	Sarsiya	75.291	25.575
5.	Bhilwara	Jahazpur	Jhalra	75.085	25.598
6.	Bhilwara	Jahazpur	Jahazpur (M)	75.249	25.591
7.	Bhilwara	Jahazpur	Khajoori	75.220	25.494
8.	Bhilwara	Jahazpur	Bihara	75.220	25.647
9.	Bhilwara	Jahazpur	Rojri	75.234	25.539
10.	Bhilwara	Jahazpur	Peeploond	75.263	25.538
11.	Bhilwara	Jahazpur	Ganeshpura Ji Ka Khera @ Viyasji	75.309	25.609
12.	Bhilwara	Jahazpur	Goram Garh	75.339	25.661
13.	Bhilwara	Jahazpur	Gadoli	75.294	25.672
14.	Bhilwara	Jahazpur	Luhari Khurd	75.394	25.671
15.	Bhilwara	Jahazpur	Nathoon	75.319	25.520
16.	Bhilwara	Jahazpur	Bheem Ka Khera	75.344	25.517
17.	Bhilwara	Jahazpur	Biletha	75.351	25.570
18.	Bhilwara	Jahazpur	Luhari Kalan	75.384	25.658
19.	Bhilwara	Jahazpur	Luhari Khurd	75.416	25.645
20.	Bhilwara	Jahazpur	Rajpura	75.332	25.520
21.	Bhilwara	Jahazpur	Biletha	75.344	25.583
22.	Bhilwara	Jahazpur	Intunda	75.400	25.614
23.	Bhilwara	Jahazpur	Utharna	75.276	25.468
24.	Bhilwara	Jahazpur	Shakar Garh	75.310	25.465
25.	Bhilwara	Jahazpur	Shakar Garh	75.326	25.463
26.	Bhilwara	Jahazpur	Bhopalpura	75.284	25.462

27.	Bhilwara	Jahazpur	Bijetha	75.370	25.598
28.	Bhilwara	Jahazpur	Sujanpura	75.238	25.444

Fig: 9



Conservation Measures

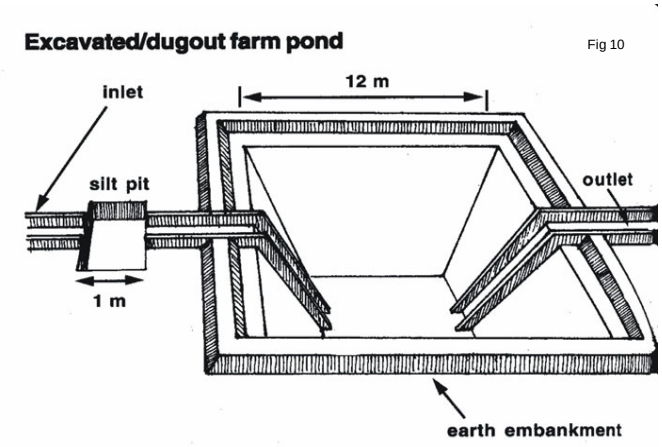
As mentioned earlier the present Plan occurs on integrated approach of interventions, which includes both recharge measures as well as conservation of water while the recharge interventions have been discussed. The proposed conservation measures discussed below includes conservation of farm ponds, revival, repair of existing water bodies, etc.

A. Farm Ponds

A farm pond is a large hole dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth depend on the amount of land available, the type of soil, the farmer's water requirements, the cost of excavation, and the possible uses of the excavated earth. Water from the farm pond is conveyed to the fields manually, by pumping, or by both methods. Pictorial diagram of farm pond is shown in fig 10.

Advantages of Farm Ponds

- They provide water to start growing crops, without waiting for rain to fall.
- They provide irrigation water during dry spells between rainfalls. This increases the yield, the number of crops in one year, and the diversity of crops that can be grown.
- Bunds can be used to raise vegetables and fruit trees, thus supplying the farm household with an additional source of income and of nutritious food.
- Farmers are able to apply adequate farm inputs and perform farming operations at the appropriate time, thus increasing their productivity and their confidence in farming.
- They check soil erosion and minimize siltation of waterways and reservoirs.
- They supplies water for domestic purposes and livestock
- They promote fish rearing.
- They recharge the ground water.
- They improve drainage.
- The excavated earth has a very high value and can be used to enrich soil in the fields, leveling land, and constructing farm roads



It is proposed to construct 232 farm ponds as per the specification of Govt. of Rajasthan (30 x 30 x 1.5 m). These farm ponds can accommodate about 11.62 MCM of runoff rainfall considering 3 fillings. Farm ponds can be constructed in the village at feasible location. Dimension of the farm pond depends on land holdings.

B. Revival, repair of water bodies

The existing ponds and tanks in loose their storage capacity as well as the natural ground water recharge through these water bodies has also become negligible due to siltation and encroachment by farmers for agriculture purposes. There are several such villages where ponds/ tanks are in dilapidated condition. These existing village tanks, which are normally silted and damaged, can be modified to serve as recharge structure in case these are suitably located to serve as percolation tanks. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into recharge structure.

Impact Assessment and Monitoring

Assessment of impact of the artificial recharge schemes implemented is essential to assess the efficacy of structures constructed. It helps in identification of cost-effective recharge mechanisms for optimal recharge into the ground water system. It also helps to make necessary modifications in site selection, design and construction of structures in future. The monitoring system should be designed judiciously to monitor impact of these structures individually as well as collectively. Demarcation of the zone of influence of the artificial recharge structure is one of the main objectives of monitoring.

It is proposed to utilize the existing data available with the Government of Rajasthan and CGWB baseline data. For assessment of the impact of proposed measures additional data will be generated by construction of the piezometer at suitable and strategic sites.

It is proposed to construct 30 piezometer, one in each village, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure. The depth of the piezometer may vary from 60 to 80 mbgl. This will help in assessing the impact of the project implementation.

Since the implantation of the Plan involves institutional framework, it is proposed to constitute State Level Technical Coordination Committee (SLTCC) and District Level Technical Coordination Committee (DLTCC) for proper monitoring and review of the implementation of the Plan.

Financial Outlay of the Plan

The total estimated cost of the Plan is 39.4212 cr, which includes Rs 14.164 cr for ground water recharge activities, Rs 23.20 cr (Farm ponds), 0.18 cr for ground water monitoring (Piezometer construction) and Rs 1.18772 cr towards operation and maintenance charges. The tentative cost estimates of the various activities of the Plan are shown in Table 5 & 6. The unit rates are as followed by the Govt. of Rajasthan (BSR). The total estimated cost of the project is **Rs 39.4212 Crores**.

Table 5: Cost of the recharge structures

Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost of Farm Pond in Rs (Unit cost Rs 0.1 cr)	Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)
11.2	23.20	Hard rock – 2.96

Table 6: Tentative cost of different activities

Feasible Artificial Recharge & Water Conservation structures/ activities	**Tentative Design**	**Quantity (in nos. or area in sq. m)**	**Rainwater harvested (mcm)**	**Tentative unit cost (in Rs lakh)**	**Total tentative cost (in Rs lakh)**	**Expected Annual GW recharge/ conservation (mcm)**
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Hard rock: Depth –60m, Dia 10-12"with filter pit	114	3.42	2.6	296.4	2.394
Percolation tanks (3 fillings)	200m*200m*1.5m	28	5.587	40	1120	3.911
Sub Total					1416.4	6.305
Water Conservation Activities						
Farm Pond (3 fillings)	(30 m x 30m x 1.5 m)	232	11.62	10	2320	8.13
Impact assessment & Monitoring						
Piezometer	Up to 80 m bgl	30		0.6	18	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					187.72	
TOTAL					**3942.12**	
Note: Type, number and cost of structure may vary according to site after ground verification						

Time Schedule

The project is to be implemented in two years, however impact assessment will be carried out for five years**.** A time schedule for different activities is given in table 7.

Table 7: Time Schedule

Steps	1st phase	2th Phase	3rd Phase	4th Phase	5th Phase	6th Phase	7th Phase	8th Phase
Constitution of State Level Technical Coordination Committee (SLTCC) and District Level Technical Coordination Committee (DLTCC)	■							
Arranging meeting of SLTCC for provision available under the scheme, request to implementing agencies for submission of DPR		■	■					
Scrutiny, recommendations & approval of AR Projects / Schemes in DLTCC & SLTCC		■	■					
Forwarding the DPR to Central Ground Water Board (CHQ), New Delhi for approval and issuing of sanction from the Ministry		■	■					
Meeting of TCC(CHQ) and release of sanction of funds		■	■					
Construction of artificial recharge structures & Monitoring of water levels in the area locally				■	■			
Completion and Utilisation certificate						■	■	
Impact Assessment and submission of report								■

Expected Benefits or outcome of the Plan

Ground water recharge and water conservation Plan of Jahazpur block, Bhilwara envisages gainful utilization of 6.31 MCM of surplus monsoon runoff for recharging of depleted aquifer system. Besides this, the proposed intervention would also lead to reduction of pre-existing ground water draft by 8.13 MCM annually through construction of farm ponds.

With the additional recharge and water conservation interventions as proposed in the Plan, it is anticipated that with enhanced recharge and reduction in ground water draft, the stage of ground water development will reduce to 101.47% from the existing

132.65%. The projected status of ground water resources and utilization scenario is presented in table 8.

Table 8: Projected Status of Groundwater Resource & Utilization

Net G.W. Availability (mcm)	Additional Recharge from RWH & conservation (mcm)	Total Net G.W. Availability after intervention (Ham)	Existing G.W Draft for all purpose (ham)	Saving of Ground water through projects (ham)	Net GW draft after interventions (ham)	Present stage of G.W. development (%)	Projected stage of G.W. Dev. (in %)
46.5904	6.305	52.8954	61.8033	8.13	53.6733	132.65	101.47

- The implementation of the project would result in additional recharge. The other tangible/ non-tangible benefits of the project are:

- Recharging the ground water will help in arresting the rapid decline in ground water resources and will also ensure improvement in quality of ground water by way of dilution.
- Proposed structures and measures will also enhance the ground water potential and would ensure sustainability of ground water resources.
- Surface runoff water stored or harnessed can be used as supplemental irrigational resources and will reduce the stress on the ground water.
- Besides, it will also help in reducing the amount and spate of storm water being drained by river and controlling soil erosion.