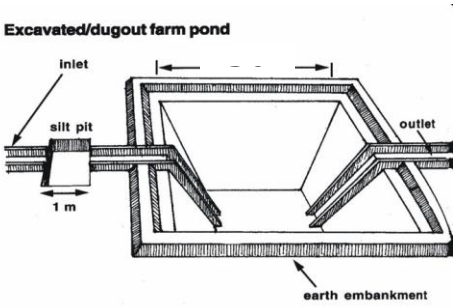
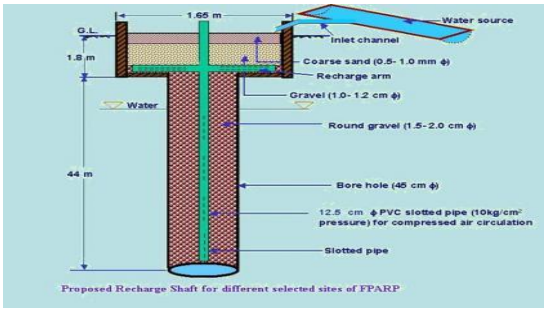
CENTRAL GROUND WATER BOARD

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





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

Western Region, Jaipur
November 2016

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

Plan at a Glance

1.	**Area of the Dhaulpur Block**	**609.32 Sq. km.**
2.	**Area identified for Artificial Recharge**	**488.85 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**67.39 MCM**
	Annual Ground Water Draft	**124.89 MCM**
	Stage of Ground Water Development	**185.33 %**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**29.525 MCM** **1.855 MCM** **4.4 MCM**
5.	**Volume of unsaturated aquifer zone available for recharge**	**652.19 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**53 shafts in 35 Nos. of existing village ponds** **22 nos.** **300 ha**
	Expected Annual GW recharge	**5.00 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**5.25 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**13.787 crore** 11.45 crore 1.50 crore 0.18 crore 0.657 crore

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

Introduction

The **Dhaulpur Block, district Dhaulpur** 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 **185.33%.**

Location of the block

The Dhaulpur Block covers an area of 609.32 Sq. km. and falls in north-eastern part of Dhaulpur district. It is located between North latitudes 26°36' & 26°56' and East longitudes 77°41' & 77°57'.

Surface Water Availability

As per the studies carried out by Water Resources Department (WRD), Government of Rajasthan there is very little surplus water available for further development at 75% dependability. Based on the data made available from GWD, the surplus runoff available at 75% dependability level has been worked out for the zones as part of watershed within the block. The nature of aquifer (Alluvium/ Hard rock) is also considered while computing the number of Artificial Recharge structures feasible.

Accordingly about 29.525 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Volume of Aquifer available for Artificial Recharge is given in **Table.1**

Supply Side Management

Feasible Artificial Recharge and Water Conservation Structures

About 0.035 MCM/year surplus has been considered for each recharge shaft and 0.2 MCM/year for percolation tank wherever feasible. The areas with shallow water level (<5m) have not been considered for construction of Artificial Recharge Structures

The number of Recharge Shaft is decided based on the number of suitable ponds available within the zone. If still some surplus remained unallocated, than few Percolation tanks are proposed at suitable locations. However, in some of the blocks entire available surplus cannot be utilized due to non availability of ponds for Recharge shaft or suitable location for Percolation tanks. Zone wise number of Recharge Structures proposed to be constructed is given in **Table 2**.

Table 1: Volume of Aquifer available for artificial recharge

District	Block	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	Thickness of unsaturated zone 3 m below ground level (m)	Volume of sub surface storage space available for artificial recharge (MCM)
Dhaulpur	DHAULPUR	609.32	488.85	SR	393.4	0.1	19.39	16.39	644.78
				HR	95.45	0.02	6.88	3.88	7.41

Table 2: Number of recharge structure

ZoneCode	Sub_ Basin	Type of Aquifer	Zone-Area (sq. km.)	Total Surplus (MCM)	Water Level >5m	Feasible_ RS_Prop	Feasible_ PT_Prop
Chambal_Chambal Downstream_009_RJ1303_AL	Chambal Downstream	SR	25.430	2.297	Y	4	5
Chambal_Chambal Downstream_010_RJ1303_AL	Chambal Downstream	SR	53.008	2.461	Y	1	8
Chambal_Chambal Downstream_010_RJ1303_SR	Chambal Downstream	SR	18.895	0.877	Y	7	0
Gambhir_Gambhir_009_RJ1303_AL	Gambhir	SR	101.233	2.390	Y	3	1
Gambhir_Gambhir_012_RJ1303_AL	Gambhir	SR	120.149	5.206	Y	7	0
Parbati_Parbati_001_RJ1303_AL	Parbati	SR	29.932	1.640	Y	2	0
Parbati_Parbati_003_RJ1303_SR	Parbati	SR	1.048	0.000	Y	0	0
Parbati_Parbati_012_RJ1303_AL	Parbati	SR	81.077	5.316	Y	1	2
Parbati_Parbati_014_RJ1303_AL	Parbati	SR	34.037	2.280	Y	0	0
Parbati_Parbati_015_RJ1303_AL	Parbati	SR	40.102	3.503	Y	0	2
Parbati_Parbati_016_RJ1303_AL	Parbati	SR	72.063	1.910	Y	5	3
Parbati_Parbati_016_RJ1303_SR	Parbati	SR	32.196	0.854	Y	23	0
Parbati_Parbati_017_RJ1303_AL	Parbati	SR	5.637	0.465	Y	0	1
Parbati_Parbati_020_RJ1303_AL	Parbati	SR	9.984	0.324	N	0	0
				29.525		**53**	**22**

Recharge Shaft

It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

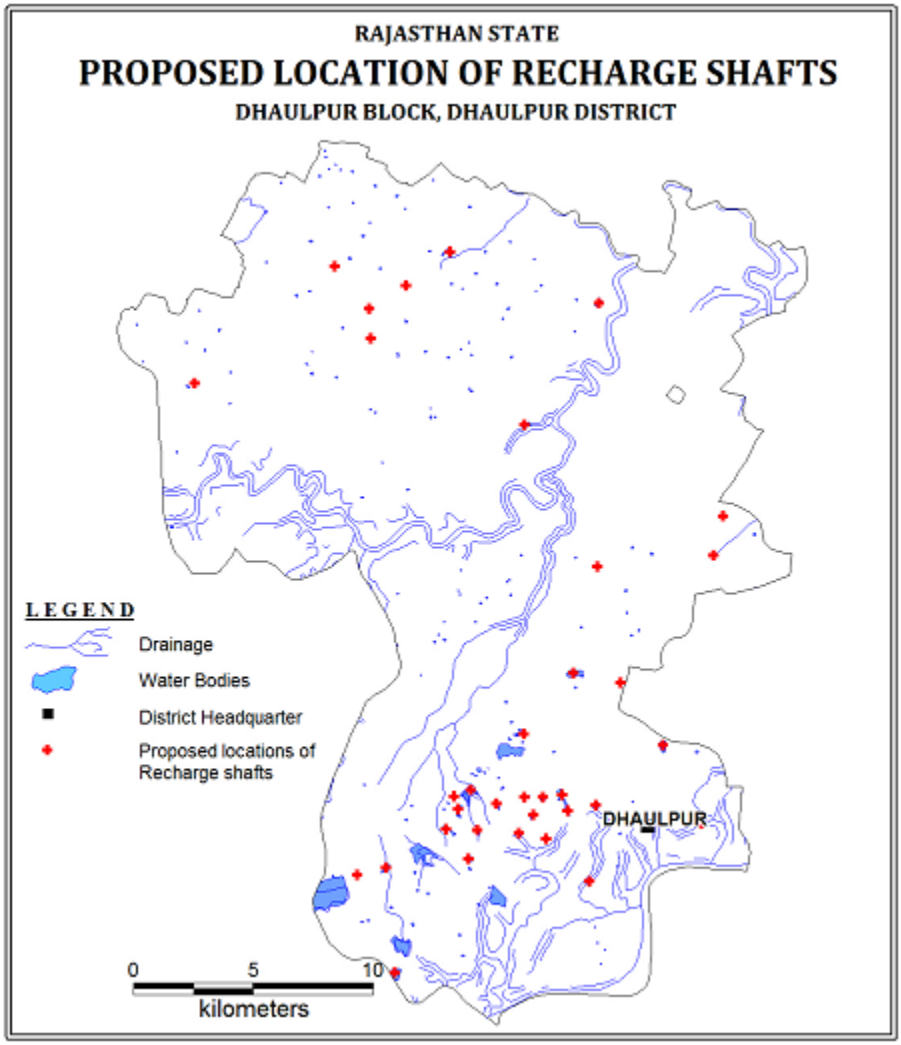
. The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

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

S.No.	Village	Long	Lat	Watershed	No of Shafts	Unit cost (Rs in lac)	Total cost (Rs in lac)
1	Dhaulpur (M)	77.905	26.706	Chambal_Chambal Downstream_009_RJ1303_AL	3	5.0	15.0
2	Dhaulpur (M)	77.921	26.677	Chambal_Chambal Downstream_009_RJ1303_AL	1	5.0	5.0
3	Kamare Ka Pura	77.874	26.655	Chambal_Chambal Downstream_010_RJ1303_AL	1	5.0	5.0
4	Patewari	77.792	26.621	Chambal_Chambal Downstream_010_RJ1303_SR	4	5.0	20.0
5	Hirnauda	77.844	26.673	Chambal_Chambal Downstream_010_RJ1303_SR	1	5.0	5.0
6	Beechhiya	77.856	26.671	Chambal_Chambal Downstream_010_RJ1303_SR	1	5.0	5.0
7	Dhaulpur (M)	77.877	26.683	Chambal_Chambal Downstream_010_RJ1303_SR	1	5.0	5.0
8	Birodha	77.930	26.792	Gambhir_Gambhir_009_RJ1303_AL	1	5.0	5.0
9	Birodha	77.926	26.777	Gambhir_Gambhir_009_RJ1303_AL	1	5.0	5.0
10	Nekpur	77.877	26.773	Gambhir_Gambhir_009_RJ1303_AL	1	5.0	5.0
11	Sahroli	77.708	26.842	Gambhir_Gambhir_012_RJ1303_AL	1	5.0	5.0
12	Jaroli	77.767	26.886	Gambhir_Gambhir_012_RJ1303_AL	1	5.0	5.0
13	Piprauwa	77.782	26.858	Gambhir_Gambhir_012_RJ1303_AL	1	5.0	5.0
14	Pati Ka Pura	77.781	26.870	Gambhir_Gambhir_012_RJ1303_AL	1	5.0	5.0
15	Piphera	77.797	26.879	Gambhir_Gambhir_012_RJ1303_AL	1	5.0	5.0
16	Singhora	77.815	26.891	Gambhir_Gambhir_012_RJ1303_AL	2	5.0	10.0
17	Nidhaira Kalan	77.878	26.872	Parbati_Parbati_001_RJ1303_AL	2	5.0	10.0
18	Jamalpur	77.847	26.826	Parbati_Parbati_012_RJ1303_AL	1	5.0	5.0
19	Narpura	77.846	26.710	Parbati_Parbati_016_RJ1303_AL	1	5.0	5.0
20	Pachgaon	77.867	26.733	Parbati_Parbati_016_RJ1303_AL	3	5.0	15.0
21	Firozpur	77.887	26.730	Parbati_Parbati_016_RJ1303_AL	1	5.0	5.0
22	Khanpura	77.776	26.658	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
23	Bishnoda	77.788	26.660	Parbati_Parbati_016_RJ1303_SR	2	5.0	10.0

24	Gunna Ka Pura	77.823	26.663	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
25	Gunna Ka Pura	77.814	26.675	Parbati_Parbati_016_RJ1303_SR	2	5.0	10.0
26	Gunna Ka Pura	77.819	26.682	Parbati_Parbati_016_RJ1303_SR	2	5.0	10.0
27	Gunna Ka Pura	77.817	26.687	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
28	Chandpur	77.824	26.689	Parbati_Parbati_016_RJ1303_SR	4	5.0	20.0
29	Milkan	77.835	26.684	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
30	Hirnauda	77.850	26.680	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
31	Hirnauda	77.846	26.687	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
32	Hirnauda	77.854	26.687	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
33	Hirnauda	77.862	26.687	Parbati_Parbati_016_RJ1303_SR	3	5.0	15.0
34	Hirnauda	77.865	26.682	Parbati_Parbati_016_RJ1303_SR	2	5.0	10.0
35	Gunna Ka Pura	77.827	26.674	Parbati_Parbati_016_RJ1303_SR	1	5.0	5.0
					53		**265**

Figure 1: Showing Tentative location of the Recharge Shaft



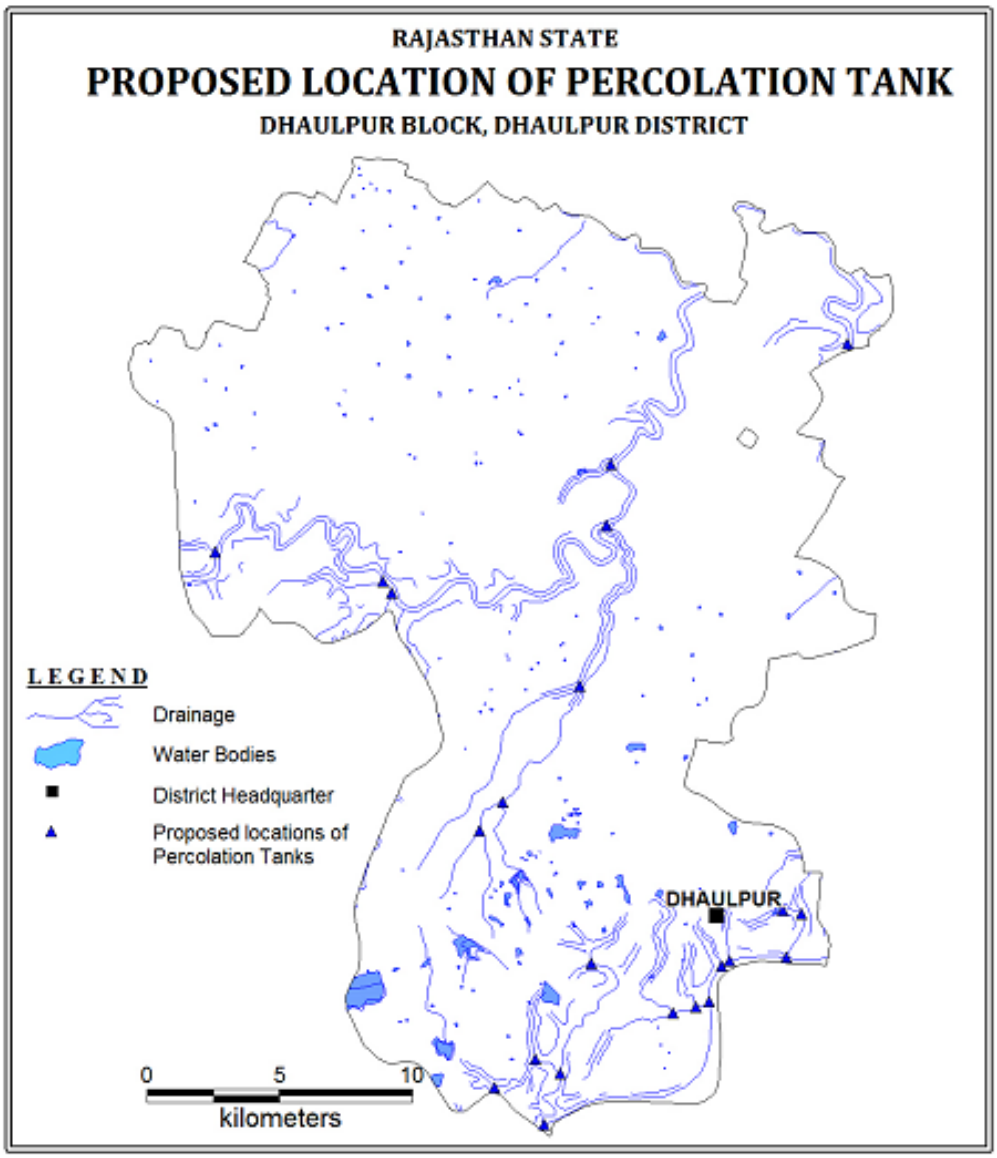
Percolation Tank

The tentative location of villages for construction of percolation tank and their cost estimates are shown in Fig 2 and Table 4

Table 4: Tentative locations of village for Percolation Tanks

S. No.	Village	Longitude	Latitude	Micro Watershed	Unit Cost (Rs. In lacs)
1	Basai Neem	77.901	26.659	Chambal_Chambal Downstream_009_RJ1303_AL	40
2	Basai Neem	77.903	26.660	Chambal_Chambal Downstream_009_RJ1303_AL	40
3	Gawan	77.925	26.662	Chambal_Chambal Downstream_009_RJ1303_AL	40
4	Gawan	77.931	26.676	Chambal_Chambal Downstream_009_RJ1303_AL	40
5	Gawan	77.924	26.678	Chambal_Chambal Downstream_009_RJ1303_AL	40
6	Beechhiya	77.851	26.660	Chambal_Chambal Downstream_010_RJ1303_AL	40
7	Kamare Ka Pura	77.882	26.643	Chambal_Chambal Downstream_010_RJ1303_AL	40
8	Kamare Ka Pura	77.891	26.645	Chambal_Chambal Downstream_010_RJ1303_AL	40
9	Nagla Moroli	77.833	26.605	Chambal_Chambal Downstream_010_RJ1303_AL	40
10	Nagla Moroli	77.830	26.627	Chambal_Chambal Downstream_010_RJ1303_AL	40
11	Patewari	77.814	26.618	Chambal_Chambal Downstream_010_RJ1303_AL	40
12	Nagla Moroli	77.839	26.622	Chambal_Chambal Downstream_010_RJ1303_AL	40
13	Kamare Ka Pura	77.896	26.647	Chambal_Chambal Downstream_010_RJ1303_AL	40
14	Bara Gaon	77.948	26.870	Gambhir_Gambhir_009_RJ1303_AL	40
15	Sakhwara	77.858	26.829	Parbati_Parbati_012_RJ1303_AL	40
16	Manpur	77.857	26.808	Parbati_Parbati_012_RJ1303_AL	40
17	Ari	77.772	26.789	Parbati_Parbati_015_RJ1303_AL	40
18	Garhi Lajja	77.708	26.799	Parbati_Parbati_015_RJ1303_AL	40
19	Bara	77.847	26.753	Parbati_Parbati_016_RJ1303_AL	40
20	Bhilgawan	77.817	26.714	Parbati_Parbati_016_RJ1303_AL	40
21	Sarani	77.809	26.705	Parbati_Parbati_016_RJ1303_AL	40
22	Ari	77.775	26.785	Parbati_Parbati_017_RJ1303_AL	40
				Total	**880**

Figure 2: Showing Tentative location of the Percolation Tank



Demand Side Management

Efficient Irrigation:

In Flood/ furrow irrigation method more than 50% of applied water is wasted through seepage to deeper levels, local inundation causes loss through evaporation and it leaches out the nutrients from the plants. While through drip and sprinkler irrigation method, wastage through irrigation loses could be minimized. Ground water usage can be minimized drastically by using HDPE pipes. Initially the scheme can be proposed to be started in 300 ha area, which is worst affected showing deepest water level and declining trends. The area is to be finalized based on land holdings, willingness of farmers and No Objection certificate from the land owner.

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.
It is proposed to construct 30 piezometers, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure.

Revival, Repair of Water Bodies

The existing ponds and tanks with time 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.

Financial Outlay of the Plan

The total estimated cost of the Plan is Rs. 13.787 cr. 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).

Table 5: Cost of the recharge structures

Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)	Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost of Sprinkler irrigation in Rs (Unit cost 0.005 cr/ha)
Soft rock – 2.65	8.80	1.50

Table 6: Tentative cost of different activities

Feasible Artificial Recharge & Water Conservation structures/ activities	Tentative Design	Quantity (in nos. or area in ha)	Rainwater harvested (MCM) or No. of sprinklers (/ha)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs lakh)	Expected Annual GW recharge/ conservation (MCM) @ 0.8 MCM/structure
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12" with filter pit	53	1.855	5	265	1.48
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	22	4.4	40	880	3.52
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**1295**	**5.24**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	30		0.6	18	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					65.65	
TOTAL					**1378.65**	**5.24**

Note: Type, number and cost of structure may vary according to site after ground verification