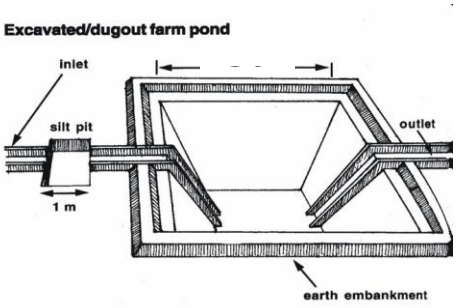
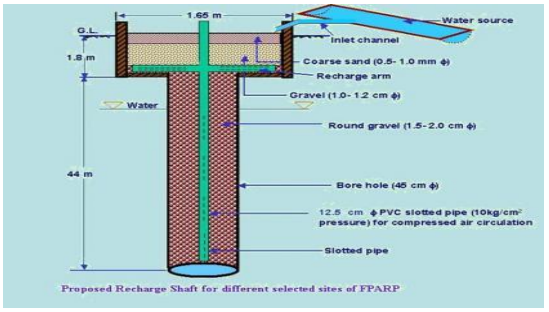
CENTRAL GROUND WATER BOARD

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





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

Western Region, Jaipur
December 2016

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

Plan at a Glance

1.	**Area of the Sheo Block**	**6667.49 sq. km.**
2.	**Area identified for Artificial Recharge**	**2654.76 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**15.46 MCM**
	Annual Ground Water Draft	**29.20 MCM**
	Stage of Ground Water Development	**188.90%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**0.234 MCM** **0.192 MCM** **--**
5.	**Volume of unsaturated aquifer zone available for recharge**	**4565.14 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**6 shafts in 6 Nos. of existing village ponds** **--** **300 ha**
	Expected Annual GW recharge	**0.154 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24**
	Total recharge/ saving of ground water	**0.394 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**1.944 crore** 0.30 crore 1.50 crore 0.036 crore 0.108 crore

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

Introduction

The **Sheo Block, district Barmer** 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 **188.90%.**

Location of the block

The Sheo Block of Barmer District covering an area of 6667.49 Sq. Km. falls in northern part of Barmer District and is located between North latitudes 25°40' & 26°31' and East longitudes 70°05' & 71°47'.

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 0.234 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)
Barmer	Sheo	6667.5	2654.76	SR	2407.32	0.06	33.97	30.97	4473.84
				HR	247.44	0.015	27.60	24.60	91.31

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
Luni_Luni_047_RJ0504_SR	Luni	SR	1.753	0.000	Y	0	0
Luni_Luni_054_RJ0504_SR	Luni	SR	65.657	0.010	Y	0	0
Luni_Luni_062_RJ0504_AL	Luni	SR	649.457	0.049	Y	1	0
Luni_Luni_062_RJ0504_AL	Luni	SR	246.705	0.018	Y	1	0
Luni_Luni_062_RJ0504_HR	Luni	HR	47.387	0.004	N	0	0
Luni_Luni_062_RJ0504_SR	Luni	SR	672.925	0.050	Y	1	0
Luni_Luni_065_RJ0504_SR	Luni	SR	680.694	0.103	Y	3	0
Outside Basin_Sub 6_057_RJ0504_SR	Sub 6	SR	2.285	0.000	Y	0	0
Outside Basin_Sub 6_057_RJ0504_SR	Sub 6	SR	0.000	0.000	Y	0	0
Outside Basin_Sub 6_058_RJ0504_AL	Sub 6	SR	0.014	0.000	Y	0	0
Outside Basin_Sub 6_059_RJ0504_AL	Sub 6	SR	65.211	0.000	Y	0	0
Outside Basin_Sub 6_059_RJ0504_SR	Sub 6	SR	258.795	0.000	Y	0	0
Outside Basin_Sub 6_060_RJ0504_AL	Sub 6	SR	168.574	0.000	Y	0	0
Outside Basin_Sub 6_061_RJ0504_AL	Sub 6	SR	679.448	0.000	Y	0	0
Outside Basin_Sub 6_061_RJ0504_SR	Sub 6	SR	521.466	0.000	Y	0	0
Outside Basin_Sub 6_062_RJ0504_AL	Sub 6	SR	60.927	0.000	Y	0	0
Outside Basin_Sub 6_067_RJ0504_AL	Sub 6	SR	804.922	0.000	Y	0	0
Outside Basin_Sub 6_068_RJ0504_AL	Sub 6	SR	499.615	0.000	Y	0	0
Outside Basin_Sub 6_068_RJ0504_SR	Sub 6	SR	313.419	0.000	Y	0	0
Outside Basin_Sub 6_069_RJ0504_AL	Sub 6	SR	392.262	0.000	N	0	0
Outside Basin_Sub 6_069_RJ0504_SR	Sub 6	SR	292.611	0.000	N	0	0
Outside Basin_Sub 6_070_RJ0504_AL	Sub 6	SR	192.664	0.000	Y	0	0
				0.234		**6**	**0**

Recharge Shaft

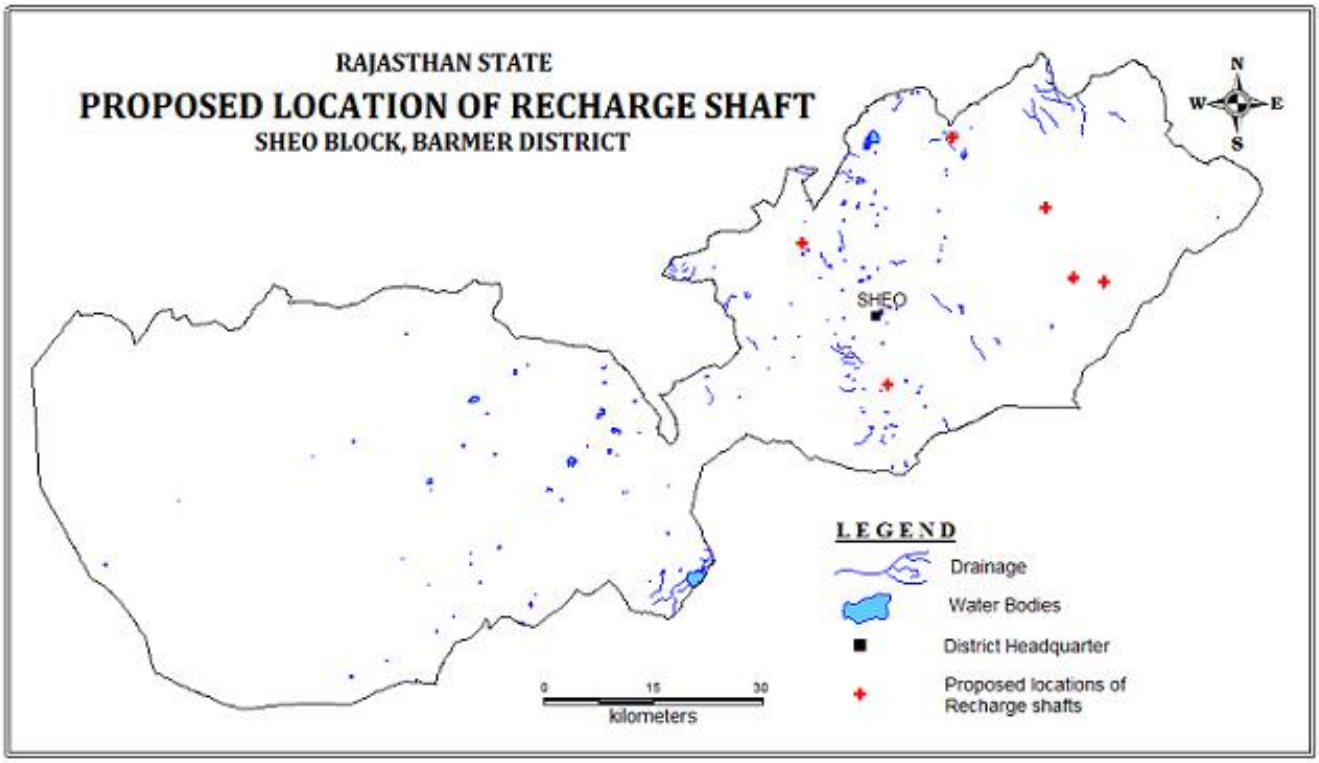
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Taloon Ka Gaon	71.252	26.100	Luni_Luni_062_RJ0504_AL	1	5	5
2	Dharwi Kalan	71.332	26.406	Luni_Luni_062_RJ0504_AL	1	5	5
3	Negrada	71.130	26.270	Luni_Luni_062_RJ0504_SR	1	5	5
4	Ramdev Nagar	71.502	26.238	Luni_Luni_065_RJ0504_SR	1	5	5
5	Jiyaniyon Ki Basti	71.544	26.234	Luni_Luni_065_RJ0504_SR	1	5	5
6	Bhiyar	71.462	26.322	Luni_Luni_065_RJ0504_SR	1	5	5
				Total	**6**		**30**

Fig: 1: Tentative location of Recharge Shaft



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 6 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. 1.944 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 4 & 5. The unit rates are as followed by the Govt. of Rajasthan (BSR).

Table 4: 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 – 0.30	-	1.50

Table 5: 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	6	0.192	5	30	0.154
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	-	-	-	-	-
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**180**	**0.394**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	6		0.6	3.60	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					9.18	
TOTAL					**192.78**	**0.394**

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