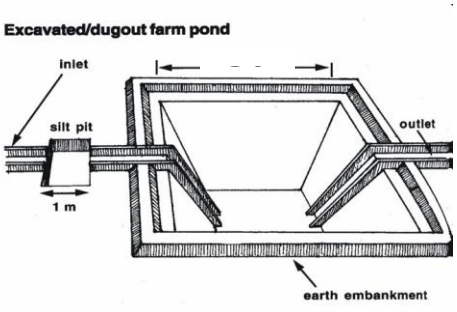
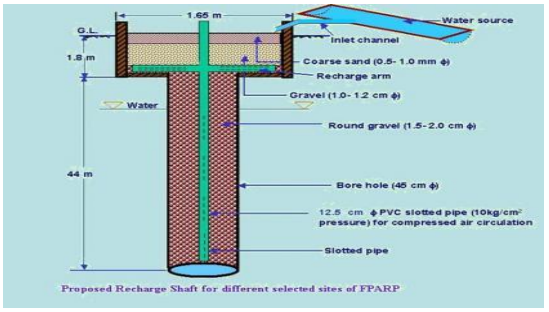
CENTRAL GROUND WATER BOARD

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





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

Western Region, Jaipur
October 2016

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

Plan at a Glance

1.	**Area of the Nadauti Block**	**650.50 sq.km.**
2.	**Area identified for Artificial Recharge**	**571.06 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**35.0656 MCM**
	Annual Ground Water Draft	**28.0676 MCM**
	Stage of Ground Water Development	**80.04%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**1.59 MCM** **1.58 MCM** **-**
5.	**Volume of unsaturated aquifer zone available for recharge**	**149.85 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**45 shafts in 45 Nos. of existing village ponds** **0** **300 ha**
	Expected Annual GW recharge	**1.26 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**1.50 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Water conservation measures Piezometer construction Operation and maintenance	**4.158 crore** 2.25 crore 1.50 crore 0.21 crore 0.198 crore

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

Introduction

The **Nadoti Block, district Karauli** 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 **80.04%.**

Location of the block

The Nadauti Block of Karauli District covering an area of 650.50 Sq. Km. falls in north-west part of Karauli District and is located between North latitudes 26°34' & 26°53' and East longitudes 76°29' & 76°52'.

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 1.59 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 are 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)
Karauli	Nadauti	650.5	571.06	SR	462.36	0.05	8.30	5.30	122.53
				HR	108.7	0.015	19.76	16.76	27.33

Table 2: Number of recharge structure

ZoneCode	Sub_ Basin	Type of Aquifer	Zone-Area	Total Surplus	Water Level >5m	Feasible_ RS_Prop	Feasible_ PT_Prop
Banas_Morel_065_RJ2303_AL	Morel	SR	78.429	0.99	Y	28	0
Banas_Morel_066_RJ2303_AL	Morel	SR	26.070	0.00	Y	0	0
Banas_Morel_066_RJ2303_HR	Morel	HR	25.109	0.00	Y	0	0
Banganga_Banganga_024_RJ2303_HR	Banganga	HR	10.433	0.00	Y	0	0
Banganga_Banganga_023_RJ2303_HR	Banganga	HR	0.989	0.00	Y	0	0
Banganga_Banganga_020_RJ2303_HR	Banganga	HR	6.217	0.00	Y	0	0
Gambhir_Gambhir_002_RJ2303_AL	Gambhir	SR	468.766	0.60	Y	17	0
				1.59		**45**	**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.

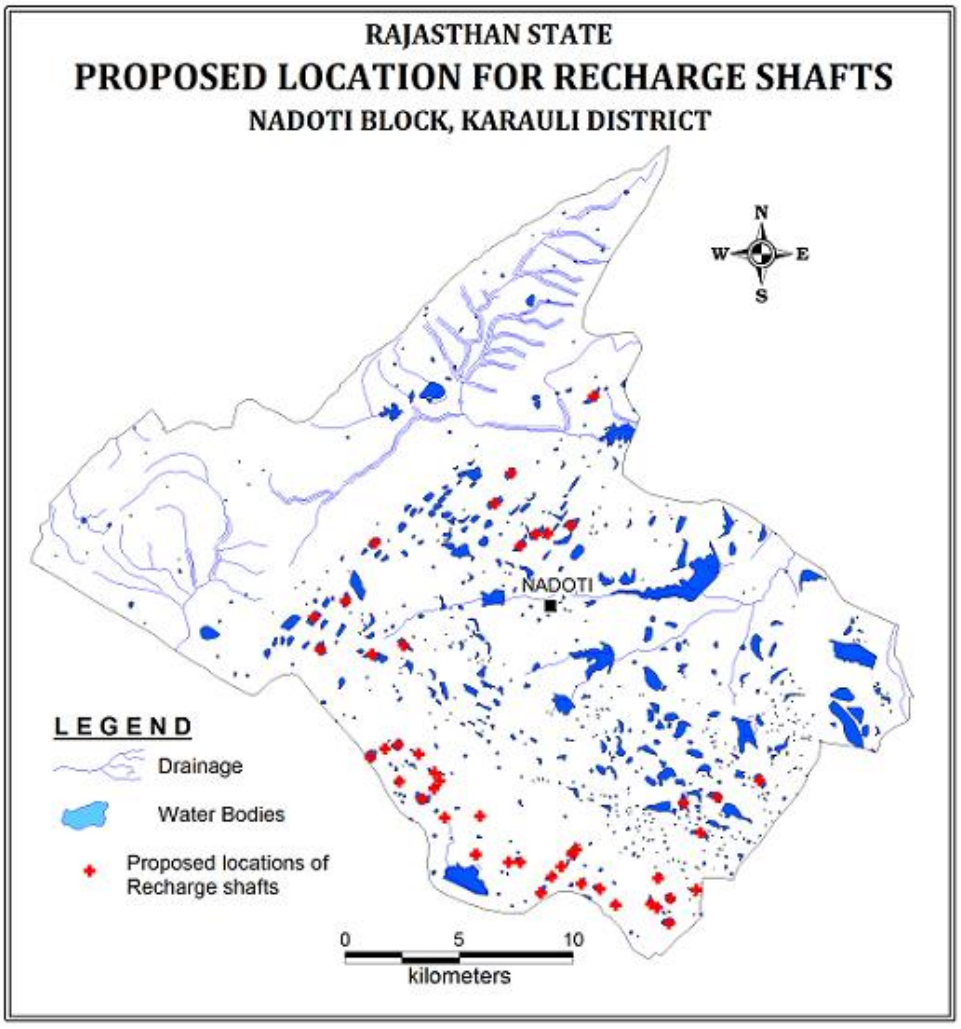
The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

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	Bara Pichanot	76.761	26.598	Banas_Morel_065_RJ2303_AL	1	5	5
2	Gurli	76.683	26.622	Banas_Morel_065_RJ2303_AL	1	5	5
3	Khura Chainpura	76.695	26.604	Banas_Morel_065_RJ2303_AL	1	5	5
4	Shahar	76.743	26.587	Banas_Morel_065_RJ2303_AL	1	5	5
5	Bara Pichanot	76.778	26.593	Banas_Morel_065_RJ2303_AL	1	5	5
6	Bamori	76.665	26.636	Banas_Morel_065_RJ2303_AL	1	5	5
7	Bamori	76.663	26.633	Banas_Morel_065_RJ2303_AL	1	5	5
8	Bamori	76.663	26.639	Banas_Morel_065_RJ2303_AL	1	5	5
9	Shahar	76.728	26.596	Banas_Morel_065_RJ2303_AL	1	5	5
10	Bamori	76.667	26.622	Banas_Morel_065_RJ2303_AL	1	5	5
11	Sanwta	76.761	26.586	Banas_Morel_065_RJ2303_AL	1	5	5
12	Bagor	76.656	26.647	Banas_Morel_065_RJ2303_AL	1	5	5
13	Shahar	76.719	26.602	Banas_Morel_065_RJ2303_AL	1	5	5
14	Bagor	76.647	26.636	Banas_Morel_065_RJ2303_AL	1	5	5
15	Shahar	76.725	26.609	Banas_Morel_065_RJ2303_AL	1	5	5
16	Bagor	76.641	26.649	Banas_Morel_065_RJ2303_AL	1	5	5
17	Garhi Khempur	76.681	26.607	Banas_Morel_065_RJ2303_AL	1	5	5
18	Shahar	76.715	26.598	Banas_Morel_065_RJ2303_AL	1	5	5
19	Khura Chainpura	76.700	26.604	Banas_Morel_065_RJ2303_AL	1	5	5
20	Shahar	76.723	26.607	Banas_Morel_065_RJ2303_AL	1	5	5
21	Shahar	76.710	26.592	Banas_Morel_065_RJ2303_AL	1	5	5
22	Sanwta	76.758	26.588	Banas_Morel_065_RJ2303_AL	1	5	5
23	Shahar	76.736	26.594	Banas_Morel_065_RJ2303_AL	1	5	5
24	Bara Pichanot	76.767	26.590	Banas_Morel_065_RJ2303_AL	1	5	5
25	Sanwta	76.766	26.580	Banas_Morel_065_RJ2303_AL	1	5	5
26	Bagor	76.647	26.650	Banas_Morel_065_RJ2303_AL	1	5	5
27	Bagor	76.635	26.645	Banas_Morel_065_RJ2303_AL	1	5	5
28	Bagor	76.657	26.629	Banas_Morel_065_RJ2303_AL	1	5	5
29	Barh Nadoti	76.713	26.733	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
30	Gurha Chandraji	76.696	26.757	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
31	Sop	76.780	26.616	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
32	Loda	76.624	26.707	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
33	Sop	76.806	26.636	Gambhir_Gambhir_002_RJ2303_AL	1	5	5

34	Dhahariya	76.701	26.728	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
35	Jeetkipur	76.636	26.730	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
36	Salawad	76.649	26.689	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
37	Salawad	76.635	26.686	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
38	Sop	76.773	26.627	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
39	Khoyli	76.613	26.688	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
40	Sop	76.787	26.630	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
41	Dholeta	76.733	26.787	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
42	Barh Nadoti	76.707	26.733	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
43	Gurha Chandraji	76.690	26.745	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
44	Bheelapara	76.723	26.737	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
45	Palri	76.610	26.700	Gambhir_Gambhir_002_RJ2303_AL	1	5	5
					45		**225**

Fig 1: Tentative Location Map for 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, worst affected area 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 35 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. 4.158 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 – 2.25	-	1.5

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	45	1.58	5	225	1.264
	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			375	1.50
Impact assessment & Monitoring						
Piezometer	50 – 80 m	35		0.6	21	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					19.8	
TOTAL					**415.80**	**1.50**

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