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

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN KALHER MANDAL, MEDAK DISTRICT, TELANGANA STATE

SOUTHERN REGION
HYDERABAD
AUGUST 2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN KALHER MANDAL, MEDAK DISTRICT, TELANGANA STATE

CONTENTS

AT A GLANCE

Name of the Mandal	Kalher
District	Medak
State	Telangana
Total Area(Sq. Kms)	227.22
Area suitable for Artificial Recharge (sq.km.)	194.22
Latitude and Longitude	18.042980 to 18.198940 and 700190 to 77.896250
Average Annual Rainfall (mm)	894
Geology	BGC
Average Depth To Water Level (Decadal) (Pre Monsoon)	23.50
Average Depth To Water Level (Decadal) (Post Monsoon)	13.90
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	24.00
Net Annual Ground Water Availability(MCM)/yr	21.60
Net Annual Ground Water Draft(MCM)/yr	22.47
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.97
Stage of Ground Water Development (%)	104
Surface runoff available (MCM)/yr	23.22
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	1.42
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 0, Check Dams-16 Farm ponds-480, Recharge Shafts-59
Improving Water use Efficiency	Micro Irrigation System -2400 ha
Tentative Total Cost in Lakhs (Rs.)	1779.12 Lakhs
Expected Recharge/Savings (MCM)/yr	8.24

1. INTRODUCTION

Kalher Mandal is one of over-exploited mandal in Medak district, Telangana State, which is economically backward and chronically drought affected. The mandal has 24 inhabited villages and one un inhabited village with 16 gram panchayats.

2. LOCATION

The mandal lies between north latitudes 18.042980 to 18.198940 and between east longitudes 77. 700190 to 77.896250. The mandal occupies the northwest part of the Medak district and is bounded on the north by Nizamabad district, on the east by Shankarampeta mandal, on the south by Narayankhed mandal and west by Kangti mandal. (Fig.1) The geographical area of the mandal is 227.22 sq.km

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams, falling in Manjeera sub-basin of Godavari basin. The streams are mostly ephemeral in nature. The drainage pattern is dendritic, rectangular to sub rectangular due to the influence of geological structures. (Fig.2)

4. RAINFALL

The average rainfall in the mandal is 894 mm. The rainfall during the South-west monsoon season i.e., June-September accounts for about 85% of the total rainfall.

5. LAND USE PATTERN

Out of the total geographical area of 227.22 sq.km, the area covered by forest is 33.07 sq.km and the net area sown is 58.21 sq.km. Barren and uncultivable land is 26.47 sq.km. The land for non agricultural use accounts for 21.69 sq.km (Fig.3)

6. HYDROGEOLOGY

The area is underlain by granitic gneisses of Archaean age (Fig.4). Ground water occurs in weathered and fractured zones under water table and semi- confined conditions. The weathered zone thickness as per the GEC report is 30 m. The weathered zone has been extensively tapped by dug and dug cum bore wells up to 30 m depth, which are mostly dry now. Ground water occurs in the fractured granites up to 200 m bgl. However, the potential fractures are encountered between 50-100 m bgl. The cumulative yield varies from 2-5lps.

7. GROUND WATER LEVEL SCENARIO

The depth to water level during pre and post-monsoon varies from 5 to 20 m bgl. The average depth to water level (decadal) during pre and post monsoon is 23.5 and 13.9 m bgl respectively. The depth to water levels maps for pre and post monsoon period (2014) are shown in Fig. 5 & 6 respectively. The decadal mean water level trend during post monsoon is depicted in the Fig.7.

8. DYNAMIC GROUND WATER RESOURCES

The Ground water availability, Utilization and stage of Development in Kalher Mandal, Medak District is given in Table-1.

Table-1: Ground water availability, Utilization and stage of Development in Kalher Mandal, Medak District.

Annual Replenishable Ground water resources (MCM)	24.00
Net Annual Ground Water Availability(MCM)/yr	21.60
Net Annual Ground Water Draft(MCM)/yr	22.47
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.97
Stage of Ground water development (%).	104
Whether notified or not with year of notification.	No

9. NEED FOR ARTIFICIAL RECHARGE AND CONSERVATION METHODS

The ground water withdrawal is more than the recharge with a stage of development above hundred percent. The long term water level trend mostly shows a declining trend and the water levels are very deep ranging upto30m. The sustainability of bore wells has become questionable as many bore wells are either drying up or have recorded reduced yields. There is no surface water irrigation facility in the area. All these factors indicate that there is an urgent need for artificial recharge and water conservation in the Mandal.

10. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Kalher Mandal falls under high stage of ground water development i.e., 104 % and with sufficient amount of uncommitted surface runoff. The area is completely dependent on ground water for domestic, industrial and irrigation purposes. During the monsoons runoff quickly flows out of the area without natural recharge to ground water. It is necessary to apply artificial recharge techniques to allow more and more recharge through check dams, PTs, MPTs, farm ponds, recharge shafts to cope up with the withdrawal pattern and also to improve ground water situation through various interventions including on farm activities and micro irrigation systems (Sprinkler-Drip-HDPE).

11. AVAILABILITY OF SURPLUS, SURFACE WATER FOR ARTIFICIAL RECAHRGE OR CONSERVATION

The runoff was calculated by taking into account of normal rainfall of the mandal and corresponding runoff yield from Strangers table. The existing storage created by various artificial recharge structures constructed by the State Government, if any, was deducted for calculating the runoff yield to recommend new AR structures.

Total Geographical area (Sq.kms)	227.22
Hilly Area (Sq.kms)	33
Area suitable for Artificial Recharge (sq.km.)	194.22
Runoff Yield in MCM/yr	23.22
Existing No. of Check Dams	156
Storage created MCM/yr	1.11
Existing No. of Percolation Tanks	45
Storage created MCM/yr	0.32
Total Existing Storage Created	1.42

12. FEASIBLE ARTIFICIAL RECHARGE STRUCTURES

Since the mandal is categorized as over exploited, there is an immediate need for improving ground water scenario and to ensure sustainability of ground water sources. It is also suggested to create additional storage capacity of surface water bodies which would result in supplementing irrigation thereby reducing the ground water draft. The run off available in the mandal has been assessed as 21.8 MCM/yr, which could be considered for further planning of artificial recharge. However, the number of artificial recharge structures feasible has been recommended in areas, by considering the utilizable yield, number of existing structures, land use, drainage pattern and also where the post monsoon water levels (decadal mean) are more than 5 m bgl., and or decadal trends are either falling or showing insignificant raising trend.

A) Check dams and Percolation Tanks:

The area is covered by seasonal nalas – drains, which carry discharge during monsoon period along with silt load and debauched into the water bodies within a short duration. It is proposed to identify such nalas for construction of check dams/Percolation tank with recharge shafts, so as to harness ground water and to increase soil moisture content.

- The site selected for check dam/Percolation Tank should have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time. The water stored in these structures is mostly confined to the stream course and height is normally less than 2m.

- These are designed based on stream width and excess water is allowed to flow over the crest wall. In order to avoid scouring from excess runoff water cushions are provided on the downstream side. To harness maximum runoff in the stream, a series of such check dams can be constructed to have recharge on a regional scale.

- Considering the annual monsoon rainfall of 894 mm, sufficient rain water can be harnessed. This will improve ground water regime as well as delaying the instant flow into the main river.

- The flow in these seasonal rivers can be sustained up to about 2 to 3 months after monsoon.

- Recharge trenches can also be constructed along upstream side of the check dam/Percolation Tank in the impoundment area for enhancing the ground water recharge rate.

A total of 16 Check dams are recommended.

B) Recharge Shafts:

The existing check dams and percolation tanks lose their storage capacity as well as recharge capacity due to siltation. Hence, Recharge shafts are recommended in the existing Check dams and Percolation tanks to enhance the ground water recharge. During the heavy downpours, there will be sufficient accumulation of runoff, which can also effectively be utilized for recharge by constructing recharge shafts. Hence, it is proposed to construct 38 and 21 recharge shafts of 165 mm dia with 30 m depth in the existing check dams and percolation tanks respectively.

C) Farm Ponds:

A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rain water 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 water from the farm pond is conveyed to the fields manually, by pumping, or by both methods.

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, levelling land, and constructing farm roads.

As per the Land use classification, majority of the area is covered by the agricultural field. Hence, it is proposed to construct 480 farm ponds in 24 villages of the Mandal @ 20 farm ponds in each village.

D) Micro Irrigation System (Sprinkler /drip/HDPE pipes):

Micro irrigation is defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery line.

In flood/furrow irrigation method more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation and it leaches out the nutrients from the plant. While through drip & sprinkler irrigation wastages of irrigational water could be minimized. The studies on different crops, has revealed that irrigation water is saved drastically. The conveyance losses (mainly seepage & evaporation) can be saved up to 25 to 40% through utilization of HDPE pipes. Initially the scheme is proposed to be implemented in worst affected areas showing deepest water levels and significant declining trends. It is proposed to take up micro irrigation system in 2400 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (KALHER MANDAL)

S.No.	Feasible Artificial Recharge & Water Conservation structures/	No. of Structures/ Quantity	Total Volume (MCM)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs Lakh)	Expected Annual GW recharge/savings (MCM)
1	Proposed Masonry Check dams Crest Length -10-15 m, Height-1-2 m) (0.007 MCM*4 fillings)	16	0.448	5	80	0.336
2	Recharge shaft in Check dam (50% of the existing Check dams)	38	0.418	0.5	19	0.418
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	0	0	15	0	0
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	21	0.231	1	21	0.231
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	480	0.06912	0.25	120	0.062208
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	2400		0.6	1440	7.2
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	24	0	0.6	14.4	0
8 (i)	Total (No. of AR Structures)	579	1.17		254.4	1.047
8 (ii)	Total (ha)	2400			1440	7.2
	Total (8(i) + 8 (ii))				**1694.4**	**8.247**
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				**84.72**	
	Grand Total				**1779.12**	

. *(Expected annual GW Recharge/Savings MCM - CDS& PTS: 75%, Farm ponds - 90%, Sprinklers-50%, Recharge shafts in existing CDS and PTS-100%)

Note: The type, number and cost of structure may vary according to site, after the ground truth verification

14. TIME SCHEDULE

Steps	Quarters							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Identification of line department/implementing agency and preparation of DPR								
Approval of Scheme and releases of sanction of funds								
Implementation of ARS								

Phase = one quarter or 3 months or equivalent to financial quarter

A). Operation and Maintenance

In all projects impact assessment has to be carried out to ensure that project is economically viable, socially equitable and environmentally sustainable by inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Accordingly it is proposed to have impact assessment as well as operation & Maintenance at the rate of 5% of the total cost of the project for 5 years from the completion of artificial recharge project.

B). Expected Benefits

The benefits of the project are:

1. The implementation of the project would result in additional recharge/Ground water savings to the tune of 8.247 MCM.
2. Ground water recharge will help in arresting the rapid decline in ground water resources and will also ensure improvement in quality of ground water by dilution.
3. Proposed structures and measures will also enhance the ground water potential and would ensure sustainability of ground water resources. It is estimated that the stage of ground water development may likely to be reduced from the present 104% to 75% (29%)
4. It will also help in controlling soil erosion.

Acknowledgements

The inputs with regard to the Utilizable Yield, existing and proposed Artificial Recharge Structures have been provided by the Director, State Ground Water Department, Government of Telangana. The same is duly acknowledged.

EXISTING ARTIFICIAL RECHARGE STRUCTURES
KALHER MANDAL, MEDAK DISTRICT, TELANGANA.

Sno	Name_Vill	Name_ARS	Long_	Lat	Agency
1	Mardi	BW Recharge	77.8320	18.1731	IWMP
2	Mardi	BW Recharge	77.8274	18.1795	IWMP
3	Mardi	BW Recharge	77.8289	18.1741	IWMP
4	Mardi	BW Recharge	77.8054	18.1958	IWMP
5	Mardi	BW Recharge	77.8311	18.1706	IWMP
6	Mardi	BW Recharge	77.8169	18.1955	IWMP
7	Mardi	BW Recharge	77.8306	18.1808	IWMP
8	Mardi	BW Recharge	77.8089	18.1774	IWMP
9	Mardi	BW Recharge	77.8327	18.1811	IWMP
10	Mardi	BW Recharge	77.8166	18.1770	IWMP
11	Mardi	BW Recharge	77.8054	18.1958	IWMP
12	Mardi	BW Recharge	77.8134	18.1789	IWMP
13	Mardi	BW Recharge	77.8124	18.1855	IWMP
14	Mardi	BW Recharge	77.8230	18.1692	IWMP
15	Mardi	BW Recharge	77.8250	18.1887	IWMP
16	Mardi	BW Recharge	77.8159	18.1667	IWMP
17	Mardi	BW Recharge	77.8111	18.1769	IWMP
18	Mardi	BW Recharge	77.8198	18.1724	IWMP
19	Mardi	BW Recharge	77.8289	18.1738	IWMP
20	Mardi	BW Recharge	77.8054	18.1958	IWMP
21	Mardi	BW Recharge	77.8248	18.1927	IWMP
22	Mardi	BW Recharge	77.8043	18.1861	IWMP
23	Mardi	BW Recharge	77.8137	18.1923	IWMP
24	Mardi	BW Recharge	77.8029	18.1879	IWMP
25	Mardi	BW Recharge	77.8103	18.1789	IWMP
26	Mardi	BW Recharge	77.8215	18.1758	IWMP
27	Mardi	BW Recharge	77.8203	18.1790	IWMP
28	Mardi	BW Recharge	77.8209	18.1786	IWMP
29	Mardi	BW Recharge	77.8212	18.1790	IWMP
30	Mardi	BW Recharge	77.8028	18.1760	IWMP
31	Mardi	BW Recharge	77.8330	18.1871	IWMP
32	Mardi	BW Recharge	77.8254	18.1719	IWMP
33	Mardi	BW Recharge	77.8306	18.1733	IWMP
34	Mardi	BW Recharge	77.8306	18.1733	IWMP
35	Kalher	BW Recharge	77.8514	18.2027	IWMP
36	Kalher	BW Recharge	77.8514	18.2027	IWMP
37	Kalher	BW Recharge	77.8532	18.1991	IWMP
38	Kalher	BW Recharge	77.8531	18.1991	IWMP
39	Kalher	BW Recharge	77.8531	18.1991	IWMP
40	Kalher	BW Recharge	77.8531	18.1991	IWMP
41	Kalher	BW Recharge	77.8531	18.1990	IWMP

42	Kalher	BW Recharge	77.8492	18.1745	IWMP
43	Kalher	BW Recharge	77.8521	18.1964	IWMP
44	Kalher	BW Recharge	77.8499	18.2018	IWMP
45	Kalher	BW Recharge	77.8383	18.1931	IWMP
46	Kalher	BW Recharge	77.8380	18.1928	IWMP
47	Kalher	BW Recharge	77.8380	18.1928	IWMP
48	Kalher	BW Recharge	77.8454	18.1728	IWMP
49	Kalher	BW Recharge	77.8502	18.1820	IWMP
50	Kalher	BW Recharge	77.8502	18.1820	IWMP
51	Raparthy	Check Dam	77.8439	18.1339	IWMP
52	Kadpal	Check Dam	77.7679	18.1129	IWMP
53	Kadpal	Check Dam	77.7556	18.1113	IWMP
54	Mardi	Check Dam	77.8138	18.1801	IWMP
55	Mardi	Check Dam	77.8162	18.1861	IWMP
56	Mardi	Check Dam	77.8088	18.1967	IWMP
57	Mardi	Check Dam	77.8069	18.1974	IWMP
58	Mardi	Check Dam	77.8110	18.1956	IWMP
59	Mardi	Check Dam	77.8103	18.1789	IWMP
60	Mardi	Check Dam	77.8163	18.1839	IWMP
61	Mardi	Check Dam	77.8191	18.1870	IWMP
62	Mardi	Check Dam	77.8169	18.1955	IWMP
63	Kalher	Check Dam	77.8303	18.1942	IWMP
64	Masan Pally	Check Dam	77.8667	18.1756	IWMP
65	Masan Pally	Check Dam	77.8670	18.1750	IWMP
66	Masan Pally	Check Dam	77.8642	18.1867	IWMP
67	Masan Pally	Check Dam	77.8789	18.1589	IWMP
68	Masan Pally	Check Dam	77.8922	18.1672	IWMP
69	Masan Pally	Check Dam	77.8617	18.1792	IWMP
70	Masan Pally	Check Dam	77.8703	18.1797	IWMP
71	Masan Pally	Check Dam	77.8660	18.1692	IWMP
72	Mahadev Pally	Check Dam	77.8354	18.1843	IWMP
73	Mahadev Pally	Check Dam	77.8927	18.1717	IWMP
74	Bibipet	Check Dam	77.7773	18.1918	IWMP
75	Fathepoor	Check Dam	77.8026	18.1973	IWMP
76	Raparthy	Farm Pond	77.8599	18.1541	IWMP
77	Raparthy	Farm Pond	77.8596	18.1532	IWMP
78	Raparthy	Farm Pond	77.8456	18.1450	IWMP
79	Raparthy	Farm Pond	77.8522	18.1458	IWMP
80	Raparthy	Farm Pond	77.8597	18.1539	IWMP
81	Raparthy	Farm Pond	77.8597	18.1539	IWMP
82	Raparthy	Farm Pond	77.8550	18.1581	IWMP
83	Raparthy	Farm Pond	77.8462	18.1431	IWMP
84	Raparthy	Farm Pond	77.8408	18.1443	IWMP

85	Raparthy	Farm Pond	77.8475	18.1393	IWMP
86	Raparthy	Farm Pond	77.8470	18.1359	IWMP
87	Raparthy	Farm Pond	77.8473	18.1392	IWMP
88	Raparthy	Farm Pond	77.8484	18.1448	IWMP
89	Raparthy	Farm Pond	77.8414	18.1498	IWMP
90	Raparthy	Farm Pond	77.8415	18.1498	IWMP
91	Kadpal	Farm Pond	77.7567	18.1133	IWMP
92	Kadpal	Farm Pond	77.7647	18.1061	IWMP
93	Kadpal	Farm Pond	77.7659	18.1074	IWMP
94	Mardi	Farm Pond	77.8028	18.1889	IWMP
95	Mardi	Farm Pond	77.8029	18.1889	IWMP
96	Mardi	Farm Pond	77.8053	18.1863	IWMP
97	Mardi	Farm Pond	77.8160	18.1906	IWMP
98	Kalher	Farm Pond	77.8442	18.1760	IWMP
99	Kalher	Farm Pond	77.8470	18.1726	IWMP
100	Kalher	Farm Pond	77.8502	18.1820	IWMP
101	Kalher	Farm Pond	77.8502	18.1820	IWMP
102	Kalher	Farm Pond	77.8511	18.1734	IWMP
103	Kalher	Farm Pond	77.8536	18.1713	IWMP
104	Kalher	Farm Pond	77.8405	18.1757	IWMP
105	Kalher	Farm Pond	77.8442	18.1761	IWMP
106	Kalher	Farm Pond	77.8442	18.1759	IWMP
107	Kalher	Farm Pond	77.8470	18.1727	IWMP
108	Raparthy	Farm Pond	77.8586	18.1600	IWMP
109	Raparthy	Farm Pond	77.8414	18.1497	IWMP
110	Raparthy	Farm Pond	77.8414	18.1498	IWMP
111	Raparthy	Farm Pond	77.8586	18.1600	IWMP
112	Raparthy	Farm Pond	77.8470	18.1359	IWMP
113	Raparthy	Farm Pond	77.8470	18.1361	IWMP
114	Raparthy	Farm Pond	77.8484	18.1448	IWMP
115	Raparthy	Farm Pond	77.8426	18.1335	IWMP
116	Raparthy	PT/MPT	77.8375	18.1495	IWMP
117	Raparthy	PT/MPT	77.8358	18.1478	IWMP
118	Raparthy	PT/MPT	77.8437	18.1296	IWMP
119	Raparthy	PT/MPT	77.8513	18.1621	IWMP
120	Raparthy	PT/MPT	77.8392	18.1534	IWMP
121	Raparthy	PT/MPT	77.8393	18.1532	IWMP
122	Kadpal	PT/MPT	77.7794	18.1168	IWMP
123	Kadpal	PT/MPT	77.7803	18.1186	IWMP
124	Kadpal	PT/MPT	77.7859	18.1259	IWMP
125	Kadpal	PT/MPT	77.7855	18.1268	IWMP
126	Kadpal	PT/MPT	77.7896	18.1209	IWMP
127	Kadpal	PT/MPT	77.7799	18.1340	IWMP

128	Kadpal	PT/MPT	77.7796	18.1312	IWMP
129	Kadpal	PT/MPT	77.7806	18.1122	IWMP
130	Kadpal	PT/MPT	77.7818	18.1120	IWMP
131	Kadpal	PT/MPT	77.7822	18.1171	IWMP
132	Kadpal	PT/MPT	77.7698	18.1104	IWMP
133	Kadpal	PT/MPT	77.7905	18.1200	IWMP
134	Kadpal	PT/MPT	77.7828	18.1171	IWMP
135	Kadpal	PT/MPT	77.7837	18.1165	IWMP
136	Kadpal	PT/MPT	77.7905	18.1192	IWMP
137	Kadpal	PT/MPT	77.7807	18.1347	IWMP
138	Kadpal	PT/MPT	77.7596	18.1353	IWMP
139	Kadpal	PT/MPT	77.7533	18.1261	IWMP
140	Mardi	PT/MPT	77.8417	18.1675	IWMP
141	Kalher	PT/MPT	77.8403	18.1722	IWMP
142	Kalher	PT/MPT	77.8490	18.1717	IWMP
143	Kalher	PT/MPT	77.8419	18.1729	IWMP
144	Kalher	PT/MPT	77.8409	18.1723	IWMP
145	Kalher	PT/MPT	77.8431	18.1741	IWMP
146	Kalher	PT/MPT	77.8426	18.1727	IWMP
147	Kalher	PT/MPT	77.8443	18.1739	IWMP
148	Kalher	PT/MPT	77.8403	18.1717	IWMP
149	Kalher	PT/MPT	77.8403	18.1717	IWMP
150	Kalher	PT/MPT	77.5412	18.1415	IWMP
151	Mahadev Pally	PT/MPT	77.8903	18.1730	IWMP
152	Mahadev Pally	PT/MPT	77.8944	18.1731	IWMP
153	Bibipet	PT/MPT	77.7838	18.1673	IWMP
154	Bibipet	PT/MPT	77.7908	18.1673	IWMP
155	Fathepoor	PT/MPT	77.7989	18.1886	IWMP
156	Raparthy	PT/MPT	77.8356	18.1375	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
KALHER MANDAL, MEDAK DISTRICT, TELANGANA.

S.No.	VNAME	Longitude	Latitude	Type of Structure
1	BOKKASGAON	77.7388	18.1847	Checkdam
2	NAGDHAR	77.8199	18.0982	Checkdam
3	ANTHERGAON	77.7561	18.1924	Checkdam
4	MUBARAKPOOR	77.7251	18.1778	Checkdam
5	MUBARAKPOOR	77.7324	18.1689	Checkdam
6	SULTANABAD	77.7398	18.1572	Checkdam
7	SIRGAPOOR	77.7298	18.1428	Checkdam
8	SIRGAPOOR	77.7338	18.1058	Checkdam
9	SIRGAPOOR	77.7149	18.1243	Checkdam
10	BIBIPET	77.7740	18.1791	Checkdam
11	MALHARPOOR	77.7978	18.0567	Checkdam
12	RAPARTHY	77.8334	18.1243	Checkdam
13	NAGDHAR	77.7986	18.1149	Checkdam
14	NAGDHAR	77.7981	18.1151	Checkdam
15	NAGDHAR	77.7981	18.1146	Checkdam
16	SIRGAPOOR	77.7335	18.1062	Checkdam

Fig.1

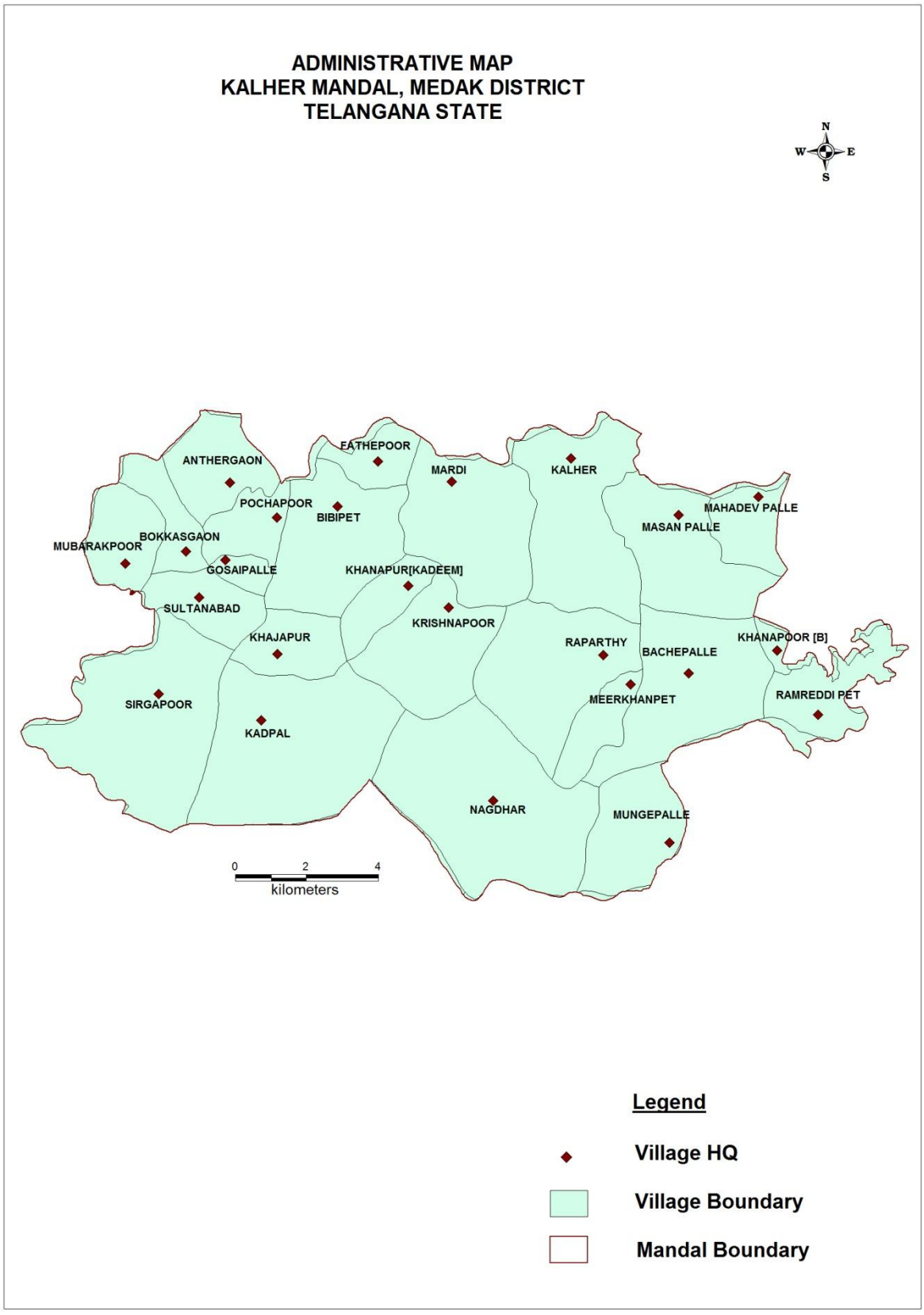

ADMINISTRATIVE MAP
KALHER MANDAL, MEDAK DISTRICT
TELANGANA STATE
N
W
E
S
ANTHERGAON
FATHEPOOR
MARDI
KALHER
POCHAPOOR
BIBIPET
MAHADEV PALLE
MASAN PALLE
MUBARAKPOOR
BOKKASGAON
GOSAIPALLE
KHANAPUR[KADEEM]
SULTANABAD
KRISHNAPOOR
KHAJAPUR
RAPARTHY
KHANAPOOR [B]
BACHEPALLE
SIRGAPOOR
MEERKHANPET
RAMREDDI PET
KADPAL
NAGDHAR
MUNGEPALLE
0
2
4
kilometers
Legend
Village HQ
Village Boundary
Mandal Boundary

Fig.2

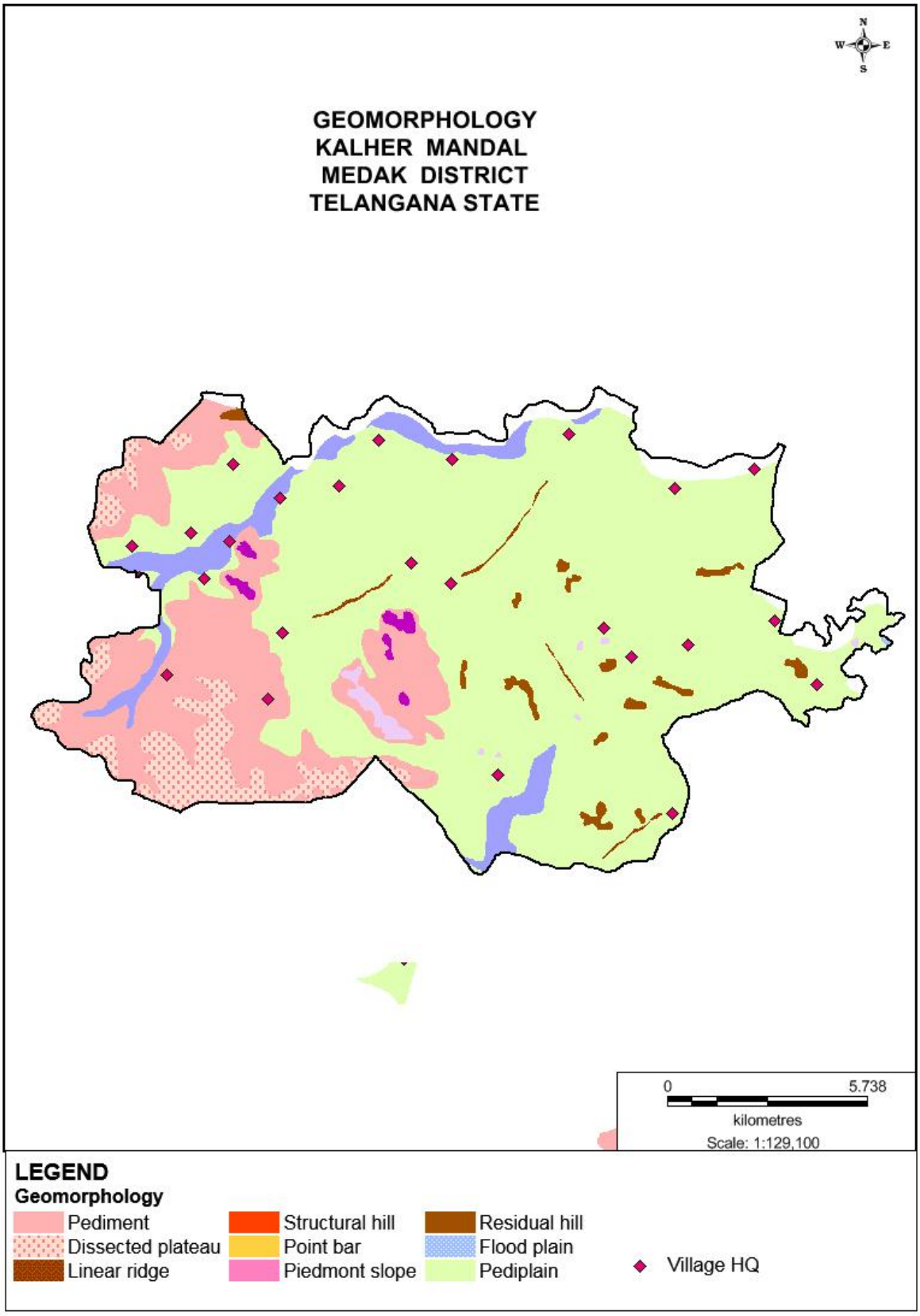

N
W
E
S
GEOMORPHOLOGY
KALHER MANDAL
MEDAK DISTRICT
TELANGANA STATE
0
5.738
kilometres
Scale: 1:129,100
LEGEND
Geomorphology
Pediment
Dissected plateau
Linear ridge
Structural hill
Point bar
Piedmont slope
Residual hill
Flood plain
Pediplain
Village HQ

Fig.3

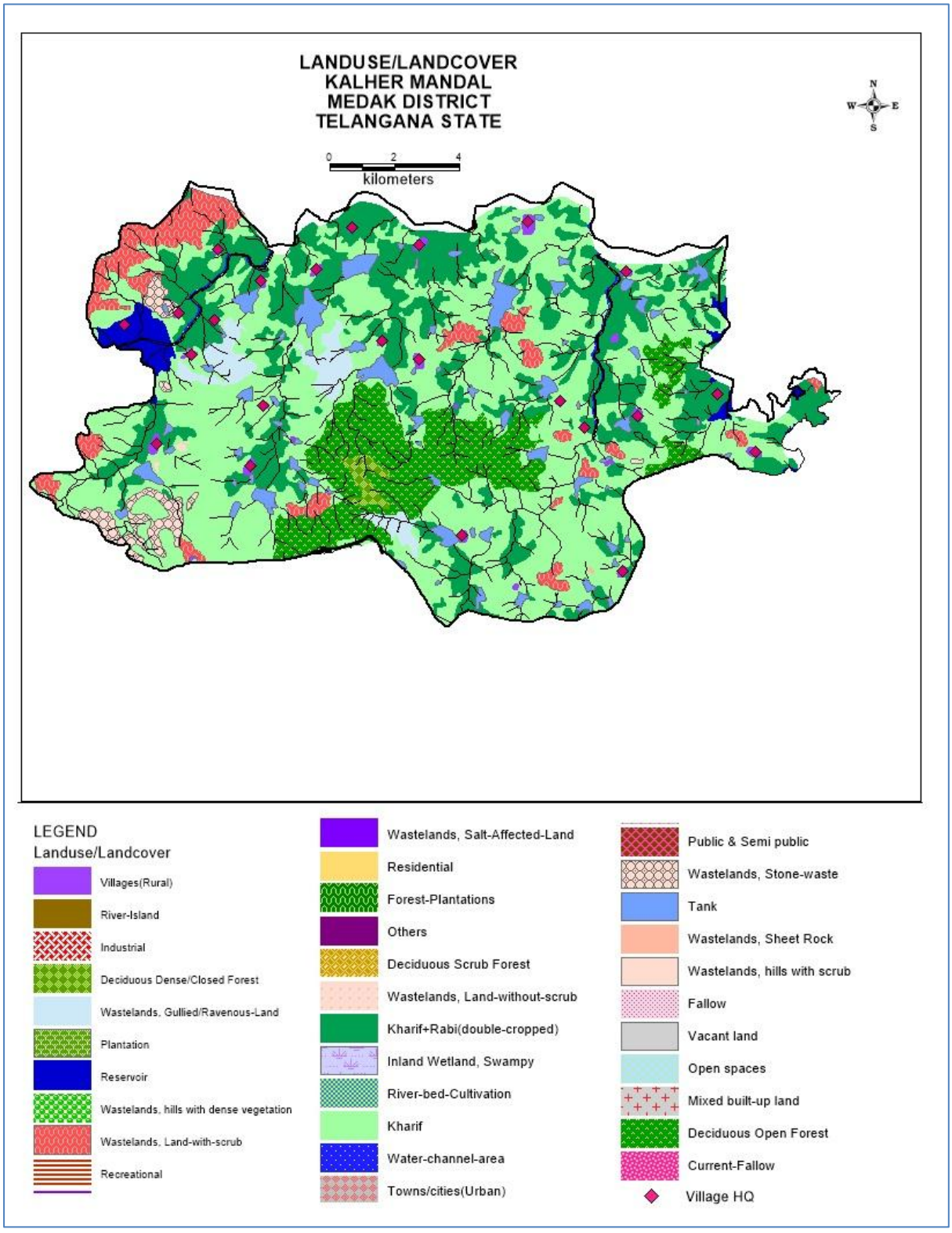

LANDUSE/LANDCOVER
KALHER MANDAL
MEDAK DISTRICT
TELANGANA STATE
N
W
E
S
0
2
4
kilometers
LEGEND
Landuse/Landcover
Villages(Rural)
River-Island
Industrial
Deciduous Dense/Closed Forest
Wastelands, Gullied/Ravenous-Land
Plantation
Reservoir
Wastelands, hills with dense vegetation
Wastelands, Land-with-scrub
Recreational
Wastelands, Salt-Affected-Land
Residential
Forest-Plantations
Others
Deciduous Scrub Forest
Wastelands, Land-without-scrub
Kharif+Rabi(double-cropped)
Inland Wetland, Swampy
River-bed-Cultivation
Kharif
Water-channel-area
Towns/cities(Urban)
Public & Semi public
Wastelands, Stone-waste
Tank
Wastelands, Sheet Rock
Wastelands, hills with scrub
Fallow
Vacant land
Open spaces
Mixed built-up land
Deciduous Open Forest
Current-Fallow
Village HQ

Fig.4

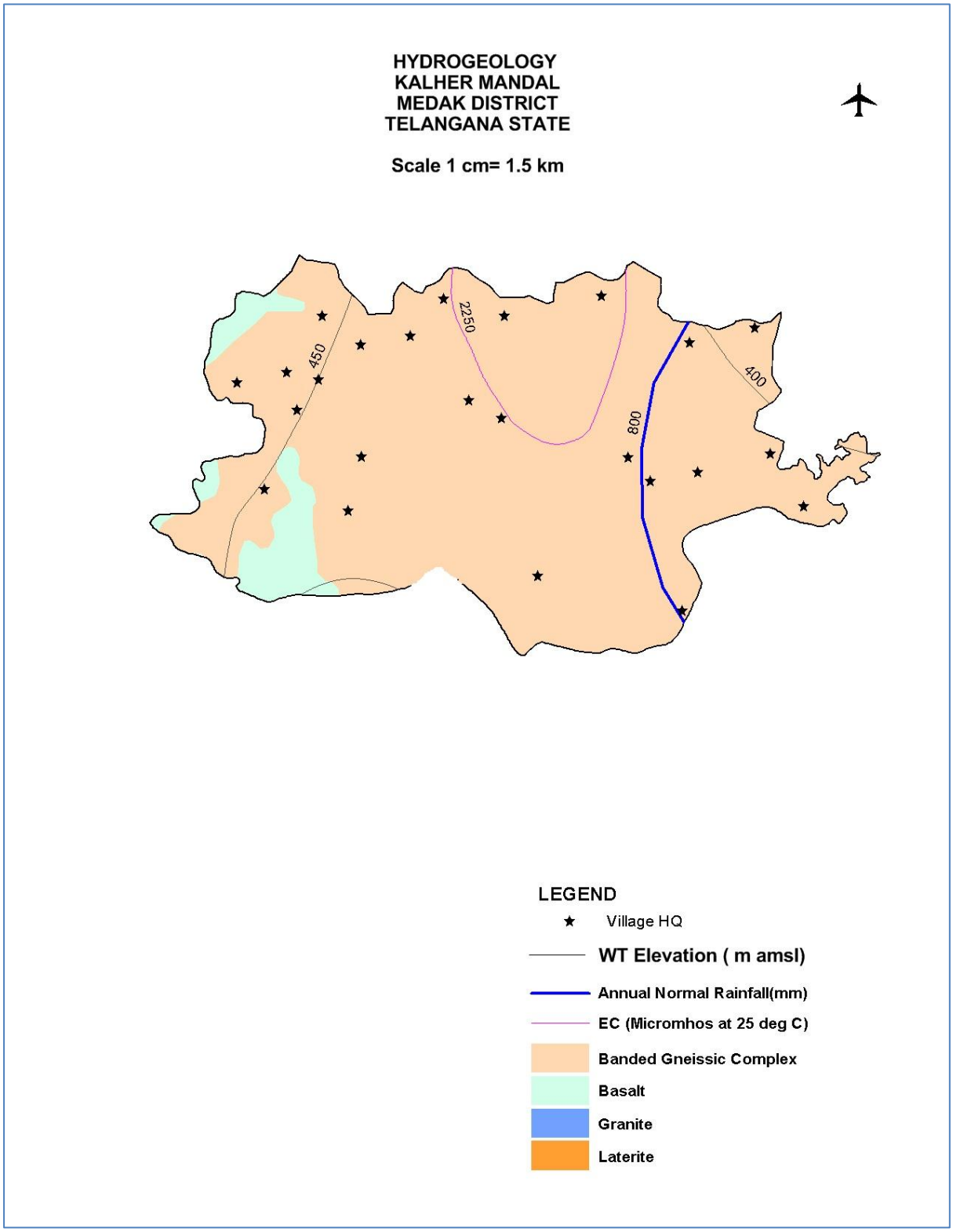

HYDROGEOLOGY
KALHER MANDAL
MEDAK DISTRICT
TELANGANA STATE
Scale 1 cm= 1.5 km
450
2250
800
400
LEGEND
Village HQ
WT Elevation (m amsl)
Annual Normal Rainfall(mm)
EC (Micromhos at 25 deg C)
Banded Gneissic Complex
Basalt
Granite
Laterite

Fig.5

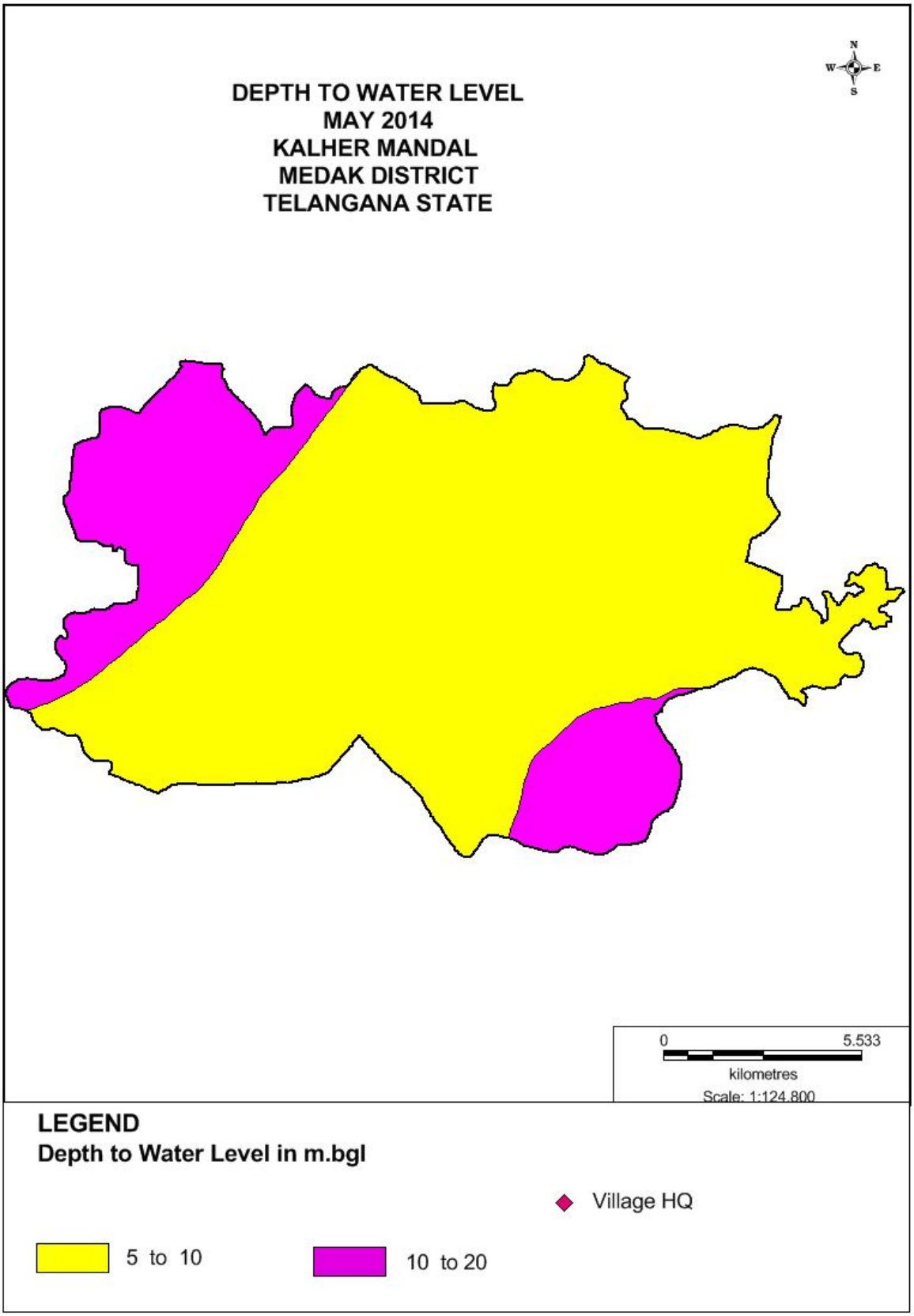

DEPTH TO WATER LEVEL
MAY 2014
KALHER MANDAL
MEDAK DISTRICT
TELANGANA STATE
N
W
E
S
0
5.533
kilometres
Scale: 1:124,800
LEGEND
Depth to Water Level in m.bgl
Village HQ
5 to 10
10 to 20

Fig.6

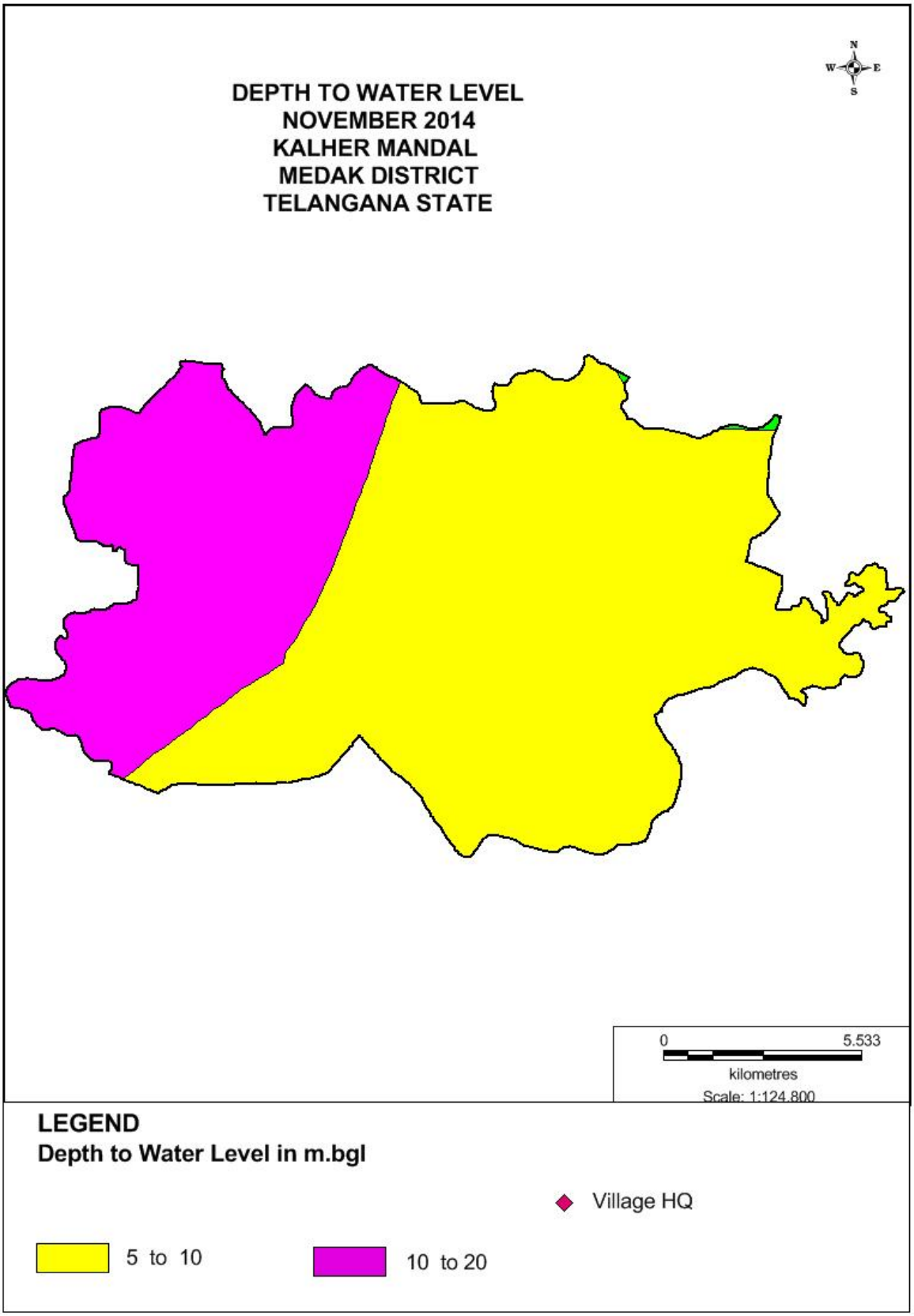
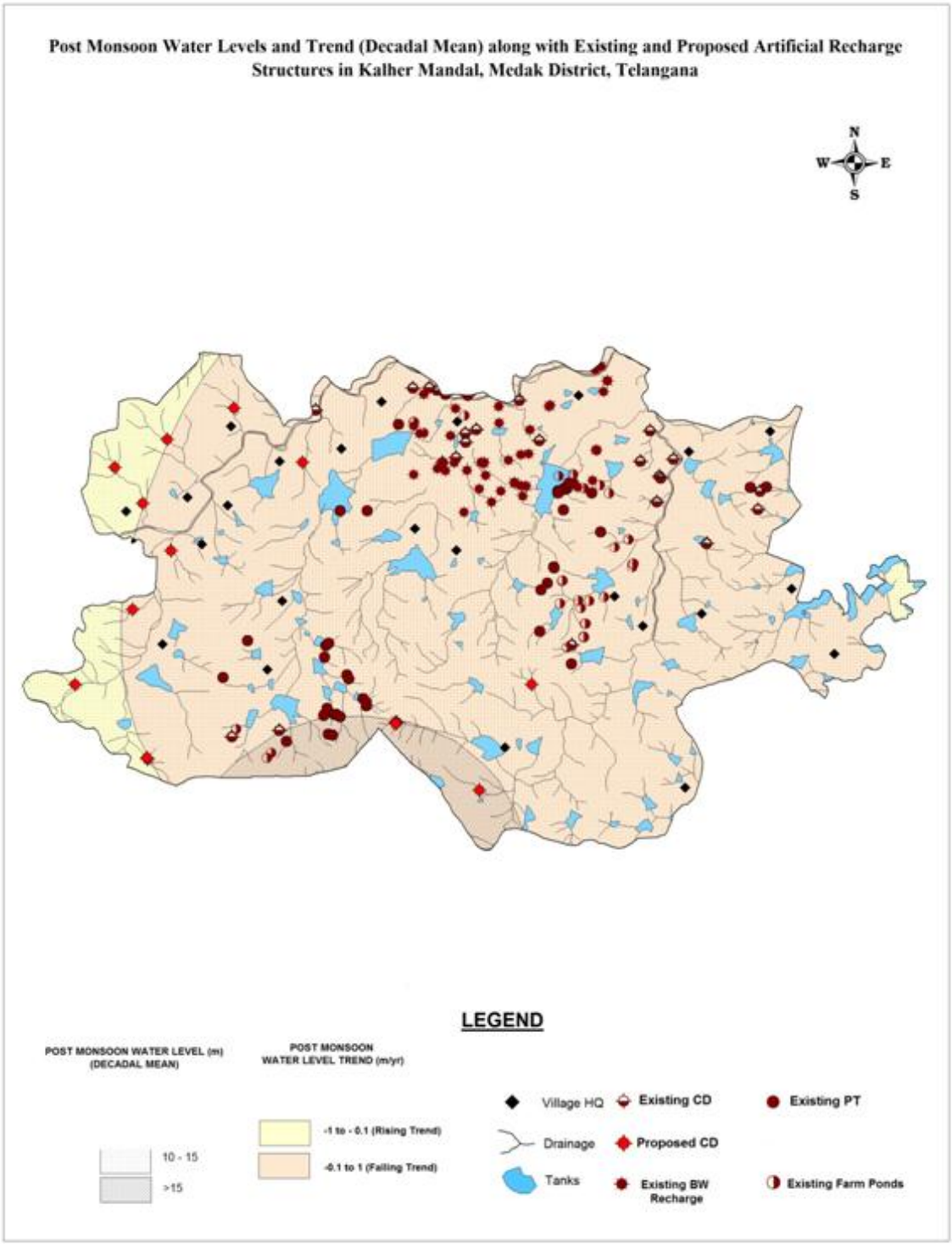

DEPTH TO WATER LEVEL
NOVEMBER 2014
KALHER MANDAL
MEDAK DISTRICT
TELANGANA STATE
N
W
E
S
0
5.533
kilometres
Scale: 1:124,800
LEGEND
Depth to Water Level in m.bgl
Village HQ
5 to 10
10 to 20

Fig.7


Post Monsoon Water Levels and Trend (Decadal Mean) along with Existing and Proposed Artificial Recharge Structures in Kalher Mandal, Medak District, Telangana
N
W
E
S
LEGEND
POST MONSOON WATER LEVEL (m) (DECADAL MEAN)
10 - 15
>15
POST MONSOON WATER LEVEL TREND (m/yr)
-1 to - 0.1 (Rising Trend)
-0.1 to 1 (Failing Trend)
Village HQ
Drainage
Tanks
Existing CD
Proposed CD
Existing BW Recharge
Existing PT
Existing Farm Ponds