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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 KODIMAL MANDAL, KARIMNAGAR DISTRICT, TELANGANA STATE

SOUTHERN REGION
HYDERABAD
AUGUST-2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN KODIMAL MANDAL, KARIMNAGAR DISTRICT, TELANGANA STATE

CONTENTS

AT A GLANCE

Name of the Mandal	KODIMAL
District	KARIMNAGAR
State	TELANGANA
Total Area(sq. km)	157
Area suitable for Artificial Recharge (Sq.kms)	112.5
Latitude and Longitude	18.567420 to 18.673490 and 78.782540 to 78.98230.
Average Annual Rainfall (mm)	897
Geology	BGC
Average Depth To Water Level (Decadal) (Pre Monsoon)	11.75
Average Depth To Water Level (Decadal) (Post Monsoon)	8.46
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	17.79
Net Annual Ground Water Availability(MCM)/yr	16.01
Net Annual Ground Water Draft(MCM)/yr	18.84
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.48
Stage of Ground Water Development (%)	118
Runoff Yield in MCM/yr	22.8
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Check Dams-62 Farm Ponds - 320
Improving Water use Efficiency	Micro Irrigation – 1600ha
Tentative Total Cost in Lakhs (Rs.)	1428
Expected Recharge/Savings (MCM)/yr	6.143

1. INTRODUCTION

Kodimal Mandal is one of the over-exploited Mandals in Karimnagar district, Telangana State, which is economically backward and chronically drought affected. The Mandal has 15 inhabited villages, and with 16 gram panchayats.

2. LOCATION

The Mandal lies between north latitudes 18.567420 to 18.673490 and between east longitudes 78.782540 to 78.98230. The Mandal occupies the western part of the Karimnagar district and is bounded on the north by Mallial mandal, on the east by Gangadhara mandal, on the south by Yemulawada mandal and west by Medipalle Mandal. (Fig.1) The geographical area of the Mandal is 157.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams, falling in Manneru 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 897 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 157 sq.km, the area under forest is 53.96 sq.km. and the net area sown is 72.37 sq.km. Barren and uncultivable land is 22.19 sq.km. The land for non agricultural use accounts for 7.42 sq.km.

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 25m.The weathered zone has been extensively tapped by dug and dug cum bore wells up to 25mbgl depth, which are mostly dry now. Ground water occurs in fractured granites down to a depth of 200 m bgl. However, the potential fractures are encountered between 50-100mbgl. The cumulative yield varies from 2-5 lps. The average depth to water level (decadal) during pre and post monsoon is 11.75 and 46 m bgl respectively.

GROUND WATER LEVEL SCENARIO

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

7. DYNAMIC GROUND WATER RESOURCES

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

Table-1: Ground water resources of Kodimal, Mandal, Karimnagar District.

Annual Replenishable Ground water resources (MCM)	17.79
Net Annual Ground Water Availability(MCM)/yr	16.01
Net Annual Ground Water Draft(MCM)/yr	18.84
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.48
Stage of Ground water development (%).	118
Whether notified or not with year of notification.	No

8. NEED FOR ARTIFICIAL RECHARGE AND CONSERVATION

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 upto15 m bgl. 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.

9. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Kodimal Mandal falls under high stage of ground water development i.e., 118 % 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).

10. 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)	157
Hilly Area (Sq.kms)	44.5
Area suitable for Artificial Recharge (sq.km.)	112.5
Runoff Yield in MCM/yr.	22.8
Utilizable Yield MCM/yr.	4.6
Existing No. of Check Dams	0
Storage created MCM/yr.	0
Existing No. of Percolation Tanks	0
Storage created MCM/yr.	0.00
Total Existing Storage Created	0.00

11. 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 for ground water recharge purpose within the mandal has been assessed as 22.8 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

The area is covered by seasonal nalas – drains, which carry discharge during monsoon period debauched into the water bodies within a short duration. It is propose that such seasonal nalas will be identified and the rain water will be harnessed through 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 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 897 mm sufficient rain water can be harnessed. This will result in recharge to ground water improving 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 rates.

A Total of 62 Check dams have been recommended

B) Farm Ponds:

A farm pond is a large 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 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 320 farm ponds in 16 villages of the Mandal @ 20 farm ponds in each village.

C). 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 1600 ha @ 100 ha per village.

12. TENTATIVE COST ESTIMATES (KODIMAL 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)	62	1.736	5	310	1.302
2	Recharge shaft in Check dam (50% of the existing Check dams)	0	0	0.5	0	0
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)	0	0	1	0	0
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	320	0.04608	0.25	80	0.0414
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1600		0.6	960	4.8
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	16	0	0.6	9.6	0
8 (i)	Total (No. of AR Structures)	398	1.78		399.6	1.343
8 (ii)	Total (ha)	1600			960	4.8
	Total (8(i) + 8 (ii))				**1359.6**	**6.143**
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				**67.98**	
	Grand Total				**1427.58**	

*(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.

13. TIME SCHEDULE

Steps	Quarter							
	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 6.14 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 118 % to 85 % (33%)
4. It will also help in controlling soil erosion.

Acknowledgements

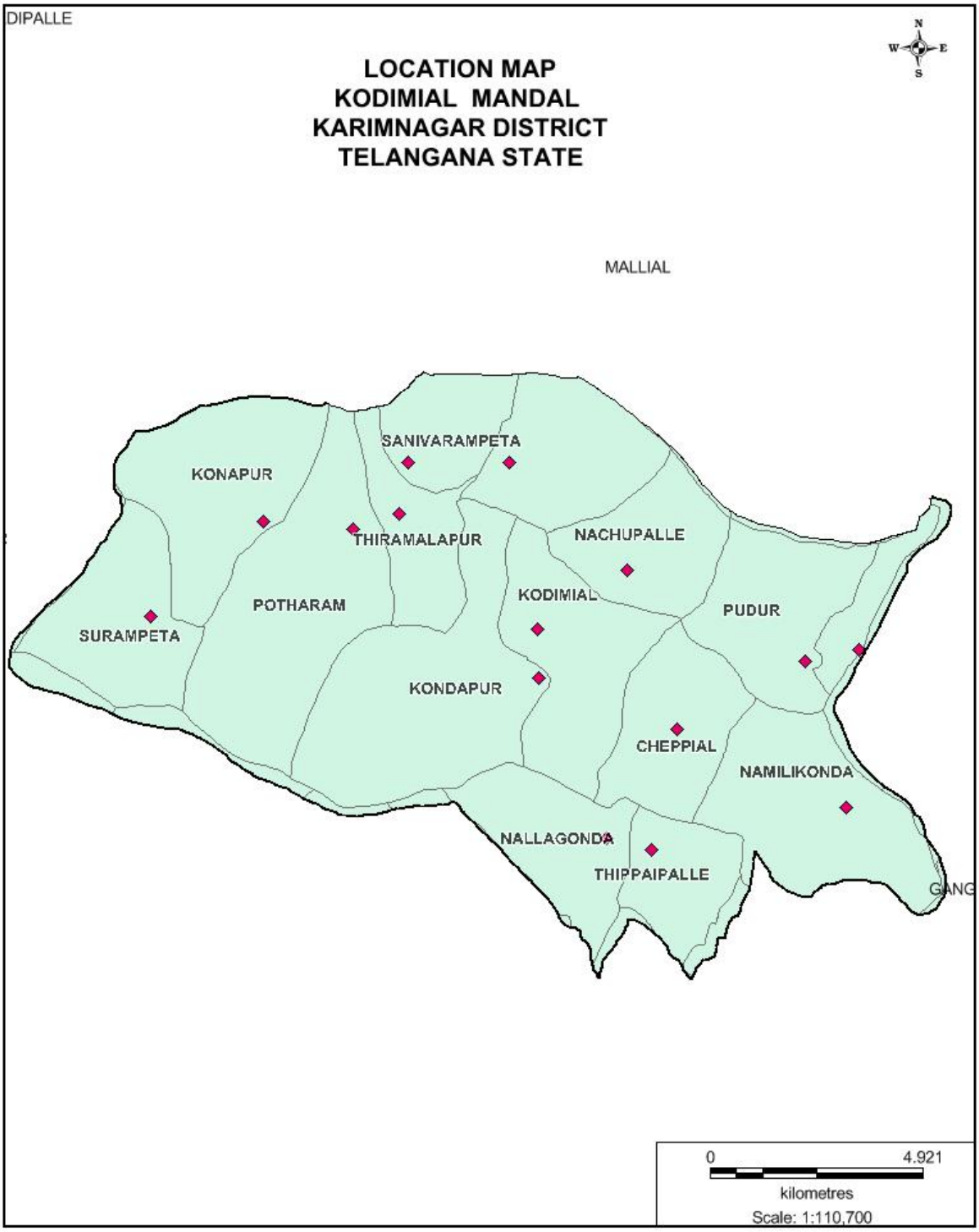
The inputs with regard to the Utilizable Yield, existing and proposed Artificial Recharge Structures have been provided by the Director, State Ground Water Department, Government of Telangana. The same is duly acknowledged.

PROPOSED ARTIFICIAL RECHARGE STRUCTURES IN
KODIMAL MANDAL, KARIMNAGAR DISTRICT, TELANGANA.

S.No.	Village	Lattitude	Longitude	Structure type
1	CHEPPIAL	18.6017	78.9363	CD
2	CHEPPIAL	18.5995	78.9254	CD
3	CHEPPIAL	18.5974	78.9151	CD
4	CHEPPIAL	18.6164	78.9389	CD
5	GOURAPUR	18.6331	78.9709	CD
6	KODIMIAL	18.6042	78.9012	CD
7	KODIMIAL	18.6015	78.9069	CD
8	KODIMIAL	18.6100	78.9057	CD
9	KONAPUR	18.6463	78.8288	CD
10	KONAPUR	18.6551	78.8265	CD
11	KONAPUR	18.6658	78.8245	CD
12	KONAPUR	18.6715	78.8421	CD
13	KONDAPUR	18.5961	78.8582	CD
14	KONDAPUR	18.6020	78.8531	CD
15	KONDAPUR	18.6147	78.8750	CD
16	KONDAPUR	18.6203	78.8581	CD
17	KONDAPUR	18.6138	78.8899	CD
18	KONDAPUR	18.6348	78.8882	CD
19	NACHUPALLE	18.6526	78.9323	CD
20	NACHUPALLE	18.6479	78.9154	CD
21	NACHUPALLE	18.6627	78.9274	CD
22	NALLAGONDA	18.5903	78.9010	CD
23	NALLAGONDA	18.5886	78.8927	CD
24	NALLAGONDA	18.5981	78.8896	CD
25	NALLAGONDA	18.5974	78.8847	CD
26	NAMILIKONDA	18.5791	78.9477	CD
27	NAMILIKONDA	18.5824	78.9623	CD
28	NAMILIKONDA	18.5896	78.9505	CD
29	NAMILIKONDA	18.6040	78.9438	CD
30	POTHARAM	18.6157	78.8419	CD
31	POTHARAM	18.6251	78.8500	CD
32	POTHARAM	18.6219	78.8421	CD
33	POTHARAM	18.6368	78.8406	CD
34	POTHARAM	18.6650	78.8566	CD
35	POTHARAM	18.6364	78.8587	CD
36	POTHARAM	18.6370	78.8637	CD
37	POTHARAM	18.6513	78.8582	CD
38	PUDUR	18.6420	78.9406	CD
39	PUDUR	18.6375	78.9995	CD
40	PUDUR	18.6407	78.9538	CD
41	RAMSAGAR	18.6636	78.9068	CD
42	RAMSAGAR	18.6631	78.9198	CD
43	RAMSAGAR	18.6760	78.9124	CD
44	RAMSAGAR	18.6683	78.9080	CD
45	SANIVARAMPETA	18.6614	78.8769	CD
46	SANIVARAMPETA	18.6664	78.8739	CD

47	SANIVARAMPETA	18.6769	78.8876	CD
48	SANIVARAMPETA	18.6769	78.8928	CD
49	SURAMPETA	18.6210	78.8196	CD
50	SURAMPETA	18.6232	78.8141	CD
51	SURAMPETA	18.6303	78.8080	CD
52	SURAMPETA	18.6310	78.7979	CD
53	SURAMPETA	18.6429	78.8040	CD
54	SURAMPETA	18.6479	78.8170	CD
55	THIPPAIPALLE	18.5821	78.9361	CD
56	THIPPAIPALLE	18.5705	78.9340	CD
57	THIPPAIPALLE	18.5756	78.9268	CD
58	THIPPAIPALLE	18.5798	78.9218	CD
59	THIRAMALAPUR	18.6357	78.8764	CD
60	THIRAMALAPUR	18.6389	78.8752	CD
61	THIRAMALAPUR	18.6514	78.8808	CD
62	THIRAMALAPUR	18.6604	78.8660	CD

Fig.1



LEGEND

Village boundary

Village HQ

Fig.2

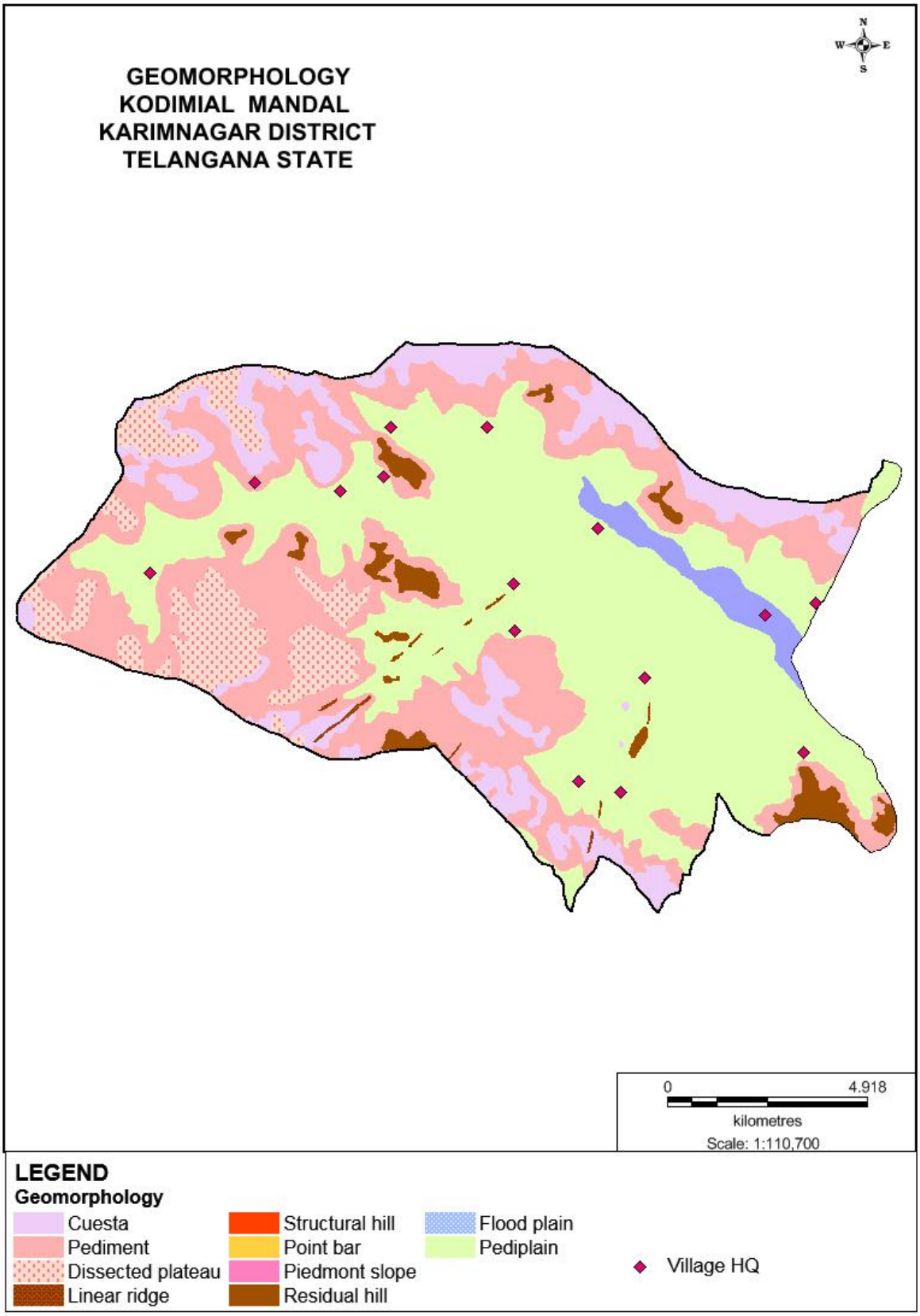

GEOMORPHOLOGY
KODIMIAL MANDAL
KARIMNAGAR DISTRICT
TELANGANA STATE
N
W
E
S
0
4.918
kilometres
Scale: 1:110,700
LEGEND
Geomorphology
Cuesta
Pediment
Dissected plateau
Linear ridge
Structural hill
Point bar
Piedmont slope
Residual hill
Flood plain
Pediplain
Village HQ

Fig.3

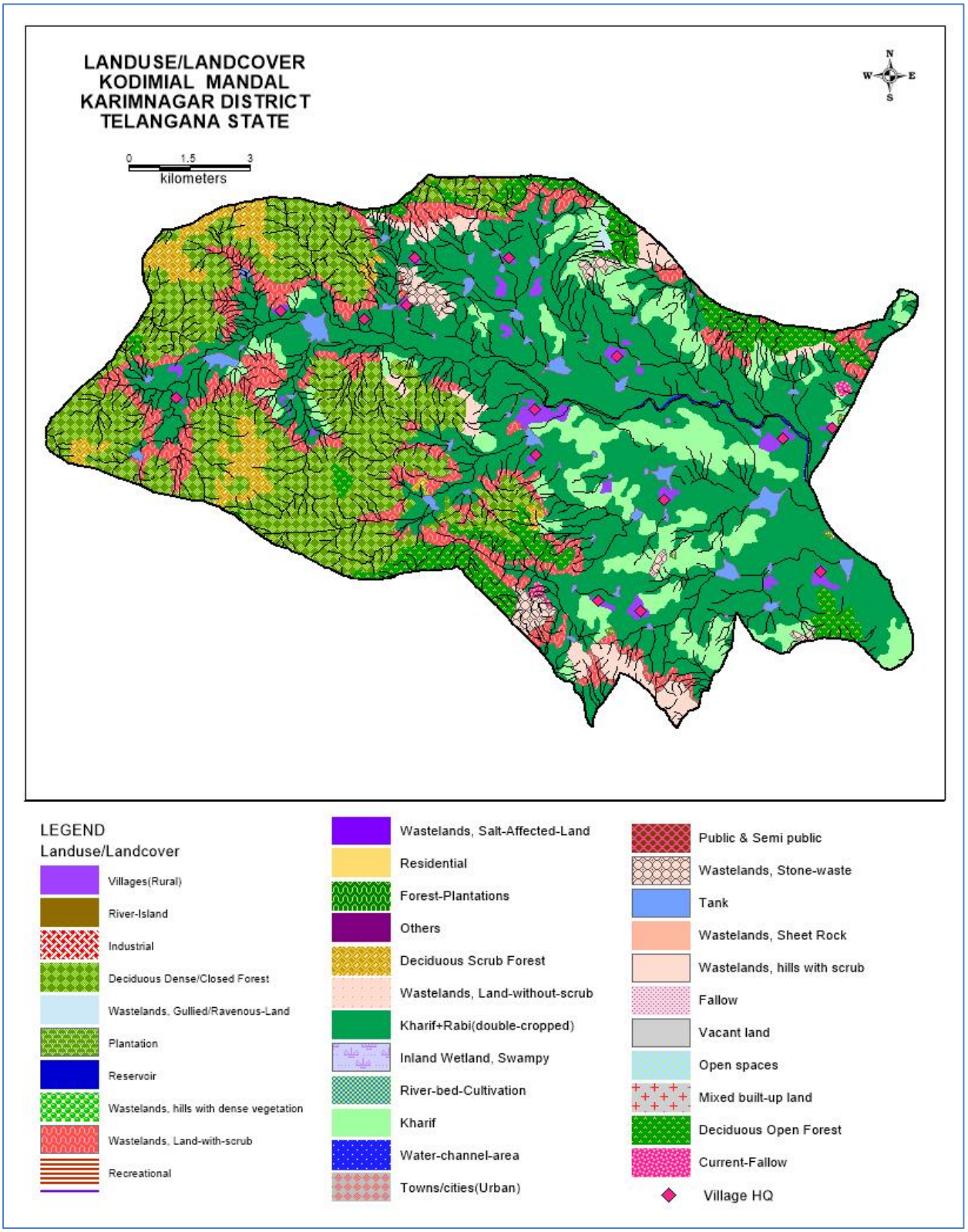

LANDUSE/LANDCOVER
KODIMIAL MANDAL
KARIMNAGAR DISTRICT
TELANGANA STATE
0 1.5 3
kilometers
N
W
E
S
LEGEND
Landuse/Landcover
Villages(Rural)
River-Island
Industrial
Deciduous Dense/Closed Forest
Wastelands, Gullied/Ravenous-Land
Plantation
Reservoir
Wastelands, hills with dense vegetation
Wastelands, Land-with-scrub
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

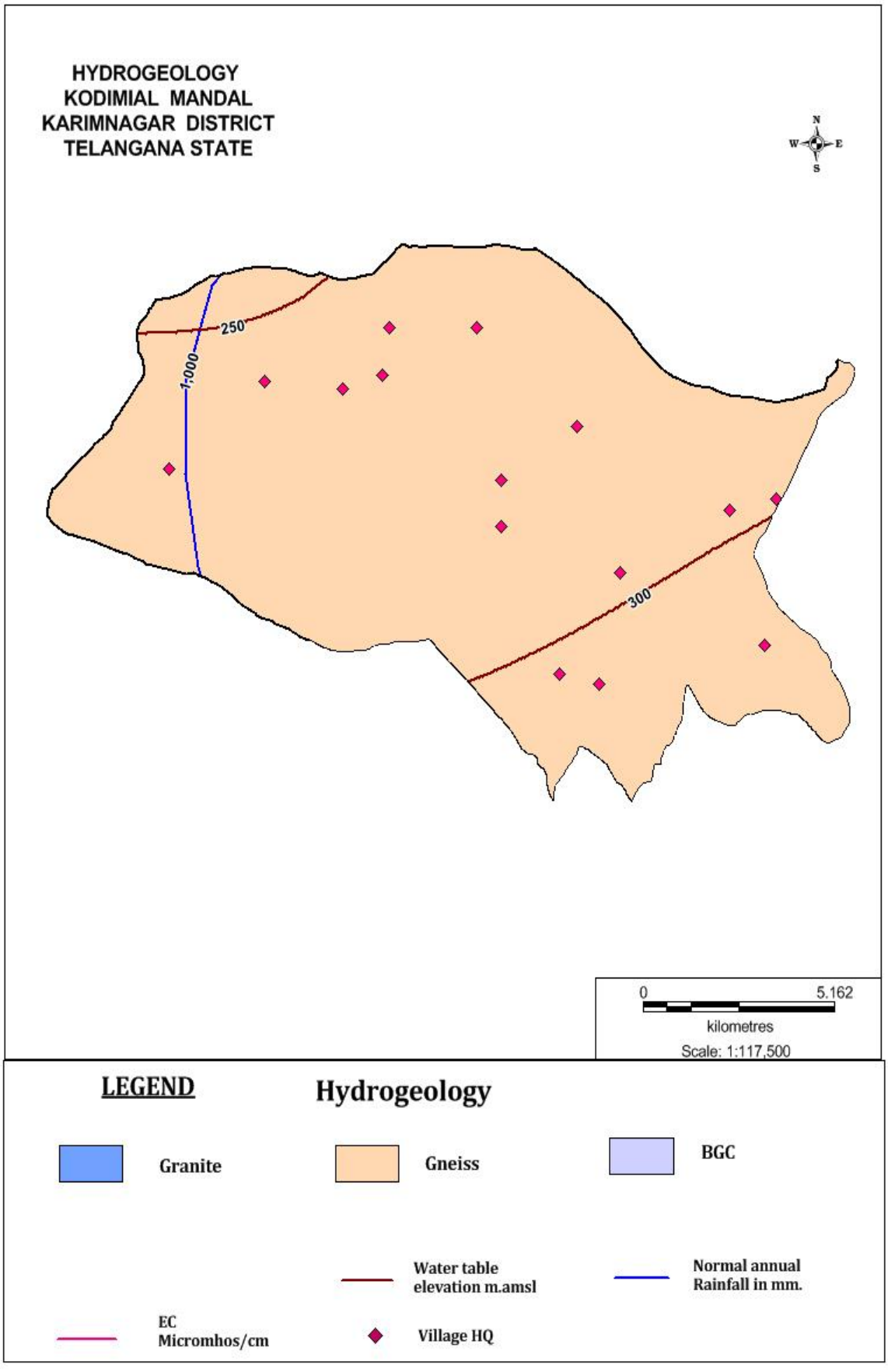

HYDROGEOLOGY
KODIMIAL MANDAL
KARIMNAGAR DISTRICT
TELANGANA STATE
N
W
E
S
250
1000
300
0
5.162
kilometres
Scale: 1:117,500
LEGEND
Hydrogeology
Granite
Gneiss
BGC
Water table elevation m.amsl
Normal annual Rainfall in mm.
EC Micromhos/cm
Village HQ

Fig.5

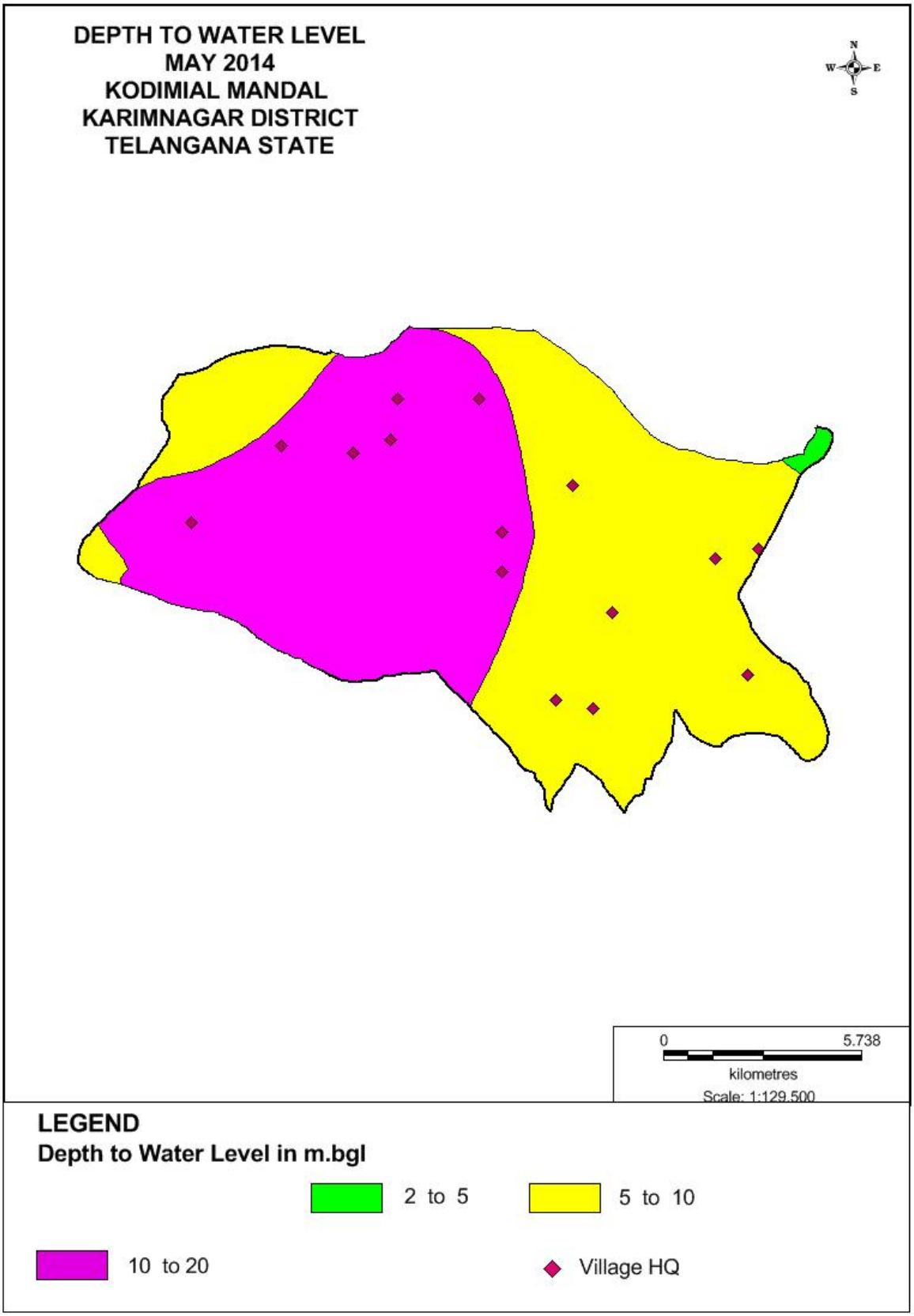

DEPTH TO WATER LEVEL
MAY 2014
KODIMIAL MANDAL
KARIMNAGAR DISTRICT
TELANGANA STATE
N
W
E
S
0
5.738
kilometres
Scale: 1:129,500
LEGEND
Depth to Water Level in m.bgl
2 to 5
5 to 10
10 to 20
Village HQ

Fig.6

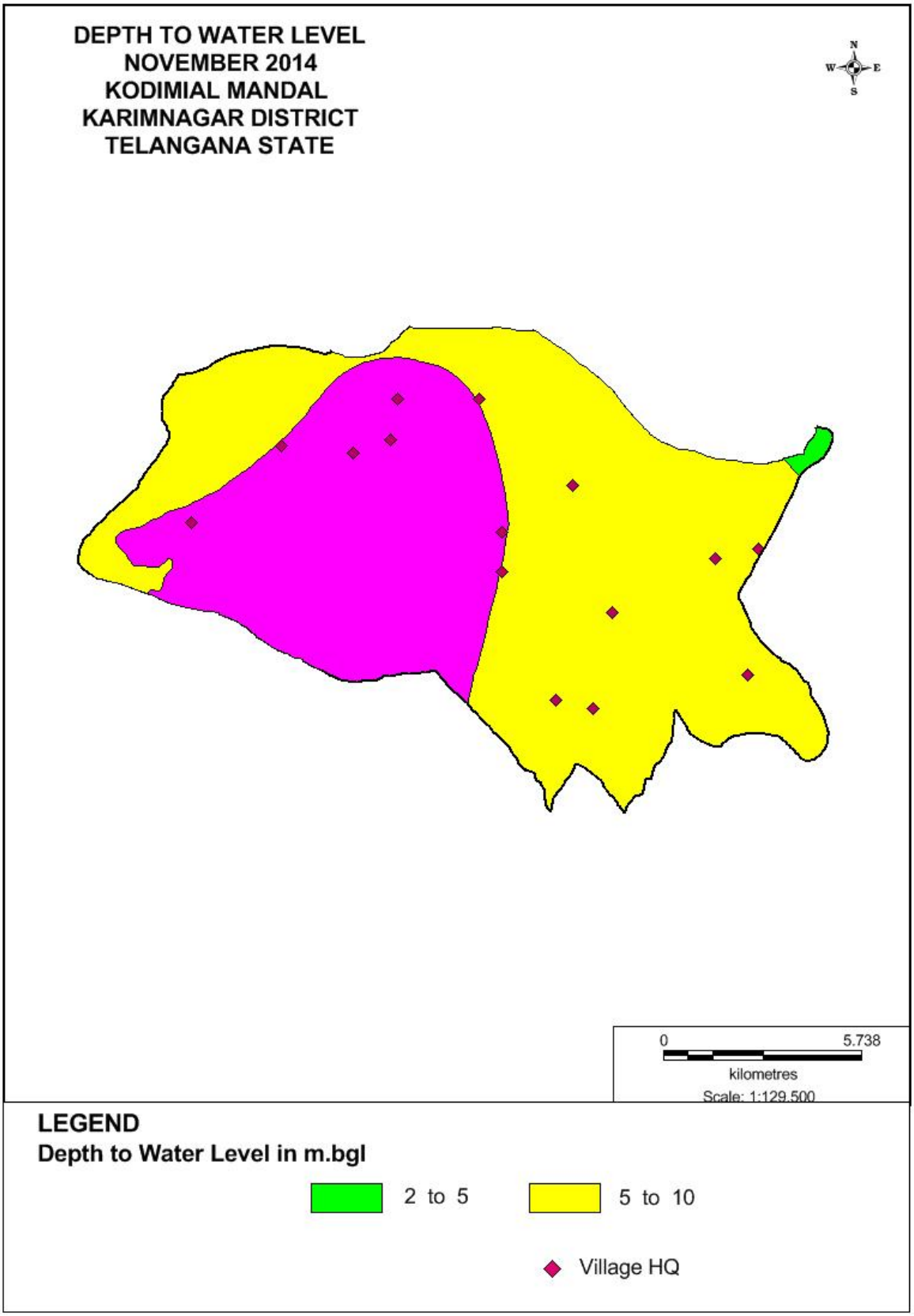
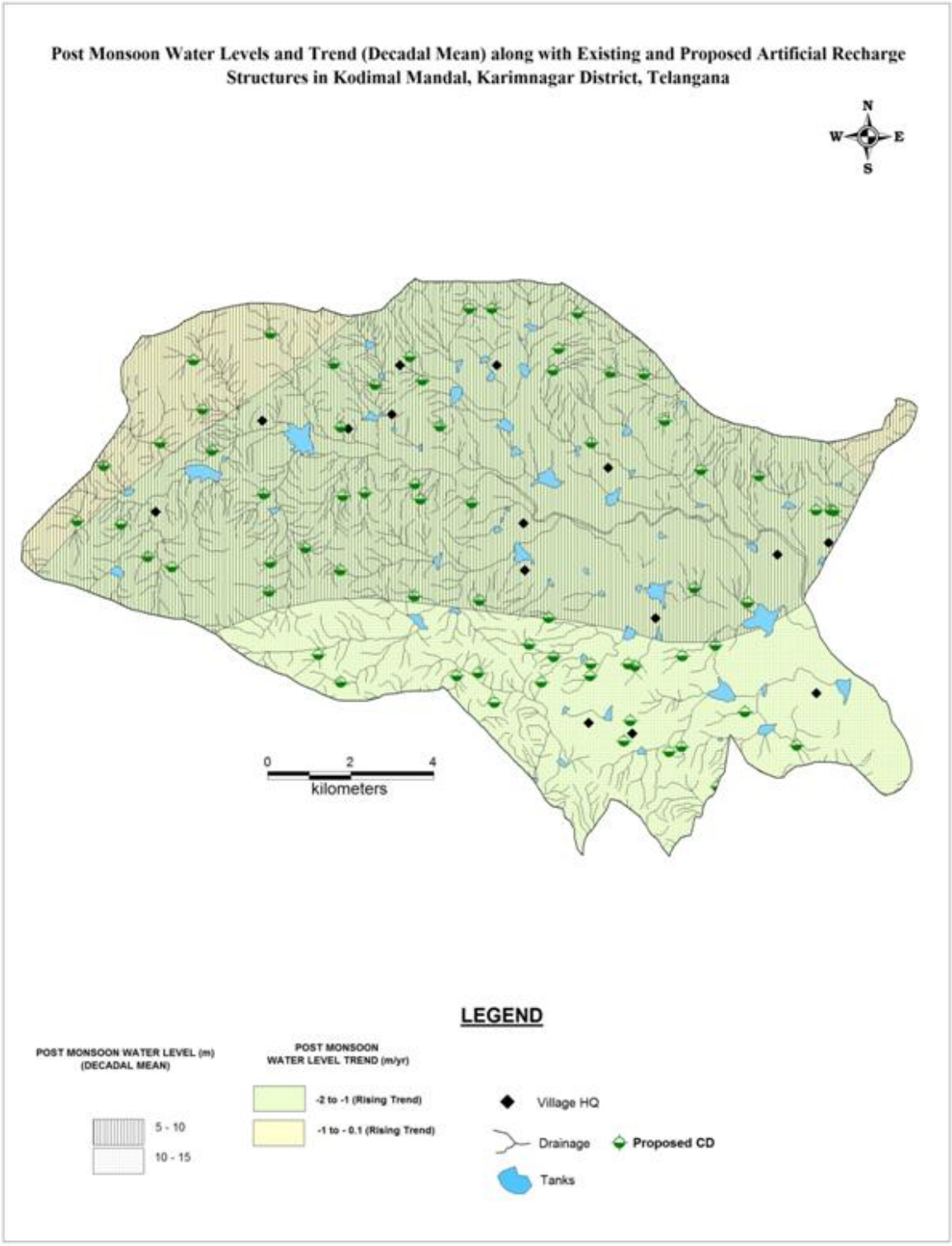

DEPTH TO WATER LEVEL
NOVEMBER 2014
KODIMIAL MANDAL
KARIMNAGAR DISTRICT
TELANGANA STATE
N
W
E
S
0
5.738
kilometres
Scale: 1:129,500
LEGEND
Depth to Water Level in m.bgl
2 to 5
5 to 10
Village HQ

Fig.7


Post Monsoon Water Levels and Trend (Decadal Mean) along with Existing and Proposed Artificial Recharge Structures in Kodimal Mandal, Karimnagar District, Telangana
N
W
E
S
0
2
4
kilometers
LEGEND
POST MONSOON WATER LEVEL (m) (DECADAL MEAN)
5 - 10
10 - 15
POST MONSOON WATER LEVEL TREND (m/yr)
-2 to -1 (Rising Trend)
-1 to - 0.1 (Rising Trend)
Village HQ
Drainage
Proposed CD
Tanks