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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 KUNDURPI MANDAL, ANANTAPUR DISTRICT, ANDHRA PRADESH

SOUTHERN REGION
HYDERABAD
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PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN KUNDURPI MANDAL, ANANTAPUR DISTRICT, ANDHRA PRADESH

CONTENTS

AT A GLANCE

Name of the Mandal	KUNDURPI
District	ANANTAPUR
State	ANDHRA PRADESH
Total Area (Sq.kms)	274
Area suitable for Artificial Recharge (Sq.kms)	229
Latitude and Longitude	14.214810 to 14.435090 and 76.930040 to 77.176420
Average Annual Rainfall (mm)	495
Geology	Granites
Average Depth To Water Level (Decadal) (Pre Monsoon)	11.6
Average Depth To Water Level (Decadal) (Post Monsoon)	5.7
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	23.75
Net Annual Ground Water Availability (MCM)/yr	21.37
Net Annual Ground Water Draft(MCM)/yr	28.72
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.8
Stage of Ground Water Development (%)	134
Surface runoff available (MCM)/yr	13.29
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	2.06
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 6, Check Dams: 12 Farm ponds: 260, Recharge Shafts: 146
Improving Water use Efficiency	Micro Irrigation System: 1300 ha
Tentative Total Cost in Lakhs (Rs.)	**1144.29**
Expected Recharge/Savings (MCM)/yr	6.242

1. INTRODUCTION

Kundurpi Mandal is one of the over-exploited mandal in Anantapur district, Andhra Pradesh State, which is economically backward and chronically drought affected. The mandal has 10 inhabited villages and with 13 gram panchayats.

2. LOCATION OF THE BLOCK

The mandal lies between north latitudes 14.214810 to 14.435090 and between east longitudes 76.930040 to 77.176420. The mandal occupies the Western part of the Anantapur district and is bounded on the north by Settur Mandal, on the east by kambadur mandal, on the south by Karnataka State and west by Karnataka State. (Fig.1) The geographical area of the mandal is 274 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams which are tributaries of Lower Thungabadra River. 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 495 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 274 sq.km, the area covered by forest is 26.64 sq.km and the net area sown is 224.21 sq.km. Barren and uncultivable land is 25.90 sq.km. The land for non agricultural use accounts for 12.32 sq.km.(Fig.3)

6. HYDROGEOLOGY

The area is underlain by granites and 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 10 m. The weathered zone has been extensively tapped by the dug and dug cum bore wells upto20 m depth. Ground water occurs in fractured granites down to a depth of 200 m bgl. However, the potential fractures are encountered between 50-100 m bgl. The cumulative yield varies from 2-5 lps.

7. 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.). The average depth to water level (decadal) during pre and post monsoon is 11.6 and 5.7 m bgl 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 Kundurpi Mandal Anantapur District is given in Table-1.

Table-1: Ground water resources of Kundurpi Mandal, Anantapur District.

Annual Replenishable Ground water resources (MCM)	23.75
Net Annual Ground water Availability. (MCM)	21.37
Net Annual Ground water Draft. (MCM)	28.72
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.8
Stage of Ground water development (%).	134
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 up to 20 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.

10. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Kundurpi Mandal falls under high stage of ground water development i.e., 134 % 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)	274
Hilly Area (Sq.kms)	45
Area suitable for Artificial Recharge (sq.km.)	229
Runoff Yield in MCM/yr.	13.29
Existing No. of Check Dams	235
Storage created MCM/yr.	1.66
Existing No. of Percolation Tanks	56
Storage created MCM/yr.	0.40
Total Existing Storage Created	2.06

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 11.23 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 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 495 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.

Thus, a total of **12 Check dams and 6 Percolation tanks** 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 118 and 28 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 260 farm ponds in 13 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 1300 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (KUNDRPI 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)	12	0.336	5	60	0.252
2	Recharge shaft in Check dam (50% of the existing Check dams)	118	1.298	0.5	59	1.298
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	6	0.6	15	90	0.45
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	28	0.308	1	28	0.308
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	260	0.03744	0.25	65	0.033696
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1300	7.8	0.6	780	3.9
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	13	0	0.6	7.8	0
8 (i)	Total (No. of AR Structures)	437	2.58		309.8	2.342
8 (ii)	Total (ha)	1300			780	3.9
	Total (8(i) + 8 (ii))				**1089.8**	**6.242**
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				**54.49**	
	Grand Total				**1144.29**	

*(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 6.424 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 134% to 103% (31%)
4. It will also help in controlling soil erosion.

Acknowledgements

The data received from the Director Ground Water Department Andhra Pradesh in respect of the basic inputs is duly acknowledged. The information on existing Artificial Recharge Structures have been taken from the EMUSTER, Department of Rural Development, Government of AP.

EXISTING ARTIFICIAL RECHARGE STRUCTURES
KUNDURPI MANDAL, ANANTAPUR DISTRICT, AP.

S.no	Gram Panchayat	Habitation	Structure Type	Longitude	Latitude	Scheme
1	Bestharapalli	Bestharapalle	Check Dam	77.0974	14.2933	NREGS
2	Bestharapalli	Bestharapalle	Check Dam	77.0961	14.2805	NREGS
3	Bestharapalli	Bestharapalle	Check Dam	77.0911	14.2722	NREGS
4	Bestharapalli	Bestharapalle	Check Dam	77.0846	14.2786	NREGS
5	Bestharapalli	Bestharapalle	Check Dam	77.0839	14.2813	NREGS
6	Bestharapalli	Bestharapalle	Check Dam	77.0910	14.2910	NREGS
7	Bestharapalli	Bestharapalle	Check Dam	77.0942	14.2923	NREGS
8	Bestharapalli	Bestharapalle	Check Dam	77.1011	14.2940	NREGS
9	Bestharapalli	Bestharapalle	Check Dam	77.1026	14.2969	NREGS
10	Kariganipalle	Kariganipalle	Check Dam	77.0769	14.3402	NREGS
11	Kariganipalle	Kariganipalle	Check Dam	77.0907	14.3280	NREGS
12	Kariganipalle	Kariganipalle	Check Dam	77.0922	14.3427	NREGS
13	Kariganipalle	Kariganipalle	Check Dam	77.0821	14.3402	NREGS
14	Kariganipalle	Kariganipalle	Check Dam	77.0968	14.3513	NREGS
15	Kariganipalle	Kariganipalle	Check Dam	77.0931	14.3493	NREGS
16	Kariganipalle	Kariganipalle	Check Dam	77.0932	14.3505	NREGS
17	Kariganipalle	Kariganipalle	Check Dam	77.0898	14.3476	NREGS
18	Kariganipalle	Kariganipalle	Check Dam	77.0877	14.3444	NREGS
19	Tenagal	Tenagal	Check Dam	77.1351	14.3403	NREGS
20	Tenagal	Tenagal	Check Dam	77.1154	14.3585	NREGS
21	Tenagal	Tenagal	Check Dam	77.1227	14.3579	NREGS
22	Tenagal	Tenagal	Check Dam	77.1109	14.3403	NREGS
23	Tenagal	Tenagal	Check Dam	77.1086	14.3538	NREGS
24	Tumukunta	Krishnapuram	Check Dam	77.1201	14.3243	NREGS
25	Tumukunta	Tumukunta	Check Dam	77.1062	14.2988	NREGS
26	Tumukunta	Tumukunta	Check Dam	77.1053	14.3020	NREGS
27	Tumukunta	Tumukunta	Check Dam	77.1052	14.3190	NREGS
28	Tumukunta	Tumukunta	Check Dam	77.1009	14.3284	NREGS
29	Tumukunta	Tumukunta	Check Dam	77.0894	14.3203	NREGS
30	Nijavalli	Nijavalli	Check Dam	77.0138	14.2648	NREGS
31	Nijavalli	Nijavalli	Check Dam	77.0042	14.2560	NREGS
32	Nijavalli	Nijavalli	Check Dam	77.0008	14.2490	NREGS
33	Nijavalli	Nijavalli	Check Dam	77.0110	14.2493	NREGS
34	Nijavalli	Venkatampalli	Check Dam	77.0344	14.2554	NREGS
35	Mahanthapuram	Kandarampalli	Check Dam	77.0620	14.2838	NREGS
36	Mahanthapuram	Kandarampalli	Check Dam	77.0606	14.2847	NREGS
37	Mahanthapuram	Kandarampalli	Check Dam	77.0635	14.2828	NREGS
38	Mahanthapuram	Kandarampalli	Check Dam	77.0667	14.2807	NREGS
39	Mahanthapuram	Kandarampalli	Check Dam	77.0754	14.2813	NREGS
40	Mahanthapuram	Kandarampalli	Check Dam	77.0705	14.2736	NREGS

41	Mahanthapuram	Kandarampalli	Check Dam	77.0719	14.2729	NREGS
42	Mahanthapuram	Mahanthapuram	Check Dam	77.0565	14.3119	NREGS
43	Mahanthapuram	Mahanthapuram	Check Dam	77.0569	14.2920	NREGS
44	Mahanthapuram	Mahanthapuram	Check Dam	77.0531	14.2888	NREGS
45	Mahanthapuram	Mahanthapuram	Check Dam	77.0646	14.2935	NREGS
46	Mahanthapuram	Mahanthapuram	Check Dam	77.0592	14.2934	NREGS
47	Mahanthapuram	Mahanthapuram	Check Dam	77.0699	14.2909	NREGS
48	Appilepalle	Appilepalle	Check Dam	77.0544	14.3334	NREGS
49	Appilepalle	Appilepalle	Check Dam	77.0603	14.3322	NREGS
50	Appilepalle	Appilepalle	Check Dam	77.0630	14.3279	NREGS
51	Appilepalle	Appilepalle	Check Dam	77.0525	14.3243	NREGS
52	Appilepalle	Appilepalle	Check Dam	77.0588	14.3189	NREGS
53	Appilepalle	Appilepalle	Check Dam	77.0532	14.3204	NREGS
54	Appilepalle	Appilepalle	Check Dam	77.0378	14.3273	NREGS
55	Appilepalle	Appilepalle	Check Dam	77.0401	14.3252	NREGS
56	Appilepalle	Appilepalle	Check Dam	77.0403	14.3238	NREGS
57	Appilepalle	Appilepalle	Check Dam	77.0406	14.3213	NREGS
58	Appilepalle	Appilepalle	Check Dam	77.0417	14.3175	NREGS
59	Appilepalle	Janampalli	Check Dam	77.0308	14.3340	NREGS
60	Appilepalle	Mandalapalli	Check Dam	77.0603	14.3242	NREGS
61	Appilepalle	Mandalapalli	Check Dam	77.0663	14.3234	NREGS
62	Appilepalle	Mandalapalli	Check Dam	77.0865	14.3123	NREGS
63	Appilepalle	Mandalapalli	Check Dam	77.0800	14.3226	NREGS
64	Appilepalle	Mandalapalli	Check Dam	77.0750	14.3075	NREGS
65	Basapuram	B.Kothuru	Check Dam	76.9979	14.3311	NREGS
66	Basapuram	Basapuram	Check Dam	76.9922	14.3376	NREGS
67	Basapuram	Basapuram	Check Dam	76.9956	14.3324	NREGS
68	Yarrakanta	Allapuram	Check Dam	77.0107	14.3374	NREGS
69	Yarrakanta	Allapuram	Check Dam	77.0082	14.3338	NREGS
70	Yarrakanta	Allapuram	Check Dam	77.0082	14.3338	NREGS
71	Yarrakanta	Yarrakunta	Check Dam	76.9853	14.3517	NREGS
72	Yarrakanta	Yerragunta	Check Dam	76.9923	14.3465	NREGS
73	Jambugumpala	Jambugumpala	Check Dam	77.0503	14.2568	NREGS
74	Jambugumpala	Jambugumpala	Check Dam	77.0532	14.2573	NREGS
75	Jambugumpala	Jambugumpala	Check Dam	77.0503	14.2568	NREGS
76	Jambugumpala	Jambugumpala	Check Dam	77.0566	14.2552	NREGS
77	Jambugumpala	Jambugumpala	Check Dam	77.0587	14.2540	NREGS
78	Jambugumpala	Jambugumpala	Check Dam	77.0588	14.2561	NREGS
79	Jambugumpala	Jambugumpala	Check Dam	77.0658	14.2622	NREGS
80	Jambugumpala	Jambugumpala	Check Dam	77.0651	14.2611	NREGS
81	Jambugumpala	Kalimipalem	Check Dam	77.0670	14.2473	NREGS
82	Jambugumpala	Kalimipalem	Check Dam	77.0754	14.2463	NREGS
83	Jambugumpala	Koligalimi	Check Dam	77.1014	14.2338	NREGS
84	Jambugumpala	Koligalimi	Check Dam	77.1001	14.2368	NREGS

85	Jambugumpala	Koligalimi	Check Dam	77.1028	14.2346	NREGS
86	Jambugumpala	Koligalimi	Check Dam	77.1068	14.2315	NREGS
87	Jambugumpala	Koligalimi	Check Dam	77.0977	14.2367	NREGS
88	Jambugumpala	Koligalimi	Check Dam	77.0972	14.2395	NREGS
89	Jambugumpala	Koligalimi	Check Dam	77.0913	14.2430	NREGS
90	Malayanur	Malayanur	Check Dam	76.9977	14.2578	NREGS
91	Malayanur	Malayanur	Check Dam	76.9976	14.2532	NREGS
92	Malayanur	Nagipalli	Check Dam	76.9404	14.2460	NREGS
93	Malayanur	Nagipalli	Check Dam	76.9435	14.2466	NREGS
94	Malayanur	Seegalapalli	Check Dam	76.9535	14.2486	NREGS
95	Malayanur	Seegalapalli	Check Dam	76.9549	14.2505	NREGS
96	Malayanur	Seegalapalli	Check Dam	76.9515	14.2448	NREGS
97	Malayanur	Vaddipalem	Check Dam	76.9519	14.2752	NREGS
98	Malayanur	Vaddipalem	Check Dam	76.9518	14.2801	NREGS
99	Kundurpi	Bandameedapalli	Check Dam	77.0041	14.2799	NREGS
100	Kundurpi	Bommajipalli	Check Dam	77.0020	14.3113	NREGS
101	Kundurpi	Bommajipalli	Check Dam	76.9959	14.3138	NREGS
102	Kundurpi	Bommajipalli	Check Dam	76.9969	14.3091	NREGS
103	Kundurpi	Kundurpi	Check Dam	77.0422	14.2671	NREGS
104	Kundurpi	Kundurpi	Check Dam	77.0444	14.2712	NREGS
105	Kundurpi	Kundurpi	Check Dam	77.0456	14.2701	NREGS
106	Kundurpi	Kundurpi	Check Dam	77.0491	14.2730	NREGS
107	Kundurpi	Kundurpi	Check Dam	77.0183	14.2849	NREGS
108	Kundurpi	Kundurpi	Check Dam	77.0240	14.3277	NREGS
109	Kundurpi	Kundurpi	Check Dam	77.0346	14.3124	NREGS
110	Kundurpi	Kundurpi	Check Dam	77.0298	14.3177	NREGS
111	Kundurpi	Kundurpi	Check Dam	77.0121	14.2973	NREGS
112	Kundurpi	Kundurpi	Check Dam	77.0107	14.2956	NREGS
113	Kundurpi	Kundurpi	Check Dam	77.0101	14.2947	NREGS
114	Kundurpi	Kundurpi	Check Dam	77.0551	14.2775	NREGS
115	Kundurpi	Kundurpi	Check Dam	77.0428	14.2850	NREGS
116	Kundurpi	Kundurpi	Check Dam	77.0475	14.3070	NREGS
117	Kundurpi	Kundurpi	Check Dam	77.0441	14.3124	NREGS
118	Kundurpi	ThammaiahDoddi	Check Dam	77.0033	14.3021	NREGS
119	Kundurpi	ThammaiahDoddi	Check Dam	76.9975	14.3058	NREGS
120	Yenumaladoddi	Bodampalli	Check Dam	77.0939	14.3974	NREGS
121	Yenumaladoddi	Bodampalli	Check Dam	77.0849	14.3986	NREGS
122	Yenumaladoddi	Bodampalli	Check Dam	77.0866	14.3988	NREGS
123	Yenumaladoddi	Bodampalli	Check Dam	77.0859	14.3983	NREGS
124	Yenumaladoddi	Guruvepalli	Check Dam	77.1123	14.4137	NREGS
125	Yenumaladoddi	Guruvepalli	Check Dam	77.0925	14.4292	NREGS
126	Yenumaladoddi	Guruvepalli	Check Dam	77.1076	14.4171	NREGS
127	Yenumaladoddi	Guruvepalli	Check Dam	77.1092	14.4180	NREGS
128	Yenumaladoddi	Guruvepalli	Check Dam	77.1187	14.4044	NREGS

129	Yenumaladoddi	Rudrampalli	Check Dam	77.1529	14.3869	NREGS
130	Yenumaladoddi	Rudrampalli	Check Dam	77.1372	14.3823	NREGS
131	Yenumaladoddi	Rudrampalli	Check Dam	77.1366	14.3928	NREGS
132	Yenumaladoddi	Rudrampalli	Check Dam	77.1410	14.3932	NREGS
133	Yenumaladoddi	Rudrampalli	Check Dam	77.1379	14.3949	NREGS
134	Yenumaladoddi	Rudrampalli	Check Dam	77.1405	14.3983	NREGS
135	Yenumaladoddi	Yenumaladoddi	Check Dam	77.1044	14.4153	NREGS
136	Yenumaladoddi	Yenumaladoddi	Check Dam	77.1050	14.3834	NREGS
137	Yenumaladoddi	Yenumaladoddi	Check Dam	77.1048	14.3785	NREGS
138	Nijavalli	Nijavalli	Check Dam	77.0138	14.2648	IWMP
139	Nijavalli	Nijavalli	Check Dam	77.0042	14.2560	IWMP
140	Nijavalli	Nijavalli	Check Dam	77.0008	14.2490	IWMP
141	Nijavalli	Nijavalli	Check Dam	77.0110	14.2493	IWMP
142	Mahanthapuram	Mahanthapuram	Check Dam	77.0699	14.2909	IWMP
143	Mahanthapuram	Mahanthapuram	Check Dam	77.0565	14.3119	IWMP
144	Mahanthapuram	Mahanthapuram	Check Dam	77.0569	14.2920	IWMP
145	Mahanthapuram	Mahanthapuram	Check Dam	77.0531	14.2888	IWMP
146	Mahanthapuram	Mahanthapuram	Check Dam	77.0646	14.2935	IWMP
147	Mahanthapuram	Mahanthapuram	Check Dam	77.0592	14.2934	IWMP
148	Jambugumpala	Jambugumpala	Check Dam	77.0532	14.2573	IWMP
149	Jambugumpala	Jambugumpala	Check Dam	77.0503	14.2568	IWMP
150	Jambugumpala	Jambugumpala	Check Dam	77.0566	14.2552	IWMP
151	Jambugumpala	Jambugumpala	Check Dam	77.0587	14.2540	IWMP
152	Jambugumpala	Jambugumpala	Check Dam	77.0588	14.2561	IWMP
153	Jambugumpala	Jambugumpala	Check Dam	77.0658	14.2622	IWMP
154	Jambugumpala	Jambugumpala	Check Dam	77.0651	14.2611	IWMP
155	Malayanur	Vaddipalem	Check Dam	76.9519	14.2752	IWMP
156	Malayanur	Vaddipalem	Check Dam	76.9518	14.2801	IWMP
157	Kundurpi	Bandameedapalli	Check Dam	77.0041	14.2799	IWMP
158	Kundurpi	Kundurpi	Check Dam	77.0422	14.2671	IWMP
159	Kundurpi	Kundurpi	Check Dam	77.0444	14.2712	IWMP
160	Kundurpi	Kundurpi	Check Dam	77.0456	14.2701	IWMP
161	Kundurpi	Kundurpi	Check Dam	77.0491	14.2730	IWMP
162	Kundurpi	Kundurpi	Check Dam	77.0101	14.2947	IWMP
163	Kundurpi	Kundurpi	Check Dam	77.0183	14.2849	IWMP
164	Kundurpi	Kundurpi	Check Dam	77.0346	14.3124	IWMP
165	Kundurpi	Kundurpi	Check Dam	77.0298	14.3177	IWMP
166	Kundurpi	Kundurpi	Check Dam	77.0240	14.3277	IWMP
167	Kundurpi	Kundurpi	Check Dam	77.0121	14.2973	IWMP
168	Kundurpi	Kundurpi	Check Dam	77.0107	14.2956	IWMP
169	Kundurpi	Kundurpi	Check Dam	77.0551	14.2775	IWMP
170	Kundurpi	Kundurpi	Check Dam	77.0428	14.2850	IWMP
171	Kundurpi	Kundurpi	Check Dam	77.0475	14.3070	IWMP
172	Kundurpi	Kundurpi	Check Dam	77.0441	14.3124	IWMP

173	Tumukunta	Krishnapuram	Check Wall	77.1258	14.3253	NREGS
174	Tumukunta	Tumukunta	Check Wall	77.1088	14.3029	NREGS
175	Tumukunta	Tumukunta	Check Wall	77.1138	14.3063	NREGS
176	Tumukunta	Tumukunta	Check Wall	77.1174	14.3089	NREGS
177	Tumukunta	Tumukunta	Check Wall	77.1011	14.3008	NREGS
178	Nijavalli	Nijavalli	Check Wall	77.0092	14.2687	NREGS
179	Nijavalli	Nijavalli	Check Wall	77.0088	14.2555	NREGS
180	Nijavalli	Nijavalli	Check Wall	77.0101	14.2535	NREGS
181	Nijavalli	Nijavalli	Check Wall	77.0076	14.2483	NREGS
182	Nijavalli	Nijavalli	Check Wall	77.0168	14.2422	NREGS
183	Nijavalli	Nijavalli	Check Wall	77.0059	14.2490	NREGS
184	Nijavalli	Venkatampalli	Check Wall	77.0317	14.2555	NREGS
185	Mahanthapuram	Kandarampalli	Check Wall	77.0763	14.2799	NREGS
186	Mahanthapuram	Mahanthapuram	Check Wall	77.0519	14.2873	NREGS
187	Mahanthapuram	Mahanthapuram	Check Wall	77.0676	14.2912	NREGS
188	Mahanthapuram	Mahanthapuram	Check Wall	77.0702	14.2928	NREGS
189	Appilepalle	Mandalapalli	Check Wall	77.0521	14.3145	NREGS
190	Appilepalle	Mandalapalli	Check Wall	77.0850	14.3171	NREGS
191	Yarrakanta	Yarrakunta	Check Wall	76.9838	14.3539	NREGS
192	Yarrakanta	Yerragunta	Check Wall	77.0288	14.3551	NREGS
193	Jambugumpala	Jambugumpala	Check Wall	77.0617	14.2579	NREGS
194	Malayanur	Vaddipalem	Check Wall	76.9500	14.2869	NREGS
195	Malayanur	Vaddipalem	Check Wall	76.9513	14.2830	NREGS
196	Kundurpi	Bandameedapalli	Check Wall	77.0096	14.2770	NREGS
197	Kundurpi	Bandameedapalli	Check Wall	77.0057	14.2748	NREGS
198	Kundurpi	Bandameedapalli	Check Wall	77.0005	14.2800	NREGS
199	Kundurpi	Bandameedapalli	Check Wall	77.0015	14.2844	NREGS
200	Kundurpi	Bandameedapalli	Check Wall	77.0031	14.2879	NREGS
201	Kundurpi	Kundurpi	Check Wall	77.0496	14.2731	NREGS
202	Kundurpi	Kundurpi	Check Wall	77.0501	14.2731	NREGS
203	Kundurpi	Kundurpi	Check Wall	77.0131	14.2985	NREGS
204	Kundurpi	Kundurpi	Check Wall	77.0287	14.3203	NREGS
205	Kundurpi	Kundurpi	Check Wall	77.0138	14.2984	NREGS
206	Kundurpi	Kundurpi	Check Wall	77.0505	14.2821	NREGS
207	Kundurpi	ThammaiahDoddi	Check Wall	76.9979	14.2984	NREGS
208	Yenumaladoddi	Bodampalli	Check Wall	77.0818	14.3954	NREGS
209	Yenumaladoddi	Yenumaladoddi	Check Wall	77.1032	14.4144	NREGS
210	Yenumaladoddi	Yenumaladoddi	Check Wall	77.1042	14.4177	NREGS
211	Yenumaladoddi	Yenumaladoddi	Check Wall	77.1034	14.4226	NREGS
212	Yenumaladoddi	Yenumaladoddi	Check Wall	77.1025	14.4227	NREGS
213	Nijavalli	Nijavalli	Check Wall	77.0092	14.2687	IWMP
214	Nijavalli	Nijavalli	Check Wall	77.0088	14.2555	IWMP
215	Nijavalli	Nijavalli	Check Wall	77.0101	14.2535	IWMP
216	Nijavalli	Nijavalli	Check Wall	77.0076	14.2483	IWMP

217	Nijavalli	Nijavalli	Check Wall	77.0168	14.2422	IWMP
218	Nijavalli	Nijavalli	Check Wall	77.0059	14.2490	IWMP
219	Mahanthapuram	Mahanthapuram	Check Wall	77.0702	14.2928	IWMP
220	Mahanthapuram	Mahanthapuram	Check Wall	77.0519	14.2873	IWMP
221	Mahanthapuram	Mahanthapuram	Check Wall	77.0676	14.2912	IWMP
222	Jambugumpala	Jambugumpala	Check Wall	77.0617	14.2579	IWMP
223	Malayanur	Vaddipalem	Check Wall	76.9500	14.2869	IWMP
224	Malayanur	Vaddipalem	Check Wall	76.9513	14.2830	IWMP
225	Kundurpi	Bandameedapalli	Check Wall	77.0096	14.2770	IWMP
226	Kundurpi	Bandameedapalli	Check Wall	77.0057	14.2748	IWMP
227	Kundurpi	Bandameedapalli	Check Wall	77.0005	14.2800	IWMP
228	Kundurpi	Bandameedapalli	Check Wall	77.0015	14.2844	IWMP
229	Kundurpi	Bandameedapalli	Check Wall	77.0031	14.2879	IWMP
230	Kundurpi	Kundurpi	Check Wall	77.0496	14.2731	IWMP
231	Kundurpi	Kundurpi	Check Wall	77.0501	14.2731	IWMP
232	Kundurpi	Kundurpi	Check Wall	77.0138	14.2984	IWMP
233	Kundurpi	Kundurpi	Check Wall	77.0131	14.2985	IWMP
234	Kundurpi	Kundurpi	Check Wall	77.0287	14.3203	IWMP
235	Kundurpi	Kundurpi	Check Wall	77.0505	14.2821	IWMP
236	Tumukunta	Tumukunta	MPT	77.1062	14.3231	NREGS
237	Tumukunta	Tumukunta	MPT	77.1052	14.3271	NREGS
238	Tumukunta	Tumukunta	MPT	77.1193	14.3130	NREGS
239	Tumukunta	Tumukunta	MPT	77.1208	14.3160	NREGS
240	Tumukunta	Tumukunta	MPT	77.1226	14.3149	NREGS
241	Tumukunta	Tumukunta	MPT	77.1222	14.3137	NREGS
242	Tumukunta	Tumukunta	MPT	77.1028	14.3191	NREGS
243	Tumukunta	Tumukunta	MPT	77.0978	14.3187	NREGS
244	Tumukunta	Tumukunta	MPT	77.1061	14.3212	NREGS
245	Mahanthapuram	Mahanthapuram	MPT	77.0602	14.3037	NREGS
246	Basapuram	B.Kothuru	MPT	76.9888	14.3103	NREGS
247	Basapuram	Basapuram	MPT	76.9813	14.3151	NREGS
248	Basapuram	MayadarlaPalli	MPT	76.9881	14.3104	NREGS
249	Basapuram	MayadarlaPalli	MPT	76.9880	14.3096	NREGS
250	Basapuram	MayadarlaPalli	MPT	76.9871	14.3092	NREGS
251	Basapuram	MayadarlaPalli	MPT	76.9868	14.3085	NREGS
252	Basapuram	MayadarlaPalli	MPT	76.9875	14.3077	NREGS
253	Basapuram	MayadarlaPalli	MPT	76.9873	14.3102	NREGS
254	Basapuram	MayadarlaPalli	MPT	76.9835	14.3138	NREGS
255	Basapuram	MayadarlaPalli	MPT	76.9840	14.3141	NREGS
256	Malayanur	Vaddipalem	MPT	76.9536	14.2821	NREGS
257	Malayanur	Vaddipalem	MPT	76.9813	14.2927	NREGS
258	Malayanur	Vaddipalem	MPT	76.9677	14.2874	NREGS
259	Yenumaladoddi	Bodampalli	MPT	77.0832	14.3966	NREGS
260	Yenumaladoddi	Bodampalli	MPT	77.0831	14.3967	NREGS

261	Mahanthapuram	Mahanthapuram	MPT	77.0602	14.3037	IWMP
262	Malayanur	Vaddipalem	MPT	76.9536	14.2821	IWMP
263	Malayanur	Vaddipalem	MPT	76.9813	14.2927	IWMP
264	Malayanur	Vaddipalem	MPT	76.9677	14.2874	IWMP
265	Kariganipalle	Kariganipalle	PT	77.0860	14.3546	NREGS
266	Kariganipalle	Kariganipalle	PT	77.0827	14.3527	NREGS
267	Kariganipalle	Kariganipalle	PT	77.0830	14.3503	NREGS
268	Tenagal	Tenagal	PT	77.1010	14.3443	NREGS
269	Tenagal	Tenagal	PT	77.1163	14.3551	NREGS
270	Tenagal	Tenagal	PT	77.1124	14.3438	NREGS
271	Mahanthapuram	Kandarampalli	PT	77.0683	14.2774	NREGS
272	Mahanthapuram	Kandarampalli	PT	77.0683	14.2774	NREGS
273	Appilepalle	Mandalapalli	PT	77.0667	14.3103	NREGS
274	Yarrakanta	Yerragunta	PT	76.9873	14.3807	NREGS
275	Malayanur	Vaddipalem	PT	76.9790	14.2837	NREGS
276	Malayanur	Vaddipalem	PT	76.9781	14.2805	NREGS
277	Malayanur	Vaddipalem	PT	76.9840	14.2897	NREGS
278	Kundurpi	Kundurpi	PT	77.0237	14.2936	NREGS
279	Kundurpi	Kundurpi	PT	77.0556	14.2720	NREGS
280	Yenumaladoddi	Bodampalli	PT	77.0892	14.3957	NREGS
281	Yenumaladoddi	Bodampalli	PT	77.0984	14.4041	NREGS
282	Yenumaladoddi	Bodampalli	PT	77.1037	14.3986	NREGS
283	Yenumaladoddi	Guruvepalli	PT	77.1149	14.4124	NREGS
284	Yenumaladoddi	Guruvepalli	PT	77.1149	14.4066	NREGS
285	Yenumaladoddi	Guruvepalli	PT	77.1090	14.4154	NREGS
286	Yenumaladoddi	Yenumaladoddi	PT	77.0882	14.3833	NREGS
287	Malayanur	Vaddipalem	PT	76.9790	14.2837	IWMP
288	Malayanur	Vaddipalem	PT	76.9781	14.2805	IWMP
289	Malayanur	Vaddipalem	PT	76.9840	14.2897	IWMP
290	Kundurpi	Kundurpi	PT	77.0237	14.2936	IWMP
291	Kundurpi	Kundurpi	PT	77.0556	14.2720	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
KUNDURPI MANDAL, ANANTAPUR DISTRICT, AP

S.No.	Mandal	Lattitude	Longitude	Structure_Type
1	Kundurpi	14.3430	77.0086	CheckDam
2	Kundurpi	14.3575	77.0464	CheckDam
3	Kundurpi	14.3630	77.1382	CheckDam

4	Kundurpi	14.3349	77.1330	CheckDam
5	Kundurpi	14.2332	77.0792	CheckDam
6	Kundurpi	14.2450	77.1083	CheckDam
7	Kundurpi	14.3183	77.0749	CheckDam
8	Kundurpi	14.3346	77.0170	CheckDam
9	Kundurpi	14.3741	77.0317	CheckDam
10	Kundurpi	14.3504	77.0523	CheckDam
11	Kundurpi	14.3904	77.1107	CheckDam
12	Kundurpi	14.2991	77.0931	CheckDam
13	Kundurpi	14.3020	76.9657	Percolation Tank
14	Kundurpi	14.2793	76.9603	Percolation Tank
15	Kundurpi	14.2741	76.9901	Percolation Tank
16	Kundurpi	14.2551	76.9885	Percolation Tank
17	Kundurpi	14.2546	77.0885	Percolation Tank
18	Kundurpi	14.3362	77.0466	Percolation Tank

Fig.1

Fig.2

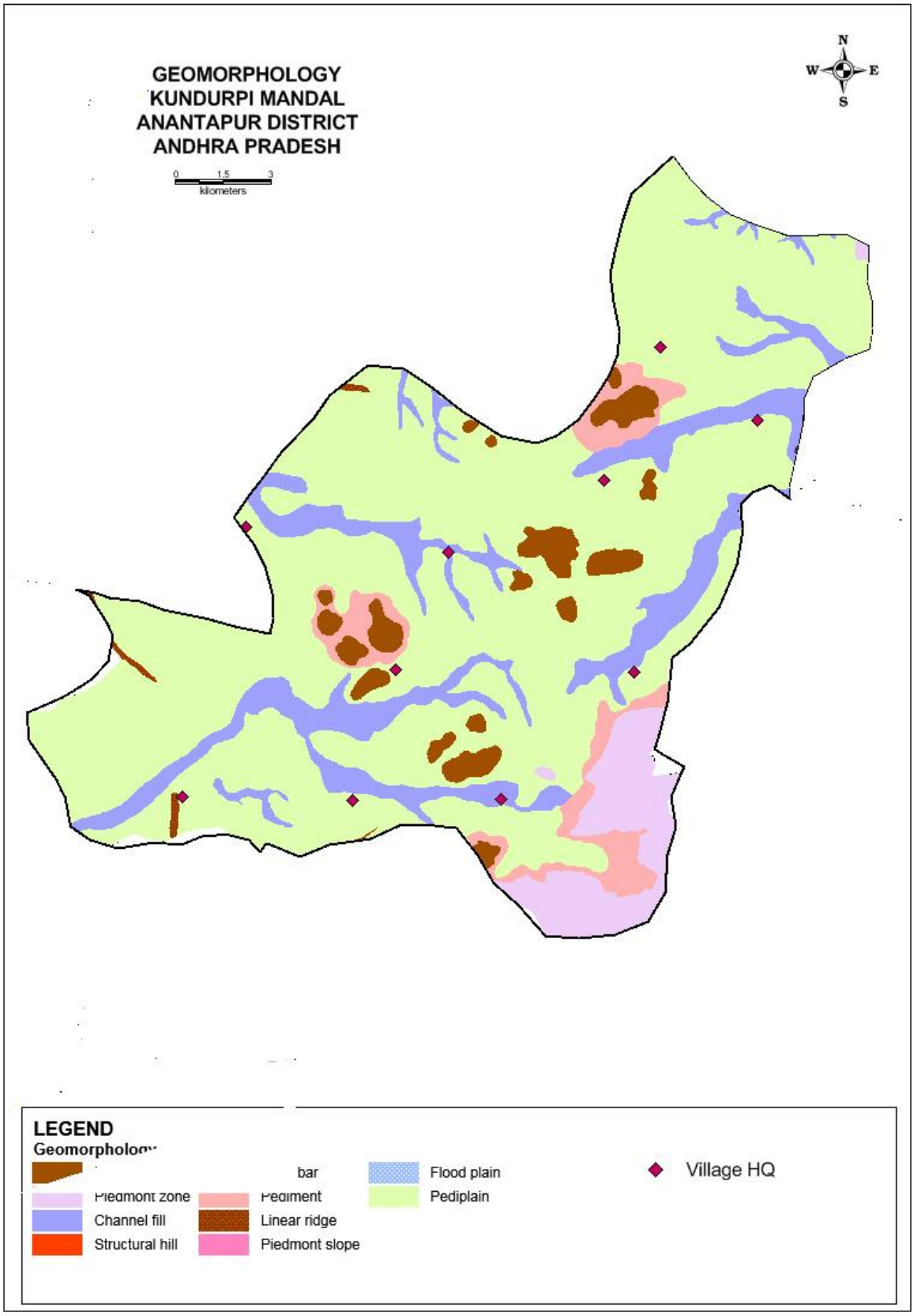

GEOMORPHOLOGY
KUNDURPI MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
kilometers
N
W
E
S
LEGEND
Geomorpholo
bar
Flood plain
Village HQ
Piedmont zone
Pediment
Pediplain
Channel fill
Linear ridge
Structural hill
Piedmont slope

Fig.3

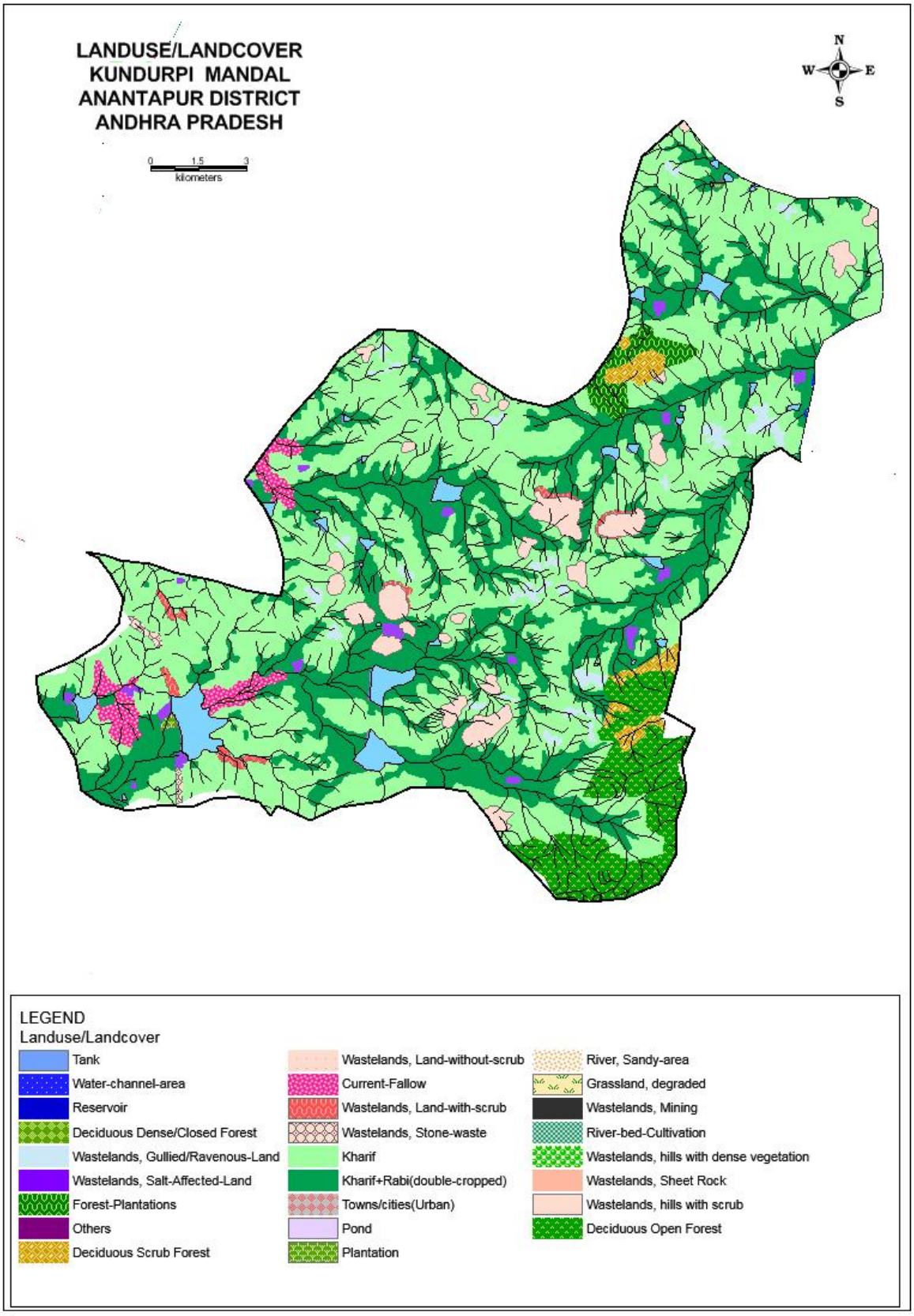

LANDUSE/LANDCOVER
KUNDURPI MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
kilometers
N
W
E
S
LEGEND
Landuse/Landcover
Tank
Water-channel-area
Reservoir
Deciduous Dense/Closed Forest
Wastelands, Gullied/Ravenous-Land
Wastelands, Salt-Affected-Land
Forest-Plantations
Others
Deciduous Scrub Forest
Wastelands, Land-without-scrub
Current-Fallow
Wastelands, Land-with-scrub
Wastelands, Stone-waste
Kharif
Kharif+Rabi(double-cropped)
Towns/cities(Urban)
Pond
Plantation
River, Sandy-area
Grassland, degraded
Wastelands, Mining
River-bed-Cultivation
Wastelands, hills with dense vegetation
Wastelands, Sheet Rock
Wastelands, hills with scrub
Deciduous Open Forest

Fig.4

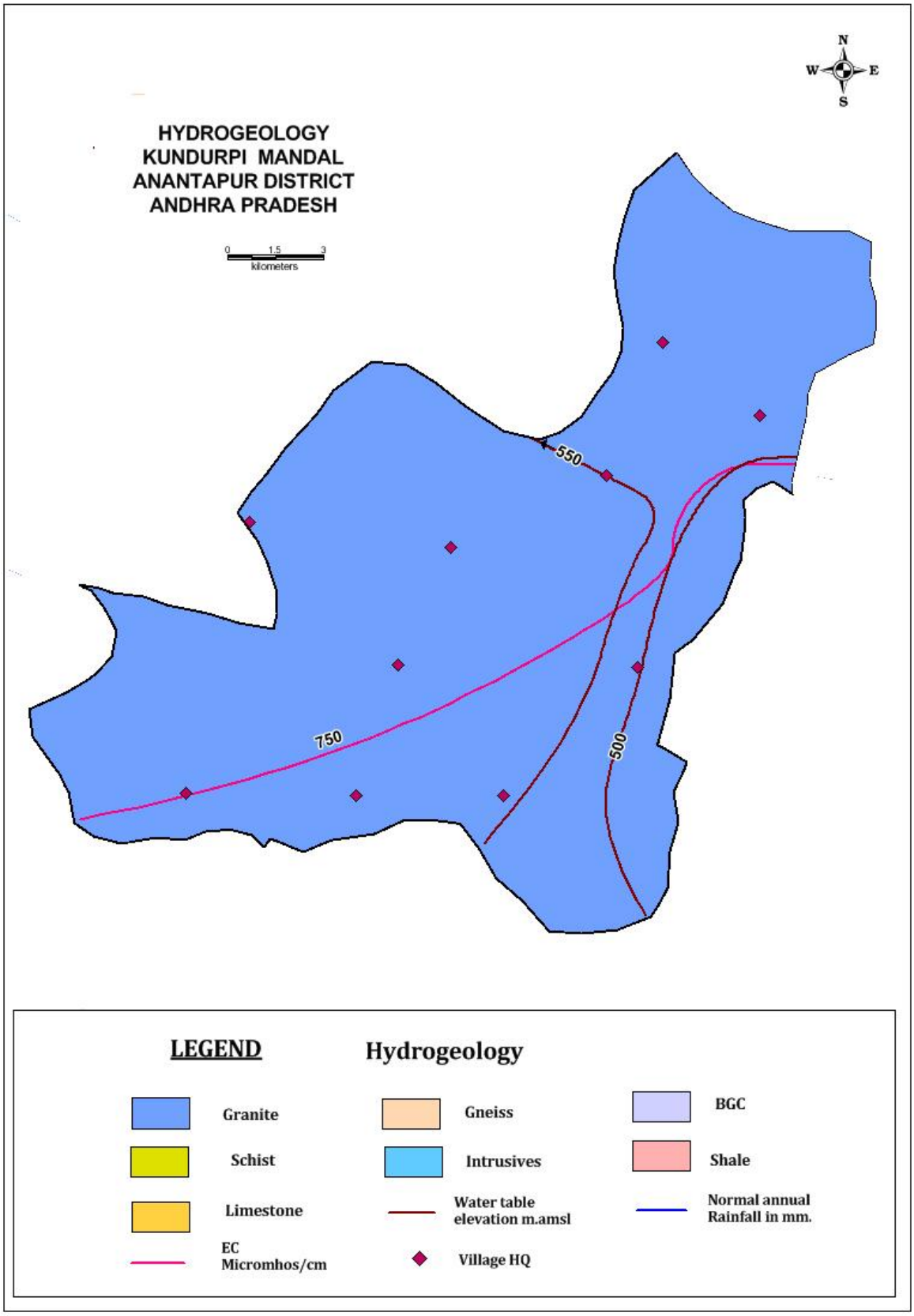

HYDROGEOLOGY
KUNDURPI MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
kilometers
N
W
E
S
550
750
500
LEGEND
Hydrogeology
Granite
Gneiss
BGC
Schist
Intrusives
Shale
Limestone
Water table elevation m.amsl
Normal annual Rainfall in mm.
EC Micromhos/cm
Village HQ

Fig.5

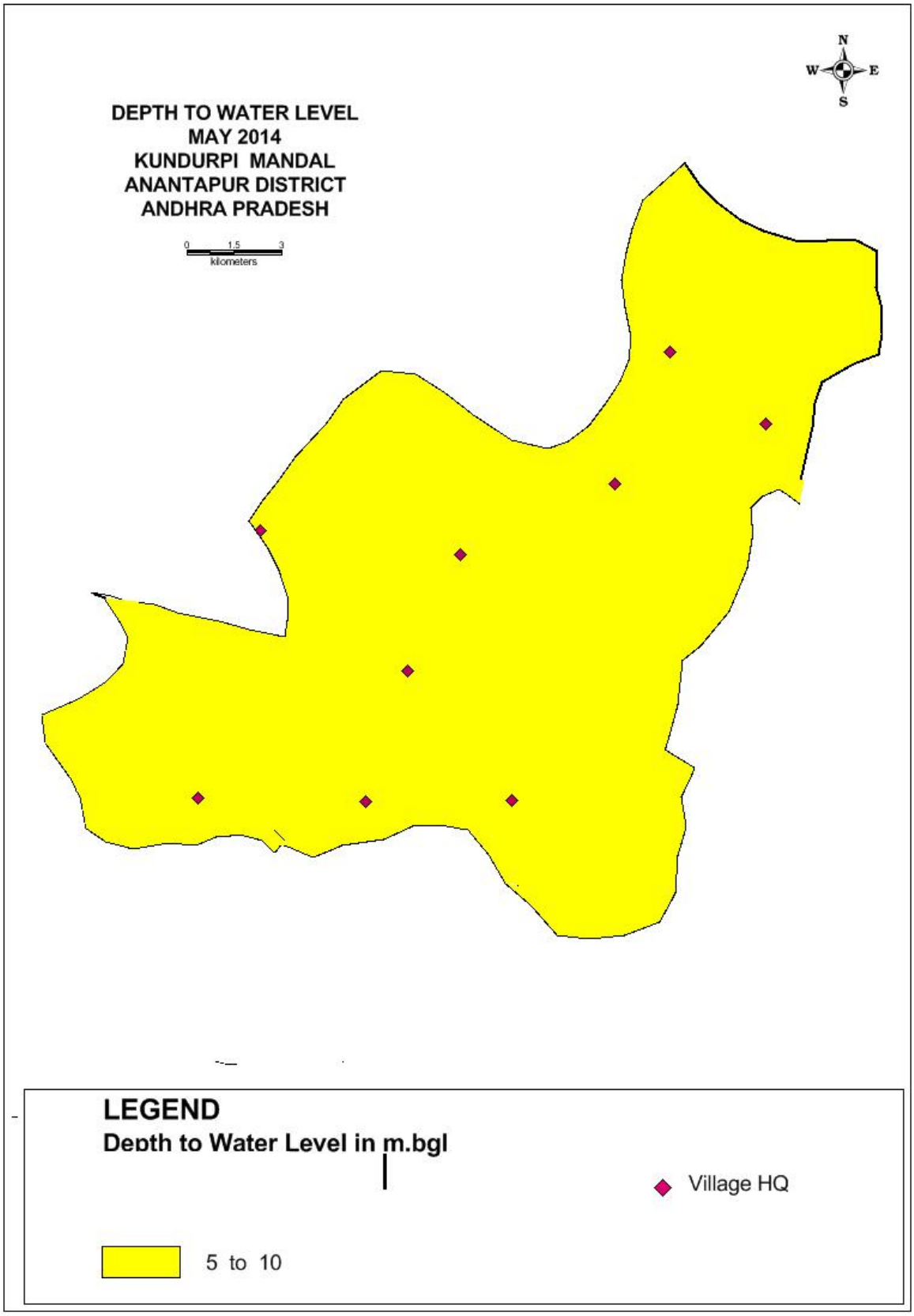

DEPTH TO WATER LEVEL
MAY 2014
KUNDURPI MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
kilometers
N
W
E
S
LEGEND
Depth to Water Level in m.bgl
Village HQ
5 to 10

Fig.6

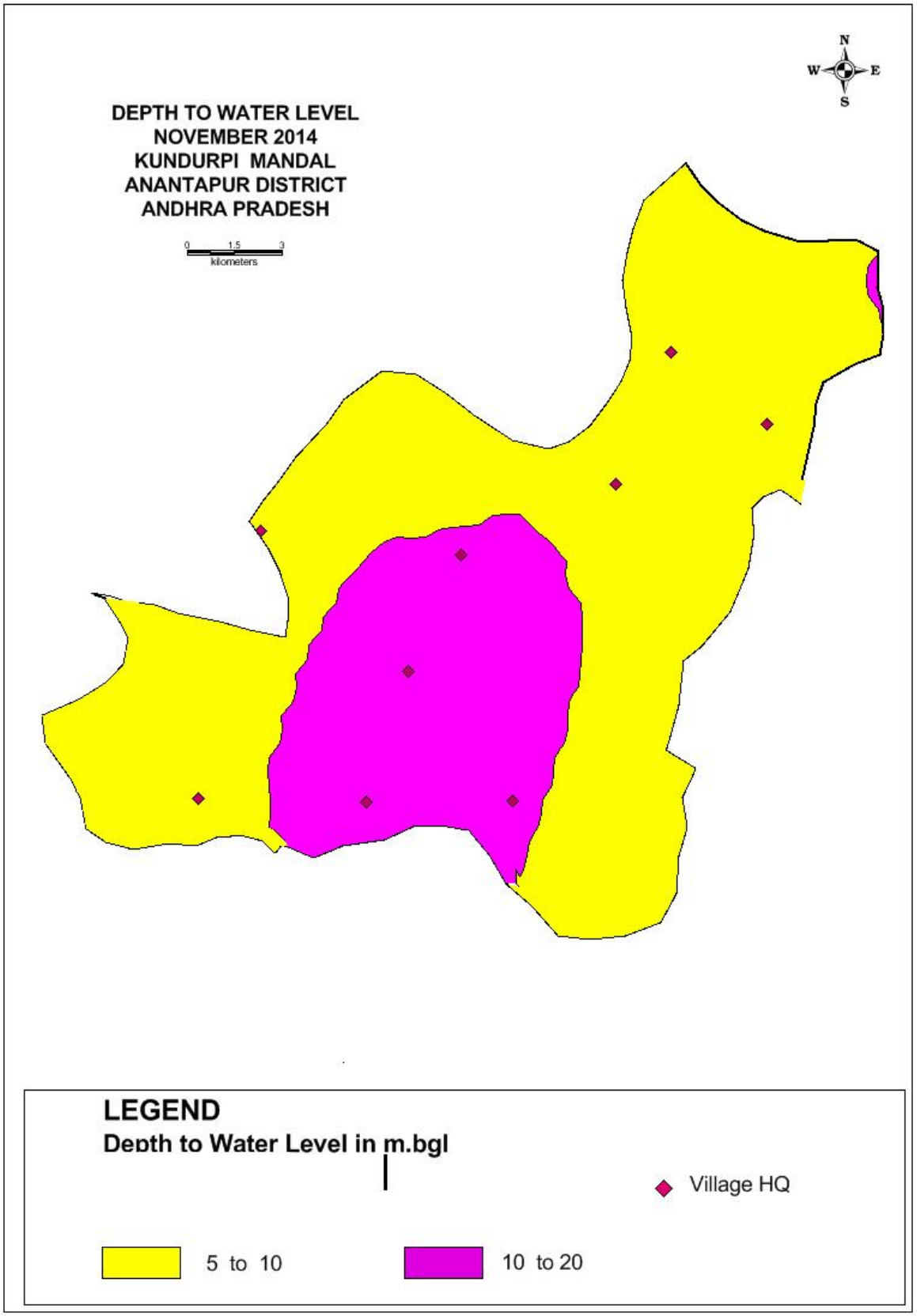
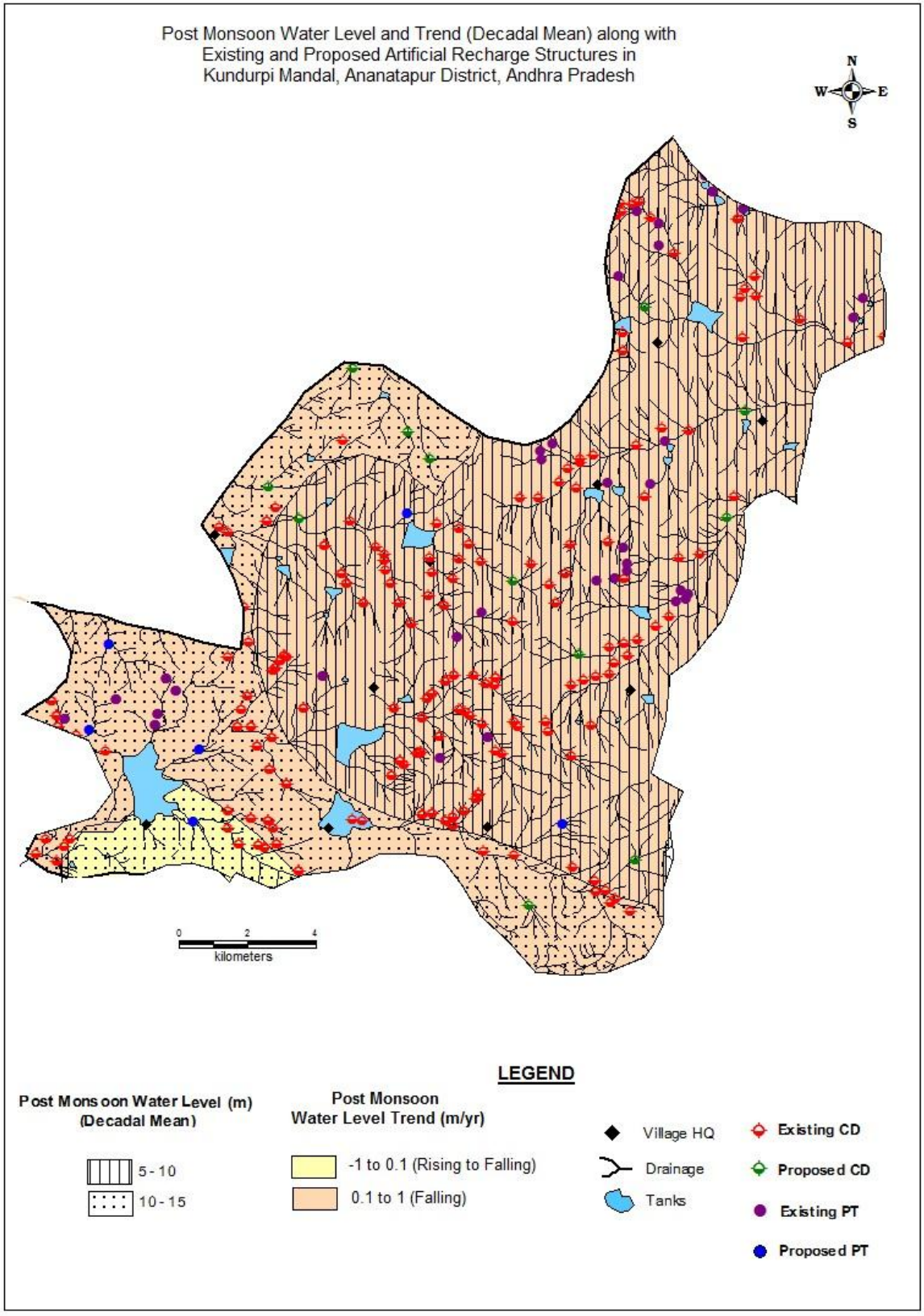

DEPTH TO WATER LEVEL
NOVEMBER 2014
KUNDURPI MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
kilometers
N
W
E
S
LEGEND
Depth to Water Level in m.bgl
Village HQ
5 to 10
10 to 20

Fig.7


Post Monsoon Water Level and Trend (Decadal Mean) along with
Existing and Proposed Artificial Recharge Structures in
Kundurpi Mandal, Ananatapur District, Andhra Pradesh
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)
-1 to 0.1 (Rising to Falling)
0.1 to 1 (Falling)
Village HQ
Drainage
Tanks
Existing CD
Proposed CD
Existing PT
Proposed PT