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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 MADAKASIRA MANDAL, ANANTAPUR DISTRICT ANDHRA PRADESH

SOUTHERN REGION
HYDERABAD
AUGUST-2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN MADAKASIRA MANDAL, ANANTAPUR DISTRICT ANDHRA PRADESH

CONTENTS

AT A GLANCE

Name of the Mandal	MADAKASIRA
District	ANANTAPUR
State	ANDHRA PRADESH
Total Area (Sq.kms)	391
Area suitable for Artificial Recharge (Sq.kms)	362
Latitude and Longitude	13.831980 to 14.034980 and 77.174490 to 77.443050
Average Annual Rainfall (mm)	606
Geology	Granites, Gneisses
Average Depth To Water Level (Decadal) (Pre Monsoon)	12.1
Average Depth To Water Level (Decadal) (Post Monsoon)	7.2
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	34.66
Net Annual Ground Water Availability(MCM)/yr	31.19
Net Annual Ground Water Draft(MCM)/yr	32.21
Projected Demand for Domestic and Industrial Use(MCM)/yr	2.81
Stage of Ground Water Development (%)	103
Surface runoff available (MCM)/yr	32.76
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	2.00
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 0, Check Dams: 20 Farm ponds: 400, Recharge Shafts: 142
Improving Water use Efficiency	Micro Irrigation System: 2000 ha
Tentative Total Cost in Lakhs (Rs.)	**1577.625**
Expected Recharge/Savings (MCM)/yr	8.034

1. INTRODUCTION

Madakasira 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 19 inhabited villages and one un inhabited village with 15 gram panchayats.

2. LOCATION

The mandal lies between north latitudes 13.831980 to 14.034980 and between east longitudes 77.174490 to 77.443050. The mandal occupies the Southwest part of the Anantapur district and is bounded on the north by Karnataka State, on the east by Parigi mandal, on the south by Karnataka State and west by Gudibanda mandal. (Fig.1) The geographical area of the mandal is 391 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by low order streams which are tributaries of Pennar 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 606 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 391 sq.km, the area covered by forest is 28.63 sq.km and the net area sown is 215.49 sq.km. Barren and uncultivable land is 13.95 sq.km. The land for non agricultural use accounts for 32.01 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 dug and dug cum bore wells up to 20 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 10 m bgl. The average depth to water level (decadal) during pre and post monsoon is 12.1 and 7.2 mbgl respectively. The decadal mean water level trend during post monsoon is depicted in the Fig-5.

8. DYNAMIC GROUND WATER RESOURCES

The Ground water availability, Utilization and stage of Development in Madakasira Mandal Ananthapur District are given in Table-1.

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

Annual Replenishable Ground water resources (MCM)	34.66
Net Annual Ground water Availability. (MCM)	31.19
Net Annual Ground Water Draft(MCM)/yr	32.21
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	2.81
Stage of Ground water development (%).	103
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 upto20m. 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

Madakasira Mandal falls under high stage of ground water development i.e., 103 % 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)	391
Hilly Area (Sq.kms)	29
Area suitable for Artificial Recharge (sq.km.)	362
Runoff Yield in MCM/yr	32.76
Existing No. of Check Dams	206
Storage created MCM/yr	1.46
Existing No. of Percolation Tanks	77
Storage created MCM/yr	0.55
Total Existing Storage Created	2.00

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 30.76 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 606 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 20 **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 103 and 39 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 400 farm ponds in 20 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 2000 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (MADAKASIRA 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)	20	0.56	5	100	0.42
2	Recharge shaft in Check dam (50% of the existing Check dams)	103	1.133	0.5	51.5	1.133
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)	39	0.429	1	39	0.429
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	400	0.0576	0.25	100	0.05184
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	2000	12	0.6	1200	6
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	20	0	0.6	12	0
8 (i)	Total (No. of AR Structures)	582	2.18		302.5	2.034
8 (ii)	Total (ha)	2000			1200	6
	Total (8(i) + 8 (ii))				**1502.5**	**8.034**
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				**75.125**	
	Grand Total				**1577.625**	

*(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 8.034 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 103% to 82% (21%)
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
MADAKASIRA MANDAL, ANANTAPUR DISTRICT, AP

S.no	Gram Panchayat	Habitation	Structure Type	Longitude	Latitude	Scheme
1	C.kodigepalle	Nallaiahpalli	Check Dam	77.4068	13.8506	NREGS
2	Chatram	Echaloddi	Check Dam	77.3227	13.9522	NREGS
3	Chatram	Echaloddi	Check Dam	77.3252	13.9474	NREGS
4	Chatram	Echaloddi	Check Dam	77.3197	13.9368	NREGS
5	Chatram	Echaloddi	Check Dam	77.3191	13.9354	NREGS
6	Chatram	Echaloddi	Check Dam	77.3232	13.9369	NREGS
7	Chatram	Echaloddi	Check Dam	77.3260	13.9380	NREGS
8	Gowdanahalli	Gowdanahalli	Check Dam	77.3180	13.9772	NREGS
9	Gowdanahalli	Gowdanahalli	Check Dam	77.3201	13.9764	NREGS
10	Gowdanahalli	Gowdanahalli	Check Dam	77.3228	13.9763	NREGS
11	Gowdanahalli	Gowdanahalli	Check Dam	77.3236	13.9785	NREGS
12	Gowdanahalli	Gowdanahalli	Check Dam	77.3248	13.9817	NREGS
13	Gowdanahalli	Gowdanahalli	Check Dam	77.3369	13.9885	NREGS
14	Gowdanahalli	Gowdanahalli	Check Dam	77.3263	13.9808	NREGS
15	Gowdanahalli	Gowdanahalli	Check Dam	77.3233	13.9657	NREGS
16	Gowdanahalli	Jammanpalli	Check Dam	77.3482	13.9886	NREGS
17	Gowdanahalli	Jammanpalli	Check Dam	77.3442	13.9892	NREGS
18	R.anantapuram	R.Anantapuram	Check Dam	77.3390	13.9460	NREGS
19	R.anantapuram	R.Anantapuram	Check Dam	77.3403	13.9446	NREGS
20	Chandakacherla	Achampalli	Check Dam	77.2951	14.0002	NREGS
21	Chandakacherla	Achampalli	Check Dam	77.2870	14.0027	NREGS
22	Chandakacherla	Bheemaryunipalli	Check Dam	77.3230	14.0088	NREGS
23	Chandakacherla	Chandrakacherla	Check Dam	77.3134	13.9903	NREGS
24	Chandakacherla	Chandrakacherla	Check Dam	77.3192	14.0015	NREGS
25	Chandakacherla	Chandrakacherla	Check Dam	77.3196	13.9961	NREGS
26	Bullasamudram	B.Rayapuram	Check Dam	77.3167	13.9210	NREGS
27	Bullasamudram	B.Rayapuram	Check Dam	77.3112	13.9169	NREGS
28	Bullasamudram	B.Rayapuram	Check Dam	77.3361	13.9125	NREGS
29	Bullasamudram	Bullasamudram	Check Dam	77.3280	13.9274	NREGS
30	Kallumarri	Ganthalapalli	Check Dam	77.3545	13.8640	NREGS
31	Kallumarri	Ganthalapalli	Check Dam	77.3519	13.8676	NREGS
32	Kallumarri	Ganthalapalli	Check Dam	77.3636	13.8641	NREGS
33	Kallumarri	Ganthalapalli	Check Dam	77.3686	13.8688	NREGS
34	Kallumarri	Kallumarri	Check Dam	77.3840	13.8742	NREGS
35	Kallumarri	Kallumarri	Check Dam	77.3898	13.8710	NREGS
36	Kallumarri	Kallumarri	Check Dam	77.3825	13.8660	NREGS
37	Kallumarri	Kallumarri	Check Dam	77.3798	13.8606	NREGS
38	Kallumarri	Kallumarri	Check Dam	77.3778	13.8620	NREGS
39	Kallumarri	Kallumarri	Check Dam	77.3737	13.8582	NREGS
40	Kallumarri	Thadakalapalli	Check Dam	77.3632	13.8905	NREGS
41	Kallumarri	Thadakalapalli	Check Dam	77.3703	13.8910	NREGS

42	Manur	Chaparlapalli	Check Dam	77.3314	13.8515	NREGS
43	Manur	M.Rangapuram	Check Dam	77.3356	13.8717	NREGS
44	Manur	Manur	Check Dam	77.3545	13.8638	NREGS
45	Manur	Manur	Check Dam	77.3520	13.8675	NREGS
46	Manur	Manur	Check Dam	77.3441	13.8593	NREGS
47	Manur	Sunkireddypally	Check Dam	77.3301	13.8490	NREGS
48	Manur	Sunkireddypally	Check Dam	77.3342	13.8556	NREGS
49	Manur	Sunkireddypally	Check Dam	77.3360	13.8612	NREGS
50	Manur	Uppidipalli	Check Dam	77.3327	13.8906	NREGS
51	Manur	Yaragodipallithanda	Check Dam	77.3286	13.8677	NREGS
52	Manur	Yaragodipallithanda	Check Dam	77.3306	13.8679	NREGS
53	Govindapuram	Dinnameedapalyam	Check Dam	77.2288	13.9004	NREGS
54	Govindapuram	E.Gollahatti	Check Dam	77.2117	13.8920	NREGS
55	Govindapuram	E.Gollahatti	Check Dam	77.2053	13.9032	NREGS
56	Amidalagondi	Amidalagondi	Check Dam	77.2719	13.9933	NREGS
57	Amidalagondi	Amidalagondi	Check Dam	77.2681	13.9889	NREGS
58	Amidalagondi	Amidalagondi	Check Dam	77.2822	14.0012	NREGS
59	Amidalagondi	Amidalagondi	Check Dam	77.2792	13.9963	NREGS
60	Amidalagondi	Amidalagondi	Check Dam	77.2836	13.9886	NREGS
61	Amidalagondi	Amidalagondi	Check Dam	77.2806	13.9811	NREGS
62	Amidalagondi	Amidalagondi	Check Dam	77.2771	13.9790	NREGS
63	Amidalagondi	Amidalagondi	Check Dam	77.2718	13.9896	NREGS
64	Amidalagondi	H.R.Palem	Check Dam	77.2650	13.9819	NREGS
65	Amidalagondi	H.R.Palem	Check Dam	77.2623	13.9809	NREGS
66	Amidalagondi	H.R.Palem	Check Dam	77.2690	13.9820	NREGS
67	Amidalagondi	H.R.Palem	Check Dam	77.2703	13.9801	NREGS
68	Amidalagondi	H.R.Palem	Check Dam	77.2539	13.9911	NREGS
69	Amidalagondi	H.R.Palem	Check Dam	77.2636	13.9924	NREGS
70	Amidalagondi	H.R.Palem	Check Dam	77.2667	13.9918	NREGS
71	Amidalagondi	H.R.Palem	Check Dam	77.2694	13.9901	NREGS
72	Amidalagondi	TirumalaDevara Pall	Check Dam	77.2867	13.9863	NREGS
73	Amidalagondi	TirumalaDevara Pall	Check Dam	77.2891	13.9867	NREGS
74	Gangalavaipalyam	DasappaPalyam	Check Dam	77.1988	13.8936	NREGS
75	Gangalavaipalyam	DasappaPalyam	Check Dam	77.1965	13.8999	NREGS
76	Gangalavaipalyam	DasappaPalyam	Check Dam	77.1984	13.8882	NREGS
77	Gangalavaipalyam	GangalavaiPalyam	Check Dam	77.1925	13.8854	NREGS
78	Gangalavaipalyam	GangalavaiPalyam	Check Dam	77.1878	13.8845	NREGS
79	Gangalavaipalyam	GangalavaiPalyam	Check Dam	77.1904	13.8840	NREGS
80	Gangalavaipalyam	NeelakantaPuram	Check Dam	77.1945	13.8969	NREGS
81	Gangalavaipalyam	NeelakantaPuram	Check Dam	77.1978	13.8860	NREGS
82	Gangalavaipalyam	NeelakantaPuram	Check Dam	77.2029	13.8976	NREGS
83	Yerrabommanahalli	Pathikunta	Check Dam	77.2574	13.8846	NREGS
84	Yerrabommanahalli	Pathikunta	Check Dam	77.2578	13.8836	NREGS
85	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2626	13.8588	NREGS

86	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2660	13.8779	NREGS
87	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2686	13.8777	NREGS
88	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2715	13.8811	NREGS
89	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2724	13.8763	NREGS
90	Yerrabommanahalli	Yerrabommanahalli	Check Dam	77.2735	13.8728	NREGS
91	Yerrabommanahalli	Zilleduguntta	Check Dam	77.2890	13.8716	NREGS
92	Yerrabommanahalli	Zilleduguntta	Check Dam	77.2867	13.8700	NREGS
93	Madakasira	Begarlapalli	Check Dam	77.2396	13.9554	NREGS
94	Madakasira	Begarlapalli	Check Dam	77.2403	13.9529	NREGS
95	Madakasira	Begarlapalli	Check Dam	77.2413	13.9510	NREGS
96	Madakasira	Begarlapalli	Check Dam	77.2426	13.9523	NREGS
97	Madakasira	Begarlapalli	Check Dam	77.2496	13.9597	NREGS
98	Madakasira	Begarlapalli	Check Dam	77.2458	13.9482	NREGS
99	Madakasira	Begarlapalli	Check Dam	77.2488	13.9486	NREGS
100	Madakasira	Begarlapalli	Check Dam	77.2467	13.9601	NREGS
101	Madakasira	Begarlapalli	Check Dam	77.2484	13.9574	NREGS
102	Madakasira	Begarlapalli	Check Dam	77.2493	13.9562	NREGS
103	Madakasira	Begarlapalli	Check Dam	77.2483	13.9534	NREGS
104	Madakasira	Begarlapalli	Check Dam	77.2488	13.9517	NREGS
105	Madakasira	Begarlapalli	Check Dam	77.2444	13.9494	NREGS
106	Madakasira	Gollahatti(Dasariind	Check Dam	77.2550	13.9410	NREGS
107	Madakasira	Madakasira	Check Dam	77.2687	13.9338	NREGS
108	Madakasira	Malerappam	Check Dam	77.2626	13.9363	NREGS
109	Haresamudram	Gollahalli	Check Dam	77.2728	13.9095	NREGS
110	Haresamudram	Kondampalli	Check Dam	77.2788	13.9179	NREGS
111	Haresamudram	Kyampuram	Check Dam	77.3103	13.9035	NREGS
112	Melavoi	D.Gollahatti	Check Dam	77.2038	13.9164	NREGS
113	Melavoi	D.Gollahatti	Check Dam	77.2053	13.9173	NREGS
114	Melavoi	E.Gollahatti	Check Dam	77.1974	13.9208	NREGS
115	Melavoi	Guddampalli	Check Dam	77.2379	13.9130	NREGS
116	Melavoi	Guddampalli	Check Dam	77.2410	13.9076	NREGS
117	Melavoi	Guddampalli	Check Dam	77.2377	13.9123	NREGS
118	Melavoi	Guddampalli	Check Dam	77.4094	13.8830	NREGS
119	Melavoi	Guddampalli	Check Dam	77.3581	13.8972	NREGS
120	Melavoi	Gundumala	Check Dam	77.2034	13.9255	NREGS
121	Melavoi	Gundumala	Check Dam	77.2081	13.9298	NREGS
122	Melavoi	Gurrapukonda	Check Dam	77.2229	13.9697	NREGS
123	Melavoi	K.Sugalithanda	Check Dam	77.2058	13.9117	NREGS
124	Melavoi	K.Sugalithanda	Check Dam	77.1980	13.9132	NREGS
125	Melavoi	Kadirepalli	Check Dam	77.2171	13.9550	NREGS
126	Melavoi	Kadirepalli	Check Dam	77.2167	13.9574	NREGS
127	Melavoi	Kadirepalli	Check Dam	77.2165	13.9624	NREGS
128	Melavoi	Kothulagutta	Check Dam	77.2186	13.9160	NREGS
129	Melavoi	Melavoi	Check Dam	77.2242	13.9358	NREGS

130	Melavoi	Melavoi	Check Dam	77.2205	13.9440	NREGS
131	Melavoi	Melavoi	Check Dam	77.2209	13.9413	NREGS
132	Melavoi	Melavoi	Check Dam	77.2212	13.9396	NREGS
133	Melavoi	Melavoi	Check Dam	77.2230	13.9379	NREGS
134	Melavoi	Melavoi	Check Dam	77.2178	13.9516	NREGS
135	Melavoi	Melavoi	Check Dam	77.2244	13.9333	NREGS
136	Melavoi	Melavoi	Check Dam	77.2291	13.9362	NREGS
137	Melavoi	Melavoi	Check Dam	77.2345	13.9484	NREGS
138	Melavoi	Melavoi	Check Dam	77.2349	13.9494	NREGS
139	Melavoi	P.Gundumala	Check Dam	77.2187	13.9234	NREGS
140	Melavoi	P.Gundumala	Check Dam	77.2139	13.9227	NREGS
141	Melavoi	P.Gundumala	Check Dam	77.2141	13.9237	NREGS
142	Melavoi	Ugrepalli	Check Dam	77.1999	13.9559	NREGS
143	Melavoi	Ugrepalli	Check Dam	77.2045	13.9532	NREGS
144	Chatram	Echaloddi	Check Dam	77.3197	13.9368	IWMP
145	Chatram	Echaloddi	Check Dam	77.3191	13.9354	IWMP
146	Chatram	Echaloddi	Check Dam	77.3232	13.9369	IWMP
147	Chatram	Echaloddi	Check Dam	77.3260	13.9380	IWMP
148	Chatram	Echaloddi	Check Dam	77.3227	13.9522	IWMP
149	Chatram	Echaloddi	Check Dam	77.3252	13.9474	IWMP
150	Madakasira	Begarlapalli	Check Dam	77.2396	13.9554	IWMP
151	Madakasira	Begarlapalli	Check Dam	77.2403	13.9529	IWMP
152	Madakasira	Begarlapalli	Check Dam	77.2413	13.9510	IWMP
153	Madakasira	Begarlapalli	Check Dam	77.2426	13.9523	IWMP
154	Madakasira	Begarlapalli	Check Dam	77.2496	13.9597	IWMP
155	Madakasira	Begarlapalli	Check Dam	77.2458	13.9482	IWMP
156	Madakasira	Begarlapalli	Check Dam	77.2488	13.9486	IWMP
157	Madakasira	Begarlapalli	Check Dam	77.2467	13.9601	IWMP
158	Madakasira	Begarlapalli	Check Dam	77.2484	13.9574	IWMP
159	Madakasira	Begarlapalli	Check Dam	77.2493	13.9562	IWMP
160	Madakasira	Begarlapalli	Check Dam	77.2483	13.9534	IWMP
161	Madakasira	Begarlapalli	Check Dam	77.2488	13.9517	IWMP
162	Madakasira	Begarlapalli	Check Dam	77.2444	13.9494	IWMP
163	Madakasira	Gollahatti(Dasariind	Check Dam	77.2550	13.9410	IWMP
164	Madakasira	Madakasira	Check Dam	77.2687	13.9338	IWMP
165	Madakasira	Malerappam	Check Dam	77.2626	13.9363	IWMP
166	Melavoi	D.Gollahatti	Check Dam	77.2038	13.9164	IWMP
167	Melavoi	D.Gollahatti	Check Dam	77.2053	13.9173	IWMP
168	Melavoi	E.Gollahatti	Check Dam	77.1974	13.9208	IWMP
169	Melavoi	Guddampalli	Check Dam	77.2379	13.9130	IWMP
170	Melavoi	Guddampalli	Check Dam	77.2410	13.9076	IWMP
171	Melavoi	Guddampalli	Check Dam	77.2377	13.9123	IWMP
172	Melavoi	Guddampalli	Check Dam	77.4094	13.8830	IWMP
173	Melavoi	Guddampalli	Check Dam	77.3581	13.8972	IWMP

174	Melavoi	Gundumala	Check Dam	77.2034	13.9255	IWMP
175	Melavoi	Gundumala	Check Dam	77.2081	13.9298	IWMP
176	Melavoi	Gurrapukonda	Check Dam	77.2229	13.9697	IWMP
177	Melavoi	K.Sugalithanda	Check Dam	77.2058	13.9117	IWMP
178	Melavoi	K.Sugalithanda	Check Dam	77.1980	13.9132	IWMP
179	Melavoi	Kadirepalli	Check Dam	77.2171	13.9550	IWMP
180	Melavoi	Kadirepalli	Check Dam	77.2167	13.9574	IWMP
181	Melavoi	Kadirepalli	Check Dam	77.2165	13.9624	IWMP
182	Melavoi	Kothulagutta	Check Dam	77.2186	13.9160	IWMP
183	Melavoi	Melavoi	Check Dam	77.2242	13.9358	IWMP
184	Melavoi	Melavoi	Check Dam	77.2244	13.9333	IWMP
185	Melavoi	Melavoi	Check Dam	77.2291	13.9362	IWMP
186	Melavoi	Melavoi	Check Dam	77.2345	13.9484	IWMP
187	Melavoi	Melavoi	Check Dam	77.2349	13.9494	IWMP
188	Melavoi	Melavoi	Check Dam	77.2205	13.9440	IWMP
189	Melavoi	Melavoi	Check Dam	77.2209	13.9413	IWMP
190	Melavoi	Melavoi	Check Dam	77.2212	13.9396	IWMP
191	Melavoi	Melavoi	Check Dam	77.2230	13.9379	IWMP
192	Melavoi	Melavoi	Check Dam	77.2178	13.9516	IWMP
193	Melavoi	P.Gundumala	Check Dam	77.2187	13.9234	IWMP
194	Melavoi	P.Gundumala	Check Dam	77.2139	13.9227	IWMP
195	Melavoi	P.Gundumala	Check Dam	77.2141	13.9237	IWMP
196	Melavoi	Ugrepalli	Check Dam	77.1999	13.9559	IWMP
197	Melavoi	Ugrepalli	Check Dam	77.2045	13.9532	IWMP
198	Amidalagondi	Amidalagondi	Check Wall	77.2757	13.9961	NREGS
199	Madakasira	Begarlapalli	Check Wall	77.2505	13.9443	NREGS
200	Madakasira	Gollahatti(Dasariind	Check Wall	77.2572	13.9393	NREGS
201	Melavoi	E.Gollahatti	Check Wall	77.1977	13.9236	NREGS
202	Melavoi	Gundumala	Check Wall	77.2057	13.9264	NREGS
203	Madakasira	Begarlapalli	Check Wall	77.2505	13.9443	IWMP
204	Madakasira	Gollahatti(Dasariind	Check Wall	77.2572	13.9393	IWMP
205	Melavoi	E.Gollahatti	Check Wall	77.1977	13.9236	IWMP
206	Melavoi	Gundumala	Check Wall	77.2057	13.9264	IWMP
207	Manur	M.Rangapuram	MPT	77.3365	13.8699	NREGS
208	Melavoi	Gurrapukonda	MPT	77.2159	13.9702	NREGS
209	Melavoi	Gurrapukonda	MPT	77.2159	13.9702	IWMP
210	C.kodigepalle	C.Kodigepalle	PT	77.3924	13.8645	NREGS
211	C.kodigepalle	C.Kodigepalle	PT	77.3949	13.8625	NREGS
212	C.kodigepalle	C.Kodigepalle	PT	77.3960	13.8597	NREGS
213	Chatram	Echaloddi	PT	77.3179	13.9448	NREGS
214	Chatram	Echaloddi	PT	77.3159	13.9419	NREGS
215	Chatram	Echaloddi	PT	77.3139	13.9431	NREGS
216	Chatram	Rangapuram	PT	77.3339	13.9439	NREGS
217	Chatram	Rangapuram	PT	77.3353	13.9448	NREGS

218	Chatram	Rangapuram	PT	77.3342	13.9445	NREGS
219	Gowdanahalli	Gowdanahalli	PT	77.3029	13.9596	NREGS
220	Gowdanahalli	Gowdanahalli	PT	77.3002	13.9608	NREGS
221	Gowdanahalli	Jammanpalli	PT	77.3470	13.9884	NREGS
222	Gowdanahalli	Jammanpalli	PT	77.3447	13.9842	NREGS
223	Gowdanahalli	Thurakavandlapalli	PT	77.3490	13.9780	NREGS
224	R.anantapuram	Peddapalli	PT	77.3599	13.9393	NREGS
225	R.anantapuram	Peddapalli	PT	77.3512	13.9421	NREGS
226	R.anantapuram	Rekulakunta	PT	77.3667	13.9546	NREGS
227	R.anantapuram	Rekulakunta	PT	77.3529	13.9343	NREGS
228	Chandakacherla	Achampalli	PT	77.2960	14.0003	NREGS
229	Chandakacherla	Achampalli	PT	77.2996	13.9999	NREGS
230	Chandakacherla	Chandrakacherla	PT	77.3123	14.0179	NREGS
231	Chandakacherla	Chandrakacherla	PT	77.3152	13.9995	NREGS
232	Chandakacherla	Chandrakacherla	PT	77.3109	13.9873	NREGS
233	Chandakacherla	Chandrakacherla	PT	77.3067	13.9850	NREGS
234	Chandakacherla	Chandrakacherla	PT	77.3188	14.0013	NREGS
235	Bullasamudram	B.Rayapuram	PT	77.3156	13.9155	NREGS
236	Bullasamudram	B.Rayapuram	PT	77.3252	13.9123	NREGS
237	Bullasamudram	B.Rayapuram	PT	77.3255	13.9106	NREGS
238	Bullasamudram	Bullasamudram	PT	77.3280	13.9265	NREGS
239	Bullasamudram	Devannapalyam	PT	77.3016	13.9230	NREGS
240	Bullasamudram	Devannapalyam	PT	77.3034	13.9230	NREGS
241	Bullasamudram	Devannapalyam	PT	77.2977	13.9220	NREGS
242	Bullasamudram	Devannapalyam	PT	77.2954	13.9263	NREGS
243	Bullasamudram	Devannapalyam	PT	77.3049	13.9286	NREGS
244	Kallumarri	Yelloti	PT	77.3656	13.9026	NREGS
245	Kallumarri	Yelloti	PT	77.3637	13.9031	NREGS
246	Kallumarri	Yelloti	PT	77.3698	13.9042	NREGS
247	Kallumarri	Yelloti	PT	77.3709	13.9052	NREGS
248	Kallumarri	Yelloti	PT	77.3830	13.9053	NREGS
249	Manur	M.Rangapuram	PT	77.3252	13.8804	NREGS
250	Manur	M.Rangapuram	PT	77.3338	13.8717	NREGS
251	Manur	M.Rangapuram	PT	77.3365	13.8728	NREGS
252	Manur	Manur	PT	77.3516	13.8666	NREGS
253	Manur	Uppidipalli	PT	77.3469	13.8716	NREGS
254	Manur	Uppidipalli	PT	77.3526	13.8782	NREGS
255	Manur	Uppidipalli	PT	77.3316	13.8811	NREGS
256	Manur	Yaragodipallithanda	PT	77.3257	13.8690	NREGS
257	Govindapuram	D.Gollahatti	PT	77.2163	13.9013	NREGS
258	Govindapuram	D.Gollahatti	PT	77.2177	13.9002	NREGS
259	Govindapuram	D.Gollahatti	PT	77.2165	13.9050	NREGS
260	Govindapuram	D.Gollahatti	PT	77.2215	13.8946	NREGS
261	Govindapuram	E.Gollahatti	PT	77.2143	13.8936	NREGS

262	Govindapuram	E.Gollahatti	PT	77.2049	13.8997	NREGS
263	Govindapuram	Govindapuram	PT	77.2265	13.9008	NREGS
264	Govindapuram	Govindapuram	PT	77.2303	13.9011	NREGS
265	Amidalagondi	H.R.Palem	PT	77.2535	13.9874	NREGS
266	Gangalavaipalyam	NeelakantaPuram	PT	77.2047	13.8944	NREGS
267	Yerrabommanahalli	Kodipalli	PT	77.2734	13.8593	NREGS
268	Yerrabommanahalli	Yerrabommanahalli	PT	77.2663	13.8627	NREGS
269	Madakasira	Begarlapalli	PT	77.2382	13.9510	NREGS
270	Haresamudram	Gollahalli	PT	77.2774	13.9033	NREGS
271	Haresamudram	Haresamudram	PT	77.2768	13.8999	NREGS
272	Haresamudram	Kyampuram	PT	77.3141	13.8981	NREGS
273	Haresamudram	Ontipalyam	PT	77.3156	13.8982	NREGS
274	Haresamudram	Upparlapalli	PT	77.3086	13.8908	NREGS
275	Melavoi	Ugrepalli	PT	77.1989	13.9565	NREGS
276	Chatram	Echaloddi	PT	77.3179	13.9448	IWMP
277	Chatram	Echaloddi	PT	77.3159	13.9419	IWMP
278	Chatram	Echaloddi	PT	77.3139	13.9431	IWMP
279	Chatram	Rangapuram	PT	77.3342	13.9445	IWMP
280	Chatram	Rangapuram	PT	77.3339	13.9439	IWMP
281	Chatram	Rangapuram	PT	77.3353	13.9448	IWMP
282	Madakasira	Begarlapalli	PT	77.2382	13.9510	IWMP
283	Melavoi	Ugrepalli	PT	77.1989	13.9565	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
MADAKASIRA MANDAL, ANANTAPUR DISTRICT, AP

S.No.	Mandal	Lattitude	Longitude	Structure_Type
1	Madakasira	14.0139	77.2650	CheckDam
2	Madakasira	14.0230	77.2721	CheckDam
3	Madakasira	13.9416	77.2921	CheckDam
4	Madakasira	13.9525	77.3092	CheckDam
5	Madakasira	13.9682	77.3502	CheckDam
6	Madakasira	13.9538	77.2718	CheckDam
7	Madakasira	13.9876	77.2443	CheckDam
8	Madakasira	13.9798	77.3021	CheckDam
9	Madakasira	14.0095	77.2488	CheckDam
10	Madakasira	13.9594	77.2266	CheckDam
11	Madakasira	13.9394	77.1992	CheckDam
12	Madakasira	13.9268	77.2634	CheckDam
13	Madakasira	13.8971	77.3414	CheckDam
14	Madakasira	13.9757	77.2582	CheckDam
15	Madakasira	13.9544	77.2634	CheckDam
16	Madakasira	13.9716	77.2843	CheckDam
17	Madakasira	13.8733	77.3624	CheckDam
18	Madakasira	13.8824	77.3969	CheckDam
19	Madakasira	13.9240	77.3460	CheckDam
20	Madakasira	13.9547	77.3502	CheckDam

Fig.1

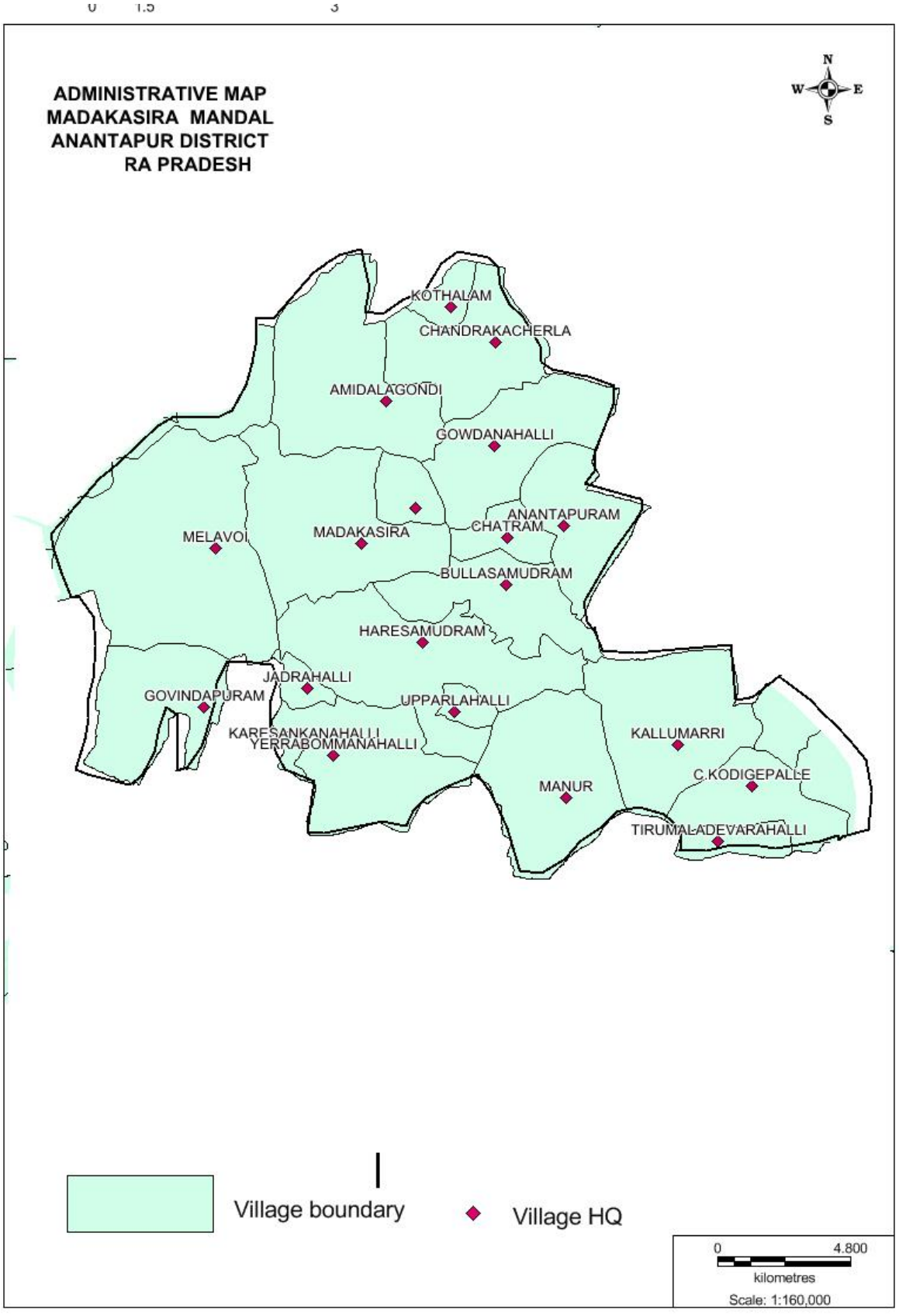

ADMINISTRATIVE MAP
MADAKASIRA MANDAL
ANANTAPUR DISTRICT
RA PRADESH
N
W
E
S
KOTHALAM
CHANDRAKACHERLA
AMIDALAGONDI
GOWDANAHALLI
ANANTAPURAM
CHATRAM
MELAVOI
MADAKASIRA
BULLASAMUDRAM
HARESAMUDRAM
JADRAHALLI
GOVINDAPURAM
UPPARLAHALLI
KARESANKANAHALLI
YERRABOMMANAHALLI
KALLUMARRI
C.KODIGEPALLE
MANUR
TIRUMALADEVARAHALLI
Village boundary
Village HQ
0
4.800
kilometres
Scale: 1:160,000

Fig.2

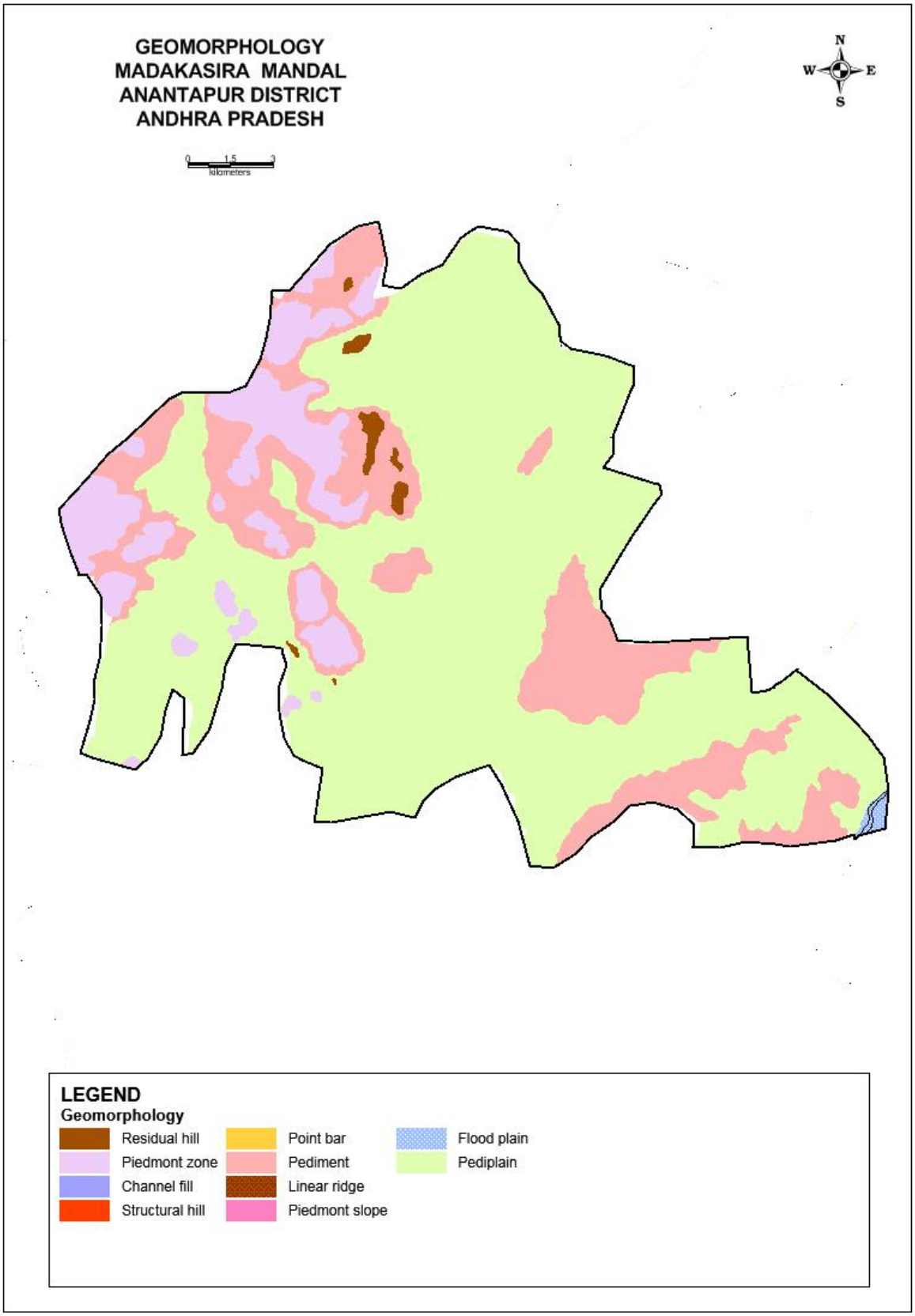

GEOMORPHOLOGY
MADAKASIRA MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
N
W
E
S
0
1.5
3
kilometers
LEGEND
Geomorphology
Residual hill
Piedmont zone
Channel fill
Structural hill
Point bar
Pediment
Linear ridge
Piedmont slope
Flood plain
Pediplain

Fig.3

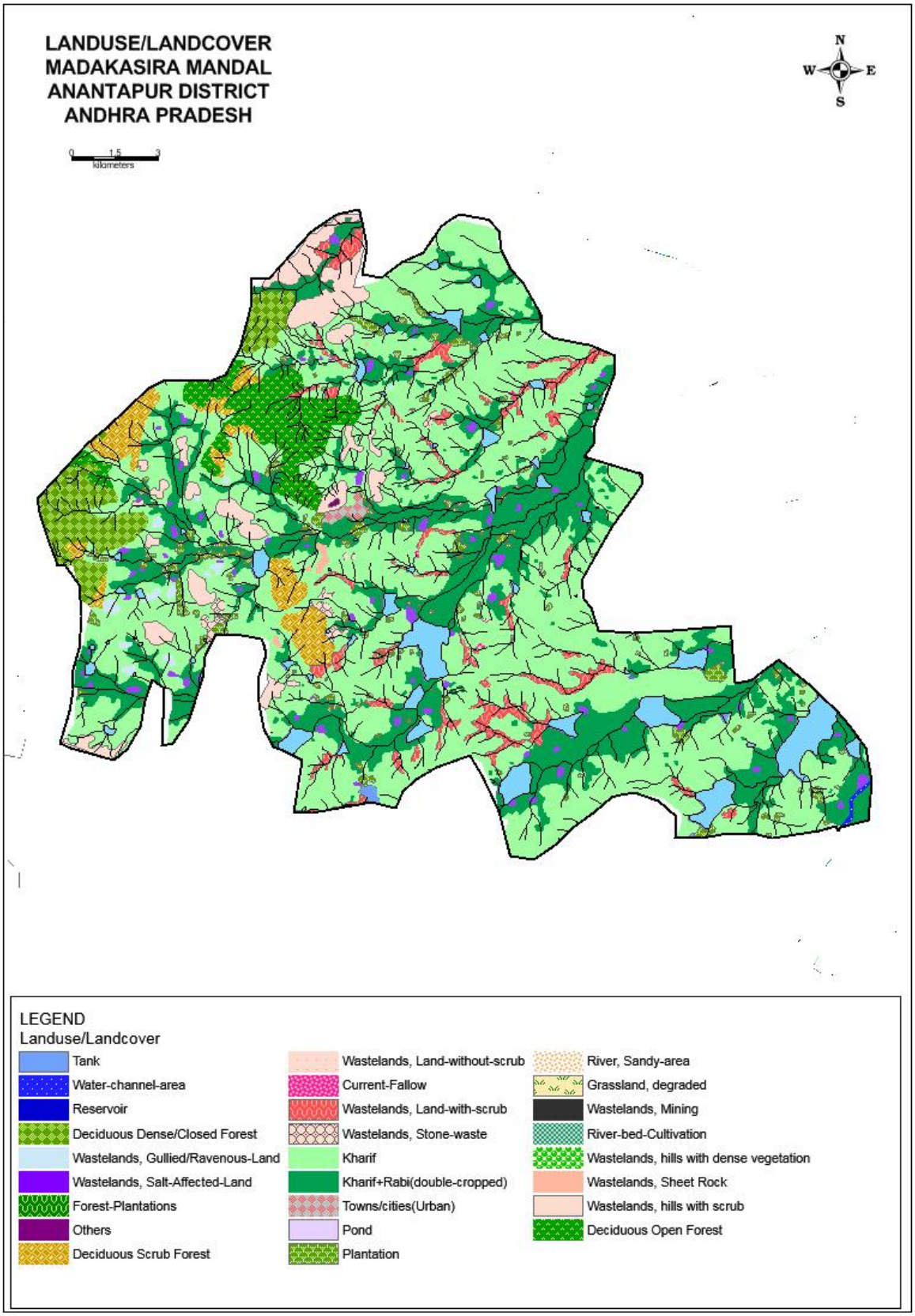

LANDUSE/LANDCOVER
MADAKASIRA MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
N
W
E
S
0 1.5 3
kilometers
LEGEND
Landuse/Landcover
Tank
Water-channel-area
Reservoir
Deciduous Dense/Closed Forest
Wastelands, Gullied/Ravenous-Land
Wastelands, Salt-Affected-Land
Forest-Plantations
Others
Deciduous Scrub Forest
Wastelands, 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

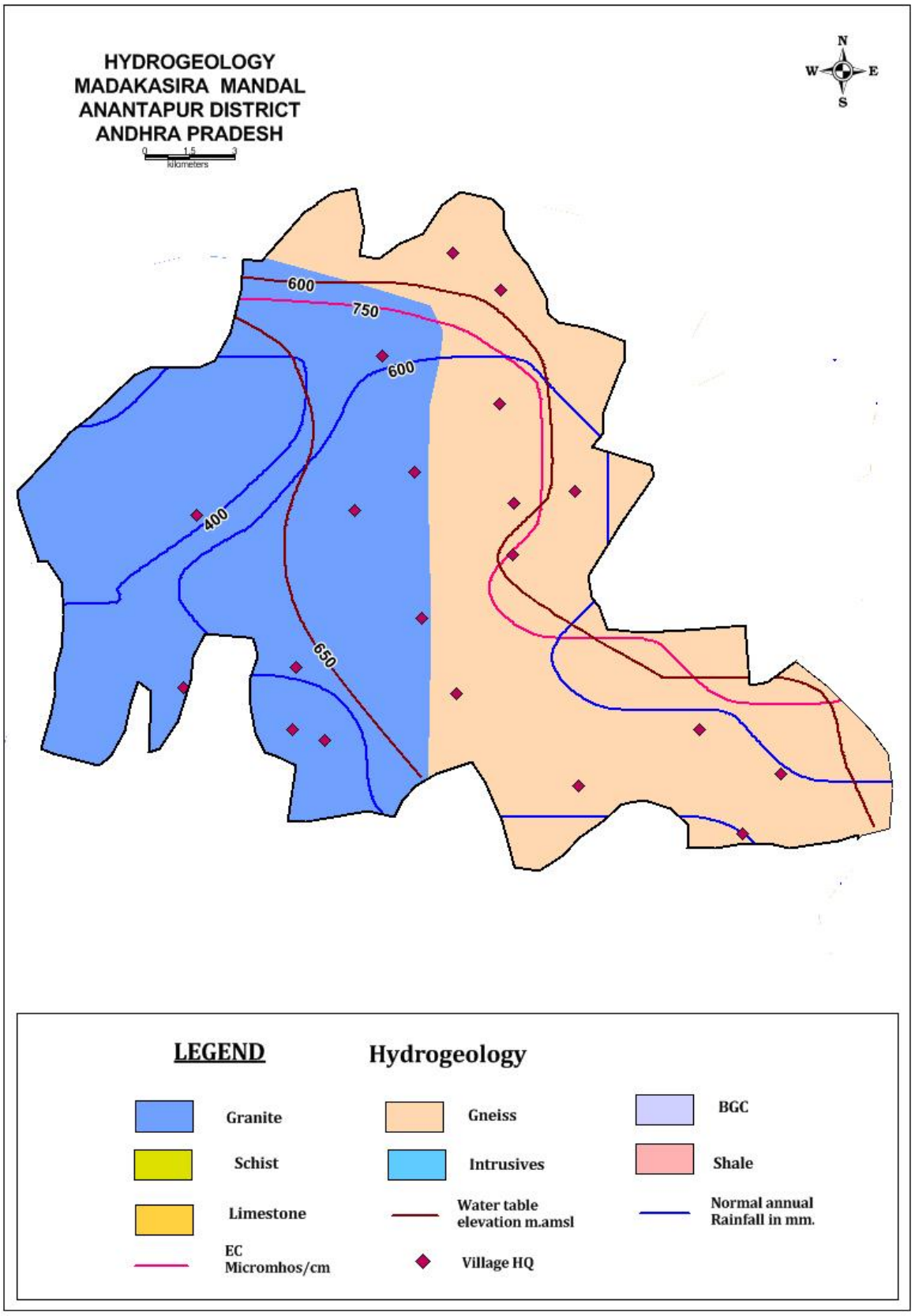
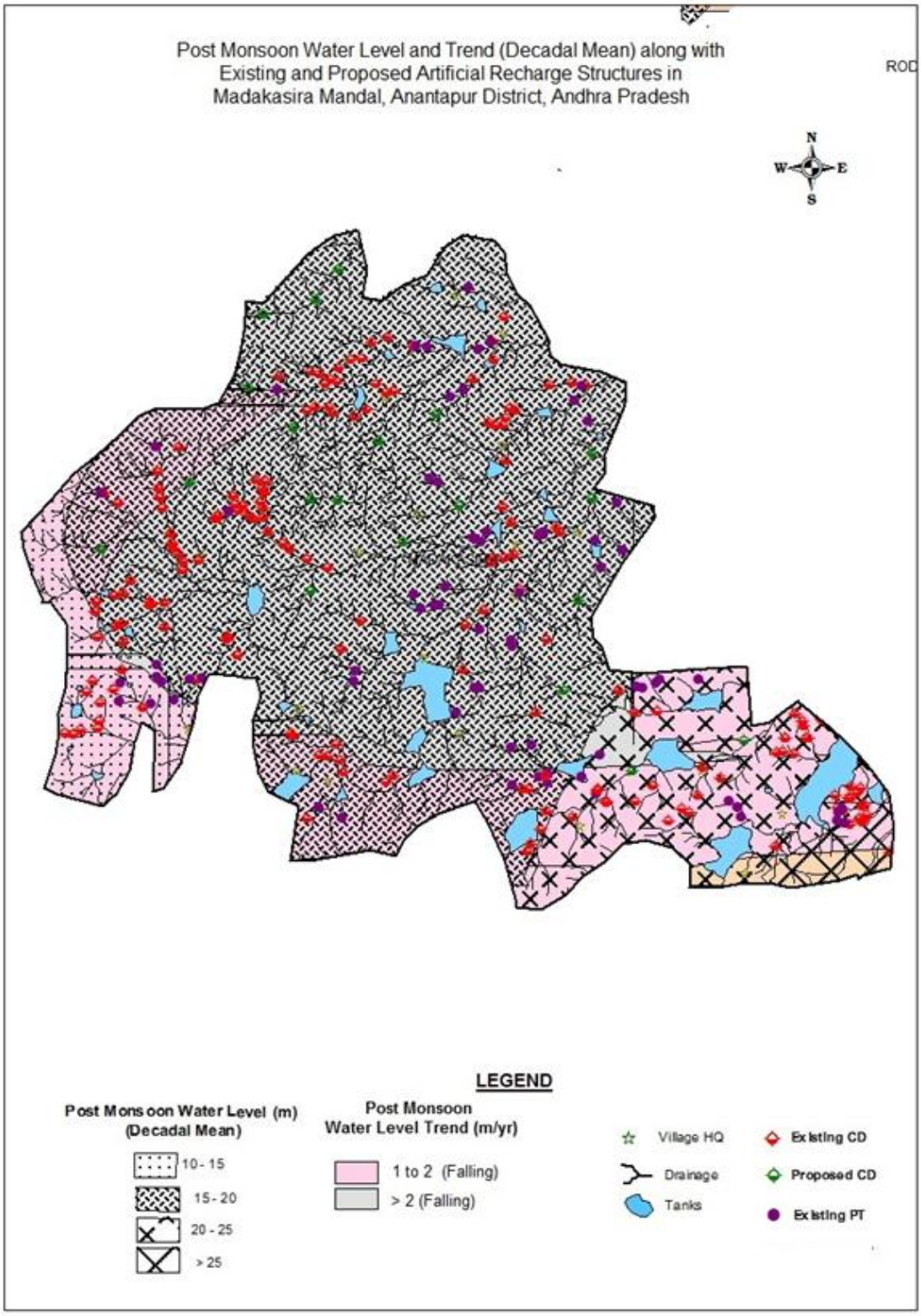

HYDROGEOLOGY
MADAKASIRA MANDAL
ANANTAPUR DISTRICT
ANDHRA PRADESH
0 1.5 3
Kilometers
N
W
E
S
600
750
600
400
650
LEGEND
Hydrogeology
Granite
Gneiss
BGC
Schist
Intrusives
Shale
Limestone
Water table elevation m.amsl
Normal annual Rainfall in mm.
EC Micromhos/cm
Village HQ

Fig.5


Post Monsoon Water Level and Trend (Decadal Mean) along with
Existing and Proposed Artificial Recharge Structures in
Madakasira Mandal, Anantapur District, Andhra Pradesh
ROD
N
W
E
S
LEGEND
Post Monsoon Water Level (m)
(Decadal Mean)
10 - 15
15 - 20
20 - 25
> 25
Post Monsoon
Water Level Trend (m/yr)
1 to 2 (Falling)
> 2 (Falling)
Village HQ
Drainage
Tanks
Existing CD
Proposed CD
Existing PT