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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
PEDDARAVEEDU MANDAL, PRAKASAM DISTRICT,
ANDHRA PRADESH STATE

SOUTHERN REGION
HYDERABAD
AUGUST-2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND
WATER CONSERVATION IN
PEDDARAVEEDU MANDAL, PRAKASAM DISTRICT,
ANDHRA PRADESH STATE

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AT A GLANCE

Name of the Mandal	PEDDARAVEEDU
District	PRAKASHAM
State	ANDHRA PRADESH
Total Area sq.km.	351
Area suitable for Artificial Recharge (sq.km.)	202
Latitude and Longitude	15.753840 to 15.964330 and 79.124840 to 79.412660.
Average Annual Rainfall (mm)	712
Geology	Shales and Quartzite
Average Depth To Water Level (Decadal) (Pre Monsoon)	19.86
Average Depth To Water Level (Decadal) (Post Monsoon)	0.25
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	14.85
Net Annual Ground Water Availability(MCM)/yr	13.36
Net Annual Ground Water Draft(MCM)/yr	17.79
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.20
Stage of Ground Water Development (%)	133
Surface runoff available (MCM)/yr	26.23
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0.41
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 0, Check Dams: 52 Farm ponds: 380, Recharge Shafts: 30
Improving Water use Efficiency	Micro Irrigation System -1900 ha
Tentative Total Cost in Lakhs (Rs.)	1604.295
Expected Recharge/Savings (MCM)/yr	7.171

1. INTRODUCTION

Peddaraveedu Mandal is one of over-exploited mandal in Prakasham district, Andhra Pradesh State, which is economically backward and chronically drought affected. The mandal has 16 inhabited villages and with 19 gram panchayats.

2. LOCATION

The mandal lies between north latitudes 15.753840 to 15.964330 and between east longitudes 79.124840 to 79.412660. The mandal occupies the north-west part of the Prakasham district and is bounded on the north by Yerragondapalem mandal, on the east by Donakonda mandal, on the south by Markapur mandal and west by Dornala mandal. (Fig.1) The geographical area of the mandal is 351 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams which are tributaries of Palar 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 712 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 351 sq.km, the area covered by forest is 130.72 sq.km and the net area sown is 81.13 sq.km. Barren and uncultivable land is 37.6 sq.km. The land for non agricultural use accounts for 53.38 sq.km.(Fig.3)

6. HYDROGEOLOGY

The area is underlain by Meta sedimentary formations comprising of Shales and Lime stones and slates of Pre-Cambrian age (Fig.4). Ground water occurs in weathered and fractured zones under water table and semi- confined conditions. The weathered zone thickness as per the GEC report is 30 m. The weathered zone has been extensively tapped by dug and dug cum bore wells upto 20 m depth, which are mostly dry now. Ground water occurs in the fractured rock formations up to 200 m bgl. The cumulative yield varies from 2-5 lps.

7. GROUND WATER LEVEL SCENARIO

The depth to water level during the pre-monsoon and post-monsoon varies from 2 to 20 m. The depth to water levels map for post monsoon period (2014) is shown in Fig 5. The Decadal mean water level trend during post monsoon is depicted in the Fig-6.

8. DYNAMIC GROUND WATER RESOURCES

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

Table-1: Ground water resources of Peddaraveedu Mandalm, Prakasham District.

Annual Replenishable Ground water resources (MCM)	14.85
Net Annual Ground Water Availability(MCM)/yr	13.36
Net Annual Ground Water Draft(MCM)/yr	17.79
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.20
Stage of Ground water development (%).	133
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 upto 20 m. 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

Peddaraveedu Mandal falls under high stage of ground water development i.e., 133 % 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)	351
Hilly Area (Sq.kms)	149
Area suitable for Artificial Recharge (sq.km.)	202
Runoff Yield in MCM/yr.	26.23
Existing No. of Check Dams	33
Storage created MCM/yr.	0.23
Existing No. of Percolation Tanks	25
Storage created MCM/yr.	0.18
Total Existing Storage Created	0.41

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 25.82 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 712 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 **52 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 17 and 13 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 380 farm ponds in 19 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 1900 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (PEDDAPAPPUR 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)	52	1.456	5	260	1.092
2	Recharge shaft in Check dam (50% of the existing Check dams)	17	0.187	0.5	8.5	0.187
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)	13	0.143	1	13	0.143
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	380	0.05472	0.25	95	0.049248
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1900	11.4	0.6	1140	5.7
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	19	0	0.6	11.4	0
8 (i)	Total (No. of AR Structures)	481	1.84		387.9	1.471
8 (ii)	Total (ha)	1900			1140	5.7
	Total (8(i) + 8 (ii))				1527.9	7.171
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				76.395	
	Grand Total				1604.295	

*(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	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
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 7.171 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 133% to 86% (47%)
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
PEDDARAVEEDU MANDAL, PRAKASHAM DISTRICT, AP

S.no	Gram Panchayat	Habitation	Structure Type	Longitude	Latitude	Scheme
1	Badveeducherlopalli	BadveeduCherlopalli	Check Dam	79.2030	15.8331	NREGS
2	Gobburu	Gobburu	Check Dam	79.2713	15.8119	NREGS
3	Gobburu	Gobburu	Check Dam	79.2772	15.8077	NREGS
4	Gobburu	Gobburu	Check Dam	79.2804	15.8055	NREGS
5	Gobburu	Gobburu	Check Dam	79.2752	15.8208	NREGS
6	Ramayapalem	Ramayapalem	Check Dam	79.1837	15.8875	NREGS
7	Ramayapalem	Ramayapalem	Check Dam	79.1713	15.8899	NREGS
8	Sanikavaram	Sanikavaram	Check Dam	79.1778	15.9066	NREGS
9	Thangirallapalli	ThangirallaPalli	Check Dam	79.3025	15.8477	NREGS
10	Regumanipalli	Pothampalli	Check Dam	79.2449	15.9180	NREGS
11	Regumanipalli	Pothampalli	Check Dam	79.2499	15.9190	NREGS
12	Regumanipalli	Regumanipalli	Check Dam	79.2446	15.9255	NREGS
13	Regumanipalli	Regumanipalli	Check Dam	79.2442	15.9265	NREGS
14	S.kothapalli	S.KothaPalli	Check Dam	79.2386	15.8167	NREGS
15	Pedaaraveedu	PedaAraveedu	Check Dam	79.2258	15.8140	NREGS
16	Pedaaraveedu	PedaAraveedu	Check Dam	79.2258	15.8141	NREGS
17	Pedaaraveedu	PedaAraveedu	Check Dam	79.2105	15.8332	NREGS
18	Pedaaraveedu	PedaAraveedu	Check Dam	79.2148	15.8313	NREGS
19	Pedaaraveedu	PedaAraveedu	Check Dam	79.2248	15.8278	NREGS
20	Pedaaraveedu	Siddinayunipalli	Check Dam	79.2288	15.8269	NREGS
21	Boyadagumpula	Yenuguladinnepadu	Check Dam	79.2568	15.8671	NREGS
22	Boyadagumpula	Yenuguladinnepadu	Check Dam	79.2609	15.8693	NREGS
23	Boyadagumpula	Yenuguladinnepadu	Check Dam	79.2665	15.8800	NREGS
24	Boyadagumpula	Yenuguladinnepadu	Check Dam	79.2427	15.8864	NREGS
25	Thokapalli	Christian Palem	Check Dam	79.2983	15.8774	NREGS
26	Thokapalli	ThokaPalli	Check Dam	79.2822	15.8891	NREGS
27	Gobburu	Gobburu	Check Dam	79.2713	15.8119	IWMP
28	Gobburu	Gobburu	Check Dam	79.2772	15.8077	IWMP
29	Gobburu	Gobburu	Check Dam	79.2804	15.8055	IWMP
30	Gobburu	Gobburu	Check Dam	79.2752	15.8208	IWMP
31	Thangirallapalli	ThangirallaPalli	Check Dam	79.3025	15.8477	IWMP
32	Thokapalli	Christian Palem	Check Dam	79.2983	15.8774	IWMP
33	Thokapalli	ThokaPalli	Check Dam	79.2822	15.8891	IWMP
34	Puchakayalapalli	Puchakayalapalli	MPT	79.1914	15.7873	NREGS
35	Puchakayalapalli	Puchakayalapalli	MPT	79.2013	15.7821	NREGS
36	Puchakayalapalli	Puchakayalapalli	MPT	79.2114	15.7945	NREGS
37	Puchakayalapalli	Puchakayalapalli	MPT	79.2069	15.8029	NREGS
38	Ramayapalem	Ramayapalem	MPT	79.1816	15.8886	NREGS
39	Thangirallapalli	ThangirallaPalli	MPT	79.3046	15.8473	NREGS
40	Pedaaraveedu	PedaAraveedu	MPT	79.2198	15.8266	NREGS
41	Thokapalli	ThokaPalli	MPT	79.2813	15.8764	NREGS

42	Thangirallapalli	ThangirallaPalli	MPT	79.3046	15.8473	IWMP
43	Thokapalli	ThokaPalli	MPT	79.2813	15.8764	IWMP
44	Badveeducherlopalli	BadveeduCherlopalli	PT	79.1867	15.8394	NREGS
45	Puchakayalapalli	Puchakayalapalli	PT	79.2002	15.7950	NREGS
46	Ramayapalem	Ramayapalem	PT	79.1738	15.8874	NREGS
47	Thangirallapalli	ThangirallaPalli	PT	79.3083	15.8320	NREGS
48	S.kothapalli	S.KothaPalli	PT	79.2502	15.8060	NREGS
49	Chatlamitta	Chatla Mitta	PT	79.2603	15.8892	NREGS
50	Devarajugattu	DevarajuGattu	PT	79.2510	15.8055	NREGS
51	Badveedu	Pragallapadu	PT	79.2400	15.8574	NREGS
52	Boyadagumpula	Yenuguladinnepadu	PT	79.2400	15.8880	NREGS
53	Maddalakatla	Maddalakatla	PT	79.1984	15.8993	NREGS
54	Maddalakatla	Maddalakatla	PT	79.1991	15.9076	NREGS
55	Maddalakatla	Tirumalapuram	PT	79.2219	15.9119	NREGS
56	Thokapalli	ThokaPalli	PT	79.2865	15.8791	NREGS
57	Thangirallapalli	ThangirallaPalli	PT	79.3083	15.8320	IWMP
58	Thokapalli	ThokaPalli	PT	79.2865	15.8791	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
PEDDARAVEEDU MANDAL, PRAKASHAM DISTRICT, AP.

S.No.	Mandal	Lattitude	Longitude	Struicture type
1	Peddaraveedu	15.8837	79.189	Checkdam
2	Peddaraveedu	15.8813	79.2003	Checkdam
3	Peddaraveedu	15.8785	79.2204	Checkdam
4	Peddaraveedu	15.869	79.2423	Checkdam
5	Peddaraveedu	15.8669	79.2342	Checkdam
6	Peddaraveedu	15.8645	79.2287	Checkdam
7	Peddaraveedu	15.8653	79.2559	Checkdam
8	Peddaraveedu	15.8821	79.2725	Checkdam
9	Peddaraveedu	15.8899	79.2823	Checkdam
10	Peddaraveedu	15.8968	79.2682	Checkdam
11	Peddaraveedu	15.8966	79.2803	Checkdam
12	Peddaraveedu	15.9	79.3048	Checkdam
13	Peddaraveedu	15.9057	79.2503	Checkdam
14	Peddaraveedu	15.8905	79.2365	Checkdam
15	Peddaraveedu	15.9064	79.207	Checkdam
16	Peddaraveedu	15.897	79.1878	Checkdam
17	Peddaraveedu	15.8878	79.1727	Checkdam
18	Peddaraveedu	15.8057	79.1522	Checkdam
19	Peddaraveedu	15.7842	79.1247	Checkdam
20	Peddaraveedu	15.818	79.1389	Checkdam
21	Peddaraveedu	15.8048	79.1663	Checkdam
22	Peddaraveedu	15.7946	79.2471	Checkdam
23	Peddaraveedu	15.8269	79.2262	Checkdam
24	Peddaraveedu	15.824	79.2418	Checkdam
25	Peddaraveedu	15.824	79.2784	Checkdam
26	Peddaraveedu	15.8347	79.273	Checkdam
27	Peddaraveedu	15.8311	79.2966	Checkdam
28	Peddaraveedu	15.8242	79.3023	Checkdam
29	Peddaraveedu	15.8397	79.3117	Checkdam
30	Peddaraveedu	15.8451	79.3163	Checkdam
31	Peddaraveedu	15.9156	79.2566	Checkdam
32	Peddaraveedu	15.9138	79.2455	Checkdam
33	Peddaraveedu	15.9222	79.2024	Checkdam
34	Peddaraveedu	15.8806	79.3248	Checkdam
35	Peddaraveedu	15.8474	79.3078	Checkdam
36	Peddaraveedu	15.8738	79.2959	Checkdam
37	Peddaraveedu	15.8749	79.3442	Checkdam
38	Peddaraveedu	15.8975	79.3346	Checkdam
39	Peddaraveedu	15.8645	79.1899	Checkdam
40	Peddaraveedu	15.8745	79.1727	Checkdam
41	Peddaraveedu	15.8809	79.1644	Checkdam

42	Peddaraveedu	15.8831	79.1526	Checkdam
43	Peddaraveedu	15.8409	79.1916	Checkdam
44	Peddaraveedu	15.8366	79.2031	Checkdam
45	Peddaraveedu	15.8053	79.2097	Checkdam
46	Peddaraveedu	15.8101	79.1849	Checkdam
47	Peddaraveedu	15.8886	79.3089	Checkdam
48	Peddaraveedu	15.8943	79.3506	Checkdam
49	Peddaraveedu	15.7922	79.1198	Checkdam
50	Peddaraveedu	15.7767	79.117	Checkdam
51	Peddaraveedu	15.8336	79.1144	Checkdam
52	Peddaraveedu	15.8135	79.2763	Checkdam

Fig.1

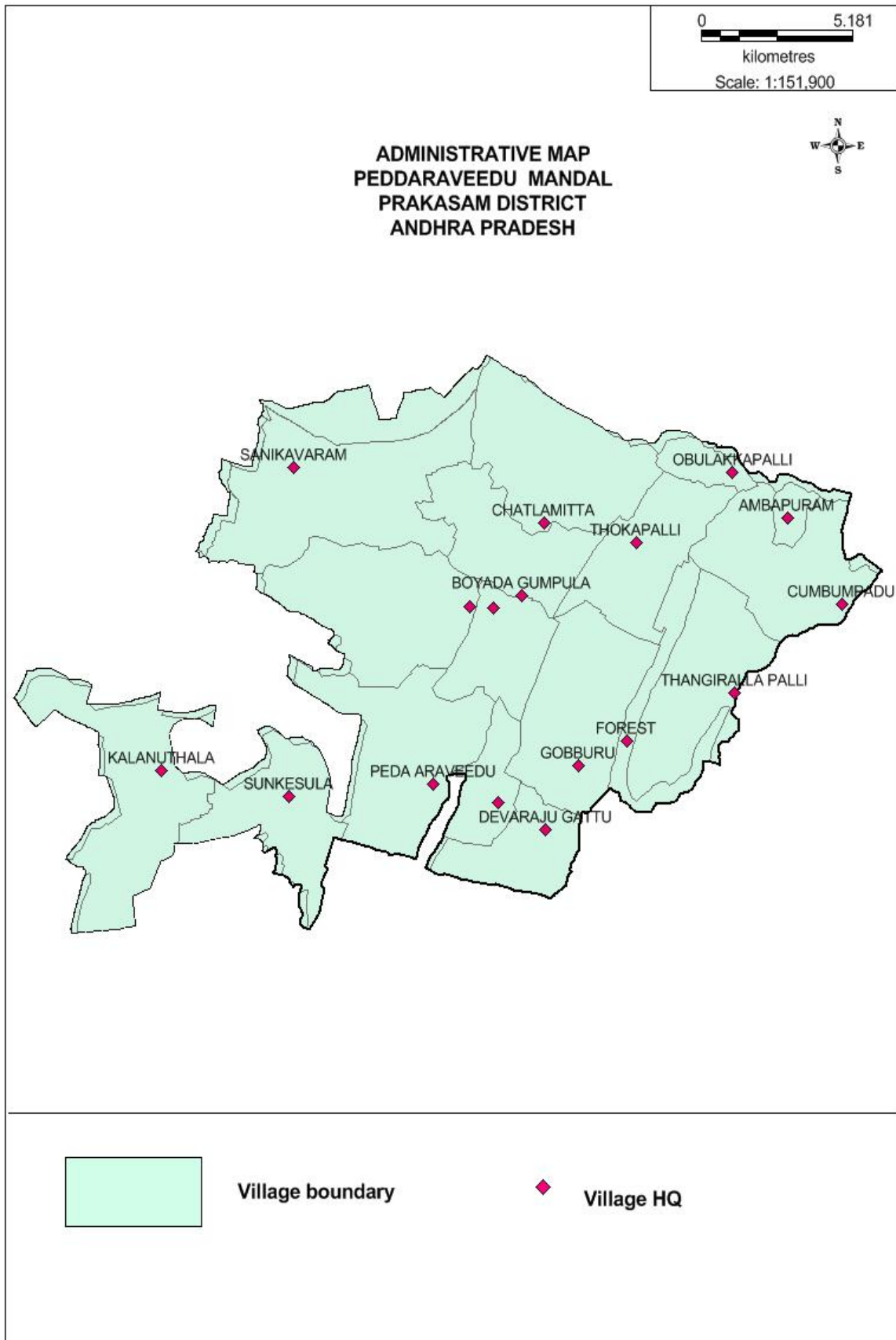


Fig.2

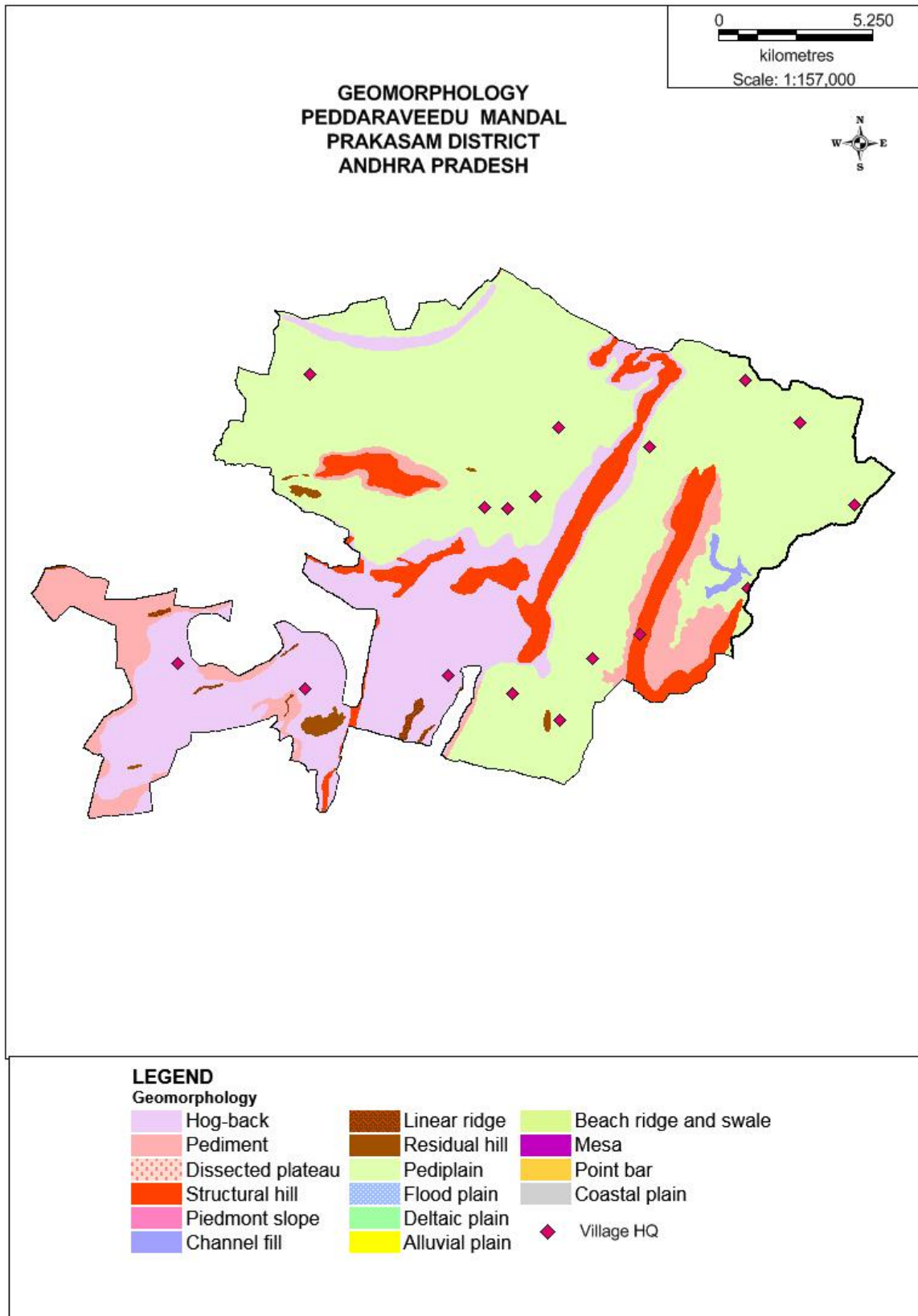


Fig.3

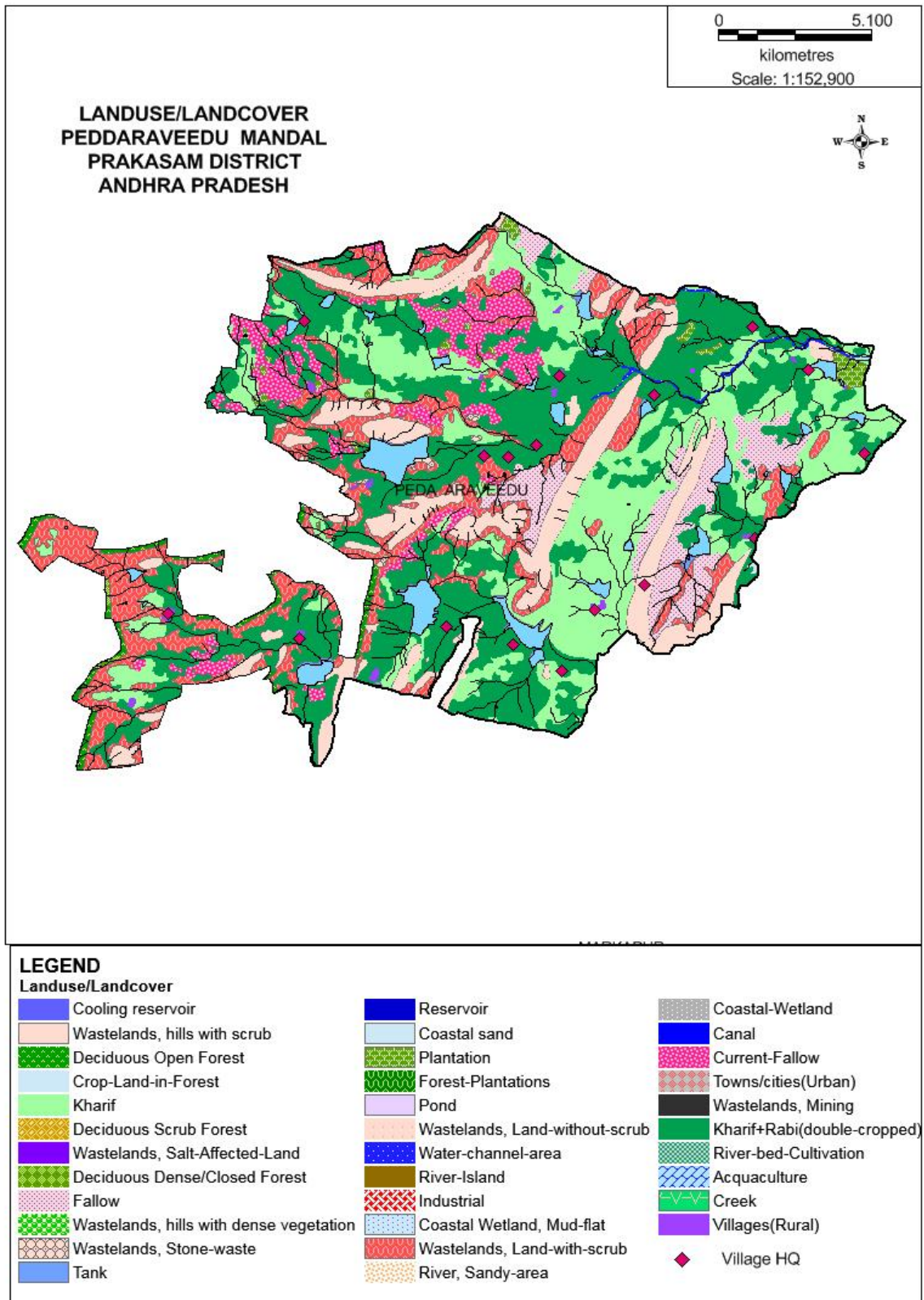


Fig.4

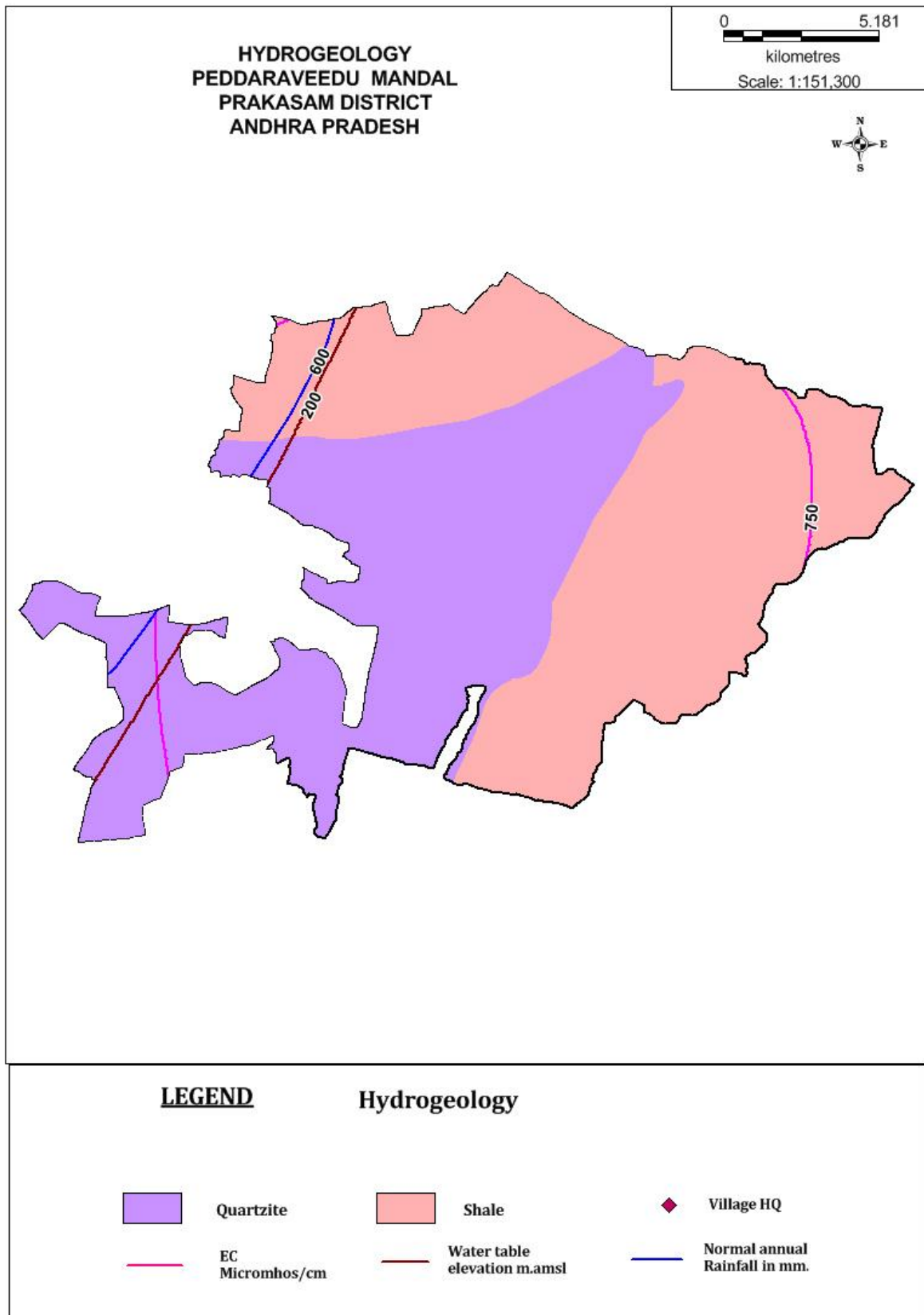


Fig.5

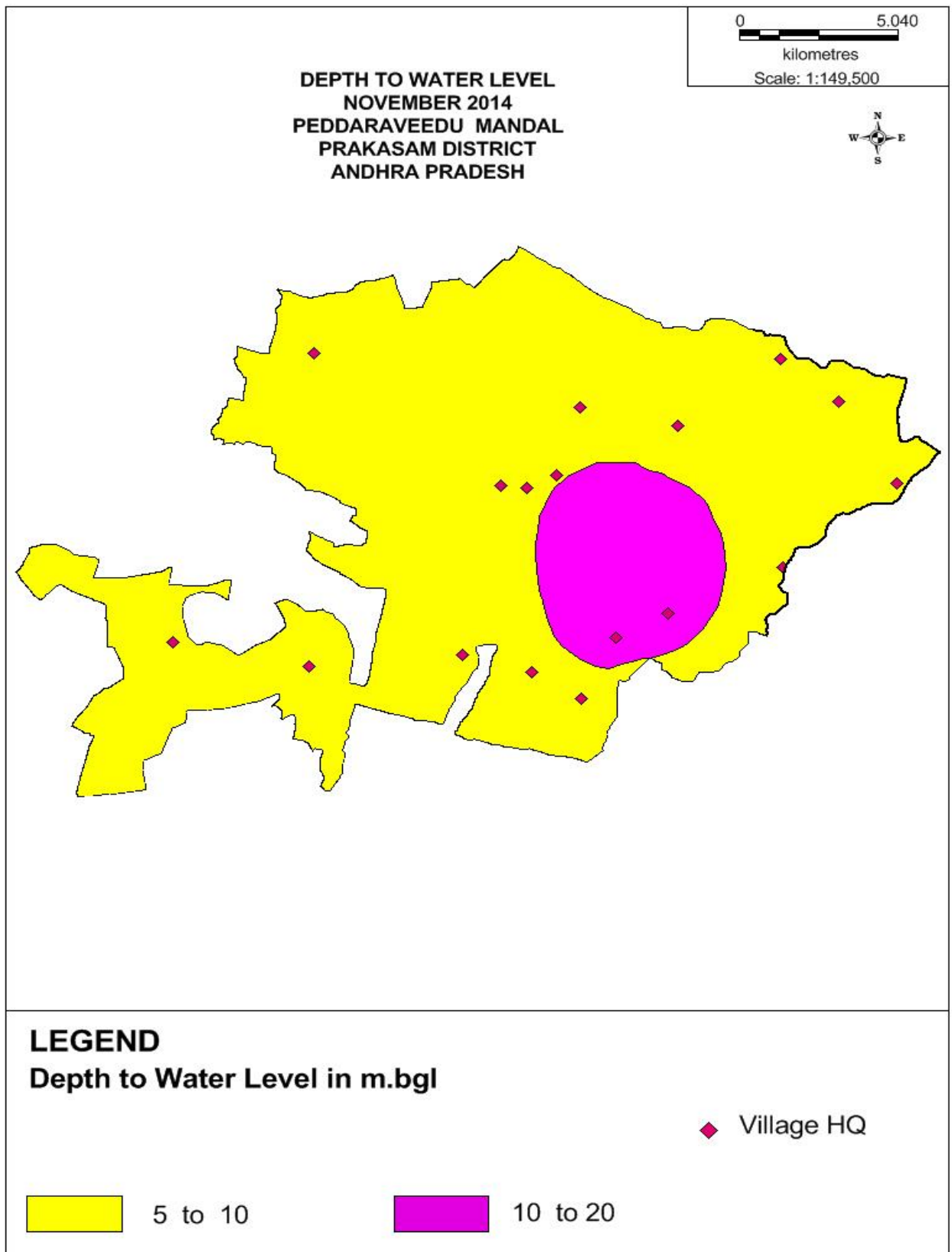


Fig.6

