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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  
KONDAPAK MANDAL, MEDAK DISTRICT,  
TELANGANA STATE

SOUTHERN REGION  
HYDERABAD  
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PLAN ON  
ARTIFICIAL RECHARGE TO GROUNDWATER AND  
WATER CONSERVATION IN  
KONDAPAK MANDAL, MEDAK DISTRICT,  
TELANGANA STATE

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AT A GLANCE

Name of the Mandal	Kondapak
District	Medak
State	Telangana
Total Area(Sq.Km)	240.29
Area suitable for Artificial Recharge (sq.km.)	229.29
Latitude and Longitude	17.871610 to 18.056110 and 78.702320 to 78.949990
Average Annual Rainfall (mm)	635
Geology	BGC
Average Depth To Water Level (Decadal) (Pre Monsoon)	21.70
Average Depth To Water Level (Decadal) (Post Monsoon)	18.3
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	35.27
Net Annual Ground Water Availability(MCM)/yr	31.74
Net Annual Ground Water Draft(MCM)/yr	34.34
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.35
Stage of Ground Water Development (%)	108
Surface runoff available (MCM)/yr	16.87
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0.94
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks-4, Check Dams-13 Farm ponds-420, Recharge Shafts-16
Improving Water use Efficiency	Micro Irrigation System -2100 ha
Tentative Total Cost in Lakhs (Rs.)	1586.655 Lakhs
Expected Recharge/Savings (MCM)/yr	7.10

## 1. INTRODUCTION

Kondapak Mandal is one of over-exploited mandal in Medak district, Telangana State, which is economically backward and chronically drought affected. The mandal has 21 inhabited villages and with 18 gram Panchayats.

## 2. LOCATION

The mandal lies between north latitudes 17.871610 to 18.056110 and between east longitudes 78.702320 to 78.949990". The mandal occupies the eastern part of the Medak district and is bounded on the north by Siddipet mandal, on the east by Warangal district, on the south by Jagdevpur mandal and west by Thogutta mandal. (Fig.1) The geographical area of the mandal is 240.29 sq.km.

## 3. PHYSIOGRAPHY AND DRAINAGE:

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

## 4. RAINFALL

The average rainfall in the mandal is 635 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 240.29 sq.km, the area covered by forest is 25.07 sq.km and the net area sown is 104.06 sq.km. Barren and uncultivable land is 11.19 sq.km. The land for non agricultural use accounts for 12.78 sq.km.(Fig.3)

## 6. HYDROGEOLOGY

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

## 7. GROUND WATER LEVEL SCENARIO

The depth to water level during pre and post-monsoon varies from 5 to 20 mbgl. The average depth to water level (decadal) during pre and post monsoon is 21.7 and 18.3 m bgl respectively. The depth to water levels maps for pre and post monsoon period (2014) are shown in (Fig. 5 & 6 respectively). The decadal mean water level trend during post monsoon is depicted in the Fig.7.

## 8. DYNAMIC GROUND WATER RESOURCES

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

Table-1: Ground water resources of Kondapak Mandal, Medak District.

Annual Replenishable Ground water resources (MCM)	35.27
Net Annual Ground Water Availability(MCM)/yr	31.74
Net Annual Ground Water Draft(MCM)/yr	34.34
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.35
Stage of Ground water development (%).	108
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 30 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

Kondapak Mandal falls under high stage of ground water development i.e., 108 % 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)	240.29
Hilly Area (Sq.kms)	11
Area suitable for Artificial Recharge (sq.km.)	229.29
Runoff Yield in MCM/yr	16.87
Existing No. of Check Dams	56
Storage created MCM/yr	0.4
Existing No. of Percolation Tanks	77
Storage created MCM/yr	0.55
Total Existing Storage Created	0.94

## 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 15.93 MCM/yr, which could be considered for further planning of artificial recharge. However, the number of artificial recharge structures feasible has been recommended in areas, by considering the utilizable yield, number of existing structures, land use, drainage pattern and also where the post monsoon water levels (decadal mean) are more than 5 m bgl., and or decadal trends are either falling or showing insignificant raising trend.

### A) Check dams and Percolation Tanks

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

- The site selected for check dam/Percolation Tank should have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time. The water stored in these structures is mostly confined to the stream course and height is normally less than 2m.
- These are designed based on stream width and excess water is allowed to flow over the crest wall. In order to avoid scouring from excess runoff water cushions are provided on the downstream side. To harness maximum runoff in the stream, a series of such check dams can be constructed to have recharge on a regional scale.
- Considering the annual monsoon rainfall of 635 mm, sufficient rain water can be harnessed. This will improve ground water regime as well as delaying the instant flow into the main river.
- The flow in these seasonal rivers can be sustained up to about 2 to 3 months after monsoon.

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

**A total of 13 Check dams and 4 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 15 and 1 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 420 farm ponds in 21 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 2100 ha @ 100 ha per village.



### 13. TENTATIVE COST ESTIMATES (KONDAPAK 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)	13	0.364	5	65	0.273
2	Recharge shaft in Check dam (50% of the existing Check dams)	15	0.165	0.5	7.5	0.165
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	4	0.4	15	60	0.3
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	1	0.011	1	1	0.011
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	420	0.06048	0.25	105	0.054432
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	2100		0.6	1260	6.3
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	21	0	0.6	12.6	0
8 (i)	Total (No. of AR Structures)	474	1.00		251.1	0.803
8 (ii)	Total (ha)	2100			1260	6.3
	Total (8(i) + 8 (ii))				<b>1511.1</b>	<b>7.103</b>
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				<b>75.555</b>	
	<b>Grand Total</b>				<b>1586.655</b>	

\*(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							
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>
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 7.10 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 108% to 88% (20%)
4. It will also help in controlling soil erosion.

## Acknowledgements

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

**EXISTING ARTIFICIAL RECHARGE STRUCTURES  
KONDAPAK MANDAL, MEDAK DISTRICT, TELANGANA.**

Sno	Name_Vill	Name_ARS	Long_	Lat
1	Bandaram	Check Dam	78.9297	18.0126
2	Bandaram	Check Dam	78.9304	18.0087
3	Bandaram	Check Dam	78.9389	18.0264
4	Bandaram	Check Dam	78.9250	18.0264
5	Bandaram	Check Dam	78.9305	18.0368
6	Bandaram	Check Dam	78.9382	18.0436
7	Bandaram	Check Dam	78.9369	18.0465
8	Duddeda	Check Dam	78.8963	18.0024
9	Duddeda	Check Dam	78.9071	18.0128
10	Duddeda	Check Dam	78.8969	18.0090
11	Duddeda	Check Dam	78.8826	18.9959
12	Duddeda	Check Dam	78.8931	18.0009
13	Duddeda	Check Dam	78.8769	18.0259
14	Duddeda	Check Dam	78.9031	18.0278
15	Duddeda	Check Dam	78.8901	18.0166
16	Duddeda	Check Dam	78.8910	18.0015
17	Duddeda	Check Dam	78.8899	18.0006
18	Duddeda	Check Dam	78.8905	18.0006
19	Marpadaga	Check Dam	78.8094	18.0302
20	Marpadaga	Check Dam	78.8373	18.0238
21	Ankireddypally	Check Dam	78.9166	18.0159
22	Ankireddypally	Check Dam	78.9227	18.0012
23	Ankireddypally	Check Dam	78.9251	18.0070
24	Ankireddypally	Check Dam	78.8835	18.0031
25	Ankireddypally	Check Dam	78.9894	18.8589
26	Ankireddypally	Check Dam	78.9196	18.0120
27	Ankireddypally	Check Dam	78.9137	18.0044
28	Marpadaga	Check Wall	78.8104	18.0337
29	Marpadaga	Check Wall	78.8083	18.0344
30	Marpadaga	Check Wall	78.8498	18.0029
31	Bandaram	Farm Pond	78.9344	18.0177
32	Bandaram	Farm Pond	78.9364	18.0294
33	Bandaram	Farm Pond	78.9315	18.0263
34	Bandaram	Farm Pond	78.9365	18.0274
35	Bandaram	Farm Pond	78.9399	18.0315
36	Bandaram	Farm Pond	78.9415	18.0336
37	Bandaram	Farm Pond	78.9403	18.0299
38	Bandaram	Farm Pond	78.9313	18.0335
39	Bandaram	Farm Pond	78.9419	18.0355
40	Bandaram	Farm Pond	78.9344	18.0177
41	Bandaram	Farm Pond	78.9364	18.0294
42	Bandaram	Farm Pond	78.9315	18.0263

43	Duddeda	Farm Pond	78.9003	18.0101
44	Duddeda	Farm Pond	78.9010	18.0129
45	Duddeda	Farm Pond	78.9018	18.0150
46	Duddeda	Farm Pond	78.8910	18.0221
47	Duddeda	Farm Pond	78.9011	18.0363
48	Marpadaga	Farm Pond	78.8656	18.0107
49	Marpadaga	Farm Pond	78.8095	18.0273
50	Marpadaga	Farm Pond	78.8063	18.0348
51	Marpadaga	Farm Pond	78.8611	18.0147
52	Ankireddypally	Farm Pond	78.9210	18.0148
53	Ankireddypally	Farm Pond	78.9176	18.0117
54	Ankireddypally	Farm Pond	78.9151	18.0142
55	Duddeda	Percolation Tank	78.8801	17.9989
56	Marpadaga	Percolation Tank	78.8001	18.0038

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

S.No.	VNAME	Longitude	Latitude	Type of Structure
1	MARPADGA	78.8268	18.0165	Checkdam
2	GIRAIPALLE	78.8209	17.9751	Checkdam
3	SIRSINGANDLA	78.8421	18.0001	Checkdam
4	DUDDADA	78.8825	18.0256	Checkdam
5	DUDDADA	78.9062	18.0299	Checkdam
6	VELIKATTU	78.9037	17.9772	Checkdam
7	THIMMAREDDIPALLE	78.8415	17.9463	Checkdam
8	THIMMAREDDIPALLE	78.8615	17.9347	Checkdam
9	KONDAPAK	78.8360	17.9390	Checkdam
10	KONDAPAK	78.8260	17.9505	Checkdam
11	KONDAPAK	78.8682	17.9705	Checkdam
12	KONDAPAK	78.8462	17.9588	Checkdam
13	KONDAPAK	78.8405	17.9814	Checkdam
14	THIMMAREDDIPALLE	78.8622	17.9435	PTS/MPTS
15	GIRAIPALLE	78.8148	17.9582	PTS/MPTS
16	SIRSINGANDLA	78.8271	17.9882	PTS/MPTS
17	MARPADGA	78.8658	18.0293	PTS/MPTS

Fig.1

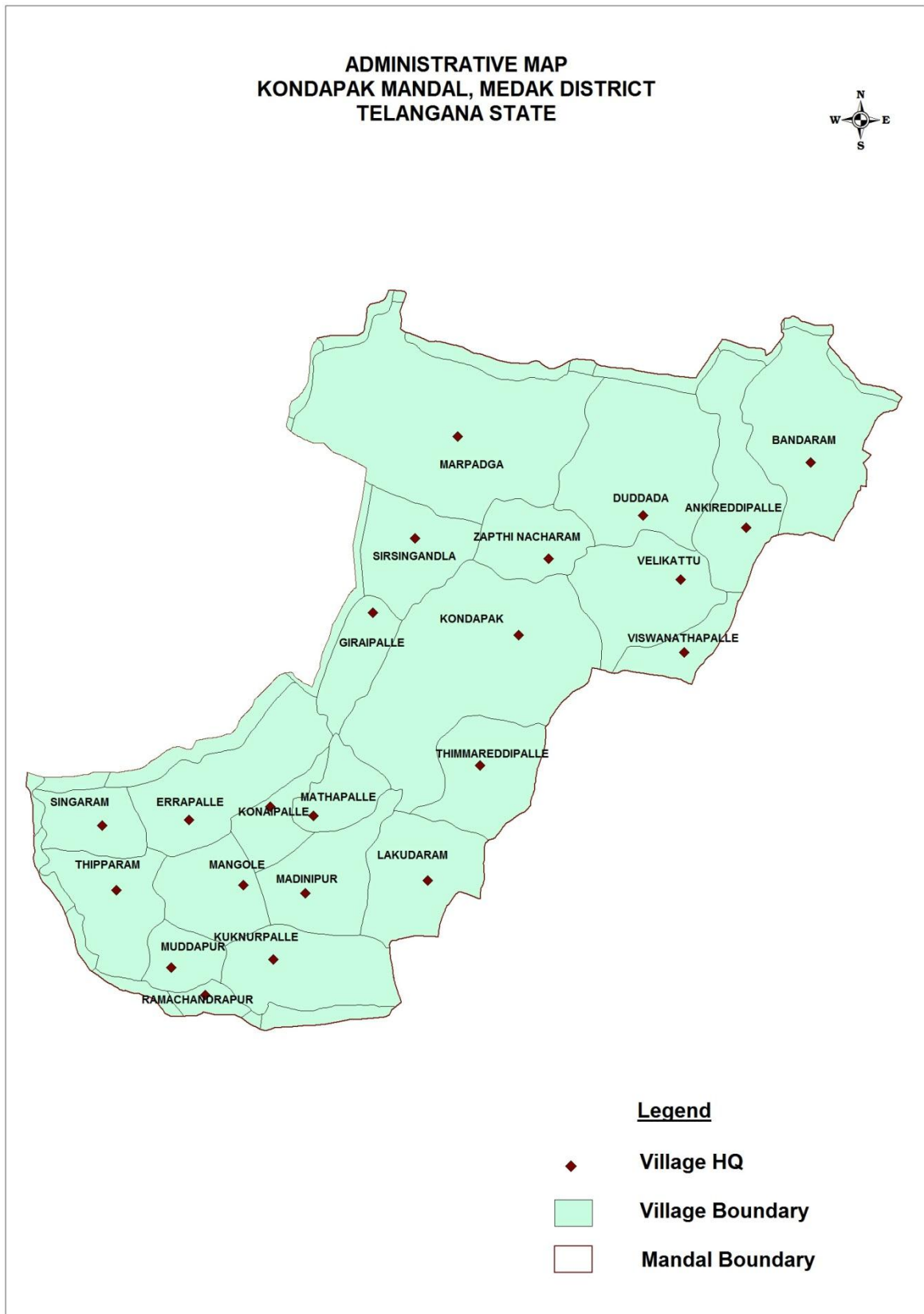


Fig.2

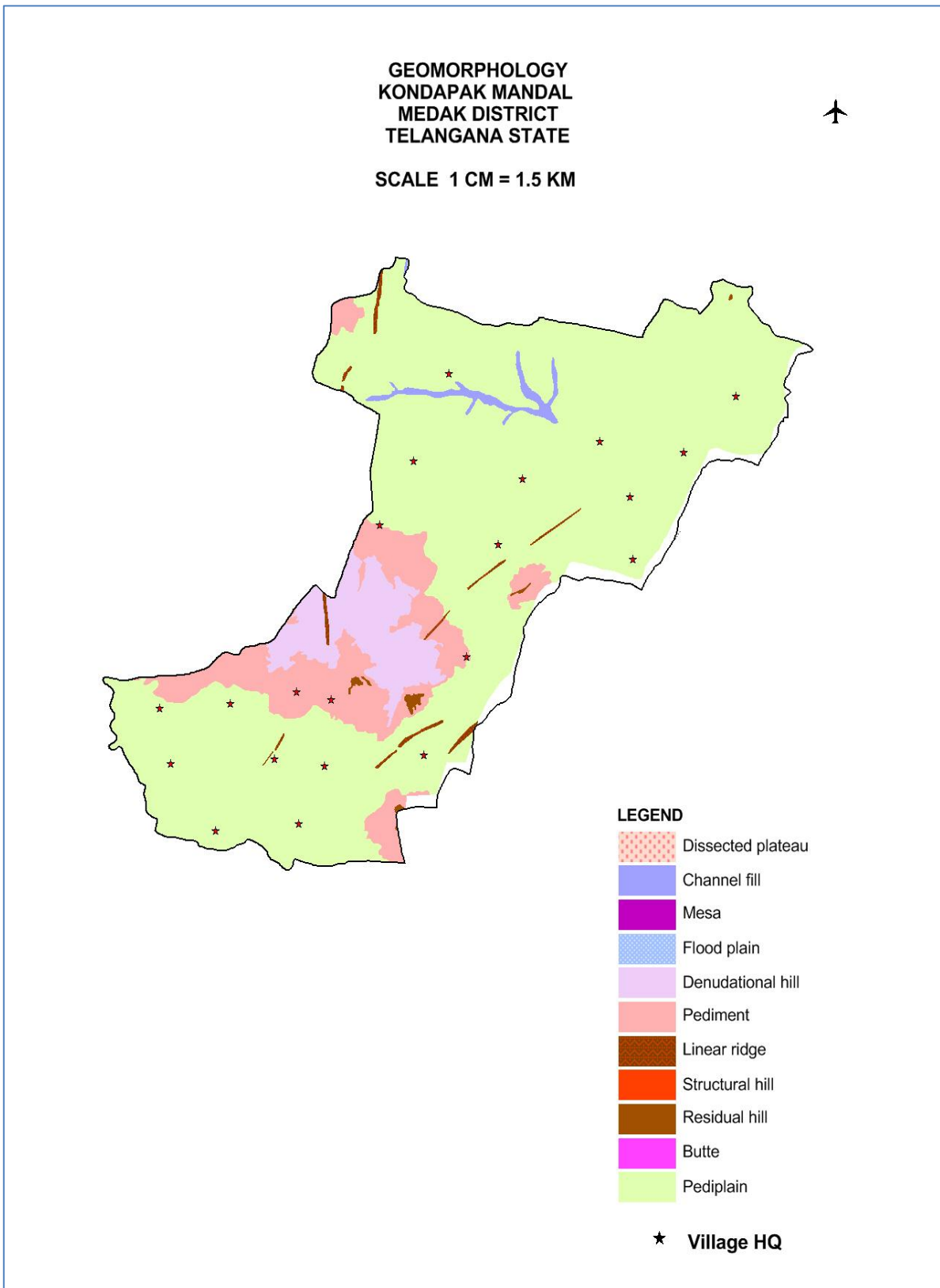


Fig.3

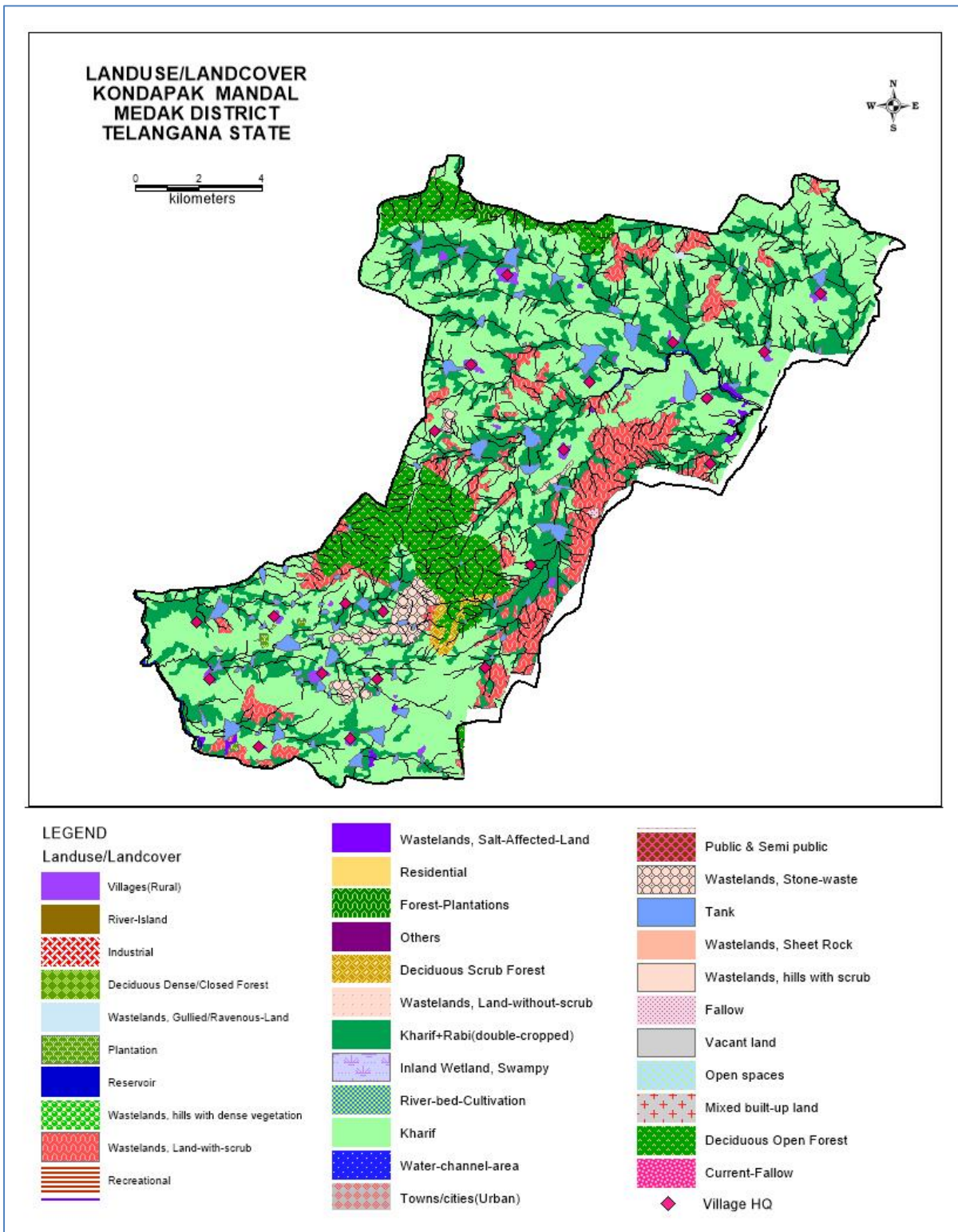




Fig.4

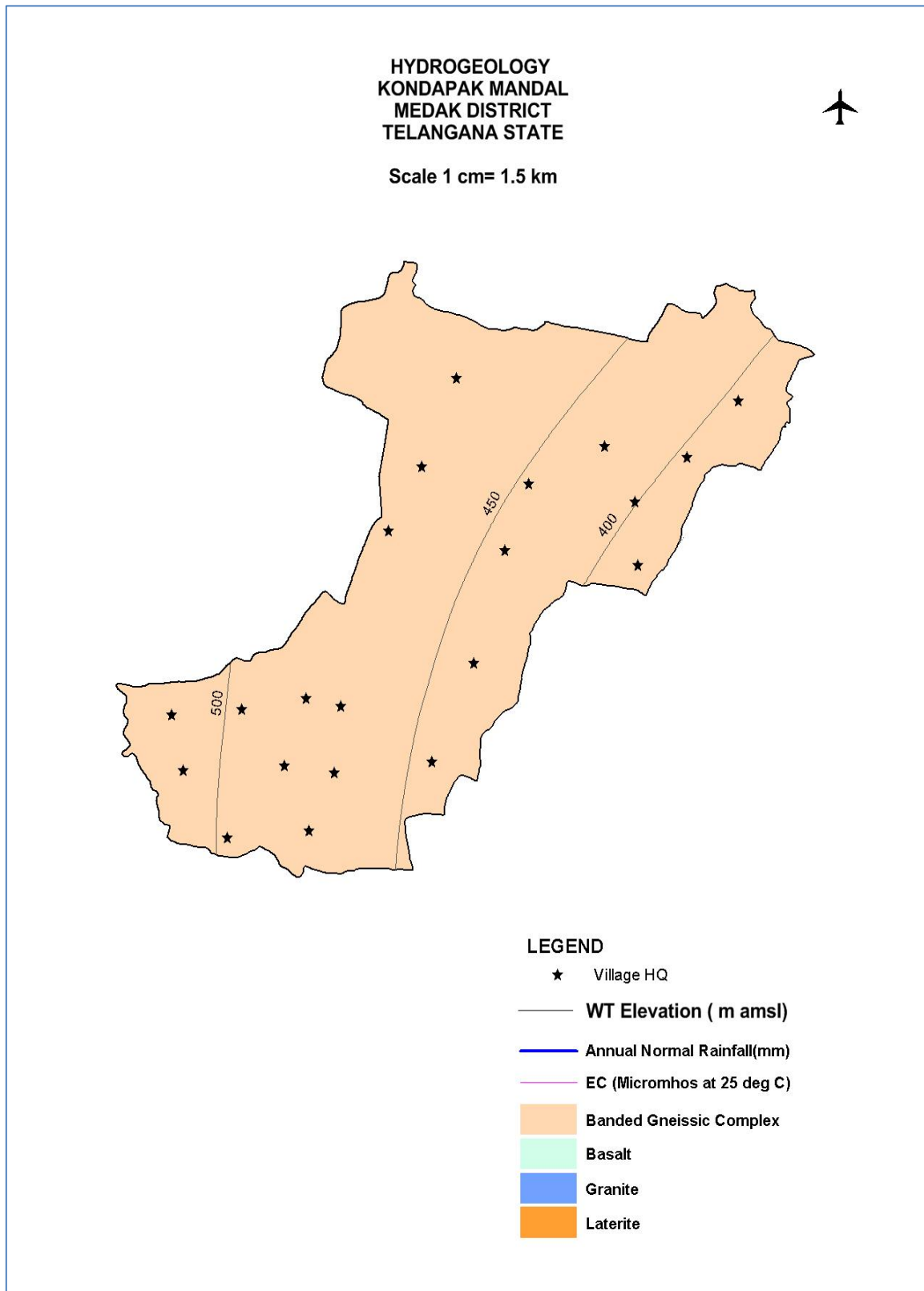


Fig.5

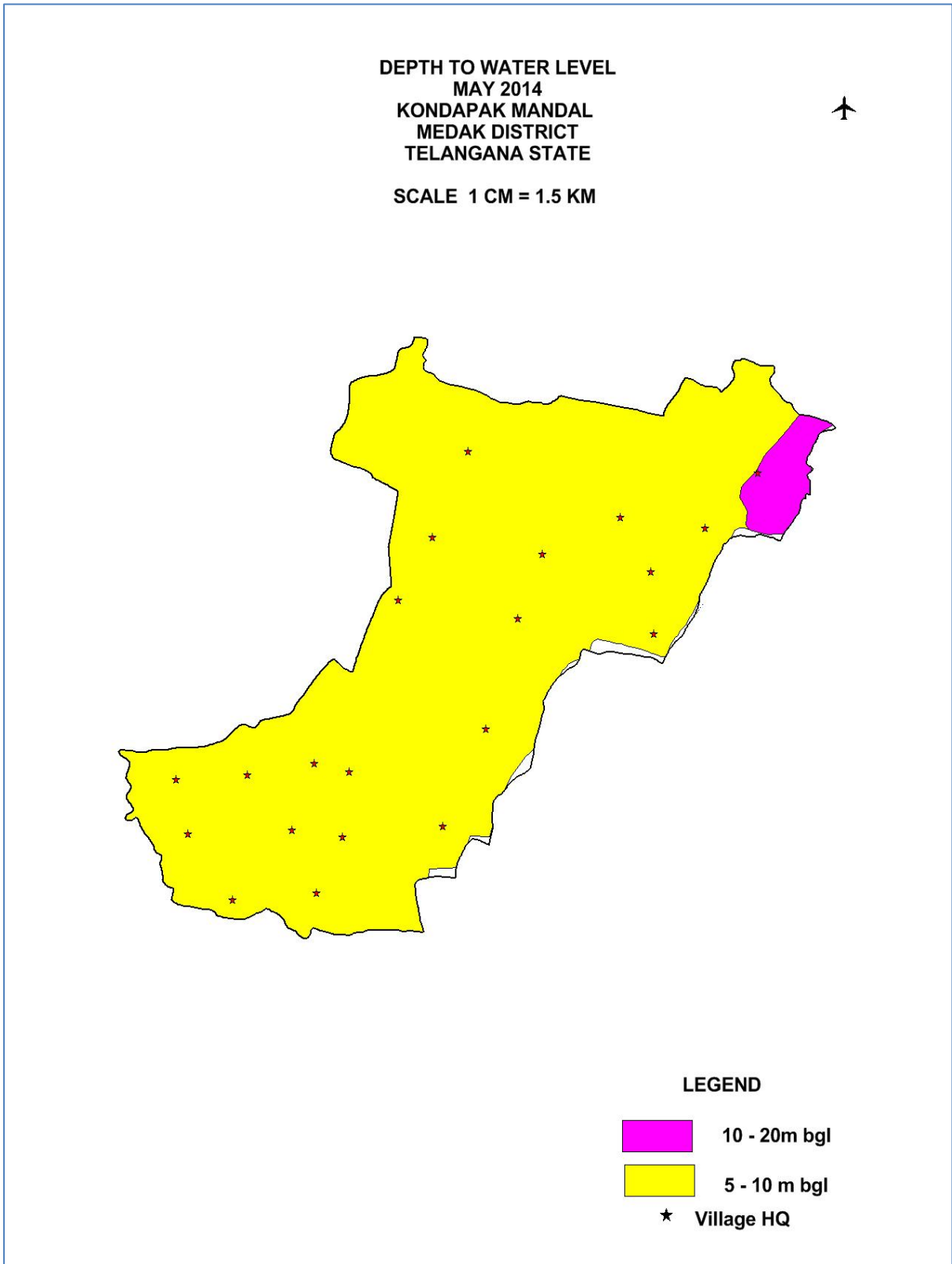


Fig.6

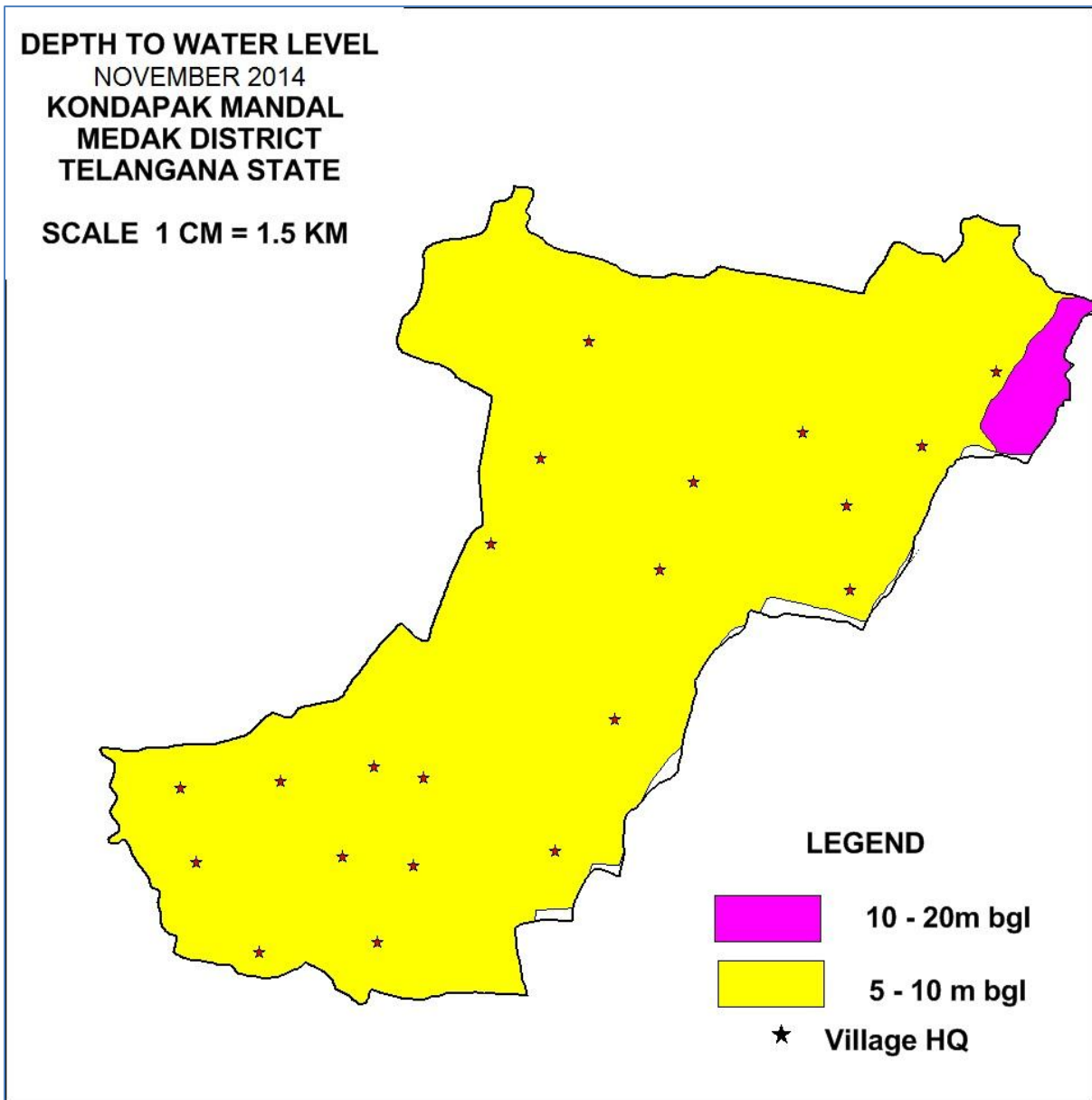


Fig.7

