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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 THOGUTTA MANDAL, MEDAK DISTRICT, TELANGANA STATE

SOUTHERN REGION
HYDERABAD
AUGUST 2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN THOGUTTA MANDAL, MEDAK DISTRICT, TELANGANA STATE

CONTENTS

AT A GLANCE

Name of the Mandal	THOGUTTA
District	MEDAK
State	TELANGANA
Total Area sq.km	140.36
Area suitable for Artificial Recharge (sq.km.)	129.36
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)	21.7
Average Depth To Water Level (Decadal) (Post Monsoon)	18.3
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	24.1
Net Annual Ground Water Availability(MCM)/yr	21.69
Net Annual Ground Water Draft(MCM)/yr	26.33
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.38
Stage of Ground Water Development (%)	121
Surface runoff available (MCM)/yr	10.58
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0.14
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	*Percolation Tanks-5, Check Dams-12* *Farm ponds-340*
Improving Water use Efficiency	*Micro Irrigation System -1700 ha*
Tentative Total Cost in Lakhs (Rs.)	1312.71 Lakhs
Expected Recharge/Savings (MCM)/yr	5.771

1. INTRODUCTION

Thogutta Mandal is one of over-exploited mandal in Medak district, Telangana State, which is economically backward and chronically drought affected. The mandal has 16 inhabited villages with 17 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 Dubbaka mandal, on the east by Kondapaka mandal, on the south by Gajwel mandal and west by Mirdoddi mandal. (Fig.1) The geographical area of the mandal is 140.36 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 140.36 sq.km, the area covered by forest is 18.75 sq.km and the net area sown is 106.41 sq.km. Barren and uncultivable land is 9.71 sq.km. The land for non agricultural use accounts for 9.55 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 10 m bgl. 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. 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 Thogutta Mandal, Medak district is given in Table-1.

Table-1: Ground water resurces of Thogunta Mandal, Medak District.

Annual Replenishable Ground water resources (MCM)	24.1
Net Annual Ground Water Availability(MCM)/yr	21.69
Net Annual Ground Water Draft(MCM)/yr	26.33
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.38
Stage of Ground water development (%).	121
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 upto30m. 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

Thogutta Mandal falls under high stage of ground water development i.e., 121 % 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)	140.36
Hilly Area (Sq.kms)	11
Area suitable for Artificial Recharge (sq.km.)	129.36
Runoff Yield in MCM/yr	10.58
Existing No. of Check Dams	0
Storage created MCM/yr	0
Existing No. of Percolation Tanks	20
Storage created MCM/yr	0.14
Total Existing Storage Created	0.14

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 10.44 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 2 m.

- 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 12 Check dams and 5 Percolation tanks are recommended.

B). Farm Pond

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 340 farm ponds in 17 villages of the Mandal @ 20 farm ponds in each village.

C). Micro Irrigation System (Sprinkler /drip/HDPE pipes)

Micro irrigation is defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery line.

In flood/furrow irrigation method more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation and it leaches out the nutrients from the plant. While through drip & sprinkler irrigation wastages of irrigational water could be minimized. The studies on different crops, has revealed that irrigation water is saved drastically. The conveyance losses (mainly seepage & evaporation) can be saved up to 25 to 40% through utilization of HDPE pipes. Initially the scheme is proposed to be implemented in worst affected areas showing deepest water levels and significant declining trends. It is proposed to take up micro irrigation system in 1700 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (THOGUTTA 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)	0	0	0.5	0	0
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	5	0.5	15	75	0.375
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	0	0	1	0	0
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	340	0.04896	0.25	85	0.044064
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1700		0.6	1020	5.1
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	17	0	0.6	10.2	0
8 (i)	Total (No. of AR Structures)	374	0.88		230.2	0.671
8 (ii)	Total (ha)	1700			1020	5.1
	Total (8(i) + 8 (ii))				**1250.2**	**5.771**
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				**62.51**	
	Grand Total				**1312.71**	

*(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 5.771 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 121% to 95% (26%)
4. It will also help in controlling soil erosion.

Acknowledgements

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

PROPOSED ARTIFICIAL RECHARGE STRUCTURES THOGUTTA MANDAL, MEDAK DISTRICT, TELANGANA

S.No.	VNAME	Longitude	Latitude	Type of Structure
1	GUDIKANDULA	78.7303	18.0871	Checkdam
2	GUDIKANDULA	78.7426	18.0908	Checkdam
3	VENKATAPUR	78.7772	18.0869	Checkdam
4	VENKATAPUR	78.7939	18.0880	Checkdam
5	P MASANPALLE	78.8144	18.0102	Checkdam
6	P MASANPALLE	78.8095	17.9898	Checkdam
7	VEMULAGHAT	78.7660	17.9790	Checkdam
8	THOGUTA	78.7535	17.9877	Checkdam
9	THOGUTA	78.7161	17.9960	Checkdam
10	ELIGADDAKISTAPUR	78.7450	17.9800	Checkdam
11	PALLEPAHAD	78.7886	17.9738	Checkdam
12	THUKKAPUR	78.7652	17.9994	Checkdam
13	GUDIKANDULA	78.7531	18.0638	PTS/MPTS
14	VENKATAPUR	78.7833	18.0704	PTS/MPTS
15	P MASANPALLE	78.8115	17.9825	PTS/MPTS
16	VEMULAGHAT	78.7542	17.9747	PTS/MPTS
17	VEMULAGHAT	78.7585	17.9498	PTS/MPTS

Fig.1

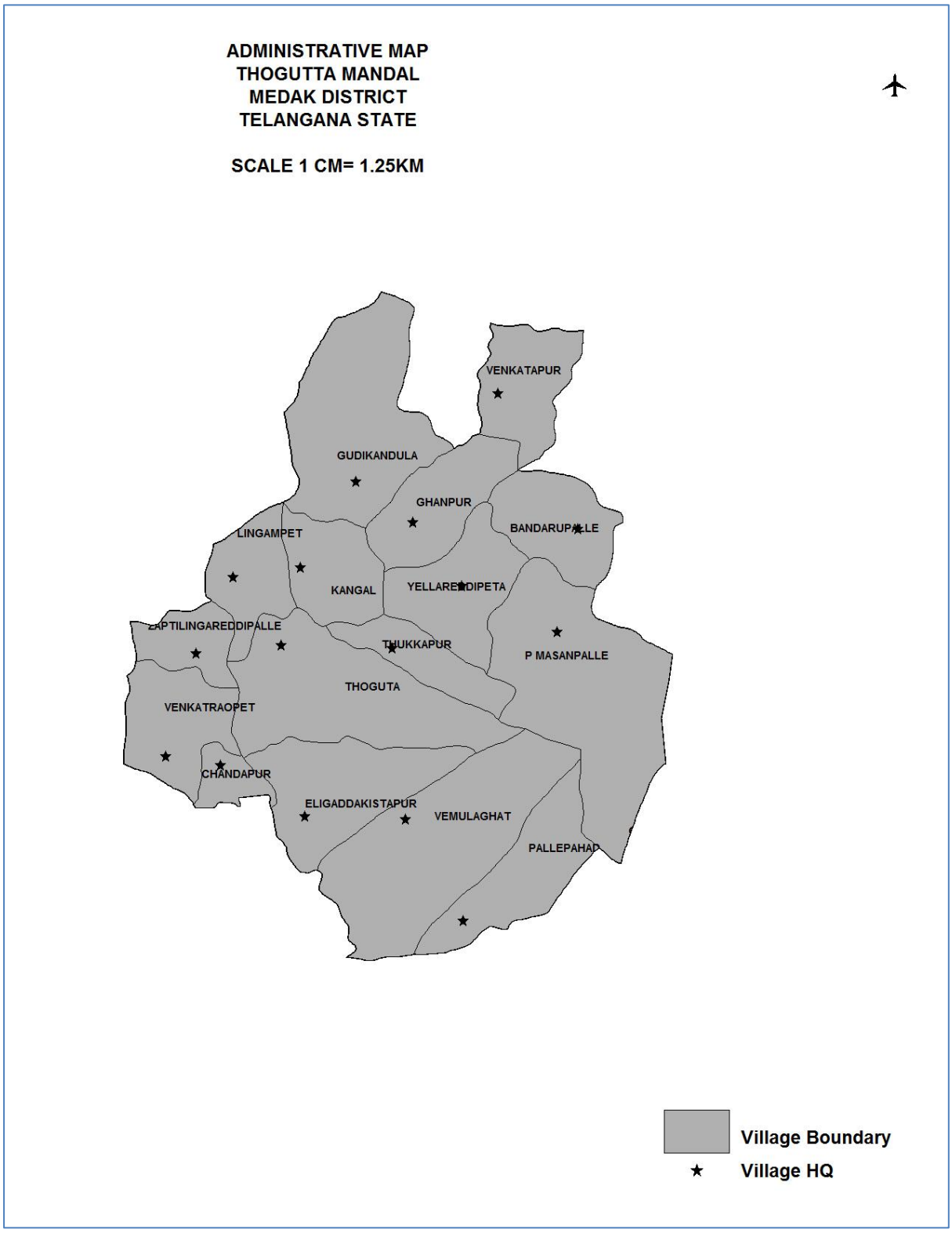

ADMINISTRATIVE MAP
THOGUTTA MANDAL
MEDAK DISTRICT
TELANGANA STATE
SCALE 1 CM= 1.25KM
VENKATAPUR
GUDIKANDULA
GHANPUR
BANDARUPALLE
LINGAMPET
KANGAL
YELLAREDDIPETA
P MASANPALLE
THUKKAPUR
THOGUTA
VENKATRAOPET
CHANDAPUR
ELIGADDAKISTAPUR
VEMULAGHAT
PALLEPAHAD
Village Boundary
Village HQ

Fig.2

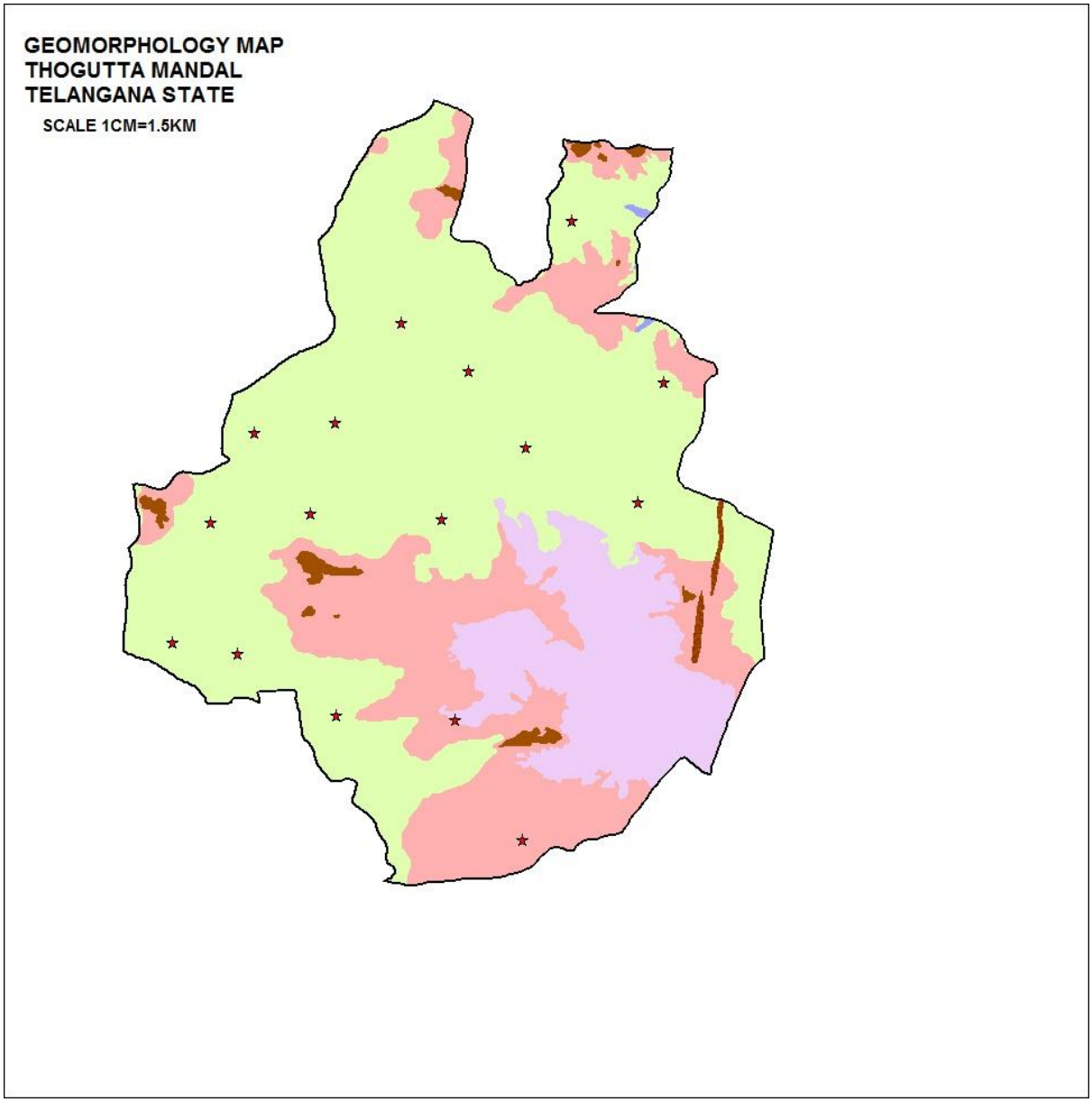

GEOMORPHOLOGY MAP
THOGUTTA MANDAL
TELANGANA STATE
SCALE 1CM=1.5KM

Fig.3

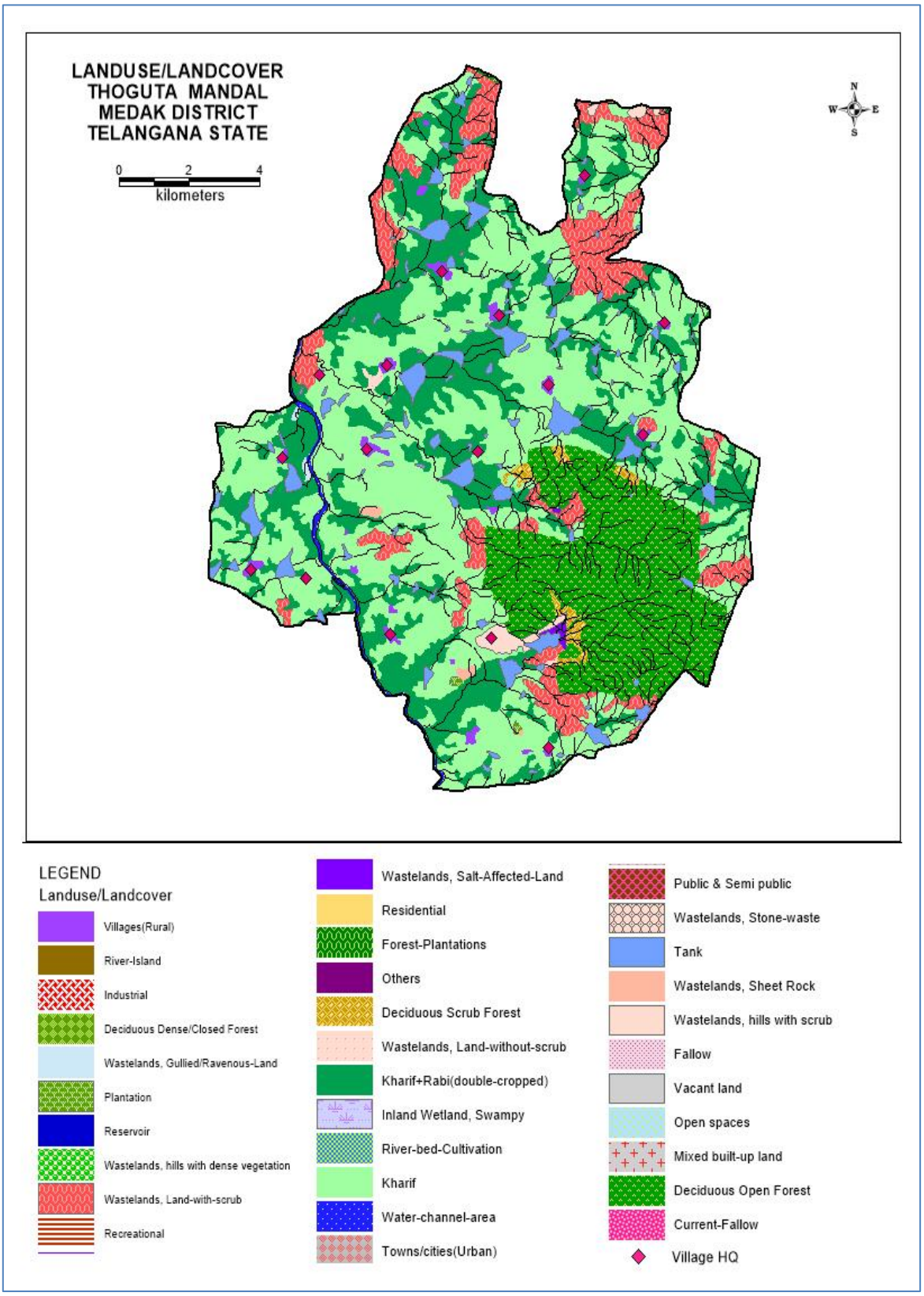

LANDUSE/LANDCOVER
THOGUTA MANDAL
MEDAK DISTRICT
TELANGANA STATE
0 2 4
kilometers
N
W
E
S
LEGEND
Landuse/Landcover
Villages(Rural)
River-Island
Industrial
Deciduous Dense/Closed Forest
Wastelands, Gullied/Ravenous-Land
Plantation
Reservoir
Wastelands, hills with dense vegetation
Wastelands, Land-with-scrub
Recreational
Wastelands, Salt-Affected-Land
Residential
Forest-Plantations
Others
Deciduous Scrub Forest
Wastelands, Land-without-scrub
Kharif+Rabi(double-cropped)
Inland Wetland, Swampy
River-bed-Cultivation
Kharif
Water-channel-area
Towns/cities(Urban)
Public & Semi public
Wastelands, Stone-waste
Tank
Wastelands, Sheet Rock
Wastelands, hills with scrub
Fallow
Vacant land
Open spaces
Mixed built-up land
Deciduous Open Forest
Current-Fallow
Village HQ

Fig.4

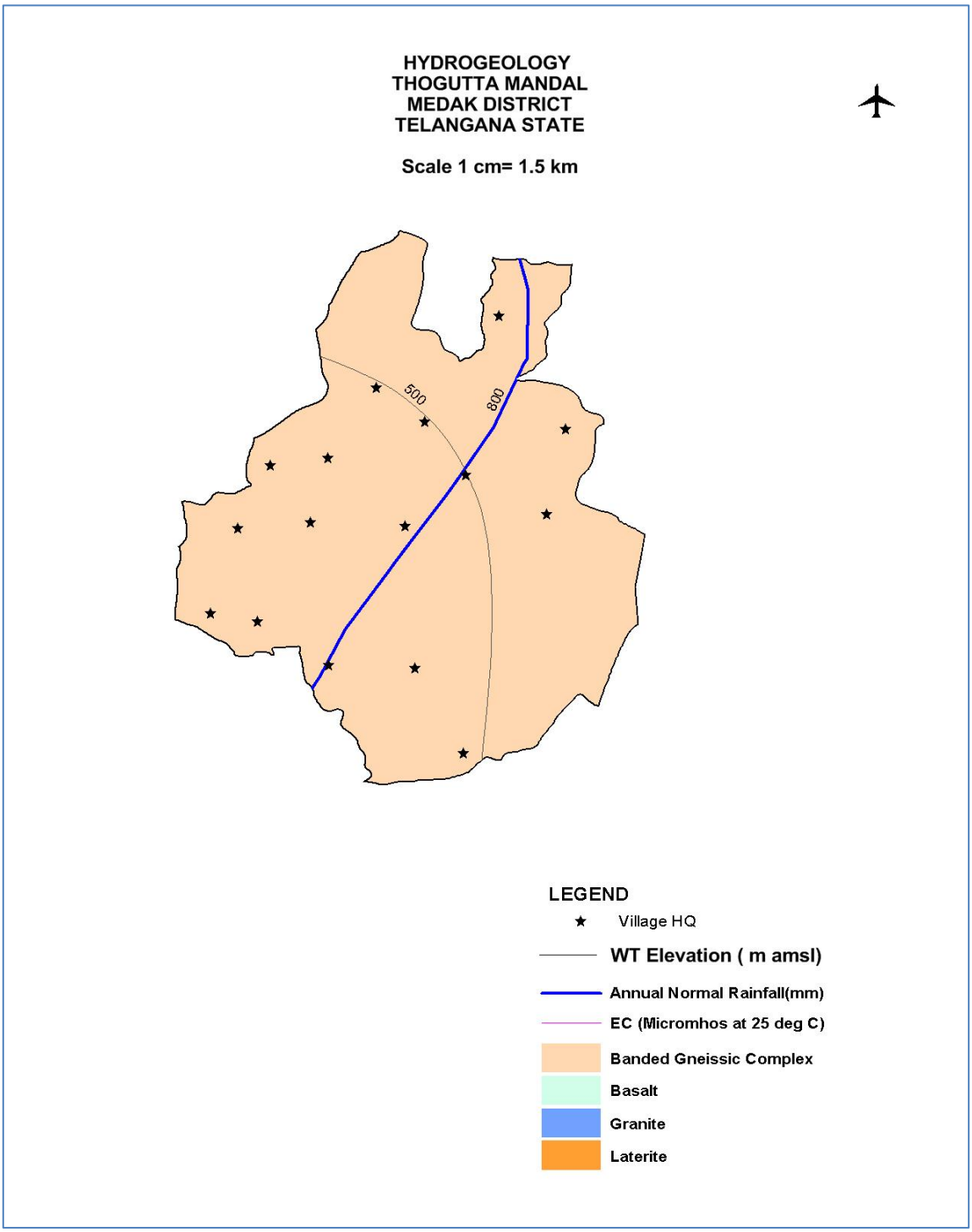

HYDROGEOLOGY
THOGUTTA MANDAL
MEDAK DISTRICT
TELANGANA STATE
Scale 1 cm= 1.5 km
500
800
LEGEND
Village HQ
WT Elevation (m amsl)
Annual Normal Rainfall(mm)
EC (Micromhos at 25 deg C)
Banded Gneissic Complex
Basalt
Granite
Laterite

Fig.5

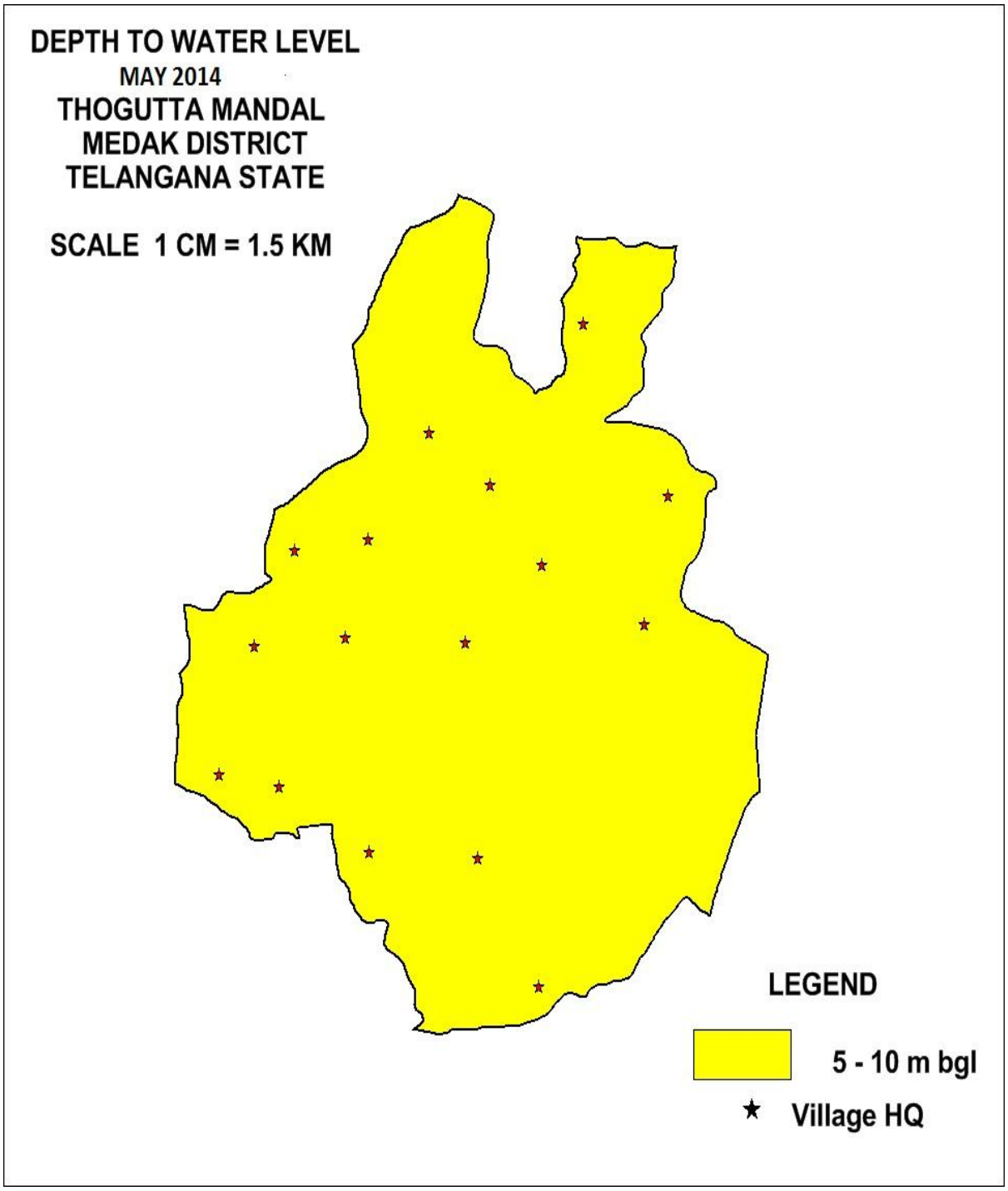

DEPTH TO WATER LEVEL
MAY 2014
THOGUTTA MANDAL
MEDAK DISTRICT
TELANGANA STATE
SCALE 1 CM = 1.5 KM
LEGEND
5 - 10 m bgl
Village HQ

Fig.6

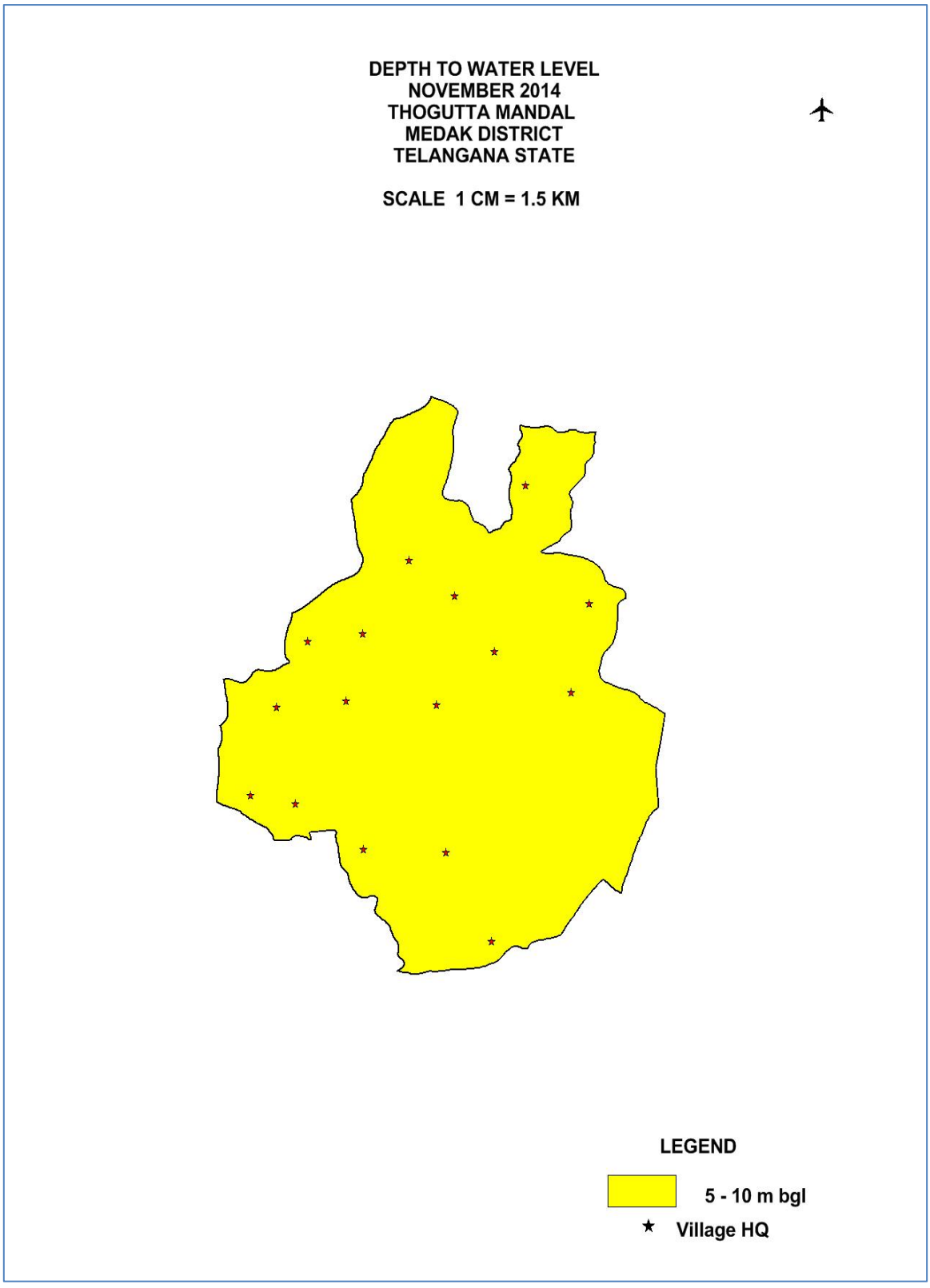
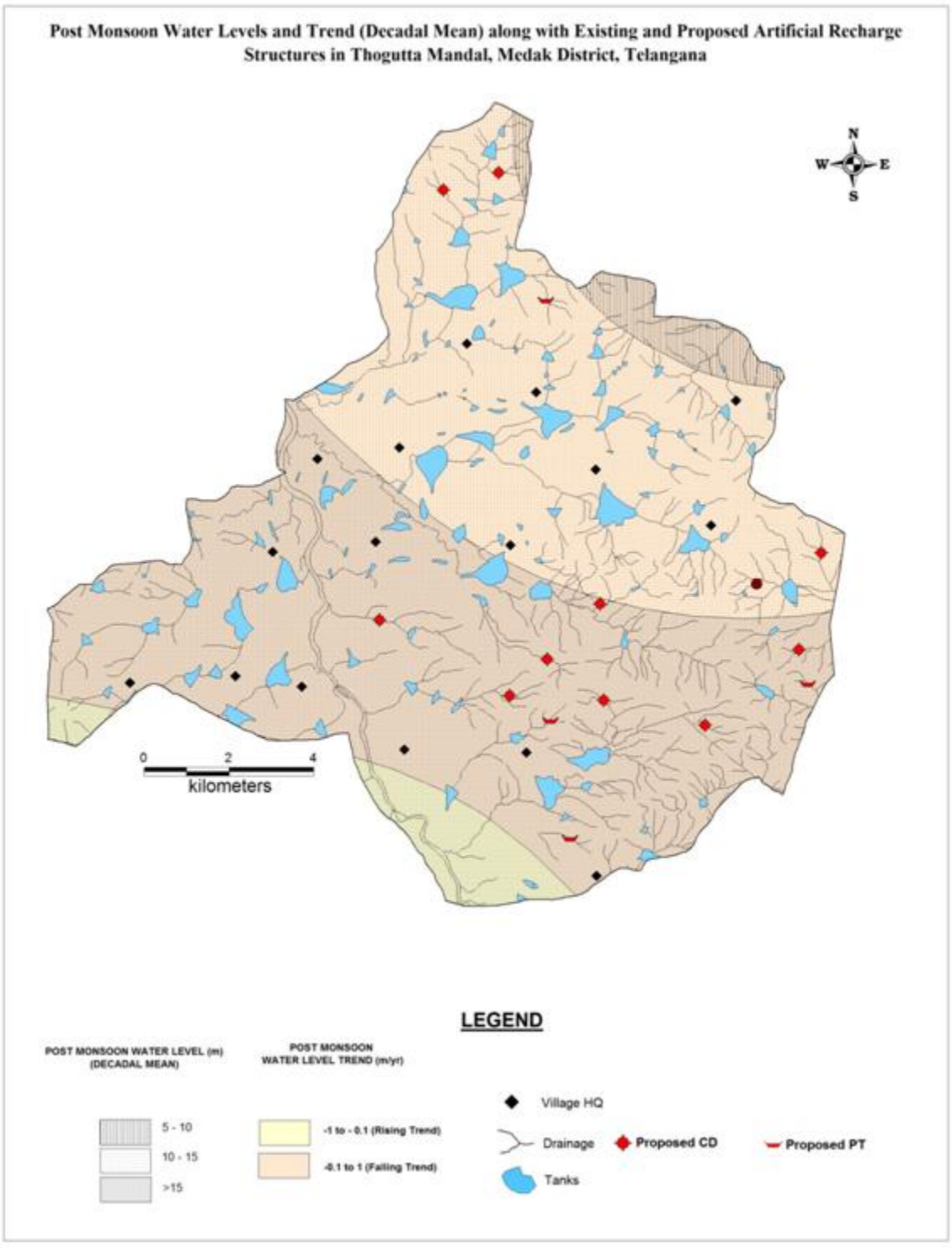

DEPTH TO WATER LEVEL
NOVEMBER 2014
THOGUTTA MANDAL
MEDAK DISTRICT
TELANGANA STATE
SCALE 1 CM = 1.5 KM
LEGEND
5 - 10 m bgl
Village HQ

Fig.7


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