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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
MUNUGODE MANDAL, NALGONDA DISTRICT,
TELANGANA STATE

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

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AT A GLANCE

Name of the Mandal	MUNUGODE
District	NALGONDA
State	TELANGANA
Total Area(sq. km)	223
Area suitable for Artificial Recharge (sq.km.)	220
Latitude and Longitude	16.994940 to 17.185760 and 78.94490 to 79.170710.
Average Annual Rainfall (mm)	745
Geology	BGC
Average Depth To Water Level (Decadal) (Pre Monsoon)	21.3
Average Depth To Water Level (Decadal) (Post Monsoon)	16
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	26.91
Net Annual Ground Water Availability(MCM)/yr	24.22
Net Annual Ground Water Draft(MCM)/yr	25.79
Projected Demand for Domestic and Industrial Use(MCM)/yr	1.72
Stage of Ground Water Development (%)	106
Surface runoff available (MCM)/yr	30.97
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0.93
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 11, Check Dams: 30 Farm ponds-420, Recharge Shafts-66
Improving Water use Efficiency	Micro Irrigation System -2100 ha
Tentative Total Cost in Lakhs (Rs.)	1832.353 Lakhs
Expected Recharge/Savings (MCM)/yr	8.535

1. INTRODUCTION

Munugode Mandal is one of over-exploited Mandal in Warangal district, Telangana State, which is economically backward and chronically drought affected. The Mandal has 21 inhabited villages, 1 uninhabited village and with 21 gram panchayats.

2. LOCATION

The Mandal lies between north latitudes 16.994940 to 17.185760 and between east longitudes 78.94490 to 79.170710. The Mandal occupies the western part of the Nalgonda district and is bounded on the north by Chityalamandal, on the east by Nalgonda mandal, on the south by Chandur mandal and west by Narayanpur Mandal. (Fig.1) The geographical area of the Mandal is 223 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by low order streams which are tributaries of Lower Krishna 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 745 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 223 sq.km, the area under forest is 1.69 and the net area sown is 128.91 sq.km. Barren and uncultivable land is 11.02 sq.km. The land for non agricultural use accounts for 11.38 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 28 m.The weathered zone has been extensively tapped by dug and dug cum bore wells up to 28 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 21.3 and 16 m bgl 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 Munugode Mandal, Nalgonda District is given in Table-1.

Table-1: Ground water resources of Munugode Mandal,Nalgonda District.

Annual Replenishable Ground water resources (MCM)	26.91
Net Annual Ground Water Availability(MCM)/yr	24.22
Net Annual Ground Water Draft(MCM)/yr	25.79
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	1.72
Stage of Ground water development (%).	106
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

Munugode Mandal falls under high stage of ground water development i.e., 106 % 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)	223
Hilly Area (Sq.kms)	3
Area suitable for Artificial Recharge (sq.km.)	220
Runoff Yield in MCM/yr	30.97
Existing No. of Check Dams	54
Storage created MCM/yr	0.38
Existing No. of Percolation Tanks	78
Storage created MCM/yr	0.55
Total Existing Storage Created	0.93

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 runoff available in the mandal has been assessed as 30.4 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 745 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 30 Check dams and 11 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 27 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 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 (MUNUGODE 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)	30	0.84	5	150	0.63
2	Recharge shaft in Check dam (50% of the existing Check dams)	27	0.297	0.5	13.5	0.297
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	11	1.1	15	165	0.825
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	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)	548	2.73		485.1	2.235
8 (ii)	Total (ha)	2100			1260	6.3
	Total (8(i) + 8 (ii))				1745.1	8.535
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				87.255	
	Grand Total				1832.355	

*(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 st	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 8.535 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 106% to 79% (27%)
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 MUNUGODE MANDAL,
NALGONADA DISTRICT, TELANGANA

S.No.	Village	Lattitude	Longitude	Structure type
1	YergandlaPalle	17.0819	78.9856	Check Dam
2	YergandlaPalle	17.0613	79.0138	Check Dam
3	YergandlaPalle	17.0347	79.0481	Check Dam
4	YergandlaPalle	17.0628	79.0057	Check Dam
5	YergandlaPalle	17.07	79.0149	Check Dam
6	KhudabakshPalle	17.103	79.0192	Check Dam
7	KhudabakshPalle	17.1055	79.0331	Check Dam
8	KhudabakshPalle	17.1458	79.0477	Check Dam
9	KhudabakshPalle	17.1224	79.0553	Check Dam
10	KhudabakshPalle	17.1208	79.058	Check Dam
11	KhudabakshPalle	17.1143	79.0626	Check Dam
12	KhudabakshPalle	17.1143	79.053	Check Dam
13	Indurthi	17.0784	79.0955	Check Dam
14	Indurthi	17.0784	79.0945	Check Dam
15	Indurthi	17.0308	79.0633	Check Dam
16	Indurthi	17.0283	79.0493	Check Dam
17	Sivannagudem	17.0744	79.084	Check Dam
18	Sivannagudem	17.084	79.0783	Check Dam
19	Sivannagudem	17.0792	79.0994	Check Dam
20	Sivannagudem	17.0756	79.0806	Check Dam
21	Sivannagudem	17.0905	79.065	Check Dam
22	Sivannagudem	17.0776	79.0753	Check Dam
23	Sivannagudem	17.0743	79.0753	Check Dam
24	Sivannagudem	17.0784	79.0421	Check Dam
25	Venkepalle	17.0715	79.035	Check Dam
26	Venkepalle	17.0725	79.0176	Check Dam
27	Venkepalle	17.0775	79.0131	Check Dam
28	Kalvalapally	17.1291	79.1526	Check Dam
29	Koratical	17.0191	79.1176	Check Dam
30	Koratical	79.0256	79.1216	Check Dam
31	Koratical	17.0297	79.1238	Check Dam
32	Pulipalupula	17.1166	79.1094	Check Dam
33	Pulipalupula	17.1149	79.1023	Check Dam
34	Pulipalupula	17.1223	79.1251	Check Dam
35	Munugode	17.1411	79.1437	Check Dam
36	Munugode	17.0724	79.0854	Check Dam
37	Munugode	17.0912	79.0531	Check Dam
38	Munugode	17.0941	79.0943	Check Dam
39	KhudabakshPalle	17.1055	79.0268	Check Dam
40	KhudabakshPalle	17.106	79.0393	Check Dam
41	Indurthi	17.0798	79.0918	Check Dam
42	Venkepalle	17.074	79.0386	Check Dam
43	Kalvalapally	17.126	79.1404	Check Dam

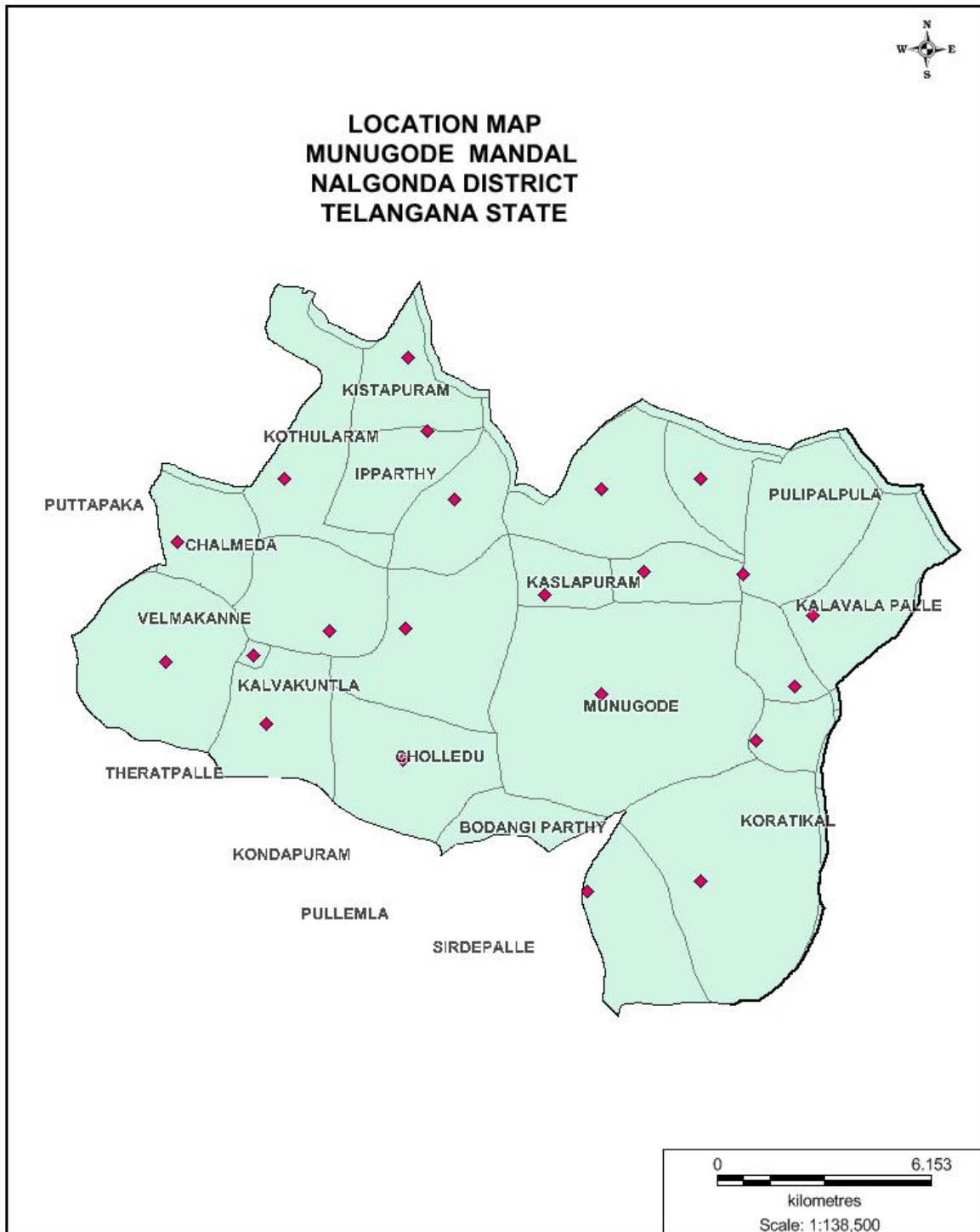
44	Kalvalapally	17.089	79.144	Check Dam
45	Koratical	17.0189	79.105	Check Dam
46	Gudapur	17.1495	79.044	Check Dam
47	Gudapur	17.087	79.12	Check Dam
48	Gudapur	17.0795	79.1174	Check Dam
49	Munugode	17.0941	79.0943	Check Dam
50	Munugode	17.0723	79.0917	Check Dam
51	Munugode	17.0905	79.056	Check Dam
52	Munugode	17.0895	79.0967	Check Dam
53	Munugode	17.0934	79.0784	Check Dam
54	Munugode	17.1039	79.0781	Check Dam
55	YergandlaPalle	17.0571	79.0336	Percolation Tank
56	YergandlaPalle	17.0512	79.0222	Percolation Tank
57	YergandlaPalle	17.0675	78.9998	Percolation Tank
58	YergandlaPalle	17.0723	78.9709	Percolation Tank
59	YergandlaPalle	17.0765	78.9573	Percolation Tank
60	YergandlaPalle	17.077	78.9692	Percolation Tank
61	KhudabakshPalle	17.0972	79.0411	Percolation Tank
62	KhudabakshPalle	17.1028	79.0139	Percolation Tank
63	KhudabakshPalle	17.1148	79.039	Percolation Tank
64	KhudabakshPalle	17.0966	79.0417	Percolation Tank
65	KhudabakshPalle	17.0951	79.0532	Percolation Tank
66	KhudabakshPalle	17.1028	79.019	Percolation Tank
67	KhudabakshPalle	17.1055	79.0268	Percolation Tank
68	KhudabakshPalle	17.1056	79.0328	Percolation Tank
69	KhudabakshPalle	17.106	79.0396	Percolation Tank
70	KhudabakshPalle	17.11	79.063	Percolation Tank
71	KhudabakshPalle	17.114	79.0661	Percolation Tank
72	KhudabakshPalle	17.1217	79.059	Percolation Tank
73	KhudabakshPalle	17.1201	79.0621	Percolation Tank
74	KhudabakshPalle	17.1166	79.0597	Percolation Tank
75	Indurthi	17.0829	79.1055	Percolation Tank
76	Indurthi	17.0884	79.1166	Percolation Tank
77	Indurthi	17.0966	79.1035	Percolation Tank
78	Sivannagudem	17.0791	79.0584	Percolation Tank
79	Sivannagudem	17.0814	79.072	Percolation Tank
80	Venkepalle	17.0791	79.0584	Percolation Tank
81	Venkepalle	17.0809	79.0521	Percolation Tank
82	Venkepalle	17.1148	79.039	Percolation Tank
83	Venkepalle	17.0767	79.0222	Percolation Tank
84	Venkepalle	17.0795	79.0228	Percolation Tank
85	Kalvalapally	17.0895	79.1327	Percolation Tank
86	Kalvalapally	17.0904	79.1446	Percolation Tank
87	Kalvalapally	17.1029	79.1432	Percolation Tank
88	Pulipalupula	17.1399	79.0954	Percolation Tank
89	Munugode	17.0892	79.0506	Percolation Tank

90	YergandlaPalle	17.0718	79.103	Percolation Tank
91	YergandlaPalle	17.0633	79.0267	Percolation Tank
92	YergandlaPalle	17.0546	79.01	Percolation Tank
93	KhudabakshPalle	17.1085	79.0612	Percolation Tank
94	KhudabakshPalle	17.1101	79.063	Percolation Tank
95	KhudabakshPalle	17.11	79.0634	Percolation Tank
96	KhudabakshPalle	17.1104	79.0665	Percolation Tank
97	KhudabakshPalle	17.1004	79.0636	Percolation Tank
98	Indurthi	17.0792	79.115	Percolation Tank
99	Indurthi	17.0731	79.123	Percolation Tank
100	Indurthi	17.037	79.0576	Percolation Tank
101	Indurthi	17.0755	79.0955	Percolation Tank
102	Indurthi	17.0454	79.0348	Percolation Tank
103	Indurthi	17.0891	79.1074	Percolation Tank
104	Indurthi	17.0982	79.1029	Percolation Tank
105	Indurthi	17.0982	79.0991	Percolation Tank
106	Sivannagudem	17.0806	79.066	Percolation Tank
107	Sivannagudem	17.0783	79.058	Percolation Tank
108	Sivannagudem	17.0796	79.0542	Percolation Tank
109	Sivannagudem	17.0757	79.0709	Percolation Tank
110	Venkepalle	17.0905	79.0291	Percolation Tank
111	Venkepalle	17.0792	79.0362	Percolation Tank
112	Venkepalle	17.0908	79.0394	Percolation Tank
113	Venkepalle	17.0755	79.0508	Percolation Tank
114	Venkepalle	17.0798	79.0478	Percolation Tank
115	Kalvalapally	17.121	79.1401	Percolation Tank
116	Kalvalapally	17.1004	79.1406	Percolation Tank
117	Kalvalapally	17.1154	79.1423	Percolation Tank
118	Kalvalapally	17.114	79.1445	Percolation Tank
119	Gudapur	17.1219	79.0508	Percolation Tank
120	Gudapur	17.1113	79.1561	Percolation Tank
121	Gudapur	17.0823	79.1231	Percolation Tank
122	Pulipalupula	17.1232	79.1257	Percolation Tank
123	Pulipalupula	17.1279	79.1369	Percolation Tank
124	Pulipalupula	17.1179	79.0908	Percolation Tank
125	Pulipalupula	17.1375	79.1189	Percolation Tank
126	Pulipalupula	17.1342	79.1328	Percolation Tank
127	Pulipalupula	17.1169	79.1117	Percolation Tank
128	Pulipalupula	17.1241	79.078	Percolation Tank
129	Pulipalupula	17.1133	79.1187	Percolation Tank
130	Gundrepalle	17.029	79.0867	Percolation Tank
131	Kasthala	17.0128	79.12	Percolation Tank
132	Thummalapalle	17.0239	79.1002	Percolation Tank

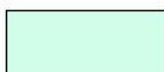
PROPOSED ARTIFICIAL RECHARGE STRUCTURES MUNUGODE MANDAL,
NALGONDA DISTRICT, TELANGANA.

SNO	Mandal	Lattitude	Longitude	Structure type
1	MUNAGODE	17.0920	78.9558	CD
2	MUNAGODE	17.1078	78.9738	CD
3	MUNAGODE	17.1155	78.9773	CD
4	MUNAGODE	17.1451	79.0174	CD
5	MUNAGODE	17.1269	79.0201	CD
6	MUNAGODE	17.1217	79.0157	CD
7	MUNAGODE	17.1389	79.0032	CD
8	MUNAGODE	17.1522	79.0213	CD
9	MUNAGODE	17.1046	79.0125	CD
10	MUNAGODE	17.0961	79.0346	CD
11	MUNAGODE	17.1064	79.0237	CD
12	MUNAGODE	17.0963	79.0702	CD
13	MUNAGODE	17.1246	79.0767	CD
14	MUNAGODE	17.1301	79.0705	CD
15	MUNAGODE	17.1168	79.0803	CD
16	MUNAGODE	17.1412	79.0992	CD
17	MUNAGODE	17.1279	79.1373	CD
18	MUNAGODE	17.1346	79.1379	CD
19	MUNAGODE	17.0292	79.0865	CD
20	MUNAGODE	17.0741	79.0567	CD
21	MUNAGODE	17.0677	79.0732	CD
22	MUNAGODE	17.0725	79.0914	CD
23	MUNAGODE	17.0444	79.1130	CD
24	MUNAGODE	17.0172	79.1239	CD
25	MUNAGODE	17.0262	79.1273	CD
26	MUNAGODE	17.0347	79.1295	CD
27	MUNAGODE	17.0183	79.1183	CD
28	MUNAGODE	17.0238	79.1008	CD
29	MUNAGODE	17.0354	79.0765	CD
30	MUNAGODE	17.0437	79.0789	CD
31	MUNAGODE	17.1175	78.9731	PT
32	MUNAGODE	17.1021	79.0079	PT
33	MUNAGODE	17.1224	79.0268	PT
34	MUNAGODE	17.0481	79.0294	PT
35	MUNAGODE	17.0591	79.0840	PT
36	MUNAGODE	17.1001	79.0895	PT
37	MUNAGODE	17.0712	79.1055	PT
38	MUNAGODE	17.0735	79.0503	PT
39	MUNAGODE	17.1329	79.0802	PT
40	MUNAGODE	17.1208	79.0787	PT
41	MUNAGODE	17.0840	78.9848	PT

Fig.1



LEGEND



Village boundary



Village HQ

Fig.2

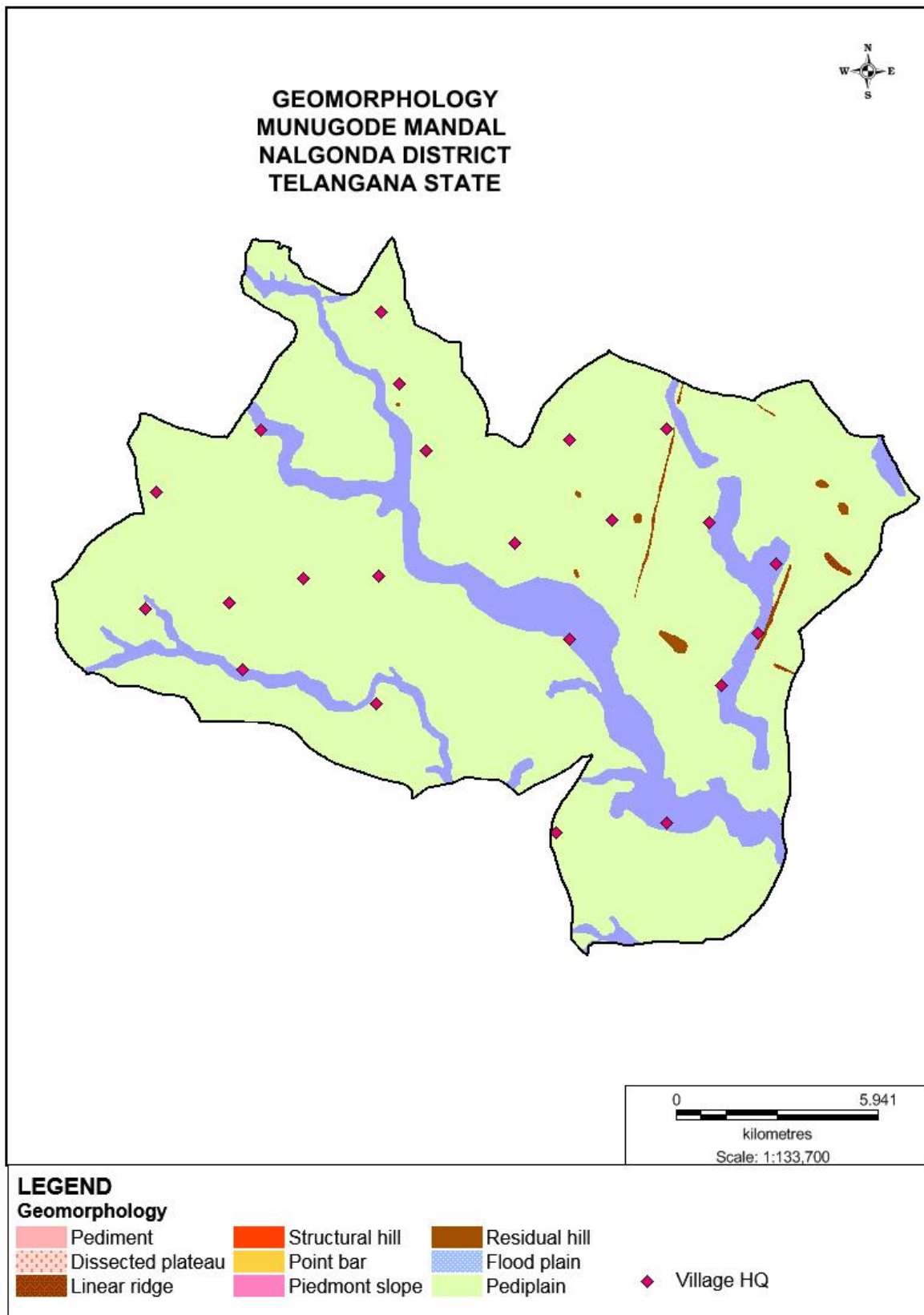


Fig.3

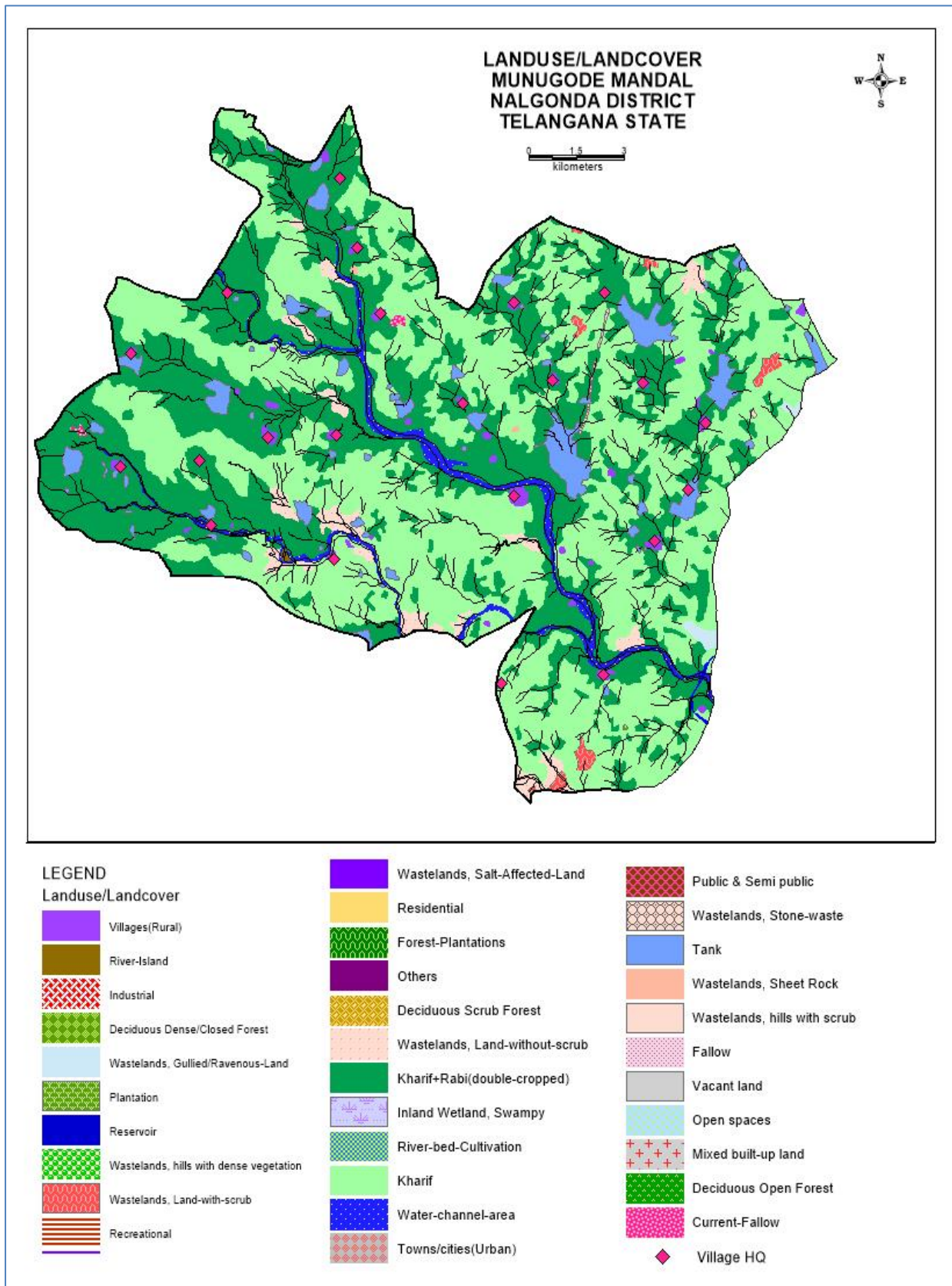


Fig.4

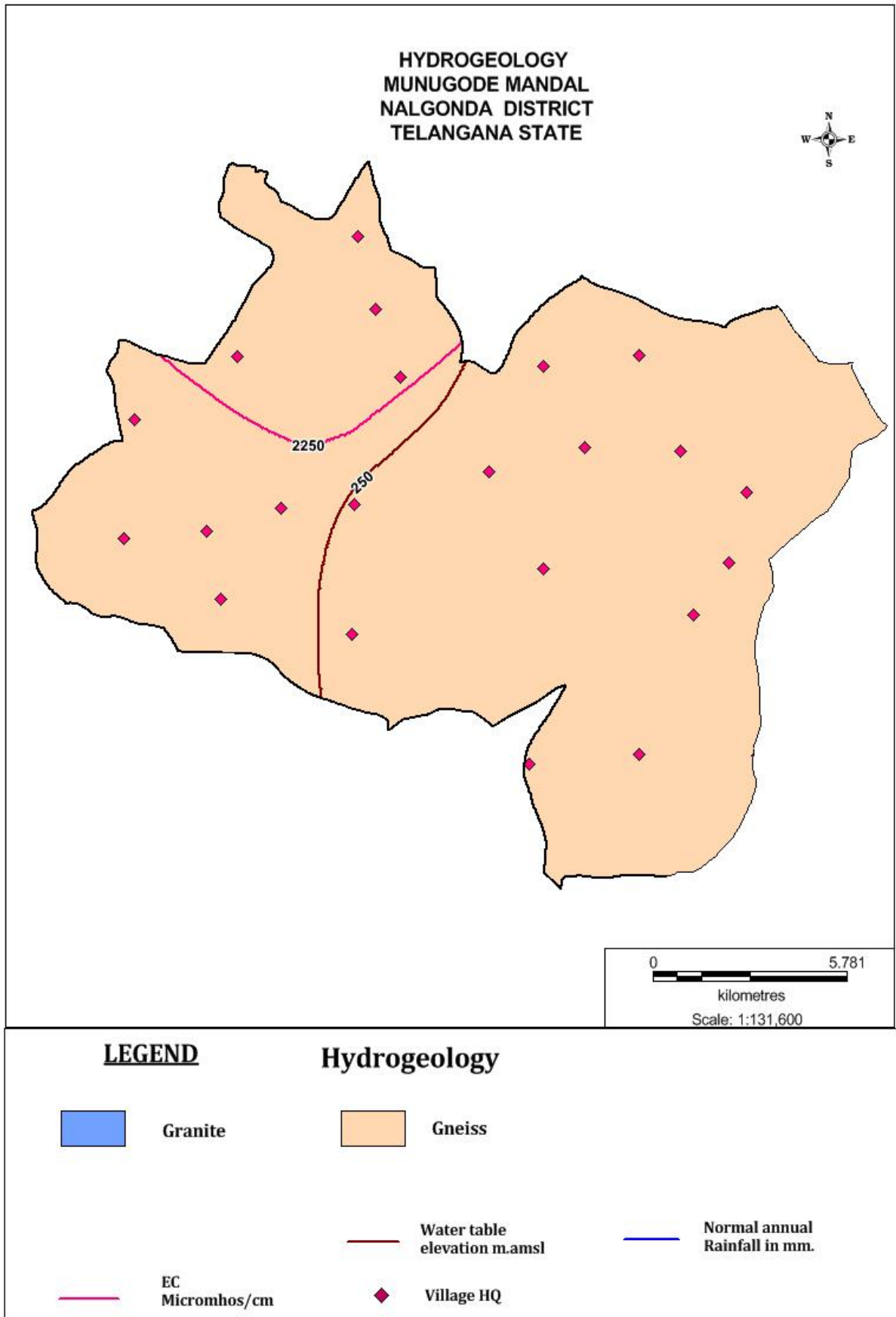


Fig.5

