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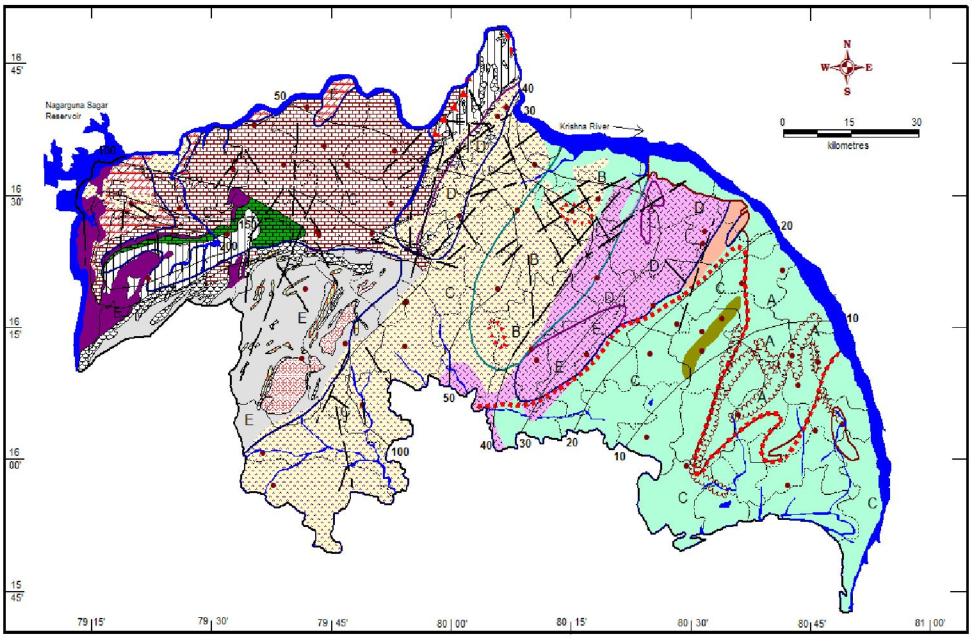
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

GROUND WATER BROCHURE
GUNTUR DISTRICT, ANDHRA PRADESH



SOUTHERN REGION
HYDERABAD
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By

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GROUND WATER BROCHURE
GUNTUR DISTRICT, ANDHRA PRADESH

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GROUND WATER BROCHURE
GUNTUR DISTRICT, ANDHRA PRADESH

DISTRICT AT A GLANCE

1. GENERAL

Location	**:** North Latitudes 15°18' and 16°50' East Longitudes 79°10' and 80°55'
Geographical area (sq.km)	:11,328.23 sq.km.
Headquarters	: Guntur
No. of revenue mandals	: 57
No. of revenue villages	: 729
Municipalities	: 10
Population (2011)	
Total	: 48,89,230 (Male:24,41,128 and Female: 24,48,102)
Urban	: 16,56,745
Rural	: 32,32,485
Population density	: 429 (persons/sq.km)
Decadal Growth Rate (1991-2001)	: 9.5%
Major rivers	: Krishna, Naguleru, Chandravanks, and Gundlakamma
Soil	: Black cotton soils, Red loamy soils, and sandy loam.

2. CLIMATE

Normal annual rainfall	: 853 mm
Actual rainfall (2010-11)	:1,357.6 mm
Average Annual Rainfall (1999-2011)	: 889.1 mm
Mean Daily Temperature	: Maximum 48.5 mm, Minimum: 16.8mm
Relative Humidity	: Highest-80 % & Lowest -30 %
Evapotranspiration	:145mm – 350 mm
Wind Speed	:4.5 to 16.3 km/hr.

3. LAND USE (2012) (Area in ha)

Forest	:1,61,941
Barren and uncultivated	:34,395
Cultivable waste	:27,486
Current fallows	:32,412
Net area sown	:6,37,671

4. IRRIGATION 2012 (area in ha)

Canals	: 3,48,719
Tanks	: 5,552
Dug wells	: 4,828
Bore/Tube wells	: 72,000

Others	: 21,134
Net area irrigated	: 4,52,233
Gross area irrigated	: 5,26,848
Major irrigation projects	: Krishna Delta, Nagarjuna Sagar project,
Medium irrigation projects	: Guntur Channel and MI Schemes

5. GEOLOGY

Major rock types	:Granite-gneisses, schist, khondalite, slaty phyllite quartzite, limestone, sandstone, shale and alluvium.

6. GROUND WATER

Exploration by CGWB	
No. of wells drilled	:113 (EW:56, OW:22,PZ:34 and WT:1)
Major aquifer zones	:9-173 m bgl in hard rocks and 7.30 to 408 m bgl in soft rocks
Depth to water level	
Pre-monsoon (min – max)	: 0.64 m to 21.46 m bgl
Post monsoon (min- max)	: 0.16 to 9.89m bgl
Aquifer parameters	
Transmissivity (sq.m/day)	:21-253 sq.m/day in hard rock 1.0 to 616 in soft rocks
Storage Co-efficient	:0.75 x 10^{-5} to 3.9 x 10^{-3} in hard rocks 1.2 x 10^{-4} to 1.2 x 10^{-2} in soft rocks
Number of Monitoring Wells	: 62 (Dug wells-43 & Pz-19)

7. GROUND WATER RESOURCES (MCM)

Net ground water availability	: 1,72,417 ham
Gross annual draft	: 31,933 ham
Net GW availability for future irrigation	: 1,32,582 ham
Stage of ground water development	: 19 %

8. CHEMICAL QUALITY	**Shallow**	**Deeper**
Electrical Conductivity (micro Siemens/cm at 25°C)	: 770-7980	380-32610
Chloride (mg/l)	: 67-1985	2-4716
Fluoride (mg/l)	: 0.16-2.40	0.250-3.45
Nitrate (mg/l)	: 3.0-1150	2-438

GROUND WATER BROCHURE
GUNTUR DISTRICT, ANDHRA PRADESH

1.0 INTRODUCTION

Guntur district is one of the Central coastal districts of Andhra Pradesh. It comprises 57 mandals under administrative control of 3 divisions namely Narasaraopet, Guntur and Tenali. The district has 729 villages and 1036 hamlets. It has a geographical area of 11,328 sq. kms. It lies between North latitudes $15^{O}18'$ & $16^{O}50'$ and East longitudes $79^{O}10'00''$ & $80^{O}55'00''$ (Fig.-1). The annual normal rainfall of the district is 889.1 mm. Southwest and northeast monsoon contributes 59% and 26% respectively. Krishna, Nagulleru, Chandravanka and Gundlakamma rivers drains the district. The district has been gifted with the vast surface and ground water resources. About 3.01 lakh ha area is irrigated by canals and it has ground water recourses of 1.72 lakh ham.

Out of the total geographical area of 11,328 sq. km, 10.27% of the area is covered by forests. Similarly, barren and uncultivable land is 3.04% and cultivable waste and current fallows put together is 4.8%. The net area sown is 56.81%.

Fig.1 Administrative Divisions of Guntur District, A.P

The important crops harvested are paddy (38%), Cotton (19.6%), Maize (9.2%), chillis (7.4%), Total food crops (73.9%) and Total pulses (14.5%). Paddy followed by cotton is the most important crop accounting for gross hactarage of 3,29,465 and 1,70,086 respectively.

2. 0 CLIMATE

The average annual rainfall of the district is 864 mm, which ranges from nil rainfall in January to 160 mm in August. August is the wettest month of the year. The mean seasonal rainfall distribution is 547 mm in southwest monsoon (June-September), 235 mm in northeast monsoon (Oct-Dec), 8 mm rainfall in Winter (Jan-Feb) and 74 mm in summer (March – May). The season-wise percentage distribution of rainfall is 63% in southwest monsoon, 27 % in northeast monsoon, 1 % in winter and 9 % in summer. The mean monthly rainfall distribution is shown in Fig-2. The annual and seasonal rainfall distribution with its departure from mean along with percentage distribution (year-wise) is furnished in Table 1.

Fig.2 Mean Monthly Rainfall Distribution – Guntur District

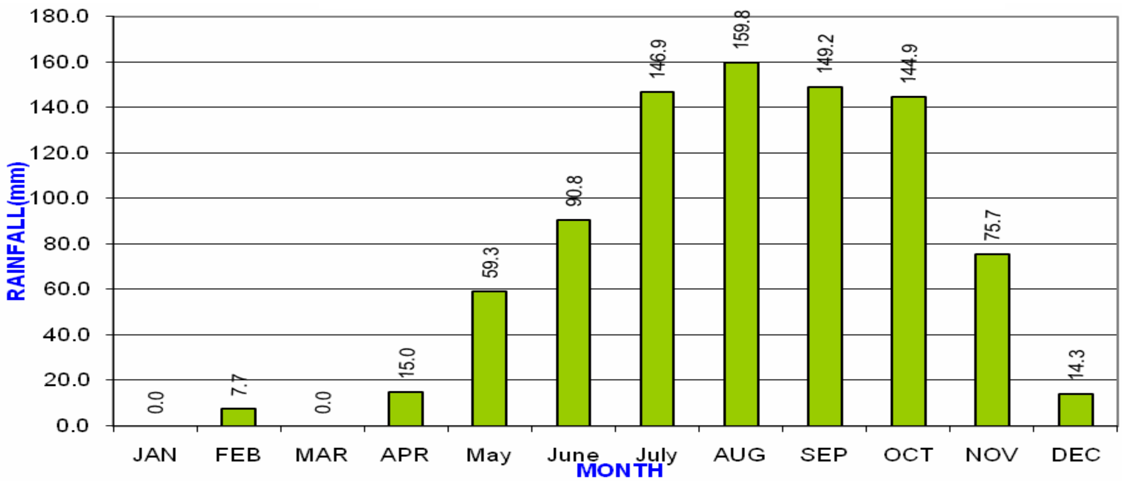


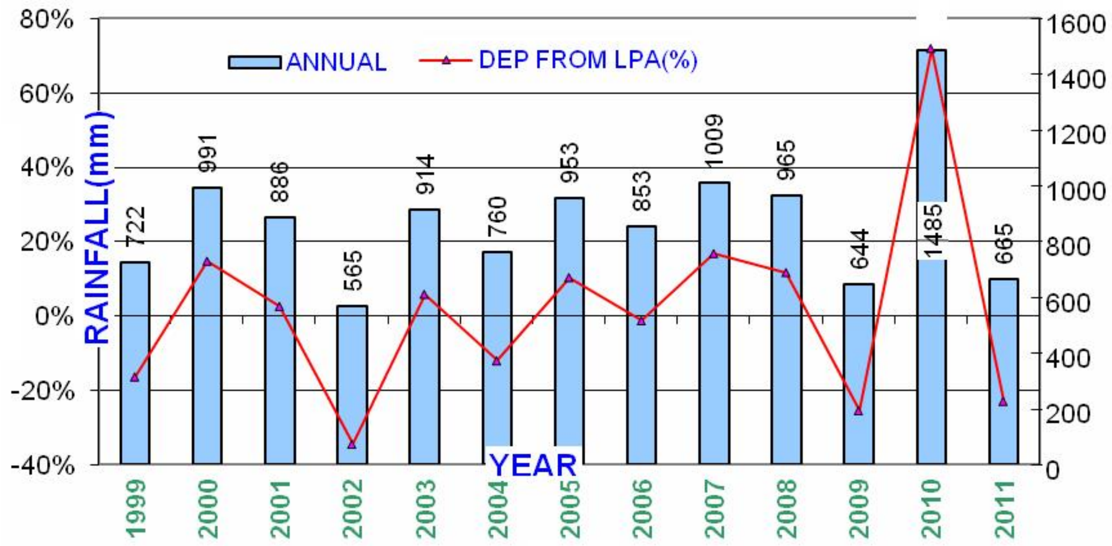
Table.1 Rainfall Distribution (1999-2011)-Guntur district

Sl No	Year	Annual	SWM	NEM	Winter	Summer	SWM %	NEM %	Winter %	Summer %	Departure from LPA
1	1999	722.0	544.0	131.0	3.0	44.0	75.35	18.14	0.42	6.09	-16%
2	2000	991.0	804.0	77.0	42.0	68.0	81.13	7.77	4.24	6.86	15%
3	2001	885.8	601.0	228.8	0.0	56.0	67.85	25.83	0.00	6.32	3%
4	2002	565.4	350.4	146.0	37.0	32.0	61.97	25.82	6.54	5.66	-35%
5	2003	914.1	631.8	258.3	1.0	23.0	69.1	28.26	0.11	2.52	6%
6	2004	759.5	526.3	151.5	3.9	77.8	69.30	19.95	0.51	10.24	-12%
7	2005	952.7	612.3	259.3	5.5	75.6	64.27	27.22	0.58	7.94	10%
8	2006	852.6	366.0	304.2	0.0	182.4	42.93	35.68	0.00	21.39	-1%
9	2007	1008.6	791.1	157.2	12.1	48.2	78.44	15.59	1.20	4.78	17%
10	2008	964.5	650.0	176.9	45.7	91.9	67.39	18.34	4.74	9.53	12%
11	2009	643.6	429.8	153.8	0.0	60.0	66.78	23.9	0.00	9.32	-26%
12	2010	1485.1	936.6	365.4	8.6	174.5	63.07	24.6	0.58	11.75	72%
13	2011	665.3	500.8	79.2	22.4	62.9	75.27	11.90	3.37	9.45	-23%
Long Period Average		863.7	546.8	234.9	7.7	74.3	63.31	27.20	0.89	8.60	

Source: Indian Meteorological Department and Directorate Of Economics And Statistics

The annual rainfall ranges from 565 mm in 2002 to 1485 mm in 2010. The annual rainfall departure ranges from -35 % in 2002 and to 72 % in 2010. The southwest monsoon rainfall contributes about 63.3 % of annual rainfall. It ranges from 350 mm in 2002 to 937 mm in 2010. The year 2009 experienced drought conditions as the annual rainfall recorded is 26% less than the long period average (LPA). The departure of annual rainfall from LPA is presented in Fig.3. The rainfall departure as on 2011 is negative i.e. 21%, showing excess rainfall.

Fig-3 Annual rainfall and departure from LPA



3.0 GEOMORPHOLOGY, DRAINAGE, IRRIGATION

3.1 Geomorphology

Geomorphologically the district is classified into three units based on relief, slope factor and soil. The three groups are (i) Hilly region (ii) The pediplain region and (iii) The fluvial and marine land forms.

i) **Hilly Region:** The structural hills and denudational hills form the main relief areas. The structural hills are confined to the western part of the district comprising the rocks of Cuddapah and Kurnool systems. The denudational hills are associated with residual hills, inselbergs etc. in the basement complex areas. These hills are largely form the run-off areas with moderate to thin forest cover. Ground water occurrence is restricted to the joints and fracture planes and storage capacity is low due to lack of weathered zone and meager infiltration.

ii) **Pediplain Region:** The pediment shallow buried/ buried pediment constitutes the pediplain unit. The pediment area accelerates surface run-off with moderate to low infiltration along the joints and weathered zones. Buried pediment areas generally possess thick zones of weathering and fracturing and sustain for long hours of pumping.

iii) **Fluvial and Marine land forms:** The valley fills, pediment zones, intermountain valleys fills and alluvial plains constitute the main fluvial land forms. The pediment zones form along the slopes of high relief areas and ground water development is poor. The valley fill material form the fluvial deposits and occupies topographic lows along Krishna river and other streams, where as alluvium of fluvial origin seen in Tenali, Duggirala, Ponnuru, and repalli mandals and in the flood plain areas of Amaravati and Thullur mandals.

3.2 Drainage

The important rivers that drain through the district are the Krishna and Gunglakamma. The river Krishna is the major river. Important tributaries include Gundlavagu, Dindi vagu, Naguleru, Gadidelavagu, Edduvagu. The drainage pattern, in general, is straight, parallel to sub-parallel and dendritic. All the streams are ephemeral in nature. The Krishna river is perennial, whereas most of the other streams are intermittent to ephemeral in nature.

3.3 Irrigation

The area irrigated during the year 2010-11 through these canals is 3,01,037 Ha., and through ground water is 77,442 Ha., Irrigation from the other sources (16,920 ha.) and through tanks 5,422 Ha. The district is blessed good network of irrigation canals of the Nagarjunasagar Right Canal Command Area, Krishna Western Delta Canal System and Guntur Channel Scheme.

4.0 GEOLOGY

The area is underlain by various geological formations of different age groups ranging from Archaean to Recent. The Archaean basement complex comprising the granite-gneisses, Schists, Khondalites, Charnockites and basic dykes of dolerites form the predominant rock types in the central part. The fringe of the Archaeans in the central part is represented by Cuddapah basin, namely Nallamalai group of Upper Cuddapahs. In a sequential order, the younger Kurnools occurring in the Cuddapahs and those in the western parts of the district are thrust over by the Cuddapahs and these in turn by the Archaean granite-gneisses. The Upper Gondwana group of sandstones and shales out crop are seen at places between Guntur and Tenali. The youngest rock types of the district appear to be of Mio- Pliocene age followed by the Alluvial deposits of Recent to Sub-Recent age.

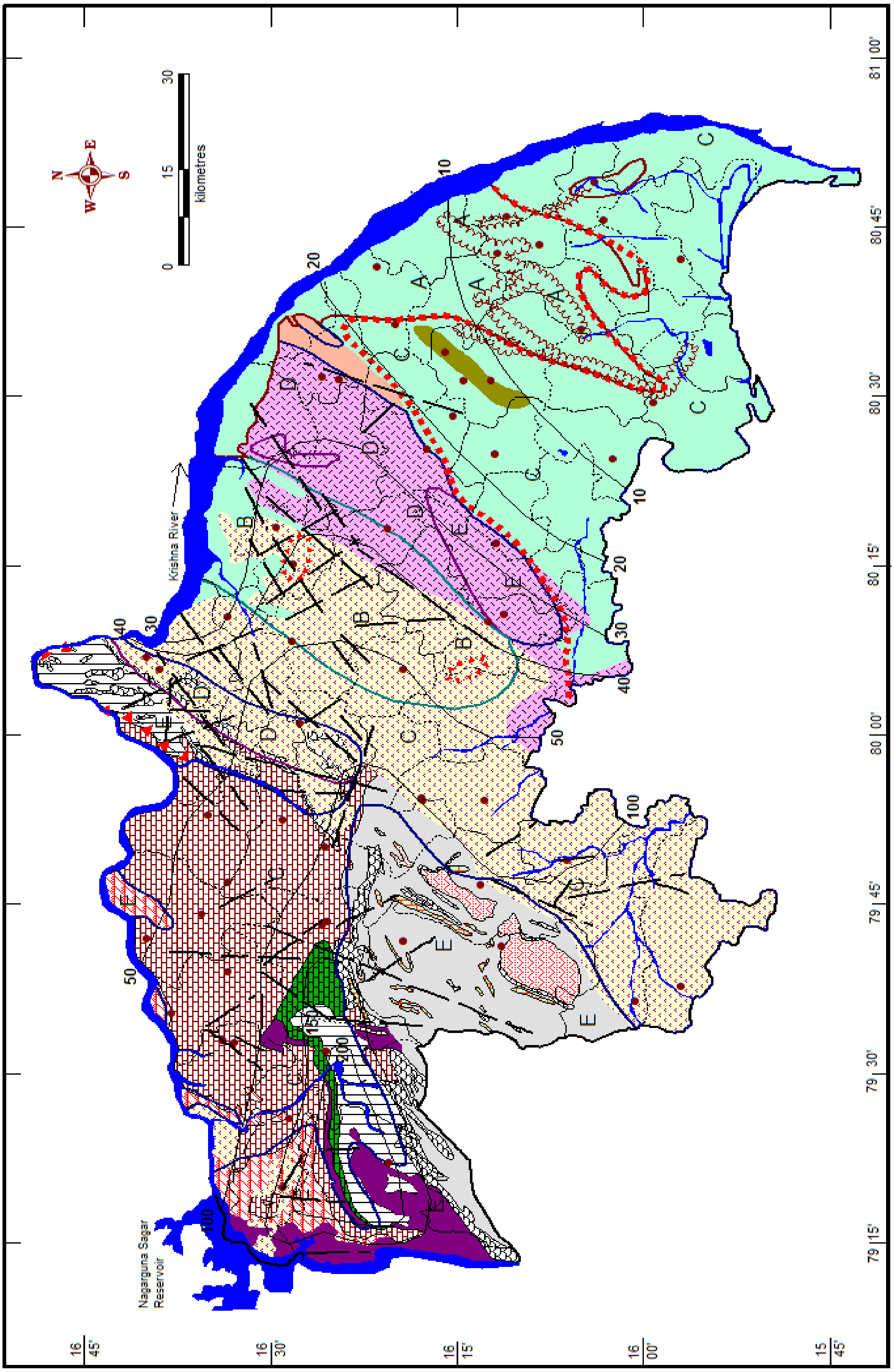
5.0 HYDROGEOLOGY

5.1 Ground water in Archaean Crystalline rocks

Archaean crystalline formations are the predominant water bearing formations with lack of primary porosity. Secondary porosity was developed through fracturing and subsequent weathering over ages and become water bearing at hydrogeologically favorable locations. The depth of weathered mantle ranges from about 8 to 15m bgl and below this zone fractured rocks are known to occur down to 40.0 m bgl. The depth to water level ranges from less than a meter to 12 m bgl. The weathered zone has been tapped extensively by the dug wells and sustain four to six hours of pumping with yield 10 to 80 or up to 200m^3/day, and capable of irrigating about 0.8 to 3.0 hectares. The hydrogeological conditions in the district are presented in Fig.4.

Central Ground Water Board has carried out ground water exploration at the locations from depth ranging 45 to 200 m bgl in hard rock areas and 25 to 430 mbgl in soft rock areas. The potential fractures were encountered between 40 and 120 m bgl. Existence of deep fractures upto 173 m bgl was also encountered. The cumulative yield of fracture zones varies from 0.12 to 15 lps. Yield of bore wells in general varies between 1 to 5 lps. A perennial spring, with a discharge of about 200 lpm is located along a fault, near Bugga Melleswara temple of Papayapalem in the Bellamkonda Mandal, and it is reported that this spring is being used to irrigate 10 hectares.

Fig. 4: Hydrogeology – Guntur District, A.P



LEGEND OF HYDROGELOGY (FIG. 4)

LITHOLOGY	GEOLOGY
ALLUVIUM	RECENT
SHALE / SANDSTONE	UPPER GONDWANA
SHALE	KURNOOL GROUP
LIMESTONE WITH SHALE	
LIMESTONE	
QUARTZITE WITH CONGLOMERATE	
QUARTZITE WITH SHALE	
QUARTZITE	CUDDAPAH SUPER GROUP
DOLAMITE / LIMESTONE	
SHALE WITH PHYLLITE	
CHARNOCKITE	ARCHAEAN
KHONDALITE	
GRANITE / GNEISS, SCHIST	
GRANITE (INTRUSIVES)	

OTHER FEATURES

- District Boundary
- Mandal Boundary
- River / Stream
- Water Body / Reservoir
- Thrust Zone
- 20 Water Table Contour (m amsl)
- Lineament
- Paleo Channel
- Exploratory Well

GROUND WATER PERSPECTIVE

	Description	Yields (approx)(in lps)	Ground Water Prospects
A	River Borne Alluvium, Valley Fills, Flood Plain, Deltaic Alluvium, Paleo channels, Buried Channels	> 3	Suitable for Dug wells / Filter Point Wells
B	Deeply Weathered Pediplain, Moderate to Highly Fractured Areas	2 to 3	Suitable for Deep Dug Wells / Bore Wells
C	Moderately Weathered Pediplain with Fractured Zones at Places, Alluvial Plain with Clayey Intercalations	1 to 2	Suitable for Dug Wells / Shallow Bore Wells
D	Shallow Weathered Pediplain with Pediment - Inselberg Complex	< 1	Suitable for Dug Wells
E	Area Occupied by Hills, Rock out crops and Forest	Meagre to Nil	Limited Potential Along the Fractures only

Fluoride Affected Area

Brackish to Saline areas

5.2 Ground Water in Cuddapah and Kurnool formations

Ground water occurs in the joints, bedding planes and the weathered portion in Cuddapah and Karnool group of rocks. The quartzite formations do not form good aquifers because of their compactness and occurrence at high relief. The ground water is developed in slaty phyllite by dug, dug-cum bore wells and few bore wells. The depth of wells varies from 3 to 25 m bgl, with moderate to very poor yields ranging between 10 to 70 m^3/day. The depth to water levels range from 0.4 to over 7.0 m bgl, but in phyllite and slates it varies from 4 to 15 m bgl. The yield of wells ranges from 20 to 80 m^3/day, with exceptions in the highly fractured locations.

5.3 Ground Water in Gondwana formation

The ground water occurs under water table and confined conditions in Gondwana formations. Ground water development in the area is by dug wells and bore wells. The depth to water ranges from 2.20 to 10.60 m bgl and the depth of dug wells varies between 5.50 and 18.50 m bgl. The tube wells in the area range in depth from 40.0 to 75.0 m bgl, with yield ranges from 28 to 1300 lpm for drawdowns of 8.0 to 15.m. The quality of ground water is potable.

5.4 Ground Water in Alluvium formation

The thickness of alluvium varies from a few meters to over 100m. The deltaic alluvium found in palaeo/buried channels upto 30m depth with thick graveliferous sand. Ground water is being developed in the flood plain areas along river course mostly through filter-points and shallow tube wells with yields ranging from 3 to over 15 lps as observed around Rayapudi and Borepalem areas of Amaravati and Thullur mandals. The depth to water level in the alluvium ranges from ground level to 5-12m bgl with poor to moderate discharges. In deltaic alluvium ground water is brackish in nature. Quality of water in palaeo-channels, buried channels is potable and brackish to saline at shallow depths in the areas bordering the coast. It is good in beach ridges.

5.5 Aquifer parameters

The Central Ground Water Board has drilled 64 Exploratory Wells, which include 41 bore wells in hard rock area and 23 tube wells in soft rock area. were conducted on these wells. The results aquifer performance tests indicate that transmissivity of the fractured aquifer varied from 21 to 253 sq.m/day and storativity values varied from 0.75 $x10^{-5}$ to 3.9.5$x10^{-3}$. The transmissivity of these soft rock aquifers varied from 1 to 616 sq.m/day and storativity values varied from 1.2 $x10^{-4}$ to 1.2 $x10^{-2}$.

5.6 Depth to water level

Ground water levels are monitored from a network of 62 hydrograph stations, include dug wells (45) and 17 Piezometers. The depth to water level maps during May, 2012 (Pre-monsoon) and Nov, 2012 (Post monsoon) were shown in Fig. 5&6. Water logging conditions or prone to water logging conditions occur in major part of the district in both during pre and post monsoon periods.

5.6.1 Pre-monsoon water levels: The depth to water level during pre-monsoon (2012) range from 0.64 m to 21.46 m bgl. The shallow water levels of 2 m are observed in southeast and eastern part of the district. The depth to water levels between 2-5 m is observed in majority of the area. Deeper water levels of >10 m bgl are observed in the western parts of the district (Fig-5).

5.6.2 Post-monsoon water levels: The depth to Water level ranges from 0.16 to 9.89m bgl during post monsoon period (2012). The shallow water levels of 2 m are observed in eastern part of the district. Water levels 2-5 m are observed in central and western part, 5-10 m and deeper are observed in western and northern part of the district (Fig-6).

5.6.3 Water level fluctuation: Majority of the district shows rise in water level between pre and post monsoon period of 2012 (0-2 m). Rise of water level of 2-4 m is observed in central areas in and very small areas in western part. Fall of 2-4 and greater than 4 m is observed as isolated patches in the district (Fig.7).

Fig.5 Depth to water level – Pre-monsoon (May 2012)

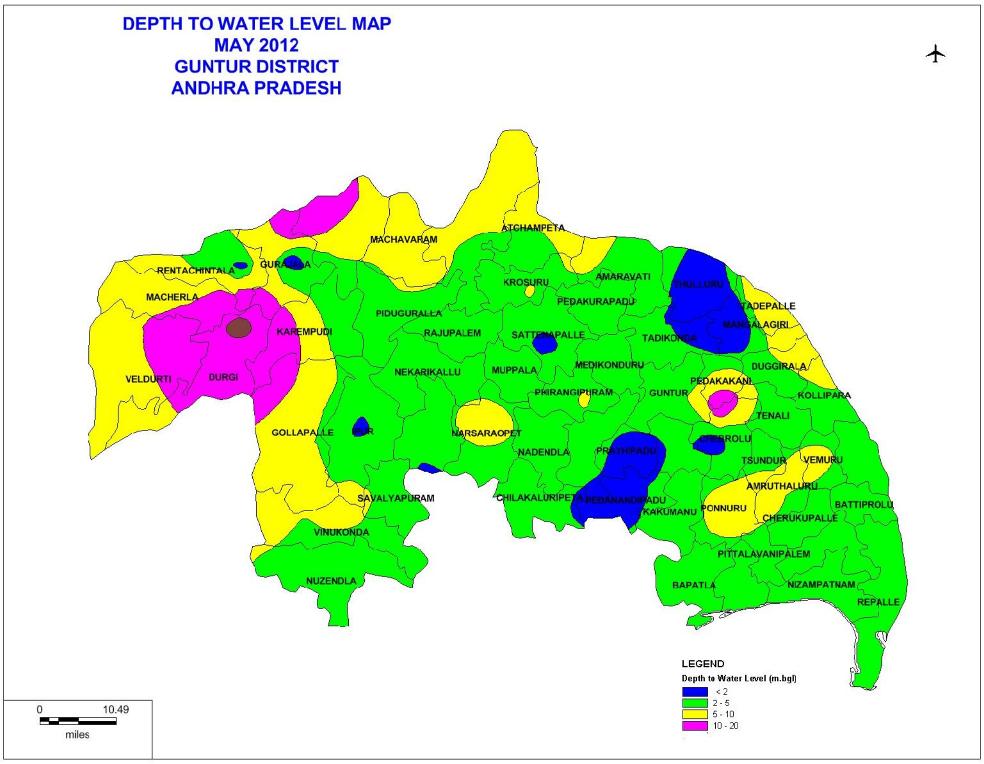


Fig.6 Depth to water level – Post-monsoon (Nov 2011)

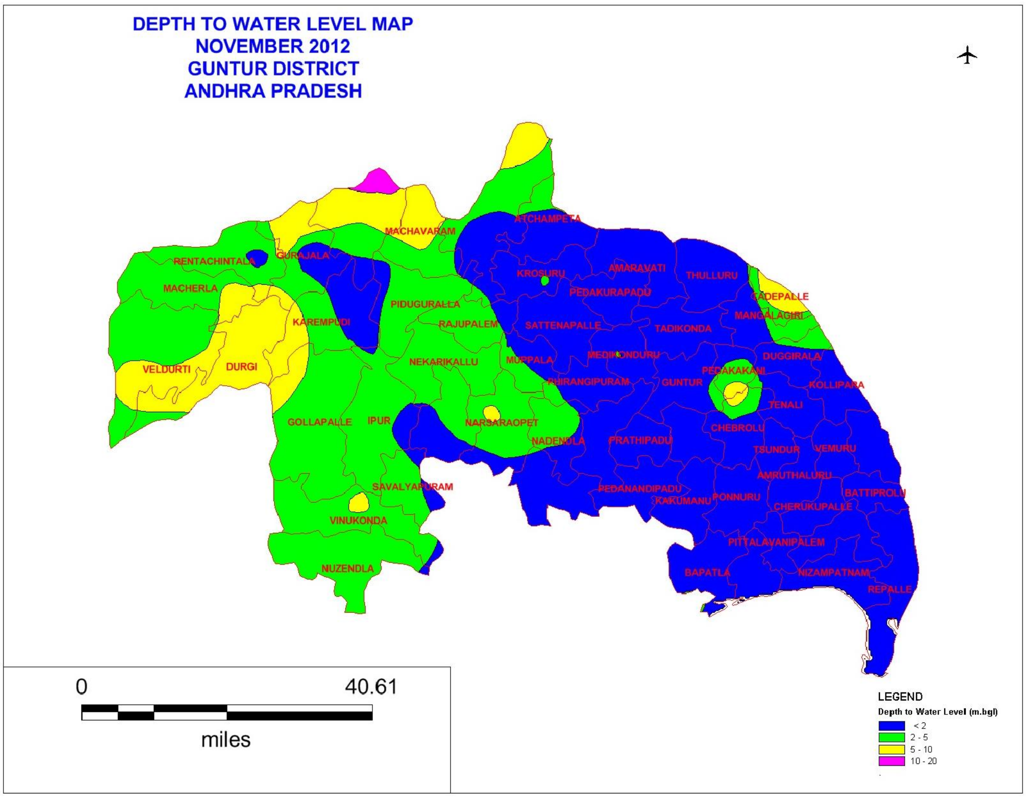
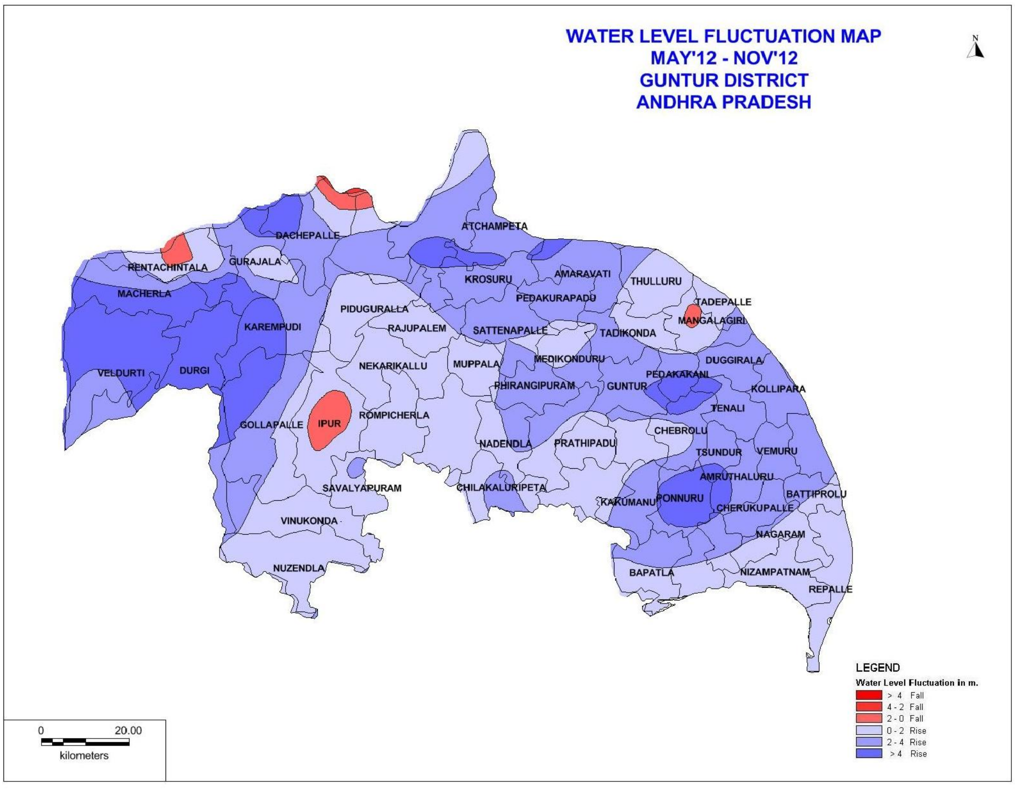


Fig.7 Water level Fluctuation (2011)

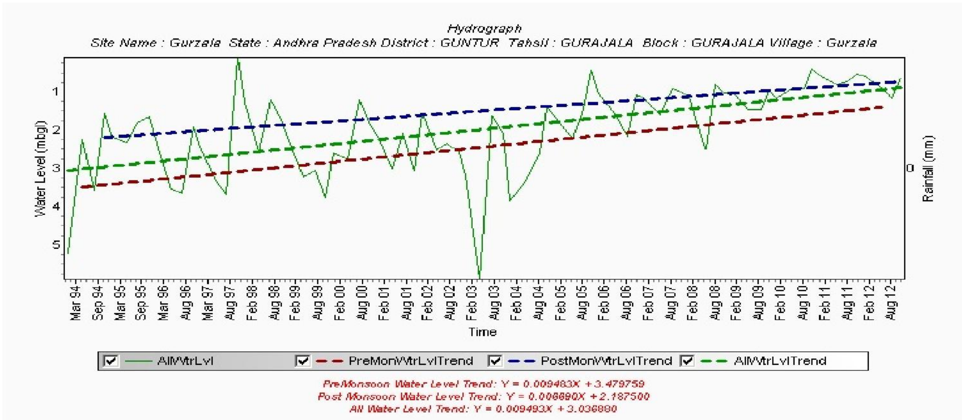


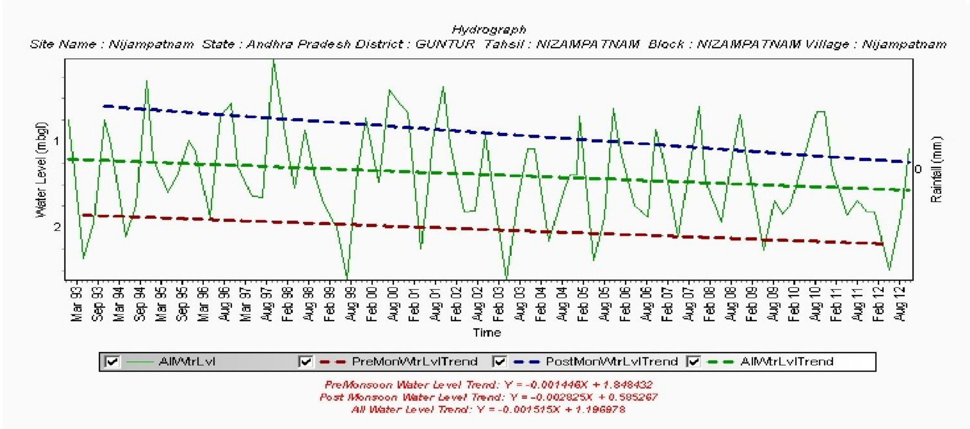
5.10 Long term water levels

There is a perceptible rise in the water levels from June/July onwards till December every year. Then the water levels fall from December onwards till May. Just after the onset of monsoon (from June) to March of the following year there is due to release of canal water in different irrigation commands in the district and between middle of March to May/June, the canal water is stopped. This is reflected in the hydrographs with a steep rise and decline. The fall in the levels of hydrographs of the district may be attributed to the cessation of canal waters, apart from the lessening effects of rainfall. Based on the representative hydrograph data, hydrographs have been generated for the period since 1993-2012 and the same are given in Fig.8. On perusal of the hydrographs it is observed that out of the 77 hydrographs 13 are showing falling trends during the period.

To assess the long-term trends of water levels, the National Hydrograph Network Stations data for 20 years (1993-2012) of CGWB and State Ground Water Department were analysed. About 83% of the wells are showing general rising trend of 0.0015 to 0.7684 m/year and the rest 17% of the wells are showing falling trend varying from 0.0101 to 0.4833m/year. Hydrographs are presented in Fig.8.

Fig.8 Hydrographs Showing Rising and falling trends (1993-2012)





6.0. GROUND WATER RESOURCES

Based on the Ground Water Estimation Committee (GEC 97) norms, ground water assessment was done in 2008-09. The mandal-wise details are presented in Table-2. The net ground water availability is 1,62,783 ha.m in command area and 9,634 ha.m in non-command area and total ground water resources available in the district 1,72,417 ha.m. The existing gross ground water draft for all uses in the district is 31,933 ha.m, which are 27,604 ha.m in command area and 4,329 ha.m in non command area. The net ground water availability for future irrigation is 1,28,445 ha.m and 4,137 ha.m in command and non-command areas respectively. The stage of ground water development in command area is 17% while it is 45% in non command areas and 19% in the entire district. All the mandals and falls under safe category.

Table-2 Mandal-wise Dynamic Groundwater Resources of Guntur District, Andhra Pradesh [2008-2009] [In Ha.M.]

Sl. No	Administrative unit/District	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and industrial water supply	Existing gross ground water draft for all uses	Provision for domestic and industrial requirement supply to 2025	Net ground water availability for future irrigation development	Stage of ground water development	Category
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Macherla	2318	575	266	841	494	1249	36	Safe
2	Rentachintala	2970	218	94	312	165	2587	11	Safe
3	Gurajala	3448	303	100	403	219	2926	12	Safe
4	Dachepalli	3829	232	109	341	251	3346	9	Safe
5	Machavaram	2721	308	109	417	182	2231	15	Safe
6	Bellamkonda	2349	141	101	242	145	2063	10	Safe
7	Atchampeta	3518	517	116	633	196	2805	18	Safe
8	Krosuru	2655	320	156	476	198	2137	18	Safe
9	Amaravathi	3297	396	213	609	219	2682	18	Safe
10	Thulluru	4526	907	27	934	202	3417	21	Safe
11	Tadepalle	1145	533	166	699	178	434	61	Safe
12	Mangalagiri	2642	668	25	693	312	1662	26	Safe
13	Tadikonda	3203	228	50	278	222	2753	9	Safe
14	Pedakurapadu	2411	387	56	443	177	1847	18	Safe
15	Sattenapalli	4192	511	361	872	408	3273	21	Safe
16	Rajupalem	1801	273	196	469	196	1332	26	Safe
17	Piduguralla	3354	624	68	692	393	2337	21	Safe
18	Karempudi	2735	794	223	1017	252	1689	37	Safe
19	Durgi	2254	815	57	872	436	1003	39	Safe
20	Veldurthi	1917	1102	55	1157	453	362	60	Safe
21	Bollapalle	2428	1392	40	1432	202	834	59	Safe
22	Nekarikallu	2792	664	226	890	226	1902	32	Safe
23	Muppalla	2127	213	44	257	241	1673	12	Safe
24	Phyrangipuram	2137	514	231	745	231	1392	35	Safe
25	Medikonduru	2031	76	45	121	184	1771	6	Safe
26	Guntur	2734	87	149	236	1269	1378	9	Safe
27	Pedakakani	2308	52	21	73	130	2126	3	Safe
28	Duggirala	3602	940	195	1135	226	2436	32	Safe
29	Kollipara	3380	1010	193	1203	214	2156	36	Safe
30	Kolluru	2897	1448	102	1550	203	1246	54	Safe
31	Vemuru	3706	653	264	917	264	2789	25	Safe
32	Tenali	3984	675	458	1133	835	2474	28	Safe
33	Tsundur	3726	472	524	996	524	2730	27	Safe

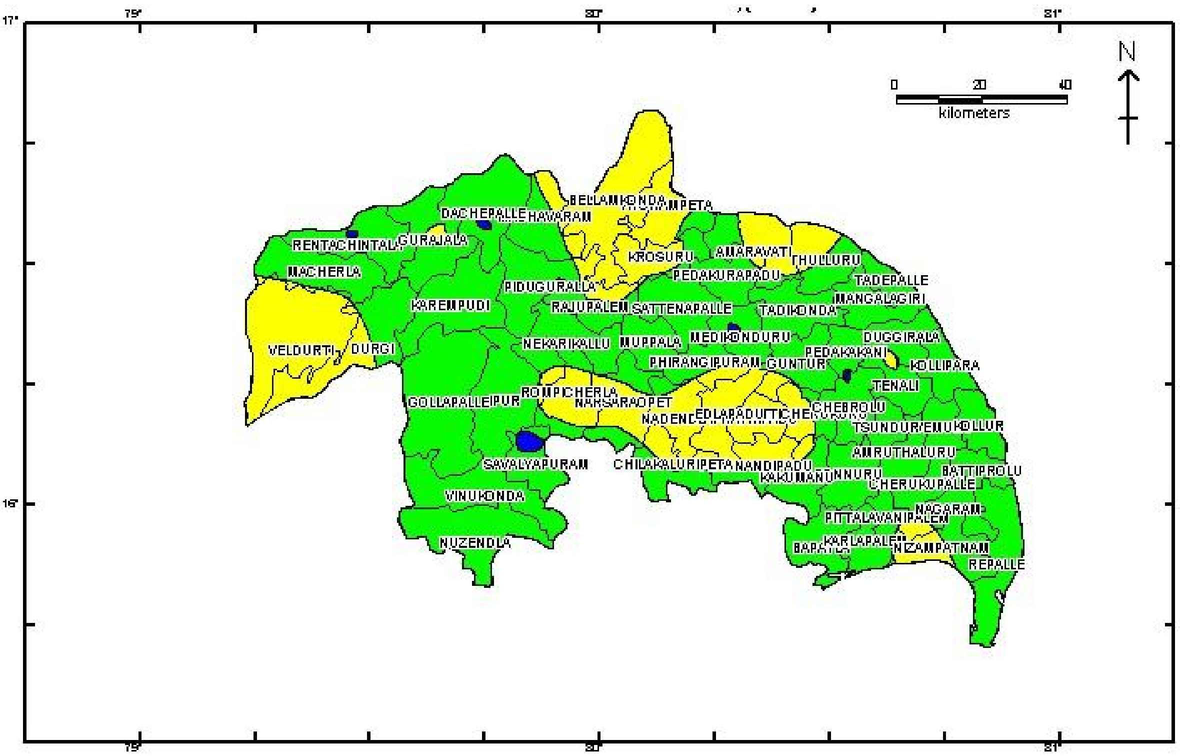
1	2	3	4	5	6	7	8	9	10
34	Chebrolu	2161	680	14	694	141	1340	32	Safe
35	Vatticherukuru	1584	1	22	23	126	1457	1	Safe
36	Prattipadu	1175	0	9	9	122	1053	1	Safe
37	Edlapadu	1391	209	79	288	150	1032	21	Safe
38	Nadendla	1918	172	96	268	185	1561	14	Safe
39	Narasaraopet	2973	388	246	634	473	2112	21	Safe
40	Rompicherla	5180	102	49	151	197	4881	3	Safe
41	Ipur	2229	383	48	431	155	1691	19	Safe
42	Savalyapuram	2213	123	71	194	132	1958	9	Safe
43	Vinukonda	3206	383	75	458	346	2477	14	Safe
44	Nuzendla	4486	82	42	124	180	4224	3	Safe
45	Chilakaluripet	2448	111	5	116	401	1936	5	Safe
46	Pedanandipadu	1968	0	19	19	220	1748	1	Safe
47	Kakumanu	1990	0	4	4	105	1885	0	Safe
48	Ponnuru	5367	575	338	913	449	4343	17	Safe
49	Amartaluru	3900	188	330	518	330	3382	13	Safe
50	Cherukupalli	3145	410	338	748	338	2397	24	Safe
51	Bhattiprolu	5624	778	79	857	195	4651	15	Safe
52	Repalle	5393	106	96	202	369	4918	4	Safe
53	Nagaram	4748	165	393	558	393	4190	12	Safe
54	Nizampatnam	3712	32	138	170	227	3453	5	Safe
55	PV Palem	2129	197	47	244	145	1787	11	Safe
56	Karlapalem	2188	181	349	530	349	1658	24	Safe
57	Bapatla	6152	505	181	686	229	5418	11	Safe
	District Total	172417	23823	8110	31933	16004	132582	19	Safe

7.0 GROUND WATER QUALITY

The ground water in the district in general is suitable for both domestic and irrigation purposes. The Electrical Conductivity ranges from 780 to 7980 micro Siemens/cm at 25^{o}C. Distribution of EC is shown in Fig.8. Fluoride concentration in some locations of the district is more than permissible limit. In some places, it is not suitable for drinking due to the presence of Nitrates. A total of 166 Fluoride affected villages are identified in the district.

The quality of ground water from deeper aquifers is assessment based on chemical analysis of 53 water samples collected from the bore wells during the exploratory drilling programme. The ground water is generally alkaline with pH varies from 7.31 to 9.52. The electrical conductivity varies from 620 to 29000 micro Siemens/cm. About 32% of the samples have Nitrate more than permissible limit of 45 mg/l. Fluoride content is more than permissible limit of 1.5 mg/l in 21% of samples.

Fig.8: Distribution of Electrical Conductivity in Guntur District, A.P (May 2012)



8.0 GROUND WATER DEVELOPMENT

The district is mainly dependent on ground water for irrigation and domestic needs. About 52937 dug wells, 33964 bore wells and 561 deep tube wells exist in the district. Ground water development is through deep bore wells in the non-command areas and through dug wells and shallow bores in command areas. Alluvial aquifers are developed through filter point wells. In command areas, the stage of ground water development is 17 per cent and in non-command areas, it is 45 per cent.

Large diameter dug wells (8 to 25 m depth) piercing the weathered rock exists in the area for irrigation purpose. The dug wells are fitted with 3 to 5 HP electrical motors and yield of dug wells varies from 10 to 220 c.m/day for a pumping period of 3 to 5 hrs/day.

The depth of bore wells range from 60-200 m bgl with 6” dia and yields range from 1 to 45 cu.m/hr. The bore wells are fitted with 5 HP motors generally and run for 4 to 8 hrs in a day. The depth of filter points along the river and stream courses varies from 3.5 to 12 m bgl with yields varying from 8 to 135 cu.m/hr. These wells yield low during summer months.

9.0 GROUND WATER RELATED ISSUES AND PROBLEMS

9.1 Water Logged areas

The water logging conditions with water levels less than 2 m bgl and prone to water logging conditions with water levels varying between 2-5 m bgl occur in major part of the district in both during pre and post monsoon periods.

9.2 Polluted areas

Ground water pollution in Guntur district is mainly by agricultural and human activities. About 75% of the samples show Nitrates beyond permissible limits in shallow ground water, while it is about 32% in deeper ground water. A total of 166 Fluoride affected villages are identified. The studies taken up in Mada-Kondaveeti vagu reveals the presence of pesticide multi residue ranging from 0.515 to 3.339 mg/l against the permissible limits of 0.001mg/l. In deltaic alluvium, ground water is brackish in both at shallow and deeper zones, except in paleochannels and beach ridges.

9.3 Water Table Depleted areas

There is no significant fall of water table noticed in the district. Long term water level trends of last two decades (1993-2012) shows that, depleting areas are limited in nature where ground water extraction is there in the soft rock areas. The range of fall varies from 0.0101 to 0.4833 in the area.

10.0 CONCLUSIONS

1. The tail-end areas of canals and upland areas in the district are facing chronic water shortage problems, where the phyllites or granite gneisses form the principal aquifers. The thick weathered mantle and deeply weathered and fractured zones occurring along certain lineaments, its intersections and buried pediments, may be tapped through proper ground water structures to draw copious supplies of ground water.

2. Conjunctive use of surface water and ground water should be followed not only to meet the requirements of tail-end areas but also to reduce the water logging and salinity problems.

3. The exploratory drilling programmes in the select places of canal commands will enlighten the conjunctive utilization of surface and ground water. In these areas ground water loss will reduce the water logging conditions and more areas may be brought under agriculture.

4. It is inferred from the exploration data, that most of the potential zones were encountered within the depth range of 30-150 m and beyond this depth, potential fractures although occur, but rare.

5. Proper measures have to be taken in selecting the ground water abstraction structures, in the implementation of water management practices and to check the aerial distribution of salinity. The ground water development in the district can be taken up as per the perspective plan.

6. Studies are to be taken up to check the recurrence of fluorosis, especially in the Vinukonda, Krosuru areas and remedial measures have to be implemented. In a fluoride endemic area, it is not necessary that every water sources is contaminated. The good sources may be identified and the local people can be educated to consume water supply only from such sources.

7. As per ground water resources estimated for the year 2008-09, all the mandals fall in safe category with stage of development less than 70%.

8. Artificial recharge structures like contour bunding, check dams, percolation tanks and farm ponds need to be constructed in the non-command areas and over-exploited villages and corpus fund has to be created to maintain those structures.