CHAPTER 4.1.9 GROUND WATER RESOURCES

VELLORE DISTRICT

INDEX

GROUND WATER REPORT OF VELLORE DISTRICT

INRODUCTION :

In Tamil Nadu, the surface water resources are fully utilized by various stake holders. The demand of water is increasing day by day. So, groundwater resources play a vital role for additional demand by farmers and Industries and domestic usage leads to rapid development of groundwater. About 63% of available groundwater resources are now being used. However, the development is not uniform all over the State, and in certain districts of Tamil Nadu, intensive groundwater development had led to declining water levels, increasing trend of Over Exploited and Critical Firkas, saline water intrusion, etc.

ADMINISTRATIVE SET UP

Vellore district, a newly formed district was carved out from the erstwhile North Arcot district during 1988-89.the Total geographical extent is 5, 92,018 hectares (5920.18 sq.km.) and is sandwiched between the following coordinates.

Latitude : 12º15'23" - 13º12'32"

Longitude : 78º24'16" - 79º54'56"

The population as per 1991 census, is estimated around 30, 26,432 of which 20, 66,718 are in rural areas and 9, 59,714 are in urban centers respectively. A somewhat belted pattern of settlement is discernible in correlation with relief, soil, rainfall, topography etc., which gives rise to either compact blocks of population or linear pattern along the river courses and arterial roads.

This district exemplifies in the development of rail and road transport systems by linking all major cities and towns both inside and outside the State.

Vellore District is totally bifurcated into 53 Firkas.

1. hydrogelogy

(i) Major Geological formations:

Geology:

Geologically, the entire district is broadly classified into hard rock and sedimentary formations.

a) Hard rock

More than 90% of the area in this district is underlain by these formations. These hard rock formations are the oldest rocks of the earth's crust and exhibit similar characters. They are Azoic, Crystalline and extremely contorted.

The most common types of hard rock formations are the Gneisses and Charnockites. The Gneissic formations are found in almost all the taluks of the district but lack uniformly both in composition and texture. Different names are attributed to the Gneissic formation based on its mineral content.

Charnockite formations occur as distinct pockets in Javadu hills, Amirthi Reserved forest etc., i.e., on the Southern and south western parts of the district. Quartzites and Doleritic Dykes which are intrusive bodies and resistant to weathering, are seen as patches among Charnockite and Gneissic formations.

Tectonically and structurally the area is traversed by minor regional faults and fissures. The regional faults of Javadi Hills are of considerable length.

b) Sedimentary formations

The sedimentary or the Quarternary Alluvial deposits which are the transported sediments by the river and streams stretch mainly along the Palar river course as thin isolated patches. These formations overlie the Hard rock formation.

Drilling bore holes:

In vellore district, more than 144 bore wells have been drilled by the State Ground and Surface Water Resources Data Centre of Public Works Department to ascertain the sub surface condition. Generally in hard rock areas, discontinuous and heterogeneous nature of weathered formation influences the occurrence and movement

of groundwater and in turn is favoured by fissures and joints towards certain restricted directions.

The thickness of top soil, weathered zone, jointed zone and depth of occurrence of fresh rock varies moderately to widely throughout the district.

In Tiruppathurtaluk, considerable thickness of weathering ranging from 15.00 to 36.00 mts. In Gudiyatham and Vellore taluks the weathering extends upto 30.00 mts. and 20.00 mts respectively. In the remaining parts of the district, the thickness of weathering ranges from 11.00 mts to 20.00 mts below ground level.

Aquifer parameters

Aquifer is a geologic formation or stratum containing water in its voids yielding significant quantities of water to a well or spring.

a) Hard rock

In hard rock areas of this district, the thickness of aquifer varies between 2.00 And 36 mts. below ground level. Deep weathering 9in gneissic rocks depends upon the mineralogical contents and fracture development. The range of aquifer parameters are as follows:

Range in hard rock formation

S.No.	Description	Range
1.	Well yield in LPM	40 - 200
2.	Transmissivity (T) m^2/day	8 - 80
3.	Permeability (K) m/day	0.5-2.5

b) Alluvium

The alluvium occurs along the Palar river course and the thickness of alluvial aquifer ranges from 10.00 mts to 12.00 mts. The range of aquifer parameters of alluvium are furnished below:

Range in Alluvial formation

S.No.	Parameters	Range
1.	Well yield in LPM	200-400
2.	Transmissivity (T) m^2/day	200-300
3.	Permeability (K) m/day	20-30

Source: State Ground and Surface Water Resources Data Centre, Chennai-113.

(iii) Drilling:

The drilling types are different according to the formation of the terrain. In general, DTH rigs are used in Hard rock formations for drilling a borewell at a depth ranges from 30m to 200m, according to the extension of joints, fractures, lineaments, etc in an area. In Sedimentary formations, rotary rigs with different rotors used according to the Tube well's diameter. The Bento novate clay is used in rotary rigs to avoid the collapse of the Tube well. The sedimentary tube wells are drilled up to a depth of 30m to 300m depending on the area, yield,etc. In alluvial formations, the hand rotary used for drilling tube wells ranges from 10m to 15m.In river beds, infiltration tube wells used for extraction of groundwater.

In Hard rock, the well designing is simple. The upper top soil and highly weathered zone is cased with PVC pipe and the remaining weathered, Fissured, Jointed portion is left as it is. In Villupuram District, the weathered zone ranges from 1.0m to 12.0m. In Granitic gneiss area, the highly weathered portion will be more up to 15m but in charnockite area, the weathered zone will extend up to 8.0m to 10.m only. In Sedimentary area, the well construction depends on the occurrence of sand thickness in the referred area. The logger is also used in the construction to identify the area of good quality of water.

2. GROUNDWATER REGIME MONITORING:

(i) Notes on existing water level scenario:

The water level is being monitored by State Ground & Surface Water Resources Data Centre from 1971 onwards from a network of 1746 observation wells (shallow open wells) located all over the State. The water level readings are observed in the first week of every month by the field officers. In Vellore District, 158 observation wells and 111 piezometers,totally 269 wells are monitoring on Monthly basis. The Central Ground Water Board also monitors the water level from 900 numbers of wells spread all over the State. They observe water level four times in a year. (i.e January, May, August and November). The collected water level data are uploaded in GWDES software and database is maintained regularly for analysing the water level trend with rainfall. From the Monitoring network of wells, the selected representative wells are taken for Resource Estimation computations.

In Vellore District, during the pre monsoon, the water level generally in declining trend ranges from G.L. to 15m. The depth of well below GroundLevel 12.0m are become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. The water level trend maps for pre and post monsoons are included as Annexure- I & II.

(ii) Long term trend of water level:

The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Vellore District. The analysis reveals that the water level has gone down in the north, west and central parts of the Vellore District. The inference taken from the annual fluctuation is due to lack of rainfall which in turn affects the groundwater levels in phreatic aquifer. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sectored needs and due to failure of monsoons, the water level has gone down. The hydrograph of observation wells water level trend from 2005 to 2017 enclosed as Annexure – III and water level trend from 2000 to 2017 of Piezometers enclosed as Annexure – IV for Vellore District.

(iii) Existing network of Monitoring wells:

In Vellore District, the existing network of monitoring wells is 269

wells, 158 wells are observation wells and 111 wells are piezometers. These wells are observed for every month water level.

Vellore: Observation Wells - Location and Co-ordinates

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
23011	Vellore	Thiruppathur	Kandili	Chinrampatti	12°25'00"	78°35'15"
23011A	Vellore	Thiruppathur	Kandili	Chinrampatti	12°23'58"	78°33'36"
23018	Vellore	Thiruppathur	Natrampalli	Katteri	12°35'00"	78°33'00"
23023	Vellore	Vaniyambadi	Alangayam	Vaniyambadi	12°38'00"	78°38'00"
23024	Vellore	Arcot	Arcot	Valavanur	12°48'00"	79°30'00"
23024A	Vellore	Arcot	Arcot	Valavanur	12°48'00"	79°30'00"
23025	Vellore	Arcot	Timiri	Maruthampadi	12°48'00"	79°17'00"
23026	Vellore	Vellore	Kaniyambadi	Pennathur	12°50'40"	79°06'40"
23027A	Vellore	Vaniyambadi	Madhanur	Ambur	12°47'00"	78°40'00"
23028	Vellore	Walajahpet	Walajahpet	Lalapet	12°58'00"	79°03'00"
23028A	Vellore	Walajahpet	Walajahpet	Thengal	12°56'40"	79°16'30"
23028AA	Vellore	Walajahpet	Walajahpet	Thengal	12°56'40"	79°16'30"
23029	Vellore	Gudiyatham	Gudiyatham	Gudiyatham	12°50'00"	78°35'00"
23029A	Vellore	Gudiyatham	Gudiyatham	Gudiyatham	12°50'00"	78°35'00"
23030	Vellore	Gudiyatham	Pernambut	Pernambut	12°58'00"	78°32'00"
23030A	Vellore	Thiruppathur	Thiruppathur	Thirupathur	12°29'00"	78°34'20"
23031	Vellore	Katpadi	Katpadi	Arumparuthi	12°58'05"	79°12'25"
23032	Vellore	Katpadi	K.V.Kuppam	Vaduganthangal	12°58'10"	79°04'10"
23034	Vellore	Arakkonam	Kaveripakkam	Kilveeranam	12°59'51"	79°28'25"

23034A	Vellore	Arakkonam	Kaveripakkam	Kilveeranam	12°59'51"	79°28'25"
23035	Vellore	Arakkonam	Kaveripakkam	Nehru Nagar	13°06'17"	79°29'45"
23036	Vellore	Arakkonam	Arakkonam	Mangammapet	13°06'19"	79°39'31"
23036A	Vellore	Arakkonam	Arakkonam	Mangammapet	13°06'19"	79°39'31"
23042	Vellore	Walajahpet	Walajahpet	Sathampakkam	12°53'49"	79°22'56"
23042A	Vellore	Thiruppathur	Kandili	Sundarampalli	12°24'00"	78°27'00"
23043	Vellore	Thiruppathur	Kandili	Kandili	12°28'45"	78°27'15"
23044	Vellore	Thiruppathur	Thiruppathur	Andiyappanur	12°22'10"	78°42'15"
23045	Vellore	Thiruppathur	Jolarpet	Vellakkalnatham	12°33'10"	78°27'30"
23045A	Vellore	Thiruppathur	Jolarpet	Vellakkalnatham	12°32'50"	78°26'38"
23046	Vellore	Thiruppathur	Natrampalli	Natrampalli	12°35'30"	78°30'45"
23047A	Vellore	Vaniyambadi	Alangayam	Alangayam	12°37'50"	78°45'15"
23048	Vellore	Vellore	Madhanur	Guruvarajapalayam	12°47'35"	78°53'00"
23049	Vellore	Vaniyambadi	Pernambut	Kailasagiri	12°50'24"	78°42'55"
23050	Vellore	Gudiyatham	Pernambut	Pallalakuppam	12°53'20"	78°46'00"
23051	Vellore	Vellore	Anicut	Pallikonda	12°54'05"	78°56'30"
23051A	Vellore	Vellore	Anicut	Pallikonda	12°54'42"	78°56'03"
23052	Vellore	Gudiyatham	Gudiyatham	Kallapadi	12°59'45"	78°54'40"
23053	Vellore	Gudiyatham	Gudiyatham	Modikuppam	13°01'45"	78°51'50"
23071	Vellore	Vellore	Vellore	Perumugai	12°56'33"	79°11'49"
23072	Vellore	Vellore	Anicut	Karadikudi	12°50'38"	78°55'49"
23073	Vellore	Vellore	Anicut	Pinnathurai	12°46'43"	78°56'11"
23074	Vellore	Vellore	Vellore	Usur	12°51'54"	79°03'43"

23075	Vellore	Vellore	Kaniyambadi	Thuthikadu	12°47'26"	79°05'09"
23076	Vellore	Vellore	Kaniyambadi	Vallam	12°45'15"	79°09'18"
23078	Vellore	Vellore	Anicut	P.S. Mangalam	12°55'05"	79°03'00"
23079	Vellore	Vellore	Madhanur	Asanampattu	12°42'17"	78°48'58"
23080A	Vellore	Vaniyambadi	Madhanur	Minnur	12°47'55"	78°40'00"
23081	Vellore	Vaniyambadi	Madhanur	Vengili	12°50'55"	78°48'11"
23082	Vellore	Katpadi	Sholinghur (W)	Ponnai	13°07'50"	79°15'35"
23083	Vellore	Walajahpet	Sholinghur	Sholinghur	13°06'25"	79°25'25"
23084A	Vellore	Walajahpet	Sholinghur	Neelakandarayanpettai	13°02'20"	79°28'00"
23085A	Vellore	Walajahpet	Sholinghur	Ozhugur	12°58'45"	79°24'40"
23086	Vellore	Walajahpet	Walajahpet	Sumaithangi	12°54'10"	79°26'30"
23086A	Vellore	Walajahpet	Walajahpet	Sumaithangi	12°54'10"	79°26'30"
23087	Vellore	Walajahpet	Walajahpet	Ammur	12°57'30"	79°17'00"
23087A	Vellore	Walajahpet	Walajahpet	Ammur	12°57'30"	79°17'00"
23088	Vellore	Arcot	Timiri	Melapalandai	12°39'30"	79°23'42"
23089	Vellore	Arcot	Timiri	Kalavai	12°46'00"	79°23'05"
23090	Vellore	Arcot	Timiri	Kaniyanur	12°48'00"	79°21'25"
23091	Vellore	Arcot	Timiri	Damaraipakkam	12°45'25"	79°18'35"
23092	Vellore	Walajahpet	Arcot	Ayilam	12°52'35"	79°15'45"
23092A	Vellore	Walajahpet	Arcot	Kilkuppam	12°52'40"	79°15'40"
23093	Vellore	Arcot	Timiri	Varagur	12°42'30"	79°12'30"
23106	Vellore	Thiruppathur	Alangayam	Hanumanthapuram	12°29'50"	78°25'30"
23107	Vellore	Arakkonam	Arakkonam	Mosur	13°05'02"	79°43'10"

23108	Vellore	Arakkonam	Arakkonam	Poyapakkam	13°02'23"	79°40'06"
23109	Vellore	Arakkonam	Arakkonam	Vellorepet	13°08'56"	79°42'17"
23109A	Vellore	Arakkonam	Arakkonam	Vellorepet	13°08'56"	79°42'17"
23134	Vellore	Arakkonam	Arakkonam	Amirpet	13°08'29"	79°36'40"
23135	Vellore	Arakkonam	Arakkonam	Narayanamangalam	13°11'19"	79°39'18"
23135A	Vellore	Arakkonam	Arakkonam	Narayanamangalam	13°11'19"	79°39'18"
23144	Vellore	Thiruppathur	Jolarpet	Yelagiri Hills	12°35'09"	78°38'01"
2402	Vellore	Walajahpet	Walajahpet	Ranipet Water Works	12°55'00"	79°12'00"
A23001	Vellore	Arakkonam	Arakkonam	Arakkonam	13°04'55"	79°40'30"
A23002	Vellore	Arakkonam	Kaveripakkam	Kaveripakkam	12°54'25"	79°27'50"
A23004	Vellore	Walajahpet	Walajahpet	Walajahpet R.S	12°55'30"	79°22'30"
A23005	Vellore	Walajahpet	Walajahpet	Ranipet E.B	12°55'40"	79°20'00"
A23006	Vellore	Arcot	Arcot	Arcot (Anjaneyar Koil)	12°55'05"	79°15'08"
A23007	Vellore	Arcot	Arcot	Timiri	12°48'00"	79°15'30"
A23020	Vellore	Vellore	Vellore	Vellore GH	12°55'31"	79°10'43"
A23020A	Vellore	Vellore	Vellore	Vellore	12°55'31"	79°10'43"
A23021	Vellore	Katpadi	Katpadi	Katpadi	12°58'05"	79°08'55"
A23022	Vellore	Gudiyatham	K.V.Kuppam	K.V.kuppam	12°57'10"	78°59'20"
A23025	Vellore	Vaniyambadi	Vaniyambadi	Ambur	12°47'13"	78°42'59"
A23025A	Vellore	Vaniyambadi	Vaniyambadi	Ambur	12°47'05"	78°42'23"
A23026	Vellore	Vaniyambadi	Vaniyambadi	Vaniyambadi	12°39'18"	78°36'31"
A23027	Vellore	Vaniyambadi	Vaniyambadi	Alangayam	12°34'04"	78°34'49"
A23029	Vellore	Thiruppathur	Jolarpet	Jolarpettai	12°34'15"	78°34'40"

A23029A	Vellore	Thiruppathur	Jolarpet	Jolarpettai	12°33'53"	78°35'02"
A23030	Vellore	Thiruppathur	Thiruppathur	Tirupathur	12°29'20"	78°34'20"
A23031	Vellore	Walajahpet	Walajahpet	Ranipet RS	12°55'05"	79°18'05"
A23032	Vellore	Walajahpet	Walajahpet	Walajahpet G.H	12°58'15"	79°03'15"
A23032A	Vellore	Walajahpet	Walajahpet	Vannivedu	12°58'15"	79°03'15"
A23033	Vellore	Arakkonam	Nemili	Sendamangalam	12°59'14"	79°40'40"
A23034	Vellore	Arcot	Arcot	Arcot (Police Station)	12°54'15"	79°20'20"
A23037	Vellore	Arakkonam	Arakkonam	Arakkonam Govt. Hospital	13°05'06"	79°33'53"
hp23043A	Vellore	Thiruppathur	Kandili	Gajalnaikampatti	12°28'48"	78°27'14"
hp23075A	Vellore	Vellore	Kaniyambadi	Shozavaram	12°47'26"	79°05'09"
hp23084A	Vellore	Walajahpet	Sholinghur	Neelakandarayanpettai	13°02'20"	79°28'00"
MicV 20001	Vellore	Arakkonam	Arakkonam	Thanigaipolur	13°07'30"	79°38'50"
MicV 20002	Vellore	Arakkonam	Kaveripakkam	Kilvanam	13°08'18"	79°36'15"
MicV 20003	Vellore	Arakkonam	Kaveripakkam	Perumalrajanpet	13°05'45"	79°34'47"
MicV 20004	Vellore	Arakkonam	Arakkonam	Puliyamangalam	13°04'35"	79°41'40"
MicV 20005	Vellore	Arakkonam	Nemili	Sainavaram	12°59'02"	79°39'00"
MicV 20006	Vellore	Arakkonam	Nemili	Reddivalam	12°56'05"	79°35'35"
MicV 20007	Vellore	Arakkonam	Nemili	Panapakkam	12°55'10"	79°34'05"
MicV 20008	Vellore	Arakkonam	Nemili	Punnai	12°58'55"	79°36'25"
MicV 20009	Vellore	Arakkonam	Kaveripakkam	Pudupattu	12°57'38"	79°30'30"
MicV 20010	Vellore	Arakkonam	Kaveripakkam	Kattalai	12°55'25"	79°27'35"

MicV 20011	Vellore	Arakkonam	Namili	Parameswara mangalam	13°00'45"	79°40'55"
MicV 20012	Vellore	Arakkonam	Kaveripakkam	Kunnathur	13°03'32"	79°31'55"
MicV 20013	Vellore	Arakkonam	Nemili	Meleri	13°01'20"	79°34'05"
MicV 20014	Vellore	Arakkonam	Kaveripakkam	Paranji	13°05'55"	79°31'50"
MicV 20015	Vellore	Arakkonam	Kaveripakkam	Gudalur	13°05'15"	79°31'02"
MicV 20016	Vellore	Arakkonam	Kaveripakkam	Ayal	13°02'45"	79°27'50"
MicV 20017	Vellore	Arakkonam	Nemili	Kalathur	12°52'07"	79°32'20"
MicV 20018	Vellore	Arakkonam	Kaveripakkam	Vegamangalam	12°52'35"	79°29'30"
MicV 20019	Vellore	Walaja	Walajapet	Kondakuppam	12°03'25"	79°18'10"
MicV 20020	Vellore	Walaja	Arcot	Nandhiyalam	12°56'00"	79°15'15"
MicV 20021	Vellore	Walaja	Arcot	Kathiyavadi	12°52'55"	79°16'35"
MicV 20022	Vellore	Walaja	Arcot	Sambasivapuram	12°51'12"	79°15'20"
MicV 20023	Vellore	Arcot	Arcot	Keerampadi	12°49'15"	79°24'10"
MicV 20024	Vellore	Arcot	Timiri	Allalacheri	12°46'55"	79°25'05"
MicV 20025	Vellore	Arcot	Timiri	Vembi	12°43'52"	79°24'35"
MicV 20026	Vellore	Arcot	Timiri	Kuttiyam	12°44'42"	79°22'25"
MicV 20027	Vellore	Vellore	Vellore	Sampanginallore A	12°57'04"	79°11'27"
MicV 20028	Vellore	Vellore	Kaniyambadi	Adukamparai A	12°50'56"	79°08'15"
MicV 20029	Vellore	Vellore	Kaniyambadi	Kattupudur Na	12°50'51"	79°05'41"
MicV 20030	Vellore	Vellore	Kaniyambadi	Pennathur A	12°50'43"	79°06'50"
MicV 20031	Vellore	Vellore	Vellore	Periyasekkanur Na	12°51'59"	79°04'01"
MicV 20032	Vellore	Vellore	Vellore	Thellur A	12°53'35"	79°04'05"

MicV 20033	Vellore	Vellore	Anicut	Genganellore Na	12°52'46"	78°59'56"
MicV 20034	Vellore	Vellore	Anicut	Anaicut	12°52'46"	78°59'03"
MicV 20035	Vellore	Vellore	Anicut	Kandaneri Na	12°54'50"	78°49'40"
MicV 20036	Vellore	Vellore	Kaniyambadi	Solavaram A	12°48'50"	79°05'52"
MicV 20037	Vellore	Vellore	Kaniyambadi	Kaniyambadi A	12°48'28"	79°08'17"
MicV 20038	Vellore	Vellore	Anicut	Kilkothur Na	12°47'45"	78°56'50"
MicV 20039	Vellore	Vellore	Anicut	Madaiyappattu A	12°44'50"	78°52'40"
MicV 20040	Vellore	Vellore	Anicut	Odugathur Na	12°46'10"	78°52'50"
MicV 20041	Vellore	Vellore	Anicut	Melarasampattu Na	12°41'37"	78°52'40"
MicV 20042	Vellore	Vellore	Kaniyambadi	Kammasamudram A	12°46'20"	79°10'52"
MicV 20043	Vellore	Gudiyatham	Katpadi	T.K. Puram	12°56'20"	79°07'20"
MicV 20044	Vellore	Gudiyatham	Katpadi	Thalayirampattu	12°56'25"	79°05'55"
MicV 20045	Vellore	Gudiyatham	K.v. kuppam	Thirumani	12°56'30"	79°04'50"
MicV 20046	Vellore	Gudiyatham	K.v.kuppam	Vadavirinjipuram	12°55'40"	79°01'15"
MicV 20047	Vellore	Gudiyatham	K.v. kuppam	Sennankuppam	12°57'00"	78°57'50"
MicV 20048	Vellore	Gudiyatham	K.v. kuppam	Angarankuppam1	12°59'55"	79°01'20"
MicV 20049	Vellore	Gudiyatham	K.v. kuppam	Angarankuppam2	12°59'55"	79°01'20"
MicV 20050	Vellore	Gudiyatham	Katpadi	Karasamangalam	12°59'05"	79°05'35"
MicV 20051	Vellore	Gudiyatham	Katpadi	Thiruvalam	12°58'55"	79°16'00"
MicV 20052	Vellore	Gudiyatham	Sholingur west	Melpadi	13°03'40"	79°17'00"
MicV 20053	Vellore	Gudiyatham	Sholinghur west	Gollapalli	13°06'10"	79°15'50"
MicV 20054	Vellore	Gudiyatham	Sholinghur west	Keerasathu	13°06'10"	79°17'00"

MicV 20055	Vellore	Gudiyatham	K.v. kuppam	Veppur	12°55'35"	78°55'20"
MicV 20056	Vellore	Gudiyatham	K.v. kuppam	Sethuvandai	12°56'50"	78°54'20"
MicV 20057	Vellore	Gudiyatham	Gudiyatham	Pakkam A	12°58'30"	78°52'06"
MicV 20058	Vellore	Gudiyatham	Gudiyatham	Sainagunta Na	13°03'58"	78°49'41"
MicV 20059	Vellore	Gudiyatham	Gudiyatham	Agaraharam A	12°57'41"	78°50'01"
MicV 20060	Vellore	Gudiyatham	Gudiyatham	Jittapalli Na	12°59'48"	78°48'26"
MicV 20061	Vellore	Gudiyatham	Pernambut	Mordana A	13°01'55"	78°47'12"
MicV 20062	Vellore	Gudiyatham	Gudiytaham	Erathangal A	12°56'51"	78°49'50"
MicV 20063	Vellore	Gudiyatham	Pernambut	Rangampettai Na	13°00'24"	78°44'46"
MicV 20064	Vellore	Gudiyatham	Pernambut	Pernambut Na	12°56'30"	78°43'56"
MicV 20065	Vellore	Gudiyatham	Pernambut	Yerikuthi A	12°55'47"	78°43'54"
MicV 20066	Vellore	Gudiyatham	Gudiyatham	Kobampatti Na	12°53'21"	78°51'18"
MicV 20067	Vellore	Gudiyatham	Gudityahtam	Ananganallur A	12°53'41"	78°51'46"
MicV 20068	Vellore	Gudiyatham	Pernambut	Balur A	12°53'36"	78°41'47"
MicV 20069	Vellore	Gudiyatham	Pernambut	Masikam Na	12°54'21"	78°41'42"
MicV 20070	Vellore	Gudiyatham	Pernambut	Charakkallu A	12°53'16"	78°40'12"
MicV 20071	Vellore	Vaniyambadi	Madhanur	Kallaparai Na	12°41'50"	78°48'19"
MicV 20072	Vellore	Vaniyambadi	Madhanur	Koothambakkam Na	12°53'12"	78°52'37"
MicV 20073	Vellore	Vaniyambadi	Madhanur	Chinnapallikuppam A	12°45'50"	78°50'15"
MicV 20074	Vellore	Vaniyambadi	Madhanur	Melpallipattu Na	12°44'11"	78°49'40"
MicV 20075	Vellore	Vaniyambadi	Madhanur	Arjathi A	12°47'38"	78°52'32"
MicV 20076	Vellore	Vaniyambadi	Madhanur	Krishnapuram Na	12°48'25"	78°52'43"

MicV 20077	Vellore	Vaniyambadi	Madhanur	Somalapuram A	12°48'34"	78°43'37"
MicV 20078	Vellore	Vaniyambadi	Madhanur	Palur Na	12°51'19"	78°51'41"
MicV 20079	Vellore	Vaniyambadi	Pernambur	Udayendram A	12°41'58"	78°37'20"
MicV 20080	Vellore	Vaniyambadi	Madhanur	Periyangkuppam Na	12°45'09"	78°42'31"
MicV 20081	Vellore	Vaniyambadi	Madhanur	Periyangkuppam A	12°44'55"	78°42'49"
MicV 20082	Vellore	Vaniyambadi	Madhanur	Vinnamangalam A	12°44'46"	78°41'28"
MicV 20083	Vellore	Vaniyambadi	Pernambur	Melsanankuppam A	12°44'31"	78°40'19"
MicV 20084	Vellore	Vaniyambadi	Pernambur	Kailasagiri Na	12°50'14"	78°42'23"
MicV 20085	Vellore	Vaniyambadi	Pernambur	Chinnavarikam Na	12°50'10"	78°42'29"
MicV 20086	Vellore	Vaniyambadi	Pernambur	Venkatasamudram A	12°47'19"	78°41'26"
MicV 20087	Vellore	Vaniyambadi	Madhanur	Agaram A	12°49'30"	78°53'45"
MicV 20088	Vellore	Vaniyambadi	Alangayam	Pudur	12°39'42"	78°36'38"
MicV 20089	Vellore	Vaniyambadi	Natrampalli	Ramanaickanpettai	12°39'46"	78°31'59"
MicV 20090	Vellore	Vaniyambadi	Alangayam	Devasthanam	12°41'04"	78°35'48"
MicV 20091	Vellore	Vaniyambadi	Alangayam	Madanancheri	12°42'06"	78°36'03"
MicV 20092	Vellore	Vaniyambadi	Natrampalli	Timmampettai	12°41'31"	78°31'52"
MicV 20093	Vellore	Vaniyambadi	Alangayam	Nimmiyampattu	12°37'50"	78°41'56"
MicV 20094	Vellore	Vaniyambadi	Thirupathur	Perumapattu	12°31'06"	78°39'04"
MicV 20095	Vellore	Vaniyambadi	Alangayam	Nayakkanur	12°34'02"	78°48'27"
MicV 20096	Vellore	Vaniyambadi	Alangayam	Beemakulam A	12°35'16"	78°48'09"
MicV 20097	Vellore	Vaniyambadi	Alangayam	Narasingapuram	12°36'43"	78°43'57"

MicV 20098	Vellore	Vaniyambadi	Alangayam	Beemakulam Na	12°35'14"	78°48'12"
MicV 20099	Vellore	Thiruppathur	Jolarpettai	Pacchal	12°30'35"	78°33'50"
MicV 20100	Vellore	Thiruppathur	Jolarpettai	Ponneri	12°35'48"	78°36'02"
MicV 20101	Vellore	Thiruppathur	Jolarpettai	Puthagaram	12°30'11"	78°30'51"
MicV 20102	Vellore	Thiruppathur	Thirupathur	Thirupathur	12°28'50"	78°34'24"
MicV 20103	Vellore	Thiruppathur	Kandili	Adiyur	12°28'32"	78°33'12"
MicV 20104	Vellore	Thiruppathur	Thirupathur	Aneri	12°27'37"	78°34'45"
MicV 20105	Vellore	Thiruppathur	Kandili	Matrapalli. N Mottur	12°25'14"	78°36'29"
MicV 20106	Vellore	Thiruppathur	Kandili	Natham	12°24'36"	78°28'22"
MicV 20107	Vellore	Thiruppathur	Kandili	Perampattu	12°22'49"	78°35'27"
MicV 20108	Vellore	Thiruppathur	Kandili	Sewathur	12°25'51"	78°30'37"
MicV 20109	Vellore	Thiruppathur	Kandili	Kurumberi	12°23'01"	78°36'46"
MicV 20110	Vellore	Thiruppathur	Alangayam	Puliyur	12°21'22"	78°40'47"
U13137	Vellore	Arakkonam	Nemili	Sayanavaram	12°58'50"	79°38'38"
U13138	Vellore	Arakkonam	Nemili	Reddyvalam	12°56'12"	79°35'35"
U13140	Vellore	Arakkonam	Kaveripakkam	Ayarpadi	12°35'05"	79°30'44"
U23015	Vellore	Arakkonam	Kaveripakkam	Sankaranbadi	12°51'30"	79°33'35"
U23029	Vellore	Arakkonam	Kaveripakkam	Karivedu	12°53'27"	79°30'50"
U23031	Vellore	Arakkonam	Kaveripakkam	Athipattu	12°52'43"	79°27'32"

Vellore Distric- Piezometers - Location and Co-ordinates

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
hp21502	Vellore	Vellore	Madhanur	Guruvarajapalaya m	12.791667	78.880000
hp21503A	Vellore	Vaniyambadi	Alangayam	Alangayam	12.622222	78.752778
hp21504A	Vellore	Vaniyambadi	Thiruppathur	Irunappattu	12.536111	78.700000
hp21505A	Vellore	Vaniyambadi	Madhanur	Chengilikuppam	12.711111	78.658333
hp21506	Vellore	Vellore	Anaicut	Poigai satyammangalam	12.918056	79.050000
hp21507	Vellore	Walajahpet	Walajahpet	Lalapettai	13.005556	79.302778
hp21508	Vellore	Walajahpet	Sholinghur	Melvenkatapuram	13.045833	79.402778
hp21509	Vellore	Arakkonam	Arakkonam	Arakkonam	13.077778	79.669444
hp21511	Vellore	Gudiyatham	Katpadi	Arumbaruthi	12.968056	79.206944
hp21512A	Vellore	Vaniyambadi	Madhanur	Madhanur	12.870833	78.846944
hp21526	Vellore	Vaniyambadi	Alangayam	Vellakuttai	12.650000	78.694444
hp21527	Vellore	Arcot	Arcot	Pudupadi	12.865278	79.373611
hp21528	Vellore	Arakkonam	Arakkonam	Valarpuram	13.168056	79.677778
hp21529	Vellore	Walajahpet	Walajahpet	Gudimallur	12.893056	79.370833
hp21530	Vellore	Gudiyatham	Gudiyatham	Nathamedu	12.879167	78.866667
hp21531	Vellore	Gudiyatham	Gudiyatham	Modikuppam	13.029167	78.865278
hp21534	Vellore	Thiruppathur	Kandili	Kakankarai	12.422222	78.479167
hp21535	Vellore	Vellore	Kaniyambadi	Melvallam	12.752778	79.152778
hp21536	Vellore	Arakkonam	Kaveripakkam	Gudalur	13.088889	79.516667
hp21537	Vellore	Arakkonam	Kaveripakkam	Siruvalaiyam	12.961111	79.534722
hp21538	Vellore	Arcot	Timiri	Damaraipakkam	12.759722	79.309722
hp21539	Vellore	Arcot	Timiri	Varagurpattanam	12.813889	79.247222
hp21540	Vellore	Gudiyatham	K.V. Kuppam	Panamadangi	13.025000	79.038889
hp21541	Vellore	Gudiyatham	Katpadi	Latteri	12.969444	79.069444
hp21542	Vellore	Thiruppathur	Natrampalli	Kothur	12.611111	78.436111
hp21544	Vellore	Vaniyambadi	Natrampalli	Thekkupattu	12.648611	78.559722
hp21545	Vellore	Thiruppathur	Jolarpettai	Mallapalli	12.552778	78.466667
hp21546	Vellore	Arakkonam	Nemili	Nagavedu	13.038889	78.627778
hp21547	Vellore	Gudiyatham	Pernambut	Gundalapalli	12.993056	78.745833
hp21548	Vellore	Gudiyatham	Pernambut	Nalanganallur	12.955556	78.784722
hp21549	Vellore	Vaniyambadi	Pernambut	Kadavalam	12.776389	78.659722
hp21550	Vellore	Gudiyatham	Pernambut	Kommeswaram	12.816667	78.736111
hp21551	Vellore	Thiruppathur	Thiruppathur	Kurusilapattu	12.508333	78.654167
hp21552	Vellore	Walajahpet	Sholinghur	Ozhugur	12.977778	79.409722
hp21553	Vellore	Walajahpet	Sholinghur	Sholinghur	13.113889	79.422222
hp21554	Vellore	Gudiyatham	Sholinghur	Vinnamballi	13.029167	79.233333
hp21555	Vellore	Arakkonam	Kaveripakkam	Banavaram	13.008333	79.491667
hp21556	Vellore	Walajahpet	Sholinghur	Sengalnatham	13.054167	79.333333

hp21557	Vellore	Arcot	Timiri	Kalavai	12.769444	79.422222
hp21558	Vellore	Vellore	Vellore	Usur	12.863889	79.061111
hp21585	Vellore	Thiruppathur	Alangayam	Pudurnadu	12.402778	78.686111
hp21632	Vellore	Walaja	Walaja	Chettithangal	12.954167	79.336111
hp21633	Vellore	Gudiyatham	Gudiyatham	Gollapalli	13.031944	78.864444
INV 21543A	Vellore	Vaniyambadi	Natrampalli	Natrampalli	12.590278	78.509722
INV 23043A	Vellore	Thiruppathur	Kandili	Gajalnaickanpatti	12.482778	78.461944
MWS21586	Vellore	Vaniyambadi	Alangayam	Kalandira	12.627778	78.606944
MWS21587	Vellore	Vaniyambadi	Madhanur	Agaramcheri	12.894444	78.897222
MWS21588	Vellore	Vaniyambadi	Pernambut	Chinnapallikuppam	12.736111	78.647222
MWS21589	Vellore	Arakkonam	Arakkonam	Cheyyur	13.055556	79.702778
MWS21590	Vellore	Arcot	Timiri	Timiri	12.826389	79.308333
MWS21591	Vellore	Walajahpet	Sholinghur	Pulivalam	13.062500	79.448611
MWS21592	Vellore	Walajahpet	Kaveripakkam	Aypedu	13.104167	79.494444
MWS21593	Vellore	Arakkonam	Nemili	Ullia-nallur	12.966667	79.559722
MWS21594	Vellore	Walajahpet	Walajahpet	Ammoor	12.975000	79.365278
MWS21595	Vellore	Arakkonam	Nemili	Chitteri	13.061111	79.606944
MWS21596	Vellore	Vaniyambadi	Natrampalli	Dasiriappanur	12.643056	78.516667
MWS21597	Vellore	Gudiyatham	Gudiyatham	Nellorepet	12.940278	78.684722
MWS21598	Vellore	Vellore	Anaicut	Devichettikuppam	12.844444	78.925000
MWS21599	Vellore	Thiruppathur	Kandili	Udaymuthur	12.434167	78.581389
MWS21600	Vellore	Thiruppathur	Kandili	Narianeri	12.491111	79.491111
MWS21601	Vellore	Arakkonam	Arakkonam	Arakkonam	13.077778	79.669444
MWS21603	Vellore	Gudiyatham	K.V. Kuppam	K.V.kuppam	12.952778	78.988889
MWS21604	Vellore	Gudiyatham	Gudiyatham	Valathur	12.880556	78.829167
MWS21605	Vellore	Gudiyatham	Pernambut	Erukkampattu	12.947222	78.684722

hp21502	Vellore	Vellore	Madhanur	Guruvarajapalaya m	12.791667	78.880000
hp21503A	Vellore	Vaniyambadi	Alangayam	Alangayam	12.622222	78.752778
hp21504A	Vellore	Vaniyambadi	Thiruppathur	Irunappattu	12.536111	78.700000
hp21505A	Vellore	Vaniyambadi	Madhanur	Chengilikuppam	12.711111	78.658333
hp21506	Vellore	Vellore	Anaicut	Poigai satyammangalam	12.918056	79.050000
hp21507	Vellore	Walajahpet	Walajahpet	Lalapettai	13.005556	79.302778
hp21508	Vellore	Walajahpet	Sholinghur	Melvenkatapuram	13.045833	79.402778
hp21509	Vellore	Arakkonam	Arakkonam	Arakkonam	13.077778	79.669444
hp21511	Vellore	Gudiyatham	Katpadi	Arumbaruthi	12.968056	79.206944
hp21512A	Vellore	Vaniyambadi	Madhanur	Madhanur	12.870833	78.846944
hp21526	Vellore	Vaniyambadi	Alangayam	Vellakuttai	12.650000	78.694444
hp21527	Vellore	Arcot	Arcot	Pudupadi	12.865278	79.373611
hp21528	Vellore	Arakkonam	Arakkonam	Valarpuram	13.168056	79.677778
hp21529	Vellore	Walajahpet	Walajahpet	Gudimallur	12.893056	79.370833
hp21530	Vellore	Gudiyatham	Gudiyatham	Nathamedu	12.879167	78.866667
hp21531	Vellore	Gudiyatham	Gudiyatham	Modikuppam	13.029167	78.865278
hp21534	Vellore	Thiruppathur	Kandili	Kakankarai	12.422222	78.479167
hp21535	Vellore	Vellore	Kaniyambadi	Melvallam	12.752778	79.152778
hp21536	Vellore	Arakkonam	Kaveripakkam	Gudalur	13.088889	79.516667
hp21537	Vellore	Arakkonam	Kaveripakkam	Siruvalaiyam	12.961111	79.534722
hp21538	Vellore	Arcot	Timiri	Damaraipakkam	12.759722	79.309722
hp21539	Vellore	Arcot	Timiri	Varagurpattanam	12.813889	79.247222
hp21540	Vellore	Gudiyatham	K.V. Kuppam	Panamadangi	13.025000	79.038889
hp21541	Vellore	Gudiyatham	Katpadi	Latteri	12.969444	79.069444
hp21542	Vellore	Thiruppathur	Natrampalli	Kothur	12.611111	78.436111
hp21544	Vellore	Vaniyambadi	Natrampalli	Thekkupattu	12.648611	78.559722
hp21545	Vellore	Thiruppathur	Jolarpettai	Mallapalli	12.552778	78.466667
hp21546	Vellore	Arakkonam	Nemili	Nagavedu	13.038889	78.627778
hp21547	Vellore	Gudiyatham	Pernambut	Gundalapalli	12.993056	78.745833
hp21548	Vellore	Gudiyatham	Pernambut	Nalanganallur	12.955556	78.784722
hp21549	Vellore	Vaniyambadi	Pernambut	Kadavalam	12.776389	78.659722
hp21550	Vellore	Gudiyatham	Pernambut	Kommeswaram	12.816667	78.736111
hp21551	Vellore	Thiruppathur	Thiruppathur	Kurusilapattu	12.508333	78.654167
hp21552	Vellore	Walajahpet	Sholinghur	Ozhugur	12.977778	79.409722
hp21553	Vellore	Walajahpet	Sholinghur	Sholinghur	13.113889	79.422222
hp21554	Vellore	Gudiyatham	Sholinghur	Vinnamballi	13.029167	79.233333
hp21555	Vellore	Arakkonam	Kaveripakkam	Banavaram	13.008333	79.491667
hp21556	Vellore	Walajahpet	Sholinghur	Sengalnatham	13.054167	79.333333
hp21557	Vellore	Arcot	Timiri	Kalavai	12.769444	79.422222
hp21558	Vellore	Vellore	Vellore	Usur	12.863889	79.061111
hp21585	Vellore	Thiruppathur	Alangayam	Pudurnadu	12.402778	78.686111
hp21632	Vellore	Walaja	Walaja	Chettithangal	12.954167	79.336111
hp21633	Vellore	Gudiyatham	Gudiyatham	Gollapalli	13.031944	78.864444

INV 21543A	Vellore	Vaniyambadi	Natrampalli	Natrampalli	12.590278	78.509722
INV 23043A	Vellore	Thiruppathur	Kandili	Gajalnaickanpatti	12.482778	78.461944
MWS21586	Vellore	Vaniyambadi	Alangayam	Kalandira	12.627778	78.606944
MWS21587	Vellore	Vaniyambadi	Madhanur	Agaramcheri	12.894444	78.897222

(iv) Data Constraints:

The following are constraints in collecting the water level data in the field and validating the data are:

1) The water level data are collected on the monthly basis in the referred observation wells and piezometers. The collected data is not sufficient quantity for analyzing purpose due to drying of wells, Wells abounded by various reasons, lack of selecting the alternate wells, lack of open wells available for monitoring purpose due to increased usage of bore wells in the villages, Panchayats, etc. In many villages, the water supply schemes implemented by overhead tank supply or mini energised pumps and the existing open wells are not used generally by the villagers and moreover, they filled with garbage.
2) The number of bore wells should be increased for monitoring purpose.
3) The site selection of new bore wells should be based on the Geological methods.
4) Strengthening the network of monitoring wells by closing the gaps in the network.
5) Maintenance cost should be allotted to maintain the bore wells on the periodical basis to maintain the quality as well as yield.
6) Installation of Automatic water level recorders in the sensitive and more water level fluctuation in the bore wells will helpful to monitor the extensive depletion of groundwater areas.
7) Upgrading the measuring instruments will helpful to take accurate reading of water levels in the field.
8) Upgrading the soft ware will helpful to minimize the errors and increasing the accuracy of data.
9) Erecting the Telemetric water level recorders in the over exploited Firkas will helpful to monitor the over extraction of groundwater.

10)Lack of manpower and transporting vehicles are also major problems for data collection in the field in proper time.

3. DYNAMIC GROUND WATER RESOURCES:

The State Ground and Surface Water Resources Data Centre has estimated the ground water resources of Tamil Nadu periodically in co-ordination with the Central Ground Water Board, Government of India , Ministry of Water Resources, Chennai, based on the Methodology evolved by the Ground Water Resources Estimation Committee, 1997 (GEC 97).

Groundwater potential assessment is a dynamic one and not static. While assessing an area, the following factors can be considered such as Geology, Total Irrigated Area, Total Number of Wells used for Irrigation, Water Level Data for the past five years, Average Rainfall, Total Recharge, Irrigation methods adopted in the area, Cropping pattern details, Seepage factor, Specific yield, Geological conditions prevailing in that area, Recharge through Artificial recharge structures, etc.

Groundwater potential assessment proposal should be presented for approval in the Central and State Level Working Group Committees and then, presented for final approval in the Central Level Committee as well as State Level Committees.

The Ground Water Potential Assessments as on January 1992 and January 1997 were done in the State, taking the Panchayat Union Block as an Assessment Unit and the entire State **was categorized as Dark, Grey and White areas**. The Blocks with more than 85% to 100% ground water development (extraction) were categorized as “Dark Blocks” and the blocks with ground water development between 65% to 85% were categorized as “Grey Blocks” and blocks with less than 65% ground water development were categorized as “White Blocks”.

Subsequently, the **Ground Water Potential Assessment was done as on March 2003 and as on March 2009.** In these assessments, the Panchayat Union Blocks in Tamil Nadu were **categorized as Over-Exploited, Critical, Semi-Critical, Safe and Saline instead of Dark, Grey and White blocks.** The Blocks with more than 100% extraction were categorized as “Over Exploited Blocks”, the blocks with 90% to 100% extraction as “Critical Blocks”, the blocks with 65% to 90% extraction

as “Semi Critical Blocks”, the blocks with less than 65% extraction as “Safe Blocks” and the bad quality blocks were categorized as “Saline Blocks”. No schemes should be formulated in over exploited and critical blocks - “Notified Blocks – A category – (Stage of Groundwater extraction is 90% and above)”.

The re-estimation of groundwater resources in the State as on March 2011 and as on March 2013 can be assessed in Micro Level basis. In these assessments, the assessing unit is Firka (Unit of Taluk) and **categorized as Over-Exploited, Critical, Semi-Critical, Safe, and Saline Firkas.** As on March 2013 assessment, in the Villupuram District

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 1139 Firkas in the State, 358 Firkas are categorized as “Over Exploited Firkas”, 105 Firkas are categorized as “Critical Firkas”, 212 Firkas are categorized as “Semi Critical Firkas”, 429 Firkas are categorized as “Safe Firkas” and 35 Firkas are categorized as “Saline Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 374 to 358 Firkas, the “Critical Firkas” increased from 48 to 105 Firkas, the “Semi Critical Firkas” comes down marginally from 235 to 212 Firkas, the “Safe Firkas” comes down marginally from 437 to 429 Firkas and the “Saline Firkas” remains same as 35 Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the “Over Exploited Firkas” by various departments.

Methodology adopted for Estimation of Ground Water Potential :

The present methodology used for resources assessment is known as Ground Water Resource Estimation Methodology - 1997 (GEC'97) .In GEC'97, two approaches are recommended - **water level fluctuation method and norms of rainfall infiltration method**. The water level fluctuation method is based on the concept of storage change due to differences between various input and output components. Input refers to recharge from rainfall and other sources and subsurface inflow into the unit of assessment. Output refers to ground water draft, ground water evapotranspiration, base flow to streams and subsurface outflow from the unit. Since the data on subsurface inflow / outflow are not readily available, it is advantageous to

adopt the unit for ground water assessment as basin / sub basin / watershed, as the inflow / outflow across these boundaries may be taken as negligible.

In each assessment unit, hilly areas having slope more than 20% are deleted from the total area to get the area suitable for recharge. Further, areas where the quality of ground water is beyond the usable limits should be identified and handled separately. The remaining area after deleting the hilly area and separating the area with poor ground water quality is to be delineated into command and non-command areas. Ground water assessment in command and non-command areas are done separately for monsoon and non-monsoon seasons.

The rainfall recharge during monsoon season computed by Water Level Fluctuation (WLF) method is compared with recharge figures from Rainfall Infiltration Factor (RIF) method. In case the difference between the two sets of data are more than 20% then RIF figure is considered, otherwise monsoon recharge from WLF is adopted. While adopting the rainfall recharge figures, weight age is to be given to WLF method over adhoc norms method of RIF. Hence, wherever the difference between RIF & WLF is more than 20%, data have to be scrutinized and corrected accordingly.

During non-Monsoon season, rainfall recharge is computed by using Rainfall infiltration Factor (RIF) method. Recharge from other sources is then added to get total non-Monsoon recharge. In case of areas receiving less than 10% of the annual rainfall during non-monsoon season, the rainfall recharge is ignored.

The total annual ground water recharge of the area is the sum-total of monsoon and non-monsoon recharge. An allowance is kept for natural discharge in the non-monsoon season by deducting 5 to 10 % of total annual ground water recharge.

The balance ground water available accounts for existing ground water withdrawal for various uses and potential for future development. This quantity is termed as Net Ground Water Availability.

Net Ground Water Availability = Annual Ground Water Recharge - Natural discharge during non-monsoon season.

GEC'97 methodology has recommended norms for various parameters being used in ground water recharge estimation. These norms vary depending upon water bearing formations and agroclimatic conditions. While norms for specific yield and recharge from rainfall values are to be adopted within the guidelines of GEC'97, in case of other parameters like seepage from canals, return flow from irrigation, recharge

from tanks & ponds, water conservation structures, results of specific case studies may replace the adhoc norms.

The Gross yearly ground water draft is to be calculated for Irrigation, Domestic and Industrial uses. The gross ground water draft would include the ground water extraction from all existing ground water structures during monsoon as well as during non-monsoon period. While the number of ground water structures should preferably be based on latest well census, the average unit draft from different types of structures should be based on specific studies or adhoc norms given in GEC'97 report.

The stage of Ground water Development is defined by

Stage of Ground water Development (%) = Existing Gross Ground water Draft for all uses / Net annual Ground Water Availability X 100

The units of assessment are categorized for ground water development based on two criteria – a) stage of ground water development and b) long-term trend of pre and post monsoon water levels. Four categories are - Safe areas which have ground water potential for development; Semi-critical areas where cautious ground water development
is recommended; Critical areas; Over -exploited areas where there should be intensive monitoring and evaluation and future ground water development be linked with water conservation measures.

The criteria for categorization of assessment units are as follows:

S. No.	Stage of Groundwater Development	Significant Long term Decline		Categorization
		Pre-monsoon	Post -monsoon	
1.	<=70%	No	No	SAFE
		Yes / No	No / Yes	To be re-assessed
		Yes	Yes	To be re-assessed

2.	>70% and <=90%	No	No	To be re-assessed
		Yes / No	No / Yes	SEMI – CRITICAL
		Yes	Yes	SEMI – CRITICAL
3.	>90 and <=100%	No	No	To be re-assessed
		Yes / No	No / Yes	CRITICAL
		Yes	Yes	CRITICAL
4.	>100%	No	No	To be re-assessed
		Yes / No	No / Yes	OVER- EXPLOITED
		Yes	Yes	OVER- EXPLOITED

Note:' *To be re-assessed' means that data is to be checked and reviewed. If the ground water resources assessment and the trend of long term water levels contradict each other. This anomalous situations requires a review of the ground water resource computations, as well as the reliability of water level data.*

The long term ground water level data should preferably be for a period of 10 years. The significant water level decline may be taken in consideration between 10 to 20 cm/ year depending upon the local hydro geological conditions.

Dynamic Ground Water Resources Estimation of TamilNadu As on March 2013

District Summary

(in ha.m)

VELLORE DISTRICT							
Sl.No (District))	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**No of Over Exploited Firkas**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	VELLORE	58,970.76	54,257.79	6,548.26	60,806.05	103	26

Firka Wise Summary

(in ha.m)

VELLORE DISTRICT							
Sl.No	**Assessment Unit (Firka)**	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**Category of the Firka**
1	AGARAM	786.99	713.75	1.82	715.57	91	CRITICAL
2	ALANGAYAM	1,086.37	1,061.18	5.06	1,066.24	98	CRITICAL
3	AMBALUR	1,041.28	1,013.40	154.46	1,167.86	112	OVER EXPLOITED
4	AMBUR	704.34	408.00	310.93	718.93	102	OVER EXPLOITED

5	AMMANANKOIL	855.57	1,242.80	111.23	1,354.03	158	OVER EXPLOITED
6	ANAICUT	918.08	1,275.55	3.01	1,278.56	139	OVER EXPLOITED
7	ANDIYAPPANUR	1,875.31	1,566.90	4.77	1,571.67	84	SEMI CRITICAL
VELLORE DISTRICT							
Sl.No	**Assessment Unit (Firka)**	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**Category of the Firka**
8	ARAKONAM(NORTH)	1,193.05	768.00	2.45	770.45	65	SAFE
9	ARAKONAM(SOUTH)	1,310.31	877.85	215.90	1,093.75	83	SEMI CRITICAL
10	ARCOT	683.48	1,012.60	3.86	1,016.46	149	OVER EXPLOITED
11	BANAVARAM	1,637.23	1,365.70	3.63	1,369.33	84	SEMI CRITICAL
12	GUDIYATHAM (WEST)	914.28	1,313.50	4.18	1,317.68	144	OVER EXPLOITED
13	GUDIYATHAM(EAST)	855.09	1,270.50	175.61	1,446.11	169	OVER EXPLOITED
14	JOLARPET	868.16	1,020.20	158.22	1,178.42	136	OVER EXPLOITED
15	K.V.KUPPAM	958.70	1,235.15	104.75	1,339.90	140	OVER EXPLOITED
16	KALAVAI	1,318.48	1,442.10	2.58	1,444.68	110	OVER EXPLOITED
17	KANDHILI	1,034.74	829.55	141.85	971.40	94	CRITICAL
18	KANIYAMBADI	1,145.02	996.55	116.96	1,113.51	97	CRITICAL
19	KATPADI	462.20	576.20	118.09	694.29	150	OVER EXPLOITED
20	KAVERIPAKKAM	1,838.10	1,610.60	68.05	1,678.65	91	CRITICAL
21	KORATTI	1,742.47	1,354.75	117.97	1,472.72	85	SEMI CRITICAL
22	MADHANUR	478.78	427.98	57.34	485.32	101	OVER EXPLOITED
23	MAMBAKKAM	1,956.73	1,443.90	60.67	1,504.57	77	SEMI CRITICAL
24	MELASANNANKUPPAM	673.80	563.15	68.40	631.55	94	CRITICAL

25	MELPADI	1,451.08	1,180.30	87.63	1,267.93	87	SEMI CRITICAL
26	MELPATTI	872.76	782.68	69.06	851.73	98	CRITICAL
27	NATRAMPALLI	755.79	595.40	76.72	672.12	89	SEMI CRITICAL
28	NEMILI	1,712.15	2,022.20	100.40	2,122.60	124	OVER EXPLOITED
29	ODUGATHUR	1,268.49	1,048.40	112.79	1,161.19	92	CRITICAL
30	PALLIKONDA	997.56	1,137.20	135.31	1,272.51	128	OVER EXPLOITED
31	PALLUR	2,329.38	1,844.00	75.23	1,919.23	82	SEMI CRITICAL
32	PANAPAKKAM	2,283.05	1,650.75	75.33	1,726.08	76	SEMI CRITICAL
33	PARANJI	1,917.79	1,582.60	87.78	1,670.38	87	SEMI CRITICAL
34	PENNATHUR	859.75	765.05	108.92	873.97	102	OVER EXPLOITED
35	PERNAMPATTU	1,035.90	763.60	100.62	864.22	83	SEMI CRITICAL
36	PUDUPADI	1,854.30	2,073.05	55.38	2,128.43	115	OVER EXPLOITED
37	PUDURNADU	730.48	256.30	222.03	478.33	65	SAFE
38	RANIPET	1,075.22	810.03	136.05	946.07	88	SEMI CRITICAL
39	SATHUVACHARI	593.69	542.30	522.93	1,065.23	179	OVER EXPLOITED
40	SHOLINGHUR	980.45	686.29	131.23	817.51	83	SEMI CRITICAL
41	THENVELLORE	60.40	0.80	140.56	141.36	234	OVER EXPLOITED
42	THIRUVALAM	1,090.05	804.75	87.66	892.41	82	SEMI CRITICAL
43	THUTHIPATTU	537.61	389.45	398.49	787.94	147	OVER EXPLOITED
44	TIMIRI	1,672.84	2,014.80	189.61	2,204.41	132	OVER EXPLOITED
45	TIRUPATHUR	1,324.15	1,382.60	351.29	1,733.89	131	OVER EXPLOITED
46	USSOOR	586.29	583.60	63.62	647.22	110	OVER EXPLOITED
47	VADAVELLORE	57.04	15.60	136.43	152.03	267	OVER EXPLOITED
48	VADUGANTHANGAL	1,135.77	1,572.80	89.11	1,661.91	146	OVER EXPLOITED
49	VALATHUR	759.63	911.05	64.95	976.00	128	OVER EXPLOITED
50	VANIYAMBADI	604.53	565.65	514.94	1,080.59	179	OVER EXPLOITED
51	VELAM	1,284.35	852.60	135.42	988.02	77	SEMI CRITICAL

52	VISHARAM	1,138.83	779.20	119.14	898.34	79	SEMI CRITICAL
53	WALAJAH	1,662.87	1,254.90	147.88	1,402.78	84	SEMI CRITICAL
TOTAL		**58,970.76**	**54,257.79**	**6,548.26**	**60,806.05**	**103**	

4. Groundwater quality issues:

The rainfall is the main source for the availability of water both in surface and sub surface. The quantum of rainfall varies every year depending upon the monsoon. However, the extraction of surface and sub surface water is increasing year by year. It leads to environmental impact on the water sources like depletion of water level, deterioration of water quality. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes.

For the present assessment, the value of Total Dissolved Solids (TDS) have been considered for demarcation of good / bad quality areas. For this purpose, the TDS value of less than or equal to 2000 mg/l have been considered as good quality and the value more than 2000 mg/l have been considered as bad quality areas.

The presence of fluoride in natural Ground Water is having its merits and demerits depending upon the concentration. Presence of fluoride <1.0 mg/l in drinking water reduces dental diseases whereas higher level > 1.50 mg/l will affect the health and causes dental fluoridise. Nitrate is noted significantly in Ground Water due to use of chemical fertilizer for agriculture and other local pollution rocks and soils are also contributing nitrate to Ground Water. Arsenic is another poisonous heavy metal in Ground Water. The allowable limits for drinking purposes are 0.05 mg/l.

In Vellore District, the quality of Ground Water generally ranges from moderate to good quality both in the shallow dug well and bore wells except in & around the Kazhuveli tank, where the water quality is poor due to seawater intrusion in the lagoons during high tide seasons, the production of salt and Aquaculture farming.

5. Groundwater issues and challenges:

The groundwater quantity and quality are to be highlighted and may be analyzed in terms of :

(i)Problems posed by nature:

In terms of Quantitative aspects, nowadays, rainfall may more within the short period of duration. Due to this aspect, recharge is less and runoff will be more. The availability of groundwater is less due to over extraction than recharge. The Percentage of OE/Critical Firkas increased due to this reason. Increasing the artificial recharge structures in the proper areas may avoid the depletion of groundwater especially in OE/Critical Firkas.

(ii) Problems caused by anthropogenic activities:

The problems caused due to intensive groundwater extraction, intensive surface water irrigation, intensive mining activities, growing urban complexes and industrial establishments will lead to drastic depletion in groundwater resources only. Proper alternative recharge structures must be established.

(iii) Problems caused by socio-economic condition:

The land holdings of farmers may be different from another. One farmer having more than 5 Acres has less expense than a farmer having one acre. The free electric supply to all farmers have chance to extract more groundwater. To avoid this, proper guidance will be given to the farmers for the usage of groundwater.

(iv) Administrative issues:

To control, regulate and manage the Ground Water Resources in the State, there is no groundwater act, now in force. But, the **Chennai Metropolitan Area Ground Water (Regulation) Act, 1987** is in force and it extends to Chennai City and notified 302 revenue villages in Kanchipuram and Thiruvallur Districts, only.

The rest of Tamilnadu, **G.O.(Ms).No.142, Public Works (R2) Department, dated: 23.07.2014** and **G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** are regulate and manage the groundwater resources. The Government of Tamil Nadu had enacted the **Tamil Nadu Ground Water (Development and Management) Act, 2003**. However, this **Act was repealed on 14.09.2013**, in order to enact a comprehensive law to develop and manage the groundwater in the changed scenario in the State.

The pricing policy for groundwater users is also an important strategy in controlling the illegal extraction of groundwater by taking from lorries,etc. The

unused dug wells and bore wells can be used as artificial recharge structures will be good concept in recharging the ground water.

6. Groundwater Management and Regulations:

(i) <u>Statute/Law/Policy/Regulations if any</u>:

The Central Ground Water Authority has been constituted to regulate, control, development and management of ground water resources for whole country based on overall situation prevailing in India. But, the ground water conditions are varying from State to State. **Ground Water is a State subject and the State Government has every right to protect and regulate their own precious ground water resources according to the prevailing conditions in the State.**

The Tamil Nadu Government had enacted **"The Tamil Nadu Ground Water (Development and Management) Act, 2003"** which was subsequently **repealed in 2013**, so as to bring out an effective management Act considering the present scenario. **As an interim measure, for regulating the exploitation of ground water, the Government have issued G.O. (Ms) No.142,PWD dated 23.07.2014 for regulations for management of ground water for safe guarding the scarce groundwater resources in Tamil Nadu State.** In the absence of an Act, the Government executes this Government order to control, regulate and manage the Ground Water Resources while taking into consideration of the future of the State and its people.

The State Ground and Surface Water Resources Data Centre has estimated the Ground Water resources of Tamil Nadu State periodically in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Methodology evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

Accordingly, **the Ground Water Potential Assessment done as on January 1992 and as on January 1997 on the basis of Panchayat Union Blocks as assessment units** in Tamil Nadu and **categorized as Dark, Grey and White areas.** The Blocks with more than 85% to 100% ground water development were categorized as "Dark Blocks" and the blocks with ground water development

between 65% to 85% were categorized as “Grey Blocks” and less than 65% ground water development were categorized as “White Blocks” and the Government approved the categorisation and released as Government order and G.O.No:326, PW (R2) Dept, dated: 23.11.1993. It was in effect up to the next assessment done as on March 2003.

Subsequently, **the Ground Water Potential Assessment done as on March 2003**, **categorized the blocks as Over Exploited, Critical, Semi Critical, Safe, Saline instead of Dark, Grey and White blocks**. The Blocks with more than 100% were categorized as “Over Exploited Blocks”, the blocks in between 90% to 100% as “Critical Blocks”, the blocks in between 65% to 90% as “Semi Critical Blocks” and less than 65% as “Safe Blocks” and the bad quality blocks were categorized as “Saline Blocks” and the same was approved by the Government and released as G.O.No:51, PW (R2) Dept, dated: 11.02.2004. It was in effect up to the next assessment done as on March 2009.

The Next **Ground Water Potential Assessment done as on March 2009**, and the same was approved by the Government and **released as G.O.No:52,PW(R2) Dept, dated: 02.03.2012.**

As per G.O.No.52,PW(R2) Dept, dated: 02.03.2012 and G.O. (Ms) No.142,PW(R2)Dept dated 23.07.2014, the State Government have authorized and empowered the Chief Engineer, State Ground and Surface Water Resources Data Centre, Chennai for issuing permission or license or No Objection Certificate/renewal for drawal and transportation of Ground Water based on the hydro geological conditions to the New Industries, Packaged Drinking Water Companies, Infrastructures and Mining projects, etc except the areas to which the Chennai Metropolitan Area Ground Water (Regulation) Act,1987 extends.

Subsequently, the next **Ground Water Resources Assessment of the State was completed as on March 2011** and taking **Firka as an assessment unit** in the State of Tamil Nadu. Based on the above assessment, **the Government had approved and issued G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** for categorisation of the Firkas in the State as Over Exploited, Critical, Semi-Critical and Safe Firkas. All the Over Exploited and Critical Firkas are notified as **“A” Category** (where the stage of ground water extraction is 90% and Above) and all the Semi Critical

and Safe Firkas are notified as **"B" Category** (where the stage of ground water extraction is below 89%). In this Government Order, the Government had directed that **no Schemes should be formulated in the "A" Category Firkas and in "B" Category Firkas, all the Schemes should be formulated through State Ground and Surface Water Resources Data Centre by issuing No Objection Certificate for Ground Water Clearance.**

The term "Schemes" excludes Energisation of Agricultural pump sets by the Tamil Nadu Electricity Board. The present order may also exclude the Ground Water drawal for a). Domestic purpose by individual household, b). Domestic Infrastructure project (Housing), c).Government's Drinking Water Supply Schemes and d). non water based industries, (i.e.- the industries which do not require and use water, either as raw material or for other processing). However, the domestic use of water by this non water based industries will be permitted by the Chief Engineer / State Ground and Surface Water Resources Data Centre based on hydro geological conditions. (i.e. NOC from Chief Engineer, State Ground and Surface Water Resources Data Centre, Water Resources Department, Chennai). The list of non water based industries will be issued by the Industries Department of Government of Tamil Nadu separately.

Appropriate rain water harvesting and Artificial recharge schemes should be carried out in the categories viz , Over exploited , Critical , Semi Critical and Safe blocks of Tamil Nadu. While carrying out the above schemes, priority should be given to marginal quality and bad quality areas so as to avoid further deterioration.

All the schemes and proposals based on Ground Water will have to adhere to the Government orders and conditions. The Chief Engineer, State Ground and Surface Water Resources Data Centre had received the Government approval on Groundwater Assessment as on March 2011.

Regarding granting permission/ License for transportation of ground water for water suppliers/ private water tankers for selling the water on commercial basis, the State Ground and Surface Water Resources Data Centre, Public Works Department is not issuing any No Objection Certificate.

The Chief Engineer, SG&SWRDC have empowered to issue the NOC for drawal of Ground Water is up to 1 Million Gallons per day. Beyond this, the

firms should get an approval in Water Utilisation Committee for drawal of both Surface and Ground Water resources in Tamil Nadu.

(ii) <u>Suggestions for improvement of groundwater governance</u>.

Groundwater is recognized as a common pool resource. The use of groundwater by anybody should in no way cause adverse impacts on realization of other person's fundamental right to safe water for life. Access to groundwater without any discrimination, equitable distribution, and sustainable use considering the needs of future generations are considered. Right to water for life is the first priority and then to agriculture, and eco system needs. The precautionary principle and the polluter pay principle only to conserve and recharge groundwater.

The responsibility of the State for ensuring every person's right to safe water even when water service is delegated to a private agency. Groundwater is not amenable to ownership by the State, communities or persons and the State is the public trustee of groundwater. It also deals elaborately on groundwater protection and groundwater security plans.

The Groundwater Act should incorporate legal pronouncement on groundwater such as the public, trust doctrine and recognition of the right to groundwater. It addresses the deficiencies in the present legal frame work in dealing with over exploitation and includes the improvements to the control mechanism to ensure the qualitative and quantitative sustainability of groundwater resources. It proposes to strengthen the regulating powers of Panchayat and Municipal bodies related to Ground water in line with articles 243G and 243W of the constitution.

The Pricing of Ground Water for irrigation, Industrial and domestic purposes and collecting fees by water users association should be left to the State decision.

(iii) <u>Institutions governing/managing/monitoring the resources and Institutional structure, gaps if any</u> :

While framing the Groundwater Act, the recommendation for the constitution of (1) Gram Panchayat Groundwater Sub-Committee, (2) Block Panchayat Groundwater Management, (3) Ward Groundwater Committee, (4)

Municipal Water Management Committee, (5) District Ground Water Council and (6) State Ground Water Advisory Council to control and manage Ground water should be considered.

- The constitution of aforesaid committees is completely based on administrative boundaries such as village, block, ward, municipality, district etc. But, with respect to water resources control and management issues and conflicts, the boundary should be based on river basins to have efficient monitoring and management of water resources. The Government of India, in all issues related to water resources considered only the basin boundary concept. Hence, the institutional frame work has to be revised so as to have the jurisdiction of the committees with respect to basin / watershed concept. Further, Government of India, MoWR, RD &GR advocates time and again integrated water resources management. The above institutional frame work separately for groundwater is not in line with that.
- Further, it has also provided for many committees, viz., Gram Panchayat Groundwater Sub-Committee, Village Water and Sanitation Committee, Ward Committee, Municipal Committee, Block level Committee, District level Committee and State level Committee. For managing surface water resource water users association already exists. Too many committees at village / ward level would jeopardize the very purpose of managing the Groundwater resources efficiently and may invite lot of conflicts.

(iv) <u>Areas of people/private participation if any</u>:

The participation of people or private parties in the groundwater management is not suggestible, acceptable one and more chances of making litigations in the society and has unnecessary law and order problems may arise.

7. Tools and Methods

(i) Water Level and quality measurements through wells, piezometers, DWLR with telemetry, ground water elevation.

In general, water levels in the observation wells and piezometers can be taken manually by measuring tape. This is the simple, cost effective, good accuracy and less maintenance method. Water Levels are observed above the Measuring point.

Monitoring water level in DWLR with telemetry is costly, high maintenance, good accuracy, get the data immediately on desktop, easy to analysis purpose.

The water quality generally is analysed in the Chemical Lab only by collecting water samples in Pre Monsoon and post Monsoon period in the field. Sometimes, instant kits are used for analyzing the TDS and Ph level in the water.

(ii) Metering water supply to confirm contribution from groundwater.

Metering the water supply is essential one to monitor the overall usage of groundwater by different sectors. Flow meter must be fixed in every extraction structure and it has to be monitored periodically by Government officials.

8. Performance Indicators:

(i) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/ standards currently.

The Ground Water resources of State periodically estimated in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Norms evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

The ground water potential assessment can be assessed based on the bench marks such as Average Rainfall, Total recharged Area, Monthly Water Level Data, Total no of wells in the area, Irrigation methods adopted, Cropping pattern details, Geological conditions prevailing in that area, Specific yield, Seepage factor, Constructed Artificial recharge structures, etc and various calculations methods, etc, have to be considered.

Status of various Performance Indicators

(ii) Percentage of over exploited ,critical, Semi critical , Safe and Saline/Poor quality Firkas/area units

- Trend of over exploited and critical Firkas to total Firkas as per pervious assessment. (2009 Assessment Vs 2011 Assessment)

  The Ground Water Potential Assessment as on March 2009, Out of 20 blocks in Vellore District, 17 blocks are categorized as Over Exploited and Critical blocks and remaining 3 blocks are categorized as Semi Critical and Safe blocks.

The next Ground Water Resources Assessment of the State was done as on March 2011 and taking Firka as an assessment unit. In Vellore District, totally 52 Firkas, 29 Firkas are categorized as Over Exploited and Critical and remaining 23 Firkas are categorized as Semi Critical and Safe blocks.

Instead of taking Block as an assessment, Firka can be taken as assessment unit is to concentrate the assessment in micro level. For Eg, a block contains more than three to four Firkas. In this block, two Firkas may have good groundwater potential than other two Firkas but it may to categorize as Over Exploited. To avoid this, assessment done on the basis of Firkas for the benefit of farmers to the implementation of schemes related to Irrigation.

The percentage of over exploited and critical Firkas has been increased by changing the concept from Block to Firka assessment. The total percentage of over exploited and critical Blocks for 2009 Assessment is 85%, but, the total percentage of over exploited and critical Firkas as on March 2011 Assessment is 55.76%, in the Vellore District.

- Trend of over exploited and critical Firkas to total Firkas as per latest assessment

The percentage of over exploited and critical Firkas has been decreased in 2013 latest assessment when compared to 2011 assessment. In 2011 assessment, out of 52 Firkas, the total percentage of over exploited and critical Firkas is 55.76%, but, In 2013 assessment, out of 53 Firkas, it has been come down marginally to 64.15%, in the Vellore District.

- Existing state of groundwater resources as compared to previous assessment (2013 Vs 2011 assessment).

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 53 Firkas in the District, 26 Firkas are categorized as “Over Exploited Firkas”, 8 Firkas are categorized as “Critical Firkas”, 17 Firkas are categorized as “Semi Critical Firkas”, 2 Firkas are categorized as “Safe Firkas”.

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2011, Out of 52 Firkas in the District, 26 Firkas are categorized as “Over Exploited Firkas”, 3 Firkas are categorized as “Critical Firkas”, 20 Firkas are categorized as “Semi Critical Firkas”, 3 Firkas are categorized as “Safe Firkas”.

When compared to last assessment as on March 2011, the "Over Exploited Firkas" maintains the same as 26 Firkas, the "Critical Firkas" increased from 3 to 8 Firkas, the "Semi Critical Firkas" decreased from 20 to 17 Firkas, the "Safe Firkas" increased from 3 to 2 Firkas and the "Saline Firkas" remains Nil Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the "Over Exploited Firkas" by various departments.

S.No	Categorisation	No of Firkas	
		2011	2013
1	Over Exploited	26	26
2	Critical	3	8
3	Semi Critical	20	17
4	Safe	3	2
5	Saline	Nil	Nil
TOTAL		52	53

(iii) Water Level(Well hydrographs and water level trends – pre and post monsoon such as declining trend/rising trend,etc).

(iv) Comparison of area irrigated from groundwater resources (Current assessment 2013 to previous assessment 2011).

S.No	Description	2011 Assessment	2013 Assessment
1	Area Irrigated from ground water resources(In hm)	6538.07	6505.06

(v) No. of groundwater abstraction structures (existing no. over the year and trends).

S.No	Description	2011 Assessment	2013 Assessment
1	No of groundwater abstraction structures for Irrigation	1,71,071 Wells	1,70,983 Wells

(vi) Trend in water quality (no of habitations affected with groundwater contamination like As, F, Salinity etc. Change in contamination level over the years.

(vii) Source augmentation (Groundwater)

- Area covered with infrastructure for recharging groundwater:

  The proper artificial recharge structures has to be constructed based on local geological conditions in the areas of existing infrastructure for recharging groundwater according to their extraction needs.

- GW recharge plan to combat adversaries:

  Groundwater recharge plans has to be strictly followed by with of implementing the groundwater laws to combat adversaries.

9. Reforms undertaken/being undertaken/proposed if any.

10. Road Map of activities/tasks proposed for better governance with timelines and agencies responsible for each task/activity.