The study area is one of the taluk of Chamarajanagar district and it located in the south end of the Karnataka state India. Southern border of the taluk links with Tamilnadu state, to the West is Gundalpet and Nanjangud taluk and north is T.Narasipur to the east is Yelandur taluk. The taluk Comprises of 5 Hobli’s namely Chamarajanagara (kasaba), Hardanahalli, Harve, Santhemaralli, Chanadakavadi and the study area is lies between $11^040’N-12^015’N$ longitude and $76^040’E-77^015’E$ latitude with geographical area extent of 1235.9 sq. kms covering 190 villages coming under the Survey of India (SOI) toposheet nos.57D/12, 57D/16, 57H/4, 58A/9, 58A/13, 58A/14, 58E/1, 58E/2, 58E/5, on a scale of 1:50,000 and falls in southern dry agro-climatic zone. The physiography of this area may be classified as partly maidan/southern plateau, table land with plain and undulating and mountainous region.

Geology of the area is fall into Proterozoic basin of southern Karnataka and comes under the semi-arid type and underlain by hard rock terrain consisting peninsular gneiss, ultramafics, hornblende-biotite gneiss, charnockites and intruded by dolerite dykes of Proterozoic era.

Groundwater is one of the most valuable natural resources in the earth. It supports human health, economic development and Ecological diversity. Largest available source of fresh water lays in underground. Due to its several inherent qualities (e.g. consistent temperature, widespread and continuous availability, excellent natural quality, limited vulnerability, low development cost and drought reliability), increase in the agricultural, industrial and domestic activities in recent
years has increased the demand for good quality water to meet the growing needs and it has become an important and dependable source of water supplies in all climatic regions including both urban and rural areas. An approach for groundwater investigations is very costly, time-consuming and requires skilled manpower (Sander et al., 1996). As remote sensors cannot detect groundwater directly, the presence of groundwater is inferred from different surface features derived from satellite imagery such as geology, lineament, geomorphology, soil, land use/land cover, surface water bodies, drainage, slope, which act as indicators of groundwater existence in the this area. Groundwater potential zones were delineated by using remote sensing and geographical information system (GIS) techniques drawing from a database that includes climate, geology, lithology, geomorphology, drainage pattern, lineament density, soil and topographic slope, satellite data and geophysical data.

The recharge capacity and groundwater quality is decided by the soil types and their texture. Main soil types identified in the area during the course of field visit are (1) Clay soil (2) Sandy clay soil (3) Sandy loom and (4) Gravel sandy loam. Soil structure and texture which are controlled by the percentage of gravel, sand, silt and clay play a dominant role in the ground water infiltration. The soil map has been helpful in delineating run off potential zones.

Structurally, the study area displays shears, joints, faults and lineaments which appear to be moderate in the intensity of developing. They are small to moderate in extent with variable dipping. They too have played some role in groundwater percolation. As joints, fractures, and shears are smaller and localized, they could not be quantified through remote sensing data. The study area work the satellite data of IRS IC and ID-LISS 111, georectified satellite images with spatial resolution
of 23.5 m obtained from NRSC and geological maps from the GSI were used. Lineaments on the image have been identified through visual interpretation by using stream alignments, vegetation, soil tonal changes and abrupt topographic changes. Based on this image interpretation of the area is recognized as eight major and eighty-eight minor lineaments. These representative lineaments have been demarcated N-S, NE-SW, NNE-SSW, NNW-SSE and E-W directions and numbers of major and minor lineaments length in formation gneissic terrain and also similar to the rose diagram of orientation distribution of lineaments demarcated the directions. The lineaments representing dykes are oriented in NW, SW and almost NE directions.

The lineaments map that areas of maximum concentration and intersections of lineaments indicate that these areas probably potential areas of groundwater accumulation. Higher concentrations of drainage lineaments are noticed in the southern and western part of study area where as low to moderate concentration of lineaments are noticed in northern portion.

The study area is controlled by the monsoon and can be classified into three categories (1) Pre-monsoon (2) SW monsoon (3) Post monsoon. Meteorological data, incoming solar radiation, wind velocity, temperature, relative humidity, sunshine, evaporation, evapotranspiration, rainfall distribution have been analyzed. The study area indicates that the mean maximum temperature is 34°C and the mean minimum temperature is 16.4°C. The annual rainfall is received 696 mm and average elevation is 656m above means level (AMSL). The relative humidity (Rh) is low during the month of March (72.10) at 8.30 AM and high in the month of May (79.50) at 8.30 AM and low (33.23) at 5.30 PM in the month of December, high in the month of September (66.60) at 5.30 PM.
The geomorphology of the area is as partly southern maiden region, plain to undulating region and major drainage of suvarnavathi and chikkahole drains are the tributaries of Cauvery. The different land forms discernible on the satellite imagery have been broadly classified into denudation and very less fluvial landforms. Geomorphic units of delineated in this area are residual hill, denudation hill, structural hill, dissected hill, pediplain, pediments, linear ridges and valley fills.

The geomorphologically, identified the delineated such as valley fill shallow and pediplain moderate and presence of number borewells are considered very good to good groundwater potential zones where as pediplain shallow area presence of borewells are considered good to moderate, pediment inselberg complex and pediment zones few number of borewells in these area indicates that are moderate to poor potential groundwater zones covering in all the sub basins of the study area. Denudational, structural and residual hills are characterized by the topographically sloping with high surface runoff and considered favourable zones for very poor groundwater potential zones. In these zones, the lineament density is very low and there is no borewell data available for these zones.

Morphometry is the measurement and mathematical analysis of the configuration of the earth surface, shape and dimensions of the land forms. This analysis can be done through measurement of linear, relief and aerial aspects of the basin and slope contribution. The morphometric parameters like stream order, stream length (Lu), mean stream length (Lsm), stream length ratio (RL), bifurcation ratio(Rb), mean bifurcation ratio (Rbm), relief ratio (Rh), drainage density (D), stream frequency (Fs), drainage texture (Rt), form factor(Rf), circulatory ratio (Rc), elongated ratio(Re), length of overland flow (Lg) have been carried out with respect
to the four sub watershed basins. They are Kamaravady, Udigala, Haradanahalli and Attigulipur sub watershed basins.

As per the field verification and the remote sensing data, the area is represented by dendritic to sub dendritic type of drainage pattern. Out of these sub basins Udigala is IV order stream where as the Kamaravady, Attigulipur and Haradanahalli are III order stream. It is noticed that the maximum frequency is in first order stream and also observed that there is a decrease in stream frequency as the stream order increases.

The morphometric parameters result are (1) flowing of streams from high altitude, change in rock type and moderately steep slopes. (2) The topographic elevation and slope of the area might be changes by deviation. (3) The variation of stream of orders indicates that late youth stage of geomorphic development. (4) In the case of, bifurcation ratio, the higher values are indicates that strong structural control in the drainage pattern and lower values are structural disturbance. (5) In the case of, drainage density and drainage factor is related to climate, types of rock, infiltration capacity, vegetation cover, surface roughness, runoff, intensity index. Drainage density values of the sub basin and the watersheds are all indicative of very coarse to coarse drainage texture which is having highly permeable sub soil, dense vegetative cover and low relief. (6) In the case of, stream frequency, higher value indicates that more slope from the surface runoff. In study area values range from 1.7-2.04 which indicate that streams are being controlled by fractures and plain land. (7) In the case of, form factor would always be greater than 0.78 for a perfectly circular basin and smaller value is more elongated will be the basin. In study area, it is noticed that values are range from 0.33 -0.67 all four sub watershed is elongate the circular
shape. In the case of circulatory ratio, the values are more than 0.5 indicate that more or less circular shape and characterized by high to moderate relief and drainage system were structurally controlled. In study area values are range from 0.62 -0.92 i.e. circular shape.

The slope analysis reveals that most of the area slope class nearly level, very gentle slope, gentle slope and all the borewells located in these categories but no borewells located in the slopping areas. The slope and its aspects information have been derived from SOI toposheet on 1:50,000 scale by adopting template method and using guidelines described by AIS &LUS on slope categories.

The slope percentage in the area varies from 0 to 50%. The areas having 0 to 1% slope fall into the ‘very good’ category because of the nearly flat terrain and relatively high infiltration rate. The slope of 1 to 3% is considered as ‘good’ for groundwater storage due to slightly undulating topography with some runoff. The slope of 3 to 5% causes relatively high runoff and low infiltration hence are categorized as ‘moderate.’ The fourth (5–10%) slope are consider as moderate to Steep (Poor) and fifth (10–15%) slopes are considered as moderate to very steep (Poor) and (15-35%) slopes are steep, 35-50% slopes are considered as very steep slope categories are considered as ‘poor’ due to higher slope and higher runoff.

The land use/land cover maps were prepared using satellite images on 1:50,000 scale and topographic maps were used as reference on the same scale. The methodology adopted according to the NRIS Node design and standards for classification of various land use/land cover classes.
The different land use/land cover classes like settlements, crop land, agricultural plantations, scrub degraded forest, forest plantation, land with scrub, land without scrub, barren rock/stony waste, rivers. Streams and tanks were delineated based on the double cropped area and agricultural plantations are mainly noticed along valleys and tank command areas. Land cover and land use visual interpretation of IRS-1D LISS 111 FCC of band 2, 3, 4 on 1:50,000 scale was carried out and various land use/land cover categories were delineated.

The various land use/land cover classes delineated in the area are (1) Vegetation (2) Forest (3) Land with or without scrub (4) Fallow land

Various kinds of vegetation seen in this area and there are two classes (1) Cultivable land and (2) trees and groves. In the study the cultivable land is covered by 67315.0 hectares and trees and groves have 1180 hectares coconut trees and Eucalyptus Vegetation ranges from Sub tropical thorn forest to mix deciduous and Eucalyptus plantations available in the area. Ground cover status-Shrub, Herb, Climbers, Grass etc.

Forest area is occupies the hilly terrain of eastern part and it’s covered by 26903 hectares and which comes under the control of the forest department as reserved forest and social forest 45, 5 hectares. In this area most of the forest belongs to the reserved forest with a flora of acacia, Albizia, Hardwickia, and Tectona, Dillenia, Eucalyptus granidis and grassy meadows and low wooded patches exist in the area. Fauna with wild pig, wild dog, cats peacocks, wolves and foxes, elephants exist in the area.
Land with or without scrub is undulating topography with thin soil cover and scattered trees/scrubs. This land use class occurs in two categories 1. cultivable waste 2921 hectares 2. Permanent pasture 11703 hectares. These lands are being used for grazing and ideal sites for plantations. The total area under this category is calculated as 14624 hectares. The fallow lands has 13087 haters and which comes under the central part of the study area.

The distribution of different hydrogeochemical parameters like Ca, Mg, Na, K, CO\textsubscript{3}, HCO\textsubscript{3}, Cl, F, NO\textsubscript{3} and SO\textsubscript{4} in groundwater of the study area, their source and influence on the quality are described, the hydrogeochemical classification has been done through Wilcox, USSL and Piper diagrams.

In generally, Total Dissolved Solids concentration is the sum of the cations (positively charged) and anions (negatively charged) ions in the water. The cations are Ca, Mg, Na, K, Fe and anions are HCO\textsubscript{3}, CO\textsubscript{3}, Cl, NO\textsubscript{3}, and SO\textsubscript{4}. In the study area of TDS concentration ranging from 79 to 1572 parts per million (ppm) and about 47.5% of the water samples (25) falls under the dominant is all the places and 49.4% of the water samples fall(16) under the centre as well as few of them north western place and 3.1 % of the water sample (05) falls on the central part of the area.

The EC ranges from 471 (Madapur) to 3043 (Kagalavady) micro mhos/cm at 25\textdegree C. Groundwater can be classified based on the electrical conductivity as during season about 1% of the samples are excellent quality of water, about 5% of the samples are good, about 6% of the samples are permissible.

The hydrogen ion concentration (pH) in the ranges from lowest concentration in Kadahalli Village (6.26) to highest concentration in Honnahalli Village (9.45) with an average around 7.85 which indicates that alkaline/caustic nature. The Ca
concentrations of study area vary from Kiligere Village 4 to Kotamballi Village (208 mg/L fluctuation in the water levels.

Sodium is highest value of represented in the study area of Masagapur village (275mg/L) and the lowest value in the village Kannegala and Govindavady (27mg/l) and Mg is highest value of 108.mg/L in Kotamballi village and lowest 8 in Aralikate, Kengaii villages. the concentration of K ions varies from lowest village Honganur, Mudnkod (1Mg/L) to highest village Yanagumba (38 mg/L). Heighest value of bicarbonate noticed in the village masgapura i.e 887 mg/L and lowest noticed in honnehalli i.e 135 mg/L. The concentration of NO₃ varies from lowest in village Hoganur, Madapur (0 mg/L) to highest in village Kagalavady (285mg/L).

In the investigated area 89.00 percent of the water have corrosive ratio (CR) of less than one (Safe zone) at same time 11.00 percent samples have (CR) more than one (Unsafe zone). Area falls under the safe zone, in the study area where groundwater has CR values >1 Polyvinyl Chloride (PVC) pipes are recommended to transport water.

In the investigated area of salinity sodium hazard, water samples fall in the category C3S1 and C4S2, indicating high to very high salinity and low to medium alkali water.

The TH which indicates that around 80.45% the study area is covered by permanent hardness and 19.55% of the area is covered by temporary hardness. Within permanent hard water A₃ similar to B₂, A₁ is predominate by A₂.

The vertical electrical sounding study reveals that the general depth of groundwater occurrence is deciphered mostly to be in the range of 160-370ft in rain fed (non-command) areas and 45-160ft in command areas. The depth of the soil cover
is 20-85 ft. hard bed rock is normally encountered at 90 – 210 ft. most of the geophysical investigated sites showed possibility of high yield along the canal courses and canal irrigated areas, considerable recharge is also deciphered along the tank areas. The Geophysical result matching with geological and geomorphological characteristics of the study area from the point of ground water potential zones falling the areas of Chamarajanagar forest, Doddabeta, Banavadi, Kannagala, Masagapur, Nanjarayanpur, Shivapur, Mudnkod, Haradanahalli forest, Hosapura, Bogapur, Kuder mole etc.

Satellite images are interpreted using image/photo interpretation keys such as color/tone, texture, pattern shape, size association, drainage, topography etc., to derive hydrogeomorphological maps. In the present study area Remote Sensing and GIS techniques were used to carry out the study on Groundwater potential zones of Chamarajanagar taluk. In the view of the satellite images was interpreted to prepare various themes which mainly include lithology, geomorphology, slope, landuse/landcover, lineament, soil map, drainage map, groundwater prospect and etc. The SOI topographical maps and other maps were used for preparation of base maps. The thematic maps so prepared by interpretation were digitized in Different GIS softwares, like ArcMap 9.2, ERDAS 9.1. This information is integrated to assess the suitability of sites to locate the ground water potential zones.

Integration of the multithematic information has been carried out by overlying the maps (in the Arc Gis 9.2, MapInfo 7.5, Erdas 9.1,) like hydrogeomorphology, geology, lineaments, soil, aquifer resistivity, thickness of weathered zone, land use/land cover, slope etc.