9. Integrated Study

Hard rock areas pose difficulties in measuring groundwater parameters, by traditional methods. It has however become possible to do so through various means available to us now, remote sensing being one such. Lineaments are a means by which some of the basic characteristics of groundwater hydrology could be analysed and understood. There are other means by which hydrochemistry could also be understood. In the integrated study, several correlations are plausible. To name a few, geology, lineaments, electrical resistivity and hydrochemistry, surface and groundwater bodies are possible. Similarly, water level, geology and electrical resistivity could be studied in an integral way. Lineaments and hydrogeology could be integratedly analysed and conclusions could be drawn as to the nature of integration itself and the relevant relationships on the other.

In hard rock terrains, folds and faults and the inter-connected system of fractures, joints and also the fissure openings in rocks are mainly the result of
tectonic phenomena of the earth's crust. Mapping of lineaments is very useful, particularly in hard rock areas, where the direction and movement are greatly influenced by these linear features. In the study area, a major part of the area is fully underlain by Hornblende Biotite Gneiss. The tributaries of the river branch out irregularly in all directions and join the main stream at all angles. These characteristics are typical of dendritic and subdendritic drainages which reflect the homogeneous character of the subsurface materials in the basin. The drainage network is mainly controlled by the irregular fracture system.

Quality of water can be deduced from resistivity analysis. In this analysis, as we have seen before, the electrical properties are measured and then matched with quality parameters. The low resistivity zones identified by the electrical properties of rocks match highly with the zones of groundwater salinity. The groundwater salinity, it has been found, ranges from 500 to 1000 ppm. It gives a clear picture that the area has a good amount of water and also good quality of water.

In the Ayyar basin, there are 63 major and minor tanks with an area of 27136.41 m². The total water
holding capacity of the tanks is about 109,578 m$^3$. Hence, the surface water availability in the area is not very appreciable and most of the farmers depend on the groundwater resources for their irrigation needs. The storage of groundwater is calculated using the saturation thickness of the aquifer and it can give an yield of 182.693 mm$^3$.

It must be emphasised that the surface and groundwater components of the total water resources are interdependent. Changes in one component do have far reaching effect on the other. It is concluded that the run-off is higher when compared to infiltration and that may be primarily due to the relief and rock characteristics of the area.

Figure 2.3 (Fence diagram of the sub-surface lithology) indicates that the thickness of the weathered Gneisses and Charnockites is large and it reflects the deformation of the aquifer zone, which is highly correlated with high water level fluctuations. It is concluded that the fluctuation is mainly dependent upon the large weathered thickness. The grid-deviation water table (also Figure 4.4) reveals that the wide spacing of contours and their disposition are suggestive of almost
a flat and a gentle gradient of water table and high permeability of the formation material. On the other, however, there is positive deviation in the upper half of the basin and negative deviation in most of the lower and the tapering half of the basin. It must be understood that the positive zone is a recharge horizon and the negative a discharge horizon. Low permeability is also indicated where the negative contours are somewhat closely placed. Hence, artificial recharge projects can be planned in the recharge horizon of the basin.
COMPARATIVE STUDY

THEIS'S RECOVERY METHOD

From Appendix E and Fig 9.1 for the well number 18 located in Eraguid, we can read the values of well discharge (529 m³/day) and residual drawdown difference per log cycle of time $S'$ (1.40m) and substitute them in the following equation

$$T = \frac{2.30 \times Q}{4\pi \Delta s}$$

$$T = \frac{2.30 \times 529}{4 \times 3.143 \times 1.40}$$

$$T = 69.13 \text{ m}^2/\text{day}$$

JACOB'S METHOD

Same location has been selected for this method, and the $\Delta s$ will taken from fig 9.2

$$T = \frac{2.30 \times Q}{4\pi \Delta s}$$

$Q = 529 \text{ m}^3/\text{day}$

$s = 1.50$

$$S = \frac{2.25 \times T \times t}{r^2}$$

$r = 2.62 \text{ m}$

$$t_w = \frac{25/1440}{\text{day}}$$

$$T = \frac{2.30 \times 529}{4 \times 3.143 \times 1.5} = 6.52 \text{ m}^2/\text{day}$$

$$S = \frac{2.25 \times 64.52 \times 25}{2.62 \times 2.62 \times 1440} = 0.368$$

Hence the values of transmissivity ($T$) (Theis's method) and values of storage co-efficient ($S$) (Jacob's method) and more or less matched with the computed values.
WELL NO-18
LOCATION: Eragudi

RESIDUAL DRAWDOWN, S'(M)

\[ \Delta S' = 1.4 \]

TIME DRAWDOWN GRAPH
(THIB'S RECOVERY)

FIG. 9.1