SUMMARY AND CONCLUSION

The results of the various kinds of groundwater investigations carried out in the Ayyar river basin are summed up here under.

1. The surface water studies indicate that there are 63 major and minor tanks are present in the basin with an area of 24,136,41 sq.m. and the total water holding capacity of the tanks are about 109,578.00 cub.m. The surface water availability is not very appreciable and most of the farmers depend on the groundwater resources.

2. Falling under As’ type, climate of the Ayyar basin is hot and dry. It has been classified as tropical accentuated bioclimate and tropical moderate bioeric bioclimate.

3. The Ayyar basin falls in the rainshadow of the southwest monsoon. Rainfall increases radially from the centre of the basin.

4. Ayyar basin is an undulating plains, flanked by hills: pachamalai and the southern extension of kollimalai. The hills are the much denuded remnants and have elevations higher than 1200 m and the lowest of the elevations is 80m.

5. The geological map
has been prepared using IRS-1A LISS II imagery and field truth. The basin is underlain by the crystalline archaean and the groundwater occurs under phreatic conditions in the weathered and fractured zones. The average annual rainfall of the basin has been found to be 722 mm.

6. Weathered gneisses are the parent material of the soils of the basin. In the plains, there are patches of black soils. Red loamy soils are found in the north of the area.

7. Top soils have a small veneer of thickness. Jointed and hard gneisses occur in selected places. Weathered gneisses occur in all villages in the basin.

8. The basin is located in between some major faults and the entire formation is highly sheared. Joints and fractures are parallel and perpendicular to fault zones adjacent to the basin.

9. A perusal of drainage map of the basin has revealed that the river Ayyar is consequent. The tributaries branch out irregularly in all directions giving rise to a dendritic pattern reflecting the homogeneous character of the subsurface geology.
10. Following, strahler's system of stream ordering, the Ayyar basin has been divided into 23 sub basins of the orders III and above. The main stream has been found to be of VII order. The triangularly hatched areas separating the sub-basins with low drainage density, low stream frequency and low relief have been demarcated as potential zones for groundwater development.

11. Factor analysis have been made for morphometric data and the results revealed that they have the greatest influence on the form and process of this drainage basin. A pictorial representation of the morphometric characteristics of the basin has been projected as a model and can be used to infer the dominant parameters typical of any part of the basin.

12. Identification and delineation of various hydrogeomorphologic units, landuse and land cover have been carried out through digital image processing techniques of IRS 1A LISS I data. The results of factor analysis of morphometric data and the principle components analysis of satellite data are compare well.
13. Water levels from 86 wells monitored during two seasons have been used to prepare water tables contour maps for both pre and post monsoon seasons. In the pre-monsoon, the water table ranges from 80 to 250 m. Post monsoon water table indicates a more or less uniform rise, 2 to 4 m, due to uniform, monsoonal recharge. In both seasons, however, the flow pattern is similar. The river remains effluent throughout the year.

14. Water levels data pertaining to twenty years have been used to prepare the grid deviation water table map and recharge and discharge zones of the basin have been marked. Artificial recharge projects through infiltration ponds can be planned in the recharge zones demarcated in the basin.

15. The annual water level fluctuation varies from 2.12 m to a maximum of 8.64 m. Study of selected well hydrographs drawn for a twenty-year period from 1971 has revealed a long term declining trend in water table. This is a reflection of over extraction of groundwater.

16. Drawdown and recovery data for 35 dug-well pumptests have been analysed to evaluate the aquifer parameters and yield characteristics. The gneisses constituting
the major part of the hard rock geology have given
the following results.

<table>
<thead>
<tr>
<th>Aquifer Parameters</th>
<th>Maximum</th>
<th>Minimum</th>
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</thead>
<tbody>
<tr>
<td>Transmissivity (m²/d)</td>
<td>468.0</td>
<td>25.00</td>
</tr>
<tr>
<td>Storage co-efficient</td>
<td>1.0</td>
<td>0.18</td>
</tr>
<tr>
<td>Slichter's average specific capacity (lpm/m)</td>
<td>649.0</td>
<td>31.00</td>
</tr>
<tr>
<td>Maximum time required for full recovery (Hrs)</td>
<td>105.0</td>
<td>3.80</td>
</tr>
<tr>
<td>Optimum yield (M³/d)</td>
<td>138.0</td>
<td>11.00</td>
</tr>
</tbody>
</table>

Zones of high transmissivity are associated in the lineament intersection.

17. Statistical probability studies of the aquifer characteristics have also been carried out. A median transmissivity value of 100 m²/d has been obtained for the gneisses and this value can be used to classify a well in the basin as fundamentally a success or failure. The statistical analysis of image index and saturated thickness of the aquifer has indicate that an optimum saturated thinkness of 2.5 m will be suitable for well design in the basin.

18. The vertical electrical soundings carried out in 83 locations using Wenner electrode configuration have
been analysed using different methods and the geoelectrical parameters determined. These results have been translated into subsurface geological details. Such studies have shown that the maximum weathered and joined zones thickness is 56.5 m. and the minimum thickness is 3 m.

19. There is a high transverse resistance coinciding in the high transmissivity areas in the north of the basin. It is the reverse in the southern basin. Having deeper basement topography, the basin has moderate to high longitudinal conductance.

20. By integrating the results of the resistivity survey and water table data a groundwater development map delineating areas favourable for the dug wells, dug-cum-bore wells and borewells has been presented.

21. Water samples collected from 40 representative large diameter wells have been analysed for their major ion concentrations. The groundwater has been classified using the criteria of Handa, Piper, Stuyfzand and U.S.S.L. schemes. Spatial variation maps depicting (i) total dissolved solids (ii) groundwater hardness. (iii) Salinity and sodium hazard (iv) index of base exchange (v) groundwater types and (vi) corrosivity
ratio of groundwater have been prepared to project the regional quality behaviour of groundwater. 22. Groundwater with both temporary and permanent hardness occurs in the basin.

23. The Schoeller's chloride dominated water types and high CaCO₃ saturation indices of most of the water samples reflect a greater residence time of the groundwater in the aquifer. The chief mechanism controlling the chemistry of groundwater of this basin is the chemistry of rock types.

24. Nearly seventy percent of the water samples fall in C₂S₁, C₃S₁ and C₃S₂ classes of the U.S.S.L. diagram and may be rated safe to marginal for irrigation use.

25. First three factor components contributing to the chemistry of the groundwater have been identified. The first factor component is weighted on the group Cl, Na+K, Mg, CO₃ and Ca. This contribute 42.88 percent of the total variance. The dominance of the chloride ion is again indicative of the longer residence time of groundwater in the aquifer. With the help of the positive scores made by the individual samples with reference to the three factor components, a hydrogeochemical model of the basin has been developed. Factor analysis of seasonal
groundwater chemistry shows that there is no seasonal variations.

26. Within the limit of the available data, a few selected methods of estimating the groundwater recharge have been attempted. The annual groundwater recharge comes to 57.40 million cubic meters by the rainfall infiltration method and 34.18 million cubic meters by the hydrodynamic method.

27. The groundwater flow model of the Ayyar basin has been developed and simulated. The inflow outflow volumes have also been evaluated. The excess of inflow over the outflow may be due to the surface water recharge and agricultural recharge.

28. An integrated analysis has been made in the Ayyar basin. Integration has been accomplished by different parameters. Lineaments and drainage patterns, quality and quantity of water, surface and groundwater and sub-surface lithology and water level fluctuation have been analysed in an integrated fashion.