INTRODUCTION TO SALEM
SUB-BASIN
CHAPTER I
INTRODUCTION TO SALEM SUB-BASIN

1.1 Introduction

The depth to the water table varies widely in crystalline rocks generally due to undulating topography. In hard rock areas two zones can be generally identified.

1. Weathered zone and
2. Hard rock with water bearing joints and fractures.

In the weathered zone, part of the bed rock, the groundwater occupies the intergranular spaces of the formation. The yielding capacity of this zone is often limited and is seasonal in character. In general, this zone does not contribute appreciably to borewell yield and the contained water can be tapped only by constructing large diameter wells. In most bore-wells, this zone is completely shut off by casing.

The saturated fractures or joints found in the relatively unweathered bed rock at greater depths are capable of yielding a substantial quantity of water. These fracture and joints are mostly horizontal in nature and interconnected with a network of joints and fissures. The yield from these zones is not readily affected by seasonal changes. In hard rock areas such saturated zones are normally found at depths ranging from 40-60 metres. In tectonically disturbed zone, such as the study area, they
may even occur at greater depths of 150 metres or more. In this zone large vertical fractures may also contribute substantially to the yield of bore-well. Deep-seated shears and tension fractures, thrust faults and folds may localise productivity along certain well-defined linear zones. In such tectonically disturbed zones significant permeability may be developed in the deep-seated fractures and these water bearing fractures may be encountered at deeper levels.

1.2 Location of the Study Area

The Salem sub-basin is located in Salem district and forms the part of Thirumanimuthar minor basin, which is a branch of Cauvery basin (Fig.1). It includes parts of Kurumbapatti Reserved Forest, Kapputhu Reserved Forest, Nagaramalai Reserved Forest in the west, Jarugumalai Reserved Forest and Jalluttu Reserved Forest in the south and Godumalai Reserved Forest, Velampatti Reserved Forest in the east and Shevaroys and Chitteri Reserved Forest in the north (Fig.2). The sub-basin is bounded on the north by Kadayampatti sub-basin, and Valasaiyur sub-basin; Attayampatti sub-basin in the south, Valappadi sub-basin in the east and parts of Sarabanga minor basin in the west. The sub-basin area lies between the co-ordinates of latitude 11°35' to 11°47' north and longitude 78°5' to 78°21' east. It comprises part of the toposheets 58 I/1, I/2, I/5 and I/6 published by the Survey of India (1972).

The total area of this sub-basin is about 342 sq.km.
1.3 Previous work

The study area has been studied by Government agencies like Public Works Department (PWD), Tamil Nadu Water Supply and Board (TWAD), Central Groundwater Board (GGWB), etc., to locate groundwater sources, water quality, pump test and fluctuation of water level periodically. Rengarajan (1986) made hydrogeological studies in Attur Valley and brought out hydrogeological variations within the Attur Valley. He observes that within a small span of few metre one come across highly productive wells, barren wells, potbale wells and highly saline wells. Jayakumar and Ravindran (1990) studied the origin and bioavailability of fluorine as toxic element in groundwater source at sengattur, Salem district.

Besides, there are also number of private consulting geologists who have surveyed the area geophysically for locating groundwater potential.

1.4 Objectives

The main objective of this study is to investigate the hydrogeology of the Salem sub-basin and to assess its geological formation, groundwater potential and quality of groundwater for domestic, industrial and agricultural purposes. The study is based on geohydrological conditions employing various techniques such as geophysical, geochemical, remote sensing and hydrogeological studies.
Salem district is known for its scarce water resources in view of low annual rain fall, absence of perennial water flow in the Thirumanimuthar river.

Under these conditions of poor surface water resources the next step is to seek sub-surface water resources for the requirement of the district. The author has taken the study of Salem sub-basin and investigated the hydrogeological conditions using detailed geological, geomorphological, geophysical, geochemical and remote sensing data. An integrated approach has been made to identify the favourable areas for groundwater resources with the available data. Hydrogeochemistry has also been used to study the quality of groundwater in the sub-basin and the same has been classified for drinking and irrigation purposes.

1.5. Methods of Study

1.5.1 Remote Sensing Techniques

Available maps prepared from Landsat imagery pertaining to Salem sub-basin has been studied by the author. From the above maps, the author has noted major lineaments, stream pattern and fault zones, and the same has been checked during the field work.

1.5.2 Field Geological Mapping

The base map of the Salem sub-basin has been prepared from the toposheets (1:50,000 scale) 58 I/1, I/2, I/5, and I/6 published by the Survey of India in the year 1972.
Systematic traverses were conducted to establish the lithological boundaries. Bearings were taken with the help of Brunton Compass in reference to prominent villages and other land mass located in the base map. Actual and inferred contacts of the various rock units occurring in the study area are represented in the geological map (Fig.3).

Lineaments, faults, folds, shear zones, fracture zones and joints were carefully checked in the field.

1.5.3 Hydrogeological Mapping

The work includes inventory of the existing wells in the study area, collection of water level data, collection of water quality data from TWAD office at Salem Circle.

The above studies aim at a quantitative assessment of the groundwater resources of this region so as to prepare a scientifically detailed plan for its exploitation. The systematic hydrogeological surveys normally include:-

(i) Geological mapping and determination of possible groundwater sources of the area,
(ii) Preparation of water table maps,
(iii) Detailed well inventory from the existing wells,
(iv) Observations of groundwater table fluctuations,
(v) Vertical electrical soundings (VES) and
(vi) Preparation of figures and tables showing water quality.
FIGURE 3: GEOLOGICAL MAP OF SALEM SUB BASIN

LEGEND

REFOLDED STRUCT.
SHEAR ZONE MUSCOVITE
PEGMATITE
SHONKINITE
PYROXENITE (1)
ESABROIC ROCK
PERIDOTITE
DUNITE
RETRACED SNEIS
(DIORITE, BIOTITE GNEIS
DOLERITE
HORNBLEND-BIOTITE GNEIS
CHALCOCITE (GARI
PYROXENE GRANULITE
BANDED MAGNETITE GNEIS
PYROXENITE (1)
GARNETIFEROUS META GNEIS

SCALE
0 1 2 3 4 5 km.
Quality of water studies include collection of water samples from dug-wells, as many as representative localities as possible within the study area and carrying out partial and complete chemical analysis of the same with a view to determine the suitability of water for domestic, agricultural and industrial uses.

1.5.4 Compilation of Hydrogeological Data

The data collected from the Government agencies and by the author has been correlated to locate suitable groundwater sources. The observations made by the author on structural aspects of the region augments well with the observations made by earlier workers on the hydrogeological conditions of this sub-basin. The above data of Salem sub-basin are discussed in the following chapters.