CHAPTER III

METHODS OF INVESTIGATION

Methods of investigation used in the study area include geological mapping, soil survey for irrigation and engineering purposes, survey for material resources and survey for ground water conditions.

GEOLOGICAL MAPPING

The geological mapping was carried out on a base map of 1 inch to a mile scale. The contact between Dhrangadhra Group and Deccan trap was observed near Daldi, Dighalia, Palasadi, Bokadthamba, Khashiagala and Bhaduka. The contact between Wadhwan Group and Deccan trap was observed near Sayla, Gosal, Phulekhi, Bhaduka, Sidsar, Muli, Gadhad, Tikar and Khatdi. In the study area the contact between Dhrangadhra Group and Wadhwan Group was not traceable continously but was observed in the river sections of Bhogavo-I at Dolia, Bhaduka, Umarda and Tidna.

All these contacts were delineated on the base map. Various profiles of quarries and hill sections were examined to establish the general geological sequence of this area. About fifty rock samples were collected during

the different field traverses. These rocks were examined in the field for their lithology and structural features and their thin sections were studied in the laboratory for their mineralogical and textural characteristics.

SOIL SURVEY

Soil surveys were carried out with two different aspects, viz. Soil survey for soil/land irrigability classification and soil survey for its use as construction material.

(a) SOIL/LAND IRRIGABILITY CLASSIFICATION:

The rapid reconnaissance soil survey method for soil/land irrigability classification was made by auger sampling. Survey of India one inch to a mile Toposheet No. $41\frac{N}{2 \& 6}$ was used as the base map. Thirty augerbores sites were fixed on a grid of approximately 47.93 sq km. Auger sampling was carried out to get required informations of the soils in relation to the geological formations of the area (Map III.1). Portable posthole auger (Fig.III.1) in dry season was used to collect the soil samples from 30 augerbores (Plates III.1 & III.2). Depth of sampling was limited upto the hard stratum or 125 cm, whichever was less. At each augerbore site, the first two soil samples

PLATE NO. III.1

Portable Post-hole Auger: Method of operation (Stage I).

PLATE NO. III.2

Portable Post-hole Auger: Method of operation (Stage II).

were collected irrespective of colour and texture variations, at 15 and 30 cm depths from the surface. The remaining samples were drawn from various depths in accordance to the variations in soil colour and texture. The field identification of each soil sample was made to determine its colour, texture, moisture and lime content. Soil colour was identified according to the colour shown in Munsell colour charts, along with its descriptive name. Soil texture was studied in the field by 'feel test' method using distilled water. Soil moisture was indicated as dry, just moist and moist depending upon the presence of moisture in the soil sample. Each soil sample was tested with dilute hydrochloric acid to determine lime content. The effervescence due to lime reaction was recorded as nil, feeble, vigorous and violent.

The soil samples from field, were air dried, reduced in size by coning and quartering, and sieved to get required soil fractions for laboratory tests (IS:460 - 1962; Appendix III.1 p.246). Soil fraction passing 2 mm IS sieve was tested for its physical properties, viz. Grain size analysis, available water holding capacity and permeability (IS:2720 - Methods of test for soils). Soil fraction passing 850 micron IS sieve was tested for its chemical properties, viz. soil reaction, electrical conductivity and percentage of total

dissolved salts (IS:2720 - Methods of test for soils). Grain size analysis of selected soil samples from 10 out of 30 augerbores was carried out by pipette method (IS:2720, P.IV, 1965) to determine the relative proportions of various sizes ranging from 2 to 0.002 mm diameter of soil particles for textural classification.

The observation and data collection of surface features were made at and around each augerbore site, with respect to relief, physiography, drainage, ground slope, erosion and depth of water table in open wells.

(b) SOIL AS A CONSTRUCTION MATERIAL:

Based on the combined results of soil survey for soil/land irrigability classification and the geological mapping for demarcating rock formations, five sites were selected for openpits (Map III.1), which were made with the help of pick and shovel. The length and the breadth of openpit were kept 150 and 120 cm respectively and the maximum depth from the ground was limited upto 135 cm or upto the parent material. The soil samples were collected from each openpit at different depths depending on the variations of colour and texture of soils in the field.

The soil samples from the field, were air-dried and sieved, as per requirements for various tests, to determine their index as well as engineering properties, viz. grain size analysis, consistancy limits, specific gravity, Proctor density, permeability, shear parameters and California Bearing Ratio (IS:2720 - Methods of test for soils). Grain size analysis of soil samples from openpits was carried out by sieving and hydrometer method (IS:2720 P.IV - 1965) to classify the soils for general engineering purposes. The graphs prepared for Proctor density, shear parameters, grain size analysis and California Bearing Ratio are given in the Chapter VI (21 to 204 . Each openpit soil sample was studied petrographically for the presence of constituents, heavy minerals and clay minerals.

MATERIAL RESOURCES

Six sand samples from river beds of Maha near Kashiagala and between Devpara and Morthala, Balal near Sagadhara, Bambhan near Nava Raisangpar, Bhogavo near Bhaduka and Kharodia nala between Paj and Dighalia were tested for their fineness of modulii. Each river sand was studied petrographically for the presence of deleterious materials.

Four crushed aggregate samples of trap from crushers located at Daldi and Muli, quartzitic sandstone near Ranipat and white sandstone near Sara were tested for their engineering properties, viz. impact value, crushing value, abrasion value, specific gravity and water absorption (IS:2386 - 1963).

Two rock samples obtained from quarries at Waori and Mahika, were tested for their physical properties, viz. specific gravity (IS:1122 - 1957), water absorption (IS:1124 - 1957) and compressive strength (IS:1121 - 1957).

The information regarding the available industrial resources, viz. fireclay, white clay, friable white sandstone for making silicasand, and coalseam were collected.

GROUNDWATER CONDITION

The depth of static ground water levels in openwells located near the augerbore sites and also at other locations in this area, were recorded. The geology of openwell sections, were also studied to find out the characteristics of aquifers and aquicludes. A contour map was prepared at five meter contour interval.