

Chapter 4

Surveys and Investigations

4.1 Topographical Surveys

4.1.1 Canal and Canal Structures

Topographical survey was carried out by NWDA along the link canal alignment. The centre line of the link canal marked on the 1:50000 scale toposheets of Survey of India has been transferred to the ground first by measuring the bearings of the alignment on the toposheets and then setting them on ground with the help of compass/theodolite.

Along the centre line of the link canal, levels were taken at 100 m interval by double leveling. The ground levels are made to correspond with MSL by connecting to GTS Bench Marks located along / nearby the alignment by double leveling.

Cross sections were taken by single leveling at 400 m interval and also at turns and bends along the alignment with levels at 50 m interval extending up to 200 m on either side of the alignment. Wherever appreciable change in topography is noticed along the cross sectional lines, levels are taken at closer intervals.

Block levels were taken at places where cross drainage works are proposed by forming 50 m grid interval to cover an area up to 300 m on either side of the centre line of the link canal along the stream and laterally up to the firm bank plus 100 m on either bank of the stream. Similarly block levels by forming 50 m interval grids were taken at road/railway crossings along the alignment.

4.1.2 Command Area

The command area proposed enroute the link lies in Nellore and Chittoor districts of Andhra Pradesh; Tiruvallur, Kancheepuram, Vellore, Tiruvannamalai, Villupuram and Cuddalore districts of Tamil Nadu and Pondicherry (U.T). The proposed gross command area is about 840218 ha and the culturable command area is about 599010 ha. The command area was measured from toposheets of scale 1:50000 procured from Survey of India (SOI). These maps were utilised for marking the layout of branch canals network in the command area.

4.2 Soil Conservation, Archaeological and Mineral Surveys

As the head works of the proposed link canal is at existing Somasila reservoir, no additional area of land would come under submergence. This does not involve any archaeological/mineral importance and hence no separate surveys are felt required for the same.

4.3 Geological Investigation

The Geological Survey of India (GSI) was entrusted with the work of carrying out preliminary regional geological survey of the proposed link canal. The report was prepared by the Engineering Geologists of GSI after field visits.

GSI carried out the geological investigations in two reaches viz. Pennar to Palar and Palar to Cauvery (Grand Anicut) and their appraisals are given below:

4.3.1 Pennar to Palar reach

The link canal between RD 0.000 to 2.800 km cuts across the steep easterly dipping quartzite with phyllite inter calations of Bairenkonta Formation. The canal passes through talcose phyllities, micaceous schists and granite gneisses of Peninsular Gneissic Complex running almost collateral and closely to the eastern margin of Cuddapah basin, which has a thrust contact with the basement rocks of Archaean age. From RD 2.800 km to 200.125 km passes in basement gneisses, schists and other acid and alkali intrusive rocks with NNW-SSE to ENE-WSW trending foliation with easterly dips of more than 60°. In this reach, the rocks are inferred to have weathered to depths varying from 10 to 18 m from surface as observed from the local open wells. It was opined that execution of the proposed canal in this reach is feasible.

4.3.2 Palar to Cauvery (Grand Anicut)

Out of the 303.890 km in this reach, 227.930 km length of the canal passes through Archaean terrain (75%), of this, 44.200 km (19.39%) of canal length will be completely cut, 68 km (29.83%) of canal length will be completely fill and 115.73 km (50.78%) will be partly cut and fill. The reaches where the canal passes through the hard crystalline rock area are RD 225.300 km to RD 226.200 km, RD 227.900 km to RD 416.785 km and RD 491.050 km to RD 529.190 km.

In the balance portion, the canal passes through sedimentary terrain for 75.960 km (25%), of this 1.700 km (0.55%) will be Gondwana sediments, 29.01 km (9.5%) will be on Cretaceous sediments (Trichinopoly group) and 45.25 km (39.48%) will be on Mio-pliocene sediments (Cuddalore group).

Preliminary geo-technical appraisal studies carried out have revealed that no major adverse geological features encountered along the alignment and the proposed alignment is suitable prima facie. Since, the canal falls in the zone – II and III of the seismic zonation map of India and number of low to moderate intensity earthquake events have also occurred in the study area, necessary seismic coefficients have to be provided in the construction stage for canal in general and structures in particular.

4.4 Geophysical Investigation

The geophysical investigation to ascertain the subsurface strata along the canal alignment was carried out by Electric Resistivity method along the alignment of canal other than embankment reaches at 1 km interval to a depth of 2 m below the canal bed level. Soundings were also taken at the location of important CD works with one sounding in the case of minor structures and at 200 m interval in the case of major/medium structures. A total of 401 soundings were done in the entire reach of the canal. The geophysical investigation was carried out by the Mysore University. The depth of the sub-surface strata profiles given by the Mysore University were used for computing the earthwork involved at different strata.

4.5 Construction Material Investigation

4.5.1 Fine aggregate

The total requirement of fine aggregate (sand) to facilitate implementation of link canal and its related works is estimated to be 28.70 lakh m³. To meet the requirement of fine aggregate, 12 probable quarry locations were identified along the alignment of the link canal and surveyed by Central Soil & Materials Research Station (CSMRS) to ascertain the availability and suitability of the materials available from these quarries for use in the proposed construction works. These samples were collected and tested at CSMRS, New Delhi. The test results reveal that all the sand samples collected from all the 12 quarries

conform to the specification requirements as per IS: 383 – 1970 and can be used as fine aggregates in concrete.

4.5.2 Coarse aggregate

The total requirement of coarse aggregate for various works of this link canal is estimated to be 57.40 lakh m³. To meet this requirement, 13 coarse aggregate quarries have been identified in the vicinity of link canal alignment, which may cumulatively yield more than the requirement. The samples from 13 quarries were collected and tested at CSMRS, New Delhi of which materials from 11 quarries are found generally suitable for the use as coarse aggregate in concrete for wearing as well as non wearing surfaces construction work. The samples of other two quarries are suitable for use in concrete for non wearing surfaces only.

4.5.3 Soils

It is estimated that, a quantum of 1105 lakh m³ of earth is required for forming embankment, etc., for the link canal. It is also assessed that about 1431 lakh m³ of earth is to be excavated for forming the canal section. It is considered that the part of earth so excavated could be used economically for forming embankments and for other filling works. In addition to the above, 25 probable locations that could be used as borrow area for a quantity of 468 lakh m³ were identified along the alignment of the canal. Suitability of the earth from borrow area have been tested at National Institute of Technology, Tiruchchirappalli.

4.5.4 Bricks

It was observed during field surveys that sufficient quantity of bricks of desired quality could be obtained from nearby areas along the entire length of canal alignment except in the initial 200 km reach.

4.5.5 Cement and Steel

There is only one cement factory located near Ariyalur in the vicinity of the link canal. However, the cement and steel can be received at the railway stations located near the canal alignment i.e. Venkatagiri, Srikalahasthi, Tiruttani, Arakonam, Kancheepuram, Tindivanam, Tirukoilur, Ulundurpettai, Vridhachalam, Ariyalur and Tiruchchirappalli and transported to the site of construction.

4.6 Soil Surveys - Mapping of Existing Landuse/Land Cover and Irrigability

4.6.1 Soil

No systematic soil survey, land use/land cover and irrigability status of the command area has been carried out. However, as per the details available from Department of Agriculture, Government of Tamil Nadu, the soils in the proposed command area are mainly falling under five soil classification groups viz., Haplustalfs, Rhodustalfs, Ustifluvents, Chromusterts and Ustropepts.

Red sandy clay loam soil, brown clay loam soil, black clay loam soil, alluvial soil etc. are the predominant soils available in the command.

4.6.2 Landuse classification

The existing land use particulars of districts lying in the command area were collected and the taluka wise area falling within the command has been computed after accounting for the forest areas, from the toposheets (Scale 1:50000) procured from Survey of India. The land use classification details of the command area of the link canal are given in Table 4.1.

Table 4.1
Land use Particulars of the Command Area

Sl.no.	Land use	Area in ha.	Percentage
1	Forest	33571	3.84
2	Barren and uncultivable land	34350	3.93
3	Land put to non-agricultural use	187279	21.44
4	Permanent pastures and other grazing lands	19579	2.24
	Sub-total	274779	31.45
5	Land under misc. trees and crops, etc	23310	2.67
6	Cultivable waste	23719	2.71
7	Current fallows	59456	6.80
8	Other fallows	79111	9.05
9	Net area sown	413414	47.32
	Sub-total	599010	68.55
10	Area sown more than once	72514	-
11	Gross area sown	485928	-
12	Geographical area	873789	100.00

4.6.3 Land Irrigability Classification

Land irrigability classification is, further grouping of the irrigable soils into land irrigability classes considering the slope, sub-surface grading, drainage, depth of water table below ground level etc. Land suitable for irrigation is grouped under classes 1 to 4 according to their limitations. Lands not suitable for irrigation are grouped under classes 5 and 6.

4.7 Drainage Survey

The proposed enroute command area is well drained by rivers/streams like Venkatagiri, Swarnamukhi, Arani Ar, Korttalaiyar, Coom, Varahanadi, Palar, Cheyyar, Ponnaiyar, Gadilam, Manimuktha nadhi, Gomukha nadhi and Vellar and also by a number of minor drains. As such, the proposed command area is not likely to encounter any serious drainage problem. However, certain provision is made in the estimate for providing drainage facilities in the command, though no detailed surveys were undertaken for the purpose.

4.8 Communication Surveys

Most of the important structures of the Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link project are approachable by pucca / kachcha roads. The National Highways No. 4 & No. 45 and the South Central Railway line connecting Srikalahasthi to Renigunta; Southern Railway line connecting Arakonam to Tiruttani, Arakonam to Katpadi, Villupuram to Tirukoilur, Salem to Vridhachalam, Vridhachalam to Ariyalur pass through the proposed command area. All the important villages/towns situated along the canal alignment and in the command area are well connected by telephone lines, power lines and wide network of major/medium district roads. Inspection roads of major branch canals in the command area would lead to further improvement in the communication network.

4.9 Hydrological and Meteorological Investigations

The data from hydrological and meteorological stations available in the command area were collected and used for computations and designs of the canal components.