Pakistan Water and Power development authority

Authority for the preservation of Mohenjo-daro

Mohenjo-daro ground water control project

Project Director
North Dadu Surface Drainage Project
Sukkur

Mohenjo-daro

Background

Mohenjo-daro, a major Harrapa city of the Indus Valley civilization inhabited about 2500-1500 B.C is one of the most striking monuments from the dawn of civilization.

Location

Its archeological remains are located on the right bank of the Indus about 200 miles north of Karachi.

Ground Water control scheme

Organized archeological excavations started in 1921. At that time, the water table was reported to be about 25' below the ground level but the present water table varies between 5' to 12' feet below the ground surface in summer and winter respectively. The rise in water table is due to the construction of the Sukkur barrage in 1932 and intensive irrigation because of the introduction of a perennial irrigation system.

Average ground level is 152' above main sea level. Maximum flood in the river which is 4 mile near the site is 170' i.e. (18' above the ground) and water level in Dadu Canal. 1500 cusecs capacity, which is three miles away on the western side is 158 i.e. (6' above the ground) which are the main factors of contributing high water table at the Mohenjo-daro site.

Mohenjo-daro ruins today face two serious preservation problems. Firstly the site itself is threatened with erosion by Indus River which is being tackled by irrigation department separately, and secondly the monuments are deteriorating under the influence of salts brought to the surface by the rising water table and capillary action from shallow water depth: such damages can be arrested only by lowering of the eater table.

Ground water control was entrusted to WAPDA on the request of Chairman Authority for preservation of Mohenjo-daro (APM) in January in 1980 as deposit work. The scheme was to be constructed as per agreement on no loss and no profit basis. It comprises three stages.

First stage:

Of 12 tube wells in 4000' diameter ring on periphery of the exposed ruins of 500' spacing instead of grid of wells extending to the heart of the area to avoid damage to monuments of 3 cruses capacity each and disposal system for lowering the water table depth up to 12ft below the ground level.

These wells will operate on 70% annual operation factor. The disposal system consists of lined collector drain at flat bed, a lined disposal drain with 1 in 7000 slope along with cross drainage works and pumping station of 100 cusecs capacity at Dadu Canal. These works of 1rst stage were completed in 1983 and since then are being maintained and operated by WAPDA.

2n stage:

In order to achieve further lowering of water table up to 32' below the ground level, it was proposed to construct 12 additional tube wells in stage II of these tube wells in the same circle/ring with 74% annual operation factor. Work of these tube wells was started was started in April 1985 and completed in December, 1985 in 9 months period.

Third Stage:

For lowering the water table 65' bellow the ground 30 additional tube will be installed in future in a second ring 800' ft. away from the existing circle and will operate on 74% annual operation factor.

For determining the location and number of tube wells, electric analogue model was constructed simulating the site conditions as closely as possible in order to examine various arrangements of wells and study the contribution of two sources (river and Dadu Canal) at the seepage draw down relationship. It was established that at the beginning of pumping major contribution came from ground water storage whereas after steady state is reached, two-third pumping comes from the river, one-third from canal and storage to contribute.

In order to monitor the depletion of water table, 35 piezometers have been installed in and around Mohenjo-daro area. The data generated from the piezometer is a great help in determining the profile of sub-soil water.

The water table has been achieved up to 28' below the ground level in winter but rises about 7'in summer.

6 additional tube wells are also proposed to be installed 4 on river side and 2 on Dadu Canal side to arrest the 7' rise in summer season.

At present the effluent is being pumped into Dadu Canal. It is proposed that when Dadu Canal is shut down for annual repairs or is in an emergency the effluent may be let into the river through a stand-by channel for uninterrupted pumping ground water.

Salient features of the scheme are as under

Stage I		
Number of tube wells	14	
Depth of water table to be maintained below Ground level	20ft	
Stage II		
Number of tube wells	12	
maintained below Ground level	32ft	
Disposal system	Length (in 1000 ft)	Capacity (cusecs)
a) Collector drain	7.650	40
b) Collector drain	8.650	40
c) Disposal system	7.65	100
Pump Station		
Eight unit of 5.5 cusecs capacity each and two units of 25 cusecs capacity each with total capacity	94 cusecs	
Capital Cost (Million rupees)	Stage I	Stage II
tube wells	3.370	2.560
Disposal system with appurtenant works	12.360	
Electrification	9.000	1.620
Construction of earthen embankment	1.950	
Total	26.680	4.180
R&M expenses	Rs. 6.0 to 6.500 million per year.	