

BULK WATER SUPPLY SYSTEMS OF KARACHI WATER & SEWERAGE BOARD

The importance of water in sustaining human life and welfare cannot be over emphasized. Man consumes about 3 liters of water per day in the form of liquid and solid in-take. This water should be clear, colourless, tasteless and should be free from biological life. It should also not contain concentration of chemicals which may be physiologically harmful, esthetically objectionable and economically damaging.

CAUSALITY OF POTABLE WATER.

A good appearance of water does not necessarily give a reliable indication of its sanitary quality. A sparkling clear water may contain impurities or germs which may be injurious to human health. Detailed examination of raw water as mentioned below is therefore, carried out for determining the treatment criteria and processes to be adopted:-

1. Microscopic examination.
2. Physical and Chemical examination.
3. Bacteriological examination.

WATER TREATMENT PROCESSED ADOPTED BY KW&SB

Pollution levels in the Kinjher & Hub Lakes, which are the water supply sources for the city, are very low. A major part of settle able solids precipitates out in the lakes and the water received at KW&SB water treatment plants contains low turbidity and less organic and bacterial loads. KW&SB has, therefore, adopted the most effective and economical treatment processes for reducing the lake waters into a portable product.

At the treatment works, raw-water is received in a distribution chamber for pre-chlorination which neutralizes organic and bacterial loads as well as optimizes the pH value for chemical treatment in later stages. Aluminium sulphate, which is used as a coagulating agent, is introduced in the raw-water before a flash mixer for uniform distribution in the water body.

The chemically mixed water is then conveyed to at flocculation unit for preparation of a thick and heavy floc of settle able matter which is separated and removed in sedimentation basins. The clarified water then receives further treatment in rapid sand filter beds. The water collected after filtration is potable and is according to WHO standards, but KW&SB normally applies post chlorination to guard against mild cases of contamination in the distribution net-work.

The various water supply systems of KW&SB are described briefly here-under for general information:-

DUMLOTTEE WELLS.

In the 19th century, Karachi was small fisherman's village situated on the left bank of Lyari River. This river remains dry through-out the year except during rainy spells when the rain water is drained out of the city through it. Initially some shallow wells were dug on the river bank for supplying water to the Karachi Port.

In the later half of 19th century, the Karachi Municipality designed the first piped water supply system from the city which was commissioned in 1883. This scheme comprises of digging some shallow wells on the banks of Malir River in Dumlottee area which is about 19 miles from the main city. The well water was pumped into a 5 MGD capacity stone masonry gravity conduit which terminated at a 5.5 MGD capacity Reservoir. The capacity of the system was increased to 20 MGD in 1923 by adding more wells, a 15 MGD gravity conduit and two 6 MG reservoirs. The supply from this system now ranges between 2 and 5 MGD, whereas the requirement diverting un-filtered but chlorinated water from the Greater Karachi raw water conduit.

HILAYA WATER SUPPLY SYSTEM.

After establishment of a cantonment in Karachi during the 2nd World war, the city water demand increased beyond the then average daily supply of 15 MGD. The local

administration, therefore, undertook implementation of the Hilaya Scheme for augmenting the city water supply by 20 MGD in two equal stages. The first stage was commissioned in 1943 and the second in 1953.

This system originally drew water from an artificial lake known as the Haleji Lake having a surface area of 11 sq. Miles and a storage capacity of 3000 acre feet. Water gravitates from the lake through a masonry conduit upto two pump houses in Gharo, each of 10 MGD capacity. Two water treatment plants of equal capacity have been constructed in Gharo where complete treatment through sedimentation, rapid sand filtration and chlorination is provided. Potable water is brought to Karachi by an RCC pipe line where it is again boosted to a 20 MG capacity reservoir before distribution in the city. The water demand from this source has now increased to about 22-24 MGD. The additional requirement of 2-4 MGD is again being met by diverting unfiltered but chlorinated water from the Greater Karachi raw-water conduit.

Haleji lake is presently being used as a stand-by source and the system draws water from the Greater Karachi Bulk Water canal net-work.

GREATER KARACHI BULK WATER SUPPLY SYSTEM.

Karachi was the first capital city of the country after its birth in 1947. It also became the most important industrial and commercial centre. The older system of water supply could not cope up with the growing demand. In order to meet shortages in supply and to cater to future demands of the expanding city, the Greater Karachi Bulk Water Supply Scheme was designed in 1953 for supply of 280 MGD potable water to the city.

On the basis of a population projection of 3 millions by the year 2000, the scheme was designed and divided into four equal phases, each of 70 MGD. It comprises of open canals, covered conduits, a tunnel, siphons, pumping stations, mains and draws water from the Kinjhar Lark.

1ST PHASE.

The first phase of the scheme for bringing 70 MGD Kinjhar Lake water to the city with raw-water pumping at Dhabeji, a 70 MGD water treatment plant at COD Hills, Karachi and complete water conveyance system comprising of a 280 MGD lined canal, a conduit of equal capacity up to Pipri and of 140 MGD capacity up to Karachi, a 10 MG reservoir at COD Hills along with the distribution net-work was started in 1954 and completed in 1961 at a total cost of Rs.18.5 Crores.

2ND PHASE.

Contracts for the 2nd phase works were awarded in 1969. The main works included construction of a 70 MGD pump house at Dhabeji, laying of 84" dia pre-stressed pipe siphons a 25 MGD pump house at = pipri and two water treatment plants of 25 and 45 MGD along with 10 MG reservoirs at Pipri and COD Hills respectively. Some additional truck mains were also laid for improving the distribution system. The 2nd phase works were completed in early 1971 at a total cost of Rs.20.0 Crores.

3RD PHASE.

The 3rd phase works were taken up in 1975 and were commissioned in 1978. The works completed under this phase include construction of a 70 MGD pumping station at Dhabeji, two pumping stations along with water treatment plants of 25 MGD capacity each at North East Karachi and pipri, 84" dia pipe syphons, three balancing reservoirs and the distribution mains. Total cost of these works in Rs.75.0 crores. A reservation for supply of 22 MGD of un-filtered water to Karachi Steel has also been made under this phase.

4TH PHASE.

Due to financial constraints, 4th Phase works have been divided into two parts. Under stage I, improvement of lined canal, modifications of the present Dhabeji Pumping Stations, laying of 84" dia pipe syphons, construction of a 25 MGD pump house and clarification units at Pipri, improvement of the secondary distribution net-work and installation of domestic meters in K.D.A. Scheme No.1 & 5 have been taken up with the World Bank assistance and are due for completion by June, 1987. After completion of these projects at a total cost of Rs.360.0 millions the city water supply will be augmented by 50 MGD.

HUB WATER SUPPLY SYSTEM.

A 151 ft. high and 21,000 ft. long earthen dam has been constructed by WAPDA on Hub River for creating a reservoir or almost one million acre feet storage capacity for meeting the agricultural and industrial water supply requirements of Baluchistan and for supply of 89 MGD water to Karachi for domestic use. The quality of Hub Water is comparable to Indus water and therefore, similar para-meters for pumping and treatment have been adopted. The project has been designed for completion in two stages. Stage-I works which comprise of a 90 MGD pump house, two steel pressure mains one 20 MG reservoir, trunk mains and primary treatment of lake water by screening and chlorination were completed and commissioned in August, 1982 at a total cost of Rs.26.6 crores, Stage-II works, which comprise of improvement of secondary distribution net-work and construction of a 90 MGD water treatment plant, will be taken up after the required fund are made available by the Govt.

5TH PHASE OF GREATER KARACHI BULK WATER SUPPLY SCHEME.

A master study for identification of water supply requirements of the city during short, medium and long term plans (upto 2025) and for preparing feasibility studies, including costing of projects during various plan periods have been assigned to a consortium of consultants. Implementation actions on the consultants proposals will be taken after their approval by the Board and after allocation of funds by the Govt.

MONITORING AND CAUSALITY CONTROLS.

Laboratory facilities have been provided at all water treatment plants for monitoring chemical dozes and maintaining quality controls according to WHO standards. In addition KW&SB Central Laboratory at COD Hills Filter Plants monitors the quality of city water by collection and testing about 1000 samples per month form the distribution net-work. The Laboratory reports indicate that the chemical and bacteriological quality of city water is within the prescribed WHO limits. However, isolated cases of contamination are being reported which are promptly attended by the KW&SB distribution engineers for ensuring that the city water remains un-contaminated and bacteria free.

During various studies conducted by us on the quality of city water. We observed that the following factors mainly cause contamination in the distribution new-work:-

1. Intermittent water supply due to general shortage of water.
2. Leakages in water supply mains which have out-lived their effective life or have not been laid in accordance with the required specifications, resulting in infiltration of contamination ground water during non-supply hours.
3. In-discriminate disposal of raw-sewage and inadequate of defective sewerage system in the city.
4. Installation of un-authorized suction pumps on water main by un-scrupulous elements for augmenting their water supply.
5. Consumption of well water in the city.
6. Sub-standard construction of water storage tanks and sewerage system at individual premises.