HISTORY

The first investigations of a potential water-supply from Vomb were made as early as August 1927. Conditions for obtaining good water were judged favourable for two reasons: (a) the water of Lake Vomb, even during the heavy floods occurring that year, was relatively clear, and (b) access to ground water (replenished, if necessary, by infiltrated water drawn from Lake Vomb) was relatively good in the sandy and gravelled areas immediately to the west and south of the lake.

The first test-borings were made in Nov. 1936; results were fairly good. The first funds for investigation were sanctioned by the city council on Dec. 17, 1936.

Subsurface investigations were resumed, and continued during the years 1937 to 1940. More than 200 sampling tubes were used.

On June 16, 1939, the city council decided to erect a waterworks at Vomb. A decision was taken to purchase about 2,600 hectares (6,400 acres) of land for this purpose, and it was decided to seek permission to withdraw and infiltrate water from Lake Vomb.

Artificial-infiltration trials were commenced on June 16, 1940.

Owing to the war, definite proposals for the development of the water supply could not be drawn up before the meeting of the town council held on Nov. 23, 1945.

Water from the Vomb works was distributed in Malmö city mains for the first time on July 30, 1948, and on June 1, 1949, the installation was officially opened.

Permission has been granted by the Water Rights Court to withdraw 600 litres per second (158 gal/s) from the waterworks, and the Court is considering a proposal to increase this amount to 850 litres per second (224 gal/s). During 1964 the City of Malmö intends to request rights to withdraw an additional amount, bringing the total to 1,500 litres per second (400 gal/s).

COST

During the years from 1936 to 1963, capital amounting to approximately 35 Million Swedish Crowns was invested in the Vomb waterworks, the water mains running to Malmö and the reservoirs on Romelåsen. In present-day money values this sum is estimated to be equivalent to 55 Million Crowns.

CONSULTANTS

The bulk of the investigatory design and construction work for the Vomb waterworks was carried out under our own auspices.

The following were commissioned as consultants:

Architect: Clas Almqvist, Malmö

Electric installations: Linus Bohlins Ingenjörsbyrå AB, Malmö.

Ventilation, heating and sanitation: Joel Österbergs Ingenjörsbyrå AB, Malmö.

CONTRACTORS AND SUPPLIERS

Subsurface investigations, well installations and infiltration installations were, in large part, carried out under our own auspices.

Among other major contractors and suppliers, the following deserve mention: for the building work, AB Skånska Cementgjuteriet and AB Armerad Beton. ASEA and AB Zander & Ingeström supplied most of the machinery and electrical equipment.

COMPONENTS

The major part of the ground water taken from the wells is obtained by infiltration of the water from Lake Vomb. An average of 420 litres per second (110 gal/s) was infiltrated in 1963.

Infiltration pumping station

Lake water is led to the pumping station via a 300-metre-long (1000 ft.) wooden intake line, 900 mm (36 in.) in diameter, then through an intake crib with widely spaced grating. Three pumps with a total capacity of 900 litres per second (240 gal/s) are installed in the station, and there is room for one additional pump. An older pumping station with a maximum capacity of approx. 100 litres per second (26 gal/s) serves as limited stand-by.

Pre-filtration station

Algae are separated out in the pre-filter to prevent rapid clogging of the bottoms of the infiltration basins.

The station is designed for installation of four rotating, cylindrical, microstraining units, each with a capacity of 250 litres per second (66 gal/s). At present three units are installed.

The screens are automatically flushed clean with screened lake water.

Infiltration basins

The major portion of the pre-filtered water is brought to the infiltration basins through pipelines.

The basins were built by scraping away the top layer of sand and gravel to form embankments, then levelling the bottom surface. The surface area of the basins varies between 2,000 and 11,000 sq. metres (0,5 and 2,7 acres); max water depth is approx. 0,75 metre (2.5 ft).

Algae sediment is cleaned from the basin bottoms once or twice a year.

Wells

All water processed at the waterworks is taken as ground water from 57 vertical wells, most of which are located 50 metres (165 ft) from each other. The wells are driven with temporary casings varying in size between 500—1500 mm (20—60 in.); their depths vary between 8 and 23 metres (26—76 ft) below the surface.

Well casings are made of copper or wood with diameters between 250—600 mm (10—24 in.). In strata carrying most water, they are provided with screens. Most of them are surrounded by single gravel-filters which thus have a diameter equal to that of the temporary casing. The three most recently built wells had to be drilled in more finely-grained soil, and were thus provided with double gravel-filters.

Pump types used previously with non-submersible motors are gradually being replaced by submersible pumps. Electrical distribution-boards on older wells are positioned in a special brick superstructure above a concrete chamber containing water meters, valves, etc. On the more recent wells, this superstructure has been done away with, and the distribution board is also located in the concrete chamber.

Iron filter

The iron and manganese contents of the water obtained from the wells are relatively high: approx. 3 and 0.3 milligrams per litre (3 and 0.3 ppm) respectively. These must thus be reduced.

Water from the wells is pressed directly up into two filter installations connected in parallel. Each comprises a drop-type aerator, a coagulation basin and ten filter beds connected in parallel.

The drop-type aerators comprise copper plates with 4-mm (0.16 in) diam. perforations on 25-mm (1 in) centres, and are located 2.5 metres (8.2 ft) above the surface of water in the reaction basins.

The basins each have a capacity of 1,600 cu. metres (420,000 gal), and a detention time of 1.0 hours at 500 litres per second (130 gal/s).

Ferrous impurities precipitate in the aerated water. Precipitant is separated out together with manganic impurities in the filter beds. Filter beds are built up of sand to a depth of approx. 1,2 metres (4 ft). The grain size of the sand varies between 1 and 3 mm. The surface area of the beds is 24 sq. metres (260 sq ft). At present the filter beds are operated at a maximum rate of 7.5 metres per hour (25 ft/h).

Chlorination station

The chlorination comprises a 0.1—0.2 grams dose of chlorine per cu. metre of water.

Apparatus for applying chlorination dosages comprises two units, each with a normal-operation capacity of 1.25 kg per hour (2.75 lb/h); one of these serves as the stand-by unit. With both units operating, a maximum of 8 kg of chlorine per hour (17.5 lb/h) can be added. Thus at 1,000 litres per second (264 gal/s) a chlorine dosage of 2.2 grams per cu. metre (2.2 ppm) can be obtained.

Low-level reservoirs

Two low-level reservoirs are available to provide stand-by water and operate as compensation tanks.

The reservoirs are made of concrete and measure 50×30 metres (55×33 yd); each has a capacity of 5,000 cu. metres (1,320,000 gal).

Pumping station

Five pumps for transferring water to consumers in Malmö, Lund, etc. are housed in the machinery hall. Each has a capacity of 250 litres per second at heads of 60 metres (66 gal/s at 200 ft).

There is room for one additional pump in the present building.

Surge in the long pipelines to Malmö is damped by means of surge chambers with a volume of 27 cu. metres (7,100 gal) connected at each end.

At rated operating conditions, the surge chambers are designed to reduce surge from three times the operating pressure to values 50—60 % above the operating pressure.

Other equipment which deserves mention includes electrical equipment, comprising three transformers (20/0.4 kV), high-voltage and low voltage-switchgear and a stand-by power unit consisting of two diesel-electric generator sets, each rated at 425 kVA. Repair shops and facilities for personnel are also housed in the building.

Water mains from Vomb to Malmö

Two pipelines, 900 mm (36 in) in diameter, carry water over the distance of about 30 kilometres which separates Vomb from Malmö.

The first, which was built between July 7, 1946, and June 7, 1948, is of "Bonna" concrete pipes made with a core of 3 mm (0.12 in) steel-plate covered externally and internally with reinforced concrete.

The second pipeline, completed in 1963, is of pre-stressed concrete pipe, Sentab type.

There are 32 high points in each pipeline where automatic air valves have been inserted. There are also 32 low points, where arrangements for drainage have been made.

At Romeleåsen, the water mains run through a pass with a maximum surface elevation of + 68 metres (+224 ft).

At Norra Ugglarp, in the pass, two reservoirs have been erected with capacities of 3,000 and 18,300 cu. metres (800,000 and 4,800,000 gal) respectively.

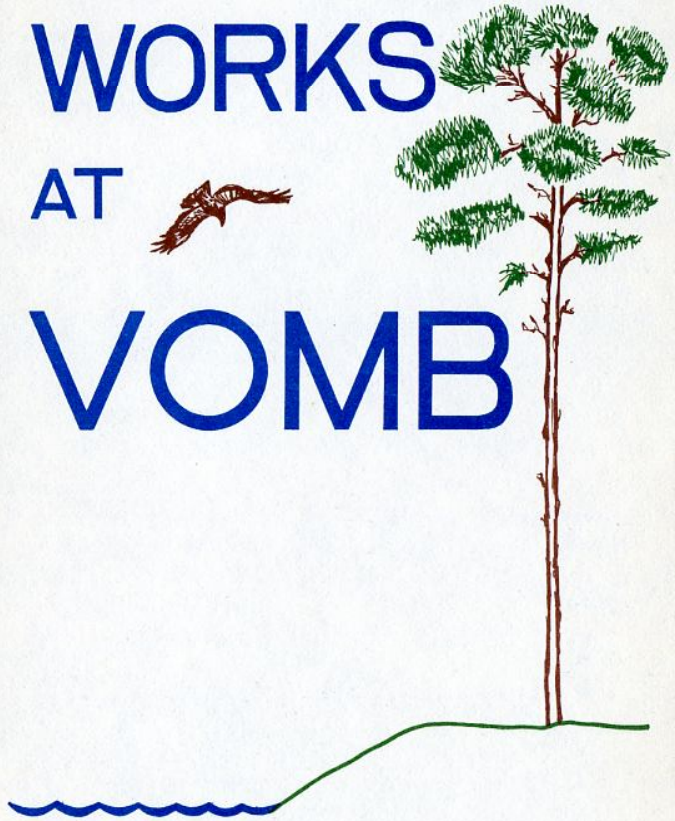
The reservoirs, which are 12 and 11 metres (39,6 and 36,2 ft) deep respectively, have their high-water level ,at +78.00 (+258 ft) i.e. 28 metres (92 ft) above the corresponding level of the elevated reservoirs in Malmö. As a result, the Ugglarp reservoirs serve as elevated reservoirs in spite of the fact that they lie directly on the ground.

REMOTE MONITORING SYSTEM

The remote monitoring system is installed in the pumping station. Well pumps and high-pressure pumps are operated automatically. Personnel at the Vomb waterworks are now on duty only during the day shift.

CITY OF MALMÖ

WATER-WORKS AT VOMB



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