



British Caribbean Water Supply

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ALTHOUGH the geography, geology, and meteorology of the British Caribbean territories vary so much that generalizations cannot be made about the quantity and quality of their water supplies, there are some common administrative problems relating to these supplies.

The territories to which I refer consist of British Guiana and the newly created West Indian Federation, which comprises Trinidad, Jamaica, Barbados, and the Leeward and Windward Islands. The federation represents a land area of 8,000 square miles, containing a population of about 3½ million. British Guiana has 83,000 square miles and less than a half million population.

One of the common problems of these territories is lack of sufficient money with which to develop waterworks that would approach United States standards in quantity and quality. Only the larger territories, such as Jamaica, with its bauxite, Trinidad, with its

oil and asphalt, British Guiana, with its bauxite and timber, and Barbados, with its rum and profitable tourist trade, appear to be exceptions. The smaller, primarily agricultural islands have to sacrifice both quantity and quality to a dangerous degree.

A second problem, which tends to exaggerate the effect of the first, is the nearly complete absence of a technically educated, subprofessional group to serve as operating, maintenance, and clerical staff. The load placed on the well-trained engineers at the top, as a result of the situation, is appalling, particularly in the smaller islands. It is not unusual to find one man responsible for roads, docks, waterworks, airfield construction, and erection of power stations. These responsibilities might not be too burdensome were it possible to delegate details to subordinates, but in many situations this is either impossible or inadvisable.

Standards of operation of the waterworks were observed to be low, with some notable exceptions in the larger islands where industry has created a market for and consequently a supply of subprofessional technicians. Most of their training is on the job, for almost no adequate trade schools or technical high schools exist. Maintenance of plant and equipment is particularly difficult under these circumstances. Many well-designed water systems cease to operate properly not long after completion.

The third problem relates to the very peculiar attitude toward wasting water which was encountered in all areas except one. Very few supplies (and these only partially) are metered. The proportion wasted is certainly very high, although it is not possible to get figures.

In general, the waterworks engineers seem

Mr. Moore, who is a lecturer on sanitary engineering at Harvard University, presented this paper in slightly different form before the Committee on Sanitation and Environment, Division of Medical Sciences, National Academy of Sciences-National Research Council, on October 7, 1958. His remarks are based on observations recorded when he and Prof. George T. Bryant of the Johns Hopkins University conducted a refresher course for waterworks engineers in the British Caribbean territories. The course, which ran from March 17 to June 6, 1958, was sponsored by the Pan American Sanitary Bureau, Regional Office of the World Health Organization, in cooperation with the government of Trinidad and Tobago.

apathetic about wastage. In many cases, the result is periodic failure of the water supply. In Port of Spain, Trinidad, which is a modern city in other respects, the mains in certain areas were empty a large part of every day during the time I stayed there. From time to time, rather feeble educational campaigns are attempted, but without apparent success. Newly instituted education in water conservation in the primary schools may have more effect.

An Apathetic Public

Public disinterest in water waste appears to be partly due to the special nature of the local water systems. All rural areas, and even the villages and smaller communities, are served by mains bearing public taps ("standpipes") to which all inhabitants come for water. Piped water in houses is rare outside the strictly urban regions. Control of waste at public taps is difficult if not impossible. One never takes a trip in the country without seeing a few taps leaking badly or left open. Consequently, the city user, with water piped into his place of residence or business, can see no reason for bearing the cost of metering, or the onus of conservation, when his rural brother does what he likes without reprisal.

The outstanding exception to the general rule of apathy to water waste is Antigua, the driest of the islands. At the height of an extreme drought several years ago, potable water is reputed to have sold for as much as \$1 (BWI) a gallon. Such severe conditions developed a public intolerance for water waste, and even the public taps are now metered.

Impoundment and Turbidity

Trinidad, with plenty of rainfall in its mountainous areas, has the problem of making suitable impoundments in very rugged terrain. When impounded, water in the zone of stagnation becomes foul because of the constant warm weather. Although there are no overturns due to fluctuations in temperature, a sudden heavy rainfall may roll over the water in the reservoir by driving a wedge of cool water under the bottom layer. Reservoirs are usually equipped with drainage gates at very low levels so that

the foul bottom water can be drawn off when heavy rain is expected. Wells in the central part of the island are high in iron and require deferrization, but conventional methods are adequate.

Georgetown, British Guiana, located in an extremely water-rich area, treats a unique type of water in its filtration plant. Entering the plant with a pH value in the low 5's and color ranging above 400 units, this "black" water from the Lamaha Canal is converted into a water of normal pH value, with color not greater than 15 or 20 units. This is accomplished by liberal doses of alum and sodium aluminate (about 1 ton of alum per day for 5 m.g.d., and about one-third as much aluminate), and two stages of sedimentation. It is undoubtedly the only waterworks in the world in which manatees are deliberately placed in its open secondary sedimentation tanks to keep down growth of vegetation.

Other areas encounter problems of very high turbidities. Kingston, Jamaica, treats turbidities, which may run occasionally as high as 5,000 units, in a conventional rapid sand filtration plant, with air-scour equipped filters. Alum doses run as high as 3½ grains per gallon. It also treats similar waters in an old but handsome slow sand filter plant by means of primary settling tanks that could well serve as yacht basins.

On Other Islands

The small, dry island of Antigua is a waterworks man's nightmare and a geologist's paradise. The northern section of this 12- by 15-mile island is limestone, yielding a niggardly quantity of very hard water. The central section is marine chert, yielding water of such high salinity as to be useless. The southern section, which is volcanic and mountainous, receives most of the small, poorly distributed rainfall and is used as the main impoundment area. Turbidities are very high, and there are no adequate filtration plants. Wells and infiltration galleries are also used in this area. It is one of the few places where a comprehensive plan for developing water resources exists, but the question of financing the plan remains unanswered.

For more than 300 years, Barbados has been emptying its wastes into one set of holes in its coralline base and drawing its water from another set. No major outbreaks of waterborne disease have been recorded, and the island is rather proud of the quality of its water. However, both the rate of draft of water and the rate at which wastes are disposed of in the so-called "suck-wells" are increasing rapidly. No one knows how long such practices can safely continue. Fortunately, the health authorities are aware of the problem and are maintaining a close watch.

Each of the other islands has its own prob-

lems of water quantity and quality and engineering difficulties in bringing water to the point of use. Heads of several hundred or a thousand feet, which have to be eliminated at pressure-break tanks along the pipelines, are commonplace.

A full presentation of the many water problems of each island is impossible in this brief report, but enough has been said to indicate that the problems of quantity and quality of water in this attractive part of the world vary fully as much as they do in continental United States, except for the difficulties associated with cold weather.

The International Health Year

Plans for an International Health Year have gained momentum with a resolution adopted by the Executive Board of the World Health Organization asking the WHO Director-General to present specific projects for the Year to the World Health Assembly in May 1959. The resolution, taken in January 1959, favored emphasis on national undertakings to be coordinated on a regional and worldwide basis.

The action followed a U.S. Senate resolution, passed in August 1958, proposing talks with other nations on the designation of an international health and medical research year, "or other methods of developing intensive international cooperation in the field of health."

In December 1958, the United Nations General Assembly also passed a resolution inviting the World Health Organization to consider organizing the Year primarily on a national basis. The purposes outlined were the spread of medical knowledge, furthering of joint scientific research, exchange of experience in the use of atomic energy in medicine, organization of mass health education on a broad scale, and provision of assistance to underdeveloped countries, including equipment, medicine, special literature, and specialists.

In anticipation that the Twelfth World Health Assembly will act favorably on the proposal, Surgeon General Leroy E. Burney has appointed an ad hoc committee to consider participation of the United States in the Year and to discuss the feasibility of establishing a national committee on the International Health and Medical Research Year. The group, which met on May 6, 1959, includes representatives of both governmental and private agencies in the health and medical fields.