

SANITATION PROBLEMS OF CALEXICO AND MEXICALI

By R. F. POSTON*

Sanitary Engineer, U. S. P. H.

Physical Characteristics, Hydrology and Climatic Conditions.—Calexico, California, and Mexicali, Baja California, located in the Imperial Valley are contiguous cities closely built to the international boundary. Their drainage area empties into the New River. This stream rises in Mexico, flows northward, entering the United States near the business district of both Calexico and Mexicali then flows about 50 miles northwesterly to the Salton Sea. The source of water for the New River is seepage and spills from irrigation, industrial waste and domestic sewage. About 4,600 feet upstream from the international boundary a tributary joins the river. This tributary roughly parallels the boundary through the city of Mexicali and is the principal waste carrier. This tributary also has the lowest sustained flow. The general elevation of the area is about sea level.

Discharge records of the New River show the flow to be extremely erratic, maximum flow record being 207 c.f.s. Inflows as low as 2 to 4 c.f.s. have persisted for four days. The average daily flow for the period of record shows a gradual decrease. Some future increase in flow may be expected when Mexico completes certain drainage works. About 1.5 miles downstream from the boundary waste water from the All-American Canal is added to the river. The amount of waste water varies widely. At times waste amounts to as much as 781 c.f.s. and again there will be no discharge for as much as two days. The waste from the All-American Canal materially benefits stream conditions below the international boundary.

The United States Weather Bureau maintains a station at Calexico and from fifteen years of their record the mean annual temperature has been found to be 71°F. The annual rainfall is 3.1 inches. The mean maximum temperature is 103.4°F. and the maximum temperature is 117°F. The dissolved oxygen content of water varies inversely with temperature, and with the high temperatures experienced in this area the dissolved oxygen available for natural stream purification is relatively low.

Population.—The present estimated population at Calexico is 6,000 and at Mexicali 40,000.

River Uses.—There is no record of the New River being used as a

* Consulting Engineer to the International Boundary and Water Commission, El Paso, Texas.

source of domestic or irrigation water. Some industrial water is taken by a soap factory in Mexicali.

Sources of Pollution.—Domestic sewage reaches the stream through public sewers that serve an estimated half of Mexicali and all of Calexico. There are seven public sewer outlets to the New River in Mexicali and one outlet in Calexico. In addition, numerous individual sewers discharge directly to the river and its tributaries in Mexicali. All sewage from Calexico and from one section of Mexicali passes through septic tanks. This is the only sewage treatment in the area. Septic tanks can be given little or no credit for improving stream conditions.

Industrial wastes from Mexicali originate at two breweries, a soap factory and a slaughterhouse. Spent grain from the breweries is not discharged to the river. Soap factory wastes are reported to contain waste fats, oils and caustic soda. The slaughterhouse discharges blood, paunch manure and offal to the stream without treatment.

Extent of Pollution.—The only quantitative data on the magnitude of pollution is furnished by the California State Department of Health, which found the bio-chemical oxygen demand at the international boundary to vary from 2,000 to 4,500 pounds per day with an average of 2,800 pounds per day, which is equivalent to a sewered population for Mexicali of 16,800. The magnitude of the industrial waste load, exclusive of the soap factory, may be estimated as follows:

Slaughterhouse in Calexico 35 cattle and 20 hogs daily, sewered population equivalent 1,960. Brewery producing 360 barrels daily, estimated population equivalent 4,320 and brewery producing 65 barrels daily, estimated sewered population equivalent 780. Thus we find the present estimated pollution load on the New River from Mexicali and Calexico to be Mexicali domestic sewage 9,740 population equivalent, Mexicali industrial waste 7,060 population equivalent and Calexico domestic sewage 6,000 population equivalent, total 22,800. The total estimated sewage flow from the area is 3 c.f.s.

The physical aspect of the river from the point where it first receives pollution to where it receives spill from the All-American Canal is typical of a highly-polluted stream. The water is black, sludge banks are found, evolved gas from digesting sludge bubbles through the water, floating solids are seen and foul odors are present. The banks of the tributary stream have been extensively used for dumping of trash and garbage which contributes materially to the pollution load. Some perhaps would liken the New River to an open sewer, but this would be giving undue credit, as sewers are usually inoffensive, due to the freshness of the sewage. A better description would perhaps be that the river is an open sewage treatment plant that is greatly overloaded.

Local residents have complained of the odor nuisance which is aggra-

vated by the prevailing winds. The California State Department of Health has shown concern over the situation.

Public Health Significance.—Based on available epidemiological data, there appears to be no definite correlation between present stream conditions and the incidence of water-borne diseases. It is an established fact, however, that contaminated water is a factor of typhoid fever and dysentery. Cattle are known to develop beef tapeworm from drinking sewage-polluted water. That there has been no serious disease outbreak attributable to the river is no indication that untoward public health conditions will not develop. The psychological effect of the odor nuisance is impossible to evaluate, but we can conclude that relaxation and enjoyment of local residents are impaired.

Although the sanitary hazard may be remote because there is no actual use of the waters of the New River below Calexico, it is desirable that all sewage and industrial waste be treated to such an extent that when they are discharged to the river nuisance conditions will not develop.

Effect of Pollution and Oxygen Relations.—In data obtained by the California State Department of Health in April, 1946, it was found that the river at the boundary never has an oxygen saturation of over 50% and about half the time all oxygen is depleted. Hydrogen sulphide was found in the absence of oxygen. The oxygen saturation curve rises to a maximum early in the morning and then falls abruptly, reflecting the effect of temperature and the oxygen demand of waste. Samples taken 3, 8, and 15 miles downstream from the boundary show some stream improvement and probably reflect the addition of dilution water from the all-American Canal, rather than the effects of natural purification. The condition of the stream at the lower sampling stations does not appear to become progressively better; rather there is a leveling off of the effects of pollution.

Practical Approach to the Problem.—The California Department of Health is anxious to remove the pollution from the New River. This would be a relatively simple matter provided the communities polluting the stream were entirely within their jurisdiction. Calexico and Mexicali, under different Governments, are unable through their own efforts to join in a stream clean-up campaign. Even if Calexico desired to install corporate sewage treatment, they would find it extremely difficult because there is no space between the lowermost sewer outfall and the international boundary to install sewage treatment works. The most logical place for Mexicali to treat their sewage is on the United States side of the international boundary. Until Mexicali sewage is treated, there would be little point in Calexico providing adequate sewage treatment as the stream conditions would not be materially improved by

Calexico's unilateral action. The local residents of Calexico and Mexicali, realizing the dilemma with which they were faced, requested their respective Governments to ask the International Boundary and Water Commission to make a joint investigation of the situation and to report upon a feasible solution to the problem. The International Boundary and Water Commission is the Agency set up by the respective countries to solve this and other types of problems on the international boundary where joint action is necessary. The United States State Department and the Ministry of Foreign Relations of Mexico have instructed their respective Sections of the International Boundary and Water Commission to make the foregoing studies. These studies are now in progress. The studies contemplated will include aerial and plane table mapping of the area, location of existing sewers, populations served, flow conditions, strength and amount of sewage, strength and amount of industrial waste and the design and location of sewage treatment works.

CONCLUSIONS

(a) A definite sanitation problem, requiring local cooperation and international action for its solution, exists on the New River at Calexico and Mexicali.

(b) The health of the public is potentially endangered by the proximity of the heavily-polluted New River to residential, business and recreational areas. Nuisance conditions that exist should be eliminated.

(c) The New River does not provide adequate dilution water at all times to satisfactorily dispose of untreated domestic sewage and industrial waste.

(d) Sewage treatment will be required to maintain the New River in sanitary condition.

(e) Additional field data will be required to determine the most feasible manner of alleviating the situation. It is, however, clear that the solution of the problem will require coordination of sewage treatment with stream flow and seasonal conditions. It appears that international control and operation is a definite requirement.

PROBLEMAS DE SANEAMIENTO EN CALEXICO Y MEXICALI (*Sumario*)

Las ciudades de Calexico, Cal., y Mexicali, B. C., en el Imperial Valley, son ciudades fronterizas contiguas, desaguando su alcantarillado en el Río Nuevo, que nace en México y pasando por los Estados Unidos desemboca en el Salton Sea. La población de Calexico es de unos 6,000 habitantes y la de Mexicali de 40,000.

La contaminación del Río Nuevo es intensa, según lo comprueban los estudios realizados por el Departamento de Sanidad del Estado de California, lo que representa un problema sanitario de importancia que requiere solución. Debido a la escasez del volumen de agua de este río, no se logra una dilución apropiada de los residuos cloacales e industriales, haciendo indispensable el establecimiento de plantas de tratamiento de aguas negras en esas ciudades.