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SEWAGE DISPOSAL AND WATER POLLUTION

STAFF REPORT

PREPARED FOR THE

JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS

ON

SEWAGE DISPOSAL AND WATER POLLUTION IN THE WASHINGTON METROPOLITAN AREA

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FOREWORD

The Joint Committee on Washington Metropolitan Problems, pursuant to the terms of House Concurrent Resolution 172, 85th Congress, is conducting a series of studies of the growth and expansion of the Washington metropolitan region. The scope of this investigation has been outlined in the committee's progress report, published as Senate Report 1230. To facilitate studies by the committee and the presentation of material in public hearings, a series of staff working papers are being prepared.

The following paper, by Gilbert V. Levin of Resources Research, Inc., is one of a group of three working papers dealing with aspects of the metropolitan water problem. Mr. Levin's paper is an independent professional analysis and will be used as a background for hearings of the Joint Committee on Washington Metropolitan Problems.

Mr. Levin's paper reviews a veritable shelf load of reports that have been written on the pollution and sewage-treatment problems of the Potomac River. The most important of these are cited in the bibliography at the end of this report.

This paper attempts an overall metropolitan view of the problem. Many of the previous studies reflect the political fractionalization of the Washington metropolitan area, and are concerned with only a part of the total problem. Others reflect the piecemeal approach dictated by the limited interests of a particular administrative organization. Within its intentionally restricted length, and by reducing this presentation to essentials, the effort has been to concentrate attention on the most important issues that must be faced.

FREDERICK GUTHEIM,
Staff Director.

SEWAGE DISPOSAL AND WATER POLLUTION IN THE WASHINGTON METROPOLITAN AREA

Introduction

Disposal of waterborne sewage has been a problem in Washington since 1840 when interior piping of water was introduced into the District of Columbia. This advance opened the way for intensive urban development but, at the same time, brought with it the threat of disease and decay caused by the mounting filth carried in the used water. In the intervening years, the only time the resultant pollution discharged to the rivers was under adequate control was during the period when nature, in the form of copious dilution water, could perform the task unassisted. By 1930, the natural assimilatory ability of the rivers was overpowered by the ever-increasing flood of pollution and the balance of power has never since been reversed. The reason for the polluted condition of the rivers has not been the inability of man to collect and treat the sewage sufficiently to allow the rivers to recover. Works have been built; but the scope and construction of these works have, without exception, been too little and too late to counter the trend.

The Washington metropolitan area is now showing unprecedented interest in the subjects of sewage disposal and water pollution. This is a direct consequence of the extraordinary development and growth of the area in recent years. Considerable sewerage and pollution abatement works have already been undertaken on the basis of detailed engineering studies and recommendations. Although a few of these studies have encompassed sizable fractions of the metropolitan area, none has considered the entire complex as a unit. Multiple jurisdictions and local sentiment have prevented this approach.

Concern for the future requires that present plans for sewage collection and treatment works for the various constituent jurisdictions be examined carefully from the standpoint of the Washington metropolitan area as presently visualized. There is precedent for such concern. Some unfortunate decisions made in the past, because of expediency, immediate economy, and of course the great difficulty of foreseeing the future, have been, and in some cases still are, very costly and difficult to correct. Because of the greatly increased orders of magnitude of the physical, financial, and population dimensions of the area, similar mistakes made in this era of accelerated development may be more serious than those past and, perhaps, irrevocable.

In one respect, today's planners have an easier task than yesterday's. This is in the tremendously important art of foresight. Economists, geographers, demographers, and other specialists have developed great skill in detecting and predicting trends of development. Reports prepared on the Washington metropolitan area by such ex-

perts in recent years leave no doubt that, barring economic, natural, or military catastrophe, the growth of the area will be tremendous. These predictions are sufficiently detailed and well grounded that, although they encompass a considerable range, the present generation will find somewhat less refuge for its mistakes in anticipating the future than did its predecessors.

In August 1957, the Public Health Service of the Department of Health, Education, and Welfare declared that pollution of an interstate character and dangerous to the public health existed in the Washington metropolitan area. The Service is conducting a series of hearings on the subject in accordance with the Federal Water Pollution Control Act.

The paramount problem in sewage disposal and water pollution now confronting the Washington metropolitan area is to develop and set in motion a coordinated program for the effective collection, treatment, and disposal of waterborne wastes for the entire area. The program must be planned and executed in such a manner that it will accommodate present conditions and those that will occur for a considerable period ahead. The system must be constructed in a manner that will provide maximum flexibility to allow expansion to meet the needs beyond this period. Above all, the system must be one soundly based on topographic and economic boundaries rather than arbitrary jurisdictional ones. The problem devolves into three basic questions:

1. What are the desired degrees of stream cleanliness toward which physical works should be designed?
2. What type of organizational pattern is best suited to administer the construction and operation of these works?
3. What is the best means of financing the required organization, construction, and operation?

The complete solution of the problem will require detailed technical analyses to provide the answers. It is possible for this committee, however, to determine the general framework within which the specific answers lie.

Effects of Pollution

RECREATION

Pollution has already denied us considerable use and benefits of our rivers. Nowhere in the metropolitan area are natural waters safe for swimming. All recreational use of the rivers and banks have been greatly impaired. Boating and fishing constitute health hazards because of the physical contact with sewage. Only gross fish regularly inhabit the rivers. A recent study of such fish caught in the area found considerable material of sewage origin in the intestines of all fish analyzed. Picnicking and even walking near the rivers is marred by unpleasant odors and visible floating sewage.

ECONOMIC

Real-estate values would undoubtedly appreciate along the rivers if the water were cleaned up. Silt pollution requires expensive dredging operations to maintain navigation channels. Shipping and pleasure craft suffer extensive paint damage and fouling inflicted by the pollution.

HEALTH

Counts of sewage bacteria found in samples of river water taken locally remind us of the ever-present threat to health. While there have fortunately been no outbreaks of major disease that might be attributed to the rivers in recent years, it is possible that their polluted condition does contribute to the incidence of minor intestinal disturbances. There is insufficient epidemiological data on such minor diseases to evaluate the role of our rivers, but all the conditions for the spread of disease exist.

And now another price we may have to pay for polluting our rivers looms ahead. Unless an adequate plan is devised and action initiated to cope with sewage disposal from the upstream region of the metropolitan area, the certain and extensive development of this region will result in sewage discharges that will threaten the safety of our water supply.[1]

POPULATION

An inspection of the growth rate of the Washington metropolitan area lends appreciation of the magnitude of the sewage disposal problem. Table 1 (1) shows the population growth and forecast for the period 1930–65. Figure 1 (2) shows the population increase that occurred in the metropolitan area from the 1950 census to January 1, 1957.

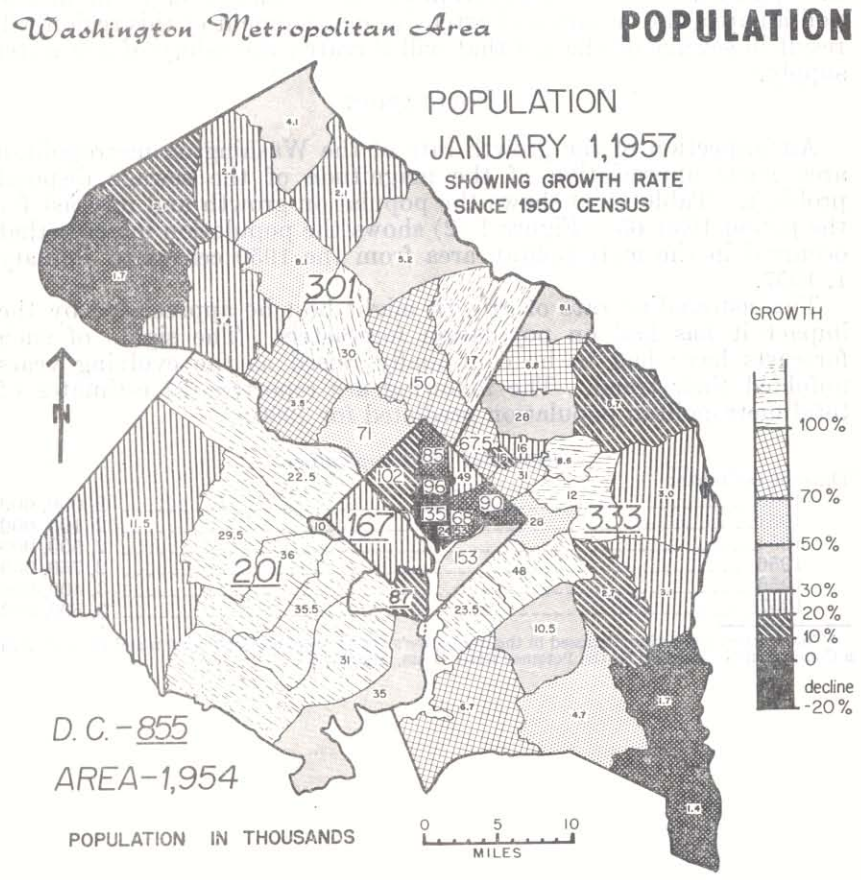
This astounding rate of growth might best be appreciated by the impact it has had on population forecasters. The sights of such forecasts have had to be continually raised as the evolving years unfolded their trend. The following are reported (3) estimates of total metropolitan population predicted for 1980:

Date of estimate:	*Estimated 1980 population*
1948	2, 000, 000
1951	2, 100, 000
1954	2, 500, 000
1956	2, 750, 000
1956	3, 400, 000
1957	3, 500, 000

[1] These factors are further discussed in the committee's Staff Report on Conservation and Recreation in a Comprehensive Program for the Potomac River Basin, March 1958.

FIGURE 1.

It is interesting and instructive to note that the most conservative of the above estimates, the 2 million figure, was actually attained by the area in 1957, 23 years ahead of schedule. The current Washington Board of Trade estimate for the metropolitan area at the year 2,000 is 4,800,000.



Summary of data presented by Dr. Jerome P. Pickard, Research Director, Economic Development Committee at the Washington Board of Trade 1957 Annual Business Outlook Conference.

TABLE 1.—*Population growth and forecast, 1930–65, Washington standard metropolitan area*

Area	Census, Apr. 1, 1930	Census, Apr. 1, 1940	Census, Apr. 1, 1950	Estimate, Jan. 1, 1957	Forecast	
					Apr. 1, 1960	July 1, 1965
Washington, D. C.	486, 869	663, 091	802, 178	855, 000	870, 000	890, 000
Montgomery County, Md	49, 206	83, 912	164, 401	301, 000	355, 000	435, 000
Prince Georges County, Md.	60, 095	89, 490	194, 182	333, 000	375, 000	460, 000
Maryland suburban	109, 301	173, 402	358, 583	634, 000	730, 000	895, 000
Arlington County, Va.[1]	26, 615	57, 040	135, 449	167, 000	180, 000	190, 000
Alexandria, Va.[1]	24, 149	33, 523	61, 787	87, 000	95, 000	105, 000
Falls Church, Va.[1]	1, 469	2, 576	7, 535	10, 000	11, 000	12, 000
Fairfax County, Va.[1]	23, 795	38, 353	98, 557	201, 000	247, 000	318, 000
Virginia suburban	76, 028	131, 492	303, 328	465, 000	533, 000	625, 000
Metropolitan area	672, 198	967, 985	1, 464, 089	1, 954, 000	2, 133, 000	2, 410, 000

[1] Falls Church City shown separately from balance of Fairfax County, Va.; city was made independent in 1948; portion of Falls Church City was in Arlington County in 1930, population of this part is included in the Arlington County total. Alexandria City annexed 7.5 square miles from Fairfax County in 1952; population estimated Jan. 1, 1957: Old city area, 70,500; annexed area, 16,500.

DESIRED WATER USES

Organized in 1940, the Interstate Commission on the Potomac River Basin has carefully followed the pollution picture in the metropolitan area. It has analyzed the rivers and the character of the area to determine the most beneficial uses which should be made of the Potomac and its tributaries. In its January 1958, meeting, the commission recommended the following water uses for adoption by all member jurisdictions, Maryland, Virginia, the District of Columbia, West Virginia, and Pennsylvania.

SECTION I

Potomac River: Monocacy River to Great Falls.

Objective: The establishment of conditions suitable for domestic water supplies, fish propagation, and recreational uses, and elimination of excessive soil erosion.

SECTION II

Potomac River: Great Falls to Little Falls.

Objective: The elimination of sewage and waste effluent and excessive soil erosion so that the water will be suitable for domestic water supplies and fish life.

SECTION III

Potomac River: Little Falls to Key Bridge.

Objective: The elimination of sewage and waste effluent and excessive soil erosion so that the water will be suitable for swimming, boating, shore recreation, and safe for all species of fish life with favorable conditions prevailing for their propagation.

SECTION IV

Potomac River: Key Bridge to Fort Washington.

Objectives: To reduce the quantity of combined sewage discharged, and to control the quality of waste effluents by effective treatment so as to make the water suitable for boating, shore recreation, industrial water supply and safe for the passage of all species of fish, with favorable conditions prevailing for the propagation of the hardier types.

SECTION V

Potomac River: Fort Washington to Hallowing Point.

Objective: To reduce the quantity of combined sewage discharged and to control the quality of waste effluents by effective treatment of wastes and disinfection of effluents to make the water suitable for boating, fishing, swimming, and other recreational uses.

PRESENT SITUATION

The boundaries of the various political jurisdictions or sanitary districts providing sewage service in the metropolitan area are shown in figure 2.

MARYLAND

Almost the entire suburban portion of the area on the Maryland side of the Potomac River is served by a single agency, the Washington Suburban Sanitary Commission. This sanitary district, which now encompasses 325 square miles and serves 475,000 people, was created in 1918 to serve an initial population of 32,000. Almost all of the sewage collected by the sanitary district is now piped to the District of Columbia for treatment in accordance with agreements reached between the two agencies in 1924 and 1954. The later agreement is very broad and provides for including capacity for anticipated sanitary district sewage in collection and treatment works constructed by the District of Columbia. The sanitary district paid an initial fee for use of the existing Washington facilities and pays its proportional share of new construction. It may elect to pay for the latter immediately or, upon the payment of interest, defer principal payment for 10 years. The single major system that will not connect to Washington will be the new Laurel sewage treatment plant which will discharge to the Patuxent River since this area lies considerably beyond the Potomac or Anacostia drainage basins. In addition to the information shown in the table, major extensions of sewerage services will be made to large areas in the Washington Suburban Sanitary District within the next several years.

DISTRICT OF COLUMBIA

The District of Columbia currently provides only primary treatment to the sewage received at its treatment plant prior to discharge to the Potomac River in Washington. The population tributary to this plant is 1,300,000. The sewage treatment plant, which went into service in 1938, is now being expanded and will provide secondary treatment this year with capacity for a design population of 1,790,000. It is estimated that approximately 2 percent of the sewage generated

and delivered to the District of Columbia escapes to the rivers prior to arriving at the treatment plant. This occurs because nearly half of the sewerage system was constructed as a combined system through which storm water and sanitary sewage were jointly transported, making it necessary to provide overflow outlets to the streams. During rains these overflows act to relieve the surcharge on the sewers and discharge mixed storm and sanitary sewage. Some 70 such structures empty into the Potomac and Anacostia Rivers and Rock Creek. Several of the overflows discharge continually because the capacities of the sewers have been exceeded by the normal flow of sanitary sewage.

FIGURE 2

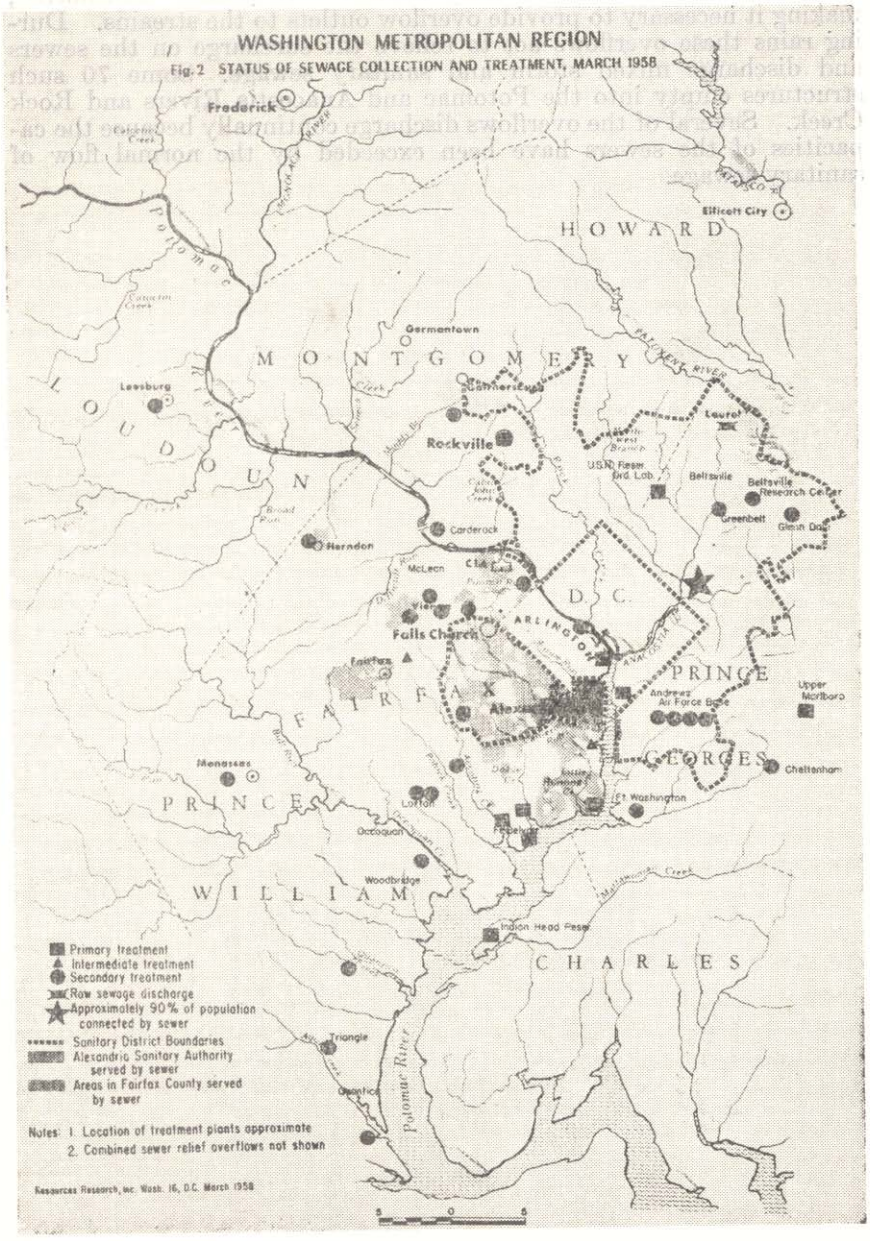

WASHINGTON METROPOLITAN REGION
Fig. 2 STATUS OF SEWAGE COLLECTION AND TREATMENT, MARCH 1958
Frederick
Ellicott City
HOWARD
Germantown
MONTGOMERY
Leesburg
LOUDOUN
Rockville
Laurel
Beltsville
Greenbelt
Herndon
Falls Church
D. C.
ARLINGTON
FAIRFAX
PRINCE GEORGES
Upper Marlboro
Andrews Air Force Base
Alexandria
Fairfax
Manassas
PRINCE WILLIAM
Lorton
Occoquan
Woodbridge
Indian Head Pen.
CHARLES
Triangle
Quantico
Potomac River
Primary treatment
Intermediate treatment
Secondary treatment
Raw sewage discharge
Approximately 90% of population connected by sewer
Sanitary District Boundaries
Alexandria Sanitary Authority served by sewer
Areas in Fairfax County served by sewer
Notes: 1. Location of treatment plants approximate
2. Combined sewer relief overflows not shown
Resources Research, Inc. Wash. 16, D.C. March 1958

TABLE 2.—*Status of sewage collection and treatment in suburban Maryland*

Source of sewage	Sewerage agency	Tributary population	Treatment plant				Remarks
			Design population	Location or name	Type	Commenced service	
Gaithersburg	WSSD	3,000	3,500	Gaithersburg	Secondary	1928 [1]	Plant to be abandoned and sewage delivered to the District of Columbia plant in 1959.
All other WSSD	WSSD	475,000					Delivered to the District of Columbia plant.
Laurel	Municipal	6,000					To connect to WSSD. Contract let by WSSD for secondary plant, 10,000 population capacity to expand to 40,000. Plant to be in operation in 1959. Effluent will discharge to Patuxent River. Sewage now discharges raw to Patuxent.
Rockville	do	20,000	3,000	Rockville	do	1939	To connect to WSSD. Plant to be abandoned and sewage delivered to the District of Columbia plant within several weeks.
Greenbelt	do	7,500	8,000	Greenbelt	do	1937	Plant doubled in 1942. Within 1 year will connect to WSSD. Plant to be abandoned and sewage delivered to the District of Columbia system.
Naval Ordnance Laboratory	U. S. Government	2,800	2,400	White Oak	Primary, secondary.	1946	2 plants in service: Secondary plant serves 2,400, septic tank serves 400. WSSD sewer will be available within 5 years. Sewage would be delivered to the District of Columbia plant.
National Agricultural Research Center.	do	1,700	5,000	Beaver Dam Creek.	Secondary	1935	Although population figures indicate reserve capacity, there is unusually high water use and the plant is now near its capacity to handle the flow. May possibly connect to WSSD for delivery of sewage to the District of Columbia and abandonment of plant within approximately 5 years.
National Agricultural Research Center plant industry station.	do	1,700		Indian Creek	do	1936	Plant doubled in 1953.
Andrews Air Force Base	do	9,000	9,000	Andrews Field	do	1941	Sewage on the base is treated at 4 separate plants. 1 plant has been enlarged twice. Additional facilities will be needed shortly. Plans exist for construction. Operation will continue by U. S. Government.

[1] Approximately.

TABLE 2.—*Status of sewage collection and treatment in suburban Maryland*—Continued

Source of sewage	Sewerage agency	Tributary population	Treatment plant				Remarks
			Design population	Location or name	Type	Commenced service	
Boys' Village of Maryland	State of Maryland	500	750	Cheltenham	do	1955	
Upper Marlboro	Municipal	1,500	600	Western Run	Primary	1939	Doubling of plant capacity recommended several years ago. Racetrack adds heavily to load.
David Taylor Model U. S. Basin.	Government	1,200	2,000	Carderock	Secondary	1945	
Fort Washington Forest	Private	700	1,000	Piscataway Creek	do	1955	
Indian Head Naval Reservation.	U. S. Government	2,200	2,500	Indian Head	Primary	1910 [1]	Plans to expand plant currently under discussion.
Glendale	District of Columbia government.	1,000	1,000	Lottsford Branch	Secondary	1930	Originally built in 1930 and improved in the late 1930's. It is planned to take flow to WSSC.

[1] Circa.

TABLE 3.—*Status of sewage collection and treatment in metropolitan Virginia*

Source of sewage	Sewerage agency	Tributary population	Treatment plant				Remarks
			Design population	Location or name	Type	Commenced service	
Arlington County and portion of Fairfax County.	Arlington County	173,000	200,000	Four Mile Run	Primary	1937; enlarged 1953.	This plant was enlarged in 1953 to accommodate the anticipated 1970 population of 200,000. However, this population will be exceeded by 1960, and expansion will again be necessary.
Alexandria Sanitary Authority.	Alexandria Sanitary Authority.	87,000	150,000	Alexandria	Intermediate	1956	
South of Annandale and majority Falls Church.	Fairfax County	104,000	80,000	Westgate	do	1953	No firm plans exist, but degree of treatment will probably be increased.
McLean area	do	4,700	7,500	Pimmit Run	Secondary	1957	
Little Hunting Creek drainage area.	do	6,000	12,500	Little Hunting Creek.	Primary	1957	Contract let for conversion to secondary treatment to be in operation this year.
Dogue Creek drainage area	do	4,100	7,500	Dogue Creek	do	1957	Do.
Churchill	Fairfax	600	600	Churchill	Secondary	1951	This plan will be abandoned and the sewage delivered to the Pimmit Run plant.
Vienna	Municipal	5,500	6,500	Vienna	do	1950, 1957	2 plants serve the town; 1 originally designed for 2,000 population expanded to 5,000 and now at capacity; 3d plant being planned.
Leesburg	do	1,700	3,500	Leesburg	do	1938	Plant enlarged 1955.
Herndon	do	1,800	1,000	Herndon	do	1930	New plant under construction, designed for 3,000. Another plant in area will probably be needed soon.
Loisdale	Private	700	1,400	Loisdale	do	1956	Capacity was doubled in 1957, additional capacity probably will be needed in 1959.
Pohick Estates	do	0	800	Pohick Creek	do		Plant just completed. Will commence operation shortly.
Pimmit Hills	do	6,000	7,000	Pimmit Run	do	1951	
Town of Fairfax	Municipal	9,000	5,000	Fairfax	See remarks		Plant being enlarged to design capacity of 20,000 population, secondary treatment; to be completed this summer. New subdivisions now waiting to connect.
Triangle area	Prince William County Sanitary District.	750	1,000	Triangle	Secondary	1950 [1]	
Occoquon-Woodbridge area	do	1,800	3,000	Marunsco Creek	do	1956	

TABLE 3.—*Status of sewage collection and treatment in metropolitan Virginia*—Continued

Source of sewage	Sewerage agency	Tributary population	Treatment plant				Remarks
			Design population	Location or name	Type	Commenced service	
Garfield	Prince William County	700	700	Neabsco Creek	do	1954	New and larger plant planned.
Manassas	Municipal	3,200	3,500	West of Manassas	do	1950	Area developing rapidly, sewers being extended. Considering building 2d plant for town.
Fort Belvoir	U S. Government	16,000		Fort Belvoir	Primary	1940 [1]	2 plants serve the base. These are old plants expanded from time to time. Further expansion needed, but no firm plans exist.
Pentagon	do	40,000	40,000	Boundary Channel.	Secondary	1942	This plant provides the highest degree of treatment in the area.
Quantico	do	15,800		Potomac	do	1940	Now being expanded to serve 20,000.
Lorton Penal Institute	District of Columbia government.	3,800	4,000	Lorton	do	1930 [2]	2 plants serve the institution. Both were rebuilt in 1939. Plans now exist to improve plants and possibly build a 3d plant to serve proposed youth institution.

[1] Approximately.

[2] Circa.

VIRGINIA

Examination of figure 2 and tables 2 and 3 make it quite evident that two markedly contrasting methods of approach to sewage disposal and water pollution control exist in the metropolitan area. The Maryland-District of Columbia complex has consolidated sewerage systems and, except for the Laurel plant in the Patuxent drainage basin and the Federal Government plants on United States reservations, has taken steps to treat virtually all sewage generated in sewered areas at a single plant.

The Virginia section of the metropolitan area, on the other hand, has elected to handle its sewage collection and treatment problems, with some limited exceptions, on an individual jurisdictional basis. As a result of this decision, made as recently as 1954, there now has come into existence a multiplicity of sewerage collection systems and treatment plants operated by almost as many separate agencies. Most of these plants are of recent construction, and operation, for the most part, is quite good. The Alexandria sewerage system, similar to that of the District of Columbia, has a number of combined sewer overflows which discharge directly to the Potomac River during rains.

In addition to sewered communities, many small towns, subdivisions and crossroads depend upon individual septic tanks for sewage disposal. In some areas, the soil is not suitable for the disposal of the effluent from the tanks and hazardous situations exist in which the partially treated sewage discharges to the surface of the ground and finds its way into the nearest streams or, in some cases, may pollute nearby wells supplying drinking water. To prevent such conditions in new subdivisions, minimum-sized building lots have been required and soil tests imposed. Nonetheless, septic tank pollution is common where rural areas have developed sufficiently to produce sizable quantities of sewage, but not sufficiently to finance collection and treatment works.

Existing Planning

MARYLAND

The Washington Suburban Sanitary Commission in 1955 (4) outlined a 5-year plan of action for sewage collection and disposal. The cost of the total program was estimated at $14,805,400. The portion of the work completed is reflected in the previous section of this report. The Cabin John trunk sewer will be connected to receive the sewage from Rockville for transport to the District of Columbia system in a matter of weeks and the existing Rockville plant will be abandoned. The Gaithersburg treatment plant will be abandoned when the sewerage system of the Gaithersburg-Washington Grove area is similarly connected in 1959. Within a year, the Greenbelt system will be likewise connected and its plant abandoned. Within several years WSSD sewers will be available to the naval ordnance laboratory at White Oak and the Department of Agriculture research center at Beltsville, and it is anticipated that negotiations will be consummated with the United States Government for both reservations to be connected. The existing plants at each would then be abandoned and the sewage delivered to the District of Columbia system. Negotiations were recently concluded whereby the sewage

from the city of Laurel will be received and treated by the Washington Suburban Sanitary Commission. At the present time the sewage from Laurel is being discharged raw to the Patuxent River. A contract has been let by the commission for the construction of a secondary treatment plant to be completed during 1959. The effluent will be discharged to the Patuxent. The remainder of the plan calls for construction of pumping stations and sewer reinforcements to reduce further the discharge of raw sewage, the payment for proportionate costs for receiving and treatment works in the District of Columbia, and for considerable extension of sewer service to open large areas to development. This 5-year plan is currently being revised and enlarged to carry through 1962.

DISTRICT OF COLUMBIA

At the present time the District of Columbia sewage-treatment plant at Blue Plains is being expanded to provide secondary treatment for a design population of 1,790,000. This stage of construction will be completed this year, and it is anticipated that the plant will provide adequate treatment for the quantity of sewage expected from the District of Columbia and the Washington Suburban Sanitary District until 1980. Plans exist to increase the degree of treatment afforded by the plant in 1965 at an additional cost of $5 million. On the basis of a recently completed engineering report (5), the Department of Sanitary Engineering of the District of Columbia has recommended adoption of a $133,174,000 sewer-construction program. The program would provide relief sewers, pumping stations and force mains. Of the total sum, $11,284,000 would be spent in converting a limited portion of the combined sewers to separate sewers. Relief sewers provided for the remaining combined sewer area would reduce the frequency and quantity of sewage overflows to the rivers. The construction program would extend over a 15-year period.

VIRGINIA

The metropolitan area of northern Virginia, encompassing Arlington County, Fairfax County, Alexandria, and Falls Church, adopted a plan for sewage disposal recommended in an engineering report (6) to a joint committee in 1954. A great deal of the construction required by the plan has been completed as indicated in the preceding tables, charts, and text. Some of the construction still anticipated by the plan includes enlargement of the Arlington County treatment plant and conversion to a higher degree of treatment around 1970 and again about 1985. Extension of the plant outfall to the Potomac River is visualized at some future date. Relief sewers and extensions and increased pumping capacities are planned in the county. The plan calls for increasing the capacity of the Alexandria treatment plant around 1973 and possible extension of its outfall to the Potomac. In the next 2 years, Fairfax County plans to spend approximately $7 million on sewers and treatment facilities. Construction is now in progress to install secondary treatment at the Little Hunting Creek and Dogue Creek plants. The plant expansions had originally been scheduled for 1970 with an expansion of the upper Pimmit and Dead Run plant.

VIRGINIA

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from the city of Laurel will be received and treated by the Washington Suburban Sanitary Commission. At the present time the sewage from Laurel is being discharged raw to the Patuxent River. A contract has been let by the commission for the construction of a secondary treatment plant to be completed during 1959. The effluent will be discharged to the Patuxent. The remainder of the plan calls for construction of pumping stations and sewer reinforcements to reduce further the discharge of raw sewage, the payment for proportionate costs for receiving and treatment works in the District of Columbia, and for considerable extension of sewer service to open large areas to development. This 5-year plan is currently being revised and enlarged to carry through 1962.

DISTRICT OF COLUMBIA

At the present time the District of Columbia sewage-treatment plant at Blue Plains is being expanded to provide secondary treatment for a design population of 1,790,000. This stage of construction will be completed this year, and it is anticipated that the plant will provide adequate treatment for the quantity of sewage expected from the District of Columbia and the Washington Suburban Sanitary District until 1980. Plans exist to increase the degree of treatment afforded by the plant in 1965 at an additional cost of $5 million. On the basis of a recently completed engineering report (5), the Department of Sanitary Engineering of the District of Columbia has recommended adoption of a $133,174,000 sewer-construction program. The program would provide relief sewers, pumping stations and force mains. Of the total sum, $11,284,000 would be spent in converting a limited portion of the combined sewers to separate sewers. Relief sewers provided for the remaining combined sewer area would reduce the frequency and quantity of sewage overflows to the rivers. The construction program would extend over a 15-year period.

VIRGINIA

The metropolitan area of northern Virginia, encompassing Arlington County, Fairfax County, Alexandria, and Falls Church, adopted a plan for sewage disposal recommended in an engineering report (6) to a joint committee in 1954. A great deal of the construction required by the plan has been completed as indicated in the preceding tables, charts, and text. Some of the construction still anticipated by the plan includes enlargement of the Arlington County treatment plant and conversion to a higher degree of treatment around 1970 and again about 1985. Extension of the plant outfall to the Potomac River is visualized at some future date. Relief sewers and extensions and increased pumping capacities are planned in the county. The plan calls for increasing the capacity of the Alexandria treatment plant around 1973 and possible extension of its outfall to the Potomac. In the next 2 years, Fairfax County plans to spend approximately $7 million on sewers and treatment facilities. Construction is now in progress to install secondary treatment at the Little Hunting Creek and Dogue Creek plants. The plant expansions had originally been scheduled for 1970 with an expansion of the upper Pimmit and Dead Run plant.

An engineering report (7) rendered to Fairfax County in 1957 recommends a scheduled plan for the expansion of the upper Pimmit Run plant for the disposal of sewage on Pimmit, Little Pimmit, Dead, Turkey, Scotts, and Bull Neck Runs. This report continues the philosophy established in 1954 of treating sewage in individual plants as close to the points of origin as topographic conditions will permit, but joint treatment in these small neighboring areas is recommended. The plan requires the present upper Pimmit Run plant to be expanded in 1960, again in 1964, and again in 1972.

The Alexandria Sanitary Authority, created in 1952, began operating its new sewage treatment plant in 1956. The authority collects and treats the sewage from Alexandria and parts of Fairfax County. Extension of the system into Fairfax County is not contemplated as the county will develop its own systems. A new engineering study is to be undertaken to provide a master plan for sewage disposal in the county. The possibility of piping sewage to Washington from a portion of the northern section of the county will be reconsidered.

The town of Fairfax is currently enlarging and extending the degree of treatment of its sewage treatment plant to handle a design capacity of 20,000 persons. This plant will enable development of several planned subdivisions in the area.

Suburban development in Virginia has now penetrated Loudoun and Prince William Counties. Several small treatment plants have been or are being constructed and more are planned.

Principal Sewage Disposal and Water Pollution Problems Facing the Metropolitan Area

We are now ready to examine the major sewage disposal and water pollution problems requiring attention today.

MULTIPLE SYSTEMS

While there may have then been some immediate financial advantage for the individual jurisdictions, the 1954 decision by the northern Virginia segment of the Washington metropolitan area to pursue a course of constructing multiple sewerage systems and treatment plants was unfortunate for the area as a whole. Ultimately, the plan will work to the detriment of the various jurisdictions. The rapid growth of the area has already leaped ahead of many of the basic population assumptions upon which the systems were designed. Perhaps an excellent example of the difficulties imposed under such conditions is that of the Washington Suburban Sanitary Commission's Bladensburg plant which was constructed in 1941. By 1956, after approximately only 15 years of service, the by then badly overloaded plant was abandoned and the sewage load delivered to the District of Columbia system.

CONSOLIDATION REJECTED

Among the alternatives considered by the northern Virginia communities in their 1954 study was the possibility of cooperating in the creation of a regional system that would convey almost all the sewage across the Potomac River to the District of Columbia plant which would be enlarged. The sewage from remote areas would be treated

in separate plants at Pimmit Run, Dead Run, Little Hunting Creek and Dogue Creek. This plan, in effect, would be the counterpart of the existing system serving the Maryland portion of the area. The decision made was based on two primary conclusions:

1. That the most economical solution to the sewage problem was for each jurisdiction, with minor exceptions, to construct and maintain its own system;

2. There would be no difference in effect on the Potomac River if the sewage effluent from Virginia were discharged at many points rather than at a single point.

Under the plan, the Virginia communities have very energetically undertaken construction of collection and treatment works. The reduction in pollution has been great. When the improvements under construction begin operating at the District of Columbia treatment plant, the anticipated total effect on the river will be dramatic as seen in figure 3. However, in view of the areawide scope of the Joint Congressional Committee on Washington Metropolitan Problems, and the continued growth of the area threatening to offset these gains, the time may be at hand for a reexamination of the local systems approach.

Figure 4 is taken from the 1954 report on the Virginia metropolitan area and presents the cost data upon which its conclusion in favor of separate treatment plants was reached. It can be seen that the costs were projected to the year 2000. The entire range over which the total costs for the alternate plans shown in the figure varied was less than $5 million, or approximately 9 percent of the total project cost of $55 million. The plan to convey the sewage to the District of Columbia was estimated at $56,300,000, only 2.4 percent more than the plan selected. In view of the extreme difficulty of estimating future costs with a degree of accuracy of several percent, the choice is not warranted on the basis of the slight difference in estimated costs shown. Even if the future proves that the estimates were extraordinarily accurate, the relatively slight difference in cost between the two alternatives should not have been a major decisive factor. Before a decision of this importance was made, it would have been well to have compared the estimated minor added cost of completely removing the sewage from the area with the public health hazards and nuisances characteristic of local plants discharging into many neighborhood watercourses. These watercourses, such as Four Mile Run, and Hunting Creek are now badly polluted.

The second conclusion upon which the decision was based might also be reviewed. It was stated that because of the wide extent of the affected reach of the river, and the mixing due to tidal action, the number of discharges to the river would have no significant effect on the capacity of the Potomac to assimilate pollution. However, in view of the fact that it takes a great number of days, frequently more than a month (8), for a drop of water in the Potomac to flow through the metropolitan area, treated sewage discharged in the upstream portion of the area will remain in the area for considerable periods of time. Were the treated sewage discharged in the downstream portion of the area, such as at the District of Columbia treatment plant outfall or this outfall extended downstream, the residence time of the sewage in the metropolitan area would be less. The sewage would mingle with the increased dilution water available downstream and would not

FIGURE 3

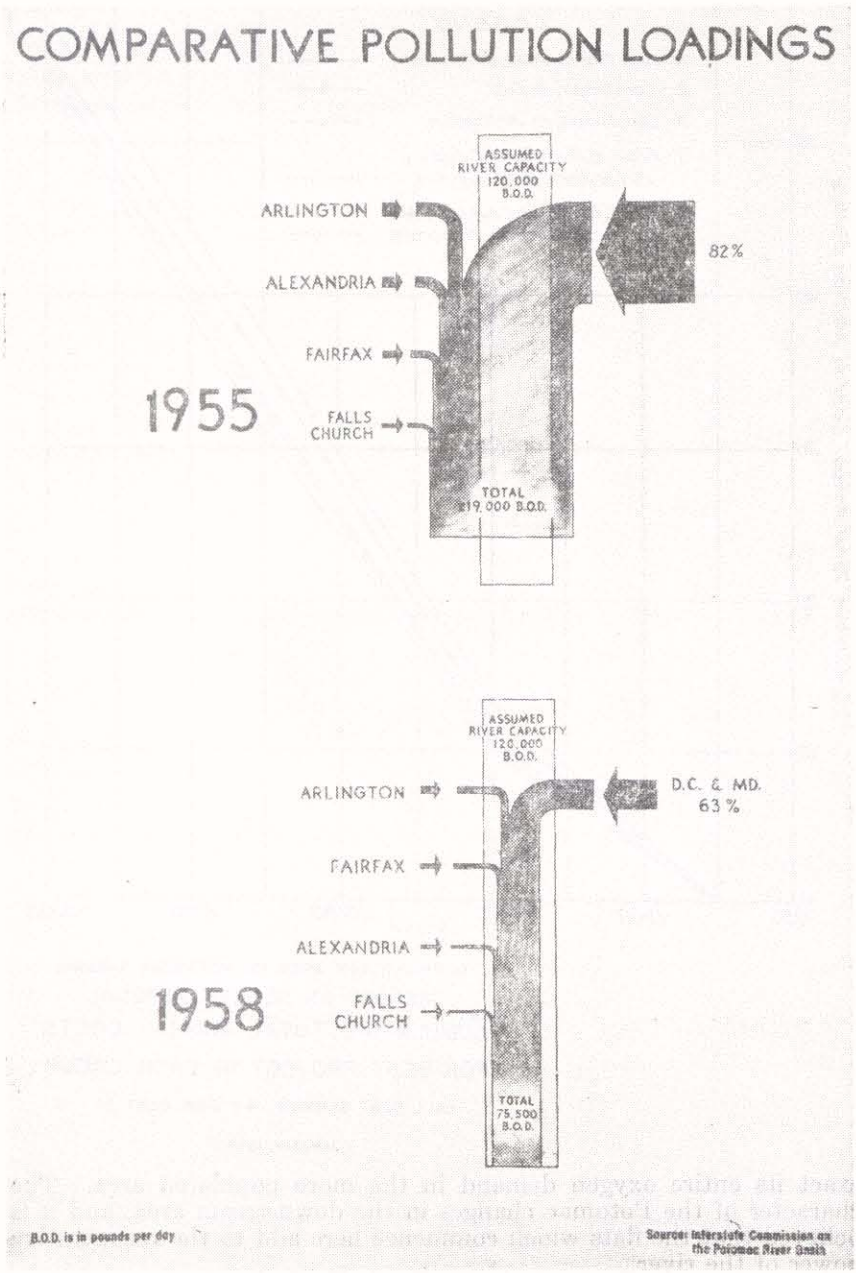
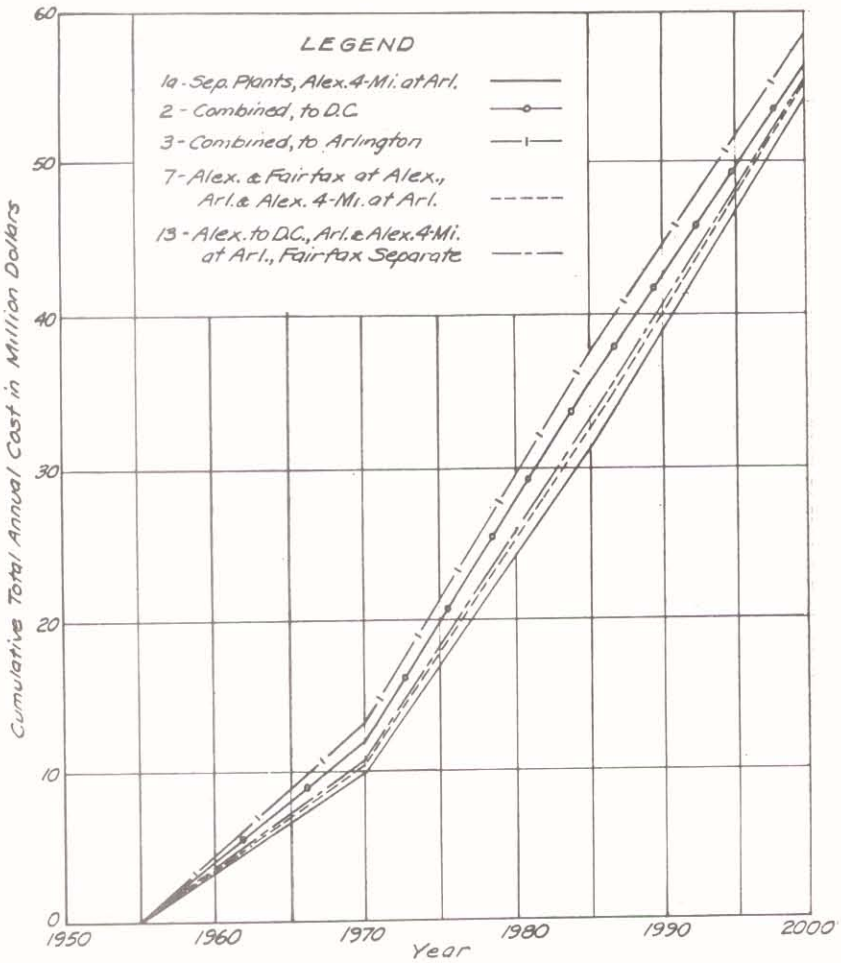

COMPARATIVE POLLUTION LOADINGS
ASSUMED RIVER CAPACITY 120,000 B.O.D.
ARLINGTON
ALEXANDRIA
FAIRFAX
FALLS CHURCH
1955
82%
TOTAL 119,000 B.O.D.
ASSUMED RIVER CAPACITY 120,000 B.O.D.
ARLINGTON
FAIRFAX
ALEXANDRIA
FALLS CHURCH
1958
D.C. & MD. 63%
TOTAL 75,500 B.O.D.
B.O.D. is in pounds per day
Source: Interstate Commission on the Potomac River Basin

FIGURE 4



exact its entire oxygen demand in the more populated area. The character of the Potomac changes in the downstream area, and it is believed that the flats which commence here add to the recuperative power of the river.

COMMITTING THE FUTURE

More important than these considerations, however, are the effects of establishing a pattern of multiple discharges which increasingly commits the future. The plants constructed and to be constructed are not considered as serving temporarily until consolidation can be effected. As the population increases, the plants are enlarged and new plants are built, in turn to be enlarged. The program initiated in 1954 was based on a design population which would attain 496,000 in the Virginia suburban area by 1970. The total population has already equaled this and the sewered population has or will within a few years. This growth alone justifies a review of the matter. Unless construction is planned with an eye toward that ultimate day when, because of the quantities of sewage generated, consolidation will no longer be an alternative but the only solution, tremendous expenses may be incurred.

COST OF OPERATION

In addition to the construction costs, the operation costs should be reexamined for the present and the future. Experience has shown that 1 or 2 central treatment plants would function more efficiently and economically than a large number of plants. Technical operation of the individual treatment plants at present is good, but it is generally easier to control treatment more closely at a centralized plant. This may become evident in the near future when the smaller plants reach capacity or beyond.

GRADUAL CONSOLIDATION

It is not suggested that the costly works recently built in the Virginia region of the metropolitan area be summarily abandoned in favor of immediate consolidation and delivery of sewage for central treatment and discharge into the Potomac. However, it is suggested that the situation be further explored to see whether a planned transition which would gradually consolidate the systems, as segments become overloaded, might be feasible.

Perhaps this could best be accomplished by establishing a single sanitary authority for the entire Washington metropolitan area. Creation of one sanitary district to encompass the northern Virginia portion of the metropolitan area, and contractual coordination with the District of Columbia and the Washington Suburban Sanitary District might provide the best solution. Expansion of the functions and powers of the Interstate Commission on the Potomac River Basin to enable it to act as the authority or coordinating agency is another possibility.

Other responsibilities that could be assigned to a metropolitan sanitary authority are those for water supply, garbage, and refuse collection, and air-pollution control.

SILT

It has recently been reported (3) that despite the major emphasis hitherto placed on sewage pollution, the most important pollutant of the Potomac is silt. Silt is rapidly filling the river and channel, renders the river unsightly, smothers normal bottom life essential to

biological balance, and will prevent full recreational use of the river should the sewage pollution be adequately controlled. Almost all the erosion products, estimated at 60 million cubic feet annually, from the 12,000 square mile drainage area of the Potomac are deposited on the river bottom in the Washington metropolitan area. This is because the river meets the tide here with the resultant great reduction in velocity that permits the suspended silt to settle. The report recommends the construction of the large dam at Riverbend and the major impounding reservoir presently being studied as a source of water supply for the District of Columbia and portions of the metropolitan area. The report states that the reservoir should be designed so that one of its major functions will be to serve as a sedimentation basin to remove the silt load from the Potomac. This matter should be taken into consideration in the current study of the Potomac River Basin by the Corps of Engineers. Other effective means to control silt are to encourage good soil conservation practices in the upstream farmlands, and to require subdivision builders to take measures against soil erosion. This occurs when the raw earth is exposed for long periods of time.[2]

THREAT TO WATER SUPPLY

A new water supply intake for the District of Columbia has just been completed by the Army engineers at Little Falls close to the northwest boundary of Washington. The original intakes, located further upstream at Great Falls, are quite old and the Little Falls intake was planned as the one to be most heavily used. The rate of housing development threatens encroachment of sewage discharges near and above both intake locations. This encroachment has already begun at upstream locations, remote from existing sewerage systems.

Examples of this are the Atomic Energy Commission building recently opened in Germantown, Md., the Central Intelligence Agency building planned for Langley, Va., the Bureau of Standards relocation planned for Gaithersburg, Md., and the Federal decision to construct a new airport at Chantilly, Va.

At best, plans provide for the treatment of the sewage generated in the agency buildings. Adequate plans have not been developed for the satellite communities which will inevitably appear. Unless action is initiated soon, the result will be the discharge of sewage into the Potomac River upstream and within a short distance of one or both Washington water-supply intakes. This is a major challenge to county and regional planning. Much greater coordination of planning and sewage programs is also needed.

It should be stressed that there is sufficient space close to existing sewerage systems to contain comfortably several times the present population of Washington without requiring the development of these remote areas. While there has been much talk of voluntary cooperation to curtail leapfrog housing development, a coordinated enforcement program is probably the only way the threat can be safely met. Some arrangement should be made between the Federal Government and the area sewerage authorities for thorough planning of proposed moves.

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SOUTHERN PORTION OF AREA

Much development is in progress in suburban Maryland south of the District of Columbia, extending almost as far as the Charles County line. This is an area well suited for development. The land is marginal for farming and there are no water supplies below it to be polluted. The area should be studied and sewerage plans made to assist an orderly development designed to avoid the future construction of numerous small sewerage systems and treatment plants the pollution from which would destroy esthetic, real estate and recreational values. The Virginia side of the river in this southerly portion of the metropolitan area is experiencing similar development in Prince William County. The same type of planning is needed here.

SEWAGE CAPACITY OF POTOMAC

Over the years there has been a continuing and increasing interest in the capacity of the Potomac River to assimilate pollution without becoming degraded to an objectionable degree. This capacity is the foundation for all sewage treatment design since the pollution load should obviously be reduced to this quantity before discharge to the river. As the total population and the sewage flow of the metropolitan area increase, higher and higher degrees of treatment are required to meet this limiting capacity.

The 1954 study in the Virginia area considered this problem in detail and, by an empirical method of analysis, calculated the capacity of the Potomac in metropolitan Washington as equivalent to the raw sewage from 600,000 persons. The Department of Sanitary Engineering of the District of Columbia had previously considered the capacity as equivalent to the raw sewage from 500,000 persons.

Since these values were determined, an intensive analysis (9) of the affected stretch of the river was made for, and released by, the Interstate Commission on the Potomac River Basin. This report cautioned that the yardstick by which the previous values had been determined, the biochemical oxygen demand, cannot be regarded as a valid measure for treatment design in the Washington metropolitan area. The actual capacity of the river is believed to be considerably below either value cited. The future may bring even lower assimilating capacities if the river flats continue to be filled in by shore "improvements." An intensive investigation of the river was recommended in the report in order to determine the true value. This is an important and fundamental consideration requiring further attention.

CHESAPEAKE BAY OUTFALL

The report cited as reference 3 also voices concern over the assimilatory capacity of the river. In particular, it cites the fact that increased degrees of treatment actually increase the quantities of dissolved nitrates and other available plant fertilizers discharged in the effluent. The report fears that the Potomac will ultimately be fertilized to the point where intensive algal and other biological growths will develop, bringing with them highly objectionable conditions similar to those of sewage pollution.

As a solution to this problem, the report proposes the construction of an outfall to the Chesapeake Bay, a distance of approximately 30

miles. Treated sewage from the District of Columbia, Arlington County, Prince Georges County, Anne Arundel County, and Calvert County would be pumped through the structure. It is anticipated that the larger quantity of receiving water in the bay will preclude any objectionable condition from arising there, and, in fact, the fertilizer may have a beneficial effect on fish and shellfish.

An alternative to this plan that might be considered is the construction of an outfall for a similar or somewhat lesser distance to discharge downstream in the Potomac. Here, also, much larger quantities of dilution water than are present in Washington would be available. The outfall could receive treated sewage from the developing areas south of the Washington Suburban Sanitary District previously discussed.

A rapidly accelerating trend in the practice of irrigation in nearby farming since 1953 has been reported (10). Major problems associated with this method of increasing crop yields are water supply and fertilizer requirements. Highly treated sewage effluent might supply both needs, restoring productivity to wornout or marginal lands and also help solve the problem of reducing the fertilizer load to the Potomac. An outfall to the bay or downstream Potomac could supply the effluent to areas it traverses.

SEPARATION OF COMBINED SEWERS

The report cited in reference 5 and the plan of action recommended by the District of Columbia Department of Sanitary Engineering contemplate a limited attack on separation of the combined sewers in Washington. Complete separation is not recommended in this plan because of the high cost estimated, $213,845,000. A breakdown of this figure, however, states that $74,018,000 are for the required sewer construction and the remaining $139,427,000 are for reconnecting private house plumbing in a manner that will deliver roof drainage to the storm sewer and domestic sewage to the sanitary sewer. Applying the same ratio of sewer to house plumbing costs, approximately $3,900,000 of the recommended plan would be expended on sewer costs in the areas where separation would take place. Insofar as street sewer costs alone are concerned, the difference between partial separation and total separation is approximately $70,118,000.

If some plan could be devised to reduce interior plumbing costs drastically, the resultant cost, spread over the number of years required to effect the separation might not be prohibitive. The report reviews a "modified" plan for effecting complete separation of the sewers which would eliminate house plumbing costs. This method would connect the house laterals to the new sanitary sewers without diverting the roof drains to the storm sewers. The plan would require larger sanitary sewers to accommodate considerable roof runoff in built-up areas. The scheme was not recommended and no cost analysis of it was reported. An analysis may be in order, examining such other possible cost-saving features as building the modified sanitary sewers within the larger storm sewers to reduce street construction, and converting some of the existing overloaded combined sewers to sanitary sewers by reconnecting street inlets to new storm sewers, thereby eliminating house plumbing work.

In considering costs of divorcing the storm and sanitary sewage flows, it should be remembered that for many decades the District of Columbia "saved" the cost of separate sewer construction.

RECREATION BASIN

Reference 3 proposes a plan whereby all sewage discharges to the Potomac in the metropolitan area would be diverted to points below a low barrier dam which would be built across the river as part of, or near, the 14th Street Bridge. The tide and its pollutional load would thus be kept below the dam. The river above 14th Street would be developed into a recreation basin where water quality would be satisfactory for swimming, fishing, and boating. Such a recreation basin can fill a great need in the Washington metropolitan area where residents must travel considerable distances for clean water recreation, and would enhance the attractions of the National Capital by positively eliminating sewage and sewage affluent. The total cost of the project is estimated as $25 million to $30 million.

INDUSTRIAL WASTES

Industrial wastes play a minor role in metropolitan area water pollution. Sand and gravel washing operations, concrete mixing and asphalt mixing do create nuisances and add to the silt problem locally. These wastes should be properly treated before discharge to the stream.

PLANNING FOR THE FUTURE

Sewage disposal and water pollution control planning in the Washington metropolitan area has followed a pattern of undertaking successive short-range construction projects. Works have been built which acknowledgedly would be rendered inadequate in relatively few years by the relentless march of population. The plans state that when this occurs, the works shall be expanded to accommodate another limited period.

In an address before the Interstate Commission on the Potomac River Basin last year, Abel Wolman stated that experience has shown that once a decision on an engineering solution has been made "it takes roughly 10 to 20 years before any results are obtained." On the whole, the metropolitan area would conform to this pattern. The Virginia communities have done better than this, but the decision was late in coming.

When solutions are planned in a series of short-range steps the danger obviously exists that the delay factor will reoccur between the stages. The farthest frontier explored by the succession of planning stages is the year 2000. The 42 intervening years may seem long in terms of human life, but, when considered in terms of the useful life of major engineering works, the period is not long. Perhaps it is time for the planners to begin to get the feel of talking about the year 2050. Certainly, in the interests of minimizing total periods of inconvenience due to construction, achieving long-range construction economy and, above all, in preventing treadmill pollution control that never quite catches up to or stays ahead of the problem, con-

struction stages should embrace greater increments of the future than has been the practice.

Sewers are long-lived structures and, therefore, deserve objective, long-range planning. Properly built conduits have a low annual cost because they may be amortized over 100 years. In Washington there are many lines over 50 years old and in good condition. European cities have "modern" sewers approximately a century old in regular service.

FINANCING

So far we have enumerated technical problems. With some exceptions, they are easy of solution. Unfortunately, before any technical problem can be solved the financial problem associated with it must be surmounted. It is obvious that the predicament now confronting the Washington metropolitan area is largely the result of failure to solve the financial problem. Financial limitations have often forced the adoption of plans of limited scope. Engineering plans have had to conform to areawide pay-as-you-go financing. This frequently means you don't go. The problem of financing should be studied concurrently with that of jurisdictional or agency consolidation previously discussed. The Federal Government and support activities required by it are responsible in large measure for the sewage-disposal problems confronting the area. Government properties do not yield taxes to local jurisdictions but usually require utility services from them.

Some problems are the sole responsibility of the Federal Government, such as the creation of satellite communities in remote areas by relocating Government agencies. Many plants serving the Government installations themselves are inadequate. As the Nation's Capital, the District of Columbia should set an example for our other cities. Accordingly, the Department of Sanitary Engineering feels it must include greater factors of safety in its sewer design than is the general practice throughout the country. The Federal Government does not defray these added costs. As yet, the Federal Government has not yet defined or recognized its role in assisting in the solution of the problems it has thus imposed on the area.

Unless an equitable and satisfactory means of financing is established throughout the metropolitan area, it will be unrealistic to expect anything other than tortuous and piecemeal progress in pollution abatement.

Summary of Major Problems Requiring Attention

The major problems of sewage disposal and water pollution control requiring attention in the Washington metropolitan area are:

1. Should the sanitary facilities of the Washington metropolitan area be consolidated either administratively, or physically; or both?
2. What must be done to control the deposition of silt in the area?
3. What actions are required to protect the Washington water supply from pollution from future upstream development?
4. How can sewer service be provided to allow and promote the orderly and pollution-free development of the downstream section of the area?
5. What is the natural capacity of the Potomac to assimilate pollution?

6. What shall be the ultimate disposal of the treated sewage effluent from the metropolitan area?

7. Can the cost of separation of the combined sewers in the District of Columbia be reduced to the point where total separation is ultimately feasible?

8. Shall the metropolitan portion of the Potomac River above 14th Street be converted into a recreational basin suitable for swimming, fishing and boating?

9. For what period into the future should plans and construction be undertaken?

10. What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

Concluding Statement

The object of the study being made by the joint congressional committee is to examine the facets of the sewage disposal and water pollution control programs of the Washington metropolitan area it believes may require additional planning or action. This brief discussion is, therefore, geared to that end. It is hoped that the analysis will be accepted for its true purpose—the objective presentation of difficult problems confronting the metropolitan area designed to promote thought toward solutions from which all will benefit.

References Cited

1. Washington Board of Trade Economic Development Committee, Dr. Jerome P. Pickard, research director, presented at annual conference, 1957.

2. Ibid.

3. A Clean Potomac River in the Washington Metropolitan Area, Wolman, Geyer, and Pyatt, Interstate Commission on the Potomac River Basin, 1957.

4. A Sewerage Program for the Sanitary District, with supplement, Washington Suburban Sanitary Commission, July 1955.

5. Report to District of Columbia Department of Sanitary Engineering on Improvements to Sewerage System, Board of Engineers, Greeley, Marston, and Requardt, 1957.

6. Metropolitan Area of Northern Virginia, Report on Sewage Disposal, Arlington County, Fairfax County, Alexandria, Falls Church, Alexander Potter Associates, and Greeley and Hansen, June 1954.

7. A Report Defining Procedure for Scheduling Expansion of Sewage Works for Disposal of Sewage on Pimmit, Little Pimmit, Dead, Turkey, Scotts and Bull Neck Runs, McLean Area, Fairfax County, Va., G. Hubard Massey, Massey Engineers, August 28, 1957.

8. A Clean River for the Nation's Capital, a Report on Water Pollution in the Washington Metropolitan Area, Section I—Summary, Interstate Commission on the Potomac River Basin, 1954.

9. A Report on Water Pollution in the Washington Metropolitan Area, Section III—Appendixes, Interstate Commission on the Potomac River Basin, 1954.

10. Trends and Developments in Irrigation, Maryland, Luther B. Bohanan, University of Maryland Agricultural Experimental Station, College Park, Md., October 1955.

Additional References Reviewed

Agreement No. DCF–A– , agreement between District of Columbia and Washington Suburban Sanitary District, 1954.

Arlington County and the Potomac River Pollution Load, Department of Public Service, Arlington County, Va., presented by F. H. Doe, Jr., sanitary engineer, at winter meeting of the Interstate Commission on the Potomac River Basin, January 31, 1957.

Arlington County, Va., Sewage Treatment Plant (fact sheet, undated).

A Review of Interstate Pollution, the Potomac River in the Washington Metropolitan Area, Department of Health, Education, and Welfare, Public Health Service, 1957.

A Report on Water Pollution in the Washington Metropolitan Area, Section II—Technical Report, Interstate Commission on the Potomac River Basin, 1954.

Dispersal of Pollution by Tidal Movements, Thomas M. Niles, ASCE Proc. Paper 1408, volume 83, No. SA5, part 1, Journal of Sanitary Engineering Division, October 1957.

District of Columbia Pollution of Potomac River, Required Degree of Treatment, Thomas M. Niles, September 1956.

Engineering and Financing Considerations of an Integrated Sewerage Program for Fairfax County, Va., Alexander Potter Associates, October 15, 1953.

Public Law 363, 83d Congress, chapter 218, 2d session, H. R. 8097, an act to authorize the financing of public works construction for the District of Columbia, May 18, 1954.

Federal Water Pollution Control Act, Public Law 660, 84th Congress.

Future Potomac Resources, Interstate Commission on the Potomac River Basin, 1956.

Ohio River Valley Water Sanitation Commission, Ninth Annual Summary, 1957.

Plan of Action for Fairfax County, Phase I Report, Public Administration Service, January 1958.

Policies for a Regional Land-Use Plan for the National Capital Region, John T. Howard, National Capital Planning Commission, National Capital Regional Planning Council, November 1956.

Population Growth in the Washington Metropolitan Area, Jerome P. Pickard, Washington Board of Trade, January 1956.

Preliminary Outline Report Establishing the Definitive Scope of an Economic Study of the Potomac River Basin, Day & Zimmerman, Inc., 1956.

Public Works Program as amended April 29, 1957, Department of Sanitary Engineering, District of Columbia, 1957.

Report of Operation of the Arlington County Sewage Treatment Plant, Fiscal Year 1956–57.

Report on Sewage Disposal Project, City of Alexandria, Va., Sanitation Authority, Greeley & Hansen Engineers, August 9, 1954.

Report to David V. Auld, Director of Sanitary Engineering, District of Columbia, Upon Investigation of Sewerage System, Metcalf & Eddy, 1955.

Report to District of Columbia Department of Sanitary Engineering on Sewage Treatment Plant, Board of Engineers, Greeley, Marston & Requardt, 1956.

Sewage Disposal in Northern Virginia, the Problem and its Solution, Arlington County, Va., 1955.

Sewage Disposal System, the City of Alexandria, Va., Sanitation Authority, Dedication Publication, December 14, 1956.

Sewerage System Planning in Arlington County, Va., Alexander Potter Associates, undated.

Stream Pollution in the Washington Metropolitan Area, Harold A. Kemp, address before Rotary Club of Washington, 1949.

Summary of Conference, Pollution of Interstate Waters, Potomac River, Washington Metropolitan Area, Department of Health, Education, and Welfare, Public Health Service, August 22, 1957.

Supplemental Report on Sewage Disposal Project, City of Alexandria, Va., Sanitation Authority, Greeley & Hansen Engineers, September 9, 1954.

The Sewerage System of the District of Columbia, Department of Sanitary Engineering, District of Columbia, 1955.

Toward a Clean Potomac, Interstate Commission on the Potomac River Basin, 1957.

Toward a Cleaner Potomac River, Alexandria, Va., Does Its Part, James J. Corbalis, Jr., Water and Sewage Works, April 1957.

Upper Potomac Basin Industrial Wastes Investigation, Ralph E. Fuhrman Interstate Commission on the Potomac River Basin, 1954.

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