EFFECT OF THE PROPOSED COOPER RIVER REDIVERSION ON SEDIMENTATION IN CHARLESTON HARBOR, SOUTH CAROLINA

By Glenn G. Patterson

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 83-4198

Prepared in cooperation with

U.S. ARMY ENGINEER DISTRICT, CHARLESTON CORPS OF ENGINEERS

Dept.
Seal

Columbia, South Carolina

1983

UNITED STATES DEPARTMENT OF THE INTERIOR

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GLOSSARY

Bottom sediment -- sediment that accumulates in unconsolidated deposits on the harbor floor. Bottom sediment is predominantly fine-grained, has a low density, and is easily transported by estuarine currents.

Bulk density -- the weight of a unit volume of dry sediment, including pore spaces.

Entrance channel -- the navigation channel extending from the entrance of Charleston Harbor, near Fort Sumter, out through the jetties to the ocean.

Estuary -- a semi-enclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with freshwater from land drainage (Pritchard, 1967).

Gross dredging volume -- an estimate of the amount of sediment actually removed from a navigation channel during dredging, including net dredging volume plus extra dredging volume commonly done to ensure that the full dimensions of the channel have been dredged.

Inner channels -- the main navigation channels of the Cooper River, extending about 20 miles from the Naval Weapons Annex to the entrance channel.

Maintenance dredging -- dredging done to maintain existing navigation channels. In this report, maintenance dredging volumes are for net maintenance dredging in the inner channels of the harbor.

Net dredging volume -- the amount of dredging for which dredgers were paid. Also known as credited dredging volume. The volume is determined by comparing channel volume from predredging surveys with specified channel dimensions.

Runback -- dredged sediment that returns to the harbor.

Sedimentation -- the process of net accumulation of sediment that occurs when sediment inflow exceeds sediment removal.

Shoal -- a deposit of sediment, in a navigation channel, that impedes navigation.

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ABSTRACT

The rates of sedimentation and of resultant maintenance dredging in Charleston Harbor increased dramatically in the 1940's, following two major modifications to the harbor. One modification was deepening of the project depth of the navigation channels from 30 to 35 feet below mean low water. The other modification was the Santee-Cooper diversion project, which added an average of 15,000 cubic feet per second of Santee River water to the Cooper River, increasing by many times the freshwater inflow to the harbor. The diversion brought additional sediment into the harbor and made the harbor a more efficient sediment trap by inducing a landward flow of salty water along the harbor floor. In 1966, plans were made to redivert most of the Santee River water back to its former channel, in order to reduce the rate of sedimentation in the harbor.

The purpose of this investigation was to use existing information to determine the probable effectiveness of the proposed rediversion in reducing rates of sedimentation and maintenance dredging in the harbor.

The approach was to estimate a sediment budget for the harbor and then estimate the effect of rediversion on the sediment budget.

Major sources of sediment included erosion from the bed and banks of the upper Cooper River and sediment that originated in the Santee River basin and passed Pinopolis Dam with the diverted water. A number of minor sources, not directly affected by the diversion, contributed additional sediment.

Between 1942 and 1953 most of the sediment that was dredged from the navigation channels was deposited in undiked spoil areas or in the harbor, resulting in a high rate of runback of dredged sediment to the navigation channels, and rapid accumulation of sediment on the harbor floor. Improvements in dredging and spoil disposal methods reduced the rate of runback of dredged sediment after 1953 to an estimated 22 percent, but the rate of maintenance dredging has remained high (about 7 million cubic yards

per year)--higher than can be accounted for by known sediment inputs. Inflow from the ocean by bottom currents may provide some of the unaccounted for sediment.

Rediversion should reduce sediment loads in the Cooper River and diminish the sediment-trapping landward bottom current. The rate of maintenance dredging that will be needed following rediversion cannot be precisely estimated because of the uncertainties in the sediment budget, but the rate of maintenance dredging following rediversion will probably be 40 to 75 percent less than the average during the period 1966-82. The reduction in the rate of maintanance dredging may be delayed by a decade or more by the need to remove previously accumulated sediment and may be partially offset by the effects of future channel deepening.

INTRODUCTION

Charleston Harbor is an estuary at the mouth of the Cooper River. Sediment is carried into estuaries both by freshwater from land drainage and by landward flow of seawater (Guilcher, 1967, p. 149). The inflowing sediment tends to accumulate in estuaries because suspended particles are agglomerated by estuarine organisms and by contact with saltwater, and because the circulation of water in estuaries often favors deposition of sediment in localized areas (Meade, 1972, p. 96-113; Postma, 1967, p. 158-178). As a result, many estuaries that are used as harbors require periodic maintenance dredging to keep navigation channels open.

Charleston Harbor Has Been Undergoing Rapid Sedimentation Since 1942

Charleston Harbor, a major harbor of the southeastern United States (fig. 1), had a low rate of sedimentation prior to 1942. Maintenance dredging was not needed in the harbor until 1928, 12 years after the channels were deepened from 28 feet to 30 feet below mean low water. Between 1928 and 1942 gross maintenance dredging in the harbor averaged about 300,000 yd^3yr^{-1} (Mathews and others, 1980, p. 173).

The rate of sedimentation in the harbor increased dramatically in the 1940's, requiring a nearly twentyfold increase in the rate of maintenance dredging (fig. 2). Between 1942 and 1982 the rate of gross maintenance dredging in the harbor averaged about 6.8 million yd^3yr^{-1} (table 1).

Two major modifications immediately preceded the sharp increase in the rate of sedimentation. One modification was deepening of the project depth of the navigation channels from 30 to 35 feet below mean low water. The deepening, which took place between 1941 and 1943, involved dredging several shallow areas that separated deeper reaches.

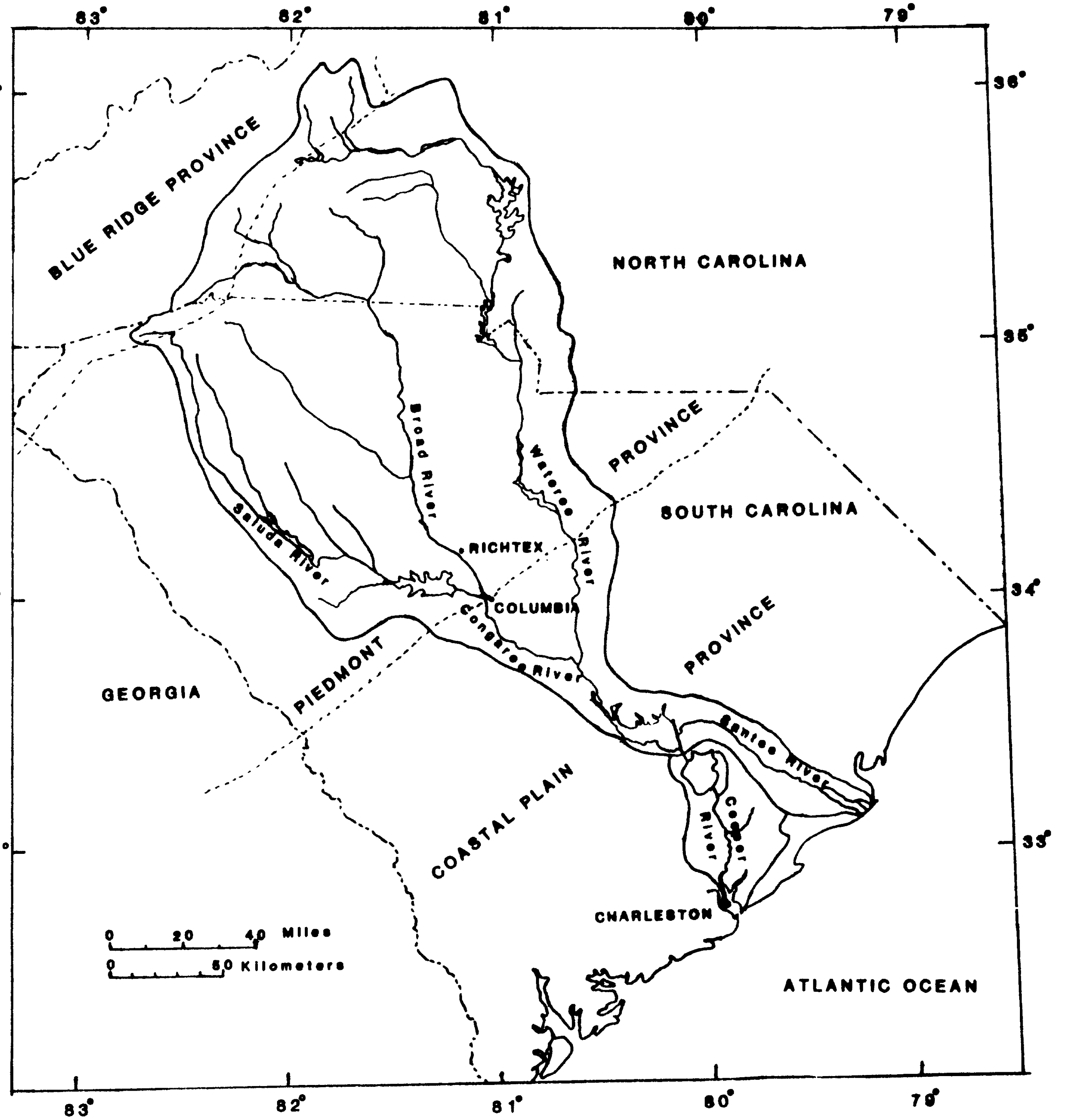

Figure 1.--Santee and Cooper River basins.

Table 1.--Gross maintenance dredging rate and estimates of rates of runback and permanent removal, all inner channels of Charleston Harbor, volumes are in cubic yards

Fiscal year	Dredging*	Runback rate, percent	Runback	Permanent removal
1942	1,449,000	90	1,304,100	144,900
1943	1,197,100	90	1,077,400	119,700
1944	2,677,000	90	2,409,300	267,700
1945	5,856,100	90	5,270,500	585,600
1946	4,892,500	90	4,403,200	489,300
1947	5,631,000	90	5,067,900	563,100
1948	4,319,700	90	3,887,700	432,000
1949	4,375,500	90	3,938,000	437,500
1950	7,466,500	90	6,719,800	746,700
1951	4,947,900	90	4,453,100	494,800
1952	7,326,900	90	6,594,200	732,700
1953	6,596,400	90	5,936,800	659,600
1954	7,221,500	77	5,560,600	1,660,900
1955	4,428,000	64	2,833,900	1,594,100
1956	9,727,300	51	4,960,900	4,766,400
1957	5,432,000	37	2,009,800	3,422,200
1958	5,100,800	22	1,122,200	3,978,600
1959	4,847,000	22	1,066,300	3,780,700
1960	8,508,600	22	1,871,900	6,636,700
1961	10,757,600	22	2,366,700	8,390,900
1962	8,702,200	22	1,914,500	6,787,700
1963	9,105,000	22	2,003,100	7,101,900
1964	9,509,700	22	2,092,100	7,417,600
1965	11,199,900	22	2,464,000	8,735,900
Subtotal 1942-65	151,275,200	54	81,328,000	69,947,200
Mean 1942-65	6,303,100	54	3,388,700	2,914,500**

Table 1.--Gross maintenance dredging rate and estimates of rates of runback and permanent removal, all inner channels of Charleston Harbor, volumes are in cubic yards (Continued)

Fiscal year	Dredging*	Runback rate, percent	Runback	Permanent removal
1966	6,713,600	22	1,477,000	5,236,600
1967	7,735,800	22	1,701,900	6,033,900
1968	6,176,000	22	1,358,700	4,817,300
1969	4,955,900	22	1,090,300	3,865,600
1970	9,705,400	22	2,135,200	7,570,200
1971	8,291,600	22	1,824,200	6,467,400
1972	6,114,700	22	1,345,200	4,769,500
1973	6,819,200	22	1,500,200	5,319,000
1974	8,183,900	22	1,800,500	6,383,400
1975	9,704,700	22	2,135,000	7,569,700
1976	9,987,700	22	2,197,300	7,790,400
1977	11,671,600	22	2,567,800	9,103,800
1978	4,223,300	22	929,100	3,294,200
1979	9,391,000	22	2,066,000	7,325,000
1980	5,997,100	22	1,319,400	4,677,700
1981	5,694,000	22	1,252,700	4,441,300
1982	7,636,100	22	1,679,900	5,956,200
Subtotal 1966-82	129,001,600	22	28,380,400	100,621,200
Mean 1966-82	7,588,300	22	1,669,400	5,918,900
Total 1942-82	280,276,800	39	109,708,400	170,568,400
Mean 1942-82	6,836,000	39	2,675,800	4,160,200

*1942-65 from U.S. Army Corps of Engineers, 1966a, table 24, rounded to nearest 100 yd^3. 1966-82 from U.S. Army Corps of Engineers, unpublished data, rounded to nearest 100 yd^3.

**Volumes on this line reflect slight rounding error.

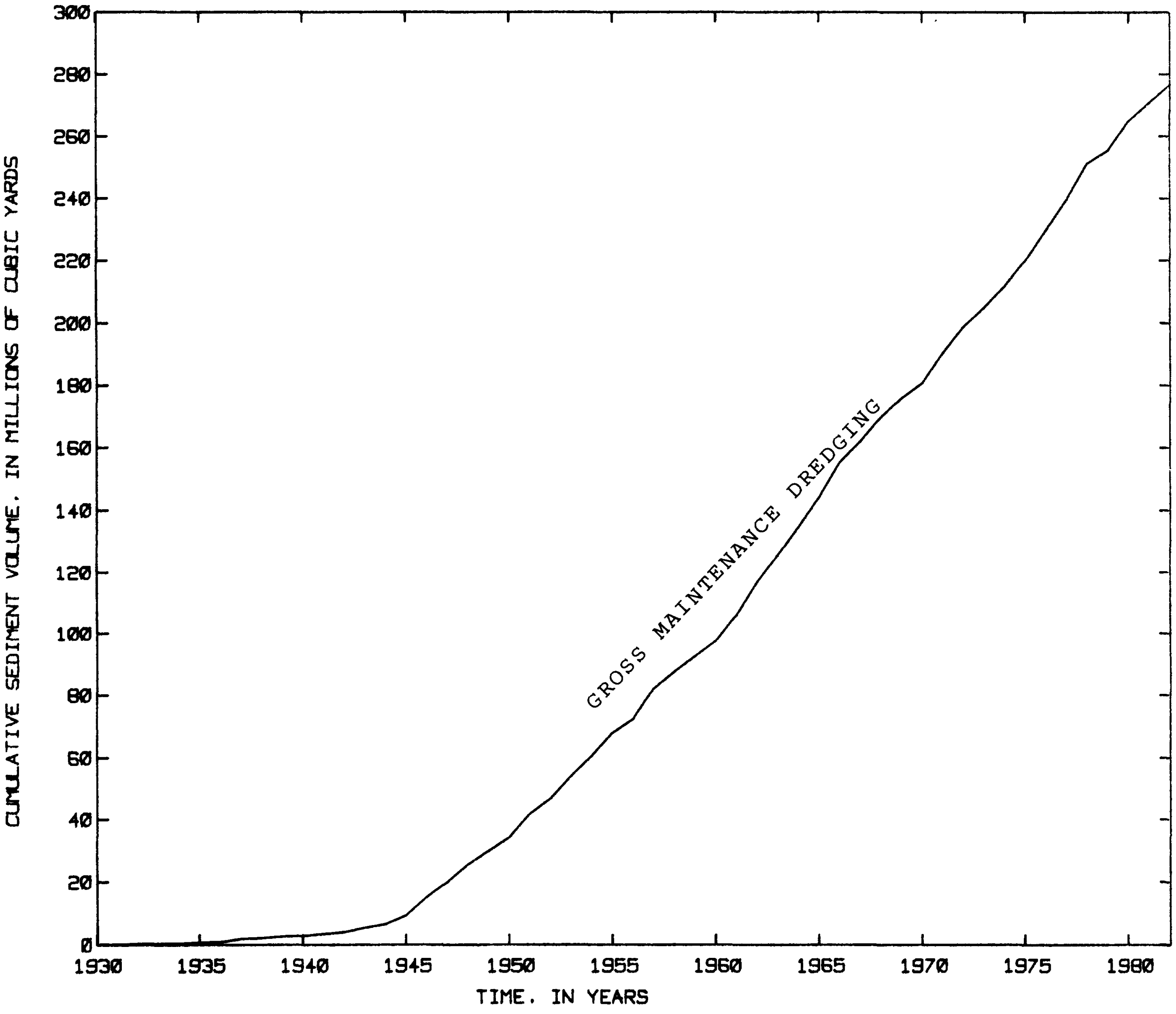

Figure 2.--Cumulative gross maintenance dredging rate, inner channels of Charleston Harbor.

The other modification was completion, in 1942, of the Santee-Cooper diversion project. This project was built to generate hydroelectric power by diverting an average of about 15,000 ft^3s^{-1} of the flow of the Santee River, the second-largest river on the east coast of the United States, into the Cooper River, the formerly sluggish Coastal Plain stream that flows into Charleston Harbor (fig. 3). Release of water to the old channel of the Santee was reduced to 500 ft^3s^{-1}, except during large floods.

The diversion increased the land area draining into Charleston Harbor twelvefold, from 1,300 mi^2 to 16,100 mi^2 (U.S. Army Corps of Engineers, 1966a, p. 37A). The increase in freshwater inflow to the harbor was even greater, because the Piedmont drainage basin of the Santee River produces more runoff per square mile than the Coastal Plain drainage basin of the Cooper River.

This increase in freshwater inflow has been cited as the major cause of the increase in the rate of sedimentation (U.S. Army Corps of Engineers, 1955, p. vi, 1966b, p. 11). The studies that led to this conclusion covered various facets of the sedimentation problem, including sediment source analysis, hydrodynamics, and hydraulic modeling. Conclusions reached from the studies were that the augmented freshwater flow increased the flow of sediment into the harbor and altered the circulation pattern of the harbor to make it a more efficient sediment trap. Channel deepening was reported to be responsible for a negligible amount of the increase in the rate of sedimentation.

As a result of the studies, the U.S. Army Corps of Engineers concluded that the most practicable way to reduce requirements for maintenance dredging was to redivert 80 percent of the Santee River water back to the Santee. It was predicted that rediversion would reduce maintenance dredging requirements by about 70 percent within about 10 years (U.S. Army Corps of Engineers, 1966c, p. B-2-4, B-2-7).

The proposed rediversion is to be accomplished via a canal connecting Lake Moultrie with the old channel of the Santee, downstream from Wilson Dam (fig. 3). A new powerhouse is to be built on the canal near St. Stephen. The rediversion project was authorized by Congress in 1967, but construction did not begin until 1979. The project was 50 percent complete in 1981, with completion scheduled for 1984.

Purpose of Study is to Determine the Extent to which Rediversion will Reduce the Rate of Maintenance Dredging

In response to questions concerning the rediversion proposal, Congress authorized an independent investigation of the effectiveness of the rediversion in solving the sedimentation problem (U.S. Congress, 1979, p. 97). At the request of the U.S. Army Corps of Engineers, the U.S. Geological Survey conducted the investigation.

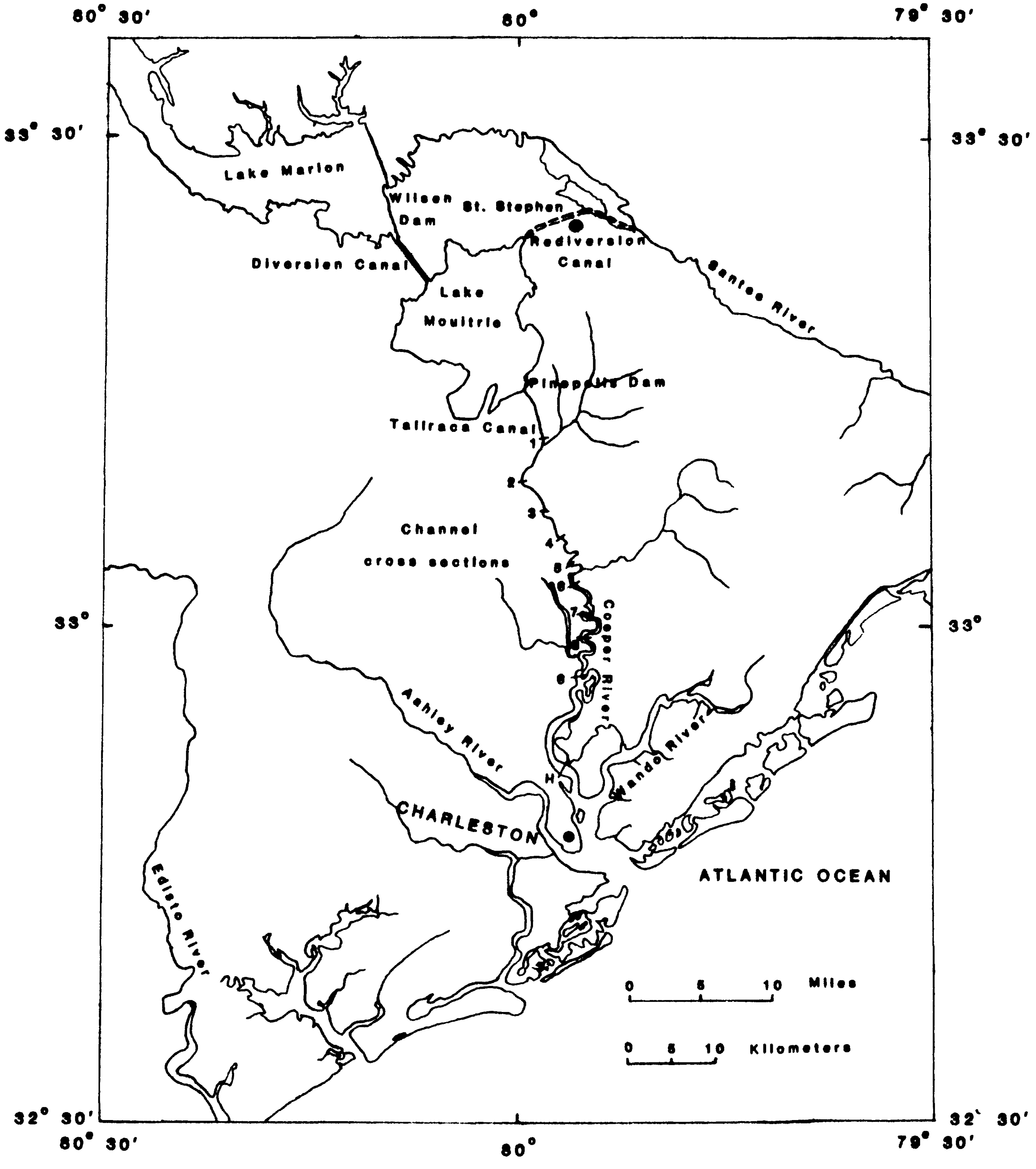

Figure 3.--Santee-Cooper project.

Scope Limited to a Review of Existing Information

The scope of the investigation is limited to evaluating the effect of the proposed rediversion on sedimentation and maintenance dredging in Charleston Harbor. The sources of information are limited to existing data and literature. Virtually no new field data were collected.

Existing data are inadequate to quantify and describe the complex process of sedimentation in the harbor. The estimates provided are based on interpretation of available data, with ranges of error dictated by uncertainties in the data.

Method of Investigation

The investigation involved three steps:

1. Gathering existing information.

2. Estimating rates of sediment inflow, removal, and accumulation that have evolved since the diversion.

3. Projecting the estimates into the future to predict the effect of rediversion on rates of sedimentation and maintenance dredging.

Information was obtained from published literature, maps, charts, hydrographic surveys, unpublished files, and knowledgeable individuals.

Acknowledgments

Gratitude is expressed to Mr. Henry B. Simmons, of the U.S. Army Corps of Engineers, Waterways Experiment Station; to the Committee on Tidal Hydraulics of the Corps of Engineers; and to Dr. James P. Bennett, Mr. David W. Hubbell, and Dr. Robert H. Meade, of the U.S. Geological Survey, for consultation during the investigation and for reviewing the manuscript.

SEDIMENT INFLOW

The primary known sources of sediment inflow to Charleston Harbor since the diversion have been eroded sediment from the bed and banks of the upper Cooper River and sediment from the Piedmont that passes through Pinopolis Dam to the Cooper River (fig. 4). Both of these sources are directly related to the diversion. Other sources such as tidal marshes and storm runoff from the Cooper River watershed contribute significant amounts of sediment to the harbor. The near-shore marine zone may be a major source. Direct measurements of the quantity of sediment inflow from most sources are not available. Estimates are based on a few available measurements, on the composition of harbor sediment, on estimates of the volume of material eroded

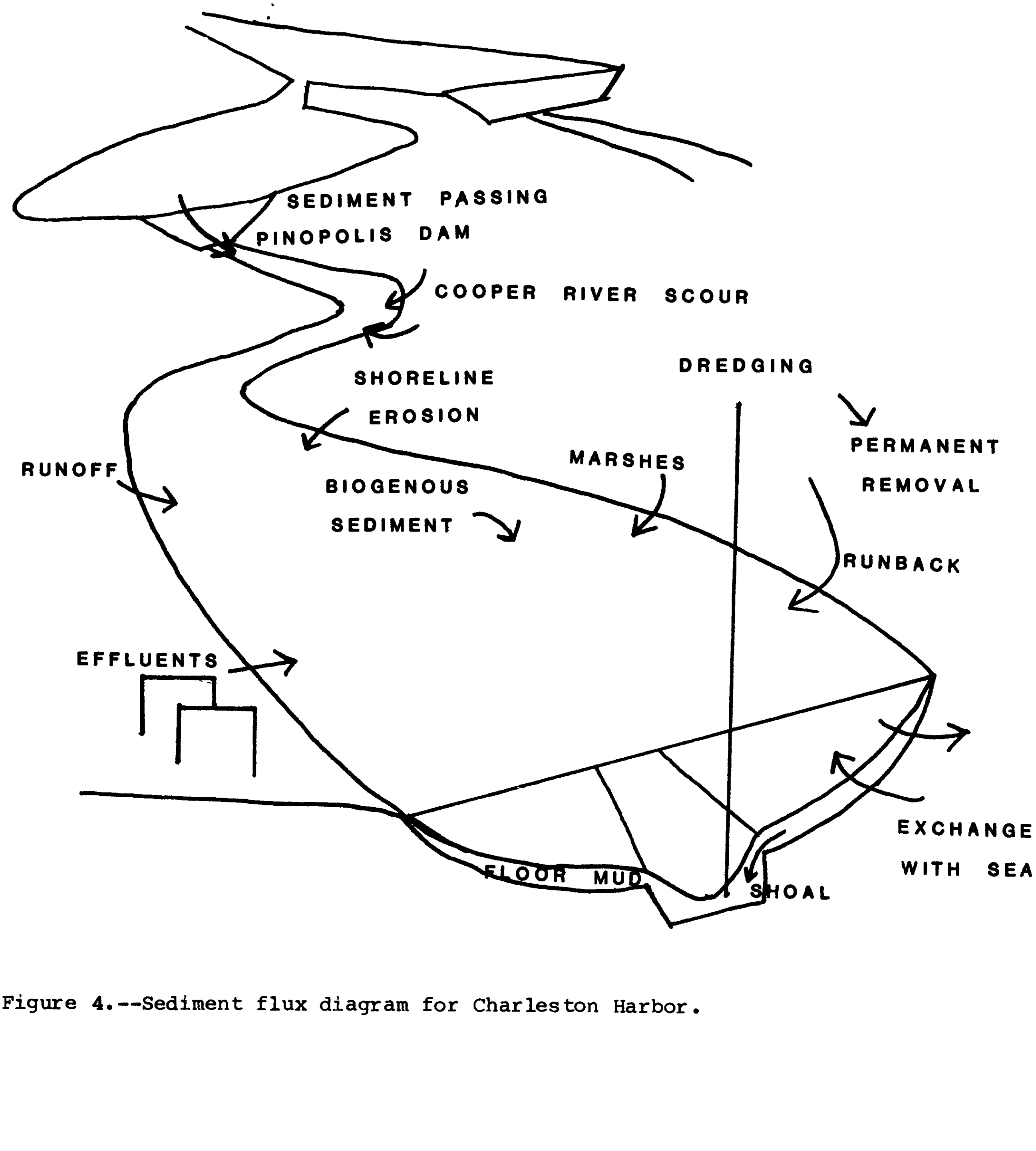

Figure 4.--Sediment flux diagram for Charleston Harbor.

from the bed and banks of the Cooper River, and on data in reports on other estuaries having sedimentation regimes similar to Charleston Harbor.

Sediment Composition Reflects Mixture of Piedmont, Coastal Plain, and Marine Sediments

The composition of sediment that has accumulated in Charleston Harbor provides information about the sources of sediment inflow. Sediment that can be traced to the Piedmont physiographic province is delivered to the Cooper River via the diversion canal between Lake Marion and Lake Moultrie (fig. 3). This is the only direct route by which Piedmont sediment can reach the harbor, although it is conceivable that Piedmont sediment could also reach Charleston Harbor indirectly via the Pee Dee and Santee Rivers and long-shore currents in the Atlantic Ocean.

The sediment that has accumulated in Charleston Harbor is predominantly inorganic clay and silt, with minor amounts of sand and organic material (U.S. Army Corps of Engineers, 1966d, tables AA-2, AA-3). In the clay fraction, the ratio of kaolinite to montmorillonite ranges from 0.5 to 2.4, indicating a mixture of Piedmont and Coastal Plain clays (Neiheisel and Weaver, 1967, p. 1110).

The silt fraction contains quartz grains similar to those in Cooper River silt (Van Nieuwenhuise and others, 1978, p. 380). The silt also contains coccoliths that were probably eroded from the Cooper Marl in the Cooper River basin, and a mixture of freshwater and saltwater diatoms (Neiheisel, 1981, unpublished data on file with USGS, Columbia, S.C.).

The ocean is the primary source of the sand, which is abundant only near the harbor entrance (Van Nieuwenhuise and others, 1978, p. 378).

Sediment is Eroded from the Bed and Banks of the Upper Cooper River

Diversion of the Santee River in 1942 caused a substantial increase in flow in the upper Cooper River between the Pinopolis Dam tailrace and Charleston Harbor (fig. 3). The augmented flow eroded a large amount of sediment from the bed and banks of the upper Cooper River and carried the sediment to Charleston Harbor.

The erosion rate has been estimated at various times since 1942 by comparing computations of channel volume based on sequential measurements of channel cross-sectional areas at nine locations along the upper Cooper River (table 2). The nine locations are shown in figure 3. The volume of the river channel at the time of each measurement was estimated using the average-end-area method (table 3). The volume of bottom sediment derived from erosion during the period between each measurement was computed by estimating the proportion of the eroded sediment that was carried to the harbor in suspension or as bed load, and adjusting for the difference in density between bank soil

Table 2.--Channel cross-sectional areas at nine points along the upper Cooper River at several times

Range number	Intervening distance miles	Intervening distance feet	Datum in feet above NGVD	Cross-sectional area, in square feet, below datum 1942	1949	1964	1965	1972	1981
1			6.5	6,399	6,940	7,240	7,180	6,949	8,266
	2.7	14,260							
2			7.0	8,621	10,830	11,120	11,075	11,120	11,200*
	3.3	17,420							
3			6.5	10,843	10,850	11,280	11,776	12,675	13,800*
	3.0	15,840							
4			5.0	8,041	9,270	10,500	11,343	11,240	11,200*
	4.1	21,650							
5			5.0	13,237	13,110	13,530	14,182	12,050	11,160
	3.0	15,840							
6			2.5	13,643	16,790	18,280	18,938	17,340	19,750
	4.9	25,870							
7			4.5	17,987	20,660	20,590	20,877	20,612	19,087
	4.1	21,650							
8			4.0	16,507	18,880	20,080	20,250	20,220	20,180*
	4.6	24,290							
9			4.0	35,693	41,660	43,860	43,312	39,810	35,000*
Source code	A		B	A	A	A	A	B	C

Source code	Source
A	U.S. Army Corps of Engineers, 1966a, table 12.
B	U.S. Army Corps of Engineers, Charleston District, 1942-72, unpublished original cross-section drawings.
C	U.S. Geological Survey, measurements and estimates made in 1981.
*	Estimate made by extrapolating the relation between 1965 and 1972.

Table 3.--Estimated channel volumes between nine points along the upper Cooper River and erosion rates at several times

Range numbers	Channel volume (cubic yards) between ranges and below datum					
	1942	1949	1964	1965	1972	1981
1-2	3,965,000	4,691,000	4,847,000	4,820,000	4,772,000	5,140,000
2-3	6,280,000	6,995,000	7,228,000	7,374,000	7,676,000	8,065,000
3-4	5,539,000	5,902,000	6,388,000	6,782,000	7,015,000	7,333,000
4-5	8,530,000	8,972,000	9,633,000	10,232,000	9,338,000	8,965,000
5-6	7,885,000	8,771,000	9,331,000	9,715,000	8,621,000	9,067,000
6-7	15,154,000	17,943,000	18,623,000	19,076,000	18,182,000	18,606,000
7-8	13,828,000	15,851,000	16,304,000	16,488,000	16,371,000	15,743,000
8-9	23,478,000	27,230,000	28,759,000	28,589,000	27,002,000	24,821,000
Total volume	84,659,000	96,355,000	101,113,000	103,076,000	98,977,000	97,740,000

	1942-49	1949-64	1964-65	1965-72	1972-81	1942-81
Number years	7	15	1	7	9	39
Change in total volume (erosion), yd3	11,696,000	4,758,000	1,963,000	-4,099,000	-1,237,000	13,081,000
Erosion, yd3yr-1	1,671,000	317,000	1,963,000	0	0	335,000
Resultant bottom sediment in harbor, $yd^3 yr^{-1}$	3,559,000	675,000	4,181,000	0	0	714,000

NOTE: This table is based on table 1 and on U.S. Army Corps of Engineers, 1966a, table 13.

and bottom sediment (U.S. Army Corps of Engineers, 1966a, p. 10A-12A). It was estimated that each cubic yard of eroded sediment resulted in about 2.13 yd^3 of bottom sediment. The dry-weight bulk density of the in-place bottom sediment was determined to be 18.8 $lbft^{-3}$ (U.S. Army Corps of Engineers, 1966a, p. 7A). Except where otherwise noted, all sediment volumes in this report may be assumed to have this bulk density.

The erosion rate in the Cooper River was greatest in the 1940's, when the river channel was first adjusting to the augmented flow. During this period an average of about 3,500,000 yd^3 of bottom sediment accumulated in the harbor each year from this source alone. The erosion rate decreased during the period 1949 to 1964, resulting in a mean rate of sediment inflow from this source of about 1 to 2 million yd^3yr^{-1} during the period 1942-64. The range of error is based on the uncertainty of estimating total channel erosion from nine cross sections. The erosion rate increased during 1964-65 due to high streamflow during this period. No measurable net erosion seems to have occurred since 1965, suggesting that the river channel has nearly adjusted to the augmented flow and the available sediment load. However, some sediment--probably no more than 500,000 yd^3yr^{-1}--may still be entering the harbor from this source without having a measurable effect on the channel cross sections.

The Diverted Flow of the Santee River Carries Piedmont Clay Past Pinopolis Dam

The Santee River carries a large amount of suspended sediment, predominately clay, that is eroded from the basins of its Piedmont tributaries. Much sediment settles out in Lakes Marion and Moultrie. However, some of the clay remains in suspension and either is transported through Wilson Dam and down the Santee River during flood releases, or through Pinopolis Dam and down the Cooper River into Charleston Harbor.

The most accurate method for determining the load of suspended sediment carried past a certain point by a river in a certain period of time is to make frequent determinations of suspended-sediment concentration and water discharge at that point. The determinations should be frequent enough to reflect the variations in each parameter. Changes in suspended-sediment concentration tend to occur slowly in the Lake Moultrie tailrace below Pinopolis Dam because the two reservoirs upstream attenuate concentration peaks and damp out fluctuations. Daily determinations of suspended-sediment concentration are sufficient to define the temporal variation in concentration of suspended sediment, and errors are probably small when daily concentrations are interpolated from weekly determinations. The temporal variation in water discharge appears to be well defined by daily mean discharge values. When these data are available, the daily sediment load can be computed as:

$$L = C \times Q \times 0.0027$$

where: L = suspended-sediment load, in tons per day;
C = average suspended-sediment concentration, in milligrams per liter;
Q = average water discharge, in cubic feet per second; and
0.0027 = a conversion factor derived from

$$1.10 \times 10^{-9} \text{ ton mg}^{-1} \times 28.3 \text{ liter ft}^{-3} \times 8.64 \times 10^{4} \text{s day}^{-1}.$$

The annual suspended-sediment load is computed by summing the daily loads.

Daily suspended-sediment concentration data for Pinopolis Dam are available for water years 1964, 1965, and about half of water year 1966 (U.S. Geological Survey, 1965-69). Weekly suspended-sediment concentration data are available for most of the rest of water year 1966, all of water year 1967, and half of water year 1968. In addition, weekly sediment data were collected during February 1950 to April 1951 (U.S. Army Corps of Engineers, 1966e, table 3-A). Records of average daily water discharge at Pinopolis Dam from 1942 to the present are kept by the South Carolina Public Service Authority. The available sediment data and corresponding water-discharge data are listed in Appendix A to this report. The annual loads of suspended sediment that passed Pinopolis Dam during the 5 years for which sediment concentration data are available are listed in table 4.

Table 4.--Total annual discharge and sediment load at Pinopolis Dam for 5 years

Water year	Total annual discharge, million acre-feet	Total annual sediment load: cubic yards	Total annual sediment load: tons
1950-51*	8.56	357,000	90,600*
1964	13.2	1,132,000	287,300
1965	15.8	1,352,000	343,200
1966	8.74	458,000	116,300
1967	8.54	400,000	101,000

*February 1950 through January 1951, from U.S. Army Corps of Engineers, 1966e, table 3-A.

Four methods, based on these data, were used to estimate the mean annual sediment load passing Pinopolis Dam since 1942.

1. Discharge from Pinopolis Dam in water year 1965 exceeded that in any other year in the operation of the dam. Discharge in the 1950-51 period was among the lowest. It is quite likely that the sediment loads in those two periods represent the extreme upper and lower limits within which the mean annual sediment load must fall. The mean annual sediment load might

therefore be estimated as the intermediate value plus or minus the difference between the mean and the extremes. The result is 217,000 ± 126,000 tons yr^{-1} (855,000 yd^3 ± 498,000 yd^3yr^{-1}).

2. A more accurate estimate of the mean annual sediment load passing Pinopolis Dam since 1942 can be obtained by correlating suspended-sediment data from Pinopolis Dam with water discharge at some point in the Santee-Cooper River basin, and using long-term records of the discharge to estimate sediment load during periods of no record. The Broad River, which is a large tributary to the Santee and has little regulation at high flows when it carries large amounts of sediment, was used for correlation. Monthly or annual means were used to determine the relation because the rapid artificial fluctuations in water releases from the reservoirs precluded correlation on a more frequent basis. It takes about one month for a suspended-sediment peak to travel from Richtex gaging station on the Broad River to Pinopolis Dam. The 81 mean monthly suspended-sediment concentration values available in 1982 (U.S. Army Corps of Engineers, 1966a, table 1; U.S. Geological Survey, 1965-69) correlated fairly well with mean water discharge for the previous month in the Broad River at Richtex (fig. 5). The correlation coefficient for log transformations of the data was 0.68. The standard error of the estimate was 0.50 log cycles, or about 50 percent of the estimate. These errors tend to cancel out over the long term. Using this method the average annual suspended-sediment load passing Pinopolis Dam between 1942 and 1979 was estimated to be about 200,000 ± 100,000 tons yr^{-1}, or about 800,000 ± 400,000 yd^3yr^{-1} of bottom sediment.

3. The relation between total annual sediment load at Pinopolis Dam and total water discharge at Pinopolis Dam is not significantly affected by short-term fluctuations in water releases or by reservoir retention time. For the 5 years listed in table 4, the correlation coefficient for the relation between the logarithm of total annual sediment load and the logarithm of total annual discharge is 0.986. The standard error of the estimate is 0.09 log cycles. The correlation coefficient for the untransformed values is 0.992, with a standard error of the estimate of ± 13,000 tons yr^{-1}. A smooth curve can be drawn through all five points (fig. 6).

   Using the smooth curve and discharge figures obtained from the South Carolina Public Service Authority, sediment loads were estimated for each calendar year since 1942 (table 5). Had the regression line been used, the estimated sediment loads would have been slightly lower. The mean of the estimated sediment loads was 189,000 tons yr^{-1} (745,000 yd^3yr^{-1}). Because only five data points were used in this analysis, the range of error suggested by the standard error of the estimate is expanded to ± 50,000 tons yr^{-1} (± 200,000 yd^3yr^{-1}).

4. The sediment load can also be estimated based on the trapping efficiency of Lakes Marion and Moultrie. From July 1966 through June 1968 weekly suspended-sediment samples were taken at both the inflow to Lake Marion (Santee River near Ft. Motte) and the Pinopolis Dam tailrace (Appendix B

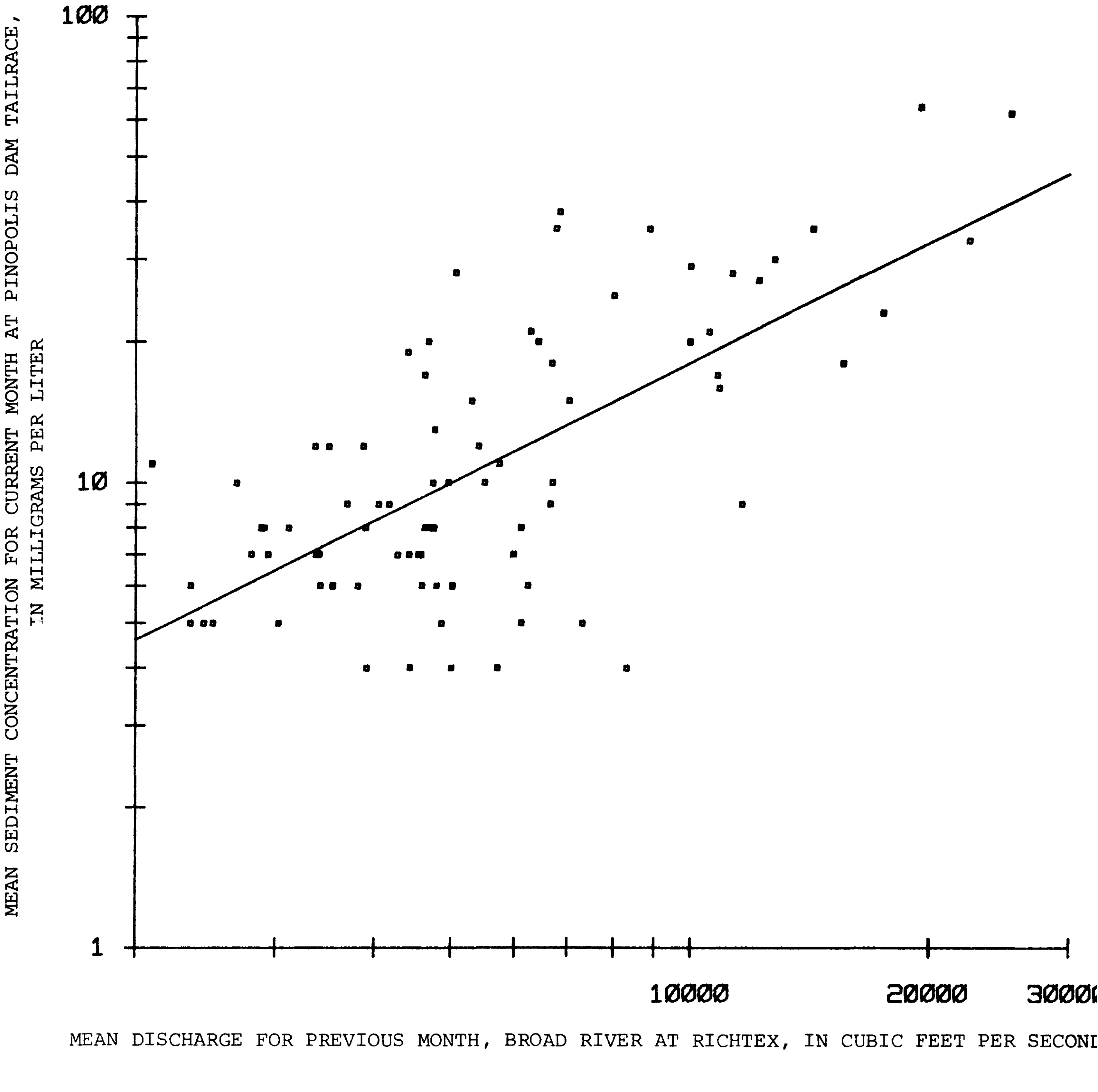

Figure 5.--Relation between monthly mean sediment concentration at Pinopolis and previous monthly mean discharge at Richtex.

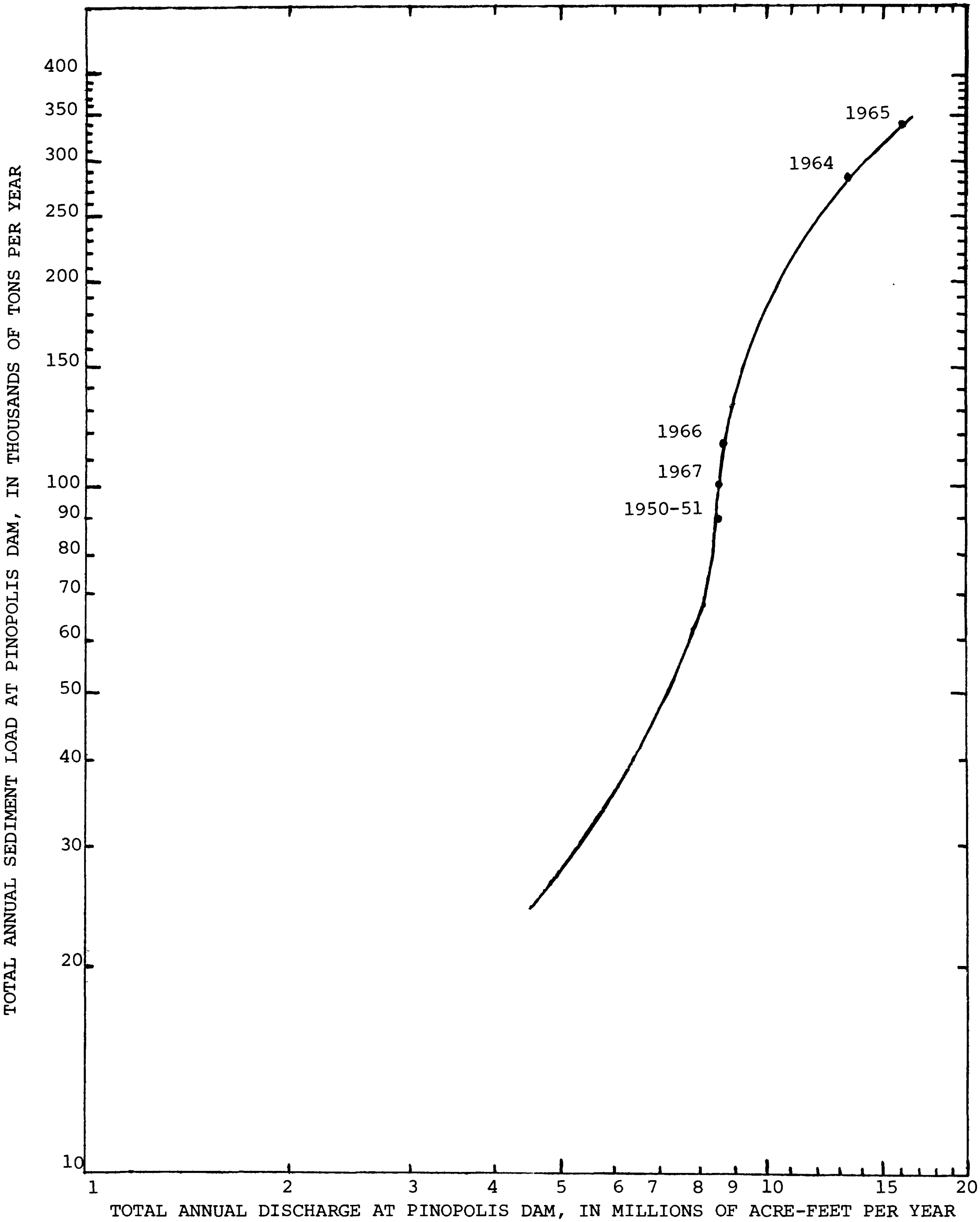

Figure 6.--Annual discharge versus annual sediment load at Pinopolis Dam.

Table 5.--Total discharge and estimated total sediment load at Pinopolis Dam for 41 years

Calendar year	Discharge, million acre-feet yr^{-1}	Sediment load, thousand tons yr^{-1}	Calendar year	Discharge, million acre-feet yr^{-1}	Sediment load, thousand tons yr^{-1}
1942	4.81	26	1965	13.5	292
1943	9.44	157	1966	8.72	115
1944	9.34	151	1967	8.86	128
1945	8.60	105	1968	9.74	173
1946	11.1	225	1969	10.9	219
1947	9.97	184	1970	7.73	62
1948	12.9	278	1971	14.6	318
1949	14.7	320	1972	12.5	268
1950	8.68	112	1973	14.2	305
1951	7.55	57	1974	11.8	250
1952	10.1	189	1975	15.4	332
1953	8.50	96	1976	11.5	239
1954	7.19	51	1977	11.1	225
1955	5.79	34	1978	10.5	205
1956	5.92	35	1979	14.8	322
1957	8.48	95	1980	11.6	242
1958	11.4	235	1981	5.1	28
1959	12.0	252	1982	10.0	185
1960	12.2	258			
1961	12.0	252	Total	429.7	7,739
1962	11.5	239	Mean	10.5	189
1963	9.0	135	ft^3s^{-1}	14,500.	--
1964	16.0	345	yd^3yr^{-1}	--	745,000

to this report). The 2-year interval included periods of both high and low flow, but was somewhat drier than average.

The total suspended-sediment load at Ft. Motte during the 2-year period was 1,900,000 ± 200,000 tons (950,000 tons yr^{-1}), or 65 tons mi^2yr^{-1}. The total load during the 2-year period at Pinopolis was 310,000 ± 20,000 tons (155,000 tons yr^{-1}), or 16 percent ± 3 percent of the load at Ft. Motte. The range of error is based on two slightly different methods of estimating missing values.

To extend the period of record at Ft. Motte, sediment yield data from other Piedmont river basins can be useful in estimating the sediment yield to Lake Marion during normal conditions. Because the Saluda, Wateree, and Broad Rivers have varying degrees of flow regulation, these three main tributaries to the Santee River will be treated separately. The Saluda River, with a basin of 2,520 mi^2, is completely controlled by Lake Murray

Dam. The sediment yield from the Saluda River is probably similar to the 12 tons $mi^{2}yr^{-1}$ from the Hyco River at McGehees Mill, N.C., which is also a Piedmont river controlled by a dam (Simmons, 1976, p. 0-17). The Wateree River, which drains 5,070 mi^{2}, has 7 major reservoirs, but is not as regulated as the Saluda. The sediment yield from the Wateree is probably similar to the 56 tons $mi^{2}yr^{-1}$ from the Neuse River at Goldsboro, N.C. (Simmons, 1976, p. 0-17). The Broad River has very little regulation in its 4,850 mi^{2} basin; therefore, the sediment yield from the Broad River is probably similar to the 180 tons $mi^{2}yr^{-1}$ from the Haw River near Haywood, N.C. (Simmons, 1976, p. 0-17).

Combining these sediment yields results in an estimate of about 1,187,000 tons yr^{-1} or 81 tons $mi^{2}yr^{-1}$ for the sediment yield to Lake Marion. This is equal to the sediment yield from the Savannah River near Clarks Hill, S.C., for the 3 years prior to construction of Clarks Hill Dam (Meade, 1976, p. 119). A range of error of about 25 percent, or ± 300,000 tons yr^{-1} should probably be applied to the estimate of 1,187,000 tons yr^{-1} entering Lake Marion. Multiplying by 0.16 ± 0.03 results in about 199,000 ± 84,000 tons yr^{-1} (783,000 ± 331,000 $yd^{3}yr^{-1}$) of sediment passing Pinopolis.

The results of these four methods indicate that a reasonable estimate of the mean annual suspended-sediment load passing Pinopolis Dam is 200,000 ± 76,000 tons yr^{-1} (800,000 ± 300,000 $yd^{3}yr^{-1}$) (table 6).

Table 6.--Estimates of mean annual sediment load passing Pinopolis Dam

Method	Tons per year	Cubic yards per year
Average of two extremes	217,000 ± 126,000	855,000 ± 498,000
Monthly regression with Richtex discharge	200,000 ± 100,000	800,000 ± 400,000
Annual regression with Pinopolis discharge	189,000 ± 50,000	745,000 ± 200,000
Sediment yield and lakes trapping efficiency	199,000 ± 84,000	783,000 ± 331,000
Adopted estimate	200,000 ± 76,000	800,000 ± 300,000

Other Sources of Sediment

The accountable sediment inflow from sources not directly affected by the diversion or by channel deepening is equivalent to about 1 to 1.5 million yd^3 of bottom sediment per year. These sources include biological activity and erosion in the harbor and surrounding marshes, storm runoff from the Cooper River watershed, and waste effluents. The estimate of about 1 million yd^3yr^{-1} agrees closely with the 1.2 million yd^3yr^{-1} estimated earlier for background sources (U.S. Army Corps of Engineers, 1966a, table 51).

Biological activity in the harbor and surrounding tidal marshes contributes both organic and inorganic sediment to the harbor. This material includes decaying plant and animal parts and skeletal remains of diatoms, foraminifera, and other plankton. Diatoms comprise from 10 to 30 percent, by volume, of the silt-size fraction of major shoals in Delaware Bay and Chesapeake Bay (U.S. Army Corps of Engineers, 1973, p. 118). Diatoms are also abundant in Charleston Harbor (Neiheisel, 1981, unpublished data on file with USGS, Columbia, S.C.), but the proportion of diatoms in the silt fraction of Charleston Harbor sediment has not been determined. If diatoms comprise 20 percent of the silt fraction of Charleston Harbor sediment, they could be responsible for about 200,000 yd^3yr^{-1} of bottom sediment.

Erosion and biological activity in tidal marshes contribute about 600,000 yd^3yr^{-1} of bottom sediment to Charleston Harbor. This estimate is based on measured sediment export rates of 1,100 tons $mi^{-2}yr^{-1}$ from a marsh in the Charleston area (Gardner and Kitchens, 1978, p. 195) and 7,800 tons $mi^{-2}yr^{-1}$ from a marsh on the Georgia coast (Odum and de la Cruz, 1967, p. 386, 387).

Storm runoff in the Cooper River basin contributes about 150,000 yd^3yr^{-1} of bottom sediment to Charleston Harbor. This sediment is transported from cultivated fields, construction sites, paved areas, logging sites, and other areas where vegetation has been removed. The estimate is based on a combination of rural and urban sediment yields measured in southeastern states weighted according to the proportions of rural and urban area in the Cooper River basin. The rural sediment yield, 23 tons $mi^{-2}yr^{-1}$, was measured in the Ogeechee River basin in Georgia, a basin similar to the rural parts of the Cooper River basin (U.S. Geological Survey, 1969, p. 489, 490). The urban sediment yield, 775 tons $mi^{-2}yr^{-1}$, was measured in Atlanta, Ga. (Stamer and others, 1978, p. 27). The urban sediment yield was adjusted to 500 tons $mi^{-2}yr^{-1}$ to account for the difference between Atlanta's location in the Piedmont and Charleston's location in the Coastal Plain.

Municipal and industrial waste effluents contribute about 20,000 yd^3yr^{-1} of mostly organic bottom sediment to Charleston Harbor (S.C. Department of Health and Environmental Control, 1981, unpublished data on file with Department of Health and Environmental Control, Columbia, S.C.).

Erosion of the harbor shoreline also contributes sediment. According to surveys of the harbor made by the National Ocean Survey in 1933 and 1963, the area of the harbor with depths between 0 and 9 feet increased by about 300,000 yd^2 during the intervening 30 years, while the area of the harbor with greater depths decreased. The loss of area along the harbor shore is equivalent to about 20,000 to 40,000 yd^3 of bottom sediment per year. The range of error is based on uncertainty about initial and final water depth in the affected area.

The ocean is also a source of sediment inflow to Charleston Harbor. A significant amount of sand is swept into the harbor by tidal currents and deposited in the lower reaches of the harbor. It is possible that fine-grained sediment is also transported into the harbor from the ocean. Potential sources of this fine-grained sediment include the continental shelf and fluvial sediment discharge updrift from Charleston. The latter source could be an indirect pathway for Piedmont sediment to enter the harbor. The few sediment transport measurements made at the harbor entrance seem to indicate a net seaward transport of sediment under normal conditions (Shultz, 1954; Neiheisel and Weaver, 1967, p. 1102-1104; Pierce and others, 1974, p. 100). However, under abnormal conditions associated with storms or high runoff, net sediment transport could be reversed. The rate of sedimentation appeared to increase following Hurricane David in September 1979 (U.S. Army Corps of Engineers, oral commun., 1981). Because the net transport of sediment at the harbor entrance cannot be reliably estimated at this time, the ocean will be treated as an unknown sediment source.

The total sediment inflow to the harbor probably includes some sediment not accounted for in the above discussion. This unaccounted sediment may come from known sources, or from unknown sources. Because of this uncertainty, the contribution of sediment from background sources may be estimated to be 1 to 1.5 million yd^3yr^{-1}.

SEDIMENT REMOVAL AND RETENTION

Sediment is removed from Charleston Harbor by dredging and by seaward flow. Sediment that is not removed by one of these means tends to settle on the harbor floor. This bottom sediment is easily resuspended and transported by tidal currents, and is the primary source of sediment for the shoals that develop in the navigation channels (U.S. Army Corps of Engineers, 1955, p. 19).

Dredged Sediment Generally Returned to the Harbor Until the Late 1950's

The dredging rate of primary concern in this report is the rate of gross maintenance dredging by all interests in all inner channels of Charleston Harbor, a grouping previously labelled "C-1" (U.S. Army Corps of Engineers, 1966a, table 18). This rate is the best available estimate of actual dredging from the harbor as a result of sedimentation in the harbor. New work dredging is excluded because it does not reflect sedimentation. Maintenance dredging in the entrance channel is discussed separately because the entrance channel is external to the harbor.

Shoals in the entrance channel are composed primarily of sand from updrift beaches (U.S. Army Corps of Engineers, 1966a, p. 25A). The rate of maintenance dredging in the entrance channel appears to be influenced primarily by channel depth. The 330 percent increase in the rate of mean annual gross maintenance dredging in the entrance channel that followed the 5-foot channel deepening and the diversion in 1942 is similar to the 187 percent increase that followed an earlier 2-foot channel deepening (table 7). By contrast, mean annual gross maintenance dredging in the inner harbor increased by about 4,800 percent following 1942.

Table 7.--Increases in gross maintenance dredging rate in the entrance channel and inner Charleston Harbor, dredging rates are in thousands of cubic yards per year

Years	Channel depth, in feet	Mean annual gross maintenance dredging, entrance channel	Percent increase from last period	Mean annual gross maintenance dredging, inner harbor	Percent increase
1899-1917 (19)	≤28	143	--	0	--
1918-41 (24)	30	267	187	142	--
1942-82 (41)	35	880	330	6,836	4,814

Sources:

U.S. Army Corps of Engineers, 1966a, table 19 (x 1.36);
Mathews and others, 1980, Appendix table C-2 (x 1.36); and
U.S. Army Corps of Engineers, unpublished data.

Some of the sediment removed from navigation channels by dredging eventually returns to the harbor. The returned sediment, or runback, includes sediment that is dislodged from the channel floor but never picked up by the dredge, and material lost through pipeline leaks or hopper overflow, or which has been disposed of in a way that allows runoff or currents to return it to the harbor. Published dredging volumes are not commonly corrected for runback because the volumes are measured by comparing channel dimensions before and after dredging, instead of by measuring the amount of sediment stored in disposal areas.

The rate of maintenance dredging increased sharply soon after the diversion (fig. 2, table 1). But the rate of permanent removal of sediment by dredging remained relatively low for 10 more years. Inefficient dredging practices resulted in a very high runback rate until 1953. Much of the dredged sediment was discharged directly into the harbor, alongside the channel, where currents could sweep it back into the channel. Some dredged sediment was pumped onto marshes for disposal. However, very little of the sediment pumped ashore was retained in the undiked marsh disposal areas (U.S. Army Corps of Engineers, 1955, p. 23). The pre-1953 runback rate is estimated to be about 90 percent of the rate of gross dredging (U.S. Army Corps of Engineers, 1966a, table 39).

Between 1953 and 1959, dredging practices were greatly improved. Dumping of dredged sediment in the harbor was curtailed and dikes were built around disposal areas on land. During this period the runback rate decreased to about 20 to 30 percent of the rate of gross dredging (U.S. Army Corps of Engineers, 1966a, table 39, also p. 24A).

The rates of cumulative gross maintenance dredging and of estimated permanent removal of sediment by dredging are listed in table 1 and shown in figure 7. The difference between the two curves is attributable to runback.

The Santee-Cooper Diversion Project Made Charleston Harbor a More Efficient Sediment Trap

Charleston Harbor prior to the diversion was a well-mixed or sectionally homogeneous estuary (fig. 8) (Schubel, 1973, p. IV-9). Vertical salinity stratification was minimal and net water movement, averaged over many tidal cycles, was seaward at all depths. The net seaward movement of water must have caused a net seaward transport of sediment, because very little sediment accumulated in the harbor between colonial times and 1942. It has been estimated that, prior to the diversion, about 50 percent of the sediment inflow was lost to the sea (U.S. Army Corps of Engineers, 1966a, table 45).

The great increase in freshwater inflow caused by the diversion changed the harbor to a partially-mixed estuary (fig. 8) in which a layer of relatively fresh water with net seaward movement overlies a wedge of relatively salty water with net landward movement. The landward flow in the salt wedge impedes the seaward movement of sediment and gradually transports some sediment upstream. In Charleston Harbor, as in other partially-mixed estuaries, heavy sedimentation appears to occur in the lens of relatively motionless water on the bottom of the harbor at the upstream limit of the net landward bottom flow (Meade, 1969, p. 227).

Hydraulic model studies indicate that the rate of sediment accumulation in the harbor has increased by about 80 percent solely because of the change in circulation pattern caused by the diversion, even without the extra sediment load from the Cooper River (U.S. Army Corps of Engineers, 1955, p. 42).

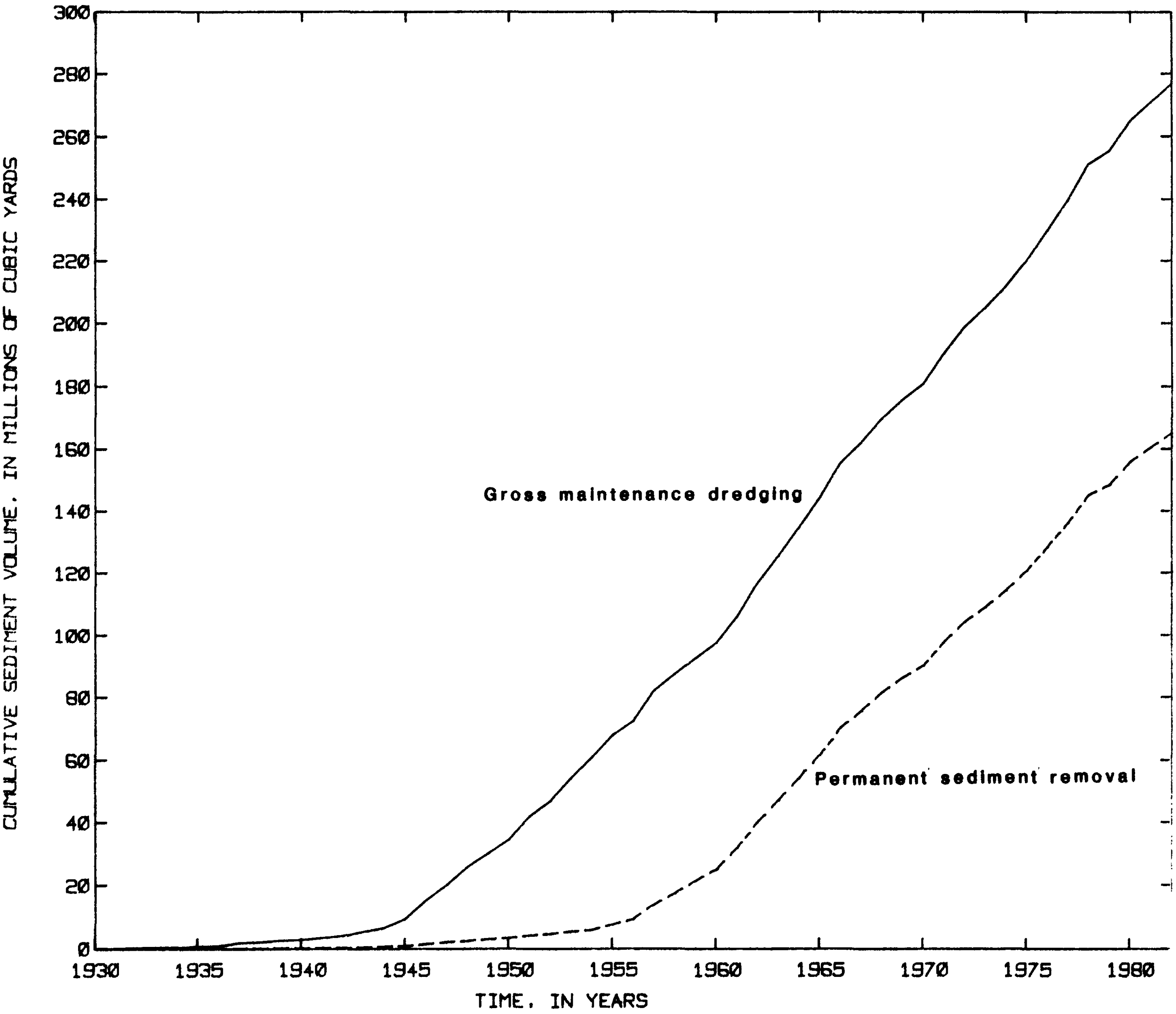

Figure 7.--Cumulative rates of gross maintenance dredging from Charleston Harbor and estimated annual permanent removal of sediment by dredging.

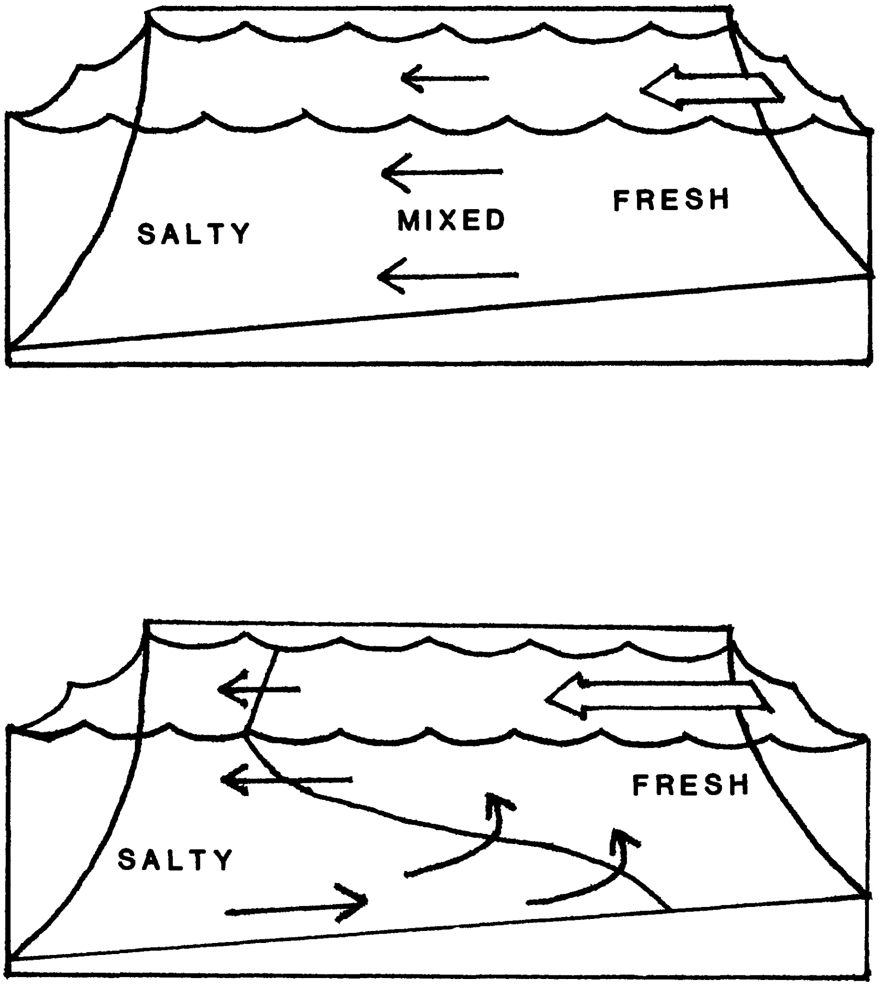

Figure 8.--Well-mixed (top) and partially-mixed (bottom) estuarine circulation.

Channel Deepening Contributed to Making the Harbor a More Efficient Sediment Trap

Deepening of navigation channels generally leads to the need for increased maintenance dredging, depending on the availability of sediment (Inglis and Allen, 1957, p. 833). In a partially-mixed stratified estuary like Charleston Harbor, channel deepening can also increase the rate of accumulation of sediment by facilitating the landward flow of seawater along the bottom (Simmons, 1965).

Deepening of some of the navigation channels of Charleston Harbor by about 17 percent, from 30 to 35 feet below mean low water, was in progress when the diversion began in 1942. Most of the channels had natural depths of 35 feet or more; therefore, the channel deepening was not a major physical alteration of the harbor. Nevertheless, the channel deepening of the early 1940's involved nearly as much dredging as had been done in the harbor, excluding the entrance channel, up to that time.

Records of channel deepening and maintenance dredging from five southeastern Atlantic Coast harbors indicate that a 17 percent increase in channel depth preceded, on the average, a 100 percent increase in the rate of maintenance dredging (Mathews and others, 1980, p. 106). A hydraulic model study of Charleston Harbor indicated that channel deepening without diversion would have increased the rate of sedimentation by about 10 percent. Ten to 100 percent of the annual prediversion sedimentation rate is 30,000 to 300,000 yd^3yr^{-1}. This range, therefore, represents an estimate of the contribution made by channel deepening to the rate of sedimentation in Charleston Harbor.

Sediment Has Accumulated on the Harbor Floor Since the Diversion

During the 8 years prior to the diversion there was a slight decrease in the volume of sediment stored on the harbor floor (U.S. Army Corps of Engineers, 1955, p. 16). The increased rate of sedimentation that followed the diversion resulted in new deposits of sediment on the harbor floor both outside of navigation channels and within the deeper parts of navigation channels between shoal areas. The volume of sediment stored on the harbor floor increased by about 30 million cubic yards between 1942 and 1963 (U.S. Army Corps of Engineers, 1966a, table 31). This increase in sediment storage resulted in an average decrease in harbor depth of about 2.5 feet during the 22-year period. The increase in sediment stored on the harbor floor is also reflected by comparison of harbor surveys conducted in 1933 and 1963 (National Ocean Survey, 1933, 1963).

The change in storage of sediment on the harbor floor since 1963 is not known, because only the upper part of the harbor has been surveyed since 1963 (National Ocean Survey, 1977). Hydrographic data from the 1977 survey, when compared with cross sections measured in 1963, indicate no additional accumulation of sediment on the floor of the upper part of the harbor outside the navigation channels. At one section, labelled "H" in figure 3, there appears to be net removal of sediment from the harbor floor since 196 , as shown in these changes in cross-sectional area of the Cooper River, not including navigation channels:

Year	Cross-sectional area, in square feet
1933	32,000
1963	27,000
1977	29,000

Gradual net removal of accumulated sediment after the mid-1960's may partially explain why dredging rates remained high even after rates of sediment inflow from runback and Cooper River scour decreased. Because there may have been a slight net removal of sediment since 1963, the increase between 1942 and 1982 in the volume of sediment stored on the harbor floor may be estimated to be 20 to 30 million yd^3.

THE ESTIMATED SEDIMENT BUDGET IS OUT OF BALANCE

An attempt to balance the long-term sediment budget for Charleston Harbor demonstrates that sediment inflow from known sources does not account for all the sediment that has been removed from the harbor by dredging. Records of gross maintenance dredging, corrected for runback, indicate that about 170 million yd^3 of sediment were removed from the harbor between 1942 and 1982 (table 1). Estimated sediment input from known sources during the same period amounted to between 86 million and 164 million yd^3 (table 8). This leaves an input deficit of 6 million to 84 million yd^3.

Table 8.--Estimated ranges for rates of mean annual sediment inflow to Charleston Harbor from known sources

Years	Mean annual sediment inflow, in cubic yards per year: Cooper River scour	Pinopolis Dam	Background sources	Total	Total sediment inflow for period, in millions of cubic yards
1942-65 (24)	1.0-2.0	0.5-1.1	1.0-1.5	2.5-4.6	60-110
1966-82 (17)	0.0-0.5	0.5-1.1	1.0-1.5	1.5-3.1	26- 53
1942-82 (41)	0.6-1.4	0.5-1.1	1.0-1.5	2.1-4.0	86-164*

*This column does not total due to rounding.

To this deficit must be added 20 to 30 million yd^3 to account for the increase in the volume of sediment stored on the harbor floor. The input deficit is therefore at least, and probably greater than, 26 million yd^3, (600,000 yd^3yr^{-1}) for the 41-year period.

To further analyze the unbalanced sediment budget, it is helpful to break the 41-year period following the diversion into two parts: 1942 to 1965, and 1966 to 1982. The first was a period of transition and sediment accumulation. The second was a period of stabilization and, perhaps, gradual sediment removal. The rate of sediment inflow from Cooper River scour was probably 1 to 2 million yd^3yr^{-1} in the early 1940's, but it stabilized at or below 500,000 yd^3yr^{-1} by 1966 (table 8). The rate of runback from dredging was about 90 percent in the early 1940's, but it stabilized at about 22 percent--possibly greater--by 1959 (U.S. Army Corps of Engineers, 1966a, p. 24a). The transition period was therefore the period with the greater rate of sediment inflow and the lesser rate of permanent removal of sediment. The rate of sediment input from known sources averaged between 2.5 and 4.6 million yd^3yr^{-1} (table 8). The rate of permanent removal by dredging averaged about 2.9 million yd^3yr^{-1} (table 9).

Table 9.--Estimated sediment budget for Charleston Harbor, 1942-82; volumes are in millions of cubic yards of in-place bottom sediment

	1942-65	1966-82	1942-82
Number of years	24	17	41
Known input, per year	2.5-4.6	1.5-3.1	2.1-4.0
Known input, total	60.0-110.4	25.5-52.7	86.1-164.0*
Permanent removal, per year	2.9	6.0	4.2
Permanent removal, total	69.9	100.6	170.6*
Accumulation, per year	1.2	-0.6-0.0	0.5-0.7
Accumulation at end of period	30.0	20.0-30.0	20.0-30.0
Input deficit, per year**	0.0-1.6	2.3-4.5	0.7-2.8
Input deficit, total	0.0-38.4	39.1-76.5	28.7-114.8*

*These totals do not agree exactly with the other columns due to rounding.

**Annual input deficit ranges from (annual removal plus lesser annual accumulation minus greater annual input) to (annual removal plus greater annual accumulation minus lesser annual input).

During the transition period about 30 million yd^3 of sediment, or 1.25 million $yd^3 yr^{-1}$ accumulated on the harbor floor. Depending on the error in estimating sediment input from known sources, there may have been no input deficit during the transition period, or the input deficit may have been as much as 1.6 million $yd^3 yr^{-1}$ (table 9).

During the period of stabilization, from 1966 to 1982, the rate of sediment input from known sources averaged between 1.5 and 3.1 million $yd^3 yr^{-1}$ (table 8). The rate of permanent removal by dredging averaged 6.0 million $yd^3 yr^{-1}$, assuming a runback rate of 22 percent (table 9). There was no apparent increase in the volume of sediment stored on the harbor floor, and there may have been a slight decrease. Therefore, the input deficit was between 2.3 and 4.5 million $yd^3 yr^{-1}$ (table 9). This is a much greater input deficit than during the transition period.

The conclusion to be drawn from the sediment budget is that either a significant quantity of sediment enters the harbor from an unknown source, or that the rate of permanent removal was overestimated, perhaps by underestimating runback, or that both of these conditions combined to produce the apparent input deficit.

If an unknown source is responsible for the deficit, the input from this source must have increased significantly following diversion and channel deepening, because sediment input to the harbor was quite low prior to 1942. Such an increase is reasonable in light of the change in circulation pattern caused by the diversion. However, it seems unreasonable that this input would be so much higher during the stabilization period than during the transition period. This unknown source, it appears, increased its sediment input in response to an increased competency of the harbor to trap sediments, brought about by the decrease in sediment input from runback and Cooper River scour. The ocean is the most likely candidate for the unknown source, but without further data on sediment transport at the harbor entrance this identification is speculative.

On the other hand, the unbalanced sediment budget could be the result of overestimating the rate of sediment removal. If the runback rate after 1959 was 50 percent instead of 22 percent, or if the rate of gross maintenance dredging was overestimated by 30 percent, the sediment budget could be balanced. However, this is also speculative, because there are no data to support a greater runback rate or an overestimation of the rate of gross maintenance dredging.

THE EFFECT OF REDIVERSION ON THE RATE OF SEDIMENTATION

Without rediversion, the rate of gross maintenance dredging would probably remain near the current (1966-82) average of 7.6 million $yd^3 yr^{-1}$. Because removal may now slightly exceed inflow, a slight decrease might eventually result as the previous accumulation of sediment is removed.

The effect of rediversion on the rate of sedimentation in Charleston Harbor may be estimated, within a range of error, by making various assumptions about the reasons for the unbalanced sediment budget and estimating the effect of rediversion under those assumptions. We can be certain of two effects. Rediversion would reduce the rate of sediment inflow to Charleston Harbor, and rediversion would make the harbor a less efficient sediment trap.

The rediversion project would reduce the mean discharge from Pinopolis Dam from about 15,000 $ft^3 s^{-1}$ to about 3,000 $ft^3 s^{-1}$. The load of suspended sediment passing Pinopolis Dam should decrease in about the same proportion, from about 800,000 $yd^3 yr^{-1}$ to about 160,000 $yd^3 yr^{-1}$. The rate of erosion of sediment from the bed and banks of the upper Cooper River should be negligible and there may even be some deposition. Rediversion should have no effect on the 1.0 to 1.5 million $yd^3 yr^{-1}$ of sediment coming from background sources. Therefore, the rate of total sediment inflow to Charleston Harbor from known sources should be reduced to about 1.2 to 1.7 $yd^3 yr^{-1}$.

Hydraulic model studies indicate that reducing the mean discharge from Pinopolis Dam to 3,000 $ft^3 s^{-1}$ will be sufficient to cause Charleston Harbor to revert to a well-mixed type of estuary (U.S. Army Corps of Engineers, 1955, p. 47). Vertical salinity stratification will diminish, as will the landward current at the harbor bottom. Sediment will have a greater tendency to be transported to the ocean, and marine sediment will probably be less likely to enter the harbor.

Following rediversion, hydraulic and sedimentary conditions in the harbor will be very similar to conditions prior to the original diversion, except for the deeper navigation channels. The effect of the deeper navigation channels was studied with a hydraulic model, which indicated a 10 percent increase in the sedimentation rate due to channel deepening alone (U.S. Army Corps of Engineers, 1966a, p. 16A). However, because the combined hydraulic model tests were unable to account for the observed increase in the sedimentation rate, it might be prudent to assume that channel deepening might be responsible for as much as 50 percent of the inflow of sediment from unknown sources--presumably the ocean. Table 10 presents a range of possible alternatives for the effect of the rediversion on the rate of maintenance dredging under different assumptions about the amount of unaccounted for sediment inflow and the effect of channel deepening. The table indicates, for each alternative, the volume of gross maintenance dredging that would be required to balance the post-rediversion average annual sediment inflow, and the percent reduction in the rate of gross maintenance dredging from the prediversion average of 7.6 million $yd^3 yr^{-1}$ for the period 1966-82.

The alternatives presented in the table, with dredging rate reductions ranging from 33 to 80 percent, were purposely chosen to represent extremes.

Table 10.--Possible effects of rediversion on maintenance dredging rate in Charleston Harbor

Unaccounted inflow, million yd^3yr^{-1}	Percent decrease in unaccounted inflow caused by rediversion	Post-rediversion annual inflow,* million yd^3yr^{-1}	Assumed runback rate, percent	Gross maintenance dredging required million yd^3yr^{-1}	Percent reduction from 7.6 (average 1966-82)
0.7	100	1.2-1.7	22	1.5-2.2	71-80
0.7	75	1.4-1.9	22	1.8-2.4	68-76
0.7	50	1.6-2.0	22	2.0-2.6	66-74
4.5	100	1.2-1.7	22	1.5-2.2	71-80
4.5	75	2.3-2.8	22	2.9-3.6	53-62
4.5	50	3.4-4.0	22	4.4-5.1	33-42
0.0	--	0.9-1.4**	50	1.8-2.8	63-76

*In addition to unaccounted input, this column includes 1.2 to 1.7 million yd^3yr^{-1} from known sources.

**This annual input is reduced because some would be lost to sea.

In order for the dredging rate reduction to be less than 33 percent, the inflow of sediment from unknown sources unrelated to the diversion would have to exceed 2.25 million yd^3yr^{-1}. This does not include the 1 to 1.5 million yd^3yr^{-1} from background sources, or sediment inflow from unknown sources that can be attributed to the change in circulation pattern caused by diversion. Such a large inflow seems quite unlikely.

In order for the dredging rate reduction to be greater than 80 percent, the entire contribution of sediment from unknown sources would have to be attributable to the change in circulation pattern caused by rediversion. It seems likely that at least some of this inflow can be attributed to channel deepening or other changes in the harbor unrelated to the diversion. The post-rediversion reduction in the rate of gross maintenance dredging is likely to fall within the somewhat narrower range, within these extremes, of 40 to 75 percent.

The full effects of the rediversion are likely to be delayed 10 years or more because the accumulated sediment on undredged areas of the harbor floor will continue to replenish shoals in the navigation channels. Further channel deepening is likely to partially offset the reduction in maintenance dredging caused by rediversion.

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APPENDIX A

DISCHARGE AND SUSPENDED-SEDIMENT RECORDS FOR LAKE MOULTRIE TAILRACE NEAR PINOPOLIS

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1963 TO SEPTEMBER 1964

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	8470	7	160	7770	6	126	4100	7	77
2	8580	7	162	8710	10	235	11500	7	217
3	8530	7	161	5800	9	141	11300	7	214
4	7520	8	162	7900	7	149	12300	5	166
5	3560	6	58	6820	7	129	10300	7	195
6	1170	4	13	7700	7	146	10100	7	191
7	6360	5	86	7540	7	143	7200	6	117
8	6600	4	71	6950	6	113	4490	6	73
9	6320	4	68	3780	6	61	11400	6	185
10	8000	4	86	1070	2	5.8	11000	5	148
11	8520	5	115	5380	4	58	11800	6	191
12	3800	4	41	5550	6	90	10800	6	175
13	1330	4	14	7610	5	103	10900	5	147
14	9210	5	124	9540	5	129	5990	4	65
15	9810	5	132	8310	6	135	3210	4	35
16	7640	5	103	8480	6	137	12300	5	166
17	8030	5	108	2940	4	32	8560	4	92
18	7790	4	84	10200	4	110	9050	4	98
19	5000	4	54	8860	3	72	16600	6	269
20	1730	4	19	8640	4	93	21100	4	228
21	8010	6	130	9010	3	73	20400	5	275
22	7310	8	158	6760	3	55	19100	3	155
23	8570	8	185	7970	2	43	21400	3	173
24	8680	7	164	2320	3	19	19700	3	160
25	7250	7	137	10200	5	138	14300	3	116
26	4160	10	112	10100	6	164	15100	2	82
27	1760	8	38	9740	5	131	16000	4	173
28	8160	8	176	8350	4	90	21300	3	173
29	7830	10	211	6570	4	71	19100	4	206
30	9120	8	197	10400	7	197	23900	3	194
31	8080	10	218	---	---	---	23900	4	258
TOTAL	206900	---	3547	220970	---	3188.8	418200	---	5014

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1963 TO SEPTEMBER 1964

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	22800	3	185	25600	8	553	27600	24	1790
2	24300	5	328	27200	9	661	26900	25	1820
3	24200	4	261	26900	9	654	27000	30	2190
4	20400	3	165	25000	8	540	26600	24	1720
5	16700	5	225	25500	9	620	26900	27	1960
6	21800	7	412	25700	9	625	25900	28	1960
7	20900	5	282	25700	11	763	26900	28	2030
8	21600	4	233	24700	10	667	27300	32	2360
9	22300	5	301	25700	10	694	25700	28	1940
10	23200	4	251	22600	14	854	26000	27	1900
11	23400	6	379	23200	17	1060	25700	25	1730
12	21200	7	401	22300	21	1260	22300	32	1930
13	25300	6	410	19800	17	909	22900	32	1980
14	26400	9	642	19100	16	825	23000	29	1800
15	26900	8	581	17300	14	654	23100	34	2120
16	27000	7	510	19700	15	798	26700	31	2230
17	27000	6	437	22600	18	1100	27100	34	2490
18	24100	7	455	26000	19	1330	26100	32	2260
19	17500	6	283	27000	19	1390	27300	31	2290
20	22900	7	433	27100	21	1540	27900	31	2340
21	22200	11	659	26100	20	1410	28100	33	2500
22	21800	10	589	26800	31	2240	28400	33	2530
23	19000	9	462	27100	24	1760	28500	29	2230
24	17600	9	428	27300	30	2210	28700	30	2320
25	14400	10	389	27300	26	1920	28500	27	2080
26	22700	11	674	27300	25	1840	28600	23	1780
27	24800	10	670	28000	20	1510	28200	27	2060
28	26000	10	702	28200	23	1750	28600	27	2080
29	27300	11	811	27900	30	2260	28400	21	1610
30	27600	9	671	---	---	---	28100	47	3570
31	28100	9	683	---	---	---	28600	35	2700
TOTAL	711400	---	13912	724700	---	34397	831600	---	66300

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1963 TO SEPTEMBER 1964

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	28500	28	2150	26700	34	2450	8580	22	510
2	28000	28	2120	26400	30	2140	14500	20	783
3	28400	30	2300	25900	26	1820	11900	19	610
4	28600	39	3010	27300	40	2950	12400	22	737
5	28300	36	2750	27300	44	3240	13000	18	632
6	27800	38	2850	26100	19	1340	11200	22	665
7	28200	39	2970	27300	37	2730	11100	19	569
8	28200	39	2970	27000	37	2700	15700	16	678
9	28400	37	2840	27000	24	1750	14700	14	556
10	27700	38	2840	27400	26	1920	11200	18	544
11	27000	40	2920	24500	33	2180	12100	16	523
12	28200	39	2970	24900	30	2020	13500	16	583
13	28500	34	2620	24500	14	926	16400	17	753
14	28400	38	2910	21800	24	1410	16800	17	771
15	28600	32	2470	21100	21	1200	18300	16	791
16	27700	32	2390	23800	8	514	15500	14	586
17	26400	33	2350	23100	21	1310	12000	16	518
18	27000	31	2260	20200	22	1200	12400	13	435
19	27400	30	2220	13100	8	283	15800	13	555
20	26500	34	2430	10500	18	510	13400	12	434
21	26000	34	2390	7430	23	461	14800	13	519
22	25900	32	2240	7800	20	421	18600	11	552
23	26200	37	2620	11800	8	255	10200	12	330
24	25600	39	2700	7740	24	502	9590	11	285
25	24800	38	2540	11300	21	641	7620	13	267
26	26000	38	2670	11700	7	221	8960	13	314
27	26400	39	2780	9660	22	574	15000	12	486
28	26500	41	2930	9190	22	546	10300	13	362
29	26400	35	2490	5600	18	272	12400	11	368
30	26700	35	2520	5770	21	327	14100	11	419
31	---	---	---	4010	21	227	---	---	---
TOTAL	818300	---	78220	567900	---	39040	392050	---	16135

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1963 TO SEPTEMBER 1964

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMBER	
1	6900	9	168	25500	4	275	26000	7	491
2	6130	9	149	25800	2	139	24200	6	392
3	7060	9	172	25100	2	136	25400	5	343
4	3870	9	94	25400	2	137	26100	7	493
5	4610	7	87	21500	4	232	26800	---	---
6	7030	9	171	19000	3	154	25900	---	---
7	7230	9	176	16800	3	136	26500	6	429
8	6750	9	164	21200	---	---	26300	7	497
9	9910	8	214	22300	---	---	26600	8	575
10	9120	7	172	23000	---	---	25900	7	490
11	7140	6	116	20600	3	167	25900	7	490
12	4760	7	90	17000	3	138	24900	---	---
13	8390	5	113	15000	4	162	21400	---	---
14	9140	4	99	12000	4	130	24500	10	661
15	12000	5	162	14700	---	---	25500	6	413
16	11900	5	161	18500	---	---	25500	6	413
17	10400	4	112	21800	5	294	24900	7	471
18	13100	4	141	22700	4	245	25700	9	625
19	12700	4	137	20900	4	226	25100	---	---
20	16100	4	174	19900	4	215	23900	---	---
21	21200	4	229	19500	4	211	25300	9	615
22	22700	4	245	20000	---	---	22400	11	665
23	23800	4	257	19700	---	---	24100	11	716
24	22900	4	247	20100	4	217	24500	8	529
25	24000	3	194	16300	4	176	18800	8	406
26	24700	4	267	15700	4	170	18900	---	---
27	25600	5	346	16900	4	183	17600	---	---
28	26100	5	352	23600	5	319	18900	12	612
29	25100	4	271	22900	---	---	12700	14	480
30	24400	3	198	24400	---	---	12700	15	514
31	25100	4	271	25300	6	410	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1964 TO SEPTEMBER 1965

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	12200	10	329	26900	---	---	22500	33	2000
2	20700	10	559	27100	30	2200	22000	28	1660
3	25000	13	877	27000	29	2110	22600	26	1590
4	25400	---	---	26900	33	2400	23500	23	1460
5	25800	---	---	26700	34	2450	22800	---	---
6	26400	15	1070	26200	34	2410	22700	---	---
7	26400	15	1070	26200	---	---	24500	25	1650
8	27200	15	1100	26000	---	---	24900	26	1750
9	27000	13	948	25700	34	2360	25000	25	1690
10	25200	12	816	25400	39	2670	23000	26	1610
11	23100	---	---	25300	36	2460	21900	25	1480
12	26400	---	---	25500	37	2550	16600	---	---
13	27000	13	948	25400	38	2610	15900	---	---
14	26900	15	1090	25300	---	---	18500	21	1050
15	26800	14	1010	25500	---	---	19200	20	1040
16	26800	13	941	26200	31	2190	19900	17	913
17	26500	---	---	24900	33	2220	20400	18	991
18	26000	---	---	25000	34	2300	21700	18	1050
19	27000	13	948	23800	32	2060	23800	---	---
20	27000	13	948	24000	31	2010	24000	---	---
21	26900	16	1160	23900	---	---	25100	19	1290
22	26900	13	944	24300	---	---	26200	16	1130
23	26900	12	872	24900	31	2080	26000	13	913
24	26300	---	---	24000	30	1940	22400	13	786
25	25900	---	---	22500	29	1760	17800	13	625
26	26800	19	1370	22500	28	1700	19700	---	---
27	27300	24	1770	23000	35	2170	24000	---	---
28	26000	26	1830	22800	---	---	26300	14	994
29	26400	24	1710	21800	---	---	26800	15	1090
30	26900	22	1600	22100	29	1730	26400	14	998
31	27100	---	---	---	---	---	26700	15	1080

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1964 TO SEPTEMBER 1965

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	26200	18	1270	25200	28	1910	27400	17	1260
2	27000	---	---	25000	32	2160	27700	16	1200
3	25900	---	---	24500	28	1850	27900	23	1730
4	26500	18	1290	24800	31	2080	27700	20	1500
5	26600	14	1010	25300	22	1500	27300	31	2290
6	26900	13	944	25200	---	---	27500	---	---
7	26600	17	1220	24900	---	---	27500	---	---
8	26200	13	920	24200	22	1440	27200	27	1980
9	26700	---	---	24400	24	1580	27400	21	1550
10	26700	---	---	23300	21	1320	27600	23	1710
11	26700	13	937	22200	22	1320	27500	17	1260
12	26800	14	1010	20400	22	1210	27700	19	1420
13	26800	18	1300	21100	---	---	27500	---	---
14	26900	18	1310	24400	---	---	26700	---	---
15	26700	19	1370	26300	17	1210	25600	18	1240
16	26800	---	---	26600	18	1290	26100	18	1270
17	27300	---	---	26900	17	1230	27400	22	1630
18	27100	22	1610	27400	16	1180	26300	20	1420
19	26900	22	1600	26700	15	1080	27200	19	1400
20	25900	20	1400	26500	---	---	27400	---	---
21	23400	20	1260	26600	---	---	27400	---	---
22	25100	20	1360	26400	15	1070	27400	21	1550
23	26000	---	---	26300	14	994	27500	22	1630
24	26400	---	---	26600	18	1290	27700	17	1270
25	25500	24	1650	27400	17	1260	27800	21	1580
26	24900	26	1750	28200	17	1290	27900	23	1730
27	24000	29	1880	27900	---	---	27900	---	---
28	24600	32	2130	28300	---	---	27900	---	---
29	24000	23	1490	---	---	---	27800	19	1430
30	23700	---	---	---	---	---	28000	22	1660
31	23700	---	---	---	---	---	27900	22	1660

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-21-83

STATION NUMBER 02172001   LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE)   LAKE   SOURCE AGENCY USGS
LATITUDE 331440   LONGITUDE 0795930   DRAINAGE AREA   DATUM   STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1964 TO SEPTEMBER 1965

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	27600	20	1490	28000	---	---	11700	6	190
2	27600	21	1560	28600	---	---	13400	6	217
3	27700	---	---	28600	12	927	13000	8	281
4	27400	---	---	27100	15	1100	12500	5	169
5	27900	20	1510	22900	12	742	8230	5	111
6	27800	21	1580	17600	14	665	4500	---	---
7	27900	20	1510	15200	12	492	14500	---	---
8	27900	25	1880	12700	---	---	11400	5	154
9	27700	24	1790	9740	---	---	9930	5	134
10	27700	---	---	17400	12	564	14100	5	190
11	27900	---	---	16300	8	352	12800	5	173
12	27800	24	1800	15800	6	256	13600	---	---
13	27800	20	1500	13000	6	211	18100	---	---
14	25900	23	1610	10600	6	172	20600	5	278
15	24100	21	1370	9520	---	---	27500	6	445
16	22700	21	1290	9550	---	---	27600	5	373
17	21200	---	---	12400	6	201	27400	4	296
18	20200	---	---	12700	14	480	27400	4	296
19	20100	20	1090	13900	12	450	27400	---	---
20	22100	21	1250	12800	7	242	26000	---	---
21	24200	21	1370	9910	6	161	25600	4	276
22	24800	11	737	6580	---	---	27200	6	441
23	23300	11	692	7820	---	---	25800	5	348
24	20700	---	---	15600	8	337	26400	5	356
25	20700	---	---	16900	6	274	26300	---	---
26	23900	11	710	16800	9	408	26700	---	---
27	25900	15	1050	15800	7	299	25000	---	---
28	22500	11	668	13400	6	217	24000	5	324
29	25200	11	748	9490	---	---	22600	5	305
30	27800	11	826	13200	---	---	23200	5	313
31	---	---	---	13500	5	182	---	---	---

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1964 TO SEPTEMBER 1965

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMBER	
1	17500	6	283	21600	---	---	17500	9	425
2	19900	4	215	23500	3	190	12000	14	454
3	21200	---	---	25900	3	210	15200	10	410
4	19800	---	---	26200	4	283	19300	---	---
5	19600	6	318	26000	3	211	18500	---	---
6	16800	4	181	25600	3	207	14900	6	241
7	13800	4	149	26500	---	---	8740	7	165
8	12700	5	171	22600	---	---	8680	4	94
9	13100	4	141	19700	3	160	10700	4	116
10	6500	---	---	13700	4	148	13300	5	180
11	7450	---	---	14200	3	115	13900	---	---
12	22300	3	181	15000	3	121	11500	---	---
13	23900	4	258	15200	4	164	14100	5	190
14	23500	4	254	14300	---	---	14900	8	322
15	26100	4	282	7470	---	---	13600	5	184
16	25900	4	280	15700	4	170	13900	3	113
17	23700	---	---	17400	4	188	12000	4	130
18	17500	---	---	15300	4	165	13800	---	---
19	19900	3	161	15500	4	167	12400	---	---
20	19300	4	208	17200	5	232	14700	4	159
21	18700	3	151	16700	---	---	13500	4	146
22	18700	4	202	8700	---	---	13600	4	147
23	19900	4	215	16400	6	266	13800	4	149
24	21300	---	---	15200	6	246	11800	3	96
25	16500	---	---	14900	6	241	11500	---	---
26	19900	5	269	17200	6	279	8070	---	---
27	18200	6	295	18500	6	300	9250	5	125
28	15900	5	215	19500	---	---	10500	4	113
29	22000	4	238	13400	---	---	11100	4	120
30	23800	3	193	12300	6	199	9250	4	100
31	22700	---	---	13900	10	375	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-06-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	11200	5	151	13400	8	289	19500	2	105
2	11600	---	---	11900	11	353	21800	3	177
3	7810	---	---	8980	12	291	21100	7	399
4	7120	5	96	11300	15	458	13700	---	---
5	8690	6	141	16800	8	363	9900	---	---
6	9070	8	196	12400	---	---	13400	6	217
7	10200	3	83	9260	---	---	20100	8	434
8	9850	9	239	10200	5	138	21400	8	462
9	11800	---	---	8120	8	175	13000	8	281
10	10900	---	---	9430	10	255	12900	7	244
11	12200	6	198	8730	4	94	11700	---	---
12	11400	7	215	10600	10	286	8720	---	---
13	8350	5	113	11300	---	---	9790	11	291
14	8630	15	350	11500	---	---	10400	8	225
15	9780	8	211	10600	8	229	11500	6	186
16	9080	---	---	8910	---	---	10900	6	177
17	5370	---	---	7950	3	64	15400	6	249
18	10800	5	146	9520	14	360	13700	---	---
19	10600	7	200	9200	15	373	14900	---	---
20	14900	6	241	9510	---	---	15300	8	330
21	15900	6	258	7190	---	---	14000	6	227
22	16500	5	223	6210	16	268	14800	7	280
23	15100	---	---	6520	15	264	14100	5	190
24	15500	---	---	12100	14	457	10500	6	170
25	12900	7	244	12300	16	531	6850	---	---
26	11900	11	353	12500	3	101	8570	---	---
27	11500	9	279	12200	---	---	12800	6	207
28	11800	7	223	11900	---	---	12500	6	202
29	12900	7	244	13000	2	70	12600	6	204
30	12000	---	---	13000	2	70	10800	6	175
31	12100	---	---	---	---	---	9400	4	102

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	4930	---	---	12400			27900		
2	4170	---	---	12500			27800		
3	7020	4	76	15200			27900		
4	8130	6	132	15100			27800		
5	7440	6	121	16500			27500		
6	5830	5	79	13200			27600		
7	6290	4	68	13700			27700		
8	8260	---	---	11600			27500		
9	7450	---	---	12200			27600		
10	8840	7	167	11800			27700		
11	7970	5	108	9100			27600		
12	9220	5	124	10200			25800		
13	8620	5	116	8200			25700		
14	7190	5	97	15600			26800		
15	9240	---	---	22500			27400		
16	6730	---	---	25300			27700		
17	7570	6	123	25700			27300		
18	7290	1	20	25800			27100		
19	10400	7	197	27400			27200		
20	11400	1	31	27400			26100		
21	10900	1	29	24700			25200		
22	9190	---	---	20800			24400		
23	6700	---	---	21500			23600		
24	10900	3	88	22000			23500		
25	12000	2	65	25100			23800		
26	15400	4	166	27900			24800		
27	13900	6	225	27900			24700		
28	12900	16	557	27800			23700		
29	14500	---	---	---			22800		
30	12600	---	---	---			20000		
31	12900	---	---	---			17200		

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	14700	---	---	7710	---	---	22200	6	360
2	17100	---	---	5250	---	---	22500	6	364
3	10800	---	---	6980	---	---	20400	8	441
4	11800	---	---	5220	---	---	11500	5	155
5	13600	---	---	2570	---	---	4960	6	80
6	12800	35	1210	5020	---	---	7510	6	122
7	12400	34	1140	6070	---	---	7290	7	138
8	14300	33	1270	5030	---	---	9430	6	153
9	15800	---	---	5910	29	463	8130	7	154
10	11700	---	---	7640	23	474	13400	6	217
11	11200	33	998	7510	20	406	16200	---	---
12	9670	34	888	6320	20	341	11900	---	---
13	9070	34	833	7090	26	498	16500	5	223
14	11800	26	828	7270	---	---	17800	6	288
15	10900	33	971	4570	---	---	13000	5	175
16	11400	---	---	3760	26	264	9190	7	174
17	7780	---	---	7330	14	277	9410	6	152
18	9200	22	546	5160	16	223	13400	---	---
19	9270	28	701	5760	26	404	9370	---	---
20	9370	28	708	8620	21	489	8140	5	110
21	6690	20	361	8480	---	---	3000	6	49
22	7820	---	---	4890	---	---	3960	6	64
23	11200	---	---	7720	27	563	6750	6	109
24	6750	---	---	3710	15	150	7870	7	149
25	9420	---	---	4690	14	177	8390	---	---
26	8980	---	---	9560	13	336	9470	---	---
27	18900	---	---	14300	9	347	17900	6	290
28	16500	---	---	15400	---	---	12600	7	238
29	6780	---	---	14000	---	---	11300	8	244
30	9200	---	---	18800	8	406	14300	8	309
31	---	---	---	21100	12	684	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMBER	
1	6850	10	185	4190	---	---	6540	---	---
2	2900	---	---	5370	---	---	8320	---	---
3	6750	---	---	6930	6	112	10300	---	---
4	2200	---	---	3640	---	---	7920	---	---
5	7310	---	---	5500	---	---	5060	---	---
6	12900	4	139	5480	---	---	8730	---	---
7	16700	---	---	1460	---	---	3560	4	38
8	10300	---	---	7540	---	---	2440	---	---
9	6980	---	---	5960	---	---	1550	---	---
10	5320	---	---	5890	6	95	1460	---	---
11	11400	---	---	7490	---	---	1200	---	---
12	12000	---	---	6800	---	---	3300	---	---
13	7900	3	64	9130	---	---	9010	---	---
14	7830	---	---	6860	---	---	11100	12	360
15	7680	---	---	13400	---	---	9110	---	---
16	4990	---	---	16100	---	---	6540	---	---
17	2100	---	---	8740	6	142	9390	---	---
18	5830	---	---	8300	---	---	6150	---	---
19	8340	---	---	9880	---	---	11100	---	---
20	10100	4	109	9130	---	---	16200	---	---
21	4900	---	---	2780	---	---	15100	9	367
22	4850	---	---	10200	---	---	13300	---	---
23	4480	---	---	10700	---	---	14100	---	---
24	3690	---	---	5210	3	42	9610	---	---
25	6250	---	---	5160	---	---	9610	---	---
26	13600	---	---	13000	---	---	14900	---	---
27	13200	12	428	20000	---	---	13900	---	---
28	15700	---	---	20000	---	---	13800	8	298
29	10100	---	---	14700	---	---	13800	---	---
30	7260	---	---	4530	---	---	12000	---	---
31	1940	---	---	6510	4	70	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-21-83

STATION NUMBER 02172001   LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE)   LAKE   SOURCE AGENCY USGS
LATITUDE 331440   LONGITUDE 0795930   DRAINAGE AREA   DATUM   STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	19300	---	---	10200	---	---	13100	---	---
2	10500	---	---	10100	---	---	11800	---	---
3	7250	---	---	12400	---	---	14300	---	---
4	10300	---	---	12900	---	---	14400	---	---
5	10800	9	262	12200	---	---	14900	---	---
6	8670	---	---	8050	---	---	12700	---	---
7	9170	---	---	10400	---	---	10400	3	84
8	8600	---	---	11600	---	---	8310	---	---
9	3700	---	---	11900	6	193	10200	---	---
10	7760	---	---	11700	---	---	11900	---	---
11	8420	---	---	10700	---	---	10500	---	---
12	8790	6	142	11500	---	---	16400	---	---
13	7530	---	---	11200	---	---	18400	---	---
14	3830	---	---	13600	---	---	17300	3	140
15	3730	---	---	11900	---	---	17300	---	---
16	2200	---	---	14500	6	235	17000	---	---
17	4520	---	---	14800	---	---	17000	---	---
18	3930	---	---	13700	---	---	13700	---	---
19	4660	6	75	12700	---	---	16900	---	---
20	4150	---	---	12400	---	---	19400	---	---
21	4120	---	---	12800	---	---	10800	4	117
22	4310	---	---	13700	---	---	18100	---	---
23	8020	---	---	15000	7	283	18100	---	---
24	9910	---	---	11500	---	---	18500	---	---
25	9100	---	---	12000	---	---	15900	---	---
26	10600	7	200	10600	---	---	12700	---	---
27	12200	---	---	8140	---	---	16100	---	---
28	10100	---	---	12200	---	---	15700	4	170
29	11500	---	---	13800	---	---	14600	---	---
30	7630	---	---	13300	9	323	16900	---	---
31	9480	---	---	---	---	---	16900	---	---

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	13800	---	---	13200	21	748	13600	6	220
2	9840	---	---	11400	---	---	10600	---	---
3	14700	---	---	12200	---	---	11000	---	---
4	14600	4	158	20400	---	---	11200	---	---
5	17200	---	---	6660	---	---	9260	---	---
6	16400	---	---	9230	---	---	12700	---	---
7	13100	---	---	8340	---	---	13400	---	---
8	9250	---	---	11800	9	287	14500	8	313
9	16400	---	---	13800	---	---	14000	---	---
10	19300	---	---	16100	---	---	14200	---	---
11	20200	4	218	14500	---	---	11500	---	---
12	19800	---	---	13600	---	---	8920	---	---
13	18100	---	---	16700	---	---	9980	---	---
14	17700	---	---	15000	---	---	10400	---	---
15	17400	---	---	15000	7	283	10300	9	250
16	20800	---	---	14500	---	---	11300	---	---
17	21100	---	---	12900	---	---	12400	---	---
18	20400	6	330	17700	---	---	14900	---	---
19	20300	---	---	13800	---	---	12100	---	---
20	18600	---	---	15300	---	---	14900	---	---
21	15500	---	---	14700	---	---	9160	---	---
22	8960	---	---	15400	8	333	10300	16	445
23	13200	---	---	16800	---	---	9610	---	---
24	10400	---	---	18400	---	---	9860	---	---
25	10100	12	327	19600	---	---	12200	---	---
26	10300	---	---	16400	---	---	6930	---	---
27	9580	---	---	17200	---	---	10300	---	---
28	14900	---	---	13300	---	---	8810	---	---
29	11500	---	---	---	---	---	7630	4	82
30	15100	---	---	---	---	---	7980	---	---
31	15200	---	---	---	---	---	9030	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-06-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	7380	---	---	3110	---	---	5810	---	---
2	5690	---	---	822	---	---	6920	---	---
3	8920	---	---	320	8	6.9	4450	---	---
4	7250	4	78	241	---	---	3580	---	---
5	1070	---	---	491	---	---	12600	---	---
6	2070	---	---	360	---	---	11000	---	---
7	936	---	---	309	---	---	9220	5	124
8	5660	---	---	271	---	---	14600	---	---
9	6560	---	---	271	---	---	18300	---	---
10	8770	---	---	233	8	5.0	16500	---	---
11	9260	---	---	230	---	---	9730	---	---
12	9390	6	152	459	---	---	14400	---	---
13	9530	---	---	355	---	---	8790	---	---
14	7520	---	---	348	---	---	4680	7	88
15	9820	---	---	1180	---	---	5930	---	---
16	7130	---	---	610	---	---	7910	---	---
17	11900	---	---	271	---	---	7700	---	---
18	11900	---	---	358	8	7.7	5500	---	---
19	10900	10	294	912	---	---	12100	---	---
20	11400	---	---	8180	---	---	9470	---	---
21	6640	---	---	7940	---	---	12600	6	204
22	327	---	---	8600	---	---	12500	---	---
23	738	---	---	15000	9	364	15200	---	---
24	---	---	---	15700	---	---	11300	---	---
25	528	---	---	14800	---	---	8330	---	---
26	1050	12	34	13000	---	---	12800	---	---
27	2590	---	---	12800	---	---	4700	---	---
28	2420	---	---	12600	---	---	2660	8	57
29	1120	---	---	11400	---	---	2750	---	---
30	1950	---	---	6340	---	---	5980	---	---
31	---	---	---	5570	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-06-83

STATION NUMBER 02172001   LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE)   LAKE   SOURCE AGENCY USGS
LATITUDE 331440   LONGITUDE 0795930   DRAINAGE AREA   DATUM   STATF 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMRER	
1	9430	---	---	11800	---	---	19800	---	---
2	11500	6	186	13300	---	---	20300	---	---
3	13800	---	---	14100	---	---	20700	---	---
4	9660	---	---	15600	---	---	21100	---	---
5	7780	10	210	14700	---	---	21300	---	---
6	8300	---	---	11700	---	---	20900	8	451
7	7790	---	---	16800	---	---	21100	---	---
8	10500	---	---	17300	---	---	20800	---	---
9	16000	---	---	15700	7	297	22100	---	---
10	18200	---	---	9790	---	---	24600	---	---
11	18700	---	---	9380	---	---	21200	---	---
12	15300	12	496	9840	---	---	19600	---	---
13	16500	---	---	8980	---	---	19600	10	529
14	9970	---	---	16000	---	---	19100	---	---
15	6350	---	---	17100	---	---	19100	---	---
16	6530	---	---	15500	8	335	20300	---	---
17	14900	---	---	13300	---	---	19500	---	---
18	15000	---	---	14200	---	---	18500	---	---
19	13700	6	222	15000	---	---	17300	---	---
20	14300	---	---	12400	---	---	16500	76	3390
21	14300	---	---	15300	---	---	16400	---	---
22	11400	---	---	14000	---	---	15100	---	---
23	8240	---	---	13400	7	253	9880	---	---
24	12900	---	---	20900	---	---	7000	---	---
25	11800	---	---	22200	---	---	12100	---	---
26	11100	6	180	28000	---	---	13000	---	---
27	10400	---	---	27900	---	---	12400	17	569
28	13200	---	---	28000	---	---	12600	---	---
29	15000	---	---	27800	---	---	10900	---	---
30	9130	---	---	25500	7	482	5540	---	---
31	12100	---	---	21100	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCFSS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	---	---	---	13600	10	367	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	9160	12	297	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	16100	10	435
7	---	---	---	---	---	---	---	---	---
8	---	---	---	19100	18	928	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	7760	9	189	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	22300	10	602
14	---	---	---	---	---	---	---	---	---
15	---	---	---	10600	7	200	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	12600	10	340	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	22500	9	547
21	---	---	---	---	---	---	---	---	---
22	---	---	---	7040	3	57	---	---	---
23	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	14000	15	567	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	23600	17	1080
28	---	---	---	---	---	---	---	---	---
29	---	---	---	10400	11	309	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-06-83

STATION NUMBER 02172001   LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE)   LAKE   SOURCE AGENCY USGS
LATITUDE 331440   LONGITUDE 0795930   DRAINAGE AREA   DATUM   STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	23100	7	437	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	16500	16	713
7	---	---	---	20700	24	1340	---	---	---
8	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	27400	8	592	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	14600	40	1580
14	---	---	---	25000	20	1350	---	---	---
15	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---
17	28000	20	1510	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	13100	14	495
21	---	---	---	22900	18	1110	---	---	---
22	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---
24	28200	22	1680	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	12100	10	327
28	---	---	---	9080	46	1130	---	---	---
29	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---
31	27800	23	1730	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02172001 LAKE MOULTRIE NEAR PINOPOLIS, S.C. (TAILRACE) LAKE SOURCE AGENCY USGS
LATITUDE 331440 LONGITUDE 0795930 DRAINAGE AREA DATUM STATE 45 COUNTY 015

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	---	---	---	11600	35	1100	---	---	---
2	---	---	---	---	---	---	---	---	---
3	12400	9	301	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	4740	8	102
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	8410	11	250	---	---	---
9	---	---	---	---	---	---	---	---	---
10	12400	8	268	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	27700	11	823
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	8550	15	346	---	---	---
16	---	---	---	---	---	---	---	---	---
17	4940	34	453	---	---	---	---	---	---
18	4680	30	379	---	---	---	---	---	---
19	---	---	---	---	---	---	22200	8	480
20	---	---	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---
22	---	---	---	14000	17	643	---	---	---
23	---	---	---	---	---	---	---	---	---
24	6760	93	1700	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	15200	14	575
27	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	6420	6	104	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

APPENDIX B

DISCHARGE AND SUSPENDED-SEDIMENT RECORDS

FOR SANTEE RIVER NEAR FORT MOTTE

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02169800 SANTEE RIVER NEAR FORT MOTTE S C STREAM SOURCE AGENCY USGS
LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMBER	
1	---	---	---	---	---	---	6380	42	723
2	---	---	---	---	---	---	---	---	---
3	---	---	---	5500	35	520	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	5620	42	637
8	---	---	---	---	---	---	---	---	---
9	---	---	---	6800	51	936	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	5700	45	693	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	7600	50	1030	---	---	---
16	12600	52	1770	---	---	---	8870	132	3160
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	7580	95	1940
21	---	---	---	---	---	---	---	---	---
22	---	---	---	---	---	---	---	---	---
23	---	---	---	7420	80	1600	---	---	---
24	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---
26	5600	26	393	---	---	---	9350	103	2600
27	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-21-83

STATION NUMBER 02169800   SANTEE RIVER NEAR FORT MOTTE S C   STREAM   SOURCE AGENCY USGS
LATITUDE 334500   LONGITUDE 0803732   DRAINAGE AREA 14100.00   DATUM   STATF 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN- TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBFR			NOVEMBER			DECEMBFR	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	14800	77	3080	6500	18	316
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	6000	52	842	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	8300	38	852
18	---	---	---	11000	42	1250	---	---	---
19	---	---	---	---	---	---	---	---	---
20	11000	53	1570	---	---	---	---	---	---
21	---	---	---	---	---	---	7250	49	959
22	---	---	---	4800	24	311	---	---	---
23	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---
26	9200	70	1740	---	---	---	---	---	---
27	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	7500	40	810
30	---	---	---	10700	55	1590	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

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LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JANUARY			FEBRUARY			MARCH	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	10700	72	2080	18100	30	1470
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	16400	40	1770	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---
9	8600	28	650	---	---	---	---	---	---
10	---	---	---	---	---	---	11300	37	1130
11	---	---	---	21600	60	3500	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	20100	50	2710
16	---	---	---	16000	72	3110	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---
21	15600	33	1390	---	---	---	---	---	---
22	---	---	---	---	---	---	---	---	---
23	7500	21	425	---	---	---	10700	38	1100
24	---	---	---	26600	86	6180	---	---	---
25	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	5400	35	510
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02169800 SANTEE RIVER NEAR FORT MOTTE S C STREAM SOURCE AGENCY USGS
LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	---	---	---	4800	44	570	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	5800	40	626	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	4800	40	518	---	---	---
12	5200	44	618	---	---	---	---	---	---
13	---	---	---	---	---	---	7750	46	963
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	---	---	---	6750	36	656	---	---	---
20	4400	34	404	---	---	---	---	---	---
21	---	---	---	---	---	---	7750	38	795
22	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	---	---	---	19600	130	6880	---	---	---
26	---	---	---	---	---	---	8300	168	3760
27	---	---	---	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	9800	78	2060	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02169800 SANTEE RIVER NEAR FORT MOTTE S C STREAM SOURCE AGENCY USGS
LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		JULY			AUGUST			SEPTEMBER	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	15200	56	2300	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	19100	84	4330
9	---	---	---	12500	76	2570	---	---	---
10	22100	524	31300	---	---	---	---	---	---
11	24100	332	21600	---	---	---	---	---	---
12	22600	211	12900	---	---	---	---	---	---
13	27100	144	10500	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	23600	52	3310
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	9500	48	1230	---	---	---
19	---	---	---	---	---	---	---	---	---
20	12500	60	2030	---	---	---	---	---	---
21	---	---	---	---	---	---	13200	53	1890
22	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	13200	96	3420	---	---	---	---	---	---
28	---	---	---	---	---	---	---	---	---
29	---	---	---	---	---	---	10100	62	1690
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY   PROCESS DATE IS 06-21-83

STATION NUMBER 02169800   SANTEE RIVER NEAR FORT MOTTE S C   STREAM   SOURCE AGENCY USGS
LATITUDE 334500   LONGITUDE 0803732   DRAINAGE AREA 14100.00   DATUM   STATE 45   COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		OCTOBER			NOVEMBER			DECEMBER	
1	---	---	---	11000	44	1310	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	11000	59	1750	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	16000	30	1300
8	---	---	---	---	---	---	---	---	---
9	---	---	---	11000	37	1100	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	13200	36	1280	---	---	---	---	---	---
14	---	---	---	---	---	---	25000	197	13300
15	---	---	---	6000	35	567	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	9200	37	919	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---
22	---	---	---	---	---	---	25600	87	6010
23	---	---	---	---	---	---	---	---	---
24	---	---	---	7250	21	411	---	---	---
25	---	---	---	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	10100	36	982	---	---	---	---	---	---
28	---	---	---	---	---	---	20600	52	2890
29	---	---	---	15600	59	2490	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

STATION NUMBER 02169800 SANTEE RIVER NEAR FORT MOTTE S C STREAM SOURCE AGENCY USGS
LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	JANUARY MEAN DISCHARGE (CFS)	JANUARY MEAN CONCEN-TRATION (MG/L)	JANUARY SEDIMENT DISCHARGE (TONS/DAY)	FEBRUARY MEAN DISCHARGE (CFS)	FEBRUARY MEAN CONCEN-TRATION (MG/L)	FEBRUARY SEDIMENT DISCHARGE (TONS/DAY)	MARCH MEAN DISCHARGE (CFS)	MARCH MEAN CONCEN-TRATION (MG/L)	MARCH SEDIMENT DISCHARGE (TONS/DAY)
1	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	27600	50	3730	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	16800	32	1450	8000	19	410
8	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	16000	32	1380	13600	54	1980
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---
19	29600	41	3280	---	---	---	---	---	---
20	28600	35	2700	8600	23	534	26600	83	5960
21	27600	40	2980	---	---	---	---	---	---
22	25600	38	2630	---	---	---	---	---	---
23	25100	30	2030	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	25600	49	3390	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	---	---	---
28	---	---	---	9500	25	641	---	---	---
29	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---
31	23100	43	2680	---	---	---	---	---	---

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE IS 06-21-83

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LATITUDE 334500 LONGITUDE 0803732 DRAINAGE AREA 14100.00 DATUM STATE 45 COUNTY 017

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	11600	38	1190	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	12500	42	1420
7	---	---	---	---	---	---	---	---	---
8	---	---	---	7750	36	753	---	---	---
9	12500	43	1450	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	12500	45	1520	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	14400	55	2140	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	8900	46	1110	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---
21	---	---	---	11000	67	1990	15600	60	2530
22	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---
25	11000	49	1460	---	---	---	---	---	---
26	---	---	---	---	---	---	---	---	---
27	---	---	---	---	---	---	14400	51	1980
28	---	---	---	7750	32	670	---	---	---
29	8600	30	697	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---
31	---	---	---	---	---	---	---	---	---