

1970
UPPER EAST RIVER
and
WESTERN LONG ISLAND SOUND SURVEY

INTRODUCTION

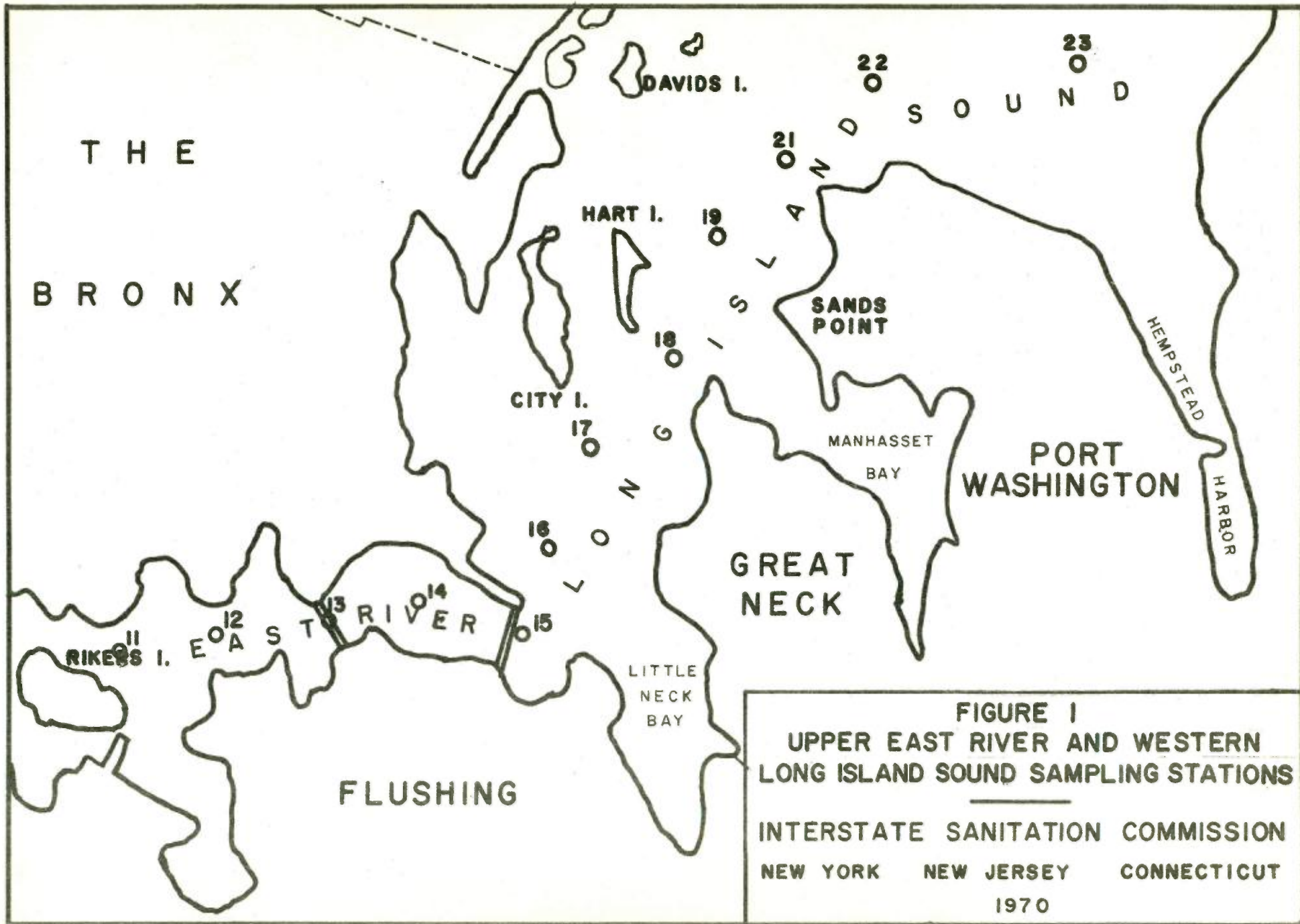
A water pollution survey was conducted in the northern portion of the East River and the westerly end of the Long Island Sound during the summer of 1970. Long Island Sound lies between the north shore of Long Island, the east shore of Westchester County, and the south shore of Connecticut. It is bounded by the Atlantic Ocean on the east and the East River on the west. The Sound is used extensively for recreational and fishing purposes and it is important that the waters be kept free from pollution. Industries and sewage treatment plants in New York City, Long Island, Westchester County and Connecticut discharge their effluents into the East River and Long Island Sound. The purposes of this study were (1) to determine the present condition of the waters, and (2) to compare the results of this survey with those obtained from a similar survey conducted in 1959.*

PROCEDURE

Twelve sampling stations were selected in the East River and Long Island Sound. These stations extended from Rikers Island in the East River to Hempstead Harbor in Long Island Sound. The stations are shown on a survey map on the following page (Figure 1) and a description is given in an Appendix at the end of this report.

Two boats were used to collect samples on eleven (11) days between July 28, 1970, and August 14, 1970. All samples were taken during daylight hours. Each station was sampled five (5) feet below the surface three (3) times a day, and determinations were made for temperature, dissolved oxygen, pH, chlorides, turbidity, ortho-phosphate, nitrate, nitrite, total carbon, total organic carbon, chromium, and iron. Several times during the survey determinations were made for chlorophyll and for total phosphate. All dissolved oxygen determinations were made aboard the boats using a modified Winkler method. Samples for the determination of the Most Probable Number of coliform organisms were taken for all stations on the first run and for half of the

*1959 Water Pollution Survey in the East River and Long Island Sound, Interstate Sanitation Commission.



stations on the third run of each sampling day. These samples were taken in sterile bottles and tubes were inoculated immediately aboard the vessels. The tubes were then returned to the Commission laboratory where they were incubated and the tests completed. All tests were made using instrumental techniques or according to "Standard Methods for the Examination of Water and Wastewater."

The data for each station were analyzed and arithmetic means were determined for each parameter except coliform density, pH and dissolved oxygen. The geometric mean was used for coliform density and logarithmic averages were used for pH. Dissolved oxygen was analyzed in accordance with procedures previously developed by the Commission.**

At a given station, high and low tide occur approximately one (1) hour later each day. Because of this and the number of days samples were taken, samples were obtained for all parts of the tidal cycle.

RESULTS

The results at each station are summarized in Table I.

Dissolved Oxygen

The tidal variations of percent saturation of dissolved oxygen and the average percent saturation were determined at each station. The method of least squares was used to determine the curves of best fit at each station. A typical curve is shown in Figure 2. The average percent saturation of dissolved oxygen varied from 25.4% at Station 11 to 98.4% at Station 23, which corresponds to concentrations of 1.87 mg/l and 7.54 mg/l of dissolved oxygen respectively. Many of the stations in Long Island Sound had single measurement percent saturation values greater than 100%, which is attributed to the presence of algae. As shown in Figure 3, at the stations common to the 1959 and 1970 surveys (Stations 11-19) the mean percent saturations of dissolved oxygen varied from 4.9% to 11.7% higher in 1970 compared to 1959.

Coliform Density

The coliform density ranged from a high average value of 56,690 MPN/100 ml (Most Probable Number per 100 milliliters) at Station 11 to a low of less than 100 MPN/100 ml

**Method for Analyzing Observed Data in Tidal Waters, Interstate Sanitation Commission.

TABLE I : SUMMARY OF RESULTS

STA-TION	TEMPER-ATURE (°C)	CHLOR-IDES (mg/l)	D.O. (mg/l)	% D.O. SAT. (A)	COLIFORM PENSITY (MPN/100 ml) (B)	pH (C)	TURBID-ITY (JTU)	ORTHO PO ₄ -P (mg/l)	NO ₃ -N (mg/l)	NO ₂ -N (mg/l)	TOTAL CARBON (mg/l)	TOTAL ORGANIC CARBON (mg/l)	IRON (mg/l)	CHRO-MIUM (mg/l)	CHLORO-PHYLL A (mg/l)
11	21.6	13,640	1.87	25.4	56,690	6.9	2.5	0.32	0.064	0.056	31.6	8.0	0.275	<0.05	0.022
12	21.4	13,696	2.04	27.4	38,220	6.9	2.6	0.31	0.065	0.053	31.1	7.5	0.263	<0.05	0.019
13	20.9	13,891	2.37	31.7	>24,970	7.0	2.2	0.29	0.055	0.040	30.6	7.1	0.230	<0.05	0.026
14	20.8	13,973	2.69	34.7	<25,950	7.0	2.2	0.27	0.053	0.036	30.0	6.7	0.221	<0.05	0.053
15	20.7	14,030	2.96	38.9	12,920	7.0	2.1	0.25	0.048	0.031	30.2	7.1	0.201	<0.05	0.051
16	20.4	14,186	3.54	47.1	4,440	7.0	1.9	0.21	0.038	0.023	30.0	7.0	0.177	<0.05	0.060
17	20.9	14,243	4.66	62.5	2,230	6.3	2.3	0.20	0.044	0.024	30.2	7.4	0.119	<0.05	0.060
18	20.9	14,226	5.07	67.8	1,800	6.5	2.1	0.19	0.040	0.021	29.8	7.6	0.115	<0.05	0.046
19	21.0	14,297	5.73	76.9	<950	6.6	2.0	0.18	0.034	0.019	29.9	7.8	0.111	<0.05	0.040
21	21.0	14,313	6.34	85.0	<220	6.7	2.0	0.16	0.024	0.017	29.7	7.9	0.110	<0.05	0.043
22	21.0	14,371	6.36	83.7	<180	6.8	1.9	0.13	0.025	0.016	29.6	8.1	0.062	<0.05	0.042
23	21.2	14,438	7.54	98.4	<110	6.9	1.9	0.11	0.015	0.012	29.4	7.8	0.077	<0.05	0.045

(A) AVERAGE FROM SINE CURVE

(B) GEOMETRIC MEAN

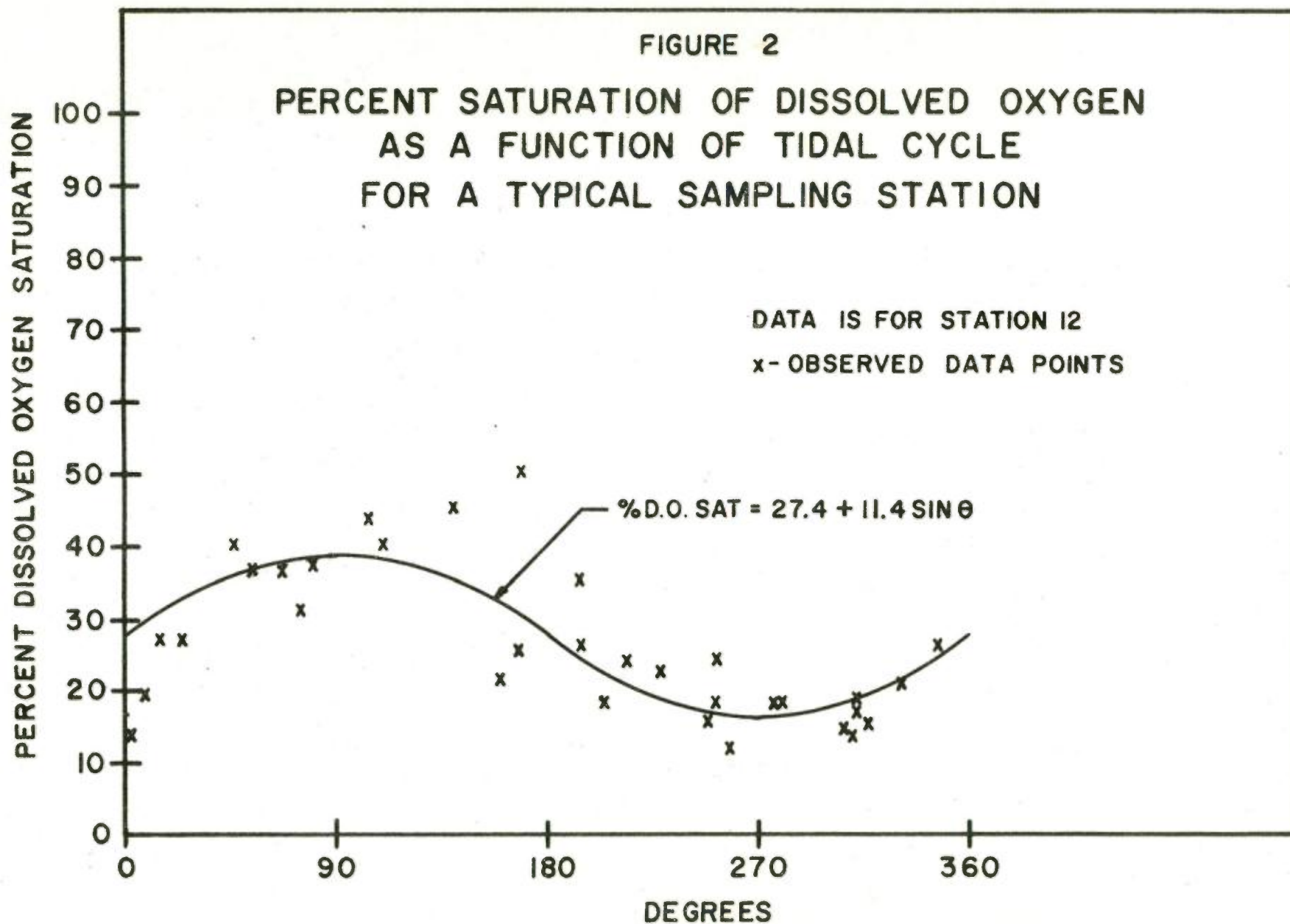
(C) LOGARITHMIC AVERAGE

FIGURE 2

PERCENT SATURATION OF DISSOLVED OXYGEN
AS A FUNCTION OF TIDAL CYCLE
FOR A TYPICAL SAMPLING STATION

DATA IS FOR STATION 12

x - OBSERVED DATA POINTS



at Station 23. As shown in Figure 4, the values obtained in 1970 are higher than those obtained in 1959.

Other Parameters

The water temperature during the survey showed very little variation between the stations. The average temperature ranged from 20.4°C at Station 16 to 21.6°C at Station 11, the station farthest into the East River.

The values for chlorides in the East River were lower than those for Long Island Sound. The farther east the station location, the higher the chloride concentrations (probably due to less influence of the Hudson and East Rivers as fresh water diluents).

All stations were in the pH range of 6.5-7.0 except for Station 17 which had an average pH of 6.3.

The values for turbidity were relatively constant. The low value was 1.9 JTU and the high value was 2.6 JTU.

The values for nutrients (ortho-phosphate - P, 0.32 mg/l; nitrate - N, 0.064 mg/l; and nitrite - N, 0.056 mg/l) were a maximum at Station 11 in the East River and in general steadily decreased to a low value of 0.11 mg/l, 0.015 mg/l, and 0.012 mg/l respectively at Station 23 in Long Island Sound. Iron and total carbon also show the same trend, but total organic carbon shows a downward trend from Station 11 (8.0 mg/l) to Station 14 (6.7 mg/l) and then an upward trend to Station 23 (7.8 mg/l). Values for chromium were less than 0.05 mg/l for all stations.

Chlorophyll A values (indicating the presence of algae) showed no definite trend except that the values to the west of the Whitestone Bridge were much lower than the rest of the stations. Ortho-phosphate - P was approximately 93 percent of the total phosphate - P value.

DISCUSSION

As already mentioned, compared to 1959 the dissolved oxygen condition of the waters is improved and the coliform density has deteriorated. Shown in Table II is a summary of the sewage discharged to the East River and Long Island Sound in the area of the Interstate Sanitation Commission survey. The total volume of sewage being treated has

FIGURE 3
AVERAGE PERCENT DISSOLVED OXYGEN SATURATIONS
OBSERVED IN 1959 AND 1970

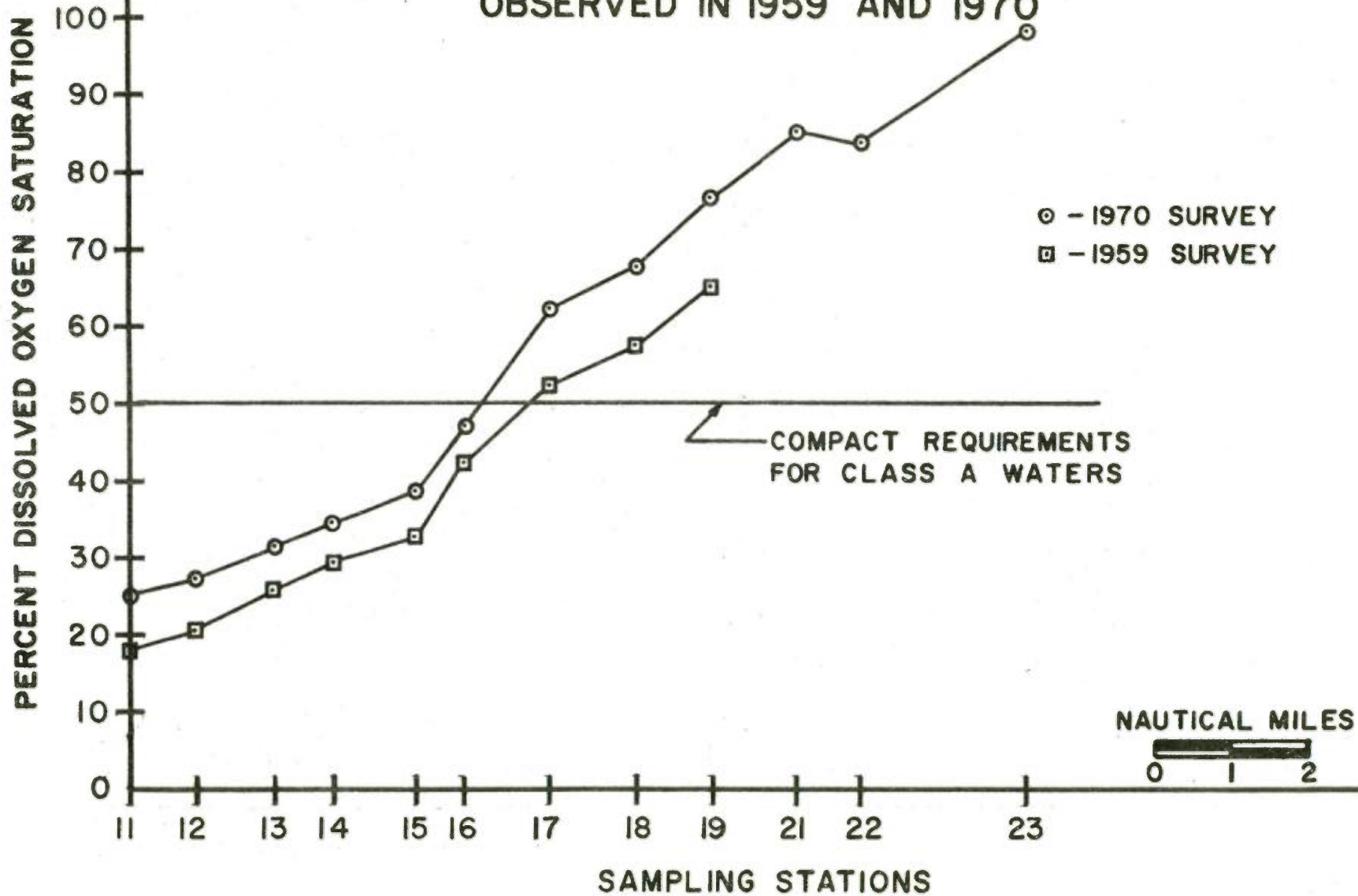


FIGURE 4

AVERAGE COLIFORM DENSITIES
OBSERVED IN 1959 AND 1970

COLIFORM DENSITY
(MPN PER 100 ML - IN THOUSANDS)

< - VALUE IS LESS THAN INDICATED
> - VALUE IS GREATER THAN INDICATED

○ - 1970 SURVEY
□ - 1959 SURVEY

NAUTICAL MILES

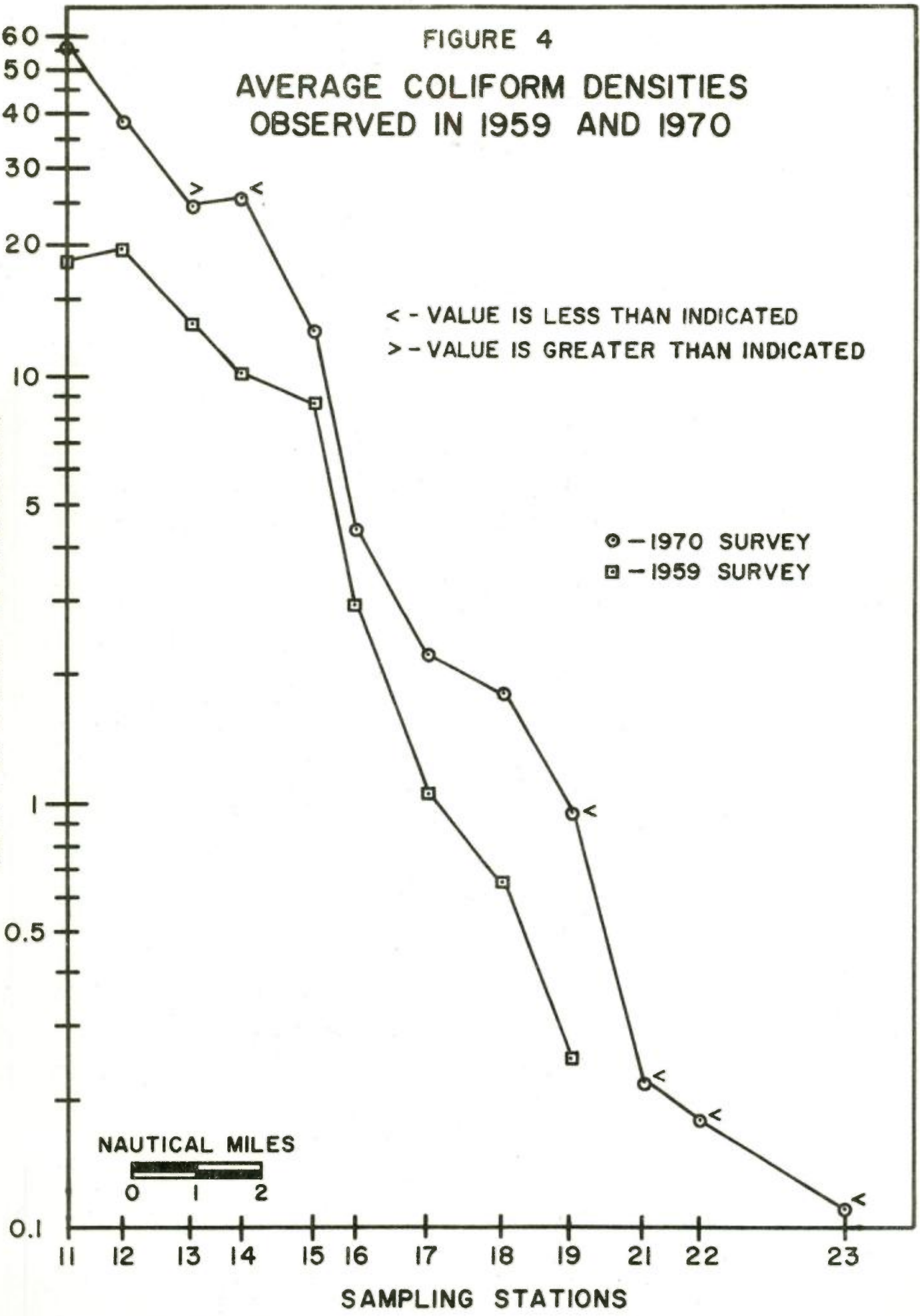


TABLE II

MGD of Sewage Discharged to the
 East River and Long Island Sound in the
 Area of the Interstate Sanitation Commission Surveys

Receiving Waterway	SECONDARY TREATMENT		PRIMARY TREATMENT		SCREENING	
	1959	1970	1959	1970	1959	1970
East River	475	740	--	--	--	--
Long Island Sound	6	15	17	32	16	--
Total	481	755	17	32	16	--

increased. This is reflected in the increased dissolved oxygen level of the waters, although the Tri-State Compact requirement of 50 percent saturation for Class A waters is still not being met for Stations 11 through 16. An increase in the percent dissolved oxygen saturation and a decrease in coliform densities can be expected after the completion of construction projects now underway at many of the sewage collection systems and treatment plants discharging to the waters covered by this survey. These projects include (1) building of pumping stations to pick up present direct discharges to the receiving waters, (2) increasing the hydraulic capacity of some of the plants, (3) upgrading to secondary treatment and increasing the degree of secondary treatment given by many of the plants, and (4) installation of adequate chlorination facilities at many of the plants.

Nutrients and the other parameters were not previously measured in the Commission's surveys. The values obtained in this survey form a reference baseline for future studies conducted in District waters.

SUMMARY AND CONCLUSIONS

- (1) The percent saturation of dissolved oxygen has increased since 1959, although the waters from stations 11 to 16 still do not meet the Tri-State Compact requirement of 50 percent saturation for Class "A" waters.
- (2) Even though there are increased chlorination facilities since 1959, these have not kept pace with the increased loadings and the coliform density in the receiving waters has increased.
- (3) No significant changes in (1) or (2) is expected until construction projects presently underway are completed.
- (4) A baseline for nutrients and other parameters has been established for future reference.

APPENDIX

DESCRIPTION OF SAMPLING STATIONS

- STATION 11 Mid-channel of East River
- East-West Range -
Fl.G. Beacon (College Point) with
stack on Rikers Island.
- North-South Range -
Line from center of Sanitation Pier
(Hunts Pt.) with Fl.R. #4 Buoy (Station
approx. 250 yds. S.E. of #4 Buoy).
- STATION 12 Mid-channel of East River
- East-West Range -
Sludge storage tank (Tallmans Island) with
large gas storage tank (Hunts Pt.).
- North-South Range -
Line of #1 Bell Buoy with Fl.G. Beacon,
College Point. (Station approx. 200 yds.
north of #1 Bell Buoy).
- STATION 13 Mid-channel of East River
- Under center of Whitestone Bridge.
- STATION 14 Mid-channel of East River
- East-West Range -
Bridge Tower (Old Ferry Pt.) with Tower
on New Throggs Neck Bridge (Fort Schuyler)
- Northeast-Southeast Range -
Fl.G. Bell Beacon (Whitestone) with
water tank (Fort Schuyler).

- STATION 15 Mid-channel of East River
- East-West Range -
R-Nun #2 (Willets Pt.) with tower on
Whitestone Bridge (Bronx)
- North-South Range -
Fl.R. #48 Bell Buoy with R-Nun #2
(Little Bay)
- STATION 16 Mid-channel of Long Island Sound
- East-West Range -
Mast at Kings Pt. with water tower
(Fort Schuyler)
- North-South Range -
Stepping Stone Light with Fl.R.
#48 Bell Buoy (Fort Schuyler)
- STATION 17 Off Stepping Stone Light
(approx. 300 yds. to N.)
- North-South Range -
Stack on Hart Island with Bridge Tower
(Fort Schuyler)
- East-West Range -
Stepping Stone Light with Mast at
Kings Pt.
- STATION 18 Off Fl.R. Bell - Hart Island
- North-South Range -
Gangway Rock Light with Stepping Stone
Light.
- East-West Range -
Fl. R. Bell (Hart Island) with tip of
Hewlett Pt.
- STATION 19 Off Gangway Rock Light
- North-South Range -
Tower on Sands Point with stack on
Hart Island

East-West Range -
#1 Gong with Fl. Bell Buoy #27
(Gangway Rock)

STATION 21 East-West Range -
#23 Black Bell and #25 Fl. Green

North-South Range -
Sands Point Light and Execution Light

STATION 22 East-West Range -
Execution Light and Matinicock Point

North-South Range -
1000 feet North of Bell Buoy #23

STATION 23 East-West Range -
Execution Light and #21 Flashing Green
on Matinicock Point

North-South Range -
Water Tower on Glen Cove and Larchmont
Breakwater Light