OFFICE OF ATTORNEY GENERAL
LANSING 2, MICHIGAN

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WISCONSIN ET AL V ILLINOIS ET AL

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Appendix B referred to in Answer of Complainants to Reply of Defendants to the Memorandum for the United States as Amicus Curiae

REPORT ON A SURVEY
OF THE
CHICAGO SANITARY CANAL AND THE CALUMET SAG CHANNEL

by

Michigan Associates
Consulting Engineers
Lansing 29, Michigan

22 April 1959

Survey and Report by
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Survey Assistant
George Kloote, Engr.

EXPLANATION OF SURVEY OF CHICAGO'S SANITARY AND SHIP CANAL

The survey which is attached vividly portrays that the Sanitary District is not doing what the Supreme Court of the United States required it to do; namely, completely collect and treat its sewage so that it could take care of the sewage disposal requirements in the Chicago area by means other than direct diversion from Lake Michigan. The importance of this survey is that it proves that the Sanitary District is failing to abide by that command -- and so long as it continues failing in that respect, it should not be allowed either by Congress or by the Court to increase the direct diversion of water to make up for its deficiencies and inefficiencies. In fact, if the Sanitary District would make its collection and treatment works perform as efficiently as do the cities of Milwaukee, Cleveland and Toronto, the probabilities are that the domestic pumpage of 1800 c.f.s. should be returned to the lake in the form of effluent emanating from its sewage treatment plants, as is done by every other municipality on the Great Lakes without suffering any deleterious effects to their health and welfare. The conclusions of this survey are confirmed by a two-day survey made by the U.S. Public Health Service on October 27 and 28, 1958. Among the facts stated in the report, we quote a few representative statements:

> "October 27, 1958: Observations were made from a motor launch along the Waterway in downtown Chicago and downstream from Chicago. While no physical evidence of pollution was observed in the Chicago River near the Lake, the surface of the North Branch carried floating trash and oil. Floating solids such as feces and other materials generally present in untreated sewage were observed in the North Branch. Gas bubbles broke the surface, indicating the presence of actively decomposing sludge deposits on the bottom. The water was black and devoid of dissolved oxygen in some locations.
>
> * * *
>
> "The Calumet Sag Channel also presented a picture similar to that of the Chicago Sanitary and Ship Canal in that sewage solids and occasional patches of oil were observed. Extensive sludge deposits were apparent, particularly in the Grand Calumet River at the Little Calumet River confluence. The water in the Calumet River appeared to be more rust colored in the reaches near Lake Michigan.

"October 28, 1958: . . . At Lockport, the water impounded immediately above the hydroelectric power plant was black. Black gaseous masses of sludge floated up to the surface indicating active decomposition of sludge on the bottom. As the flow passed through the lock and hydroelectric power plant, a thick and persistent white froth developed. In the main channel of the Ship Canal at Lockport and downstream through the Brandon Pool, patches of oil, general discoloration, and floating sewage solids were observed. As the water left the Brandon Pool, large banks of froth were produced. These floated downstream in patches."

The observations made, the samples of water taken and the photographs attached to this report unmistakably bear out the following facts:

(a) That the specific areas of the waterway examined are grossly polluted and have been such for an indefinite period in the past;

(b) That raw sewage and industrial wastes are allowed to be discharged into the waterway without requiring that they be properly treated before discharge.

(c) That two of the sewage treatment plants operated by the Metropolitan Sanitary District of Greater Chicago either are not efficiently operated or that a large quantity of sewage is bypassing these plants directly into the waters of the canal;

(d) That the Sanitary District is engaged in unorthodox and unrecognized sanitary treatment procedures by maintaining for many years an extensive number of sludge lagoons along the canal which overflow and discharge into the canal without prior treatment.

All of the foregoing practices indulged in by the officials of the Sanitary District result in a heavy and concentrated pollution of the waters of the canal and form the real basis for demands on the part of Illinois for a greater quantity of direct fresh water diversion from Lake Michigan.

On account of the construction of the St. Lawrence Seaway and the hydroelectric power plants by the Power Authority of New York and the Province of Ontario, the Great Lakes Basin now needs all the water which rightfully belongs to it. In 1913 the then Secretary of War, Henry L. Stimson, in denying an application by the Sanitary District for diversion of 10,000 c.f.s. in a written

memorandum pointed out:

> "In a word, every drop of water taken out at Chicago necessarily tends to nullify costly improvements made under direct authority of Congress throughout the Great Lakes, and a withdrawal of the amount now applied for would nullify such expenditures to the amount of many millions of dollars, as well as inflict an even greater loss upon the navigation interests using such waters."

Today as never before the Great Lakes Basin requires "every drop of water" or otherwise the millions of dollars which have been spent on the Seaway and the deepening of the connecting channels will necessarily be proportionately nullified. This does not mean that the legitimate needs of the people in the Chicago area for water cannot be taken care of. But what other communities must do, certainly the public officials of the State of Illinois and of the Chicago area can do; namely, maintain a system of complete collection and treatment of their sewage so that all the water abstracted can either be returned to the Great Lakes Basin whence it came and where it belongs, or such other measures be adopted which will cut down and restrict the amount of water which may be diverted.

PAUL L. ADAMS
Attorney General
State of Michigan

Dated: May 1, 1959

REPORT ON A SURVEY OF THE CHICAGO SANITARY CANAL AND THE CALUMET SAG CHANNEL

INTRODUCTION:

At the request of the Attorney General's office of the State of Michigan, this firm undertook a survey of the Chicago Sanitary Canal and the Calumet Sag Channel. This survey was made during the second and third weeks of April, 1959. The primary purpose of the survey was to evaluate the above waterways from a pollutional standpoint and to gather evidence of improperly treated or untreated sewage or industrial waste being discharged into these waterways, within the boundaries of the Chicago Sanitary District, if such evidence was available.

GENERAL DISCUSSION OF SURVEY:

The survey was conducted by the writer and one engineer assistant, and commenced just upstream from the control works at Lockport, Illinois. A 14 foot outboard motorboat was utilized to traverse the waterways herein discussed. Both black and white pictures and 35 mm. color slides were taken during this survey, and are included as a part of this report. Various samples of the canal waters and sewer discharges were taken and kept refrigerated for B.O.D. determination by the Michigan Water Resources Commission. B.O.D., as herein used, is the abbreviation for Biochemical Oxidation Demand and is the standard accepted measure of the strength of a sewage or waste. B.O.D. indicates the amount of decomposable organic matter in waste waters and is therefore an important index of the strength of wastes and can be used in determining the wastes effect on receiving waterways. As a means of comparison, a pure unpolluted water would have a B.O.D. of 0 parts per million and normal domestic sewage might have a B.O.D. of about 250 ppm. Most modern sewage treatment works treating domestic sewage are capable of discharging treated sewage effluent with a B.O.D. of less than 25 ppm.

FIG. 1 of this report is a map of the Chicago area showing the major waterways system under discussion. The area within the shaded boundary is that of the present Chicago Sanitary District. The cross hatched waterways denote the area actually traversed by boat during the survey. Picture and sample locations are also shown on this map.

PICTURE 1 was taken at the point used to dock the motorboat at Lockport, Illinois. As can be seen, the surface of the water is covered with bubbles. Bubbles of this type are typical of heavily polluted waters and are the result of methane and carbon dioxide production in organic sludge deposits at the bottom of the canal. At this particular location, which is about 5 miles downstream from the Chicago Sanitary District boundary, the gas bubbles are most evident when water is withdrawn from the canal for operation of the locks. The sudden use of water apparently lowers the water level in the canal and the resulting reduction in water pressure releases a large quantity of gas as evidenced by the picture.

PICTURE 2 was taken at the junction of the Chicago Sanitary Canal and the Calumet Sag Channel. This picture again shows gas bubbles which have risen to the surface from organic sludge deposits. Gas bubbles of this type are tell-tale evidence of very heavily polluted waters, and these were seen on every section of the canals, except for a short distance downstream from the control works on Lake Michigan, where clean lake water entered.

PICTURES 3, 4, 5, 6, 7 show discharging sewers along the area of the Chicago Sanitary District raw sludge lagoons. There are indications that these sewers are direct overflows from these raw sewage sludge lagoons. Samples were taken from the discharging wastes and the following results are reported:

Sample from sewer shown in picture 3	135 ppm, B.O.D.
Sample from sewer shown in picture 4	350 ppm, B.O.D.
Sample from sewer shown in picture 5	780 ppm, B.O.D.
Sample from sewer shown in picture 6	320 ppm, B.O.D.

The high strength of waste indicated by the above data and the quantities being discharged as shown in the pictures would normally dictate treatment of these wastes before discharge into a receiving waterway. Standard engineering practice would be to pump this waste back to the treatment plant and treat it with the incoming raw sewage.

PICTURES 8 and 9 were taken just upstream from highway bridge, Route 171, and show a waste of undetermined origin heavily laden with floating solids. A B.O.D. determination of this waste showed 375 ppm B.O.D. Floating solids as seen in this picture can easily be removed from a waste by the simplest of treatment processes. The presence of these solids and the high B.O.D. indicate that no treatment is given to this very strong waste prior to discharge into the Chicago Sanitary Canal.

PICTURES 10, 11, 12, 13 show raw ground garbage floating on the surface. These pictures were taken just downstream from the Stickney Sewage Treatment Plant discharge sewer. No garbage could be found floating on the upstream side of this sewage plant outfall, and it is therefore concluded that this material is being discharged from the plant itself. If this is the case, one can only conclude that a percentage of Chicago's raw sewage is being bypassed around the plant without treatment. The floating solids, as shown in the pictures, were found in concentrated form for about one-quarter of a mile downstream from the sewage plant outfall. It should be pointed out that the portion of ground garbage that would be seen floating is probably only a small percentage of the original untreated sewage being discharged. It should also be pointed out that the crudest methods of sewage treatment are capable of removing the solids that are shown in these pictures.

PICTURES 14, 15, 16, 17 were taken upstream from the Stickney Sewage Plant in the area of numerous oil works. The pictures show oil slicks on the surface of the canal, and thick oil scum deposits along the banks. Heavy oil slicks, as shown in picture 16, inhibit the transfer of atmospheric oxygen into the canal

water, and thereby, reduce the ability of the water to purify itself through natural biological processes.

PICTURE 18 was taken at the junction of the Chicago Sanitary Canal and the canal leading to the Union Stock Yard area. These solids were composed of grease, scum, organic solids and debris, and is typical of many areas along the entire length of canal that was traveled.

PICTURE 19 was taken in the canal leading to the Union Stock Yard area, and shows the gas bubbles rising from the sludge deposits on the bottom of the canal. A representative sample taken from the canal water near the surface at the end of this canal showed a B.O.D. of 205 ppm. Our boat followed a barge tug about half way up this canal. The tug's large screw churned the water considerably and stirred up the bottom sludge deposits. A sample of the stirred up water was taken and can best be described by saying that it was black as ink, and had a very foul and nauseating odor. In fact, the general impression while traveling this canal was that of boating in a septic tank. The upper end of this canal is too shallow for barge traffic, and as a result, the sludge deposits are not kept stirred up. While we were in this area, large chunks of organic sludge, 3 and 4 feet long, would periodically break loose from the bottom and come boiling to the surface. The putrid nature of this water and the heavy sludge deposits are conclusive indications that strong sewage is discharged into this canal.

PICTURE 21 is a sewer outlet discharging from the property of a manufacturing plant. A sample from this waste water showed a B.O.D. of 230 ppm. This strength of waste is comparable to the strength of raw, untreated domestic sewage.

PICTURES 22, 23, 24 show a discharging sewer under the Halsted Street bridge crossing the north branch loop, just above Chicago Avenue. In picture 22, heavy grease scum can be seen floating downstream. Pictures 23 and 24 show the discoloration of the canal, due to the high solids content of the waste. A sample of this waste showed a B.O.D. greater than 790 ppm. There is little doubt that this waste receives no treatment prior to discharge into the canal.

The Calumet Sag Channel was traveled up to Lake Calumet, and although the waters seemed better than the Sanitary Canal, there were still signs of gross pollution. A representative water sample taken just upstream from the junction of the Calumet Sag Channel and the Calumet River showed a B.O.D. of 83 ppm. Supposedly, there are no sanitary sewer discharges upstream from this junction, and there are no other streams or canals joining the channel above this point. It can be assumed that the only water in the upper branch of this Channel would come from relatively pure storm water and clean water diverted from Lake Michigan. With this in mind, it can only be concluded that sewage is being discharged into Calumet Sag Channel along its upper reaches.

A representative sample was taken from the outfall of the Calumet Sewage Treatment plant which is located at the Blue Island Control Works. The B.O.D. of this sample was 116 ppm. If the raw sewage entering this plant were assumed to be 250 ppm, B.O.D., this sample would indicate that the plant is given only 54% removal of B.O D. Normally, one could expect that a plant of the design of the Calumet Sewage plant would give over 90% removal of B.O.D. under proper operation. The obvious conclusion to be drawn is that considerable raw sewage is bypassing the Calumet Sewage Plant in an untreated, or partially treated condition.

PICTURES 25, 26, 27, 28 show the oil slicks and oil scum bank deposits, and are representative of many areas along the Calumet Sag Channel.

CONCLUSIONS:

In all fairness, it must be pointed out that all pictures and samples used in the report were taken on a particular day, and therefore, cannot, with certainty, be stated to represent average conditions. Nevertheless, the condition of the waterways observed during this survey indicates that dumping of untreated wastes into the canals is standard practice and not due to breakdown of treatment facilities. An accurate determination of the amount of untreated wastes being discharged into these waterways would necessitate a lengthy study involving daily composite sampling techniques, and much more thorough

investigation of the entire Sanitary District.

Even considering the limitations of the data herein presented, the following conclusions can be made:

1. The lengths of waterways covered in this survey are grossly polluted, and have been for an undetermined length of time.
2. Raw sewage and industrial wastes were observed being discharged into the waterways with little or no prior treatment.
3. There are indications that two of the three sewage treatment plants in the Chicago Sanitary District are operating at a lower level of efficiency than that normally expected of such plants, or that a substantial percentage of sewage is bypassing these plants.
4. There is evidence that one of the Chicago District Sewage plants is not conforming to recognized sanitary engineering treatment procedure, in that highly concentrated raw sludge lagoons overflows are allowed to discharge into the canal without treatment.

SURVEY OF THE CHICAGO SANITARY CANAL
AND THE CALUMET SAG CHANNEL
PICTURE DESCRIPTIONS AND SAMPLE RESULTS

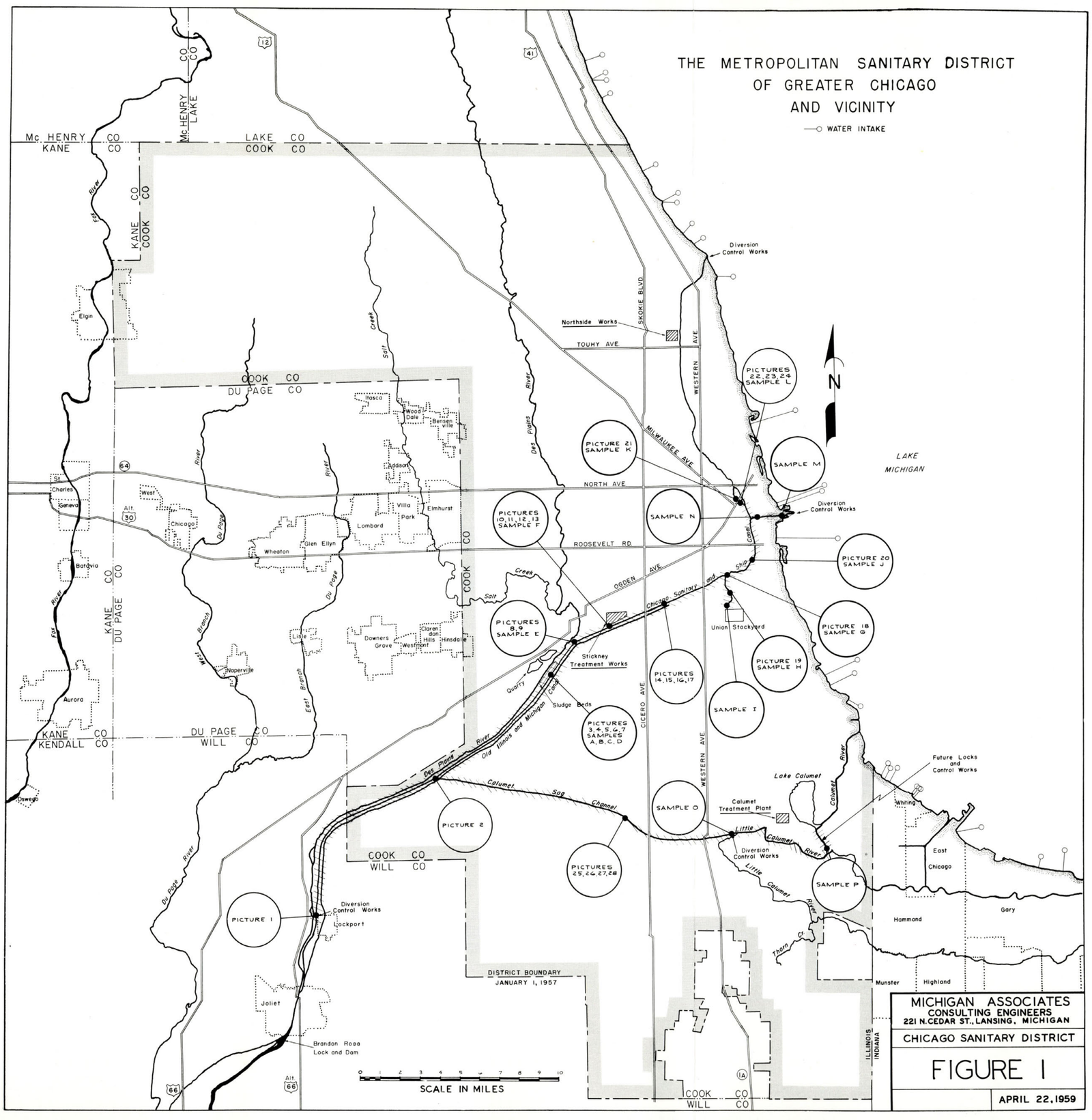
SAMPLE DESIGNATION	BLACK & WHITE PICTURE DESIG.	COLORED PICTURE DESIGNATION	DATE OF PICTURE &/OR SAMPLE	DESCRIPTION	BOD OF SAMPLE IN PPM
	1		4-10-59	Lockport, Illinois, just upstream from Locks. Note gas bubbles on surface of water which have risen from septic sludge deposits on bottom of canal	
	2		4-14-59	Junction of Calumet Sag Canal and Chicago Sanitary Canal. Note gas bubbles.	
A	3		4-14-59	Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons Discharging waste water believed to be either overflow or underdrainage from lagoons.	135
B	4	4	4-14-59	Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons Discharging waste water believed to be either overflow or underdrainage from lagoons.	350
C	5	5	4-14-59	Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons Discharging waste water believed to be either overflow or underdrainage from lagoons.	780
D	6	6	4-14-59	Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons Discharging waste water believed to be either overflow or underdrainage from lagoons.	320
	7		4-14-59	Discharging outlets along area of Stickney Sewage Treatment Works sludge lagoons.	
E	8	8	4-14-59	Sewer outlet just upstream from highway bridge, Route 171.	375
E	9	9	4-14-59	Sewer outlet just upstream from highway bridge, Route 171.	375
F	10	10	4-14-59	Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about 1/4 of a mile from outfall.	1260

SAMPLE DESIG-NATION	BLACK & WHITE PICTURE DESIG.	COLORED PICTURE DESIG-NATION	DATE OF PICTURE &/OR SAMPLE	DESCRIPTION	BOD OF SAMPLE IN PPM
F	11	11	4-14-59	Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about 1/4 of a mile from outfall.	1260
F	12	12	4-14-59	Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating Garbage prevalent for about 1/4 of a mile from outfall.	1260
F	13	13	4-14-59	Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about 1/4 of a mile from outfall.	1260
	14		4-14-59	Sewer outlet by Lake-River Terminal Oil Co. Note heavy oil slicks around sewer opening.	
	15	15	4-14-59	Sewer outlet by Lake-River Terminal Oil Co. Note heavy oil slicks around sewer opening.	
	16	16	4-14-59	Heavy Oil slicks on surface and banks of canal just downstream from Hughes Oil Co.	
	17	17	4-14-59	Heavy Oil slicks on surface and banks of canal just downstream from Hughes Oil Co.	
G	18	18	4-14-59	Floating grease, scum and debris typical of many areas along Chicago Sanitary Canal. Picture taken at junction of Chicago Sanitary Canal and canal leading to Union Stock Yard area.	540
H	19	19	4-14-59	Canal leading to Union Stock Yard area. Note gas bubbles from heavy septic sludge deposits along bottom of Canal. Note also the thick hunks of sludge which have broken loose from the bottom deposits and floated to the surface.	450
I			4-14-59	Sample from top water at end of canal leading to Union Stock Yard area.	205

SAMPLE DESIG-NATION	BLACK & WHITE PICTURE DESIG.	COLORED PICTURE DESIG-NATION	DATE OF PICTURE &/OR SAMPLE	DESCRIPTION	BOD OF SAMPLE IN PPM
J	20	20	4-14-59	Sewer outlet under Railroad bridge just upstream from Canal Street in Chicago Sanitary Canal.	6
K	21	21	4-14-59	Sewer outlet by Container Company situated in North branch loop just above Chicago Avenue.	230
L	22	22	4-14-59	Sewer outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note scum floating downstream from outlet.	Greater Than 790
L	23	23	4-14-59	Sewer outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note milky discoloration of canal due to high solids concentration of waste.	Greater Than 790
L	24	24	4-14-59	Sewer outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note milky discoloration of Canal due to high solids concentration of waste.	Greater Than 790
M				Mid channel sample about 100 yds. from Control Works near Navy Pier.	3
N				Mid channel sample about 100 yds. from junction of North branch of Chicago River.	0
	25	25	4-10-59	Oil slicks and bank deposits typical of many areas along Cal Sag Canal.	
	26	26	4-10-59	Oil slicks and bank deposits typical of many areas along Cal Sag Canal.	
	27	27	4-10-59	Oil slicks and bank deposits typical of many areas along Cal Sag Canal.	
	28	28	4-10-59	Oil slicks and bank deposits typical of many areas along Cal Sag Canal.	
O			4-10-59	Sample taken at outfall of Calumet Sewage Treatment Plant.	116
P			4-10-59	Sample taken just upstream from the junction of the Calumet Sag Channel and the Calumet River.	83

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO AND VICINITY

WATER INTAKE

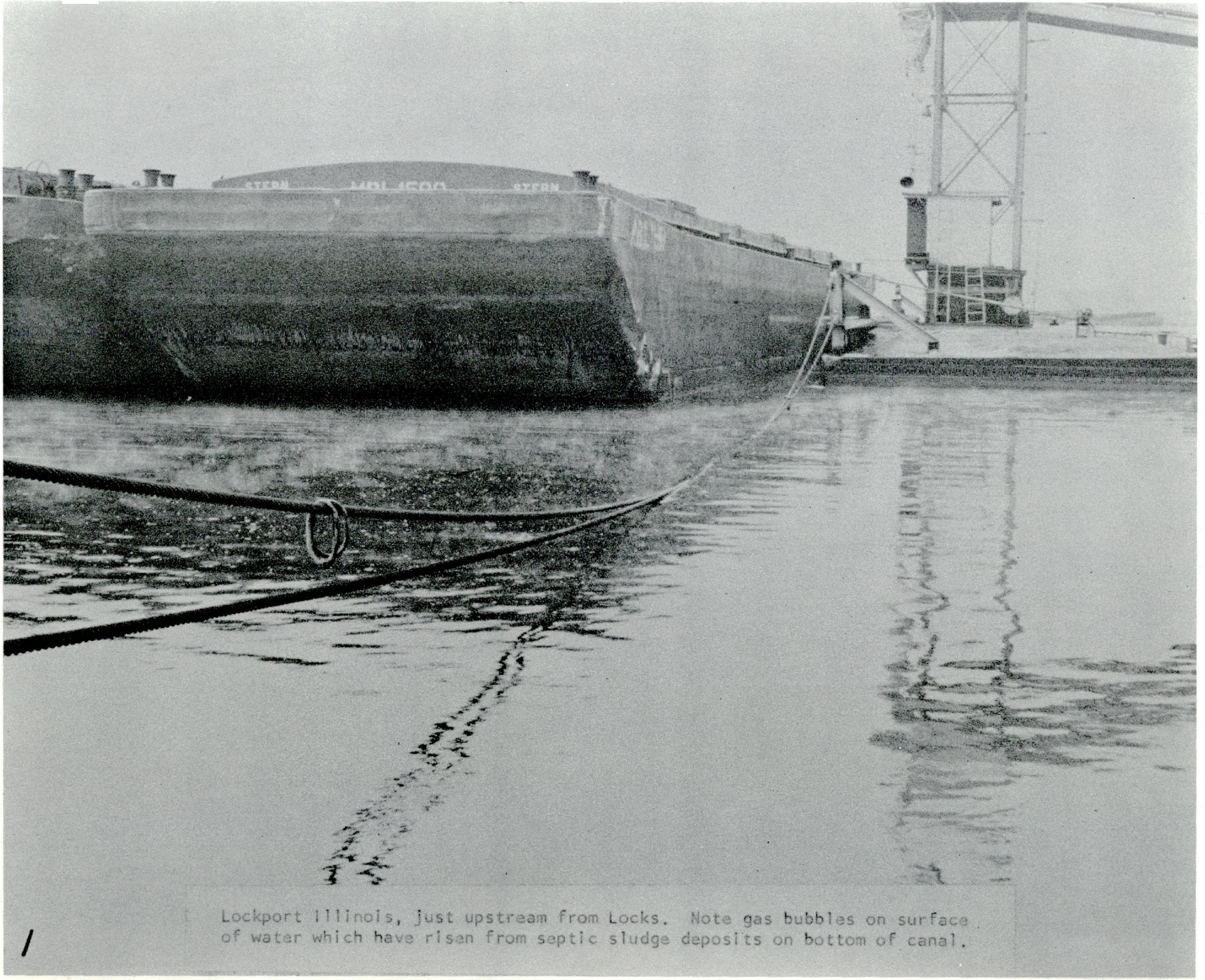


MICHIGAN ASSOCIATES
CONSULTING ENGINEERS
221 N. CEDAR ST., LANSING, MICHIGAN

CHICAGO SANITARY DISTRICT

FIGURE 1

APRIL 22, 1959



Lockport Illinois, just upstream from Locks. Note gas bubbles on surface of water which have risen from septic sludge deposits on bottom of canal.

2 Junction of Cal Sag Canal and Chicago Sanitary Canal. Note gas bubbles.

3

Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons. Discharging waste water believed to be either overflow or underdrainage from lagoons.

4

Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons. Discharging waste water believed to be either overflow or underdrainage from lagoons.

5

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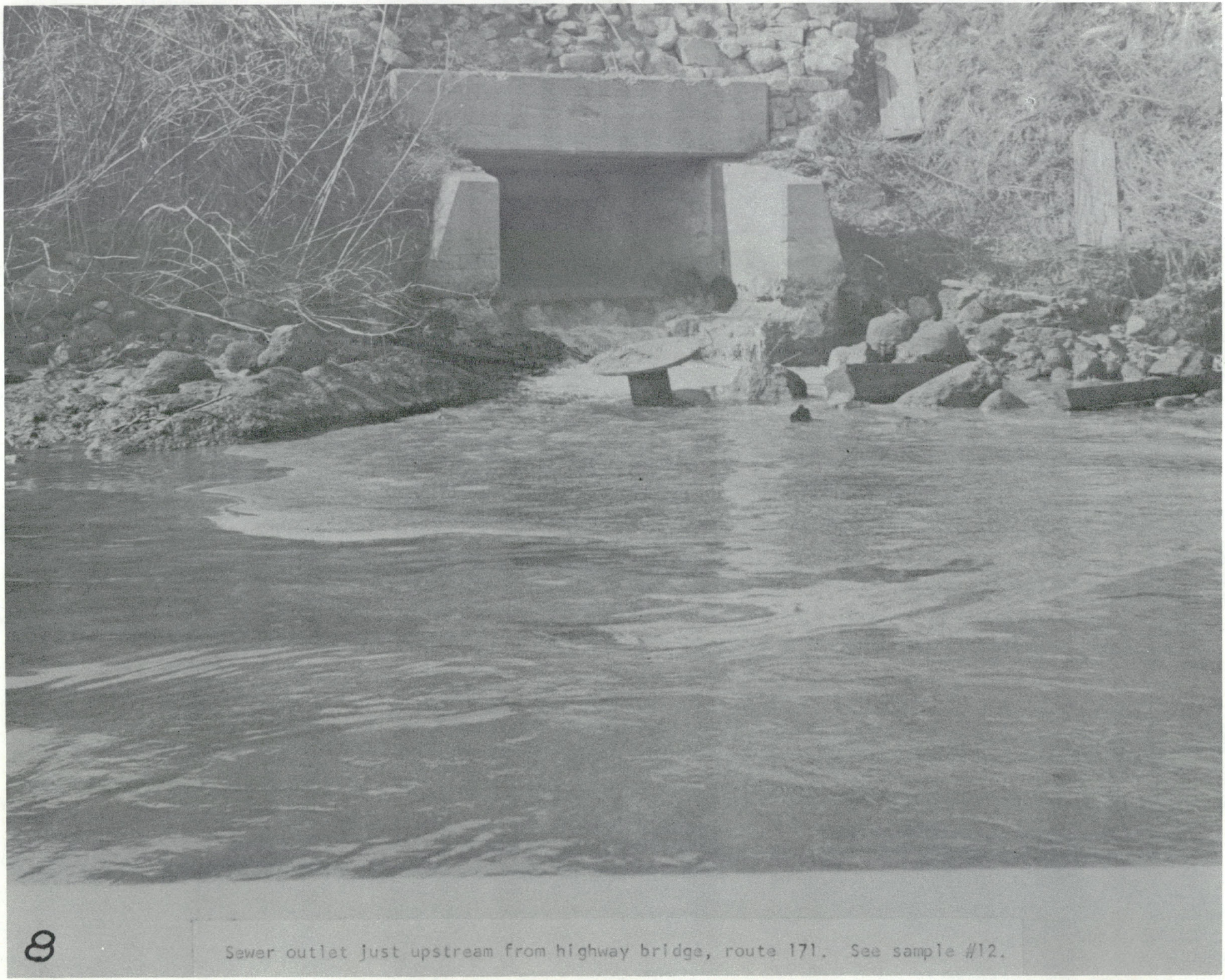
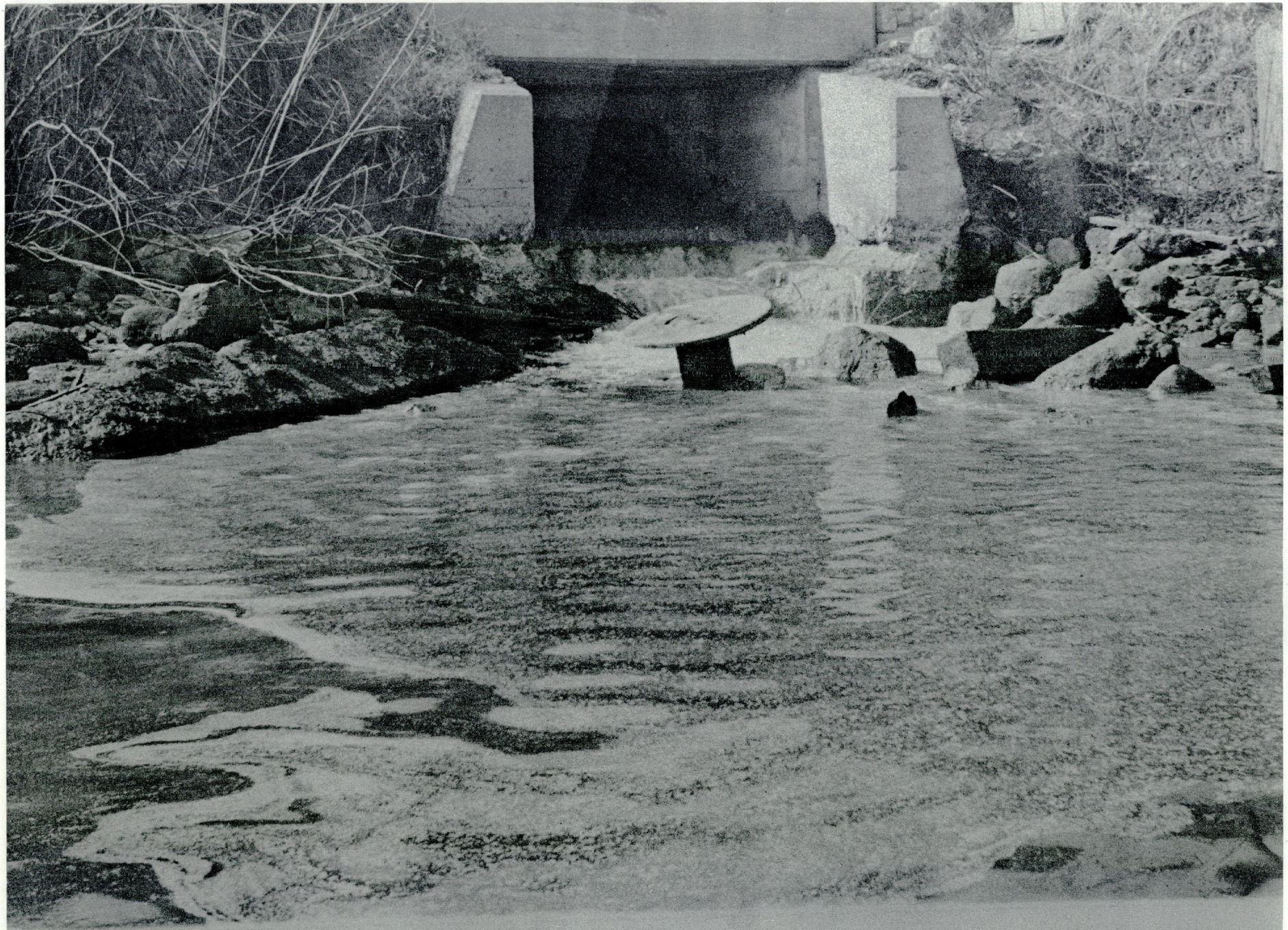
Sewer outlet along area of Stickney Sewage Treatment Works sludge lagoons. Discharging waste water believed to be either overflow or underdrainage from lagoons.

7 Discharging outlets along area of Stickney Sewage Treatment Works sludge lagoons.



8

Sewer outlet just upstream from highway bridge, route 171. See sample #12.



9 Sewer outlet just upstream from highway bridge, route 171. See sample #12.

10

Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about one quarter of a mile from outfall. See sample #11.

Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about one quarter of a mile from outfall. See sample #11.

11

12

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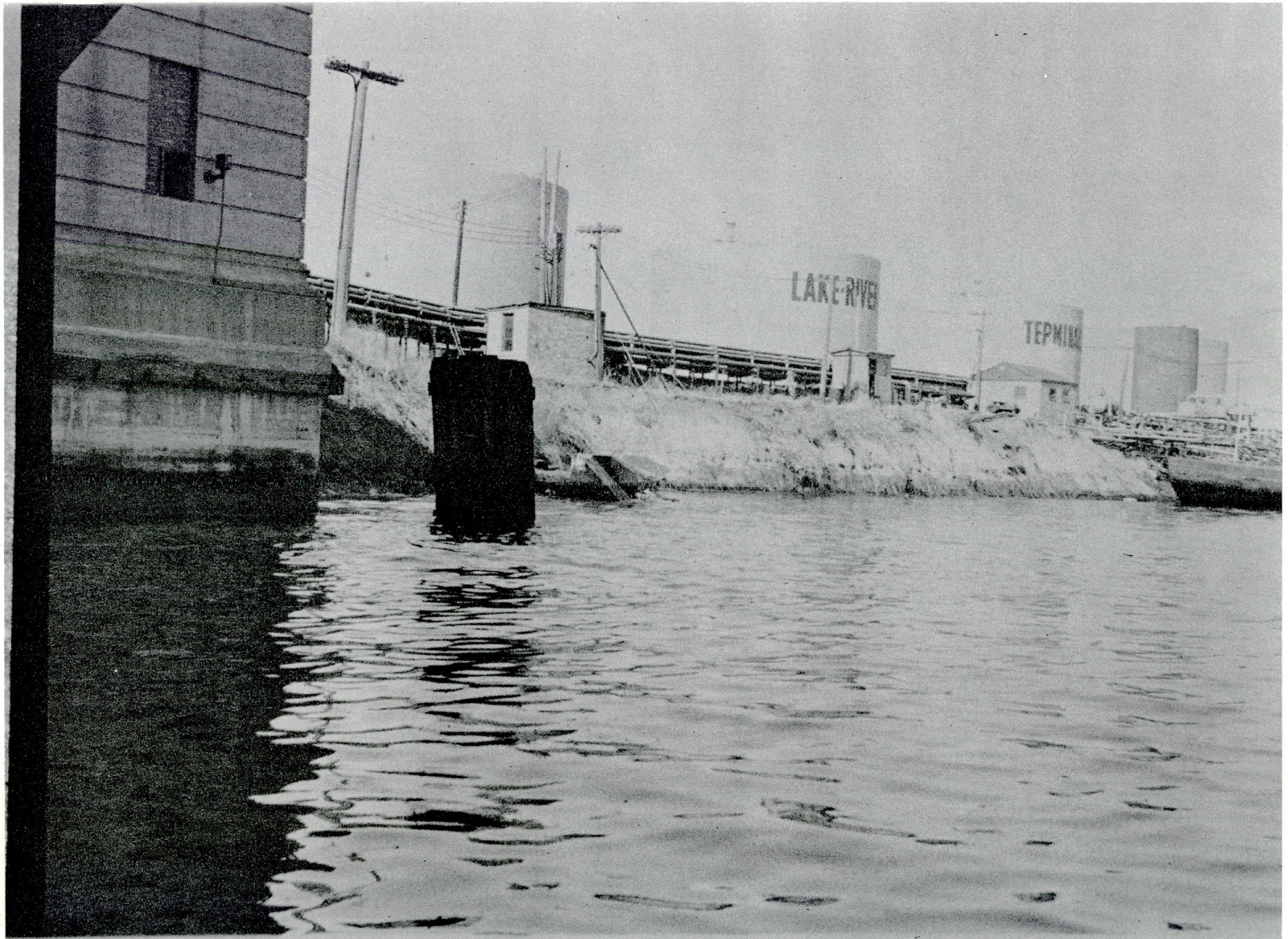
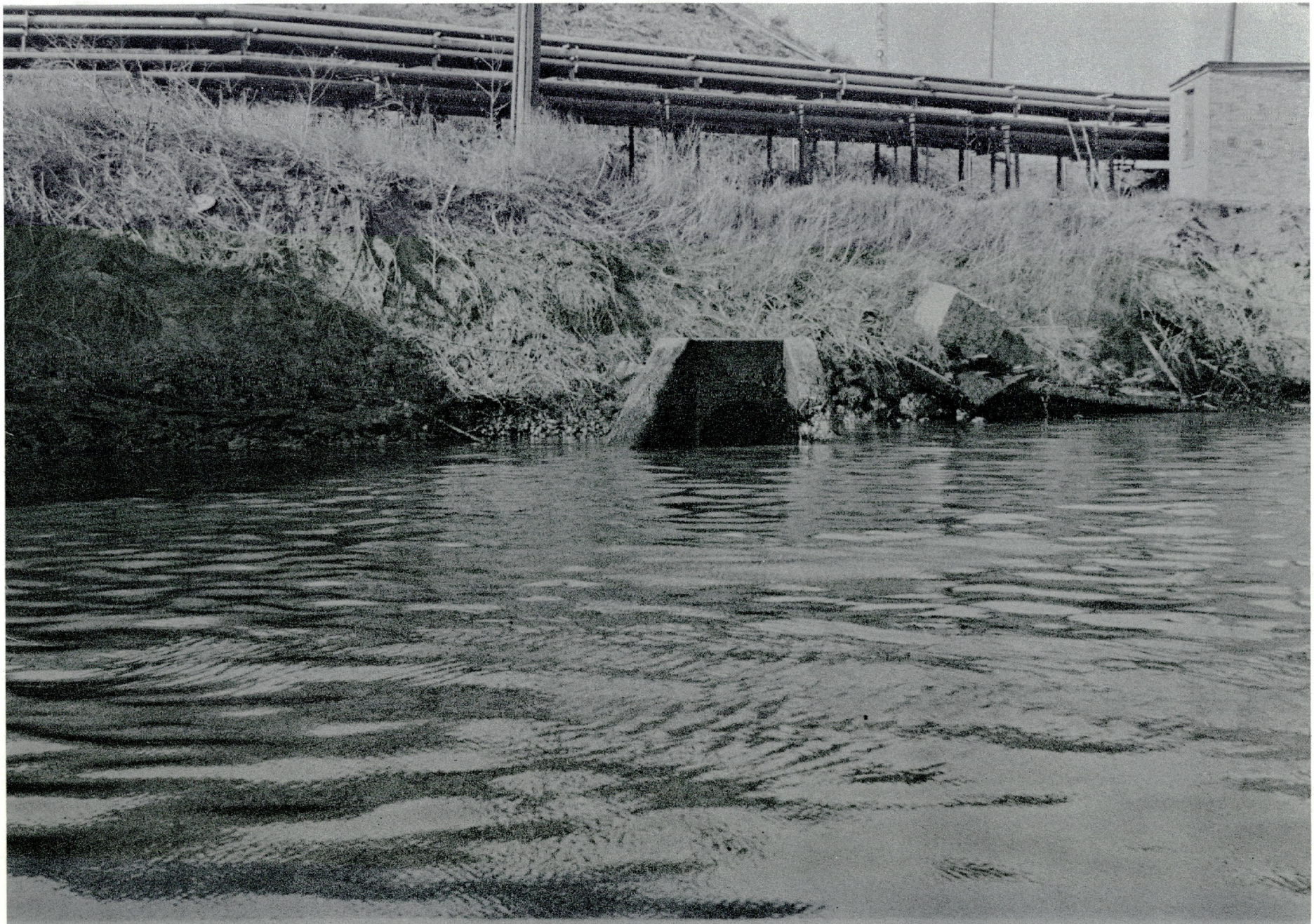
13

Floating fresh ground garbage. Condition found just downstream from Stickney Sewage Treatment Plant outfall. Floating garbage prevalent for about one quarter of a mile from outfall. See sample #11.



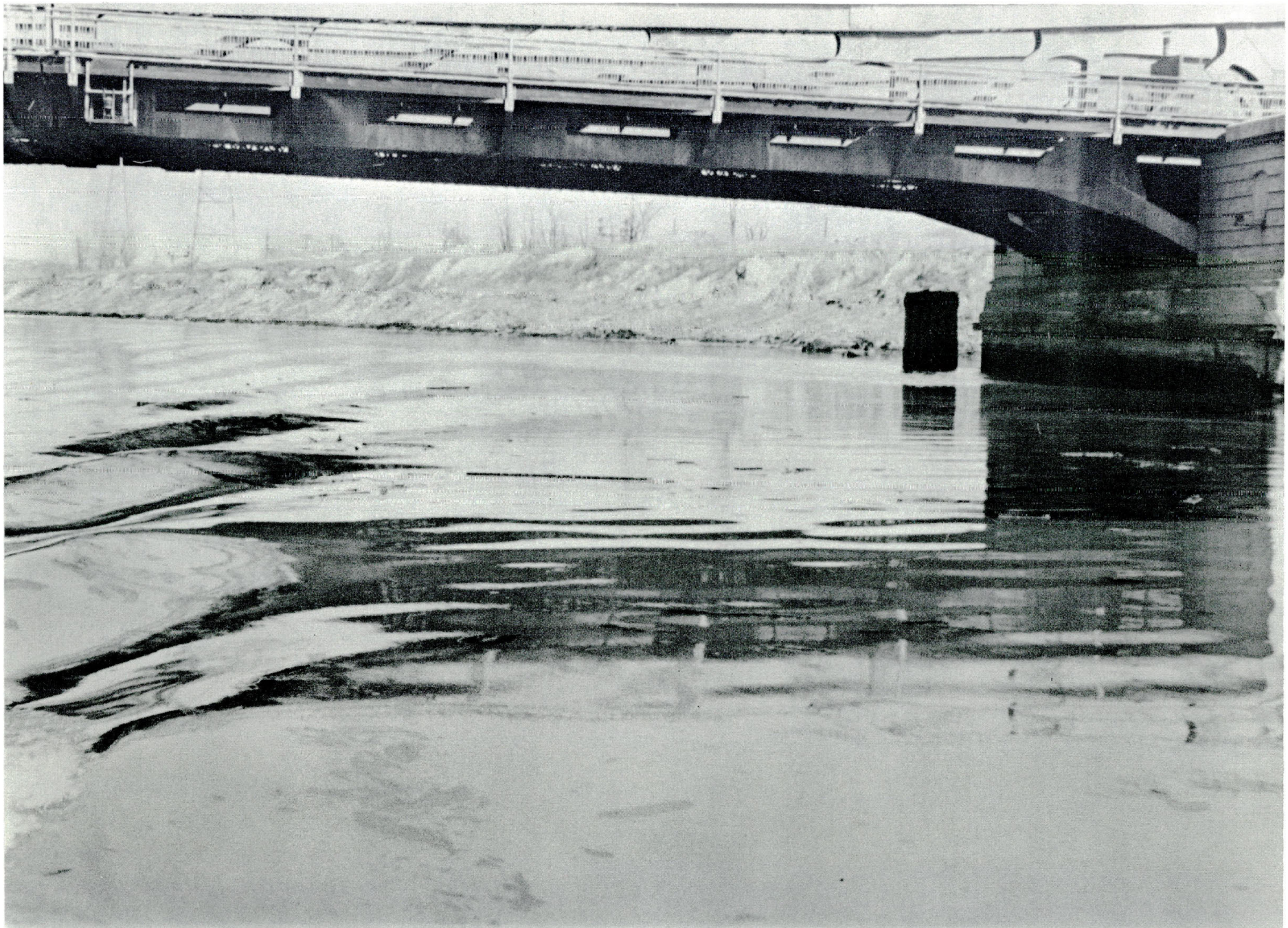
14

Sewer outlet by Lake-River Terminal Oil Co. Note heavy oil slicks around sewer opening.



15

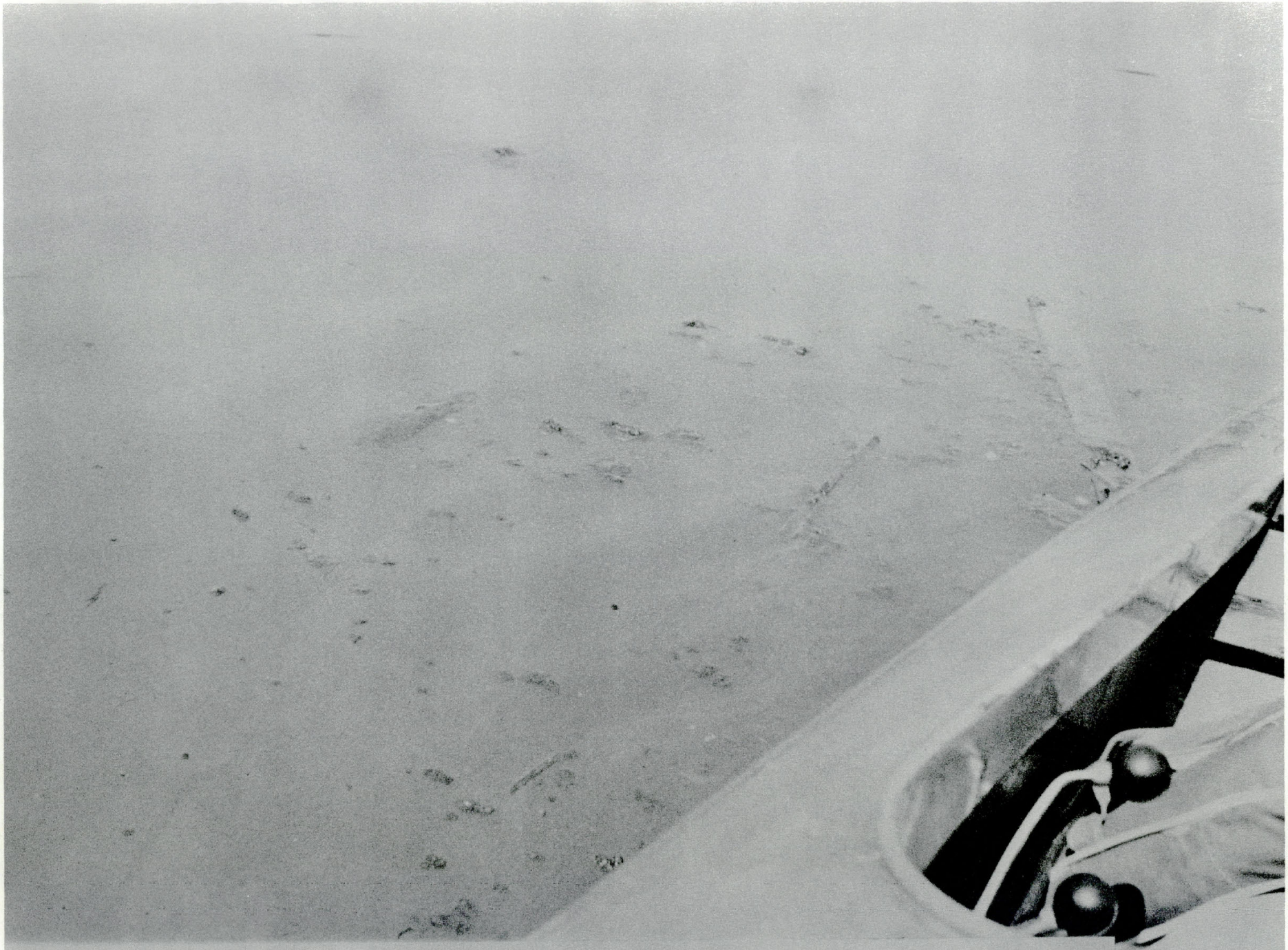
Sewer outlet by Lake-River Terminal Oil Co. Note heavy oil slicks around sewer opening.



16

Heavy oil slicks on surface and banks of canal just downstream from Hughes Oil Co.

17 Heavy oil slicks on surface and banks of canal just downstream from Hughes Oil Co.

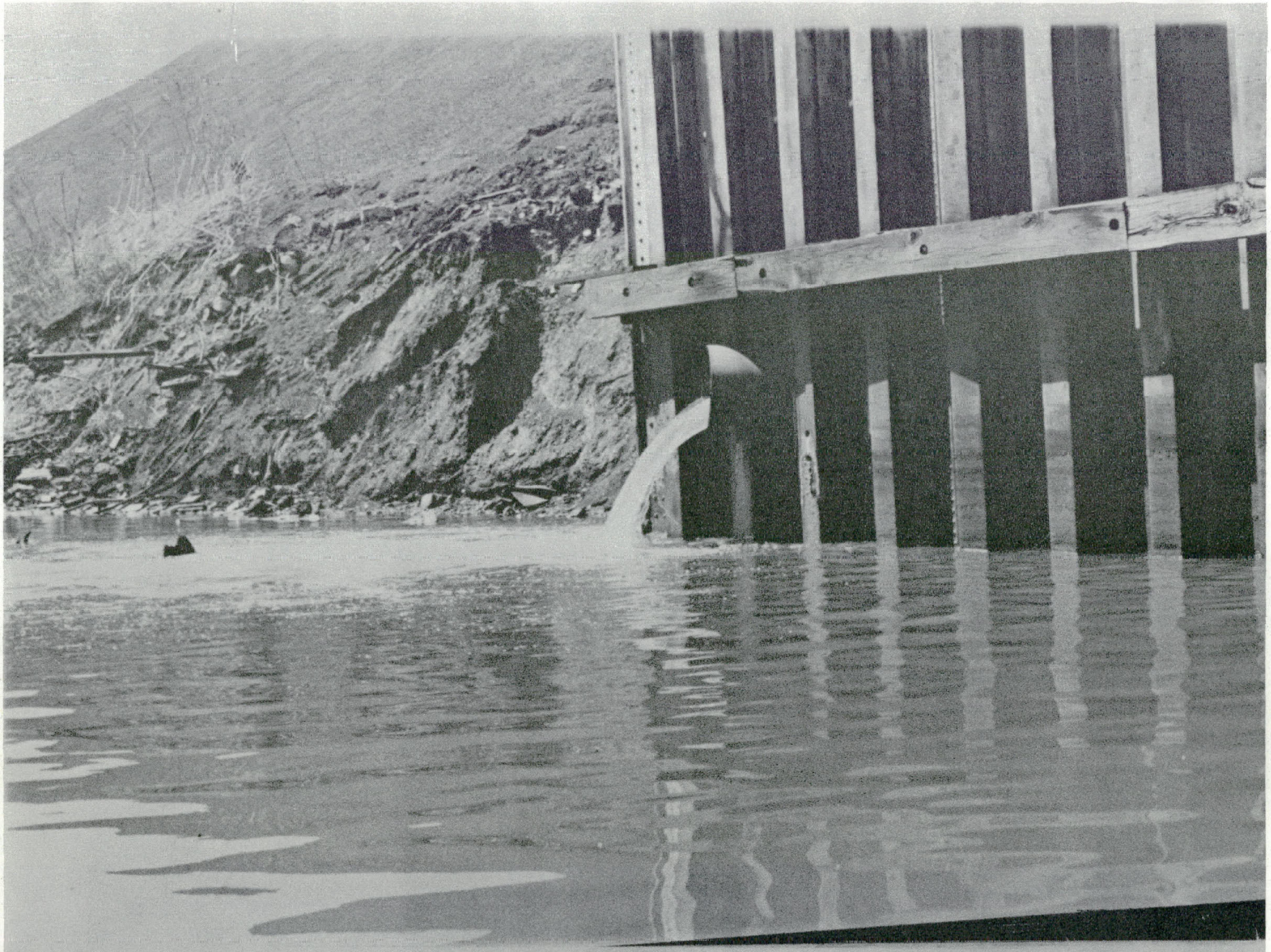


18

Floating grease, scum and debris typical of many areas along Chicago Sanitary Canal. Picture taken at Junction of Chicago Sanitary Canal and canal leading to Union Stock Yard area. See sample #7

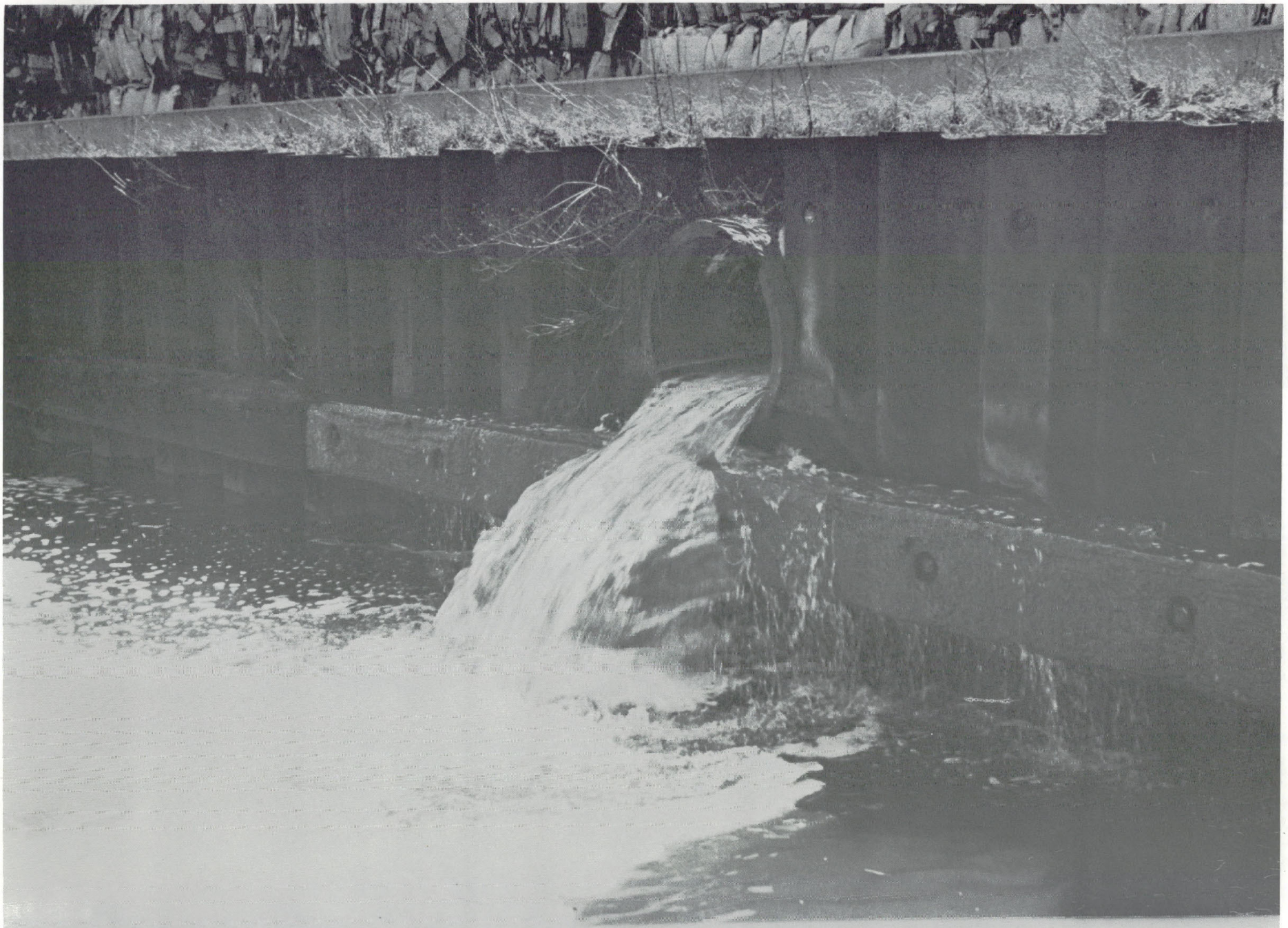
19

Canal leading to Union Stock Yard area. Note gas bubbles from heavy septic sludge deposits along bottom of Canal. See Sample #8

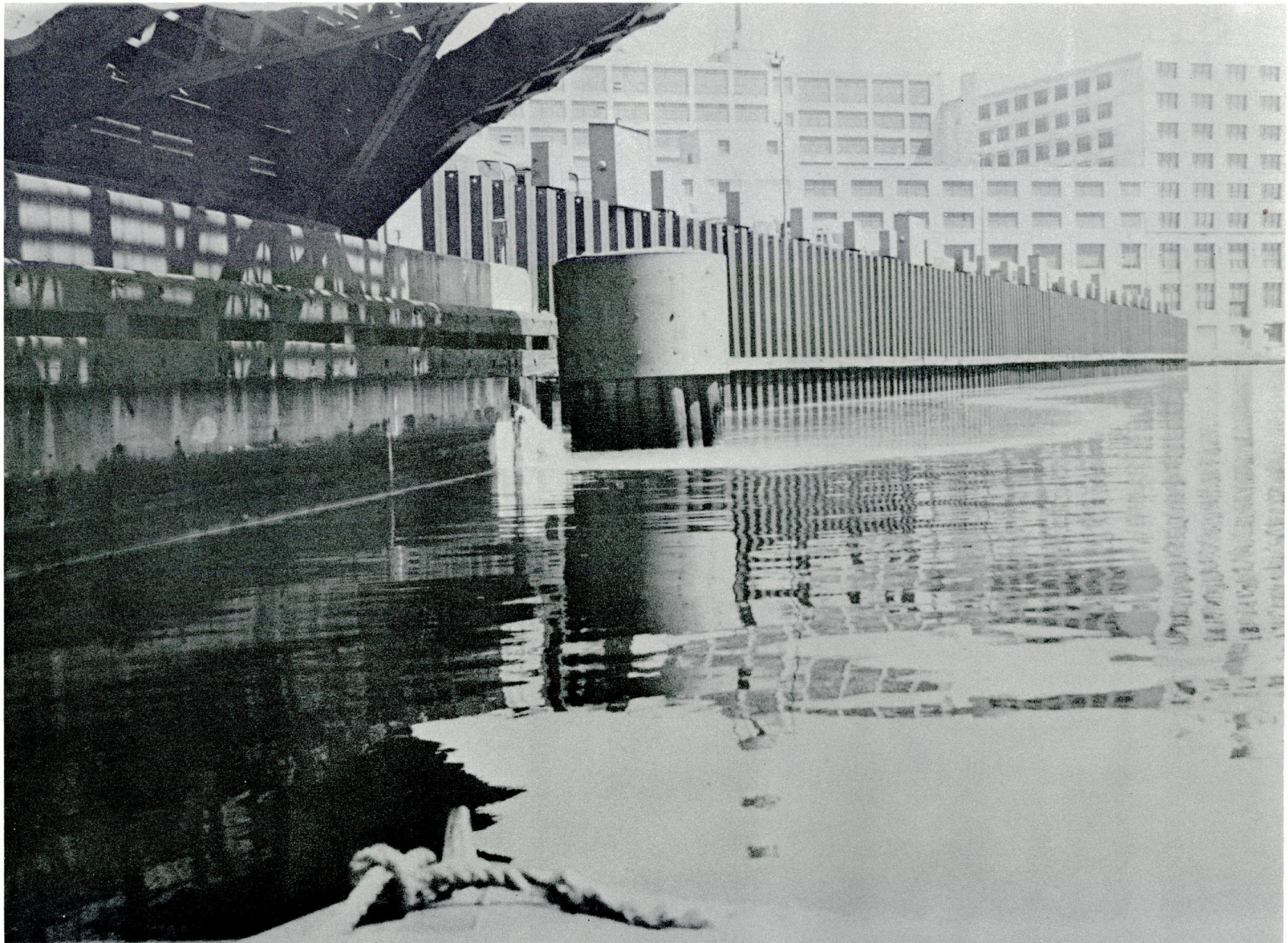


20

Sewer outlet under Railroad bridge just upstream from Canal Street in Chicago Sanitary Canal.

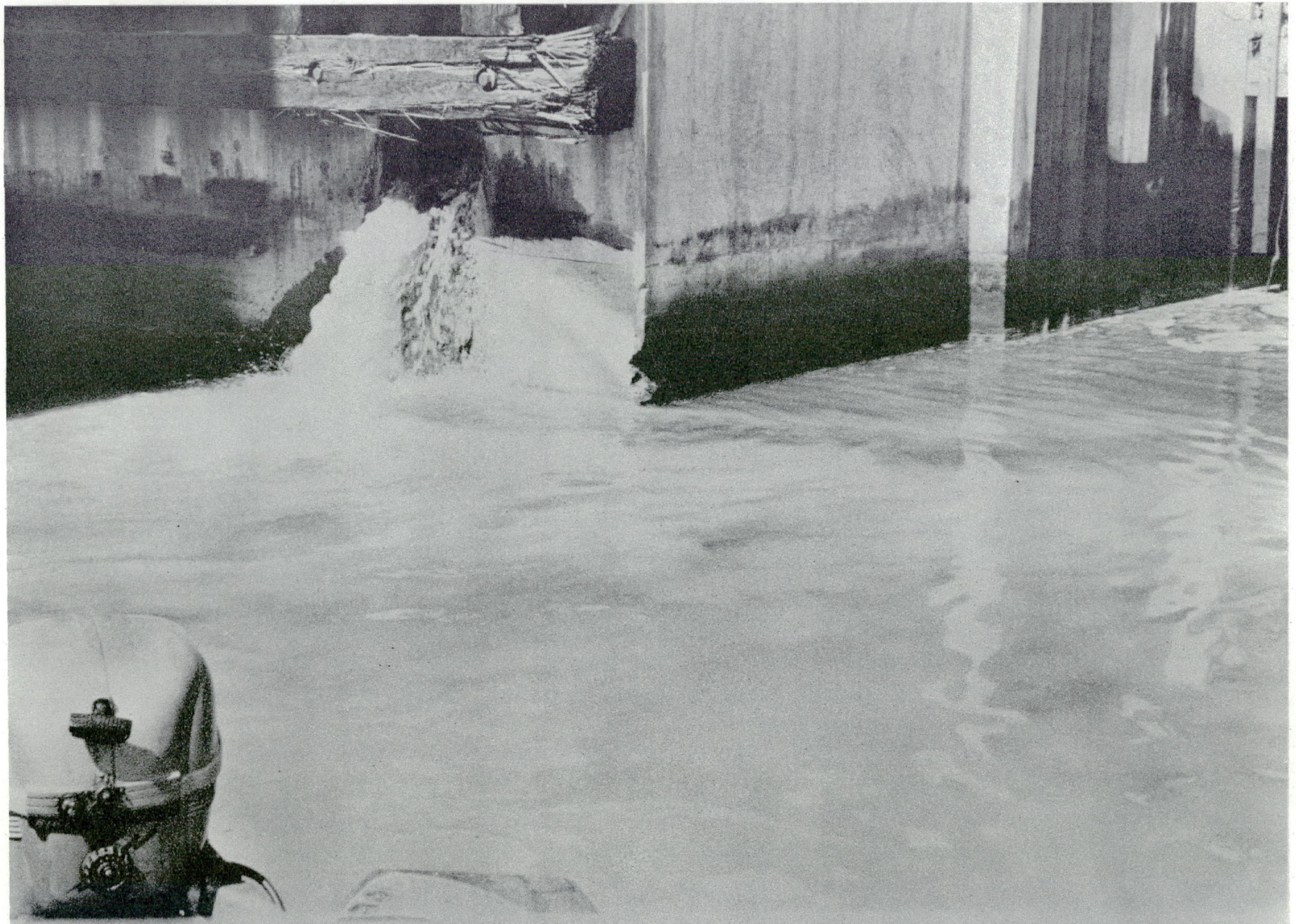


1 Sewer Outlet by Container Company situated in North branch loop just above Chicago Avenue.



22

Sewer Outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note scum floating downstream from outlet.



23

Sewer Outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note milky discoloration of canal due to high solids concentration of waste. See Sample #5

24

Sewer Outlet under Halsted Street bridge crossing North branch loop just above Chicago Avenue. Note milky discoloration of Canal due to high solids concentration of waste. See Sample #5

25

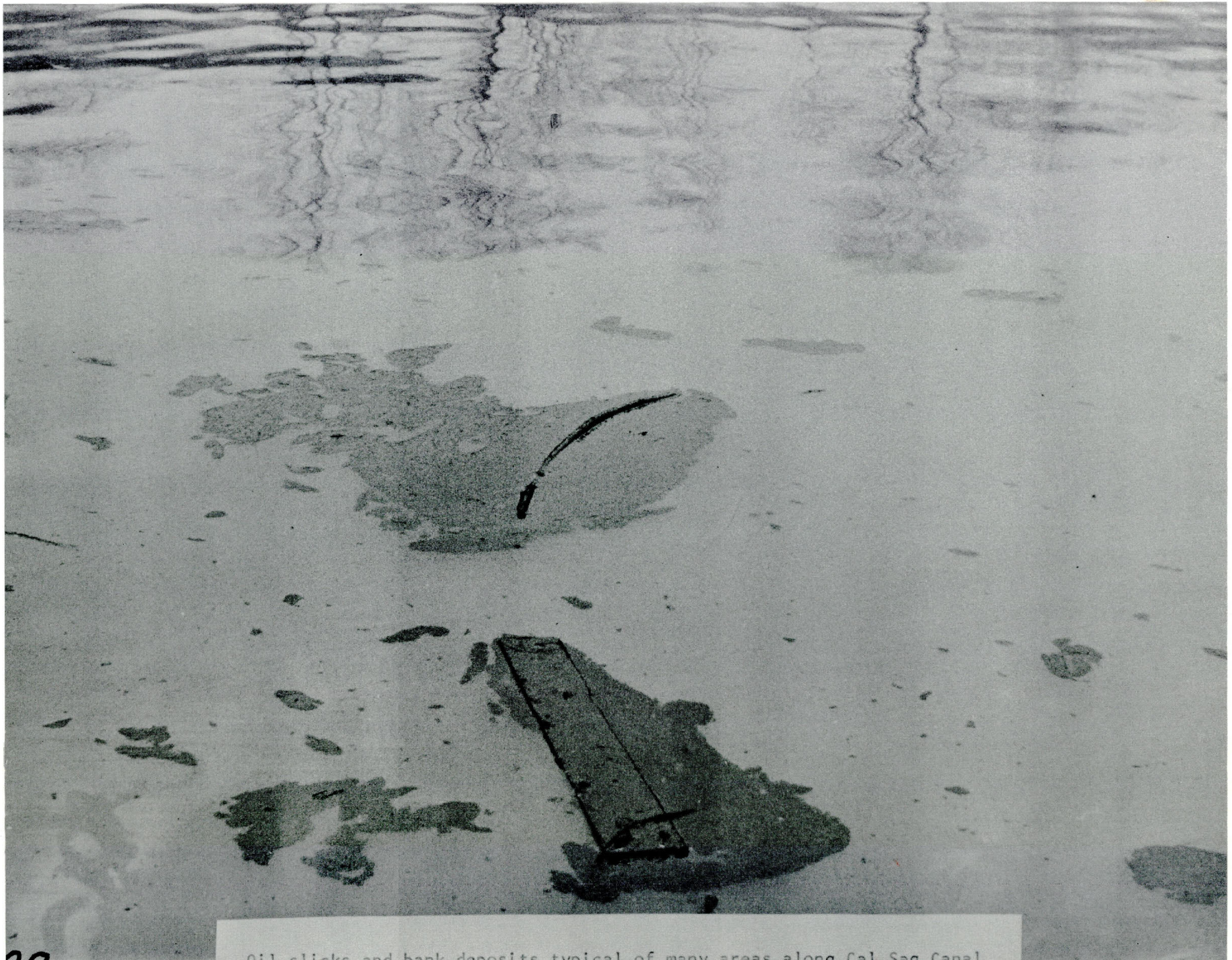
Oil slicks and bank deposits typical of many areas along Cal Sag Canal.

26

Oil slicks and bank deposits typical of many areas along Cal Sag Canal.

27

Oil slicks and bank deposits typical of many areas along Cal Sag Canal.



Oil slicks and bank deposits typical of many areas along Cal Sag Canal.