

A 0008028

WESHER

21 June 1961

SUBJECT: Lake Pontchartrain Model Study

*1/3 and 2/3 openings in
Gulf Outlet Connection
for 1949 high inflow year*

TO: District Engineer
U. S. Army Engineer District, New Orleans
New Orleans, Louisiana

1. Inclosed, in preliminary form, are 24 figures presenting the results of four tests made in the model to determine the effects of partial openings of a control structure at the Lake Pontchartrain end of the Inner Harbor Navigation Canal on salinity conditions in Lake Pontchartrain. The model tests involved the following conditions of opening: (a) complete closure, (b) one-third reduction in discharge, (c) two-thirds reduction in discharge, and (d) 100 per cent opening. All tests were made with hurricane surge control structures (25 per cent opening) in the Rigolets and Chef Menteur Passes, and all tests were made for conditions of a high inflow year (1949). Test conditions and procedures for these tests were agreed upon during a conference held on 26 April 1961 in your office.

2. A cursory examination of the test results indicates that salinities throughout Lake Pontchartrain were slightly lower for the test with the Inner Harbor Navigation Canal control structure closed completely, and the hurricane surge control structures installed in the Rigolets and Chef Menteur Passes, than for the test of existing conditions (base test). The test results indicate further that salinities throughout Lake Pontchartrain increase progressively with increase in discharge through the Inner Harbor Navigation Canal control structure. For the test with two-thirds reduction in discharge through this structure, Lake Pontchartrain salinities were substantially higher than for existing conditions, and salinities were increased further as discharge through the structure increased.

3. As an index to the effects of the various degrees of discharge through the Inner Harbor Navigation Canal control structure on salinity conditions in Lake Pontchartrain, salinities at all lake stations were averaged over the last 50 tidal cycles of the tests reported herein. The results show that the average salinity for the test of existing conditions was 1147 ppm; that for the test of complete closure of the structure was

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1100 ppm; that for one-third reduction in discharge was 4270 ppm; that for two-thirds reduction in discharge was 3486 ppm; and that for complete opening of the structure was 6176 ppm.

4. In accordance with agreement reached during telephone conversation between Messrs. Gentilich and Simmons on 10 February 1961, copies of this letter, with inclosures, are being forwarded direct to the Lower Mississippi Valley Division and to five representatives of the U. S. Fish and Wildlife Service shown on inclosure 26.

FOR THE DIRECTOR:

26 Incl

- 1.-24. Plots of test data
25. Location map
26. U.S. Fish and Wildlife Service Mailing List

E. P. FORTSON, JR.
Engineer
Chief, Hydraulics Division

Copy w/incl furnished:

LAVD
Representatives, U.S. Fish
and Wildlife Service

FISH AND WILDLIFE MAILING LIST

**Dr. George Rousapel, Laboratory Director
Bureau, Commercial Fisheries Biological Laboratory
Fort Crockett
Galveston, Texas
ATTN: Dr. Joe Graham**

**Director, Louisiana Wildlife & Fisheries Commission
Wildlife and Fisheries Building
400 Royal Street
New Orleans, Louisiana
ATTN: Dr. Ted Ford**

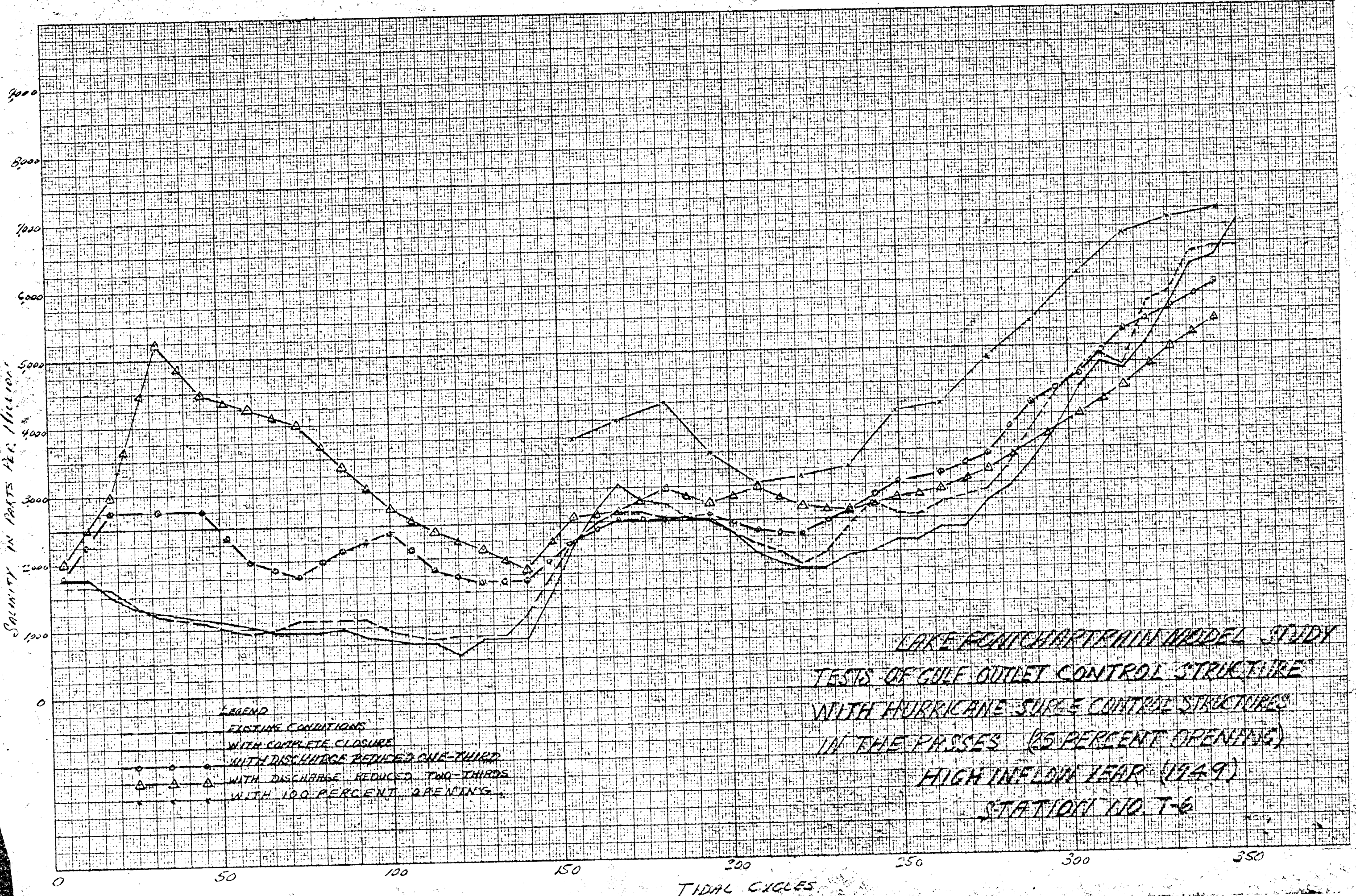
**Dr. Robert Reid
Texas A. & M. College
Department of Oceanography & Meteorology
College Station, Texas**

**Regional Director, U.S. Fish & Wildlife Service
Bureau, Sport Fisheries and Wildlife
Peachtree/Seventh Building
Atlanta 23, Georgia
ATTN: BRBS**

**Field Supervisor, U. S. Fish & Wildlife Service
Bureau, Sport Fisheries & Wildlife
Branch River Basin Studies
817 Crawford Street
Vicksburg, Mississippi**

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SALINITY IN PARTS PER MILLION



LEGEND
 EXISTING CONDITIONS
 WITH COMPLETE CLOSURE
 WITH DISCHARGE REDUCED ONE-THIRD
 WITH DISCHARGE REDUCED TWO-THIRDS
 WITH 100 PERCENT OPENING

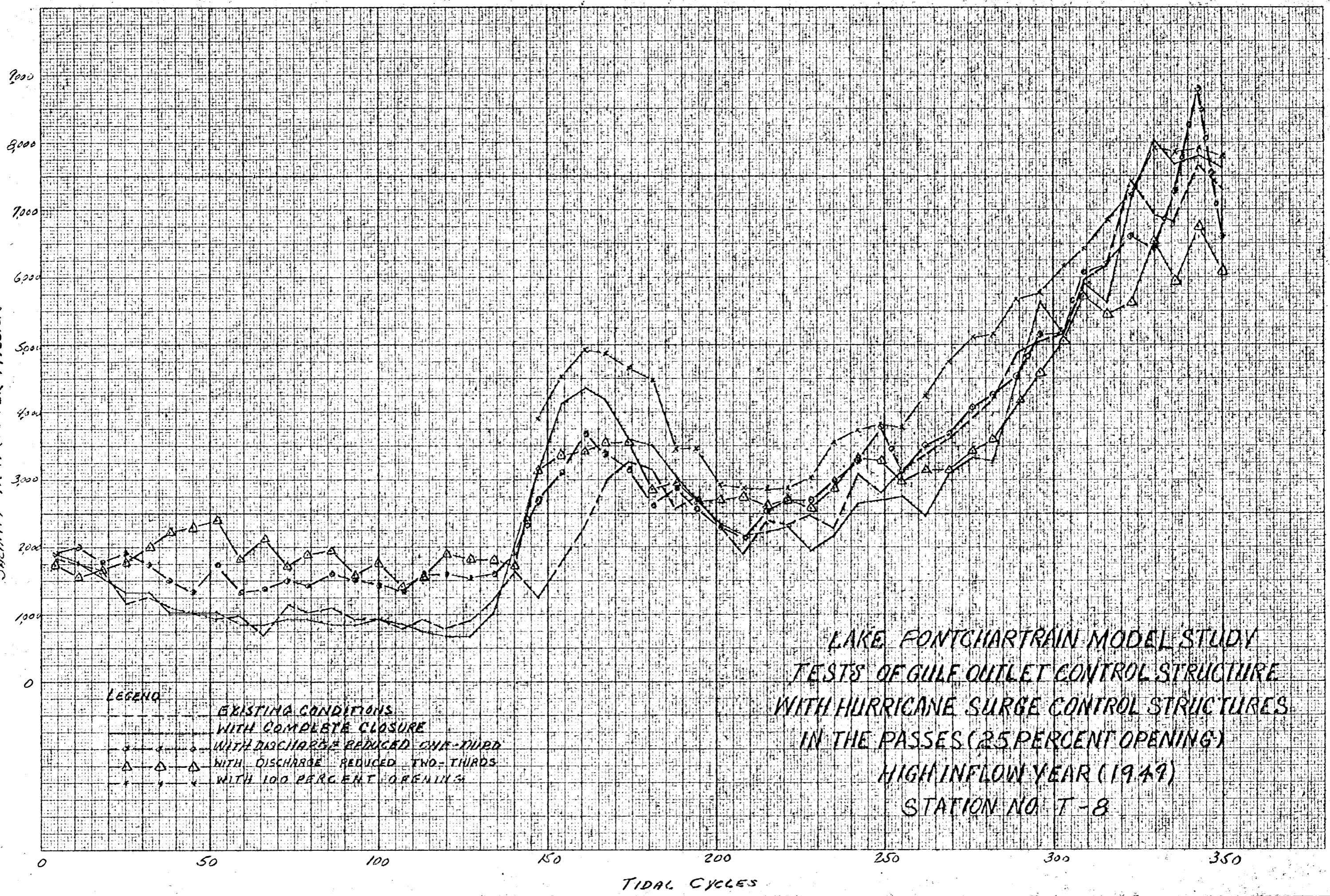
LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH FLOW YEAR (1949)
 STATION NO. T-6

TIDAL CYCLES

Chase

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SALINITY IN PARTS PER MILLION



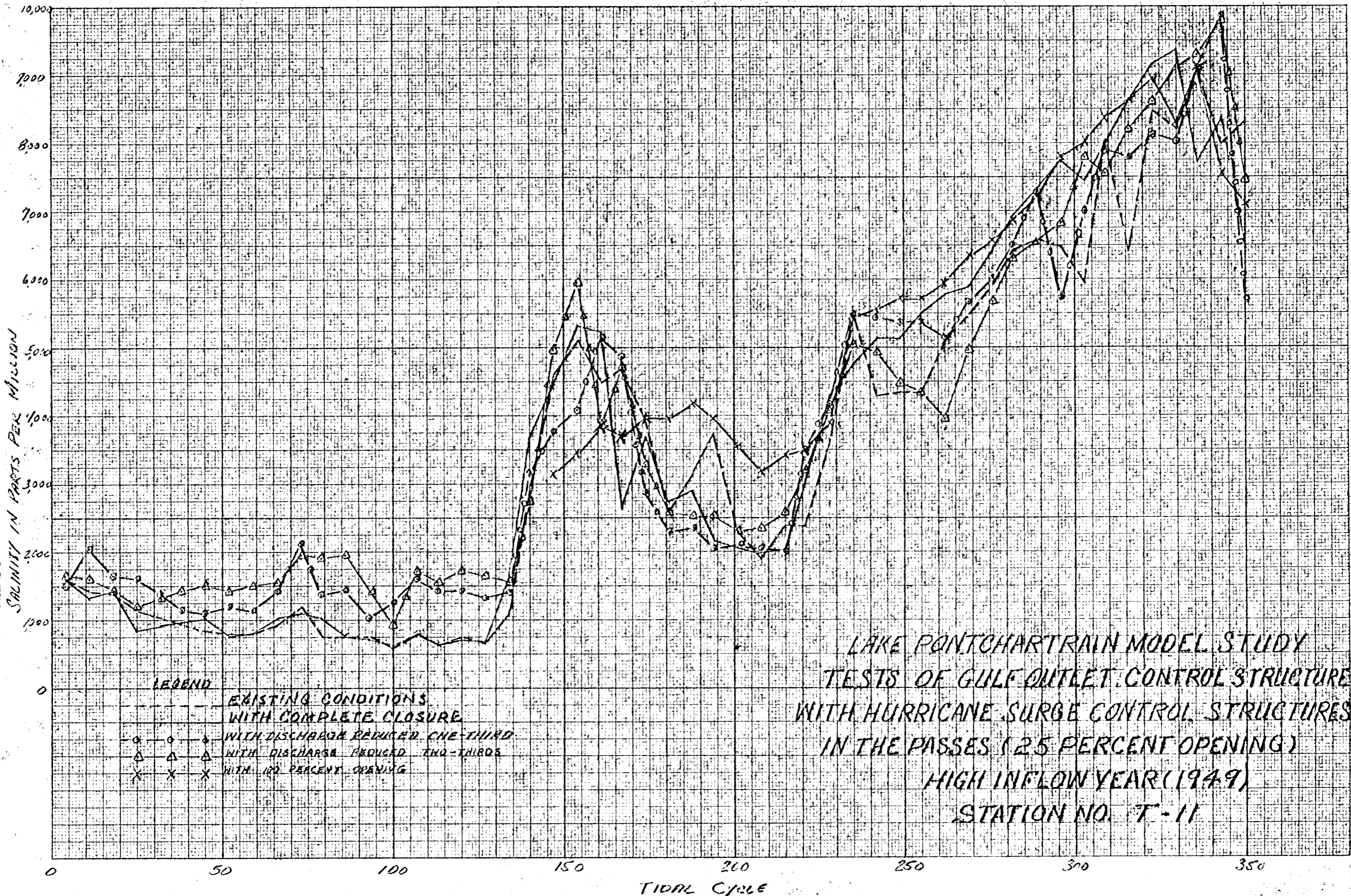
LEGEND

- EXISTING CONDITIONS
- WITH COMPLETE CLOSURE
- o WITH DISCHARGE REDUCED ONE-THIRD
- Δ WITH DISCHARGE REDUCED TWO-THIRDS
- x WITH 100 PERCENT OPENING

LAKE FONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. T-8

TIDAL CYCLES

June 2



June 3

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SALINITY IN PARTS PER MILLION

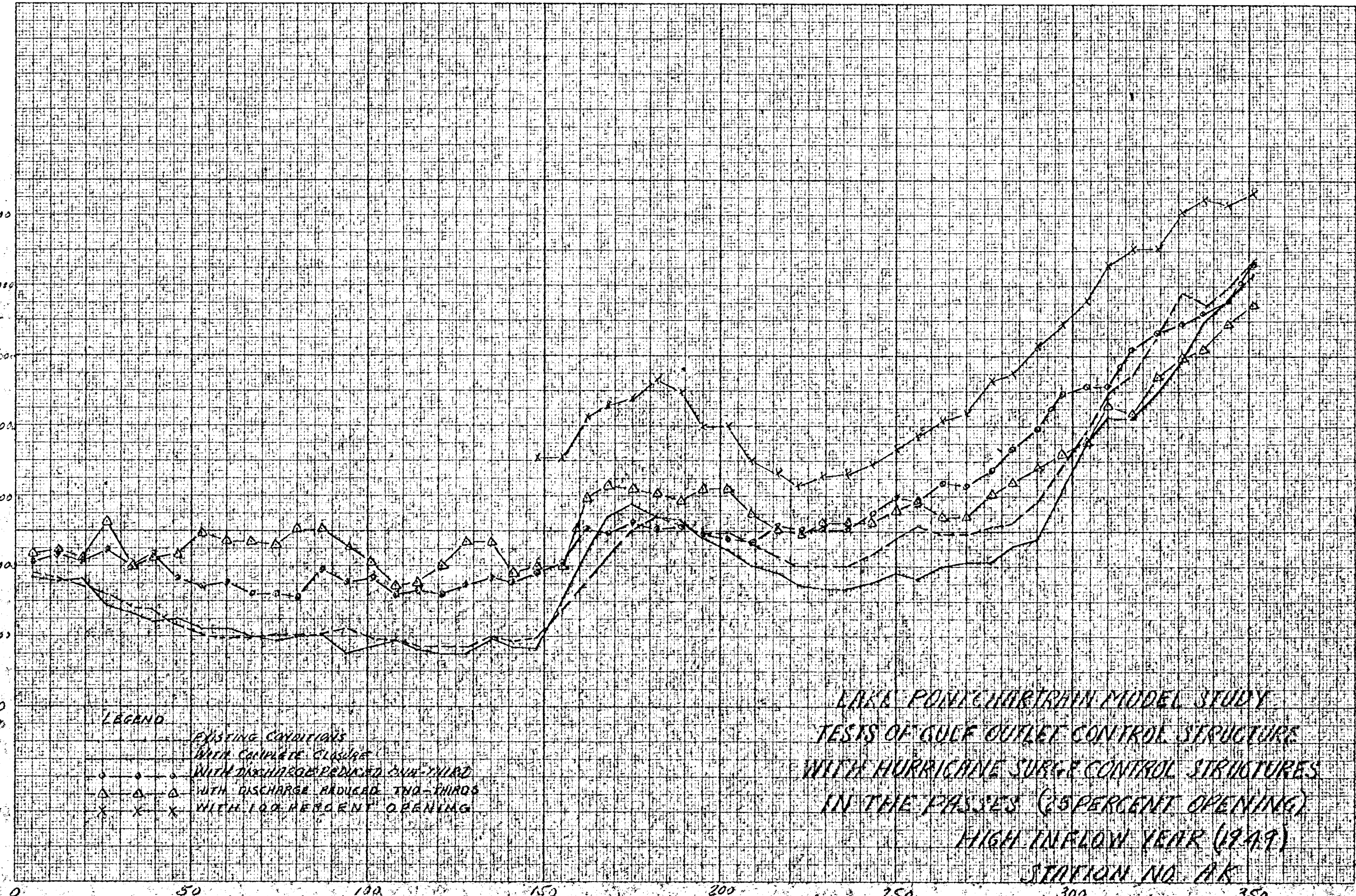
7000
6000
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1000
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LEGEND

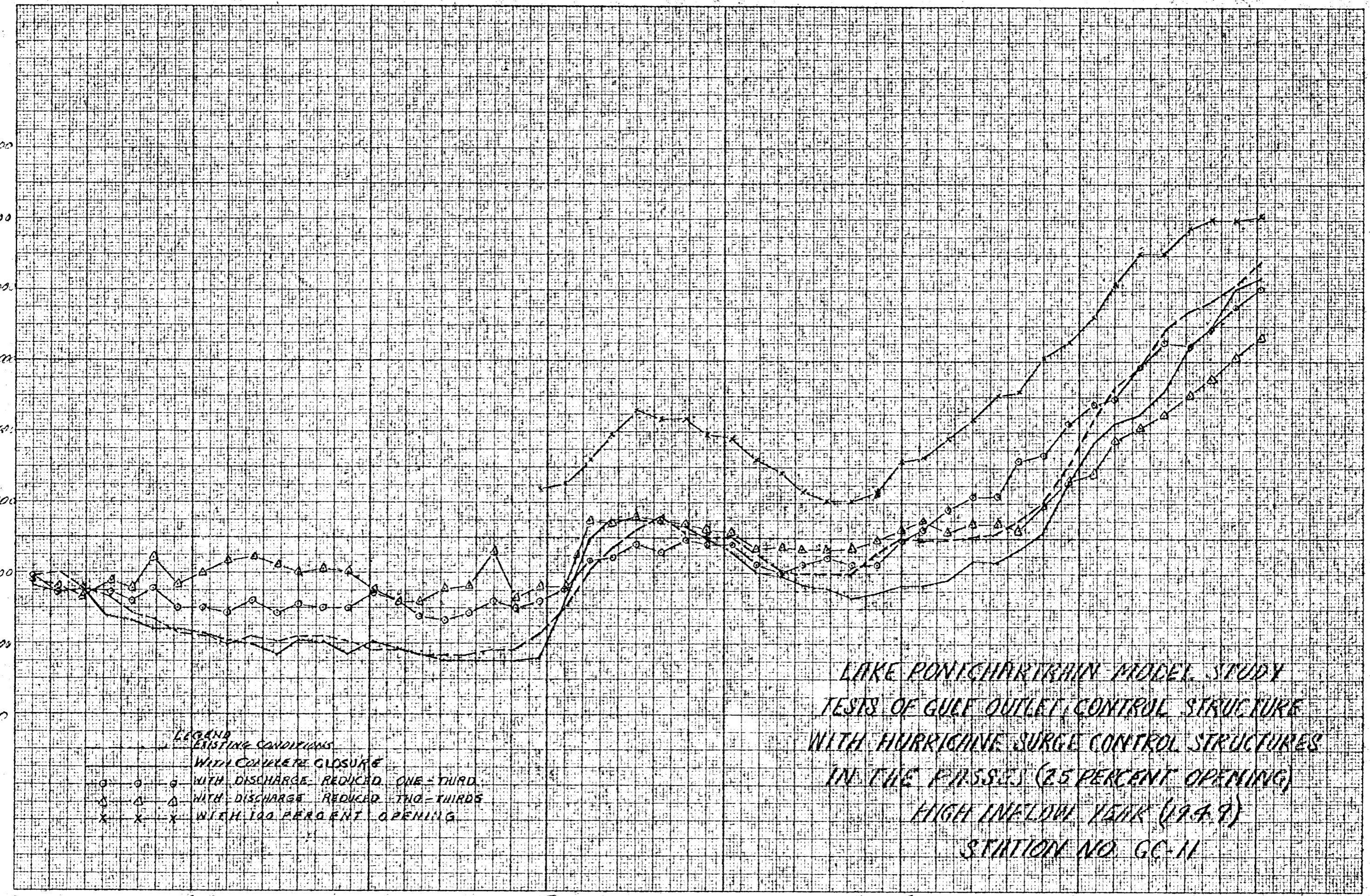
- EXISTING CONDITIONS
- WITH COMPLETE CLOSURE
- WITH DISCHARGE REDUCED ONE-THIRD
- WITH DISCHARGE REDUCED TWO-THIRDS
- WITH 100 PERCENT OPENING

LAKE PONCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. AK

TIDAL CYCLES



SALINITY IN PARTS PER MILLION



LEGEND
 ○ ○ ○ EXISTING CONDITIONS
 △ △ △ WITH COMPLETE CLOSURE
 × × × WITH DISCHARGE REDUCED ONE-THIRD
 × × × WITH DISCHARGE REDUCED TWO-THIRDS

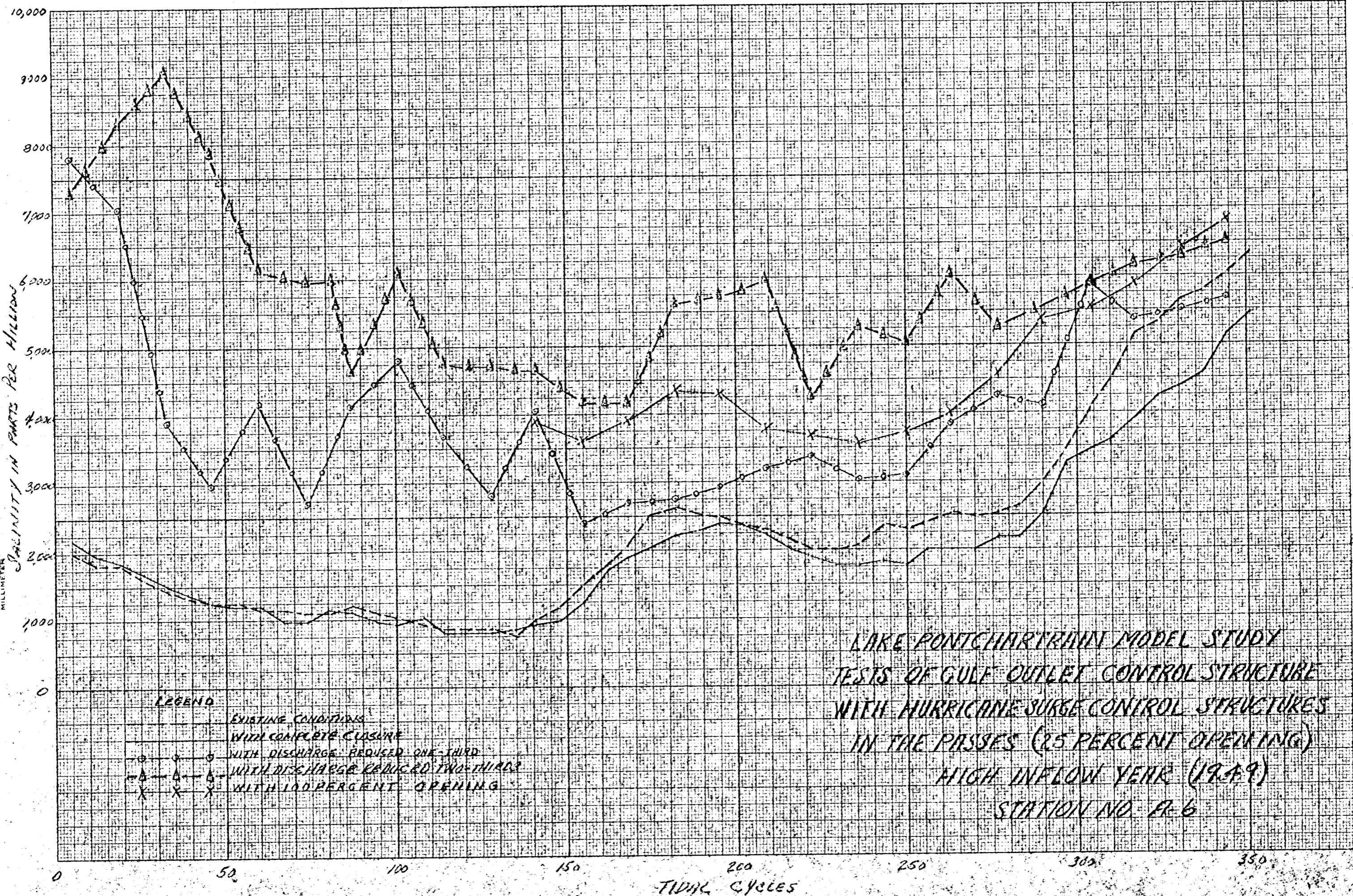
LAKE PONCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (2.5 PERCENT OPENING)
 HIGH INEQUAL YEAR (1949)
 STATION NO. GC-11

TIDAL CYCLES

face 5

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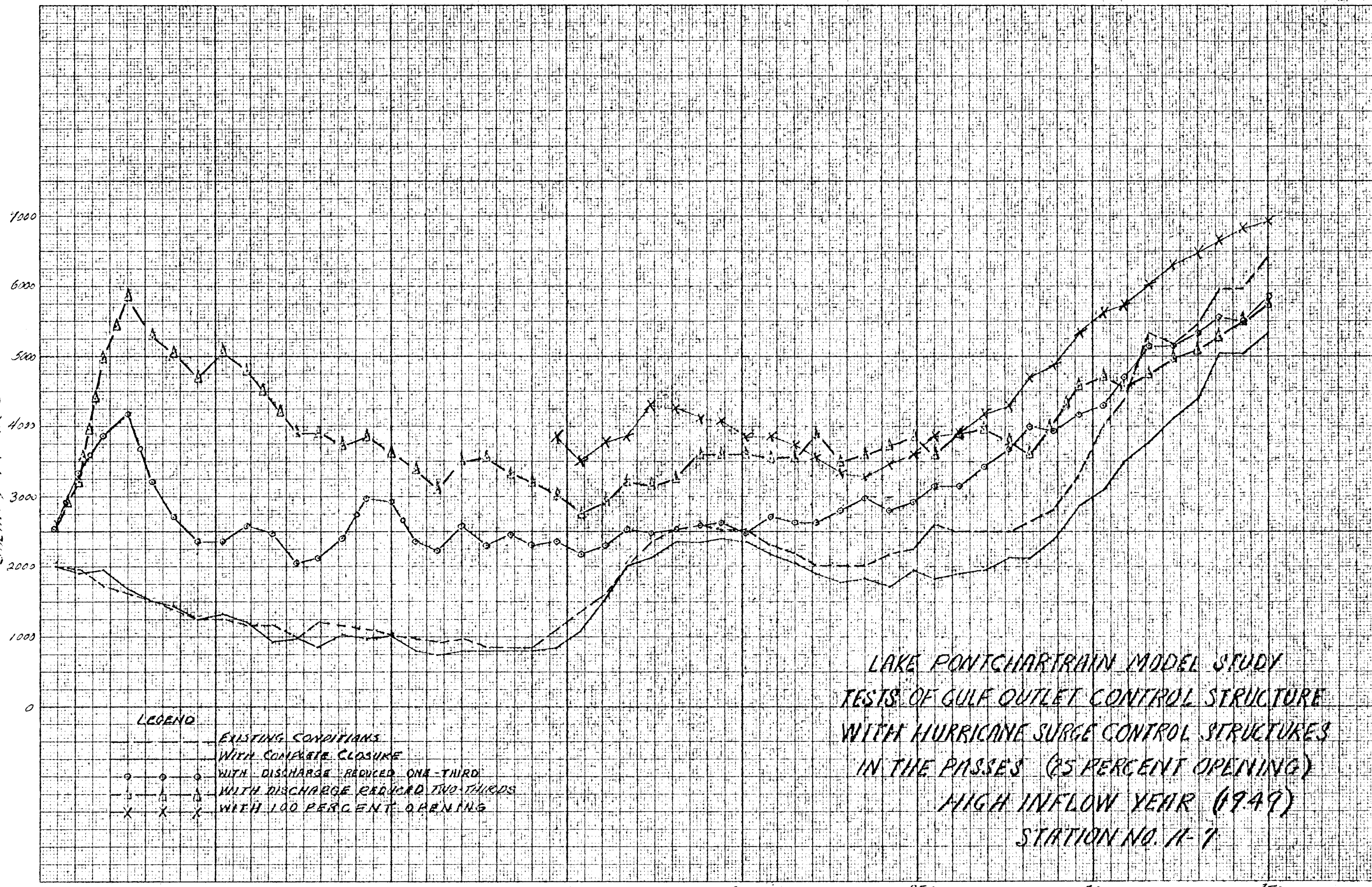
LEGEND

- EXISTING CONDITIONS
- - -○- - -○- - -○- WITH COMPLETE CLOSURE
- WITH DISCHARGE REDUCED ONE-THIRD
- - -○- - -○- - -○- WITH DISCHARGE REDUCED TWO-THIRDS
- x—x—x— WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1949)
 STATION NO. A-6

June 6

SALINITY IN PARTS PER MILLION



LEGEND

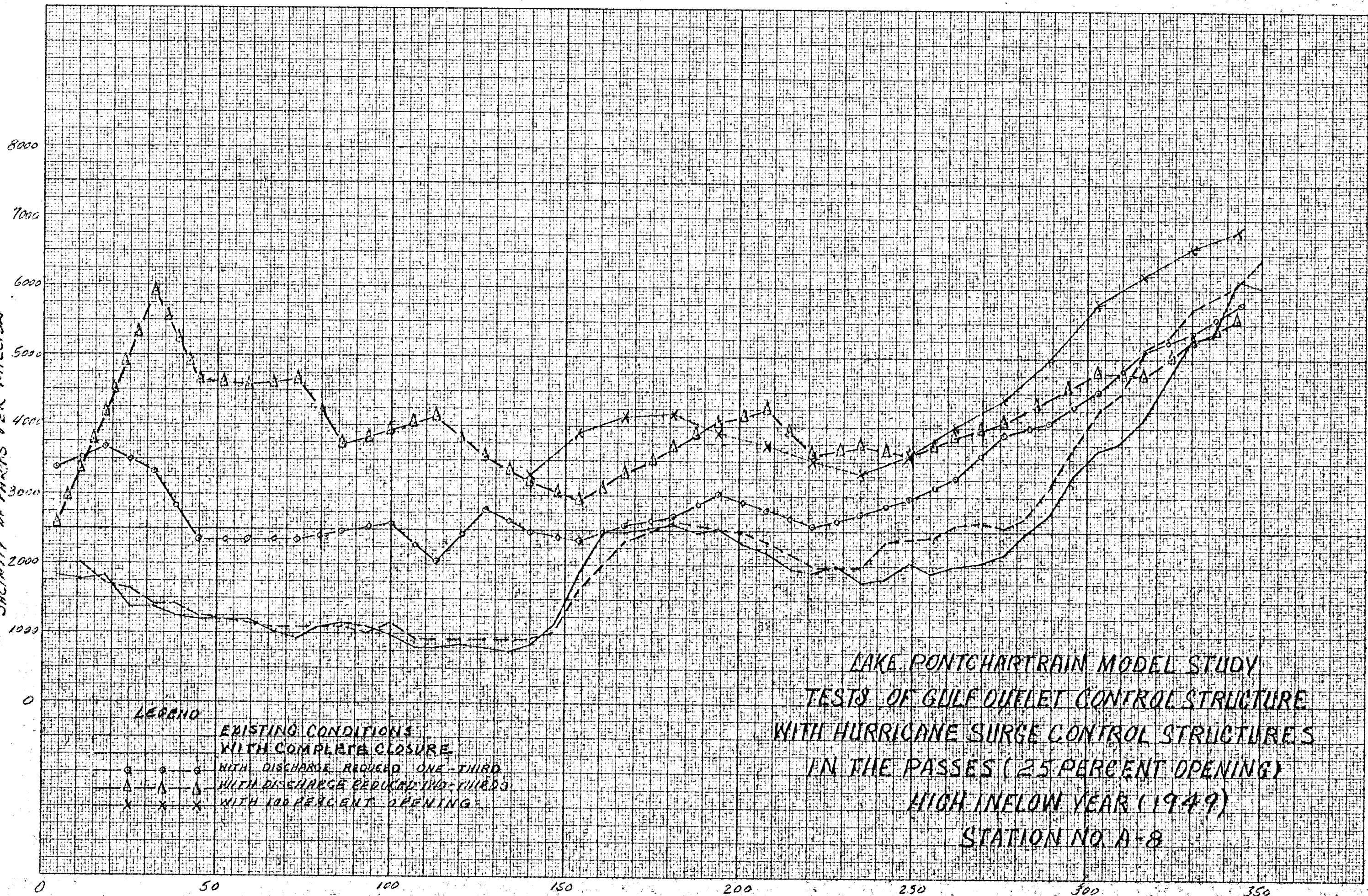
- EXISTING CONDITIONS
- WITH COMPLETE CLOSURE
- WITH DISCHARGE REDUCED ONE-THIRD
- △ WITH DISCHARGE REDUCED TWO-THIRDS
- × WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. 11-7

TIDAL CYCLES

Over 70

SALINITY IN PARTS PER MILLION



LEGEND

- ○ ○ EXISTING CONDITIONS WITH COMPLETE CLOSURE
- △ △ △ WITH DISCHARGE REDUCED ONE-THIRD
- × × × WITH DISCHARGE REDUCED TWO-THIRDS
- — — WITH 100 PERCENT OPENING

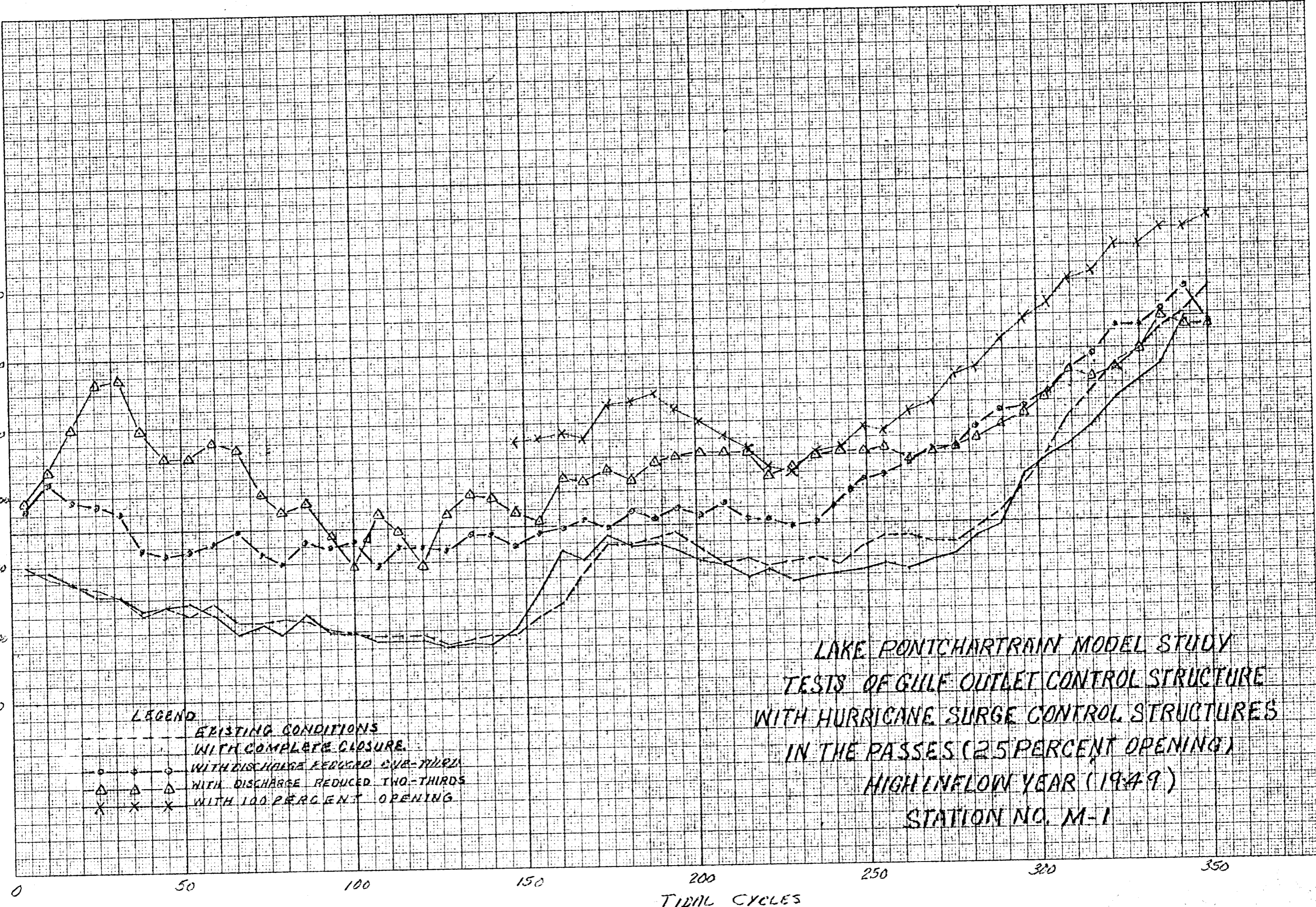
LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OULET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. A-8

TIDAL CYCLES

June 8

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SALINITY IN PARTS PER MILLION



LEGEND
— EXISTING CONDITIONS
- - - WITH COMPLETE CLOSURE
○ WITH DISCHARGE REDUCED ONE-THIRD
△ WITH DISCHARGE REDUCED TWO-THIRDS
X WITH 100 PERCENT OPENING

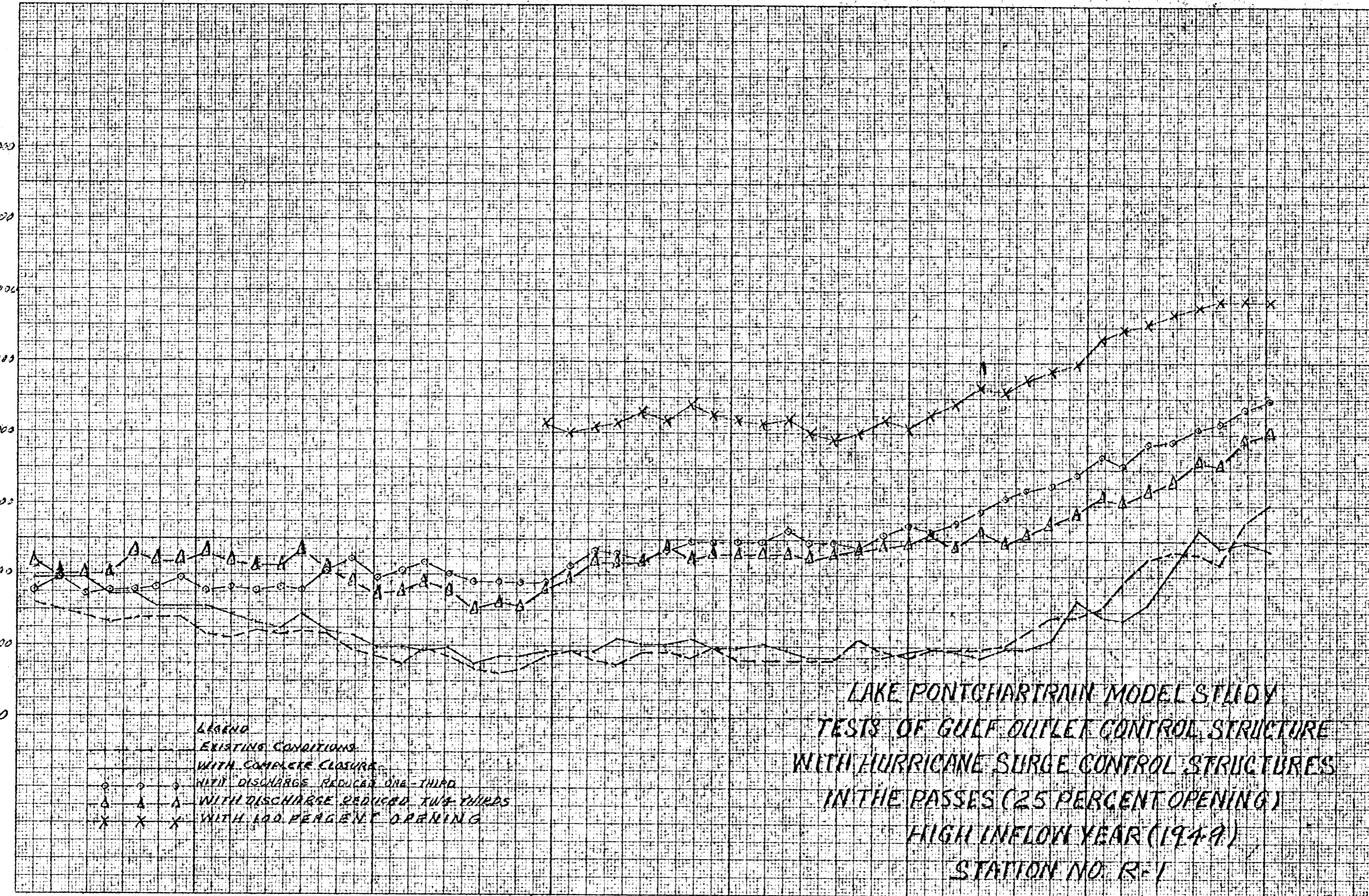
LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGHEST LOW YEAR (1949)
STATION NO. M-1

June 9

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SALINITY IN PARTS PER MILLION

8000
7000
6000
5000
4000
3000
2000
1000
0



LEGEND
 --- EXISTING CONDITIONS
 --- WITH COMPLETE CLOSURE
 ○ WITH DISCHARGE REDUCED ONE-THIRD
 △ WITH DISCHARGE REDUCED TWO-THIRDS
 × WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OULET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1949)
 STATION NO. R-1

TIDAL CYCLES

3/2/50

SALINITY IN PARTS PER MILLION

8000

7000

6000

5000

4000

3000

2000

1000

0

0

50

100

150

200

250

300

350

TIDAL CYCLES

LEGEND

EXISTING CONDITIONS

WITH COMPLETE CLOSURE

○ WITH DISCHARGE REDUCED ONE-THIRD

△ WITH DISCHARGE REDUCED TWO-THIRDS

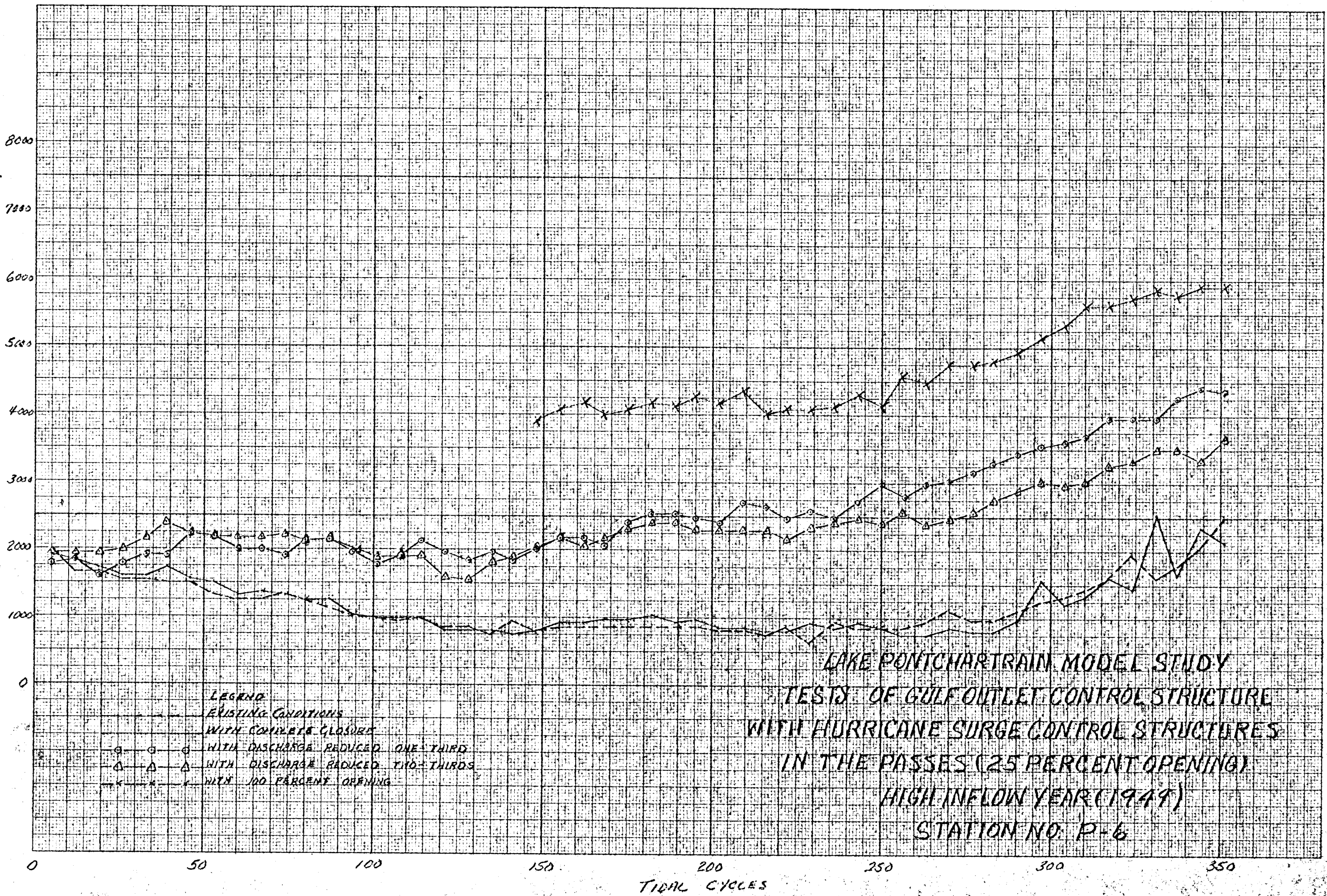
x WITH 100 PERCENT OPENING

LAKE PONCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-3

June 11

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SALINITY IN PARTS PER MILLION

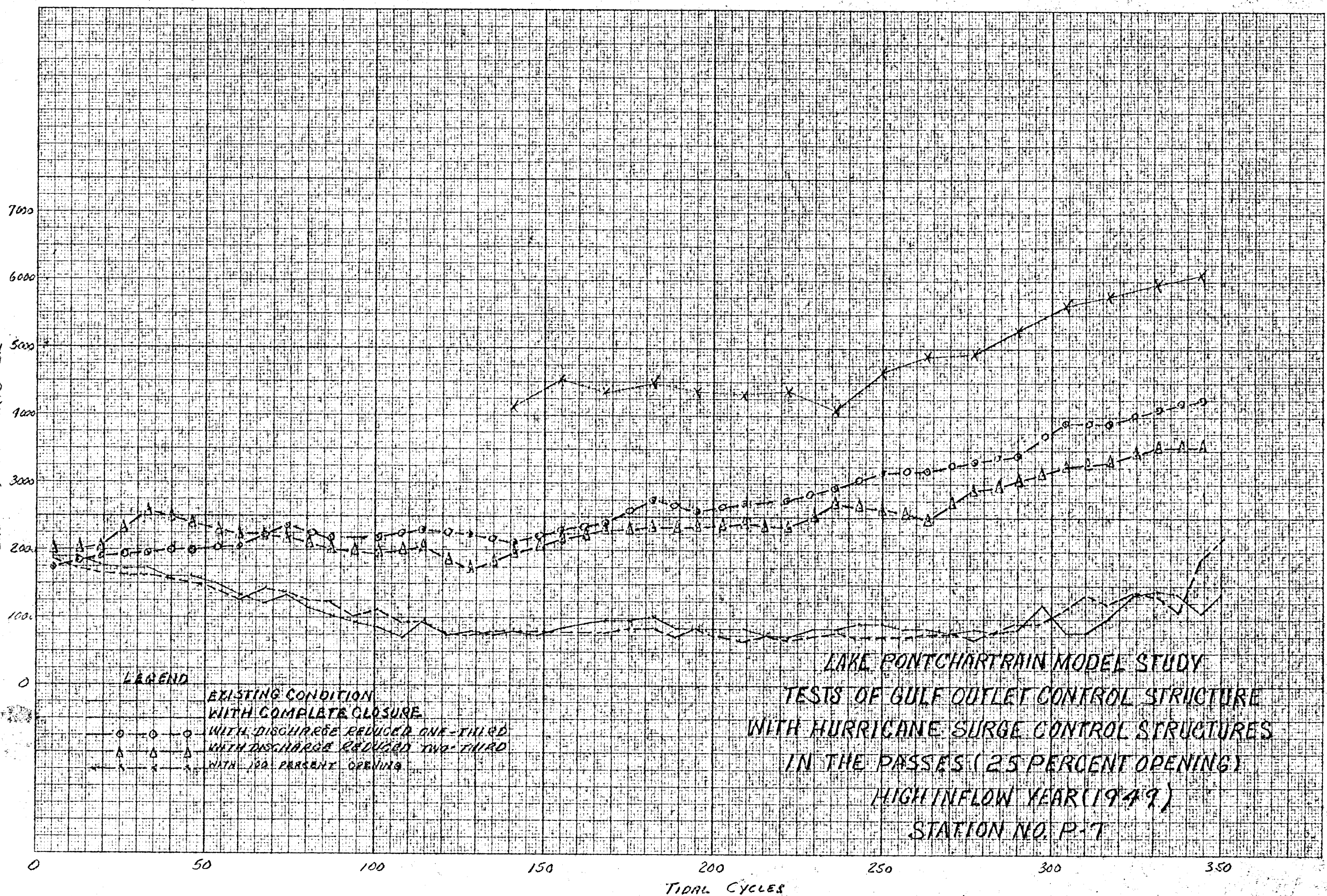


LEGEND
EXISTING CONDITIONS
WITH COMPLETE CLOSURE
○ WITH DISCHARGE REDUCED ONE-THIRD
△ WITH DISCHARGE REDUCED TWO-THIRDS
x WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH FLOW YEAR (1949)
STATION NO. P-6

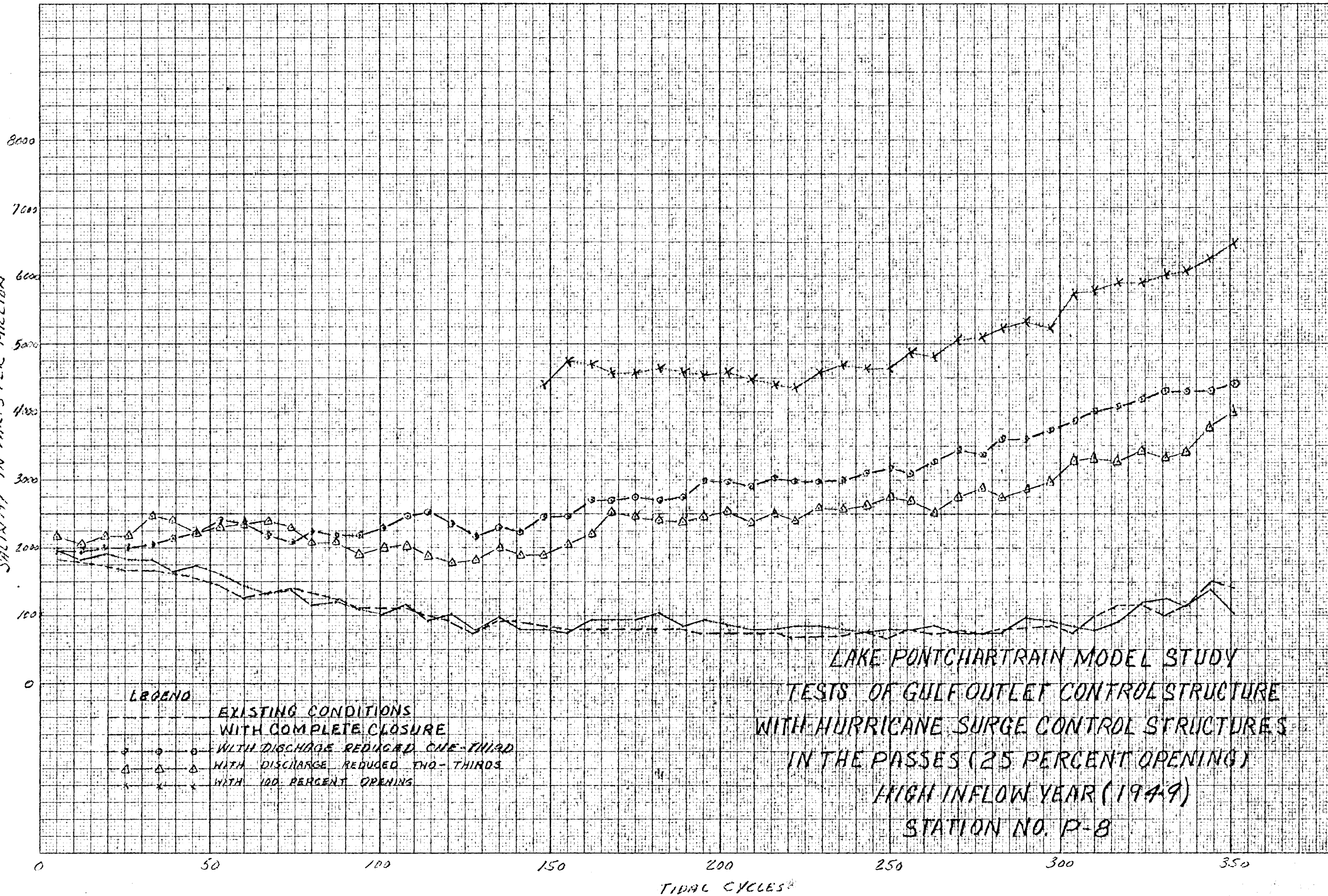
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June 13

SALINITY IN PARTS PER MILLION



LEGEND

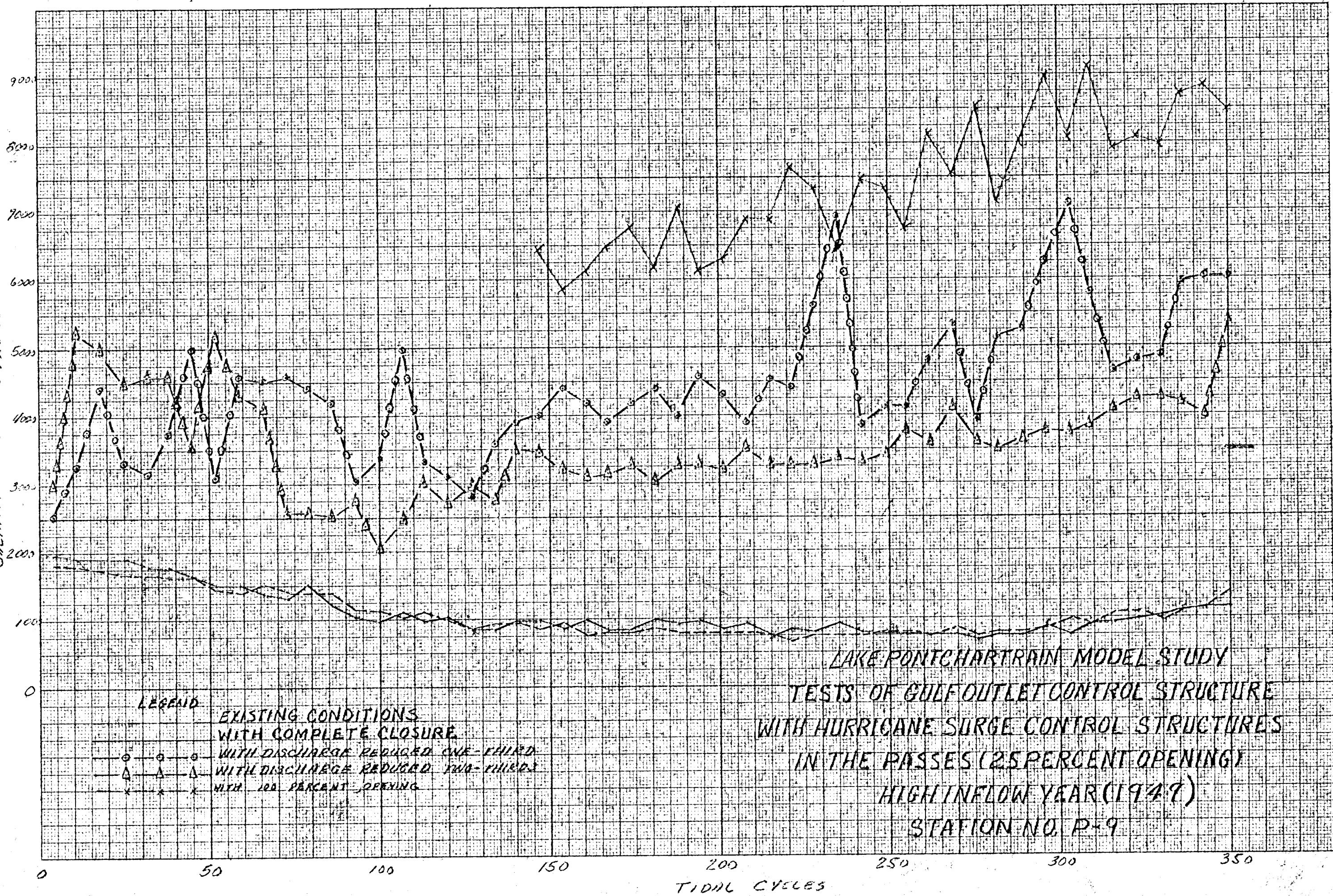
- EXISTING CONDITIONS
- - - WITH COMPLETE CLOSURE
- WITH DISCHARGE REDUCED ONE-THIRD
- △ WITH DISCHARGE REDUCED TWO-THIRDS
- × WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1949)
 STATION NO. P-8

TIDAL CYCLES

Sheet 14

SALINITY IN PARTS PER MILLION



LEGEND

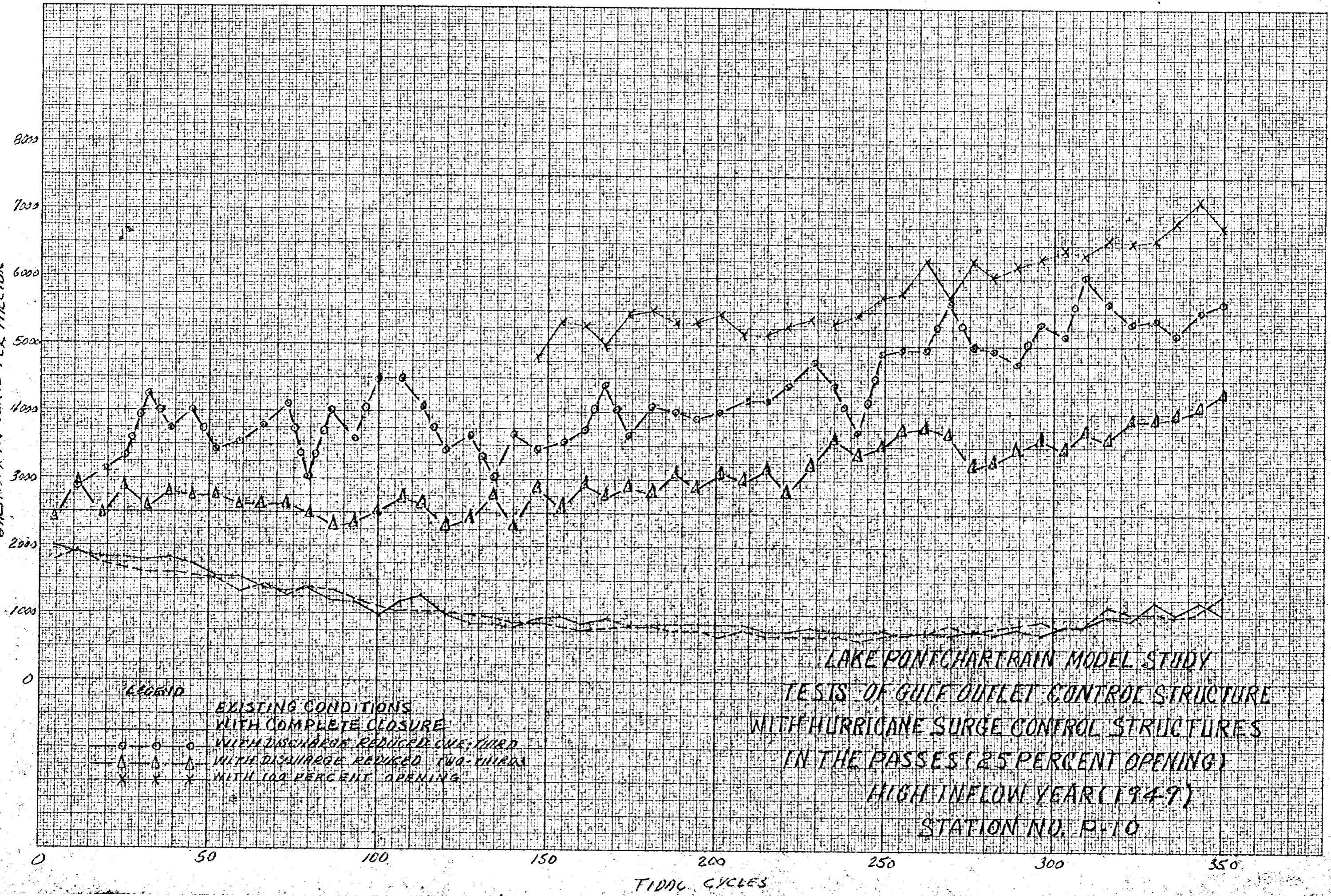
- EXISTING CONDITIONS
- WITH COMPLETE CLOSURE
- WITH DISCHARGE REDUCED ONE-THIRD
- WITH DISCHARGE REDUCED TWO-THIRDS
- WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-9

file 15

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SALINITY IN PARTS PER MILLION



LEGEND

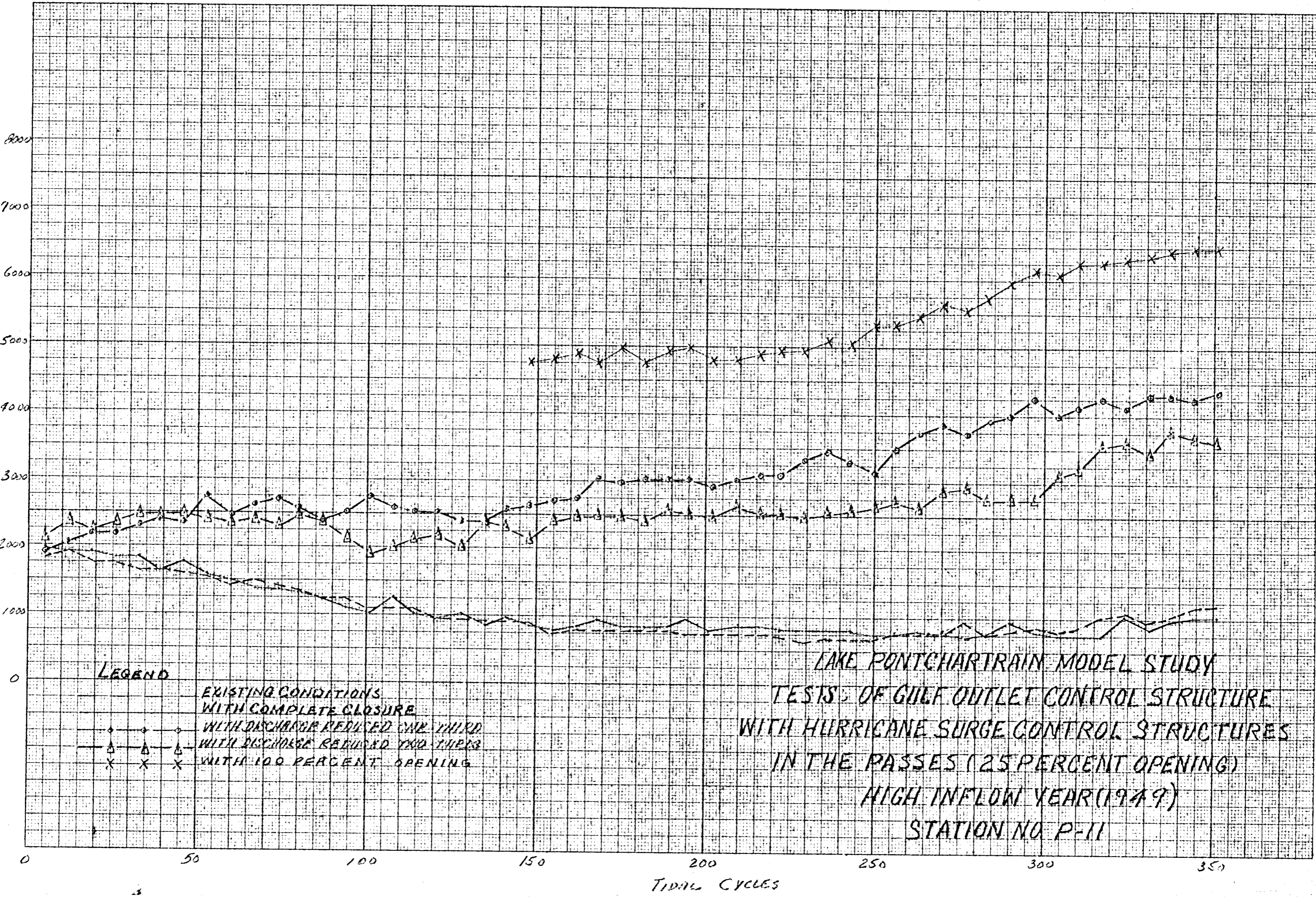
- — — — — EXISTING CONDITIONS
- — ○ — ○ WITH COMPLETE CLOSURE
- △ — △ — △ WITH DISCHARGE REDUCED ONE-THIRD
- × — × — × WITH DISCHARGE REDUCED TWO-THIRDS
- × — × — × WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1947)
 STATION NO. P-10

TIDAL CYCLES

June 16

SALINITY IN PARTS PER MILLION



LEGEND

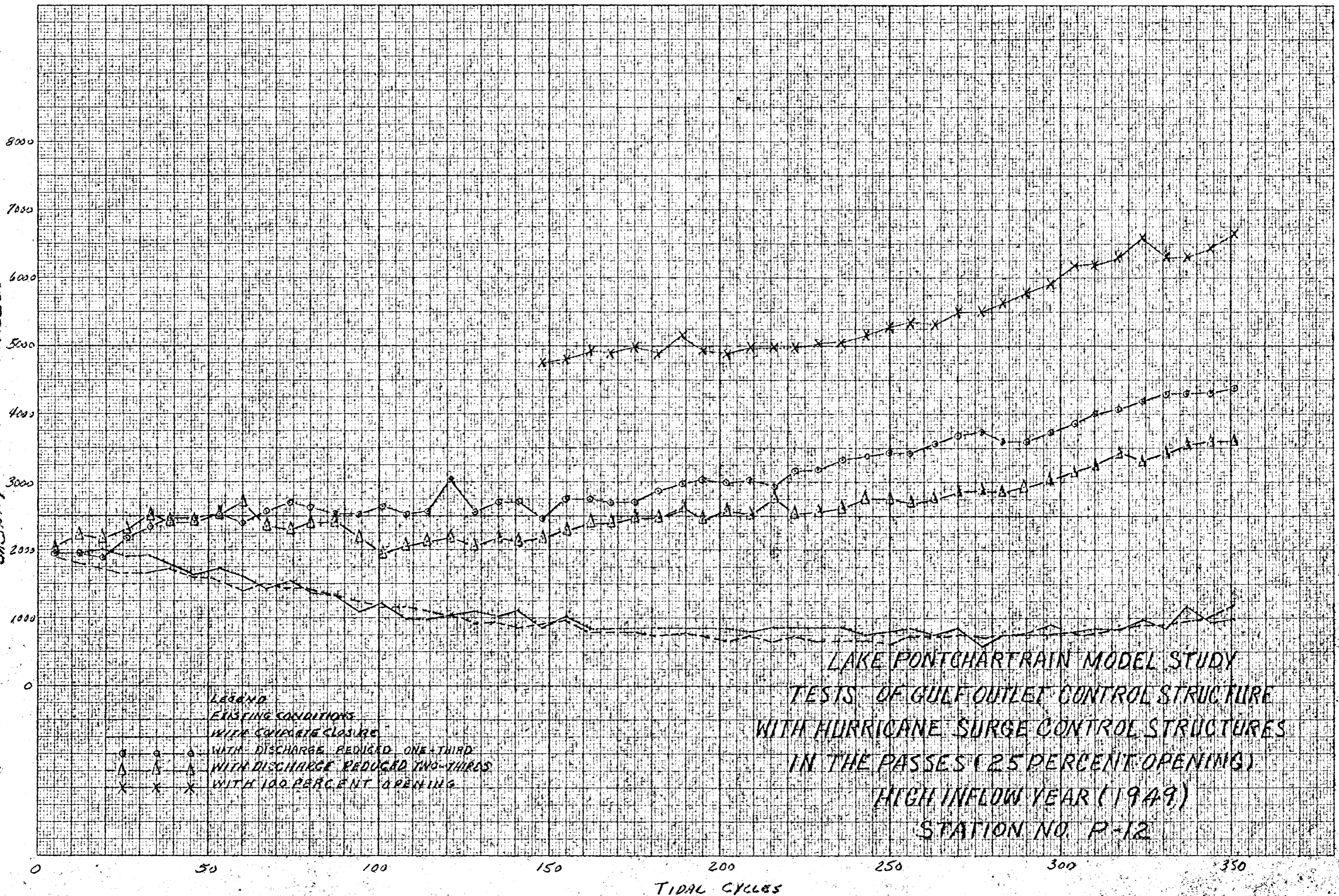
- EXISTING CONDITIONS WITH COMPLETE CLOSURE
- △ WITH DISCHARGE REDUCED ONE THIRD
- × WITH DISCHARGE REDUCED TWO THIRDS
- - - WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-11

Sheet 17

TIDAL CYCLES

SALINITY IN PARTS PER MILLION

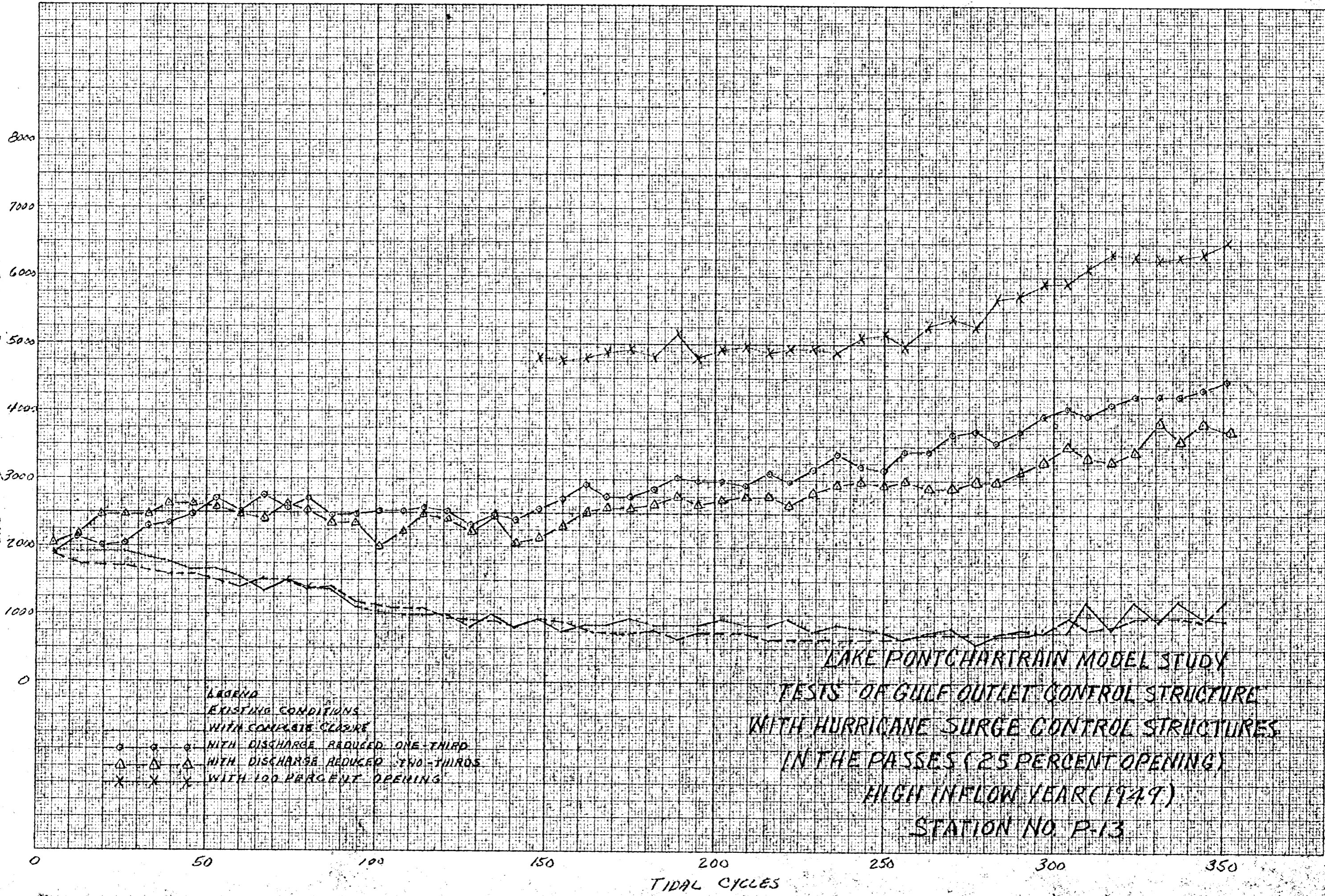


LEGEND
 EXISTING CONDITIONS
 WITH CONCRETE CLOSURE
 WITH DISCHARGE REDUCED ONE-THIRD
 WITH DISCHARGE REDUCED TWO-THIRDS
 WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1949)
 STATION NO. P-12

TIDAL CYCLES

June 1950



LEGEND
EXISTING CONDITIONS
WITH COMPLETE CLOSURE
O O O WITH DISCHARGE REDUCED ONE-THIRD
Δ Δ Δ WITH DISCHARGE REDUCED TWO-THIRDS
X X X WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-13

6/21/59

SALINITY IN PARTS PER MILLION

8000

7000

6000

5000

4000

3000

2000

1000

0

LEGEND

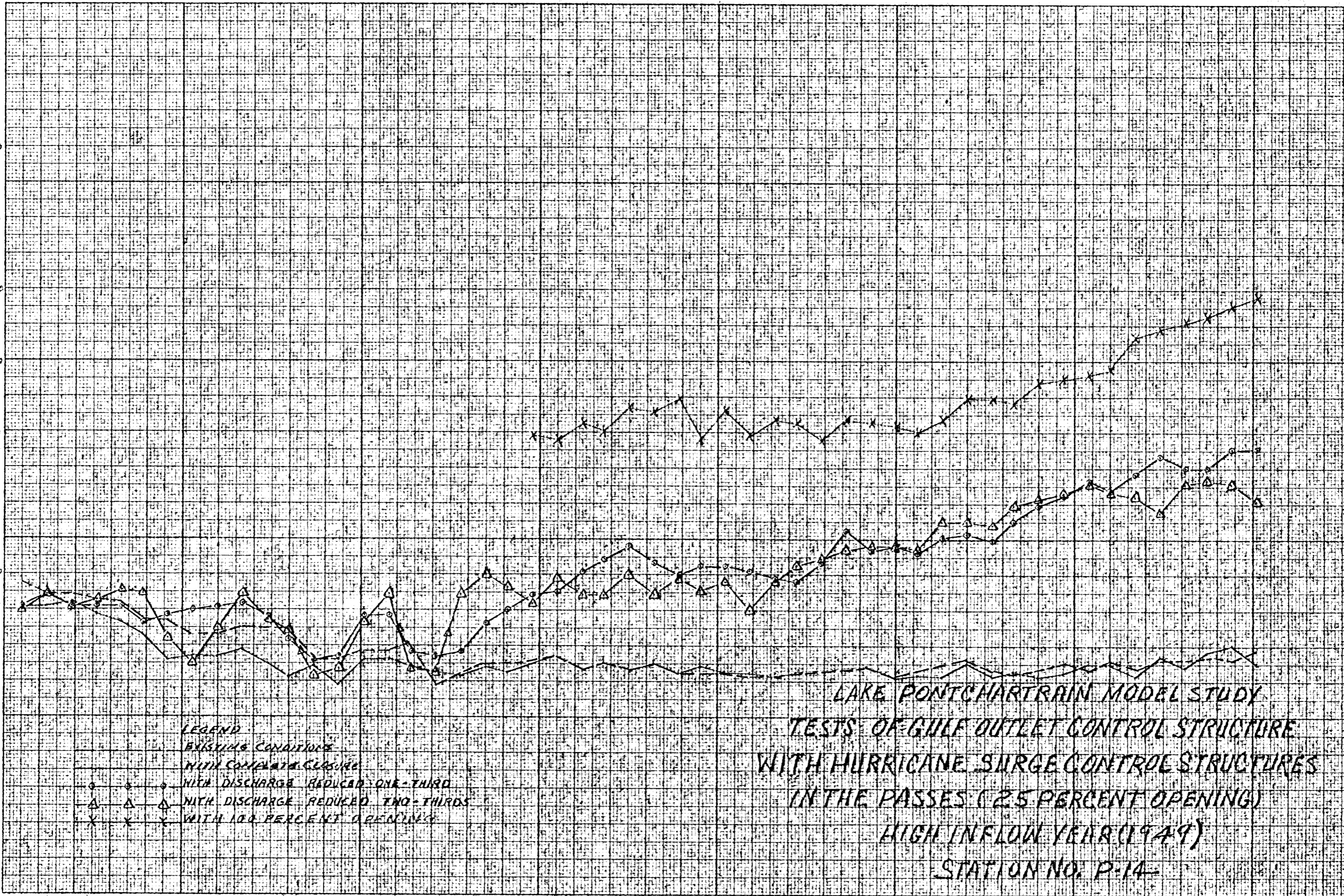
- EXISTING CONDITIONS
- WITH COMPLETE CLOSURE
- △ WITH DISCHARGE REDUCED ONE-THIRD
- △ WITH DISCHARGE REDUCED TWO-THIRDS
- × WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
 TESTS OF GULF OUTLET CONTROL STRUCTURE
 WITH HURRICANE SURGE CONTROL STRUCTURES
 IN THE PASSES (25 PERCENT OPENING)
 HIGH INFLOW YEAR (1949)
 STATION NO. P-14

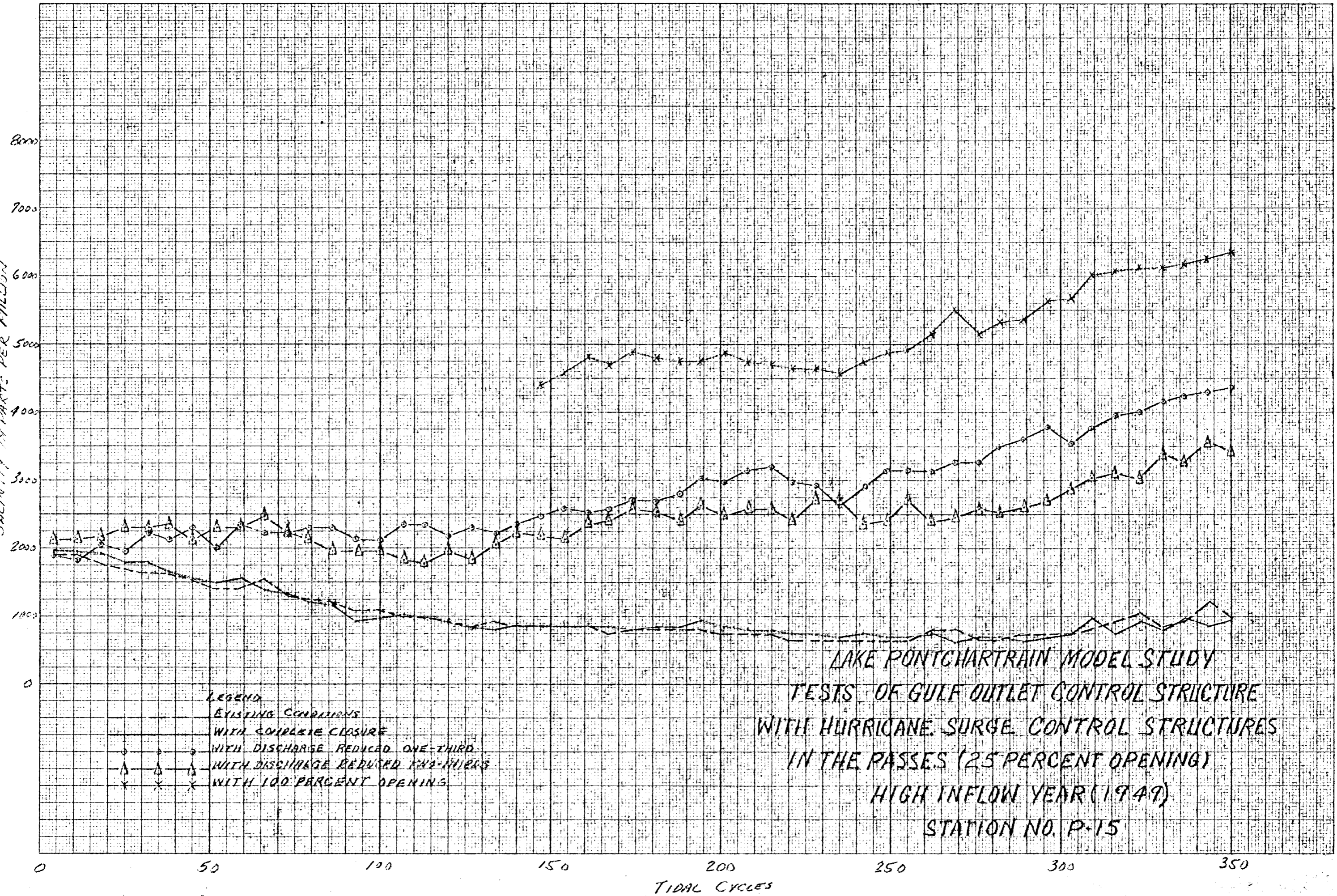
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TIDAL CYCLES

Jan 20



SALINITY IN PARTS PER MILLION

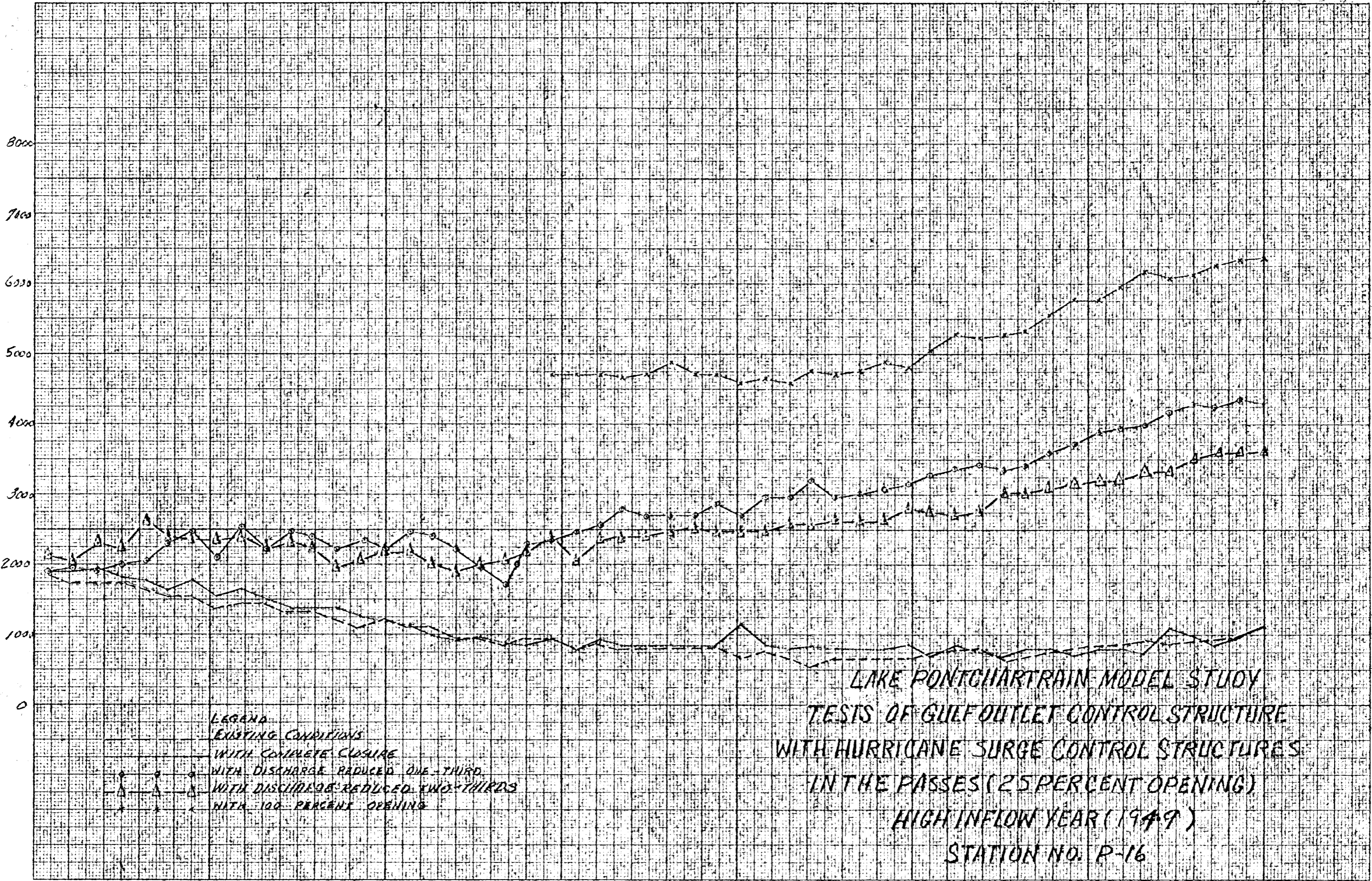


LEGEND
EXISTING CONDITIONS
WITH COMPLETE CLOSURE
WITH DISCHARGE REDUCED ONE-THIRD
WITH DISCHARGE REDUCED TWO-THIRDS
WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-15

June 21

STRAINITY IN PARTS PER MILLION



LEGEND
● EXISTING CONDITIONS
▲ WITH COMPLETE CLOSURE
■ WITH DISCHARGE REDUCED ONE-THIRD
◆ WITH DISCHARGE REDUCED TWO-THIRDS
× WITH 100 PERCENT OPENING

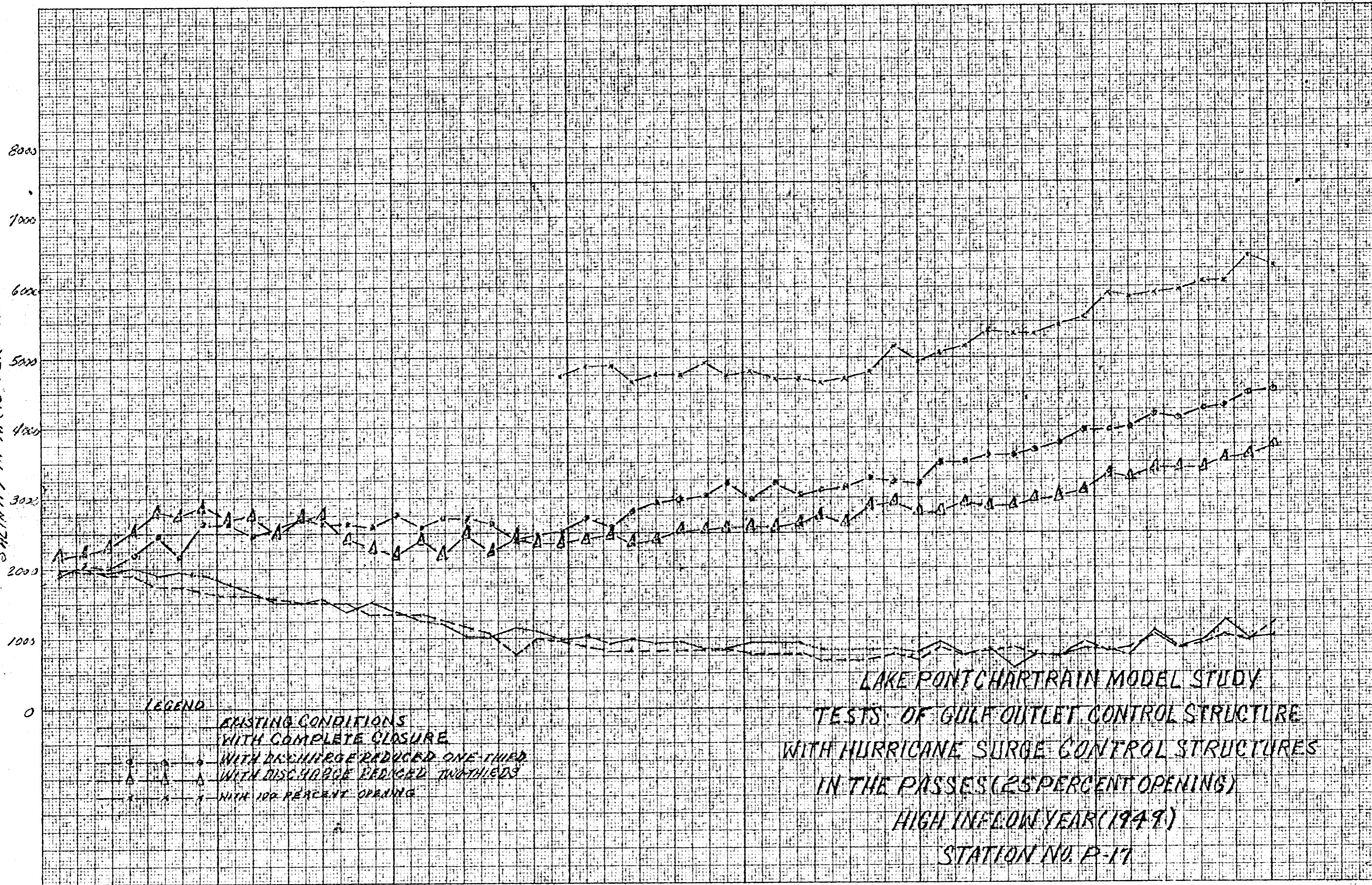
LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-16

0 50 100 150 200 250 300 350
TIDAL CYCLES

June 23

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SALINITY IN PARTS PER MILLION



LEGEND

- EXISTING CONDITIONS WITH COMPLETE CLOSURE
- ▲ WITH DISCHARGE REDUCED ONE-THIRD
- WITH DISCHARGE REDUCED TWO-THIRDS
- × WITH 100 PERCENT OPENING

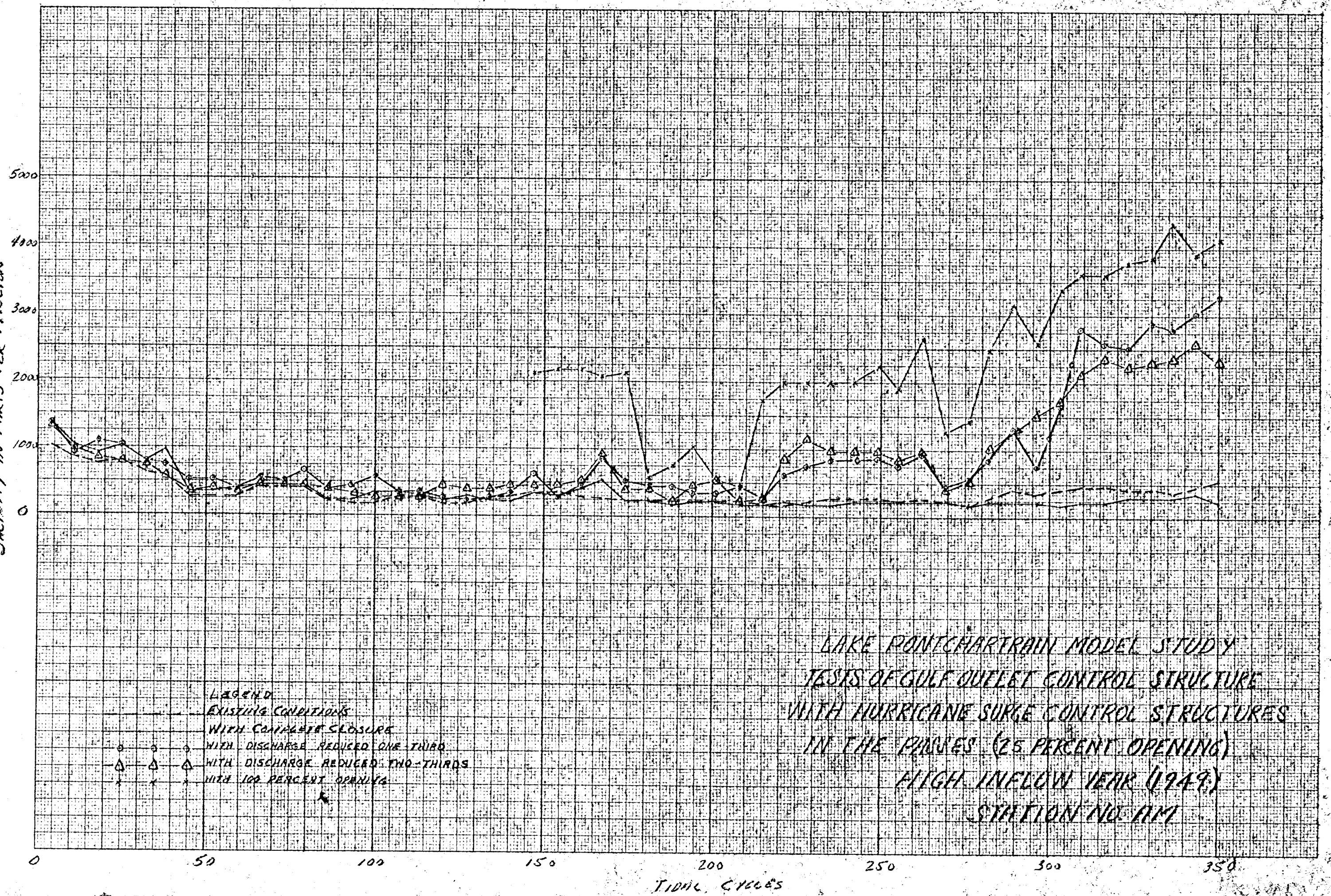
LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OUTLET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. P-17

June 23, 1951

TIDAL CYCLES

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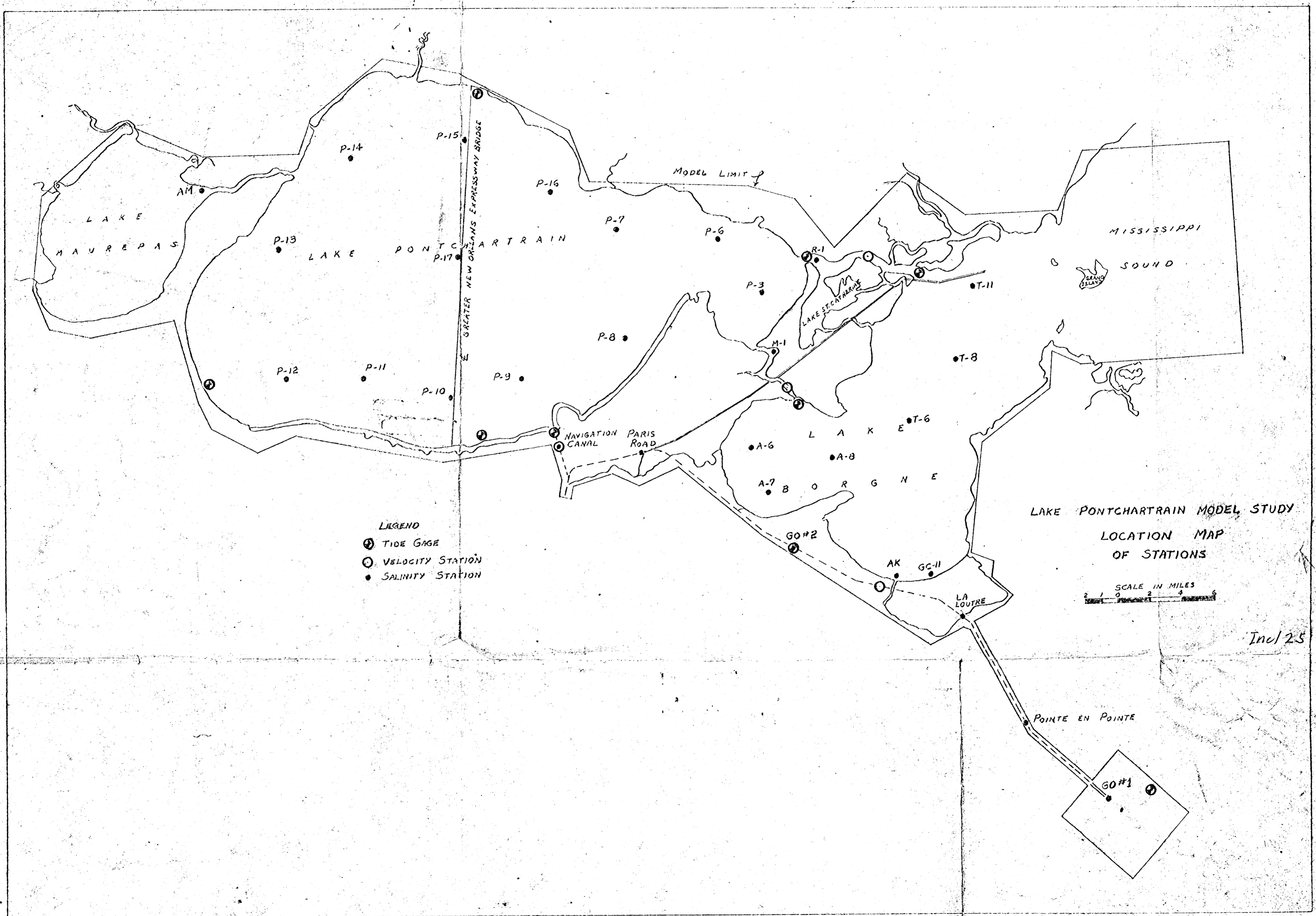
SALINITY IN PARTS PER MILLION



LEGEND
EXISTING CONDITIONS
WITH COMPLETE CLOSURE
WITH DISCHARGE REDUCED ONE-THIRD
WITH DISCHARGE REDUCED TWO-THIRDS
WITH 100 PERCENT OPENING

LAKE PONTCHARTRAIN MODEL STUDY
TESTS OF GULF OULET CONTROL STRUCTURE
WITH HURRICANE SURGE CONTROL STRUCTURES
IN THE PASSES (25 PERCENT OPENING)
HIGH INFLOW YEAR (1949)
STATION NO. 111

TIDAL CYCLES



LEGEND
 (circle with horizontal line) TIDE GAGE
 (circle with vertical line) VELOCITY STATION
 (circle with dot) SALINITY STATION

LAKE PONTCHARTRAIN MODEL STUDY
 LOCATION MAP
 OF STATIONS

SCALE IN MILES
 0 1 2 4 6

Incl 2-5

Sheet 25