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A Survey in the Lafayette River for Oysters and Shell in the Vicinity of the Lakewood Bridge

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City of Norfolk

by

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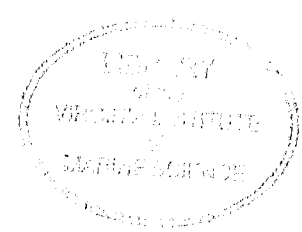

INTRODUCTION

At the request of the Department of Highways and Transportation the Virginia Institute of Marine Science made a study of the value of the oyster grounds in the vicinity of the Lakewood Bridge on the Lafayette River in Norfolk.

The study included numbers of oysters and amounts of shell, or natural reef, in the area of acquisition and within a buffer area either side of the present bridge. The buffer area, or area of potential construction impact, extended 500 feet upriver of the bridge and 500 feet downriver of the bridge. This buffer area was the maximum distance upriver and downriver for any construction activity.

The study was made by the Virginia Institute of Marine Science, Gloucester Point, Virginia, on November 6, 7, 8 and 13, 1985. Collection of field data was under the direction of James P. Whitcomb and the final report was prepared by Mr. Whitcomb.

There are no public Baylor acreages in the vicinity of the bridge. However, there are several tracts (File No. 2869, File No. 2868 and File No. 2521) leased to Holland Fisheries Inc.

Our study was restricted to leased bottom and the buffer area. The area of acquisition was 165 feet wide, including the present bridge which is 35 feet wide plus an extension of 52 feet downriver and 78 feet upriver. The total acquisition area was 3.08 acres.

The following acreages are defined for reference purposes:

Acreages

North side of bridge

Tract 2869 — 10.3 acres

South side of bridge

Tract 2868	9.0 acres
Tract 2521	1.4 acres
Area of acquisition	
dimension (165 feet x 814.18 feet)	3.084 acres
upriver extension (78 feet x 814.18 feet)	1.46 acres
downriver extension (52 feet x 814.18 feet)	0.97 acres
Bed A (oysters)	0.64 acres
Bed B (oysters)	0.20 acres

EVALUATION OF THE AREA

The Lakewood Bridge over the North branch of the Lafayette River is in an urban area. The east shore is bulkheaded and is largely residential. While the west shore is part resident and part borders on a park and is dominated by marsh grass. Salinities in the area are similar to those encountered in the Hampton Roads area (18 to 24 $^{o}/_{oo}$).

Over most of the area surveyed the bottom was soft mud with buried shells. When oysters did occur they were on an old reef rising up above the mud or an old planting which formed a layer of shells and oysters on the top of the mud bottom. Outside these above described beds a few oyster survived as single, large oysters (as large as 6" in length).

Effective 15 June 1983 the Virginia State Department of Health placed all of the Lafayette River and its tributaries within a special restricted area. Within the special restricted area all shellfish harvesting, including relaying, is prohibited. This special restricted area is defined in State Department of Health's "Notice and Description of Shellfish and Condemnation Number 7, Hampton Roads, effective 15 June 1983."

METHODS OF COLLECTING SAMPLES

Beginning at the bridge margin on the west shore stations every forty-two feet were sampled on a transect on the downriver, or south side, adjacent to the bridge and on a parallel transect fifty feet downriver. Stations at 100 foot intervals on five additional parallel transects, 100 foot apart downriver, were sampled.

Beginning adjacent to the bridge on the west shore stations were sampled at forty two feet intervals on three transects located at the distances 0, 50 and 100 feet from the bridge on the north, or upriver, side. Stations were sampled at 100 foot intervals on four additional transects, 100 foot apart, upriver. The total number of samples was 185.

The tongs were fastened near the head by a piece of line so that they opened exactly two feet for each sample. The head of the tong was 36 inches wide making each sample 6.0 $feet^2$.

The following data were collected from each tonged sample: number of live oysters; number of oyster boxes (a box is a shell which does not contain an oyster; i.e., the two valves are still hinged but empty); and the volume of loose shells.

Between sites of tonged samples, the bottom was probed with a rod to determine its character. This information with that obtained by tonging made possible the delineation of the resource (Fig. 1).

The quantity of oysters and shell in each area was calculated by multiplying number of samples times the area covered by the head of the tongs (6.0 $feet^2$). This product represents the total area sampled. The result was multiplied by the numbers of oysters or quantity of shell to give the numbers or volumes in all the samples. From these calculations the

numbers and volumes could be calculated for the larger areas represented by the samples.

The number of oysters per bushel was calculated from the relationship between numbers (88) of oysters collected and volume (26 quarts) of oysters collected in the study (Appendix). Based upon 50 quarts per bushel it was calculated that each bushel contained 169 oysters.

Traces (Fig. 2 a,b) were made with a fathometer along the 100 foot and 200 foot transects on either side of the bridge. By comparing these fathometer traces with similar trace after construction any large changes in the bottom due to the construction activity can be documented.

RESULTS OF THE SURVEY

A detailed summary of numbers of oysters, shells, and boxes found at each station is given in the Appendix; the locations of transects is shown in Fig. 1.

Most of the areas sampled were soft mud or mud with a few buried shells. Two "beds" of oysters were described by the samples and the probe. "Bed A" is an old reef surrounded by soft mud bottom while "Bed B" is an old planting of oysters.

No hard clams, Mercenaria mercenaria, or soft clams, Mya arenaria, were collected during the study. It is doubtful that they have occurred in the area.

Generally the oysters were clean or fouling organisms were absent. The mean size was 102 mm (4 inches), exclusive of spat. Ninety six percent of the oysters were market size (over 3 inches). A few ribbed mussels (Modiolus) occurred near the bridge and on "Bed B". Generally the mussel were solitary and located on an oyster or shell near the bridge but clustered on shells or oysters on "Bed B".

Only three spat were counted and the boxes comprised 51 percent, based upon numbers, of the total sample. The largest oyster measured was 6.4 inches in length, measuring the right valve. The age of the boxes could not always be determined because the soft mud bottom and sluggish current favored retention. Almost all shells were buried and the frequency of shells in the samples was 2.5 times the frequency of oysters.

Oyster and Shell Resource

Distinct "beds" or groupings of oysters observed while sampling (Fig. 1) are described below.

Bed A. This 0.64 acre bed extended under the bridge near the east end of the bridge. It is largely within the construction easement and the remainder is on leased bottom. It contained 83.5 bushels of oysters and 150.1 bushels of shell (Table 1).

Bed B. This 0.20 acre bed was on the south side of the bridge and it is entirely on the leased bottom. It contained 34.4 bushels of oysters and 52.8 bushels of shell. This area extended beyond the study area (Table 2).

Easement. A 0.36 acre segment of "Bed A" within the easement contained 47.0 bushels of oysters and 84.4 bushels of shells. The remainder of the easement contained 5.4 bushels of oysters. The shell in the remainder of the easement was buried and not associated with oysters and, therefore, does not represent a resource (Table 3, Table 4).

DISCUSSION

On the soft mud lease bottom which has not been maintained, or shelled, the potential for resource exists only on old reefs or old plantings. "Bed A" is an old reef and rises out of the mud bottom and will recruit new

oysters. "Bed B" is an old planting and it survives on the surface of the mud and will recruit oysters if not disturbed. Other shell which on these lease holdings is primarily buried, and not associated with an old planting or reef, do not represent a real or potential resource.

The small numbers of spat (3 spat) in all of the samples and the large number of boxes (51%) indicate that recruitment on this lease would be unable to replace mortalities if there was any appreciable exploitation or harvesting. Therefore, since also the mean size of oysters is large, this lease appears not to have been harvested in over ten years.

Since the entire Lafayette River has been included in the special restricted area from which no shellfish may be removed, the real or potential value of shellfish and shells is very minimal. Our contract requires the Institute to place a value upon the resource within the area of acquisition, or the easement. Correspondence with the Virginia Department of Health reveal no plans for testing the oysters from "Shellfish Area Condemnation Number 7, Hampton Roads" to establish any criteria for guidance in relaying the oysters. Therefore, there is no real value for the oyster resource in this area. We assume similar reasoning should be applied to the shell resource.

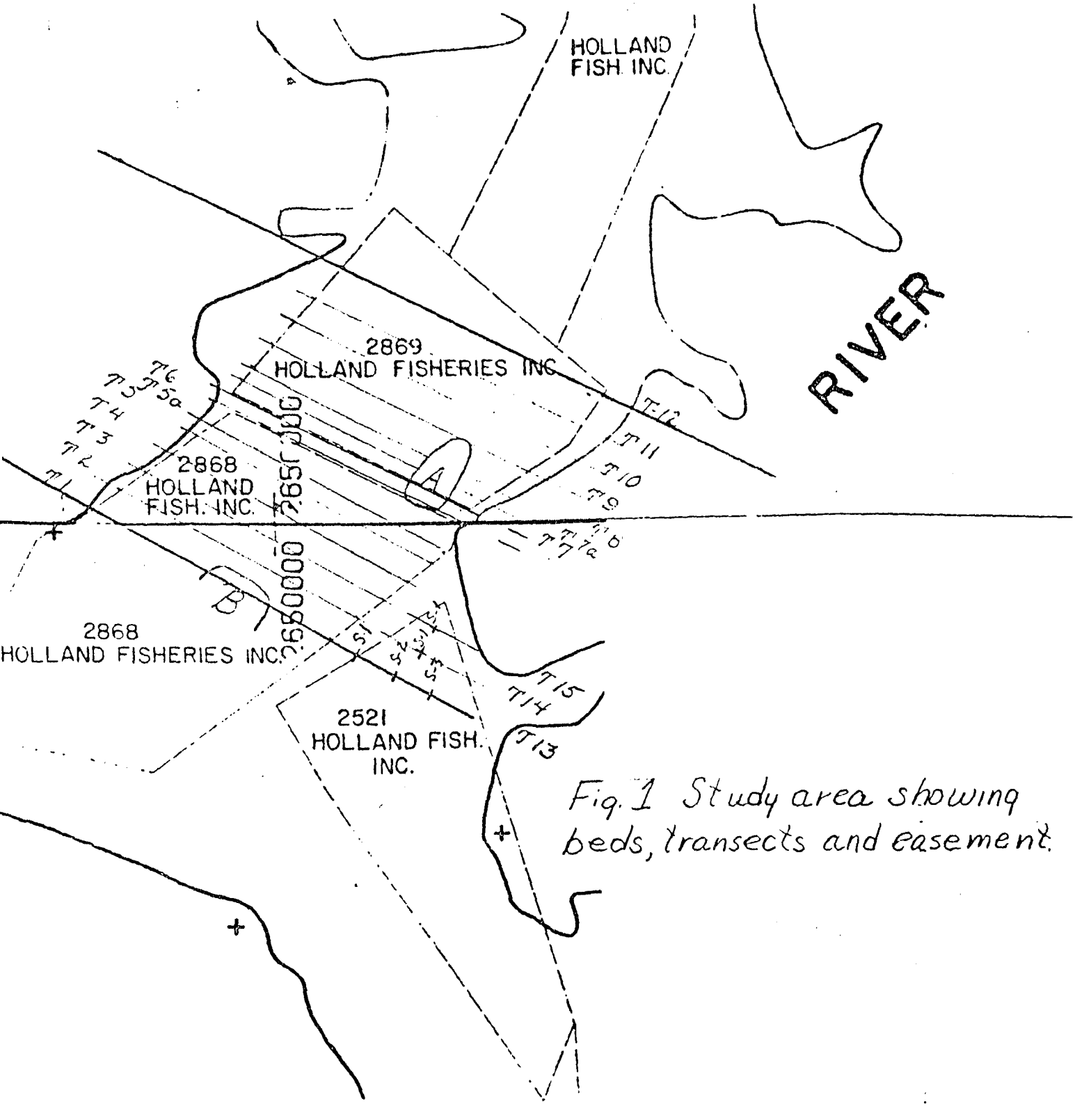

Fig. 1 Study area showing beds, transects and easement.

Table 1

Number of Oysters, Boxes, and Quarts of Shell
Per Sample at A
0.64 Acre

Trans.	Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts. Shell per Sample
VI	29	0	0	0.2
	31	0	1	0.4
	33	0	1	0.5
	35	1	1	0.4
	37	1	0	0
	39	3	2	0
VII	29	6	4	2.5
	31	1	1	0.3
	33	9	6	2.0
	35	8	4	2.0
	37	0	2	0
VIIa	29	0	0	0.4
	31	9	5	4.0
	33	4	8	4.0
	35	2	8	3.0
	37	0	4	3.0
	39	10	0	2.0
VIII	29	0	0	0.5
	31	0	0	0.8
	33	4	5	7.0
	35	0	0	0.2
	37	1	0	0.1
	39	9	5	4.0
IX	34	0	0	0.1
	39	8	7	3.0
TOTALS		76	64	40.4

Calculations Showing Total Quantity of Oysters, Shell, and Boxes

25 Samples
6.0 ft^2 sample
6 x 25 = 150 ft^2
43560 ft^2/acre ÷ 150 = 290.4
76 x 290.4 = 22070.4 oysters or 130.5 bushels/acre
64 x 290.4 = 185856 boxes/acre
40.4 x 290.4 = 11732.2 quarts of shell or 234.6 bushels/acre

Table 2

Number of Oysters, Boxes, and Quarts of Shell
Per Sample at B
0.2 Acre

Trans.	Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts. Shell per Sample
I	20	4	4	4.0
	24	6	0	2.0
	29	8	0	2.0
	34	1	0	1.0
	39	1	0	0.1
	TOTALS	20	4	9.1

Calculations Showing Total Quantity of Oysters, Shell, and Boxes

5 Samples
6.0 ft^2 sample
5 x 6 = 30 ft^2
43560 ft^2/acre ÷ 30 = 1452
20 x 1452 = 29040 oysters or 171.8 bushels/acre
4 x 1452 = 5808 boxes/acre
9.1 x 1452 = 13213.2 quarts of shell or 264.2 bushels/acre

Table 3

Number of Oysters, Boxes, and Quarts of Shell
Per Sample in Easement
2.72 Acres (Exclusive of Bed A)

Trans.	Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts. Shell per Sample
Va	5	0	0	0
	7	0	0	0
	9	0	0	0
	11	0	0	0
	13	0	0	0
	15	0	0	0
	17	0	0	0
	19	0	0	0
	21	0	0	0
	22C	0	0	0
	23	0	0	0.3
	25	0	0	0.2
	27	0	0	0
	29	0	0	0.3
	31	0	0	0
	33	0	0	0.3
	35	0	0	0
	37	0	0	0.2
	39	0	0	0.3
	41	0	0	1.0
	43	2	0	1.0
VI	5	0	0	0
	7	0	0	0
	9	0	0	0
	11	0	0	0
	13	0	0	0
	15	0	0	0
	17	0	0	0
	19	0	0	0
	21	0	0	0
	22C	0	0	0
	23	0	0	0
	25	0	0	0
	27	0	0	0.2
	41	0	0	0
	43	0	1	0.2
VII	5	0	0	0
	7	0	0	0
	9	0	0	0
	11	0	0	0
	13	0	0	0

Trans.	Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts. Shell per Sample
VI	15	0	0	0.2
	17	0	0	0.1
	19	0	0	0
	21	0	0	0.1
	22C	0	0	0
	23	1	0	0
	25	0	0	0.1
	27	0	0	0.3
VIIa	5	0	0	0
	7	0	1	0
	9	0	0	0
	11	0	0	0
	13	0	0	0
	15	0	0	0
	17	0	0	0
	19	0	0	0
	21	0	0	0
	22C	0	0	0.2
	23	0	0	0.4
	25	0	0	0
	27	0	0	0.4
	TOTALS	3	2	5.8

Calculations Showing Total Quantity of Oysters, Shell, and Boxes

66 Samples
6.0 ft^2 sample
6 x 66 = 396 ft^2
43560 ft^2/acre ÷ 396 = 110
3 x 110 = 330 oysters or 2.0 bushels/acre
2 x 110 = 220 boxes/acre
5.8 x 110 = 638 quarts of shell or 12.8 bushels/acre

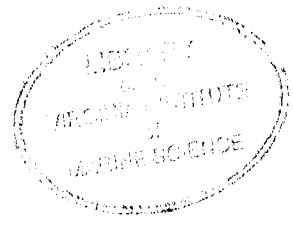

Table 4

Number of Oysters with Easement
3.08 Acres

Bushels per acre in Bed A	130.5 bushels/acre
Acreage within fraction of Bed A within Easement	x0.36 acres
Bushels within fraction	46.98 or 47 bushels
Bushels per acre within Easement exclusive of Bed A	2.0 bushels/acre
Area within Easement exclusive of Bed A	x2.72 acres
	5.44 or 5.4 bushels
	47.0 bushels
	+5.4 bushels
Total oysters in Easement	52.4 bushels

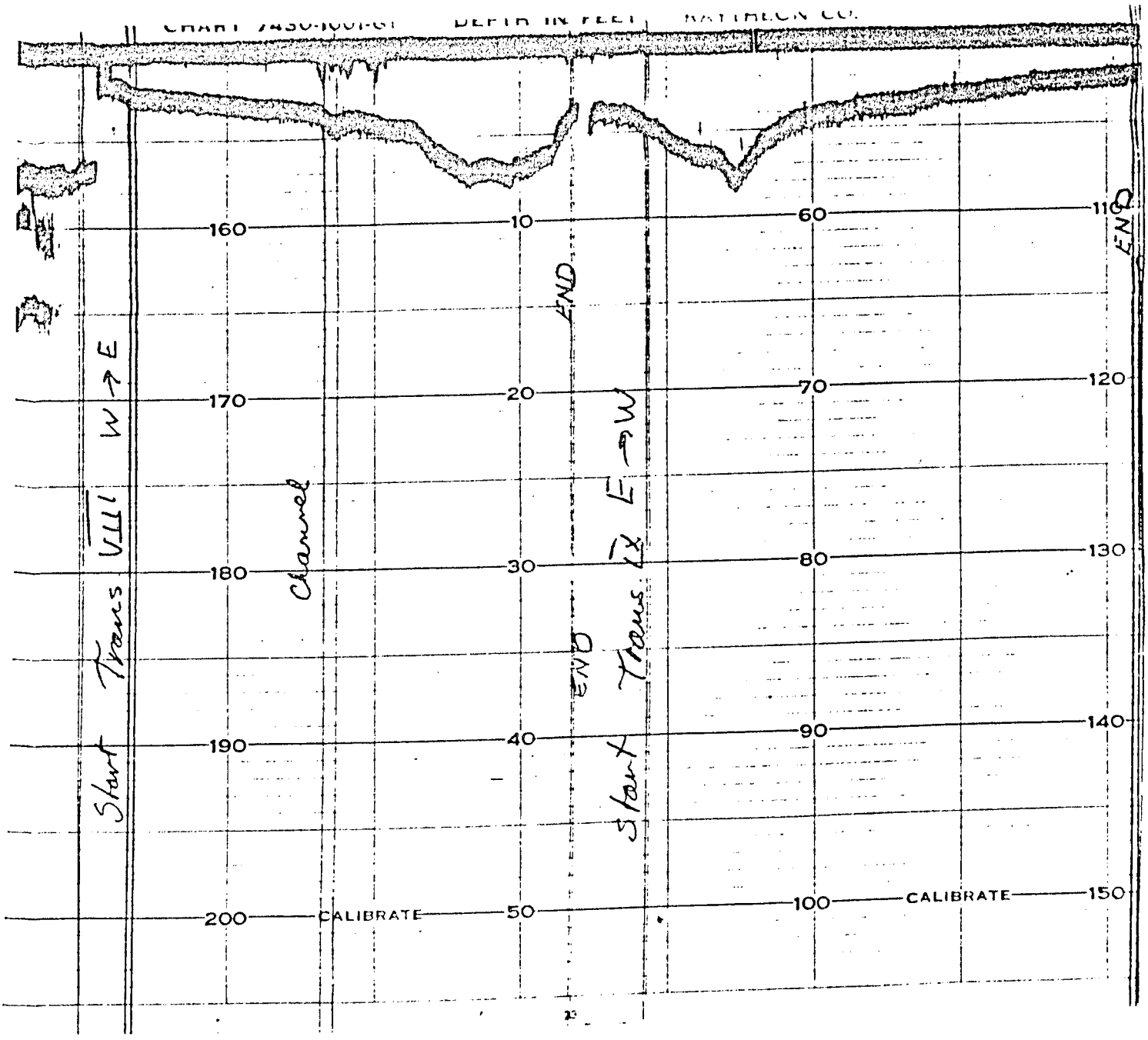

Fig. 2a Bottom Trace.

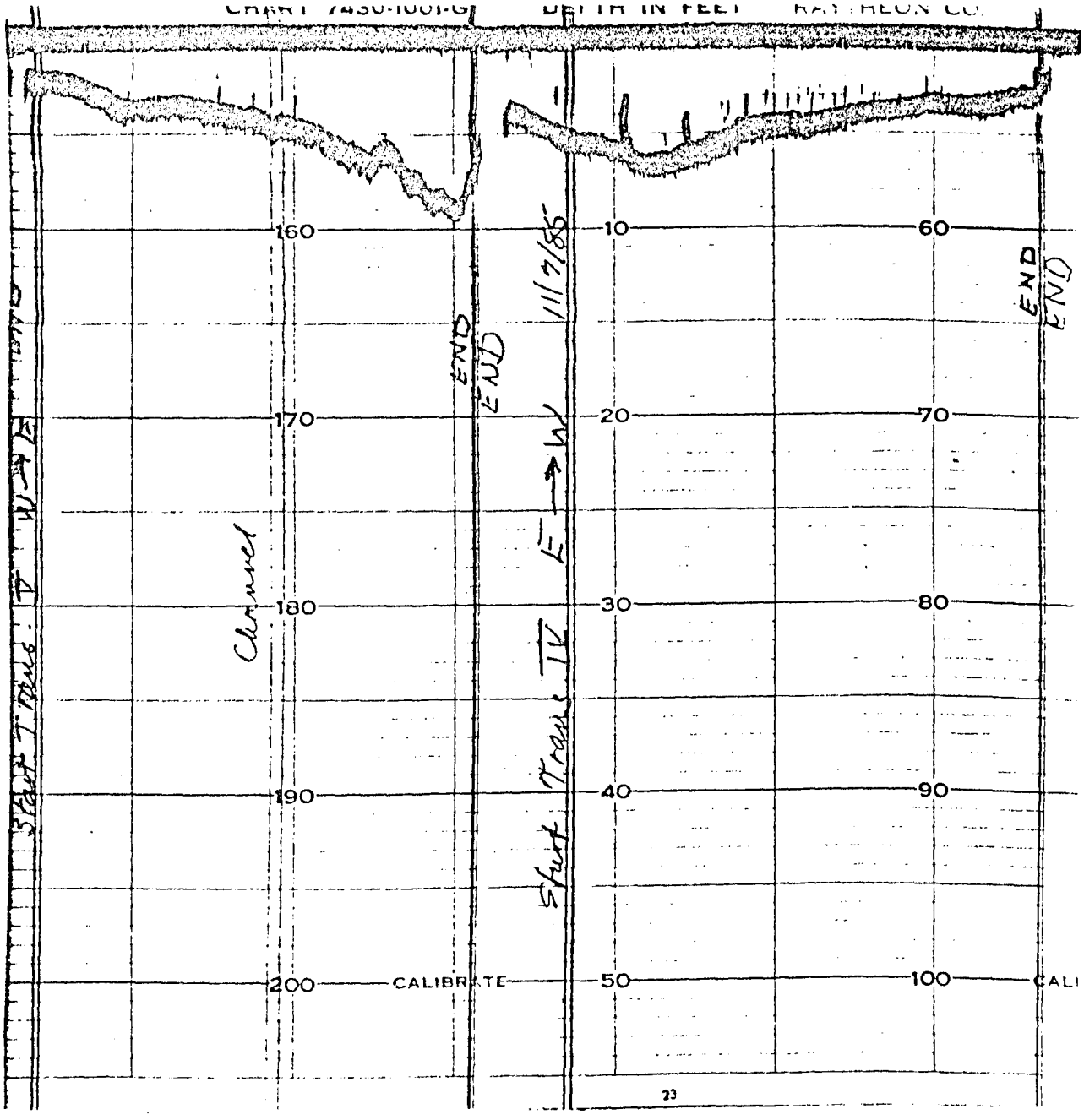

Fig. 26 Bottom Trace

APPENDIX
RESULTS
LAKEWOOD BRIDGE STUDY

SHELLS OYSTERS

Transect	Stations	Depth in feet	Quarts	No.	Quarts	No.	Boxes	Remarks
I	5	3 1/2						sand
	10	6						sand, mud
	15	8						mud
	20	7	4		1	4	4	shell, oysters, mud
	24	7 1/2	2		1 1/2	6		shell, oysters, mud
	29	7	2		2 1/2	8		shell, oysters, mud
	34	9	1			1		shell, oysters, mud
	39	8		1		1		shell, oysters, mud
	44	8						mud
II	5	4						sand, mud
	10	4 1/2						mud
	15	6						mud
	20	6						mud
	24	7	1/2	5				buried shell, mud
	29	7 1/2		3				buried shell, mud
	34	7 1/2						mud
	39	7 1/2						mud
	44	7	1	3				buried shell, mud
III	5	3 1/2		1				buried shell, mud
	10	4						mud
	15	5						mud
	20	7						mud
	24	6 1/2		1				buried shell, mud
	29	8		1				buried shell, mud
	34	8		4				buried shell, mud
	39	7 1/2						mud
	44	7 1/2		2				buried shell, mud
IV	5	3 1/2						1 cluster (1 pt) mussels
	10	5 1/2						mud
	15	5 1/2						mud
	20	5 1/2						mud
	24	6 1/2		2				buried shell, mud
	29	7						mud
	34	8						mud
	39	8						mud
	44	7	1			1	1	buried shell, oysters, mud

SHELLS OYSTERS

Transect	Stations	Depth in feet	Quarts	No.	Quarts	No.	Boxes	Remarks
V	5	4						sand
	10	5						mud
	15	6						mud
	20	7						mud
	24	10		2				buried shell, mud
	29	8		2				buried shell, mud
	34	8 1/2		3				buried shell, mud
	39	9		6	1			buried shell, mud
	44	8	4			2	8	buried shell, oysters, mud 2 spat
Va	5	4 1/2						sand
	7	6						sand, mud
	9	7						mud
	11	7						mud
	13	7						mud
	15	7						mud
	17	7						mud
	19	7						mud
	21	7						mud
	22c	8						buried shell, mud
	23	7 1/2		3				buried shell, mud
	25	8		2				mud
	27	8						buried shell, mud
	29	8		3				mud
	31	9 1/2						buried shell, mud
	33	9 1/2		3				mud
	35	9						buried shell, mud
	37	10 1/2		2				buried shell, mud
	39	12		3				buried shell, mud
	41	11 1/2	1	6				shell, oysters, mud,
	43	4	1	6		2		Tagelus shell
VI	5	3 1/2						hard sand
	7	4				1		sand, mud yearling on Tagelus shell
	9	6						mud
	11	6						mud
	13	6						mud
	15	7						mud
	17	7						mud, stones
	19	7						mud
	21	7						mud
	22C	7						timbers
	23	7						mud
	25	7 1/2						mud

SHELLS OYSTERS

Transect	Stations	Depth in feet	Quarts	No.	Quarts	No.	Boxes	Remarks
	27	8		2				buried shell, mud
	29	9		2				buried shell, mud
	31	9		4			1	buried shell, mud
	33	9		5			1	buried shell, mud
	35	9		4		1	1	buried shell, mud
	37	11						1 spat, mud
	39	14				3	2	shells, mud
	41	9						sand, sticky mud, 2 Tagelus shells
	43	3						rocks
VII	5	3						hard sand
	7	6						mud
	9	6						mud
	11	6						mud
	13	6						mud
	15	6		2				buried shell, mud
	17	8		1				buried shell, mud
	19	8						mud
	21	8		1				buried shell, mud
	22C	8						mud
	23	8				1		mud
	25	8		1				buried shell, mud
	27	8		3				buried shell, mud
	29	9	2 1/2		2	6	4	buried shell oysters, mud, mussels (on oysters)
	31	9 1/2		3		1	1	buried shell, oysters, mud
	33	9 1/2	2		2	9	6	buried shell, oysters mud, mussels (on oysters)
	35	9	2		4	8	4	buried shell, oysters, mud, mussels (on oysters)
	37	10					2	mud
	39							no sample
	41	9						hard sand
	43	3						hard sand
VIIa	5	2						sand
	7	3 1/2					1	mud
	9	4						mud
	11	4						mud
	13	4						mud
	15	4						mud
	17	4						mud
	19	4 1/2						mud

SHELLS OYSTERS

Transect	Stations	Depth in feet	Quarts	No.	Quarts	No.	Boxes	Remarks
	21	4 1/2						mud
	22C	5		2				buried shell, mud
	23	5		4				mud
	25	5						mud
	27	6		4				buried shell, mud
	29	6 1/2		4				buried shell, mud
	31	7 1/2	4		3	9	5	shells, oyster, mud
	33	8	4		1	4	8	shells, oysters, mud
	35	8	3			2	8	rock
	37	8	3				4	shell, mud, mussels
	39	10	2		4	10		shell, oysters, mud
	41	7 1/2						sand
	43	3 1/2						sand
VIII	5	3 1/2						sand, mud
	7	3 1/2						sand, mud
	9	3 1/2						sand, mud
	11	4						sand, mud
	13	4						mud
	15	4						mud
	17	4						mud
	19	4						mud
	21	4 1/2		1				buried shell, mud
	22C	4 1/2						mud
	23	4 1/2						mud
	25	5						mud
	27	5						mud
	29	6		5				buried shell, mud
	31	7		8				buried shell, mud
	33	8	7		1	4	5	buried shell, oysters, mud
	35	8		2				buried shell, mud
	37	8		1		1		buried shell, oysters, mud
	39	9	4		3	9	5	shell, oysters, mud
	41	7						sand
	43	5						mud
IX	5	3						mud
	10	3 1/2						mud
	15	3 1/2						mud
	20	3 1/2						mud
	24	4		2				buried shell, mud
	29	4 1/2						mud
	34	6		1				buried shell, mud
	39	7	3		2 1/2	8	7	shell, oysters, mud
	44	6						mud

SHELLS OYSTERS

Transect	Stations	Depth in feet	Quarts	No.	Quarts	No.	Boxes	Remarks
X	5	3						mud
	10	3						mud
	15	3 1/2						mud
	20	4						mud
	24	4		2				buried shell, mud
	29	5						mud
	34	8						mud
	39	8						mud
	44	5						mud
XI	5	3						sand, mud
	10	3						mud
	15	3 1/2						mud
	20	3 1/2						mud
	24	3 1/2		1				buried shell, mud
	29	4 1/2						mud
	34	5						mud
	39	7 1/2						mud
	44	6						mud
XII	5	1						sand
	10	3						mud
	15	3 1/2						mud
	20	4 1/2						mud
	24	4						mud
	29	4 1/2						mud
	34	5						mud
	39	7						mud
	44	6						mud
XIII	1	7		3				buried shell, mud
	2	6		2				buried shell, mud
	3	4		2				sand, mud
XIV	1	6						sand, mud
XV	1	6						sand, mud