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The 1987 update on leased grounds near the US 17 bridge over Chuckatuck Creek

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INTRODUCTION

This report is an update of a study made in June to mid-august 1979. This study was made by the Virginia Institute of Marine Science of the College of William and Mary for the Department of Highways and Transportation, Suffolk, Virginia. The previous study provided: 1) a description of the shellfish resource prior to construction of a new bridge; 2) an estimate of the value of the oysters and shell on leased areas within the right-of-way; and 3) a basis for a later study after construction to evaluate possible environmental changes.

Since 1979 the Commonwealth has purchased the right-of-way and the VMRC has opened it to public fishing. There is no shellfish resources in the right-of-way. Therefore, the study describes the present shellfish resource in the adjacent leases, within 600 ft. of the center of the bridge, which might be affected by construction activity.

Description of the Area

Chuckatuck Creek is a tributary to the James River and the Chuckatuck Bridge is located approximately seven-tenths (0.7) of a nautical mile upstream from the point where Chuckatuck Creek empties into Batten Bay. The saline water enters the creek from the James River. The salinity in the James River averages about seventeen (17) parts near (at Nansemond Ridge) the mouth of Chuckatuck Creek. In May 1987 the salinity (at Nansemond Ridge) fell to 4.8 $^{o}/oo$; in October 1986 the salinity (at Nansemond Ridge) rose to 22.2 $^{o}/oo$. Oysters (*Crassostrea virginica*), but not hard clams (*Mercenaria mercenaria*), grow in the waters adjacent to the Chuckatuck

Bridge. In recent years there has been very little set of oysters in the vicinity of the Chuckatuck Bridge. In years of more normal precipitation than 1986 or 1987 the mouth of the Chuckatuck Creek is at, or near, the upper salinity level of the diseases MSX, Dermo and the predatory oyster drill. Therefore, during most years these factors are not a problem in oyster culture.

The shore along the west side, in the vicinity of the bridge, is a tidal marsh while on the higher ground of the eastern shore there are homes and a boat yard. The waters of the study area were condemned by the Virginia Department of Public Health effective 28 June 1979 (see Health Department Condemnation Area 80) and the harvesting of shellfish after that date was restricted. The restrictions placed on harvesting and marketing oysters from this area include:

1. The oysters must be relaid in clean waters under the supervision of the Virginia Marine Resources Commission.
2. The oysters must stay on this bottom for at least 15 days with the water temperature over $50^{\circ}F$.

METHODS AND MATERIALS

The surveyor from the Virginia Marine Resource Commissioner marked the right-of-way line on either site of the bridge and an additional line 600 feet away from the center line of the bridge on both the upriver and downriver side of the bridge. With the use of the surveyor's lines, additional stakes and a floating measured line the stations occupied in 1979 were relocated. Each station was located at the center of a square forming a part of a 100 foot grid system superimposed on the study area, outside of the right-of-way (Figures 1-A, 1-U). A strip recording fathometer survey was made on the right-of-way line and on a parallel transect 100 feet further upriver and 100 feet further downriver.

Samples of material from the bottom of the creek were collected using a conventional pair of oyster tongs; the shafts of the tongs were tied so that the tongs opened an equal distance each grab. A grab (i.e. one sample) was taken at each station, or at the center of each square. The areas covered by the tong heads varied from 6 ft^2 to 10.5 ft^2 depending on depths and bottom type; these areas were used to calculate oyster density.

The leased plots sampled, the area studied and the number of samples on each plot are shown in Tables 1-A (1979) and 1-U (1987).

The following data was collected at each station:

- numbers and volumes of live large (3 inches and more in length) oysters;
- numbers and volumes of live small oysters;
- numbers of spat (oysters which had set in the summer of 1986);
- numbers of boxes (a box is an oyster shell which has both valves still hinged but is empty of meat);

- volume of shells which had been resting on the bottom (spat may attach to this shell);
- volume of shells which had been buried in the bottom; and
- type of bottom (M = soft mud; MSh = mud and shells; MS = mud and sand.

Oyster mortality was calculated as follows:

$$\% \text{ mortality} = \frac{\text{No. Boxes}}{\text{No Live Oysters \& No. Boxes}}$$

A portable recording fathometer was used to profile the bottom along transects parallel to the bridge. These profiles (see Appendix) will show damage to areas outside the right-of-way by construction activity.

RESULTS AND DISCUSSION

Observations and results will be presented and discussed for each leased plot.

Leased Area 1 (William R. Gay, Jr.)

The area studied is 5.50 acres. Results of the hand tong sampling are shown in Table 2.

This area can be described as a mud bottom with scattered oysters and shell. Live oysters were found at two stations. Two additional stations had buried shell. The total number of oysters was 6 and the total volume of shell was 0.5 quarts (buried). The average density of oysters is $0.02/ft^2$

and shell averaged 0.002/ft^2. There are 47.9 bushels of oysters on this area and this appears to be a harvested area.

Leased Area 2 (Nansemond Fish and Oyster Co.)

The area studied is 1.89 acres. Results of the hand tong sampling are shown in Table 3.

This area can be described as a mud bottom with the occasional oysters and no shell. Live oysters were found at one station and no surface or buried shells were found. The total number of oysters was 2 and the average density of oysters is 0.02/ft^2. There are 16.5 bushels of oysters on this area and this appears to be a harvested area.

Leased Area 3 (Gregory B. Ward)

The area studied is 1.51 acres. Results of the hand tong sampling are shown in Table 4.

This area can be described as mostly a mud bottom with scattered oysters and shell. Live oysters were found at two stations and shell at two additional stations. The total number of oysters was 13 and oyster shells totalled 1.9 quarts. Eighty-nine percent of the shell was on the surface. The average density of oysters is 0.12/ft^2 and the average density of shell is 0.02 quarts/ft^2. There are 78.9 bushels of oysters on this area and this appears to be a harvested area.

Leased Area 4 (William H. Hatton, et al)

This area studied is 2.18 acres. Results of the hand tong sampling are shown in Table 5.

This area is mostly mud and shell. Seventy nine percent of the stations had shell and over one-third had oysters. The average density of oysters is 0.16/ft^2 and the averaged density of shell is 0.09 quarts/ft^2. There are 129.9 bushels of oysters on this area and 170.9 bushels of shell on this area. Fifty-two percent of the shell is on the surface. This appears to be a light planting of oysters.

Leased Area 5 (Edwin Crittenden)

The area studied is 1.36 acres. Results of the hand tong sampling are shown in Table 6.

This area is mostly mud bottom and one station had 0.2 quarts buried shell. There was no surface shell or oysters in the samples. This area would be described as barren bottom.

Leased Area 6 (G. C. Martin, Jr.)

The area studied is 2.91 acres. Results of the hand tong sampling are shown in Table 7.

The area is a mud bottom with scattered oysters and shells. Five live oysters and 0.8 quarts of shell were present in fourteen grabs. The average density of oysters is 0.06/ft^2 and the average density of shell is 0.01 quarts/ft^2. There are 65 bushels of oyster on the area. This distribution

of oysters would be described as mud lumps, or groups of oyster and shell surrounded by mud bottom. It is characteristic of harvested or abandoned bottom.

Leased Area 7 (Nansemond Fish and Oyster Co)

The area studied is 6.05 acres. Results of the hand tong sampling are shown in Table 8.

There is a large shelled area in the center of this area and forty-seven percent of the stations had shell. The average density of oysters is $0.08/ft^2$ and the average density of shell is 0.05 quarts/ft^2. There are 140.6 bushels of oysters on this area and 263.5 bushels of shell, of which 52% is on the surface. This is a light planting but the surface shell is capable of acquiring a natural set.

Leased Area 8 (Nansemond Fish and Oyster Co.)

The area studied is 1.23 acres. Results of the hand tong sampling are shown in Table 9.

This a small section of lease area 7 which was cut-off when the right-of-way was acquired. It is barren and the substrate is mud.

Leased Area 9 (J. W. Ingersoll)

The area studied is 1.23 acres. Results of the hand tong sampling are shown in Table 10.

This is a muddy area with a shelled section in the center. The average density of oysters is 0.24/ft^2 and the average density of shell is 0.11 quarts/ft^2. There are 57.2 bushels of oysters on this area and 117.9 bushels of shells. Eighty percent of the shell is on the surface. This is a light planting of oysters and the surface shell has the capability of acquiring a natural set.

Leased Area 10 (Newman Oyster Farms Inc.)

The area studied is 2.02 acres. Results of the hand tong sampling are shown in Table 11.

This entire area was shelled and fifty-three percent of the shell is on the surface. The average density of oysters is 0.11/ft^2 and the average density of shell is 0.06 quarts/ft^2. There are 43 bushels of oysters and 105.6 bushels of shell on this area. This is a light planting of oysters and the surface shell has the capability of acquiring a natural set.

Leased Area 11 (Lawrence G. Geistel)

The area studied is 1.10 acres. Results of the hand tong samples are shown in Table 12.

There is a shelled section in the offshore west corner of this area and the remaining bottom is mud. The average density of oysters is 0.13/ft^2 and the average density of shells is 0.05 quarts/ft^2. There are 27.7 bushels of oysters on this area in the offshore corner adjacent to the right-of-way. There is also 47.9 bushels of shell in the same corner and 80 percent is on the surface. The shell has a potential for natural set.

SUMMARY

Densities in bushels per acre and quantities of oysters and shells estimated to be in leased grounds outside the right-of-way are summarized in Table 13. The values of the oysters and shells are not calculated by leases. If construction activity impacted upon a lease, outside the right-of-way it would rarely require compensation for the entire area and the sub-area in question would have to be estimated after construction is completed. The present market price of premium oysters is $25.00 per bushel. It must be assumed that all small oysters would have grown to market size eventually so the total value would assume all oysters are market size at present. The present price of "house shell" (from shucking houses), which is the most likely source of shell used for settlement of spat, is 37 cents per bushel. These values would have to be reduced by 30% since the study area is classed as condemned and oysters must be relaid prior to sale. The condemnation is in effect at present.

Table 1-A

Leases in the Vicinity of the US 17 Bridge Across Chuckatuck Creek - Sampled June thru August 1979.

	Lessee's Name	Acreage in Lease	Area Studied[1] (acres)	Number of Stations	Number of Samples
1.	William R. Gay, Jr.	11.52	6.58	31	62
2.	Nansemond-Adams Oyster Co.	7.80	2.60	12	23
3.	Linwood C. Wright	5.02	1.99	10	19
4.	James C. Hatten	4.63	2.60	14	26
5.	Edwin Crittenden	1.59	1.59	8	14
6.	G. C. Martin, Jr.	7.19	3.82	20	40
7.	Nansemond Fish & Oyster Co.	4.80	4.80	26	52
8.	Nansemond Fish & Oyster Co.	16.47	14.88	69	134
9.	J. W. Ingersoll	3.23	3.23	16	29
10.	Annie E. Newman	10.16	2.68	10	10
11.	Ralph E. Blythe, Sr.	1.14	1.14	7	14
12.	Nansemond-Adams Oyster Co.	1.43	0.69	4	6
	TOTALS		46.60	227	429

Note:

1. Measured by VIMS.

Table 1-U

Leases in the vicinity of the US 17 Bridge across Chuckatuck Creek - Sampled June 1987

Lessee's Name	Plat file number	Area[1] Studied acres	Number of Stations
1. William R. Gay, Jr.	13767	5.50	25
2. Nansemond Fish & Oyster Co.	10949	1.89	11
3. Gregory B. Ward	13659	1.51	10
4. Wm. H. Hatton et al.	10898	2.18	14
5. Edwin Crittenden	6920	1.36	6
6. G. C. Martin, Jr.	12607	2.91	14
7. Nansemond Fish & Oyster Co.	14479	6.05	32
8. Nansemond Fish & Oyster Co.	14480	1.23	4
9. J. W. Ingersoll	14484	1.23	7
10. Newman Oys. Fms. Inc.	14491	2.02	8
11. Lawrence G. Geistell	14960	1.10	5
TOTALS		26.98	136

Note:

1. Measured by VIMS.

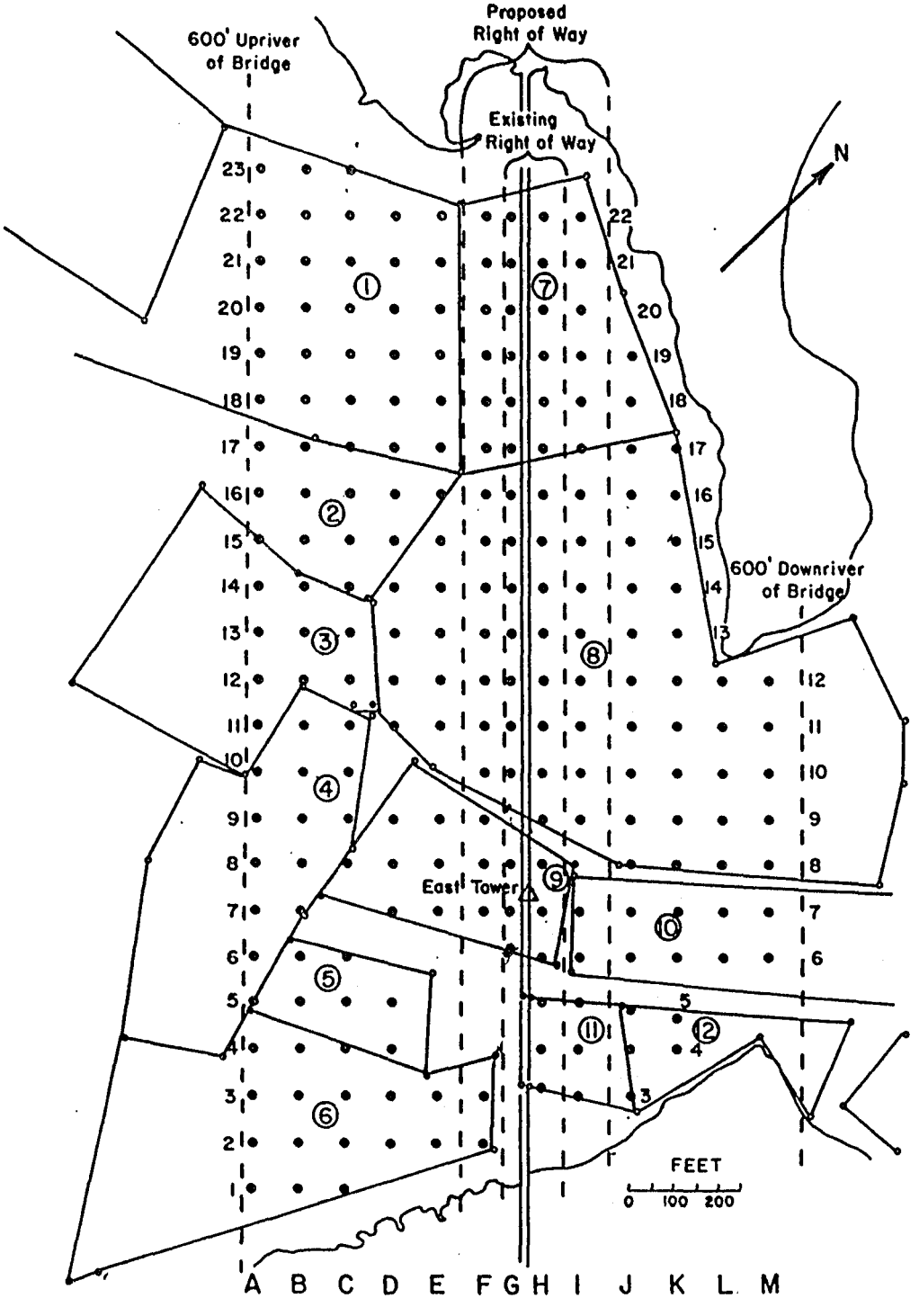


Figure 1-A Chuckatuck Creek, in the vicinity of the US 17 Bridge; showing oyster ground leases, right-of-way, and location of stations sampled with hand tongs in 1979.

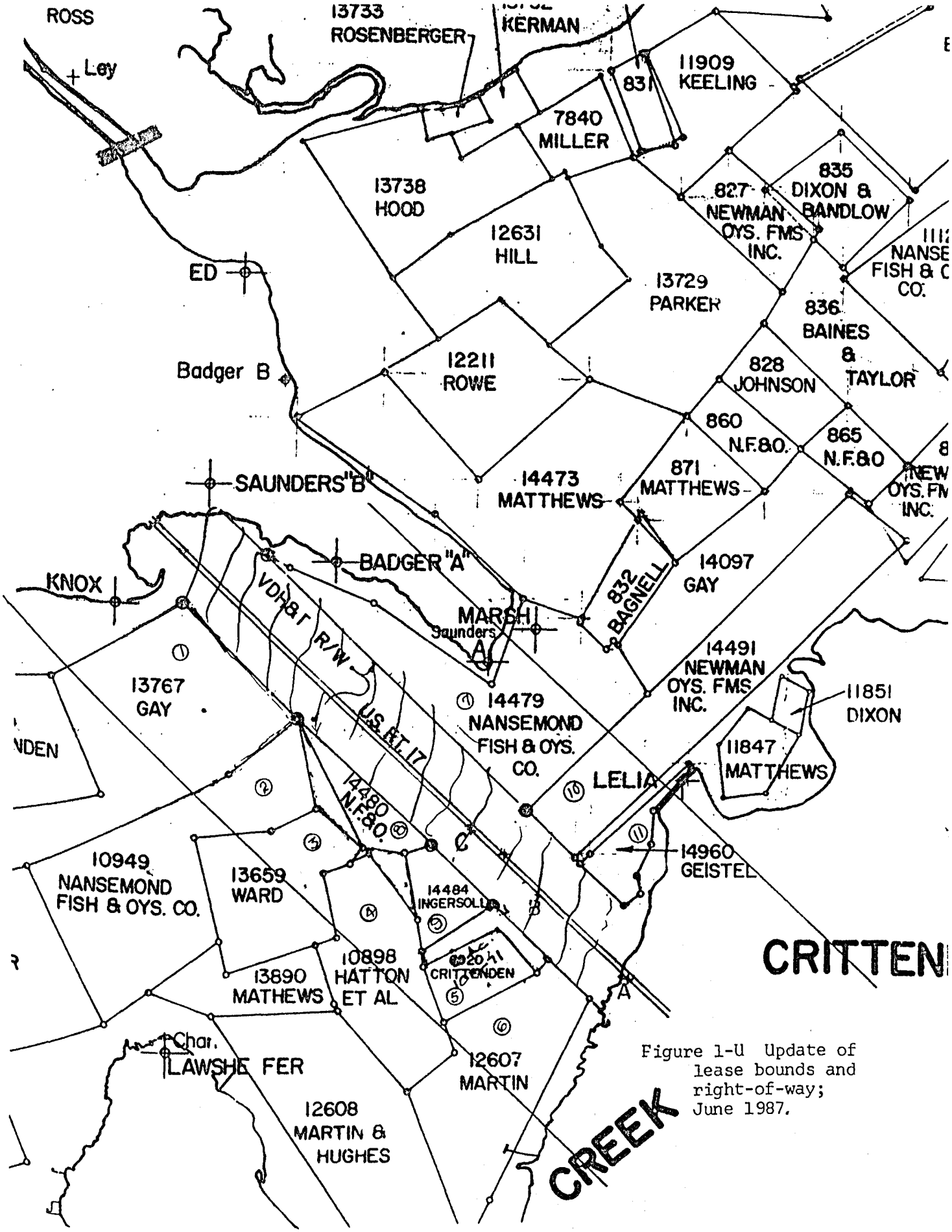


Figure 1-U Update of lease bounds and right-of-way; June 1987.

Table 2

Results of Sampling Leased Area 1 (Wm. R. Gay, Jr.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
A18	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A19	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A20	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A21	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A22	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A23	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B18	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B19	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B20	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B21	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B22	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B23	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C17	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C18	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C19	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C20	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C21	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C22	10.5	M	0	0	0	—	0	0	0	0	0.1	0.1	0.01
C23	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D17	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D18	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D19	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D20	10.5	M	2	3	5	0.48	0	2	29	0	0	0	—
D21	10.5	M	1	0	1	0.10	0	0	0	0	0.1	0.1	0.01
D22	10.5	M	0	0	0	—	0	0	0	0	0.3	0.3	0.03

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

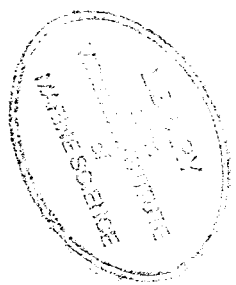


Table 3

Results of Sampling Leased Area 2 (Nansemond Fish and Oyster Co.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Quantity (Quarts) Surface	Buried	Total	Density of Total Qts/ft^2
A15	10.5	M	2	0	2	0.19	0	1	30	0	0	0	—
A16	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A17	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B15	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B16	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B17	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C14	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C15	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C16	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D15	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D16	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
1. Densities are averages.

Table 4

Results of Sampling Leased Area 3 (Ward)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
A11	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A12	10.5	M,Sh	10	1	11	1.05	0	0	0	1.5	0	1.5	0.14
A13	10.5	M	0	0	0	—	0	0	0	0.2	0	0.2	0.02
A14	10.5	M	0	0	0	—	0	0	0	0	0	0	—
A15	10.5	M	2	0	2	0.19	0	0	0	0	0.1	0.1	0.01
B12	10.5	M	0	0	0	—	0	0	0	0	0	0	—
B13	10.5	M	0	0	0	—	0	0	0	0	0.1	0.1	0.01
B14	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C12	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C13	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 5

Results of Sampling Leased Area 4 (Hatton et al)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
A5	6.0	M	0	0	0	—	0	0	0	0	0	0	—
A6	6.0	M,Sh	0	0	0	—	0	0	0	0	0.3	0.3	0.06
A7	10.5	M,Sh	0	0	0	—	0	0	0	0	0.5	0.5	0.5
A8	10.5	M,Sh	3	1	4	0.38	0	5	56	0	1.0	1.0	0.10
A9	10.5	M,Sh	0	0	0	—	0	0	0	0	0.2	0.2	0.02
A10	10.5	M	0	0	0	0	0	0	0	0.1	0.1	0.2	0.02
B7	10.5	M,Sh	0	1	1	0.10	1	4	80	0.5	0	0.5	0.05
B8	10.5	M,Sh	1	0	1	0.10	0	0	0	0.5	0	0.5	0.05
B9	10.5	M,Sh	3	4	7	0.67	0	4	36	3.0	2.0	5.0	0.48
B10	10.5	M,Sh	0	0	0	—	0	0	0	0	0.5	0.5	0.05
B11	10.5	M	0	0	0	—	0	0	0	0	0	0	—
C9	10.5	M,Sh	9	4	13	1.24	2	5	31	1.5	1.5	3.0	0.29
C10	10.5	M,Sh	0	0	0	—	0	0	0	1.0	0	1.0	0.10
C11	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 6

Results of Sampling Leased Area 5 (Crittenden)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
B5	6.0	M	0	0	0	—	0	0	0	0	0	0	—
B6	6.0	M	0	0	0	—	0	0	0	0	0	0	—
C5	6.0	M	0	0	0	—	0	1	NA	0	0.2	0.2	0.02
C6	6.0	M	0	0	0	—	0	0	0	0	0	0	—
D4	6.0	M	0	0	0	—	0	0	0	0	0	0	—
D5	6.0	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 7

Results of Sampling Leased Area 6 (Martin)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
A1	6.0	M	0	0	0	—	0	0	0	0	0	0	—
A2	6.0	M	0	0	0	—	0	0	0	0	0	0	—
A3	6.0	M	0	0	0	—	0	0	0	0	0	0	—
A4	6.0	M	0	0	0	—	0	0	0	0	0	0	—
B1	6.0	M	0	0	0	—	0	0	0	0	0	0	—
B2	6.0	M	0	0	0	—	0	0	0	0	0	0	—
B3	6.0	M,Sh	1	2	3	0.50	0	2	40	0	0	0	—
B4	6.0	M,Sh	1	0	1	0.17	0	0	0	0	0.1	0.1	0.01
C1	6.0	M	0	0	0	—	0	0	0	0	0	0	—
C2	6.0	M	0	0	0	—	0	0	0	0	0	0	—
C3	6.0	M,Sh	0	1	1	0.17	0	0	0	0	0.5	0.5	0.08
C4	6.0	M,Sh	0	0	0	—	0	0	0	0	0.1	0.1	0.01
D2	6.0	M	0	0	0	—	0	0	0	0	0	0	—
D3	6.0	M,Sh	0	0	0	—	0	0	0	0	0.1	0.1	0.01

Notes:

1. Samples were taken with hand tongs.
2. Densities are averages.

Table 8

Results of Sampling Leased Area 7 (Nansemond Fish & Oyster Co.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
J8	No sample												
J9	10.5	M,Sh	0	0	0	—	0	0	0	0	0.5	0.5	0.05
J10	10.5	M,Sh	0	0	0	—	0	0	0	0	0.5	0.5	0.0o5
J11	10.5	M,Sh	2	0	2	0.19	0	0	0	1.3	0.2	1.5	0.14
J12	10.5	M,Sh	4	4	8	0.76	0	0	0	0.3	0	0.3	0.03
J13	10.5	M	0	0	0	—	0	0	0	0	0	0	—
J14	10.5	M,Sh	0	1	1	0.10	0	0	0	0	1.0	1.0	0.10
J15	10.5	M	0	0	0	—	0	0	0	0	0	0	—
J16	10.5	M	0	0	0	—	0	0	0	0	0	0	—
J17	10.5	M	0	0	0	—	0	0	0	0	0	0	—
J18	10.5	M	0	0	0	—	0	0	0	0	0	0	—
J19	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K8	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K9	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K10	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K11	10.5	M,Sh	1	1	2	0.19	0	1	30	0.5	0	0.5	0.05
K12	10.5	M,Sh	7	1	8	0.10	1	2	20	2.0	0	2.0	0.19
K13	10.5	M,Sh	0	0	0	—	0	0	0	1.0	0	1.0	0.10
K14	10.5	M,Sh	2	0	2	0.19	0	1	30	0	0	0	—
K15	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Table 8 (Con't)

Results of Sampling Leased Area 7 (Nansemond Fish & Oyster Co.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
K16	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K17	10.5	M,S	0	0	0	—	0	0	0	0	0	0	—
L8	No sample												
L9	10.5	M	0	0	0	—	0	0	0	0	0	0	—
L10	10.5	M,Sh	0	0	0	—	0	0	0	0	0.5	0.5	0.05
L11	10.5	M,Sh	1	0	1	0.10	1	0	0	1.5	0	1.5	0.14
L12	10.5	M,Sh	1	0	1	0.10	0	1	50	0	2	2	0.19
M8	No sample												
M9	10.5	M	0	0	0	—	0	0	0	0	0	0	—
M10	10.5	M,Sh	1	1	2	0.19	0	1	30	0	2	2	0.19
M11	10.5	M,Sh	0	0	0	—	0	2	NA	1.5	0	1.5	0.14
M12	10.5	M,Sh	0	0	0	—	0	0	0	0	2	2	0.19

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 9

Results of Sampling Leased Area 8 (Nansemond Fish and Oyster Co.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Quantity (Quarts) Surface	Buried	Total	Density of Total Qts/ft^2
D11	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D12	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D13	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D14	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs
2. Densities are averages.

Table 10

Results of Sampling Leased Area 9 (Ingersoll)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
C8	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D7	10.5	M,Sh	6	3	9	0.86	2	2	18	2.4	0.6	3.0	0.29
D8	10.5	M	0	0	0	—	0	0	0	0	0	0	—
D9	10.5	M	0	0	0	—	0	0	0	0	0	0	—
E7	10.5	M,Sh	4	5	9	0.86	1	1	10	4	1	5	0.48
E8	10.5	M	0	0	0	—	0	0	0	0	0	0	—
E9	10.5	M	0	0	0	—	0	0	0	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 11

Results of Sampling Leased Area 10 (Newman OYS.FMS.)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Quantity (Quarts) Surface	Buried	Total	Density of Total Qts/ft^2
J6	10.5	M,Sh	0	0	0	—	0	0	0	0	0.17	0.17	0.02
J7	10.5	M,Sh	2	0	2	0.19	0	0	0	0.09	0	0.09	0.01
K6	10.5	M,Sh	0	0	0	—	0	0	0	0	0.34	0.34	0.03
K7	10.5	M,Sh	3	0	3	0.29	1	0	0	2	0	2	0.19
L6	10.5	M,Sh	1	0	1	0.10	0	0	0	0	0.45	0.45	0.04
L7	10.5	M,Sh	1	0	1	0.10	0	0	0	0	0.17	0.17	0.02
M6	10.5	M,Sh	0	0	0	—	0	0	0	0	0.51	0.51	0.05
M7	10.5	M,Sh	2	0	2	0.19	0	0	0	0	1.5	1.5	0.14

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 12

Results of Sampling Leased Area 11 (Geistel)

Station	Area Sampled ft^2	Bottom Type	Live Oysters					Boxes		Shell			
										Quantity (Quarts)			
			Large	Small	Total	Density of Total No/ft^2	Spat	Number	Percent of total	Surface	Buried	Total	Density of Total Qts/ft^2
J3	10.5	M	1	1	2	0.19	0	0	0	0	0	0	—
J4	10.5	M,Sh	0	1	1	0.10	0	0	0	0	0.5	0.5	0.05
J5	10.5	Sh	4	0	4	0.38	0	2	30	2	0	2	0.19
K4	10.5	M	0	0	0	—	0	0	0	0	0	0	—
K5	10.5	M	0	0	0	—	0	1	NA	0	0	0	—

Notes:
1. Samples were taken with hand tongs.
2. Densities are averages.

Table 13

Estimates of Quantities of Live Oysters and Shell in Sampled Portions of Leased Oyster Ground Outside the Right-of-Way

Area Number & Name of Lessee[1]	Portion of Lease in Area acres	LIVE OYSTERS Est. Average Density bu/ac	LIVE OYSTERS Estimated Quantity bu	SHELL Est. Average Density bu/ac	SHELL Estimated Quantity bu
1. Gay	5.50	8.7	47.9	0.2	1.0
2. Nansemond F&O	1.89	8.7	16.5	0	0
3. Ward	1.51	52.3	78.9	2.6	4.0
4. Hatton, et al.	2.18	59.6	129.9	34.5	75.3
5. Crittenden	1.36	0	0	2.0	2.8
6. Martin	2.91	22.3	65	1.6	4.7
7. Nansemond F&O	6.05	23.2	140.6	7.2	43.6
8. Nansemond F&O	1.23	0	0	0	0
9. Ingersoll	1.23	46.5	57.2	28.9	35.6
10. Newman	2.02	21.3	43.0	26.9	54.2
11. Geistel	1.10	25.2	27.7	37.7	41.5

Notes:
1. See Table 1-U

APPENDIX

Methods and constants used in making calculations

1. The area of the bottom which the hand tongs covered was controlled by tying the shafts of the tongs, thereby controlling the distance which the head could be opened. A smaller set of tongs was used in the SW quadrant upriver while working on low water.
2. The following numbers of live oysters per bushel were used for the various leased areas (based upon samples):

Leased Area	Number
1	100
2	100
3	100
4	117
5	117
6	117
7	150
8	NA
9	225
10	225
11	225

3. The average number of shells, based up on samples, in one quart was 11.7.
4. Estimated densities of oysters and shell were calculated as shown:

   For a given Lease.

a. Total oyster in all samples divided by total area of all samples = oysters/ft^2.

b. Total quarts shell in all samples divided by total area of all samples = qts shell/ft^2.

5. Estimated quantities of oysters and shell were calculated as shown:

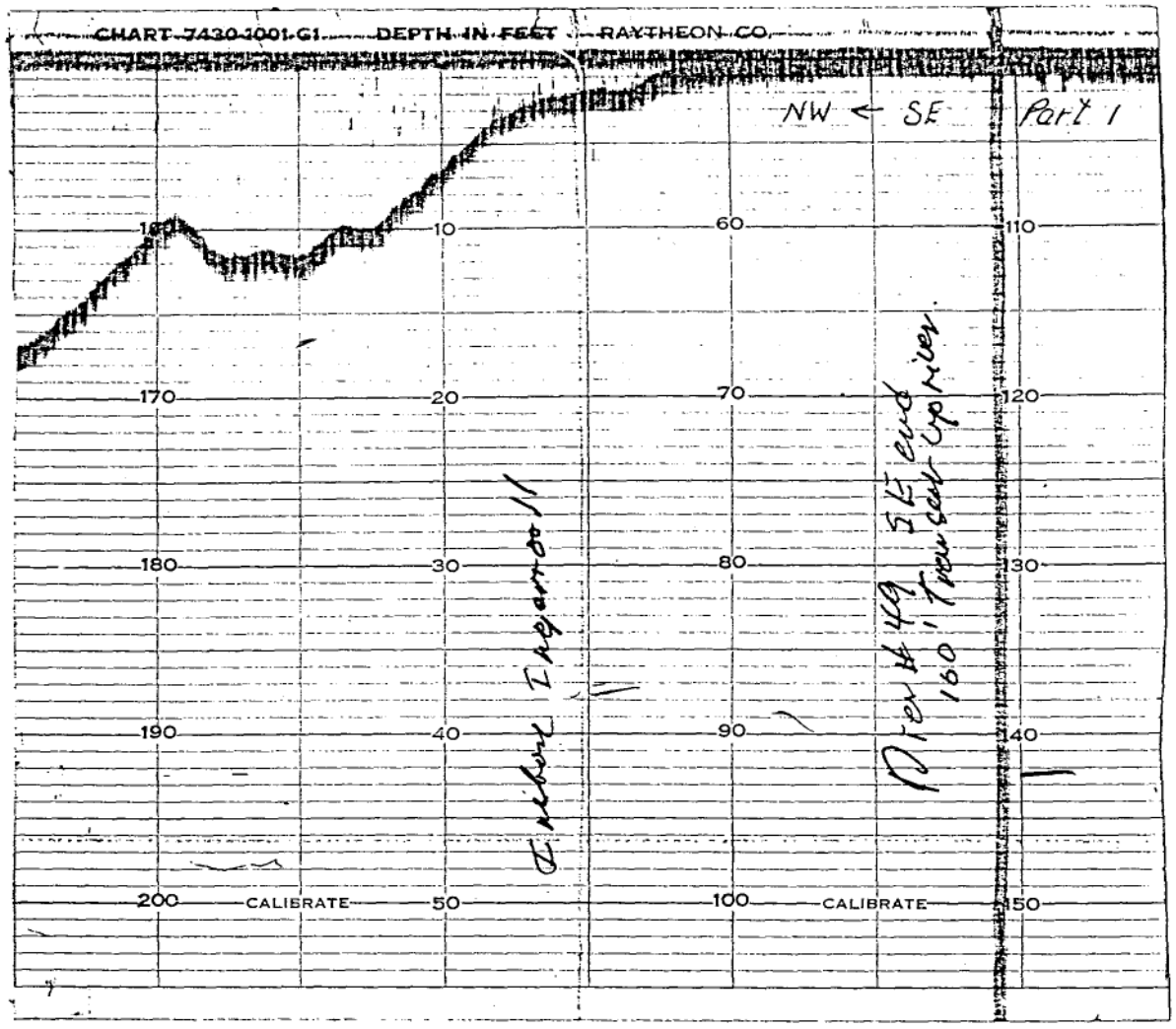
For a given Lease.

a. 43,560 ft^2 divided by summation of sample areas X no. of oysters in samples divided by bushel count = total bushels of oysters.

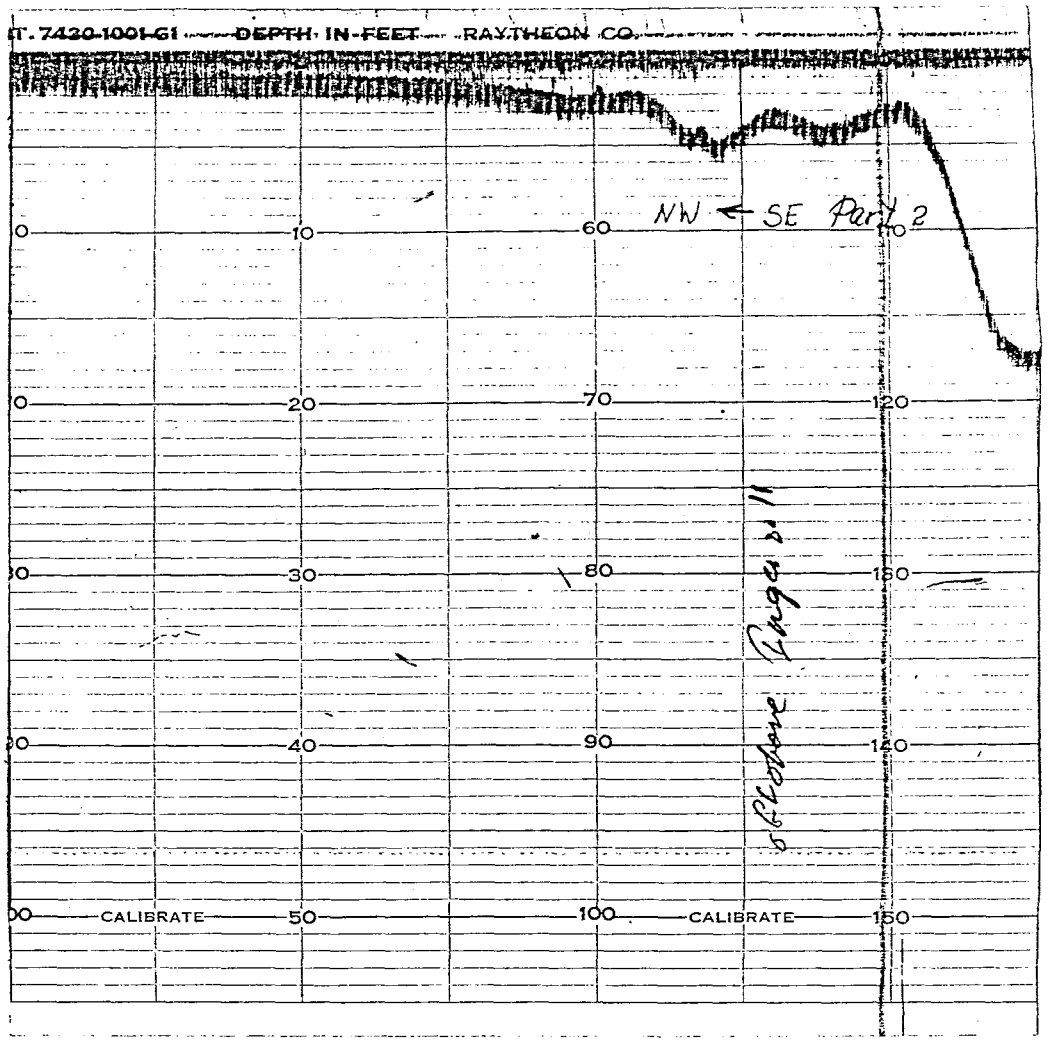
Total bushels of oyster divided by acres = bu/acres

b. 43,560 ft^2 divided by summation of sample areas X no. of quarts shell in samples divided by 50 qts = total bushels of shell.

Total bushel shells divided by acres = bu/acres.

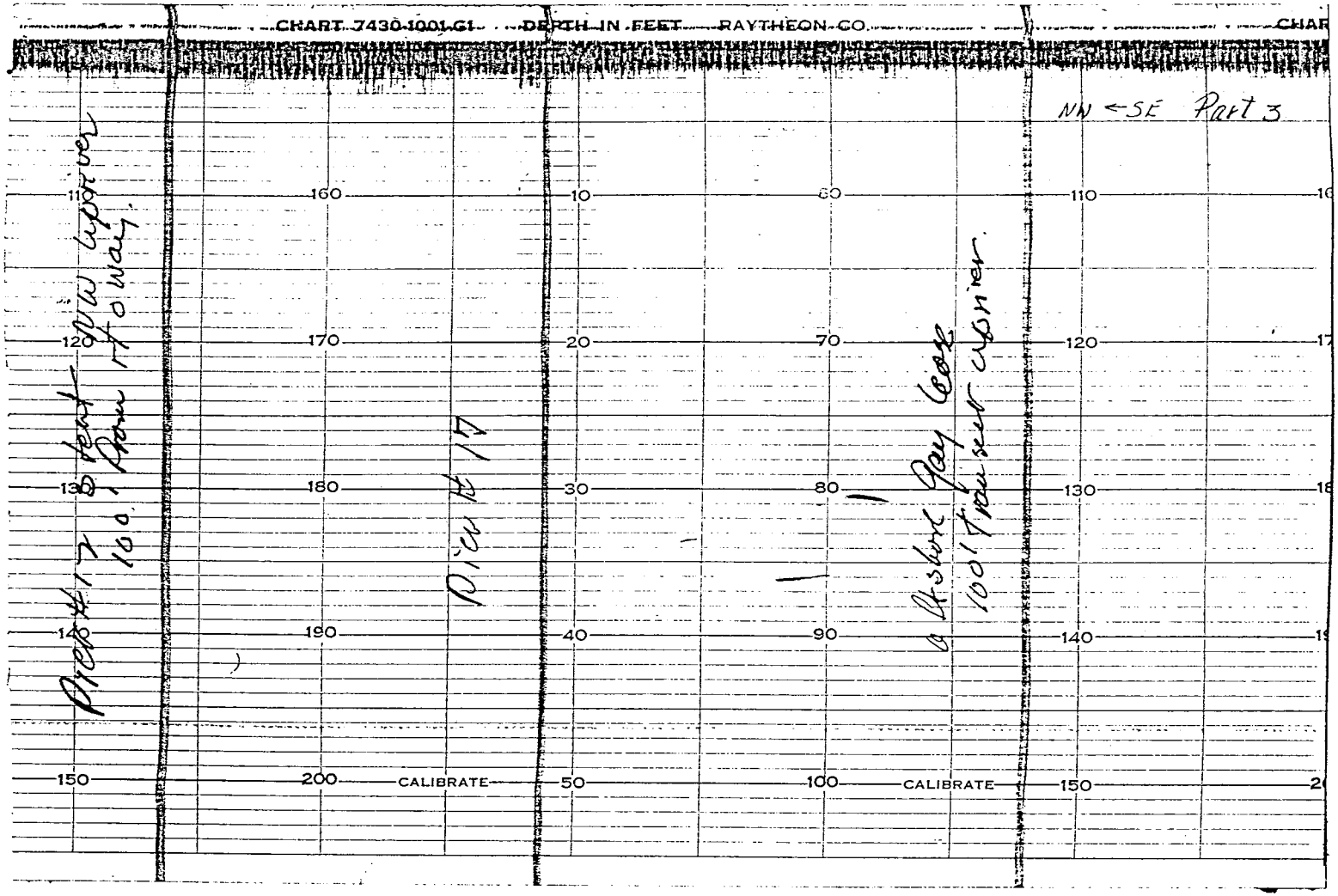


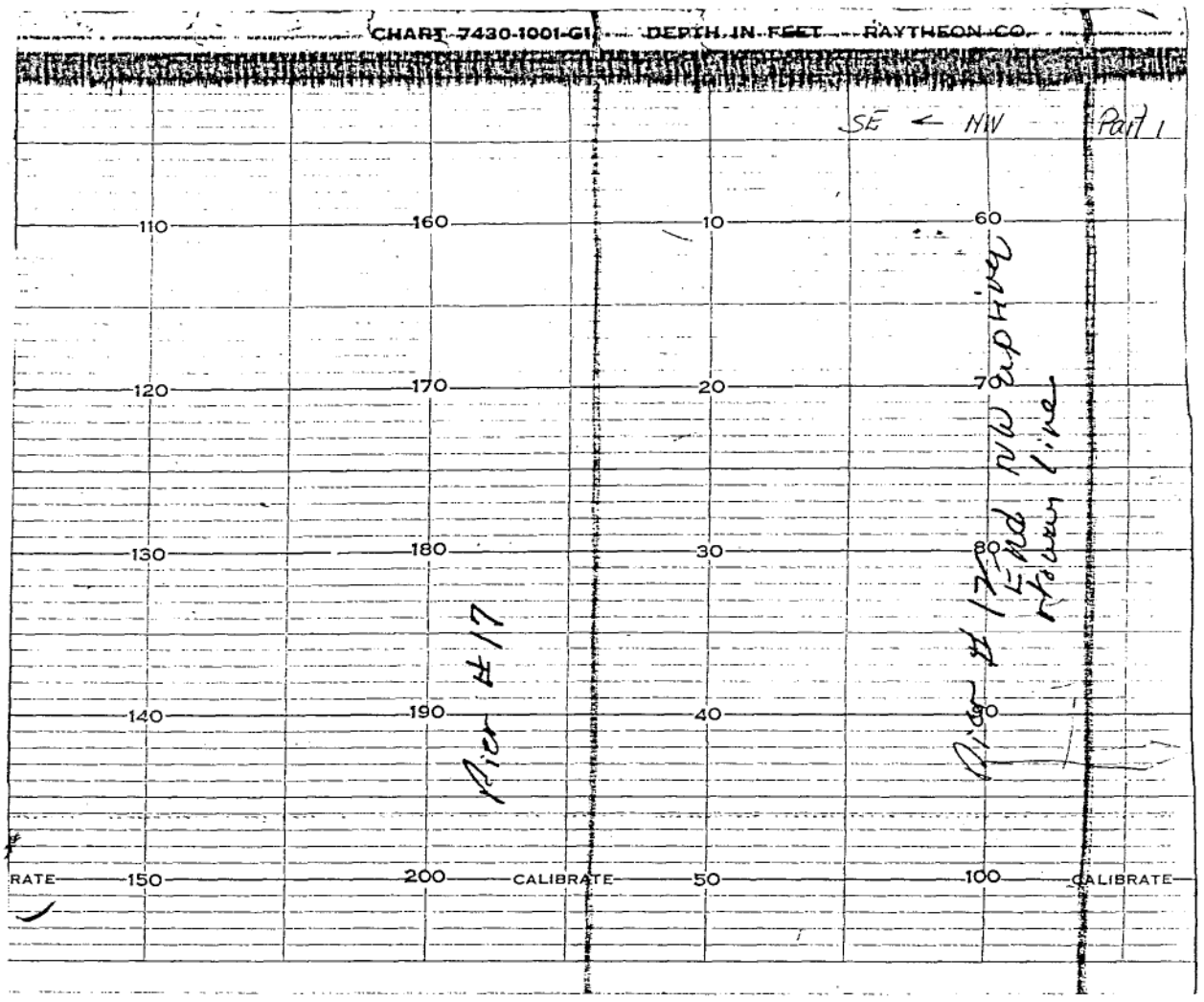
Transect 1. 100 feet above upriver **right** of-way line.



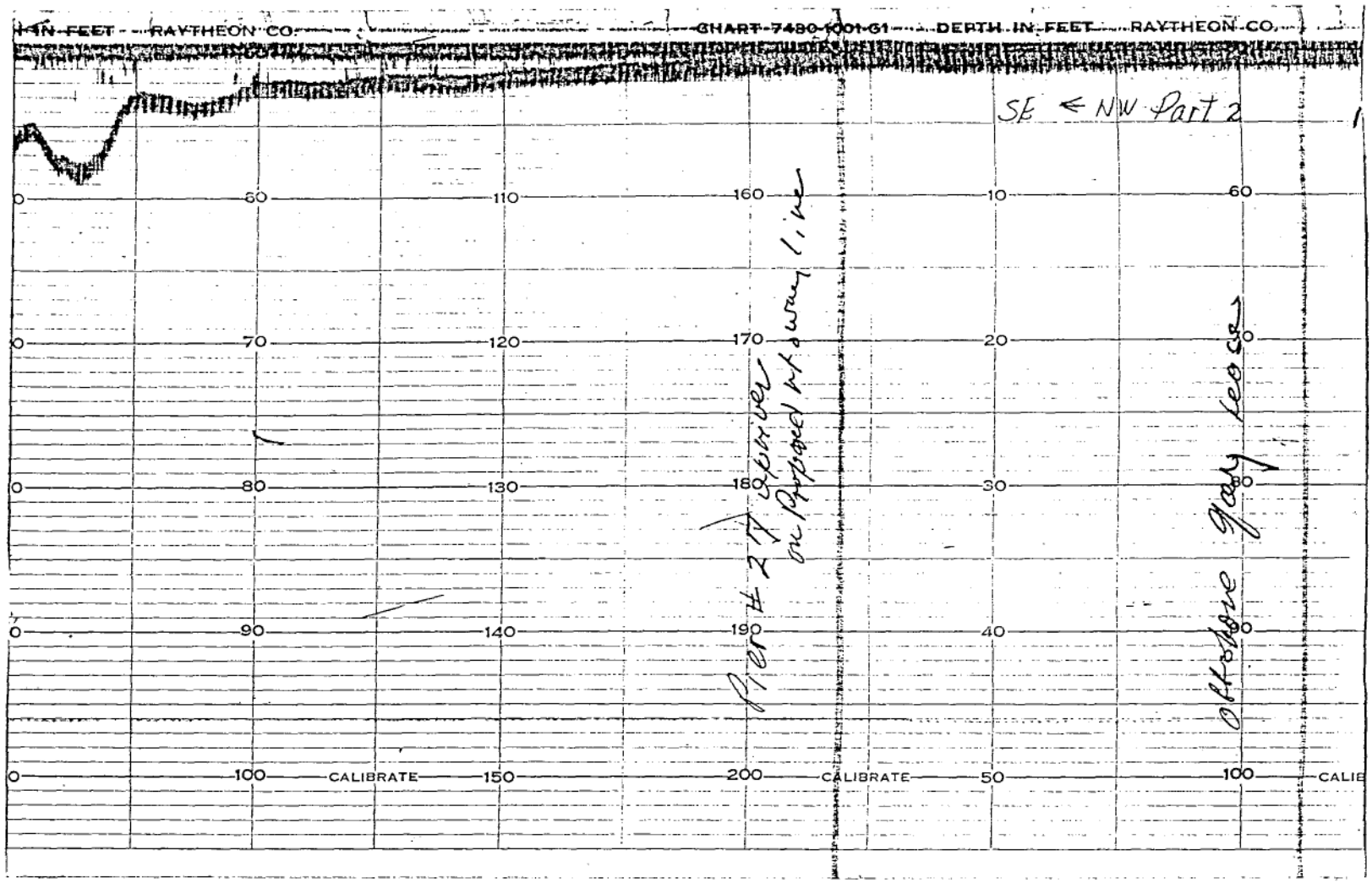
Transect 1. con't.

Transect 1. con't



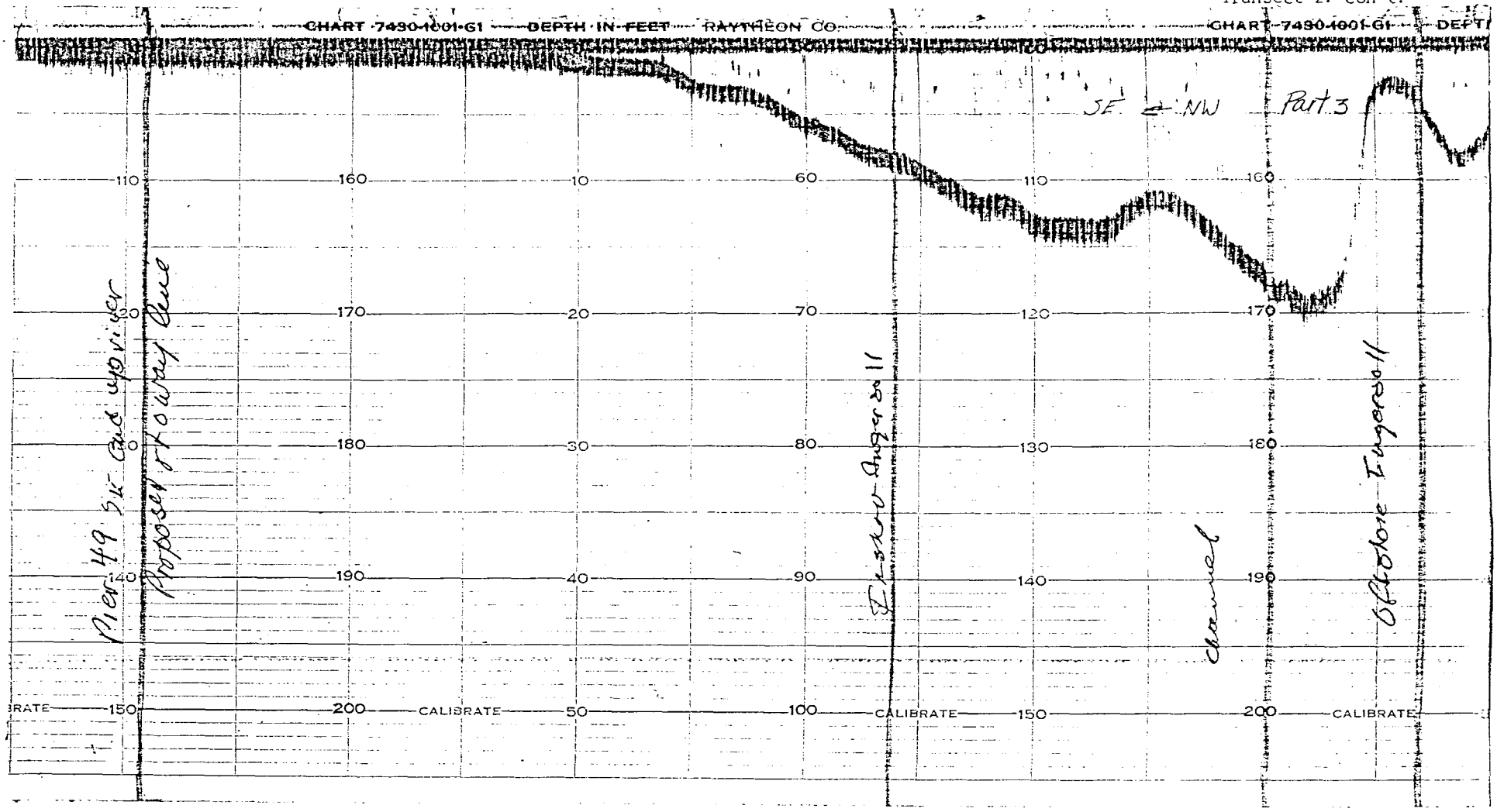


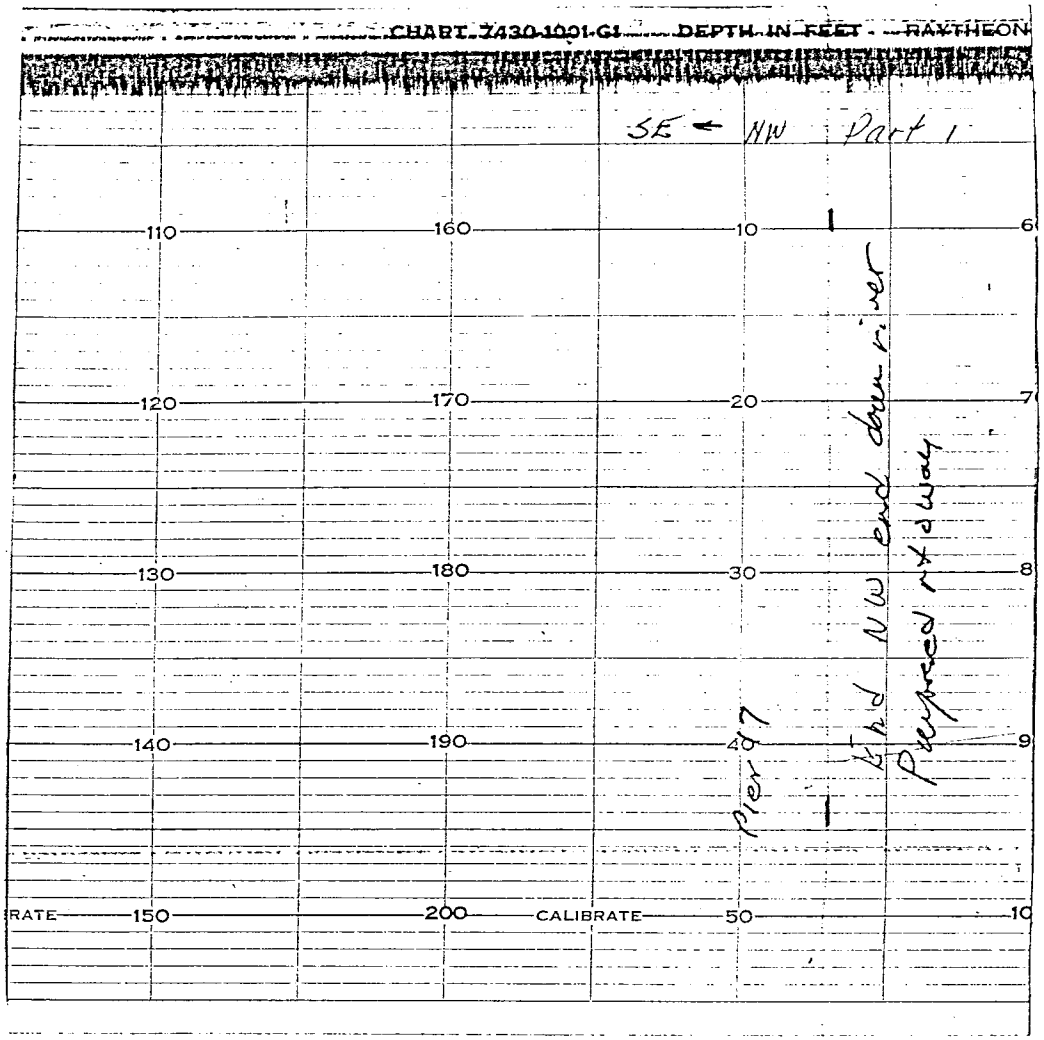
Transect 2. Upriver right-of-way line.



Transect 2. con't.

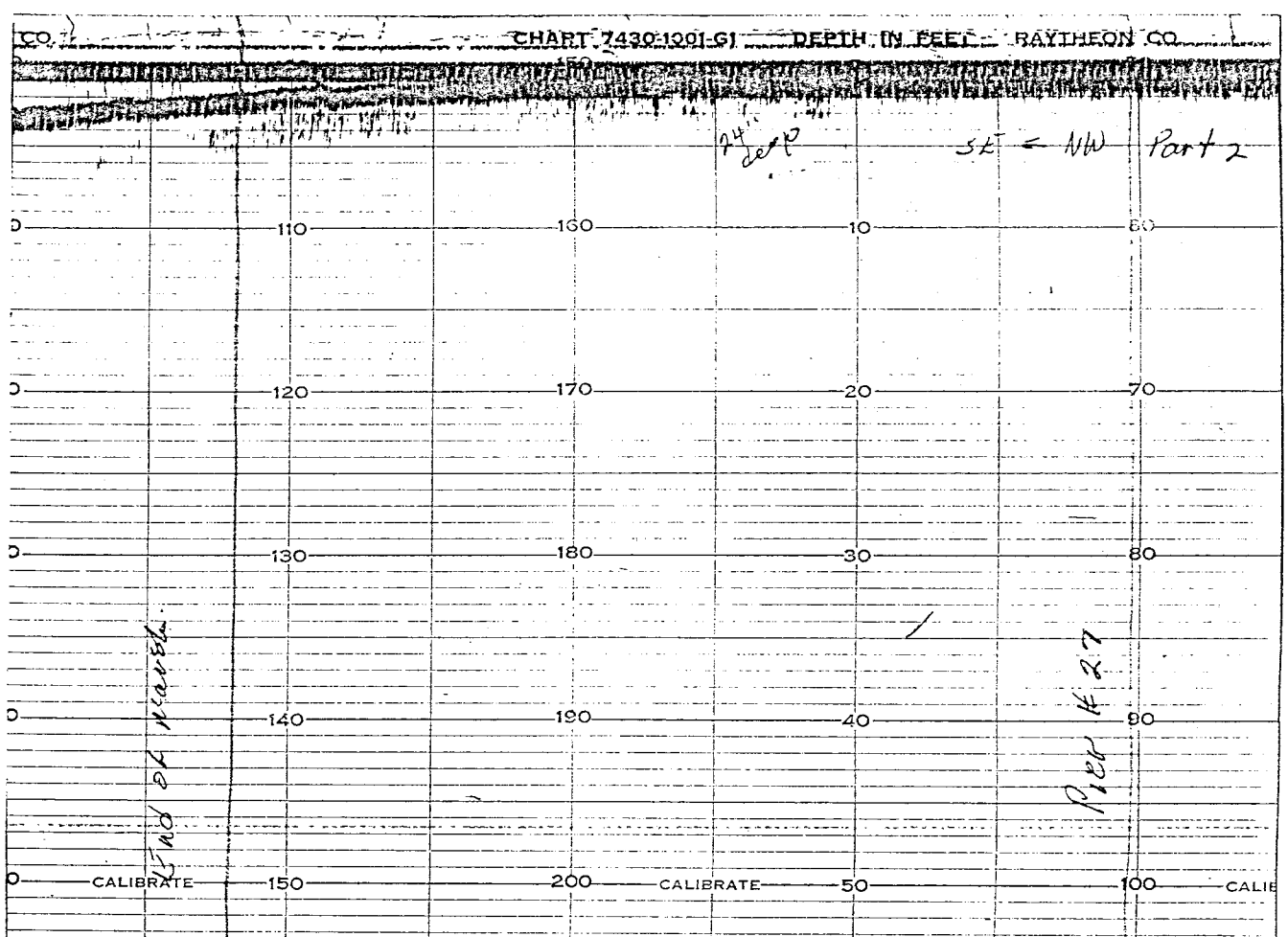
Transect 2. con't.



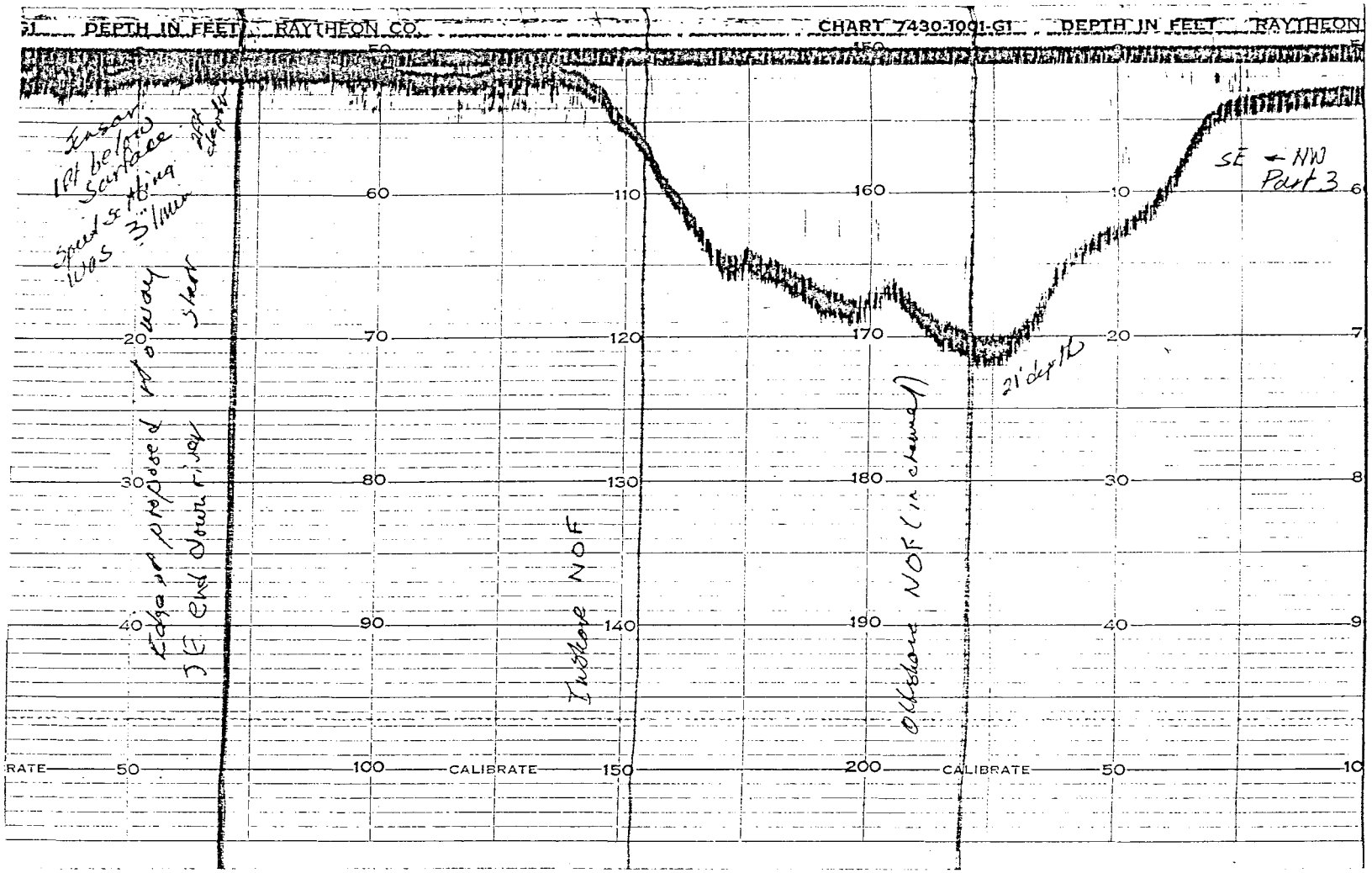


Transect 3. Downriver right-of-way line.

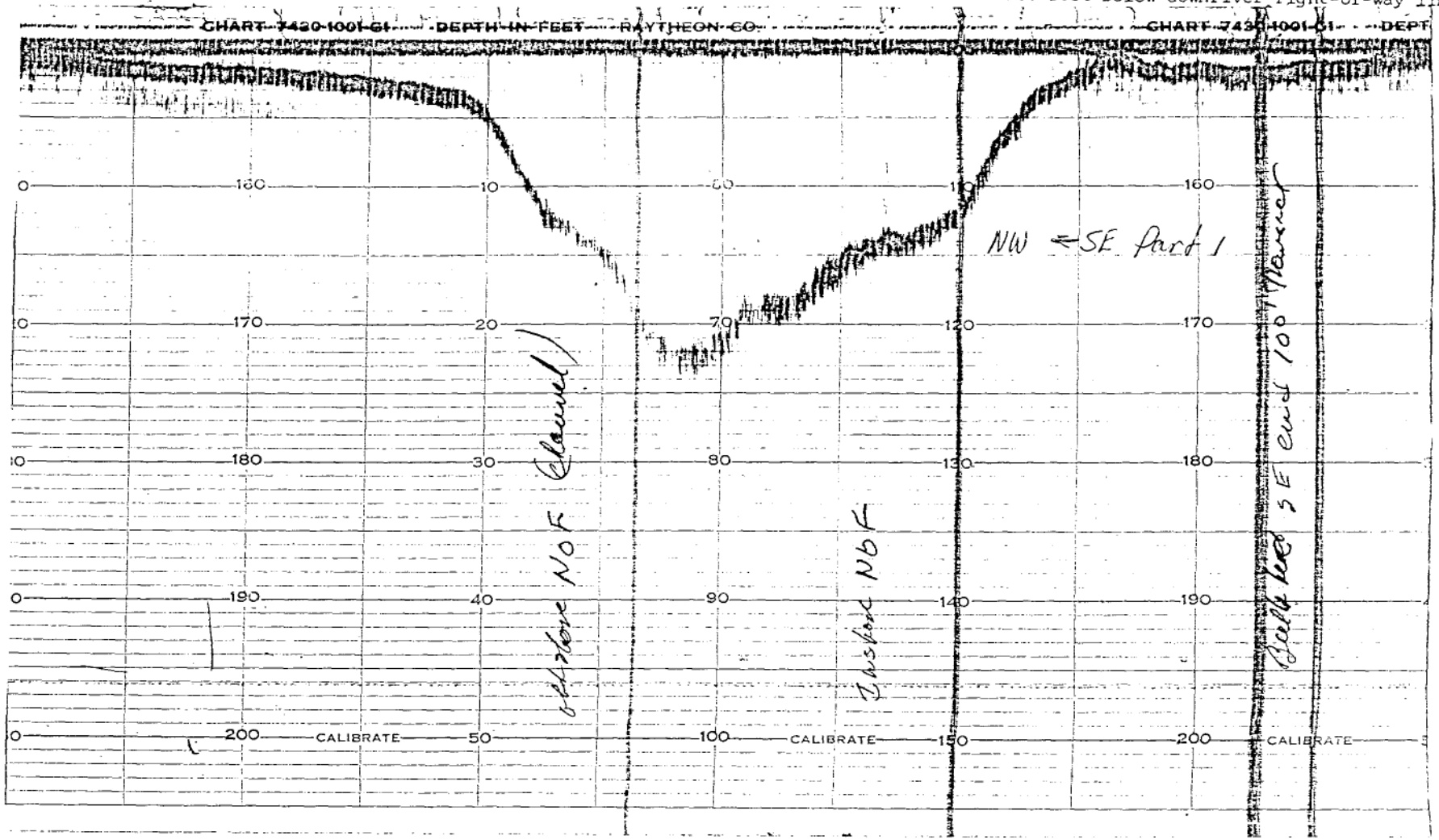
Transect 3. con't.



Transect 3. con't.



Transect 4. 100 feet below downriver right-of-way line.



Transect 4. con't.