

Study of Leased Oyster Ground at the Site of the  
Proposed Route 143 Bridge Across Hampton River

Conducted for the  
Virginia Department of Highways and Transportation  
Project 0143-114-102, RW-201

by

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## INTRODUCTION

A study of leased oyster planting ground in the vicinity of the proposed Route 143 Bridge across Hampton River was made by the Virginia Institute of Marine Science in March 1982. The study was made at the request of the Virginia Department of Highways and Transportation in conjunction with Project 0143-114-102, RW-201.

### The Hampton River - A Review

The Hampton River is a short estuary which runs into the lower James (Hampton Roads); the area studied in our survey is located in the City of Hampton. The height of the existing Queen Street Bridge across the lower end of the study area prevents large boats from going upriver of it. Partly for that reason, both banks upriver of this bridge are residential. Below the existing Queen Street Bridge there is much industrial activity, heavy boat traffic, and several large marinas (Figure 1).

The Virginia Department of Health has restricted the harvest of shellfish from Hampton River to prevent them from being sent directly to market for human consumption. Restrictions require that harvesting from a restricted area be done only after permission has been obtained from the Health Department, and only during a certain time of year. Shellfish must be transported to an area where the water has no health restrictions and planted or relaid there for a minimum of 15 days with water temperature over 50°F. Relaying oysters adds greatly to the seller's cost since it means a double harvest; also, it is not economically feasible to recover more than about 70% of the oysters during each of the

two harvests. Therefore, relaying oysters is regarded by most commercial growers as economically impractical.

The bottom in the area near and upriver of the proposed bridge was sandy near the banks; it became progressively softer (largely mud) as it sloped toward the channel. The depth in the channel was about 14 feet<sup>1</sup> at the Queen Street Bridge but quickly became shallower going upriver toward I664. The single lease studied downriver of the bridge was in a shallow area (4 ft) some distance inshore of the deep channel (Figure 1).

Salinities in the area are satisfactory for oyster and hard clam growth since they range from about 20 parts per thousand (‰) in fall to 18‰ in spring.

The oyster pathogens "MSX", Minchinia nelsoni, and "Dermo", Perkinsus marinus, are endemic to Hampton Creek. These diseases are capable of causing extensive oyster mortalities in years when fall salinities exceed about 15‰.

## METHODS

### Locating Leased Grounds

Locations of plots of leased oyster ground were taken from chart 255-2620 prepared by the Virginia Marine Resources Commission (Figure 1). In the river, leased plots were located by reference to stakes at the corners of the leases placed there by VMRC engineers.

<sup>1</sup>Depths less than on NOAA chart.

## The Sampling Plan

The area to be studied was gridded into squares 100 feet on a side with the grid-axis approximately paralleling the route of the proposed bridge.<sup>2</sup> VIMS personnel put down additional stakes 100 feet apart to be used as references in locating stations. Stations were located in the centers of the grid-squares.

An area 600 feet up-and downriver from the proposed bridge route was chosen for study. The entire area upriver of the existing bridge was occupied by leased ground; below the existing bridge in the study area there was only one lease. Figure 1 shows the area sampled. The leaseholders, acreages held, acreages studied, numbers of stations and samples are shown for each lease in Table 1.

## Method of Taking Samples

At each station two samples or "licks" were taken with oyster tongs by an experienced tonger. The following observations were made and recorded for each sample:

1. Numbers and volumes of large oysters;
2. Numbers and volumes of small oysters;
3. Numbers and volumes of hard clams;
4. Volumes of loose shell material;
5. That portion of loose shell which had been resting on the surface of the bottom and that which had been buried in the bottom; and,
6. Numbers of oyster boxes (intact shells of dead oysters).

<sup>2</sup>The grid was oriented on a preliminary drawing which was later modified in its location of the proposed bridge. Correcting the location of the bridge made the grid less parallel than planned, but this had no effect on sampling.

6 hard clams, and 33.7 quarts of shell (almost entirely oyster shell), (Tables 3 and 3a). Using calculations shown in Table 2, we estimated quantities present as follows: large oysters - 376 bushels; small oysters - 225 bushels; hard clams - 26 bushels; and shell - 857 bushels (Table 4). A few oyster spat (oysters which had set in the summer of 1981) were seen.

Recent mortalities of oysters, based on counts of boxes (i.e. hinged shells of dead oysters) was 25%.

Sixty-four percent of the oysters were classed as small (less than 3 inches in length). Oysters and shell occurred in isolated patches, not in a continuous distribution. Wherever shells were found, the bottom was firmer than the surrounding soft mud; firmness increased with the amount of shell. On many of these patches of shell oysters were found; oysters were not found on the soft mud surrounding the patches.

Fathometer recordings of the bottom profile in the area along transects 1, 2, 4, 5, 6, 7, 9, 10, 11, and 12 (Figure 2 and Appendix) indicate that the bottom was mostly smooth with a number of low irregular rises which were probably patches of shell and/or oysters.

#### A Portion of Darling's Lease Outside the Proposed Temporary Construction Easement

An area of 9.20 acres of Darling's lease was sampled outside the proposed easement (Figure 1). The bottom was mud with small isolated patches of scattered shell. Depths of water varied from 9 feet in the middle of the river to about 3 feet close to shore.

Here 86 samples taken at 38 locations yielded 34 large oysters, 30 small oysters, 15 hard clams and 49.1 quarts of shell; some spat were

found. In taking these 86 samples, the tongs covered 294.4 square feet of bottom (Tables 3 and 3a). Estimated quantities were as follow: large oysters - 230 bushels; small oysters - 92 bushels; hard clams - 71 bushels; and shell - 1,337 bushels (Table 4).

Boxes accounted for 30% of the total of live and dead oysters found. Forty-seven percent of the live oysters were under three inches long.

Traces of the bottom topography made by the fathometer along transects 2, 6, 7, 8, 9, 10, 11, and 12 (Figure 2 and Appendix) show a generally smooth bottom with a number of low rises where most of the oysters were found.

#### Stocker's Lease

This 2.5 acre lease lay along the shoreline of the West side of the river, and was entirely outside the proposed temporary construction easement (Figure 1). Twelve samples taken at six locations yielded no oysters (either live or boxes), no clams, and a minimal amount (1.1 quart of shell), (Table 5). The entire quantity of shell was estimated at only 60 bushels (Table 4).

Portions of fathometer transects 10 and 11 (Figure 2 and Appendix) indicate that the bottom at those locations was generally smooth and flat. The exception to the foregoing was a 2-foot high lump which represented the bar off a nearby point of land. Probing the bottom with a metal pole as well as digging the bottom with the tongs indicated that the bottom was composed only of mud and sand.

### A Portion of Gordon's Lease

One and three-fourths acres of this lease were within the study area (Figure 1). In 14 samples tonged at 7 stations no oysters or clams and 1.6 quarts of shell were found (Table 6). The estimated quantity of shell present, based on the results of sampling was only 56 bushels (Table 4).

Parts of two fathometer transects (Figure 2) crossed this area. The fathometer traces (Appendix: Transects 10 and 11) indicate a smooth bottom.

### Tabb's Lease

This 1.34 acre lease was downriver of the Queen Street Bridge on the East side (Figure 1). Live oysters (19) were found at three of the six stations where sampling was conducted. In addition, 2 hard clams and 9.5 quarts of shell were found (Table 7). Based on the above results, the following quantities were estimated for the lease: 34 bushels of large oysters; 32 bushels of small oysters; 10 bushels of hard clams; and 257 bushels of shell (Table 4). About three percent of the shell recovered during tonging had been resting on the surface of the bottom; the remainder had been buried in the soft mud. Recent mortality, as indicated by the box count (14%), had been lower than on other grounds sampled.

A fathometer was not used on this lease due to the presence of a barge over part of one end of the lease and the shallowness of the inshore edge of the lease.

## SUMMARY

The study area in Hampton Creek is restricted for oyster culture by the Virginia Department of Health. However, environmental factors are such that it supports small natural populations of oysters and hard clams. It is quite possible that the Hampton Creek area was used commercially for oyster culture in the mid to early 1950's, but since that time (to the authors' knowledge) it has not been used commercially.

On Darling's lease there was appreciable volumes of shell which were covered with soft mud. Scattered over this area were isolated lumps or islands of exposed shell where live oysters occurred.

Stocker's and Gordon's leases were soft mud, and there was no evidence of their having been productive during recent years.

Tabb's lease was similar to Darling's in respect to bottom type and occurrence of oysters.

There follows our estimates of values of the resource on each lease. These values are clearly maximal since it is seldom economically feasible to harvest oysters where densities are less than about 20-30 bushels per acre. Where hard clam density is less than about 8 bushels per acre it is seldom economically feasible to harvest them.

### Darling's Lease Inside the Proposed Temporary Construction Easement

Of Darling's lease, 5.62 acres were included in the proposed easement; no other leased ground was in the easement area (Figure 1). Within the proposed easement there were the following estimated quantities: 376 bushels of large oysters; 225 bushels of small oysters; 857 bushels of shell; and 26 bushels of hard clams (Table 4).

In estimating the value of the oysters the prices of \$12 per bushel of large oysters and \$6 per bushel for small oysters are reasonable. However, these were halved since the harvest of shellfish from the study area is restricted. A price of \$0.40 was used for planting a bushel of shell because that was the approximate price in 1981. A price of \$17.28 per bushel was used to estimate the value of hard clams because clam dealers have paid 6¢ apiece for cherrystone clams from restricted areas. Estimated values of the oysters, clams and shell were as follow:

large oysters	\$2,256.00
small oysters	\$ 675.00
shell	\$ 342.80
clams	\$ 449.28 <sup>3</sup>

A Portion of Darling's Lease Outside the Proposed Temporary Construction Easement

An additional 9.2 acres of Darling's lease was sampled and estimated to contain 230 bushels of large oysters, 92 bushels of small oysters, 1,337 bushels of shell, and 71 bushels of hard clams. Values were estimated as follow:

large oysters	\$1,380.00
small oysters	\$ 275.00
shell	\$ 534.80
clams	\$1,226.88 <sup>3</sup>

<sup>3</sup>Table 4 shows hard clam densities on Darling's ground vary from 4.6 to 7.7 bu/acre. These are low densities and it is doubtful that they could be harvested economically.

Stocker's Lease

No oysters or clams and negligible shell was found here.

Part of Gordon's Lease

No oysters or clams and negligible shell was found here.

Tabb's Lease

Oysters were found at three locations. The estimates of quantity and value are as follow:

	<u>Quantity</u>	<u>Value</u>
large oysters	34 bu	\$204.00
small oysters	33 bu	\$ 96.00
shell	257 bu	\$102.80
clams	10 bu	\$172.80 <sup>4</sup>

<sup>4</sup>The density of clams was only 7.5 bu/acre (Table 4). It is doubtful that this resource could be economically harvested.

Table 1

Oyster Ground Leases Studied, Number of Stations and Samples  
Taken in the Vicinity of the Proposed Route 143 Bridge  
Across Hampton River - March 1982.

<u>Lessee's Name</u>	<u>Area Studied (Acres)</u>	<u>Number of Stations</u>	<u>Number of Samples</u>
Darling, J. S. & Son			
a- in proposed temporary construction easement	5.62	26	56
b- outside proposed easement	9.20	38	86
c- overall	14.82	64	142
Gordon, Jerome <sup>1</sup>	1.75	7	14
Stocker, Ann H. <sup>1</sup>	2.50	6	12
Tabb, Thomas <sup>1</sup>	1.34	6	12

<sup>1</sup>All acreage outside proposed easement.

Table 2

Methods of Calculating Estimates of Densities and Quantities of Oysters and Shell.

1. Calculation of the area covered by each grab of the tongs was done in the following manner (this calculation was done for both pair of tongs used:

The distance which the tongs were open was the same each time a pair of tongs were used because the heads of the tongs were tied. The opening distance and the length of the tong heads were measured and multiplied to give the area of the bottom covered per grab or "lick".

2. Oysters and clams collected in a day's sampling were returned to the laboratory where they were volumed and numbers/bushel was calculated. These data were used to calculate bushels/acre. These data follow:

	<u>Number per VA Bushel</u>
Large (3" or longer) oysters	200
Small and yearling oysters	585
Hard clams	288
Shell	610

3. Estimates of density of shellfish and shell were calculated as shown:

Data from Station A7 - on Darling's lease - is used as an example: 4 large oysters, 4 small oysters, and 1.0 quart of surface shell were tonged up from an area of bottom measuring 14.24 square feet.

$$4 \text{ lg. oysters} \div 14.24 \text{ square feet} = 0.28 \text{ lg. oysters/ft}^2$$

$$4 \text{ sm. oysters} \div 14.24 \text{ square feet} = 0.28 \text{ sm. oysters/ft}^2$$

$$1.0 \text{ qt shell} \div 14.24 \text{ square feet} = 0.07 \text{ qt/ft}^2$$

4. Estimates of quantities of oysters and shell were calculated as shown:

Data from the easement across the Darling lease (an area of 5.62 acres), for example, (26 stations) show that 59 large oysters, 103 small oysters, 6 clams, and 33.7 quarts of shell were tonged from an area of 192.5 square feet of bottom.

Table 2 (Contd.)

- 59 large oysters  $\div$  192.5 ft<sup>2</sup> X 43,560 ft<sup>2</sup>/acre  $\div$  200 large oysters/bushel X 5.62 acres = 375 bushels of large oysters
- 103 small oysters  $\div$  192.5 ft<sup>2</sup> X 43,560 ft<sup>2</sup>/acre  $\div$  585 small oysters/bushel X 5.62 acres = 224 bushels of small oysters
- 6 clams  $\div$  192.5 ft<sup>2</sup> X 43,560 ft<sup>2</sup>/acre X 5.62 acres = 26 bushels
- 33.7 quarts shell  $\div$  50 quarts/bushel  $\div$  192.5 ft<sup>2</sup> X 43,560 ft<sup>2</sup>/acre X 5.62 acres = 857 bushels of shell

Table 3

Results of Sampling Part of Darling's Lease Adjacent to the Proposed Route 143 Bridge Over Hampton River and Estimates of Density - March 1982.

## OYSTERS

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No./ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Total
			Lg (>3")	Sm (<3")	Total	Lg	Sm			
A. Outside Proposed Temporary Construction Easement										
G 8	R	14.24	10	4	14	0.7	0.3	6	20	30
9	S	7.12	0	0	0	--	--	1	1	100
10	S	7.12	0	0	0	--	--	0	0	--
A 4	M	6.14	0	1	1	--	0.2	2	3	67
5	M	6.14	0	0	0	--	--	0	0	--
6	M	12.28	1	0	1	0.1	--	0	1	0
7	M	14.24	4	4	8	0.3	0.3	6	14	43
8	M	7.12	6	9	15	0.8	1.3	5	20	25
9	M	7.12	0	0	0	--	--	0	0	--
10	M	7.12	0	0	0	--	--	0	0	--
11	M	7.12	1	0	1	0.1	--	0	1	0
B 1	S	7.12	0	0	0	--	--	0	0	--
2	M	7.12	0	0	0	--	--	0	0	--
3	M	7.12	0	0	0	--	--	0	0	--
4	M	7.12	0	0	0	--	--	0	0	--
5	M	7.12	0	0	0	--	--	0	0	--
7	M	6.14	0	0	0	--	--	0	0	--
8	M	6.14	0	0	0	--	--	0	0	--
9	M	6.14	0	0	0	--	--	0	0	--
10	M	7.12	0	2	2	--	0.3	3	5	60
11	M	7.12	1	0	1	0.1	--	0	1	0
C 2	S, Sh	7.12	1	4	5	0.1	0.6	0	5	0
3	S, Sh	7.12	2	0	2	0.3	--	0	2	0
4	Sm, Sh	7.12	0	0	0	--	--	0	0	--
7	M	6.14	2	1	3	0.3	0.2	2	5	40

Table 3 (Contd.)

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No./ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Total
			Lg (>3")	Sm (<3")	Total	Lg	Sm			
C 8	M	7.12	0	0	0	--	--	0	0	--
9	M	14.24	4	6	10	0.3	0.4	3	13	23
10	M	14.24	0	0	0	--	--	0	0	--
11	M, Sh	7.12	2	9	11	0.3	1.3	2	13	15
12	S, Sh	7.12	0	0	0	--	--	0	0	--
D 8	M	6.14	0	0	0	--	--	0	0	--
9	M	6.14	0	0	0	--	--	0	0	--
10	M	7.12	0	0	0	--	--	0	0	--
11	Sm	7.12	0	0	0	--	--	0	0	--
E 9	M, Sh	6.14	0	0	0	--	--	1	1	100
10	M	6.14	0	0	0	--	--	0	0	--
11	S, M	7.12	0	0	0	--	--	0	0	--
F10	M	7.12	0	0	0	--	--	0	0	--
Totals		294.4	34	40	74	5,031/ acre	5,918/ acre	31	105	30

B. In Proposed Temporary Construction Easement

A 1	M	7.12	0	0	0	--	--	1	1	100
2	M	7.12	7	20	27	1.0	2.8	12	39	31
3	M	7.12	0	1	1	--	0.1	2	3	67
G 1	M	6.14	0	0	0	--	--	0	0	--
2	M	6.14	0	1	1	--	0.2	1	2	50
3	R	6.14	13	4	17	2.1	0.6	3	20	15
4	Sh	6.14	8	8	16	1.3	1.3	6	22	27
5	M	6.14	0	0	0	--	--	0	0	--
6	M	14.24	0	0	0	--	--	1	1	100
7	M	14.24	0	0	0	--	--	0	0	--

Table 3 (Contd.)

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No. ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Total
			Lg (>3")	Sm (<3")	Total	Lg	Sm			
H 2	M	6.14	6	16	22	1.0	2.6	4	26	15
3	M, Sh	6.14	0	2	2	--	0.3	0	2	0
4	M	7.12	0	0	0	--	--	0	0	--
5	M	7.12	0	0	0	--	--	0	0	--
6	R	7.12	12	11	23	1.7	1.5	1	24	4
7	M	7.12	0	0	0	--	--	0	0	--
8	S, M	7.12	0	0	0	--	--	0	0	--
I 2	S	7.12	0	1	1	--	0.1	1	2	50
3	S	7.12	0	0	0	--	--	0	0	--
4	S, M	7.12	0	2	2	--	0.3	2	4	50
5	M	7.12	0	4	4	--	0.6	1	5	20
6	M, Sh	7.12	11	15	26	1.5	2.1	10	36	28
7	S, M	7.12	2	18	20	0.3	2.5	9	29	31
8	S, M	7.12	0	0	0	--	--	1	1	100
J 6	S	7.12	0	0	0	--	--	0	0	--
7	S	7.12	0	0	0	--	--	0	0	--
Totals		192.5	59	103	162	13,351 /acre	23,307 /acre	55	217	25
Overall Totals		486.9	93	143	236	8,320 /acre	12,793 /acre	86	322	27

<sup>1</sup>M = mud; Sm = sandy mud; S = sand; Sh = shell; R = oyster rock.

Table 3a

Results of Sampling Part of Darling's Lease Adjacent to the Proposed Route 143 Bridge Over Hampton River and Estimates of Density - March 1982.

## HARD CLAMS AND SHELL

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
A. Outside Proposed Temporary Construction Easement						
G 8	14.24	1	0.07	6.8	0.48	41
9	7.12	2	0.28	0.1	0.01	(1)
10	7.12	0	--	0.0	--	--
A 4	6.14	0	--	0.6	0.10	0
5	6.14	0	--	1.0	0.16	30
6	12.28	0	--	1.7	0.14	0
7	14.24	0	--	2.4	0.17	42
8	7.12	1	0.14	0.7	0.10	71
9	7.12	0	--	0.9	0.13	33
10	7.12	0	--	0.8	0.11	25
11	7.12	1	0.14	0.8	0.11	(1)
B 1	7.12	0	--	0.1	0.01	0
2	7.12	0	--	0.0	--	--
3	7.12	0	--	0.0	--	--
4	7.12	0	--	0.0	--	--
5	7.12	0	--	0.0	--	--
7	6.14	0	--	0.1	0.02	0
8	6.14	0	--	1.1	0.18	0
9	6.14	0	--	1.8	0.29	0
10	7.12	2	0.28	3.6	0.50	22
11	7.12	2	0.28	3.0	0.42	30
C 2	7.12	1	0.14	1.5	0.21	(1)
3	7.12	0	--	1.0	0.14	50
4	7.12	1	0.14	2.6	0.36	31
7	6.14	0	--	0.0	--	--
8	7.12	1	0.14	0.2	0.03	0
9	14.24	1	0.07	3.5	0.24	34

Table 3a (Contd.)

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
C10	14.24	2	0.14	2.8	0.20	0
11	7.12	0	--	3.0	0.42	75
12	7.12	0	--	3.0	0.42	50
D 8	6.14	0	--	0.2	0.03	0
9	6.14	0	--	0.8	0.13	0
10	7.12	0	--	1.0	0.14	0
11	7.12	0	--	1.8	0.25	0
E 9	6.14	0	--	1.2	0.20	0
10	6.14	0	--	0.1	0.02	0
11	7.12	0	--	0.2	0.03	0
F10	7.12	0	--	0.7	0.10	14
Totals	294.4	15	2,219/acre	49.1	145 bu/acre	29

## B. In Proposed Temporary Construction Easement

A 1	7.12	0	--	0.6	0.08	(1)
2	7.12	0	--	3.0	0.42	33
3	7.12	0	--	0.8	0.11	(1)
G 1	6.14	0	--	0.0	--	--
2	6.14	1	0.16	1.6	0.26	50
3	6.14	0	--	6.0	0.98	52
4	6.14	2	0.32	6.5	1.06	35
5	6.14	0	--	0.2	0.03	0
6	14.24	0	--	1.1	0.08	0
7	14.24	0	--	0.3	0.02	0
H 2	6.14	0	--	0.3	0.05	(1)
3	6.14	2	0.32	0.1	0.02	(1)
4	7.12	1	0.14	0.5	0.07	0
5	7.12	0	--	0.2	0.03	0

Table 3a (Contd.)

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
H 6	7.12	0	--	4.0	0.56	45
7	7.12	0	--	0.0	--	--
8	7.12	0	--	0.0	--	--
I 2	7.12	0	--	0.2	0.03	(1)
3	7.12	0	--	0.0	--	--
4	7.12	0	--	0.8	0.11	38
5	7.12	0	--	0.6	0.08	(1)
6	7.12	0	--	0.3	0.04	100
7	7.12	0	--	2.4	0.34	100
8	7.12	0	--	1.0	0.14	0
J 6	7.12	0	--	3.0	0.42	17
7	7.12	0	--	0.2	0.03	0
Totals	192.5	6	1,358/acre	33.7	152 bu/acre	40
Overall Totals	486.9	21	1,879/acre	82.8	148 bu/acre	33

<sup>1</sup>Data not available.

Table 4

Estimates of Quantities of Live Oysters and Clams and Shell in Sampled Portions of Leased Oyster Ground - March 1982.

## A. Outside the Proposed Temporary Construction Easement

Name of Lessee	Size of Above Area (acres) <sup>1</sup>	Oysters				Clams		Shell
		Density (Bu/Ac)		Quantity (Bu)		Bu/Ac	(Bu) <sup>2</sup>	(Bu)
		Large	Small	Large	Small			
Darling	9.20	25	10	230	92	7.7	71	1,337
Gordon	1.75	0	0	0	0	0.0	0	56
Stocker	2.50	0	0	0	0	0.0	0	60
Tabb	1.34	25	24	34	32	7.5	10	257

## B. In the Proposed Temporary Construction Easement

Darling	5.62	67	40	376	225	4.6	26	857
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<sup>1</sup>From Table 1.

<sup>2</sup>The following figures (which were derived from observations on the Darling lease) were used to convert data in Tables 3 through 6 from number of oysters per acre to bushels per acre: 200 large oysters per bushel; 585 small oysters per bushel; and 288 hard clams per bushel.

Table 5

Results of Sampling Stocker's Lease Adjacent to the Proposed Route 143 Bridge Over Hampton River and Estimates of Density - March 1982.

## OYSTERS

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No./ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Total
			Lg. (>3")	Sm. (<3")	Total	Lg	Sm			
B6	M	6.14	0	0	0	--	--	0	0	--
C1	M	7.12	0	0	0	--	--	0	0	--
C5	M	6.14	0	0	0	--	--	0	0	--
C6	M	6.14	0	0	0	--	--	0	0	--
D2	M, S	7.12	0	0	0	--	--	0	0	--
D5	S	7.12	0	0	0	--	--	0	0	--
Totals		39.78	0	0	0	--	--	0	0	--

## HARD CLAMS AND SHELL

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
B6	6.14	0	--	0.3	0.05	0
C1	7.12	0	--	0.0	--	0
C5	6.14	0	--	0.1	0.02	0
C6	6.14	0	--	0.1	0.02	0
D2	7.12	0	--	0.6	0.08	0
D5	7.12	0	--	0.0	--	0
Totals	39.78	0	--	1.1	24 bu/acre	0

<sup>1</sup>M = mud; S = sand.

Table 6

Results of Sampling a Part of Gordon's Lease Near the Proposed Route 143 Bridge Over Hampton River and Estimates of Density - March 1982.

## OYSTERS

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No./ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Totals
			Lg (>3")	Sm (<3")	Total	Lg	Sm			
D6	M	6.14	0	0	0	--	--	0	0	--
D7	M	6.14	0	0	0	--	--	0	0	--
E5	M	6.14	0	0	0	--	--	0	0	--
E6	M	6.14	0	0	0	--	--	0	0	--
E8	M	6.14	0	0	0	--	--	0	0	--
F8	M	6.14	0	0	0	--	--	0	0	--
F9	M	6.14	0	0	0	--	--	0	0	--
Totals		42.98	0	0	0	--	--	0	0	--

## HARD CLAMS AND SHELL

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
D6	6.14	0	--	0.0	--	0
D7	6.14	0	--	0.0	--	0
E5	6.14	0	--	0.3	0.05	0
E6	6.14	0	--	0.0	--	0
E8	6.14	0	--	0.2	0.03	0
F8	6.14	0	--	1.1	0.18	0
F9	6.14	0	--	0.0	--	0
Totals	42.98	0	--	1.6	32 bu/acre	0

<sup>1</sup>M = mud.

Table 7

Results of Sampling Tabb's Lease Near the Proposed Route 143 Bridge Over Hampton River and Estimates of Densities - March 1982.

## OYSTERS

Station Designation	Bottom Type <sup>1</sup>	Area Covered (ft <sup>2</sup> )	Number of Live			Density of Live (No./ft <sup>2</sup> )		Number of Boxes	Total Live + Boxes	Percent Boxes in Total
			Lg (>3")	Sm (<3")	Total	Lg	Sm			
K1	M, Sh	7.12	0	0	0	--	--	2	2	100
K2	M	7.12	3	3	6	0.4	0.4	0	6	0
K3	M	7.12	0	0	0	--	--	0	0	--
K4	M, Sh	7.12	1	1	2	0.1	0.1	1	3	33
K5	M	7.12	0	0	0	--	--	0	0	--
K6	M	7.12	1	10	11	0.1	1.4	0	11	0
Totals		42.72	5	14	19	5,098/ acre	14,275/ acre	3	22	14

## HARD CLAMS AND SHELL

Station Designation	Area Covered (ft <sup>2</sup> )	Hard Clams		Shell		Percentage on Surface
		Number Live	Density (No./ft <sup>2</sup> )	Quantity (Qts)	Density (Qts/ft <sup>2</sup> )	
K1	7.12	0	--	4.2	0.59	0
K2	7.12	1	0.14	3.2	0.45	9
K3	7.12	0	--	0.3	0.04	0
K4	7.12	0	--	0.7	0.10	--
K5	7.12	0	--	0.0	--	0
K6	7.12	1	0.14	1.0	0.14	0
Totals	42.72	2	2,039/acre	9.4	192 bu/acre	3

<sup>1</sup>M = mud; Sh = shell.

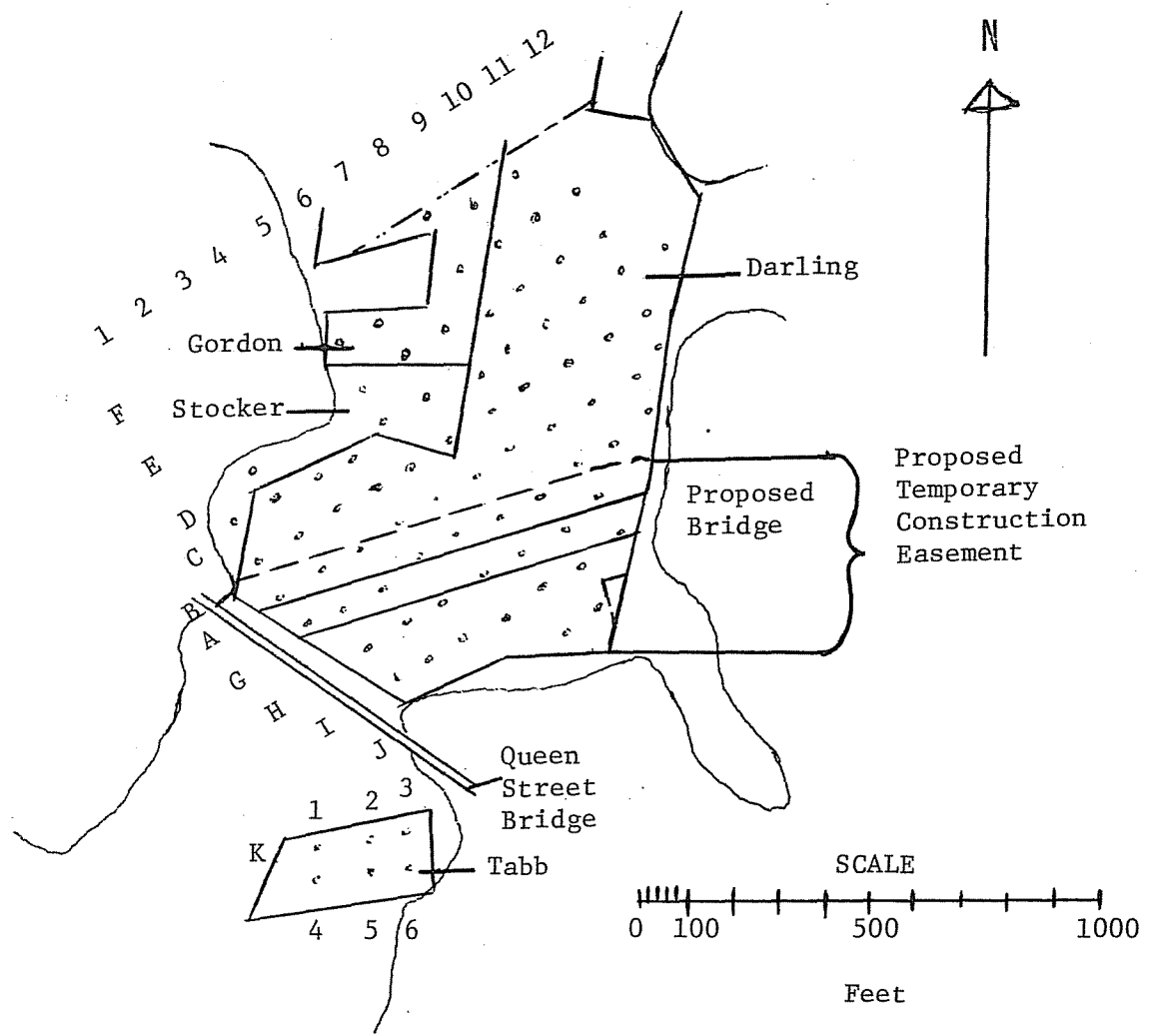


Figure 1. Area studied in Hampton River (from VMRC chart 255-2620). Boundaries of oyster ground leases are shown; dashed line shows extent of sampling in 1982.

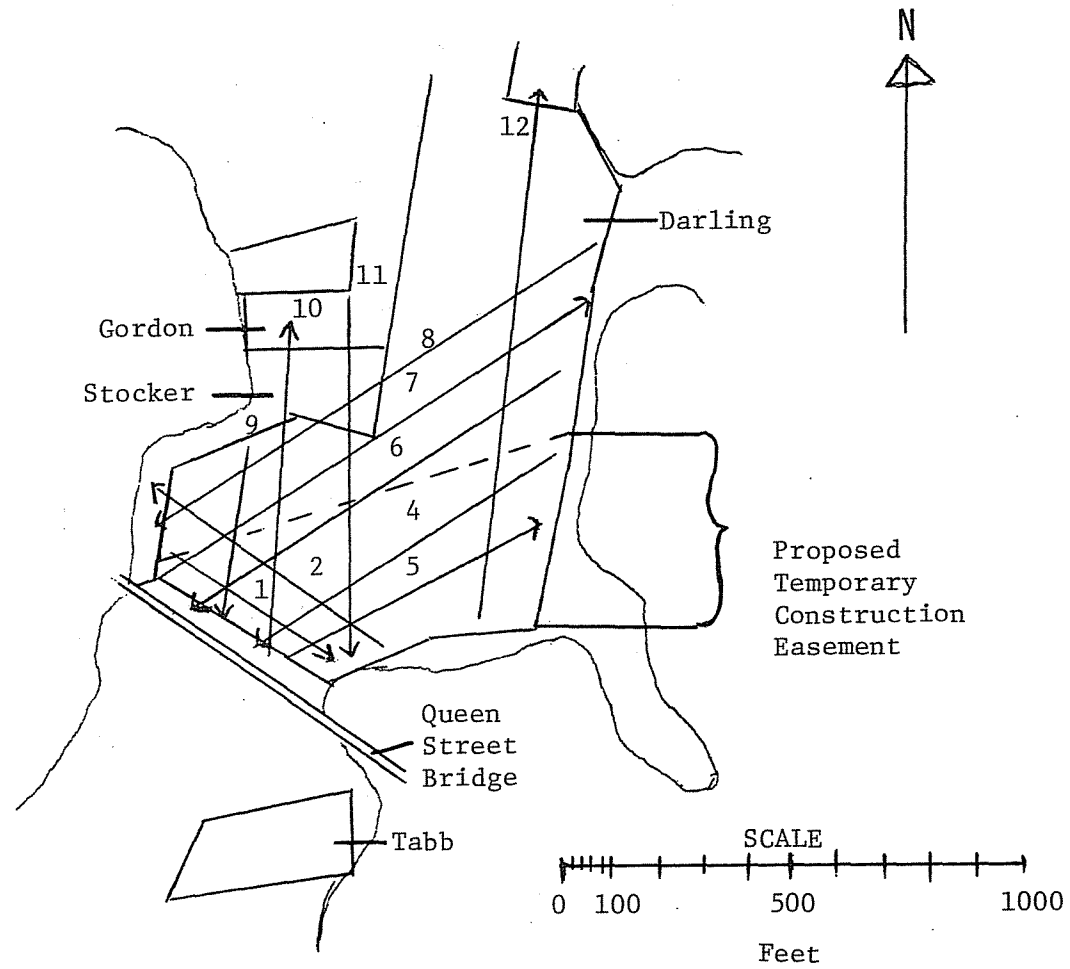
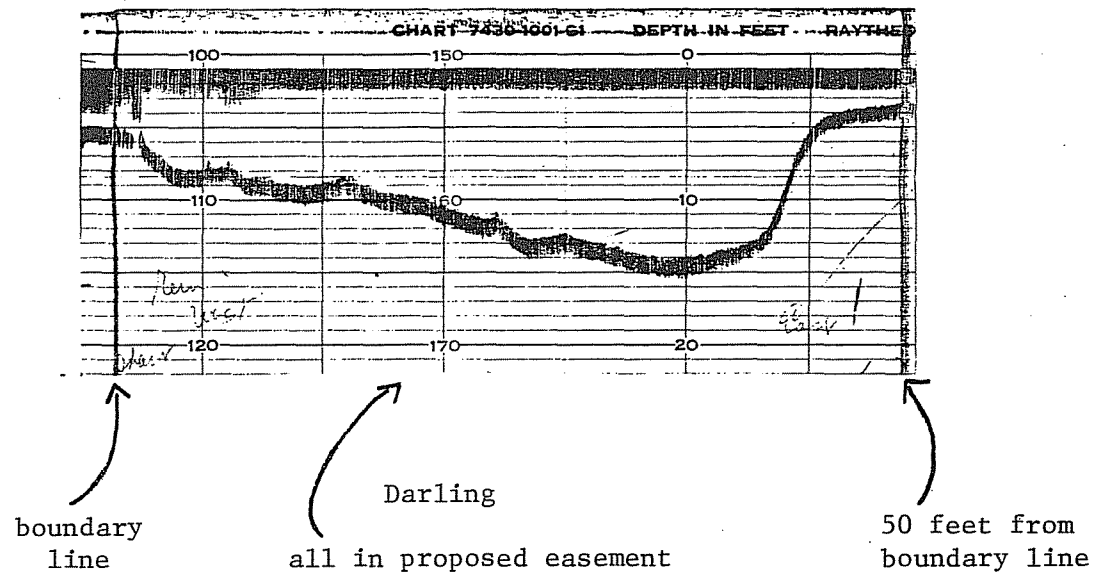


Figure 2. Fathometer transects in Hampton River - March 18, 1982.

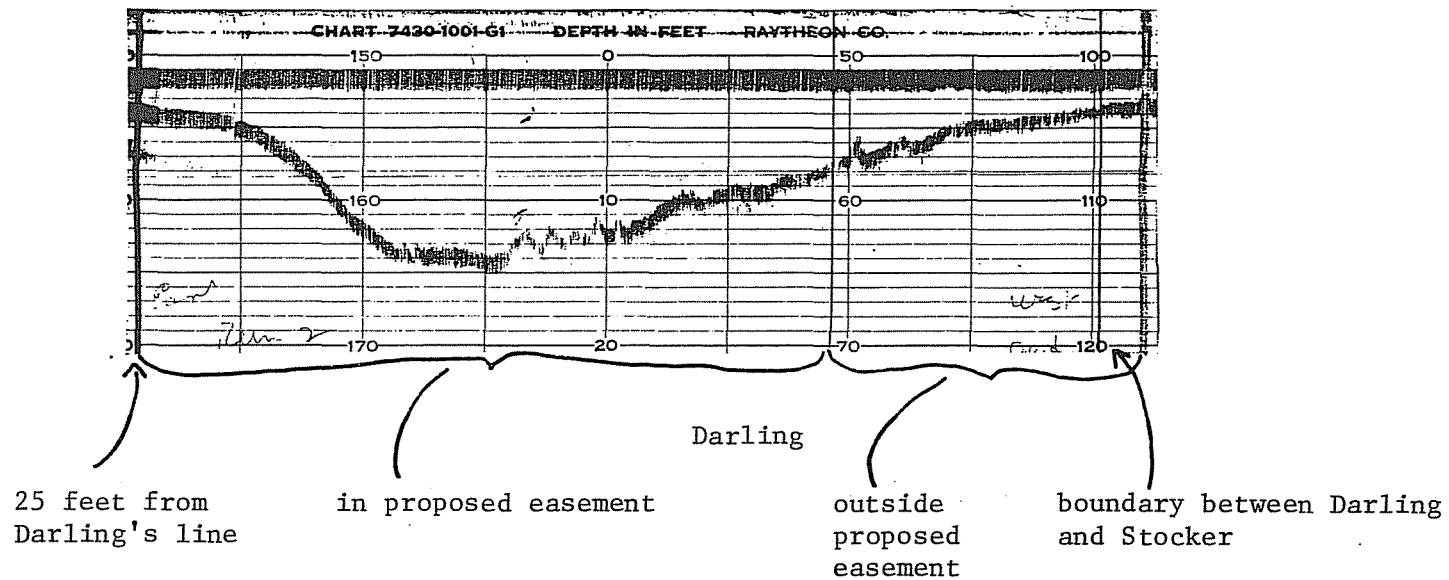
APPENDIX

Fathometer Tracings of the Bottom in the Hampton River (see Figure 2).

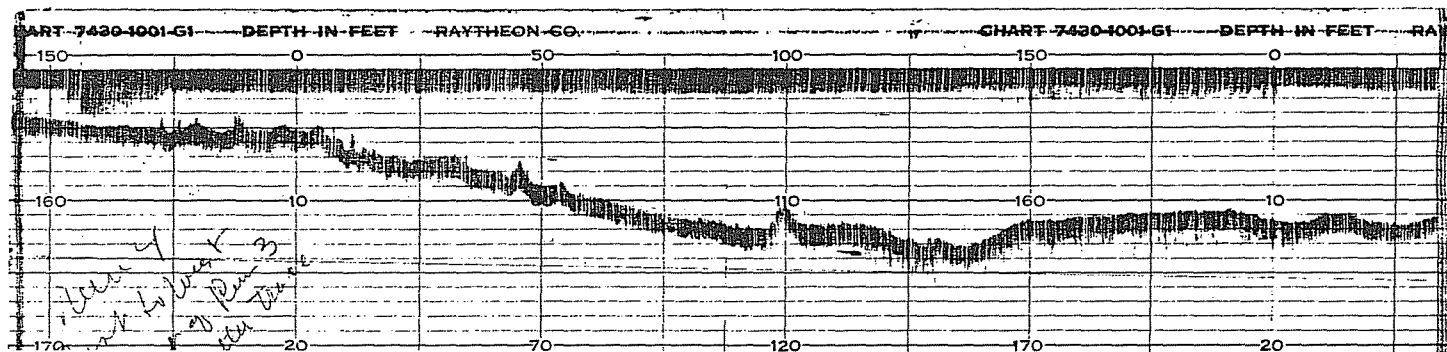
Made 18 March 1982.



Appendix: Transect 1 - 100 feet upriver of and parallel to the Queen Street Bridge, moving from West to East. See Figure 2. Made 18 March 1982.



Appendix: Transect 2 - 200 feet upriver of and parallel to the Queen Street Bridge, moving from East to West. See Figure 2. Made 18 March 1982.

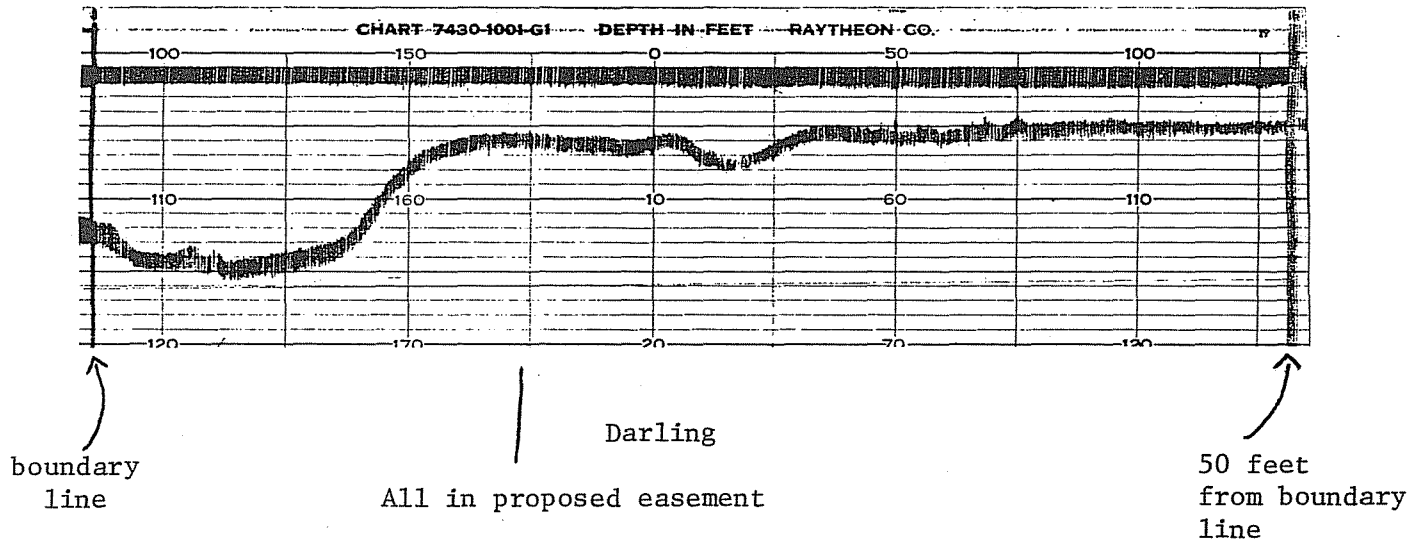


25 feet from  
boundary line

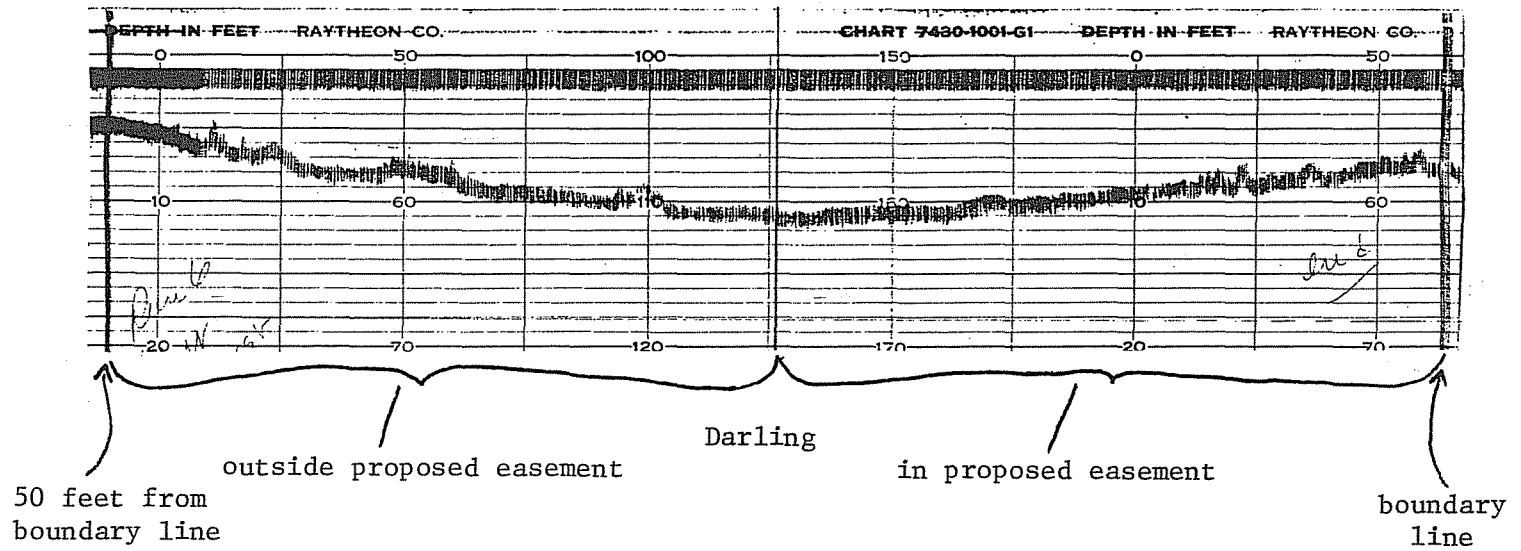
|  
Darling  
All in proposed easement

boundary  
line

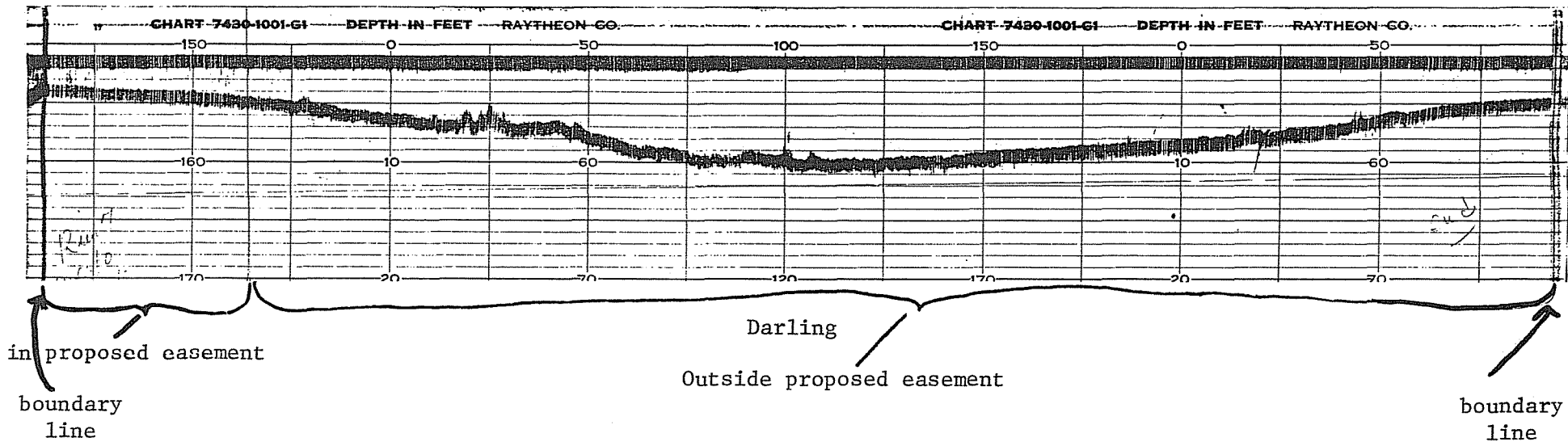
Appendix: Transect 4 (repeat of Transect 3) - Across proposed bridge site, moving from East to West. See Figure 2. Made 18 March 1982.



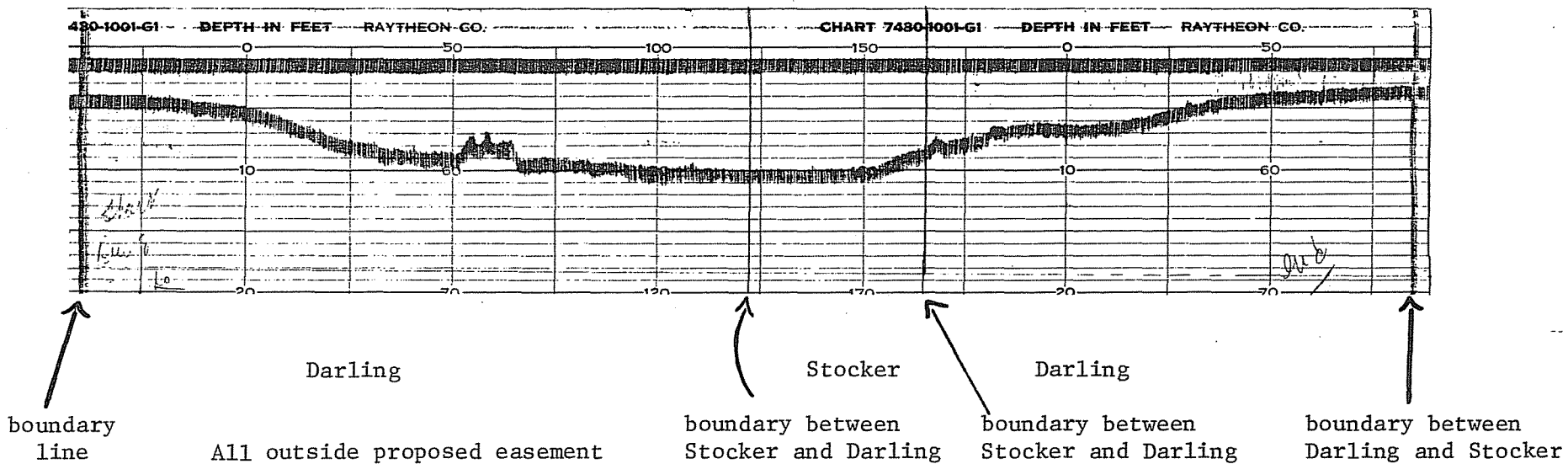
Appendix: Transect 5 - Downriver of the proposed bridge route, running from West to East. See Figure 2. Made 18 March 1982.



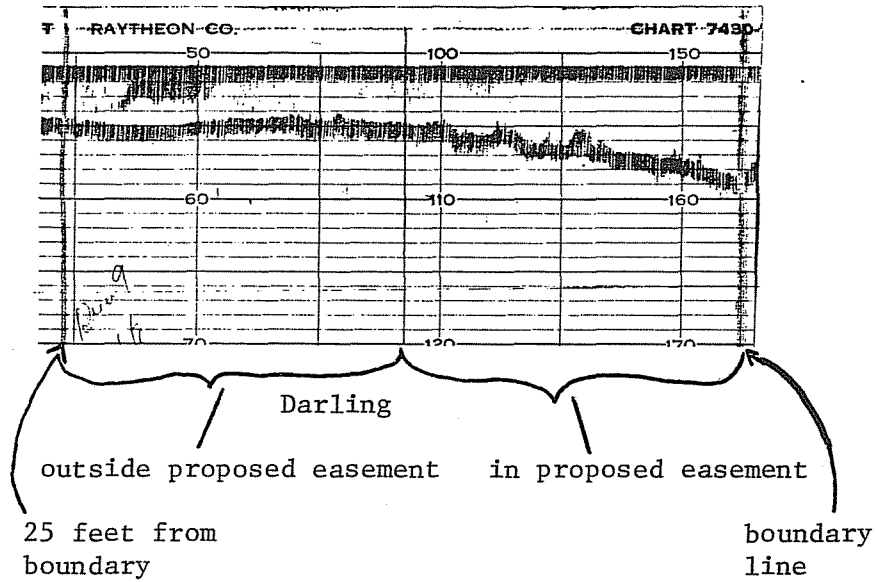
Appendix: Transect 6 - Upriver of an across the proposed bridge route, running from East to West. See Figure 2. Made 18 March 1982.



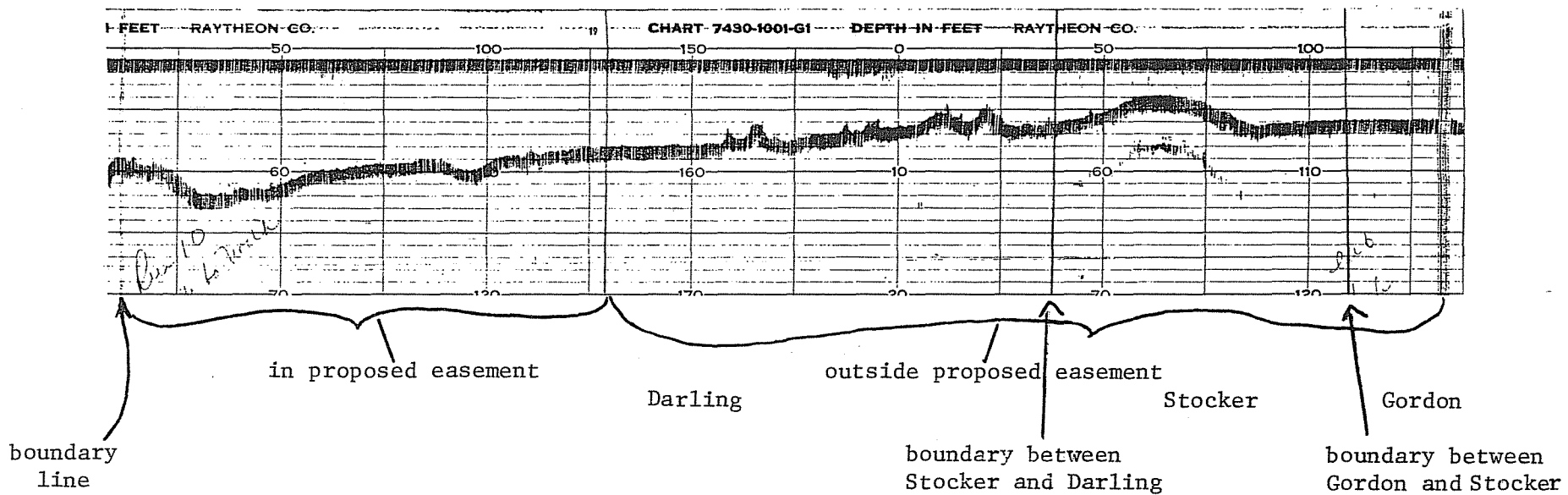
Appendix: Transect 7 - Upriver of the proposed bridge, running from West to East. See Figure 2.  
 Made 18 March 1982.



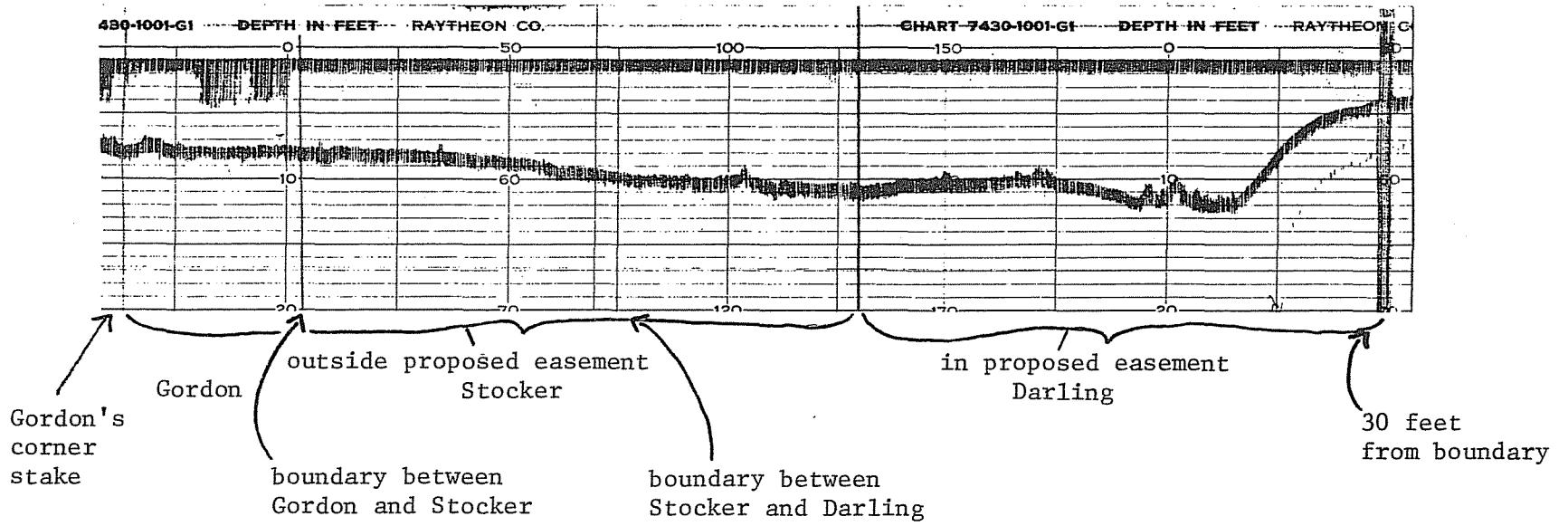
Appendix: Transect 8 - Upriver of the proposed bridge, going from East to West.  
See Figure 2. Made 18 March 1982.



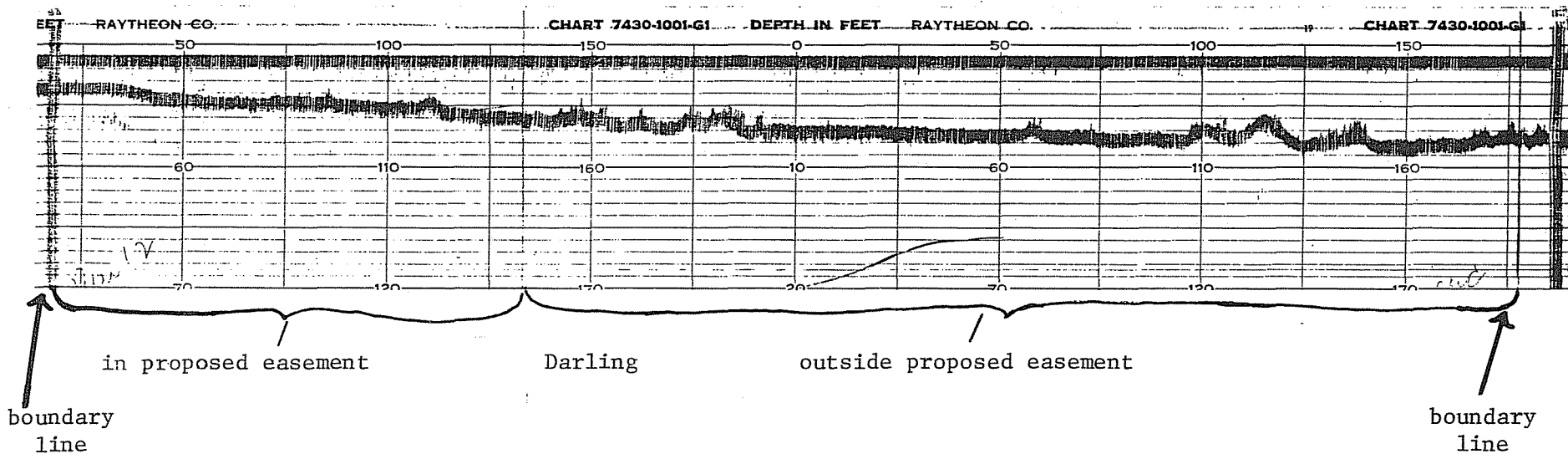
Appendix: Transect 9 - Going from North to South across the route of the proposed bridge. See Figure 2. Made 18 March 1982.



Appendix: Transect 10 - Going from South to North across the route of the proposed bridge. See Figure 2. Made 18 March 1982.



Appendix: Transect 11 - Going from North to South across the route of the proposed bridge. See Figure 2. Made 18 March 1982.



Appendix: Transect 12: Going from South to North across the route of the proposed bridge. See Figure 2. Made 18 March 1982.

From the observations, the following estimates were calculated:

1. Estimated density of oysters and hard clams;
2. Estimated density of shell;
3. Percentage of surface shell per grab; and,
4. Percentage of mortality based on box counts.

Methods used in our calculations are shown in Table 2.

Results of sampling and our estimates based on them are shown in later tables in this report.

#### Bottom Topography

A recording fathometer was used to trace profiles of the bottom along transects shown in Figure 2. Copies of the traces are included in the Appendix.

### RESULTS AND DISCUSSION

The detailed results of our sampling are discussed below in relation to each lease.

#### Darling's Lease Inside the Proposed Temporary Construction Easement

The proposed easement covers 5.62 acres of the Darling lease (Figure 1). The main channel of the river crossed this area and varied in depth from about 14 feet near the Queen Street Bridge to about 9 feet at a distance of 500 feet from the bridge. Most of the bottom was shallower than about 5 feet. The bottom was mud except for some sand near the shore.

At 26 locations in this area 56 licks or grabs of the hard tongs were made (Table 1); the total area covered by the tongs was 192.5 square feet. Sampling in this way recovered 59 large oysters, 103 small oysters,