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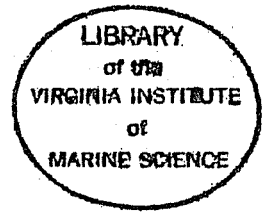
Haven, D. S., Whitcomb, J. P., & Kendall, P. C. (1976) A Survey in the Lafayette River for Oysters, Clams, and Shell in the Vicinity of the Proposed Granby Street Bridge.. Virginia Institute of Marine Science, College of William and Mary. <https://doi.org/10.25773/a6kf-0b68>

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A Survey in the Lafayette River for Oysters,
Clams, and Shell in the Vicinity of the
Proposed Granby Street Bridge.

--State Project--
.0460-122-102, PE-101



by

Dexter S. Haven, James P. Whitcomb and Paul C. Kendall
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18 August, 1976

INTRODUCTION

The purposes of this study are: 1) to survey populations of oysters, clams, and shells in the immediate vicinity of the site of the proposed Granby Street Bridge in the Lafayette River, Virginia; 2) to evaluate the present and future potential of the area for shellfish culture; and, 3) to estimate the value of the existing stocks of shellfish.

The study was conducted by the Virginia Institute of Marine Science, Gloucester Point, Virginia, on July 21, 22, 23 and 26, 1976. Collection of field data was under the direction of Mr. James P. Whitcomb, and the final report was prepared by Mr. Haven, Mr. Whitcomb, and Mr. Kendall.

There are no Baylor bottoms in the vicinity of the new bridge. However, upriver there was located a 21.90 acre tract (File No. 2868, VMRC); downriver was located a 68.73 acre tract (File No. 7764, VMRC). These bottoms are leased by Edwin T. and R. D. Holland.

Our study was restricted to leased and unassigned public bottoms, 700 feet upriver from the edge of the old bridge, under the bridge, and 700 feet downriver, since construction activity was expected to occur within this area. Within this zone was the highway construction easement area for the new bridge. It extended 150 feet on each side of the centerline of the proposed bridge which was 37 feet upriver from the centerline of the old one.

Within the 700 foot limits the following acreages are defined for reference purposes.

<u>Below Bridge</u>	Acres
Centerline of proposed project to downriver edge of old bridge 65.6 ft (not leased)	0.75
Edge of old bridge downriver to edge of proposed temporary construction easement 84.4 ft (not leased)	0.97
Leased area surveyed	6.3
Total area surveyed.	8
 <u>Above Bridge</u>	
Centerline of proposed project to edge of proposed temporary construction easement 150 ft (leased)	2.47
Total area surveyed (leased)	13.8*

EVALUATION OF THE AREA

The Granby Street Bridge over the Lafayette River is in an urban area. The south shore of the study area is bulkheaded, and there is located the Lafayette Yacht Club, where numerous boats are moored. There is a large storm sewer dumping into the adjacent Lafayette Yacht Club basin. The north side of the survey area is largely residential, and the shoreline is dominated by marsh grass and several small tributary creeks. Salinities in the area are similar to those encountered in the Hampton Roads area (18 to 24‰).

Over most of the area surveyed, the bottom was soft mud, and a pole could easily be pushed 2 to 3 feet into the bottom. When oysters did occur, they were found on a thin crust of shell over a mud bottom.

* About 0.5 acres on south shore was too shallow to study (less than 3 feet), was not included.

Since the Lafayette River is in an industrialized region with much boat traffic and several sewerage outfalls in its lower portion, the area is classed as restricted for the harvest of oysters by the Virginia Bureau of Shellfish Sanitation. Shellfish grown there may not be marketed directly for human consumption. They may be marketed, however, if they are first harvested and replanted during the approved season on State approved bottoms for a period of 15 days with water temperatures above 50°F. This cultural practice is expensive since it means a double harvest; seldom is it feasible to recover more than about 70% of the replanted oysters. Therefore, relaying is today regarded as economically impractical by most oyster growers.

The oyster disease MSX is present in the Lafayette River as it is throughout lower Chesapeake Bay where salinities average above 15 parts per thousand. MSX entered the bay in 1960 and made oyster culture unprofitable in the high salinity regions. In years characterized by heavy rainfall, salinities in downriver regions, similar to the Lafayette River, may drop to the level when MSX becomes inactive. Therefore, oyster culture may become temporarily practical in these locations. With the return of high salinities, however, mortalities again become excessive.

In summary, the study area in the Lafayette River is located where it is not economically feasible because of MSX and pollution to culture oysters from seed to market size. The area has been subject to below average salinities during the past 4 to 5 years. As a result, mortalities due to MSX seem to have been low and this has allowed scattered populations of oysters to develop.

The area, for reasons which will be shown in this report, does not seem satisfactory for growing seed oysters.

METHODS OF COLLECTING SAMPLES

Samples were collected with oyster tongs on transects marked by stakes at 100 foot intervals. This delineated seven transects on either side of and parallel to the bridge. The transects extended shoreward to about 3 feet MLW on either bank and are designated by letters (A, B, C...). Successive stations starting from the south bank are numbered consecutively (1, 2, 3...) (Figure 1). When distribution of oysters was changing rapidly, stations were occasionally taken at 50 foot intervals. These are designated by a letter showing the transect and by a sub-letter (EX. Aa).

Calibration of the tongs was accomplished by attaching a rope near the head so that the tongs opened exactly two feet. The head of the tong was 37 inches wide making each sample 6.17 square feet.

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 are empty); volume of loose shells; and number of clams.

Between sites of tonged samples, the bottom was repeatedly probed with a rod to determine its character. This information in conjunction with that obtained by tonging made possible the delineation of the productive areas (Figure 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 (6.17). This product represents the total area sampled. This product was then divided into the total area. The result was multiplied by numbers of oysters or quantity of shell to give volume or numbers for each area.

The number of oysters per bushel was calculated on the basis that the 172 oysters collected in the study (Appendix) totaled 39.5 quarts. Calculations based on 50 quarts per bushel show that this is 218 oysters per bushel. Therefore, this latter value was used to convert numbers of oysters to bushels.

RESULTS OF THE SURVEY

A detailed summary of numbers of oysters, shells, and boxes found at each station is given in the appendix; location of stations is shown in Figure 1.

Most of the areas sampled were soft mud devoid of shells or living oysters. However, five distinct "beds" of oysters were observed; these were located on a thin crust of shell overlying a soft bottom. Most of the oysters seemed to be the result of a natural strike which occurred about 4 or 5 years ago.

No hard clams, Mercenaria mercenaria, or soft clams, Mya arenaria were collected during the study and it is doubtful if they occurred in the area in the past 5 years since shells of the two species were not seen in the samples.

Size and Appearance of Oysters and Mussels

A randomly selected sample of 50 oysters averaged 87 mm long (3.4 inches) and ranged from 40 to 125 mm. Seventy-five percent of the oysters in the sample were market size (over 3 inches). The oysters were heavily coated with two species of sponge (Halichondria bowerbanki and Microciona, with an occasional barnacle Balanas improvisus and an anenome Diodumene leucolena).

About 15 oysters were opened and the meats were fat. However, the mud blister worm Polydora ligni was very abundant in the shells and this gave the shell interior a much blackened appearance. The mantles of the oysters were an atypical red-brown color.

Out of several hundred oysters and shells examined only one oyster which set in 1975 was seen; none which set in 1976 were noted. The oysters had very thick shells and had obviously set at least 4 or 5 years ago.

The ribbed mussel Modiolus was especially abundant on the living oysters and shell and in several locations (especially in the vicinity of the bridge) clumps about one foot in diameter were collected. In length, they ranged from 22 to 65 mm with a mean length of 44.9 mm (1.8 inches).

Mortality of oysters in the area as shown by box counts (appendix) was low (5%).

About 75% of the shell recovered in the survey area was buried in the sediments when in place in the bottom.

Occurrence of Oysters and Shells

The five distinct patches or beds of oysters observed during sampling (Figure 1) are described below.

I: This bed (1 acre) was located at depths ranging from about 3 to 6 feet MLW on the south side of the area, and below the bridge (Table 3). It contained about 129 bushels of oysters and about 634 bushels of shell. This area was located about half on leased bottom and half on unassigned bottom.

II: This 1.0 acre bed was on the south bank near the bridge. It lay partially within the construction easement, partly on unassigned state bottom, and partly on leased bottom. An estimated 395 bushels of oysters and 517 bushels of shell were in this area (Table 4).

Transect I in this distribution was directly under the bridge, and on the south side oyster concentration was very high, and the bottom hard. The oysters there probably set on the bridge pilings and fell to the bottom.

III: This area is located on the upriver side of the bridge near the north bank. It is partially on the construction easement. It contained about 4 bushels of oysters and about 49 bushels of surface shell (Table 5).

IV: This area is near the center of the embayment on the upriver side of the bridge. It was estimated that this 0.69 acre area contains 110 bushels of oysters and 616 bushels of shell (Table 6). This "bed" was surrounded by soft bottom, devoid of shell and oysters.

V: This very small patch is less than 100 ft² and is located on a pile of rocks. It was estimated to contain about 2.6 bushels of shell and about 0.6 bushel of oysters (Table 7).

Oysters and Shell in 150 Foot Proposed Construction Easement

This 150 foot wide lane is about 2.47 acres in extent. In estimating oyster numbers for this area, stations were located 50 ft upriver from the existing bridge (J), and 100 ft upriver. Transect L, upriver from K, was devoid of oysters. This study showed about 66 bushels of oysters and about 522 bushels of shell within the construction easement.

DISCUSSION

Most of the bottom 700 feet on either side of the Granby Street Bridge was soft mud. Within this zone, however, were 5 discrete areas where oysters occurred. With the exception of the concentrations under the bridge, these beds occurred on a thin crust of shell overlying soft mud. Underneath the bridge, the bottom was firm and was composed of shell and oysters to an unknown depth.

Concentrations of oysters underneath the bridge were 56 per tong on 9 ft² which is as high as that found on many commercially productive beds. Those located elsewhere were less than 10 per tong (1.6 ft²). This maximal value is low for a commercially productive bed. The oysters were large with thick shells with an average length of 3.4 inches. Frequently they were thickly covered with mussels. The meats were in good condition (fat), but the edges of the mantles were discolored, and the interior surfaces of the shells were heavily blackened by tunnels of the mud worm Polydora.

Value of the Existing Resource (Total Area)

It was established by conversation with dealers that, at the present time, shells cost about 32¢ a bushel delivered to the site and placed on the bottom. Oysters from unpolluted bottoms, if they are fat, would sell for about \$7.50 per bushel. Those in the Lafayette River, however, are growing in a restricted area and would have to be relaid prior to sale at additional cost. This added step would cost at least \$2.50 per bushel. Oysters from this system would have a maximum value of \$5.00 per bushel.

Using the preceding values, the total value of the oysters in the entire survey area was estimated at \$2,993 for 598 bushels. The estimated volume of 1,767 bushels of shell would be \$566. Most of this shell occurred as a thin crust on the surface, and did not appear to be at any great depth in the bottom (Table 9).

Value of the Resource in the Proposed Construction Easement Area

The 150 foot easement consists largely of soft mud with two areas of oysters and shell (Table 8). The 66 bushels of oysters estimated to be present were valued at \$330; the 524 bushels of shell would cost \$168 planted (Table 10).

Potential of the Area for Shellfish Culture

The Granby Street area of the Lafayette River is classed as restricted for shellfish culture, and is upriver from a heavily industrialized zone. A large storm sewer empties into the yacht basin only a short distance away. Therefore, there seems little

prospect that its classification as a restricted area will change in the foreseeable future. Oysters grown in this area would have to be relaid, and as outlined in the introduction, this is not considered economically feasible today.

The area does not seem to have a potential as a seed producing area since this study suggests that no set has occurred there during the past 4 to 5 years.

Most of the bottom was soft mud and would require extensive shelling prior to planting with oysters.

MSX is still present in the area and although it has allowed limited populations to develop it may return at a later date. MSX resistant seed has been developed by the Virginia Institute of Marine Science but at present it is not available in commercial quantities.

No hard or soft clams were taken during the study and the potential production of these two species is low.

We conclude that the area surveyed has a low potential for future shellfish production.

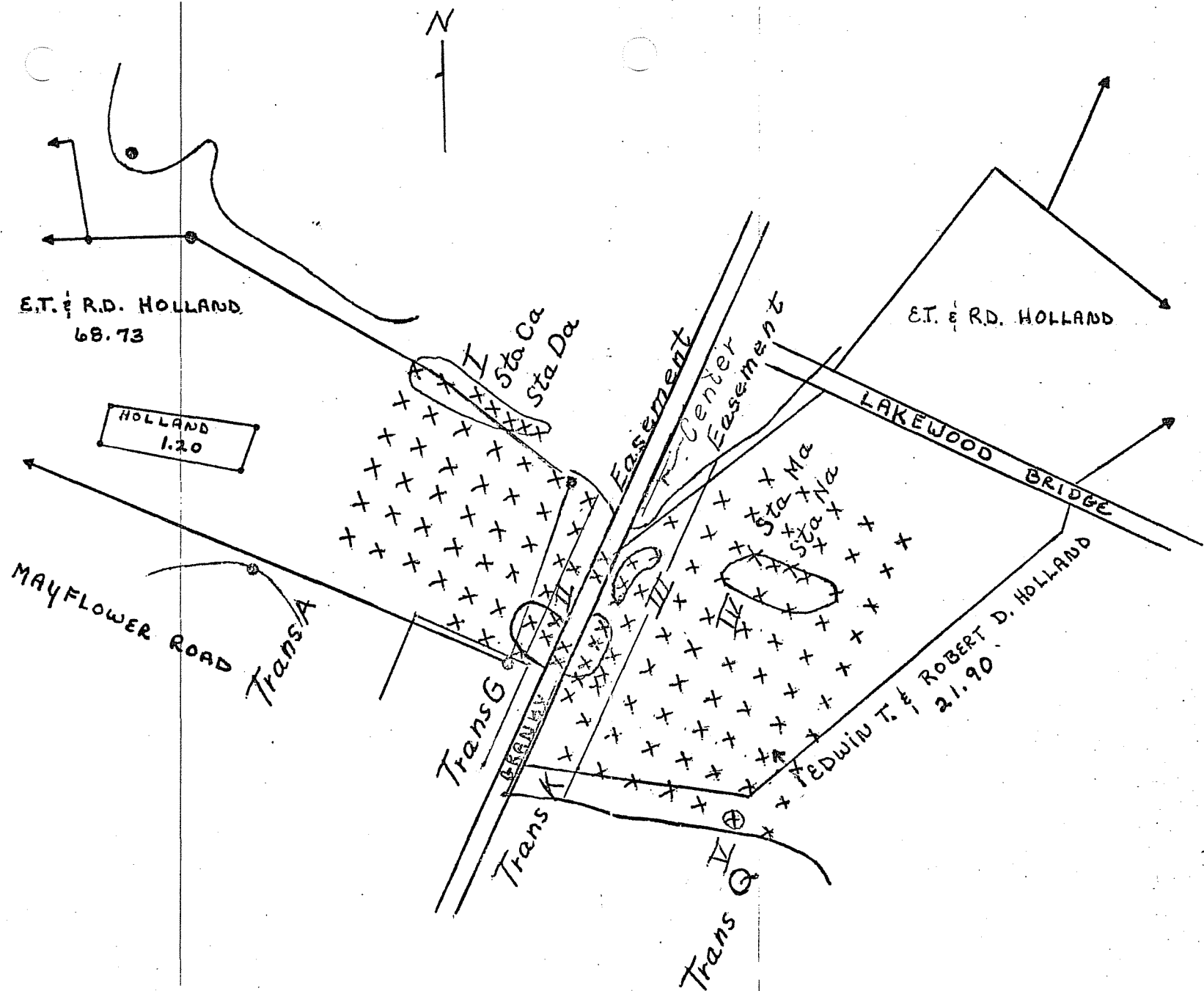


Fig 1
 Stations Sampled (X) in the Vicinity of the Granby Bridge
 Stations numbered South to North
 Transects lettered west to East
 Stations 100 feet apart Scale 1:5000

Table 1

Granby Bridge Project
Lengths of Oysters

mm	mm	
68	85	
90	55	
90	100	
95	80	
98	70	N = 50
93	75	
92	90	EX = 4363
78	75	
102	100	\bar{X} = 87.3 mm
82	98	= 3.4 inches
115	72	
93	85	
65	85	
75	86	
80	115	
75	90	
87	86	
85	96	
85	85	
86	72	
95	95	
93	80	
98	75	
40	115	
113	125	

Table 2

Granby Bridge Project
Lengths of Mussels

mm

31
22
43
43
52
46
32
64
40
36
65
62
53
43
42
49
41

$$N = 17$$

$$EX = 764$$

$$\bar{X} = 44.0 \text{ mm}$$
$$= 1.8 \text{ inches}$$

Table 3

Number of Oysters, Boxes, and Quarts of Shell
Per Sample at I
Downriver - North Bank
1 Acre

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
A-6	2	1	0
B-6	2	0	0.5
C-6	3	0	2
Ca	5	1	11
D-6	8	0	9
Da	6	0	8
E-7	2	0	1
TOTALS	28	2	31.5

Calculations Showing Total
Quantity of Oysters, Shell, and Boxes

7 Samples

6.17 ft² sample

7 X 6.17 = 43.19 ft²

43500 ft²/acre ÷ 43.19 = 1007.18

28 X 1007.18 = 28201.0 oysters or 129 bushels of oysters

2 X 1007.18 = 2014.1 boxes

31.5 X 1007.18 = 31726.72 qts of shell or 634 bushels of shell

Table 4

Number of Oysters, Boxes and Quarts of Shell at II
South Bank Near Bridge
1 Acre

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
G-1	2	0	1
G-2	9	0	9
H-2	10	0	3
H-3	2	0	3
I-1	56	0	0
I-2	20	0	0
J-2	3	0	12
J-3	4	0	0
J-4	0	0	0
J-5	4	1	5
TOTALS	110	1	33

Calculations Showing Total
Quantity of Oysters, Shell and Boxes

10 Samples

6.17 ft²/sample

10 X 6.17 = 61.7 ft²

43500 ft²/acre ÷ 61.7 = 705.02

110 X 705.02 = 77552.2 oysters or 355 bushels of oysters

1 X 705.02 = 705 boxes

33 X 705.02 = 23266 qts of shell or 465 bushels of shell

Table 5

Number of Oysters, Boxes, and Quarts of Shell at III
 North Bank Near Bridge
 0.23 Acre

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
J-6	1	0	0
J-7	0	0	4
J-8	1	1	1
K-8	0	0	1
TOTALS	2	1	6

Calculations Showing Total
Quantity of Oysters, Shell, and Boxes

4 Samples

6.17 ft²/sample

4 X 6.17 = 24.68 ft²

10005 ft² ÷ 24.68 = 405.39

2 X 405.39 = 810.8 oysters or 3.7 bushels of oysters

1 X 405.19 = 405.0 boxes

6 X 405.19 = 2431 qts of shell or 49 bushels of shell

Table 6

Number of Oysters, Boxes, and Quarts of Shell
 Per Sample at IV
 North Side of Channel - Upriver
 0.69 Acre

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
M-7	8	0	8
Ma	0	1	2
N-7	0	0	15
Na	18	3	7
O-7	4	0	5
P-8	0	0	1
TOTALS	30	4	38

Calculations Showing Total
 Quantity of Oysters, Shell, and Boxes

6 Samples

6.17 ft²/sample

6 X 6.17 = 37.02 ft²

30015 ft² ÷ 37.02 = 810.77

30 X 810.77 = 24323.1 oysters or 110 bushels of oysters

4 X 810.77 = 3243 boxes

38 X 810.77 = 30,809.25 quarts of shell or 616 bushels of shell

Table 7

Number of Oysters, Boxes and Quarts of Shell
Per Sample at V
Rocks - Upriver - South Bank
0.009 Acre

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
P-1	2	0	2

Calculations Showing Total
Quantity of Oysters, Shell, and Boxes

1 Sample

6.17 ft²/sample

400 ft² ÷ 6.17 = 64.8

2 X 64.8 = 129.6 oysters or 0.6 bushels of oysters

2 X 64.8 = 129.6 quarts of shell or 2.6 bushels of shell

Table 8

Estimate of Oysters, Boxes, and Shell on Leased Bottom in the
Construction Easement Above the Bridge.
2.47 Acres

Station	No. Oysters/ Sample	No. Boxes/ Sample	Qts Shell/ Sample
J-1	0	0	0
2	3	0	12
3	4	0	0
4	0	0	0
5	4	1	5
6	1	0	0
7	0	0	4
8	1	1	1
K-1	0	0	0
2	0	0	0
3	0	0	0
4	1	2	0.5
5	0	0	2
6	0	0	0
7	0	0	0
8	0	0	1
9	0	0	0
TOTALS	14	4	25.5

Calculations Showing Total
Quantity of Oysters, Shell, and Boxes

17 Samples

6.17 ft²/sample

17 X 6.17 ft² = 104.89 ft²

107,445 ft² ÷ 104.89 ft² = 1024.35

14 X 1024.35 = 14341.0 oysters or 66 bushels of oysters

4 X 1024.35 = 4097 boxes

25.5 X 1024.35 = 26120 quarts of shell or 522 bushels of shell

Table 9

Quantities and Values of Oysters and Shell in the
700-foot Areas Surveyed in the Lafayette
River at the Granby Street Bridge.

Area	Acres	Bushels Oysters	Value \$	Bushels Shell	Value \$
I	1.0	129	645	634	203
II*	1.0	355	1,775	465	149
III*	0.23	4	20	49	16
IV	0.69	110	550	616	197
V	0.01	0.5	3	3	1
TOTALS		598	2,993	1,767	566

* Parts of these areas are in the construction easement.

Table 10

Quantity and Value of Oysters and Shell in the 150 foot
 Proposed Construction Easement Area on Leased
 Bottom Upriver from the Granby Street
 Bridge in the Lafayette River.

Area	Acres	Bushels Oysters	Value \$	Bushels Shells	Value \$
Ease- ment area	2.47 56	66	330	522	167

APPENDIX

RESULTS

Grandby Bridge Project Samples

Trans.	Station	Depth in feet	SHELLS		OYSTERS		Boxes	Remarks
			Quarts	No.	Qts. Est.	No.		
A	1	5						Mud, no shell
	2							Mud, no shell
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	4			1	2 Market	1	Scattered shell, mussels
B	1	5						Mud, no shell
	2							Mud, no shell
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	4	1/2	3	1/2	2 Small		Shelly, mussels
C	1	10						Mud, no shell
	2							Mud, no shell
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	4	2		1/2	1 Market 2 Small		Shelly, mussels
Ca	Ca	3-1/2	11		2	5 Market	1	Shelly
D	1	12						Mud, no shell
	2							Mud, no shell
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	3	9		2	3 Market 5 Small		Shelly, mussels
Da	Da	4	8		2	6 Oysters		Shelly
E	1	4						Mud, with sand
	2			2 Tag.				Mud, no shell

Grandby Bridge Project Samples (Contd.)

Trans.	Station	Depth in feet	SHELLS		OYSTERS		Boxes	Remarks
			Quarts	No.	Qts. Est.	No.		
E	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6							Mud, no shell
	7	3	1			2		Scattered shell, microciona
F	1	4						Mud, no shell microciona
	2							Mud, no shell
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	4						Mud, no shell
G	1	4-1/2	1		1/2	1 Market 1 Small		Muddy
	2		9		2-1/2	9 Market		Shelly, mussels, Molgula
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6	4						Mud, no shell
H	1							Mud, 1/2 qt mussels
	2		3		2-1/2	10		Shell on mud
	3		3		1/2	2		50% shell
I	1				10	56		1 qt. cinder
	2				4	20		No shell
	3							Hard, tongs would not catch
	4					2 Markets		5 qts mussels
J	1	4						Mud
	2		12		1	3		Mussels
	3				1	4		18 qt. mussels
	4							18 qt. cinder
	5		5		1	4	1	Shelly
	6					1		Mussels, abundant
	7		4					Firm
	8		1			1	1	Firm

Grandby Bridge Project Samples (Contd.)

Trans.	Station	Depth in feet	SHELLS		OYSTERS		Boxes	Remarks
			Quarts	No.	Qts. Est.	No.		
K	1	4						Mud
	2							Mud
	3							Mud, no shell
	4		1/2	4		1	2	Muddy
	5		2					Muddy, buried shell
	6							Mud, no shell
	7							Mud, no shell
	8			1				Buried shell, mud
	9	3			1			Mud, buried
Ka	Ka	Sounded cont. between transects						Mud
L	1	3-1/2						Mud
	2							Mud
	3							Mud, no shell
	4							Mud, no shell
	5							Mud, no shell
	6							Mud, no shell
	7							Mud, no shell
	8							Mud, no shell
	9	3-1/2						Mud, no shell
M	1	4						Mud
	2							Mud
	3							Mud, no shell
	4							Mud, no shell
	5				1			Muddy
	6							Mud, no shell
	7			8		2	8	Muddy, buried shell
	8							Mud, no shell
	9							Mud, no shell
	10	3-1/2						Mud, no shell
Ma	Ma		2				1	Buried shell, mud

Grandby Bridge Project Samples (Contd.)

Trans.	Station	in feet	SHELLS		OYSTERS		Boxes	Remarks	
			Quarts	No.	Qts. Est.	No.			
N	1	3						Mud	
	2							Mud	
	3							Mud, no shell	
	4							Mud, no shell	
	5							Mud, no shell	
	6							Mud, some grass	
	7			15				Mud, buried shell	
	8							Mud, no shell	
	9							Mud, no shell	
	10		4					Mud, no shell	
Na	Na		7	3-1/2	18	3	Mussels		
O	1	4						Mud	
	2							Mud	
	3							Mud, no shell	
	4							Mud, no shell	
	5							Mud, no shell	
	6							Mud, no shell	
	7			5		2	4 Markets	Mussels, oyster bottom	
	8							Mud, no shell	
	9							Mud, no shell	
	10		4-1/2					Mud, no shell	
P	1	4	2		1/2	1 Small 1 Market		Oysters attached to object	
	2						Mud		
	3							Mud, no shell	
	4							Mud, no shell	
	5							Mud, no shell	
	6							Mud, no shell	
	7							Mud, no shell	
	8			1	4				Muddy, buried shell
	9								Mud, no shell
	10		4-1/2						Mud, no shell

Grainy Bridge Project Samples (Contd.)

Trans. Station	in feet	SHELLS		OYSTERS		Boxes	Remarks
		Quarts	No.	Qts. Est.	No.		
Q	1	4					Mud
	2						Mud
	3						Mud, no shell
	4						Mud, no shell
	5						Mud, no shell
	6						Mud, no shell
	7				2		Muddy
	8			2		Muddy	
	9					Mud, no shell	
	10	5		2		Muddy	