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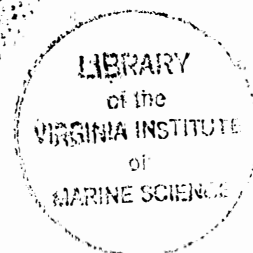
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A Survey for Oysters and Shell in the Vicinity
of the Proposed Construction Site for a City of Norfolk
Water Line Across the Lafayette River
Near the Hampton Boulevard Bridge.

Under Contract with the City of Norfolk

by

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INTRODUCTION

At the request of the Department of Utilities of the City of Norfolk, the Virginia Institute of Marine Science conducted a survey of the oyster ground in the Lafayette River in the immediate vicinity of the proposed construction site for a 20 " water line across the river just below the Hampton Blvd. bridge and in front of the Norfolk Yacht and Country Club (Figure 1).

The section of river bottom surveyed was delineated by the Department of Utilities engineers on their site plans. It consisted of a strip across an oyster ground leased by Holland Fisheries, Inc. (Virginia Marine Resources Commission Plat File No. 1403), with boundaries parallel to the proposed water line, approximately 680 ft long on the SE side and 550 ft long on the NW side (Figure 2). The strip was approximately 35 ft wide on the NW side of the proposed water line and 82 ft wide on the SE side. The total area surveyed was estimated to be 1.8 acres. Overall area of the oyster ground lease is 33.80 acres.

The survey was conducted between November 2 and 6, 1990. Collection of field data was done by Reinaldo Morales and Kenneth S. Walker. The final report was prepared by Mr. Morales and Dr. Roger Mann.

DESCRIPTION OF SURVEY AREA

The proposed water line crosses the oyster ground leased by Holland Fisheries, Inc. near its NW end. The NE boundary of the oyster ground (at the point where the water line would cross it) lies on the edge of a marked navigation channel, approximately 200 ft from the Norfolk Yacht and Country Club piers. The SW boundary of the transect lies approximately 800 ft from the shore at the point where the proposed water line enters the Lafayette River off the end of Eleanor Court Street.

Preliminary soundings of the bottom with a 3/4-inch-diameter copper pipe indicated that the bottom in the survey area was muddy with a thin layer of shells over it. This was deduced from the fact that the pipe penetrated the bottom with ease and could be pushed far into the bottom but at the same time the presence of shells was detected frequently by the scratchy sound produced when the pipe struck the shells. The mud bottom, however, was well compacted and appeared capable of sustaining oysters and shells above the bed surface.

Water salinity in the Lafayette River ranges between 18 and 24 ‰ and is similar to that found in Hampton Roads. That salinity range is within the optimum range for oyster culture. It is also, however, within the optimum range for growth and development of the oyster pathogens "MSX" (Haplosporidium nelsoni) and "Dermo" (Perkinsus marinus), which have decimated oyster populations in Hampton Roads and vicinity. The Lafayette River and its tributaries have also been included since 1983 in a special restricted area by the Virginia State Department of Health, within which all shellfish harvesting and relaying is prohibited. The special restricted area is defined in the State Department of Health's "Notice and Description of Shellfish and Condemnation Number 7, Hampton Roads, effective 15 June 1983".

METHODS OF SAMPLE COLLECTION

The corners of the oyster ground leased by Holland Fisheries, Inc. (VMRC Plat File No. 1403) as well as the points at which the proposed water line intersected the oyster ground boundaries were located and marked with stakes by surveyors from the Virginia Marine Resources Commission. We used those markers to locate the boundaries of the area to be surveyed and to locate and mark the points to be sampled within that area.

Three transects parallel to the proposed water line were sampled within the survey area (Figure 3). Transect A-B was approximately 6 ft inside the SE boundary of the survey area; transect C-D was half-way between the SE and NW boundaries, approximately 20 ft on the SE side of the water line; transect E-F was approximately 6 ft inside the NW boundary of the survey area. Approximate transect lengths were: A-B, 680 ft; C-D, 650 ft; E-F, 550 ft.

A sampling grid was devised based on sampling points spaced at 50-ft intervals along transect A-B with additional sampling points just inside the oyster ground boundary at both ends of transects C-D and E-F (Figure 3). Forty-one points within the survey area were targeted for sampling; their location was established by measuring grid distances with a floating line marked at 50-ft intervals and towed behind the boat; the points to be sampled were marked with anchored buoys.

Samples were collected with an 18-ft-long pair of oyster tongs. The tongs' shafts were adjusted so that the distance between the open heads would be 20 inches, which combined with the head-width of 2 ft provided a sample area of 3.33 ft^2 . Maximum penetration of the tongs' heads into the bottom was estimated at 2.5 inches. Each sample consisted of a single oyster tongs grab at each sampling point.

Information recorded from each sample included:

1)the number of live oysters,broken down into market (3 in. or larger), small (smaller than 3 in., excluding spat) and spat (young-of-the year).

2)the number of oyster boxes (a box is a pair of shell halves still hinged together but open and without any oyster meat inside); oyster boxes were classified as "recent" if the inside of the shells was clean, indicating that the oyster had died very recently, most likely within the previous week, or as "old" if the inside of the shells was distinctly covered by fouling organisms, indicating that the oyster had most likely been dead for a period exceeding one week.

3)numbers of other organisms found in the sample.

4)the volume of loose shells above the bottom (surface shells) and of shells buried in the mud (identifiable by their color, either gray or white, and the absence of any fouling growth on them).

The number of oysters per bushel was obtained by dividing the number of oysters and spat by the total volume of surface shells as well as by the total combined volume of surface and buried shell. The quantity of oysters and shells within the survey area was calculated by converting the combined number or volume in all the samples collected into bushels per unit area in acres and multiplying that value by the number of acres in the survey area. The monetary value of those quantities was then estimated from the most current market information available.

RESULTS

The numerical information obtained from each of the individual samples appears in Table 1. Four of the 41 points targeted for sampling were not sampled because water depth exceeded the operable length of the oyster tongs; sampling time at those points coincided with high tide and on November 5 and 6 tides were extremely high. Those four points, however, were within the navigation channel and the bottom there would probably have not had any shell or oysters on it.

The bottom at all but seven of the points sampled consisted of mud overlaid by a relatively thin layer of shells and oysters; at two of those seven points there were no oysters but there were some surface shells, at four of them there was only mud and buried shells and at one (number 14, in the navigation channel) there was only mud. There were only five samples in which no buried shells or just a trace of buried shells was found. Only fourteen of the samples (38 %) contained more than 10 oysters (Figure 4). The presence of mud and buried shells in most of the samples, as well as the collection of angel-wing clam shells in several of them (angel-wing clams inhabit burrows in stiff mud or clay), substantiates our conclusion that the ground surveyed supported only a thin layer of oyster shells on its surface.

Only three market-size oysters were found in all the samples. There were 252 small oysters and 127 spat in the collections. Most of the oysters were under 2 inches. Most of the small oysters were also very young, probably less than two years old, as was evident from their being flattened against the surface of the shell to which they were attached. Most of the recent boxes found were also small (2 inches or less).

The percentage of recent boxes, which by definition represent recently-dead oysters, was low in the combined samples, 11% (46 boxes among 419 oysters, spat and recent boxes), indicating that recent mortality was low in the surveyed area.

No hard clams (Mercenaria mercenaria) or soft clams (Mya arenaria) were collected. The only other organism found in significant numbers was the slipper shell Crepidula convexa. There were a few mud crabs, hooked mussels, and sea squirts in the samples.

ESTIMATION OF THE QUANTITY OF OYSTERS AND SHELLS IN SURVEY AREA

Area sampled by oyster tongs:

$$\begin{aligned} \text{Width of heads X width of distance between open heads} &= 2 \text{ ft X } 20 \text{ in} \\ &= 3.3 \text{ ft}^2 \end{aligned}$$

Total area of oyster ground included in samples;

$$37 \text{ samples X } 3.3 \text{ ft}^2 \text{ per sample} = 123.2 \text{ ft}^2$$

$$\text{Based on } 43560 \text{ ft}^2 \text{ in one acre, the above} = 0.0028 \text{ acres}$$

Oysters and shell quantities collected in samples:

$$\text{Number of oysters} = 252$$

$$\text{Number of spat} = 127 \quad \text{Combined total} = 379$$

$$\text{Volume of surface shells} = 139.75 \text{ qts}$$

$$\text{Volume of buried shells} = 47.0 \text{ qts} \quad \text{Combined total} = 186.75 \text{ qts}$$

Number of acres in whole segment of oyster ground surveyed:

= 1.8 acres

Number of oysters and spat per unit volume of surface shells:

= 379 / 139.75 = 2.7/qt

= 135/bu (based on 50 qts in one Virginia bushel)

Number of oysters and spat per unit volume of surface + buried shells:

= 379 / 186.75 = 2.0/qt

= 100/bu

Total volume of surface and buried shells in whole segment of oyster ground:

= 186.75 qts / 50 qts = 3.735 bu

3.735 bu / 0.0028 acres = 1333.9 bu/acre

1333.9 bu/acre X 1.8 acres = 2401 bu

VALUE OF OYSTER SEED AND SHELLS

Seed Oysters:

The current price for a bushel of oyster seed, which would consist of one bushel of bottom substrate (shells + seed-size oysters), is about \$6.00. That price, however, might only be paid for a bushel that contained at least 600 seed oysters.

Our estimate for the number of seed oysters per bushel of bottom

substrate in the oyster ground surveyed is only 100/bu. It is unlikely that a bushel of bottom material containing so few seed oysters would command any commercial value.

Shells:

The current price for a bushel of shells from a shucking house ("house shells") fluctuates around 50 cents. These, however, would be clean, solid shells. The quality of the shells we found on the bottom of the surveyed oyster ground segment were of a lower quality than that of "house shells" (10-20 % of them were found to be riddled by boring sponges).

It is difficult, therefore, to place a price per bu on those shells, but any value would be below that for "house shells". Assuming a value of 30 cents/bu, their total value would be $2401 \times 0.30 = \$720.30$ (delivered).

CONCLUSIONS

The oyster ground surveyed by us must have been a healthy and productive ground in years past. It is obvious, however, that the effects of the oyster diseases "MSX" and "Dermo" have for all practical purposes terminated its productivity. This is evident from the fact that the few oysters found, as well as the recently-dead oysters, were small and young (probably less than two-years-old), indicating that oysters were dying before they could attain a larger size or grow older. The oysters found on the ground would, therefore, be only suitable for sale as seed. Their quantity, however, is so small

(100/bu) that it would not be worthwhile harvesting the ground for that purpose.

The relatively small number of spat found suggests that recruitment of new oysters into these grounds has been very low. The small number of recent boxes found, although an indicator of low recent mortalities, also indicates that the total number of oysters present in the grounds prior to mortalities was still very low.

The sparse productivity of these grounds, associated with the absence of active cultivation, has reduced the shell cover over the bottom to a thin layer of relatively poor quality material. Any value that those shells might have as cultch material for use on other productive grounds would be small and not profitable for the lease-holders to sell it.

The presence on this ground of surface shells, small oysters and spat, as well as other organisms such as slipper shells, hooked mussels and mud crabs, indicates that it would be productive in the absence of the oyster diseases and restrictions due to contamination of the river waters. The only value that could be assigned to this resource would have to be based on its potential for production sometime in the future. It is impossible at present to predict when, if ever, that would occur, and what the future value of the resource might be.

The above value assessment is rendered moot by the inclusion of the Lafayette River in a special restricted area from which no shellfish may be removed. This, in effect, means that at this time no real value can be assigned to the oysters on the ground. It is assumed that the same is true for the shells.

Table 1. Number of oysters, boxes, and other organisms and volume of shells found in tonged samples from a section of oyster ground leased to Holland Fisheries, Inc. (VMRC Plat File No. 1403), which lies in path of water line proposed to be constructed by the City of Norfolk in the Lafayette River. Samples collected on November 5 and 6, 1990.

SAMPL NO.	OYSTERS			BOXES		SHELL (Qts.)		OTHER ORGANISMS			
	MK	SM	SP	RC	OD	SURFC	BURIED	CR	MC	HM	AW
<u>Transect A-B</u>											
1	0	2	2	1	0	1.5	3.5	3			
2	0	2	1	0	1	2	2.5	2			
3	0	3	3	0	2	2	3	4			
4	0	0	0	0	0	0	Tr.*	0			
5	0	0	0	0	0	0	Tr.*	0			
6	0	0	0	0	0	0	0.5	0			
7	0	0	0	0	0	0	1	0			
8	1	17	13	2	5	9	1.5	10			
9	0	0	0	1	1	0.75	0.75	3			
10	0	12	8	6	6	6	3.5	7			
11	1	23	15	2	2	8	0.75	11	1	1	
12	0	6	3	1	1	5	0.5	5			
13	0	1	2	0	1	1	0.25	9	1		
14		Only mud in sample									
Totals	2	66	47	13	19	35.25	17.75	54	2	1	0
<u>Transect C-D</u>											
15	0	4	1	0	1	2	2	1	0	0	
16	0	5	2	0	1	2.5	1.5	2			
17	0	8	3	0	3	2	2	6			4
18	0	4	1	1	2	2.75	1	4			1
19	0	2	2	1	0	0.75	0.25	1			1
20	0	4	0	0	5	3.5	3	6	1		
21	0	12	6	4	1	5	1	8			

Table 1 (Contd.)

SAMPL NO.	OYSTERS			BOXES		SHELL (Qts.)		OTHER ORGANISMS			
	MK	SM	SP	RC	OD	SURFC	BURIED	CR	MC	HM	AW
<u>Transect C-D (Contd.)</u>											
22	0	14	15	2	4	9.5	1	3			
23	0	2	2	1	4	7.5	0	2	1		
24	1	17	6	6	4	9	2	11	1		
25	0	8	4	2	3	6	2*	6			
26	0	9	6	1	3	3.5	Tr.	5			
27	No sample collected; water depth greater than tongs length.										
28	No sample collected; water depth greater than tongs length.										
Totals	1	100	48	18	31	54	15.75	55	3	0	6
<u>Transect E-F</u>											
29	0	0	1	1	0	3	1				
30	0	0	0	0	0	1	1.75				
31	0	5	4	0	2	3.75	2.5	4	1		
32	0	6	2	0	1	4	2	2			
33	0	7	1	1	3	4	0	1			
34	0	8	3	1	2	4.5	1	4	1		
35	0	20	2	6	3	10	2	12	2		
36	0	11	1	3	1	7	1	9			
37	0	0	2	0	0	0.25	0.25				7
38	0	8	1	1	1	7	1.5	5			
39	0	12	15	2	6	6	0.5	10	1	1	
40	No sample collected; water depth greater than tongs length.										
41	No sample collected; water depth greater than tongs length.										
Totals	0	77	32	15	19	50.5	13.5	47	5	1	7

OTHER OBSERVATIONS: 1) Many sea-squirts (Molgula) seen in sample 13 ; 2) One pistol shrimp (Alpheus) found in sample 16 ; 3) It was estimated that boring sponges (Cliona) were present in approximately 10-20% of the shells in each sample.

Table 1 (Contd.)

Key to Abbreviations

*Tr.= Trace; less than five shells in sample.

OYSTERS:

MK= Market-size oysters; 3 inches or larger.

SM= Small oysters past spat stage but less than 3 inches.

SP= Spat: small, with all edges flat against substrate.

BOXES:

RC= Recent; inside of shells clean (no fouling).

OD= Old; fouling evident on inside of shells.

SHELL:

SURFC= Surface shells; not buried in bottom sediments.

BURIED= Shells buried in bottom sediments.

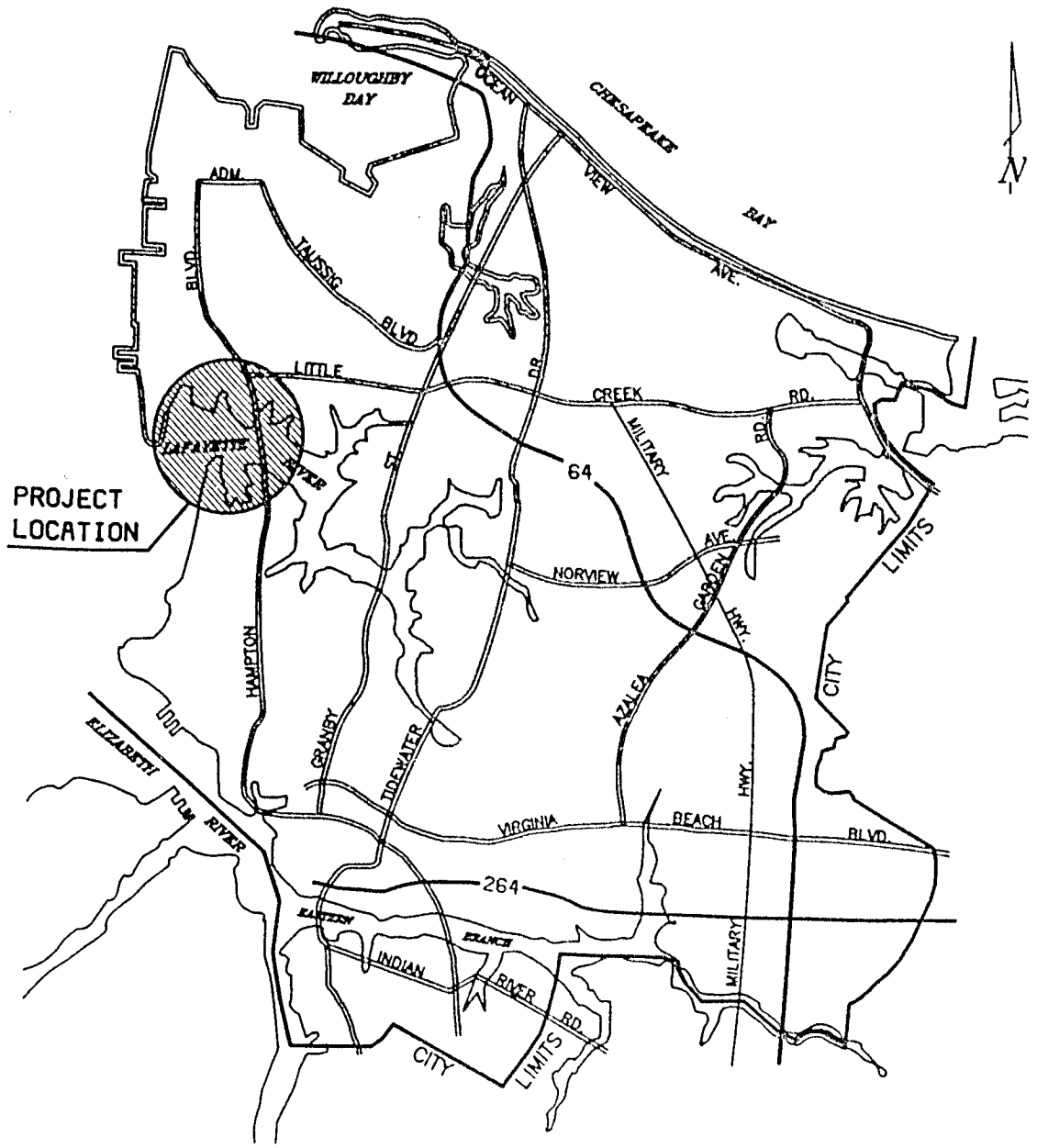
OTHER ORGANISMS:

CR= Live "convex slipper shells" (Crepidula convexa).

MC= Live "mud crabs" (family Xanthidae)

HM= Live "hooked or bent mussels" (Ischadium recurvum).

AW= Shells and fragments of "angel-wing clams" (Cyrtopleura costata).



LOCATION MAP

FIGURE 1. Overview of the area of the Lafayette River where the proposed water line is to be constructed and where the oyster ground survey was conducted.

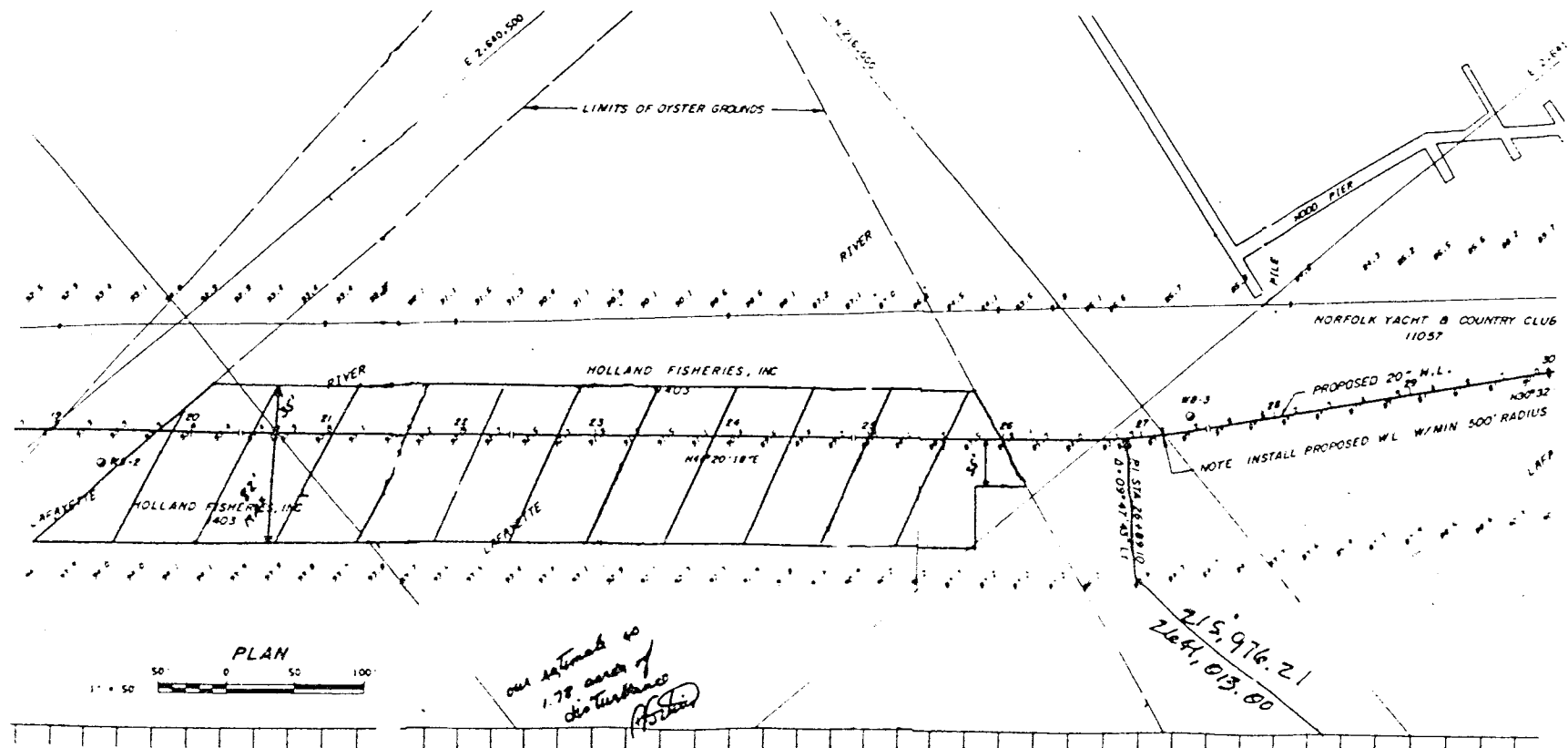


FIGURE 2. Section of plan prepared by the Department of Utilities of the City of Norfolk showing the outline of the area of the oyster ground leased by Holland Fisheries, Inc. (VMRC Plat File No. 1403) in the Lafayette River to be surveyed by VIMS and its location in relation to the proposed water line and the Norfolk Yacht and Country Club piers.

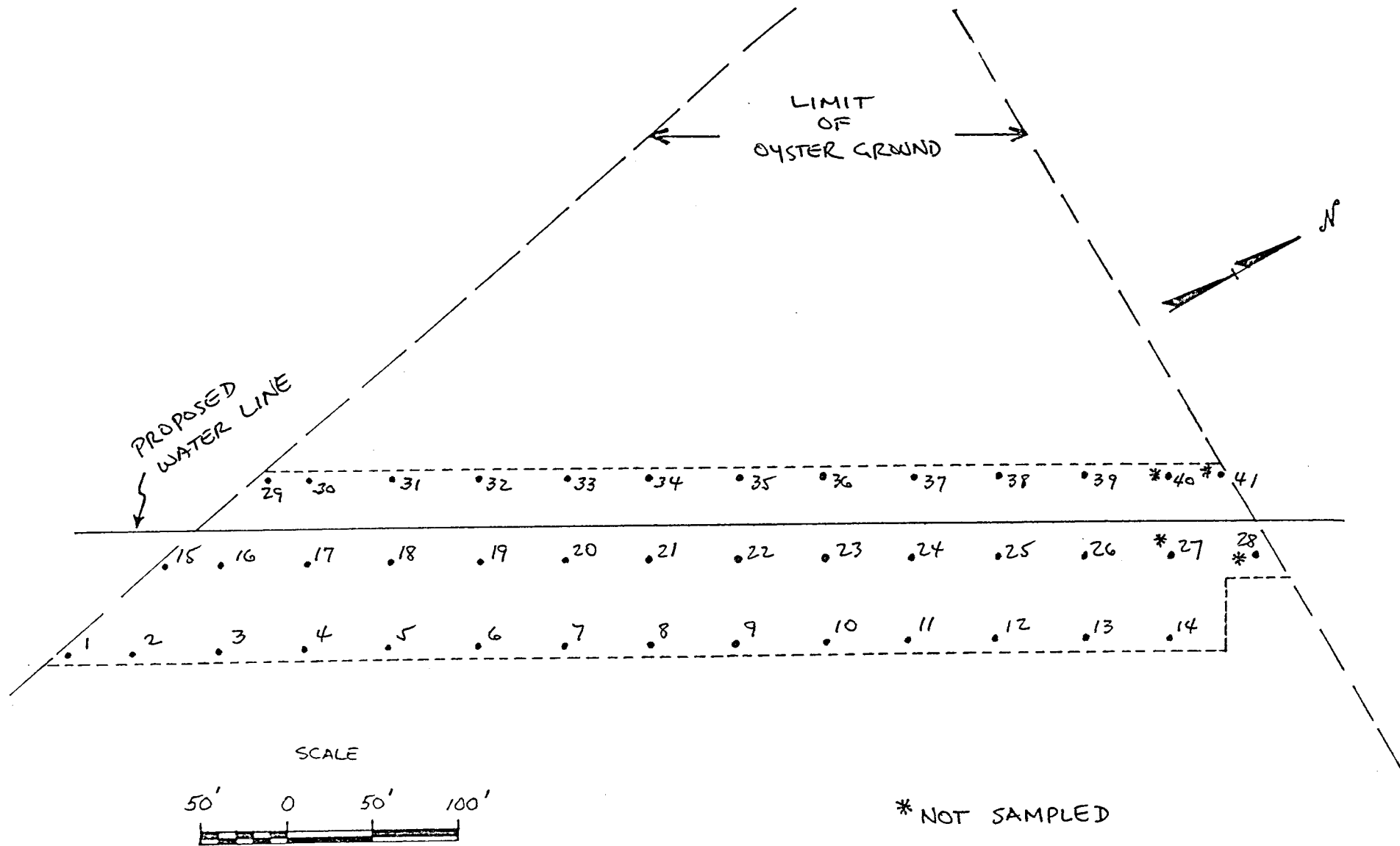


FIGURE 3. Location of sampling points along three transects on the section of oyster ground leased by Holland Fisheries, Inc. (VMRC Plat File No. 1403) in the Lafayette River at which bottom samples were collected for assessment of the quantities of oysters and shells.

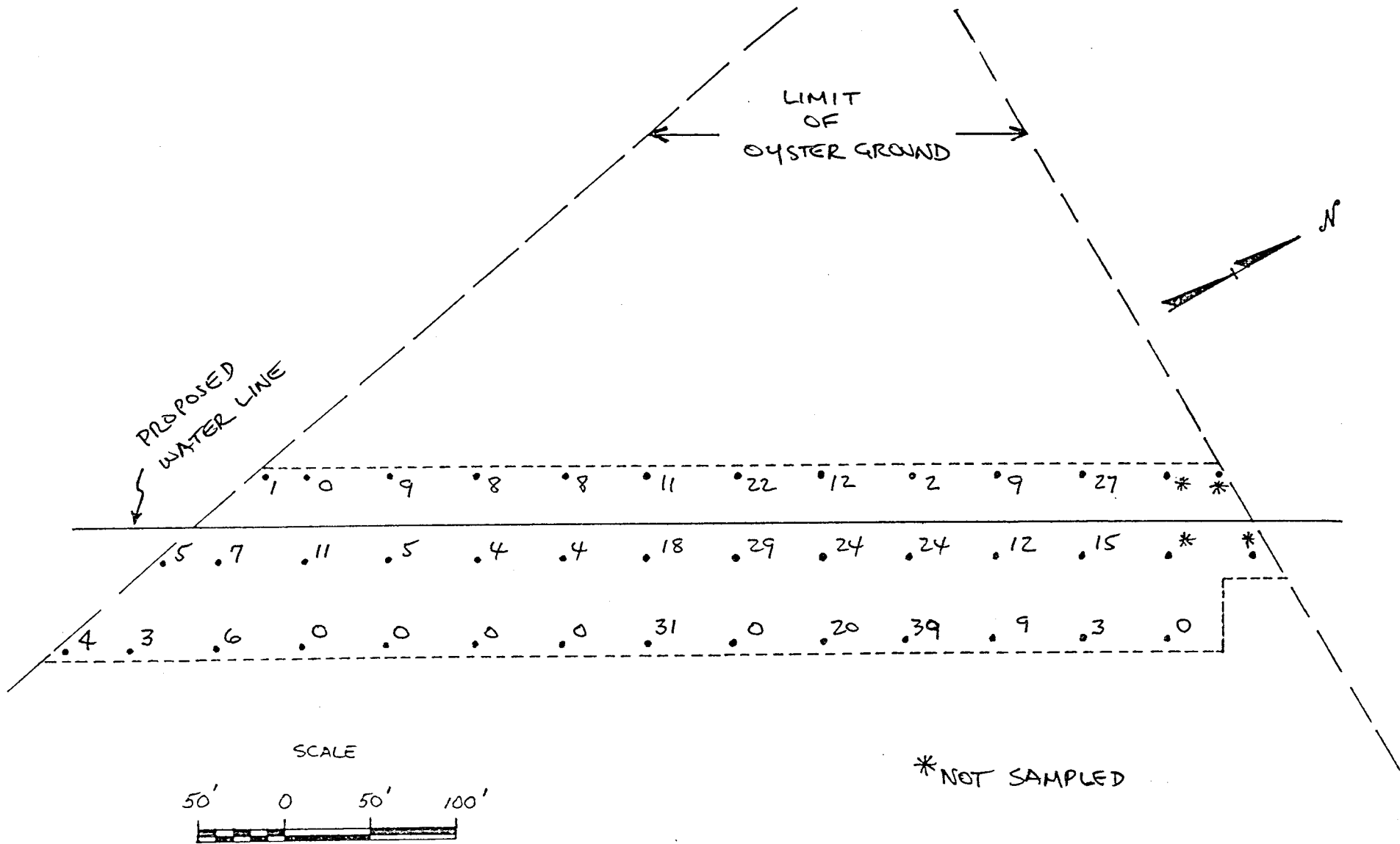


FIGURE 4. Combined number of oysters and oyster spat in one oyster tongs grab at each of the points sampled on the section of oyster ground in the vicinity of the water line proposed for construction by the City of Norfolk in the Lafayette River.