Publication No. 75-e38

WA-17-0020

KILISUT HARBOR REPORT

by

Allen W. Moore

Washington State Department of Ecology

September 25, 1975

KILISUT HARBOR

History

Kilisut Harbor is formed by Indian Island on the west and Marrowstone Island on the east. The mouth of the harbor opens to the northwest into Port Townsend. The south end has historically been open (as shown on Figure 1) with a small island formed by two channels which converge into one channel as it enters Oak Bay. On May 7, 1792, Mr. Johnstone of Captain George Vancouver's exploration party of Puget Sound rowed back and forth through the channel. He 'found the channel to be navigable for small boats only from half flood to half ebb and was dry at low water.' During the late 1880's and '90's the father of Ralph Johnson, a local native, sailed a 30 foot sloop through the channel. Also, cattle scows were run through the channel.

In 1908 and 1912, bridges were constructed with one across each channel connecting Indian Island to Marrowstone Island. There was enough clearance for navigation by rowboat since one or two of the local residents rowed through on their way to work at fish canneries or for fishing in Oak Bay until about 1940. Shortly after 1940 the bridges were taken out and large culverts were installed. In 1958 the large culverts were taken out and the currently existing smaller culverts, approximately three feet in diameter, were installed. At the same time the road bed was reinforced with fill and riprap was installed. The smaller culverts nearly completely restricted any tidal flows compared to the pre-culvert flows.

On September 5, 1974, a letter of complaint was written by John O. Taylor, M. D. to the Department of Fisheries describing a kill of small Dungeness crabs, cockles and sand dollars along his shoreline property at the east beach of southern Kilisut Harbor. Associated with this marine kill was a foul odor coming from gray, turbid water extending ¼ to ½ mile north of his house, halfway across the harbor to the west and an undetermined distance to the south. Dissolved oxygen concentrations in the turbid water were 3.5 to 5.5 ppm. The foul odor was first noted on August 16 through the end of the month during days of low tides.

This situation again occurred in late August and early September of 1975 but to a lesser extent. In August 1975 the problem was brought to the attention of the Department of Ecology. On September 3, 1975 my assistant, Darrel Anderson and I drove to Kilisut Harbor and met Dr. Taylor at his house. He showed us the area in front of his house where the gray water was again occurring. Dead cockles, crabs and sand dollars were found on the beach. The eelgrass was also dying in large amounts and decaying along with the dead invertebrates. Water samples were taken on 5 locations in the harbor. Figure 2 shows the sample locations and the table lists the lab data.

Results

The low numbers of total and fecal coliforms indicates little or no influence from any nonpoint sewage in the area. Nutrients were somewhat normal with the exception of the ammonia which was quite high probably be-

cause of the breakdown of the dead invertebrates and eelgrass. Total phosphates were high with a highest reading of 0.13 ppm at the south end of the bay. This value could indicate a buildup of nutrients.

Discussion

Examination of historical data and personal interviews shows that a considerable amount of water flowed back and forth through the channel between Indian Island and Marrowstone Island during high tides. The duration of flow plus the speed of the flow provided good flushing action. This flushing between the south end of Kilisut Harbor and Oak Bay has been virtually eliminated by the installation of culverts. Not only was the water flow severely restricted but visual examination shows a buildup of sediment on both sides of the culvert. As time goes by, more wind and wave caused buildup will result with perhaps a complete blockage of water exchange between Oak Bay and Kilisut Harbor. Before the culverts were installed wind and wave action and current action apparently were sufficient to prevent further sediment buildup. Presently the only water exchange between Oak Bay and Kilisut Harbor occurs at extreme high tides and on a very limited scale.

Kilisut Harbor is now essentially a cul-de-sac with poor flushing. Natural biological conditions create a nutrient buildup in a poorly flushed area such as this. This is further compounded by the summer north winds which hold the water in the harbor, further restricting the flushing action. If the channel at the south end were still open the water would run out through the channel on an incoming tide decreasing any chance of nutrient buildup.

As the tide starts to run out, the stream direction would reverse and Oak Bay water would run into Kilisut Harbor diluting nutrient buildups. Starting at the time of culvert installation, when flows were severely restricted and continuing to the present, as flows are cut even more due to blockage by sediment build ups, conditions have favored a buildup of nutrients. The results of this nutrient buildup have become apparent during the late summer months of 1974 and 1975. A combination of high water temperature and nutrient buildup caused by poor flushing coupled with a high sunlight level result in heavy phytoplankton blooms (red tides). The phytoplankton then die off and start decomposing. The decomposition uses up most or all of the oxygen available in the water which in turn kills off the invertebrates coming in contact with the water. The dead and decomposing plankton and invertebrates cause an obnoxious odor. The murky, gray water is probably nitrogenous decomposition products coming out of solution in the oxygen deficient water. Consultations with biologist Ron Westley of the Washington State Department of Fisheries, Point Whitney Shellfish Lab, and Dr. Clifford Barnes of the Department of Oceanography, University of Washington, confirm these conclusions.

Conclusions

The conditions which have been causing the red tides and consequent shellfish kills during the late summer of 1974 and 1975 will continue and perhaps intensify as the sediments build up with decomposed materials. The young Dungeness crab mortalities may also deplete the commercial crab fishery at the north end of Kilisut Harbor. The only logical way to reverse these conditions would be to restore the channels at the south end of Kilisut

Harbor to the natural depths and widths indicated on the 1880 Coast and Geodetic Survey chart shown on Figure 1. Bridges would then have to be constructed over the channels for transportation to Marrowstone Island.

References

Books

Meany, Edmond S., Vancouver's Discovery of Puget Sound, Binfords and Mort, Portland, Oregon, 1957, p95.

Personal Interviews

Barnes, Dr. Clifford A., Department of Oceanography, University of Washington, Seattle, Washington 98195

Johnson, Ralph B., Nordland, Washington 98358

Taylor, Dr. John O., Box 116, Nordland, Washington 98358

Westley, Ron, Point Whitney Shellfish Lab, Brinnon, Washington 98320

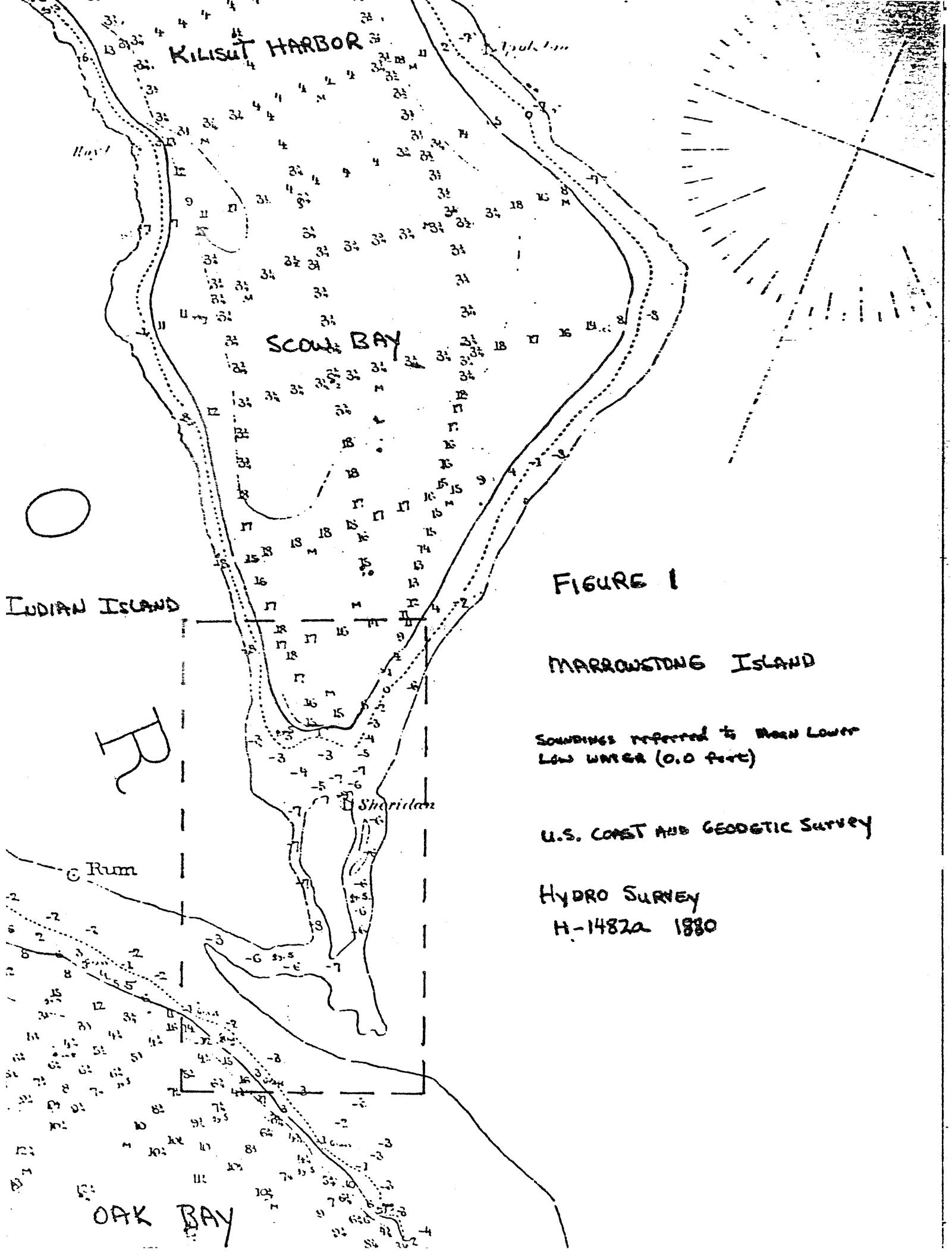


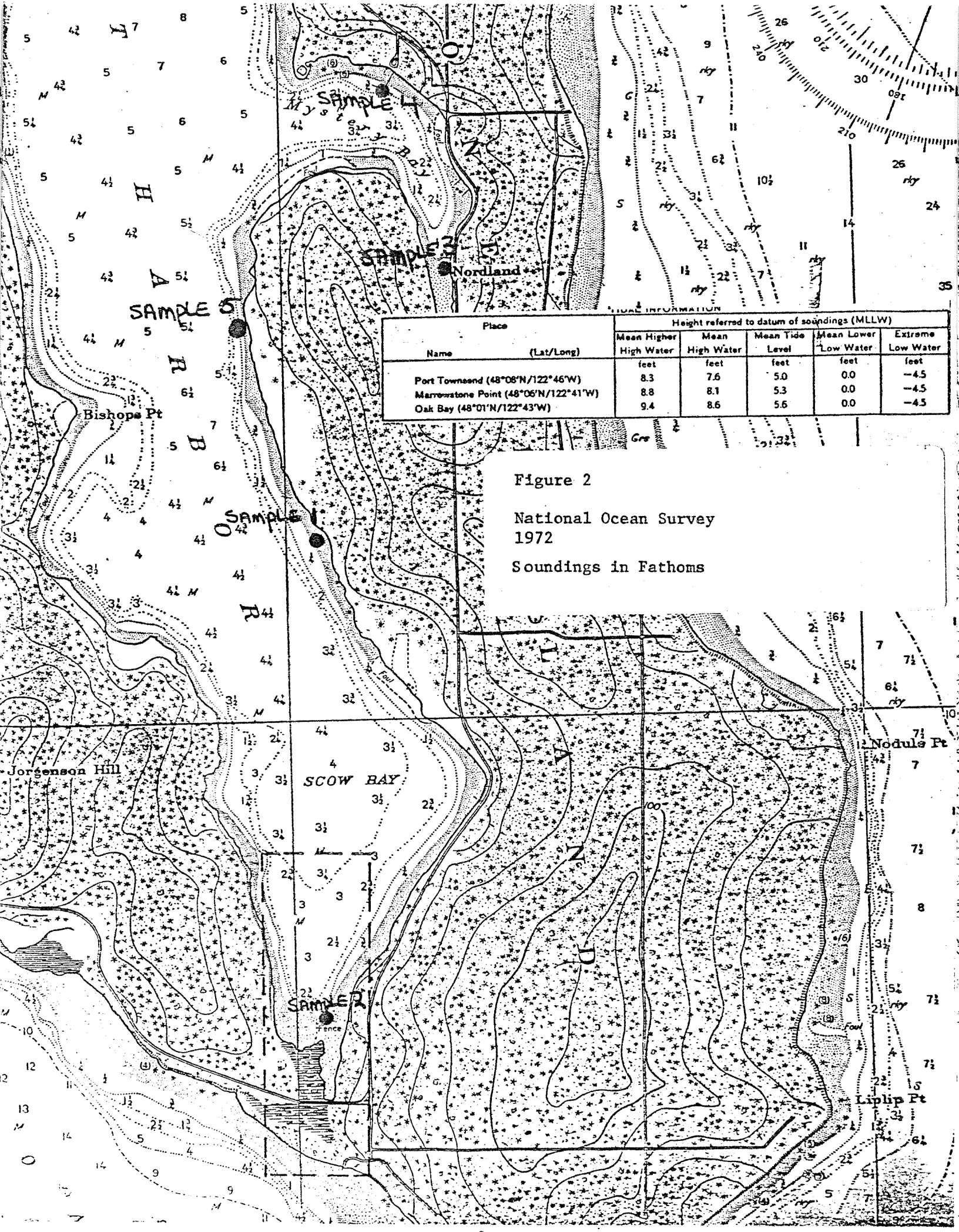
FIGURE 1

MARROWSTONE ISLAND

SOUNDINGS REFERRED TO MEAN LOWER LOW WATER (0.0 feet)

U.S. COAST AND GEODETIC SURVEY

HYDRO SURVEY
H-1482a 1880



Place Name (Lat/Long)	Height referred to datum of soundings (MLLW)				
	Mean Higher High Water	Mean High Water	Mean Tide Level	Mean Lower Low Water	Extreme Low Water
	feet	feet	feet	feet	feet
Port Townsend (48°08'N/122°46'W)	8.3	7.6	5.0	0.0	−4.5
Marrowstone Point (48°06'N/122°41'W)	8.8	8.1	5.3	0.0	−4.5
Oak Bay (48°01'N/122°43'W)	9.4	8.6	5.6	0.0	−4.5

Figure 2

National Ocean Survey
1972

Soundings in Fathoms

KILISUT HARBOR LAB DATA

September 3, 1975

Station Time	1 1015	2 1045	3 1110	4 1120	5 1150
Total Coliform (Col/100 ml)	<50	<50	< 10	< 10	< 50
Fecal Coliform (Col/100 ml)	Est. 20	<20	< 20	< 2	< 20
NO_3O-N (Filtered)	0.04	0.04	0.01	0.01	0.01
NO_2-N (Filtered)	ND	ND	ND	ND	ND
NH_3-N (Unfiltered)	0.22	0.17	0.17	0.15	0.17
T. Kjeldahl-N (Unfiltered)	0.52	1.5	0.54	0.40	0.80
$O\text{-}PO_4$-P (Filtered)	0.02	0.03	0.03	0.03	0.03
Total Phos.-P (Unfiltered)	0.05	0.13	0.06	0.06	0.08
Turbidity	1	2	3	4	5

20—THE DAILY NEWS
Port Angeles, Wash., Wed., Dec. 10, 1975

To prevent future problems

Restore old watercourse

Peninsula east

PORT TOWNSEND—Restoration of water channels and bridges from Marrowstone Island to Indian Island are the only logical way to solve the problems of Kilisut Harbor, according to an environmentalist in the Water Quality Investigations section of the Department of Ecology.

A copy of Allen W. Moore's report to the department was sent to the Jefferson County Commissioners as well as other state departments which had shown an interest in complaints received by Dr. John Taylor and Ralph B. Johnson, both of Nordland.

The conditions causing the red tides and consequent shellfish kills in 1974 and 1975 will intensify as long as sediment continues to build up with decomposed materials in the southern end of Kilisut Harbor, according to Moore. He also predicts the depletion of the commercial crab fishery at the north end of the harbor for the same reason.

The only logical way to reverse the conditions is to restore the channels at the south end of the harbor to depths and widths indicated in 1880 charts and construct bridges over the channels for transportation to Marrowstone Island.

An early history of the harbor indicates the south end of the harbor was open with two channels meeting into one channel as the waters entered Oak Bay. Records show the channels were used by boats and scows, according to Moore's report.

In 1908 and 1912, bridges were constructed, one across each channel, connecting Indian and Marrowstone islands. Rowboats could pass under them. In 1940, the bridges were removed and culverts installed. In 1958, the large culverts were removed and smaller culverts, three feet in diameter, were installed and the road bed reinforced. Moore said the smaller

near Kilisut, study urges

culverts restricted the tidal flows.

John O. Taylor, Marrowstone Island resident, complained to the Department of Fisheries in September 1974, saying small crabs, cockles and sand dollars along his shoreline property were dying and a foul odor was coming from gray turbid water in Kilisut Harbor.

The situation recurred in 1975 to a lesser extent and Taylor notified the Department of Ecology. Investigation showed large amounts of eelgrass was also dying.

The natural flushing action of water flow between Oak Bay and Kilisut Harbor was eliminated with the installation of the smaller culverts and Moore speculates that more sediment buildup on both sides of the culverts will completely block the water exchange between the two bodies of water.

Restoration of the water channels would return the tidal flushing action and prevent a buildup of nutrients which have caused the red tides and the marine kills.

County Engineer Ed Becker said Tuesday the matter has been brought to the county's attention several times over the past few years but nothing has been done.

He said pressures in the future will be great enough that county government will have to consider restoration of the channels and construction of bridges.