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STATE OF WASHINGTON

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Governor

DEPARTMENT OF ECOLOGY

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MEMORANDUM
March 24, 1980

To: John Glynn

From: Jerry Thielen

Subject: Results of Oak Harbor Receiving Water Study, November 26 and 27, 1979

Introduction

Oak Harbor is a fairly large inlet located on the east shore of Whidbey Island. It is connected to Puget Sound and Port Susan by Saratoga Passage (Figure 1). The sewage treatment plant (STP) serves the community of Oak Harbor (population 12,070) discharging to the harbor from a diffuser located approximately 1500 feet offshore from the city's public beach.

Oak Harbor currently meets both state and federal water quality goals for Class A waters.

A receiving water survey and Class II facility inspection were conducted at Oak Harbor on November 26 and 27, 1979. Results of the receiving water survey are documented in this report.

Methods

Surface water samples were collected at 10 stations (Figure 1), packed on ice, and transported to the DOE Tumwater water quality laboratory for the following nine analyses:

1. Fecal Coliforms (org/100 ml)
2. Total Coliforms (org/100 ml)
3. Nitrate-N
4. Nitrite-N
5. Ammonia-N
6. Orthophosphate-P
7. Total Phosphate-P
8. pH
9. Turbidity

Depth profiles were also obtained for the following parameters utilizing a Beckman salinometer and a IBC dissolved oxygen (D.O.) probe calibrated using the Azide modification of the Winkler method:

1. Temperature (°C)
2. Dissolved Oxygen (mg/l)
3. Salinity (ppt)
4. Conductivity (μmhos/cm)

All analyses were conducted as per *Standard Method for the Examination of Waste and Wastewater* (1975).

Results and Discussion

Results of the receiving water survey are given in Tables 1 and 2. These data show that the STP wastewaters have a negligible impact on water quality in Oak Harbor. This appears to be principally due to the small quantity of effluent discharged (daily average of 0.5 MGD) compared to the estimated exchange of water in the harbor (358 billion gallons) (Reid, Middleton, 1973).

For comparative reference, levels of water quality constituents observed in the inner harbor (Stations 1 and 2) showed no degradation compared to levels found in Saratoga Passage (C1 and C2).

JT:cp

Attachments

LITERATURE CITED

APHA, 1976. *Standard Methods for the Examination of Water and Wastewaters*, Am. Pub. Health Assoc., 1015 - 18th St. N.W., Wash. D.C., 14th Edition, 1193 pp.

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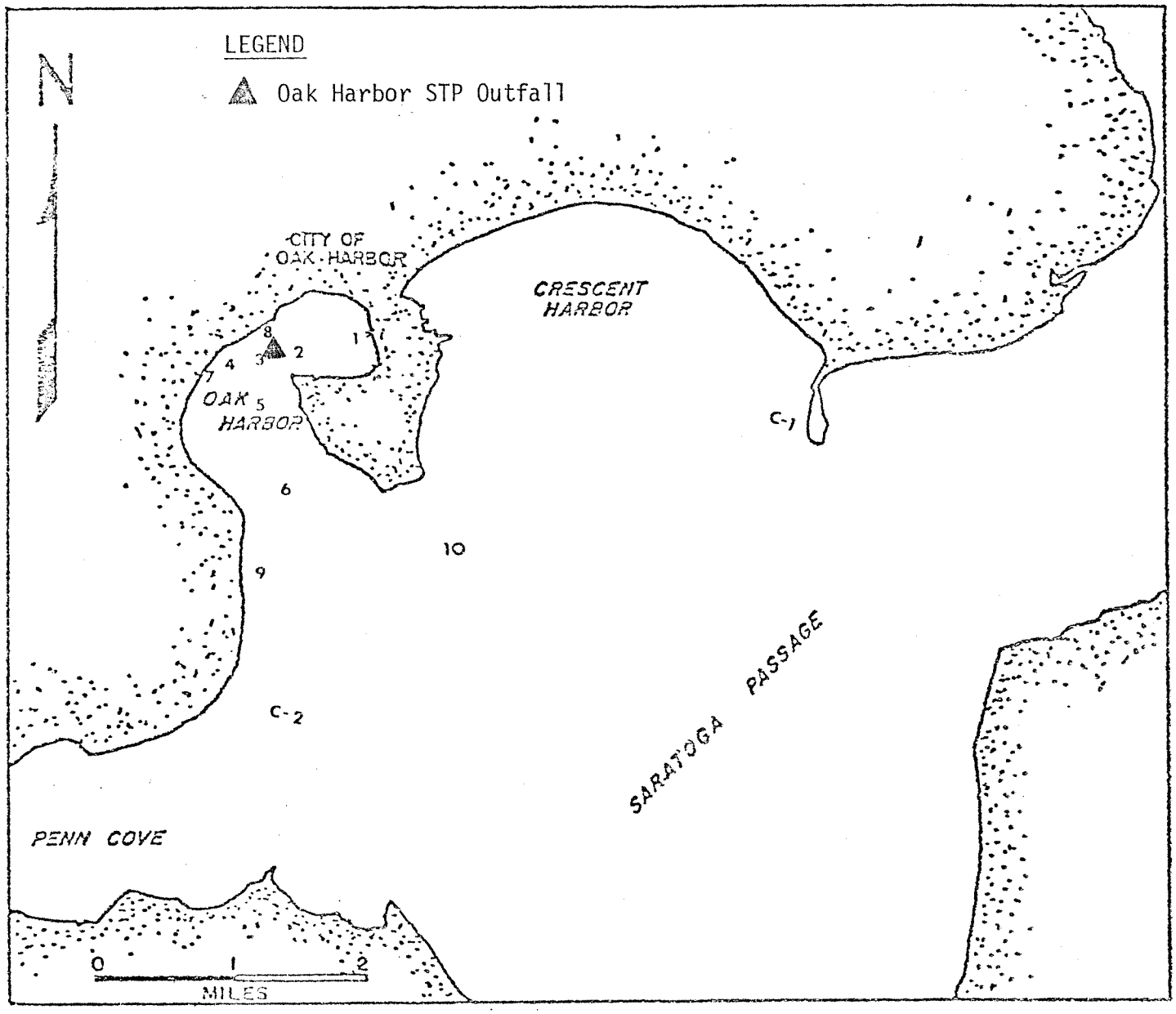

Figure 1. Map depicting Oak Harbor water quality stations - DOE survey, November 1979.

Table 1. DOE Water Quality Sampling Data - Oak Harbor, Washington, Low Tide, November 26, 1979

Station Number	Station Description	Temp. (°C)	pH	Specific Conductance (mmhos/cm)	Turbidity	D.O.[2/] (mg/l)	D.O. Sat. (%)	Salinity (% or ppt)	Fecal Coliform (org/100 ml)	NH_3-N (mg/l)	NO_3-N (mg/l)	NO_2-N (mg/l)	O-PO_4-P (mg/l)	T-PO_4-P (mg/l)
1S	Inner Harbor @ Channel Marker #10 - Surface	6.8	7.7	27.4	1	9.4	91	26.1	<1	<0.01	0.29	<0.01	0.06	0.06
1D	Depth of 4 m	7.3	---	30.7	-	8.6	86	29.7	1B[3/]	--	--	--	--	--
2S	Between channel marker #8 and old pier 100 yds east of outfall	6.4	7.7	27.4	1	9.7	93	26.4	<1 [4/]	<0.01	0.29	<0.01	0.07	0.08
2D	Depth of 5 m	7.0	---	30.9	-	8.8	85	25.9	1B	--	--	--	--	--
STP	Oak Harbor Effluent[1/]	15.4	7.0	1.2	-	---	--	---	23B	29.8	<0.20	<0.02	8.60	9.60
3S	Between green flashing light #7 and windmill (N. shore) 50 yds west of outfall	6.6	7.7	27.2	1	9.7	94	26.4	2B	<0.01	0.29	<0.01	0.06	0.07
3D	Depth of 4 m	7.0	---	30.8	-	8.7	87	29.8	7B	--	--	--	--	--
4S	From Station 3 heading of 210° @ 1300 RPM for 1.5 min.	6.4	7.7	27.3	2	9.8	94	26.5	1B	<0.01	0.29	<0.01	0.06	0.07
4D	Depth of 1.5 m	6.9	---	29.9	-	9.0	89	28.7	3B	--	--	--	--	--
5S	Mid-way between Gr. marker #7 and Gr. marker #5	6.6	7.7	27.8	1	9.6	93	27.0	2B	0.01	0.30	<0.01	0.06	0.07
5D	Depth of 6 m	7.0	---	31.8	-	8.6	86	30.7	5B	--	--	--	--	--
6S	At Gr. marker #5	6.5	7.7	28.1	1	9.7	94	27.3	--	<0.01	0.30	<0.01	0.06	0.08
6D	Depth of 2.5 m	7.0	---	31.3	-	9.0	90	29.9	3B	--	--	--	--	--
7S	Offshore of pink house - West shore	7.5	7.7	28.0	2	9.4	93	26.2	<1	<0.01	0.30	<0.01	0.06	0.07
8S	Offshore of public beach - North shore	6.8	7.7	25.7	2	9.9	94	23.4	4B	0.01	0.31	<0.01	0.06	0.09
9S	From Station 6 - 170° - half the distance to shore	6.6	7.7	28.9	2	9.4	91	27.3	4B	<0.01	0.30	<0.01	0.06	0.09
9B	Depth of 2 m	7.9	---	29.4	-	9.3	92	28.9	--	--	--	--	--	--
10S	Red flashing light #2 - off Mahlor Point	6.8	7.7	29.1	1	9.1	89	28.2	1B	0.01	0.31	<0.01	0.06	0.09
10B	Depth of 5 m	8.5	---	34.0	-	7.3	76	31.8	--	--	--	--	--	--

1/ Samples collected as part of Class II inspection, 24-hour composite of final effluent.
2/ D.O. corrected for salinity.
3/ B = Estimated value.
4/ < = Less than.

Table 2. DOE Water Quality Sampling Data - Oak Harbor, Washington, High Tide, November 27, 1979

Station Number	Station Description	Temp. (°C)	pH	Specific Conductance (mmhos/cm)	Turbidity	D.O.[2/] (mg/l)	D.O. Sat. (%)	Salinity (% or ppt)	Fecal Coliform (org/100 ml)	Total Coliform (org/100 ml)	NH_3-N (mg/l)	NO_3-N (mg/l)	NO_2-N (mg/l)	O-PO_4-P (mg/l)	T-PO_4-P (mg/l)
1S	Inner Harbor @ Channel Marker #7 - Surface	6.0	7.6	29.0	1	8.2	79	28.7	1B[3/]	3B	0.02	0.32	<0.01	0.07	0.09
1B	Depth of 4 m	9.8	---	31.0	-	8.6	86	30.2	1B	17B	--	--	--	--	--
2S	Btwn Channel Marker #8 and old pier 100 yds east of outfall	6.6	7.6	29.2	1	9.1	89	28.4	<1 [4/]	---	0.01	0.32	<0.01	0.07	0.08
2B	Depth of 7 m	7.0	---	31.9	-	8.4	85	31.0	120	300	--	--	--	--	--
STP	Oak Harbor Eff.[1/]	15.4	7.0	1.2	-	---	--	---	23B	---	29.8	<0.20	<0.02	8.60	9.60
3S	Btwn gr. flashing light #7 & windmill (N. shore) 50 yds W. of outfall	6.4	7.6	28.7	2	7.9	77	28.0	<1	16B	0.01	0.32	<0.01	0.06	0.09
3B	Depth of 6 m	7.1	---	32.0	-	8.0	81	31.2	22	50	--	--	--	--	--
4S	Frm Sta. 3 heading of 210° @ 1300 RPM for 1.5 min.	6.4	7.6	28.3	2	8.9	86	27.6	<1	16B	<0.01	0.32	<0.01	0.06	0.08
4B	Depth of 3 m	6.4	---	30.4	-	8.9	88	29.9	5B	28B	--	--	--	--	--
5S	Mid-way btwn Gr. marker #7 & Gr. marker #5	7.2	7.6	28.7	1	8.3	80	27.0	1B	13B	0.02	0.33	<0.01	0.06	0.08
5B	Depth of 8 m	6.6	---	32.6	-	8.0	81	31.5	10B	47B	--	--	--	--	--
6S	At Gr. marker #5	6.8	7.7	29.0	2	8.3	81	28.1	1B	<2	<0.01	0.33	<0.01	0.06	0.08
6B	Depth of 4 m	7.0	---	29.5	-	8.2	81	28.5	1B	13B	--	--	--	--	--
7S	Offshore of pink house - W. Shore	5.8	7.7	28.0	1	9.4	90	27.8	1B	2B	0.01	0.31	<0.01	0.06	0.07
8S	Offshore of pub. beach - N. Shore	6.3	7.7	28.6	1	9.1	88	28.0	1B	2B	<0.01	0.32	<0.01	0.06	0.07
9S	Frm Sta. #6 - 170° - half the distance to shore	6.4	7.7	28.8	1	8.5	83	28.3	<2	10B	<0.01	0.33	<0.01	0.06	0.07
9B	Depth of 4 m	7.0	---	31.1	-	8.2	82	30.3	<1	2B	--	--	--	--	--
10S	Red flashing light #2 - off Mahlor Pt.	6.7	7.7	30.8	1	8.1	79	28.2	<1	--	<0.01	0.33	<0.01	0.06	0.06
10B	Depth of 11 m	10.2	---	38.6	-	4.2	47	34.9	<1	<2	--	--	--	--	--
C-1S	200 yds W. of Polnell Point	6.9	7.7	30.6	2	8.8	88	29.6	6B	5B	<0.01	0.32	<0.01	0.06	0.08
C-1B	Depth of 6 m	10.3	---	38.1	-	4.9	54	34.4	<1	<2	--	--	--	--	--
C-2S	Mid-channel entr. to Penn Cove	6.6	7.7	29.7	1	9.0	88	28.8	<1	<2	<0.01	0.33	<0.01	0.07	0.08
C-2B	Depth of 10 m	8.4	---	33.9	-	8.3	87	32.2	2B	5B	--	--	--	--	--

1/ Samples collected as part of Class II inspection, 24-hour composite of final effluent.
2/ D.O. Corrected for salinity.
3/ B = Estimated value.
4/ < = Less than.