MEMORANDUM

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TO: Nelson Graham, Merley

DATE: 2-17-70

FROM: Ron Lee

SUBJECT: Willapa River Estuary Survey

A water quality survey was conducted on the Willapa River Estuary to evaluate bacteriological contamination relative to: (1) existing sewage lagoon discharges at Raymond and South Bend, (2) Raymond's primary digester effluent, and (3) the Weyerhauser lumber mill. Secondary objectives included measurements of the extent of salt water intrusion in the Willapa River at high and low tide, the effect of the primary digester effluent on dissolved oxygen concentration in the river, and the influence of Weyerhauser's cooling water effluent on the rivers temperature regime.

Bacteriological and water samples were collected at various sampling locations on February 2, 1970 (low tide) and on February 3, 1970 (high tide) (Figures 1 and 2). Surface bacteriological samples were usually taken in duplicate at each station approximately one hour apart. Turbidity, PBI, and pH determinations were made on surface water samples and are included in the appendix. Salinity profile data for the lower Willapa River is also presented in the appendix.

The significant feature of the survey was the consistency of high coliform counts at most sampling stations (Table 1). The City of South Bend was discharging untreated sewage to the river, but coliform counts below the discharge were not significantly higher than counts obtained upstream. The data suggests that bacteriological contamination from the Raymond lagoon discharge does not increase coliform counts already present in the river. It is not surprising to find that high bacteria counts were obtained at stations adjacent to the Weyerhauser cooling water effluent and log storage areas. The highest coliform counts, however, were recorded below Raymond's primary digester effluent.

Another area of concern results from the coliform counts obtained on shellfish culturing grounds in Willapa Bay (Stations 15A,15B and WPA004). All three values are above the shellfish water quality criteria set at 70 MPN with 10% of the samples not to exceed 230 MPN (Table 1).

The dissolved oxygen concentration in the river was little effected by the primary digester discharge and no increase in temperature was recorded at a radial distance of 10 feet from the Weyerhauser cooling water discharge. Oxygen concentrations decreased from 12.4 ppm above the digester to 11.4 ppm immediately below (water temperature, 7.3 °C). During low flow and warm weather conditions, however, the difference in oxygen content may greatly increase.

RL:ah

FIGURE 1

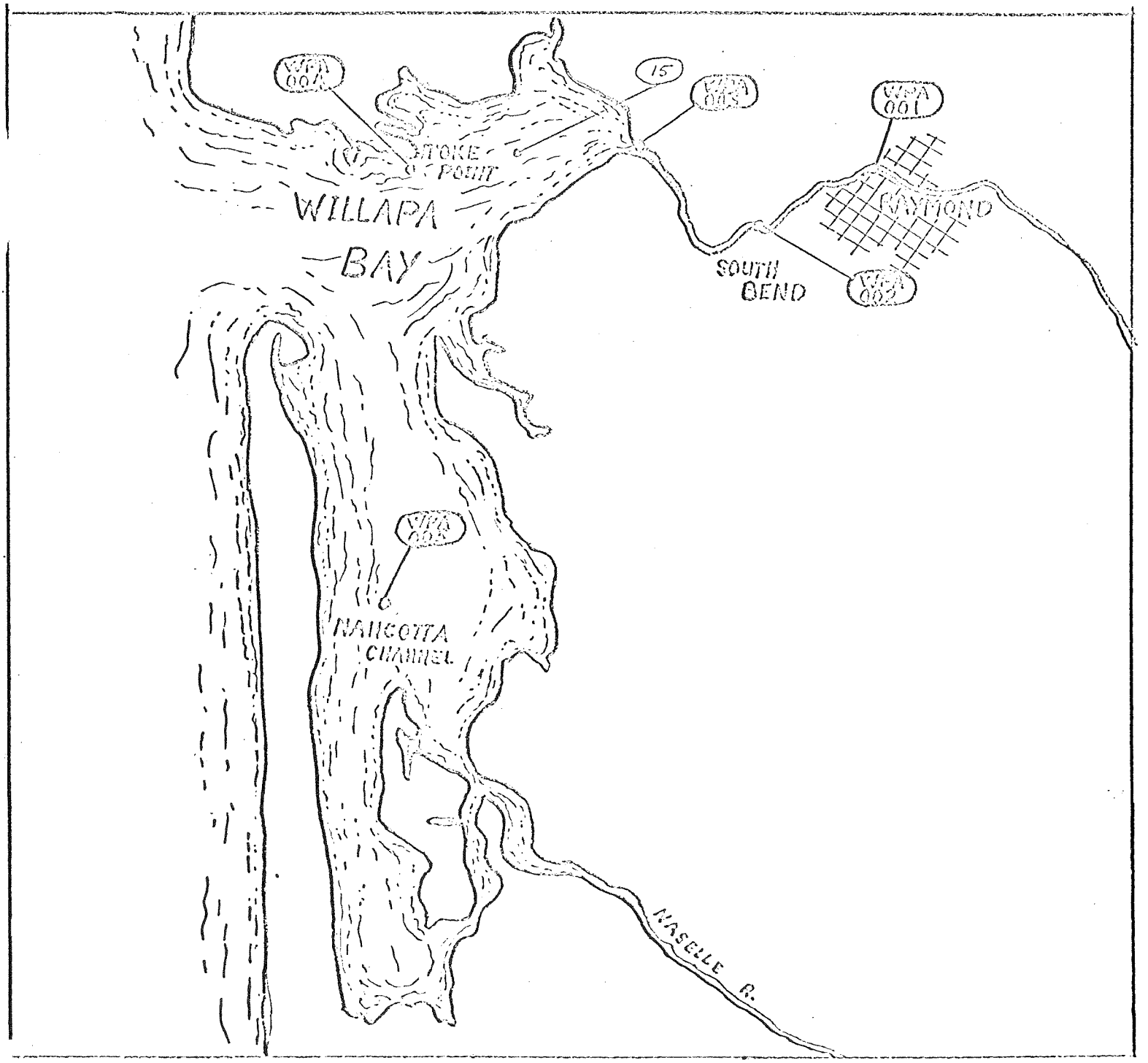
WPA 007
15
WPA 005
WPA 001
STOKE POINT
WILLAPA BAY
RAYMOND
SOUTH BEND
WPA 002
WPA 003
NAHCOTTA CHANNEL
NASELLE R.

FIGURE 2

WILLAPA RIVER

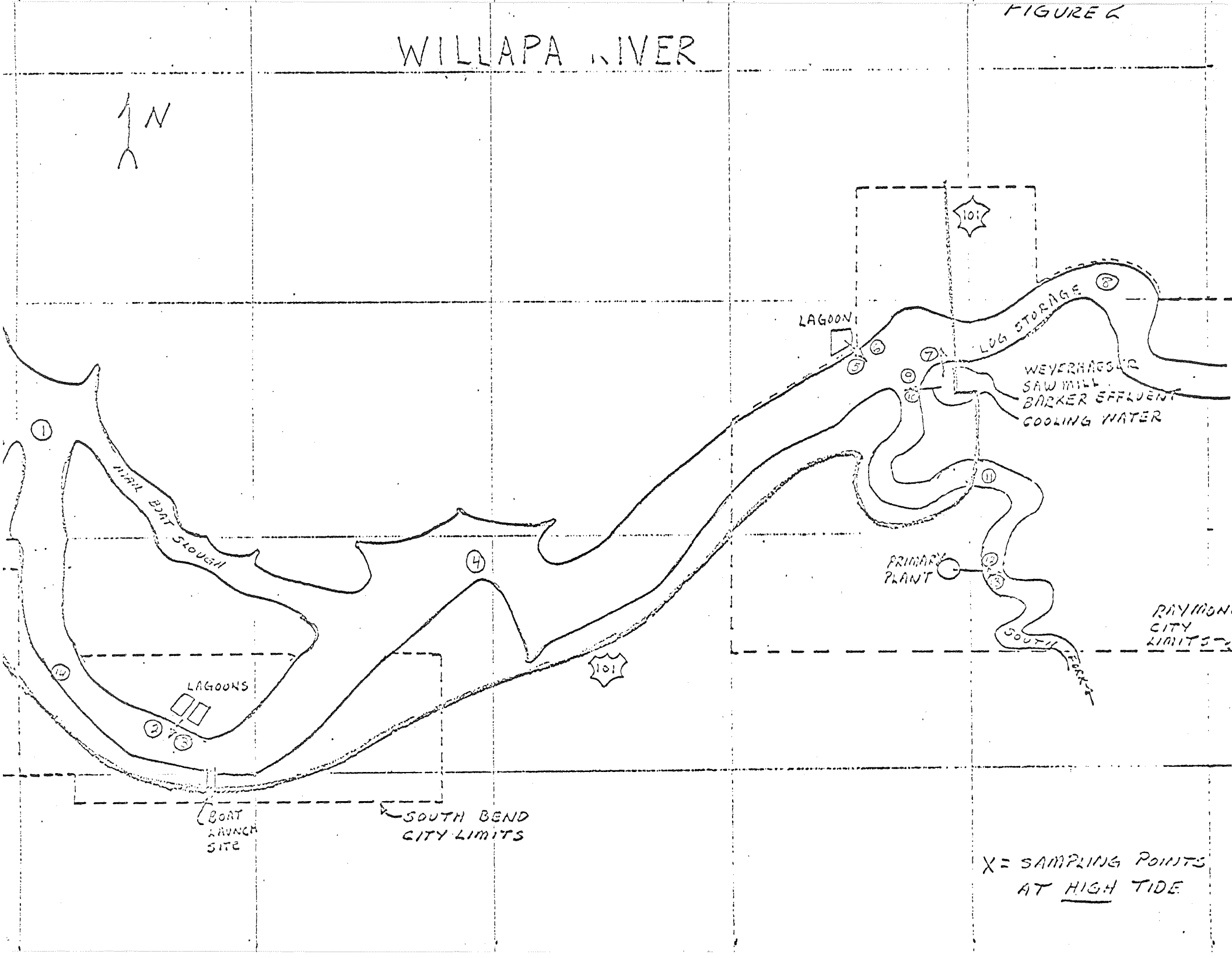

Table 1. Tabulation of coliform data collected at various sampling stations in the Willapa River Estuary on February 2 and 3, 1970. Values are based on counts per 100 mls of sample.

Station	High Tide (11.3 ft) Total	Fecal	Low Tide (0,5 ft) Total	Fecal
1A	360		980	
1B	720		860	
2A	720	170	800	120
2B	840	1100	940	125
3A	960		760	
3B	530		770	
4A	2000		---	
4B	2000		960	
5A	210	40	1000	80
5B	100		1540	120
6A	700		820	
6B	140		1100	
7A	620	100	960	80
7B	4000	1080	1320	75
8A	940		760	
8B	840		1120	
9A	1200	205	1860	305
9B	980		2300	450
10A	---		1520	
11A	2400		---	
11B	1460		1200	
12A	1840	2100	560	1300
12B	1300	260	15,500	1940
13A	2300		580	
13B	1400		660	
14	980		---	
15A	---		740	
15B	---		400	
WPA001	---		1100	
WPA002	---		1100	
WPA003	---		800	
WPA004	---		150	

Appendix I. Turbidity, pH, and PBI values collected at various sampling stations in the Willapa River Estuary on February 2 and 3, 1970.

Station	High Tide (11.3 ft) Turbidity (JTU)	pH	PBI	Low Tide (0.5 ft) Turbidity (JTU)	pH	PBI
1	12.3	7.2	7	11.2	7.3	5
2	9.0	7.2	5	10.4	7.1	5
3	--	--	--	13.2	7.1	2
4	12.7	7.2	12	13.6	7.0	5
5	16.0	7.1	5	29.3	6.9	2
6	--	--	--	30.3	6.9	2
7	16.5	7.1	19	26.6	6.9	2
8	10.8	7.1	7	26.9	6.8	5
9	11.8	7.1	5	20.2	7.0	7
11	14.7	7.0	5	8.4	71	2
12	15.2	7.0	12	10.7	7.1	7
13	12.2	7.1	5	8.6	7.2	0

Appendix II. Salinity and temperature profile data for selected stations during low tide on February 2, 1970.

Station No. 2

Depth (ft)	1	5	10	15	20	25	30	35	40
Temperature (°C)	7.3	7.3	7.3	7.3	7.2	7.2	7.2	7.2	7.2
Salinity	8.6	9.7	11.4	12.9	15.9	17.8	19.3	22.5	22.5

Station No. 4

Depth (ft)	1	5	10	15	20	25	30	35	40
Temperature (°C)	7.1	7.1	7.2	7.2	7.2	7.2	7.1	7.1	7.1
Salinity	5.4	5.9	6.5	6.7	10.2	13.7	17.2	19.3	20.2

Station No. 6

Depth (ft)	1	20	35
Temperature (°C)	7.3	7.2	7.2
Salinity	5.2	6.6	8.3

Appendix III. Salinity and temperature profile date for elected stations during high tide on February 3, 1970.

Station No. 2

Depth (ft)	1	5	10	15	20	25	30	35
Temperature (°C)	6.8	6.8	7.2	7.4	7.5	7.5	7.5	7.5
Salinity	12.6	14.8	18.5	22.0	25.6	26.3	26.4	26.6

Station No. 4

Depth (ft)	1	5	10	15	20	25	30	35	40
Temperature (°C)	7.0	7.0	7.2	7.3	7.4	7.4	7.4	7.5	7.5
Salinity	10.5	11.9	15.0	20.3	23.6	24.6	25.1	25.2	25.2

Station No. 6

Depth (ft)	1	5	10	15	20	25	30	35	40
Temperature (°C)	7.1	7.1	7.3	7.4	7.5	7.4	7.5	7.5	7.5
Salinity	10.5	12.0	16.7	21.5	22.6	23.0	23.2	23.2	23.5

Station No. 8

Depth (ft)	1	5	10	15	20	25	30
Temperature (°C)	7.1	7.1	7.2	7.3	7.3	7.3	7.3
Salinity	10.4	11.2	16.7	19.6	20.9	21.4	21.4

Station No. 12

Depth (ft)	1	5	10	15	20
Temperature (°C)	7.1	7.1	7.2	7.3	7.3
Salinity	8.8	11.8	18.3	19.5	19.5