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STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800

MEMORANDUM

July 14, 1978

To: Ken Mauermann

From: John Bernhardt

Subject: Mercer Slough Survey Results

For several years Bellefield Management Company has been developing swamp and bog lands along lower Kelsey Creek, also named Mercer Slough, into an office park. The company has completed development of the wetlands along the upper portion of the slough and now proposes to expand into the lower section (Figure 1).

On June 27, 1978, a water quality survey was conducted to determine if the Mercer Slough wetlands landfilled with woodwaste during the first stage of Bellefield's project are discharging leachate to the watercourse. Four DOE representatives participated in the survey, including John Bernhardt, Darrel Anderson, Ken Mauermann and Nan Reed.

For the effort, surface water quality and biological samples were collected at seven stations (Figure 1). Station 1 was the control (upstream) while the remaining six stations were spaced at intervals along the slough above, within and below the existing development area. Water quality samples collected at each station were transported to the DOE Tumwater Analytical Laboratory for 15 analyses:

(1) pH
(2) Turbidity
(3) Specific Conductivity
(4) COD
(5) Fecal Coliform
(6) Nitrates (NO_3-N)
(7) Nitrites (NO_2-N)
(8) Ammonia (NH_3-N)
(9) T. Kjeldahl-N
(10) Ortho-phosphates ($O\text{-}PO_4\text{-}P$)
(11) Total Phosphates
(12) Color
(13) Iron
(14) Tannin-Lignan
(15) Chlorphyll a and pheophytin a

In addition to the laboratory samples, dissolved oxygen content (D.O.) and water temperature were measured in the field.

Results of the laboratory analyses for the seven stations sampled are given in Tables 1 and 2. These data are discussed below:

(1.) pH - Woodwaste leachates are characteristically acidic, having a pH of about 4.5 to 5.5. Waters throughout the slough were slightly alkaline and the alkalinity appeared to increase somewhat at the

downstream stations. Either the woodwaste leachate was not having any measurable impact on pH or, if so, this effect was more than offset by another process, probably algal activity which is known to increase pH (see chlorophyll a).

(2.) Turbidity - No significant changes between stations.

(3.) Specific Conductivity - No significant changes between stations.

(4.) Chemical Oxygen Demand (COD) - Woodwaste leachates typically have a high COD, in the 8,000 mg/l range. COD was about the same at all stations indicating no measurable impact.

(5.) Fecal Coliform - Fecal coliform densities were generally high along the entire reach of Mercer Slough sampled, including the control station. The source of these high counts at station 1 is unknown, however, waterfowl appeared to be utilizing the slough (stations 2 to 7) in numbers sufficiently great enough to account for this.

(6.) Nitrates, Nitrites, Ammonia, T. Kjeldahl, Nitrogen, Ortho-phosphates, Total Phosphates - These six indicators of nutrient enrichment were about the same throughout the slough, except for T. Kjeldahl-N which increased at the downstream stations. T. Kjeldahl-N is an indicator of proleinaceous material and would be expected to increase somewhat if an algal bloom was in progress (see chlorophyll a).

(7.) Color - Leachate drawn from a woodwaste landfill is initially brown in color but changes to ink-black within a few minutes exposure to the atmosphere. The waters of Mercer Slough were "brownish" indicating another souce was causing the discoloration. This was probably algae (see chlorophyll a).

(8.) Tannin-Lignan - No significant changes between stations.

(9.) Chlorophyll a and Pheophytin a - Chlorophyll a content is an indicator of "living" algal biomass while Pheophytin a is an indicator of "dead" algae. The combination of high chlorophyll a content and low Pheophytin a content throughout Mercer Slough proper (Stations 2 to 7) indicated an algal bloom was in progress at the time of the survey, and still in the growth phase. This section of the slough is wide and shallow with a slow flow velocity. The algal species responsible for the bloom was not identified however microscopic examination indicated a brown pigment.

(10.) Iron - No significant changes between stations.

(11.) Total Organic Carbon (TOC) - The TOC of woodwaste leachates is characteristically high at about 2400 mg/l. TOC loading was the same in Mercer Slough proper as at Station 1, the control.

(12.) Dissolved Oxygen (D.O.) and Temperature. The field sampling data are given below:

Station No.	Temperature (°C)	Dissolved Oxygen mg/l	Dissolved Oxygen % Saturation
1	19.0	9.6	104
2	20.0	12.0	132
3	18.0	14.2	150
4	19.0	13.0	140
5	20.5	14.1	157
6	20.5	12.3	137
7	20.0	14.0	154

Water temperatures were generally warm and the stream waters, particularly stations 2 to 7, were supersaturated with oxygen at the time of the survey. D.O. supersaturation would be expected during the growth phase of an algal bloom.

In conclusion, the data presented above indicate Mercer Slough at Bellefield Development was not being affected to a measurable degree by woodwaste leachate, as of the June 27 survey. There is probably no problem during summer. Some leaching may occur during the wet winter months. A winter survey would have to be conducted to determine if this is the case.

JB:ee
Attachments

cc: Dick Cunningham
Darrel Anderson
Nan Reed

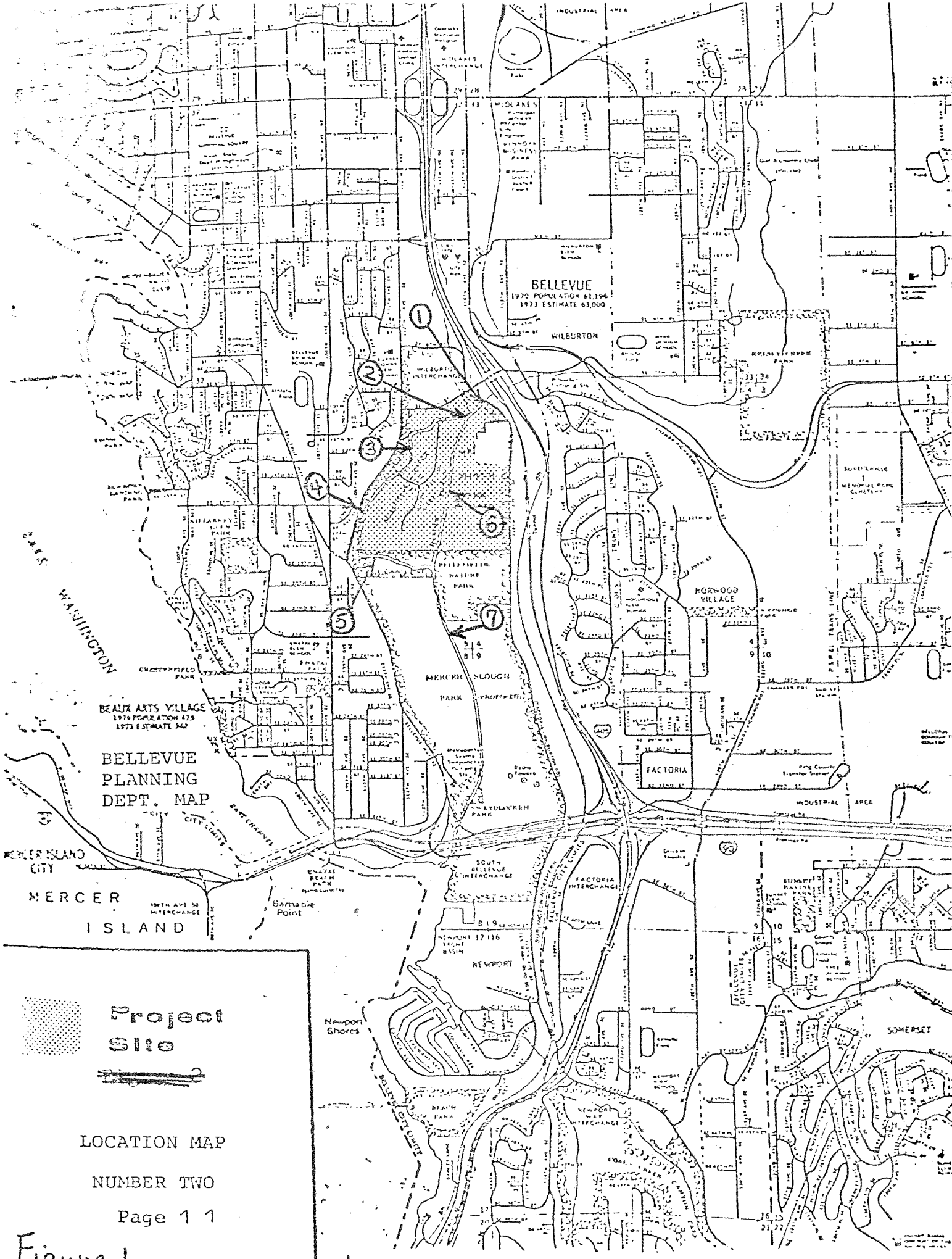
BELLEVUE
1970 POPULATION 61,196
1973 ESTIMATE 63,000
WILBURTON
NORTHWOOD VILLAGE
FACTORIA
MERCER SLOUGH PARK
BEAUX ARTS VILLAGE
1970 POPULATION 475
1973 ESTIMATE 340
BELLEVUE PLANNING DEPT. MAP
MERCER ISLAND CITY
MERCER ISLAND
Project Site
LOCATION MAP
NUMBER TWO
Page 11

Figure 1.

State of Washington
Department of Ecology

OLYMPIA LABORATORY

DATA SUMMARY

..JR.....
COPIES TO:
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LAB. FILES....

Source Mercer Slough @ Bellevue Collected By J. Bernhardt

Date Collected 6-27-78

Log Number:	78-2397	98	99	2400	01	02	03			
Station:	1	2	3	4	5	6	7			
pH	7.7	7.9	8.3	7.8	8.2	8.0	8.2			
Turbidity (NTU)	10.	4.	4.	4.	3.	4	4.			
Sp. Conductivity (umhos/cm)	203	203	211	223	214	203	216			
COD	8.	16.	16.	16.	16.	4.	28.			
BOD (5 day)										
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)	est 690	270	est 100	est 1300	est 400	est 130	est 54			
NO3-N (Filtered)	.61	.16	.01	<.01	<.01	.27	.01			
NO2-N (Filtered)	.01	<.01	<.01	<.01	<.01	.01	<.01			
NH3-N (Unfiltered)	0.04	0.01	———				>			
T. Kjeldahl-N (Unfiltered)	.26	.43	.44	.56	.60	.67	.68			
O-PO4-P (Filtered)	.06	.01	<.01	<.01	<.01	.01	<.01			
Total Phos.-P (Unfiltered)	.09	.08	.06	.08	.09	.08	.07			
~~Total Solids~~ Chlorophyll "Ratio"	2.2	1.2	1.7	0.9	1.2	0.7	2.2			
Total Non. Vol. Solids										
Total Suspended Solids										
Total Sus. Non Vol. Solids										
Color (Color units)	54	46	50	38	38	33	38			
IRON	.50	.30	.11	.16	.10	.20	.10			
TANNIN-LIGNIN	.23	.22	.28	.28	.40	.26	.35			
Chlorophyll a	1.1	16.8	16.1	26.1	40.4	20.5	29.7			
Pheophytin a	2.2	1.2	1.7	0.9	1.2	0.7	2.2			

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected"
"<" is "Less Than" and ">" is "Greater Than"

ECY 040-2-32 TABLE 1

Summary By [signature] Date 7-7-78

Washington Department of Ecology

OLYMPIA LABORATORY

DATA SUMMARY

COPIES TO: K. Wakeman

LAB. FILES ✓

Source Mercer Slough

Collected By John Bernhardt

Date Collected 6/27/78

Log Number:

Station:	1	2	3	4	5	6	7			
TOTAL ORGANIC CARBON (mg/l)	59	62	56	51	53	60	60			
Turbidity (NTU)										
Sp. Conductivity (μmhos/cm)										
COD										
BOD (5 day)										
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)										
NO3-N (Filtered)										
NO2-N (Filtered)										
NH3-N (Unfiltered)										
Org. Kjeldahl-N (Unfiltered)										
PO4-P (Filtered)										
Total Phos.-P (Unfiltered)										
Total Solids										
Total Non. Vol. Solids										
Total Suspended Solids										
Total Sus. Non Vol. Solids										

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected" "<" is "Less Than" and ">" is "Greater Than"

ECY 040-2-32 TABLE 2

Summary By L. Ashley Date 7/7/78