

STATE OF WASHINGTON

DEPARTMENT OF EC
DANIEL J. EVANS
GOVERNOR

JOHN
DIRE

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WA-09-1028

MEMORANDUM

TO: John Glynn

FROM: Scott Jeane

SUBJECT: Newaukum Creek Re-evaluation

OBJECTIVE: To determine the effect of manure disposal by dairy farms on Newaukum Creek water quality.

John Glynn, Ron Pine, and myself met in Enumclaw on February 15, 1972 and conducted a survey of Newaukum Creek. Previous surveys were conducted in June and August 1970 and July 1971. (See your files)

The nine original stations were sampled with the addition of three new stations. (Stations 10, 11, and 12) The location of all stations is depicted in Figure 1. Stations 3 and 4 are the control stations. Stations 1, 2, 10, 11, and 12 measured the runoff from manure disposal areas. Newaukum Creek proper was monitored at Stations 5, 6, 7, 8, and 9. Parameters tested included basic water quality, bacteria and nutrient levels. (Table 1)

In addition to the chemical and bacteriological examinations, the type and number of aquatic benthos were sampled at selected stations. (See Table 1)

Data Analysis

pH: The control stations exhibited a pH of 7.0 & 7.1. Department of Ecology water quality standards are from 6.5 to 8.5. Station 1 is the only station that is not within the required range.

Temperature: All stations are fairly consistent except for Stations 1 and 12 which are high due to the immediate presence of runoff from manure spraying operations.

Chemical Oxygen Demand: This test is a measure of the oxygen required to oxidize all organic matter present. Stations 1, 2, and 10 were approximately three to four times higher than the control stations, while Stations 11 and 12 exhibited greatest COD concentrations.

Biological Oxygen Demand: The BOD test measures the oxygen demand of carbonaceous and oxidizable nitrogen matter. This analysis was run at selected stations only. Stations 11 and 12 demonstrated a very high biological oxygen demand.

Nutrients: The nutrients added to the creek exceed the critical levels necessary for potential algae blooms and denote excess organic pollution. The NH_3 levels are much higher at the polluted stations than the NO_2 and NO_3 because the NH_3 has not had time to become oxidized. This is

an indication of the lack of natural purification taking place in the pastures due to rapid surface runoff of sprayed manure to the feeder creeks of Newaukum Creek.

Both organic and total PO_4 levels are twice as high for Stations 1 and 2 while Stations 11 and 12 are six to seven times greater than the control stations.

Bacteria: Both total coliform and fecal coliform were tested. All stations exceed the Class A standard (240 organisms/100 ml.) except the two control stations. Bacteria levels also exceed the public health criteria for water contact sports.

Aquatic Benthos: The quantity and species diversification of aquatic insects reveals that portions of the creek are not grossly polluted. The abundance of tubifex and isopods at Stations 2, 6, 7, 9, and 11 show that the organic detritus carried by the creek is high and at lower stream flows the effects of this material may be much more significant.

Conclusions

Newaukum Creek has a Class A (Intrastate) Excellent water quality criteria classification by the Department of Ecology. The major characteristic uses of the stream are water supply, wildlife habitat, stock watering, water contact sports, and aesthetic enjoyment. The spray disposal of manure is the major source of pollution for the portions of the creek surveyed. The creek does not meet Department of Ecology or public health criteria for water contact sports, domestic water supply or aesthetic enjoyment (see complaints attached to 1971 survey). The previous surveys also reveal the same gross bacteria pollution problem.

Five stations did not meet the 8 mg/l for dissolved oxygen. The spraying operations would have a more detrimental effect during warmer temperatures. This could lead to the destruction of beneficial fish and invertebrates. During the survey we noted the presence of successful salmon spawning activity at Station 3. A general review of Table II will show the presence of sufficient number and diversity of aquatic insects to support salmon and trout populations.

The problem parameters at each station is illustrated by Table V. Please be aware that all parameters were not tested at all stations during the three surveys. Stations 1, 2, 11, and 12 have the greatest number of violations. The detrimental effect of the discharge from Stations 10, 11, and 12 on the main creek is demonstrated by a lowering of water quality at Station 9.

Table 1. Chemical analysis of samples collected February 15, 1972, from Newaukum Creek.
 Values are expressed in mg/l unless otherwise noted.

Parameters	Stations											
	1	2	3	4	5	6	7	8	9	10	11	12
Temp. °C	8.3	6.5	5.6	5.7	5.9	6.0	6.3	6.4	6.4	5.9	6.0	6.8
D.O.	4.4	7.0	11.6	11.4	9.7	9.9	10.0	10.0	9.4	7.7	4.2	>0.5
BOD	---	5	---	1	3	---	---	---	4	---	18	110
COD	60	67	15	22	44	44	37	44	37	60	130	425
Turb. (JTU)	6	6	10	10	15	15	10	10	10	9	15	35
Conductivity (µmhos/cm)	195	180	62	60	89	98	101	100	110	176	235	582
pH	6.4	6.5	7.1	7.0	6.8	7.0	6.9	6.8	6.8	6.8	6.8	7.2
Coliform colonies/ 100 mls	4000	5000	150	150	5000	6000	7000	8000	10,000	10,000	40,000	>40,000
Total Fecal	>600	>600	<40	<40	>600	>600	>600	>600	>600	>600	>600	>3000
Chloride	8	15	3	3	5	6	6	6	5	7	13	29
NH ₃ -N	0.46	0.47	0.06	0.09	0.17	---	0.31	---	3.3	---	5.8	18.6
NO ₃ -N (filtered)	2.78	0.31	0.78	1.08	0.11	---	0.74	---	1.02	---	2.12	0.18
NO ₂ -N (filtered)	0.01	0.01	0.01	<0.01	0.01	---	0.01	---	0.02	---	0.06	0.03
T-PO ₄ -P	0.61	0.63	0.31	0.29	0.37	---	0.31	---	0.56	---	1.70	2.19
O-PO ₄ -P	0.24	0.29	0.07	0.10	0.16	---	0.16	---	0.23	---	1.13	1.19
T-Kjeldahl	1.1	0.62	0.21	1.5	1.6	---	0.98	---	9.0	---	19.9	23.1
Organic Kjeldahl-N	0.60	0.15	0.15	1.4	1.4	---	0.67	---	5.7	---	14.1	4.5

Table II. Aquatic benthos from stations located on Newaukum Creek. Samples collected February 15, 1972.

Organisms	Stations							
	2	3	4	5	6	7	9	11
Trichoptera (Caddisflies)								
Hydropsychidae			F	F	S	F	I	
Brachycentridae	S							
Plecoptera (Stoneflies)		A	F		S	A		
Ephemeroptera (Mayflies)								
Baetidae		F	A	F	A	A	A	
Other		F	S	A	F	A	A	
Diptera (Midges)								F
Isopoda (Freshwater Shrimp)	A			I		F	S	
Oligochaeta								
Tubifex					A	A	A	A
Other	S				F	F	A	A
Hirudinea (Leeches)	F					F	S	

In descending order of abundance

A = Abundant
 F = Frequent
 I = Infrequent
 S = Seldom

Table III. General Observations at Newaukum Creek Stations, February 15, 1972.

<u>Stations</u>	<u>Observations</u>
1	Farmer spraying manure above station. Bottom soft with fine sediment and organic detritus. Flow approximately $\frac{1}{2}$ cfs.
2	Bottom firm consisting of rubble to 5" rocks. Large amount of organic detritus. Evidence of manure also present at this station. Discharge approximately 10 cfs.
3	Firm clean bottom composed mainly of small rubble (1"-3") and rocks. Higher velocity at this station than #4.
4	Bottom consisting of small rubble and sand. Very clean and loose.
5	Main branch of Newaukum Creek. Large rocks (8"-10") and coarse gravel. Bottom fairly clean, some organic detritus present. Suspicious discharge (sink or septic tank).
6	Bottom large rocks and gravel, no detritus present.
7	Bottom medium rubble (4") and sand.
11	Bottom soft, water murky, considerable slime growth.
12	Water very turbid and odorous with a green color.

Table IV. Critical levels of nitrogenous and phosphoric compounds.
Based on Sawyer and Klein.

<u>Parameter</u>	<u>Critical Level</u>	<u>Significance</u>
NO ₃ -N	.3	Algae bloom potential
NO ₂ -N	.02	Organic pollutions, low oxygen concentration in stream
NH ₃ -N	.2	Organic pollution
NH ₃ -N	1.0	Unattractive for fish (toxic)
O-PO ₄ -P	.01	Algae bloom potential

Table V. Violations of Water Quality Class A and parameters exceeding approximate critical concentration levels. Water quality data collected June and August 1970, July 1971, and February 1972.

	1	2	3	4	5	6	7	8	9	10	11	12
D.O.	*x	*								*	*	*
Turbidity												*
pH	*											
Coliform (Total)	*x√	*x√	x√	x√	*x√	*x√	*x√	*x	*x√	*	*	*
NH ₃ -N	*	*					*		*		*	*
NO ₃ -N	*x√	*x√	*x√	*x√	x√	x√	*x√	x	*x√		*	*
NO ₂ -N	x	x				x			x		*	*
O-PO ₄ -P	*x	*x	*	*x	*x	x	*x	x	*x		*	*

* 1972 Survey
x 1971 Survey
√ 1970 Survey

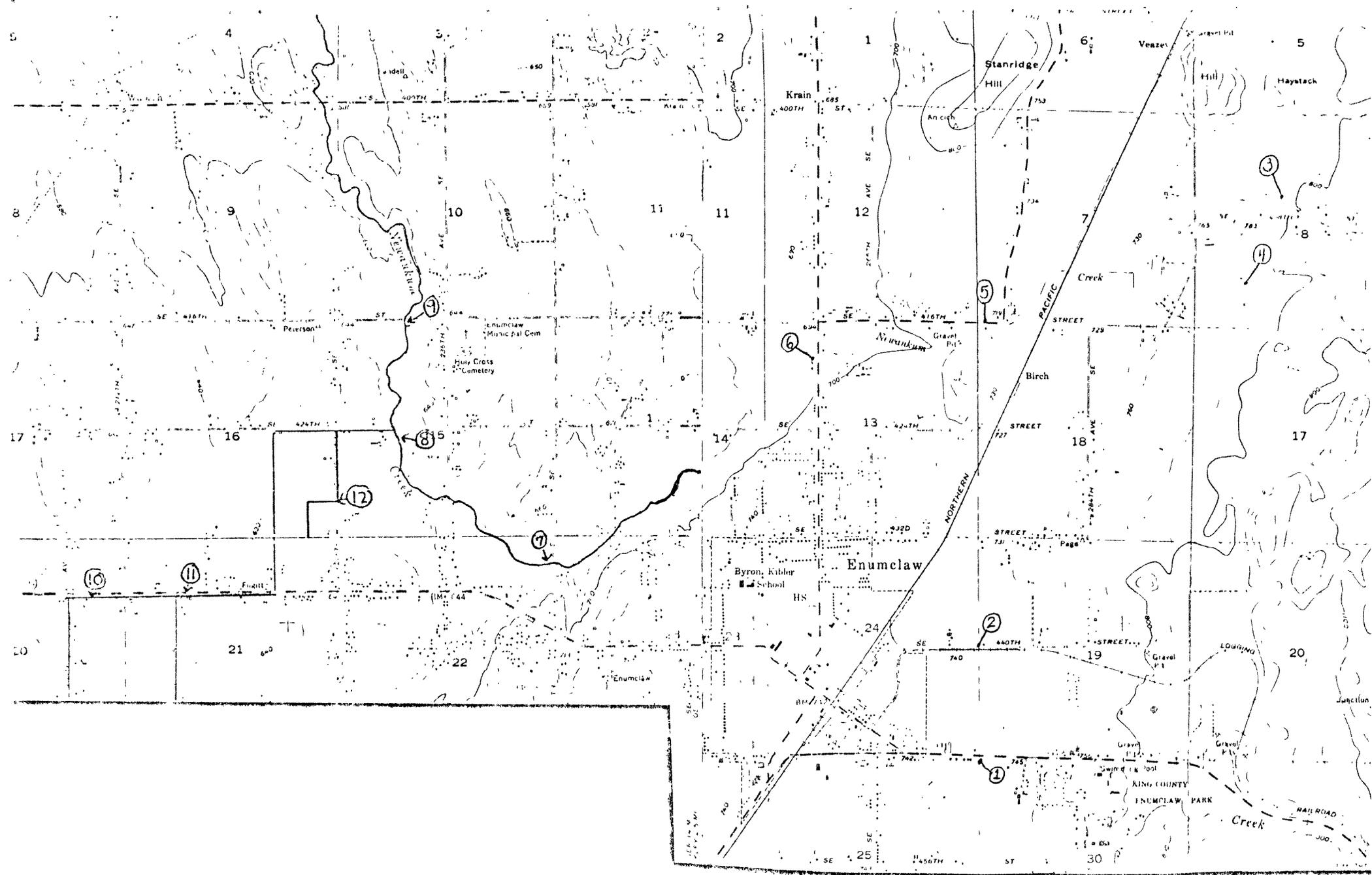


Figure 1. Location of stations on Newaukum Creek, February 15, 1972.

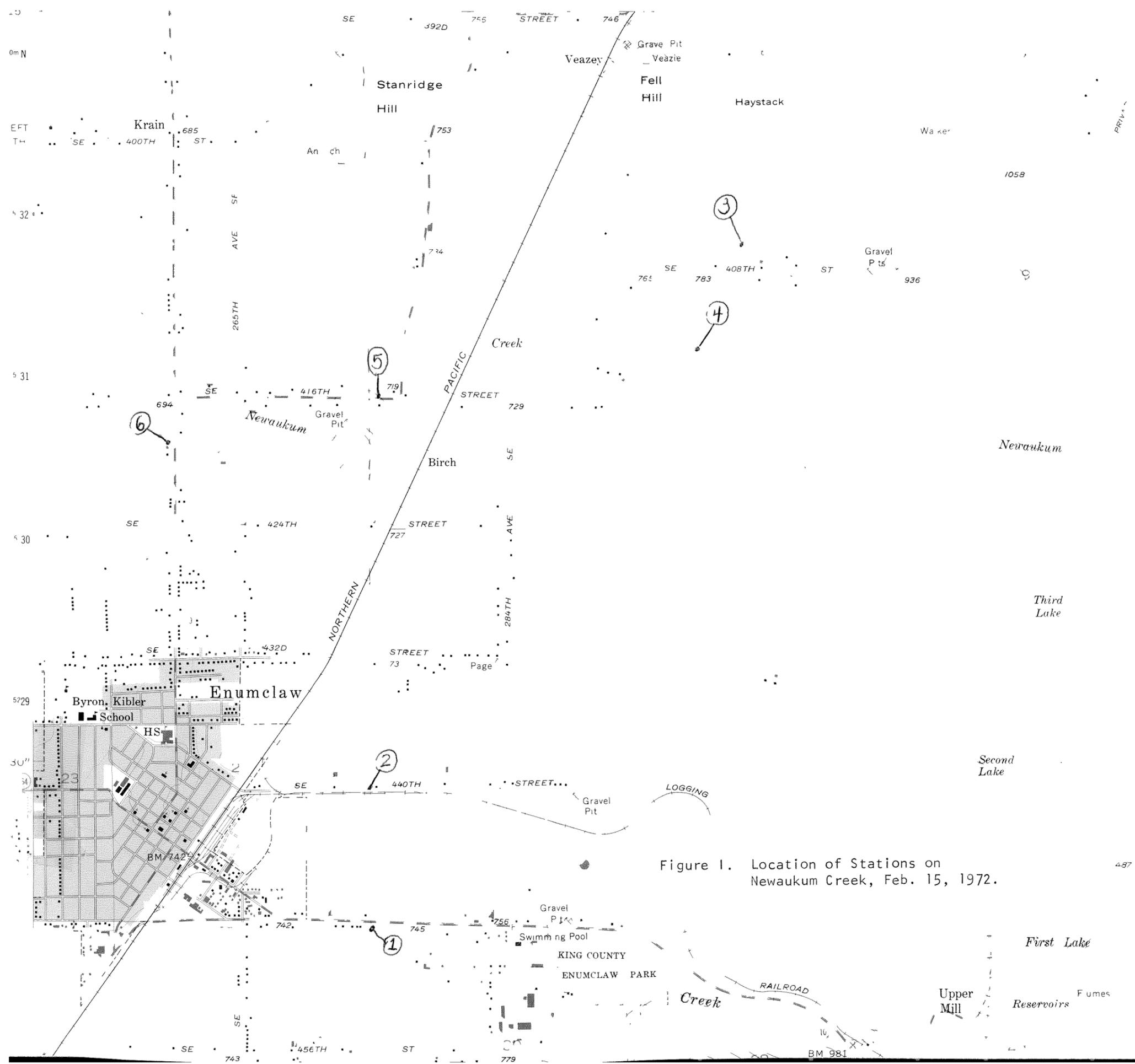


Figure 1. Location of Stations on Newaukum Creek, Feb. 15, 1972.

M E M O R A N D U M

TO: Pete Hildebrandt, ~~Ron Pine~~, Robert McCormick & Stewart Messman
FROM: John H. Glynn
SUBJECT: SURVEYS OF BOISE AND NEWAUKUM CREEKS
DATE: January 11, 1972

This memo is to re-request Surveys on Boise and Newaukum Creeks to supplement surveys done on August 2, 1971 and July 14, 1971 respectively.

Objective:

The objective is to determine the effect of manure disposal by dairy farms on surface water quality.

1. Dairies spray a manure slurry on pastures as a means of disposing of cow manure and wash water.
2. Cow/acre ratio is very high.
3. Runoff from pastures during winter months is high.

Expected Results:

It is anticipated that coliform, fecal coliform, $\text{NH}_3 - \text{N}$, BOD and suspended solids levels will be high.

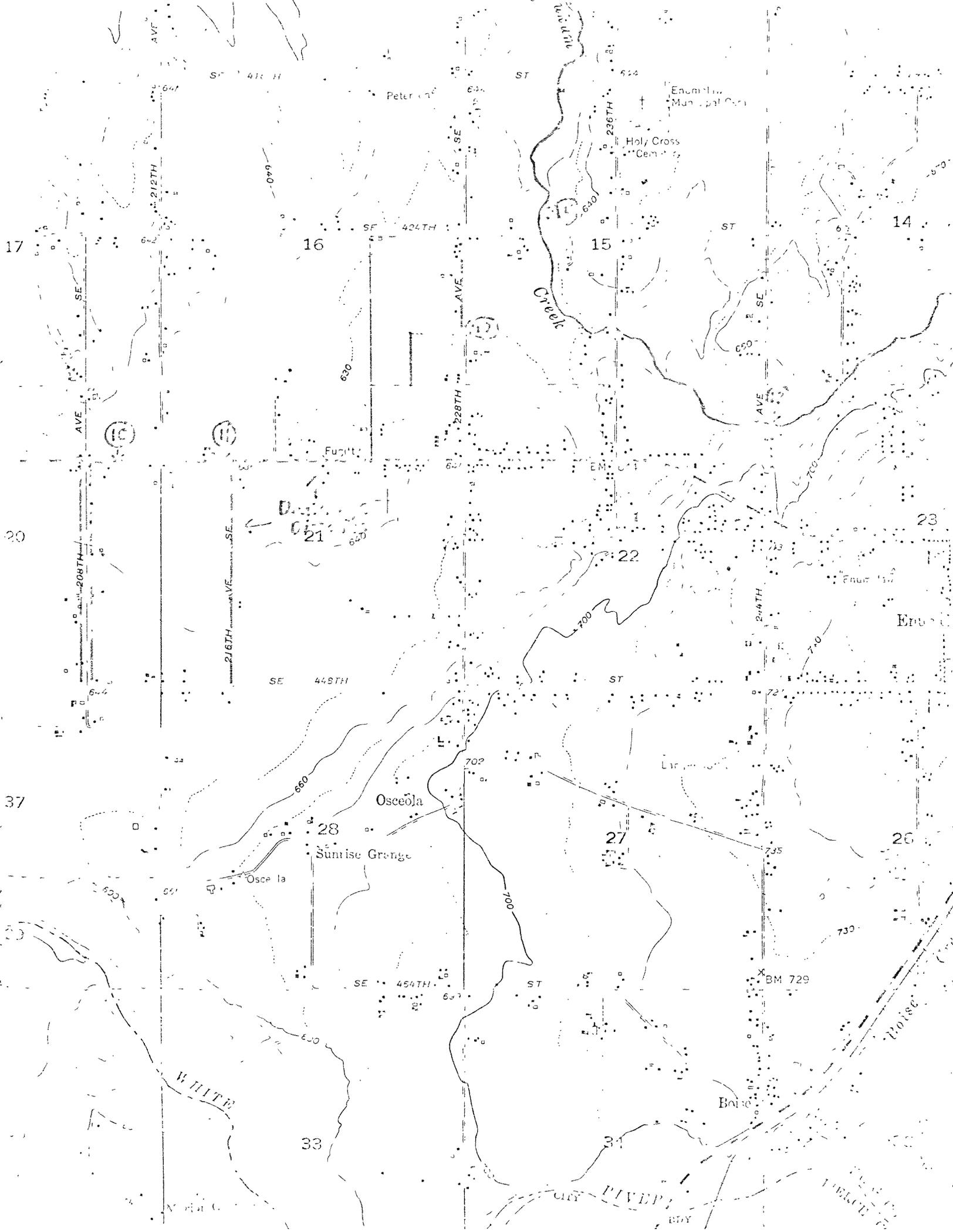
Sampling Sites:

For the purposes of comparison, it is requested that the same sampling points and tests as employed on the previous tests be employed. In addition, it is requested that sampling sites listed in the enclosed map be added to the Newaukum survey with the same tests to be run as those run on July 14, 1971.

If it is convenient, I would like to be present during the survey.

JHG:ll

1-17-72



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WHITE RIVER

OSCEOLA CREEK

BOISE

RDY

BOISE

BM 729

Sunrise Grange

Osceola

Enumolu

Enumolu

Holy Cross Cemetery

Enumolu Municipal Center

Peter's

Fugitt

Fruit

North

