Publication No. 71-e24

# MEMORANDUM

TO: NELSON GRAHAM DATE: December 16, 1971

FROM: RON PINE

SUBJECT: Horseshoe Lake Survey, Woodland
RE: Memo from Nelson Graham dated October 12, 1971.

The objective of the subject study was to evaluate the present water quality of Horseshoe Lake. The information developed would then be used to determine the need for corrective action.

The study was conducted between 1100 hours and 1400 hours on December 6, 1971. Specific station locations are shown in Figure 1 and the results are presented in Table 1. Dye was placed in the effluent line at the Woodland Sewage Treatment Plant and Station 2 was located in the discharge boil approximately 30 yards downstream of the pump which lifts water from the Lewis River into Horseshoe Lake. Station 2A was located approximately 100 yards downstream from Station 2.

## Results and Discussion

All of the total coliform values observed, except Stations 6, 16 and 17, exceed the maximum standard for Class A and Lake Class water. The primary nutrients are present in trace amounts which indicates that they are being incorporated into new living tissue at about the same rate as decomposing tissue is releasing them into the lake. Although the lake water was somewhat turbid and greenish in color, the condition of the Lewis River was very similar. There is also a substantial number of domesticated ducks and other water fowl which frequent the lake. This activity may explain the slightly high coliform values.

The discharge from the Woodland STP enters the Lewis River immediately adjacent to the shoreline, approximately 50 yards downstream of the pump which transfers water from the Lewis River to Horseshoe Lake. There appears to be no possibility of STP effluent entering the Horseshoe Lake pump. This should be verified, however, at extreme low summer flows.

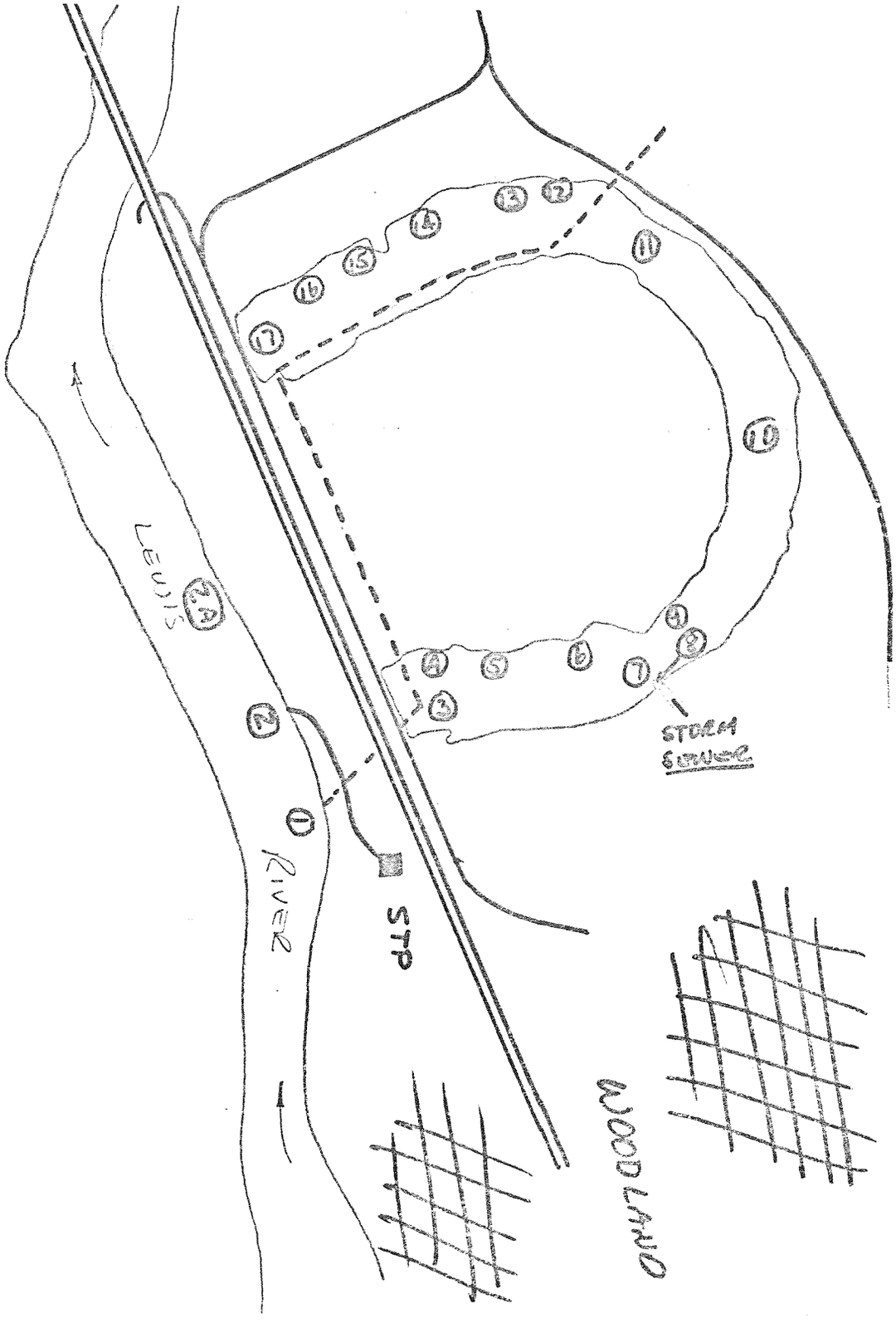
RP:as
41/04

1/31/72

TABLE 1. Analytical Results of Horeshoe Lake Study, December 6, 1971. All values expressed as mg/l unless otherwise noted.

| STA NO. | TIME | TEMP°C | D.O. | Colonies/100 ml's TOTAL COLI. | FECAL COLI. | FECAL STREP. | CHLORIDE | ALK. $CaCO_3$ | $NH_3$-N | $NO_2$-N (FILT) | $NO_3$-N (FILT) | T-$PO_4$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1340 | 8.0 | 12.4 | 500 | <40 | <20 | 1.9 | 16 | 0.00 | <0.01 | 0.27 | 0.02 |
| 2 | 1401 | 8.5 | 12.2 | >16,000 | 40 | >100 | 2.4 | 17 | 0.20 | <0.01 | 0.35 | 0.09 |
| 2A | 1405 | 8.0 | 12.1 | 3,000 | <40 | <20 | 1.9 | 16 | 0.00 | <0.01 | 0.31 | 0.02 |
| 3 | 1100 | 7.0 | 12.4 | 300 | <40 | <20 | 1.9 | 16 | 0.00 | <0.01 | 0.06 | 0.02 |
| 4 | 1103 | 7.0 | 12.2 | 320 | <40 | <20 | 2.4 | 16 | 0.00 | 0.00 | 0.05 | 0.01 |
| 5 | 1110 | 7.0 | 12.2 | 280 | <40 | <20 | 1.9 | 16 | 0.04 | 0.00 | 0.06 | 0.01 |
| 6 | 1113 | 7.0 | 12.2 | 240 | <40 | <20 | 1.9 | 16 | 0.00 | 0.00 | 0.04 | 0.02 |
| 7 | 1116 | 7.0 | 12.6 | 270 | <40 | <20 | 1.9 | 16 | 0.00 | 0.00 | 0.04 | 0.02 |
| 8 | 1120 | 7.0 | 12.6 | 430 | <40 | <20 | 1.9 | 16 | 0.02 | 0.00 | 0.03 | 0.04 |
| 9 | 1124 | 6.8 | 12.8 | 270 | <40 | <20 | 1.9 | 15 | 0.02 | 0.00 | 0.04 | 0.02 |
| 10 | 1127 | 6.3 | 12.5 | 290 | <40 | <20 | 1.9 | 15 | 0.04 | 0.00 | 0.02 | 0.02 |
| 11 | 1131 | 6.3 | 13.0 | 270 | <40 | <20 | 1.9 | 16 | 0.02 | <0.01 | 0.03 | 0.02 |
| | 1135 | 6.5 | 13.3 | 260 | <40 | 24 | 1.9 | 15 | 0.02 | 0.00 | 0.00 | 0.02 |
| 13 | 1138 | 6.3 | 12.7 | 320 | <40 | 25 | 1.9 | 15 | 0.02 | 0.00 | 0.04 | 0.02 |
| 14 | 1140 | 6.3 | 12.8 | 440 | <40 | 50 | 1.9 | 15 | 0.02 | 0.00 | 0.09 | 0.02 |
| 15 | 1143 | 6.3 | 12.6 | 700 | <40 | 20 | 1.9 | 15 | 0.00 | 0.00 | 0.11 | 0.03 |
| 16 | 1147 | 6.1 | 12.5 | 200 | <40 | <20 | 1.9 | 15 | 0.00 | 0.00 | 0.00 | 0.03 |
| 17 | 1150 | 6.0 | 12.9 | 64 | <40 | <20 | 1.9 | 15 | 0.00 | 0.00 | 0.00 | 0.03 |

Figure 1. Horseshoe Lake study, December 6, 1971



STATE OF WASHINGTON

# DEPARTMENT OF ECOLOGY

DANIEL J. EVANS
GOVERNOR

JOHN A. BIGGS
DIRECTOR

M E M O R A N D U M

October 12, 1971

TO: The Office of Technical Services

FROM: The Southwest Regional Office

SUBJECT; Request for Survey of Horseshoe Lake, Woodland, Washington, Cowlitz County

A. A survey is requested by the Southwest District Engineer. This data is needed to evaluate the water quality of Horseshoe Lake. The data will be used to determine the need for further action to improve the water quality in this lake.

B. We hope to be able to pin point the sources of pollution in this lake. The extent of fecal contamination is not fully known, nor is the nutrient situation. We hope to determine the magnitude of these problems and suggest solutions or corrections which can be initiated to improve the lake environment.

C. Two people should be able to conduct the survey in one day. The Regional Office will not contribute to this manpower but will scope the survey with this memo and will be available to answer specific questions.

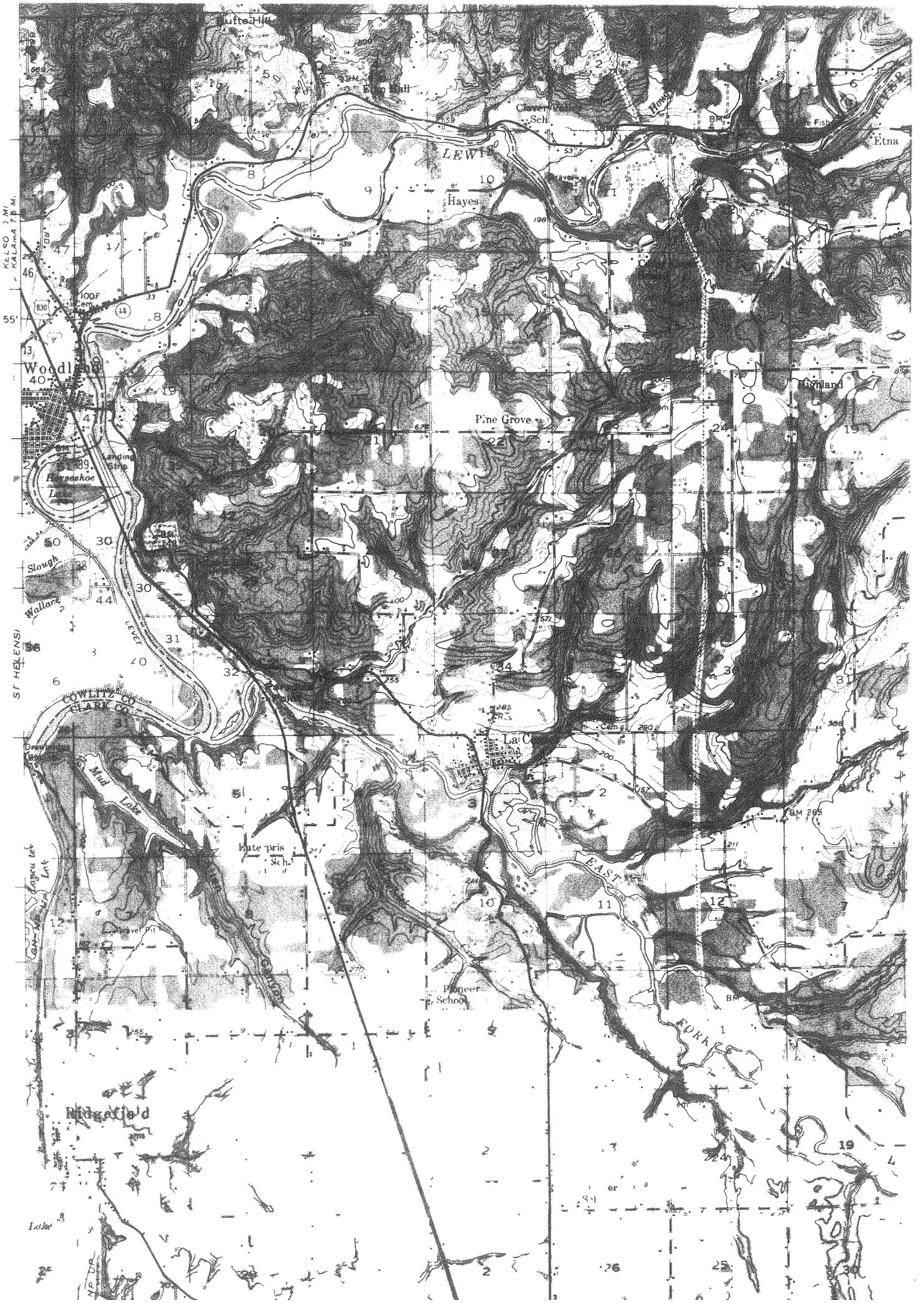
D. We would like to have the results of this survey in our hands by November 30, 1971. The survey must be run during a heavy rain or immediately after to be of any value.

E. A boat and regular sampling equipment will be needed. A supply of dye will be needed.

F. The attached maps show the location of Horseshoe Lake and the location of sampling stations within the lake and in the Lewis River. The following parameter should be measured at each station; turbidity, dissolved oxygen, temperature, total coliform, fecal coliform, fecal streptococci and nutrients. We would request that dye be placed in the City's Sewage Treatment Plant outfall and that the sewage effluent be traced visually to determine if the effluent is getting into the lake.

NG:rc
25/7

cc: City of Woodland
Cowlitz - Wahkiakum Health District
Clark - Skamania Health District



Butte Hill
Etna Hall
Clover Sch
LEWIS
Hayes
Etna
Woodland
Pine Grove
Highland
Landing Strip
Horseshoe Lake
Slough
Wallace
LEVEE
ST HELENS
COWLITZ CO
CLARK CO
Mud Lake
Enterprise Sch
EAST
FORK
Pioneer School
Ridgefield
Lake

# MASTER PLAN

## SEWERAGE STUDY
## WOODLAND, WASHINGTON

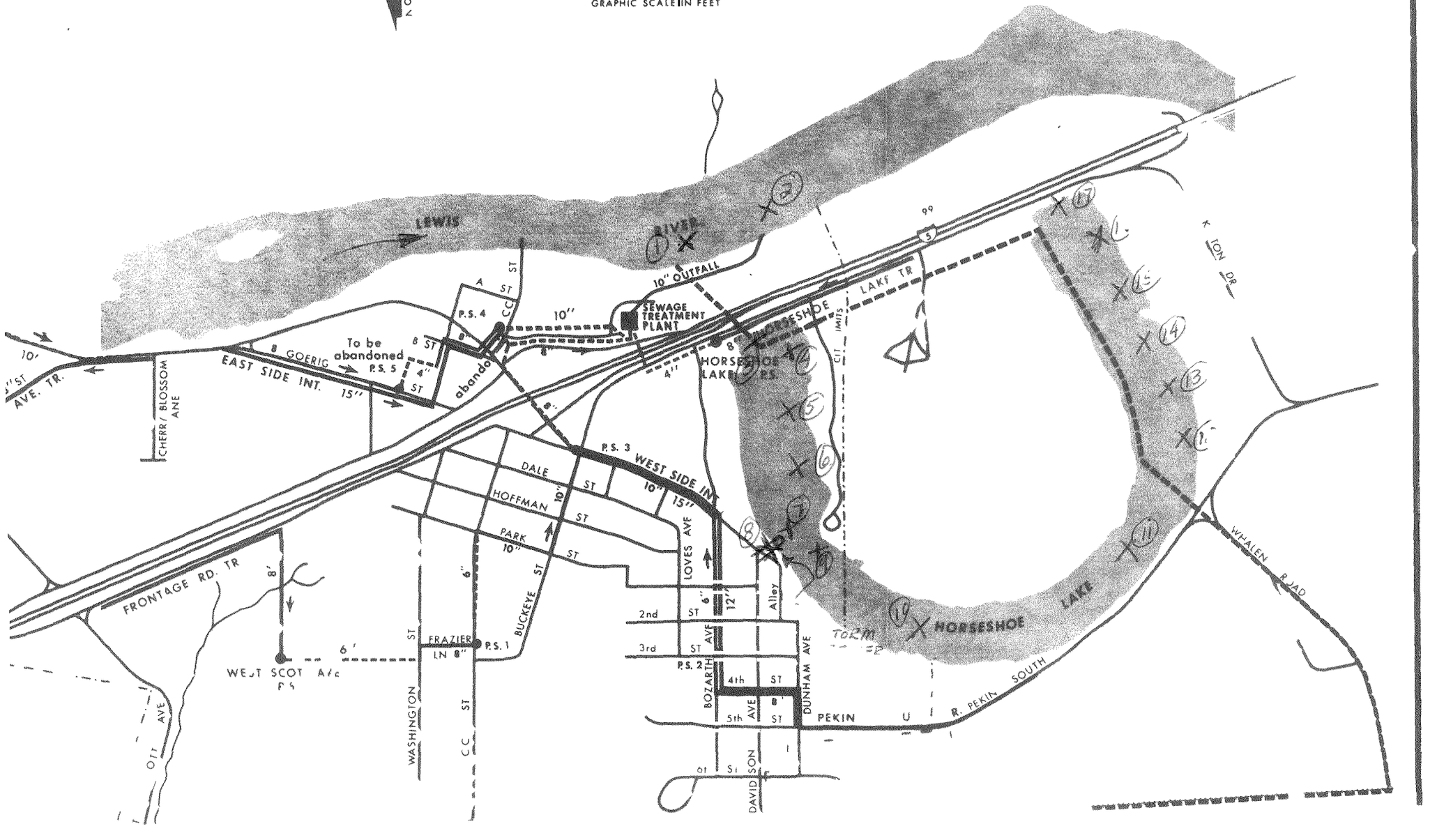
### LEGEND

| EXISTING | PROPOSED PHASE 1 | PROPOSED PHASE 2 | PROPOSED PHASE 3 | |
|---|---|---|---|---|
| 8" | 8' | 8" | 8" | GRAVITY SEWER |
| 4" | 8" | 8" | 8" | FORCE MAIN |
| ● | ● | ● | ● | PUMP/LIFT STATION |
| | | | | STUDY BOUNDARY |

NORTH

GRAPHIC SCALE IN FEET (500, 500, 1 00, 150)

. tever s, Thomp or & Runyan, Inc.
*Engineers Planners*
PO LAN EATT



ANALYTICAL REPORT SHEET

Ken Fine

Merley McCall

To: _____

The following are the analytical results from survey conducted at.

Horseshoe Lake 03-02.21

Collected 12/7/71

| LAB. NO. | STATION NO. | ppm Chloride | ppm as CaCO3 Alkalinity | Total coliform (colonies/100 ml) | Fecal coliform (colonies/100 ml) | Fecal strep (colonies/100 ml) | ppm $NH_3$-N | ppm $NO_3$-N Filtered | ppm $NO_3$-N Filtered | ppm T-$PO_4$-P |
|---|---|---|---|---|---|---|---|---|---|---|
| 71-3888 | 1 | 1.9 | 16. | 500. | <40. | <20. | .00 | <.01 | .27 | .02 |
| 89 | 2 | 2.4 | 17. | > 16,000. | 40. | >100. | .20 | <.01 | .35 | .09 |
| 90 | 2A | 1.9 | 16. | 3,000. | <40. | <20. | .00 | <.01 | .30 | .02 |
| 91 | 3 | 1.9 | 16. | 300. | <40. | <20. | .00 | <.01 | .06 | .02 |
| 92 | 4 | 2.4 | 16. | 320. | <40. | <20. | .00 | .00 | .05 | .01 |
| 93 | 5 | 1.9 | 16. | 280. | <40. | <20. | .04 | .00 | .06 | .01 |
| 94 | 6 | 1.9 | 16. | 240. | <40. | <20. | .00 | .00 | .04 | .02 |
| 95 | 7 | 1.9 | 16. | 270. | <40. | <20. | .00 | .00 | .04 | .02 |
| 96 | 8 | 1.9 | 16. | 430. | <40. | <20. | .02 | .00 | .03 | .04 |
| 97 | 9 | 1.9 | 16. | 270. | <40. | <20. | .02 | .00 | .04 | .02 |
| 98 | 10 | 1.9 | 15. | 290. | <40. | <20. | .04 | .00 | .02 | .02 |
| 99 | 11 | 1.9 | 16. | 270. | <40. | <20. | .02 | <.01 | .03 | .02 |
| 00 | 12 | 1.9 | 15. | 260. | <40. | 24. | .02 | .00 | .00 | .02 |
| 01 | 13 | 1.9 | 15. | 320. | <40. | 25. | .02 | .00 | .04 | .02 |
| 02 | 14 | 1.9 | 15. | 440. | <40. | 50. | .02 | .00 | .09 | .02 |
| 03 | 15 | 1.9 | 15. | 700. | <40. | 20. | .00 | .00 | .11 | .03 |
| 04 | 16 | 1.9 | 15. | 200 | <40. | <20. | .00 | .00 | .00 | .03 |
| 05 | 17 | 1.9 | 15. | 64 | <40. | <20 | .00 | .00 | .00 | .03 |

Notes:

Summarized by Pat Lee

Date 12/13/71