
Appendix A:

Copies of Sampling Plans

MAY 21 2001

CH2M HILL
BOISE

Lower Boise River Riparian Corridor Bacteria Source Identification Monitoring Plan

Idaho Division of Environmental Quality, v. 27 March, 2000

INTRODUCTION

The lower Boise River watershed from Lucky Peak Reservoir to the Snake River near Parma contains nearly one-third of Idaho's population. Land uses in the watershed are quite varied, including urban, industrial, irrigation, agriculture and rangeland. The 1290 square mile watershed contains 350,000 acres of irrigated farmland.

In 1994 the Idaho DEQ placed the lower Boise River on the State 303(d) list for impairment of primary and secondary contact designated uses. The fecal coliform bacteria in the lower Boise River exceed the State standards for these uses at nearly all locations. As a result of the 303(d) listing, a Total Maximum Daily Load, TMDL, was prepared for the lower Boise River for bacteria. The TMDL indicated that bacteria discharge loads would require reductions up to 98% from non-point sources in order to meet the current primary contact bacteria standard of 50 organisms/100 ml at Parma.

LBRWQP DNA TESTING 319 GRANT

The large bacteria reductions called for in the lower Boise River TMDL led to the submittal and subsequent approval of a 319 grant for DNA fingerprinting of coliform bacteria in the watershed (i.e. human vs. different kinds of animal). This source identification will provide a method for prioritizing the location of BMPs for bacteria reduction. The grant monies encompass sampling tributaries and in-river sites. However, concerns that this sampling would not characterize the riparian corridor run-off itself were raised.

RIPARIAN CORRIDOR BACTERIA SOURCE IDENTIFICATION

One of EPA's concerns with the December 1998 submission of the lower Boise River TMDL was the lack of a bacteria load reduction target for the riparian corridor. The riparian area sampling outlined in this work plan addresses these concerns by not only delineating riparian corridor bacteria sources, but also providing coliform counts necessary in determining riparian corridor reduction targets.

This sampling plan uses the riparian corridor as delineated by Ferguson (Figure 8, LBR TMDL, 1998), which is the area defined in Figure 8 of the TMDL as the Boise River. The riparian area defined by Ferguson does not correspond with the true riparian corridor, nor does it include adjacent subwatersheds. It does, however, represent the area of land for which EPA emphasized a bacteria load allocation needed to be defined.

Because the natural riparian area acts as a filter, and overland flow is often not present, DEQ personnel determined that the best way to characterize riparian runoff was to sample smaller drains that only drained the riparian area as defined by Ferguson. This sampling effort adds to the existing 319 study and refines bacteria loading estimations.

DNA TESTING PROGRAM

The samples collected in this effort follow the sample protocol for the current 319 grant DNA testing being performed by the Lower Boise River Water Quality Program. See attached sampling protocol for information on the DNA testing program. (Appendix A)

SAMPLING LOCATIONS

In order to delineate between the various uses in the watershed, DEQ chose to focus on two different types of land use activities: urban/suburban and rural transitional/agricultural. Sampling locations were determined by looking at current zoning in the area. Urban/suburban encompasses higher density housing and light industrial use. Rural transitional/agricultural includes a mix of parcels 20 acres or less zoned for agriculture and light residential.

SITE DESCRIPTION

EAGLE – Rural Transitional / Agricultural

This sample site is the Mason - Catlin Canal just before it goes into the North Channel of the Boise River (Table 2). It is located in the floodplain between the two sections of the Boise River just southwest of Eagle. The drainage area includes a mix of farmland and residence. There is a 160-acre farm as well as subdivision located upriver in the same floodplain.

To get there from the town of Eagle take Eagle Road directly South. Cross the Eagle Bridge and take the first right after the bridge onto Mace Road. Follow Mace Rd. 1.6 miles in to address 2500 Mace Rd.

TABLE 2 – Rural-Transitional Sample Location

LATITUDE	43° 41' 06"
LONGITUDE	116° 22' 51"
Star Quadrangle NW corner of SE corner, T4N, R1E section 18	

See Appendix B –Eagle Sampling Location

BOISE – Urban/Suburban

This sample site is located in Ann Morrison Park between Americana Blvd. and Capitol Blvd (Table 3). The site is approximately 100 meters upstream from the footbridge that crosses the river in middle of the park. The specific sampling site is at the outfall of a small wetland, which serves as the final destination of the Bubb canal system. The Bubb canal meanders throughout the riparian corridor providing water for and collecting water from a variety of sources, including storm water from Ann Morrison Park. The outfall is approximately 20 meters above the wetlands confluence with the Boise River.

The site can be accessed a number of ways. Locate the greenbelt path on the south side of the river. There is a small bridge that crosses the wetland outfall. The path to this bridge is situated slightly off of the main greenbelt, but is still paved. The sample will be collected just above the confluence with the Boise, but far enough away to avoid backwater situations.

TABLE 3 – Urban/Suburban Sample Location

LATITUDE	43° 36' 45"
LONGITUDE	116° 12' 42"
Boise South Quadrangle NW corner of SE corner, T3N, R2E section 09	

See Appendix B –Boise Sampling Location

SAMPLING FREQUENCY

A total of 59 samples will be collected by DEQ personnel at two sites, all located within a ¼ mile of the river. Samples will be collected once a week for eight weeks during the high flow run-off period (April 10- June 10) and once a week for eight weeks during the irrigation season (July 10 –September 10) when air

and water temperatures are highest. Additional samples will be collected at both sites during storm events in an attempt to characterize storm event inputs.

SAMPLING METHODS

Grab samples at each site will be taken in 250 ml nalgene bacteria bottles treated with sodium thiosulfate. Samples will be gathered from the main current or outflow. A ½ inch air space will be left at the top of each bottle. During high flows at the urban/suburban storm drain site, a polyethylene dipper may be used to collect water and transfer it immediately into the sample bottle. The dipper will be rinsed with deionized water prior to use and triple rinsed with the sample water before the actual sampling occurs. Sampling personnel will wear rubber gloves to prevent sample contamination when collecting the sample from the site. The samples will be stored at 4 degrees Celsius and delivered to Analytical Labs within 8 hours of sample collection.

Each sample will be labeled with Site ID, time, date and sampling personnel. Information about the specific site (i.e. climactic conditions, site conditions etc.) will be recorded in the lower Boise River bacteria sampling field book. DEQ personnel will fill out a chain of custody form to be submitted along with the appropriate sample request form.

ANALYSIS

The City of Boise West Boise WWTP laboratory will perform the fecal coliform counts and the University of Washington will perform the DNA testing. Fecal coliform cultures will be prepared utilizing the Membrane Filtration Technique with m-FC agar by DIFCO as outlined in the Standard Methods, 18th Edition section 9222 D. The lab will ensure that there are 20-80 cultures per plate (i.e. dilutions may be necessary) and determine fecal coliform numbers per sample. They will ship the samples by overnight mail within 7 days to the University of Washington for DNA testing. All samples will remain refrigerated during this time.

SUMMARY

Upon completion of this project, DEQ will review the coliform density data and prepare a bacteria reduction target for the riparian corridor. The reduction target will be consistent with the format outlined in the Lower Boise River TMDL. Data derived from the bacteria source identification will then be reviewed to help characterize where in the riparian corridor bacteria loads are being derived. Any applicable reduction implementation strategies will be addressed in the lower Boise River implementation plan.

Appendix A

LBRWQP

DNA TESTING 319 GRANT

SAMPLING PROTOCOL

INTRODUCTION

The Lower Boise River watershed from Lucky Peak Reservoir to the Snake River near Parma contains almost one-third of Idaho's citizens. Land uses in the watershed are quite varied. They include urban, industrial, irrigation, agriculture, and rangeland. The 1290 square mile watershed contains 350,000 acres of irrigated farmland. An arid climate (approximately 10-inches of annual rainfall) makes irrigation a requirement on the majority of the farmland. The large amount of irrigation required, coupled with reuse of pasture water on irrigated fields, results in the contribution of nonpoint discharge of fecal Coliform bacteria to the river.

In 1994 the State DEQ placed the Lower Boise River on the State 303d list for impairment of primary and secondary contact designated uses. The Fecal Bacteria in the Lower Boise River exceed the State standards for these uses.

Bacteria TMDL

As a result of the 303d listing a Total Maximum Daily Load, TMDL, was prepared for the Lower Boise River for Bacteria. The draft TMDL submittal was completed and submitted to the USEPA on December 31, 1998. The TMDL indicates that bacteria discharge loads will require over 95% reductions from Non-Point Source bacteria loadings in order to meet the current Primary Contact Bacteria Standard of 50 organisms/100 ml at Parma.

This is an ambitious goal for the stakeholders in the Lower Boise River Watershed to meet. In order to focus bacteria reduction improvements, a proposed DNA Fingerprinting of Coliform Bacteria program was proposed as a 319 Grant in March, 1998. This 319 Grant was accepted and approved by the State in May, 1999 and contracts were signed between the Lower Boise River Water Quality Plan, (WAG) and DEQ to implement this testing program in June, 1999.

Bacteria Source Fingerprinting Tool

The use of DNA Fingerprinting technology will conclusively identify the origins of fecal Coliform bacteria contained in the main stem of the Lower Boise River as well as the tributaries sampled under this testing program. With this information directed actions and BMP's will be identified and proposed to specifically address these sources of bacteria pollution.

The DNA Fingerprinting tool will provide a basis for prioritizing pollution prevention actions. It will also adapt a means for this emerging technology for rapid source characterization in other watersheds in Idaho. Finally the development of this database in the Lower Boise River Watershed will serve to heighten the awareness of water quality impacts from life style activities on the part of citizens residing in the Lower Boise River Watershed.

DNA TESTING PROGRAM

The testing program proposed for the Lower Boise River will consist of a three-phase effort involving Federal and State Agency sample collection, local stakeholder bacteria culturing, and the University of Washington DNA fingerprinting analysis. Water Sampling will be completed by the USGS on the main stem of the Lower Boise River and Tributaries.

Water Samples will also be collected by the Department of Agriculture in the designated drains which discharge into the Lower Boise River. Skat sampling of various potential sources of fecal Coliform identified within the watershed will be collected by the State Soil Conservation Commission. Bacteria fingerprinting samples for humans will be taken from several wastewater treatment facilities within the watershed by the POTW owner personnel.

Fecal Coliform cultures will be prepared in the City of Boise Water Quality Laboratory prior to shipment to the University of Washington for DNA analysis and fingerprinting. In addition to the Bacteria DNA Analysis, the Department of Agriculture may also conduct sample screening for pathogens as a parallel effort to the University of Washington analysis in order to provide a degree of human health risk to the information derived from this testing program.

Objectives

The proposed 319 Grant Program consists of water quality sampling at two selected River sites and two selected tributaries or drains that discharge into the Lower Boise River. The Lower Boise River Technical Advisory Committee, TAC, met in April, 1999 to designate these specific sampling locations as well as to identify the potential sources of fecal bacteria, (animal and human), that should be sampled for fingerprinting in the watershed.

At this initial TAC meeting the two River Sites selected for water quality sampling were the USGS monitoring sites at Parma and Glenwood Bridge. The two tributaries selected for water quality sampling were Indian Creek upstream of the Riverside Canal Diversion, and Dixie Slough.

The potential sources of fecal bacteria within the watershed selected for fingerprinting are Ducks, Geese, Gulls, Dog, Human, Cow, Sheep, Llama, and Horse. The resulting DNA fingerprints from local sources will be combined with the DNA fingerprinting library already accumulated by the University of Washington to identify to bacteria sources in the Lower Boise River Watershed from the water quality sampling at the selected river and tributary sites.

Program Responsibilities

In general, water samples will be taken by Dept of Agriculture personnel at the River sites and at the mouths of the selected Tributaries. These samples will be taken (3) days per week for a (4) week period of time. The first sample period will occur during the 1999 or 2000 irrigation season (July through September). The second sample period will occur during the high flow run-off period. (April to Mid-June, 2000).

Skat Samples for fingerprinting will be completed by the Department of Agriculture, the Idaho Fish and Game and the City of Boise as appropriate. Responsibilities for specific Skat Sampling are itemized below.

The City of Boise, Water Quality Laboratory will be responsible for developing Fecal Coliform Cultures from the water quality samples. These cultures will then be sent to the University of Washington of DNA Analysis and fingerprint determinations. The City of Boise will also be

responsible for preparing the sample bottles, coolers, and chain of custody forms for the Department of Agriculture's use in obtaining the water samples.

The Department of Agriculture will be responsible for collecting and mailing the Skat Samples directly to the University of Washington for DNA fingerprint development. There is no sample preparation or Fecal Culture development associated with the Skat Samples other than refrigeration.

SAMPLING PROGRAM

Table 1

DNA Fingerprinting Sampling Plan

Phase	Step	Date	Activity	Responsible Party
Skat		July – October, 1999	Collect Skat Samples from Ducks, Geese, Gulls (ID F&G); Cows, Horses, Llama, Dogs, Sheep (Dept. of Agriculture); Humans –through WWTP Influent (City of Boise)	Idaho Fish and Game, Department of Agriculture, and City of Boise. Department of Agriculture responsible for shipping all Skat Samples except WWTP samples to U of W for DNA Fingerprinting.
Water Quality	1	July-September, 1999 or 2000	Collect Water Quality Samples from the Parma and Glenwood Sampling Stations and from Indian Creek upstream of the Riverside Canal diversion and from the mouth of Dixie Slough. Samples to be taken (3) days per week for a 4-week period, (Typ. of 12 sample trips per season)	Department of Agriculture to collect water samples. Four (4) samples per site on Tuesday, Wednesday & Thursday for (4) continuous weeks, (Typ. of 48 samples per site or a subtotal of 192 samples per season). Take 2 additional samples per site at any time during this sampling period. (Total 200 Samples per Season) City of Boise to develop Fecal Cultures from water samples using membrane filter and m-FC Agar. (Total 200 Culture Plates per Season). City will then ship cultures to University of Washington
Water Quality	2	April – Mid June, 2000	Collect Water Quality Samples from the Parma and Glenwood Sampling Stations and from Indian Creek upstream of the Riverside Canal diversion and from the mouth of Dixie Slough. Samples to be taken (3) days per week for a 4-week period, (Typ. of 12 sample trips per season)	Department of Agriculture to collect water samples. Four (4) samples per site on Tuesday, Wednesday & Thursday for (4) continuous weeks, (Typ. of 48 samples per site or a subtotal of 192 samples per season). Take 2 additional samples per site at any time during this sampling period. (Total 200 Samples per Season) City of Boise to develop Fecal Cultures from water samples using membrane filter and m-FC Agar.

				(Total 200 Culture Plates per Season). City will then ship cultures to the University of Washington
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Elements of Sampling Program

Source Fingerprinting

Potential bacteria sources from within the Lower Boise River Watershed will be fingerprinted with the skat samples obtained from Ducks, Geese, Gulls, Cows, Horses, Llama, Dogs, Sheep, and Humans. No sample preparation will be required for the skat sampling for the animals previously listed. For humans the influent domestic wastewater to local WWTP's will be sampled and fecal Coliform cultures prepared using the membrane filtration technique. The cultures will then be sent to the U of W for DNA Fingerprinting.

Surface Water Sampling

Four (4) water quality samples will be taken at each sampling site three days a week for four weeks as indicated in Table 1. An additional two (2) samples per site will be taken on a random basis during the four week sampling period. A Chain of Custody form will accompany the sample bottles from pick-up to return to the City of Boise Water Quality Laboratory. The water samples will be kept in coolers on ice while in the field and will be returned to the City of Boise Water Quality Lab for filtration and incubation within 6 hours of the time the sample was taken.

Bacteria Culture Preparation

Fecal Coliform Cultures will be prepared utilizing the Membrane Filtration Technique with m-FC Agar by DIFCO as outline in the Standard Methods, 18th Edition. Dilutions will be made to insure between 20-80 bacteria colonies on each culture plate. Following the prescribed incubation period the culture plates may be refrigerated a maximum of 7 days prior to shipment to the University of Washington for analysis.

Culture Plate Shipment to University of Washington

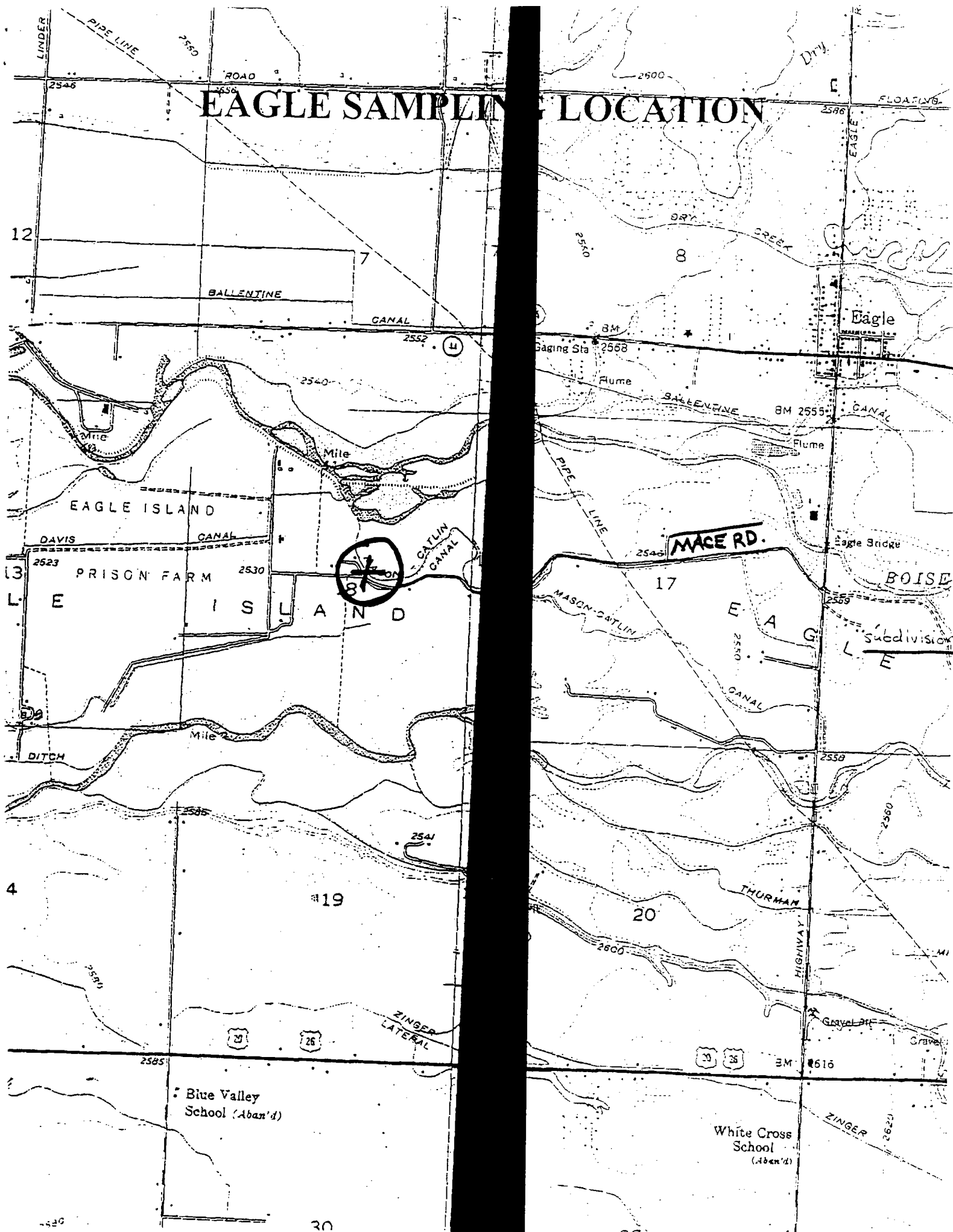
Shipments should be made on Mondays. The finished Fecal Coliform cultures will be shipped by overnight mail to:

Mansour Samadpour
Health Science Building, Room E-164
University of Washington
Seattle, Washington 98195
(206) 660-5090

Appendix B



EAGLE SAMPLING LOCATION

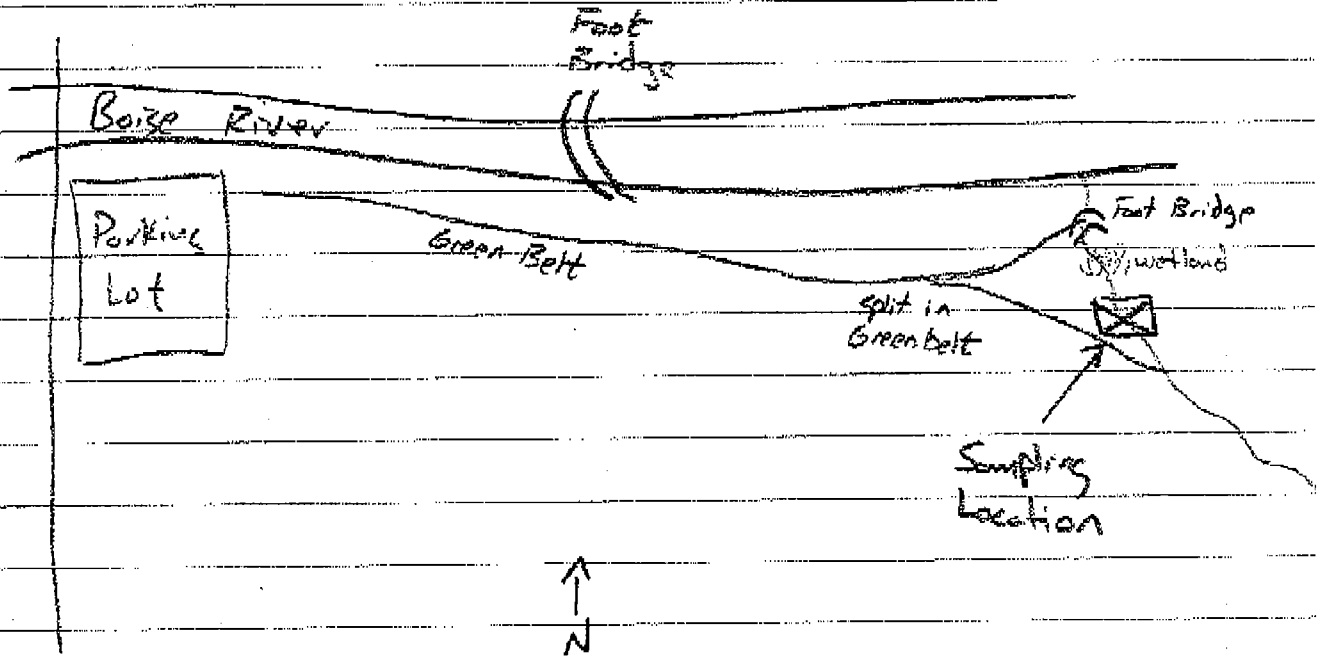


Lower Boise River Riparian Corridor Bacteria Sampling Data
Year 2000 Monitoring by Freeman and Eskalin
Analysis by City of Boise, DNA analysis by University of Washington

Location	Date	Fecal Coliform cfu/100ml
Ann Morrison Park	04/11/00	1000
Ann Morrison Park	04/11/00	670
Eagle Island	04/11/00	29
Field Blank	04/11/00	<1
Ann Morrison Park	04/13/00	220 storm event
Eagle Island	04/13/00	31 storm event
Ann Morrison Park	04/17/00	610
Eagle Island	04/17/00	380
Eagle Island	04/17/00	310
Ann Morrison Park	04/24/00	320
Ann Morrison Park	04/24/00	450
Eagle Island	04/24/00	61
Ann Morrison Park	05/01/00	200
Eagle Island	05/01/00	390
Eagle Island	05/01/00	290
Ann Morrison Park	05/08/00	120
Ann Morrison Park	05/08/00	78
Eagle Island	05/08/00	92
Ann Morrison Park	05/15/00	130
Eagle Island	05/15/00	70
Eagle Island	05/15/00	90
Ann Morrison Park	05/22/00	310
Ann Morrison Park	05/22/00	290
Eagle Island	05/22/00	70
Ann Morrison Park	05/30/00	130
Eagle Island	05/30/00	120
Eagle Island	05/30/00	80
Ann Morrison Park	06/12/00	70 storm event
Eagle Island	06/12/00	270 storm event
Ann Morrison Park	07/03/00	300
Eagle Island	07/03/00	180
Eagle Island	07/03/00	190
Ann Morrison Park	07/10/00	66

Post-it® Fax Note 7671

Date 4/4/01	# of pages 1
To Tom Kumsick	From Bryan Harsburg
Co./Dept. CHEM	Co. DEQ
Phone #	Phone #
Fax #	Fax #

Am Morrison Park SiteEarle Island Park Site

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