

**Orofino Creek Mercury Monitoring Project
Final Report
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**Lewiston Regional Office
Idaho Department of Environmental Quality**

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Project Personnel

Project participants included Department staff from the Lewiston Regional Office, the Boise Regional Office, Technical Services, and the Water Quality Program.

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1. Introduction

This project was completed to verify the presence of or document the absence of total mercury at the site, and determine the level of concern for potential water quality impairment resulting from the presence of total mercury within Orofino Creek.

In August of 2006, a recreational miner working a historic placer mining site within Orofino Creek downstream of Pierce reported elemental mercury in a clay lens below the creek bed gravels. Mercury is associated with traditional gold ore processing methods and can be found by recreational miners and others in historic mining sites.

2. Project Description

Orofino Creek is located within the Pierce Mining District, the oldest mining district in Idaho. Gold was first discovered in Canal Gulch, a tributary to Orofino Creek, in 1860. Since 1860, the Pierce Mining District and Orofino Creek have been the site of various mining activities.

The project was completed to determine the level of concern for potential water quality impairment resulting from the presence of total mercury within Orofino Creek and the need to complete a more intensive and comprehensive monitoring program to characterize the nature of mercury contamination in Orofino Creek.

Two sites were monitored. Site one is an easily accessible family recreation site popular for gold panning, swimming, fishing, hunting, and camping on Orofino Creek. Site two is immediately upstream of the Riverside Water Association's water supply intake on the Clearwater River, the closest downstream public drinking water system.

3. Project Preparation

Lewiston Region Office field staff were trained in the application of U.S. Environmental Protection Agency (EPA) *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Level*, by the Senior Quality Assurance Project Plan (QAPP) Protocol Coordinator. The Senior QAPP Protocol Coordinator was specifically selected to provide this training to the field staff based on education and experience with the method.

4. Project Quality Assurance

The project objective is exploratory. The project goal was to collect uncontaminated environmental samples using sample collection and preparation methods previously adopted from accepted protocol references. Quality assurance objectives focused on the execution of protocol to limit introduced mercury contamination into samples collected. Each project participant carried out the assignments and responsibilities as listed in the project plan. Quality assurance samples collected include transport and transfer blanks, a field blank, a field duplicate sample, and a matrix spike.

5. Project Design

The monitoring project consisted of a sample collection event at two sites on September 26, 2006 (Table 1 and Table 2). Site 1 was on Orofino Creek where water, sediment and fish tissue samples were collected in the immediate vicinity of its confluence with Cow Creek. Site 2 was on the Clearwater River where ambient surface water samples were collected immediately upstream of the Riverside Water Association's drinking water system supply intake. Locations of Site 1 and Site 2 are illustrated on the map in Figure 1.

Resident species of salmonids were collected. Ten salmonid fish were collected. Ambient water samples at both sites were collected as grab samples to verify or deny the presence of total mercury at concentrations of concern. Sediment sampling followed the procedures outlined in EPA's *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*.

Table 1. Sample collection sites.

Site Number	Site ID	Idaho Waterbody ID	Site Description	Comments
1	LRO Merc - 1	17060306CL039_04	Orofino Creek at Historic Placer Workings	Latitude 46 29 43.0 Longitude 115 55 57.5
2	LRO Merc - 2	17060306CL021_06	Clearwater River at Riverside Water Association Intake	Latitude 46 29 38.34 Longitude 116 17 7.45

Table 2. Field samples collected.

Parameter	# Sample	# Duplicates	#Blanks	# Replicates
Water Total Hg	8	1	1	1
Salmonid, Fish Total Hg	10	1	0	1
Sediment Total Hg	2	1	0	1

Clearwater Subbasin 17060306

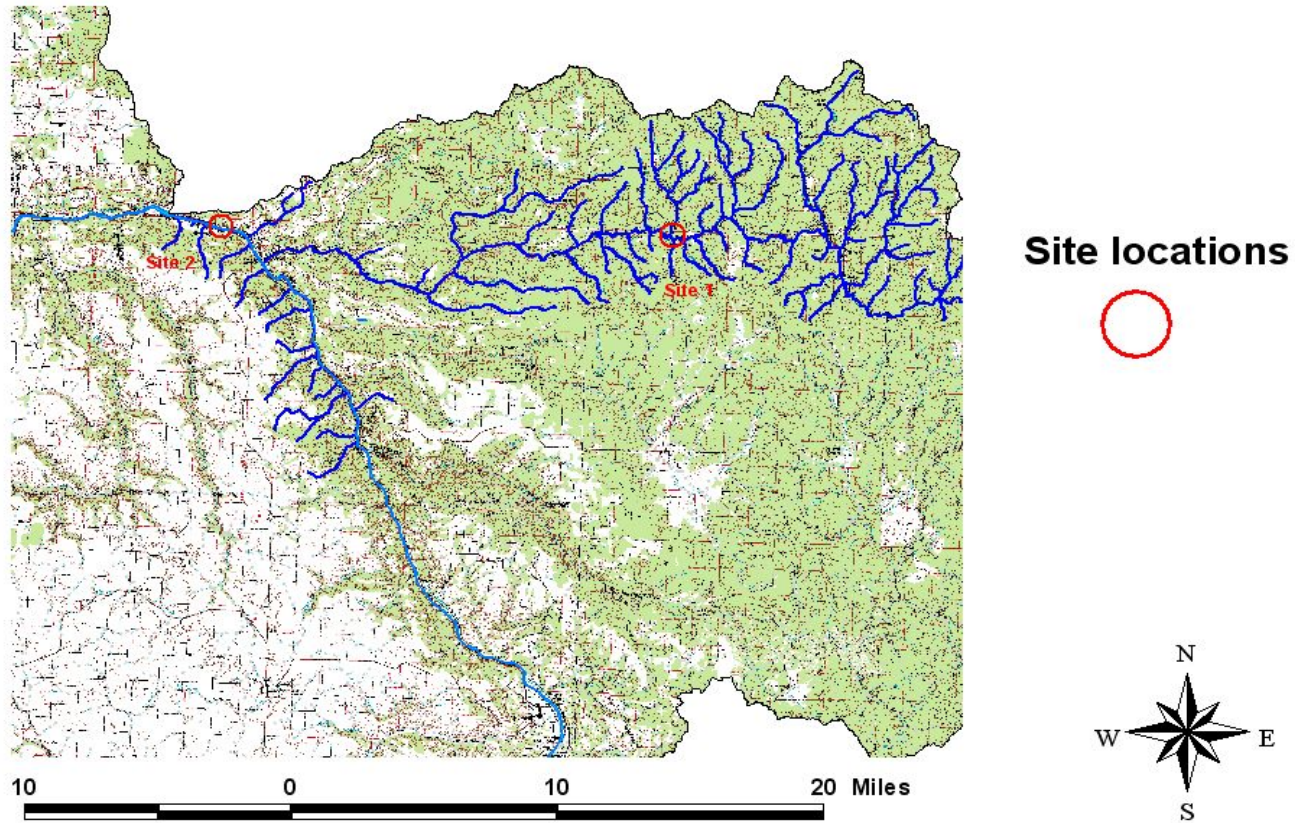


Figure 1. Site Locations

6. Sample Methods

Fish Tissue Samples

Field documentation for each sample collected was noted in a notebook of prepared field data sheets. For each fish, an estimated length, specie, time and date of collection, station ID, sample ID and any abnormalities noted were recorded in a project field notebook.

Fish handling followed EPA Method 1669, “clean-hands” and “dirty-hands” protocols. Fish were handled and preserved following the procedures described in the project plan. Each fish was considered an individual sample and double bagged in a re-closeable plastic bag. Bagged and labeled samples were placed in an ice chest/cooler and transported to the DEQ-Boise Regional Office Laboratory.

Fish tissue preparation followed the procedures described in the Guidance for Assessing Chemical Contamination Data for Fish Advisories.

Ambient Water Samples

Ambient creek and river water grab samples for total mercury followed the “clean hands” and “dirty hands” collection techniques as referenced in the project’s QAPP. Fluoropolymer or borosilicate glass bottles with fluoropolymer or fluoropolymer-lined caps were utilized for mercury samples.

The samples were placed in a cooler and chilled on ice. Samples were delivered to the DEQ-Boise Regional Office Laboratory.

Sediment Samples

Sediment sampling followed the procedures outlined in EPA’s Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels.

7. Sample Processing and Transport

Chain of Custody procedures were followed as described in the project plan.

8. Laboratory Analyses

Analytical parameters, analytical methods, sample containers, sample preservatives, and sample holding times used in this project are listed in Table 3.

Table 3. Laboratory methodology.

Parameter	Matrix	Method	Bottle	Preservative	Holding Times
Total Hg	Water	EPA Method 1631EM	250ml	Chill to 4°C	90 days
Total Hg	Fish	EPA Method 7471	Glass	Chill to 4°C/Frozen	89 days
Total Hg	Sediment	EPA Method 7471	4 oz Glass	Chill to 4°C/Frozen	89 days

9. Data management and Storage

Field data is stored in the regional water quality mercury file for this project at the Lewiston Regional Office. Laboratory data has been provided to the Laboratory and Analyses Coordinator at the Surface Water Program at the State Office.

10. Data Applications

The Regional Project Manager reviewed the data resulting from this project and found the data meets the project's objectives. No data quality problems were noted. Precision, completeness, and accuracy were found to be within acceptable limits.

11. Conclusions

Samples collected during the completion of this project are listed in Table 4. Laboratory analyses results are listed in Table 5. Comparison of the fish tissue biota data with the Idaho Water Quality Standard for Idaho's human health fish tissue criterion of 300 ng/g for methylmercury shows both the mono-methyl and total results are well below the criterion and no violation of the water quality standard occurred. These results are likely protective of human health through fish consumption for the general population, and are indicative of water quality protective of aquatic life as well.

Although Idaho has no water column Hg criteria, one can compare the water results to EPA's 1984 Hg chronic aquatic life criterion, which is 12 ng/L. The concentrations measured are well below this threshold, within the range of background levels of mercury.

The matrix of sediment is expressed as ng/g. The measured levels are well below NOAA's sediment guidelines (NOAA, 1999) low effects level of 150 ng/g and appear to be within the range of background levels.

The data indicate that the presence of liquid Hg is not a cause of localized toxicity, or has been up taken by resident biota such as fish. This may depend on the rate of conversion to soluble and then organic forms that are occurring.

Table 4. Sample tracking and analysis

Tracking Number	Receiving Date	Sampling Date	Prep date	Analysis date	Fraction	Qualifier	Project	
							Ref #	Method#
06BR1595-03	10/5/06	9/26/06	10/17/06	10/24/06	T		ID Q002	EPA 1631, Appendix
06BR1595-04	10/5/06	9/26/06	10/17/06	10/24/06	T		ID Q002	EPA 1631, Appendix
06BR1595-03	10/5/06	9/26/06	10/17/06	10/18/06	T		ID Q002	EPA 160.3
06BR1595-04	10/5/06	9/26/06	10/17/06	10/18/06	T		ID Q002	EPA 160.3
06BR1595-01	10/5/06	09/26/06	10/12/06	10/13/06	T		ID Q002	EPA 1630 Mod.
06BR1595-02	10/5/06	09/26/06	10/12/06	10/13/06	T		ID Q002	EPA 1630 Mod.
06BR1595-05	10/5/06	9/26/06	10/13/06	10/16/06	T		ID Q002	EPA 1631
06BR1595-06	10/5/06	9/26/06	10/13/06	10/16/06	T		ID Q002	EPA 1631
06BR1595-07	10/5/06	9/26/06	10/13/06	10/16/06	T		ID Q002	EPA 1631
06BR1595-08	10/5/06	9/26/06	10/13/06	10/16/06	T	B	ID Q002	EPA 1631
06BR1595-09	10/5/06	9/26/06	10/13/06	10/16/06	T	B	ID Q002	EPA 1631
06BR1595-01	10/5/06	09/26/06	10/23/06	10/30/06	T		ID Q002	EPA 1631, Appendix
06BR1595-02	10/5/06	09/26/06	10/23/06	10/30/06	T		ID Q002	EPA 1631, Appendix
06BR1595-10	10/5/06	09/27/06			T		ID Q002	No analysis

Table 5. Laboratory analyses results.

Tracking #	Sample Tag #	Batch #	Analysis	Matrix	Result	Final Unit
06BR1595-03	OC-2006-01-SED-THg-1	06-0900	Hg	Sediment	30.02	ng/g (dry)
06BR1595-04	OC-2006-01-SED-THg-DUP-1	06-0900	Hg	Sediment	53.08	ng/g (dry)
06BR1595-03	OC-2006-01-SED-THg-1	06-0902	% Solids	Sediment	74.61	% Solids
06BR1595-04	OC-2006-01-SED-THg-DUP-1	06-0902	% Solids	Sediment	75.92	% Solids
06BR1595-01	5264191	06-0903	Hg(Monomethyl)	Biota	91.0	ng/g
06BR1595-02	5264194	06-0903	Hg(Monomethyl)	Biota	103.0	ng/g
06BR1595-05	OC-2006-01-H2O-THg-01	06-0924	Hg	Water	4.25	ng/L
06BR1595-06	OC-2006-01-H2O-THg-DUP-01	06-0924	Hg	Water	4.40	ng/L
06BR1595-07	CWR-2006-01-H2O-THg-01	06-0924	Hg	Water	1.58	06BR1595-10
06BR1595-08	OC-2006-01-H2O-THg-FB-1	06-0924	Hg	Water	0.21	ng/L
06BR1595-09	OC-2006-01-H2O-THg-TB-1	06-0924	Hg	Water	0.23	ng/L
06BR1595-01	5264191	06-0965	Hg	Biota	98.2	ng/g
06BR1595-02	5264194	06-0965	Hg	Biota	134	ng/g