Sampling and Analysis Plan for

Huntington Creek TMDL Study for Selenium

Huntington, Utah

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With monitoring to be conducted by:
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Division of Water Quality Watershed Coordinator	Date
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1.0 INTRODUCTION

Previous monitoring by the Utah Division of Water Quality showed exceedances of the selenium standard in Huntington Creek. As a result, it was placed on the 303(d) list of impaired waterbodies and follow up monitoring was conducted. Those results showed concentrations consistently below the detection limit for selenium so Division staff would like additional samples collected to determine whether or not the decrease in selenium is still being observed.

This Sampling and Analysis Plan (SAP) may support the development of a Huntington Creek Success Story for selenium, but additional data must first be collected. This SAP will discuss the various sampling sites and monitoring protocol necessary to determine the current concentrations of selenium in Huntington Creek.

Total dissolved solids, boron and temperature will also be measured in response to concerns about those parameters in the Huntington Creek watershed. Sampling will include grab samples for those parameters, as well as stream flow measurements. Monitoring is scheduled to occur on a monthly basis beginning May 2, 2016. A determination will be made in December 2016 about whether or not to continue with monthly monitoring.

1.1 Site Name or Sampling Area

Huntington Creek and Cedar Creek

1.2 Site or Sampling Location

Huntington Creek in Emery County, Huntington City, Utah. Sampling sites span from upstream near the Utah Power and Light (UP&L) diversion downstream to the Green River Cutoff road near Buckhorn flat.

1.3 Responsible Agency

Sampling and monitoring will be performed by Utah Association of Conservation Districts (UACD) and Natural Resources Conservation Service (NRCS) staff based out of the Castle Dale NRCS office. Information and record keeping will be performed by the Utah Division of Water Quality West Colorado watershed coordinator (Amy Dickey). Flow data for the UP&L diversion site will come from Pacificorp staff (Cody Allred).

Project Organization

Entities involved in the Huntington Creek sampling and analysis plan:

Title/Responsibility	Name	Phone #
DWQ Watershed Coordinator/Project Manager	Amy Dickey	(801) 536-4334
NRCS Salinity Project Coordinator/Monitoring	Jim Greenan	(435) 381-2300, x 111
Utah Department of Agriculture and Food Zone Coordinator/Monitoring and local oversight	Roger Barton	(435) 381-5333, x 113
PacifiCorp Public Relations/Flow data UP&L	Cody Allred	(435) 687-4306

Table 1: Contact information

1.4 Statement of the Specific Problem

Huntington Creek was 303(d) listed in 2008 for exceedances in selenium concentrations based on samples collected downstream of Highway 10, above the Huntington sewage lagoon discharge,. The State selenium standard is 4.6µg/L. Selenium is a naturally occurring element that is nutritionally essential, but it can be toxic to aquatic life (such as fish and invertebrates) where concentrations are excessive. Selenium is also toxic to birds that consume aquatic organisms containing excessive levels of selenium. At high doses, livestock can exhibit symptoms of selenium toxicity, which include poor reproductive performance, low weight gain, hoof and horn changes or loss, lameness and death. Toxic levels of selenium in water bodies have mostly been linked to natural weathering of selenium rich soils, irrigation of western soils that are naturally high in selenium, ash pond discharges from coal-fired power plants using coal that contains selenium, petroleum refinery effluents, runoff or discharges from certain mining activities.

2.0 BACKGROUND

Huntington Creek is one of many streams that drain the Wasatch Plateau of central Utah. This plateau is the northernmost of the plateaus of Utah and is situated in the central part of the State. The eastern slopes of the Wasatch Plateau are dissected by deep, rocky gorges with fast flowing streams similar to lower Huntington Creek. The eastern face of the plateau consists of sharp cliffs of Starpoint sandstone and rough erosion of the uppermost layers of Mancos shale. From the mouth of Huntington Canyon, Castle Valley extends eastward toward the San Rafael River which collects the waters of Huntington Creek and other drainage waters of the eastern slopes of the plateau. (Squires, R, & J, 1973) The water at Huntington Creek at the UP&L diversion, the Highway 10 crossing, and above the Huntington City sewage lagoons have been sampled and tested by the Utah Division of Water Quality from 1997 to 2013. These three sites have been added into the SAP for historical comparison and future consideration. Additional sites have been

added for monitoring including the Cedar Creek tributary and a downstream site at the Green River cutoff road.

2.1 Site Descriptions

STORET	Coordinates N/W	Site Description
4930530	39 23 31 111 6 7.0	Huntington Creek above UP&L diversion.
4930524	39 20 7.2 110 57 23.3	Huntington Creek at the Hwy 10 crossing.
QA/QC DUPLICATE		
4930527	**39 20 7.2 110 57 23.3**	**Huntington Creek at the Hwy 10 crossing**
4930522	39 12 59.2 110 54 54.4	Huntington Creek at Green River cutoff rd.
4930520	39 18 58 111 55 22	Huntington Creek ab lagoons outfall.
4930500	39 18 20 110 55 11	Huntington Creek below lagoons outfall.
4930518	39 20 41.2 110 55 31.2	Cedar Creek at the county road crossing.

Table 2: Site STORET number, coordinates and description

The highest upstream sampling point of the study for selenium is at the UP&L diversion up highway 31, site 4930530 (refer to Figure 1).

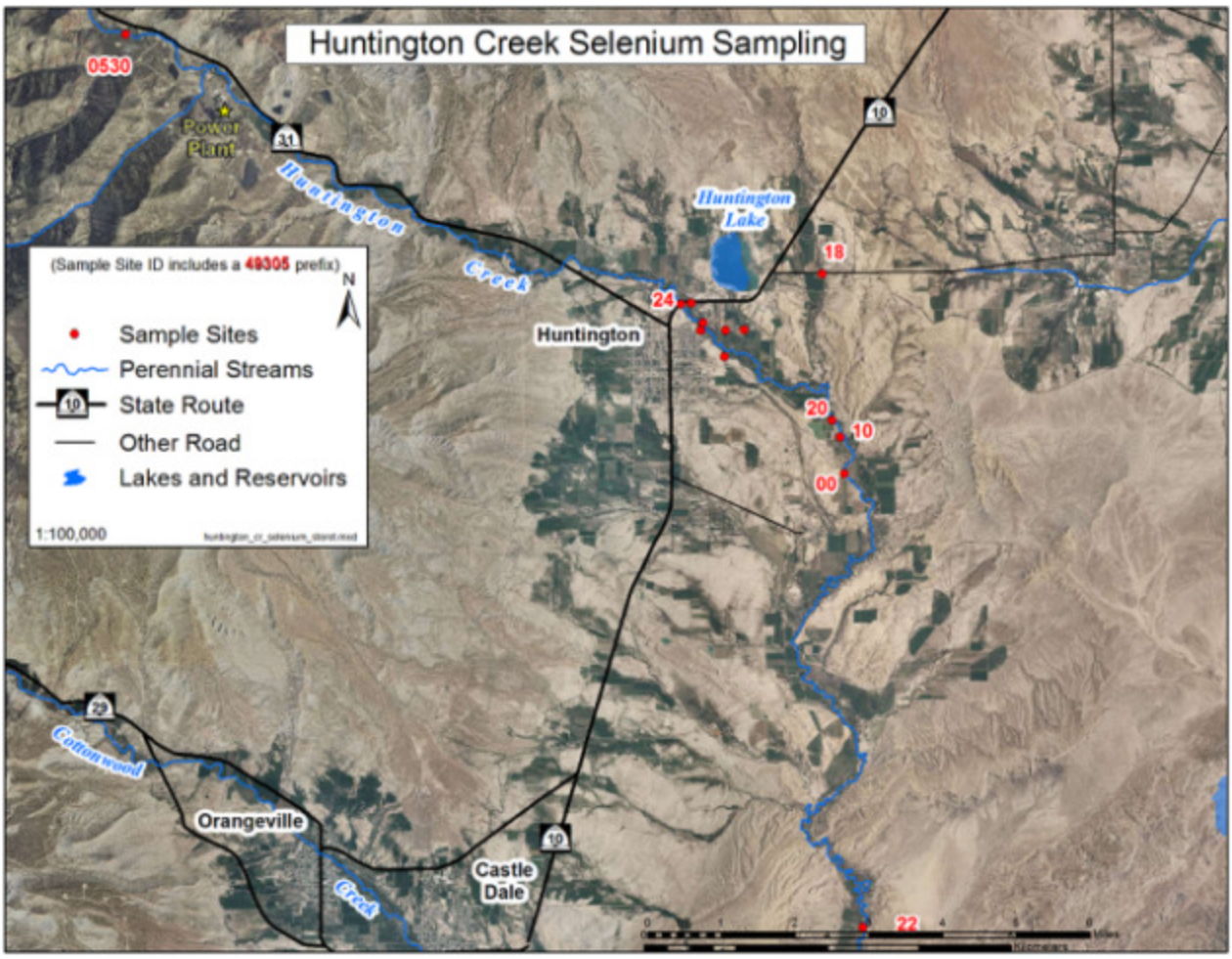


Figure 1: Huntington Creek Selenium Sampling: Storet numbers 4930500-4930530.

This point is used primarily to identify any background selenium inputs from higher in the watershed. The farthest downstream monitoring site on Huntington Creek is 4930522 at the Green River cutoff road. Refer to the appendix for sampling site photographs.

Refer to Figure 2 below for sampling points near the city of Huntington. From the

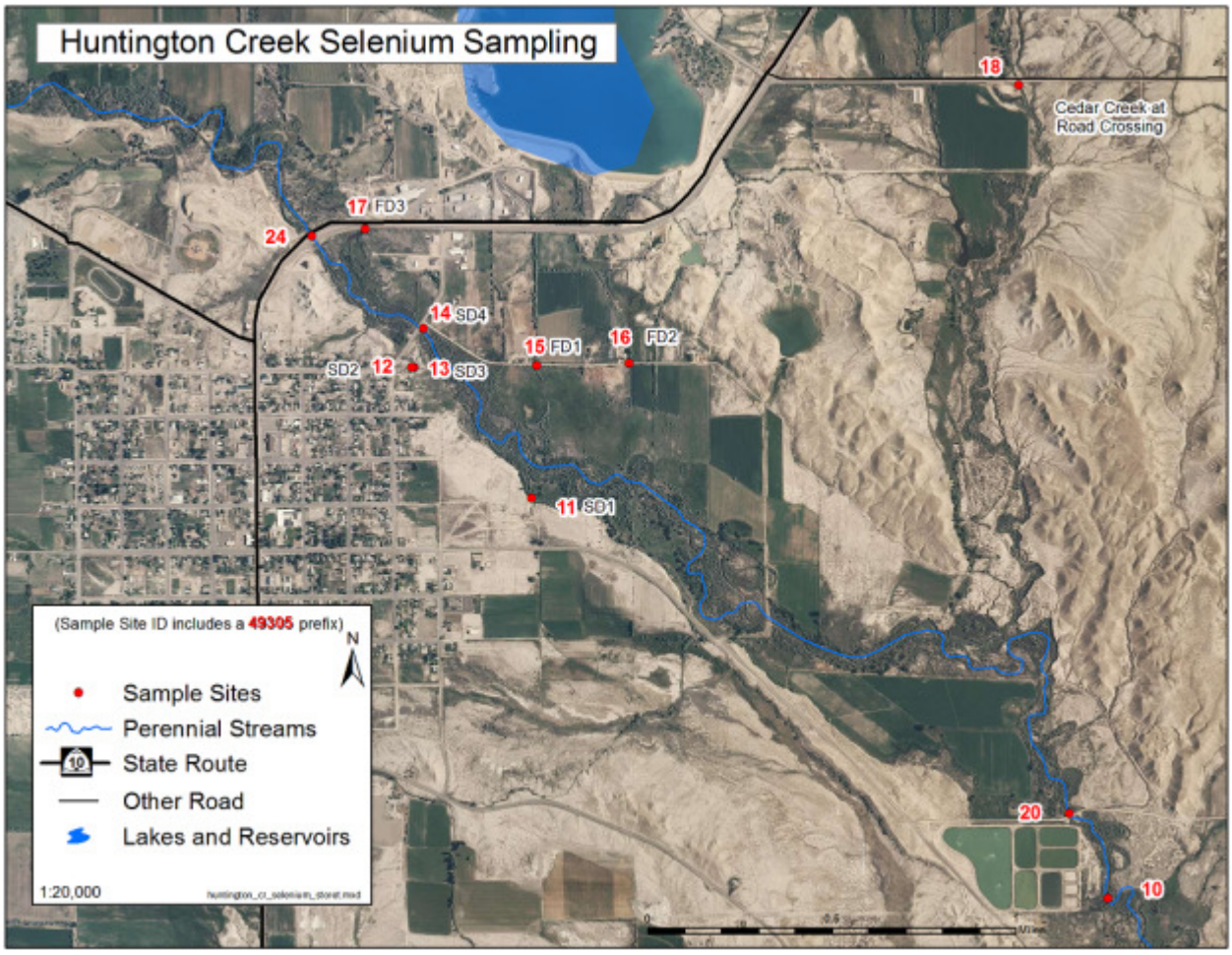


Figure 2: Huntington Creek Selenium Sampling: Sampling points around the city of Huntington.

UP&L diversion the next downstream sampling point is at the Highway 10 crossing in Huntington City (4930524), where selenium has been detected infrequently. On the eastern side of Huntington City three miles downstream from the Highway 10 crossing are the evaporative sewage lagoons. Treated water from the lagoons is released into Huntington creek during low evaporative months. Sampling points were established above (4930520) and below the effluent (4930500). The lagoon discharge (4930510) has been monitored in the past but will not be included in this plan.

Previous monitoring data collected by the State of Utah, suggests that the selenium inputs occur above the sewage lagoons. The sampling point upstream from the effluent is where concentrations of selenium are consistently over the standard. The only significant input between the Highway 10 crossing and the site above the sewage lagoons is Cedar Creek. Cedar Creek has consistent flow year round and is subject to higher flows during storm events. Monitoring site 4930518 on Cedar Creek was added to determine if there is any potential loading of selenium into Huntington Creek from the Cedar Creek tributary.

There are four storm drains that empty into Huntington Creek. All four (4930511-4930514) have been listed as potential sources and were monitored in the past as part of the Colorado Basin intensive monitoring run but will not be included in this plan.

Huntington Reservoir sits to the north of Huntington Creek and the area below the dam is prone to seepage. Three field drains direct water back to Huntington Creek. All 3 field drains (4930515-4930517) were sampled in the past but will not be included in this plan.

The field blank is 4930526, and the duplicate sample is 4930527.

2.2 Operational History

An active coal fire power plant is just below the highest sampling site in the watershed. Evaporating ponds are used and no return flows from the ash ponds enter Huntington Creek. The Huntington City sewage lagoon effluent empties into Huntington Creek when evaporation rates are low. Preliminary data suggests that the selenium source is above the sewage lagoons; in fact the effluent from the lagoons appears to be diluting the selenium concentrations below the effluent release point. Active and abandoned mines dot the upper watershed, whether any significant contributions come from these sources is largely unknown. According to the 2010 census, Huntington City has a population of 2,129 (CensusViewer.com, 2011). The area around Huntington is mainly rural agriculture and the soils have a high abundance of Mancos shale. "Nitrate concentrations are known to occur naturally in water from Cretaceous shales (possibly from N-fixing plants or from organic N in shale kerogen), and these naturally occurring NO_3- concentrations also have associated high concentrations of Se in water. However, in irrigated environments, the naturally occurring N has usually been removed from the soil, and N fertilizer amendments are needed for crop growth. Proper management of N fertilizer applications in Cretaceous shale settings might help to control the oxidation and mobilization of Se and other trace constituents into the environment.

By preventing the oxidation and mobilization of Se at the source (rather than treating it in the end), Se concentrations might decrease in water bodies receiving irrigation drainage from shale terrains." (Wright, 1999)

2.3 Previous Investigations and Regulatory Involvement

All previous investigative samples were collected by the Utah Division of Water Quality. At site 4930530 (UP&L diversion) of the 13 samples collected from 1997 to 2008, all were non-detects for selenium. Twenty two samples were collected at site 4930524 (Hwy 10 crossing) from 2004-2008 and only one sample exceeded the standard. Approximately 3 miles downstream at site 4930520 (above the sewage lagoons) the selenium concentrations consistently exceed the standard. Of the 10 samples taken from 2002-2008, 8 are in exceedance.

2.4 Environmental and/or Human Impact

Selenium is a naturally occurring element that is nutritionally essential, but it can be toxic to aquatic life (such as fish and invertebrates) where concentrations are high. Excessive selenium concentrations can also result in a decrease of recreational potential. Selenium is toxic to birds that consume aquatic organisms containing excessive levels of selenium. Livestock can exhibit symptoms of selenium toxicity, which include poor reproductive performance, low weight gain, hoof and horn changes or loss, lameness and death. Reduction in the health and vigor of livestock can result in economic hardships.

3.0 PROJECT DATA QUALITY OBJECTIVES

Selenium has been detected above the State standard of 4.6µg/L in 8 out of 10 sampling events on Huntington Creek above the sewage lagoons. The objective of this SAP is to guide collection of at least 12 months additional data in order to determine use support/impairment in Huntington Creek, or delisting due to non-detects. This SAP will answer the following;

1. Determine concentrations of selenium in Huntington Creek above, below and in the area of concern.

The area of concern is Huntington Creek at the Highway 10 crossing to the site just above the sewage lagoons (4920520.

Monitoring will occur monthly through December 2016 at which time the DWQ watershed coordinator will make the decision on whether or not to continue monthly collection. A record of decision will be created at that time based on the available data.

3.1 Project Task and Problem Definition

Water grab samples at all sites (if flow is sufficient) will include chemical analysis for total dissolved solids (TDS) and total suspended solids (TSS) and filtered metals

analysis for selenium and boron. Flow will be measured at, or obtained for, each site.

3.2 Data Quality Objectives

Objective 1: Collect at least a 12 month data set in order to determine use support/impairment for selenium on Huntington Creek, or delisting due to non-detects.

3.3 Data Review and Validation

Data will be reviewed by the UDWQ West Colorado watershed coordinator.

3.4 Data Management

All field data (measured flow) and water chemistry measurements (lab analysis of water grab samples) associated with Huntington Creek selenium monitoring will be stored in the UDWQ AWQMS database.

3.5 Assessment Oversight

The UDWQ West Colorado watershed coordinator will be responsible for analysis of the data. It will be compared to the state standard for selenium to determine where, when and how often the standard is exceeded.

4.0 REQUEST FOR ANALYSIS

Samples will be processed using the State Public Health Laboratory at 4431 South 2700 West in Taylorsville, Utah. Total samples are listed in Table 3 below. Parameters: Selenium, TDS, TSS.

Type	Volume	Suite	Additive
Total Chemical Analysis	1 Quart	X	None
Filtered Metals	500ml	X	Nitric Acid (HNO_3)

Table 3: Total and type of water samples to be tested

4.1 Analysis Narrative

In-stream water grab samples will be taken at 6 sites, using 6 standard 1 quart total chemical analysis bottles and 6 filtered metals using 500ml filtered metals bottles. For quality control a trip blank will be included as well as a duplicate collection site. Flow data will be measured at the following sites on Huntington Creek: Highway 10 crossing (4930524), above (4930520) and below (4930500) the sewage lagoons and at the Green River cutoff road (4930522). Flow will also be measured at Cedar Creek (4930518). Flow data for 4930530 will be obtained through UP&L.

5.0 FIELD METHODS AND PROCEDURES

5.1 Field Equipment

5.1.1 List of Equipment Needed

1. Geopump, with filters, pre-filters, hose and DC power cable.
2. Flow meter, with cable and rod
3. Measuring tape
4. Waders/sandals (seasonal), insect repellant, sun screen.
5. Total Chemical 1 quart analysis bottles
6. Filtered metals bottle
7. Markers, run sheets, clipboard
8. Cooler and ice.
9. Camera and GPS unit

5.2 Water Sampling

Grab: Samples will be collected at one time from one location. The sample should be taken from flowing, non stagnant water and the sampler should be facing upstream in the middle of the stream. Samples will be collected by hand or with a sample bottle holder. For samples taken at a single depth, the bottle should be uncapped and the cap protected from contamination. The bottle should be plunged into the water mouth down and filled 6-12" below the surface of the water. Samples will be stored on ice until they can be delivered to the lab for processing.

5.3 Decontamination Procedures

All equipment that comes into contact with potentially contaminated water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Grab bottles will be triple rinsed before reusing. Geopumps will be flushed before use on a different sample.

6.0 SAMPLE CONTAINERS, PRESERVATION AND STORAGE

The number of sample containers, volumes and materials are listed in section 5.0. The containers are precleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by the State public health lab to the containers prior to delivery for the Huntington Creek selenium monitoring run.

6.1 Water Samples

Filtered Metals: Parameters; Selenium and boron. Water samples collected for filtered metals analysis will be filtered into 500ml polyethylene bottles. The samples will be preserved by the added nitric acid (HNO_3). The bottle will be capped and lightly shaken to mix in the acid. After capping, the bottle will

immediately be chilled and stored on wet ice until it can be delivered to the State public health lab.

Total Chemical Analysis: Parameters; TDS, TSS. Water samples collected for total chemical analysis will be collected in 1 quart polyethylene bottles. The samples will not be preserved. Samples will be chilled on wet ice immediately upon collection until they can be delivered to the State public health lab.

7.0 SAMPLE DOCUMENTATION AND SHIPMENT

7.1 Field Notes

Preprinted run sheet and the associated lab sheets will be used on the Huntington Creek monitoring run. Field notes and field measurements are recorded as part of each run. Hard copies are kept in a binder in the DWQ West Colorado watershed coordinator's office. The stream flow measurements are entered into an excel spreadsheet and uploaded to the UDWQ AWQMS data base.

7.1.1 Field Log Books

Run sheets and lab sheets will be used to log the collection information including:

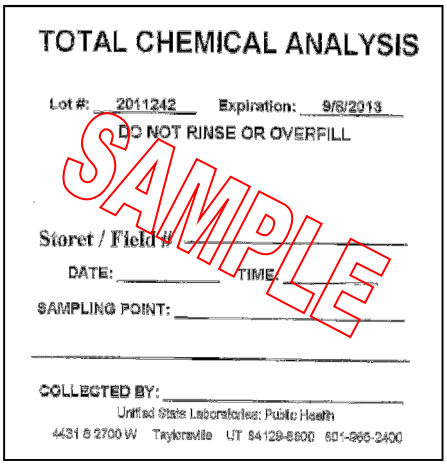
1. Sample location and description.
2. Sampler's name.
3. Date and time of sample collection.
4. Field instrument readings for DO, pH, temperature and conductivity.
5. Field observations.
6. Lot numbers, Storet numbers, and recipient laboratory.

7.1.2 Photographs

Photographs may be taken at the sampling locations and at other areas of interest in the watershed as deemed necessary or helpful by monitors. Photos can be emailed to the DWQ West Colorado watershed coordinator.

7.2 Labeling

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. All samples will include the appropriate completed lab sheet and bottle label will be filled out completely. A copy of the sample label is included to the right (Figure 3). The samples will have pre-assigned, identifiable,


TOTAL CHEMICAL ANALYSIS

Lot #: 2011242 Expiration: 9/6/2013

DO NOT RINSE OR OVERFILL

SAMPLE

Storet / Field #

DATE: TIME:

SAMPLING POINT:

COLLECTED BY:

United State Laboratories: Public Health

4431 S 2700 W Taylorville UT 84129-8600 801-966-2400

Figure 3: Bottle label sample.

and unique numbers (STORET). At a minimum, the sample will include the following information: Station location number (STORET), date and time of collection, sampling point description, and name of collector.

7.3 Packaging and Shipment

Samples will need to be shipped.

- All sample containers will be placed in a strong-sided shipping container. When ice is used, pack it in a zip-locked, double plastic bags.
- Seal the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.
- Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of the sample bottles with indelible ink.
- Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipping.
- Each ice chest will be securely taped shut with fiberglass strapping tape.
- Include correct address for shipping and number of total number of bottles on the outside.

8.0 QUALITY CONTROL

8.1 Field Quality Control Samples

Quality assurance and control samples will be included with the run. Quality assurance and control will consist of a field blank and a duplicate sample.

8.1.1 Assessment of Field Contamination (Blanks)

A field blank will be collected at the start of each trip. Bottles will be filled with deionized water prior to leaving the office and stored in the cooler for the duration of the run. The field blank will be identified as Huntington Creek selenium trip blank, with STORET 4930526 and will be treated identically to the samples collected in the field.

8.1.2 Assessment of Sample Variability (Field Duplicate or Co-located Samples)

A field duplicate sample will also be collected on each monthly run. That sample will be identified as Huntington Creek at Highway 10 Duplicate, with STORET 4930527.

9.0 FIELD HEALTH AND SAFETY PROCEDURES

Use standard safety procedures for outdoors monitoring. The area around Huntington is prone to flash floods so be cautious monitoring when conditions are overcast. Huntington is arid, bring extra water.

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Appendix

Figure 4: Site 4930530; Huntington Creek above the UP&L diversion

Figure 5: Site 4930524; Huntington Creek at the highway 10 crossing

Figure 6: Site 4930522; Huntington Creek at the Green River cutoff road

Figure 7: Site 4930520; Huntington Creek above the sewage lagoon outfall

Figure 8: Site 4930500; Huntington Creek below the sewage lagoon outfall

Figure 9: Site 4930518; Cedar Creek at the county road crossing