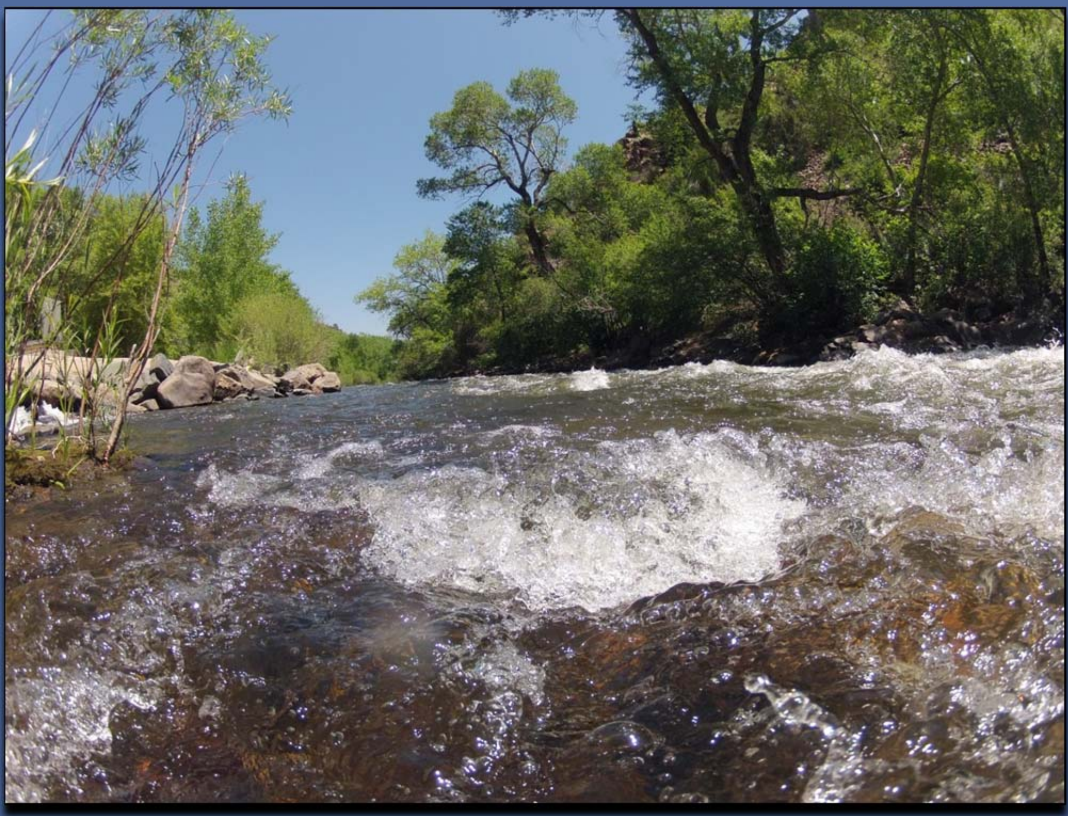

Clear Creek / Standley Lake Watershed Agreement

2013 Annual Report

September 29, 2014

Clear Creek Watershed Annual Report – 2013

September 29, 2014

Submitted to the Water Quality Control Commission by:

Black Hawk/Central City Sanitation District
Central Clear Creek Sanitation District
Church Ditch Water Authority
City of Arvada
City of Black Hawk
City of Golden
City of Idaho Springs
City of Northglenn
City of Thornton
City of Westminster
Clear Creek County
Clear Creek Skiing Corporation
Clear Creek Watershed Foundation
Climax Molybdenum Company/Henderson Operations
Colorado Department of Transportation
Farmers' High Line Canal and Reservoir Company
Farmers' Reservoir and Irrigation Company
Molson Coors Brewing Company
Gilpin County
Jefferson County
St. Mary's Glacier Water and Sanitation District
Town of Empire
Town of Georgetown
Town of Silver Plume
Upper Clear Creek Watershed Association

Prepared by:
Christine Hawley, Jean Marie Boyer, and Taylor Adams
Hydros Consulting Inc.
1731 15th Street, Suite 103
Boulder, CO 80302

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Cover photograph compliments of the City of Westminster

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List of Acronyms and Abbreviations

BHCCSD – Black Hawk/Central City Sanitation District

BMP – Best management practice

BNR – Biological nutrient removal

CC26 – Clear Creek Sampling Station: Clear Creek at Lawson Gage

CC40 – Clear Creek Sampling Station: Clear Creek near the junction of US-6 and I-70

CC50 – Clear Creek Sampling Station: North Fork of Clear Creek at Mouth

CC60 – Clear Creek Sampling Station: Clear Creek at Church Ditch Headgate

CCAS26 – Clear Creek Autosampler Station: Clear Creek at Lawson Gage

CCAS59 – Clear Creek Autosampler Station: Clear Creek 2 Miles West of Highway 58/US6 in Golden

CCAST11 – Farmers' High Line Canal Autosampler Station: Inflow to Standley Lake

CCAST27 – Church Ditch Autosampler Station: Inflow to Standley Lake

CCWF – Clear Creek Watershed Foundation

CDOT – Colorado Department of Transportation

CDPHE – Colorado Department of Public Health and Environment

CDPS – Colorado Discharge Permit System

Chl *a* – Chlorophyll *a*

Church – Church Ditch

Croke – Croke Canal

DBP – Disinfection By-Product

DEA – Drug Enforcement Administration

DO – Dissolved oxygen

EPA – U.S. Environmental Protection Agency

EWM – Eurasian Watermilfoil

FHL – Farmers' High Line Canal

I-70 – U.S. Interstate 70

KDPL – Kinnear Ditch Pipeline

MGD – Millions of gallons per day

NPDES – National Pollution Discharge Elimination System

ORP – Oxidation/Reduction Potential

OWTS – Onsite Wastewater Treatment System

SCADA – Supervisory Control and Data Acquisition

SCAP - Sediment Control Action Plan

SH119 – State Highway 119

SL10 – Standley Lake sampling location near WTP intake

TIN – Total inorganic nitrogen

TN – Total nitrogen

TOC – Total organic carbon

TP – Total phosphorus

TSS – Total suspended solids

UCCWA – Upper Clear Creek Watershed Association

USGS – United States Geological Survey

WWTF – Wastewater Treatment Facility

Executive Summary

ES-1. Introduction

Standley Lake is an off-channel, municipal and agricultural reservoir located in Jefferson County. This 43,000 acre-foot reservoir is a direct-use drinking water supply for over 250,000 consumers in the downstream cities of Northglenn, Westminster, and Thornton. The reservoir also provides water to farms located in Adams and Weld counties, as well as recreational opportunities. The Standley Lake watershed consists of 400 square miles of the upper Clear Creek watershed (the Upper Basin), small direct drainage areas to delivery canals (the Canal Zone), and the lake's relatively small direct watershed. Figure ES-1 shows Standley Lake, the Upper Basin, and the Canal Zone.

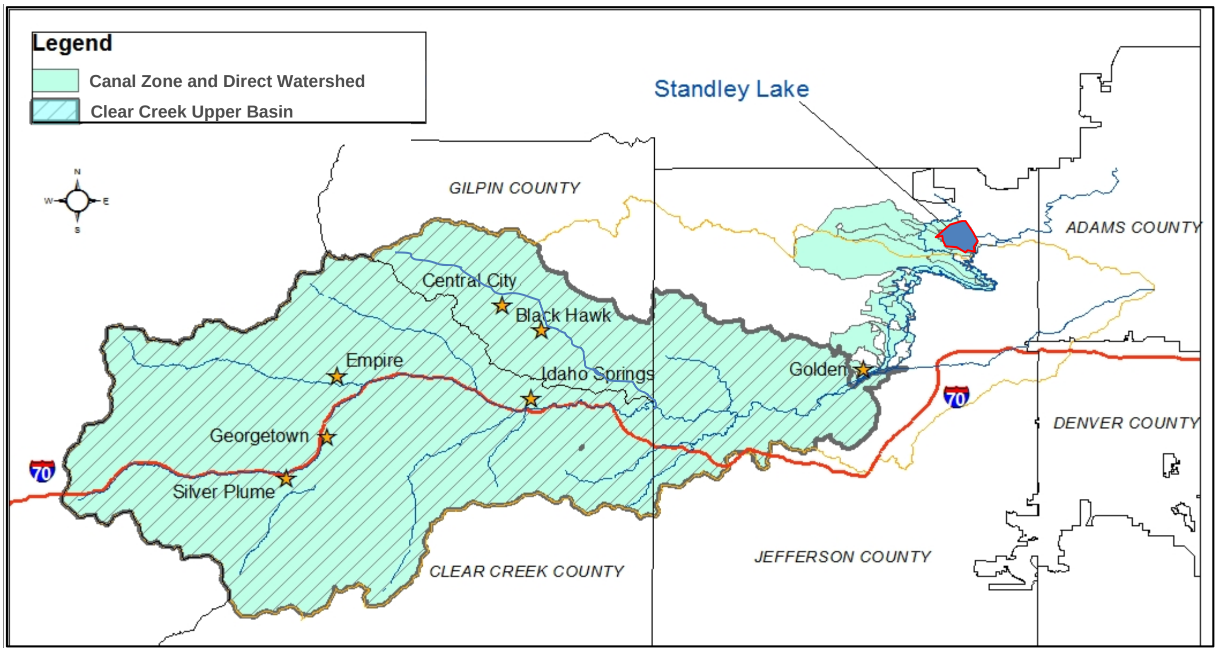

Figure ES-1. Standley Lake and Its Watershed

The Upper Basin contains nine wastewater treatment facilities (WWTFs) serving the local population and resorts. Other factors affecting water quality in Clear Creek include operating and abandoned mines, trans-mountain diversions, and various nonpoint sources of pollution. Nonpoint sources of pollution within the basin include numerous onsite wastewater treatment systems [OWTS], application of roadway deicers and traction sands, and residential and commercial stormwater runoff.

In 1993, the Clear Creek/Standley Lake Watershed Agreement (1993 Agreement) was signed to address certain water-quality issues and concerns within the Clear Creek watershed. The focus of the 1993 Agreement is water quality as it affects Standley Lake. In accordance with the annual reporting obligations set forth in the 1993 Agreement, an overview of 2013 monitoring, management, activities and accomplishments protective of water quality is presented in this report. This information is supported by a summary of observed 2013 WWTF, Clear Creek, Canal Zone, and Standley Lake water quality data, compared to recent previous years of record.

ES-2. 2013 Monitoring Activities

Flow and water-quality samples are collected in Standley Lake and at numerous stations throughout the watershed to monitor the concentrations and loading of nutrients, select metals, and other key constituents. Standley Lake is monitored throughout the year when ice is off the lake. Daily lake profiles are taken, and bi-monthly grab samples are also collected at three depths (at the surface, in the photic zone, and in the hypolimnion). In 2013, a total of 68 grab samples were collected from the lake.

Upper Basin and Canal Zone monitoring for water quality includes grab sampling and the use of autosamplers. There has been a shift in recent years toward an increased use of autosamplers over grab sampling for ambient condition (non-event) sampling in the Upper Basin. The 24-hour composite ambient samples collected by autosamplers provide a better measure of average water quality on the date of sampling, as compared to grab samples. In addition to collecting 24-hour ambient samples, the autosamplers are also used to collect event-triggered samples. Events are typically storm events, though first-flush startup of water delivery to Standley Lake is also conducted as event sampling in the Canal Zone. A total of 118 grab samples, 46 ambient autosampler samples, and 27 event-triggered autosampler samples were collected in the Upper Basin and Canal Zone in 2013. Table ES-1 summarizes sample counts in 2013 by sample type and portion of the watershed.

Table ES-1. Number of Samples Collected and Number of Sampling Locations in the Upper Basin and in the Canal Zone, 2013

	Grab Samples		24-hour Ambient Auto-Samples		Event-Triggered Auto-Samples	
	Number of Samples	Number of Locations	Number of Samples	Number of Locations	Number of Samples	Number of Locations
Upper Basin	49	20	36	4	16	3
Canal Zone	57	8	10	1	11	4

ES-3. 2013 Activities and Accomplishments

In 2013, members of the Upper Clear Creek Watershed Association (UCCWA), the Standley Lake Cities (SLC), and all parties to the 1993 Agreement continued to work diligently to monitor, improve, and protect water quality. These efforts included:

- Maintenance and operation of canals;
- WWTF (wastewater treatment facility) operational improvements;
- Addressing illicit discharges, emergency response, nonpoint sources, and abandoned mines;
- Public education and outreach; and
- Planning and modeling investigations.

Highlights of this work are presented below. This is not a complete list, and additional important activities and details are presented in the main report.

Maintenance and Operation of Canals

- Routine operations protect the water quality of Standley Lake by diverting the first flush away from Standley Lake. Additionally, diversions are stopped, as appropriate, in response to occurrences reported through the emergency call-down system.
- Routine maintenance of the canals also protects the water quality of Standley by placing the removed spoils from capacity maintenance below the canals' banks and grading slopes to drain away from the canals.
- Extensive repairs to the canals and structures were necessary following the September 2013 flooding event (e.g., Figure ES-2).

Figure ES-2. Extensive Bank Erosion on Church Ditch by Leyden Creek after the September 2013 Flood Event (right)

Wastewater Treatment Facility (WWTF) Improvements

- In response to requirements of the Colorado Department of Public Health and Environment (CDPHE) Regulation 85 (issued in 2012), WWTFs began nutrient sampling, as required. This sampling replaces end-of-pipe effluent sampling previously funded and implemented by the Standley Lake Cities and UCCWA members.
- The City of Idaho Springs began planning to switch its SCADA (Supervisory Control and Data Acquisition) system over to DO/ORP (dissolved oxygen/oxidation reduction potential) level controls. The change is expected to not only save the city in energy costs, but to enhance the denitrification process and reduce the plant's effluent nitrate and nitrite concentrations.
- Black Hawk/Central City Sanitation District (BHCCSD) made improvements to its tertiary filtration process by replacing the existing shallow bed sand filters with mechanical disk filters.
- BHCCSD also added a new chemical addition process with coagulation/flocculation to reduce soluble reactive phosphorus following final clarification. These BHCCSD improvements have resulted in the reduction of effluent total phosphorus (TP) concentrations by approximately 35%.

Efforts to Control Illicit Discharges, Emergency Response, Nonpoint Sources, and Abandoned Mines

- The City of Golden responded to 23 reports of discharges or potential discharges to the storm sewer system.
- The City of Arvada issued 22 written Notices of Violation and conducted 335 outfall inspections, issuing 15 written warnings, 17 verbal warnings and billing two parties for clean-up costs.

- The City of Arvada conducted 1,558 erosion and sediment control inspections on active construction sites, issuing 192 warnings and 36 Notices of Violation.
- Through the City of Golden's Stormwater Maintenance Program, 135 inspections of permanent water-quality BMPs (Best Management Practices) were conducted. The City of Golden also conducted 435 erosion and sediment control inspections.
- The City of Golden completed water-quality improvements to two detention structures and constructed water-quality features associated with improvements to South Golden Road.
- The Clear Creek Office of Emergency Management continued to maintain and update the Code Red emergency call-down system database. In 2013, the Clear Creek Office of Emergency Management launched seven calls, and the City of Golden Dispatch Center launched 5 calls for incidents within its jurisdiction impacting Clear Creek.
- The Clear Creek County Environmental Health Department issued 28 on-site wastewater treatment system (OWTS) permits in 2013 and continued monitoring existing systems for failure.
- The City of Golden authorized proceeding with a rehabilitation project, regrading approximately 24 acres of open land adjacent to Guanella Reservoir used for aggregate processing until 2013. Permanent BMP's included installation of 2,200 square yards of erosion control blankets and seeding the site.

Public Education, Outreach, and Partnerships

- The Clear Creek Watershed Foundation organized and hosted the fifth annual Clear Creek Watershed Festival in September 2013. More than 800 people attended the event held in central Idaho Springs, which included more than 30 environmental education booths.
- Over 1,200 students, teachers, and parents from the water service areas of Thornton, Northglenn, and Westminster participated in the tenth annual Youth Water Festival at Front Range Community College in Westminster (held on May 21, 2013).

Figure ES-3. 2013 Youth Water Festival Cake

- The Clear Creek County Transfer Station sponsored three Household Hazardous Waste Collection events, collecting a total of 751 gallons of liquid material as well as with flammable solids, adhesives, and small amounts of acids, bases, oxidizers, and mercury.
- Staff from the City of Golden's Stormwater Program distributed educational materials and attended/hosted public events, including a Waterwise Seminar, the Golden Flower Show, and Greener Golden.
- The City of Arvada hosted water-quality education booths at five festivals in Colorado in 2013.

- The City of Golden continued funding for the Rooney Road Recycling Center, which provides critical recycling and disposal services of household chemicals and annually serves more than 3,000 Jefferson County residents.
- The Drug Enforcement Administration (DEA) sponsored two National Pharmaceutical Take-Back Days in 2013. The City of Arvada collected 1,286 pounds of medications, the City of Golden collected 514 pounds. The Standley Lake Cities collected 1,746 pounds (for a combined increase of 39% over 2012 totals) and provided funding in support of a drop box at King Soopers in Wheat Ridge.

Planning and Modeling Investigations

- The Colorado Department of Transportation (CDOT) completed the Sediment Control Action Plan (SCAP) study for Clear Creek, from the Eisenhower Tunnel to the divergence of I-70 and Clear Creek below Idaho Springs. This study provides recommendations for how to reduce sediment input from highway runoff into Clear Creek.
- The Clear Creek Watershed Foundation conducted critical strategic planning for remediation of abandoned mine sites. At least three projects will go to construction in 2014, including:
    - North Empire Creek Riparian Corridor Restoration Project,
    - Clear Creek Tributaries Sediment Control and Metal Removal Project, and
    - Fishing Is Fun Access Project.
- The Upper Clear Creek Watershed Association (UCCWA) began updating its 2006 Watershed Plan. The effort was completed in in 2014.
- The Standley Lake Cities funded an update and refinement of the Clear Creek watershed hydrologic and water-quality model, which is a powerful tool for water-quality management support.

ES-4. 2013 Observed Flow and Water Quality

To assess 2013 conditions in Clear Creek and Standley Lake, flow and water-quality records were reviewed and compared to the previous five years of record (2008-2012). The water-quality analyses focused on total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP). In addition, chlorophyll *a*, Secchi depth, and dissolved oxygen were assessed in Standley Lake. In the Upper Clear Creek Basin, data analyses focused on results from Clear Creek inupstream portion of the Upper Basin at Lawson (CCAS26/CC26) and near the downstream end of the Upper Basin (CCAS59/CC60), located near the canal diversion points to Standley Lake. In this report, water-quality analyses of Standley Lake focused on results from sampling location SL10, near the deepest part of the lake. Highlights of findings from these analyses are presented below.

2013 Runoff Flow Rates

Hydrologic conditions in 2013 were remarkable due to a rainfall-runoff event of historic proportions in September. Near Golden, Colorado, 10.8 inches of rain fell over five consecutive days leading up to peak flows on September 13, 2013. The heaviest precipitation in the focus area fell on September 13, 2013, with 6.5 inches near Golden (according to data from the Utah Climate Center). Twelve counties, including Clear Creek County and Jefferson County, were placed on FEMA's list of emergency declaration. Rainfall totals and runoff response were less extreme farther up in the Upper Basin but it was still an exceptionally large event. Near Georgetown, 3.9 inches of rain fell between September 9 and September 13, 2013.

Annual hydrographs for 2008-2013 from CC60 (located on Clear Creek near the diversion points for the three main canals that bring water to Standley Lake) are presented in Figure ES-4. In 2013, runoff from snowmelt peaked in early June. The peak of the September hydrograph at CC60 was higher than that of the snowmelt runoff peak, comprising roughly one-fourth of the 2013 annual flow volume at that location, at a time when flow rates are typically low.

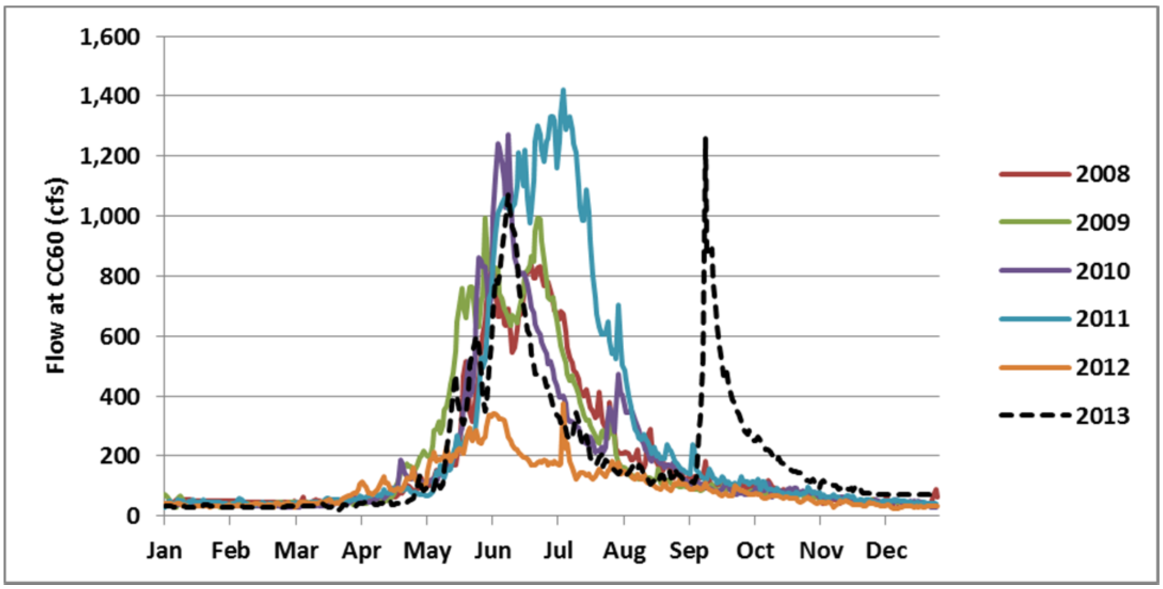

Figure ES-4. Annual Hydrographs for 2008-2013 near the Downstream End of the Upper Basin (CC60)

WWTF Effluent Concentrations

The WWTFs in the Clear Creek watershed continued efforts in 2013 to reduce nutrient discharges. In 2012, the Colorado Department of Public Health and Environment (CDPHE) issued Regulation 85, the Nutrients Management Control Regulation, which establishes numeric effluent limits for nutrient concentrations in effluent discharged by certain WWTFs. WWTFs with a design capacity of less than or equal to one million gallons per day (MGD) or those owned by disadvantaged communities are not required to meet these limits. Of the WWTFs in the Upper Clear Creek Basin, only the Black Hawk/Central City WWTF is subject to the Regulation 85 numeric effluent limits (due to flows greater than 1 MGD). Regulation 85 requires all WWTFs to sample and report effluent nutrient concentrations (required frequency varies depending on flows). Required sampling for Regulation 85 began in April of 2013. Prior to this, though not required by NPDES permits, periodic (though less frequent) effluent sampling for nutrients was conducted as part of the Upper Clear Creek Monitoring Program, funded by the Standley Lake Cities and UCCWA members. With implementation of Regulation 85, the Upper Clear

Creek Monitoring Program discontinued nutrient analysis of samples from the WWTFs as of April 2013. A summary of 2013 TP and TN effluent data from the eight WWTFs sampled in the watershed is presented in Table ES-2. This summary includes a few samples collected as part of the Upper Clear Creek Monitoring Program in early 2013, but primarily reflects results of sampling for Regulation 85.

Table ES-2. Summary of Total Phosphorus and Total Nitrogen Concentrations in Wastewater Treatment Facility Effluent, 2013 (Grab Samples)

	Total Phosphorus (mg/L)			Total Nitrogen (mg/L)		
WWTF	Min	Max	Average	Min	Max	Average
Loveland Ski Area	0.005	8.91	1.86	5.40	26.20	12.36
Georgetown	0.10	3.34	0.49	2.20	5.20	3.45
Empire	0.17	3.02	1.38	15.14	29.75	22.45
Central Clear Creek	0.03	0.57	0.27	22.92	75.07	42.18
St. Mary's	0.26	2.09	1.17	2.39	9.40	5.90
Idaho Springs	0.09	1.10	0.56	3.20	11.20	6.51
Black Hawk / Central City	0.06	0.21	0.12	2.00	6.00	3.63
Eisenhower Tunnel*	-	-	0.56	-	-	8.00

*Only one data point for 2013, so Min and Max not restated.

Total Suspended Solids and Nutrients in Clear Creek

Non-storm-event concentrations and loads of TSS, TP, and TN in 2013 in the Upper Basin of Clear Creek were generally comparable to ranges estimated for 2008-2012. Inclusion of estimates for concentrations and loading from the September 2013 storm event, however, sharply increased the annual load and volume-weighted average concentration estimates. The September event is estimated to have increased the annual TSS load at CC60 by roughly a factor of six, more than doubled the annual TP load, and increased the TN load by approximately 46%. As an example, the estimated 2013 annual TSS loading at the downstream end of the Upper Basin is presented in Figure ES-5, with and without inclusion of estimates from the September 2013 event. The hatched area represents the estimated mass of TSS associated with the 2013 event. There is significant uncertainty associated with this estimate; however, it is expected to reasonably demonstrate the relative effect of this major event.

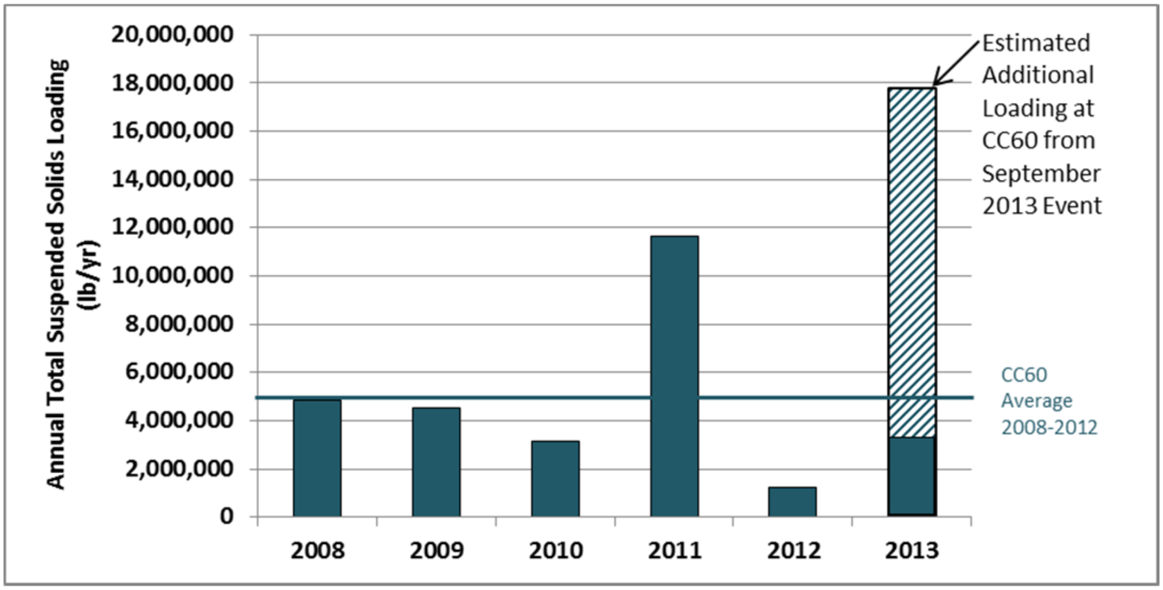

Figure ES-5. Total Suspended Solids Loading Estimates near the Downstream End of the Upper Basin (CC60), 2008-2013 (Ambient [non-storm-event] sample data were used to generate the solid bars; limited storm-event sample data from September 2013 were used to generate the hatched bar.)

Inflow and Loading into Standley Lake

During the September 2013 flooding event, Farmers High Line, Croke, and Church Ditch canal headgates at Clear Creek were closed. Only runoff from direct watersheds to the lake and the canals entered Standley Lake during this period of time. The total inflow volume to Standley Lake in 2013 was 47% higher than the 2008-2012 average. Outflow, however, was 18% lower than the 2008-2012 average, yielding a net increase in contents in 2013. Figure ES-6 presents total annual inflow and outflow volumes for 2008-2013 as well as 2008-2012 averages.

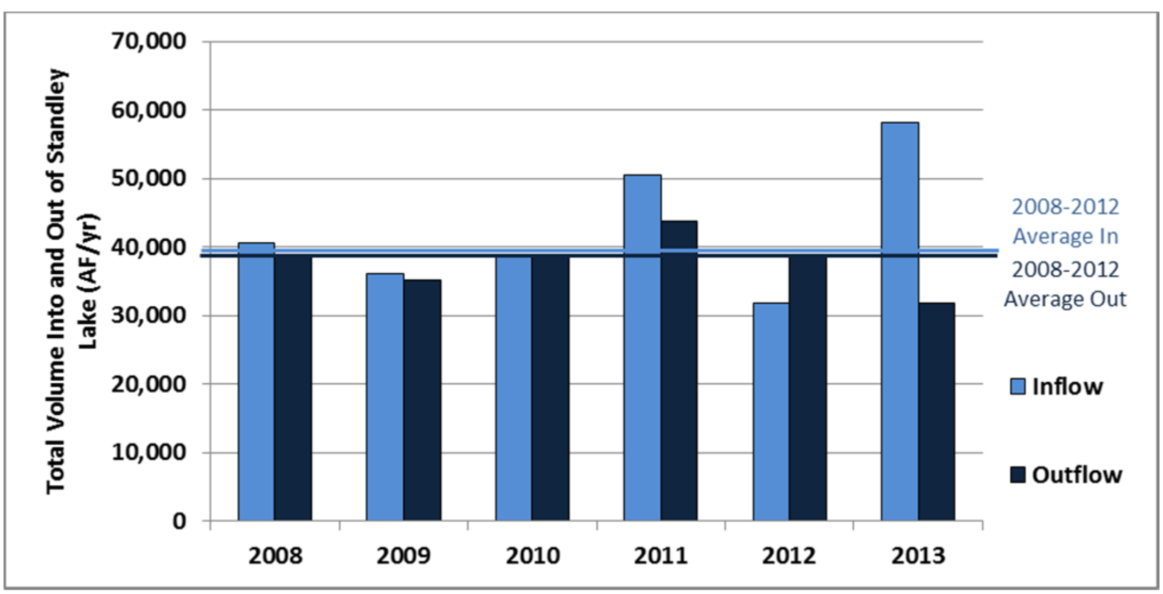

Figure ES-6. Total Annual Inflow and Outflow for Standley Lake, 2008-2013

Standley Lake daily contents in 2013 are presented with 2008-2012 contents data in Figure ES-7. Because of dry conditions in 2012, the lake volume started out much lower in 2013 than in the previous five years. The Lake was filled by mid-June, and because of inflows from the historic precipitation event in September, Standley Lake water levels ended 2013 higher than any of the recent five years.

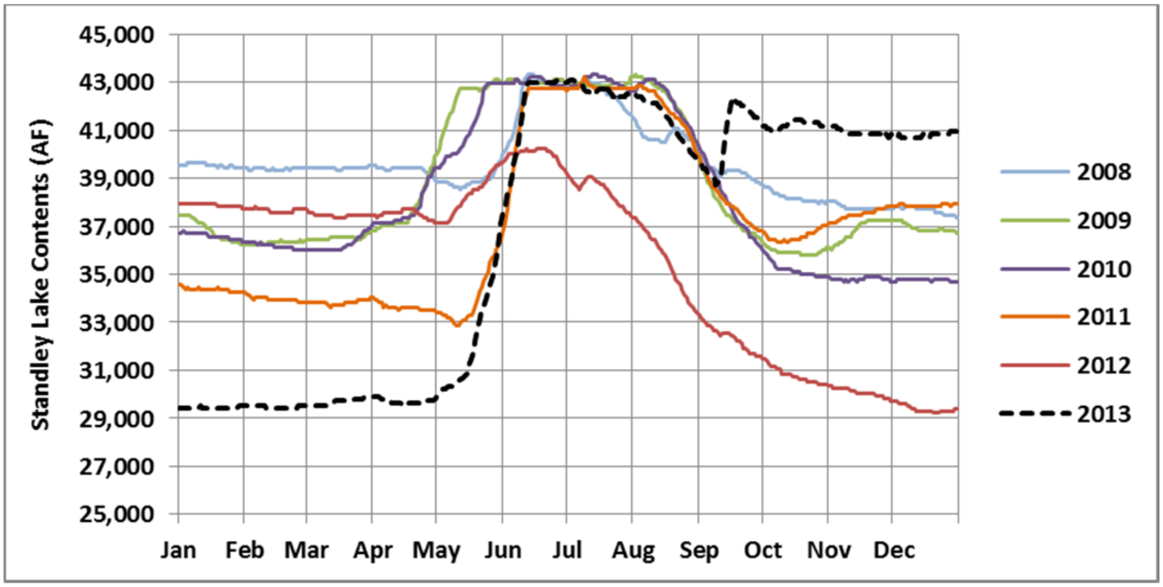

Figure ES-7. Standley Lake Contents, 2008-2013

Total phosphorus loading estimates into and out of Standley Lake based on all ambient (non-storm-event) samples are displayed in Figure ES-8. Total phosphorus loading into Standley Lake was 75% above the 2008-2012 average. The volume-weighted TP concentration of the 2013 inflow was 22% above the 2008-2012 average.

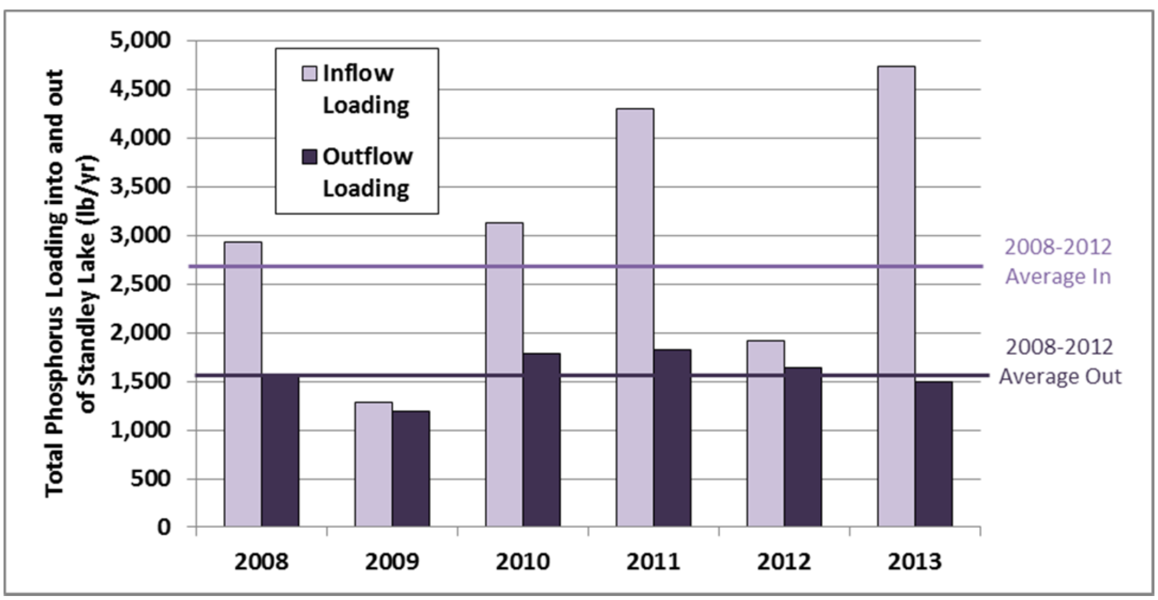

Figure ES-8. Total Phosphorus Loading into and out of Standley Lake, 2008-2013

Total nitrogen loading (based on all non-storm-event samples) into and out of Standley Lake for 2008-2013 is presented in Figure ES-9. Total nitrogen loading was 58% above the 2008-2012 average. The 2013 volume-weighted TN concentration into Standley Lake was 8% lower than the 2008-2012 average.

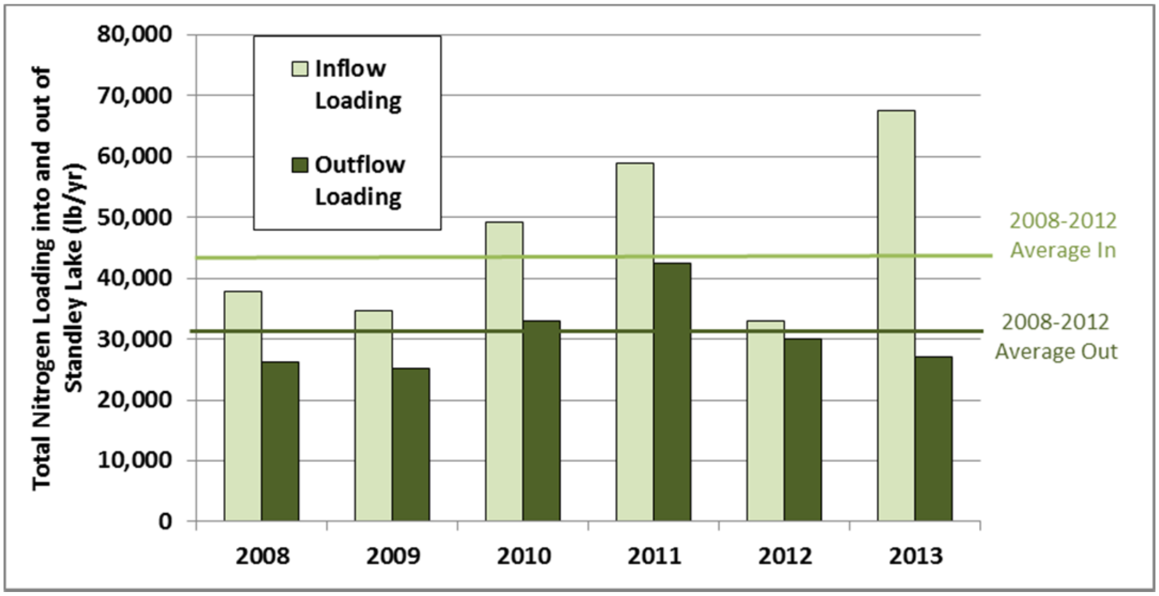

Figure ES-9. Total Nitrogen Loading into and out of Standley Lake, 2008-2013

In 2013, three storm events were sampled on Farmers' High Line Canal (FHL). Incorporation of the observed storm events yields an 18% increase in the estimated 2013 TN loading to Standley Lake from FHL and a 42% increase in TP loading. This result supports findings from previous years indicating the significance of nutrient loading from storm events on the canals.

Water Quality in Standley Lake

In spite of the historic rainfall runoff event in 2013, water quality in Standley Lake was good throughout the year. Stratification patterns and hypoxic conditions in the hypolimnion were typical in 2013, with a total of 93 days of hypoxia (<2 mg/L dissolved oxygen) in the hypolimnion, one day more than the 2008-2012 average. Nutrient concentrations at the top and bottom of Standley Lake also followed typical seasonal patterns and concentrations ranges. As shown in Figure ES-10 and ES-11, TN and TP concentrations at the bottom of the reservoir increased, as usual, during the period of stratification and hypoxia in the hypolimnion, due to internal loading from sediments. Overall, the average TP concentration in 2013 was 12% lower in the hypolimnion than the respective 2008-2012 average and 4% higher in the photic zone. Average TN concentrations in 2013 were 10% lower in the hypolimnion and 3% higher in the photic zone, as compared to the averages from 2008-2012.

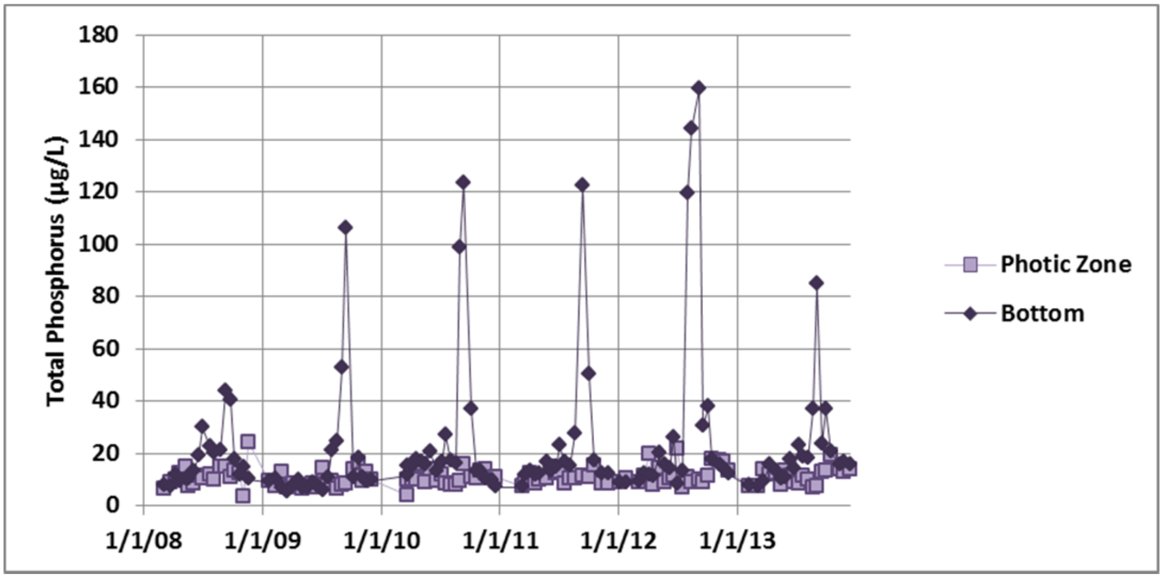

Figure ES-10. Total Phosphorus Concentrations in the Photic Zone and Bottom of Standley Lake, 2008-2013 (Site SL10)

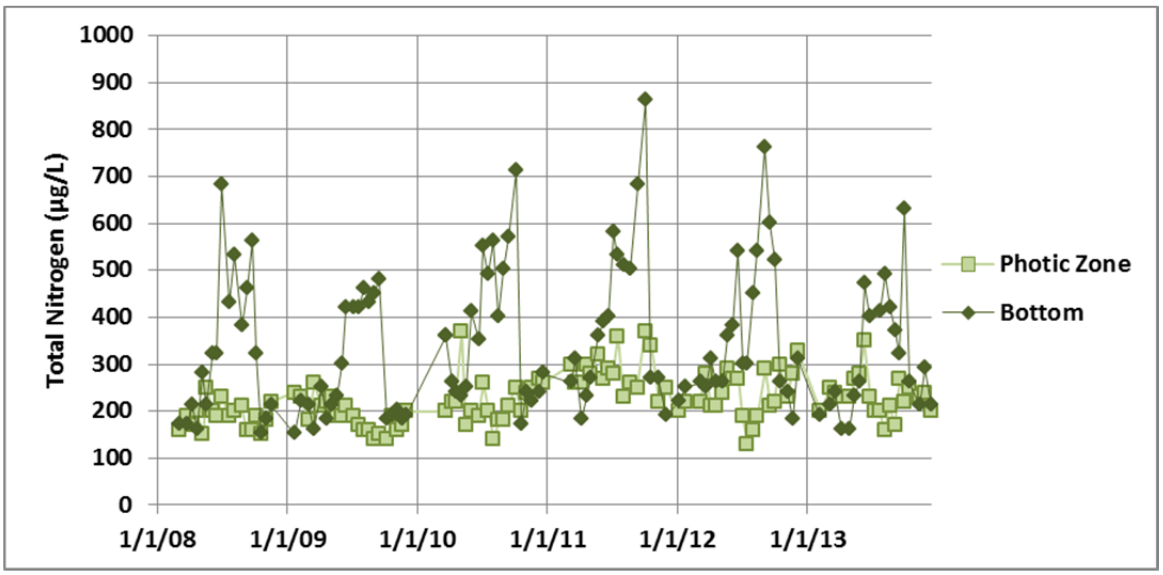

Figure ES-11. Total Nitrogen Concentrations in the Photic Zone and Bottom of Standley Lake, 2008-2013 (Site SL10)

As seen in previous years, chlorophyll *a* concentrations in Standley Lake in 2013 were low during summer months, with the peak concentration (10.6 µg/L) observed in October. This peak was the second highest of the 2008-2013 period and may, in part, reflect a response to nutrient loading from the historic September precipitation event. The site-specific March through November chlorophyll *a* standard of 4 µg/L was once again met in 2013 with an average value of 3.8 µg/L. The standard is met when four out of the five recent years have a March-though-November average below 4.0 µg/L. No March through November average values in the previous five years have exceeded the 4.4 µg/L assessment threshold or the 4 µg/L standard value, as shown in Figure ES-12. In fact, eight of the recent nine years (2007 being the exception at 4.8 µg/L) had March-though-November average concentrations below 4.0 µg/L.

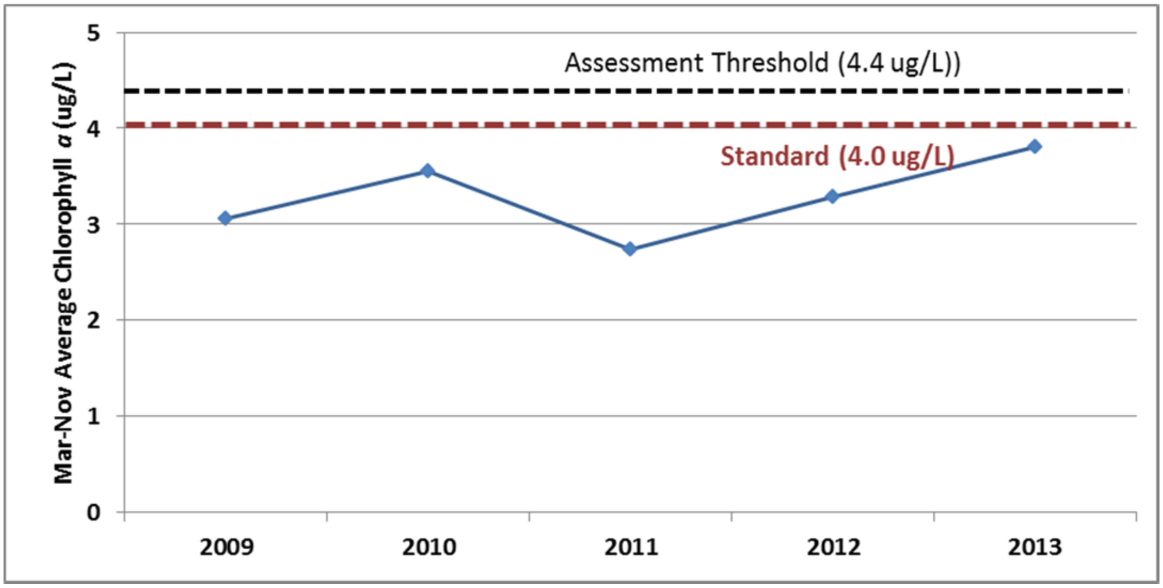

Figure ES-12. Observed Average Chlorophyll *a* Concentrations (Mar-Nov) Compared with the Standard and the Assessment Threshold, 2009-2013 (Site SL10)

I. Introduction

A. Purpose and Scope of Report

In 1993, the Clear Creek/Standley Lake Watershed Agreement (1993 Agreement; Appendix A) was signed by a contingent of governmental agencies and private corporations to address certain water-quality issues and concerns within the Clear Creek watershed – specifically as they affect the water quality of Standley Lake. This annual water-quality report presents a review of 2013 water-quality efforts in the Clear Creek watershed, according to the annual reporting obligations set forth in the 1993 Agreement. Water-quality data for 2013 are also presented and compared to the previous five years of data (2008-2012). The cooperative Water Quality Monitoring Program document, required by the 1993 Agreement, is included with the report (Appendix B).

Prior to 2009, a main focus for the signatories to the 1993 Agreement was to meet the 1993 narrative standard for Standley Lake:

> *The trophic status of Standley Lake shall be maintained as mesotrophic as measured by a combination of common indicator parameters such as total phosphorus, chlorophyll* a*, Secchi depth, and dissolved oxygen. Implementation of this narrative standard shall only be by Best Management Practices and controls implemented on a voluntary basis.*

Under the narrative standard, numerous water-quality improvements were achieved in the watershed. In 2009, the Water Quality Control Commission adopted a numeric chlorophyll *a* standard for Standley Lake. A 4.0 µg/L chlorophyll *a* standard is now in place as a protective measure for this drinking water supply reservoir. The intention of the numeric standard is to control the contribution of algae to the formation of disinfection by-product (DBP) precursors. In addition to the numeric standard, the Commission retained the first sentence of the narrative standard described above, which refers to maintaining mesotrophic conditions in the lake.

Figure 1. Looking West over Standley Lake

The Clear Creek watershed spans 575 square miles from its headwaters near the Continental Divide to the South Platte River. The Standley Lake watershed consists of the upper 400 square miles of the Clear Creek watershed, lands draining into the three Clear Creek delivery canals, and the lake's direct watershed. For purposes of this report, the Standley Lake watershed geographic area is divided into three sub-regions:

- **The Upper Basin** – the upper portion of the Clear Creek watershed, from its headwaters to the Croke Canal headgate;
- **The Canal Zone** – the three canals that deliver water from Clear Creek to Standley Lake, from their headgates to their lake entry points, including their direct watersheds; and
- **Standley Lake** – the lake and its direct watershed.

B. Organization of the Report

Following this introductory section, the report is organized as follows:

- **Section II. Description of the Lake, Watershed, and Routine Monitoring**– An overview of Standley Lake and its watershed, including maps and monitoring practices.
- **Section III. Activities and Accomplishments in 2013** – A summary of activities related to water-quality management and improvement in the Clear Creek Basin, canals, and Standley Lake.
- **Section IV. Upper Basin Water Quality** – A presentation of data collected from key locations in the Upper Basin, with a focus on nutrient concentrations and annual loading of total nitrogen, total phosphorus, and total suspended solids.
- **Section V. Standley Lake Inflow, Outflow, and Volume –** A summary of 2013 inflow to Standley Lake, including timing of use of each canal, outflow from the lake, and lake volume.
- **Section VI. Loading Into and Out of Standley Lake** – An analysis of nutrient loading into and out of the lake, with consideration of total nitrogen and total phosphorus loads from each canal.
- **Section VII. Standley Lake Water Quality -** An analysis of lake water quality with a focus on total nitrogen, total phosphorus, chlorophyll *a,* dissolved oxygen, and clarity as measured by Secchi depth.
- **Section VIII. Conclusions** – A summary of findings from the report.

II. Description of the Lake, Watershed, and Routine Monitoring

This section presents a broad description of Standley Lake and its watershed (the Upper Basin and the Canal Zone). The discussion also includes a summary of routine monitoring activities.

A. Standley Lake Overview

Standley Lake is an off-channel, municipal and agricultural reservoir located in Jefferson County. This 43,000 acre-foot reservoir is a direct-use drinking water supply for over 250,000 consumers in the downstream cities of Northglenn, Westminster, and Thornton. In addition, the reservoir supports recreational activities and provides water to farms located in Adams and Weld counties. It is owned and operated by Farmers' Reservoir and Irrigation Company.

Figure 2. Wake Boarding on Standley Lake; Photo by Soren McCarty, Mountain Weekly News

Through the Standley Lake Monitoring Program, the lake is frequently monitored throughout the year when ice is off the lake. The lake is sampled at multiple locations. This report focuses on the results from the deepest sampling location, SL10 (Figure 3). This location is approximately 0.25 miles south of the municipal supply intakes. Routine monitoring practices for Standley Lake are described in detail in Appendix B. Lake monitoring efforts are summarized as follows:

- **Daily Profiles –** Standley Lake water quality is measured every meter, from the surface to within 2 meters of the bottom, four times daily using an automated profiler (Figure 4). The profiler is equipped with a multi-probe sonde and provides readings of water temperature, dissolved oxygen, pH, conductivity, turbidity, oxidation reduction potential (ORP), and chlorophyll *a* concentrations.
- **Surface and Bottom Sampling** – Grab samples are collected in the lake at the surface, in the photic zone (at two times the measured Secchi depth), and one meter from the bottom. Sampling occurs twice each month if the lake is not frozen. A wide range of constituents are measured, including nutrients, metals, algae, suspended solids, and numerous field parameters.
- **Zooplankton Tows** – Zooplankton tows are conducted during each lake sampling event.
- **Invasive Species Monitoring** – Monitoring for Eurasian watermilfoil and zebra and quagga mussels is conducted during each lake sampling event.

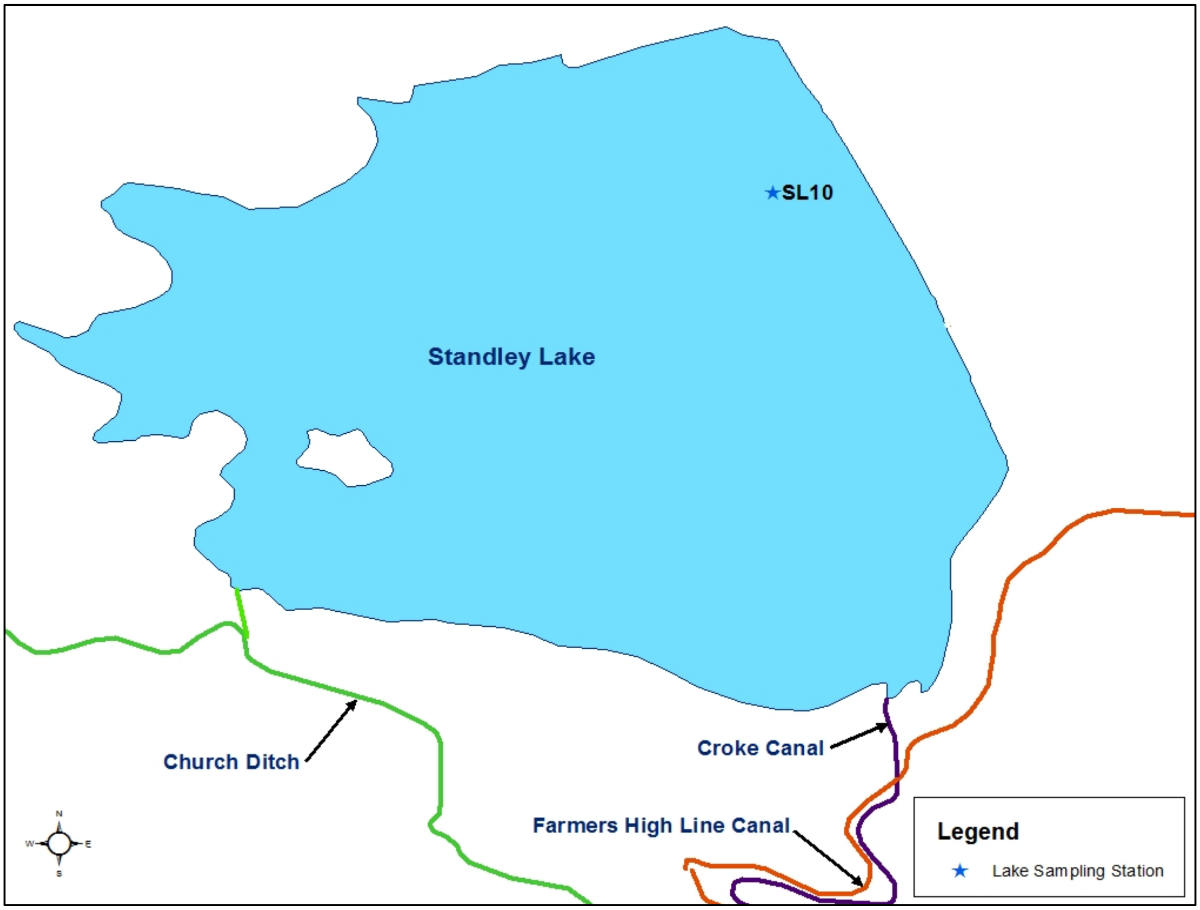

Figure 3. Standley Lake and Sampling Location SL10

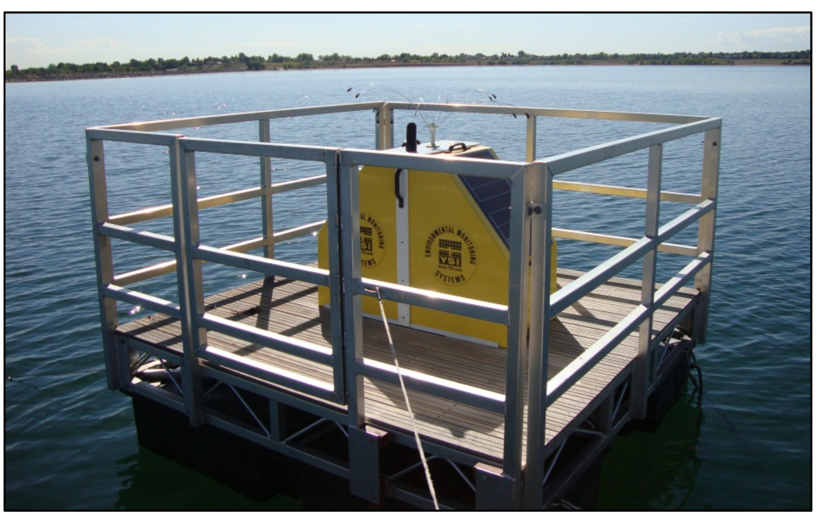

Figure 4. Profiler at SL10

B. Description of the Watershed

The Clear Creek watershed is located west of Denver, Colorado, with its headwaters in the mountains at the Continental Divide (Figure 5). The watershed covers an area of 575 square miles, beginning at an elevation of about 14,000 feet and descending to approximately 5,000 feet where it joins the South Platte River in north Denver. In addition to supplying drinking water to 350,000 residents in the watershed, Clear Creek provides water for various recreational, agricultural, and industrial purposes.

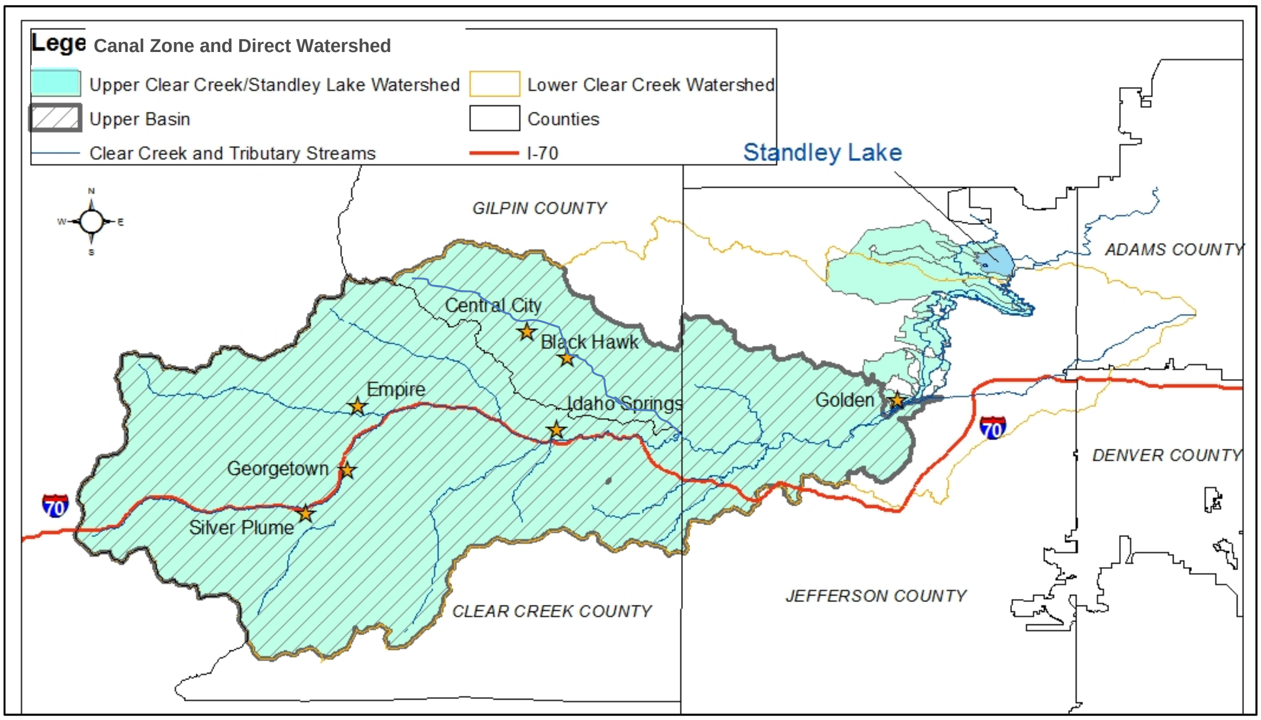

Figure 5. The Standley Lake Watershed – Upper Basin, Canal Zone, and Direct Watershed

The Standley Lake watershed includes the Upper Basin of the Clear Creek watershed, the canals used to transport water from Clear Creek to the lake (the Canal Zone), and a direct lake watershed. The following subsections describe the Upper Basin and the Canal Zone.

1. Upper Basin

The Upper Basin region of the Clear Creek watershed (Figure 6) includes the 400 square miles upstream of the Croke Canal headgate. This region includes the upper portion of Clear Creek and its various tributaries, the most prominent of these being the West Fork of Clear Creek, Leavenworth Creek, the South Fork of Clear Creek, Fall River, Chicago Creek, the North Fork of Clear Creek, Beaver Brook, Soda Creek, and Elk Creek. Numerous cities and towns are scattered throughout this mountainous area including Idaho Springs, Black Hawk, Central City, Empire, Georgetown, and Silver Plume. Additionally, U.S. Interstate 70 (I-70), a highly-utilized transportation corridor, runs through the watershed, providing access to these municipalities and recreational areas.

The Upper Basin contains nine wastewater treatment facilities (WWTFs) which serve the local population and resorts (Figure 6). Additionally, the Upper Basin contains operating and abandoned mines and trans-mountain diversions. Water quality in the Upper Basin may also be impacted by nonpoint sources of pollution, including numerous onsite wastewater treatment systems (OWTS), application of roadway deicers and traction sands, and residential and commercial stormwater runoff.

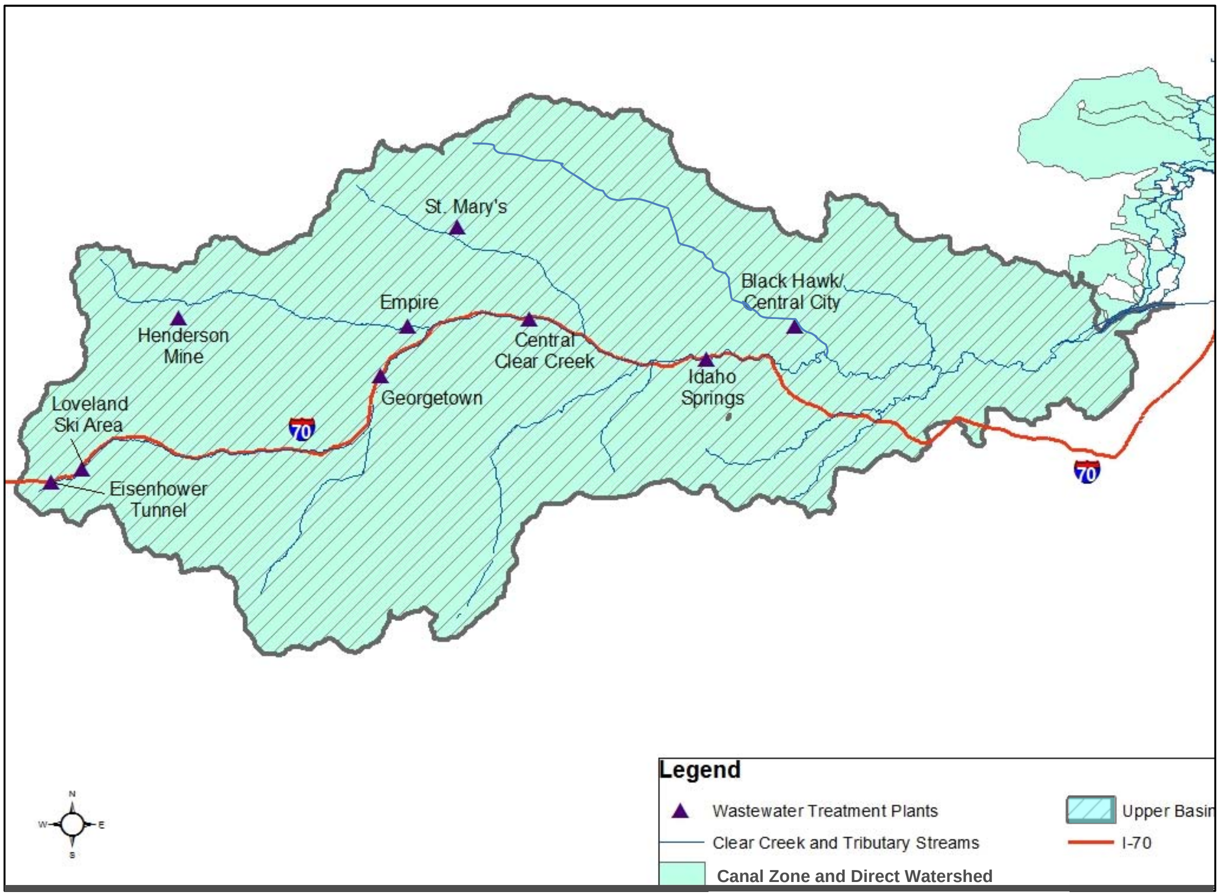

Figure 6. Wastewater Treatment Plants in the Upper Basin

Flow measurements and water-quality samples are collected at numerous stations throughout the watershed to monitor the concentrations of nutrients, select metals, and other key constituents (Figure 7).

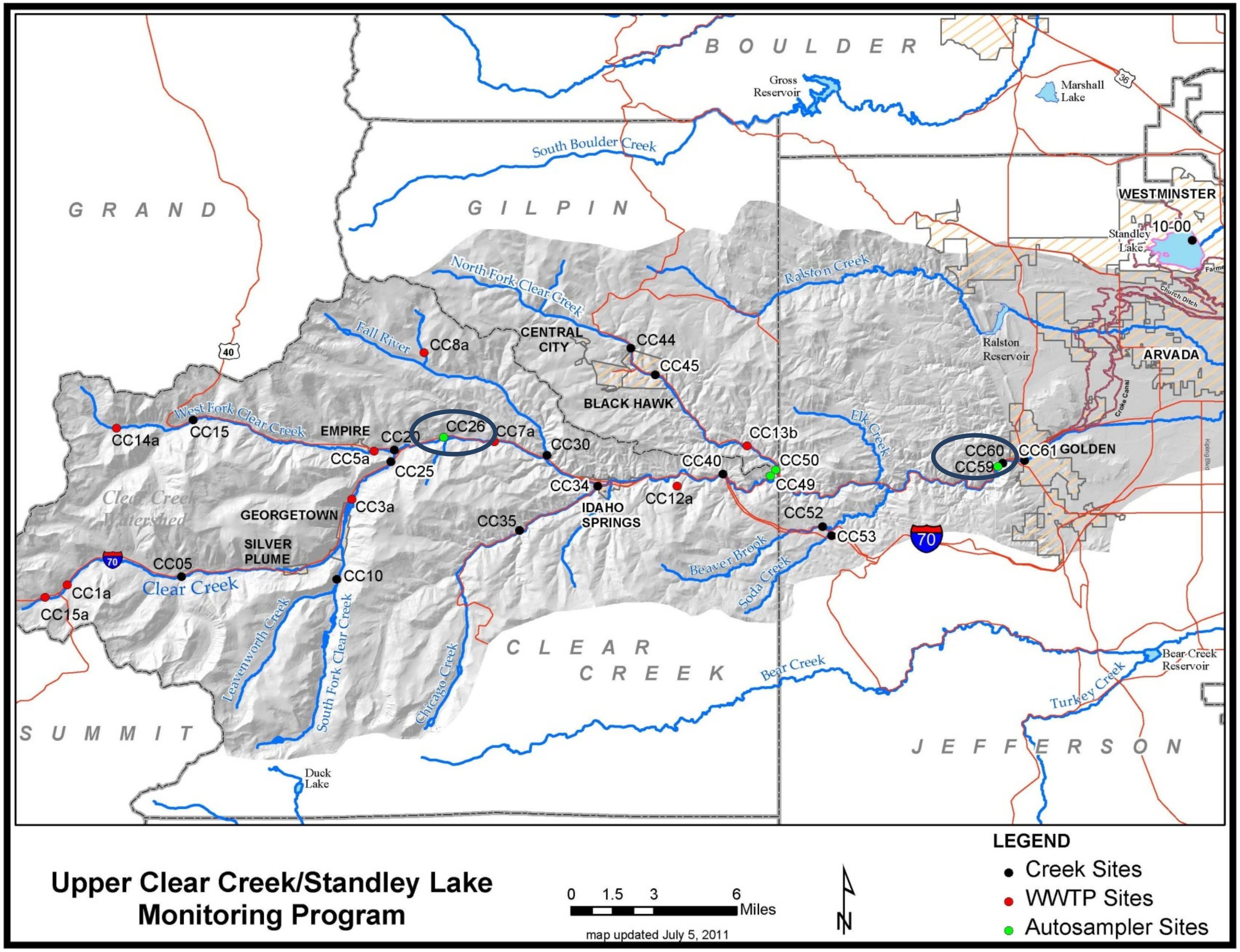

Figure 7. Upper Clear Creek Sampling Stations (Key Locations for this Report are Circled)

Upper Basin monitoring activities have been designed to evaluate the relative contributions of various nutrient sources, effectiveness of BMPs, wastewater treatment plant operational changes, and nutrient reductions from treatment plant upgrades. In recent years, the monitoring program has shifted toward increased use of autosamplers instead of grab sampling in the Upper Basin. The 24-hour composite samples collected by autosamplers are more representative than grab samples of water quality on the date of sampling. In addition to collecting 24-hour ambient samples, the autosamplers are also used to collect specific storm-triggered event samples at some locations. Routine monitoring for the Upper Basin is described in detail in Appendix B.

Figure 8. Water-Quality Data Collection on Clear Creek

The analysis presented in the Upper Basin portion of this report is based on data from two key locations (circled on Figure 7). These data include grab samples collected at sampling locations CC26 (Clear Creek at Lawson Gage) and CC60 (Clear Creek at Church Ditch Headgate), combined with 24-hour composite samples from nearby autosampler locations CCAS26 (Clear Creek at Lawson Gage) and CCAS59 (Clear Creek 2 miles west of Highway 58/US6). These locations were selected for focus in this report because of their higher relative frequency of sampling and because of their locations. These stations reflect mainstem water quality coming from the upper portion of the Upper Basin (CC26/CCAS26) and net water quality in the mainstem toward the end of the Upper Basin (CC60/CCAS59) near the headgates for the canals to Standley Lake. Data presented in this report for the Upper Basin include total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) concentrations.

2. Canal Zone

The Canal Zone is composed of three canals that divert water from Clear Creek into Standley Lake: Church Ditch, Farmers' High Line Canal (FHL), and the Croke Canal (Figure 5). In addition to the three canals diverting water from Clear Creek, Kinnear Ditch Pipeline (KDPL) also contributes water to Standley Lake from Coal Creek and the South Boulder Diversion Canal. The canals are open, slow-flowing (low-gradient), and largely unlined ditches that direct water to the reservoir. The canals are subject to nonpoint-source loading from adjacent horse and cattle operations, agricultural operations, and residential properties (some with onsite wastewater treatment systems). Note that a significant percentage (~80%) of the historical direct runoff drainage area into the canals has been hydrologically disconnected from the canals since the 1990s to protect Standley Lake water quality.

To provide information for evaluation of the nutrient loadings from nonpoint sources in the Canal Zone, the three canals are sampled at the headgates, where water is diverted from Clear Creek, and at the inlets into the lake. Figure 9 shows the inlet monitoring location for each canal (CCT4, CCT11, CCT27, and CCT22d). Routine monitoring for the Canal Zone is described in detail in Appendix B.

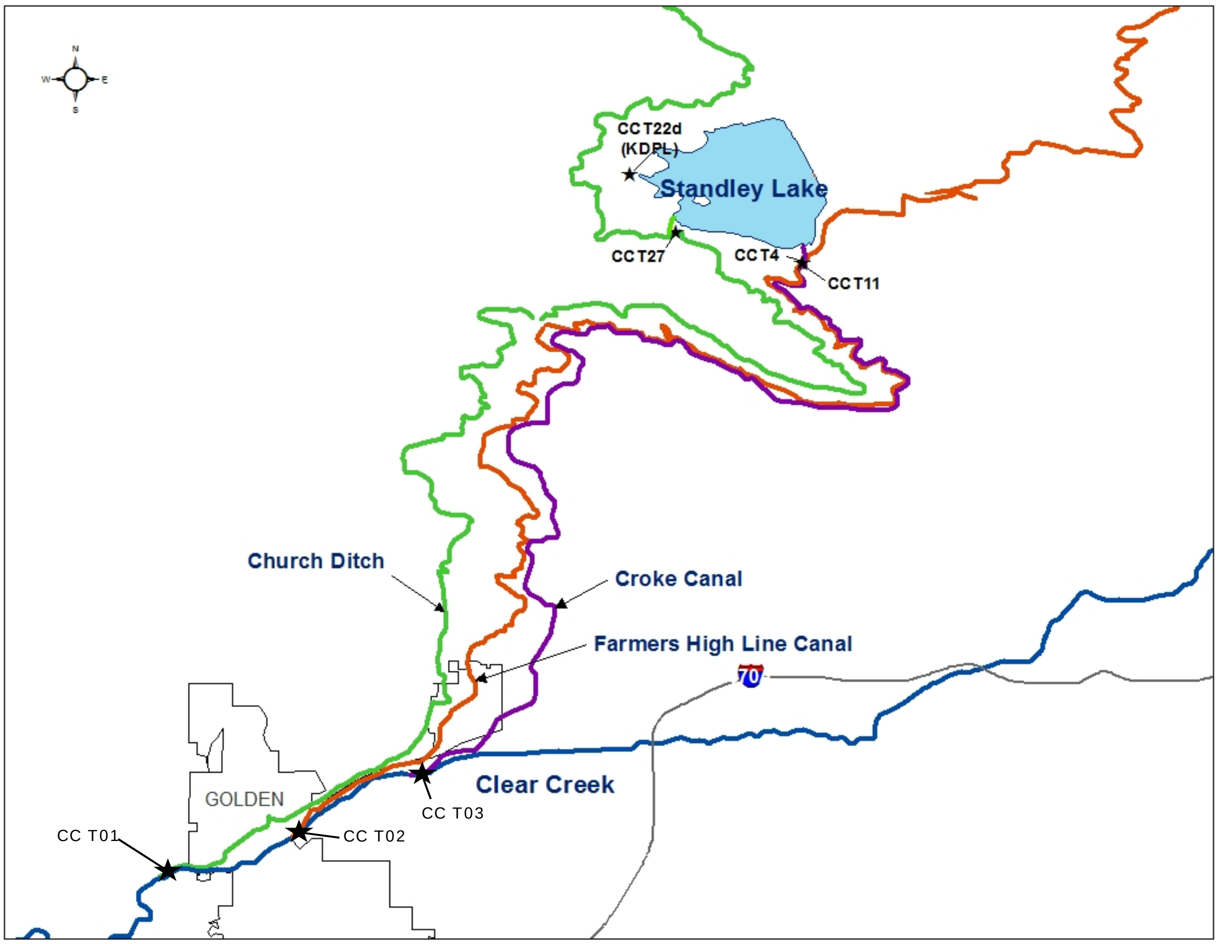

Figure 9. The Three Canals that Divert Water from Clear Creek to Standley Lake and Sampling Stations at the Lake Inflow Locations

III. Activities and Accomplishments in 2013

Many groups and facilities continued efforts in 2013 to manage, enhance, and protect water quality throughout the Clear Creek watershed and in Standley Lake. This section highlights 2013 activities and accomplishments in the following areas:

- Monitoring,
- Canal operations and maintenance,
- Wastewater treatment facilities,
- Illicit discharges and emergency response,
- Nonpoint source control,
- Public education, outreach, and partnerships,
- Planning activities, including modeling efforts, and
- Other activities.

A. 2013 Monitoring Activities

The Upper Clear Creek/Standley Lake Watershed Water Quality Monitoring Program (updated in 2013; Appendix B) provides the framework for routine collection of flow and water-quality samples throughout the Upper Basin, the Canal Zone, and in Standley Lake. The program was partially described in Section II, and all monitoring data for 2013 are included in Appendix C. Monitoring conducted in 2013 is discussed below.

1. 2013 Upper Basin and Canal Zone Water Quality Sampling

In 2013, samples were collected in the Upper Basin through a combination of grab samples at 20 locations and ambient autosamplers at four locations. Autosamplers are also used to collect event-triggered storm samples at three locations in the Upper Basin (CCAS49, CCAS 50, and CCAS59; Figure 7). In 2013, a total of 49 grab samples were collected in the Upper Basin. Also in 2013, autosamplers collected 36 ambient, 24-hour composite samples and an additional 16 event-triggered samples in the Upper Basin.

Figure 10. Taking a Grab Sample from Clear Creek at Lawson Gage (CC 26).

Similarly, both grab sampling and autosamplers were utilized for ambient sampling in the Canal Zone. Grab samples were collected at eight locations, and autosamplers collected ambient, 24-hour composite samples at one location. Autosamplers collected event samples at four locations. Events samples on the Canals can be first flush samples or storm event samples. In 2013, a total of 57 grab samples were collected in the Canal Zone. Also in 2013, autosamplers in the Canal Zone collected ten ambient, 24-hour samples and 11 event-triggered samples.

2. 2013 Standley Lake Water Quality Sampling

In 2013, daily lake profiles were taken in Standley Lake, along with bi-monthly grab samples collected at three depths (at the surface, in the photic zone, and in the hypolimnion). A total of 68 grab samples were collected and analyzed.

3. Flow and Water Quality Monitoring Costs

In 2013, Clear Creek water quality monitoring costs for the City of Golden were approximately $16,500. The City of Golden contributed $9,720 to fund the USGS gage on the West Fork of Clear Creek at Empire. The Upper Clear Creek Watershed Association (UCCWA) costs associated with the maintenance and monitoring the CC40 gage (Clear Creek near the junction of US 6 and I-70) were $4,500. Clear Creek County continued sponsorship of two gages, on Leavenworth Creek and at Berthoud Falls. Clear Creek County also continued sponsorship the State Engineer's gage at Fall River. Freeport-McMoRan assists the county with an annual contribution for these efforts through its Henderson Mine operation, another UCCWA member. In addition, the Standley Lake Cities contributed $10,520 to fund operations of the USGS gages on Clear Creek at Lawson and Bakerville. In all, the Standley Lake Cities monitoring costs were in excess of $200,000 in 2013.

B. Canal Operation and Maintenance

The Croke Canal, Church Ditch, and Farmers' High Line Canal (FHL) divert water from Clear Creek to Standley Lake. The majority of the water diverted by these three canals originates from within the Clear Creek Basin, but there is some additional trans-basin water diverted into the Upper Clear Creek Basin from the Fraser River Basin via the Berthoud Pass Ditch. Water from the Fraser River Basin is also diverted through the Moffat Tunnel and blended with water from South Boulder Creek and Coal Creek before being delivered to Standley Lake through the Kinnear Ditch Pipe Line. The Croke Canal, Church Ditch, and Farmer’s High Line Canal received routine maintenance in 2013, including the following activities:

- Diverting the first flush of the canals to prevent trash and other contaminants that accumulate in the canals during the off-season from entering Standley Lake.
- Stopping diversions from Clear Creek into the canals in response to events that potentially impact water quality such as: significant storm events, mine blow-outs, vehicles crashed in the creek, and other occurrences reported through the emergency call-down system.
- Maintaining and cleaning canals to restore capacity.
- Placing the removed spoils below the canals' banks and grading slopes to drain away from the canals.
- Requiring all development projects, adjacent to the canals to install BMP's to mitigate impacts caused by stormwater drainage, or to re-route stormwater drainage from developments around Standley Lake.

In September 2013, an historic, multi-day rainfall event generated a massive amount of runoff (discussed further in Section IV.A). The event carried significant sediment and debris into urban drainage systems, plugging culverts and causing extensive damage to infrastructure. All of the Standley Lake raw water delivery ditches sustained varying amounts of damage. FHL sustained three major slough areas, and the Croke Canal sustained multiple breach points and sloughs. On the Church Ditch there were 12 major damage areas. Church Ditch damage included sloughing and drawdown failures of ditch walls and overflow from Ralston and Leyden Creeks. Figure 11 shows the Church Ditch where Leyden Creek crosses under it in a 72" pipe. During the flood event of 2013, this pipe became blocked on the upstream side, eventually filling up the small valley and spilling over into the Church Ditch. Once overwhelmed, the Church Ditch bank breached on the downstream side, eventually gouging a hole 100 feet wide and 80 feet deep.

Figure 11. Extensive Bank Erosion on Church Ditch by Leyden Creek after the September 2013 Flood Event (right)

The ditch companies have worked diligently to repair damaged sections of all canals. Repairs on Church Ditch were completed in April of 2014, at a cost of more than $600,000.

C. Wastewater Treatment Facilities

Nine wastewater treatment facilities (WWTFs) are situated in the Upper Basin (see locations in Figure 6). The following is a brief discussion to highlight key activities at individual plants in 2013. Observed effluent TN and TP nutrient concentrations are also presented from 2008 through 2013. Also, in 2012, the Colorado Department of Public Health and Environment (CDPHE) issued Regulation 85[1], the Nutrients Management Control Regulation, which establishes numeric standards for nutrient concentrations in effluent discharged by WWTFs and requires effluent dischargers to sample and report nutrient concentrations on a monthly basis. Sampling for Regulation 85 is conducted by the WWTFs and began, where required, in April of 2013. Water quality effluent observations for TN and TP are presented below in subsection III.C.4.

1. Idaho Springs WWTF

The City of Idaho Springs began planning to switch its SCADA system over to DO/ORP level controls. The change is expected to not only save the city in energy costs, but to enhance the denitrification

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[1] Colorado Department of Public Health and Environment (CDPHE). 2012. Nutrients Management Control Regulation. 5 CCR 1002-85 (Regulation 85). Water Quality Control Commission. Adopted June 11, 2012; Effective September 30, 2012.

process and reduce the plant's effluent nitrate and nitrite concentrations. Additionally, the City of Idaho Springs and CDOT established a cooperative agreement for treatment of wastewater generated by the Twin Tunnels project. No significant impact on the treated effluent was observed as a result.

2. Georgetown WWTF

The Georgetown WWTF performed well during 2013, processing the influent wastewater to a high quality.

3. Black Hawk/Central City Sanitation District WWTF

Black Hawk/Central City Sanitation District (BHCCSD) continues to achieve excellent nutrient removal in their WWTF. The District's WWTF is considered a Level 4 treatment plant and employs enhanced biological nutrient removal (BNR) treatment plus filtration and UV disinfection. In 2013, the 50^{th} and 85^{th} percentiles of the Total Phosphorus (TP) concentrations measured in the effluent were 0.1 mg/L and 0.14 mg/L respectively. This is a slight decrease from the 85^{th} percentile of 0.17 mg/L measured in in 2012. In mid-May of 2013, BHCCSD made improvements to its tertiary filtration process by replacing the existing shallow bed sand filters with mechanical disk filters. Additionally, a new chemical addition process with coagulation/flocculation was added to reduce soluble reactive phosphorus following final clarification. These improvements have resulted in the reduction of total phosphorus (TP) concentrations. The implementation of the improvements has resulted in the reduction of summer season (April - October) effluent total phosphorus (TP) by approximately 35%, as compared to the most recent five-year average seasonal concentration.

Total inorganic nitrogen (TIN) concentrations also decreased in 2013. The 50th and 85th percentiles of the TIN concentrations measured in the effluent were 3.39 and 4.86 mg/L respectively. This compares favorably with 2012, in which the 50th and 85th percentiles were 4.45 and 7.00 mg/L respectively. Average daily effluent flow rates in 2013 were similar to 2012, averaging 0.406 million gallons per day (MGD) versus 0.416 MGD in 2012.

4. Observed WWTF Effluent Concentrations

As noted above, in 2012, the Colorado Department of Public Health and Environment (CDPHE) issued Regulation 85, the Nutrients Management Control Regulation, which establishes numeric standards for nutrient concentrations in effluent discharged by certain WWTFs[2]. Of the nine Upper Basin WWTFs located in Figure 6, only the Blackhawk/ Central City WWTF is required to meet the Regulation 85 effluent limits. WWTFs with a design capacity of less than or equal to 1 MGD (defined as minor discharges) and any other WWTF owned by a disadvantaged community are not required to meet these discharge limits set in Regulation 85.

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[2] Domestic wastewater treatment works (DWWTW) with a design capacity of less than or equal to 1 MGD and any other DWWTW owned by a disadvantaged community are not required to meet these discharge limits set in Regulation 85. Of the eight WWTFs located in Figure 6, only Blackhawk/ Central City WWTF is required to meet the Regulation 85 effluent limits.

Regulation 85 also requires all WWTFs to sample and report effluent nutrient concentrations. For minor discharges (less than 1 MGD), required sampling frequency is once every two months. For major WWTF discharges (greater than 1 MGD), monthly sampling is required. Sampling for Regulation 85 began in April of 2013. Prior to this, though not required by NPDES permits, periodic (though less frequent) effluent sampling for nutrients was conducted as part of the Upper Clear Creek Monitoring Program, funded by the Standley Lake Cities. With implementation of Regulation 85, the Standley Lake Cities have discontinued nutrient analysis of samples from the WWTFs. Sampling locations have not changed (all samples represent end-of-pipe water quality), but data collected for Regulation 85 is generated by different laboratories, using, in some cases, different methods.

TP and TN concentrations measured for each WWTF in 2008-2013 are presented in Figure 12 through Figure 17. These figures show observations from the Upper Clear Creek Monitoring Program (through early 2013) and observations from Regulation 85 sampling (beginning in 2013). Note that the sampling frequency varied by WWTF and over the course of the year. Data collected as part of the Upper Clear Creek Monitoring Program are depicted with filled data points, and data collected as part of Regulation 85 are depicted with hollow data points.

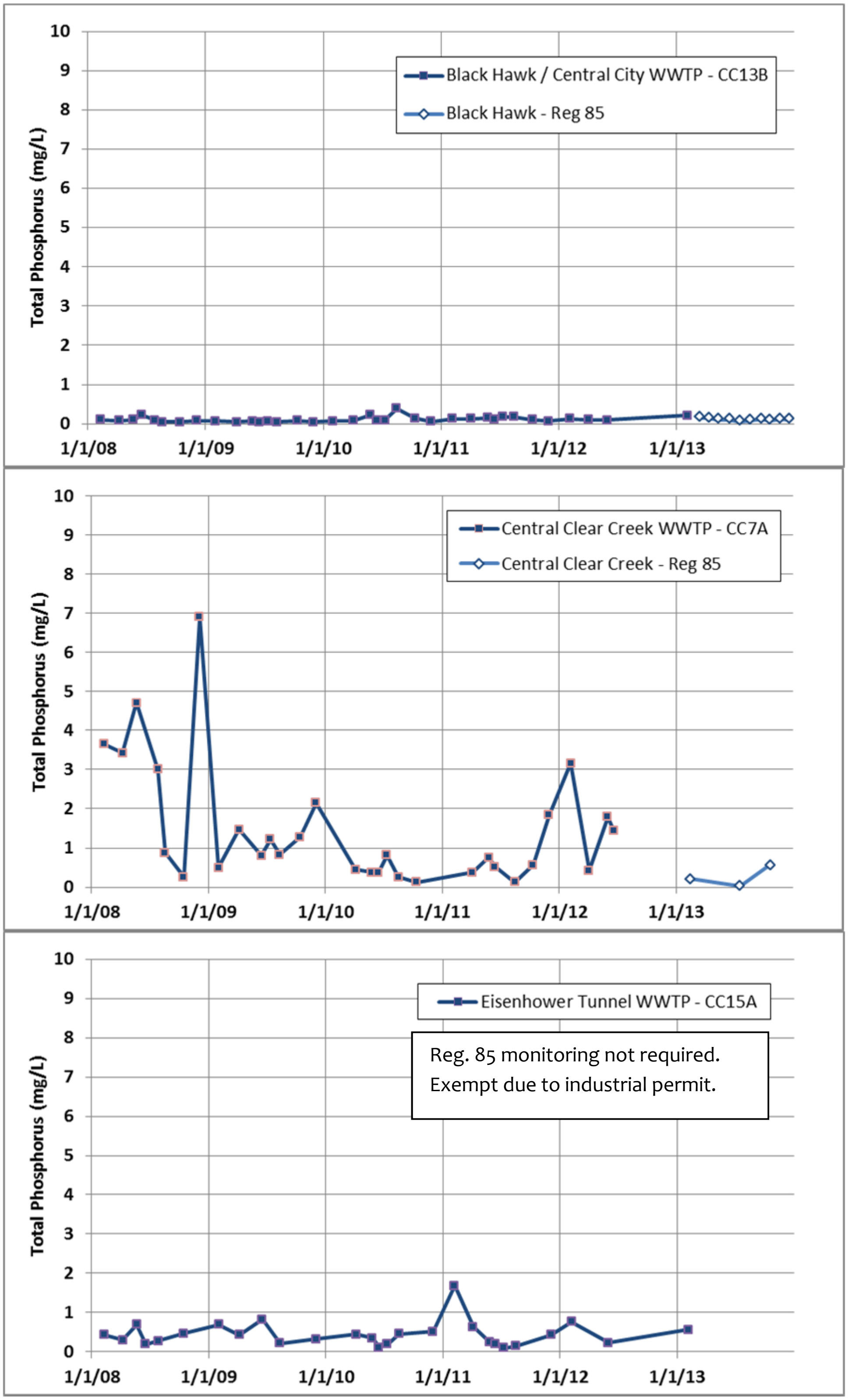

Figure 12. Effluent TP Concentrations (2008-2013) for Black Hawk/Central City, Central Clear Creek, and Eisenhower Tunnel

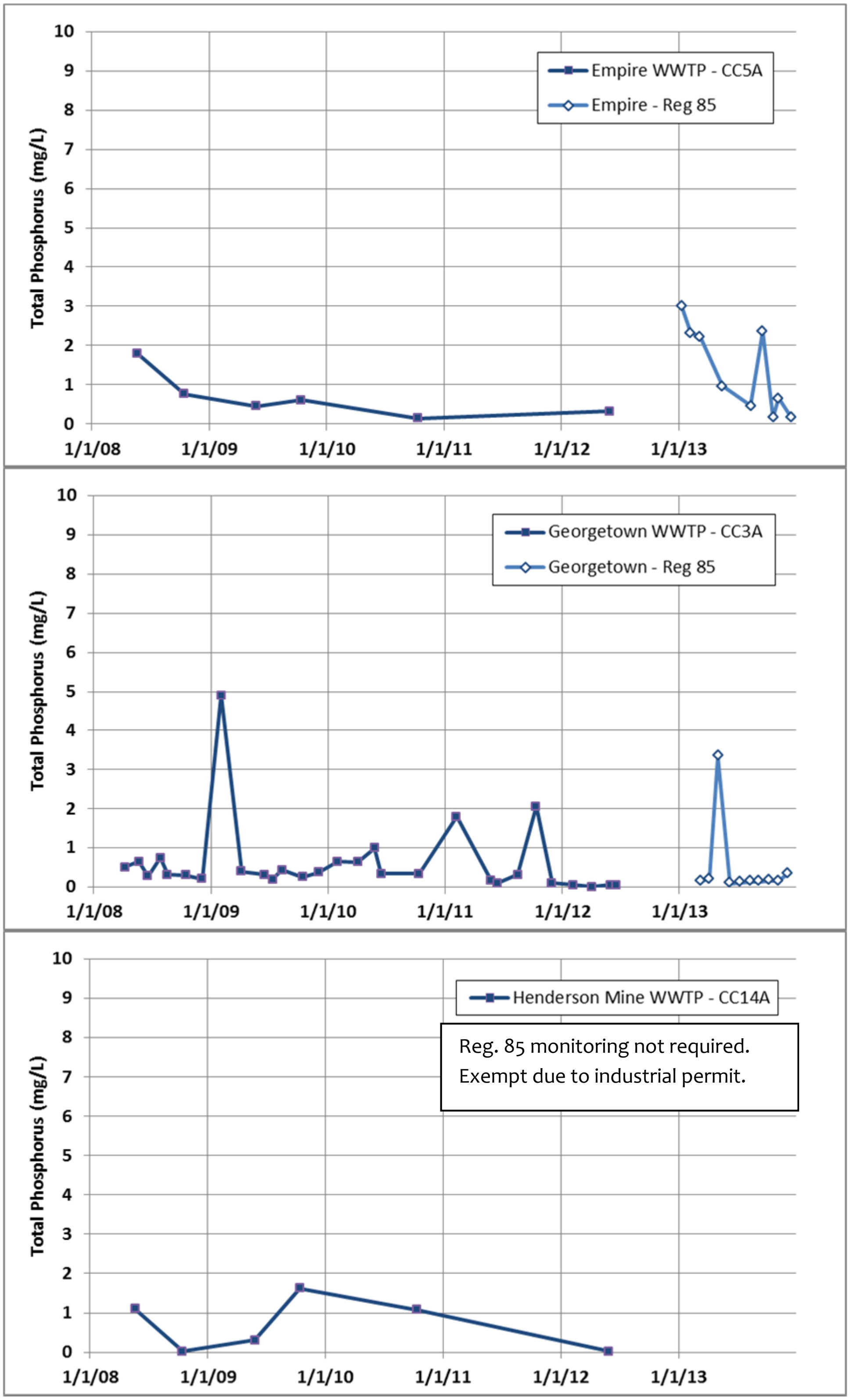

Figure 13. Effluent TP Concentrations (2008-2013) for Empire, Georgetown, and Henderson Mine

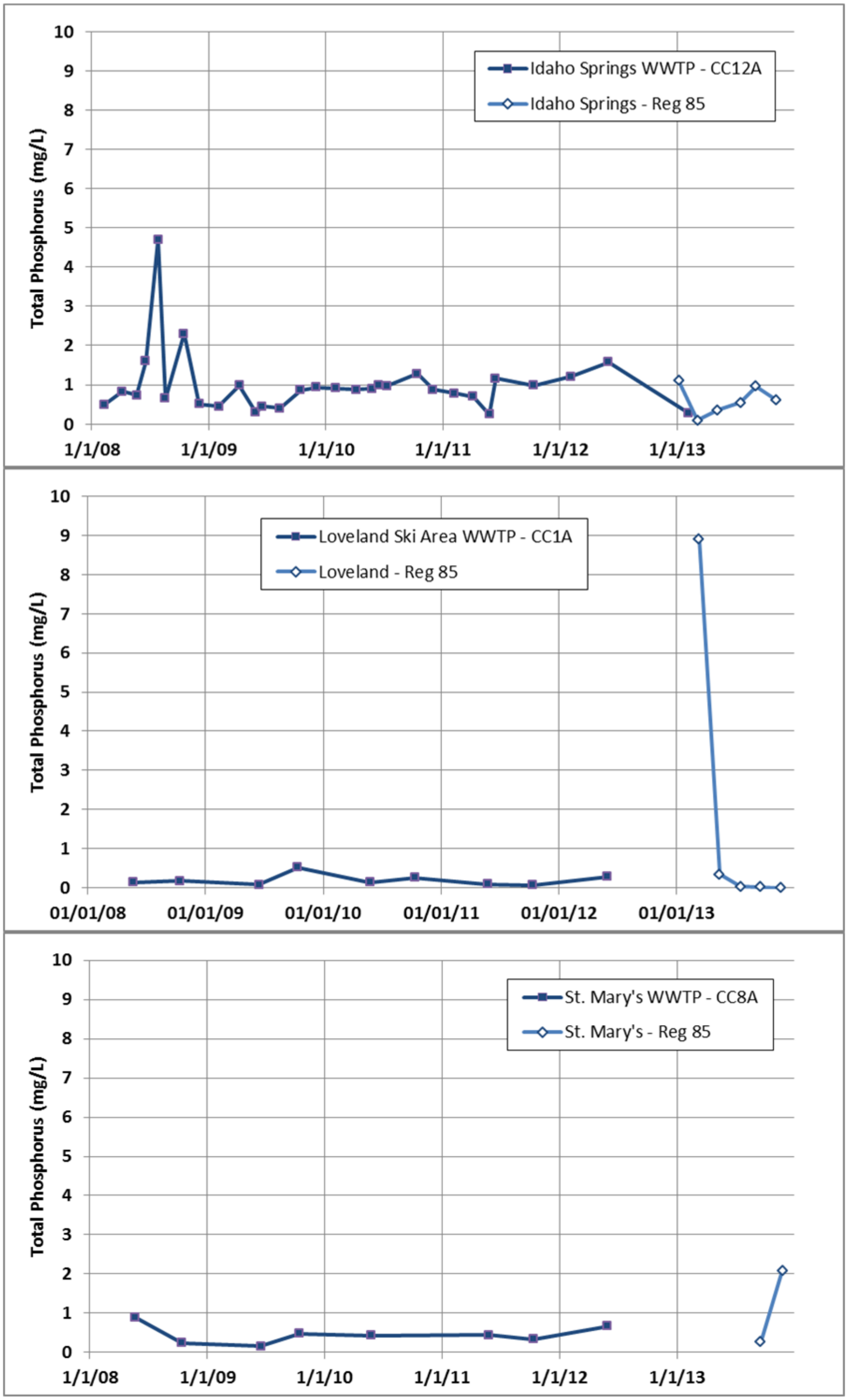

Figure 14. Effluent TP Concentrations (2008-2013) for Idaho Springs, Loveland Ski Area, and St. Mary's

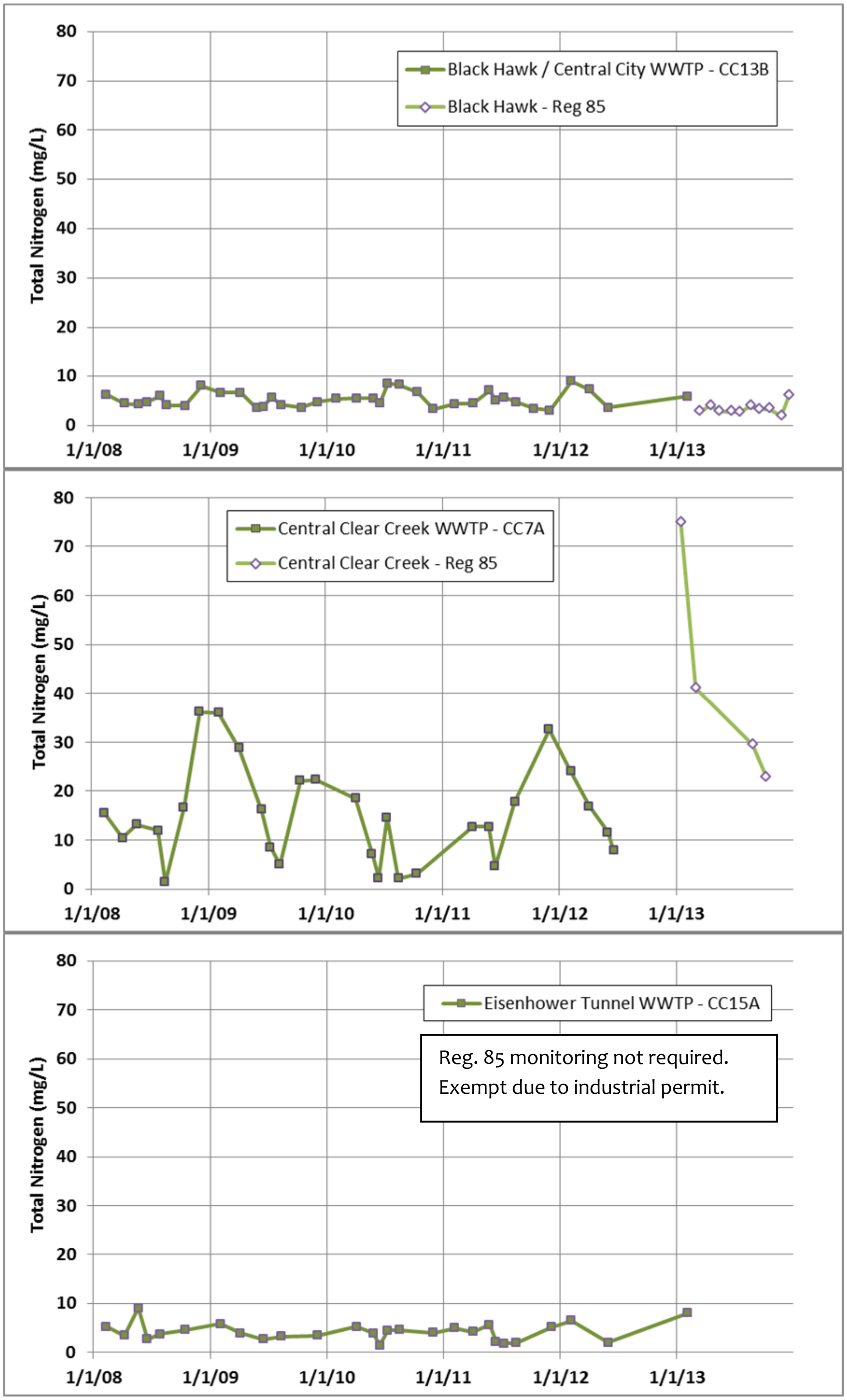

Figure 15. Effluent TN Concentrations (2008-2013) for Black Hawk/Central City, Central Clear Creek, and Eisenhower Tunnel

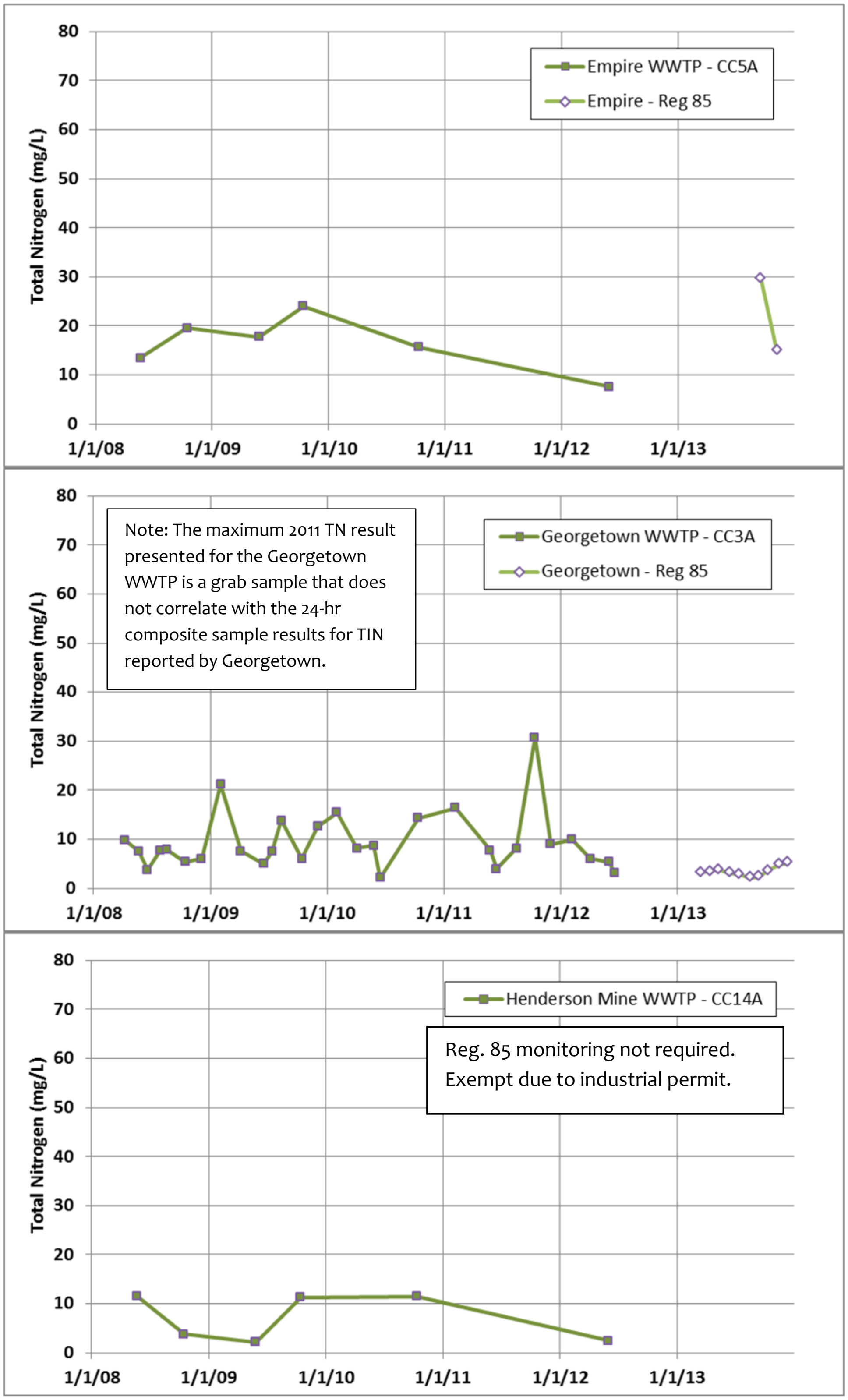

Figure 16. Effluent TN Concentrations (2008-2013) for Empire, Georgetown, and Henderson Mine

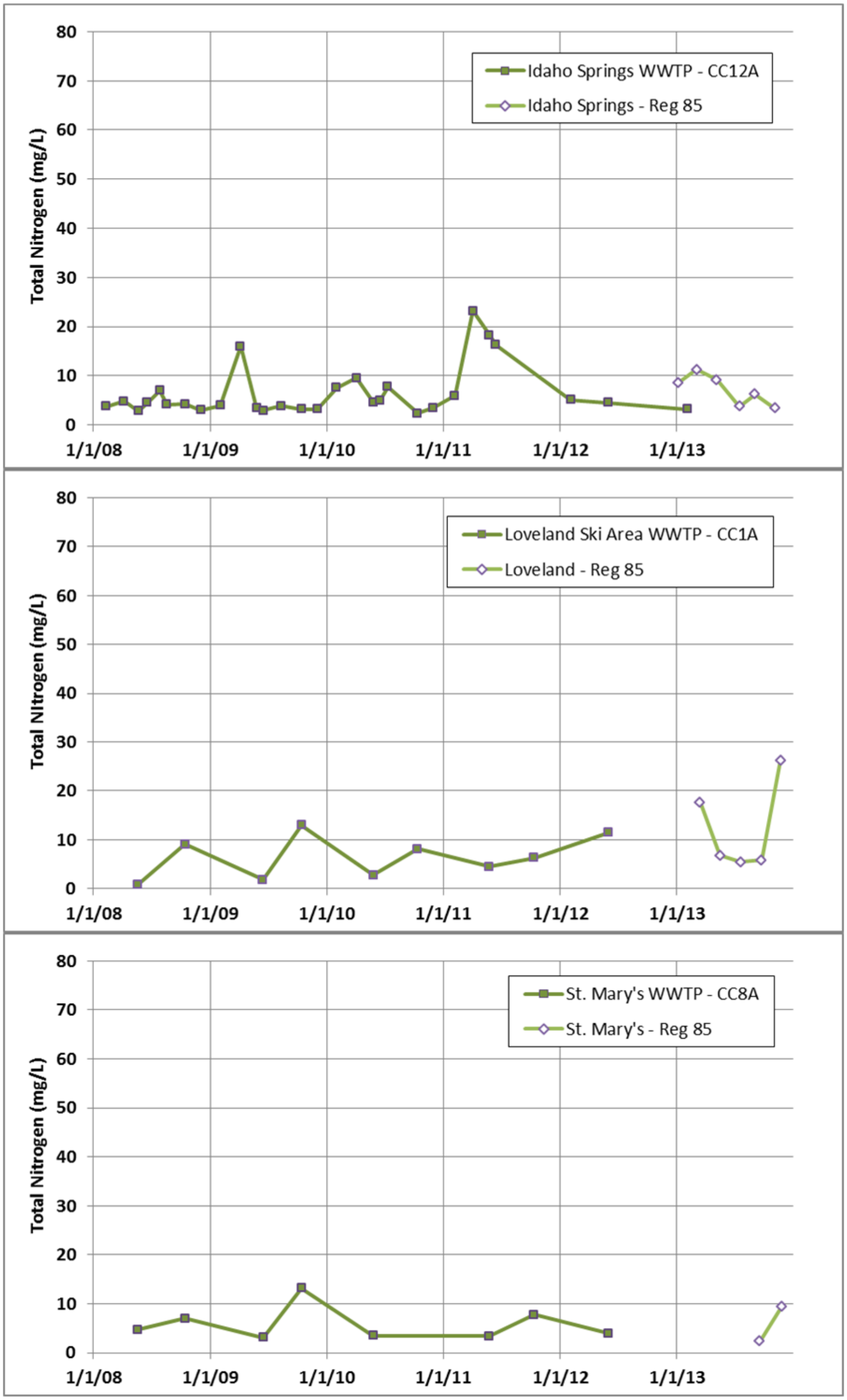

Figure 17. Effluent TN Concentrations (2008-2013) for Idaho Springs, Loveland Ski Area, and St. Mary's

D. Illicit Discharges and Emergency Response

1. Illicit Discharges

In 2013, The City of Golden responded to 23 reports of illicit discharges or potential discharges to the storm sewer system. Three written warnings and ten verbal warnings were issued. In 2013, the City of Arvada issued 22 written Notices of Violation, resulting in six responsible parties being required to pay for cleanup. In addition, Arvada conducted 335 outfall inspections, also called dry-weather screenings, to identify potential sources of illicit discharges and, if necessary, eliminate them. These inspections also evaluate whether outfalls are in need of repair. Outfalls found to be in need of repair are listed on a maintenance schedule.

2. Emergency Response

In order to promptly and effectively notify downstream Clear Creek water users of any potential contamination from an upstream source, Clear Creek County uses the Code Red emergency call-down system. The Clear Creek Office of Emergency Management continues to maintain and update the database for the call lists. The system applies to incidents/spills into Clear Creek and tributaries leading into Clear Creek that occur in Clear Creek County. In 2013, Clear Creek Dispatch launched seven calls. In 2013, the City of Golden Dispatch Center launched 5 calls for incidents within its jurisdiction impacting Clear Creek.

E. Nonpoint Source Control, Stormwater Management, and Abandoned Mine Remediation

Efforts to reduce nonpoint source pollutant and nutrient loading to Clear Creek continued in 2013, including sediment management on highways, erosion and sediment control in urban areas, onsite wastewater treatment system monitoring, and site remediation. The following subsections provide selected highlights of activities.

1. Management of Sediment from Highway Activities

CDOT continues to use more liquid deicer relative to traction sand. This reduces the amount of winter traction sand entering the creek. CDOT Maintenance now trains new members in order to ensure that only enough deicer (of any kind) is used, and no more. Training is the best BMP for minimizing deicer usage.

Figure 18. CDOT Liquid Deicer Truck

CDOT continues its rockfall control projects along I-70, just west of Georgetown. As part of these projects, CDOT removes both large boulders and fine material from the west-bound side ditches. The boulders would not reach Clear Creek, but fines can.

2. Erosion and Sediment Control in Urban and Rural Areas

The City of Golden administered 21 stormwater-quality construction permits in 2013; conducted 435 erosion and sediment control inspections; issued 148 written notifications of violations and 116 verbal notifications of violation; and used performance security for corrections at one site. The Stormwater Maintenance Program conducted 135 inspections of permanent water quality BMP's and sent 150 letters requesting maintenance to land owners.

In July 2013, the City of Golden amended Chapter 13.18 of the Municipal Code to clarify mining restrictions, specifically gold panning activities, within the City's water course. The modification restricts any activity other than use of gold pans.

Following the September 2013 flooding on Clear Creek, the City of Golden removed an estimated 2,500 cubic yards of sediment from Tucker Gulch. Golden also completed water-quality improvements to two existing detention structures and constructed water-quality features associated with improvements to South Golden Road.

Clear Creek County issued 2 flood plain permits and 2 BMP permits in 2013.

3. Erosion and Sediment Control in Active Construction Sites

a) City of Arvada Stormwater Programs

The City of Arvada has continued to focus on improving the quality of runoff through the operation of a Municipal Separate Storm Sewer System (MS4) stormwater program. A significant component of the MS4 Program is related to ensuring that erosion and sediment controls are implemented on active construction sites. In 2013, 1,558 erosion and sediment control inspections were conducted on 129 active construction sites. As a result of these inspections, 192 Warnings and 36 Notices of Violation were issued. Eight builders received further enforcement in 2013 and now must show compliance prior to receiving building permits.

In September 2013, a major flood event significantly affected compliance at active construction sites. A Notice was submitted to CDPHE outlining what was considered an Upset Condition with respect to construction site compliance.

In addition to oversight of active construction, the City of Arvada carries out inspection and enforcement related to post-construction permanent BMPs, which includes detention and retention ponds, swales, and underground proprietary devices. In 2013, 12 new permanent BMPs were added to the 143 BMPs already implemented since the program began. The City inspected all 143 permanent BMPs in 2013. Inspections are followed by corresponding reports that identify noncompliant issues needing to be addressed. Such reports are sent to owners of the stormwater conveyance.

b) CDOT I-70 Twin Tunnels Project

Construction for the widening of the eastbound Twin Tunnels project was completed in 2013. Members of UCCWA participated in the project's leadership and development, including roles on the Project Leadership Team and in the SWEEP (Stream and Wetland Ecological Enhancement Program) and ALIVE (A Landscape Level Inventory of Valued Ecosystem Components) committees. These committees focus on aquatic resources, wetlands, water quality, and wildlife concerns.

Figure 19. Twin Tunnels: Completed Wider Eastbound Tunnel (left), To-be Widened Westbound Tunnel (right); Image from: http://www.coloradodot.info/projects/i70twintunnels

Improving the health of Clear Creek was a core value in the project's development. This goal has been advanced in several ways. One curve was straightened on the eastbound I-70 alignment, which was the cause of numerous accidents, including truck spills that would release contaminants directly into Clear Creek. The anticipated reduction in accidents in this area (just west of Hidden Valley) will also improve water quality.

The project also includes several sediment control measures, such as sediment basins along the four mile stretch. The goal of the project is to capture 80% of the water that passes through the facility. Three spill containment facilities are also included in the project's ultimate solution which will be completed in the summer of 2015.

CDOT also sought to improve the health of Clear Creek through a unique partnership with another UCCWA partner, the City of Black Hawk. Together, the two entities purchased and installed a turbidimeter to track turbidity within the project area. This device has served as a monitor for construction activities and garnered trust with downstream users that the contractor's practices are compliant with its CDPS (Colorado Discharge Permit System) permit. Beyond construction, Black Hawk will have the long term ability to instantly notify stakeholders of high levels of sediment in the creek year round.

4. Pollution Prevention

All City of Arvada facilities with runoff control plans are inspected twice annually. In 2013, 113 employees were trained. The training focus is two-fold, 1) preventing and mitigating any potential contamination sources from City facilities, and 2) spill response procedures specific to work in the field. Arvada's spill response hotline is answered after-hours by personnel at the water treatment plant, who then dispatch those on call to the spill.

5. Onsite Wastewater Treatment Systems

The Clear Creek County Environmental Health Department issued 28 Onsite Wastewater Treatment System permits in 2013 and continued monitoring existing systems for failure. No failures were identified during the year.

6. Site Remediation

In July 2013, the City of Golden awarded a bid to McCollum's Excavating LLC to proceed with a rehabilitation project on approximately 24 acres of remaining open land adjacent to Guanella Reservoir. This area was used for aggregate processing until 2013. The Scope of Work included regrading the site to pre-mining contours, filling in two impoundment ponds, and applying 15,000 cubic yards of topsoil. Permanent BMP's included installation of 2,200 square yards of erosion control blankets and seeding the site.

F. Public Education, Outreach, and Partnerships

Through a series of festivals, seminars, and public meetings, as well as the household chemical disposal programs, the public was able to actively learn about and participate in protection of water quality in Clear Creek.

1. General Public Education and Outreach

The Clear Creek Watershed Foundation, in close collaboration with the newly established Clear Creek County CSU Extension Service, organized and hosted the fifth annual Clear Creek Watershed Festival on September 21, 2013. Approximately 600 people attended. This growing, popular event is held along the banks of Clear Creek in central Idaho Springs and helps raise the consciousness of the community about the watershed. Clear Creek County and the Standley Lake Cities each sponsored one of the over 30 environmental education booths.

Figure 20. Jim McCarthy of Arvada at a Source Water Protection Plan Open House. (Special thanks to Mr. McCarthy for his decades of work for Arvada on watershed activities. Mr. McCarthy retired in February 2014)

The City of Golden Stormwater Program continues its public education campaign by distributing educational materials and attending or hosting public events, including the Waterwise Seminar, the Golden Flower Show and Greener Golden.

The City of Arvada provides education for contractors, city personnel, citizens, and students on an on-going basis. This ensures that the public is aware that city storm drains flow directly to waterways and certain activities can contaminate those waterways. Arvada provides the public with various resources to increase their awareness, such as adopt-a-street or trail programs, storm drain marking, household hazardous chemical disposal and recycling, brochures, and demonstrations that are focused on preventing stormwater pollution. In 2013, the City also hosted booths at five festivals where staff spoke one-on-one to attendees about issues concerning water quality.

2. Recycling and Disposal of Household Chemicals and Hazardous Waste

In 2013, the City of Golden contributed $7,903 to the Rooney Road Recycling Center. The City actively participates as a member of the Board of Managers for the Rooney Road Recycling Center Authority. This facility provides critical recycling and disposal services of household chemicals and annually serves more than 3,000 Jefferson County residents. The City has also been an active founding member of the Rooney Road Recycling Center Foundation. The foundation was created to help secure additional funding for the Rooney Road Recycling Center Authority to further grow the number of residents served by the recycling facility.

The Clear Creek County Transfer Station sponsored three Household Hazardous Waste Collection events, collecting 715 gallons of material along with flammable solids, resins, adhesives, and small amounts of acids, bases, oxidizers, and mercury. Fees collected at those events totaled $3,074; the County paid $17,267 to properly dispose of the hazardous materials. Throughout 2013 in its regular operations, the Transfer Station collected and transferred 1,275 tons of solid waste to an appropriate disposal site and sent 301 tons of recyclable materials for reuse, diverting all that material from the watershed.

3. Pharmaceutical Disposal

The Drug Enforcement Administration (DEA) once again sponsored National Pharmaceutical Take-Back Days in 2013. These nationwide events provided a unified opportunity for the public to surrender expired, unwanted, or unused pharmaceutical controlled substances and other medications to law enforcement officers for destruction. The DEA's efforts bring national focus to the issues of pharmaceutical substance abuse and the hazards associated with contamination of our water systems with prescription drugs. DEA efforts also provide a secure outlet for disposal that will protect our water resources. In 2013, the City of Arvada collected 1,286 pounds of medications, the City of Golden collected 514 pounds, and the Standley Lake Cities collected 1,746 pounds. These combined collection totals represent a 39% increase over totals from 2012, showing growing success of this important program. The Standley Lake Cities also supported the pharmaceutical drop box at King Soopers in Wheat Ridge.

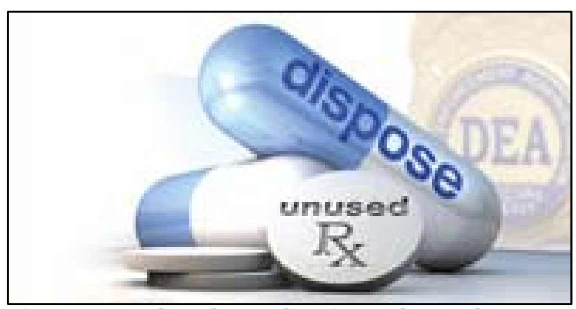

Figure 21. Colorado Medication Take-Back Project (Image from http://www.deadiversion.usdoj.gov/drug_disposal/takeback/)

4. Youth Water Festival

On May 21, 2013, fourth and fifth graders converged to learn about a variety of Colorado water topics. This year we celebrated our 10th year, having hosted over 10,000 kids at this event over these ten years. Kids from the water service areas of Northglenn, Thornton, and Westminster participated in the annual Youth Water Festival at Front Range Community College in Westminster. Over 1,200 students, teachers and parents attended the event, which offered a day of fun and educational workshops featuring active learning and hands-on activities. This year, thirty-two percent of the attendees were from Thornton schools, forty percent were from Westminster, and twenty-eight percent were from Northglenn.

Figure 22. 2013 Youth Water Festival

The Festival's workshops were designed to teach students about water conservation, water chemistry, the water cycle, local water supplies, water treatment, Colorado water law, aquatic wildlife, ecology and more. For a well-rounded experience, each class of about twenty-eight students was scheduled to attend five to six workshops on different topics during the day.

Sixty-nine presenters from local, state, federal, non-profit, and private businesses provided the time and energy needed to make this a successful event. Among the 2013 Water Festival presenters were professionals from The Colorado Climate Center, Environmental Learning for Kids, Butterfly Pavilion, Bureau of Reclamation, Raptor Education Foundation, University of Colorado Science Discovery Program, Metropolitan Wastewater Reclamation District, Mad Science of Denver, North Metro Fire Rescue, Thornton Fire Department, Colorado School of Mines, Colorado State Forest Service, Garbage Busters, Earth Force, Colorado Mosquito Control, Carlson Hammond and Paddock, Bishop-Brogden Associates, Collins Cockrel and Cole, the City of Aurora, the City of Brighton, the Denver Zoo, Regional Air Quality Control, Water for People, the Colorado Water Conservation Board, Rocky Mountain Bird Observatory, Rocky Mountain Music and staff from the sponsoring cities of Thornton, Northglenn and Westminster.

G. Planning Activities

Water-quality management planning and numerical modeling to support planning for Clear Creek was conducted in 2013. These activities are described briefly in the following subsections.

1. Sediment Management, Erosion Control and Spill Containment

In 2013, CDOT completed the Sediment Control Action Plan (SCAP) study for Clear Creek, from the Eisenhower Tunnel to the divergence of I-70 and Clear Creek below Idaho Springs. This study provides recommendations for how to reduce sediment input from highway runoff into Clear Creek.

SCAP features will be incorporated into future capital projects along the I-70 corridor within Clear Creek County. UCCWA members participated in the study's development and early implementation which will generate opportunities for partnerships along the corridor.

2. Remediation Planning

The Clear Creek Watershed Foundation continues its efforts in remediation of abandoned mine sites, classic nonpoint source locations, thereby improving water quality in Clear Creek and its tributaries. The Foundation's work is funded through grants and contributions. Strategic planning was a priority in 2013 and the Foundation was deeply involved in project development during the year. Each of those efforts have borne fruit and at least three projects will go to construction in 2014, including:

Figure 23. Clear Creek Watershed Foundation Logo

* North Empire Creek Riparian Corridor Restoration Project,
* Clear Creek Tributaries Sediment Control and Metal Removal Project, and
* Fishing Is Fun Access Project.

3. Watershed Plan Development

In 2013, UCCWA began the process of updating its 2006 Watershed Plan. Funding was provided by UCCWA and Molson Coors, an UCCWA member agency. The plan will serve an important function in monitoring and tracking the needs identified along Clear Creek. Completion is expected in 2014.

4. Watershed Modeling Update

In 2013, the Standley Lake Cities funded an update of the Clear Creek watershed hydrologic and water-quality WARMF (Watershed Analysis Risk Management Framework) model. WARMF is a mechanistic, numerical, watershed hydrologic and water-quality modeling tool in the public domain. The WARMF model developed for the Standley Lake Cities simulates flow and water quality in the Standley Lake watershed, including surface water and shallow groundwater in the Clear Creek basin from the headwaters to the headgates of the canals leading to Standley Lake. The model simulates point-source and non-point source loading of nutrients. Output from the model includes daily flow rates and nutrient concentrations at the major monitoring locations throughout the watershed. The updated model simulates calendar years 2005 through 2012.

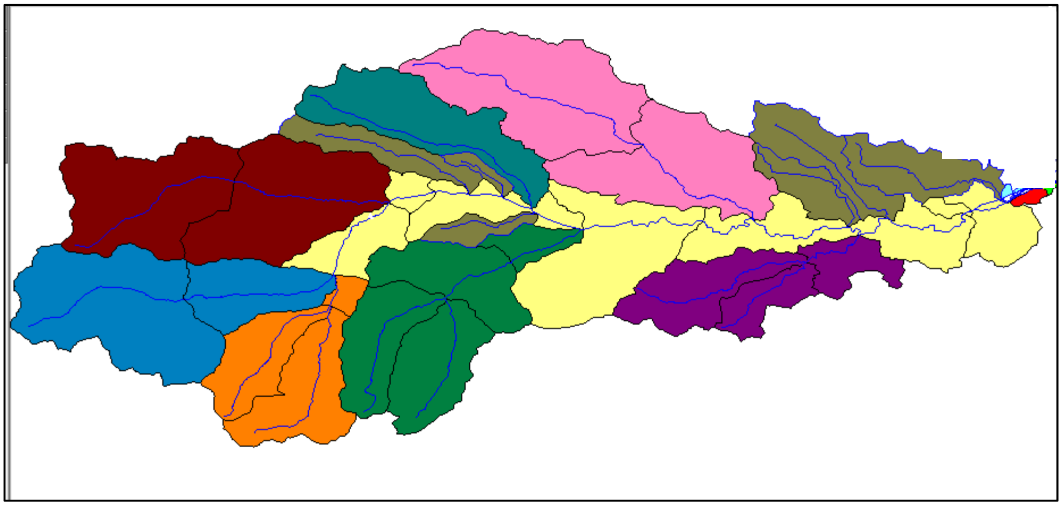

Figure 24. Clear Creek WARMF Model Sub-Basin Layout - Upper Basin

The WARMF Clear Creek model becomes more reliable and useful with each update. Each update provides an opportunity to review model performance and refine model settings to simulate an expanded range of conditions. Additionally, each update requires a detailed review and compilation of observed data for model input and performance assessment. This detailed data review can generate important immediate feedback on sampling issues, changing patterns in point source loading terms, or changing conditions in system response.

H. Other Activities

1. North Fork Heavy Metals and Water Rights Issue

Construction of a CDPHE/EPA water treatment facility required by the OU4 ROD order to remove heavy metals from the North Fork of Clear Creek was postponed. The postponement is due to a a potential conflict with local water rights. CDPHE, the Division of Reclamation and Mining Safety, CDOT, the Colorado Water Conservation Board, Colorado Parks and Wildlife, Gilpin County, the City of Balckhawk, and other agencies have begun negotiations to resolve the potential conflict. Progress continues with the hope that construction may begin in 2014.

2. Upper Basin 208 Management

The Upper Clear Creek Watershed Association (UCCWA) is the designated 208 management agency for the Upper Basin responsible overseeing and reporting water quality and water resource issues through the upper portion of the Clear Creek Watershed. In that capacity, UCCWA reviewed and commented on three referrals in 2013.

3. Green Lake

The City of Black Hawk along with Clear Creek County has been operating Green Lake which receives water delivery by way of Vidler Tunnel and Leavenworth Creek. The County and City installed an additional 315 linear feet of 18-inch pipe starting toward the Lake from where work ended in 2012. The remaining "old" pipe will be replaced in stages over the next three years.

Figure 25. New section of pipe from Leavenworth Creek toward Green Lake

4. Georgetown Lake

In 2013, the City of Black Hawk and the Town of Georgetown completed the design of the new Georgetown Lake outlet. The new outlet will be able to pass a flow of at least 500 cubic feet per second to meet the State Engineer's Office requirements for a storage decree application. Construction on the project is expected to begin after the 2014 spring runoff subsides.

Figure 26. Georgetown Lake (photo from: http://www.uncovercolorado.com/towns/georgetown/)

5. Molson Coors

Molson Coors Brewing Company continues to fund stormwater efforts, water quality monitoring, and habitat restoration projects throughout the Clear Creek watershed. In particular, Molson Coors funded $30,000 to the Clear Creek Watershed Foundation in continued support of orphaned mine restoration.

In addition, Molson Coors has started a program that will strengthen its focus on Corporate Responsibility through partnerships with the United Nations CEO Water Mandate, Beverage Industry Environmental Roundtable (BIER) and other agencies that report water use. The goal of this program is to make the public aware of water use by Molson Coors and efforts underway to decrease the amount of water used globally at all Molson Coors breweries, including those in the United Kingdom, Canada, and India. A large portion of this program is based on the success that has been achieved within the Clear Creek watershed. In addition, Molson Coors has been presenting the efforts of the Clear Creek watershed to organizations around the U.S. as a working case of the success of cooperation.

Molson Coors reports water use, efficiencies, and program improvements to several reporting groups including the Dow Jones Sustainability Index and the Water Disclosure Project. Both of these groups allow for external reporting of water use.

6. Aquatic Invasive Species Management

Eurasian Watermilfoil - Eurasian Watermilfoil (EWM; *Myriophyllum spicatum L)* is a non-native, aquatic, noxious weed that grows rapidly and to a depth of 35 feet. EWM can grow into dense mats that severely interfere with recreation and can provide a substrate for blue-green algae growth. Blue-green algae blooms can ultimately cause taste and odor events in drinking water supplies. EWM was first observed in Standley Lake in 1998. It was positively identified in 2000. In 2012, it was confirmed that the Eurasian watermilfoil hybridized with a native Colorado species, Northern watermilfoil (*Myriophillum sibiricum*). The hybrid species is more robust and grows even faster than the Eurasian watermilfoil. As lake conditions permit, bathymetric studies are performed on Standley Lake during the early summer for mapping the submerged aquatic vegetation in order to assess milfoil growth and the effectiveness of the remedies.

EWM weevils have been stocked on the west side of the lake on five occasions since 2002. The weevil larvae bore into the stem of the milfoil which damages the plant. When an adequate weevil population is sustained, the weevils may be able to control the spread of the milfoil. Annual surveys of weevil populations in the lake are performed by contractors. Weevil populations have been observed to be declining since 2006. In 2013, no weevils were found in field observations or laboratory analysis from the annual survey.

Standley Lake experienced a steady milfoil density decline between 2006 to 2011, from 500 stems/m^2 to 26 stems/m^2. Unfortunately with the appearance of the hybrid milfoil, the density again increased in 2012 to 106 stems/m^2. Milfoil density was lower in the 2013 survey, averaging 43 stems/m^2; however, given the low weevil population, milfoil may rebound, and further weevil stocking may be needed[3].

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[3] EnviroScience. 2013. 2013 Milfoil Weevil Survey at Standley Lake, Westminster, Colorado. Prepared for City of Westminster Public Works and Utilities. November 18, 2013.

Zebra and Quagga Mussels - Zebra and quagga mussels are non-native, aquatic invasive species that are introduced to new water bodies by the unintentional transfer of organisms from an infested water body via boats or fishing bait. Aquatic mussels cause serious damage to the ecosystem and result in costly control procedures for drinking water treatment facilities. Both zebra and quagga mussels were discovered in 2008 in a few of Colorado's lakes. Prevention of aquatic mussel infestation is key to protecting Standley Lake. An intensive boat inspection and decontamination program was initiated in 2008 to protect the lake from new invasive species. Additionally, no live aquatic baits are allowed at Standley Lake.

Standley Lake is monitored for aquatic mussels every two weeks using the zooplankton tow procedure. The tows are performed at the lake inlets, SL-10, and the boat ramp/outlet area. Several invasive species have a planktonic life stage, and sampling with the plankton nets can provide early warning of infestation. In addition, substrate samplers, constructed and monitored by Colorado Parks and Wildlife, are placed throughout the lake. Substrate samplers are made up of a float, rope, plastic plates and an anchor weight. A plate is located at every 10 feet of depth from the surface to the bottom of the lake at various locations. The plates and ropes are checked periodically for aquatic mussel growth. A plate or rope that feels like sand paper will be scraped and examined under the microscope for veligers (zebra or quagga mussel larvae). Shoreline surveys are performed when the water level is at the lowest for the year. A shoreline survey consists of walking the shoreline in teams looking for adult mussels attached to any hard substrate.

Sampling tows, substrate samplers, and shoreline surveys from 2013 show that Standley Lake continues to be free of zebra and quagga mussels.

IV. Upper Basin Flows and Water Quality

The previous section highlighted activities and accomplishments of various groups to manage, enhance, and protect water quality. This section presents an analysis of 2013 water-quality data in the Upper Basin. Constituents presented include discharge (flow), total suspended solids, total phosphorus, and total nitrogen. The analysis is based on grab sample data collected at sampling locations CC26 (Clear Creek at Lawson Gage) and CC60 (Clear Creek at Church Ditch Headgate), combined with data from proximal ambient autosamplers, CCAS26 (Clear Creek at Lawson Gage) and CCAS59 (Clear Creek 2 miles west of Highway 58/US-6). Locations CC26 and CCAS26 (jointly referred to as simply CC26 in this report) are located on the mainstem of Clear Creek (Figure 7) and provide information on water quality in the upper portion of the Upper Basin. CC60 and CCAS59 (jointly referred to as CC59/60), located on the mainstem of Clear Creek near the headgates of the Canals to Standley Lake (Figure 7), provide data at the bottom of the Upper Basin near Golden.

A. Discharge

Annual hydrographs for the key Upper Basin locations (CC26 and CC60) are presented in Figure 28, compiled from mean daily flow rates. The flow rates for the first eight months of the year exhibited a fairly typical pattern. Flow rates began to increase in early April, coinciding with snowmelt and spring runoff, reaching a peak in early June. In September, an uncommon and persistent weather pattern occurred, funneling abundant moisture toward the Front Range. In the Clear Creek Upper Basin, the result was a hydrograph peak on September 13 which exceeded the snowmelt peak at CC60. This peak flow rate on September 13 followed five consecutive days of heavy precipitation that contributed a total of 3.9 inches in the Upper Basin near Georgetown and 10.8 inches near Golden. The heaviest precipitation fell on 9/13/2013, with 1.5 inches near Georgetown and 6.5 inches near Golden (according to data from the Utah Climate Center). The greater rainfall totals lower in the basin are reflected in the relative magnitudes of the flow rate peaks at CC26 versus CC60 in Figure 28.

Figure 27. Soda Creek, a Tributary of Clear Creek, Breaching its Banks Upstream from This Location, September, 2013.
(This photo shows the resulting damage to a campground in Idaho Springs with the normal Soda Creek channel to the left.)

This significant precipitation event caused record flooding across much of the Front Range. A total of 17 counties were affected by the flood, for a total impacted area of 4,500 square miles. Twelve counties, including Clear Creek County were placed on FEMA's list of emergency declaration. In Clear Creek at Golden, peak flow rates were very high but below the previous record of 2,370 cfs set in July of 1983[4]. In addition to the September peak, the falling limb of the hydrograph from the September event extended through October, resulting in above average flow rates at CC60 through that period as well.

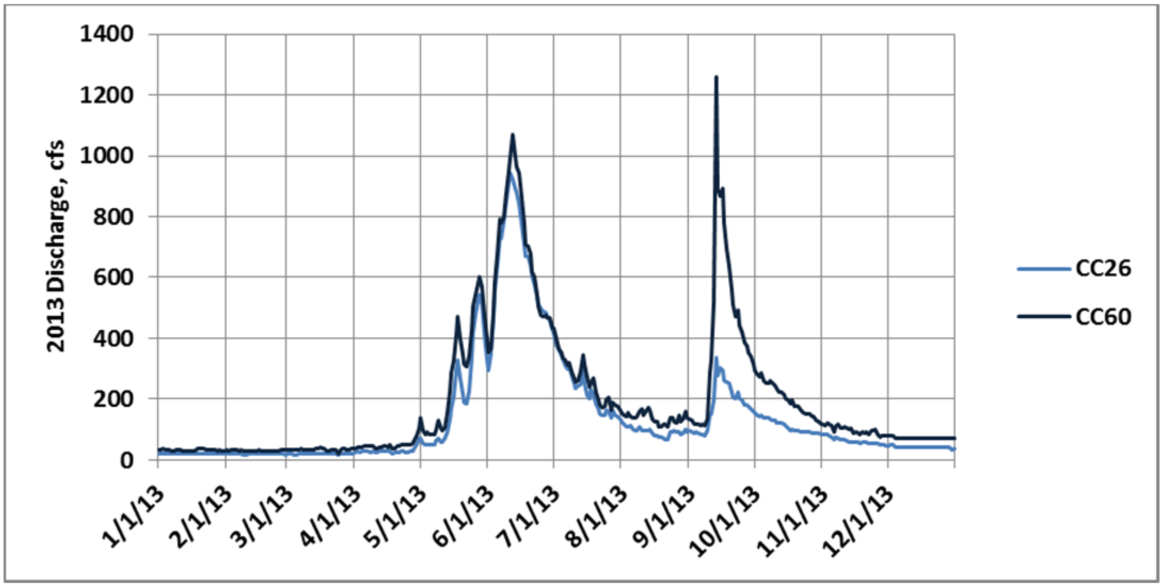

Figure 28. 2013 Hydrographs for the Upper Basin (CC26, CC60)

The total flow volume through Clear Creek in 2013 was similar to the average annual flow volume from the previous five years (2008 through 2012). Compared with the average of the previous five years (2008-2012), 2013 annual flows were 5% above average at CC60 and 3% below average at CC26. This stands in particular contrast to 2012, which was an unusually low runoff year, and 2011 which had unusually high runoff. Total annual flow volumes (in acre-feet per year) for 2008-2013 are presented in Figure 29, which also indicates the 2008-2012 average flow volume at each location for reference. The September event, assuming a hydrograph response duration from September 9 through October 31, comprised 26% of the total annual 2013 flow at CC60 and 16% of the annual flow at CC26 (included in the total annual 2013 volumes shown on Figure 29).

[4] From the USGS Colorado Division of Water Resources, Urban Drainage Flood Control District, as reported here: http://coflood2013.colostate.edu/docs/wwa_assessment.pdf.

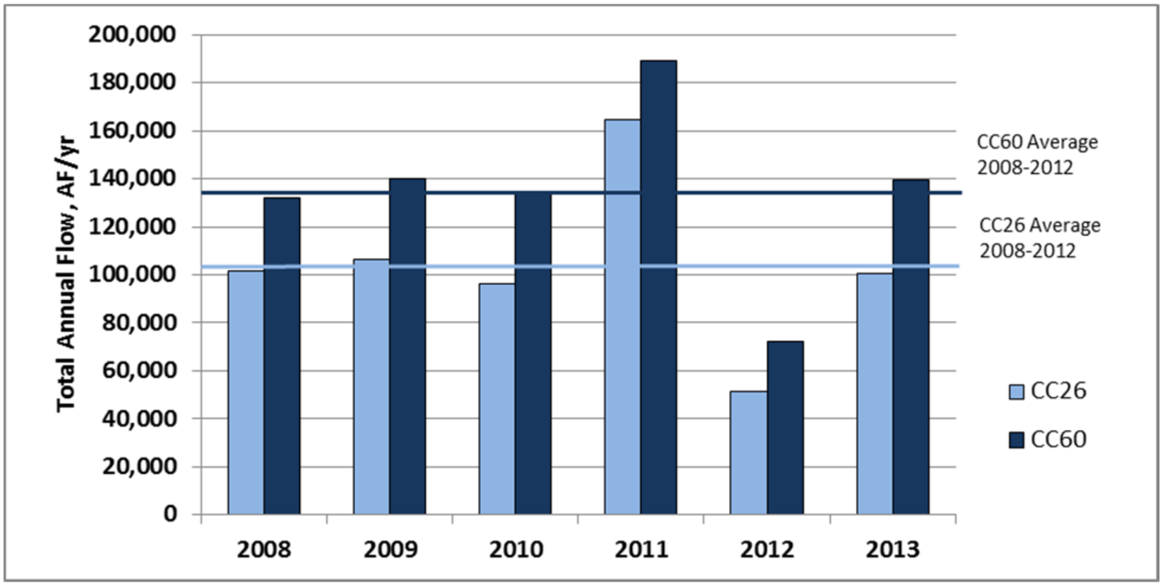

Figure 29. Total Annual Flow in Clear Creek at CC26 and CC60, 2008-2013

Hydrograph comparisons at CC60 for 2008-2013 are presented in Figure 30. The dramatic change in flow rate patterns relative to recent previous years due to the major September rainfall event in 2013 is clearly illustrated in these overlaid hydrographs for CC60.

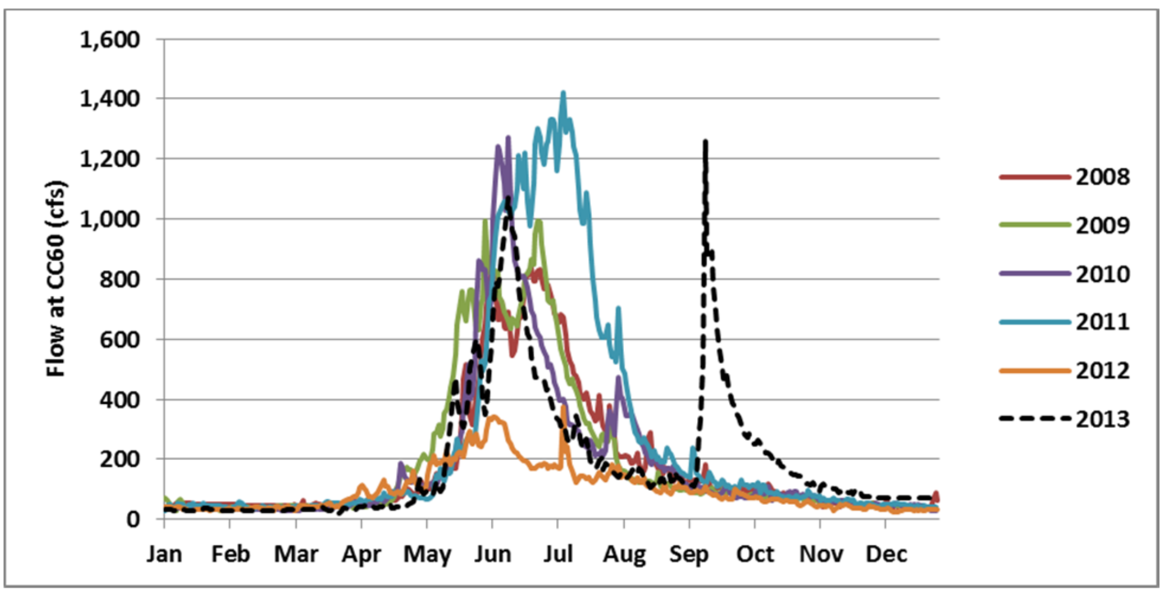

Figure 30. Annual Hydrographs for 2008-2013 in the Upper Basin (CC60)

B. Total Suspended Solids

Total suspended solids concentrations from grab and ambient autosamplers in the Upper Basin (location CC59/60) from 2013 are presented in Figure 31. The lower part of the basin experienced higher concentrations than the upper portion of the basin (CC26). This is consistent with previous years and reflects land use loading patterns. The peak TSS concentration (42 mg/L) was measured at

CCAS59 on 5/19/13 during the rising limb of the snowmelt hydrograph, roughly one month before peak runoff. The maximum observed TSS at CC26 was also observed at this time. At that time, there had also been several spring storms (totaling 1.9 inches of precipitation near Georgetown over 11 days, and 1.3 inches near Golden).

There were no grab or ambient autosampler samples collected on Clear Creek during the rising or falling limb of the September 2013 flood event; however, there were two event-triggered samples early in the event at CCAS59. At this location, samples were collected by the event autosampler on the early rising limb of the major event on September 9 and September 10. TSS concentrations from those samples were 564 mg/L and 420 mg/L, respectively. These values are comparable to or slightly higher than the average of the 20 storm event sample TSS results collected at CC59 between 2008 and 2012 (431 mg/L TSS). TSS concentrations likely increased further as rain continued and flow rates continued to increase until September 13.

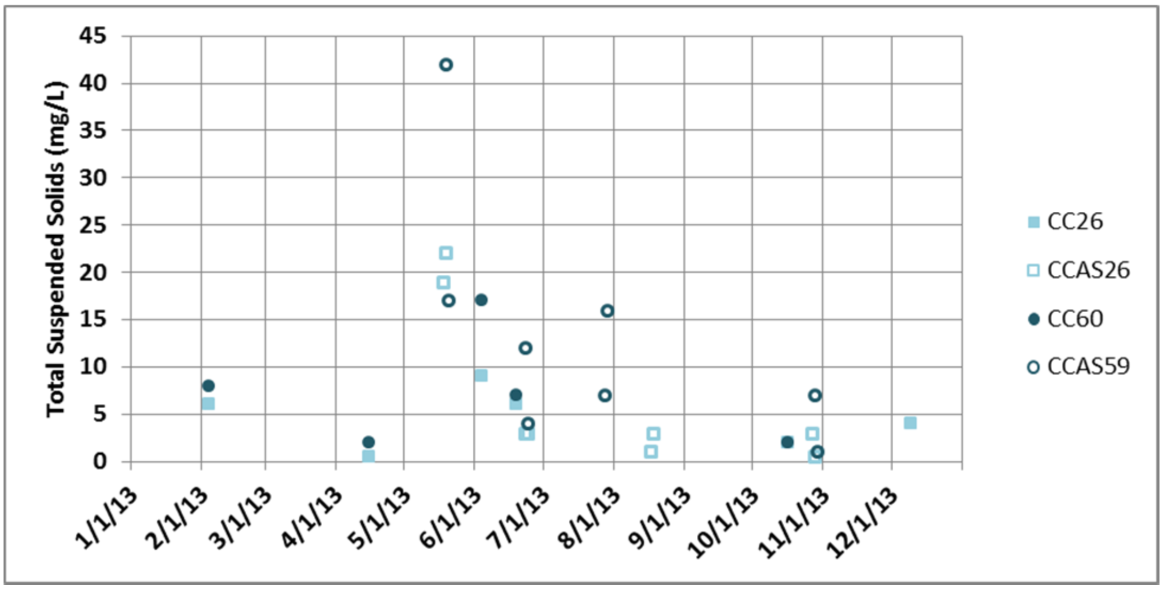

Figure 31. Total Suspended Solids Concentrations (Non-Event) in the Upper Basin, 2013

Non-storm-event triggered TSS sample results in the Upper Basin for 2008-2013 are presented in Figure 32. A pattern of higher concentrations at the lower location (CC59/60) is apparent. The peak 2013 TSS concentrations during the snowmelt runoff are similar to values observed over the previous five years. As noted above, this figure presents ambient grab and autosampler results and therefore does not reflect TSS during the flooding event hydrograph of September 2013 (or shorter duration TSS effects of smaller storms in all years).

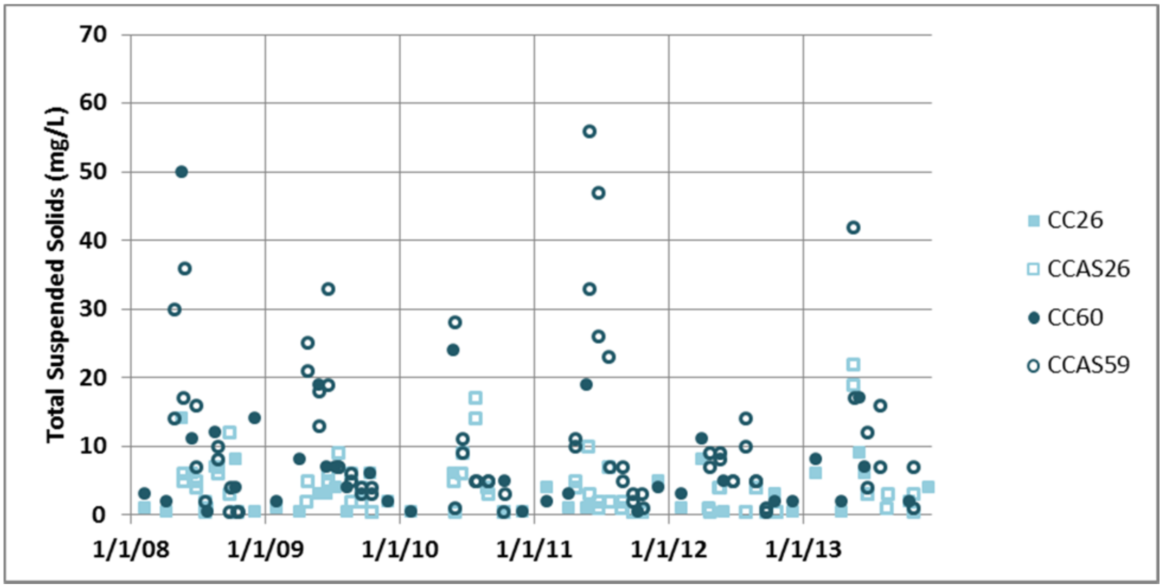

Figure 32. Total Suspended Solids Concentrations (Non-Event) in the Upper Basin, 2008-2013

Average monthly TSS concentrations at CC59/60 in 2013 are compared to the average and range of previous years (2008-2012) in Table 1. For each of the months with ambient observations, values fall within or near ranges observed from previous years, with the exception of February. This February result, however, is considered suspect[5].

Table 1. Monthly Average Total Suspended Solids Concentrations (Non-Event) in the Upper Basin at CC59/60

Month	2013 TSS Concentrations (mg/L)	2008-2012 Average and Range of TSS (mg/L)	% Change in 2013 from the 2008-2012 Average
February	8.0*(suspect)	2.1 (0.5-3)	+281%
April	2.0*	11.0 (2-25)	-82%
May	29.5	23.7 (5-56)	+24%
June	10.0	16.4 (1-47)	-39%
July	11.5	8.0 (0.5-10.9)	+45%
October	3.3	2.5 (0.5-6)	+31%

* "Average" based on only one observed value.

Non-storm-event TSS loading at CC26 and CC59/60 was calculated for 2013 and compared to estimates from 2008-2012. Annual TSS loads calculated with ambient sample data are presented as solid bars in Figure 33. Because no grab or ambient autosampler TSS data were available for the

[5] The TSS sample result from February 2013 at CC59/60 and CC26 was higher than any observed in recent years. It is not clear what may have caused this higher TSS result. This value is considered suspect because turbidity, TOC, and TP from the same February, 4, 2013 sample at CC59/60 were low (the lowest at that location for all of 2013).

period from September 9 through October 16, calculations of loads from ambient sample data alone are not expected to adequately represent the loading through this extended runoff period.

Another estimate of 2013 annual TSS loading was calculated for CC59/60 in an attempt to better represent concentrations of TSS from September 9 through mid-October. Specifically, storm event-triggered sample data from CC59 from early in the September event were combined with the ambient sample data[6]. The increase in annual TSS load due to inclusion of this storm event data, as described, are shown on Figure 33 in the hatched area for CC59/60 for 2013. The estimation of TSS loading shows that the September event may have added roughly 7,000 tons of additional TSS loading at CC59/60, increasing the estimated annual load by a factor of nearly six in 2013.

There are many possible approaches and assumptions that could be applied to develop an estimate of loading during this extended event from the limited available data. As such, there is significant, unquantifiable uncertainty associated with this estimate. Recognizing this uncertainty, the intent of including this calculation is to represent, in a relative sense, the magnitude of additional loading. The same calculations were not performed for CC26, since no storm event samples were taken at that location. The effects of the storm on loading at CC26, however, are expected to be lesser than those at CC59/60 based on relative flow differences during the event at those locations (Figure 28).

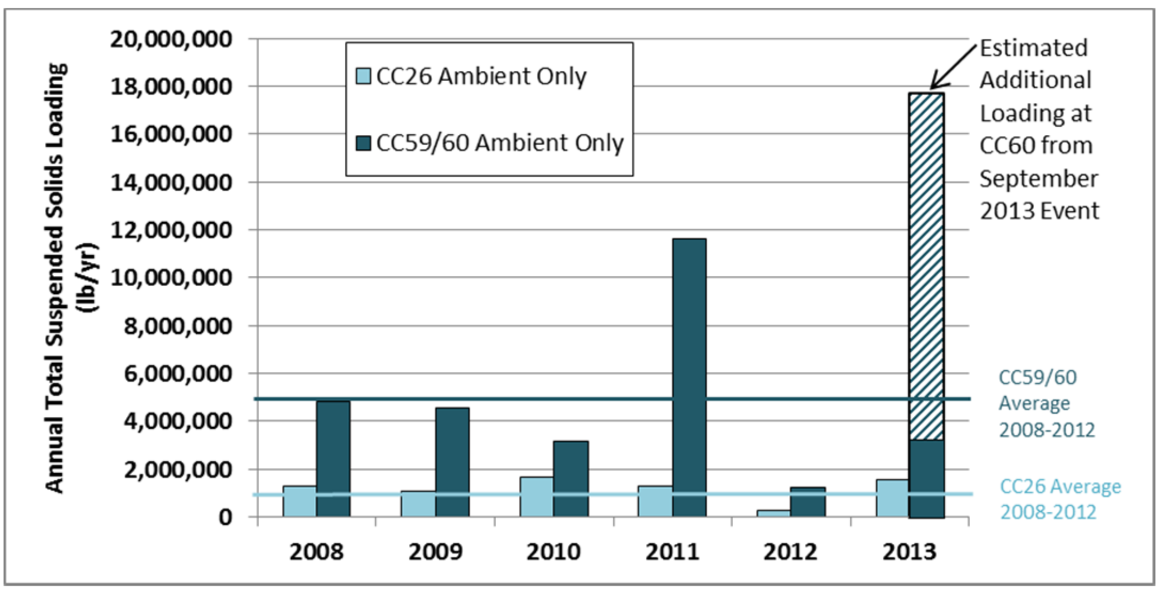

Figure 33. Total Suspended Solids Loading Estimates in the Upper Basin, 2008-2013

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[6] The TSS concentration from a storm event sample at CC59 from September 9, 2013 was applied to replace the ambient concentration value for that date. A second storm event sample was collected at CC59 on September 10, 2013. The TSS result from this sample was applied as a constant value for a period of four days (September 10-13), then reduced linearly over the next ten days to the ambient concentration. As such, the storm-event concentrations were applied, as described, for a total period of 15 days, starting on September 9. There were no other storm event samples collected at this location during the rising or falling limb of the event for use in developing this estimate.

Figure 34 presents volume-weighted concentrations at both key locations for 2008-2013. Annual volume-weighted concentrations are calculated by summing the annual load and dividing by the annual flow volume. Both CC59/60 annual loading estimates (one based only on ambient sampling data and one including September storm event sampling data) were used in this calculation. Again, recognizing the uncertainty in the storm loading estimate, the purpose of performing the calculation with the storm event sampling data included was to demonstrate, in terms of relative magnitude, the significance of the September event.

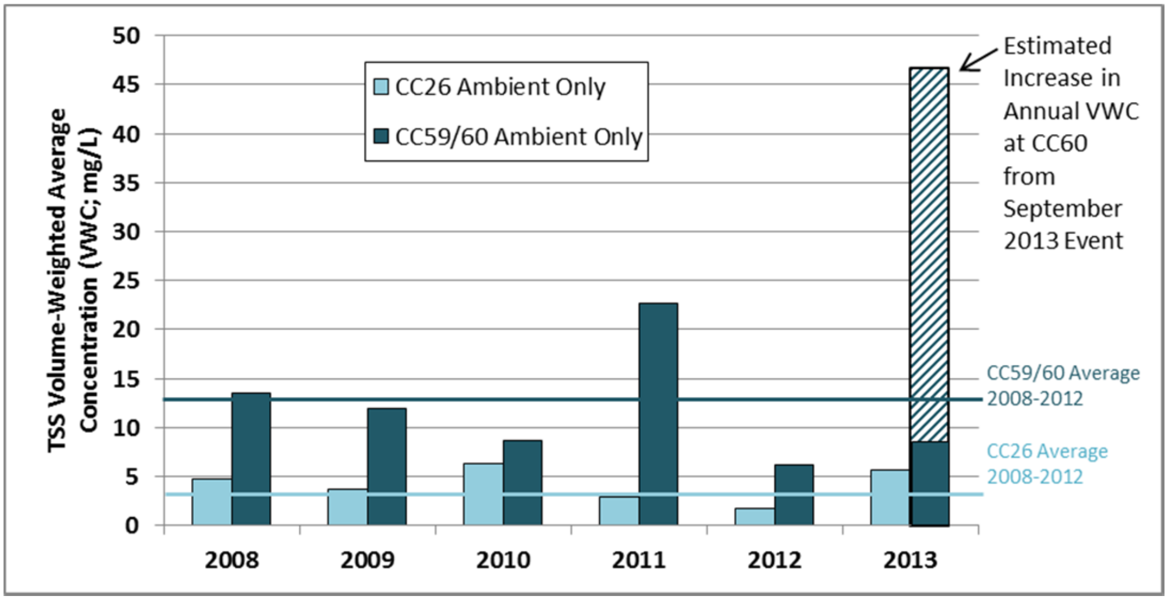

Figure 34. Total Suspended Solids Volume-Weighted Concentration Estimates in the Upper Basin, 2008-2013

C. Total Phosphorus

Total phosphorus concentrations from grab samples and ambient autosamplers in 2013 in the Upper Basin are presented in Figure 35. As seen in previous years, TP concentrations generally increase at both locations in the spring during the snowmelt runoff. Also as seen in previous years, peak concentrations tend to be higher at CC59/CC60 relative to CC26 during spring and summer, but more comparable in late summer and fall. This likely reflects the similar pattern observed for TSS. The maximum measured ambient concentration of 49.5 µg/L occurred on 5/19/13 at CCAS59 during the rising limb of the snowmelt hydrograph.

As noted for TSS, no grab or ambient autosampler samples were collected during the rising or falling limb of the major precipitation event that affected flows from September 9 through mid-October. There is TP data from one event-triggered sample[7] from the first day of the extended September rainfall (September 9, 2013) at CCAS59. The TP concentration from that sample was 240 µg/L, which

[7] A second event-triggered sample was collected on September 10, 2013 at CCAS59; however TP results from that sample (20 µg/L) are considered unreliable based on comparison with the turbidity results. All other historical storm data show relatively consistent turbidity:TP relationships, and this result falls well outside that pattern with sharply lower TP concentrations than would be expected (discussed later in Section IV.E., see also Figure 43).

is relatively low compared to the average of the 20 storm event TP results observed at CCAS59 from 2008-2012 (434 µg/L). Higher TP concentrations may have occurred across the event, but no observations were available.

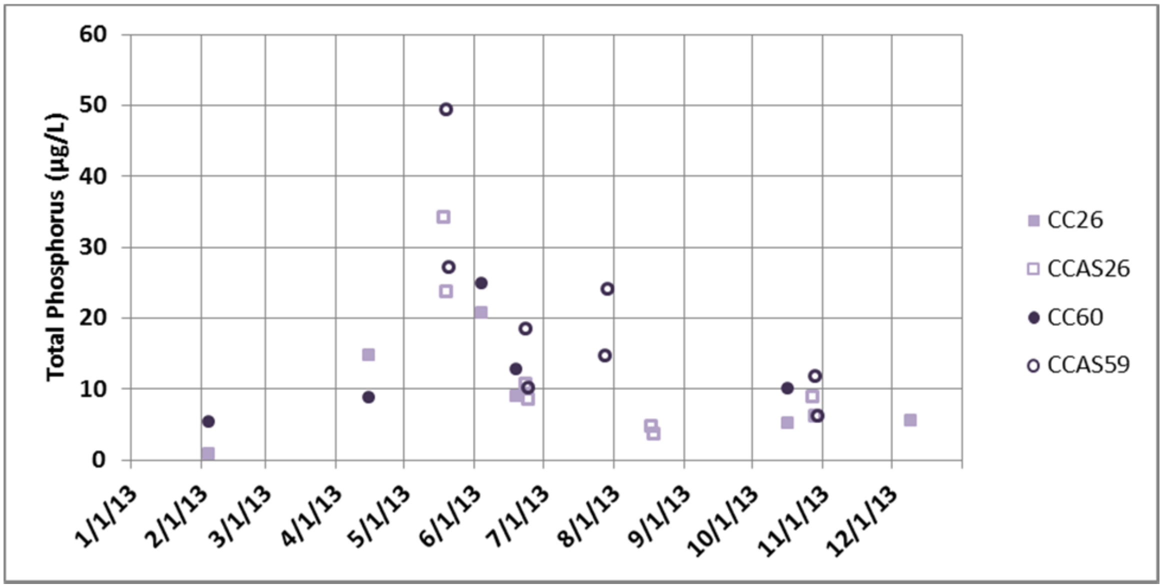

Figure 35. Total Phosphorus Concentrations (Non-Event) in the Upper Basin, 2013

Non-storm-event triggered TP sample results in the Upper Basin for 2008-2013 are presented in Figure 36. The pattern and range of concentrations in 2013 ambient samples is generally similar to that observed in recent years. As noted above, this figure presents ambient grab and autosampler results and therefore does not reflect TP during the flooding event hydrograph of September 2013 or during shorter-duration storm events over the years.

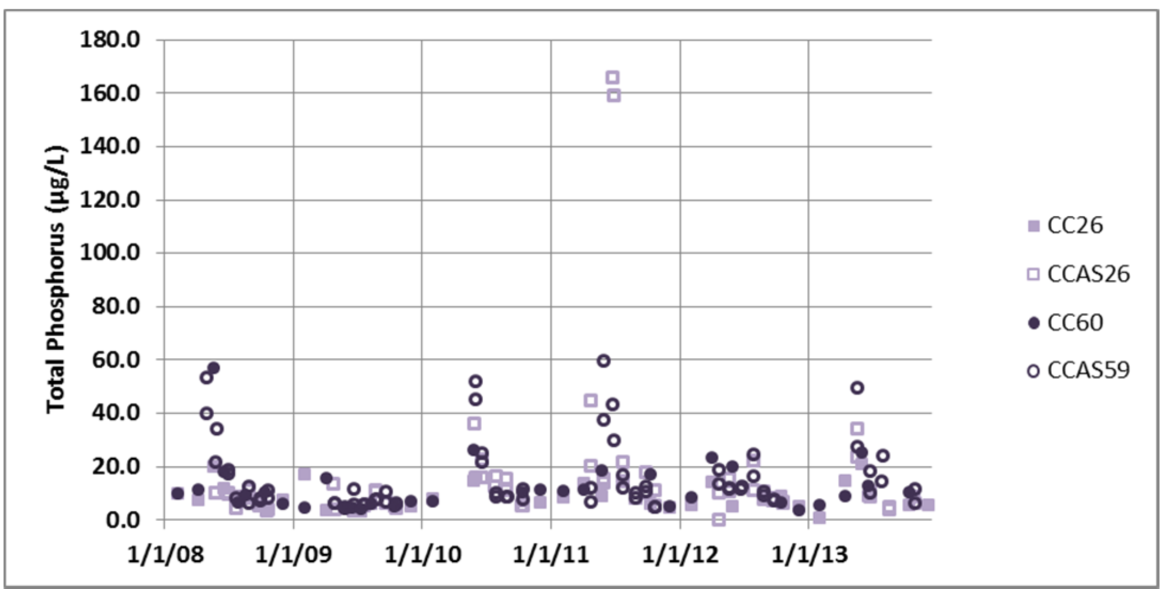

Figure 36. Total Phosphorus Concentrations (Non-Event) in the Upper Basin, 2008-2013

Table 2 presents monthly average TP concentrations for 2013 and for the 2008-2012 average and range. Results from 2013 fall within observed ranges from the previous five years for all six of the months with ambient condition observations. Direct comparison of averages likely largely reflects variability of runoff timing from year to year.

Table 2. Monthly Average Total Phosphorus Concentrations (Non-Event) in the Upper Basin at CC59/60

Month	2013 Average TP (µg/L)	2008-2012 Average and Range of TP (µg/L)	% Change in 2013
February	5.3*	8.1 (4.6-10.8)	-35%
April	8.8*	15 (6.3-40.2)	-41%
May	38.4	26.6 (4.3-59.5)	+44%
June	16.7	22.2 (4.5-52)	-25%
July	19.5	10.9 (4-24.5)	+79%
October	9.3	8.4 (4.8-17.1)	+12%

*"Average" based on only one observed value.

Non-storm-event TP loading at CC26 and CC59/60 was calculated for 2013 and compared to estimates from 2008-2012. Annual TP loads calculated with ambient sample data are presented as solid bars in Figure 37. Because no grab or ambient autosampler TP data were available for the period from September 9 through October 16, calculation of loads from ambient sample data alone are not expected to adequately represent the loading through this extended runoff period.

Another estimate of 2013 annual TP loading was calculated for CC59/60 in an attempt to better represent concentrations of TP from September 9 through mid-October. Specifically, storm-event triggered sample data from CC59 from early in the September event were combined with the ambient sample data[8]. The increase in annual TP load due to inclusion of this storm event data, as described, are shown on Figure 37 in the hatched area for CC59/60 for 2013. These estimates of TP loading suggests that the September event may have comprised nearly 4 tons of TP loading at CC59/60, more than doubling the annual load for 2013.

There are many possible approaches and assumptions that could be applied to develop an estimate of loading during this extended event from the limited available data. As such, there is significant, unquantifiable uncertainty associated with this estimate. Recognizing this uncertainty, the intent of including this calculation is to represent, in a relative sense, the magnitude of additional loading. The same calculations were not performed for CC26, since no storm event samples were taken at that location. The effects of the storm on loading at CC26, however, are expected to be lesser than those at CC59/60 based on relative flow differences during the event at those locations (Figure 28).

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[8] The TP result from a storm event sample at CC59 from September 9, 2013 was applied as a constant value for a period of five days (September 9-13), then reduced linearly over the next ten days to the ambient concentration. As such, the storm-event concentration was applied, as described, for a total period of 15 days, starting on September 9. TP results from a CC59 storm event sample on September 10, 2013 were not used in this calculation because they were considered suspect (discussed later in Section IV.E, see also Figure 43).

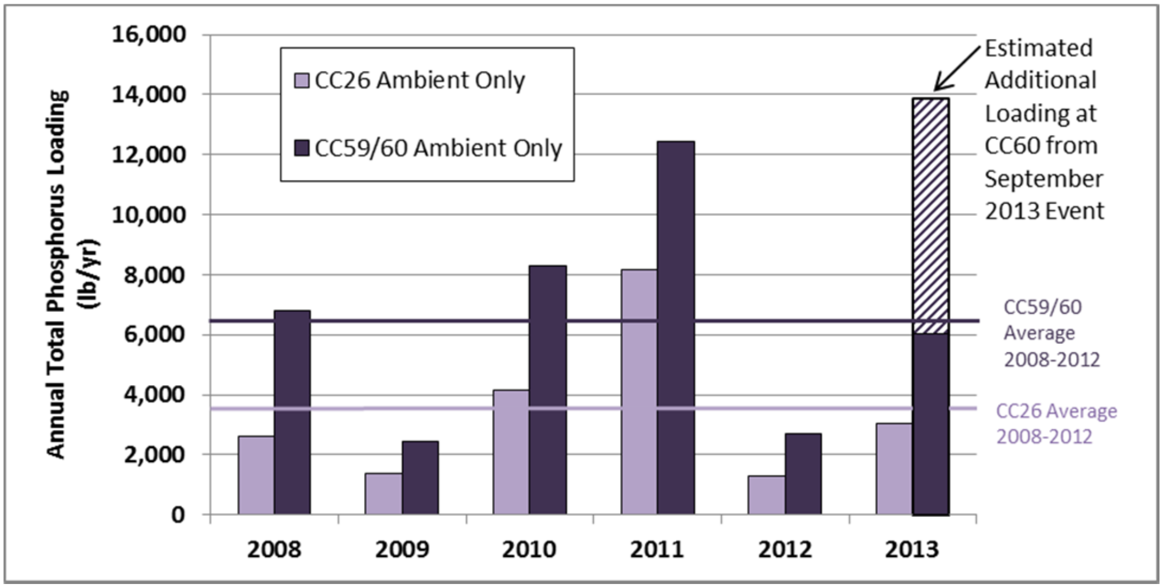

Figure 37. Annual Total Phosphorus Loading Estimates in the Upper Basin, 2008-2013

Volume-weighted concentrations (annual load divided by annual volume) of TP at CC26 and CC59/60 are presented in Figure 38 for 2008-2013. Both CC59/60 annual TP loading estimates (one based only on ambient sampling data and one including September storm event sampling data) were used in this calculation. Again, recognizing the uncertainty in the storm loading estimate, the purpose of performing the calculation with the storm event sampling data included was to demonstrate, in terms relative magnitude, the significance of the September event on the average volume-weighted TP concentration for the year. By this rough estimate, the runoff from the September event increased the annual average volume-weighted TP concentration by approximately 20 µg/L at CC59/60.

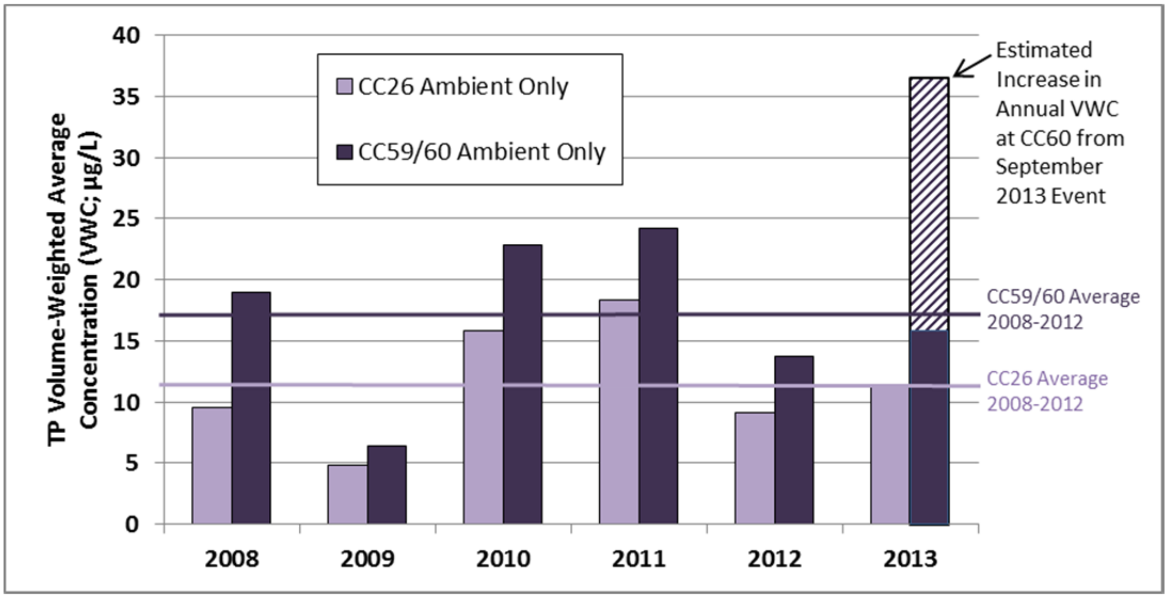

Figure 38. Volume-Weighted Total Phosphorus Concentration Estimates in the Upper Basin, 2008-2013

D. Total Nitrogen

Figure 39 presents ambient total nitrogen concentrations observed in the Upper Basin for 2013 based on grab samples and 24-hour composite autosampler data. Data from both stations follow the same general seasonal pattern, with lower concentrations during the summer months, and higher concentrations during the winter and early spring. The maximum non-storm-event concentration was observed at CC26 on 4/15/2013; the maximum concentration at CC60 was observed on 5/19/2013, coincident with the peak TSS and TP concentrations.

No grab sample or ambient autosampler measurements were made during the extended September precipitation event or over the following month when water levels were elevated during the falling limb of that major event. At CCAS59, however, samples were collected by the event autosampler on the early rising limb of the major event on September 9 and September 10. TN concentrations from those samples were 4,130 µg/L and 2,000 µg/L, respectively. These values are comparable to or higher than the average of the storm event sample TN results collected at CC59 between 2008 and 2012 (1,999 µg/L TSS).

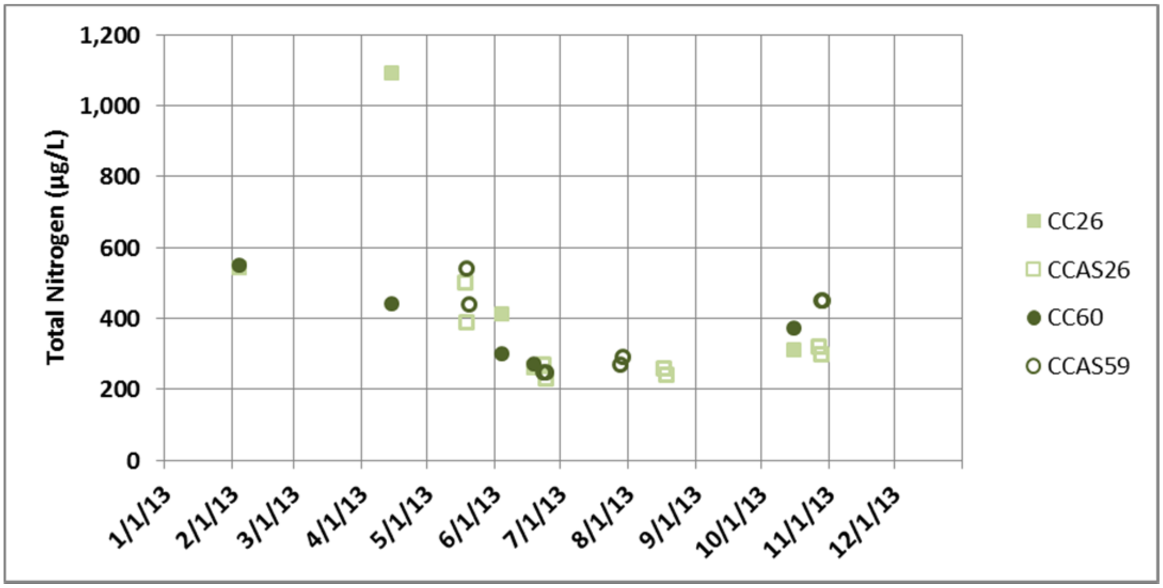

Figure 39. Total Nitrogen Concentrations (Non-Event) in the Upper Basin, 2013

The temporal pattern for 2013 ambient TN concentration data is consistent with previous years (lower in summer and higher in winter), as shown in Figure 40. However, the maximum observed ambient concentrations at CC26 (in April) was higher in 2013 than in the previous five years.

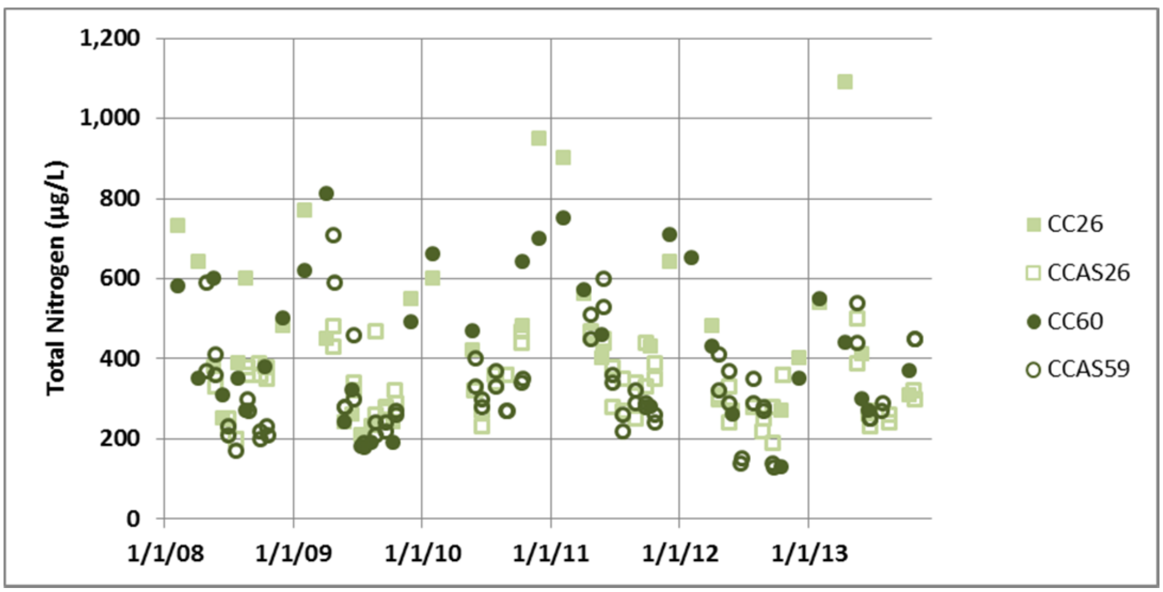

Figure 40. Total Nitrogen Concentrations (Non-Event) in the Upper Basin, 2008-2013

A comparison of monthly average TN concentrations at CC59/60 for 2013 and the 2008-2012 average is provided in Table 3. These non-storm-event results for TN from 2013 all fall within observed ranges from the previous five years.

Table 3. Monthly Average Total Nitrogen Concentrations (Non-Event) in the Upper Basin at CC59/60

Month	2013 TN (µg/L)	2008-2012 Average and Range of TN (µg/L)	% Change in 2013
February	550*	652 (580-750)	-16%
April	440*	502 (320-810)	-12%
May	490	401 (240-600)	+22%
June	268	304 (140-530)	-12%
July	280	263 (170-370)	+7%
October	423	291 (130-640)	+46%

*Average based on one observed value.

Non-storm-event TN loading at CC26 and CC59/60 were calculated for 2013 and compared to estimates from 2008-2012. Annual TN loads calculated with ambient sample data are presented as solid bars in Figure 41. Because no grab or ambient autosampler TN data were available for the period from September 9 through October 16, calculations of loads from ambient sample data alone are not expected to adequately represent the loading through this extended runoff period.

Another estimate of 2013 annual TN loading was calculated for CC59/60 in an attempt to better represent concentrations of TN from September 9 through mid-October. Specifically, storm-event triggered sample data from CC59 from early in the September event were combined with the ambient sample data[9]. The increase in annual TN load due to inclusion of this storm event data, as described, are shown on Figure 41 in the hatched area for CC59/60 for 2013. The estimate of TN loading shows that the September event may have added roughly 30 tons of additional TN loading at CC59/60, increasing the estimated annual load by a factor of nearly six in 2013.

As noted in preceding discussions for TSS and TP, there are many possible approaches and assumptions that could be applied to develop an estimate of loading during this extended event from the limited available data. As such, there is significant, unquantifiable uncertainty associated with this estimate. Recognizing this uncertainty, the intent of including this calculation is to represent, in a relative sense, the magnitude of additional loading. The same calculations were not performed for CC26, since no storm event samples were taken at that location. The effects of the storm on loading at CC26, however, are expected to be lesser than those at CC59/60 based on relative flow differences during the event at those locations (Figure 28).

[9] The TN concentration from a storm event sample at CC59 from September 9, 2013 was applied to replace the ambient concentration value for that date. A second storm event sample was collected at CC59 on September 10, 2013. The TN results from that sample was applied as a constant value for a period of four days (September 10-13), then reduced linearly over the next ten days to the ambient concentration. As such, the storm-event concentrations were applied (as described) for a total period of 15 days, starting on September 9. There were no other storm event samples collected at this location during the rising or falling limb of the event for use in developing this estimate.

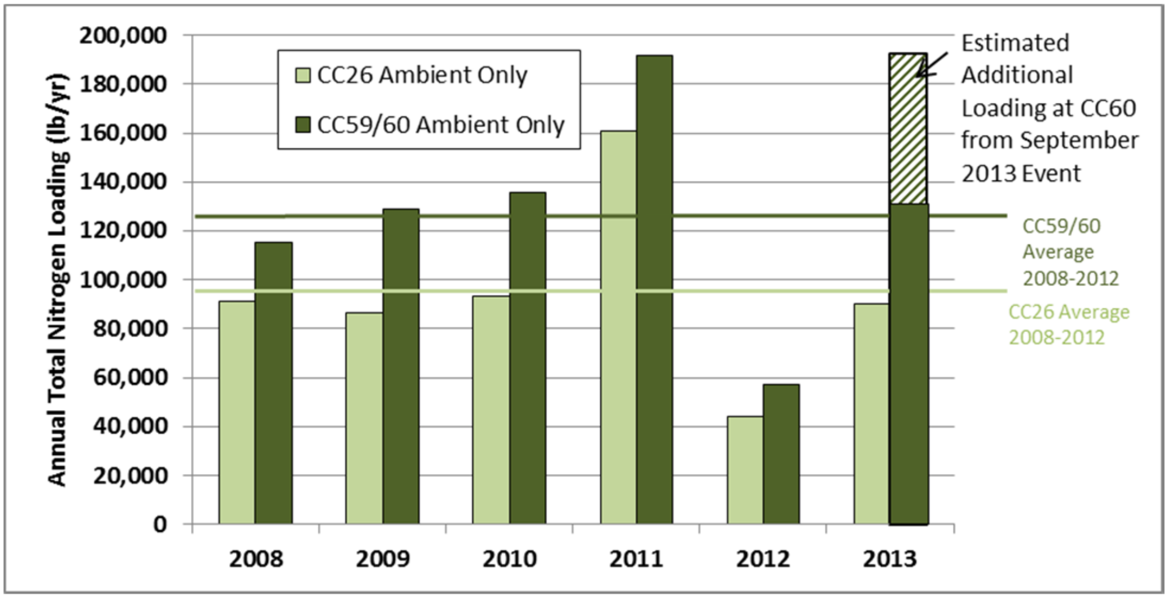

Figure 41. Total Nitrogen Loading Estimates in the Upper Basin, 2008-2013

Volume-weighted concentrations (annual load divided by annual volume) of TN at CC26 and CC59/60 are presented in Figure 38 for 2008-2013. Both CC59/60 annual TN loading estimates (one based only on ambient sampling data and one including September storm event sampling data) were used in this calculation. Again, recognizing the uncertainty in the storm loading estimate, the purpose of performing the calculation with the storm event sampling data included was to demonstrate, in terms relative magnitude, the significance of the September event on the average volume-weighted TN concentration for the year. By this rough estimate, the runoff from the September event increased the annual average volume-weighted TN concentration by approximately 160 ug/L (a 46% increase) at CC59/60.

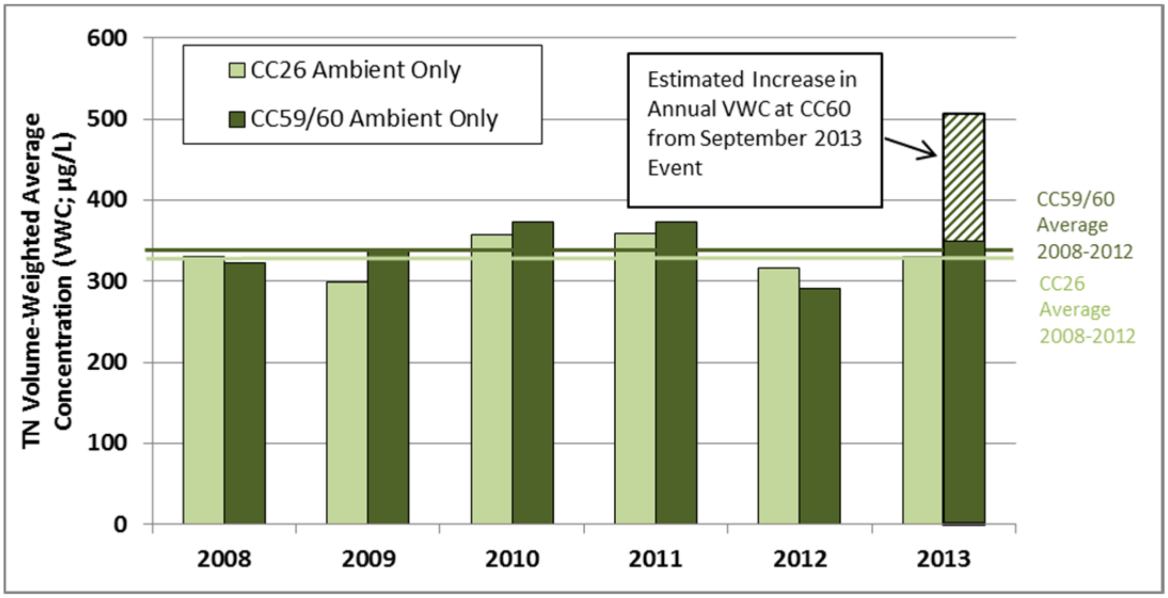

Figure 42. Volume-Weighted Total Nitrogen Concentration Estimates in the Upper Basin, 2008-2013

E. Effects of Storm Events on Loading

The ambient loading calculation results presented in the preceding subsections incorporate grab samples and ambient autosampler data, both of which are taken at regular intervals, and are not intended to capture the water-quality response to storm events. Estimates of ambient loading in the previous subsections also attempted to account for the historic runoff event that extended from September 9 through October on the hydrograph. Other event-triggered autosampler data from smaller precipitation events are not included in the annual loading estimates presented in the preceding subsections. As discussed in the 2012 Clear Creek/Standley Lake Annual Report, even events much smaller in scale than the September 2013 extended rainfall event can substantially increase annual nutrient loading.

In 2013, five event-triggered samples were collected at CCAS59. Two separate flow-composite samples were taken from a storm event spanning the dates 7/12/13 - 7/14/13, one flow-composite sample was taken over the course of an hour on 8/24/13 in response to steady rains over the previous three days, and two flow-composite samples were taken in the late night of 9/9/13 and early morning of 9/10/13. Event samples with elevated turbidity are submitted to a commercial analytical laboratory for nutrient analyses. Analytical results for three event samples for TP are considered suspect. The basis for designation of these sampling results as suspect is from review of the relationship between TP and turbidity. The relationship was sharply different for most storm event samples in 2013 as compared to storm event samples from the Upper Basin in previous years (Figure 43). In 2014, the commercial lab will use two methods to test the event samples for TP (colorimetric and ICP) to help assess this issue.

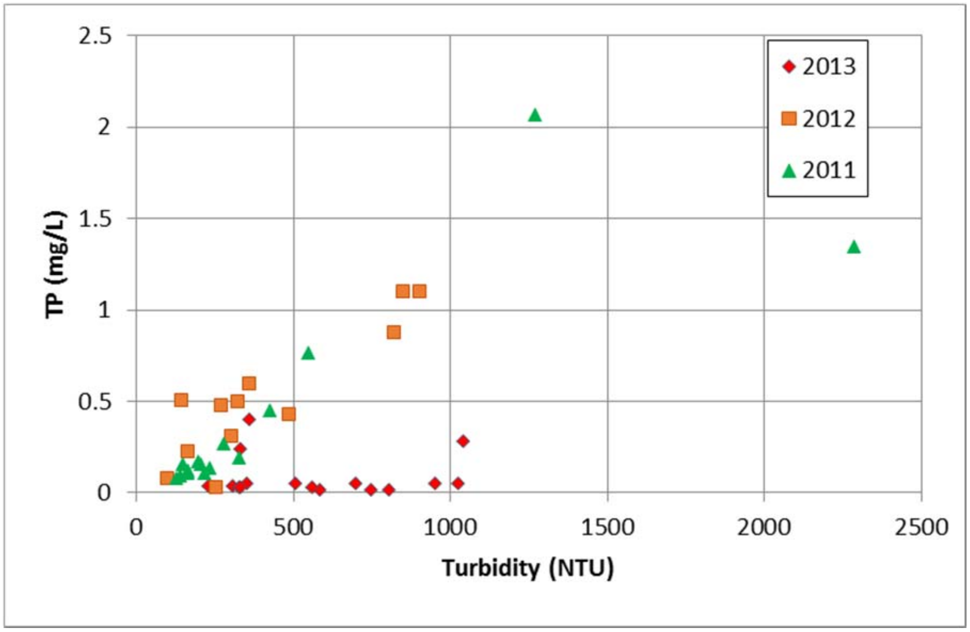

Figure 43. TP and Turbidity Data from Storm Event Samples in the Upper Basin, 2011-2013

These samples are invaluable measures of the water-quality response to storm events in the Clear Creek basin, but it is important to remember that they do not represent all of the storm events of 2013. As such, estimates of loading from these events estimate only part of the additional annual loading attributable to storm events.

Water quality measured in the event samples were applied to estimate loading (assume one day duration of concentrations for smaller events; assume extended [total of 15-days] influence as described in Section IV.B, IV.C, and IV.D for the September event). The results indicate an increase in annual loading estimates at CC59/60 (over ambient loading estimates) of 50% for TN, 143% for TP (suspect results excluded), and 469% for TSS. The vast majority of this additional load is attributable to estimates for the historic storm event affecting the hydrograph from September 9 through mid-October. The effects of the smaller storm events are more apparent in the estimated increases in monthly loading, with the greatest effect on percent increases in TSS in all cases. Table 4 presents a summary of the increase in TN, TP, and TSS loading on an annual basis and a monthly basis for the events sampled in 2013 at location CCAS59.

Table 4. Effect of Storm Events on Annual and Monthly Loading with 2013 Event Autosampler Data at CCAS59

Time Period	Increase in TN Loading with Storm Events	Increase in TP Loading with Storm Events	Increase in TSS Loading with Storm Events
2013 (Annual Load)	50%	143%	469%
July 2013 (Monthly Load)	41%	127%	444%
August 2013 (Monthly Load)	15%	n/a*	43%
September 2013 (Monthly Load)	238%	1058%	7745%

*TP Results from August storm event sample considered suspect.

Figure 44 presents a comparison of TN, TP, and TSS estimated annual loads with and without available storm event data for 2013 at CCAS59. This figure reflects the same results as the annual percent-difference summary values in Table 4. Annual TN, TP, and TSS loads all increase with inclusion of storm events, and the majority of this increase in 2013 is attributable to increased loading from the September event. The greatest relative increase in loading for storm events is for TSS. As noted above, there were other storms during 2013 that were not sampled, so it is expected that additional unmeasured TN, TP, and TSS load flowed past CC59/60. These general findings about the significance of storm events in annual loads are consistent with the results reported in the 2011 and 2012 Clear Creek/Standley Lake Annual Reports.

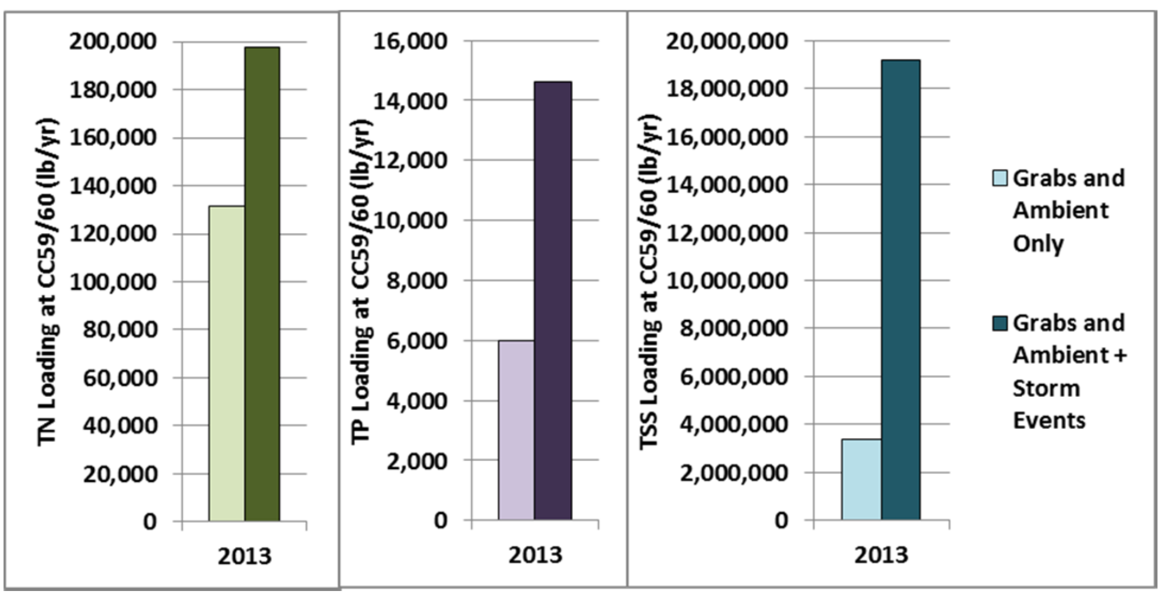

Figure 44. Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loading in 2013, With and Without Storm Events

(Note: "Grab and Ambient Only" values are based on ambient data only and do not include any storm data, even through the September event. These correspond to the solid- colored (not hatched) bars on Figure 33, Figure 37, and Figure 41.)

V. Standley Lake Inflow, Outflow, and Contents

In this Section, inflow to and outflow from Standley Lake are described, along with lake storage records for 2013. Hydrologic data are provided to support subsequent Section discussions of loading to and water quality in Standley Lake. Results are presented for 2013 and compared to the recent five years for perspective. Water enters Standley Lake through four managed sources (see Figure 9): the Church Ditch, the Croke Canal, Farmers' High Line Canal (FHL), and the Kinnear Ditch Pipeline (KDPL).

Figure 45. View West across Standley Lake

Figure 46 presents a hydrograph of the inflow to Standley Lake in 2013 by source. Delivery periods for each source are apparent in the figure. Outside of the storm-influenced period in September, typical temporal inflow patterns occurred. The Croke Canal has the most senior rights in the Clear Creek Basin during the non-irrigation season (November – March) and typically provides the majority of the inflow to Standley Lake during that time period. This was also the case in 2013. FHL, which is very high in the priority order during the irrigation season, is typically the dominant source of inflows to Standley Lake from April-October. Both of these typical operational patterns occurred in 2013.

During the historic September 2013 precipitation event, a measured total of 3,783 AF of water entered the Standley Lake from the Canals (primarily from the Croke and FHL) between September 9 and September 17, 2013. At the start of the rainfall event in the Upper Basin, on September 9, 2013, water was flowing to Standley Lake via FHL, Church Ditch, and KDPL. By the height of the event, all major canals headgates were closed, though water from the small canal drainage areas kept canals running, with bank full conditions observed at the peak of the event. Between September 9 and September 17, 2013, the Standley Lake water balance estimates that unmeasured inflows, likely consisting primarily of overland runoff from Standley Lake's relatively small local watershed, totaled 668 AF (roughly 1.6% of the total capacity of Standley Lake).

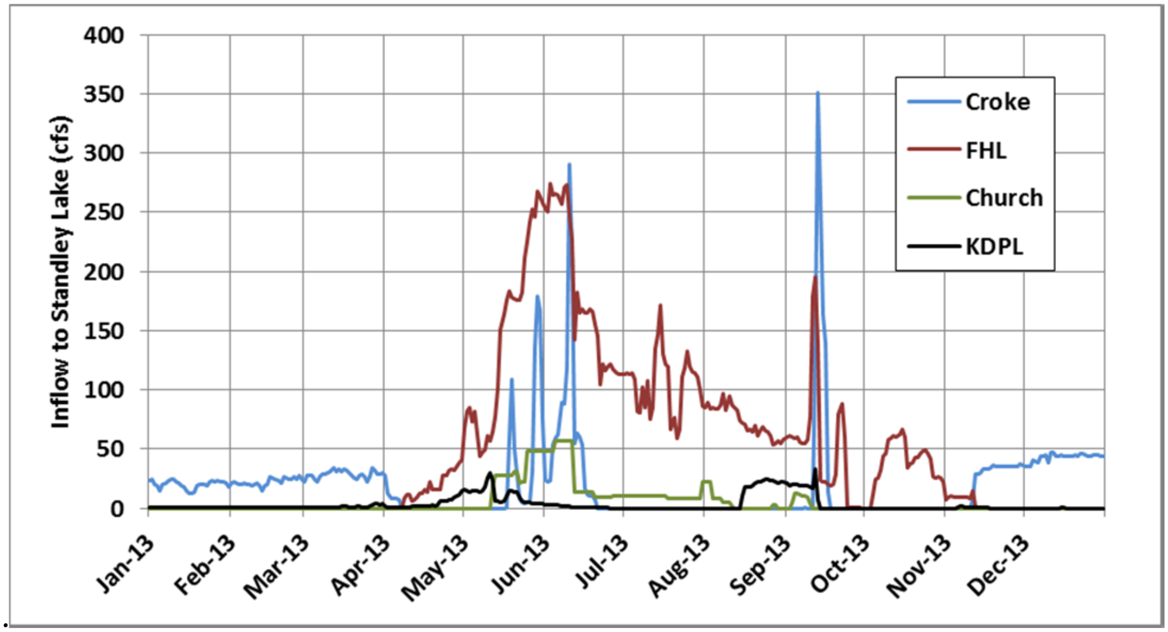

Figure 46. Hydrograph of Inflow to Standley Lake, 2013

Figure 47 presents a hydrograph of outflow from the lake in 2013, with the largest net outflow volumes occurring in June and August. Releases during the historic September precipitation event were reduced to roughly 50 to 100 AF/day to provide some downstream flood control support. In all, Standley Lake contents increased 3,645 AF between September 9 and September 17, 2013, or roughly 8.5% of total capacity.

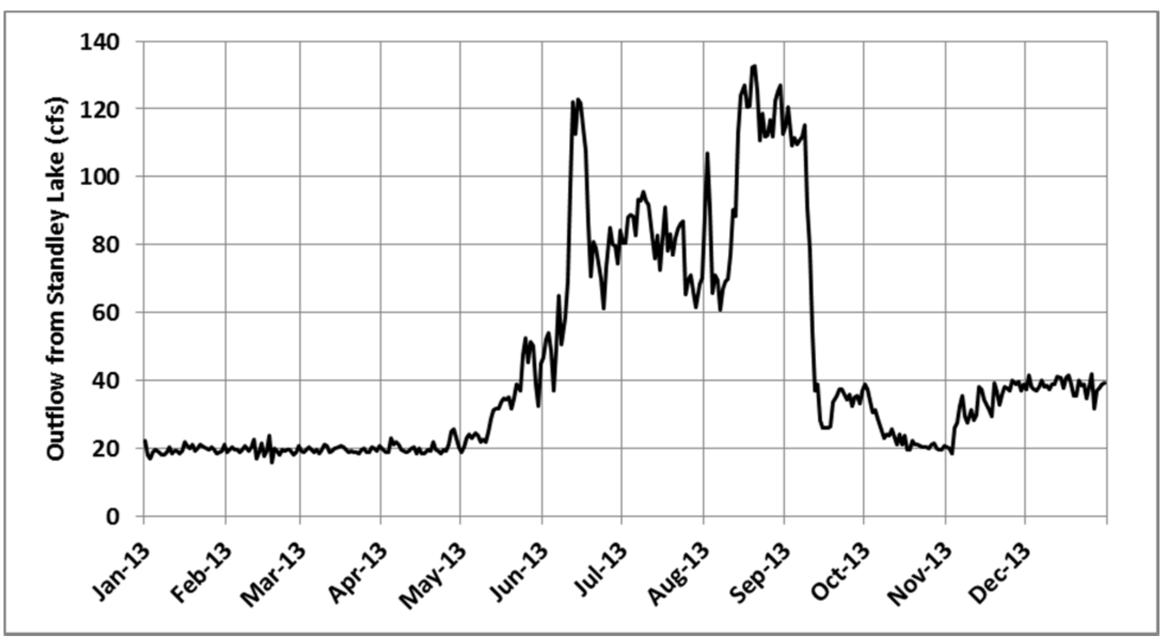

Figure 47. Hydrograph of Outflow from Standley Lake, 2013

The annual inflow volume from each source for 2008-2013 is shown in Figure 48. Relative percent contributions from each canal in 2013 were nearly identical to the 2008-2012 averages, though total volumes were higher. Inflow volumes from Church Ditch, the Croke, and FHL were the highest of the recent six year period.

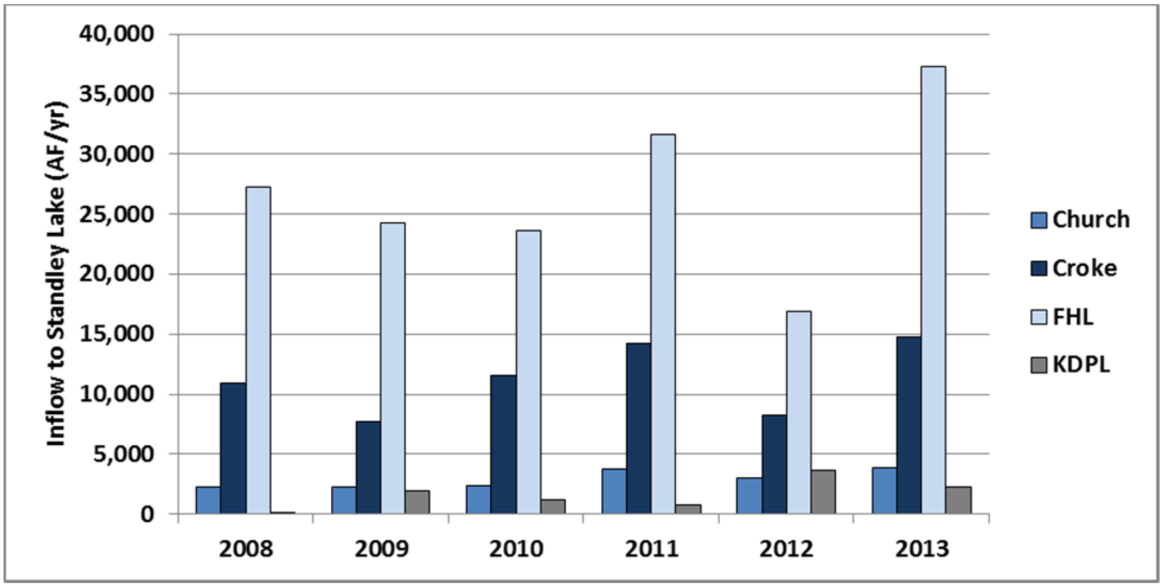

Figure 48. Annual Inflow to Standley Lake by Source, 2008-2013

The total measured annual inflow (all four sources combined) and outflow volumes for these years are presented in Figure 49. The total inflow volume in 2013 was 47% higher than the 2008-2012 average. Outflow, however, was 18% lower than the 2008-2012 average, yielding a net increase in contents in 2013.

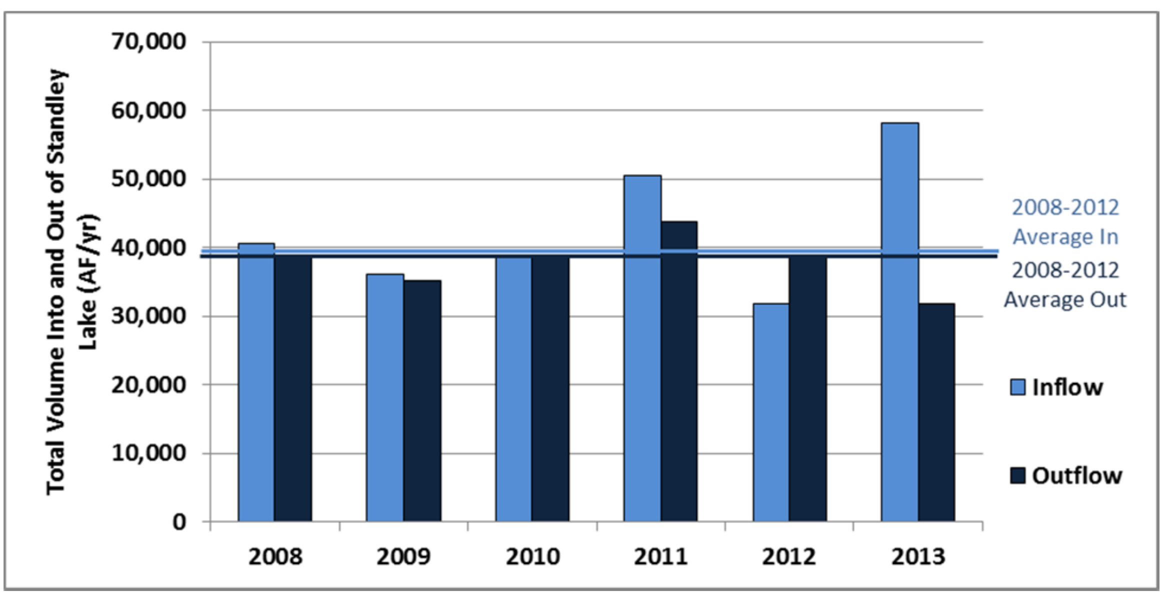

Figure 49. Total Measured Annual Standley Lake Inflow and Outflow, 2008-2013

The daily volume records for Standley Lake for 2013 and previous years are presented in Figure 50. The volume was calculated using gage-height measurements and elevation-area-volume data for the lake. Because of dry conditions in 2012, the lake volume started out much lower in 2013 than in the previous five years. However, the lake contents from mid-May to early September 2013 closely mirror 2011 conditions, with the lake filling by mid-June. Withdrawal from the lake was lowering water levels in August, but inflows over a period of nine days during the historic precipitation event in September increased water levels by 3,645 AF. Standley Lake contents ended the year higher than any of the recent five years, though overall the annual average 2013 lake volume was 3% lower than the 2008-2012 average.

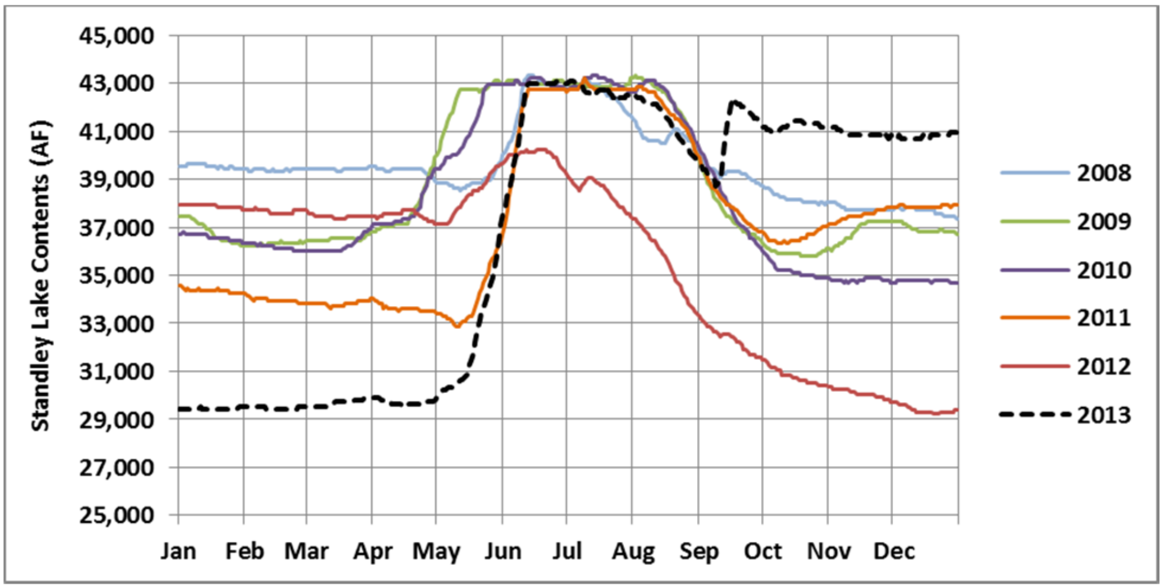

Figure 50. Standley Lake Volume, 2008-2013

VI. Loading Into and Out of Standley Lake

This section describes estimates of nutrient loading into and out of the lake. Loads are calculated using inflow ambient grab samples, 24-hour ambient autosampler data, and autosampler data from first-flush startup of deliveries, where available. To compute the loads, daily concentrations were filled using a mid-point step function between the available sample data. An indication of the effects of storm events on loading is assessed with available data from those event-triggered autosamplers

A. Total Phosphorus

Total phosphorus loading into Standley Lake is presented in Figure 51 by source for 2008-2013. As noted above, this presentation of loading includes ambient samples and autosampler results from first-flush startup of deliveries. The data include one pair (two back-to-back 24-hour autosampler runs) of first-flush samples each for the Croke and FHL, and one sample for Church Ditch. No first-flush type samples were collected for KDPL. The canals which contributed the greatest volumes of water to Standley Lake, the Croke and FHL (Figure 48), correspondingly delivered the largest TP loads, matching relative patterns seen in the previous five years. Note that inclusion of the first flush samples changed annual loading values for TN and TP by less than 3% in all cases in 2013.

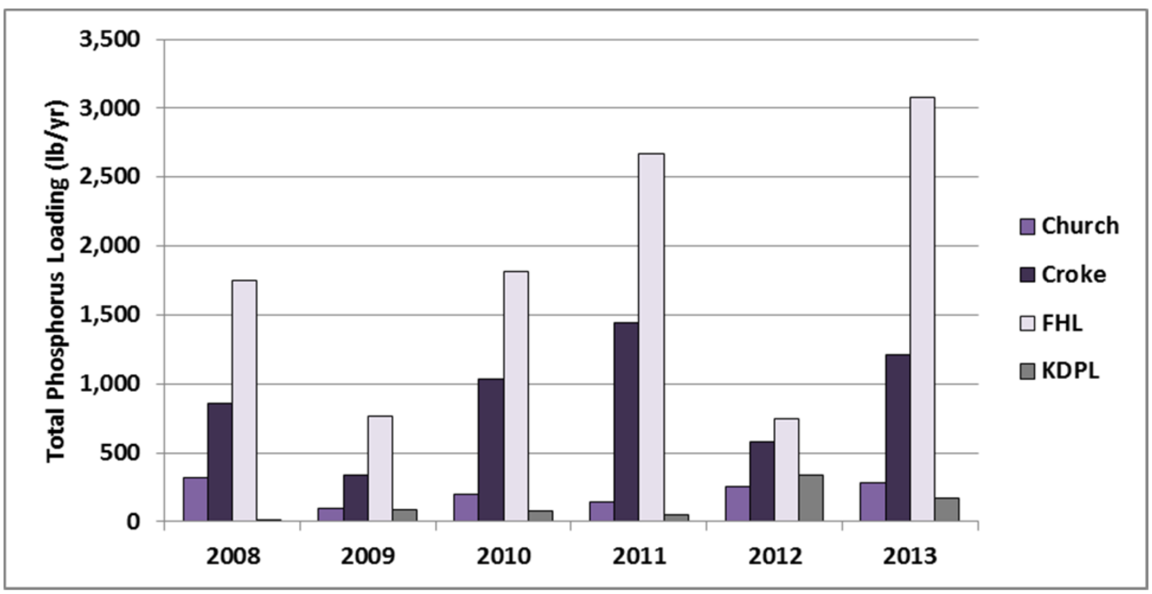

Figure 51. Total Phosphorus Loading into Standley Lake by Source, Using Grab Samples and 24-Hour Ambient Autosampler Data, 2008-2013

Estimated annual TP loadings into and out of Standley Lake for 2008-2013 are presented in Figure 52. The 2013 non-storm-event TP loading into the lake was 75% above the 2008-2012 average, and the outflow was 7 % below the 2008-2012 average.

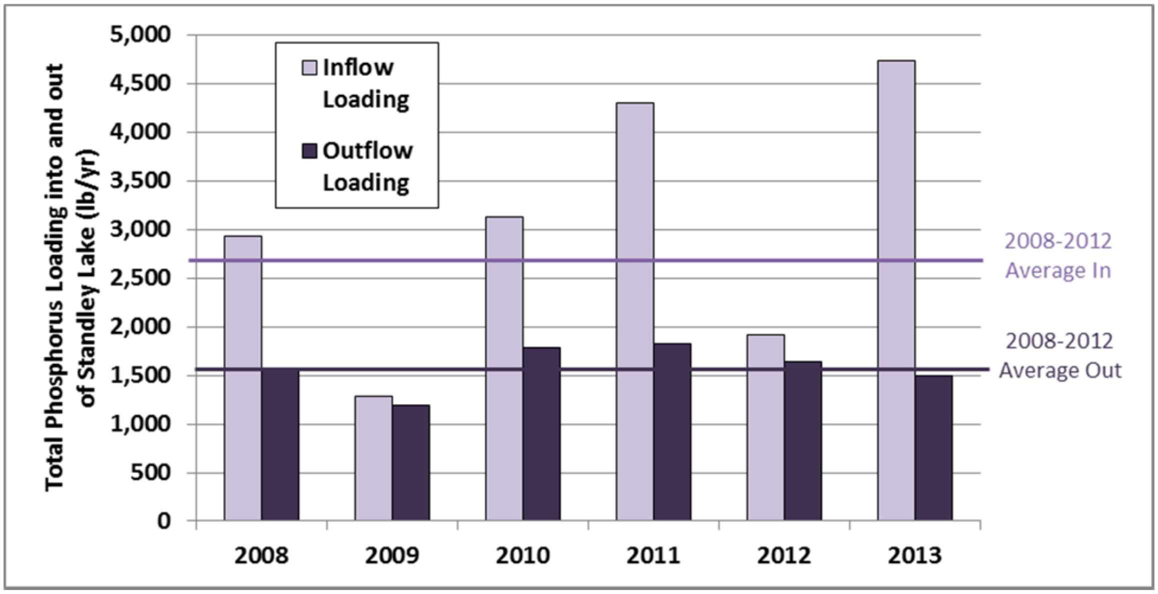

Figure 52. Total Phosphorus Loading into and Out of Standley Lake, 2008-2013

The volume-weighted TP concentrations into Standley Lake are presented in Figure 53 by source. The non-storm-event volume-weighted TP concentrations were similar across all the canals in 2013, and 22% above the 2008-2012 average.

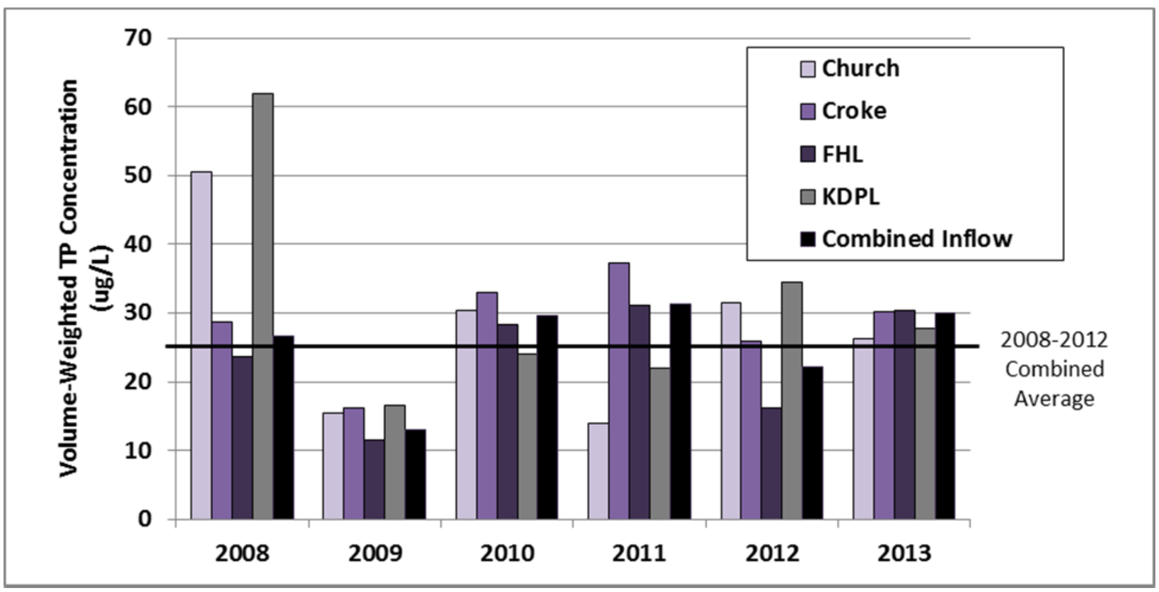

Figure 53. Volume-Weighted Total Phosphorus Concentrations into Standley Lake, 2008-2013

In 2009, a by-pass project was implemented in Church Ditch with the aim of reducing its high nutrient concentrations. As more data become available, the analysis of the success of that project is updated in this annual report. Monthly volume-weighted TP concentrations in Church Ditch for 2005-2013 are provided in Figure 54. The median volume-weighted TP concentrations have decreased by 44% comparing 2005-2008 to 2009-2013. The statistical significance of this decrease was tested using a one-sided, two-sample Kolmogorov-Smirnov test[10]. The test results indicate a 99.9% probability that there has been a decrease in TP concentrations since implementation of the by-pass project, further confirming findings presented in the 2012 annual report. The result is the same even if the two highest values of TP observed in 2008 are excluded.

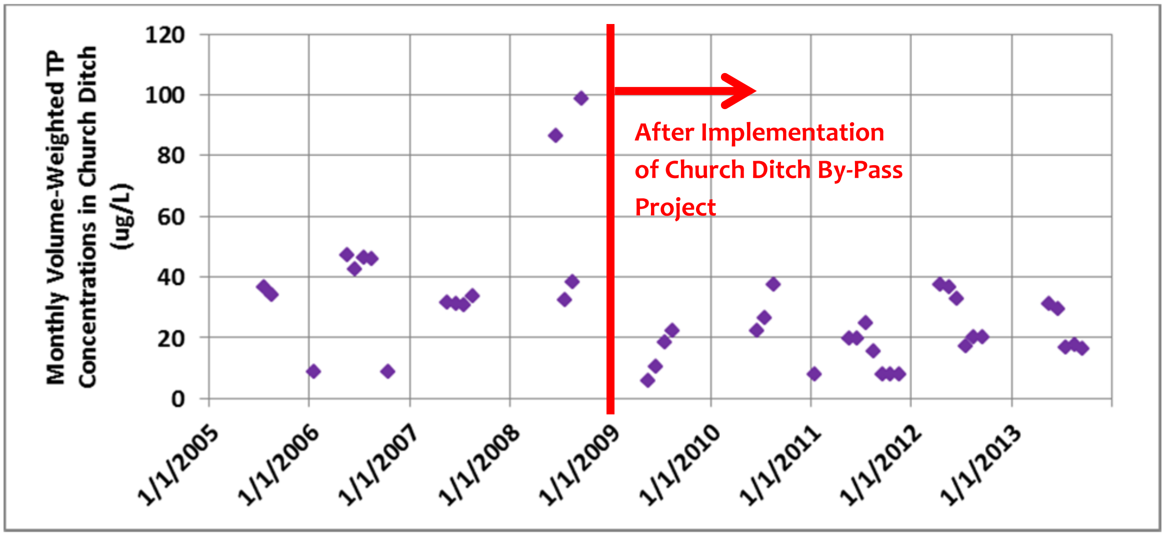

Figure 54. Volume-Weighted Average Total Phosphorus Concentrations in Church Ditch, 2005-2013

B. Total Nitrogen

Total nitrogen loading into Standley Lake, based on ambient sampling and first-flush startup of delivery samples, is presented in Figure 55 by source. Combined TN loading into and out of the lake is presented in Figure 56. The relative pattern of loading by source was the same as that seen in 2008-2012, though total nitrogen loading into the lake was 58% higher in 2013 than the 2008-2012 average. The 2013 outflow total nitrogen load was 14% below the 2008-2012 average.

[10] A one-sided, two-sample Kolmogorov-Smirnov test is a nonparametric statistical test of two datasets that assesses a null hypothesis that one dataset is greater in magnitude than the other dataset.

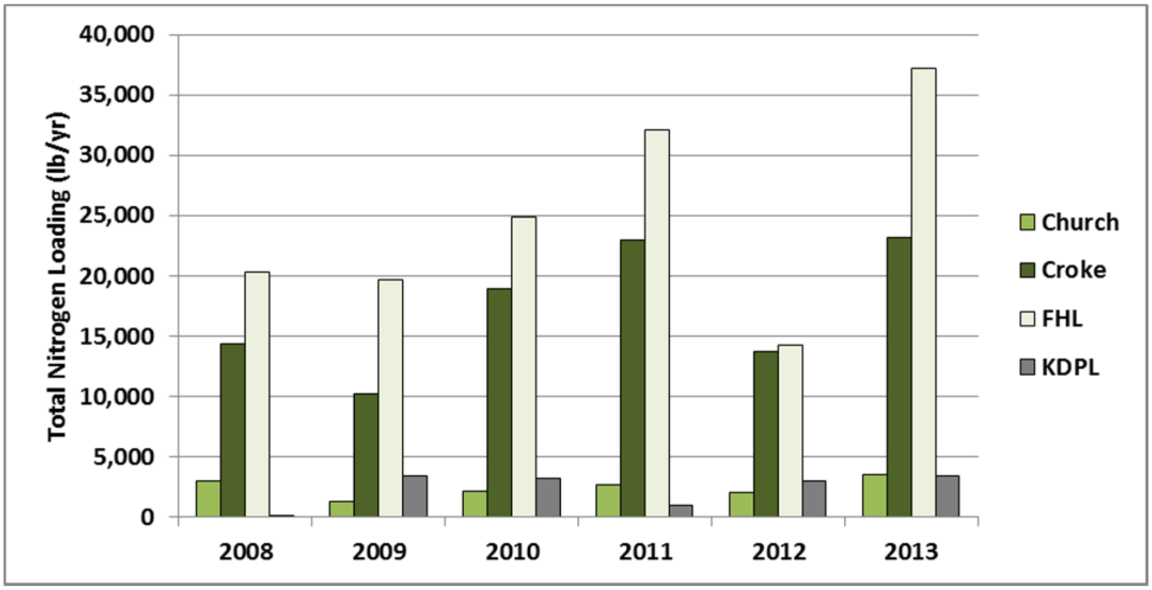

Figure 55. Total Nitrogen Loading into Standley Lake by Source, 2008-2013

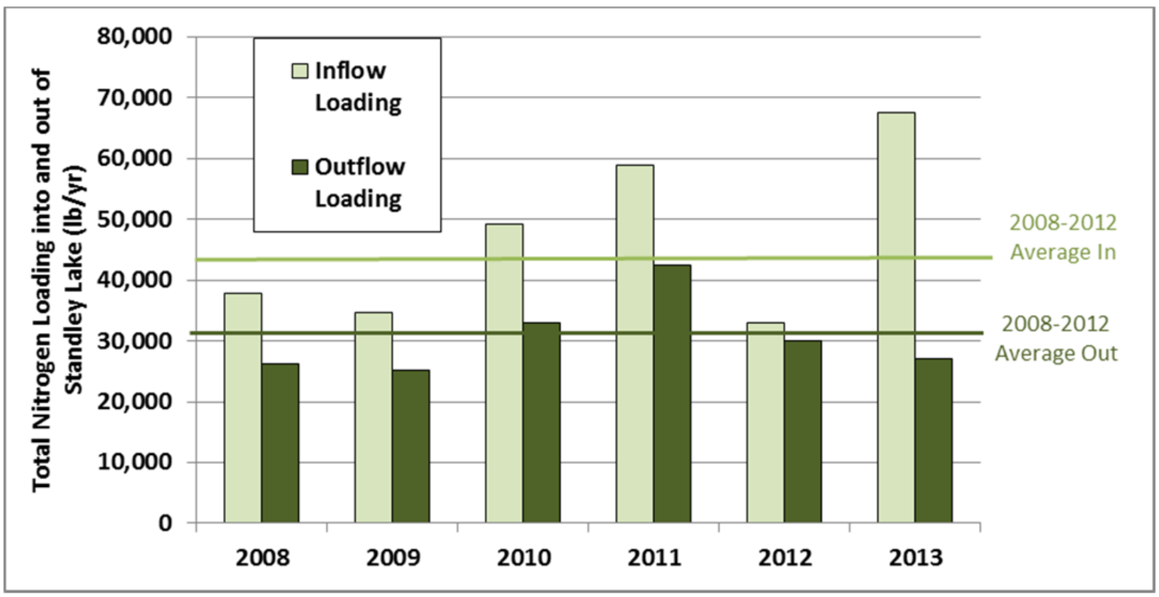

Figure 56. Total Nitrogen Loading into and Out of Standley Lake, 2008-2013

Volume-weighted total nitrogen concentrations into the lake are presented in Figure 57. The combined average from all sources in 2013 was 8% higher than the combined average for 2008-2012.

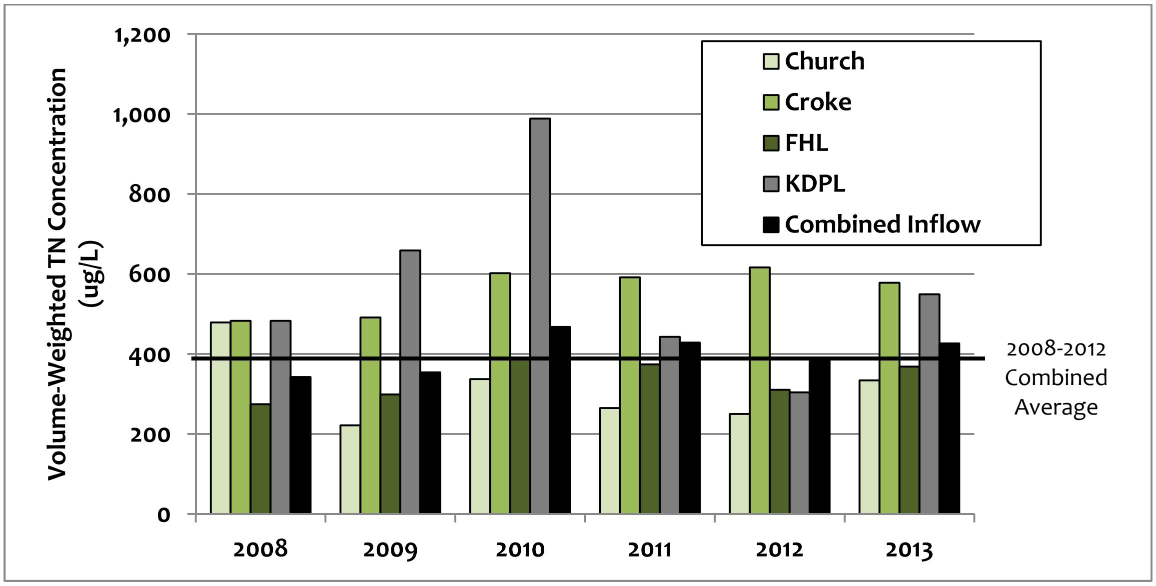

Figure 57. Volume-Weighted Total Nitrogen Concentrations into Standley Lake, 2008-2013

Volume-weighted TN concentrations in Church Ditch for the period 2005-2013 are presented in Figure 58. As seen above with TP concentrations, the volume-weighted TN concentrations in Church Ditch are lower beginning in 2009, coinciding with the implementation of the by-pass project. The median volume-weighted TN concentrations have decreased by 43% comparing 2005-2008 to 2009-2013. The statistical significance of this decrease in TN was tested using a two-sample Kolmogorov-Smirnov test[11]. As seen for TP, the test results indicate a 99.9% probability that there has been a decrease in TN concentrations since implementation of the by-pass project. The result is the same even if the two highest values of TN observed in 2008 are excluded.

[11] A one-sided, two-sample Kolmogorov-Smirnov test is a nonparametric statistical test of two datasets that assesses a null hypothesis that one dataset is greater in magnitude than the other dataset.

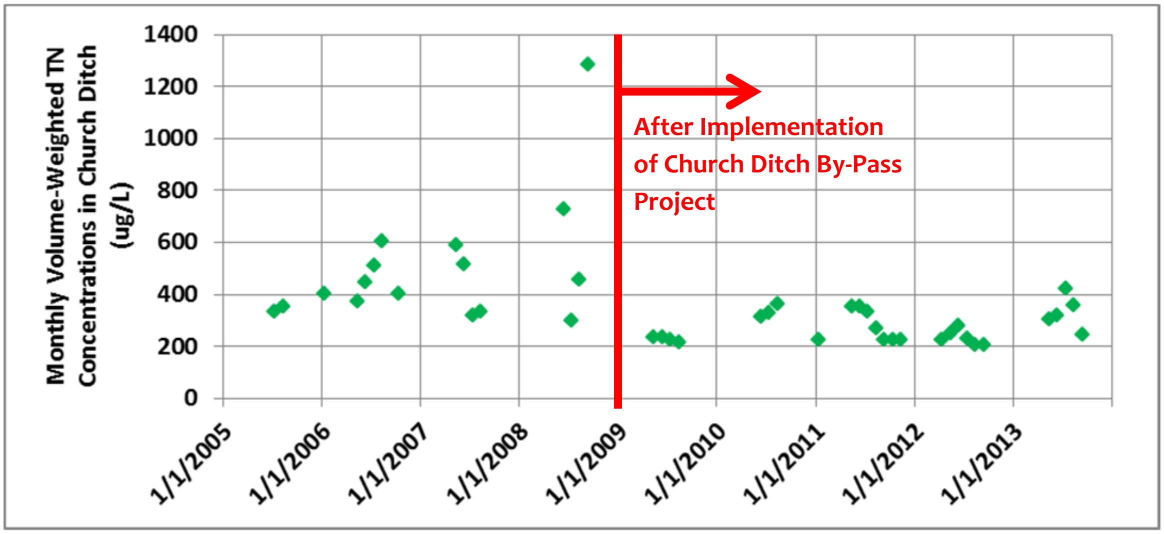

Figure 58. Volume-Weighted Average Total Nitrogen Concentrations in Church Ditch, 2005-2013

C. Effect of Storm Events on Nutrient Loading

The nutrient loads presented above were calculated using grab samples, ambient autosampler data, and autosampler data from delivery startup conditions, where available. Event-triggered autosampler data were not included in those calculations. In 2013, there were three days with event-triggered samples, all collected on FHL at the inflow location to Standley Lake (7/14/2013, 8/28/2013, and two samples on 9/10/13). The samples on 9/10/2013 were during the very early portion of the historic September precipitation event, three days before peak runoff and peak precipitation rates in the Upper Basin. As an indication of the effects of storm events on nutrient loading, TN and TP loads in 2013 were calculated for FHL with and without the events data. Storm event samples were assumed to represent conditions for the full 24-hour period on the sample date for the July and August events, and a total of five days (matching the period of higher flow rates in FHL) for the September event.

A comparison of nutrient loading into Standley Lake from FHL in 2013 with and without the sampled storm events taken into consideration is shown in Figure 59. The lighter bars in the figure represent the loading estimated excluding storm-event autosampler data. The darker bars represent nutrient loading that includes the events listed above. As a reminder, this figure shows the estimated effect on annual loads in FHL from three stormwater sampling events, but does not represent an estimate of the effect of all storm events in 2013. Incorporation of the observed storm events yields a 18% increase in 2013 TN loading from FHL and a 42% increase in TP loading. Similar calculations from 2012 data, presented in the 2012 Annual Report, showed 5% and 35% increases in TN and TP loading, respectively. Loading during storm events can be a significant fraction of the total annual load to Standley Lake.

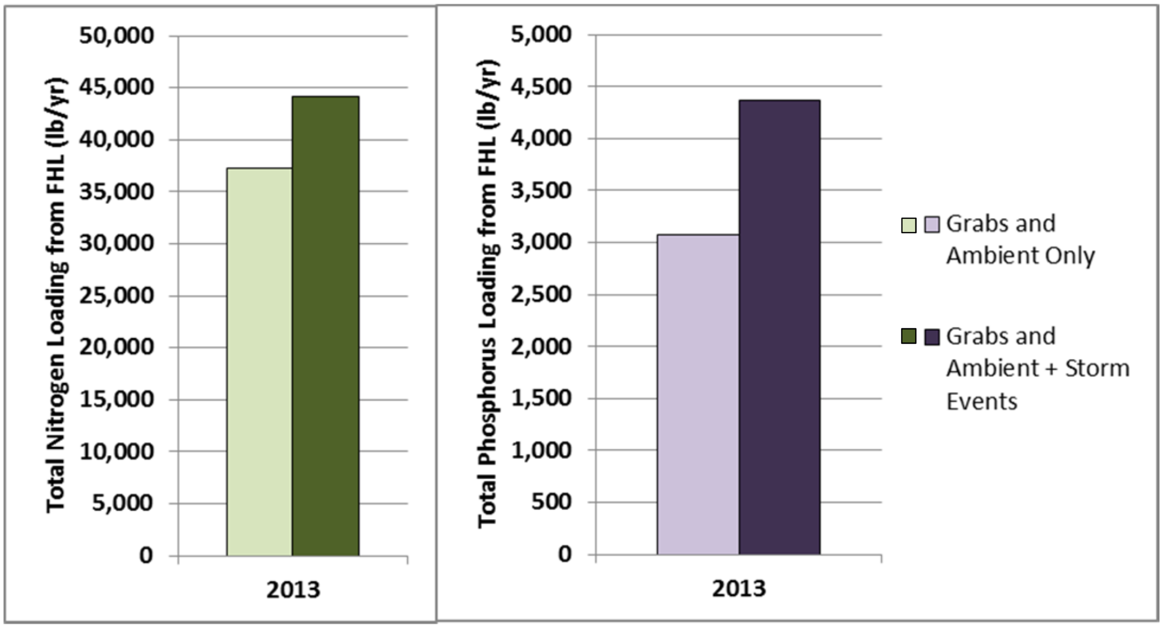

Figure 59. Nutrient Loading to Standley Lake from Farmers' High Line Canal in 2013, With and Without Storm Events

VII. Standley Lake Water Quality

Inflows, outflows, and the nutrient loads to Standley Lake were described in the previous sections. In this section, water-quality data in the reservoir are presented. The data considered here were measured at sampling location SL-10 (Figure 3). This analysis focuses on dissolved oxygen (DO), total phosphorus (TP), total nitrogen (TN), chlorophyll *a*, and clarity as measured by Secchi depth.

A. Dissolved Oxygen

Dissolved oxygen is an important water-quality parameter in the lake because it can affect algal growth, aquatic life, and drinking water treatment. Low dissolved oxygen at the sediment-water interface (i.e. the bottom of the lake) is of particular concern as it relates to internal loading of nutrients and release of certain metals from the sediment. Such releases can, in turn, lead to increases in water treatment costs and the potential for taste and odor events in drinking water.

Each year, Standley Lake experiences hypoxic (DO ≤ 2 mg/L) conditions in the hypolimnion, which is common for stratified reservoirs in Colorado. In 2013, hypoxic conditions started in mid-July. Hypoxic conditions in 2013 ended in early October during turnover, which is typical. An isopleth of dissolved oxygen concentrations in Standley Lake for March through November 2013 is provided in Figure 60.

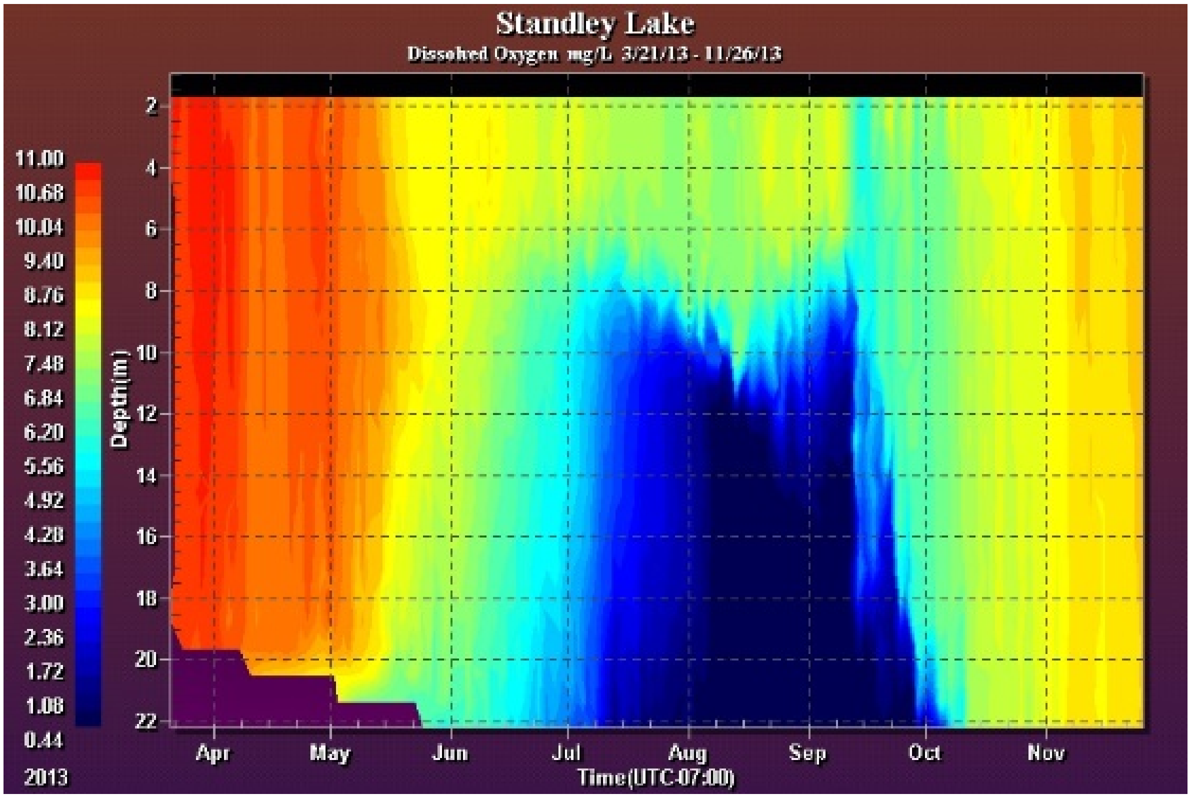

Figure 60. Isopleth of Dissolved Oxygen in Standley Lake, March-November 2013

A time-series presentation of dissolved oxygen concentrations at the top and bottom of Standley Lake in 2013 is provided in Figure 61. Concentrations at the surface largely reflect changing solubility of dissolved oxygen with changing water temperatures. One exception to this pattern at the top is apparent in September, at the time corresponding to the historic precipitation event. For several days, as shown on Figure 46, there were high inflows to the lake from the Croke and FHL. Additionally, there was overland inflow from the direct watershed. This large influx of water was likely well-oxygenated; yet, there was a drop in dissolved oxygen at the top of the reservoir at this time. This drop is expected to reflect some vertical mixing with hypoxic water in the hypolimnion, induced by the kinetic energy of the inflow. This effect during the historic precipitation event in September 2013 is also apparent in the dissolved oxygen isopleth (Figure 60). Further supporting an effect on vertical mixing by the September event are the turbidity data. Figure 62 presents the March-November isopleth of turbidity in the lake, and the signal of the highly turbid storm inflows are apparent diving into the stratified lake to a depth of 16+ m, presumabley due to inflow temperatures.

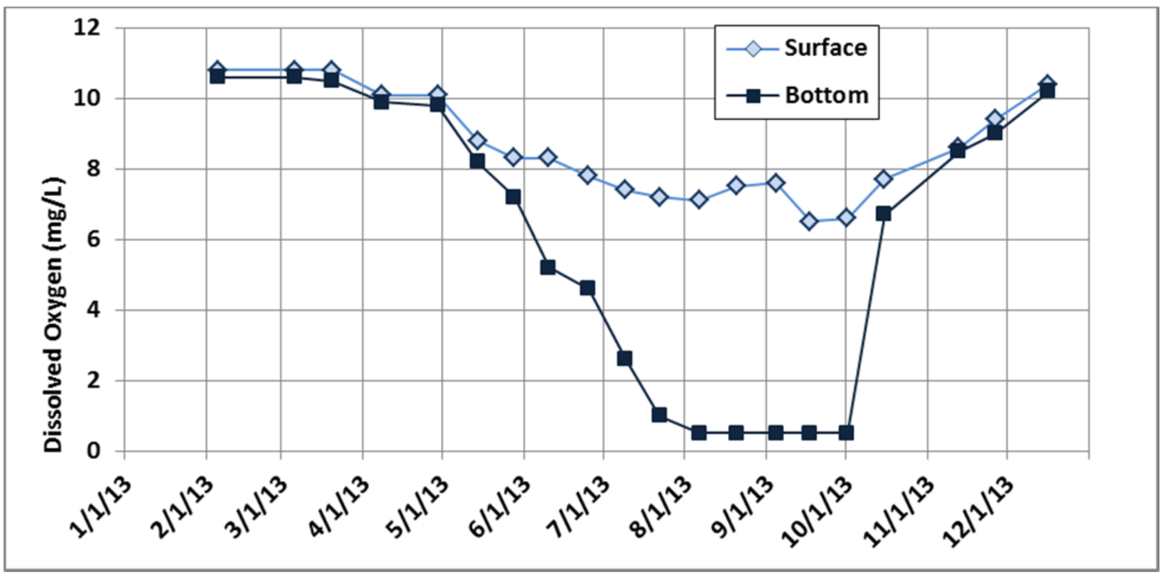

Figure 61. Dissolved Oxygen Concentrations in Standley Lake, 2013

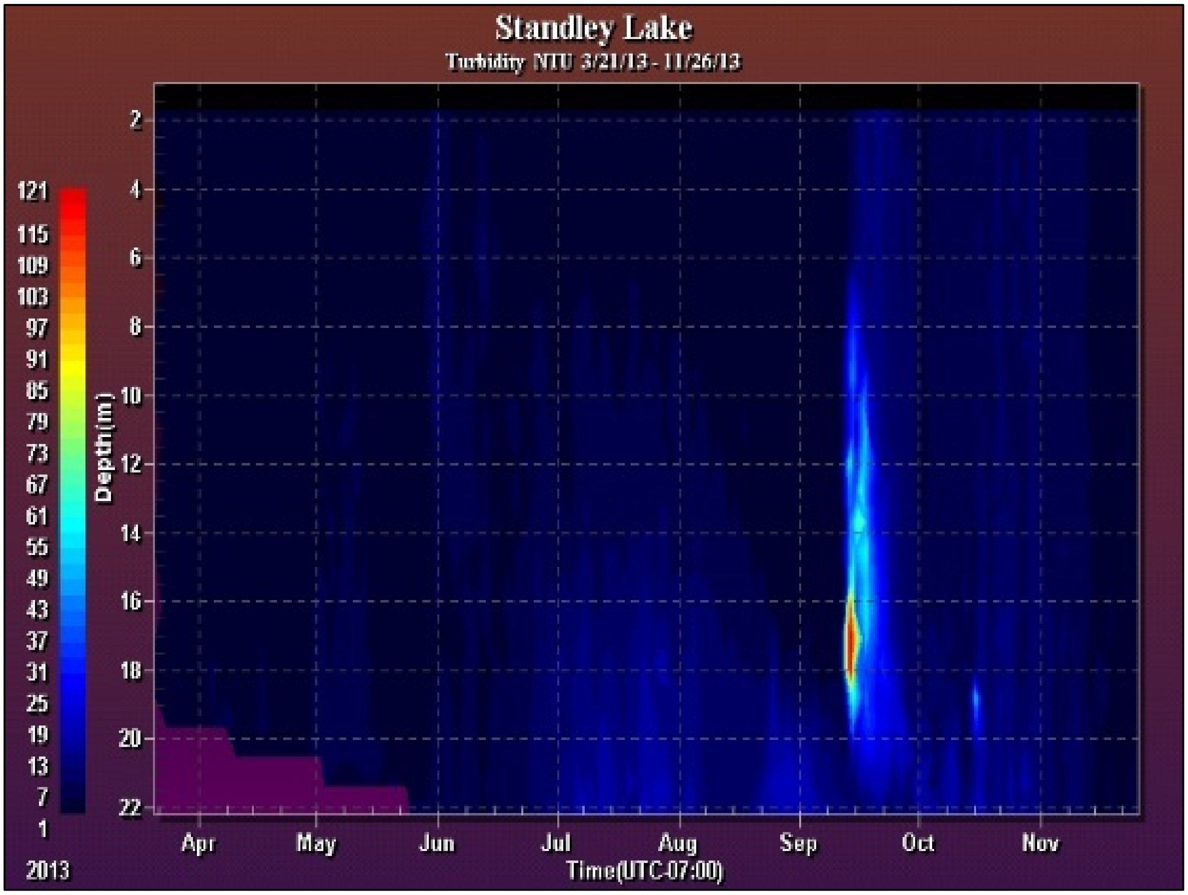

Figure 62. Isopleth of Turbidity in Standley Lake, March-November 2013

At the bottom of the reservoir, decay of organic matter in the water column and sediment oxygen demand result in decreased dissolved oxygen concentrations throughout the period of stratification. Concentrations increase sharply with mixing at fall turnover. The 2013 seasonal dissolved oxygen patterns closely matches those observed in previous years in Standley Lake, as shown in Figure 63.

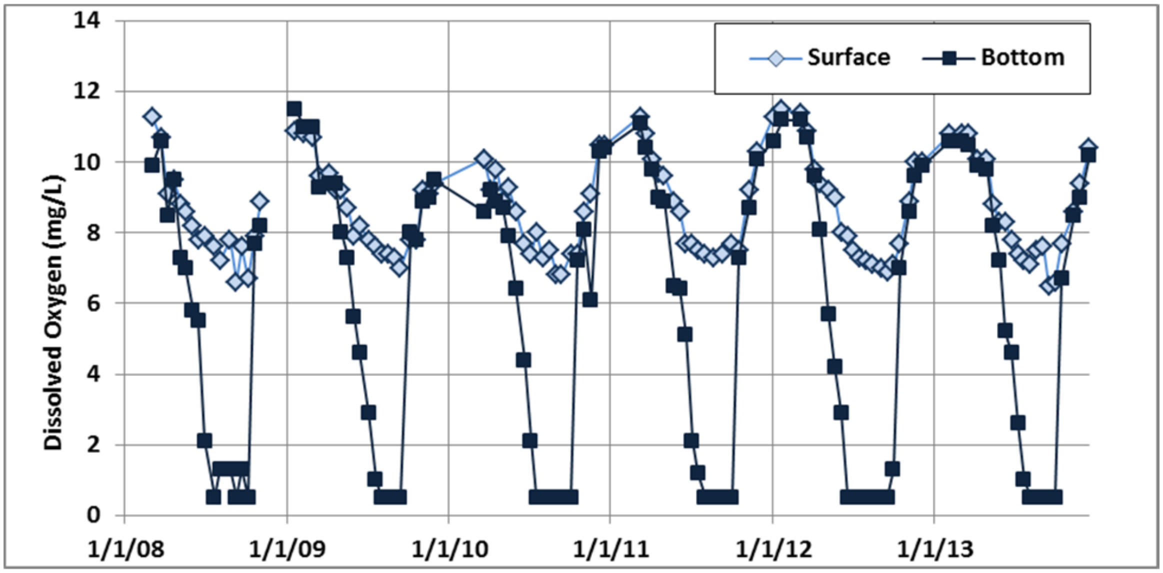

Figure 63. Dissolved Oxygen Concentrations in Standley Lake, 2008-2013

Hypoxia occurs each year in the hypolimnion of Standley Lake, but the duration varies from year to year. In 2013, DO at the bottom dropped below 2 mg/L in mid-July. The hypoxic period lasted 93 days until turnover occurred in early October (Figure 64). In 2013, the lake hypolimnion was hypoxic for one day longer than the 2008-2012 average.

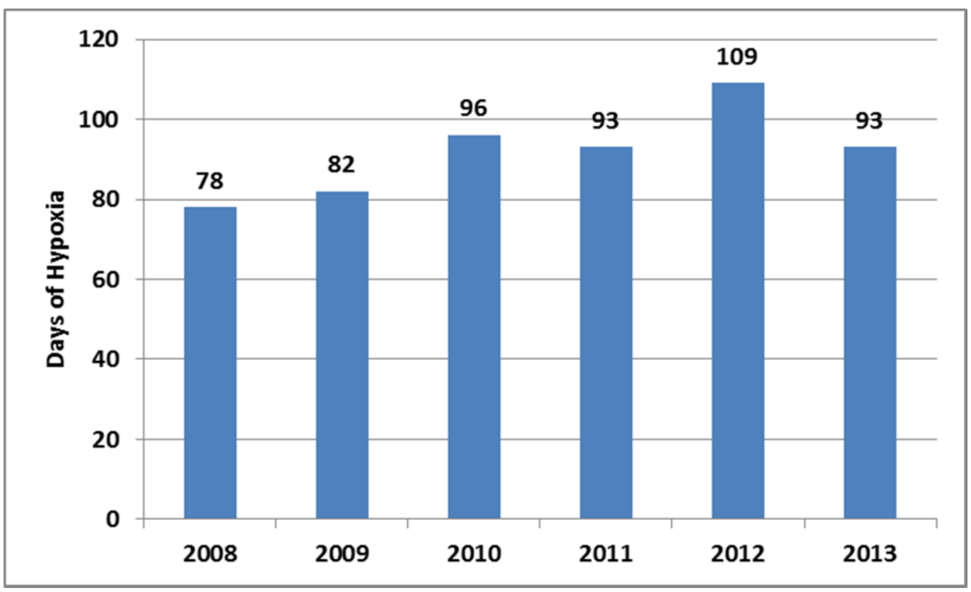

Figure 64. Days of Hypoxia (DO < 2.0 mg/L), 2008-2013

B. Total Phosphorus

Total phosphorus concentrations observed in 2013 in the photic zone (twice the Secchi depth) and at the bottom (hypolimnion) of Standley Lake are presented in Figure 65. The most visible feature of the annual time-series is the spike in phosphorus in the hypolimnion in late summer/early fall, which reached a maximum observed concentration of 84.5 µg/L on 9/4/13. This pattern of increasing hypolimnetic TP concentrations in late summer/fall is attributable to sediment releases of nutrients during conditions of hypoxia.

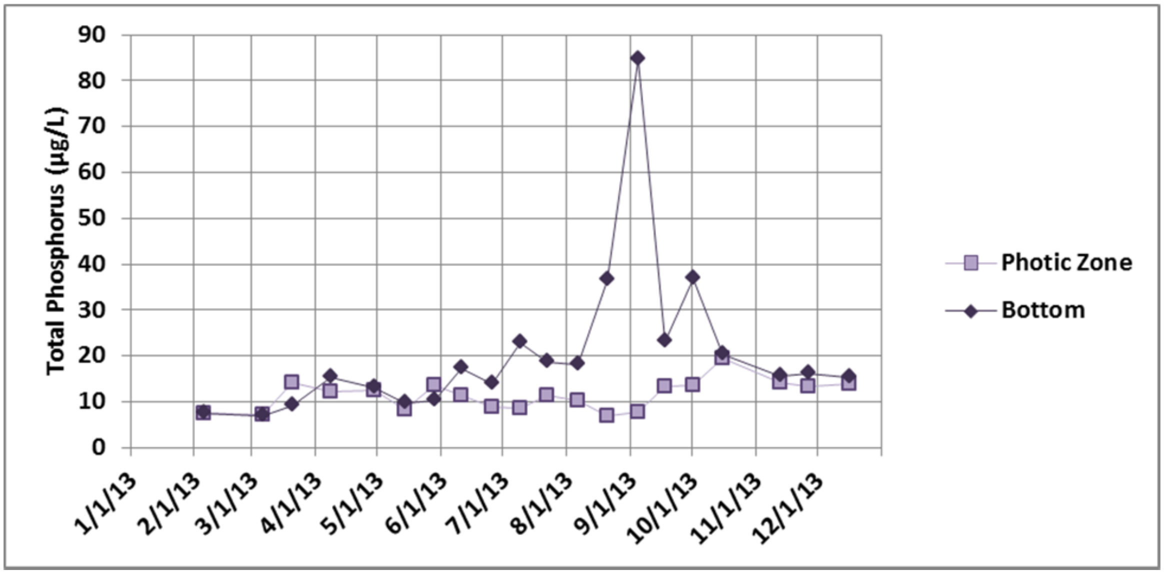

Figure 65. Total Phosphorus Concentrations in Standley Lake, 2013

This observed pattern is typical of previous years, as shown in Figure 66. Overall, the average TP concentration in 2013 was 12% lower in the hypolimnion than the respective 2008-2012 average and 4% higher in the photic zone.

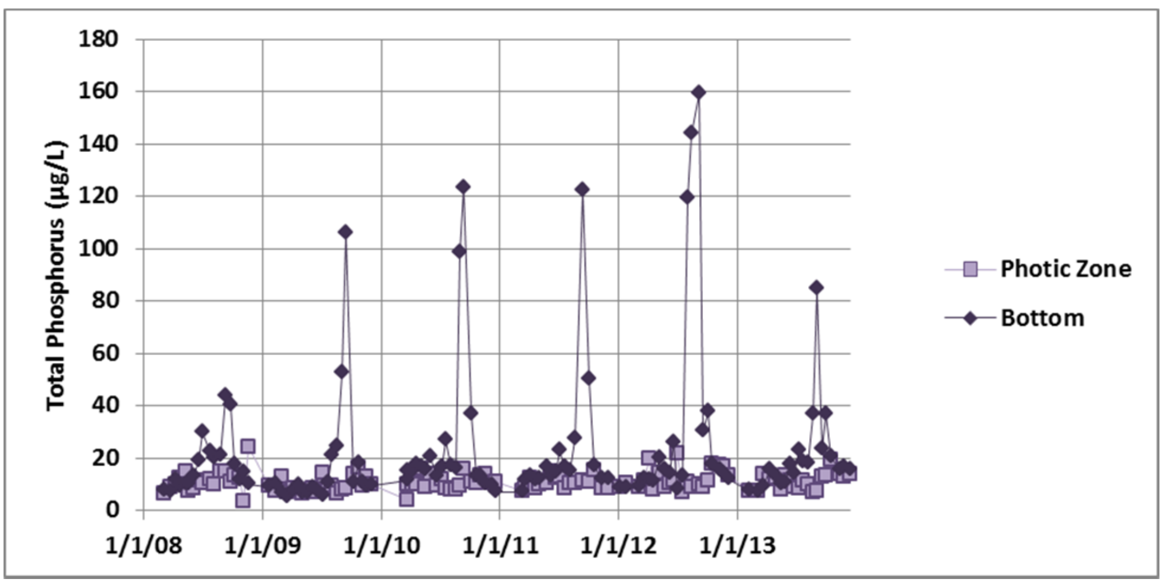

Figure 66. Total Phosphorus Concentrations in Standley Lake, 2008-2013

C. Total Nitrogen

Concentrations of TN observed in Standley Lake in 2013 in the photic zone (twice the Secchi depth) and hypolimnion (bottom) are presented in Figure 67. The pattern in the hypolimnion is similar to that seen in other years and is a reflection of external loading during runoff, subsequent nitrification dynamics, and internal loading in late summer. The maximum 2013 concentration observed in the hypolimnion (630 µg/L) was observed on 10/1/2013. Concentrations in the photic zone display smaller fluctuations throughout the year.

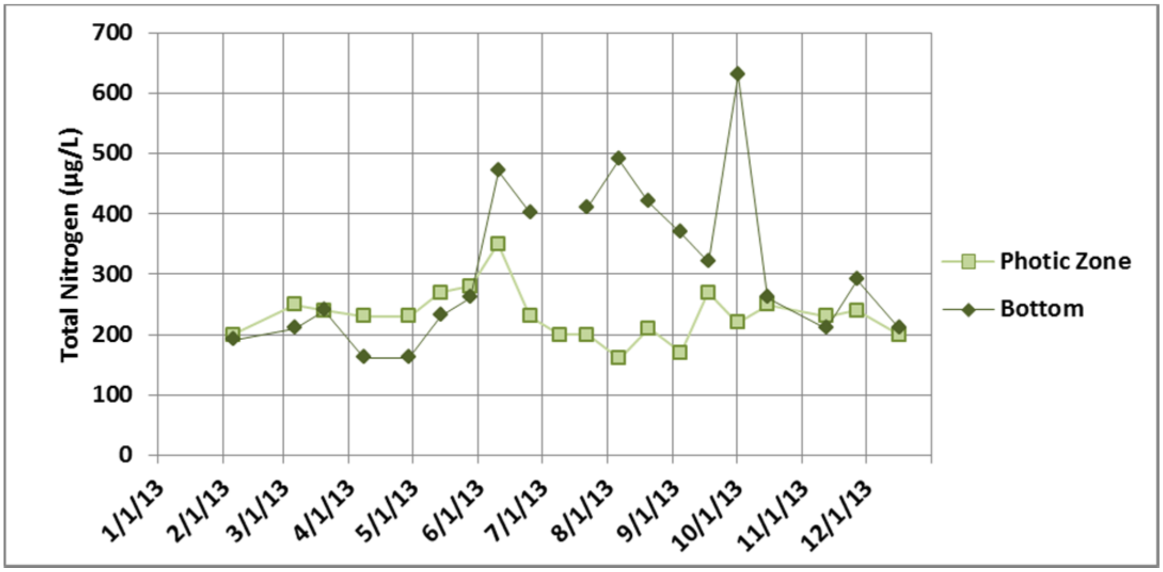

Figure 67. Total Nitrogen Concentrations in Standley Lake, 2013

Concentrations of TN in the lake for 2008-2013 are shown in Figure 68. Overall, TN concentration ranges observed in 2012 in the photic zone and at the bottom were similar to previous years. When compared with the 2008-2012 annual average concentrations, the 2013 average TN concentrations were 10% lower in the hypolimnion and 3% higher in the photic zone. These relative differences are almost identical to the relative differences noted for TP (12% and 4%, respectively).

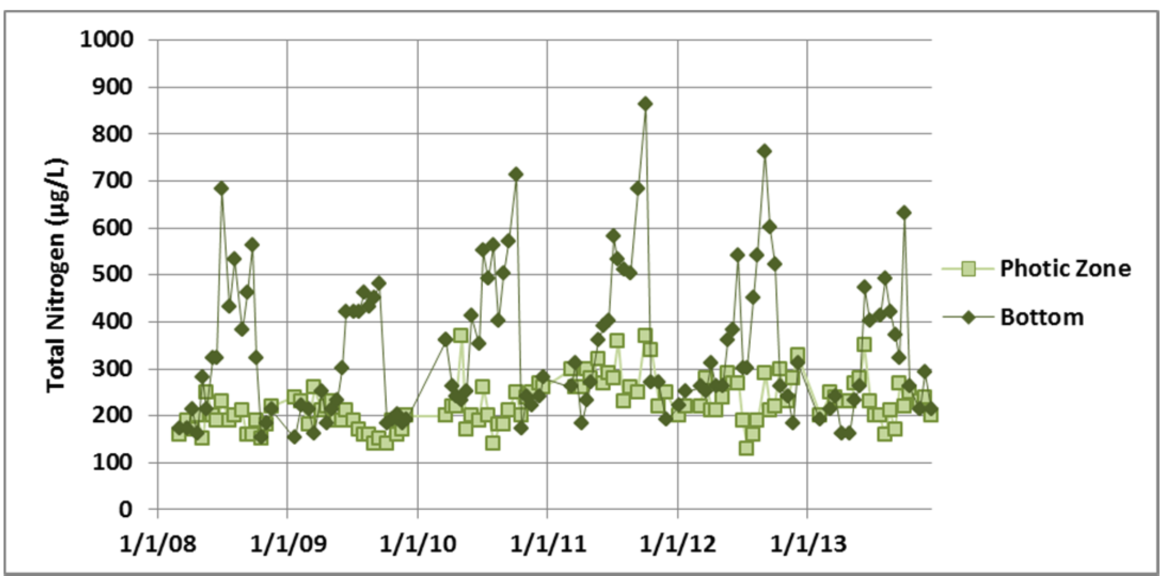

Figure 68. Total Nitrogen Concentrations in Standley Lake, 2008-2013

D. Chlorophyll *a*

The chlorophyll *a* standard of 4 µg/L (assessed at 4.4 µg/L) established in 2009 for Standley Lake is evaluated on an annual basis as the average of observed data from March through November. Chlorophyll *a* concentrations observed in Standley Lake in 2013 are presented in Figure 69, with March-November observations (the relevant period for assessment of the standard) outlined in green. The maximum concentration measured in 2013 was 10.6 µg/L and occurred on 10/15/13.

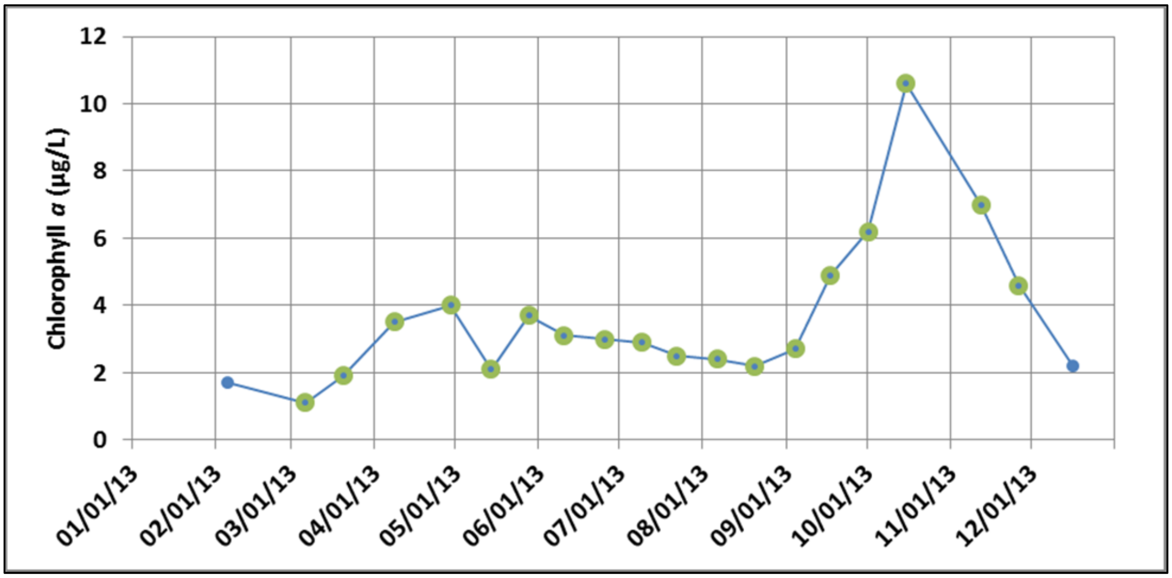

Figure 69. Chlorophyll *a* Concentrations in Standley Lake, 2013 (March-November observations highlighted in green)

Chlorophyll *a* concentrations observed from 2008 through 2013 are presented in Figure 70. The green-outlined markers indicate March-November observations used to evaluate the chlorophyll *a* standard. The 2013 seasonal pattern with chlorophyll *a* concentrations peaking after fall turnover is typical for Standley Lake. The 2013 peak of 10.6 µg/L is the second highest peak in the recent six year; the highest was 14 µg/L observed on 11/19/12. The 2013 chlorophyll *a* peak is likely a response to turnover and corresponding increased concentrations of more bioavailable nutrient species in the photic zone, as in other years. The 2013 peak chlorophyll *a* observation may also reflect a response to inflow of nutrients from the historic rainfall event in September.

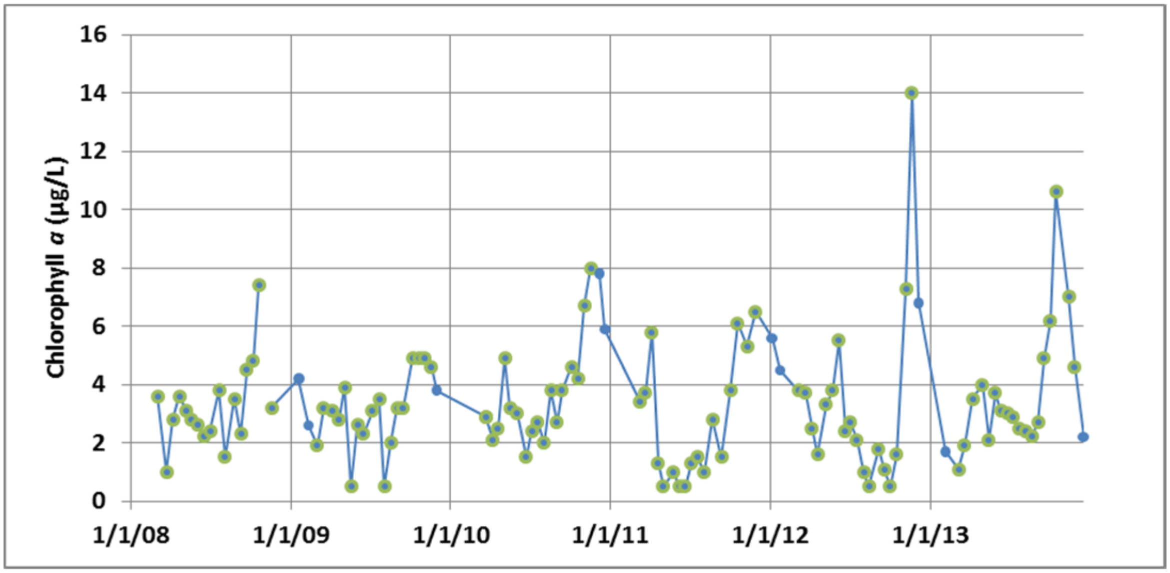

Figure 70. Chlorophyll *a* Concentrations in Standley Lake, 2008-2013 (with March-November observations highlighted)

An isopleth of chlorophyll *a* concentrations in Standley Lake for March-November 2013 is shown in Figure 71. Following a relatively small, vertically-mixed bloom in April, the annual peak algae bloom is apparent in October. The isopleth data are based on more frequent observations than the grab data and suggest that the true peak chlorophyll *a* in the photic zone may have occurred roughly one week before the 10/15/2013 observation. As seen in previous years, slightly higher chlorophyll a concentrations occurring during the summer do not extend to the lake bottom, due to summer thermal stratification.

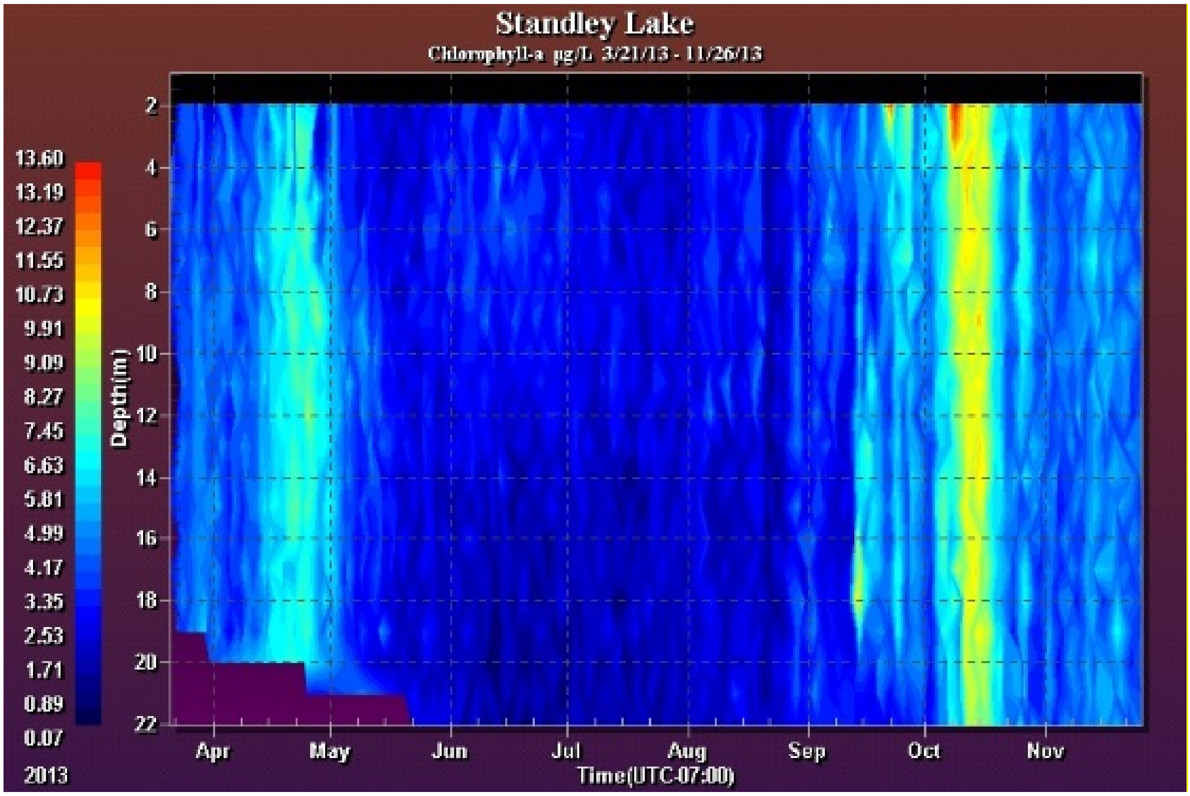

Figure 71. Isopleth of Chlorophyll *a* Concentrations in Standley Lake, March-November 2013

The chlorophyll *a* standard for Standley Lake was met once again in 2013 (Figure 72). The standard is met when four out of the five most recent years have a March-though-November average below 4.0 µg/L. An assessment threshold of 4.4 µg/L is used, calculated using the annual arithmetic mean of grab-sample observations in the photic zone. In 2013, the average March-November concentration was 3.8 µg/L, which complies with the 4 µg/L standard and is below the assessment threshold. For the five-year period 2009-2013, each year had March-November average concentrations below 4.0 µg/L. In fact, eight of the recent nine years (2007 being the exception at 4.8 µg/L) had March-November average concentrations below 4.0 µg/L.

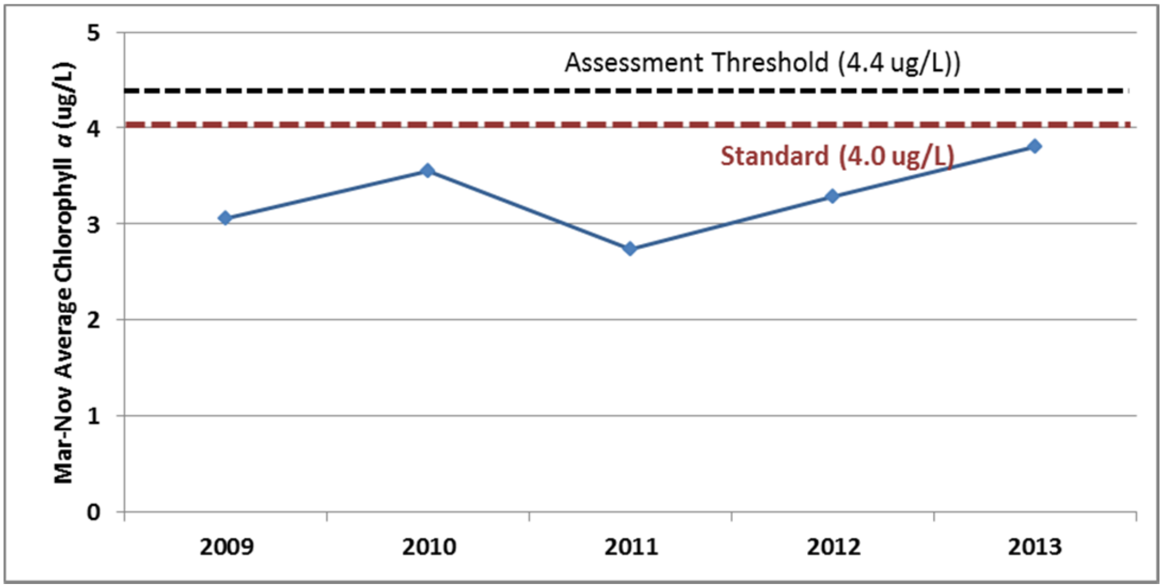

Figure 72. March - November Average Chlorophyll *a* Concentrations for Standard Evaluation, 2009-2013

The seasonal patterns for total algae counts and observed chlorophyll *a* concentrations in Standley Lake for 2013 are presented in Figure 73. Algae counts track chlorophyll *a* concentrations well, matching findings from previous recent years.

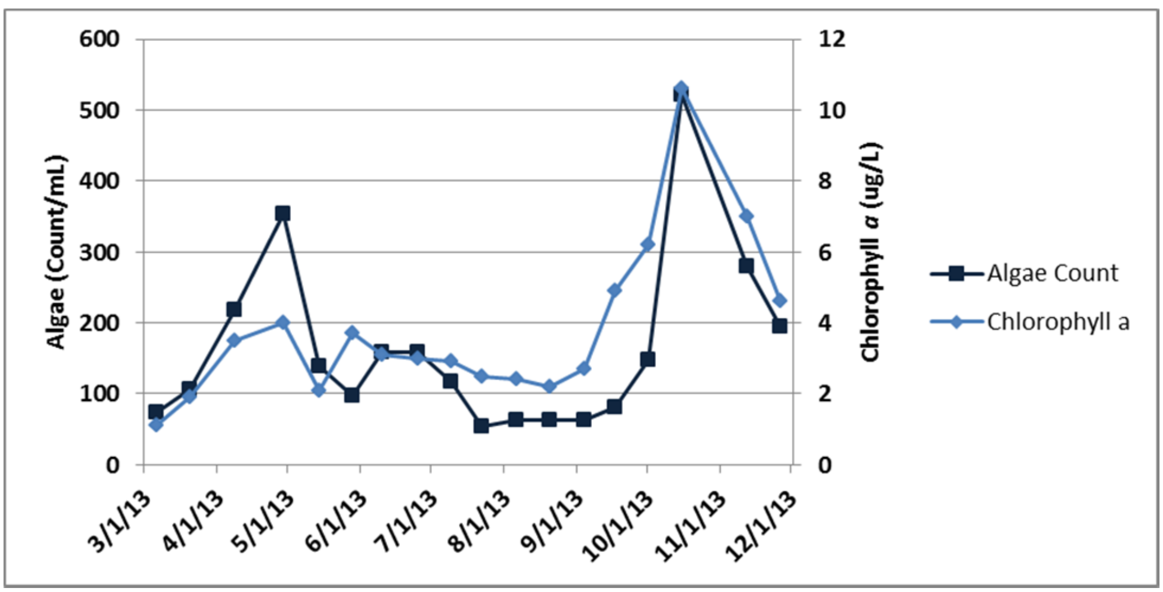

Figure 73. Algae Count and Chlorophyll *a* Concentrations in the Photic Zone of Standley Lake, March-November 2013

E. Secchi Depth

Clarity in Standley Lake is measured using a Secchi disk. A black-and-white painted disk is lowered vertically from the lake surface until the pattern is no longer visible. The Secchi depth is a combined measure of scattering and absorption of light in the upper portion of the water column, including the effects of algae, non-algal organic particulate matter, inorganic suspended solids, dissolved organic matter, and the water molecules themselves. Secchi-depth measurements for Standley Lake in 2013 are shown in Figure 74. The deepest measure of clarity (6.7 m) occurred on 8/20/2013. Prior to this, clarity varies, likely reflecting a combination of effects of inflowing suspended solids, algal growth, and stratification. Clarity decreased slightly after the August maximum depth at the time of the historic September precipitation event, likely reflecting inflow of suspended solids. A larger decrease in clarity may have been observed with the highly turbid inflow had it entered primarily within the photic zone, as opposed to diving to a depth of 16+ meters (Figure 62). Peak algae concentrations in October likely explain the continued relative limited clarity of 2 meters or less in October and early November.

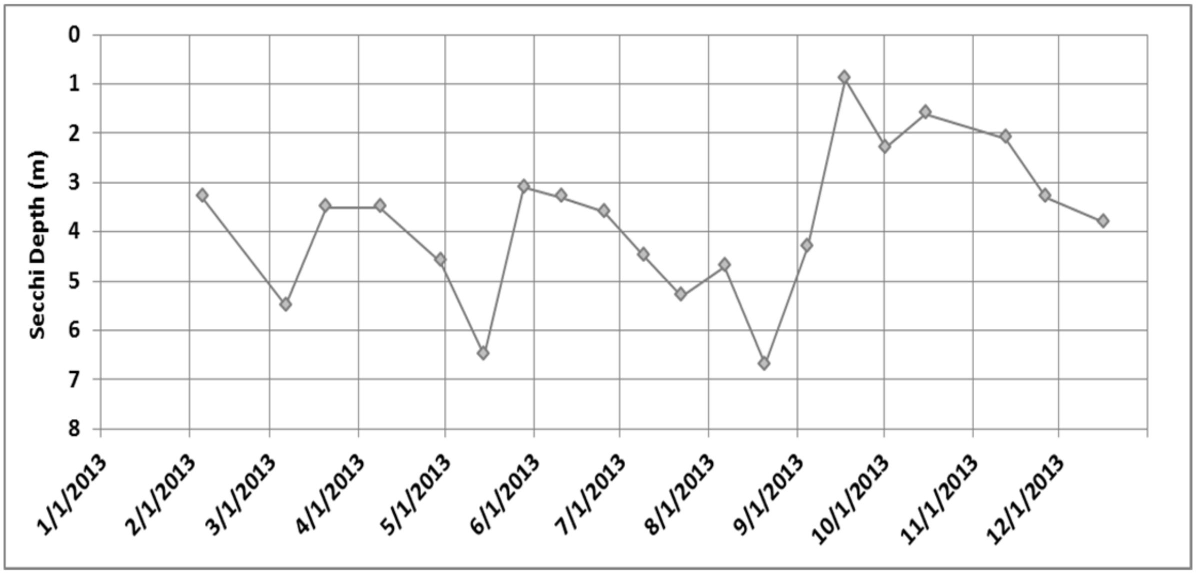

Figure 74. Clarity as Measured by Secchi Depth in Standley Lake, 2013

Secchi-depth measurements for 2008-2013 are shown in Figure 75. The maximum Secchi depth measurements in 2013 returned to depths similar to maximum depths measured prior to 2012 (a low clarity year in which the maximum Secchi depth recorded was only 5 m). Figure 76 presents average annual Secchi depths for 2008-2013.

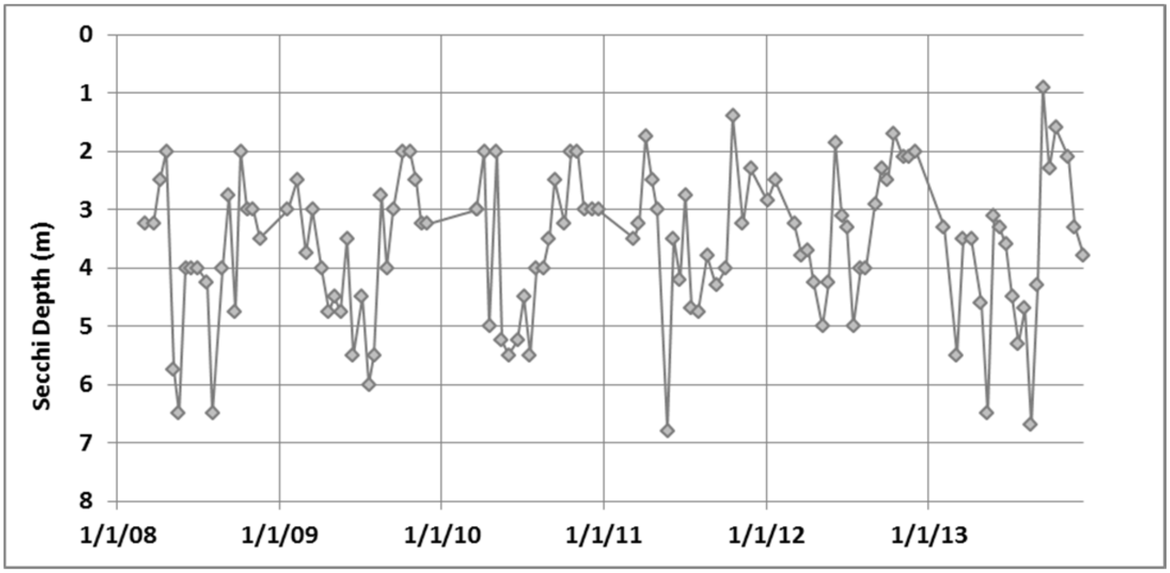

Figure 75. Clarity as Measured by Secchi Depth in Standley Lake, 2008-2013

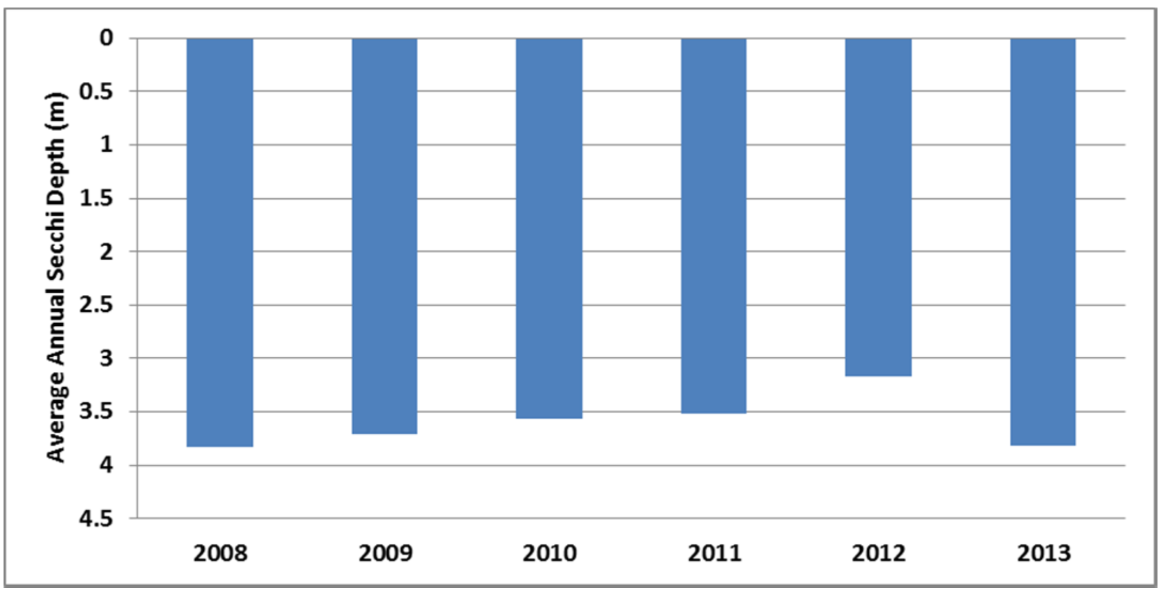

Figure 76. Average Annual Secchi Depth in Standley Lake, 2008-2013

VIII. Conclusions

Members of the UCCWA, Standley Lake Cities, and parties to the 1993 Agreement continued efforts in 2013 to monitor, preserve, and improve water quality in Clear Creek and Standley Lake. These activities included site remediation, control of sediment and nonpoint sources of pollution, numerous public outreach and educational activities, extensive water quality monitoring, advanced planning, and watershed modeling efforts to support management.

Hydrologic conditions in 2013 were remarkable due to a rainfall-runoff event of historic proportions in September. Near Golden, Colorado, 10.8 inches of rain fell over five consecutive days leading up to peak flows on September 13, 2013. The heaviest precipitation in the focus area fell on 9/13/2013, with 6.5 inches near Golden (according to data from the Utah Climate Center). Twelve counties, including Clear Creek County and Jefferson County, were placed on FEMA's list of emergency declaration. Rainfall totals and runoff response were less extreme farther up in the Upper Basin but still comprised a very large September storm. Near Georgetown, 3.9 inches of rain fell between September 9 and September 13, 2013.

Damage was sustained in all delivery canals to Standley Lake during the September precipitation event. All headgates from Clear Creek to the canals were closed before the peak of the event. Repairs to canals began as soon as possible after the event. There were no issues with Standley Lake infrastructure, and the lake provided some flood control support by retaining roughly 3,600 AF of water during the event.

Overall, Upper Basin annual flows (at CC60) in 2013 were 5% above the 2008-2012 average, but the seasonal pattern was unusual. The peak of the September hydrograph at CC60 in the Upper Basin near the canal headgates was higher than that of the snowmelt runoff peak, comprising roughly one-fourth of the annual flow volume at that location, at a time when flows are typically low. Ambient condition concentrations of TSS, TP, and TN were typical of conditions seen during 2008-2012 in the Upper Basin, but inclusion of data from the major September storm event resulted in above average volume-weighted average concentrations. The event is estimated to have increased the annual TSS load at CC60 by roughly a factor of six, more than doubled the annual TP load, and increased the TN load by approximately 40%.

Annual loads of TN and TP delivered to Standley Lake were above average, reflecting above-average inflow volumes and the effects of storm flows, including the major September event. Updated statistical analyses show that the Church Ditch by-pass continues to be effective at reducing TN and TP concentrations flowing to Standley Lake. Specifically, the median TN and TP concentrations have decreased by 43% and 44%, respectively.

Despite the historic rainfall runoff event in 2013, water quality in Standley Lake was good throughout the year. Water levels in Standley Lake started the year below average due to low flow conditions in 2012 and ended the year above average due to the September storm event. Stratification patterns and hypoxic conditions in the hypolimnion were typical in 2013, as were nutrient concentrations at the top and bottom of the lake. On two sampling dates, clarity in Standley Lake met or exceeded 6.5 m, which has only occurred three times in the past six years. The inflows from the September storm event exhibited high turbidity and were observed to dive to a depth of 18+ m in the stratified lake due to inflow temperatures, inducing some mixing. The site-specific March through November chlorophyll *a* standard of 4 µg/L was once again met in 2013 with an average value of 3.8 µg/L. None of the March-through-November average values in the previous five years have exceeded the 4.4 µg/L assessment threshold or the 4 µg/L standard value.

Appendix A – Clear Creek/Standley Lake Watershed Agreement

Appendix A

Clear Creek / Standley Lake

Watershed Agreement

AGREEMENT

The undersigned parties hereto agree as follows:

I. Preamble.

This Agreement seeks to address certain water quality issues and concerns within the Clear Creek Basin of Colorado, and specifically, such issues as they affect the water quality of Standley Reservoir, an agricultural and municipal water supply reservoir located in Jefferson County Colorado, which is supplied with water primarily from Clear Creek. For purposes of this Agreement, the Clear Creek Basin is divided into three (3) areas of segments: the Upper Clear Creek Basin ("Upper Basin"), consisting of Clear Creek and its tributaries from its source to and including the headgate of the Croke Canal in Golden, Colorado; the Standley Lake Tributary Basin ("Tributary Basin"), consisting of the lands directly tributary to Standley Lake, the Church Ditch, the Farmers High Line Canal, the Croke Canal, and lands directly tributary to these Canals; and Standley Lake ("Standley Lake"), consisting of the Lake itself.

The parties to this Agreement are governmental agencies and private corporations having land use, water supply, and/or wastewater treatment responsibilities within the Clear Creek Basin. The parties are: (1) UCCBA; (2) City of Golden; (3) City of Arvada; (4) Jefferson County; (5) Jefferson Center Metropolitan District; (6) City of Westminster; (7) City of Northglenn; (8) City of Thornton; (9) City of Idaho Springs; (10) Clear Creek County; (11) Gilpin County; (12) Black Hawk/Central City Sanitation District; (13) Town of Empire; (14) City of Black Hawk; (15) City of Central; (16) Town of Georgetown; (17) Town of Silverplume; (18) Central Clear Creek Sanitation District; (19) Alice/St. Mary's Metropolitan District; (20) Clear Creek Skiing Corporation; (21) Henderson Mine; (22) Coors Brewing Company; (23) Church Ditch Company; (24) Farmers High Line Canal and Reservoir Company; and (25) Farmers Reservoir and Irrigation Company. For purposes of this Agreement, the parties can be divided into four (4) functional groups, as follows: The Upper Basin Entities ("Upper Basin Users" or "UCCBA"), consisting of the members of the Upper Clear Creek Basin Association (generally representing entities with jurisdiction over land use and wastewater treatment activities in the Upper Basin that can affect water quality in the Upper Basin); the Tributary Basin Entities ("Tributary Basin Entities"), consisting of the Cities of Golden, Arvada, and Westminster, and the County of Jefferson and the Jefferson Center Metropolitan District (generally representing entities with jurisdiction over land use activities that can affect water quality in the Tributary Basin); the Standley Lake Cities ("Standley Lake Cities"), consisting of the Cities of Westminster, Northglenn, and Thornton, (representing the municipal water users from Standley Lake); and the three canal companies (the "Canal Companies"), consisting of the Church Ditch Company, the Farmers High Line Canal and Reservoir Company, and the Farmers Reservoir and Irrigation Company (representing the entities that own and operate canals through which water is conveyed to Standley Lake for municipal and agricultural use).

In accordance with the geographical and functional divisions, this Agreement generally sets out rights and obligations with respect to certain water quality matters within the Clear Creek Basin (as above defined) by area or segment and by functional group.

II. Agreement.

1. The parties will submit a joint alternative proposal to the Water Quality Control Commission ("WQCC") in the matter captioned "For Consideration of Revisions to the Water Quality Classifications and Standards, Including Adoption of a Narrative Standard, for Segment 2, Standley Lake, of Big Dry Creek, in the South Platte Basin, and Adoption of a Standley Lake Control Regulation" on or before December 23, 1993. Said alternative proposal shall contain the following points:

a. Request the WQCC to adopt a narrative standard only for Standley Lake at this time, with further consideration of any control regulation or numeric criteria for implementation of the standard at or after the triennial review of the South Platte River to be held in 1997. The narrative standard shall require maintenance of Standley Lake in a mesotrophic state, as measured by a combination of relevant indicators, as recommended by the parties' consultants prior to December 23, 1993.

b. Request language in the Rule and in the Statement of Basis and Purpose for the regulation explaining that during the next triennium ending in 1997 ("triennium") the parties hereto will be conducting additional testing and monitoring, as well as implementing certain best management practices and controls on a voluntary basis, the results of which will be reported to the WQCC on an annual basis, and that point-source discharge permits written during the triennium shall not include any new or more stringent nutrient effluent limitations or wasteload allocations to meet the narrative standard. The proposed language will also refer to the intention of the parties and the Commission that should the narrative standard not be met at the end of the triennium, and substantial progress has not been made in reducing the nutrient loads to Standley Lake, additional measures may be required, including numeric standards or effluent limitations for phosphorous and/or nitrogen in the Upper Basin, and for additional best management controls in Standley Lake to be considered.

2. Should the WQCC fail to approve and adopt the substance of the proposed alternative described in paragraphs 1.a. and 1.b. above, this agreement shall automatically terminate and the parties shall be released from all other obligations and rights hereunder.

3. At or after the triennial review in 1997, the UCCBA and Standley Lake Cities agree that if substantial progress has not been made by the UCCBA in reducing its portion of nutrient loading and in developing controls to maintain appropriate reductions in nutrient loads to Standley Lake sufficient to maintain the narrative standard, they

will jointly petition the Commission to adopt a control regulation for Standley Lake containing the following points:

a. Total Phosphorous effluent limitation of 1.0 mg/l as P as a thirty (30) day average at the Upper Clear Creek Wastewater Treatment Plants, or such other numeric standard(s) or effluent limitations (s) for phosphorous or nitrogen, or in combination, with opportunity for point to point source and nonpoint source to point source trading among the entities that operate the UCCBA treatment plants, as has been determined will be effective in achieving and maintaining the narrative standard for Standley lake. Such numeric standard(s) or effluent limitation(s) shall be implemented over a three year period to allow time for the affected entities to fund, design and construct improvements necessary to meet the standards.

b. In-lake treatment to reduce internal phosphorous loading by 50% from the 1989-90 measured loadings in the 1993 USGS report by Mueller and Ruddy, or such other standards for reduction of internal phosphorous and nitrogen loading as has been determined will be effective in achieving and maintaining the narrative standard for Standley Lake, within three (3) years.

4. The UCCBA, in consultation with the Standley Lake Cities and Tributary Basin Entities will prepare a Best Management Practices Manual by December 31, 1994 for nonpoint sources that will cover disturbed areas of 1 acre or more and use its best efforts to have it approved and adopted for implementation by all jurisdictions within the Upper Basin by July 1, 1995. This Manual will be prepared to deal with the geologic, topographic and weather conditions existing within the Upper Basin to facilitate the reduction of nutrient loading from the various activities of the Upper Basin. This Manual will be coordinated with the Standley Lake Cities and Tributary Basin entities. The plan will include a program for monitoring representative results, to be included in the overall basin monitoring plan. For purposes of development of BMPs, Jeffco will not be considered to be part of the UCCBA.

5. The UCCBA, in consultation with the Standley Lake Cities and the Tributary Basin Entities, will examine the costs and effects of nutrient removal at UCCBA wastewater treatment plants, including operational controls or modifications which would decrease nutrient loads. Recommendations of such review shall be furnished to all the parties hereto by June 30, 1994. The UCCBA will use its best efforts to have its members implement operational modifications which can be implemented without significant capital improvements as quickly as reasonably practical.

6. The Standley Lake Cities, in consultation with the other parties, will develop a Standley Lake Management Plan by December 31, 1994 which will address in-lake nutrient loading and potential nutrient loading from lake activities, water supply operations, recreational activities, and activities in the watershed. The Standley Lake Cities will use their best efforts to implement the Lake Management Plan by

June, 1995. It is understood that the water rights implications of the plan must be considered.

7. The parties will jointly design, implement, and fund in such allocations as they shall agree a monitoring program to evaluate (1) nutrient loadings from point sources; (2) nutrient loadings from non-point sources in the Upper Basin; (3) nutrient loadings from non-point sources in the Tributary Basin; (4) internal Lake loading; and (5) the effect of nutrient reduction measures implemented by the various parties on the trophic status of Standley Lake. The results of the monitoring program will be provided to the Water Quality Control Commission for informational purposes annually. A description of the monitoring program will be included with the Annual Reports.

8. The Tributary Basin Entities and the Standley Lake Cities, in consultation with the other parties, will develop Best Management Practices (BMPs) for each of their jurisdictions by December 31, 1994, and shall use their best efforts to have them adopted as regulations by July, 1995. The BMPs will be designed to remove pollutants to the maximum extent practical considering the costs and benefits of possible measures; provided, however that no retro-fitting of existing construction or development will be required.

9. The Tributary Basin Entities, the Standley Lake Cities and the Canal Companies will develop a Management Plan for the Tributary Basin, addressing stormwater quality and quantity, hazardous substance spills, canal flushing, crossing permits, the Canal Companies' stormwater concerns, and the water rights implications of the above by December, 1994, and use their best efforts to achieve adoption of the portions of the Plan under the control of each entity by July, 1995. If not all affected parties adopt the agreed measures, then the parties that have adopted such measures will determine whether or not to implement the Plan despite such non-adoption by one or more parties.

10. Each functional group (The UCCBA, The Tributary Entities, The Standley Lake Cities, and the Canal Companies) shall provide each other group with semi-annual reports detailing the progress made on the implementation of its responsibilities herein, including development of any BMPs, nutrient reduction programs or controls, or other items required by this agreement, beginning in June, 1994. The parties shall also meet periodically after each report is completed to discuss progress by the parties. It is anticipated that the various functional groups may assign or appoint task groups or committees to address specific tasks or areas of concern (e.g. BMPs; ISDS; Wastewater Plant operational changes; monitoring, etc). If so, then the task groups shall provide the appropriate reports and participate in follow-up meetings.

11. This agreement may be enforced as a contract according to the laws of the State of Colorado; however, this agreement shall not create any right to claim or recover monetary damages for a breach thereof.

12. It is anticipated that other regional agencies with land use and/or water quality responsibilities or impacts within the Clear Creek Basin (as above defined) may join in the parties' monitoring and other efforts pursuant to this Agreement.

13. This Agreement may be executed in counterparts.

Appendix B – Upper Clear Creek/Standley Lake Watershed Water Quality Monitoring Program

Upper Clear Creek/Standley Lake Watershed

Water Quality Monitoring Plan

Standley Lake

December 2013

TABLE OF CONTENTS

APPENDICES

Abbreviations and Acronyms

BH/CC	Blackhawk/Central City
C	Centigrade
CC	Clear Creek
cfs	cubic feet per second
COC	chain of custody
CWQCC	Colorado Water Quality Control Commission
DI	Deionized Water
DO	Dissolved Oxygen
DRP	Dissolved Reactive Phosphorus (ortho-Phosphate-P)
EPA	U.S. Environmental Protection Agency
FHL	Farmers Highline Canal
FRICO	Farmers Reservoir and Irrigation Company
HCl	Hydrochloric acid
ISDS	Individual Sewage Disposal System
KDPL	Kinnear Ditch Pipe Line
LDMS	Laboratory Data Management System
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
m	meter
mgd	million gallons per day
mg/L	milligrams per liter
MSCC	Mainstem Clear Creek
mv	millivolt
N	Nitrogen
NFCC	North Fork Clear Creek
NG	City of Northglenn
NPS	Nonpoint Source
NTU	Nephelometric Turbidity Units
ORP	Oxidation Reduction Potential
OWTS	Onsite Wastewater Treatment System
pCi/L	picocuries per liter
P	Phosphorus
QC	Quality Control
SDWA	Safe Drinking Water Act
SFCC	South Fork Clear Creek
SLC	Standley Lake Cities
SLWQIGA	Standley Lake Water Quality Intergovernmental Agreement
SM	Standard Methods for the Examination of Water and Wastewater
TH	City of Thornton
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TVSS	Total Volatile Suspended Solids
UCC	Upper Clear Creek
USGS	United States Geological Survey
Westy	City of Westminster
WFCC	West Fork Clear Creek
WMA	Upper Clear Creek Watershed Management Agreement
WQIGA	Water Quality Intergovernmental Agreement (Standley Lake)
WQS	Colorado Water Quality Standards (Regs #31 and #38)
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

MONITORING PROGRAMS OVERVIEW

Introduction

The quality of the water in Standley Lake has been monitored for more than two decades. Efforts to protect Standley Lake through state water quality regulations culminated in adoption of the numeric chlorophyll *a* standard for the lake in 2009. The Colorado Water Quality Control Commission ("CWQCC") established the chlorophyll *a* standard at 4.0 µg/L with a statistically derived assessment threshold of 4.4 µg/L. The standard is based on the arithmetic average of the individual monthly average chlorophyll *a* data for samples collected during March through November in each year. Exceedance of the standard would occur if the yearly 9-month average of the monthly chlorophyll *a* average results is greater than 4.4 µg/L more frequently than once in five years. In addition, a version of the narrative standard adopted in 1993 was also retained stating that the trophic status of Standley Lake shall be maintained as mesotrophic as measured by a combination of common indicator parameters such as total phosphorus, chlorophyll *a*, secchi depth and dissolved oxygen. The voluntary implementation of best management practices clause included in the 1993 version of the standard was eliminated from the 2009 narrative standard.

The Standley Lake Cities ("SLC") of Northglenn, Thornton and Westminster remain committed to effective and efficient water quality monitoring in the watershed as originally agreed to in the 1993 Watershed Management Agreement. The Standley Lake Water Quality Intergovernmental Agreement ("SLWQIGA" or "WQIGA"), entered into between the SLC, details the provisions for costs sharing related to cooperative efforts regarding water quality issues in the Clear Creek Basin and Standley Lake. The WQIGA monitoring program is subdivided into three inter-related programs for which the SLC provide field sampling, laboratory analyses and data management support: the Upper Clear Creek Monitoring Program, the Tributary Basin Monitoring Program and the Standley Lake Monitoring Program.

The Monitoring Committee was formed to periodically evaluate the monitoring programs and propose appropriate modifications as necessary. The proposals are evaluated by the SLWQIGA committee prior to implementation. Representatives from the SLC, Upper Clear Creek Basin and the Tributary Basin are actively involved in committee activities as appropriate. This document details the specific requirements and responsibilities of the SLC and outlines the commitments of additional entities involved in the Standley Lake watershed monitoring programs.

Standley Lake serves as the sole drinking water source for the cities of Northglenn and Westminster and is one of several drinking water sources for the City of Thornton. The monitoring program is designed to collect samples from a variety of locations in the watershed with varying anthropogenic and natural sources of pollutants. The data is used for trend analysis, modeling and for numerous other applications. Interpretation of the results allows the upstream and downstream communities to work cooperatively to minimize impacts to water quality.

Safety Considerations

The personal safety of the sampling team members is paramount in the decision making process for collection of water quality samples. At no time should personal safety be jeopardized in order to collect a sample. Environmental conditions may change suddenly and are variable throughout the watershed.

The following safety measures should be observed during all sampling activities:

- Sample collection should be performed by a two person team whenever possible.
- Weather conditions at the sampling sites should be evaluated prior to leaving the laboratory.
- Personal flotation devices should be worn if the creek water level is greater than twelve inches deep. Hydrostatically triggered, self-inflating personal flotation devices are recommended for non-lake sampling, as the device will automatically inflate if the sensor is submerged below six inches of water.
- Personal flotation devices are mandatory on Standley Lake. Lake sampling team members should be experienced swimmers.
- Wear waterproof gloves and sock liners, as appropriate.
- Exercise caution on slippery rocks, river banks and boat docks.
- Cell phones must be available during sampling, but be aware that cell phone signals are not reliable in all areas of Clear Creek Canyon.
- First aid kits must be available in all sampling vehicles, including boats. It is recommended that sampling team members be trained in basic first aid techniques.
- Supervisors are notified of the sampling team's itinerary and the expected return time to the lab. Sampling teams will notify supervisors of any delay in the expected return time.

UPPER CLEAR CREEK MONITORING PROGRAM

The Upper Clear Creek ("UCC") Monitoring Program is designed to provide water quality information in order to evaluate nutrient loadings from both point sources (discrete) and non-point sources (dispersed) within the Upper Clear Creek Basin.

The Upper Clear Creek Monitoring Program includes three distinct sub-programs, each designed to obtain water quality data during specified conditions:

- ambient grab samples;
- continuous stream monitoring and the automated collection of 48-hour ambient samples, and
- the automated collection of event samples.

UCC – AMBIENT GRAB SAMPLES

Program Coordination: Thornton
Program Participants: Thornton, Westminster, Arvada, Golden, Upper Basin WWTPs

Grab samples are single, point-in-time samples collected in-stream throughout the Upper Clear Creek Basin. Grab sample locations were selected to correspond with established USGS gage stations and additional sites have been included over the years as the monitoring program has evolved. Refer to the table below for sample site locations. The rationale for selection of the specific sampling sites is included in Appendix A. A map of the watershed is included in Appendix B.

Grab samples are collected five times during the year to correspond with seasonally varying flow conditions in Clear Creek. The *Short Schedule* is collected three times per year (February, April and December) and includes four stream locations. The *Long Schedule* is collected twice per year (May and October) and includes 16 stream locations. Laboratory analytical protocols limit sample collection to Monday through Thursday. Sampling is performed each year on approximately the same schedule. The specific sampling dates for the year are predetermined at the beginning of the year.

Starting in 2013, Wastewater Treatment Plant (WWTP) effluent samples are collected by treatment plant staff and are analyzed for nutrients (nitrogen and phosphorus) by commercial laboratories in accordance with Colorado Regulation 85. Sampling and analysis plans were developed by each WWTP outlining the monitoring locations, frequency and analytical parameters for testing. The analytical data reported by the WWTPs to the Colorado Water Quality Control Division will be included in the watershed annual reports.

WWTP Effluent Sample ID	Sample Location
CC1A	Loveland WWTP
CC3A	Georgetown WWTP
CC5A	Empire WWTP
CC7A	Central Clear Creek WWTP
CC8A	St Mary's WWTP
CC12A	Idaho Springs WWTP
CC13B	Black Hawk/Central City WWTP
CC14A	Henderson Mine WWTP
CC15A	Eisenhower Tunnel WWTP

UCC – AMBIENT GRAB SAMPLES

Locations and Sample Schedule

Clear Creek Sample ID	Flow Gage	Sample Location *	Early Feb	Early Apr	Late May	Mid Oct	Early Dec
CC05	Staff gage	MSCC at Bakerville			X	X	
CC10	Recording gage	SFCC upstream of the lake			X	X	
CC15	Staff gage	WFCC below Berthoud			X	X	
CC20	Recording gage	WFCC below Empire			X	X	
CC25	Recording gage	MSCC above WFCC			X	X	
CC26	Recording gage	MSCC at Lawson Gage	X	X	X	X	X
CC30	Staff gage	Fall River above MSCC			X	X	
CC34	----	MSCC above Chicago Creek			X	X	
CC35	Recording gage	Chicago Creek above Idaho Springs WTP			X	X	
CC40	Recording gage	MSCC below Idaho Springs WWTP (US 6 and I-70))	X	X	X	X	X
CC44	Staff gage	NFCC above BH/CC WTP intake			X	X	
CC45	----	NFCC above original BH/CC WWTP			X	X	
CC50	Recording gage	NFCC at the mouth	X	X	X	X	X
CC52	----	Beaver Brook at the mouth			X	X	
CC53	----	Soda Creek at the mouth			X	X	
CC60	----	MSCC at Church Ditch Headgate	X	X	X	X	X

* MSCC = Mainstem Clear Creek WFCC = West Fork Clear Creek WTP = Water Treatment Plant
SFCC = South Fork Clear Creek NFCC = North Fork Clear Creek WWTP = Wastewater Treatment Plan

UCC – AMBIENT GRAB SAMPLES

Analytical Parameters for Creek samples – includes parameters for both Short and Long Schedules

Analyte	Analytical Method Reference	Reporting Limit Goal	Responsible Laboratory
Total Nitrogen	SM 4500-NO3 I	0.02 mg/L	Westminster
Nitrate/Nitrite as N	SM 4500-NO3 I	0.01 mg/L	Westminster
Ammonia as N	SM 4500-NH3 H	0.01 mg/L	Westminster
Total Phosphorus	SM 4500-P E	0.0025 mg/L	Northglenn
Ortho-phosphate as P (dissolved) or DRP	SM 4500-P E	0.0025 mg/L	Northglenn
Total Organic Carbon (TOC)	SM 5310 B	0.5 mg/L	Thornton
Total Suspended Solids	SM 2540 D	1 mg/L	Thornton
Temperature	SM 2550 B	1.0 °C	Field Teams/Golden
pH	SM 4500-H+ B	1.0 Std Units	Field Teams/Golden
Conductivity	SM 2510 B	10 µS/cm	Field Teams/Golden
Turbidity	SM 2130 B	1.0 NTU	Field Teams/Golden
Dissolved Oxygen	SM 4500-O G	1.0 mg/L	Field Teams/Golden
Stream Depth	Staff gage reading	0.1 ft	Field Teams

Table Notes:
1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limit goals are matrix dependent and may be increased for complex matrices and may be lower depending on laboratory capability.
3) TOC is analyzed on samples from sites CC05, CC20, CC26, CC35, CC40, CC45, CC50, CC52, CC53, and CC60 during the Long Schedule events. TOC is analyzed on all four creek grab samples during the Short Schedule events.

UCC – AMBIENT GRAB SAMPLES

Flow Monitoring

Various mechanisms are employed throughout the watershed for monitoring the hydrologic conditions at strategic locations. USGS real-time recording gages are installed at CC10, CC20, CC25, CC26, CC35, CC50 and CC61 (Clear Creek at Golden). USGS staff gages are in place at CC05, CC15, CC30 and CC44. The staff gage readings are recorded to the nearest 0.1 foot and may be converted to stream flow using the USGS calibration rating curve established for the location.

The recording gage at CC40 (Clear Creek at US 6 and I-70) is operated and maintained by Clear Creek Consultants on behalf of UCCWA. The SLC provide financial support for the USGS gages at CC05 at Bakerville (staff gage) and CC26 at Lawson (recording gage). The City of Golden provides financial support for the USGS gage on the West Fork of Clear Creek at Empire.

UCC – AMBIENT GRAB SAMPLES

Program Coordination - Short Schedule (Thornton)

Two weeks before the scheduled Clear Creek sampling date:

- Contact Westminster and Northglenn to request adequate supply of sample bottles from each lab.
- Prepare four sample kits as directed below. Each sample bottle kit includes the containers for sampling at one location.

Sample Bottle Kit Prep- Short Schedule

Destination	Quantity	Volume	Bottle Type	Parameter	Laboratory	Additional Documentation
Clear Creek Team – Feb, April and Dec **ONLY** (Collect samples at CC26, CC40, CC50 and CC60)	4	1L	Rectangular plastic	Phosphorus series	Northglenn	Instructions, COCs and one field data sheet
	4	500 mL	Plastic jug	TSS	Thornton	
	4	250 mL	Rectangular plastic	Nitrogen series	Westminster	
	4	40 mL	Glass vial	TOC	Thornton	

Table Notes:
1) Phosphorus series includes total P and dissolved ortho-phosphate-P (also referred to as DRP).
2) Nitrogen series includes total N, ammonia-N and nitrate/nitrite-N.
3) The additional documentation forms are included in Appendix C.

On Clear Creek sampling day (Short Schedule):

- Calibrate turbidity, pH, conductivity, and DO meters in the lab. Ensure all probes and meters are working properly before leaving the lab. Take aliquots of the standards into the field to check instrument calibration if necessary.

- At each sample location, collect samples and analyze for pH, temperature, DO, conductivity, and turbidity. Complete the COC and record all results on the Field Data Sheet (refer to Appendix C).

- The field samples are returned to the Thornton Lab and refrigerated until pickup by Westminster and Northglenn personnel. The samples are relinquished to Westminster (nitrogen) and Northglenn (phosphorus) and the COCs are signed appropriately. The original copies of the COCs are retained by Westminster and Northglenn. Original field data sheets and copies of the COCs are retained by the City of Thornton for permanent archive.

UCC – AMBIENT GRAB SAMPLES

Sampling Locations Directions and Narrative Descriptions - Short Schedule

Sampling Frequency: Feb, April, Dec

POINT	DIRECTIONS AND DESCRIPTION OF LOCATION
CC26	Travel westbound I-70 and exit at Dumont/Downieville. Travel frontage road west towards Lawson. Immediately after the I-70 overpass turn left and park in area just beyond the end of the guardrail. Sample creek at USGS gage and sampling station by bridge. [RECORDING GAGE] **Sample TOC**
CC40	Travel eastbound on I-70 and take US 6 exit. Pull off in parking area just east of the off ramp. (The Tributary at 244 Restaurant is across the road) Sample just below the USGS recording gage. **Sample TOC**
CC50	Travel US 6 eastbound to the intersection of US 6 and CO 119. Turn left up Highway 119 towards Blackhawk/Central City. Approximately 0.2 miles upstream from the intersection is a pullout area on the left with a small red building and cellular antenna pole near a boarded-up tunnel entrance. Sample at the USGS recording gage. [RECORDING GAGE] **Sample TOC**
CC60	Approximately 1 mile west of intersection of Hwy 58 and US 6. Park in the pullout on the south side of highway and walk (or drive) downhill to the Church Ditch diversion structure. Go across the mesh bridge and sample from the main stem of Clear Creek. Do not sample from Church Ditch. **Sample TOC**

Photographs of the sampling locations and GPS coordinates are included in Appendix D.

UCC – AMBIENT GRAB SAMPLES
Program Coordination - Long Schedule (Thornton)

Two weeks before the scheduled Clear Creek sampling date:

- Contact Westminster and Northglenn to request adequate supply of sample bottles from each lab.
- Contact and coordinate the sampling teams. Make sure that there are two samplers available and one set of field meters (turbidity, pH, conductivity and DO) for two Creek Teams. Refer to the Program Participants Contact Information list in Appendix F for sampling personnel who may assist with sampling.
- Prepare sample kits as directed below. Each sample bottle kit includes the containers for sampling at one location.

Prepare sample bottle kits as directed below. Each sample bottle kit contains the prepared sample bottles to collect samples at one location. Prepare 16 bottle kits: 8 kits each for Creek Teams A and B.

Sample Bottle Kit Prep- Long Schedule

Destination	Quantity	Volume	Bottle Type	Parameter	Laboratory	Additional Documentation
Clear Creek Team A (Collects samples at CC25, CC05, CC10, CC26, CC34, CC35, CC52 and CC53)	8	1L	Rectangular plastic	Phosphorus series	Northglenn	One set of: Instructions, COCs and one field data sheet
	8	500 mL	Plastic jug	TSS	Thornton	
	8	250 mL	Rectangular plastic	Nitrogen series	Westminster	
	5	40 mL	Glass vial	TOC	Thornton	
Clear Creek Team B (Collects samples at CC15, CC20, CC30, CC40, CC44, CC45, CC50 and CC60)	8	1L	Rectangular plastic	Phosphorus series	Northglenn	One set of: Instructions, COCs and one field data sheet
	8	500 mL	Plastic jug	TSS	Thornton	
	8	250 mL	Rectangular plastic	Nitrogen series	Westminster	
	5	40 mL	Glass vial	TOC	Thornton	
QC	4	2 L	1:1 HCl rinsed Rectangular plastic	QC spikes and dups for Golden	Golden	QC sampling completed by Team A in May and Team B in October.
	1 (blank)	1 L	Rectangular plastic	Phosphorus series	Northglenn	
	1 (blank)	250 mL	Rectangular plastic	Nitrogen series	Westminster	

Table Notes:
1) Phosphorus series includes total P and dissolved ortho-phosphate-P (also referred to as DRP).
2) Nitrogen series includes total N, ammonia-N and nitrate/nitrite-N.
3) The additional documentation forms are included in Appendix C.

On Clear Creek sampling day (Long Schedule):

- Calibrate turbidity, pH, conductivity, and DO meters in the lab. Ensure all probes and meters are working properly before leaving the lab. Take aliquots of the standards into the field to check instrument calibration if necessary.

- Prepare coolers with ice and sample bottle kits. The Creek Team chosen for QC sampling must also include in the field sample bottle kit: field blank bottles (nitrogen and phosphorus), one field duplicate cubitainer, and at least 4 two-liter bottles for QC samples. Thornton prepares both sample kits for Clear Creek Teams A and B and will provide the extra materials needed for the QC sampling in the appropriate sample kit.

- Meet your sampling team partner at the designated location (usually City of Golden Public Works).

- At each sample location, collect samples and analyze for pH, temperature, DO, conductivity, and turbidity. Complete the COC and record all results on the Field Data Sheet (refer to Appendix C). Samples will be collected at all creek sites for nitrogen series, phosphorus series and TSS. TOC samples are collected only at designated creek sites: CC05, CC20, CC26, CC35, CC40, CC45, CC50, CC52, CC53, and CC60.

- The Clear Creek Team selected for QC sampling will randomly select four creek sites. Collect one sample (2-liter HCl rinsed bottle) at four randomly selected creek sites for preparation of the spike and duplicate nutrient QC samples by Golden Laboratory staff.

- Complete the COC for the QC samples.

- Return to the Golden Lab when sampling is completed. Relinquish the QC samples to the Golden Lab staff.

- Golden Lab staff prepares one duplicate and one spike sample for total nitrogen and total phosphorus from the four QC samples.

- Analyze and complete any missed field parameters as allowable.

- Make two copies of each team's field data sheet: one of each for Golden and one of each for Westminster to use for logging in the samples to the electronic spreadsheet.

- The field samples and prepared QC samples are returned to the Thornton Lab and refrigerated. The samples are relinquished to Westminster (nitrogen) and Northglenn (phosphorus) and the COCs are signed appropriately. The original copies of the COCs are retained by Westminster and Northglenn. Original field data sheets and copies of the COCs are retained by the City of Thornton for permanent archive.

UCC – AMBIENT GRAB SAMPLES
Sampling Locations Directions and Narrative Descriptions - Long Schedule

Clear Creek Team A

Sampling frequency: late May, mid Oct

Sample bottles: Creek sites: One 1 liter rectangular (phosphorus series), one 500 mL (TSS), one 250 mL (nitrogen series) and one 40 mL amber glass vial (TOC) as required.

POINT	DIRECTIONS AND DESCRIPTION OF LOCATION
CC25	Travel west on I-70 approximately 0.8 miles west of mile marker 232. Pull off the highway on the right side immediately beyond the guardrail for the bridge structure. Walk down the hill to the creek. Sample immediately downstream of the box culvert across from the recording gage located downstream. [RECORDING GAGE]
CC05	1-70 westbound to Exit 221 (Bakerville) Exit; go south back over Interstate (left). Park at call box. Take sample upstream of parking area, read gage located downstream. [Read the STAFF GAGE and record on the field data sheet]. **Sample TOC**
CC10	I-70 eastbound to Georgetown. Begin at intersection of 6th and Rose in Georgetown. Go 2.2 miles up Guanella Pass Road (go to the first lake). U-turn by the lake inlet and park on the right side of road. Sample from stream above lake inlet point. [RECORDING GAGE]
CC26	Travel eastbound on I-70 and exit at Lawson. Travel frontage road through Lawson. Immediately before the road curves left under I-70 is a parking area straight ahead through an opening at the end of a guardrail. Sample creek at gage and USGS sampling station by the bridge over the creek. [RECORDING GAGE] **Sample TOC**
CC34	From I-70 (either direction) Exit 240 (Chicago Creek), pull off in the small parking area on the other side of the bridge. Sample the main stem of Clear Creek upstream of Chicago Creek across from the Forest Service Building.
CC35	Continue approx. 3.7 miles on Hwy 103. Pull off on the right shoulder just past the green roofed house that looks like a barn (on the left). Cross road and sample creek at recording gage. [RECORDING GAGE] **Sample TOC**
CC52	Exit I-70 eastbound at Beaver Brook/Floyd Hill (Exit #247). Turn left onto the north frontage road (US Hwy 40). Travel east approximately 2.4 miles. Pull off to the side of road and sample Beaver Brook at this point. **Sample TOC**

CC53 Continue travelling east bound 0.3 miles and cross the second white bridge. Exit immediately on the right to Soda Creek Drive. Park on the right. Sample Soda Creek upstream of the bridge. **Sample TOC**

Photographs of the sampling locations and GPS coordinates are included in Appendix D.

UCC – AMBIENT GRAB SAMPLES
Sampling Locations Directions and Narrative Descriptions - Long Schedule

Clear Creek Team B

Sampling frequency: late May, mid Oct

Sample bottles: Creek sites: One 1 liter rectangular (phosphorus series), one 500 mL (TSS), one 250 mL (nitrogen series) and one 40 mL amber glass vial (TOC) as required.

POINT	DIRECTIONS AND DESCRIPTION OF LOCATION
CC40	Traveling westbound on I-70 take the US 6 exit (#244) at the bottom of Floyd Hill. Turn right at the bottom of the ramp, and pull off to the right in the parking area 150 feet east of the off-ramp. (The Tributary at 244 Restaurant is across the road). Sample below recording gage. [RECORDING/STAFF GAGE] **Sample TOC**
CC30	Drive west on 1-70 to Exit 238 (Fall River Road/St. Mary's Glacier). At the junction of the on/off ramp and Fall River Road is a parking area on the left across from a railing and stairway with USGS equipment. Descend the stairs and sample the creek above the staff gage attached to the bridge. [Read the STAFF GAGE and record on the field data sheet]
CC15	Travel west on I-70 and take US 40 west through Empire. Approximately 6 miles west of Empire there is a large pullout on the creek (left) side of the highway with a large tree in the middle of the pullout. Sample directly below the tree at the creek. Staff gage is along the north bank of stream next to a tree at the stream's edge. [Read the STAFF GAGE and record on the field data sheet]
CC20	Returning back through Empire eastbound, travel along the road/ramp from US 40 towards Westbound I-70. Immediately after turning onto road/ramp, there is a large open space on the right and a Colorado Dept. of Transportation (CDOT) maintenance area on the left. If the gate is open, turn left into the CDOT maintenance yard and sample approx. 150 feet downstream of the bridge at recording gage/staff gage. If the gate is closed, park across the street from the gate and walk into the CDOT maintenance area. [RECORDING/STAFF GAGE] **Sample TOC**
CC44	Return east on I-70 to the Central City Parkway and take the Parkway to Central City. Central Parkway turns into Nevada Street. Nevada Street turns into Spring Street when it crosses over Main Street. Take Spring Street to Gregory Street and turn right. Travel down through Central City into Blackhawk, past Blackhawk's Main Street and turn left on Hwy 119. Travel westbound on 119 approx. 0.9 miles.

There is a small wooden building and parking area on the left side of the road at the Black Hawk water intake. Sample the creek behind the building.

CC45 Turn around and drive east on 119 approx. 1.5 miles and turn right on Mill Street. Take the first left onto Main Street and drive to the east end of the casino and parking garage on the left. At the east end of the building is an alley between the parking garage and a small brown building. Sample the creek at the end of the alley upstream of the old Black Hawk WWTP site. **Sample TOC**

CC50 Continue down Hwy 119 eastbound toward US 6. Approximately 1.4 miles downstream of the new Black Hawk/Central City WWTP and approximately 0.2 miles upstream from the intersection of Hwy 119 and US 6 is a pullout area on the right just past a small red building and cellular antenna pole near a boarded-up tunnel entrance. Sample at the recording gage. [RECORDING GAGE] **Sample TOC**

CC60 Drive east down US 6/Hwy 119. Approximately 0.6 miles east of Tunnel 1 (0.45 miles west of the intersection of Hwy. 58 and US 6) is a pullout/dirt road on the south side of highway. Walk or drive down the hill to the Church Ditch diversion structure. Go across the mesh bridge and sample from the main stem of Clear Creek. Do not sample from Church Ditch. **Sample TOC**

Photographs of the sampling locations and GPS coordinates are included in Appendix D.

UCC – AMBIENT GRAB SAMPLES

QA/QC Program - Long Schedule Only

Duplicate and spike quality control samples are prepared from creek samples collected during the Clear Creek Long Schedule sampling events for selected nutrients and are analyzed by Westminster (total nitrogen) and Northglenn (total phosphorus). The QC samples are prepared by the City of Golden at their laboratory on the day of sampling. Four creek locations are randomly selected for preparation of the QC samples. One duplicate and one spike are submitted to each laboratory. The analytical procedure for QC preparation is detailed below:

SOP - QC Preparation for Clear Creek Studies

Night before:

- Soak 2 1-Liter Class A volumetric flasks with 1:1 HCl. One flask will be used to make up fresh Nitrate standard and the other will be used for spiking the selected Clear Creek sample (with both nitrate and phosphorus spikes).

The Morning of Sampling Day:

- Remove 5 mg/L Phosphorus standard from fridge to warm to room temperature. This standard is prepared by the City of Northglenn and is stable for 3 months. It is usually in a 125 ml brown glass bottle.
- Remove 100 mg/L Nitrate-N standard from fridge. It is stored in a 125 ml brown Nalgene bottle. This standard is prepared fresh by the City of Golden each time. The method to prepare a 100 mg/L NO3-N standard is in Standard Methods, 21st Ed., page 4-120 and described below.

- **To Prepare Fresh Nitrate-N Standard**
  - Thoroughly rinse out one of the HCl acid soaked 1-Liter flasks to prepare the fresh standard in.
  - Fill flask with 200-300 mL DI water.
  - Weigh out 0.7218 grams of KNO3 and add to flask. (KNO3 is stored in the desiccator).
  - Dilute to 1-Liter volume with DI and mix thoroughly.
  - Discard old standard and refill bottle with fresh standard. Rinse bottle out with fresh standard 2-3 times before filling. Record new prep date on bottle.

- Prepare 4 sample bottles for spike and duplicate samples. Bottles used for spike and duplicate prep are provided by the City of Thornton and are the square plastic 16 ounce "milk type" bottle. They are pre HCl washed and stored in the cabinet above the wastewater sink.

  Two labs receive spike and duplicate samples from this program:
  - Northglenn for low level total phosphorus analysis.
  - Westminster for total nitrogen analysis.

  The bottles are marked with consecutive numbers from month to month, year after year. Refer to the last sample set numbers in the brown Clear Creek Quality Control Log Book (above Vicki's desk) and mark new bottles with the next consecutive number set (##). Mark the 4 bottles with the following information:

  - City of Northglenn - P(##) - Spike for Phosphorus, Date of sampling.
  - City of Northglenn - D(##) - Duplicate for Phosphorus, Date of sampling.

  - City of Westminster - N(##) - Spike for Nitrogen, Date of Sampling.
  - City of Westminster - D(##) - Duplicate for Nitrogen, Date of sampling.

When Samples Arrive in Golden's Lab:

Certain 2 Liter samples from Clear Creek sites will have been randomly selected by the sampling team as "QC" samples.

- Select ONE of these as the QC sample (**spike and duplicate**) and set aside. Record which site was chosen in the QC log book.

This sample will be spiked with both Nitrogen and Phosphorus at concentrations within the analytical ranges of Northglenn's and Westminster's labs.

The "**spiked sample"** will be made in the remaining HCl rinsed volumetric flask and will use up 1 liter from the 2 liter bottle.
The remaining 1 liter volume will be split into the "**duplicate sample**" bottles for both labs.

- **To Prepare Spiked Sample**

  - Rinse out the remaining 1-Liter volumetric flask with DI.
  - Then rinse flask with a small portion of the selected QC Creek sample - 2 times.
  - Refer to the last sampling to determine new spike volumes.

  **Spike amounts for Phosphorus are usually within the 1.75 to 3.0 ml volume range for a total spiked concentration of 0.00875 mg/L to 0.015 mg/L, i.e.,*

  1.75 mL of 5 mg/L phosphorus standard in 1 liter = 0.00875 mg/L concentration spiked

  **Spike amounts for Nitrogen are usually within a 1.5 to 3.0 ml volume range for a total spiked concentration of 0.15 mg/L to 0.3 mg/L, i.e.,*

  1.5 mL of 100 mg/L nitrogen-N standard in 1 liter = 0.15 mg/L concentration spiked

- Mix the Clear Creek sample well and pour approximately 500 mL into pre-rinsed flask.
- Add determined spike volumes of both standards to flask. Mix well.
- Dilute to volume with additional Creek sample finalizing volume with a pipet. (It is too hard to bring it to volume by pouring from the 2 liter container!)
- Mix well and pour into 2 bottles labeled for spike samples ("N" and "P").

To Prepare Duplicate Sample

- Thoroughly mix remaining Clear Creek sample.
- Pour into 2 bottles labeled for duplicates ("D").

Record the following information in the brown "Clear Creek QC" book:

1. the time the samples arrived at Golden
2. the new consecutive sample numbers
3. the Clear Creek sample site number that was selected for preparation of the QC samples
4. the volumes spiked for phosphorus and nitrogen

Generate new chain of custody forms for the 4 new samples. One form can be filled out for both Westminster and Northglenn labs. Sampling teams will deliver samples to respective labs. Copies of previous chain of custody forms are in the lower file drawer in drinking water cabinet.

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES

Program Coordination: Westminster and Golden
Field Sampling Teams: Westminster, Thornton, Golden, Arvada

Autosampler sites were selected at strategic locations in the watershed in order to assess diurnal variations in water quality in Clear Creek. The 48-hour ambient composites are collected with programmable automatic sampling devices. Each of the 24 sample bottles represents a two hour time period, resulting from collecting equal volumes of sample in each of two consecutive hours; therefore, 48 hours of samples are collected in 24 bottles. The 24 discrete samples are composited into two 24-hour samples on a time weighted basis (i.e. equal sample volumes are taken from 12 discrete autosampler bottles and combined into a single composite sample). Additional discrete or composite samples may be submitted for analysis based on anomalies noted in field observations for the individual autosampler bottles.

Ambient samples are collected approximately seven times per year on a monthly schedule starting in April and ending in October. The schedule for the ambient sampling is based on clear weather predictions and is staggered at different times during the week, including weekends.

Analytical probes and data logging equipment are active at the autosampler sites year-round to continuously monitor in-stream conditions for temperature and conductivity. From April through October, or as weather conditions permit, additional probes are deployed for pressure (depth), turbidity and pH. YSI multi-probe sondes are deployed at each autosampler location. The sample locations are equipped with data loggers for remote monitoring of water quality conditions in the watershed and to remotely control activation of the autosamplers.

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES

Sample Locations

CC AS 26	Mainstem of CC at USGS Lawson gage
CC AS 49	Mainstem of CC above the confluence of the North Fork
CC AS 50	North Fork of CC above confluence of Mainstem of CC at USGS gage
CC AS 59	Mainstem of CC above Golden and Church Ditch diversions

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES

Flow Monitoring

USGS gages provide the average daily flow associated with each of the two 24-hour composite samples for the ambient autosamplers. Flow data is obtained directly from the gage stations at CC26 and CC50 to correlate with CC AS 26 and CC AS 50, respectively. Flow data from the gage at CC40 is used to correlate to CC AS 49 because there are no significant inflows to or diversions from Clear Creek between CC40 and CC AS 49.

The flow data associated with CC AS 59 is considered to be an estimated flow. The flows diverted to the City of Golden water treatment plant and the Church Ditch will be added to the gage flows recorded at the USGS gage at CC61 (Clear Creek at Golden) to estimate the flow at CC AS 59.

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Analytical Parameters

Analyte	Analytical Method Reference	Reporting Limit Goal	Responsible Laboratory
Total Nitrogen	SM 4500-NO3 I	0.02 mg/L	Westminster
Nitrate/Nitrite-N	SM 4500-NO3 I	0.01 mg/L	Westminster
Ammonia-N	SM 4500-NH3 H	0.01 mg/L	Westminster
Total Phosphorus	SM 4500-P E	0.0025 mg/L	Northglenn
Ortho-phosphate-P (dissolved) or DRP	SM 4500-P E	0.0025 mg/L	Northglenn
Total Suspended Solids (TSS)	SM 2540 D	1 mg/L	Thornton
Total Organic Carbon (TOC)	SM 5310 B	0.5 mg/L	Thornton
pH	SM 4500-H+ B	1.0 Std Units	Field Teams
Temperature	SM 2550 B	1.0 °C	Field Teams
Conductivity	SM 2510 B	10 µS/cm	Field Teams
Turbidity	SM 2130 B	1.0 NTU	Field Teams
Total and Dissolved Arsenic	EPA 200.7	0.001 mg/L	Golden
Total and Dissolved Cadmium	EPA 200.7	0.0005 mg/L	Golden
Total and Dissolved Copper	EPA 200.7	0.002 mg/L	Golden
Total and Dissolved Iron	EPA 200.7	0.02 mg/L	Golden
Total and Dissolved Lead	EPA 200.7	0.0005 mg/L	Golden
Total and Dissolved Manganese	EPA 200.7	0.002 mg/L	Golden
Total and Dissolved Molybdenum	EPA 200.7	0.002 mg/L	Golden
Total and Dissolved Zinc	EPA 200.7	0.02 mg/L	Golden

Table Notes:
1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limit goals are matrix dependent and may be increased for complex matrices and may be lower depending on laboratory capability.
3) EPA recommended holding times less than 72 hours may not be met due to the extended sampling routine.
4) Samples collected for nutrients (nitrogen and phosphorus) with a turbidity reading of greater than 100 NTU are analyzed by commercial laboratories that have demonstrated proficiency in analyzing complex matrices for nutrients.

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Program Coordination (Westminster and Golden)

Field Equipment

Equipment Installed At Autosampler Locations

- Permanent and tamper-proof enclosure box with lock
- American Sigma 900, 900 Max or other automated sampler
- Power supply – solar panel, rechargeable battery or direct power
- Sample tubing long enough to reach from the autosampler to the streambed. Probes must be contained in protective piping secured in the creek bed
- Dedicated field probes for turbidity, temperature, conductivity and pH
- Depth/velocity flow sensor
- Recording gage at CC26 – Operated and maintained by USGS
- Staff gage at CC50
- Rain gage at CC59
- 24 discrete HCl rinsed autosampler bottles with caps. Bottles must be numbered and inserted in the designated position in autosampler (positions numbered 1 through 24)
- Continuous recording datalogger
- Cellular modem and antenna at CC26, CC50 and CC59

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Autosampler Operation

On a monthly basis between April and October, autosamplers are set to collect time-weighted discrete samples for a 48-hour period. The autosamplers are strategically located in order to correlate stream flow with the chemical water quality data collected on the samples. In order to associate the relative impacts of the point and nonpoint pollutant sources located between the sample stations, it is advisable to observe the same "slug" of water at both the upstream and downstream locations. Using the "time of travel" study conducted by USGS in 1999, the downstream autosamplers on Clear Creek are delayed for a predetermined time based on in-stream flow at the Lawson stream gage.

The time of travel estimates tables are included in Appendix E.

Autosampler Setup:

Equipment required:

- 24 discrete HCl rinsed autosampler bottles with caps
- Keys and/or tools to access autosampler enclosure
- Field data collection/station audit sheets

Setup Procedure:

1. Unlock sample enclosure and remove sampler head. Set aside without disturbing or bumping the distributor arm.
2. Load uncapped bottles in the correct positions in the bottom of the sampler.
3. Secure bottles in place with the retaining ring. Store caps in a ziplock bag inside the autosampler until sample collection.
4. Program the sampler according to manufacturer's instructions to collect two 450 mL storm samples per bottle, one sample per pulse.
5. After starting the autosampler, ensure that the distributer arm is positioned above bottle #1.
6. Replace sampler head and lock in place.
7. Record station/equipment information on field sheet.
8. Make sure the autosampler program is ***RUNNING*** before locking the enclosure.
9. The autosampler may be set up ahead of a scheduled start time.

Sample Collection

Additional equipment required:

- Keys and/or tools to access autosampler enclosures
- Large cooler with ice to collect sample bottles
- 24 pre-cleaned, HCl rinsed, discrete sample replacement bottles
- Field data sheets/station audit sheets
- Chain of custody forms
- Laptop with Loggernet software and data cable (9 pin serial cable with SC32B adapter) if retrieving data directly from datalogger
- Two 3-liter or larger Nalgene bottles (clean and rinsed with 1:1 hydrochloric acid) for compositing samples
- 250 mL graduated cylinder (clean and rinsed with 1:1 hydrochloric acid) for compositing samples

- Prepared sample bottles provided by participating Cities for nutrients, solids and metals analyses
  - 1 L square plastic – phosphorus series (Northglenn)
  - 250 mL plastic – nitrogen series (Westminster)
  - 500 mL plastic bottle – TSS (Thornton)
  - 45 mL amber glass vial with septa cap – TOC (Thornton)
  - 250 ml round plastic – total and dissolved metals (Golden - for Clear Creek sites)
- Chain of Custody forms – Refer to Appendix C
- Field Sampling form - Refer to Appendix C

Sample Collection Procedure:

1. Unlock enclosure and remove sampler head.
2. Retrieve date/time information from autosampler if required. To collect sample history on American Sigma samplers, press <Change/ Halt> button, press <time/read> button for 5 seconds. The sample collection time for the first sample will appear. Record data on the field sheet. Press <yes> for next sample time to appear. Continue until all data is recorded.
3. Date and time information for samples is also automatically stored in a data file by the dataloggers at all sites except CC59.
4. Record station/equipment information on field sheet.
5. Make note of any samples with high turbidity determined by visual observance or data obtained from the datalogger.
6. Cap bottles and place in a cooler with ice for transport to Golden lab for compositing.

   Optional compositing of samples in the field is performed by pouring off equal volumes into 3-liter (or larger) pre-cleaned bottles. Refer to the Sample Compositing Procedure Step 1. Save remaining volume of any high turbidity samples to take back to the lab. Discard remaining sample.
7. Clean out autosampler base and reload with a new set of pre-cleaned bottles.
8. Reset the autosampler by pressing the START button (Sigma 900 autosampler). Ensure that the distributor arm is parked over bottle #1 and the display reads "Program Running" before closing the autosampler and placing it back in the enclosure. .
9. Take all samples to the Golden Water Quality Laboratory for compositing, splitting, distribution and wet chemistry analysis of pH, turbidity and conductivity.

UCC AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Sample Compositing

1. Composite samples in the laboratory if compositing was not performed in field. Shake sample bottles and pour equal volumes of sample from the first 12 bottles into a composite bottle marked "A". Shake sample bottles and pour equal volumes of sample from the remaining 12 bottles into a composite bottle marked "B".
2. Perform turbidity, temperature, pH and conductivity measurements on composited samples. Enter data on the Sampling Form.
3. Use the well mixed composites (A and B) to fill the appropriate bottles for the Northglenn, Thornton, Westminster and Golden labs.
4. If any discrete bottle(s) appears to have an unusually high turbidity and enough sample is available, analyze for turbidity and conductivity. Record on Sampling Form. If there is enough sample, pour the high turbidity discreet samples into separate nutrient and solids bottles for individual analysis.
5. Complete the COCs.
6. Deliver and relinquish to each city their respective samples (Westminster-nitrogen series, Thornton-TSS and TOC, Northglenn-phosphorus series) and sign COCs as appropriate.
7. Original field data sheets and COCs are retained by the Cities of Westminster and Golden for permanent archive.
8. Samples are created in the web-accessible Excel spreadsheet by Westminster for data entry and results archive.

UCC AUTOSAMPLERS – EVENT SAMPLES
Sample Locations

CC AS 49 Event	Mainstem of CC above the confluence of the North Fork
CC AS 50 Event	North Fork of CC above confluence of Mainstem of CC at USGS gage
CC AS 59 Event	Mainstem of CC above Golden and Church Ditch diversions

UCC AUTOSAMPLERS – EVENT SAMPLES
Flow Monitoring

Westminster and Golden will obtain the 15 minute interval flow data from the USGS gage at CC61 (Clear Creek at Golden) to correlate to CC AS 59. The average event flow will be calculated to correspond to the specific time-event composited samples. If the 15 minute interval flow data is not available, the average daily flow will be associated with the event. The average daily flow at UCCWA gage CC40 will be used to correlate with CC AS 49. Flow at CC50 is measured by a USGS gage at that site.

UCC AUTOSAMPLERS – EVENT SAMPLES
Analytical Parameters

Storm event samples are analyzed for the same suite of analytical parameters listed in the previous section for the 48-hour ambient samples. Samples may not be analyzed within the EPA recommended holding time for some parameters based on the random nature of the storm event triggering.

UCC AUTOSAMPLERS – EVENT SAMPLES
Program Coordination (Westminster and Golden)

Field Sampling Teams: Westminster, Thornton, Golden, Arvada

The event autosampler program was initiated in 2006 to assess the pollutant concentrations mobilized during significant snow melt (runoff) or rain events at 48-hour ambient locations CC AS 49, CC AS 50 and CC AS 59. Automated sample collection of stormwater is triggered based on changes in ambient turbidity, conductivity, stage height, or rain gage readings, depending on the autosampler location. The autosamplers are currently set to trigger when the 30 minute running average exceeds a predetermined turbidity level (for example, 100 NTU). The autosampler at CC AS 50 triggers based on a combination of change in stream depth, precipitation and turbidity in order to eliminate triggering autosampler event sampling that might be associated with localized human disturbances in the creek (e.g. sluice mining). Autosamplers trigger independently depending on the localized conditions in the watershed. The autosampler collects discrete samples every 15 minutes until the parameter that triggered the event returns to the ambient condition or until the maximum number of samples is collected. The discrete samples may be analyzed individually or multiple discrete samples may be composited based on the field observations. As necessary, refer to the previous section for instructions on compositing samples from autosamplers. Event sampling can also be started remotely in the event of a spill or other event that might not cause the triggering parameters to be met.

Storm event samples are analyzed for the same suite of analytical parameters listed in the previous section for the 48-hour ambient samples. Samples may not be analyzed within the EPA recommended holding time for some parameters based on the random nature of the storm event triggering.

UCC AUTOSAMPLERS - EVENT SAMPLES

Field Equipment

Storm event sampling utilizes the same equipment listed in the previous section for the 48-hr ambient samples.

Autosampler Operation

Field equipment used for storm event sampling is operated using the same techniques as described in the previous section for 48-hr ambient sampling.

Sample Compositing

Sample compositing is performed similarly to the procedure described in the previous section for 48-hr ambient sampling; however, fewer samples are typically composited based on the severity and duration of a storm event.

TRIBUTARY BASIN MONITORING PROGRAM

The Standley Lake Tributary Basin Monitoring Program is designed to provide water quality information for evaluation of the nutrient loadings from non-point sources in the Standley Lake Tributary Basin. The only point source discharge between CC60 on the main stem of Clear Creek and the canal diversions to Standley Lake is the Coors cooling basin return flow.

Three tributaries (the terms trib and canal are interchangeable) divert Clear Creek water to Standley Lake: the Church Ditch, the Farmers Highline ("FHL") Canal and the Croke Canal. The trib monitoring locations were selected to assess the relative loadings to the canals from areas within unincorporated Jefferson County and the city limits of Golden and Arvada. Denver Water supplies Westminster with a small quantity of water via the Kinnear Ditch Pipeline ("KDPL") which enters Standley Lake after passing through a wetlands area located west of 96th Ave and Alkire Street. The upstream and downstream locations near the wetlands are monitored when there is flow through the pipeline. The Denver Water raw water sources include Gross Reservoir and Coal Creek.

Trib samples are collected year-round on a monthly basis. All tributaries flowing at a rate that allows collection of a representative sample are monitored.

The Church Ditch delivery structure at Standley Lake was relocated in 2008 from the west side of the lake to the south side of the lake in order to avoid the potential for significant stormwater impacts to the lake. The former Church Ditch monitoring location at Standley Lake (T-09) was abandoned in 2009 when the new delivery structure (T-27) became operational.

The raw water pipeline at Semper (T-24) is monitored monthly. The raw water pipeline at NWWTP (T-25) is monitored only when the Semper facility is offline.

TRIB SAMPLES

Locations and Sample Schedule

Sample ID	Sample Location *	Every month of the year when flowing**
T-01	Church Ditch at Headgate on MSCC	X
T-02	FHL at Headgate on MSCC	X
T-03	Croke Canal at Headgate on MSCC	X
T-04	Croke Canal at Standley Lake	X
T-11	FHL at Standley Lake	X
T-22A	Kinnear Ditch Pipeline (KDPL) – at Coal Creek entry point into pipeline	X
T-22D	Kinnear Ditch Pipeline (KDPL) downstream of wetlands	X
T-24	Raw Water Pipeline at Semper	X
T-25	Raw Water Pipeline at NWWTP	X
T-27	Church Ditch delivery structure at SL (est. 2009)	X

*MSCC = Mainstem Clear Creek

** Exceptions noted in paragraph above the table.

TRIB SAMPLES

Analytical Parameters and Analytical Scheme

Analyte	Analytical Method Reference	Reporting Limit Goal	Responsible Laboratory	Monitoring Frequency
Temperature	SM 2550 B	1.0 °C	Field Team	Monthly
pH	SM 4500-H+ B	1.0 Std Units	Field Team	Monthly
Conductivity	SM 2510 B	10 µS/cm	Field Team	Monthly
Turbidity	SM 2130B	1.0 NTU	Field Team	Monthly
Dissolved Oxygen	SM 4500-O G	1.0 mg/L	Field Team	Monthly
Total Phosphorus	SM 4500-P E	0.0025 mg/L	Northglenn	Monthly
Ortho-phosphate as P (dissolved) or DRP	SM 4500-P E	0.0025 mg/L	Northglenn	Monthly
Total Suspended Solids (TSS)	SM 2540 D	1 mg/L	Thornton	Monthly
Total Organic Carbon	SM 5310	0.5 mg/L	Thornton	Monthly
E. coli	SM 9221 D	1 cfu/100mL	Thornton	Monthly
Total and Dissolved Iron	EPA 200.7	0.05 mg/L	Thornton	Monthly
Total and Dissolved Manganese	EPA 200.8	0.002 mg/L	Thornton	Monthly
Total and Dissolved Zinc	EPA 200.8	0.020 mg/L	Thornton	Monthly
Total Nitrogen	SM 4500-NO3 I	0.02 mg/L	Westminster	Monthly
Nitrate/Nitrite as N	SM 4500-NO3 I	0.01 mg/L	Westminster	Monthly
Ammonia as N	SM 4500-NH3 H	0.01 mg/L	Westminster	Monthly
Gross Alpha and Gross Beta	EPA 901.1	0.1 pCi/L	Westminster	Quarterly
Total and Dissolved Arsenic	EPA 200.8	0.001 mg/L	Thornton	Quarterly
Total and Dissolved Barium	EPA 200.8	0.002 mg/L	Thornton	Quarterly
Total and Dissolved Cadmium	EPA 200.8	0.0005 mg/L	Thornton	Quarterly
Total and Dissolved Chromium	EPA 200.8	0.001 mg/L	Thornton	Quarterly
Total and Dissolved Copper	EPA 200.8	0.002 mg/L	Thornton	Quarterly
Total and Dissolved Iron	EPA 200.7	0.05 mg/L	Thornton	Quarterly
Total and Dissolved Lead	EPA 200.8	0.0005 mg/L	Thornton	Quarterly
Total and Dissolved Manganese	EPA 200.8	0.002 mg/L	Thornton	Quarterly
Total and Dissolved Molybdenum	EPA 200.8	0.002 mg/L	Thornton	Quarterly
Total and Dissolved Selenium	EPA 200.8	0.005 mg/L	Thornton	Quarterly
Total and Dissolved Zinc	EPA 200.8	0.020 mg/L	Thornton	Quarterly
Bromide	SM 4110 A	0.1 mg/L	Thornton	Monthly
Chloride	SM 4110 A	5 mg/L	Thornton	Quarterly
Sulfate	SM 4110 A	10 mg/L	Thornton	Quarterly
Total Hardness (as $CaCO_3$)	EPA 130.2	5 mg/L	Thornton	Quarterly

Table Notes:
1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limit goals are matrix dependent and may be increased for complex matrices and may be lower depending on laboratory capability.
3) Quarterly parameters are analyzed in March, June, September and December at all sampled locations.
4) Samples collected for nutrients (nitrogen and phosphorus) with a turbidity reading of greater than 100 NTU are analyzed by commercial laboratories that have demonstrated proficiency in analyzing complex matrices for nutrients.

TRIB SAMPLES

Program Coordination (Northglenn)

Before the scheduled Tributary sampling date:

- Ensure an adequate supply of sample containers is available from Thornton. Westminster's bottles will be picked up at Westminster on sampling day before the start of sampling at T-24.
- Label the Trip blank bottle and fill with laboratory DI water.
- Calibrate the multimeter for conductivity, pH and DO.
- Analyze the Trip Blank for conductivity, pH and DO.
- Pack Trip Blank in cooler to monitor field activities for phosphorus contamination.

Sample Bottle Kit – Tribs Monthly and Quarterly

Quantity	Volume	Bottle Type	Parameter	Laboratory
9	500 mL	Rectangular plastic	Phosphorus series	Northglenn
1 (Trip blank)	500 mL	Rectangular plastic	Phosphorus series	Northglenn
9	500 mL	Plastic	TSS, Total Hardness, Chloride, Sulfate	Thornton
9	40 mL	Glass vial	TOC	Thornton
9	250 mL	Glass	E. coli	Thornton
9	250 mL	Plastic	Total Metals	Thornton
9	125 mL	Plastic	Dissolved Metals	Thornton
9	250 mL	Plastic	Quarterly Total Metals	Thornton
9	125 mL	Plastic	Quarterly Dissolved Metals	Thornton
9	250 mL	Plastic	Nitrogen series, UV-254	Westminster
9	1 L	Plastic	Rads	Westminster

Sample Collection

Equipment required:

- Key to access T-2
- Key to access T-27
- Gate Code for access at T-22A
- Field data book
- Cooler with blue ice or ice
- Trip blank filled with DI
- Sample bottles as detailed above

- Bucket for sample collection
- pH and DO meters and probes
- Ballpoint pen
- Waterproof marker
- Chain of custody forms
- NOTE – Four wheel drive vehicle recommended for sampling due to steep inclines at some locations and potentially rugged or muddy conditions.

Sample collection procedure:

1. Meet with Westminster staff at Semper. Drop off bottles for Westminster staff to collect sample at T-25.
2. Starting with T-24, collect field samples in the order detailed below for each location where water is flowing.
3. Rinse the sample bucket with the field sample water repeatedly at each location before collecting the sample.
4. Collect enough volume of the field sample in the bucket to fill all sample bottles for the location.
5. Fill the appropriate sample bottles from the bucket.
6. Label the sample bottles with location, date and time of collection.
7. Analyze the sample in the field for conductivity, pH, DO and temperature. Record data in the field notebook.
8. Repeat the process at each location.
9. Return to Westminster's Semper WTP to receive T-25 sample from Westminster staff. Sign COC and keep the original copy of the COC.
10. Leave an unsigned copy of the Thornton COC at Westminster so the samples can be logged into the Tribal database by Westminster staff.
11. Complete the COCs and relinquish custody of the samples to Westminster staff. Sign COC and keep a copy of the COC. Leave the original COC with the samples.
12. Return to Northglenn Lab and analyze samples for turbidity on a calibrated meter. Record data in the field notebook.
13. Contact Thornton to pick up collected field samples. Request replenishment of bottles for the next sampling event as needed.
14. Relinquish samples to Thornton and sign COCs. Retain a copy of the COC. Thornton takes possession of the original COC.
15. Northglenn retains a copy of all COCs and field documentation for permanent archive.

TRIB SAMPLES

Sampling Locations Directions and Narrative Descriptions

Tributary sampling occurs generally in an upstream to downstream fashion. Samples are collected at designated locations when water is flowing.

Trib 24
T-24 is located at Westminster's Semper Water Treatment Plant at 8900 Pierce Street. The sample is collected from the RAW water tap in the Operator's Laboratory. Do **NOT** increase the flow at the tap at this location. First tap on the left labeled 24.

Trib 22A
T-22A is the upstream sample point on the Kinnear Ditch pipeline. It is accessed through a gate located at Hwy. 72 and Plainview Rd. A key is required to access the location. The sample point is approximately 0.2 miles from Plainview Rd. Sample is taken at the flume where Coal Creek enters the pipeline.

Trib 1
T-1 is located at the Church Ditch headgate on Clear Creek. This site is accessed via Hwy 6 approximately 0.5 miles west of Hwy 93. There is a diversion from Clear Creek above this location which diverts water from Clear Creek and runs it parallel to the Creek. There are two gates at this location one sends water back into Clear Creek and the other is the Church Ditch headgate. Sample is taken from the bridge just above both gates.

Trib 2
T-2 is located at the Farmers Highline headgate on Clear Creek.
The site is accessed behind the Coors office building at the end of Archer St. Sample is taken from the bridge just inside the gate. Sample the downstream side of the headgate if it is open or on the upstream side if the headgate is closed (Clear Creek side).

Trib 3
T-3 is located at the Croke Canal headgate on Clear Creek.
This site is on Coors property. It is along the frontage road through Coors, on the east side of a small "pond". Sample the downstream side of the headgate if it is open or on the upstream side if the headgate is closed (Clear Creek side).

Trib 22D
T-22D is on the Kinnear Ditch Pipeline between 96th Ave and 88th Ave on Alkire St.
The sample is taken just downstream of the culvert on the east side of Alkire St.

Trib 04 and Trib 11
The Croke Canal (T-04) passes UNDER the Farmers Highline (T-11) in the area just west of 86th and Kipling prior to entering Standley Lake. The Farmers Highline passes OVER the Croke in a concrete structure. Sample the Croke on the south side of the Farmers Highline concrete structure. Sample the Farmers next to the white autosampler housing box.

Trib 25
Located at Westminster's Northwest Water Treatment Plant located at 104th & Wadsworth. The sample is collected by Westminster from the raw water tap on the west wall in the membrane filter gallery. Sample only if T-24 is not running.

Trib 27
Located on the south side of Standley Lake at the Church Ditch delivery structure. This sampling location was activated in 2009.

Photographs of the sampling locations and GPS coordinates are included in Appendix D.

TRIB CONTINUOUS MONITORING

Program Coordination (Westminster)

Field sampling team: Westminster

A YSI multi-parameter sonde and data logging equipment are deployed year-round at the trib location where the Farmers Highline Canal (T-11) crosses over the Croke Canal (T-04), provided there is sufficient flow in one of the canals. A sonde was also installed at the new Church Ditch inlet (T-27) in 2009 and operates under similar conditions. The probes provide continuous in-stream monitoring of pH, ORP, temperature, depth (pressure transducer), conductivity and turbidity. Remote access to the data logger data facilitates monitoring of water quality at these inflow locations to Standley Lake. The FHL/Croke station is also equipped with a tipping-bucket rain gauge.

TRIB CONTINUOUS MONITORING

Sample Locations

CC AS T04	Croke Canal approximately 0.5 mile from Standley Lake inlet
CC AS T11	Farmers Highline Canal approximately 0.5 mile from Standley Lake inlet
CC AS T27	Church Ditch at Standley Lake inlet

Table Note: Historical data from these locations are available as part of the Clear Creek Canal Program that was eliminated in 2008. The sample location identifications associated with the Clear Creek Canal Program have been retained.

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES

Program Coordination: Westminster
Field Sampling Teams: Westminster

Autosampler sites in the Tributary Basin are located at the canal inlets to Standley Lake. The 48-hour ambient composites are collected with programmable automatic sampling devices as described in the UCC autosampler 48-hr ambient program section of this plan in order to assess any water quality impacts introduced by the canals.

Ambient samples are collected approximately seven times per year on a monthly schedule starting in April and ending in October to coincide with the UCC autosampler 48-hr ambient sample program.

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Sample Locations

CC AS T04	Croke Canal approximately 0.5 mile from Standley Lake inlet
CC AS T11	Farmers Highline Canal approximately 0.5 mile from Standley Lake inlet
CC AS T27	Church Ditch at Standley Lake inlet

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Flow Monitoring

Flow in the canals is tracked by the ditch operators and water accountants.

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Analytical Parameters

Analyte	Analytical Method Reference	Reporting Limit Goal	Responsible Laboratory
Total Nitrogen	SM 4500-NO3 I	0.02 mg/L	Westminster
Nitrate/Nitrite-N	SM 4500-NO3 I	0.01 mg/L	Westminster
Ammonia-N	SM 4500-NH3 H	0.01 mg/L	Westminster
Total Phosphorus	SM 4500-P E	0.0025 mg/L	Northglenn
Ortho-phosphate-P (dissolved) or DRP	SM 4500-P E	0.0025 mg/L	Northglenn
Total Suspended Solids (TSS)	SM 2540 D	1 mg/L	Thornton
Total Organic Carbon (TOC)	SM 5310 B	0.5 mg/L	Thornton
Total and Dissolved Arsenic	EPA 200.8	0.001 mg/L	Thornton
Total and Dissolved Barium	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Cadmium	EPA 200.8	0.0005 mg/L	Thornton
Total and Dissolved Chromium	EPA 200.8	0.001 mg/L	Thornton
Total and Dissolved Copper	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Iron	EPA 200.7	0.05 mg/L	Thornton
Total and Dissolved Lead	EPA 200.8	0.0005 mg/L	Thornton
Total and Dissolved Manganese	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Molybdenum	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Selenium	EPA 200.8	0.005 mg/L	Thornton
Total and Dissolved Zinc	EPA 200.8	0.020 mg/L	Thornton
pH	SM 4500-H+ B	1.0 Std Units	Field Teams
Temperature	SM 2550 B	1.0 °C	Field Teams
Conductivity	SM 2510 B	10 µS/cm	Field Teams
Turbidity	SM 2130 B	1.0 NTU	Field Teams

Table Notes:
1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limit goals are matrix dependent and may be increased for complex matrices and may be lower depending on laboratory capability.
3) EPA recommended holding times less than 72 hours may not be met due to the extended sampling routine.
4) Samples collected for nutrients (nitrogen and phosphorus) with a turbidity reading of greater than 100 NTU are analyzed by commercial laboratories that have demonstrated proficiency in analyzing complex matrices for nutrients.

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Program Coordination (Westminster)

Field Equipment

Equipment Installed At Autosampler Locations

- Permanent and tamper-proof enclosure box with lock
- American Sigma 900, 900 Max or other automated sampler
- Power supply – solar panel, rechargeable battery or direct power
- Sample tubing long enough to reach from the autosampler to the streambed. Probes must be contained in protective piping secured in the creek bed
- Dedicated field probes for turbidity, temperature, conductivity and pH
- Depth/velocity flow sensor
- Rain gage at T4/T11
- 24 discrete HCl rinsed autosampler bottles with caps. Bottles must be numbered and inserted in the designated position in autosampler (positions numbered 1 through 24)
- Continuous recording datalogger
- Cellular modem and antenna at T4/T11 and T27

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES
Autosampler Operation

On a monthly basis between April and October, autosamplers are set to collect time-weighted discrete samples for a 48 hour period. The autosamplers are located at the canal inlets to Standley Lake. In order to associate the relative impacts of the point and nonpoint pollutant sources located between the last autosampler location on Clear Creek (CC AS 59), it is advisable to observe the same "slug" of water at the canal inlets to Standley Lake. The time of travel in the Farmer's Highline canal is calculated from the inflows to the canal at the headgate on Clear Creek.

The time of travel estimates table for the Farmer's Highline Canal is included in Appendix E.

Autosampler Setup:

Equipment required:

- 24 discrete HCl rinsed autosampler bottles with caps
- Keys and/or tools to access autosampler enclosure.
- Field data collection/station audit sheets.

Setup Procedure:

1. Unlock sample enclosure and remove sampler head. Set aside without disturbing or bumping the distributor arm.
2. Load uncapped bottles in the correct positions in the bottom of the sampler.
3. Secure bottles in place with the retaining ring. Store caps in a ziplock bag inside the autosampler until sample collection.
4. Program the sampler according to manufacturer's instructions to collect two 450 ml storm samples per bottle, one sample per pulse.
5. After starting the autosampler, ensure that the distributer arm is positioned above bottle #1.
6. Replace sampler head and lock in place.
7. Record station/equipment information on field sheet.
8. Make sure the autosampler program is ***RUNNING*** before locking the enclosure.
9. The autosampler may be set up ahead of a scheduled start time.

Sample Collection

Additional equipment required:

- Keys and/or tools to access autosampler enclosures
- Large cooler with ice to collect sample bottles
- 24 pre-cleaned, HCl rinsed, discrete sample replacement bottles
- Field data sheets/station audit sheets
- Chain of custody forms
- Laptop with Loggernet software and data cable (9 pin serial cable with SC32B adapter) if retrieving data directly from datalogger
- Two 3-liter Nalgene bottles (clean and rinsed with 1:1 hydrochloric acid) for compositing samples
- 250 mL graduated cylinder (clean and rinsed with 1:1 hydrochloric acid) for compositing samples
- Prepared sample bottles provided by participating Cities for nutrients, solids and metals analyses
    - 1 L square plastic – phosphorus series (Northglenn)
    - 250 mL plastic – nitrogen series (Westminster)
    - 500 mL plastic bottle – TSS (Thornton)
    - 45 mL amber glass vial with septa cap – TOC (Thornton)
    - 500 ml non-preserved metals bottle and 500 ml preserved metals bottle (Thornton)
- Chain of Custody forms – Refer to Appendix C
- Field Sampling form - Refer to Appendix C

Sample Collection Procedure:

1. Unlock enclosure and remove sampler head.
2. Retrieve date/time information from autosampler if required. To collect sample history on American Sigma samplers, press <Change/ Halt> button, press <time/read> button for 5 seconds. The sample collection time for the first sample will appear. Record data on the field sheet. Press <yes> for next sample time to appear. Continue until all data is recorded.
3. Date and time information for samples is also automatically stored in a data file by the dataloggers at all sites except CC59.
4. Record station/equipment information on field sheet.
5. Make note of any samples with high turbidity determined by visual observance or data obtained from the datalogger.
6. Optional compositing of samples in the field is performed by pouring off equal volumes into three-liter (or larger) pre-cleaned bottles. The 24 sample bottles may also be brought back to a laboratory for compositing. Refer to the Sample Compositing Procedure Step 1. Save remaining volume of any high turbidity samples to take back to the lab. Discard remaining sample.
7. Clean out autosampler base and reload with a new set of pre-cleaned bottles.
8. Reset the autosampler by pressing the START button (Sigma 900 autosampler). Ensure that the distributor arm is parked over bottle #1 and the display reads “Program Running” before closing the autosampler and placing it back in the enclosure.
9. Return to the Westminster Water Quality Laboratory for compositing, splitting, distribution and wet chemistry analysis of pH, turbidity and conductivity.

TRIB AUTOSAMPLER 48-HOUR AMBIENT SAMPLES

Sample Compositing

1. Composite samples in the laboratory if compositing was not performed in field. Shake sample bottles and pour equal volumes of sample from the first 12 bottles into a composite bottle marked "A". Shake sample bottles and pour equal volumes of sample from the remaining 12 bottles into a composite bottle marked "B".
2. Perform turbidity, temperature, pH and conductivity measurements on composited samples. Enter data on the Sampling Form.
3. Use the well mixed composites (A and B) to fill the appropriate bottles for the Northglenn, Thornton and Westminster labs.
4. If any discreet bottle(s) appears to have an unusually high turbidity and enough sample is available, analyze for turbidity and conductivity. Record on Sampling Form. If there is enough sample, pour the high turbidity discreet samples into separate nutrient and solids bottles for individual analysis.
5. Complete the COCs.
6. Relinquish to each city their respective samples (Westminster-nitrogen series, Thornton-TSS, metals and TOC, Northglenn-phosphorus series) and sign COCs as appropriate.
7. Original field data sheets and COCs are retained by the Cities of Westminster for permanent archive.
8. Samples are created in the web-accessible Excel spreadsheet by Westminster for data entry and results archive.

TRIB AUTOSAMPLER EVENT SAMPLES
Program Coordination (Westminster)

Field Sampling Team: Westminster

The event autosampler program was initiated on the Tributaries in 2009 at CC AS T11 to assess the pollutant concentrations mobilized during significant snow melt (runoff) or rain events at the location closest to Standley Lake. Automated sample collection of stormwater is triggered based on a turbidity reading of 100 NTU. The autosampler may also be activated remotely to begin sampling immediately or programmed to start sampling at a designated time in an attempt to capture the downstream effects of a storm in the upper watershed based on time of travel. The autosampler collects discrete samples every 15 minutes until the ambient condition drops below the trigger level or until the maximum number of samples is collected. The discrete samples may be analyzed individually or multiple discrete samples may be composited based on the field observations.

TRIB AUTOSAMPLERS EVENT MONITORING
Sample Locations

Trib Autosampler Event Samples are only collected at CC AS T11. First flush samples may be collected at all three Trib Autosampler Continuous Monitoring locations.

CC AS T11 Event	Farmers Highline Canal approximately 0.5 mile from Standley Lake inlet

Table Note: Historical data from this location is available as part of the Clear Creek Canal Program which was eliminated in 2008. The sample location identifications associated with the Clear Creek Canal Program have been retained.

TRIB AUTOSAMPLER EVENT SAMPLES
Flow Monitoring

Flow in the canals is tracked by the ditch operators and water accountants. The average daily flow data corresponding with the time-event composited samples will be used for loadings calculations for storm events.

Refer to Appendix E for the time of travel data for the Farmers Highline Canal. Time of travel studies have not been performed from the canal headgates on Clear Creek to Standley Lake for the Croke Canal or the relocated Church Ditch inlet structure.

TRIB AUTOSAMPLER EVENT SAMPLES
Analytical Parameters

Storm event samples are analyzed for the same suite of analytical parameters listed in the previous section for the 48-hour ambient samples. Samples may not be analyzed within the EPA recommended holding time for some parameters based on the random nature of the storm event triggering.

TRIB AUTOSAMPLER EVENT SAMPLES

Field Equipment

Storm event sampling utilizes the same equipment listed in the previous section for the 48-hr ambient samples.

Autosampler Operation

Field equipment used for storm event sampling is operated using the same techniques as described in the previous section for 48-hr ambient sampling.

Sample Compositing

Sample compositing is performed similarly to the procedure described in the previous section for 48-hr ambient sampling; however, fewer samples are typically composited based on the severity and/or duration of a storm event.

STANDLEY LAKE MONITORING PROGRAM

Standley Lake is a storage reservoir that serves as the raw drinking water source for the SLC. Over 250,000 consumers rely on Standley Lake for their drinking water. The Standley Lake ("SL") Monitoring Program is designed to provide water quality information in order to evaluate internal loadings in Standley Lake and the effects of nutrient reduction measures and best management practices on the trophic status of Standley Lake. Regularly spaced and frequent sampling is necessary to provide sufficient data for monitoring trends for the analytes used to evaluate trophic status including dissolved oxygen, chlorophyll and nutrients.

The main water quality monitoring efforts on Standley Lake include:

- Daily top to bottom lake profiles
- Bimonthly grab samples
- Zooplankton tows
- Invasive species monitoring and control

SL – DAILY LAKE PROFILES

Program Coordination (Westminster)

The sampling location in Standley Lake (Site 10-00) is situated near the outlet structure. The lake site was selected based on the lengthy historical record of water quality monitoring data and because the water is drawn from the lake at this location via pipelines to the SLC's water treatment plants. Sampling at varying depths in the lake provides extensive information for use in drinking water treatment process decisions and evaluating water resource management options.

Standley Lake is monitored at Site 10-00 using an automated profiler equipped with a multi-probe sonde four times each day from early spring to late fall for the analytes listed in the following table. The profiler is removed from the lake prior to freezing of the lake surface. Refer to the watershed map in Appendix B for the location of the SL monitoring location. The solar powered unit collects data from the surface of the lake to within five feet off the bottom and every meter in between. The profiler data is accessible via the internet and provides a depth-integrated profile of the lake water quality.

SL – DAILY LAKE PROFILES

Analytical Parameters

Analyte	**Analytical Method Reference**	**Reporting Limit Goal**
Temperature	SM 2560 A	1.0 °C
pH	SM 4500-H+ B	1.0 Std Units
Conductivity	SM 2510 B	10 µS/cm
Turbidity	SM 2130 B	1.0 NTU
Dissolved Oxygen	YSI (optical probe)	1.0 mg/L
Chlorophyll	YSI (electrode)	1.0 µg/L
ORP	SM 2580 A	1.0 mv

Table Notes: 1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limits are matrix dependent and may be increased for complex matrices.

SL – BIMONTHLY GRAB SAMPLES
Program Coordination: Westminster

The same sampling location in Standley Lake (Site 10-00) is used for both the daily lake profiles and the bimonthly grab samples. Sampling at varying depths in the lake provides extensive information for use in drinking water treatment process decisions and evaluating water resource management options. Refer to the watershed map in Appendix B for the location of the SL monitoring location.

SL – BIMONTHLY GRAB SAMPLES
Locations

Grab samples are collected twice each month from March through November, but the sampling may be extended during the winter if the lake is not frozen. The raw water pipeline at Semper (T-24) may be sampled for a subset of the routine analytical parameters when the lake is frozen or when safety of the sampling team is a concern (i.e. high winds, frozen boat dock ramp, etc.).

Sample Identification	**Sample Location**
SL 10-00	SL surface
SL 10-PZ	SL at two times the Secchi depth
SL 10-70	SL at five feet off the bottom. (Approximate depth of 60 ft when lake is full at gage height 96)
SL 69-00	SL surface at the boat dock
T-24	Semper raw water pipeline. T-24 is approximately 10 ft higher than SL 10-70

SL – BIMONTHLY GRAB SAMPLES

Analytical Parameters

Analyte	**Analytical Method Reference**	**Reporting Limit Goal**	**Responsible Laboratory**
Temperature	SM 2550 B	1.0 °C	Field Team
pH	SM 4500-H+ B	1.0 Std Units	Field Team
Conductivity	SM 2510 B	10 µS/cm	Field Team
Turbidity	SM 2130 B	1.0 NTU	Field Team
Dissolved Oxygen	YSI (optical probe)	1.0 mg/L	Field Team
ORP	YSI (electrode)	1 mv	Field Team
Chlorophyll	YSI (electrode)	1.0 µg/L	Field Team
Secchi Depth	Secchi disk	0.1 meter	Field Team
Total Nitrogen	SM 4500-NO3 I	0.02 mg/L	Westminster
Nitrate/Nitrite as N	SM 4500-NO3 I	0.01 mg/L	Westminster
Ammonia as N	SM 4500-NH3 H	0.01 mg/L	Westminster
Gross Alpha and Gross Beta	EPA 900.0	0.1 pCi/L	Westminster
Zooplankton	SM 10900	1 per L	Westminster
Algae	SM 10900	1 per mL	Westminster
Chlorophyll *a*	SM 10200-H	1.0 µg/L	Westminster
UV-254	SM 5910 B	0.001 cm^{-1}	Westminster
Total Phosphorus	SM 4500-P E	0.0025 mg/L	Northglenn
Ortho-phosphate as P (dissolved) or DRP	SM 4500-P E	0.0025 mg/L	Northglenn
Total Organic Carbon	SM 5310 B	0.5 mg/L	Thornton
Total Suspended Solids	SM 2540 D	1 mg/L	Thornton
Total and Dissolved Arsenic	EPA 200.8	0.001 mg/L	Thornton
Total and Dissolved Barium	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Cadmium	EPA 200.8	0.0005 mg/L	Thornton
Total and Dissolved Chromium	EPA 200.8	0.001 mg/L	Thornton
Total and Dissolved Copper	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Iron	EPA 200.7	0.05 mg/L	Thornton
Total and Dissolved Lead	EPA 200.8	0.0005 mg/L	Thornton
Total and Dissolved Manganese	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Molybdenum	EPA 200.8	0.002 mg/L	Thornton
Total and Dissolved Selenium	EPA 200.8	0.005 mg/L	Thornton
Dissolved Silicon	EPA 200.7	0.02 mg/L	Westminster
Total and Dissolved Zinc	EPA 200.8	0.020 mg/L	Thornton
Total Mercury	EPA 245.1	0.0002 mg/L	Thornton
Total Hardness (as $CaCO_3$)	EPA 130.2	5 mg/L	Thornton
E. coli	SM 9221 D	1 cfu/100mL	Thornton
BTEX	EPA 524.2	0.0005 mg/L	Thornton

Table Notes: 1) SM refers to the 22nd Edition of Standard Methods for the Examination of Water and Wastewater.
2) Reporting limit goals are matrix dependent and may be increased for complex matrices and may be lower depending on laboratory capability.

SL – BIMONTHLY GRAB SAMPLES

Analytical Scheme

The analytical scheme for Standley Lake was designed to capture the biological, physical and chemical changes occurring in the lake ecosystem throughout the year. Seasonality plays an important role in lake dynamics and subsequently, on the water treatment processes. The table below details the variable analytical scheme, with the caveat that weather patterns may require modification to the plan. Rads (Gross Alpha and Gross Beta) and metals are collected before and after run-off, and before and after lake turnover, which are both subject to annual fluctuation.

Month	**Lake Sample Location**	**Analytes**														
		Hand Profile	Secchi depth	Rads	E coli	Zooplankton	Nutrients	Metals	Algae	Chlorophyll *a*	TOC	TSS	Total Hardness	BTEX	UV-254	Dissolved Silicon
January 1st week	10-00	X	X	X	X	X										
	10-PZ			X			X	X	X	X	X	X	X		X	X
	10-70	X		X	X		X	X			X	X	X		X	X
	T-24								X						X	
January 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	
February 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X	X		X	X
	10-70	X			X		X				X	X	X		X	X
	T-24								X						X	
February 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	
March 1st week	10-00	X	X	X	X	X										
	10-PZ			X			X		X	X	X	X	X		X	X
	10-70	X		X	X		X				X	X	X		X	X
	T-24								X						X	
March 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	
April 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X	X		X	X
	10-70	X			X		X				X	X	X		X	X
	69-00													X		
	T-24								X						X	
April 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	

Month	Lake Sample Location	Analytes														
		Hand Profile	Secchi depth	Rads	E coli	Zooplankton	Nutrients	Metals	Algae	Chlorophyll *a*	TOC	TSS	Total Hardness	BTEX	UV-254	Dissolved Silicon
May 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X	X		X	X
	10-70	X			X		X				X	X	X		X	X
	T-24								X						X	
May 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	69-00													X		
	T-24								X						X	
June 1st week	10-00	X	X	X	X	X										
	10-PZ			X			X	X	X	X	X	X	X		X	X
	10-70	X		X	X		X	X			X	X	X		X	X
	T-24								X						X	
June 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	69-00													X		
	T-24								X						X	
July 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X	X		X	X
	10-70	X			X		X				X	X	X		X	X
	T-24								X						X	
July 3rd week	10-00	X	X			X										
	10-PZ						X	**X**	X	X			X		X	X
	10-70	X					X	**X**					X		X	X
	69-00													X		
	T-24								X						X	
August 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X			X	X
	10-70	X			X		X				X	X			X	X
	T-24								X						X	
August 3rd week	10-00	X	X	X		X										
	10-PZ			X			X	X	X	X			X		X	X
	10-70	X		X			X	X					X		X	X
	69-00													X		
	T-24								X						X	
September 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X			X	X
	10-70	X			X		X				X	X			X	X
	T-24								X						X	

Month	Lake Sample Location	Analytes														
		Hand Profile	Secchi depth	Rads	E coli	Zooplankton	Nutrients	Metals	Algae	Chlorophyll *a*	TOC	TSS	Total Hardness	BTEX	UV-254	Dissolved Silicon
September 3rd week	10-00	X	X	X		X										
	10-PZ			X			X	X	X	X			X		X	X
	10-70	X		X			X	X					X		X	X
	69-00													X		
	T-24								X						X	
October 1st week	10-00	X	X		X	X										
	10-PZ						X	**X**	X	X	X	X	X		X	X
	10-70	X			X		X	**X**			X	X	X		X	X
	T-24								X						X	
October 3rd week	10-00	X	X	X		X										
	10-PZ			X			X	X	X	X			X		X	X
	10-70	X		X			X	X					X		X	X
	69-00													X		
	T-24								X						X	
November 1st week	10-00	X	X		X	X										
	10-PZ						X		X	X	X	X	X		X	X
	10-70	X			X		X				X	X	X		X	X
	T-24								X						X	
November 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	
December 1st week	10-00	X	X	X	X	X										
	10-PZ			X			X		X	X	X	X	X		X	X
	10-70	X		X	X		X				X	X	X		X	X
	T-24								X						X	
December 3rd week	10-00	X	X			X										
	10-PZ						X		X	X					X	X
	10-70	X					X								X	X
	T-24								X						X	

Table notes:

1) Hand Profile includes analysis of temperature, pH, conductivity, turbidity, DO, chlorophyll and ORP at the surface of the lake and at the bottom of the lake using the sonde.
2) Rads includes Gross Alpha and Gross Beta.
3) Metals includes the total and dissolved forms of As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Mo, Se and Zn, dissolved Si and total Hg. **Metals for the 3rd week of July and the 1st week of October consist of ONLY total and dissolved arsenic.**
4) Nutrients include the phosphorus series and the nitrogen series analytes. Phosphorus series includes total P and dissolved ortho-phosphate-P (also referred to as DRP). Nitrogen series includes total N, ammonia-N and nitrate/nitrite-N.
5) Total Hardness is reported as $CaCO_3$.

SL – BIMONTHLY GRAB SAMPLES

Program Coordination (Westminster)

SL Sample bottle kit

The sample containers required for each monitoring event varies depending on the parameters to be analyzed. Westminster will assemble sample bottle kits for each event. The following table details the sample containers for various parameters.

Parameter	Volume	Bottle Type	Laboratory
Phosphorus series	1L	Rectangular plastic	Northglenn
Nitrogen series, UV-254	250 mL	Rectangular plastic	Westminster
Rads	1 L	Plastic	Westminster
Zooplankton	250 mL	Plastic	Westminster
Algae	1 L	Plastic	Westminster
Chlorophyll *a*	1 L	Brown plastic	Westminster
Dissolved Silica	250 mL	Rectangular Plastic	Westminster
Total metals, Total Hg	500 mL	Plastic	Thornton
Dissolved metals	500 mL	Plastic	Thornton
TOC	40 mL	Glass vial	Thornton
TSS, Total Hardness	500 mL	Plastic jug	Thornton
E. coli	250 mL	Glass	Thornton
BTEX	40 mL	Glass vial	Thornton
BTEX trip blank	40 mL	Glass vial	Thornton

Table Notes:

1) A trip blank is required to be prepared when field samples are collected for BTEX. The trip blank is comprised of a pre-cleaned glass vial filled with DI and is used to monitor for volatile organic contamination during transport and lab storage prior to analysis. Analysis of the trip blank is only required when any of the BTEX analytes are detectable in the field samples.
2) Phosphorus series includes total P and dissolved ortho-phosphate-P (also referred to as DRP).
3) Nitrogen series includes total N, ammonia-N and nitrate/nitrite-N.
4) Rads includes: Gross Alpha and Gross Beta
5) BTEX includes: benzene, toluene, ethyl benzene and total xylenes

SL – BIMONTHLY GRAB SAMPLES
Sample Collection

Equipment

Pontoon Boat
Marking Pen – Waterproof
Depth Finder
Secchi Disk
Log book and pen
Van Dorn bottle
Labeled sample bottles (refer to individual monitoring plans)
Churn sample splitter
PZ tube sampler
Ice packs
Coolers
Chain of custody forms
YSI 6600 Sonde - calibrated
YSI 650 Meter and cable
Handheld anemometer/%Relative humidity meter
Cellular phone
GPS unit
Digital camera
Boat Tool Kit
Laptop computer – fully charged with communication cable and "console" application installed
Water pitcher and wide bristle brush for cleaning sonde cage
Jackets, hats, gloves or other protective clothing as appropriate for the weather conditions
First aid kit
Personal flotation devices (one per person)
Survival Suits – yellow (1 hr protection) and orange (1/2 hr protection) -as appropriate
Profiler enclosure key
Boat Anchor(s)
Key for boat ramp during off-season
Zooplankton tow net – 63 µm

Sample collection procedure

At Laboratory

- Prepare and label all required sampling containers.
- Complete basic information on the chain of custody (COC) forms.
- Update the YSI 6600 file names using the format XXMMDDYY, where XX denotes the field sampling program identification (e.g. SL, CC, RC, etc.), MM denotes the month, DD denotes the day and YY denotes the year.
- Notify laboratories about the sampling event and schedule sample pickup.
- Assemble the sampling equipment and load into the truck.
- Calibrate the sonde.

Sampling on Standley Lake

Van Dorn Bottle

- The Van Dorn bottle provides a means of collecting water samples at selected depths below the surface. It is made of an open-ended plastic cylinder that is attached to a rope, and lowered to any desired depth.
- Each end of the cylinder is fitted with a rubber cover. The Van Dorn bottle is attached to the length of rope, marked in 0.1 m increments, with the covers pulled out and attached to the trigger device.
- The depth of the lake is determined using the sonde. The bottle is lowered to a depth one meter above the bottom of the lake.
- A metal weight called a "messenger" is attached to the rope above the bottle. The water sample is taken by dropping a weighted “messenger" down the rope. When the weight hits the triggering device on the upper Van Dorn bottle, the catch releases the rubber end covers. The two covers are pulled together and seal off the ends.
- When the bottle has been closed, it is pulled to the surface.
- Water samples from the Van Dorn bottle are transferred to the appropriate sample containers.
- The Van Dorn sampler has a four liter capacity. If the volume of sample required is greater than the Van Dorn sampler can hold, multiple sample volumes can be collected and combined in the churn. The churn and churn spigot should be rinsed out with new sample water prior to sample collection in order to prevent cross-contamination from prior samples. Once the churn contains enough sample, it is thoroughly mixed and the sample is dispensed into the required sample containers.
- Sample containers are labeled with sample location, date and time of sample collection and the sampler’s initials. The label should indicate any preservative in the sample container.
- Full sample containers are placed in coolers with ice packs until they are returned to the laboratory.

PZ Tube Sampler

- The PZ (photic zone) sampler is used to sample a column of water from the surface of the lake to the depth of the photic zone. Photic zone is defined as twice the secchi depth. The PZ sampler is comprised of a churn sample splitter connected to a polypropylene tube equipped with a quick release connector on one end and a check valve on the other end.
- Measure the secchi depth through the floor port on the pontoon boat. Do not wear sunglasses. Record data in the logbook.
- Hook up the quick release connector end of the tube to the churn.
- The tube is marked in 0.5 meter lengths. Lower the end of the tube with the check valve into the water until it is at the depth of the photic zone.
- Pull the tube up out of the water and hold the end with the check valve upside-down at a height over your head, until the tube drains down to floor level, then quickly drop the check-valve end of the tube back into the water vertically to the depth of the photic zone. The water entering the end of the tube will push the air bubble and prior sample into the churn as the tube is lowered into the water. Use the first collected volume of sample to rinse the tube and churn. Waste the sample back to

the lake. Start collecting the second volume of sample. Repeat this step until sufficient quantity of sample has been collected in the churn. The capacity of the churn is 12 liters.

- Once the churn contains enough sample, it is thoroughly mixed and the sample is dispensed into the required sample containers.
- Sample containers are labeled with sample location, date and time of sample location and the sampler's initials. The label should indicate any preservative in the sample container.
- Sample containers are placed in a cooler with ice packs until they are returned to the laboratory.

Surface Sampling

- Surface sampling is accomplished through the floor port of the pontoon boat. Sample containers are dipped into the water until full to collect samples.
- Sample containers are labeled with sample location, date and time of sample collection and the sampler's initials. The label should indicate any preservative in the sample container.
- Sample containers are placed in a cooler with ice packs until they are returned to the laboratory.

Zooplankton Tows

- Zooplankton samples are collected at SL-10 using a 63 µm tow net.
- A vertical tow sampling methodology involves lowering the tow net to the bottom of the lake and retrieving it at a slow speed of approximately one foot per second up to the surface.
- The zooplankton collected in the net are washed into a 250 mL sample bottle using multiple DI water rinses to ensure all organisms in the net are transferred to the sample container. The final volume in the bottle is not required to be consistent.
- The sample depth is recorded on the sample bottle along with date and location.

SL – AQUATIC INVASIVE SPECIES MANAGEMENT

Eurasian Watermilfoil

Eurasian Watermilfoil ("EWM"), *Myriophyllum spicatum L*, is a non-native, aquatic, noxious weed that grows rapidly and to a depth of 35 feet. EWM grows in dense mats that severely interfere with recreation and has been known to provide a substrate for blue-green algae growth. Blue-green algae blooms can ultimately cause taste and odor events in drinking water supplies. EWM was first observed in Standley Lake in 1998. It was positively identified in 2000. In 2012, it was confirmed that the Eurasian watermilfoil hybridized with a native Colorado species Northern watermilfoil (Myriophillum sibiricum). The hybrid species is more robust and grows even quicker than the Eurasian watermilfoil.

Eurasian milfoil weevils have been stocked in the lake (on the west side) on four occasions from 2004 through 2011. The weevil larva bore into the stem of the milfoil which damages the plant. When an adequate weevil population is sustained, the weevils may be able to control the spread of the milfoil. Annual surveys of weevil populations in the lake are performed by contractors. Standley Lake experienced a steady milfoil density decline from 2006, of 500 stems/m^2 to 26 stems/m^2 in 2011. Unfortunately with the appearance of the hybrid milfoil, the density again increased in 2012 to 106 stems/m^2.

In 2007 the SLC initiated a pilot study on Standley Lake using two solar pond aerators to investigate the theory that continuous aeration will oxidize the sediment and deprive the milfoil of nutrients. Samples were collected and analyzed for nutrients to assess nutrient reduction at the aerator sites compared to other sites in the lake. The solar aerators were removed in the fall of 2009. The results of the study were inconclusive as there was an overall reduction in milfoil growth throughout the lake in 2009.

As lake conditions permit, bathymetric studies are performed on Standley Lake during the early summer for mapping the submerged aquatic vegetation in order to assess milfoil growth and the effectiveness of the remedies.

Zebra and Quagga Mussels

Zebra and quagga mussels are non-native, aquatic invasive species that are introduced to new water bodies by the unintentional transfer of organisms from an infested water body via boats or fishing bait. Aquatic mussels cause serious damage to the ecosystem and result in costly control procedures for drinking water treatment facilities. Both zebra and quagga mussels were discovered in 2008 in a few of Colorado's lakes. Prevention of aquatic mussel infestation is key to protecting Standley Lake. An intensive boat inspection and decontamination program was initiated in 2008 to protect the lake from new invasive species. No live aquatic baits are allowed at Standley Lake.

Standley Lake is monitored for aquatic mussels every two weeks using the zooplankton tow procedure described previously. The tows are performed at the lake inlets, SL-10, and the boat ramp/outlet area. Several invasive species have a planktonic life stage and sampling with the plankton nets will provide early warning of infestation. In addition, substrate samplers, constructed and monitored by Colorado Parks and Wildlife are placed throughout the lake. Substrate samplers are made up of a float, rope, plastic plates and an anchor weight. A plate is located at every 10 feet of depth from the surface to the bottom of the lake at various locations. The plates and ropes are checked periodically for aquatic mussel growth. A plate or rope that feels like sand paper will be scraped and examined under the microscope for veligers (zebra or quagga mussel larvae).

Shoreline surveys are performed when the water level is at the lowest for the year. A shoreline survey consists of walking the shoreline in teams looking for adult mussels attached to any hard substrate.

DATA MANAGEMENT AND REPORTING

The City of Westminster is responsible for management of the data collected in support of the monitoring efforts. A Microsoft Excel spreadsheet is used for archival of monitoring data collected for all programs detailed in this document except the lake profile data. The IGA partners have access to the system via an internet host site which also provides backup protection for the data.

The City of Westminster logs in all samples collected by the various sampling teams. The coordinated sample creation effort reduces interpretation errors and subsequent reporting inconsistencies. Each IGA partner is responsible for analytical results entry for their assigned analyses into the spreadsheet. On a quarterly basis, a peer review team, comprised of at least one representative from each of the SLC, evaluates the data and identifies possible errors or data anomalies. Each city makes corrections to the spreadsheet and submits a final version of the data. The spreadsheet is current to within six months.

Data results from this program, along with other reporting requirements as stated in the Joint Agreement, will be reported to the Colorado Water Quality Control Commission on an annual basis. Only data collected during the normal sampling schedule is included in the annual report. The data is reported in tabular and graphic formats.

Each laboratory must retain all records (i.e. field notebooks and logs, instrument logs, bench sheets, instrument printouts, electronic data files, chain of custody forms, etc.) pertaining to the monitoring programs until the SLC IGA representatives jointly, in writing, authorize disposal of the records.

The periods of record for monitoring data are summarized in the following table:

Program	Period of Record	Available Format
Clear Creek Grabs	1994 – 2001	MS Access/Excel
	2002 – current	MS Excel
Clear Creek Grabs - EPA Metals Data	1994 – current	MS Excel
Clear Creek Autosamplers Ambient	2006 – current	MS Excel
Clear Creek Autosamplers Event	2006 – current	MS Excel
Standley Lake Tributaries – grabs and autosamplers (includes data for the program formerly called Clear Creek Canals)	1988 – 2001	MS Access/Excel
	2002 - current	MS Excel
Standley Lake	1988 – 2001	MS Access/Excel
	2002 - current	MS Excel

Table Notes: The data archive includes phosphorus data from 1999-current, all Thornton data from 2001-current and all Westminster data from 2002-current.

Appendix C – Clear Creek, Canal, and Standley Lake Water Quality Monitoring Data – 2013

Clear Creek - Grab Sampling Results

			Method	**SM2550B**	**SM4500H+B**	**SM2510B**	**SM4500OG**	**SM2130B**	**SM5310B**	**SM2540D**	**SM4500NH3H**	**SM4500NO3I**	**SM4500NO3I**	**SM4500PE**	**SM4500PE**	**NA**	**NA**
			DL	**1.0**	**1.0**	**1**	**1.0**	**1**	**0.5**	**1**	**0.01**	**0.01**	**0.02**	**0.0025**	**0.0025**	**NA**	**NA**
			Reporting Units	**°C**	**s.u.**	**µS/cm**	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**NA**	**NA**
Sample Date	**Sample Time**	**Sample Type**	**Location ID**	**Temp**	**pH**	**Conductivity, Specific**	**Oxygen, Dissolved**	**Turbidity**	**Carbon, Total Organic**	**Solids, Total Suspended**	**Nitrogen, Ammonia (Salicylate)**	**Nitrogen, Nitrate+Nitrite**	**Nitrogen, Total Nitrogen**	**Phosphorus, Dissolved (DRP)**	**Phosphorus, Total**	**Notes**	**Lab Notes**
02/04/13	Unknown	**G**	**CC 7A, CCC WWTP**	9.4	7.1	986	10.9	6.6	NT	10	0.53	16.7	23.2	0.247	0.776		
02/04/13	Unknown	**G**	**CC 12A, Idaho Springs WWTP**	9.8	7.1	466	5.1	2.5	NT	1	0.3	0.82	3.2	0.115	0.279		
02/04/13	Unknown	**G**	**CC 13B, BH/CC WWTP**	13.5	7.2	1090	6.5	2.9	NT	8	0.13	3	5.9	0.0364	0.211		
02/04/13	Unknown	**G**	**CC 15A, Eisenhower T. WWTP**	12	7.5	2190	11.6	1.7	NT	7	4.1	2.1	8	0.384	0.56		
02/04/13	Unknown	**G**	**CC 26**	3.8	8.2	406	10.5	<1	0.7	6	< 0.01	0.37	0.54	< 0.0025	0.00077		
02/04/13	Unknown	**G**	**CC 40**	1.3	8.2	413	8.4	<1	0.7	9	< 0.01	0.39	0.63	0.0037	0.0084		
02/04/13	Unknown	**G**	**CC 50**	3.3	7.3	942	13	2.3	2	8	0.06	1.02	1.5	0.0035	0.0279		
02/04/13	Unknown	**G**	**CC 60**	1.2	7.3	461	8.5	<1	0.9	8	< 0.01	0.39	0.55	< 0.0025	0.0053		
04/15/13	11:23	**G**	**CC 26**	1.8	7	401	**S** 10.9	<1	2	<1	0.01	0.25	1.09	< 0.0025	0.0147	DO data suspect	
04/15/13	12:00	**G**	**CC 40**	1.1	7.4	501	**S** 6.4	2.8	1.4	3	< 0.01	0.23	0.41	< 0.0025	0.0135	DO data suspect	
04/15/13	12:16	**G**	**CC 50**	2	7.2	771	**S** 4.5	2.9	1.8	4	< 0.01	0.77	0.95	< 0.0025	0.0127	DO data suspect	
04/15/13	12:59	**G**	**CC 60**	3.3	7.4	492	**S** 1.8	<1	1.2	2	< 0.01	0.29	0.44	< 0.0025	0.0088	DO data suspect	
06/04/13	10:25	**G**	**CC 05**	4.6	7.8	117	10.7	1.2	3.8	8	< 0.01	0.08	0.31	0.0046	0.0131		
06/04/13	10:53	**G**	**CC 10**	6.9	7.8	92	9.9	<1	NT	5	< 0.01	0.09	0.31	0.0044	0.0093		
06/04/13	9:27	**G**	**CC 15**	3.6	7	168	9.1	2.9	NT	5	0.02	0.12	0.21	0.0037	0.0079		
06/04/13	9:49	**G**	**CC 20**	4.9	7.1	145	9.2	4.4	3.2	7	0.01	0.12	0.24	0.003	0.011		
06/04/13	10:00	**G**	**CC 25**	7.6	8.2	129	10.9	2.5	NT	10	0.01	0.1	4.1	0.0087	0.0189		Sample retested for TN. Results confirmed.
06/04/13	11:20	**G**	**CC 26**	8.1	7.8	138	**S 5.3**	1.8	3.2	9	< 0.01	0.11	0.41	0.0074	0.0208	DO data suspect	
06/04/13	10:12	**G**	**CC 30**	5.1	7	42	8.3	4.2	NT	7	< 0.01	0.04	0.22	0.005	0.0172		
06/04/13	11:55	**G**	**CC 34**	8.4	7.5	60	**S 4.9**	<1	NT	5	< 0.01	0.03	0.36	0.0039	0.0215	DO data suspect	
06/04/13	11:40	**G**	**CC 35**	6.8	7.5	55	**S 1.6**	<1	5.7	6	0.01	0.05	0.44	0.0041	0.0204	DO data suspect	
06/04/13	10:32	**G**	**CC 40**	7.4	7.1	119	8.6	7.9	3.6	10	< 0.01	0.09	0.3	0.003	0.0226		
06/04/13	10:59	**G**	**CC 44**	6.1	7.1	54	7.9	2.5	NT	3	< 0.01	< 0.01	0.14	0.0039	0.0093		
06/04/13	11:10	**G**	**CC 45**	7	6.9	97	8.1	3.2	2.7	3	0.02	0.01	0.19	0.0039	0.0081		
06/04/13	11:29	**G**	**CC 50**	9.6	7.2	155	7.5	4.1	2.9	4	< 0.01	0.09	0.23	< 0.0025	0.0104		
06/04/13	12:30	**G**	**CC 52**	14.1	8.1	529	**S 8.3**	<1	3.1	1	0.01	0.15	0.33	0.0013	0.0072	DO data suspect	
06/04/13	12:17	**G**	**CC 53**	14.1	7.9	560	**S 5.8**	<1	2.9	2	< 0.01	0.23	0.38	0.0034	0.014	DO data suspect	
06/04/13	12:07	**G**	**CC 60**	9.4	7.2	129	7.7	9.2	3.3	17	0.02	0.09	0.3	< 0.0025	0.0249		
06/19/13	9:48	**G**	**CC 26**	3.6	7.8	104	7.4	2.7	2.1	6	< 0.01	0.13	0.26	< 0.0025	0.0089		
06/19/13	10:12	**G**	**CC 40**	3.8	7.8	90	6.5	3	2.1	5	0.01	0.13	0.28	< 0.0025	0.0101		
06/19/13	10:24	**G**	**CC 50**	4	7.4	183	6.3	3	2.6	5	0.01	0.17	0.33	0.0025	0.0084		
06/19/13	10:51	**G**	**CC 60**	4.2	7.6	135	6.6	5.5	2.1	7	0.01	0.12	0.27	0.0028	0.0128		
10/16/13	10:10	**G**	**CC 05**	<1	**S 6.5**	172	11	<1	1.5	1	0.01	0.33	0.43	0.0043	0.0043	pH data suspect	
10/16/13	10:45	**G**	**CC 10**	4	7.1	95	9.6	<1	NT	2	0.01	0.17	0.24	0.0038	0.0043		
10/16/13	10:44	**G**	**CC 15**	1.4	7.4	328	9.4	1.5	NT	1	0.02	0.25	0.33	< 0.0025	0.0041		
10/16/13	10:24	**G**	**CC 20**	1.4	7.4	219	10	1.4	1.1	17	0.01	0.2	0.28	< 0.0025	0.004		
10/16/13	9:48	**G**	**CC 25**	3.6	**S 5.9**	146	8.4	<1	NT	1	0.02	0.24	0.41	< 0.0025	0.0064	pH data suspect	
10/16/13	11:04	**G**	**CC 26**	2.7	7.1	162	12.6	<1	1.4	2	0.02	0.21	0.31	0.0027	0.0052		
10/16/13	10:08	**G**	**CC 30**	<1	7.4	61	10.2	<1	NT	NT	< 0.01	0.14	0.22	0.0025	0.005		
10/16/13	11:30	**G**	**CC 34**	3.2	7.4	149	7.9	<1	NT	3	0.01	0.22	0.3	< 0.0025	0.0052		
10/16/13	11:20	**G**	**CC 35**	<1	7.6	64	13.2	<1	2.8	2	0.01	0.13	0.26	< 0.0025	0.0059		
10/16/13	9:52	**G**	**CC 40**	2.2	7.4	172	9.5	1.1	2.3	3	0.01	0.21	0.32	< 0.0025	0.0052		
10/16/13	11:31	**G**	**CC 44**	1.3	7.3	94	10.2	<1	NT	1	0.02	0.03	0.13	0.003	0.0043		
10/16/13	11:46	**G**	**CC 45**	2.7	7	259	10	11.5	2.6	17	0.03	0.09	0.24	0.0035	0.0139		

Clear Creek - Grab Sampling Results

Sample Date	Sample Time	Sample Type	Location ID	Temp	pH	Conductivity, Specific	Oxygen, Dissolved	Turbidity	Carbon, Total Organic	Solids, Total Suspended	Nitrogen, Ammonia (Salicylate)	Nitrogen, Nitrate+Nitrite	Nitrogen, Total Nitrogen	Phosphorus, Dissolved (DRP)	Phosphorus, Total	Notes	Lab Notes
			Method	SM2550B	SM4500H+B	SM2510B	SM4500OG	SM2130B	SM5310B	SM2540D	SM4500NH3H	SM4500NO3I	SM4500NO3I	SM4500PE	SM4500PE	NA	NA
			DL	1.0	1.0	1	1.0	1	0.5	1	0.01	0.01	0.02	0.0025	0.0025	NA	NA
			Reporting Units	°C	s.u.	μS/cm	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NA	NA
10/16/13	12:18	G	CC 50	5.2	7.6	372	9.8	17.9	2.6	7	0.02	0.33	0.46	0.0048	0.0136		
10/16/13	12:00	G	CC 52	5.2	7.5	310	6.8	2.7	6.4	5	< 0.01	0.23	0.47	0.0059	0.0151		
10/16/13	12:06	G	CC 53	6.1	7.8	396	8.2	2.2	5.6	2	< 0.01	0.34	0.63	0.0051	0.0174		
10/16/13	13:01	G	CC 60	4.4	7.6	217	10.3	3.1	2	2	0.01	0.24	0.37	0.0027	0.01		
12/09/13	9:51	G	CC 26	<1	7.7	291	11	<1	NT	4	NT	NT	NT	< 0.0025	0.0055		N not run. Hold time exceeded.

Canal - Grab Sampling Results

			Method	SM2510B	SM4500OG	SM4500H+B	SM2550B	SM2130B	SM4500PE	SM4500PE	SM4500NH3H	SM4500NO3I	SM4500NO3I	SM7110B	SM7110B	SM7110B	SM7110B	SM5310B	SM2540D	SM9221D	EPA200.7
			DL	1	1.0	1.0	1.0	1	0.0025	0.0025	0.01	0.01	0.02	variable	variable	variable	variable	0.5	1	1	0.02
			Reporting Units	µS/cm	mg/L	s.u.	°C	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L	pCi/L	mg/L	mg/L	cfu/mL	mg/L
Sample Date	**Sample Time**	**Sample Type**	**Location ID**	**Conductivity, Specific**	**Oxygen, Dissolved**	**pH**	**Temp**	**Turbidity**	**Phosphorus, Dissolved (DRP)**	**Phosphorus, Total**	**Nitrogen, Ammonia (Salicylate)**	**Nitrogen, Nitrate+Nitrite**	**Nitrogen, Total Nitrogen**	**Gross Alpha**	**Gross Alpha, Uncertainty**	**Gross Beta**	**Gross Beta, Uncertainty**	**Carbon, Total Organic**	**Solids, Total Suspended**	**E. coli,**	**Iron, Dissolved**
01/02/13	9:00	G	Trib 01	426	12.5	7.5	1.1	< 1	< 0.0025	0.0055	0.05	0.56	0.66					0.8	1	18	<0.02
01/02/13	9:15	G	Trib 02	420	9.7	7.8	4.6	< 1	< 0.0025	0.006	0.04	0.54	0.78					1	2	120	<0.02
01/02/13	9:30	G	Trib 03	448	9	8	7.7	1.6	0.0026	0.008	0.04	0.6	0.85					1.1	3	28	<0.02
01/02/13	10:05	G	Trib 04	463	10.9	7.8	2.1	55.1	< 0.0025	0.0186	0.04	0.54	0.73					1.1	86	94	0.022
02/06/13	9:10	G	Trib 01	431	12.7	7.9	2.2	< 1	0.0025	0.0064	< 0.01	0.38	0.57					0.9	6	<1	<0.02
02/06/13	9:30	G	Trib 03	454	9	8	10.6	2	0.0037	0.0127	< 0.01	0.44	0.56					1	6	69	0.024
02/06/13	10:00	G	Trib 04	471	10.4	8	7.2	20.1	0.0054	0.0757	0.01	0.41	0.61					1.3	24	65	0.03
03/06/13	9:40	G	Trib 01	463	13.7	7.6	1.5	1.3	0.0025	0.0087	0.02	0.41	0.62	0.6	1.9	0.5	2.3	1.2	5	1	<0.0027
03/06/13	9:55	G	Trib 03	469	12.8	7.8	5	1.5	0.0029	0.0097	< 0.01	0.42	0.71	1.8	2.2	0.5	2.1	1.1	3	91	<0.0027
03/06/13	10:45	G	Trib 04	528	10.3	7.6	3.9	36.5	0.0067	0.0536	0.02	0.26	0.62	9.5	3.8	6.2	2.6	2.2	5	26	<0.0027
03/06/13	9:20	G	Trib 22a	373	11.5	7.4	4.2	1.3	0.0034	0.0113	0.01	0.04	0.26	1.9	1.5	0	1.9	1.9	50	1	<0.0027
03/06/13	10:25	G	Trib 22d	566	11.8	7.5	3.6	3	0.0029	0.0135	0.01	0.07	0.37	7.2	3.2	3.8	2.5	2.8	5	3	<0.0027
04/03/13	9:20	G	Trib 01	482	10.2	7.4	4.2	1.4	< 0.0025	0.0099	< 0.01	0.35	0.62					1.4	2	1	0.1
04/03/13	9:40	G	Trib 02	485	6.6	7.8	14.4	1.6	0.0029	0.0085	< 0.01	0.29	0.39					1.2	3	30	<0.03
04/03/13	9:00	G	Trib 22a	488	10	7.5	4	1.2	< 0.0025	0.0057	< 0.01	0.44	0.59					3.2	<1	1	0.07
04/03/13	10:15	G	Trib 22d	654	9.4	7.7	7.5	3.2	0.0256	0.084	< 0.01	0.41	0.64					3.9	5	3	0.17
05/01/13	9:35	G	Trib 01	415	9.9	7.5	5	13.4	< 0.0025	0.0463	< 0.01	0.25	0.57					1.6	24	5	0.07
05/01/13	9:45	G	Trib 02	415	9.3	7.7	7.1	18.5	< 0.0025	0.0578	0.01	0.25	0.59					1.8	32	26	0.07
05/01/13	10:05	G	Trib 03	467	8.9	7.7	7.1	17.5	0.0051	0.0405	0.03	0.28	0.59					1.9	21	411	0.26
05/01/13	10:45	G	Trib 11	431	8.1	7.7	8.2	9.9	0.0032	0.0301	0.02	0.2	0.46					1.4	16	147	0.08
05/01/13	9:20	G	Trib 22a	317	10.7	7	3.7	27.9	0.01	0.0498	< 0.01	0.98	1.35					5.7	38	31	0.4
05/01/13	10:30	G	Trib 22d	347	11.1	7.6	4.2	24.4	0.0121	0.0418	< 0.01	0.94	1.22					6.1	26	55	0.42
06/05/13	10:00	G	Trib 01	130	8.5	7.5	9.8	4.2	0.0046	0.0513	< 0.01	0.11	0.41	3.2	1.9	0	2.1	3.3	43	20	0.14
06/05/13	10:15	G	Trib 02	128	7.9	7.1	9	16.1	0.0059	0.0487	< 0.01	0.11	0.46	4.2	2	0	2	3.5	39	74	0.14
06/05/13	10:25	G	Trib 03	129	7.7	7.5	10	20.4	0.0045	0.0388	< 0.01	0.11	0.41	3.4	1.9	2.4	2.1	3.4	37	111	0.15
06/05/13	11:30	G	Trib 04	174	5.7	7.3	13.1	10.6	0.0073	0.0247	< 0.01	0.08	0.28	0.8	1.5	1	2.1	3	20	205	0.16
06/05/13	11:25	G	Trib 11	148	6.5	7.3	11.7	18.2	0.006	0.0327	< 0.01	0.1	0.33	2.8	1.7	0.9	2.1	3	37	144	0.25
06/05/13	11:10	G	Trib 22d	353	7.9	7.4	12.2	5.1	0.0352	0.0593	0.02	0.05	0.43	1.5	1.8	1.5	2	5.8	7	158	0.19
06/05/13	10:55	G	Trib 27	135	6.1	7.3	11.9	16.2	0.0092	0.031	< 0.01	0.09	0.3	1.6	1.7	9.1	2.7	3.3	24	326	0.24

Canal - Grab Sampling Results

Sample Date	Sample Time	Sample Type	Location ID	Conductivity, Specific	Oxygen, Dissolved	pH	Temp	Turbidity	Phosphorus, Dissolved (DRP)	Phosphorus, Total	Nitrogen, Ammonia (Salicylate)	Nitrogen, Nitrate+Nitrite	Nitrogen, Total Nitrogen	Gross Alpha	Gross Alpha, Uncertainty	Gross Beta	Gross Beta, Uncertainty	Carbon, Total Organic	Solids, Total Suspended	E. coli,	Iron, Dissolved
			Method	SM2510B	SM4500OG	SM4500H+B	SM2550B	SM2130B	SM4500PE	SM4500PE	SM4500NH3H	SM4500NO3I	SM4500NO3I	SM7110B	SM7110B	SM7110B	SM7110B	SM5310B	SM2540D	SM9221D	EPA200.7
			DL	1	1.0	1.0	1.0	1	0.0025	0.0025	0.01	0.01	0.02	variable	variable	variable	variable	0.5	1	1	0.02
			Reporting Units	µS/cm	mg/L	s.u.	°C	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L	pCi/L	mg/L	mg/L	cfu/mL	mg/L
07/10/13	9:15	G	Trib 01	149	8	7.5	16	2.4	0.0025	0.0108	0.01	0.12	0.27					2.2	2	3	<0.0027
07/10/13	9:30	G	Trib 02	140	8	7.7	15.5	2.1	< 0.0025	0.0087	0.01	0.12	0.27					1.4	<1	5	<0.0027
07/10/13	9:45	G	Trib 03	140	7.5	7.7	18.7	2.2	< 0.0025	0.0073	0.01	0.09	0.21					1.9	1	35	<0.0027
07/10/13	10:35	G	Trib 11	134	7	7.7	18.4	9.2	< 0.0025	0.0171	0.01	0.07	0.26					1.4	11	411	0.22
07/10/13	10:20	G	Trib 27	129	7.3	7.7	18.4	3.7	0.0035	0.0163	0.02	0.07	0.44					1.5	<1	411	0.076
08/07/13	9:10	G	Trib 01	185	7	7.4	15.2	3	0.0031	0.0123	0.08	0.15	0.36					1.5	1	19	<0.0027
08/07/13	9:25	G	Trib 02	191	6	7.7	20.3	3.6	0.0026	0.0123	0.01	0.16	0.29					1.6	1	32	<0.0027
08/07/13	9:45	G	Trib 03	206	5.8	7.7	20.6	3.9	0.0029	0.0136	0.02	0.18	0.34					1.6	2	185	<0.0027
08/07/13	10:25	G	Trib 11	187	6.8	7.7	18.4	5.1	0.0031	0.0147	0.01	0.12	0.24					1.2	6	236	<0.0027
08/07/13	10:15	G	Trib 27	181	6.3	7.6	17.2	2.3	< 0.0025	0.0176	0.01	0.1	0.36					1.4	2	435	<0.0027
09/04/13	9:05	G	Trib 01	200	7.3	7.5	17.7	3.7	0.0032	0.0101	< 0.01	0.2	0.32	1.3	1.2	1.6	2.2	2.2	6	11	<0.0027
09/04/13	9:25	G	Trib 02	203	6.2	7.8	21.1	3.6	0.0032	0.0105	< 0.01	0.2	0.32	1.3	1.6	0	1.9	2.3	3	14	<0.0027
09/04/13	9:40	G	Trib 03	217	5.8	7.8	22.4	3	<0.0025	0.0101	0.02	0.21	0.32	0	1.7	0	1.9	2.5	3	108	<0.0027
09/04/13	10:35	G	Trib 11	206	6.6	7.8	20.5	9.7	0.0027	0.0163	0.01	0.18	0.36	1.1	1.5	0.3	2.1	2.1	10	411	<0.0027
09/04/13	10:25	G	Trib 22d	59	9	7.6	15	2.2	0.0094	0.0098	< 0.01	0.07	0.21	1.3	1	0	1.8	3.5	2	91	0.056
09/04/13	10:10	G	Trib 27	206	6.7	7.8	21.6	4.5	< 0.0025	0.0162	< 0.01	0.1	0.24	0.2	1.1	2.8	2.2	2.5	4	304	<0.0027
09/12/13	11:05	G	Trib 04	NT	NT	NT	NT	NT	NT	**S 0.02**	0.37	1.19	1.5					5.9	900	NT	NT
10/02/13	9:40	G	Trib 01	204	9.5	7.4	10.6	5.3	< 0.0025	0.0124	0.01	0.27	0.43					2.6	2	4	<0.0027
10/02/13	9:50	G	Trib 02	223	9.2	7.6	10.4	5.3	0.0035	0.0141	< 0.01	0.28	0.36					2.3	7	12	<0.0027
10/02/13	10:05	G	Trib 03	222	7.9	7.7	11.8	6.6	< 0.0025	0.0159	0.01	0.28	0.4					2.5	17	33	<0.0027
11/06/13	9:10	G	Trib 01	276	10.9	7.2	2.2	3.9	0.0026	0.0107	0.01	0.31	0.55					1.9	3	<1	<0.0027
11/06/13	9:20	G	Trib 02	304	10.6	7.5	4	5	0.0028	0.0142	< 0.01	0.37	0.6					1.7	8	5	0.0148
11/06/13	9:35	G	Trib 03	293	8.7	7.6	6.7	3.8	0.0028	0.0102	< 0.01	0.32	0.48					2	2	24	0.0223
11/06/13	10:05	G	Trib 11	305	10.4	7.6	3.5	2.4	0.0035	0.0078	< 0.01	0.24	0.43					2.6	3	38	0.0193
12/03/13	10:10	G	Trib 01	308	12.4	7.6	4.4	2.5	< 0.0025	0.006	< 0.01	0.26	0.29	1.7	2	1.5	2.3	2.1	<1	2	0.0205
12/03/13	10:25	G	Trib 02	332	11.4	7.7	3.9	2.4	< 0.0025	0.0057	< 0.01	0.29	0.3	3	2	0	2	1.7	<1	3	0.0187
12/03/13	10:40	G	Trib 03	318	9.2	7.8	8.4	2.8	0.0025	0.0064	< 0.01	0.29	0.34	2	1.8	0.6	2.1	1.9	1	4	NT
12/03/13	11:20	G	Trib 04	344	9.3	7.8	7.3	7.2	0.0042	0.0115	< 0.01	0.28	0.35	2.3	2	0.5	2.1	1.8	8	17	0.02

Canal - Grab Sampling Results

			Method	EPA200.7	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA130.2	SM4500ClG	SM4500SO4E	SM4110A	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8
			DL	0.02	0.002	0.002	0.020	0.020	5	5	10	0.1	0.001	0.001	0.002	0.002	0.0005	0.0005	0.001	0.001	0.002	0.002
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	**Sample Time**	**Sample Type**	**Location ID**	**Iron, Total**	**Manganese, Dissolved**	**Manganese, Total**	**Zinc, Dissolved**	**Zinc, Total**	**Hardness, Total**	**Chloride**	**Sulfate**	**Bromide**	**Arsenic, Dissolved**	**Arsenic, Total**	**Barium, Dissolved**	**Barium, Total**	**Cadmium, Dissolved**	**Cadmium, Total**	**Chromium, Dissolved**	**Chromium, Total**	**Copper, Dissolved**	**Copper, Total**
01/02/13	9:00	G	Trib 01	0.063	0.033	0.038	0.18	0.19														
01/02/13	9:15	G	Trib 02	0.12	0.029	0.045	0.17	0.18														
01/02/13	9:30	G	Trib 03	0.15	0.027	0.064	0.13	0.15														
01/02/13	10:05	G	Trib 04	3.6	<0.002	0.23	0.057	0.29														
02/06/13	9:10	G	Trib 01	0.081	0.06	0.07	0.19	0.35														
02/06/13	9:30	G	Trib 03	0.21	0.061	0.087	0.12	0.12														
02/06/13	10:00	G	Trib 04	1.3	0.064	0.13	0.043	0.12														
03/06/13	9:40	G	Trib 01	0.07	0.068	0.074	0.153	0.196	164	54	111		0.0003	0.00038	0.0483	0.0516	0.00062	0.00071	0.0006	0.00068	0.00477	0.00624
03/06/13	9:55	G	Trib 03	0.11	0.045	0.0579	0.0658	0.122	184	44	104		0.00039	0.00047	0.0494	0.0533	0.00033	0.00048	<0.0002	0.00079	0.00473	0.00606
03/06/13	10:45	G	Trib 04	0.94	0.148	0.222	0.014	0.138	188	58	93		0.00131	0.00287	0.0559	0.0692	<0.000070	0.00082	<0.0002	0.00132	0.014	0.014
03/06/13	9:20	G	Trib 22a	0.088	0.0152	0.0197	0.00288	0.00337	100	74	27		0.00039	0.00043	0.055	0.0587	<0.000070	<0.000070	<0.0002	0.00234	0.00055	0.00055
03/06/13	10:25	G	Trib 22d	0.22	0.173	0.177	0.00356	0.0056	156	86	42		0.00067	0.00077	0.0662	0.0715	<0.000070	<0.000070	0.00106	0.00111	0.00089	0.00089
04/03/13	9:20	G	Trib 01	0.1	0.0469	0.0626	0.179	0.179														
04/03/13	9:40	G	Trib 02	0.25	0.0363	0.0531	0.112	0.148														
04/03/13	9:00	G	Trib 22a	0.08	0.0108	0.0143	0.00367	0.00367														
04/03/13	10:15	G	Trib 22d	0.36	0.203	0.231	0.00545	0.00812														
05/01/13	9:35	G	Trib 01	1.4	0.101	0.407	0.133	0.399														
05/01/13	9:45	G	Trib 02	1.3	0.0845	0.472	0.122	0.431														
05/01/13	10:05	G	Trib 03	0.92	0.0845	0.244	0.0932	0.231														
05/01/13	10:45	G	Trib 11	0.5	0.0286	0.0727	0.0477	0.0802														
05/01/13	9:20	G	Trib 22a	1.9	0.0114	0.0881	0.00542	0.0104														
05/01/13	10:30	G	Trib 22d	1.6	0.0228	0.0773	0.00585	0.0114														
06/05/13	10:00	G	Trib 01	1.4	0.0519	0.44	0.0678	0.215	92	17	29		0.0002	0.00056	0.0188	0.0306	0.00028	0.00088	<0.0002	<0.0002	0.00553	0.0151
06/05/13	10:15	G	Trib 02	1.7	0.051	0.5	0.0705	0.248	72	12	26		0.00023	0.00065	0.0194	0.033	0.00026	0.00102	<0.0002	<0.0002	0.00545	0.0184
06/05/13	10:25	G	Trib 03	1.6	0.0492	0.47	0.0644	0.237	80	12	28		0.00023	0.00061	0.019	0.0318	0.00024	0.00096	<0.0002	<0.0002	0.00536	0.0173
06/05/13	11:30	G	Trib 04	0.58	0.0375	0.0828	0.0313	0.0741	84	14	31		0.00095	0.00118	0.0266	0.0309	<0.000070	0.00023	<0.0002	<0.0002	0.00374	0.00879
06/05/13	11:25	G	Trib 11	1.2	0.0284	0.185	0.0532	0.127	80	13	30		0.00035	0.00051	0.0203	0.029	0.0002	0.0005	<0.0002	<0.0002	0.00542	0.0119
06/05/13	11:10	G	Trib 22d	0.45	0.103	0.122	0.00753	0.0113	134	36	31		0.00085	0.00088	0.0523	0.0569	<0.000070	<0.000070	<0.0002	<0.0002	0.0018	0.00231
06/05/13	10:55	G	Trib 27	0.91	0.0284	0.125	0.0516	0.103	80	14	33		0.00033	0.00051	0.02	0.0273	0.00019	0.0004	<0.0002	<0.0002	0.00561	0.0102

Canal - Grab Sampling Results

			Method	**EPA200.7**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA130.2**	**SM4500ClG**	**SM4500SO4E**	**SM4110A**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**
			DL	**0.02**	**0.002**	**0.002**	**0.020**	**0.020**	**5**	**5**	**10**	**0.1**	**0.001**	**0.001**	**0.002**	**0.002**	**0.0005**	**0.0005**	**0.001**	**0.001**	**0.002**	**0.002**
			Reporting Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L as CaCO3**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Sample Date	**Sample Time**	**Sample Type**	**Location ID**	**Iron, Total**	**Manganese, Dissolved**	**Manganese, Total**	**Zinc, Dissolved**	**Zinc, Total**	**Hardness, Total**	**Chloride**	**Sulfate**	**Bromide**	**Arsenic, Dissolved**	**Arsenic, Total**	**Barium, Dissolved**	**Barium, Total**	**Cadmium, Dissolved**	**Cadmium, Total**	**Chromium, Dissolved**	**Chromium, Total**	**Copper, Dissolved**	**Copper, Total**
07/10/13	9:15	**G**	**Trib 01**	0.11	0.0418	0.0665	0.0474	0.0683														
07/10/13	9:30	**G**	**Trib 02**	0.11	0.0399	0.0661	0.0553	0.066														
07/10/13	9:45	**G**	**Trib 03**	0.11	0.0501	0.0754	0.0566	0.0626														
07/10/13	10:35	**G**	**Trib 11**	0.22	0.00767	0.0859	0.0377	0.0595														
07/10/13	10:20	**G**	**Trib 27**	0.18	0.0278	0.0776	0.0425	0.0453														
08/07/13	9:10	**G**	**Trib 01**	0.21	0.0306	0.0597	0.0569	0.0742														
08/07/13	9:25	**G**	**Trib 02**	0.22	0.0359	0.0595	0.0591	0.0697														
08/07/13	9:45	**G**	**Trib 03**	0.22	0.135	0.177	0.039	0.0621														
08/07/13	10:25	**G**	**Trib 11**	0.2	0.00469	0.0461	0.0171	0.0375														
08/07/13	10:15	**G**	**Trib 27**	0.15	0.00636	0.0295	0.0265	0.0265														
09/04/13	9:05	**G**	**Trib 01**	0.21	0.0306	0.0597	0.0569	0.0742	96	16	49		0.00019	0.00029	0.0304	0.0331	0.00021	0.00032	<0.0002	<0.0002	0.00454	0.00454
09/04/13	9:25	**G**	**Trib 02**	0.26	0.0287	0.0699	0.0389	0.0681	96	16	49		0.00019	0.00027	0.0304	0.0332	0.0002	0.0003	<0.0002	<0.0002	0.00507	0.00507
09/04/13	9:40	**G**	**Trib 03**	0.23	0.0681	0.099	0.028	0.0494	92	18	51		0.00027	0.00037	0.0317	0.0352	0.00015	0.00022	<0.0002	<0.0002	0.00278	0.00438
09/04/13	10:35	**G**	**Trib 11**	0.39	0.0126	0.0633	0.0138	0.0438	68	16	49		0.00032	0.00055	0.028	0.0337	<0.00007	0.00022	<0.0002	<0.0002	0.00397	0.0055
09/04/13	10:25	**G**	**Trib 22d**	0.12	0.00699	0.0205	0.00258	0.00258	60	10	25		<0.00008	<0.00008	0.0137	0.016	<0.00007	<0.00007	<0.0002	<0.0002	0.00086	0.00086
09/04/13	10:10	**G**	**Trib 27**	0.14	0.00687	0.0207	0.017	0.0295	88	16	49		0.00031	0.00039	0.0303	0.0332	<0.00007	0.00012	<0.0002	<0.0002	0.00299	0.00328
09/12/13	11:05	**G**	**Trib 04**	NT	NT	NT	NT	NT														
10/02/13	9:40	**G**	**Trib 01**	0.37	0.202	0.229	0.161	0.22														
10/02/13	9:50	**G**	**Trib 02**	0.39	0.197	0.223	0.145	0.21														
10/02/13	10:05	**G**	**Trib 03**	0.45	0.189	0.236	0.132	0.21														
11/06/13	9:10	**G**	**Trib 01**	0.376	0.222	0.302	0.174	0.254														
11/06/13	9:20	**G**	**Trib 02**	0.565	0.233	0.301	0.169	0.242														
11/06/13	9:35	**G**	**Trib 03**	0.429	0.225	0.279	0.176	0.233														
11/06/13	10:05	**G**	**Trib 11**	0.0782	0.0767	0.0863	0.0529	0.0529														
12/03/13	10:10	**G**	**Trib 01**	0.321	0.262	0.268	0.183	0.218	128	21	63	<0.1	<0.00008	0.00018	0.0388	0.0405	0.00071	0.00076	<0.0002	<0.0002	0.00519	0.0126
12/03/13	10:25	**G**	**Trib 02**	0.312	0.251	0.258	0.176	0.204	132	25	63	<0.1	<0.00008	0.0002	0.0415	0.0437	0.00066	0.00077	<0.0002	<0.0002	0.00504	0.0124
12/03/13	10:40	**G**	**Trib 03**	0.344	0.237	0.246	0.141	0.185	128	25	61	<0.1	0.00017	0.00022	0.0398	0.0413	0.00062	0.00075	<0.0002	<0.0002	0.006	0.0133
12/03/13	11:20	**G**	**Trib 04**	0.416	0.144	0.167	0.0882	0.124	132	26	64	<0.1	0.00057	0.00085	0.0424	0.0464	0.00014	0.00031	<0.0002	<0.0002	0.00271	0.0105

Canal - Grab Sampling Results

			Method	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**NA**	**NA**	**NA**
			DL	**0.0005**	**0.0005**	**0.002**	**0.002**	**0.005**	**0.005**	**0.005**	**0.005**	**0.0005**	**0.0005**	**NA**	**NA**	**NA**
			Reporting Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**NA**	**NA**	**NA**
Sample Date	**Sample Time**	**Sample Type**	**Location ID**	**Lead, Dissolved**	**Lead, Total**	**Molybdenum, Dissolved**	**Molybdenum, Total**	**Nickel, Dissolved**	**Nickel, Total**	**Selenium, Dissolved**	**Selenium, Total**	**Silver, Dissolved**	**Silver, Total**	**Notes**	**Field Notes**	**Lab Notes**
01/02/13	9:00	**G**	**Trib 01**												Lots of geese at location	
01/02/13	9:15	**G**	**Trib 02**												Lots of geese at location	Received 2 vials labeled T-2
01/02/13	9:30	**G**	**Trib 03**													Received 2 vials labeled T-2
01/02/13	10:05	**G**	**Trib 04**													
02/06/13	9:10	**G**	**Trib 01**													
02/06/13	9:30	**G**	**Trib 03**													
02/06/13	10:00	**G**	**Trib 04**													
03/06/13	9:40	**G**	**Trib 01**	<0.000070	0.00036	0.00242	0.00242			<0.00014	<0.00014					Holding time exceeded for filtering dissolved metals.
03/06/13	9:55	**G**	**Trib 03**	<0.000070	0.00079	0.00252	0.00252			0.00062	0.00068					Holding time exceeded for filtering dissolved metals.
03/06/13	10:45	**G**	**Trib 04**	0.00066	0.0199	0.00283	0.00283			0.00065	0.00065					Holding time exceeded for filtering dissolved metals.
03/06/13	9:20	**G**	**Trib 22a**	<0.000070	<0.000070	<0.00013	<0.00013			0.00053	0.00057					Holding time exceeded for filtering dissolved metals.
03/06/13	10:25	**G**	**Trib 22d**	<0.000070	0.00025	0.00084	0.00084			0.00081	0.00081					Holding time exceeded for filtering dissolved metals.
04/03/13	9:20	**G**	**Trib 01**													
04/03/13	9:40	**G**	**Trib 02**													
04/03/13	9:00	**G**	**Trib 22a**													
04/03/13	10:15	**G**	**Trib 22d**													
05/01/13	9:35	**G**	**Trib 01**													
05/01/13	9:45	**G**	**Trib 02**													
05/01/13	10:05	**G**	**Trib 03**													
05/01/13	10:45	**G**	**Trib 11**													
05/01/13	9:20	**G**	**Trib 22a**													
05/01/13	10:30	**G**	**Trib 22d**													
06/05/13	10:00	**G**	**Trib 01**	0.0008	0.0112	0.00218	0.00244			<0.00009	<0.00009					
06/05/13	10:15	**G**	**Trib 02**	0.00083	0.0129	0.0022	0.0023			<0.00009	<0.00009					
06/05/13	10:25	**G**	**Trib 03**	0.00078	0.0123	0.00217	0.00221			<0.00009	<0.00009					
06/05/13	11:30	**G**	**Trib 04**	0.00121	0.00684	0.00257	0.00257			<0.00009	<0.00009					
06/05/13	11:25	**G**	**Trib 11**	0.00076	0.00537	0.00207	0.00207			<0.00009	<0.00009					
06/05/13	11:10	**G**	**Trib 22d**	<0.000070	0.00065	0.00124	0.00124			<0.00009	<0.00009					
06/05/13	10:55	**G**	**Trib 27**	0.00064	0.00421	0.00213	0.00213			<0.00009	<0.00009					

Canal - Grab Sampling Results

			Method	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	NA	NA	NA
			DL	0.0005	0.0005	0.002	0.002	0.005	0.005	0.005	0.005	0.0005	0.0005	NA	NA	NA
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NA	NA	NA
Sample Date	Sample Time	Sample Type	Location ID	Lead, Dissolved	Lead, Total	Molybdenum, Dissolved	Molybdenum, Total	Nickel, Dissolved	Nickel, Total	Selenium, Dissolved	Selenium, Total	Silver, Dissolved	Silver, Total	Notes	Field Notes	Lab Notes
07/10/13	9:15	G	Trib 01													
07/10/13	9:30	G	Trib 02													
07/10/13	9:45	G	Trib 03													
07/10/13	10:35	G	Trib 11													
07/10/13	10:20	G	Trib 27													
08/07/13	9:10	G	Trib 01													
08/07/13	9:25	G	Trib 02													
08/07/13	9:45	G	Trib 03													
08/07/13	10:25	G	Trib 11													
08/07/13	10:15	G	Trib 27													
09/04/13	9:05	G	Trib 01	<0.000070	0.00142	0.00234	0.00234			<0.00009	<0.00009					
09/04/13	9:25	G	Trib 02	0.00021	0.00138	0.00237	0.00237			<0.00009	<0.00009					
09/04/13	9:40	G	Trib 03	<0.000070	0.0014	0.00257	0.00258			<0.00009	<0.00009					
09/04/13	10:35	G	Trib 11	0.00024	0.00348	0.00253	0.00253			<0.00009	<0.00009					
09/04/13	10:25	G	Trib 22d	<0.000070	<0.000070	0.00075	0.00076			<0.00009	<0.00009					
09/04/13	10:10	G	Trib 27	<0.000070	0.00089	0.00239	0.00248			<0.00009	<0.00009					
09/12/13	11:05	G	Trib 04											First Flush. Grab.		SGS analyzed nutrients. TP data is suspect.
10/02/13	9:40	G	Trib 01													
10/02/13	9:50	G	Trib 02													
10/02/13	10:05	G	Trib 03													
11/06/13	9:10	G	Trib 01													
11/06/13	9:20	G	Trib 02													
11/06/13	9:35	G	Trib 03													
11/06/13	10:05	G	Trib 11													
12/03/13	10:10	G	Trib 01	0.00058	0.00089	0.00228	0.00228			<0.00009	<0.00009					
12/03/13	10:25	G	Trib 02	0.00021	0.00089	0.00223	0.00238			<0.00009	<0.00009					
12/03/13	10:40	G	Trib 03	0.00025	0.00108	0.00224	0.00224			<0.00009	<0.00009					
12/03/13	11:20	G	Trib 04	0.00042	0.00402	0.00223	0.00223			0.00057	0.00063					

Clear Creek and Canal -
Ambient Autosampler Results

			Method	SM2550B	SM4500H+B	SM2510B	SM2130B	SM4500NH3H	SM4500NO3I	SM4500NO3I	SM4500PE	SM4500PE	SM5310B	SM2540D	EPA200.8	EPA200.8
			DL	1	1	1	0.1	0.01	0.01	0.02	0.0025	0.0025	0.5	1	0.001	0.001
			Reporting Units	°C	s.u.	µS/cm	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Time	Sample Type	Location ID	Temp	pH	Conductivity, Specific	Turbidity	Nitrogen, Ammonia (Salicylate)	Nitrogen, Nitrate+Nitrite	Nitrogen, Total Nitrogen	Phosphorus, Dissolved (DRP)	Phosphorus, Total	Carbon, Total Organic	Solids, Total Suspended	Arsenic, Dissolved	Arsenic, Total
05/20/13	7:00	24C	CC AS 59	16.8	7.3	200	11.3	0.03	0.14	0.44	0.0051	0.0273	5.1	17		
05/19/13	13:00	24C	CC AS T11	14.5	7.3	220	49.6	0.01	0.16	0.63	0.0057	0.0897	4.6	85	0.00074	0.00139
05/20/13	13:00	24C	CC AS T11	13.2	7.3	211	38.2	0.01	0.16	0.53	0.0054	0.058	4.2	60	0.0007	0.00093
06/23/13	1:00	24C	CC AS 26	15.2	7.3	196	3.3	< 0.01	0.13	0.27	0.004	0.0108	1.8	3		
06/24/13	1:00	24C	CC AS 26	14	7	166	4.4	< 0.01	0.14	0.23	< 0.0025	0.0087	1.6	3		
06/23/13	4:45	24C	CC AS 49	16.8	7.1	96	3.2	0.01	0.11	0.23	< 0.0025	0.0084	2.1	5		
06/24/13	4:45	24C	CC AS 49	16.8	7	99	2.2	0.01	0.12	0.22	< 0.0025	0.0086	2	2		
06/23/13	4:45	24C	CC AS 50	17.4	7.2	203	2.2	< 0.01	0.19	0.31	< 0.0025	0.0075	2.4	1		
06/24/13	4:45	24C	CC AS 50	17.5	7.3	203	2.6	0.01	0.16	0.28	< 0.0025	0.0076	2.4	1		
06/23/13	8:00	24C	CC AS 59	20	7.5	104	5.3	< 0.01	0.11	0.25	< 0.0025	0.0186	2.7	12		
06/24/13	8:00	24C	CC AS 59	20	7.5	106	3.5	< 0.01	0.11	0.25	0.0026	0.0103	2.2	4		
06/23/13	16:00	24C	CC AS T11	20.6	7.2	118	17.4	0.01	0.1	0.3	0.0033	0.0245	1.9	42	0.00044	0.00044
06/24/13	16:00	24C	CC AS T11	19.4	7.3	119	8.4	< 0.01	0.1	0.26	0.0029	0.0133	1.8	12	0.00031	0.00031
07/28/13	0:00	24C	CC AS 49	17.5	**S 6.9**	93	3.6	< 0.01	0.13	0.21	< 0.0025	0.0105	1.3	7		
07/29/13	0:00	24C	CC AS 49	17.5	**S 6.9**	151	7.8	0.02	0.14	0.24	< 0.0025	0.0181	1.7	8		
07/28/13	0:00	24C	CC AS 50	17.5	**S 7.2**	238	12.9	< 0.01	0.69	0.89	< 0.0025	0.0198	2.1	13		
07/29/13	0:00	24C	CC AS 50	17.2	**S 7.2**	415	121	0.03	0.59	0.9	< 0.0025	0.113	2.9	109		
07/28/13	6:30	24C	CC AS 59	19.4	7.8	163	4.2	0.01	0.12	0.27	< 0.0025	0.0148	2	7		
07/29/13	6:30	24C	CC AS 59	19.2	7.9	159	9.3	0.02	0.14	0.29	< 0.0025	0.0241	1.6	16		
07/28/13	15:30	24C	CC AS T11	17.4	7.6	182	14.5	< 0.01	0.12	0.27	< 0.0025	0.0245	1.7	24	0.00026	0.00052
07/29/13	15:30	24C	CC AS T11	16.9	7.5	179	14.7	< 0.01	0.15	0.3	< 0.0025	0.0303	1.5	29	0.00027	0.0006
08/17/13	12:30	24C	CC AS 26	18.2	**S** 10.7	312	7.1	0.02	0.14	0.26	< 0.0025	0.0048	1.2	1		
08/18/13	12:30	24C	CC AS 26	17.6	**S** 10.4	177	5.5	< 0.01	0.16	0.24	< 0.0025	0.0038	1	3		
08/17/13	22:00	24C	CC AS 49	20.8	7.8	194	2.3	0.02	0.15	0.27	< 0.0025	0.005	1.4	1		
08/18/13	22:00	24C	CC AS 49	21.1	7.8	197	2	< 0.01	0.17	0.26	< 0.0025	0.0054	1.5	3		
08/17/13	22:00	24C	CC AS 50	21	7.9	543	16.2	0.01	0.61	0.83	< 0.0025	0.0149	4.1	13		
08/18/13	22:00	24C	CC AS 50	21.3	7.9	575	21.8	< 0.01	0.74	1	< 0.0025	0.0216	2.3	16		
08/18/13	16:00	24C	CC AS T11	24.1	6.9	228	12.3	0.02	0.1	0.26	< 0.0025	0.0145	1.5	14	0.00058	0.00082
08/19/13	16:00	24C	CC AS T11	23.7	7.3	230	5.5	0.05	0.13	0.63	< 0.0025	0.015	1.4	8	0.00055	0.00064
10/27/13	15:30	24C	CC AS 26	5.8	7.1	172	1	< 0.01	0.23	0.32	0.0042	0.0089	1.3	3		
10/28/13	15:30	24C	CC AS 26	4.8	6.8	160	<1	< 0.01	0.23	0.3	0.0044	0.0063	1.1	<1		
10/28/13	1:00	24C	CC AS 49	2.7	7.7	218	2.8	< 0.01	0.25	0.33	0.0042	0.0104	1.4	2		
10/29/13	1:00	24C	CC AS 49	2.2	7.7	216	1.7	< 0.01	0.25	0.33	0.0042	0.0095	1.6	1		
10/28/13	1:00	24C	CC AS 50	2.7	7.7	400	20.9	0.02	0.4	0.62	0.0047	0.0189	2.6	19		
10/29/13	1:00	24C	CC AS 50	2	7.6	398	20.7	0.01	0.39	0.57	0.0044	0.017	2.4	24		
10/28/13	9:00	24C	CC AS 59	8.8	7.8	242	3.9	0.02	0.28	0.45	0.0037	0.0118	2.2	7		
10/29/13	9:00	24C	CC AS 59	10	7.9	242	3.3	0.02	0.28	0.45	0.004	0.0062	2	1		
10/28/13	21:00	24C	CC AS T11	2.5	7.3	270	4.4	< 0.01	0.22	0.39	0.0047	0.0187	1.9	11	0.00022	0.00033
10/29/13	21:00	24C	CC AS T11	2.7	7.5	274	3.2	< 0.01	0.26	0.39	0.0047	0.0085	1.9	3	0.0002	0.0003

Clear Creek and Canal - Ambient Autosampler Results

			Method	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.7	EPA200.7	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8
			DL	0.00025	0.00025	0.0005	0.0005	0.00050	0.00050	0.002	0.002	0.02	0.02	0.0005	0.0005	0.002	0.002	0.002
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Time	Sample Type	Location ID	Barium, Dissolved	Barium, Total	Cadmium, Dissolved	Cadmium, Total	Chromium, Dissolved	Chromium, Total	Copper, Dissolved	Copper, Total	Iron, Dissolved	Iron, Total	Lead, Dissolved	Lead, Total	Manganese, Dissolved	Manganese, Total	Molybdenum, Dissolved
05/20/13	7:00	24C	CC AS 59															
05/19/13	13:00	24C	CC AS T11	0.0493	0.0582	0.00157	0.00181	<0.00020	0.00098	0.034	0.0379	1.7	4.4	0.0122	0.0181	0.405	0.65	0.00197
05/20/13	13:00	24C	CC AS T11	0.0415	0.0458	0.00103	0.00113	<0.00020	<0.00020	0.0245	0.0257	1.1	2.6	0.00859	0.0107	0.273	0.378	0.00199
06/23/13	1:00	24C	CC AS 26															
06/24/13	1:00	24C	CC AS 26															
06/23/13	4:45	24C	CC AS 49															
06/24/13	4:45	24C	CC AS 49															
06/23/13	4:45	24C	CC AS 50															
06/24/13	4:45	24C	CC AS 50															
06/23/13	8:00	24C	CC AS 59															
06/24/13	8:00	24C	CC AS 59															
06/23/13	16:00	24C	CC AS T11	0.025	0.025	0.00049	0.00049	<0.00020	<0.00020	0.00986	0.00986	0.43	0.64	0.00538	0.00538	0.186	0.202	0.00165
06/24/13	16:00	24C	CC AS T11	0.0209	0.0209	0.00023	0.00023	<0.00020	<0.00020	0.00565	0.00565	0.19	0.29	0.00216	0.00216	0.072	0.075	0.00193
07/28/13	0:00	24C	CC AS 49															
07/29/13	0:00	24C	CC AS 49															
07/28/13	0:00	24C	CC AS 50															
07/29/13	0:00	24C	CC AS 50															
07/28/13	6:30	24C	CC AS 59															
07/29/13	6:30	24C	CC AS 59															
07/28/13	15:30	24C	CC AS T11	0.0243	0.0302	<0.00007	0.00037	<0.0002	<0.0002	0.00245	0.00708	<0.0027	0.46	0.00033	0.00447	0.0006	0.118	0.00286
07/29/13	15:30	24C	CC AS T11	0.0243	0.0314	<0.00007	0.00039	<0.0002	<0.0002	0.00534	0.00815	<0.0027	0.6	<0.00007	0.0055	0.00073	0.138	0.00271
08/17/13	12:30	24C	CC AS 26															
08/18/13	12:30	24C	CC AS 26															
08/17/13	22:00	24C	CC AS 49															
08/18/13	22:00	24C	CC AS 49															
08/17/13	22:00	24C	CC AS 50															
08/18/13	22:00	24C	CC AS 50															
08/18/13	16:00	24C	CC AS T11	0.0311	0.036	<0.000070	0.00027	<0.00020	<0.00020	0.00229	0.00568	<0.0027	0.31	<0.000070	0.00355	0.00063	0.0696	0.00285
08/19/13	16:00	24C	CC AS T11	0.0317	0.0339	<0.000070	0.00018	<0.00020	<0.00020	0.00244	0.00427	<0.0027	0.19	<0.000070	0.00216	0.00097	0.0441	0.00295
10/27/13	15:30	24C	CC AS 26															
10/28/13	15:30	24C	CC AS 26															
10/28/13	1:00	24C	CC AS 49															
10/29/13	1:00	24C	CC AS 49															
10/28/13	1:00	24C	CC AS 50															
10/29/13	1:00	24C	CC AS 50															
10/28/13	9:00	24C	CC AS 59															
10/29/13	9:00	24C	CC AS 59															
10/28/13	21:00	24C	CC AS T11	0.0364	0.0407	0.00031	0.00048	<0.0002	<0.0002	0.00508	0.00048	0.0242	0.331	0.00029	0.00243	0.0389	0.0864	0.00239
10/29/13	21:00	24C	CC AS T11	0.0368	0.0392	0.00037	0.00049	<0.0002	<0.0002	0.00485	0.011	0.025	0.259	0.00023	0.00138	0.0533	0.0718	0.00222

Clear Creek and Canal - Ambient Autosampler Results

			Method	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	NA	NA	NA
			DL	0.002	0.00050	0.0025	0.02	0.02	NA	NA	NA
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	NA	NA	NA
Sample Date	Sample Time	Sample Type	Location ID	Molybdenum, Total	Selenium, Total	Zinc, Dissolved	Zinc, Dissolved	Zinc, Total	Notes	Field Notes	Lab Notes
05/20/13	7:00	24C	CC AS 59						Sample B. Start time 0800 on 05/19/13, end time 0700 on 05/20/13.		
05/19/13	13:00	24C	CC AS T11	0.00197	<0.00030	<0.000090	0.368	0.414	Sample A. Start time 1400 on 05/18/13, end time 1300 on 05/19/13.		
05/20/13	13:00	24C	CC AS T11	0.00199	<0.00030	<0.000090	0.245	0.273	Sample B. Start time 1400 on 05/19/13, end time 1300 on 05/20/13.		
06/23/13	1:00	24C	CC AS 26						Sample A. Start time 0200 on 06/22/13, end time 0100 on 06/23/13.		
06/24/13	1:00	24C	CC AS 26						Sample B. Start time 0200 on 06/23/13, end time 0100 on 06/24/13.		
06/23/13	4:45	24C	CC AS 49						Sample A. Start time 0545 on 06/22/13, end time 0445 on 06/23/13.		
06/24/13	4:45	24C	CC AS 49						Sample B. Start time 0545 on 06/23/13, end time 0445 on 06/24/13.		
06/23/13	4:45	24C	CC AS 50						Sample A. Start time 0545 on 06/22/13, end time 0445 on 06/23/13.		
06/24/13	4:45	24C	CC AS 50						Sample B. Start time 0545 on 06/23/13, end time 0445 on 06/24/13.		
06/23/13	8:00	24C	CC AS 59						Sample A. Start time 0900 on 06/22/13, end time 0800 on 06/23/13.		
06/24/13	8:00	24C	CC AS 59						Sample B. Start time 0900 on 06/23/13, end time 0800 on 06/24/13.		
06/23/13	16:00	24C	CC AS T11	0.00192	<0.00030	<0.000090	0.109	0.109	Sample A. Start time 1700 on 06/22/13, end time 1600 on 06/23/13.		Holding time exceeded for filtering of dissolved metals.
06/24/13	16:00	24C	CC AS T11	0.00206	<0.00030	<0.000090	0.0579	0.0579	Sample B. Start time 1700 on 06/23/13, end time 1600 on 06/24/13.		Holding time exceeded for filtering of dissolved metals.
07/28/13	0:00	24C	CC AS 49						Sample A. Start time 0100 on 07/27/13, end time 0000 on 07/28/13.	Field pH suspect. Lab pH = 7.96.	
07/29/13	0:00	24C	CC AS 49						Sample B. Start time 0100 on 07/28/13, end time 0000 on 07/29/13.	Field pH suspect. Lab pH = 7.66.	
07/28/13	0:00	24C	CC AS 50						Sample A. Start time 0100 on 07/27/13, end time 0000 on 07/28/13.	Field pH suspect. Lab pH = 7.99.	
07/29/13	0:00	24C	CC AS 50						Sample B. Start time 0100 on 07/28/13, end time 0000 on 07/29/13.	Field pH suspect. Lab pH = 7.90.	
07/28/13	6:30	24C	CC AS 59						Sample A. Start time 0730 on 07/27/13, end time 0630 on 07/28/13.		
07/29/13	6:30	24C	CC AS 59						Sample B. Start time 0730 on 07/28/13, end time 0630 on 07/29/13.		
07/28/13	15:30	24C	CC AS T11	0.00251	<0.00009	<0.00009	0.0185	0.074	Sample A. Start time 1630 on 07/27/13, end time 1730 on 07/28/13.		
07/29/13	15:30	24C	CC AS T11	0.00242	<0.00009	<0.00009	0.0179	0.0872	Sample B. Start time 1630 on 07/28/13, end time 1530 on 07/29/13.		
08/17/13	12:30	24C	CC AS 26						Sample A. Start time 1330 on 08/16/13, end time 1230 on 08/17/13.		
08/18/13	12:30	24C	CC AS 26						Sample B. Start time 1330 on 08/17/13, end time 1230 on 08/18/13.		
08/17/13	22:00	24C	CC AS 49						Sample A. Start time 2300 on 08/16/13, end time 2200 on 08/17/13.		
08/18/13	22:00	24C	CC AS 49						Sample B. Start time 2300 on 08/17/13, end time 2200 on 08/18/13.		
08/17/13	22:00	24C	CC AS 50						Sample A. Start time 2300 on 08/16/13, end time 2200 on 08/17/13.		
08/18/13	22:00	24C	CC AS 50						Sample B. Start time 2300 on 08/17/13, end time 2200 on 08/18/13.		
08/18/13	16:00	24C	CC AS T11	0.00285	<0.000090	<0.000090	0.0122	0.0507	Sample A. Start time 1700 on 08/17/13, end time 1600 on 08/18/13.		
08/19/13	16:00	24C	CC AS T11	0.00295	<0.000090	<0.000090	0.0142	0.0334	Sample B. Start time 1700 on 08/18/13, end time 1600 on 08/19/13.		
10/27/13	15:30	24C	CC AS 26						Sample A. Start time 1630 on 10/26/13, end time 1530 on 10/27/13.		
10/28/13	15:30	24C	CC AS 26						Sample B. Start time 1630 on 10/27/13, end time 1530 on 10/28/13.		
10/28/13	1:00	24C	CC AS 49						Sample A. Start time 0200 on 10/27/13, end time 0100 on 10/28/13.		
10/29/13	1:00	24C	CC AS 49						Sample B. Start time 0200 on 10/28/13, end time 0100 on 10/29/13.		
10/28/13	1:00	24C	CC AS 50						Sample A. Start time 0200 on 10/27/13, end time 0100 on 10/28/13.		
10/29/13	1:00	24C	CC AS 50						Sample B. Start time 0200 on 10/28/13, end time 0100 on 10/29/13.		
10/28/13	9:00	24C	CC AS 59						Sample A. Start time 1000 on 10/27/13, end time 0900 on 10/28/13.		
10/29/13	9:00	24C	CC AS 59						Sample B. Start time 1000 on 10/28/13, end time 0900 on 10/29/13.		
10/28/13	21:00	24C	CC AS T11	0.00219	<0.00009	<0.00009	0.0881	0.125	Sample A. Start time 2200 on 10/27/13, end time 2100 on 10/28/13.		
10/29/13	21:00	24C	CC AS T11	0.00218	<0.00009	<0.00009	0.0988	0.12	Sample B. Start time 2200 on 10/28/13, end time 2100 on 10/29/13.		

Clear Creek - Ambient Autosampler Results - Metals (Golden)

		Method	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7
		DL	variable	variable	variable	variable	0.004	0.004	0.01	0.01
		Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Type	Location ID	Cadmium, Dissolved	Cadmium, Total	Copper, Dissolved	Copper, Total	Iron, Dissolved	Iron, Total	Lead, Dissolved	Lead, Total
5/18/2013	24C	CC26A	<0.004	<0.004	0.008	0.015	0.09	0.98	<0.01	<0.01
5/19/2013	24C	CC26B	<0.004	<0.004	0.009	0.014	0.045	0.62	<0.01	<0.01
6/23/2013	24C	CC26A	<0.004	<0.004	0.006	0.01	0.009	0.19	<0.01	<0.01
6/24/2013	24C	CC26B	<0.004	<0.004	0.013	0.008	0.006	0.18	<0.01	<0.01
8/17/2013	24C	CC26A	<0.004	<0.004	<0.005	<0.005	0.026	0.19	<0.01	<0.01
8/18/2013	24C	CC26B	<0.004	<0.004	<0.005	<0.005	0.021	0.17	<0.01	<0.01
10/27/2013	24C	CC26A	<0.004	<0.004	<0.005	<0.005	0.06	0.15	<0.01	<0.01
10/28/2013	24C	CC26B	<0.004	<0.004	<0.005	<0.005	0.03	0.13	<0.01	<0.01
5/19/2013	24C	CC49A	<0.004	<0.004	0.007	0.025	0.044	1.9	<0.01	<0.01
5/20/2013	24C	CC49B	<0.004	<0.004	0.009	0.022	0.055	0.83	<0.01	<0.01
6/23/2013	24C	CC49A	<0.004	<0.004	<0.005	0.005	0.006	0.22	<0.01	<0.01
6/24/2013	24C	CC49B	<0.004	<0.004	<0.005	<0.005	0.006	0.2	<0.01	<0.01
7/28/2013	24C	CC49A	<0.004	<0.004	<0.005	0.006	0.01	0.36	<0.01	<0.01
7/29/2013	24C	CC49B	<0.004	<0.004	<0.005	0.007	0.009	0.43	<0.01	<0.01
8/17/2013	24C	CC49A	<0.004	<0.004	<0.005	0.0055	0.016	0.2	<0.01	<0.01
8/18/2013	24C	CC49B	<0.004	<0.004	<0.005	0.006	0.016	0.24	<0.01	<0.01
10/28/2013	24C	CC49A	<0.004	<0.004	<0.005	0.009	0.024	0.27	<0.01	<0.01
10/29/2013	24C	CC49B	<0.004	<0.004	<0.005	0.009	0.023	0.18	<0.01	<0.01
5/19/2013	24C	CC50A	<0.004	<0.004	0.012	0.064	0.29	5.7	<0.01	0.026
5/20/2013	24C	CC50B	<0.004	<0.004	0.014	0.047	0.38	3.66	<0.01	0.013
6/23/2013	24C	CC50A	<0.004	<0.004	0.012	0.018	0.81	1.54	<0.01	<0.01
6/24/2013	24C	CC50B	<0.004	<0.004	0.01	0.02	0.62	1.52	<0.01	<0.01
7/28/2013	24C	CC50A	<0.004	<0.004	0.0075	0.018	0.005	1.24	<0.01	<0.01
7/29/2013	24C	CC50B	<0.004	0.007	0.01	0.13	0.005	11.9	<0.01	0.2
8/17/2013	24C	CC50A	<0.004	<0.004	0.007	0.026	0.005	1.58	<0.01	0.023
8/18/2013	24C	CC50B	<0.004	<0.004	0.0065	0.024	0.008	1.75	<0.01	0.023
10/28/2013	24C	CC50A	<0.004	0.004	0.011	0.15	<0.004	3.4	<0.01	<0.01
10/29/2013	24C	CC50B	<0.004	0.004	0.012	0.15	0.006	3.5	<0.01	<0.01
5/19/2013	24C	CC59A	<0.004	<0.004	0.008	0.032	0.075	2.5	<0.01	0.013
5/20/2013	24C	CC59B	<0.004	<0.004	0.009	0.021	0.09	1.16	<0.01	<0.01
6/23/2013	24C	CC59A	<0.004	<0.004	<0.005	0.009	0.07	0.71	<0.01	<0.01
6/24/2013	24C	CC59B	<0.004	<0.004	<0.005	0.006	0.058	0.28	<0.01	<0.01
7/28/2013	24C	CC59A	<0.004	<0.004	<0.005	0.007	0.01	0.32	<0.01	<0.01
7/29/2013	24C	CC59B	<0.004	<0.004	<0.005	0.011	0.008	0.8	<0.01	0.01
10/28/2013	24C	CC59A	<0.004	<0.004	0.006	0.019	0.029	0.79	<0.01	<0.01
10/29/2013	24C	CC59B	<0.004	<0.004	0.007	0.017	0.024	0	<0.01	<0.01

Clear Creek - Ambient Autosampler Results - Metals (Golden)

		Method	EPA200.7	EPA200.7	EPA200.7	EPA200.7
		DL	0.001	0.001	0.030	0.030
		Reporting Units	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Type	Location ID	Manganese, Dissolved	Manganese, Total	Zinc, Dissolved	Zinc, Total
5/18/2013	24C	CC26A	0.012	0.3	0.07	0.16
5/19/2013	24C	CC26B	0.08	0.22	0.08	0.13
6/23/2013	24C	CC26A	0.055	0.09	0.042	0.06
6/24/2013	24C	CC26B	0.06	0.08	0.05	0.06
8/17/2013	24C	CC26A	0.01	0.08	0.021	0.046
8/18/2013	24C	CC26B	0.021	0.076	0.022	0.045
10/27/2013	24C	CC26A	0.09	0.1	0.06	0.071
10/28/2013	24C	CC26B	0.09	0.1	0.066	0.074
5/19/2013	24C	CC49A	0.009	0.55	0.09	0.3
5/20/2013	24C	CC49B	0.06	0.29	0.11	0.21
6/23/2013	24C	CC49A	0.043	0.08	0.05	0.07
6/24/2013	24C	CC49B	0.047	0.086	0.057	0.063
7/28/2013	24C	CC49A	<0.001	0.07	0.033	0.07
7/29/2013	24C	CC49B	0.001	0.08	0.053	0.08
8/17/2013	24C	CC49A	0.018	0.072	<0.03	0.07
8/18/2013	24C	CC49B	0.032	0.08	0.054	0.084
10/28/2013	24C	CC49A	0.13	0.18	0.12	0.16
10/29/2013	24C	CC49B	0.16	0.18	0.15	0.16
5/19/2013	24C	CC50A	0.094	0.58	0.16	0.38
5/20/2013	24C	CC50B	0.17	0.45	0.19	0.31
6/23/2013	24C	CC50A	0.35	0.37	0.18	0.2
6/24/2013	24C	CC50B	0.36	0.37	0.17	0.2
7/28/2013	24C	CC50A	0.34	0.77	0.15	0.27
7/29/2013	24C	CC50B	0.015	0.98	0.61	0.11
8/17/2013	24C	CC50A	0.65	0.81	0.22	0.35
8/18/2013	24C	CC50B	0.71	0.81	0.24	0.35
10/28/2013	24C	CC50A	0.79	0.88	0.44	0.74
10/29/2013	24C	CC50B	0.9	0.91	0.56	0.77
5/19/2013	24C	CC59A	0.007	0.51	0.12	0.35
5/20/2013	24C	CC59B	0.03	0.28	0.12	0.23
6/23/2013	24C	CC59A	0.05	0.16	0.055	0.1
6/24/2013	24C	CC59B	0.043	0.07	0.052	0.07
7/28/2013	24C	CC59A	<0.001	0.055	0.035	0.06
7/29/2013	24C	CC59B	<0.001	0.085	0.041	0.88
10/28/2013	24C	CC59A	0.19	0.19	0.14	0.16
10/29/2013	24C	CC59B	0.18	0.18	0.16	0.17

Clear Creek and Canal -
Event Autosampler Results

			Method	SM2550B	SM4500H+B	SM2510B	SM2130B	SM4500NH3H	SM4500NO3I	SM4500NO3I	SM4500PE	SM4500PE	SM4500NH3H	EPA 300.0	SM4500NorgB	Calc	SM4500PE
			DL	1	1	1	0.1	0.01	0.01	0.02	0.0025	0.0025	0.05	0.02	0.01	0.1	0.01
			Reporting Units	°C	s.u.	µS/cm	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Time	Sample Type	Location ID	Temp	pH	Conductivity, Specific	Turbidity	Nitrogen, Ammonia (Salicylate)	Nitrogen, Nitrate+Nitrite	Nitrogen, Total Nitrogen	Phosphorus, Dissolved (DRP)	Phosphorus, Total	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Total Kjeldahl	Nitrogen, Total Nitrogen	Phosphorous, Dissolved (SRP)
4/9/2013	7:00	CE	CC AS T11	9.6	7.9	510	2.6	0.01	0.05	0.18	< 0.0025	0.013	NT	NT	NT	NT	NT
4/10/2013	0:00	CE	CC AS T11	9.7	8	506	2.3	0.02	0.06	0.22	< 0.0025	0.0113	NT	NT	NT	NT	NT
5/14/2013	9:30	CE	CC AS T27	19.5	7.8	398	61	<0.01	0.21	0.53	< 0.0025	0.0176	NT	NT	NT	NT	NT
07/12/13	4:54	CE	CC AS 59	21.4	7.9	156	505							0.19	1.5	1.69	
07/14/13	3:28	CE	CC AS 59	21.5	7.7	158	360							0.42	1.31	1.73	
7/14/2013	9:08	CE	CC AS T11	21	7.9	158	304							0.48	2.44	2.92	
7/28/2013	22:00	CE	CC AS 50	17.2	S 7.3	379	305							0.53	1.55	2.08	
8/13/2013	22:59	CE	CC AS 50	16.7	6.7	295	1040							0.44	6.77	7.21	
08/24/13	5:56	CE	CC AS 59	24.5	7.8	213	747							0.2	1.41	1.61	
08/27/13	0:38	CE	CC AS 49	18.1	6.8	174	584							0.22	1.8	2.02	
08/27/13	4:08	CE	CC AS 49	17.5	7.2	173	804							0.21	1.52	1.73	
08/26/13	23:58	CE	CC AS 50	20.4	7.3	405	949							0.32	2.47	2.79	
8/28/2013	9:08	CE	CC AS T11	21.2	7.7	206	423							0.25	0.64	0.89	
09/09/13	19:39	CE	CC AS 49	15.6	8	187	228						0.18	0.22	0.9	1.12	
09/09/13	23:50	CE	CC AS 49	15.6	8	182	352						0.35	0.26	1.27	1.53	
09/09/13	19:51	CE	CC AS 50	16.2	8	520	696						0.18	0.53	0.99	1.52	
09/09/13	23:48	CE	CC AS 50	16.1	8	453	1023						0.2	0.32	1.52	1.84	
09/09/13	22:31	CE	CC AS 59	19	7.7	189	330						0.21	0.2	3.93	4.13	
09/10/13	4:09	CE	CC AS 59	18.3	7.8	225	325						0.21	0.27	1.73	2	
09/10/13	21:40	CE	CC AS 49	16	7.8	170	330						0.16	0.2	0.59	0.79	
09/10/13	22:39	CE	CC AS 50	16.5	7.5	328	560						0.18	0.24	1.22	1.46	
9/10/2013	19:18	CE	CC AS T11	18.3	7.8	215	163						0.24	0.3	1.45	1.75	
9/10/2013	22:42	CE	CC AS T11	18	7.7	218	374						0.13	0.24	1.44	1.68	
11/12/13	13:00	CE	CC AS T3	15.5	8.2	291	3.9	< 0.01	0.3	0.42	0.0035	0.008					
11/13/13	13:00	CE	CC AS T3	13.2	8	295	3.4	< 0.01	0.29	0.38	0.0028	0.0061					
11/12/13	12:22	CE	CC AS T4	8.9	8.3	364	19.6	< 0.01	0.15	0.36	0.0051	0.036					
11/13/13	12:22	CE	CC AS T4	7.8	8.3	332	19	< 0.01	0.22	0.4	< 0.0025	0.028					

Clear Creek and Canal -
Event Autosampler Results

			Method	SM4500PE	SM5310B	SM2540D	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.7	EPA200.7	EPA200.8	EPA200.8
			DL	0.01	0.5	1	0.001	0.001	0.00025	0.00025	0.0005	0.0005	0.00050	0.00050	0.002	0.002	0.02	0.02	0.0005	0.0005
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Time	Sample Type	Location ID	Phosphorous, Total	Carbon, Total Organic	Solids, Total Suspended	Arsenic, Dissolved	Arsenic, Total	Barium, Dissolved	Barium, Total	Cadmium, Dissolved	Cadmium, Total	Chromium, Dissolved	Chromium, Total	Copper, Dissolved	Copper, Total	Iron, Dissolved	Iron, Total	Lead, Dissolved	Lead, Total
4/9/2013	7:00	**CE**	**CC AS T11**	NT	1.6	3	0.00063	0.00066	0.0464	0.0465	0.00017	0.00029	<0.00020	<0.00020	0.00377	0.00501	<0.030	0.15	<0.00007	0.00078
4/10/2013	0:00	**CE**	**CC AS T11**	NT	1.6	2	0.00058	0.00064	0.043	0.0435	0.00016	0.00024	<0.00020	<0.00020	0.00356	0.00452	<0.030	0.09	<0.00007	0.00058
5/14/2013	9:30	**CE**	**CC AS T27**	NT	3.3	116	0.00139	0.00164	0.0895	0.0898	0.0011	0.00114	0.00053	0.00059	0.0233	0.0235	0.76	1.6	0.00818	0.0115
07/12/13	4:54	**CE**	**CC AS 59**	**S 0.05**	2.5	517														
07/14/13	3:28	**CE**	**CC AS 59**	0.4	1.8	305														
7/14/2013	9:08	**CE**	**CC AS T11**	**S 0.03**	3.4	513	0.00152	0.00171	0.0951	0.11	0.00113	0.00113	0.00165	0.00165	0.0269	0.0292	2.7	2.7	0.0216	0.0216
7/28/2013	22:00	**CE**	**CC AS 50**	**S 0.04**	3.8	285														
8/13/2013	22:59	**CE**	**CC AS 50**	**S 0.28**	7.1	2340														
08/24/13	5:56	**CE**	**CC AS 59**	**S 0.02**	1.7	230														
08/27/13	0:38	**CE**	**CC AS 49**	**S 0.02**	3.3	758														
08/27/13	4:08	**CE**	**CC AS 49**	**S 0.02**	3	894														
08/26/13	23:58	**CE**	**CC AS 50**	**S <0.1**	5.3	1330														
8/28/2013	9:08	**CE**	**CC AS T11**	**S 0.02**	2.3	432	<0.000080	0.00407	0.0271	0.0974	0.00012	0.00094	<0.00020	0.00354	0.00372	0.0449	<0.0027	4	0.00035	0.0943
09/09/13	19:39	**CE**	**CC AS 49**	**S 0.04**	3.3	312														
09/09/13	23:50	**CE**	**CC AS 49**	**S 0.05**	3	484														
09/09/13	19:51	**CE**	**CC AS 50**	**S 0.05**	3.7	650														
09/09/13	23:48	**CE**	**CC AS 50**	**S 0.05**	3.9	1080														
09/09/13	22:31	**CE**	**CC AS 59**	0.24	3	564														
09/10/13	4:09	**CE**	**CC AS 59**	**S 0.03**	1.9	420														
09/10/13	21:40	**CE**	**CC AS 49**	**S 0.03**	3.2	426														
09/10/13	22:39	**CE**	**CC AS 50**	**S 0.03**	4.2	706														
9/10/2013	19:18	**CE**	**CC AS T11**	0.13	2.8	222	0.00035	0.00218	0.0333	0.0892	0.0001	0.00219	<0.0002	0.00158	0.0035	0.0403	<0.0027	4.3	0.00048	0.0387
9/10/2013	22:42	**CE**	**CC AS T11**	0.42	2.9	380	0.00033	0.00222	0.037	0.128	0.00013	0.00312	<0.0002	0.00191	0.00396	0.0657	<0.0027	6.2	0.00057	0.0587
11/12/13	13:00	**CE**	**CC AS T3**		1.3	2	<0.000080	0.00022	0.0378	0.0419	0.00055	0.00076	<0.0002	<0.0002	0.00357	0.0119	0.0232	0.383	0.00024	0.00174
11/13/13	13:00	**CE**	**CC AS T3**		1.2	1	<0.000080	0.00021	0.0384	0.0414	0.00058	0.00073	<0.0002	<0.0002	0.00374	0.0115	0.0226	0.33	0.00083	0.0013
11/12/13	12:22	**CE**	**CC AS T4**		1.8	25	0.00087	0.00162	0.0455	0.0541	<0.000070	0.00027	<0.00020	<0.00020	0.00282	0.0101	0.0307	0.602	0.00048	0.00914
11/13/13	12:22	**CE**	**CC AS T4**		1.7	24	0.00073	0.00172	0.0418	0.0481	<0.00007	<0.0007	<0.00020	<0.00020	0.00249	0.0122	0.0303	0.649	0.00191	0.00904

Clear Creek and Canal -
Event Autosampler Results

			Method	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA200.8	NA	NA
			DL	0.002	0.002	0.002	0.002	0.00050	0.00050	0.02	0.02	NA	NA
			Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NA	NA
Sample Date	Sample Time	Sample Type	Location ID	Manganese, Dissolved	Manganese, Total	Molybdenum, Dissolved	Molybdenum, Total	Selenium, Dissolved	Selenium, Total	Zinc, Dissolved	Zinc, Total	Notes	Lab Notes
4/9/2013	7:00	CE	CC AS T11	0.00066	0.0301	0.00365	0.00365	<0.000090	<0.000090	0.032	0.0469	First Flush. Sample A. Start time 0800 on 04/08/13, end time 0700 on 04/09/13. Bottles 1-12.	
4/10/2013	0:00	CE	CC AS T11	0.00086	0.0264	0.00349	0.00349	<0.000090	<0.000090	0.0327	0.0458	First Flush. Sample B. Start time 0800 on 04/09/13, end time 0000 on 04/10/13. Bottles 1-9. Bottle 9 half-full, then sample lines frozen.	
5/14/2013	9:30	CE	CC AS T27	0.159	0.384	0.00155	0.00155	0.00136	0.00136	0.224	0.244	Startup of deliveries from Church Ditch to SL - 2nd 24 hours. Start time 1030 on 05/13/13, end time 0930 on 05/14/13. Bottles 1-12.	
07/12/13	4:54	CE	CC AS 59									Event. Bottles 1-8. Start time 0311 on 07/12/13, end time 0454 on 07/12/13.	Nutrient analyses performed by SGS. TP data suspect.
07/14/13	3:28	CE	CC AS 59									Event. Bottles 1-20. Start time 2252 on 07/13/13, end time 0328 on 07/14/13.	Nutrient analyses performed by SGS.
7/14/2013	9:08	CE	CC AS T11	0.496	0.496	0.00193	0.00201	<0.00030	<0.000090	0.25	0.25	Event. Bottles 8-20. Start time 0608 on 07/14/13, end time 0908 on 07/14/13.	Nutrient analyses performed by SGS. TP data suspect.
7/28/2013	22:00	CE	CC AS 50									Event. Bottles 8-20. Start time 1500 on 07/28/13, end time 2200 on 07/28/13.	Nutrient analyses performed by SGS. TP data suspect.
8/13/2013	22:59	CE	CC AS 50									Event. Bottles 1-24. Start time 1714 on 08/13/13 end time 2259 on 08/13/13.	Nutrient analyses performed by SGS.
08/24/13	5:56	CE	CC AS 59									Event. Bottles 18-22. Start time 0458 on 08/24/13, end time 0556 on 08/24/13.	Nutrient analyses performed by SGS. TP data suspect.
08/27/13	0:38	CE	CC AS 49									Event. Bottles 1-5. Start time 2338 on 08/26/13, end time 0038 on 08/27/13.	Nutrient analyses performed by SGS. TP data suspect.
08/27/13	4:08	CE	CC AS 49									Event. Bottles 6-19. Start time 0053 on 08/27/13, end time 0408 on 08/27/13.	Nutrient analyses performed by SGS. TP data suspect.
08/26/13	23:58	CE	CC AS 50									Event. Bottles 1-4. Start time 2313 on 08/26/13, end time 2358 on 08/26/13.	Nutrient analyses performed by SGS. TP data suspect.
8/28/2013	9:08	CE	CC AS T11	0.00081	0.348	0.00073	0.00073	<0.000090	<0.000090	0.0258	0.273	First Flush. Bottles 1-16. Start time 0523 on 08/28/13, end time 0908 on 08/28/13.	Nutrient analyses performed by SGS. TP data suspect.
09/09/13	19:39	CE	CC AS 49									Event. Bottles 1-4. Start time 1854 on 09/9/13, end time 1939 on 09/9/13.	Nutrient analyses performed by SGS. TP data suspect.
09/09/13	23:50	CE	CC AS 49									Event. Bottles 5-16. Start time 2105 on 09/9/13, end time 2350 on 09/9/13.	Nutrient analyses performed by SGS. TP data suspect.
09/09/13	19:51	CE	CC AS 50									Event. Bottles 1-4. Start time 1906 on 09/9/13, end time 1951on 09/9/13.	Nutrient analyses performed by SGS. TP data suspect.
09/09/13	23:48	CE	CC AS 50									Event. Bottles 5-17. Start time 2045 on 09/9/13, end time 2348 on 09/9/13.	Nutrient analyses performed by SGS. TP data suspect.
09/09/13	22:31	CE	CC AS 59									Event. Bottles 1-4. Start time 2247 on 09/09/13, end time 2231 on 09/09/13.	Nutrient analyses performed by SGS.
09/10/13	4:09	CE	CC AS 59									Event. Bottles 5-17. Start time 0115 on 09/10/13, end time 0409 on 09/10/13.	Nutrient analyses performed by SGS.
09/10/13	21:40	CE	CC AS 49									Event. Bottles 1-15. Start time 1810 on 09/10/13, end time 2140 on 09/10/13.	Nutrient analyses performed by SGS.
09/10/13	22:39	CE	CC AS 50									Event. Bottles 1-4. Start time 2154 on 09/10/13, end time 2239 on 09/10/13.	Nutrient analyses performed by SGS.
9/10/2013	19:18	CE	CC AS T11	0.00396	0.716	0.00141	0.00141	<0.00009	<0.000090	0.0359	0.445	Event. Bottles 1-4. Start time 1833 on 09/10/13, end time 1918 on 09/10/13.	Nutrient analyses performed by SGS.
9/10/2013	22:42	CE	CC AS T11	0.0022	1.1	0.00095	0.00095	<0.00009	<0.000090	0.044	0.66	Event. Bottles 5-17. Start time 1942 on 09/10/13, end time 2242 on 09/10/13.	Nutrient analyses performed by SGS.
11/12/13	13:00	CE	CC AS T3	0.2	0.257	0.00228	0.00228	<0.00009	<0.000090	0.134	0.173	First Flush. Croke Headgate. Botttles 1-12. Start time 1400 on 11/11/13, end time 1300 on 11/12/13.	
11/13/13	13:00	CE	CC AS T3	0.218	0.232	0.00235	0.00235	<0.00009	<0.000090	0.152	0.207	First Flush. Croke Headgate. Botttles 13-24. Start time 1400 on 11/12/13, end time 1300 on 11/13/13.	
11/12/13	12:22	CE	CC AS T4	0.00066	0.104	0.0029	0.0029	<0.00009	<0.00009	0.0283	0.0797	First Flush. Botttles 1-12. Start time 1322 on 11/11/13, end time 1222 on 11/12/13.	
11/13/13	12:22	CE	CC AS T4	0.00218	0.126	0.00295	<0.0013	<0.00009	<0.00009	0.0303	0.0886	First Flush. Botttles 13-24. Start time 1322 on 11/12/13, end time 1222 on 11/13/13.	

Clear Creek - Event Autosampler Results - Metals (Golden)

		Method	EPA200.7	EPA200.7	SM5310B	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7	EPA200.7
		DL	0.004	0.004	0.5	0.005	0.005	0.004	0.004	0.01	0.01
		Reporting Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Type	Location ID	Cadmium, Dissolved	Cadmium, Total	Carbon, Total Organic	Copper, Dissolved	Copper, Total	Iron, Dissolved	Iron, Total	Lead, Dissolved	Lead, Total
8/27/2013	CE	CC 49 Event	<0.004	0.018	2.51	<0.005	0.25	0.091	46.6	<0.01	1.05
8/27/2013	CE	CC 49 Event	<0.004	0.02	NT	<0.005	0.32	0.086	54.4	<0.01	1.53
9/9/2013	CE	CC 49 Event	<0.004	0.006	NT	<0.005	0.043	0.093	20.9	<0.01	0.02
9/9/2013	CE	CC 49 Event	<0.004	0.009	NT	<0.005	0.075	0.07	30.9	<0.01	0.057
9/10/2013	CE	CC 49 Event	<0.004	0.009	NT	<0.005	0.084	0.087	28.1	<0.01	0.16
7/28/2013	CE	CC 50 Event	<0.004	0.015	NT	0.01	0.3	0.024	26.8	<0.01	0.47
8/14/2013	CE	CC 50 Event	<0.004	0.08	NT	0.008	1.7	0.012	118	<0.01	3.9
8/26/2013	CE	CC 50 Event	<0.004	0.042	NT	<0.005	0.84	0.06	87.7	<0.01	0.85
9/9/2013	CE	CC 50 Event	<0.004	0.015	NT	0.005	0.17	0.051	40	<0.01	0.066
9/9/2013	CE	CC 50 Event	<0.004	0.028	NT	0.005	0.46	0.056	66.8	<0.01	0.22
9/10/2013	CE	CC 50 Event	<0.004	0.02	NT	0.008	0.4	0.15	46.1	<0.01	0.34
7/12/2013	CE	CC 59 Event	<0.004	0.014	NT	0.03	0.08	3.63	31.8	0.015	0.036
7/14/2013	CE	CC 59 Event	<0.004	0.013	NT	0.0056	0.26	0.051	24	<0.01	0.48
8/24/2013	CE	CC 59 Event	<0.004	0.014	NT	<0.005	0.2	0.042	37.9	<0.01	0.87
9/9/2013	CE	CC 59 Event	<0.004	0.007	NT	<0.005	0.047	0.11	24.2	<0.01	0.039
9/10/2013	CE	CC 59 Event	<0.004	0.009	NT	<0.005	0.095	0.07	27.6	<0.01	0.081

Clear Creek - Event Autosampler Re

		Method	EPA200.7	EPA200.7	EPA200.7	EPA200.7	NA
		DL	0.001	0.001	0.030	0.030	NA
		Reporting Units	mg/L	mg/L	mg/L	mg/L	NA
Sample Date	Sample Type	Location ID	Manganese, Dissolved	Manganese, Total	Zinc, Dissolved	Zinc, Total	Notes
8/27/2013	CE	CC 49 Event	0.11	1.43	0.041	0.87	Bottles 1-5; 1st Flush
8/27/2013	CE	CC 49 Event	0.2	1.75	0.047	1	Bottles 6-19; 2nd Peak
9/9/2013	CE	CC 49 Event	0.01	0.58	0.014	0.22	Bottles 1-4; 1st Flush
9/9/2013	CE	CC 49 Event	0.014	0.94	<0.03	0.33	Bottles 5-16; 2nd Peak
9/10/2013	CE	CC 49 Event	0.08	1	<0.03	0.43	Bottles 1-15
7/28/2013	CE	CC 50 Event	0.003	1.17	0.06	1.02	#20-23; Discreet sample
8/14/2013	CE	CC 50 Event	0.25	4	0.33	3.36	Bottles 1-24; Event Composite
8/26/2013	CE	CC 50 Event	0.4	3.92	0.064	2.93	Bottles 1-4; Event Composite
9/9/2013	CE	CC 50 Event	0.37	1.7	0.061	0.79	Bottles 1-4; 1st Flush
9/9/2013	CE	CC 50 Event	0.31	2.75	0.036	1.84	Bottles 5-17; 2nd Peak
9/10/2013	CE	CC 50 Event	0.25	2.1	0.12	1.5	Event Composite
7/12/2013	CE	CC 59 Event	0.82	1.05	0.19	0.29	Bottles 1-8
7/14/2013	CE	CC 59 Event	0.018	0.63	0.08	0.77	Bottles 1-20
8/24/2013	CE	CC 59 Event	0.012	1.1	0.011	0.7	Bottles 18-22
9/9/2013	CE	CC 59 Event	0.006	0.91	0.011	0.3	Bottles 1-4
9/10/2013	CE	CC 59 Event	0.025	1.1	0.021	0.56	Bottles 5-17

Standley Lake Results

		Method	electrode	SM2510B	electrode	SM4500OG	SM4500H+B	SM2550B	SM2130B	Secchi Disk	SM4500NH3H	SM4500NO3I	SM4500NO3I	FlowCAM	SM10200H	SM5910B
		DL	1.0	1	1	1.0	1.0	0.1	1	0.1	0.01	0.01	0.02	1	1.0	0.001
		Reporting Units	µg/L	µS/cm	mv	mg/L	s.u.	°C	NTU	m	mg/L	mg/L	mg/L	ct/mL	µg/L	cm-1
Sample Date	**Sample Type**	**Location ID**	**Chlorophyll a, Field**	**Conductivity, Specific**	**ORP Oxidation Reduction Potential**	**Oxygen, Dissolved**	**pH**	**Temp**	**Turbidity**	**Secchi Depth,**	**Nitrogen, Ammonia (Salicylate)**	**Nitrogen, Nitrate+Nitrite**	**Nitrogen, Total Nitrogen**	**Algae**	**Chlorophyll a, Lab (Methanol)**	**UV 254**
02/05/13	G	SL 10-00	2	326	59	10.8	7.8	3.1	2.3	3.3						
02/05/13	C	SL 10-PZ									0.01	0.01	0.2	123	1.7	0.291
02/05/13	G	SL 10-70	2.8	325	70	10.6	7.9	3	2.8		< 0.01	0.01	0.19			0.293
03/06/13	G	SL 10-00	1.2	310	251	10.8	7.9	3	1	5.5						
03/06/13	C	SL 10-PZ									0.03	0.03	0.25	73	1.1	0.296
03/06/13	G	SL 10-70	2	310	268	10.6	8	3.1	1.2		0.01	0.02	0.21			0.284
03/20/13	G	SL 10-00	1.2	359	70	10.8	7.8	5.1	2.3	3.5						
03/20/13	C	SL 10-PZ									0.01	0.03	0.24	107	1.9	0.286
03/20/13	G	SL 10-70	3.2	355	75	10.5	7.9	4.5	3		0.01	0.03	0.24			0.284
04/08/13	G	SL 10-00	1.5	323	265	10.1	8.2	8.3	1.4	3.5						
04/08/13	C	SL 10-PZ									0.02	0.02	0.23	218	3.5	0.28
04/08/13	G	SL 10-70	3.8	323	269	9.9	8.1	7.6	6.2		0.01	0.01	0.16			0.267
04/29/13	G	SL 10-00	2	333	-12	10.1	8.1	10.8	1.5	4.6						
04/29/13	C	SL 10-PZ									0.02	0.02	0.23	353	4	0.294
04/29/13	G	SL 10-70	4.3	330	23	9.8	7.8	6.2	4.2		0.02	< 0.01	0.16			0.275
04/29/13	g	69-00														
05/14/13	G	SL 10-00	1.2	342	271	8.8	8.3	15.4	1.2	6.5						
05/14/13	C	SL 10-PZ									0.02	0.01	0.27	139	2.1	0.309
05/14/13	G	SL 10-70	2.1	333	297	8.2	7.8	7.3	3		0.05	< 0.01	0.23			0.281
05/28/13	G	SL 10-00	1.4	322	98	8.3	8.1	17.3	3.1	3.1						
05/28/13	C	SL 10-PZ									0.03	0.03	0.28	97	3.7	0.534
05/28/13	G	SL 10-70	4	335	100	7.2	7.4	7.9	2.9		0.1	0.01	0.26			0.293
05/28/13	G	69-00														
06/10/13	G	SL 10-00	1.3	294	276	8.3	8.1	19.5	2.2	3.3						
06/10/13	C	SL 10-PZ									0.02	0.03	0.35	158	3.1	0.555
06/10/13	G	SL 10-70	1.2	336	325	5.2	7.3	8.1	4.9		0.25	0.02	0.47			0.31
06/25/13	G	SL 10-00	1.9	278	17	7.8	8	20.2	1.9	3.6						
06/25/13	C	SL 10-PZ									0.03	0.02	0.23	159	3	0.611
06/25/13	G	SL 10-70	1.1	337	59	4.6	7.1	9.5	16.5		0.2	0.03	0.4			0.319
06/25/13	G	69-00														
07/09/13	G	SL 10-00	1.9	267	303	7.4	8.2	22.6	1.6	4.5						
07/09/13	C	SL 10-PZ									0.02	< 0.01	0.2	117	2.9	0.554
07/09/13	G	SL 10-70	1.8	323	349	2.6	7.1	11	13.6		0.12	0.18	0.51			0.344
07/22/13	G	SL 10-00	1.7	266	161	7.2	8.2	24	1.1	5.3						
07/22/13	C	SL 10-PZ									0.02	0.01	0.2	54	2.5	0.525
07/22/13	G	SL 10-70	6.5	322	185	1	7.1	11.3	35.8		0.01	0.26	0.41			0.396
07/22/13	G	69-00														
08/06/13	G	SL 10-00	2.1	256	294	7.1	8.1	22.4	1.2	4.7						
08/06/13	C	SL 10-PZ									< 0.01	< 0.01	0.16	63	2.4	0.473
08/06/13	G	SL 10-70	1.9	312	348	< 1.0	7	12	9.4		0.14	0.19	0.49			0.406
08/20/13	G	SL 10-00	0.9	260	206	7.5	8.2	22.8	0.7	6.7						
08/20/13	C	SL 10-PZ									0.02	< 0.01	0.21	63	2.2	0.456
08/20/13	G	SL 10-70	1.1	313	17	< 1.0	7	12.4	9.5		0.15	0.14	0.42			0.463
08/20/13	G	69-00														
09/04/13	G	SL 10-00	3.1	256	278	7.6	8.5	23.3	1.1	4.3						
09/04/13	C	SL 10-PZ									< 0.01	< 0.01	0.17	61	2.7	0.43
09/04/13	G	SL 10-70	1.5	292	290	< 1.0	7	14.1	10		0.21	0.02	0.37			0.579
09/17/13	G	SL 10-00	3.5	249	212	6.5	7.7	20.9	10.8	0.9						
09/17/13	C	SL 10-PZ									0.02	0.03	0.27	79	4.9	0.544
09/17/13	G	SL 10-70	1.8	309	33	< 1.0	7	13	9.7		0.08	0.04	0.32			0.621
09/17/13	G	69-00														
09/17/13	G	Depth									0.11	0.14	0.5			
10/01/13	G	SL 10-00	3.3	249	304	6.6	7.7	17.9	3	2.3						
10/01/13	C	SL 10-PZ									0.03	0.01	0.22	147	6.2	0.542
10/01/13	G	SL 10-70	2	302	303	< 1.0	7.1	14	9.5		0.34	< 0.01	0.63			0.6
10/15/13	G	SL 10-00	8.5	251	324	7.7	7.9	14.7	5.8	1.6						
10/15/13	C	SL 10-PZ									0.02	< 0.01	0.25	521	10.6	0.532
10/15/13	G	SL 10-70	5.9	248	329	6.7	7.7	14.1	30		0.02	0.01	0.26			0.515
10/15/13	G	69-00														
11/12/13	G	SL 10-00	4.6	253	310	8.6	7.9	9.4	2.5	2.1						
11/12/13	C	SL 10-PZ									0.02	< 0.01	0.23	278	7	0.498
11/12/13	G	SL 10-70	4.8	253	328	8.5	7.8	9.2	4.4		0.02	< 0.01	0.21			0.493
11/26/13	G	SL 10-00	1.8	259	288	9.4	7.9	7.1	3.3	3.3						
11/26/13	C	SL 10-PZ									0.04	0.02	0.24	194	4.6	0.493
11/26/13	G	SL 10-70	3.2	260	301	9	7.8	6.9	6.2		0.04	0.03	0.29			0.475
12/16/13	G	SL 10-00	1.7	267	249	10.4	7.9	2.8	2.9	3.8						
12/16/13	C	SL 10-PZ									0.03	0.03	0.2	63	2.2	0.479
12/16/13	G	SL 10-70	1.4	268	291	10.2	7.9	2.8	3.5		0.03	0.03	0.21			0.484

Standley Lake Results

		Method	SM7110B	SM7110B	SM7110B	SM7110B	SM4500PE	SM4500PE	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA524.2	EPA524.2	EPA524.2	EPA524.2	EPA200.8
		DL	variable	variable	variable	variable	0.0025	0.0025	0.001	0.001	0.002	0.002	0.0005	0.0005	0.0005	0.0005	0.0005
		Reporting Units	pCi/L	pCi/L	pCi/L	pCi/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Type	Location ID	Gross Alpha	Gross Alpha, Uncertainty	Gross Beta	Gross Beta, Uncertainty	Phosphorus, Dissolved (DRP)	Phosphorus, Total	Arsenic, Dissolved	Arsenic, Total	Barium, Dissolved	Barium, Total	BTEX, Benzene	BTEX, Ethylbenzene	BTEX, Tolune	BTEX, Xylenes	Cadmium, Dissolved
02/05/13	G	SL 10-00	0.5	1.7	0.2	2.2											
02/05/13	C	SL 10-PZ	6.7	2.8	3.6	2.5	< 0.0025	0.0076	<0.001	0.001	0.051	0.051					<0.0005
02/05/13	G	SL 10-70	3.7	2.6	3.6	2.4	< 0.0025	0.0074	<0.001	<0.001	0.049	0.049					<0.0005
03/06/13	G	SL 10-00	0	1.2	0	2											
03/06/13	C	SL 10-PZ	0.5	1.3	0.5	2	< 0.0025	0.0073									
03/06/13	G	SL 10-70	0.9	1.3	1.1	2	< 0.0025	0.0069									
03/20/13	G	SL 10-00															
03/20/13	C	SL 10-PZ					< 0.0025	0.0141									
03/20/13	G	SL 10-70					< 0.0025	0.0092									
04/08/13	G	SL 10-00															
04/08/13	C	SL 10-PZ					< 0.0025	0.0122									
04/08/13	G	SL 10-70					< 0.0025	0.0154									
04/29/13	G	SL 10-00	NT	NT	NT	NT											
04/29/13	C	SL 10-PZ	NT	NT	NT	NT	0.0044	0.0126									
04/29/13	G	SL 10-70	NT	NT	NT	NT	< 0.0025	0.013									
04/29/13	g	69-00															
05/14/13	G	SL 10-00															
05/14/13	C	SL 10-PZ					< 0.0025	0.0082									
05/14/13	G	SL 10-70					< 0.0025	0.0098									
05/28/13	G	SL 10-00															
05/28/13	C	SL 10-PZ					< 0.0025	0.0135									
05/28/13	G	SL 10-70					< 0.0025	0.0103									
05/28/13	G	69-00											<0.00014	<0.00010	<0.00010	<0.00015	
06/10/13	G	SL 10-00	0.7	1.6	1.3	3.1											
06/10/13	C	SL 10-PZ	1.6	2.2	0	3.3	< 0.0025	0.0113	0.00069	0.00074	0.0422	0.0434					<0.000070
06/10/13	G	SL 10-70	1.6	1.9	3.2	3	0.0031	0.0172	0.00069	0.00071	0.0516	0.0534					<0.000070
06/25/13	G	SL 10-00															
06/25/13	C	SL 10-PZ					< 0.0025	0.0089									
06/25/13	G	SL 10-70					0.0039	0.0139									
06/25/13	G	69-00											<0.00014	<0.00010	<0.00010	<0.00015	
07/09/13	G	SL 10-00															
07/09/13	C	SL 10-PZ					< 0.0025	0.0087									
07/09/13	G	SL 10-70					0.0044	0.0227									
07/22/13	G	SL 10-00															
07/22/13	C	SL 10-PZ					< 0.0025	0.0114	0.00068	0.00069	0.041	0.044					<0.00007
07/22/13	G	SL 10-70					0.0033	0.0186	0.00046	0.00058	0.0476	0.0529					<0.00007
07/22/13	G	69-00											<0.00014	<0.00010	<0.00010	0.00097	
08/06/13	G	SL 10-00															
08/06/13	C	SL 10-PZ					< 0.0025	0.0102									
08/06/13	G	SL 10-70					0.0052	0.018									
08/20/13	G	SL 10-00	0.4	1.4	0	1.8											
08/20/13	C	SL 10-PZ	0.4	1.5	0	2.1	< 0.0025	0.0069									
08/20/13	G	SL 10-70	0.5	1.6	0.3	2.1	0.0082	0.0365									
08/20/13	G	69-00											<0.00014	<0.00010	<0.00010	<0.00015	
09/04/13	G	SL 10-00															
09/04/13	C	SL 10-PZ					< 0.0025	0.0077									
09/04/13	G	SL 10-70					0.0432	0.0845									
09/17/13	G	SL 10-00	0.4	1.8	0.2	2											
09/17/13	C	SL 10-PZ	0	1.6	0.4	2.2	0.0083	0.0132	0.00063	0.00071	0.0412	0.0445					<0.00007
09/17/13	G	SL 10-70	1.8	1.8	0.2	2.1	0.017	0.0231	0.00077	0.00092	0.0415	0.0473					<0.00007
09/17/13	G	69-00											<0.00014	<0.00010	<0.00010	<0.00015	
09/17/13	G	Depth					0.0292	0.0585	0.00083	0.00114	0.0378	0.0516					<0.00007
10/01/13	G	SL 10-00															
10/01/13	C	SL 10-PZ					< 0.0025	0.0135	0.00061	0.00066	0.0406	0.0435					<0.00007
10/01/13	G	SL 10-70					0.0103	0.0369	0.00169	0.00191	0.0465	0.052					<0.00007
10/15/13	G	SL 10-00	0.7	1.5	0.9	2.1											
10/15/13	C	SL 10-PZ	0.7	1.6	0.9	2.1	< 0.0027	0.0196	0.00059	0.00075	0.0408	0.0428					<0.00007
10/15/13	G	SL 10-70	0.9	1.4	1.3	2.2	0.0032	0.0203	0.00058	0.00081	0.0419	0.0468					<0.00007
10/15/13	G	69-00											<0.00014	<0.00010	<0.00010	<0.00015	
11/12/13	G	SL 10-00															
11/12/13	C	SL 10-PZ					0.0037	0.0141									
11/12/13	G	SL 10-70					0.0033	0.0156									
11/26/13	G	SL 10-00															
11/26/13	C	SL 10-PZ					0.0054	0.0132									
11/26/13	G	SL 10-70					0.0049	0.0162									
12/16/13	G	SL 10-00	2.5	1.8	0.8	2.2											
12/16/13	C	SL 10-PZ	0	1.3	0	1.9	0.0064	0.0138									
12/16/13	G	SL 10-70	0.2	1.3	0	1.9	0.0062	0.0154									

Standley Lake Results

		Method	EPA200.8	SM5310B	EPA200.8	EPA200.8	SM9221D	EPA200.8	EPA200.8	EPA130.2	EPA200.7	EPA200.7	EPA200.8	EPA200.8	EPA200.8	EPA200.8	EPA245.1
		DL	0.0005	0.5	0.001	0.001	1	0.002	0.002	5	0.02	0.02	0.0005	0.0005	0.002	0.002	0.0002
		Reporting Units	mg/L	mg/L	mg/L	mg/L	cfu/mL	mg/L	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Date	Sample Type	Location ID	Cadmium, Total	Carbon, Total Organic	Chromium, Dissolved	Chromium, Total	E. coli,	Copper, Dissolved	Copper, Total	Hardness, Total	Iron, Dissolved	Iron, Total	Lead, Dissolved	Lead, Total	Manganese, Dissolved	Manganese, Total	Mercury, Total
02/05/13	G	SL 10-00					15										
02/05/13	C	SL 10-PZ	<0.0005	1.6	<0.001	<0.001		<0.002	<0.002	140	<0.02	0.082	<0.0005	0.00056	<0.002	0.043	<0.0002
02/05/13	G	SL 10-70	<0.0005	1.5	<0.001	<0.001	15	<0.002	<0.002	128	<0.02	0.05	<0.0005	<0.0005	0.025	0.025	<0.0002
03/06/13	G	SL 10-00					<1										
03/06/13	C	SL 10-PZ		1.9						136							
03/06/13	G	SL 10-70		1.5			<1			120							
03/20/13	G	SL 10-00															
03/20/13	C	SL 10-PZ															
03/20/13	G	SL 10-70															
04/08/13	G	SL 10-00					<1										
04/08/13	C	SL 10-PZ		1.8						120							
04/08/13	G	SL 10-70		1.5			4			136							
04/29/13	G	SL 10-00															
04/29/13	C	SL 10-PZ															
04/29/13	G	SL 10-70															
04/29/13	g	69-00															
05/14/13	G	SL 10-00					<1										
05/14/13	C	SL 10-PZ		2						128							
05/14/13	G	SL 10-70		1.6			2			132							
05/28/13	G	SL 10-00															
05/28/13	C	SL 10-PZ															
05/28/13	G	SL 10-70															
05/28/13	G	69-00															
06/10/13	G	SL 10-00					<1										
06/10/13	C	SL 10-PZ	<0.000070	2.2	<0.00020	0.00102		0.00224	0.00224	112	0.07	0.07	0.0003	0.00053	0.0123	0.0123	<0.00005
06/10/13	G	SL 10-70	<0.000070	1.6	<0.00020	0.00148	<1	0.00094	0.00095	116	0.06	0.12	<0.000070	0.00022	0.434	0.434	<0.00005
06/25/13	G	SL 10-00															
06/25/13	C	SL 10-PZ															
06/25/13	G	SL 10-70															
06/25/13	G	69-00															
07/09/13	G	SL 10-00					1										
07/09/13	C	SL 10-PZ		2.2						60							
07/09/13	G	SL 10-70		2.1			1			76							
07/22/13	G	SL 10-00															
07/22/13	C	SL 10-PZ	<0.00007		0.00101	0.00089		0.00208	0.00208	108	<0.0027	<0.0027	<0.00007	0.00039	0.00098	0.0107	<0.00005
07/22/13	G	SL 10-70	<0.00007		0.00082	0.00127		0.00236	0.00236	132	0.21	0.21	0.00024	0.00136	0.00179	0.133	<0.00005
07/22/13	G	69-00															
08/06/13	G	SL 10-00					2										
08/06/13	C	SL 10-PZ		2													
08/06/13	G	SL 10-70		2			16										
08/20/13	G	SL 10-00															
08/20/13	C	SL 10-PZ								100							
08/20/13	G	SL 10-70								116							
08/20/13	G	69-00															
09/04/13	G	SL 10-00					<1										
09/04/13	C	SL 10-PZ		2.4													
09/04/13	G	SL 10-70		2.3			53										
09/17/13	G	SL 10-00					14										
09/17/13	C	SL 10-PZ	<0.00007	2	<0.00020	<0.00020		0.0022	0.0022	NT	<0.0027	0.085	<0.00007	0.00056	0.00134	0.00895	<0.00005
09/17/13	G	SL 10-70	<0.00007	2.2	<0.00020	<0.00020	33	0.00182	0.00182	NT	<0.0027	0.17	<0.00007	0.00093	0.173	0.226	<0.00005
09/17/13	G	69-00															
09/17/13	G	Depth	<0.00007	3	<0.00020	0.00061	89	0.00259	0.00327	112	<0.0027	0.41	<0.00007	0.0029	0.00177	0.0675	<0.00005
10/01/13	G	SL 10-00					5										
10/01/13	C	SL 10-PZ	<0.00007	2.1	<0.00020	<0.00020		0.00139	0.00187	128	<0.0027	0.073	<0.00007	0.00043	0.00459	0.0225	<0.00005
10/01/13	G	SL 10-70	<0.00007	2.2	<0.00020	<0.00020	66	0.00042	0.00099	92	<0.0027	0.17	<0.00007	0.00081	1.69	1.73	<0.00005
10/15/13	G	SL 10-00															
10/15/13	C	SL 10-PZ	<0.00007		<0.0002	<0.0002		0.00143	0.00191	96	<0.0027	0.084	<0.00007	0.00069	0.00104	0.023	<0.00005
10/15/13	G	SL 10-70	<0.00007		<0.0002	<0.0002		0.00117	0.00255	100	<0.0027	0.24	<0.00007	0.00199	0.0617	0.137	<0.00005
10/15/13	G	69-00															
11/12/13	G	SL 10-00					47										
11/12/13	C	SL 10-PZ		1.9						128							
11/12/13	G	SL 10-70		2.1			40			124							
11/26/13	G	SL 10-00															
11/26/13	C	SL 10-PZ															
11/26/13	G	SL 10-70															
12/16/13	G	SL 10-00					20										
12/16/13	C	SL 10-PZ		1.9						112							
12/16/13	G	SL 10-70		2.3			15			108							

Standley Lake Results

		Method	**EPA200.8**	**EPA200.8**	**EPA200.8**	**EPA200.8**	**SM2540D**	**EPA200.8**	**EPA200.8**	**NA**	**NA**
		DL	**0.002**	**0.002**	**0.005**	**0.005**	**1**	**0.020**	**0.020**	**NA**	**NA**
		Reporting Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**NA**	**NA**
Sample Date	**Sample Type**	**Location ID**	**Molybdenum, Dissolved**	**Molybdenum, Total**	**Selenium, Dissolved**	**Selenium, Total**	**Solids, Total Suspended**	**Zinc, Dissolved**	**Zinc, Total**	**Field Notes**	**Lab Notes**
02/05/13	G	SL 10-00									
02/05/13	C	SL 10-PZ	0.0033	0.0034	<0.005	<0.005	43	<0.005	<0.020		Silicon analyzed by SGS
02/05/13	G	SL 10-70	0.0031	0.0031	<0.005	<0.005	3	<0.005	0.021		Silicon analyzed by SGS
03/06/13	G	SL 10-00									
03/06/13	C	SL 10-PZ					6				Silicon analyzed by SGS
03/06/13	G	SL 10-70					3				Silicon analyzed by SGS
03/20/13	G	SL 10-00									
03/20/13	C	SL 10-PZ									Silicon analyzed by SGS
03/20/13	G	SL 10-70									Silicon analyzed by SGS
04/08/13	G	SL 10-00									
04/08/13	C	SL 10-PZ					6				Silicon analyzed by SGS
04/08/13	G	SL 10-70					8				Silicon analyzed by SGS
04/29/13	G	SL 10-00									
04/29/13	C	SL 10-PZ									Silicon analyzed by SGS
04/29/13	G	SL 10-70									Silicon analyzed by SGS
04/29/13	g	69-00									
05/14/13	G	SL 10-00									
05/14/13	C	SL 10-PZ					2				Silicon analyzed by SGS
05/14/13	G	SL 10-70					3				Silicon analyzed by SGS
05/28/13	G	SL 10-00									
05/28/13	C	SL 10-PZ									Silicon analyzed by SGS
05/28/13	G	SL 10-70									Silicon analyzed by SGS
05/28/13	G	69-00									
06/10/13	G	SL 10-00									
06/10/13	C	SL 10-PZ	0.0031	0.00352	<0.000090	<0.000090	4	0.00807	0.00807		Holding time exceeded for filtering dissolved metals. Silicon analyzed by SGS
06/10/13	G	SL 10-70	0.00339	0.00359	<0.000090	<0.000090	4	0.0109	0.0109		Holding time exceeded for filtering dissolved metals. Silicon analyzed by SGS
06/25/13	G	SL 10-00									
06/25/13	C	SL 10-PZ									Silicon analyzed by SGS
06/25/13	G	SL 10-70									Silicon analyzed by SGS
06/25/13	G	69-00									
07/09/13	G	SL 10-00									
07/09/13	C	SL 10-PZ					3				Silicon analyzed by SGS
07/09/13	G	SL 10-70					18				Silicon analyzed by SGS
07/22/13	G	SL 10-00									
07/22/13	C	SL 10-PZ	0.00322	0.00327	<0.00009	<0.00009	2	0.00566	0.00566		Silicon analyzed by SGS
07/22/13	G	SL 10-70	0.00297	0.00313	<0.00009	<0.00009	10	0.0163	0.0163		Silicon analyzed by SGS
07/22/13	G	69-00									
08/06/13	G	SL 10-00									
08/06/13	C	SL 10-PZ					1				Silicon analyzed by SGS
08/06/13	G	SL 10-70					11				Silicon analyzed by SGS
08/20/13	G	SL 10-00									
08/20/13	C	SL 10-PZ									Silicon analyzed by SGS
08/20/13	G	SL 10-70									Silicon analyzed by SGS
08/20/13	G	69-00									
09/04/13	G	SL 10-00									
09/04/13	C	SL 10-PZ					19				Silicon analyzed by SGS
09/04/13	G	SL 10-70					32				Silicon analyzed by SGS
09/17/13	G	SL 10-00									
09/17/13	C	SL 10-PZ	0.00305	0.00305	<0.00009	<0.00009	9	0.00632	0.00632		Silicon analyzed by SGS
09/17/13	G	SL 10-70	0.00311	0.00311	<0.00009	0.00058	14	0.01	0.0114		Silicon analyzed by SGS
09/17/13	G	69-00									
09/17/13	G	Depth	0.00304	0.00246	<0.00009	0.00051	32	0.0129	0.0175	Post flood canal inlet plume depth - 15 m	
10/01/13	G	SL 10-00									
10/01/13	C	SL 10-PZ	0.00314	0.00322	<0.00009	<0.00009	8	0.00634	0.00634		Silicon analyzed by SGS
10/01/13	G	SL 10-70	0.00415	0.00415	<0.00009	<0.00009	21	0.0124	0.0125		Silicon analyzed by SGS
10/15/13	G	SL 10-00									
10/15/13	C	SL 10-PZ	0.00318	0.00307	<0.00009	<0.00009		0.00327	0.00616		Silicon analyzed by SGS
10/15/13	G	SL 10-70	0.00321	0.00285	<0.00009	<0.00009		0.00848	0.016		Silicon analyzed by SGS
10/15/13	G	69-00									
11/12/13	G	SL 10-00									
11/12/13	C	SL 10-PZ					3				Silicon analyzed by SGS
11/12/13	G	SL 10-70					3				Silicon analyzed by SGS
11/26/13	G	SL 10-00									
11/26/13	C	SL 10-PZ									Silicon analyzed by SGS
11/26/13	G	SL 10-70									Silicon analyzed by SGS
12/16/13	G	SL 10-00									
12/16/13	C	SL 10-PZ					2				Silicon analyzed by SGS
12/16/13	G	SL 10-70					2				Silicon analyzed by SGS

Appendix D – Regulation 85 Water Quality Monitoring Data – 2013

Regulation 85 Data

Facility	Sample Date	Lab	Effluent Flow (MGD)	NH3 (mg/L)	TIN (mg/L)	TKN (mg/L)	TN (mg/L)	TP (mg/L)	NO3+NO2 (mg/L)	NO3 (mg/L)	Comment
St. Marys Glacier W&S District	9/18/2013	Colorado Analytical Laboratories		0.34		1.70	1.00	2.39	0.26	1.39	
St. Marys Glacier W&S District	11/25/2013	Colorado Analytical Laboratories		6.19		6.50	9.10	9.40	2.09	0.27	
St. Marys Glacier W&S District	9/18/2013	n/a	0.20								
St. Marys Glacier W&S District	11/25/2013	n/a	0.14								
Town of Empire	1/9/2013	Colorado Analytical Laboratories		0.20		21.50			3.02	21.26	
Town of Empire	2/6/2013	Colorado Analytical Laboratories		0.20		28.50			2.32	28.31	
Town of Empire	3/7/2013	Colorado Analytical Laboratories		0.19		19.50			2.23	19.35	
Town of Empire	5/16/2013	Colorado Analytical Laboratories		0.36		24.20			0.97	23.81	
Town of Empire	8/13/2013	Colorado Analytical Laboratories		1.64		22.90			0.47	21.23	
Town of Empire	9/18/2013	Colorado Analytical Laboratories		8.90		28.40	10.20	29.75	2.36	19.55	
Town of Empire	10/22/2013	Colorado Analytical Laboratories		0.58		21.30			0.17	20.68	
Town of Empire	11/7/2013	Colorado Analytical Laboratories		0.59		12.90	2.50	15.14	0.66	12.64	
Town of Empire	12/16/2013	Colorado Analytical Laboratories		0.17		12.80			0.18	12.62	
Town of Empire	1/9/2013	n/a	0.04								
Town of Empire	2/6/2013	n/a	0.03								
Town of Empire	3/7/2013	n/a	0.04								
Town of Empire	5/16/2013	n/a	0.03								
Town of Empire	8/13/2013	n/a	0.03								
Town of Empire	9/18/2013	n/a	0.03								
Town of Empire	10/22/2013	n/a	0.04								
Town of Empire	11/7/2013	n/a	0.33								
Town of Empire	12/16/2013	n/a	0.04								
Idaho Springs	1/7/2013	Colorado Analytical Laboratories				10.61	6.40	8.60	1.10	2.13	
Idaho Springs	3/5/2013	Colorado Analytical Laboratories				10.70	4.60	11.20	0.09	6.59	
Idaho Springs	5/7/2013	Colorado Analytical Laboratories				2.70	7.50	9.20	0.36	1.72	
Idaho Springs	7/17/2013	Colorado Analytical Laboratories				2.50	2.90	3.80	0.55	0.95	
Idaho Springs	9/3/2013	Colorado Analytical Laboratories				4.40	3.30	6.20	0.96	2.99	
Idaho Springs	11/5/2013	Colorado Analytical Laboratories				1.30	1.70	3.40	0.61	2.69	
Idaho Springs	1/7/2013	n/a	0.17								
Idaho Springs	3/5/2013	n/a	0.14								
Idaho Springs	5/7/2013	n/a	0.22								
Idaho Springs	7/17/2013	n/a	0.25								
Idaho Springs	9/3/2013	n/a	0.25								
Idaho Springs	11/5/2013	n/a	0.28								
BHCCSD	3/13/2013	SGS commercial				2.84	0.49	1.27	0.07	1.21	
BHCCSD	3/20/2013	SGS commercial		0.18			1.90				
BHCCSD	4/10/2013	SGS commercial								0.40	
BHCCSD	4/11/2013	SGS commercial							0.13		
BHCCSD	4/13/2013	SGS commercial								3.91	
BHCCSD	4/17/2013	SGS commercial					0.83				
BHCCSD	4/18/2013	SGS commercial		0.15		4.06		1.69			
BHCCSD	4/19/2013	SGS commercial							<0.1		
BHCCSD	5/8/2013	SGS commercial								1.12	
BHCCSD	5/10/2013	SGS commercial							0.06		
BHCCSD	5/14/2013	SGS commercial		<0.05			0.77				
BHCCSD	5/15/2013	SGS commercial				2.9		1.12			
BHCCSD	6/13/2013	SGS commercial								0.96	
BHCCSD	6/14/2013	SGS commercial							0.10		
BHCCSD	6/18/2013	SGS commercial		#VALUE!			0.77				
BHCCSD	6/21/2013	SGS commercial				2.82		0.96			
BHCCSD	6/28/2013	SGS commercial					1.57				
BHCCSD	7/11/2013	SGS commercial								0.98	
BHCCSD	7/15/2013	SGS commercial							0.03		
BHCCSD	7/16/2013	SGS commercial					0.97				
BHCCSD	7/17/2013	SGS commercial		<0.05		2.73		0.98			
BHCCSD	8/15/2013	SGS commercial								1.42	
BHCCSD	8/16/2013	SGS commercial							0.05		
BHCCSD	8/20/2013	SGS commercial		0.07			0.93				
BHCCSD	8/21/2013	SGS commercial				3.96		1.60			
BHCCSD	9/11/2013	SGS commercial								1.28	
BHCCSD	9/17/2013	SGS commercial		<0.05			0.93				
BHCCSD	9/18/2013	SGS commercial				3.32		1.40			
BHCCSD	9/20/2013	SGS commercial							0.07		
BHCCSD	10/10/2013	SGS commercial								1.31	
BHCCSD	10/15/2013	SGS commercial		<0.05			0.60				
BHCCSD	10/17/2013	SGS commercial							0.08		
BHCCSD	10/18/2013	SGS commercial				3.39		1.31	0.03		
BHCCSD	11/13/2013	SGS commercial								0.81	
BHCCSD	11/18/2013	SGS commercial							0.05		
BHCCSD	11/20/2013	SGS commercial		<0.05			0.62				
BHCCSD	11/25/2013	SGS commercial				2.00		1.77			
BHCCSD	12/11/2013	SGS commercial								2.21	
BHCCSD	12/16/2013	SGS commercial							0.06		
BHCCSD	12/17/2013	SGS commercial		<0.05			0.60				
BHCCSD	12/18/2013	SGS commercial				6.00		2.21			
BHCCSD	3/13/2013	n/a	0.32								
BHCCSD	4/10/2013	n/a	0.33								
BHCCSD	5/8/2013	n/a	0.37								
BHCCSD	6/11/2013	n/a	0.40								
BHCCSD	7/10/2013	n/a	0.47								
BHCCSD	8/14/2013	n/a	0.41								
BHCCSD	9/11/2013	n/a	0.43								
BHCCSD	10/9/2013	n/a	0.50								
BHCCSD	11/12/2013	n/a	0.35								
BHCCSD	12/11/2013	n/a	0.39								
CCCSD	1/10/2013	Colorado Analytical Laboratories			0.64	0.89				0.45	
CCCSD	1/15/2013	Colorado Analytical Laboratories					74.3	75.07			
CCCSD	2/14/2013	Colorado Analytical Laboratories							0.21		
CCCSD	2/15/2013	Colorado Analytical Laboratories		0.12							
CCCSD	3/2/2013	Colorado Analytical Laboratories					13.6	41.17			
CCCSD	7/18/2013	Colorado Analytical Laboratories		0.19							
CCCSD	7/19/2013	Colorado Analytical Laboratories							0.03		
CCCSD	8/22/2013	Colorado Analytical Laboratories			27.86	28.06				13.93	
CCCSD	8/27/2013	Colorado Analytical Laboratories					1.7	29.57			
CCCSD	10/3/2013	Colorado Analytical Laboratories			21.21					10.605	
CCCSD	10/8/2013	Colorado Analytical Laboratories				21.4	1.7	22.92			
CCCSD	10/22/2013	Colorado Analytical Laboratories		0.18					0.57		
CCCSD	12/31/2013	Colorado Analytical Laboratories			24.28					15.43	
CCCSD	1/2/2014	Colorado Analytical Laboratories		7.47		35.04					
CCCSD	1/3/2014	Colorado Analytical Laboratories							6.25		
CCCSD	3/21/2014	Colorado Analytical Laboratories			31.82					15.91	
CCCSD	3/24/2014	Colorado Analytical Laboratories							1.04		
CCCSD	3/25/2014	Colorado Analytical Laboratories		0.11							
CCCSD	3/27/2014	Colorado Analytical Laboratories					1.7				
CCCSD	3/28/2014	Colorado Analytical Laboratories				31.94		33.53			
CCCSD	1/9/2013	n/a	0.06								
CCCSD	3/1/2013	n/a	0.04								
CCCSD	8/21/2013	n/a	0.02								
CCCSD	10/8/2013	n/a	0.05								
CCCSD	3/20/2014	n/a	0.04								
Georgetown	3/7/2013	Colorado Analytical Laboratories							0.16	1.67	
Georgetown	3/8/2013	Colorado Analytical Laboratories		0.83		2.50					
Georgetown	3/12/2013	Colorado Analytical Laboratories					1.50				
Georgetown	3/13/2013	Colorado Analytical Laboratories						3.20			
Georgetown	4/4/2013	Colorado Analytical Laboratories		0.8					0.20	2.92	
Georgetown	4/10/2013	Colorado Analytical Laboratories				3.00	0.50				
Georgetown	4/11/2013	Colorado Analytical Laboratories						3.40			
Georgetown	5/2/2013	Colorado Analytical Laboratories		0.22					3.34	0.85	
Georgetown	5/7/2013	Colorado Analytical Laboratories					3.00				
Georgetown	5/8/2013	Colorado Analytical Laboratories				3.60		3.80			
Georgetown	6/6/2013	Colorado Analytical Laboratories		0.06						2.6	
Georgetown	6/7/2013	Colorado Analytical Laboratories							0.10		
Georgetown	6/11/2013	Colorado Analytical Laboratories					0.50				
Georgetown	6/13/2013	Colorado Analytical Laboratories				2.60		3.10			
Georgetown	7/3/2013	Colorado Analytical Laboratories								2.21	
Georgetown	7/8/2013	Colorado Analytical Laboratories							0.12		
Georgetown	7/9/2013	Colorado Analytical Laboratories		0.19							
Georgetown	7/11/2013	Colorado Analytical Laboratories				2.40	0.60	2.80			
Georgetown	8/8/2013	Colorado Analytical Laboratories		0.22						1.39	
Georgetown	8/9/2013	Colorado Analytical Laboratories							0.14		
Georgetown	8/16/2013	Colorado Analytical Laboratories				1.60	0.80	2.20			
Georgetown	9/5/2013	Colorado Analytical Laboratories		0.2						1.47	
Georgetown	9/6/2013	Colorado Analytical Laboratories							0.14		
Georgetown	9/10/2013	Colorado Analytical Laboratories					1.00				

Regulation 85 Data

Facility	Sample Date	Lab	Effluent Flow (MGD)	NH3 (mg/L)	TIN (mg/L)	TKN (mg/L)	TN (mg/L)	TP (mg/L)	NO3+NO2 (mg/L)	NO3 (mg/L)	Comment
Georgetown	9/11/2013	Colorado Analytical Laboratories				1.70		2.40			
Georgetown	10/4/2013	Colorado Analytical Laboratories								3.14	
Georgetown	10/7/2013	Colorado Analytical Laboratories							0.17		
Georgetown	10/8/2013	Colorado Analytical Laboratories		0.24							
Georgetown	10/10/2013	Colorado Analytical Laboratories					0.40				
Georgetown	10/11/2013	Colorado Analytical Laboratories				3.40		3.60			
Georgetown	11/7/2013	Colorado Analytical Laboratories		0.11					0.16	4.22	
Georgetown	11/12/2013	Colorado Analytical Laboratories					0.60				
Georgetown	11/13/2013	Colorado Analytical Laboratories				4.30		4.80			
Georgetown	12/5/2013	Colorado Analytical Laboratories								4.36	
Georgetown	12/6/2013	Colorado Analytical Laboratories							0.35		
Georgetown	12/10/2013	Colorado Analytical Laboratories		0.11			0.80				
Georgetown	12/11/2013	Colorado Analytical Laboratories				4.50		5.20			
Georgetown	1/9/2014	Colorado Analytical Laboratories								3.79	
Georgetown	1/13/2014	Colorado Analytical Laboratories							0.15		
Georgetown	1/14/2014	Colorado Analytical Laboratories		0.12			0.50				
Georgetown	1/16/2014	Colorado Analytical Laboratories				3.90		4.20			
Georgetown	2/6/2014	Colorado Analytical Laboratories								2.85	
Georgetown	2/7/2014	Colorado Analytical Laboratories		0.07					0.24		
Georgetown	2/11/2014	Colorado Analytical Laboratories					0.20				
Georgetown	2/12/2014	Colorado Analytical Laboratories				2.90					
Georgetown	2/14/2014	Colorado Analytical Laboratories						3.10			
Georgetown	3/8/2013	n/a	0.18								
Georgetown	4/4/2013	n/a	0.20								
Georgetown	5/2/2013	n/a	0.22								
Georgetown	6/6/2013	n/a	0.43								
Georgetown	7/9/2013	n/a	0.33								
Georgetown	8/8/2013	n/a	0.26								
Georgetown	9/5/2013	n/a	0.29								
Georgetown	10/8/2013	n/a	0.20								
Georgetown	11/7/2013	n/a	0.18								
Georgetown	12/10/2013	n/a	0.22								
Georgetown	1/14/2014	n/a	0.24								
Georgetown	2/7/2014	n/a	0.28								
Loveland	3/8/2013	Colorado Analytical Laboratories			0.22					0.15	
Loveland	3/12/2013	Colorado Analytical Laboratories		13.8					8.91		
Loveland	3/13/2013	Colorado Analytical Laboratories				13.40					
Loveland	3/14/2013	Colorado Analytical Laboratories					17.30				
Loveland	3/15/2013	Colorado Analytical Laboratories						17.6			
Loveland	5/10/2013	Colorado Analytical Laboratories			0.93					0.46	
Loveland	5/14/2013	Colorado Analytical Laboratories					5.9		0.35		
Loveland	5/15/2013	Colorado Analytical Laboratories		4.4							
Loveland	5/16/2013	Colorado Analytical Laboratories				5.3		6.8			
Loveland	7/16/2013	Colorado Analytical Laboratories		0.28	4.43					2.21	
Loveland	7/18/2013	Colorado Analytical Laboratories					1				
Loveland	7/19/2013	Colorado Analytical Laboratories							0.03		
Loveland	7/20/2013	Colorado Analytical Laboratories				4.7		5.4			
Loveland	9/18/2013	Colorado Analytical Laboratories			4.4					2.195	
Loveland	9/19/2013	Colorado Analytical Laboratories		0.52			1.4		0.02		
Loveland	9/23/2013	Colorado Analytical Laboratories				4.9		5.8			
Loveland	11/15/2013	Colorado Analytical Laboratories			5.64					2.815	
Loveland	11/20/2013	Colorado Analytical Laboratories		20.26							
Loveland	11/21/2013	Colorado Analytical Laboratories							<0.01		
Loveland	11/22/2013	Colorado Analytical Laboratories				25.9	20.5	26.2			
Loveland	1/31/2014	Colorado Analytical Laboratories			<0.02						from ski area kitchen
Loveland	1/31/2014	Colorado Analytical Laboratories								<0.02	Had to reseed plant
Loveland	1/31/2014	Colorado Analytical Laboratories								<0.01	overloaded influent
Loveland	2/3/2014	Colorado Analytical Laboratories							2.13		
Loveland	2/4/2014	Colorado Analytical Laboratories						74.9			from another facility
Loveland	2/4/2014	Colorado Analytical Laboratories		68.62							Plant died- O & G
Loveland	2/4/2014	Colorado Analytical Laboratories					74.9				with activated sludge
Loveland	2/4/2014	Colorado Analytical Laboratories				68.6					
Loveland	3/18/2014	Colorado Analytical Laboratories		38.63	<0.02					0.06	
Loveland	3/20/2014	Colorado Analytical Laboratories					77				
Loveland	3/21/2014	Colorado Analytical Laboratories				69.4		77	1.55		
Loveland	3/12/2013	n/a	0.02								
Loveland	5/15/2013	n/a	0.02								
Loveland	7/16/2013	n/a	0.01								
Loveland	9/19/2013	n/a	0.01								
Loveland	11/20/2013	n/a	0.01								
Loveland	2/4/2014	n/a	0.01								
Loveland	3/18/2014	n/a	0.02								