LOWER SWIFT CREEK WATER QUALITY REPORT

Complete 540
Triangle Expressway Southeast Extension

Wake and Johnston Counties

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1.0 INTRODUCTION

The North Carolina Turnpike Authority (NCTA) of the North Carolina Department of Transportation (NCDOT) proposes construction of a new road corridor from NC-55 (Apex) East to US-64 Bypass (Knightdale). Dwarf Wedgemussel (*Alasmidonta heterodon,* DWM), which is listed by the US Fish and Wildlife Service (USFWS) as a federally endangered species, occurs in Swift Creek of the Neuse River Basin within the proposed action area of the project. It was first documented to occur in Swift Creek in 1991.

To update the environmental baseline for the DWM population in Swift Creek, a multi-tier study was conducted to determine the viability of this population. This report addresses water quality conditions in the Swift Creek Watershed (SCW) to assist in determining if conditions are sufficient to continue to support DWM. The historical range of DWM extends 23 miles from above the Wake/Johnston County line to Swift Creek Road in Johnston County. The study area for this report includes the historical range, which extends from Lake Benson to the confluence with the Neuse River, and is referred to here as Lower SCW.

As detailed in the Phase 1 Dwarf Wedgemussel Viability Study completed for this project by Three Oaks Engineering/The Catena Group (Catena 2014), there are limited water quality datasets in the Lower SCW. Therefore, greater efforts were made to gather water quality information for the Lower SCW, particularly in regard to parameters that threaten the DWM, such as pH, dissolved oxygen (DO), ammonia, and copper.

1.1.Background

Under the Clean Water Act, the U.S. Environmental Protection Agency (EPA) recommends levels of ambient water quality concentrations to protect aquatic organisms living in surface waters. These levels are developed by determining the effects of pollutants on aquatic organisms. An aquatic life criterion is set at the highest concentration of a pollutant that is not expected to pose a significant threat to the majority of species in a given environment. Given the sensitivity of freshwater mussels' life cycle, means of consuming food, and inability to move long distances, there is concern that certain water quality criteria might not protect mussels from dangerous levels of some pollutants.

The North Carolina Division of Water Resources (DWR, formerly the Division of Water Quality) is responsible for managing North Carolina's surface waters. Effective January 1, 2015, North Carolina has adopted water quality standards for several dissolved metals, including copper. Though the EPA has not yet approved these standards, for the purposes of this report, they will be used as the water quality standards for copper (USEPA 2007, NC Register 2014). Similar standards for copper have been accepted by EPA for recommended water quality criteria, so the newly adopted NC rules will likely get approved. There are no state water quality

standards for ammonia, so the EPA approved water quality criteria will be used for analysis of ammonia (USEPA 2013).

Several studies have examined methods for determining toxicity levels of certain water quality parameters on freshwater mussels. A discussion of two of these methods follows. The first study (Ward et al. 2007) examines both copper and ammonia ambient concentrations and implications for toxicity. The second study (Augspurger 2012) focuses on copper, which the Ward study identifies as the most significant pollutant to freshwater mussels in the SCW.

1.2. Previous Studies

Ward et al. (2007) examined water quality by analyzing copper, ammonia, and chlorine in three river basins in NC that contain either DWM or Carolina Heelsplitter (*Lasmigona decorata*), both endangered freshwater mussels. Along with several sampling locations in the SCW, they also sampled in Fishing Creek (part of the Tar-Pamlico River basin) and Goose Creek (part of the Yadkin-Pee Dee River basin). Sampling was conducted at five sites in each drainage basin, with varying proximity to wastewater treatment facilities (often sources of contamination). Samples were collected every two months for one year, usually during base flow conditions (not during storm events). In addition to DO, temperature, pH, and total residual chlorine (measured in the field), total ammonia and total recoverable copper were analyzed. Additionally, ammonia and copper data were obtained from DWR ambient monitoring stations in each of the three drainage basins.

Ammonia toxicity is dependent on temperature and pH. The 2007 Ward et al. study used EPA's "1999 Update of ambient water quality criteria for ammonia" and mussel toxicity data to determine acute and chronic concentrations of ammonia that should not harm mussels based on site-specific pH (USEPA 1999).

Copper toxicity is influenced by pH, dissolved organic carbon, water hardness, sodium, potassium, sulfate, chloride, alkalinity, and temperature. The EPA's "1996 Water quality criteria documents for the protection of aquatic life in ambient water", which was based only on water hardness, was used to determine acute and chronic concentrations that should not harm mussels based on site-specific hardness (USEPA 1996). The "2007 EPA updated aquatic life criteria for copper" uses a biotic ligand model (BLM), which requires several more parameters than were available for the Ward study (see Section 1.3 for more details, USEPA 2007).

In measuring concentrations of the three parameters in the three river basins, Ward et al. (2007) found that Goose Creek had the most elevated ammonia concentrations. Copper was less than or equal to 10 ug/L in all but 7 of the 95 samples, all 7 of which occurred in Goose Creek on one day during a heavy storm event, indicating that the elevated levels were likely due to an increase in suspended sediment in the stream. Chlorine was detected less frequently than ammonia or

copper. The median chlorine level was below the method detection limit (MDL) (5.7 ug/L), yet several samples were above 200 ug/L. These elevated samples were in Tar River and Goose Creek and below Waste Water Treatment Plants.

While risk of exposure to all parameters was highest in Goose Creek, copper concentrations were concerns in all three drainages, including Swift Creek. Chlorine concentrations were infrequently a concern, and risks associated with periodic spikes were not well understood.

1.3. Biotic Ligand Model

Metal toxicity and biological availability is known to be dependent on water chemistry (Adams and Chapman 2007). HydroQual developed a method for determining metal toxicity using the BLM (HydroQual 2005). This model incorporates a total of 12 water quality parameters to analyze how metal toxicity changes at the biotic ligand, or the site of action on an aquatic organism. This model is thought to more accurately represent the sensitivity of freshwater mussels to metals, and it was incorporated into the EPA's revised water quality criteria in 2007 (USEPA 2007).

A study by Augspurger (2012) analyzed copper concentrations in the Goose Creek watershed in Union County, NC, the same watershed examined in the 2007 Ward study, and evaluated the potential for toxicity using the BLM. This 2012 study found that Goose Creek copper concentrations did not exceed acute or chronic concentrations as derived from the BLM. A sensitivity analysis of the BLM indicated pH and dissolved organic carbon were the most influential of the 12 water quality parameters on the outcome of the BLM analysis. These papers form the foundation of the water quality analysis performed here. The BLM was published after the Ward study, so it could not be used to analyze the data from the Ward study.

2.0 METHODS

2.1. Water Quality Data Collection

Water quality sampling in the Lower SCW was performed at three locations; Swift Creek crossings of NC 50 (Benson Road), SR 1555 (Barber Mill Road), and NC 210 (Figure 1). The sites were selected for ease of access and it is the opinion of Three Oaks that water quality conditions at these locations are indicative of the current occupied range of DWM in Swift Creek. These sampling sites are believed to represent the range of conditions in the watershed in terms of habitat conditions and flow conditions. At the upper most site (NC 50), Swift Creek is largely influenced by development. As the stream flows southeast, it moves further from urban areas and becomes more stable. Samples were collected from November 2014 through July 2015. Water quality parameters that were measured are listed in Table 1.

Table 1. Water quality parameters measured in Lower SCW.

Field Parameters	Laboratory Parameters
Dissolved Oxygen	Calcium (Ca)*
Temperature*	Magnesium (Mg)*
Conductivity	Sodium (Na)*
pH*	Potassium (K)*
	Sulfate as SO_4*
	Chloride (Cl)*
	Total Alkalinity (as $CaCO_3$)*
	Dissolved Organic Carbon (DOC)*
	Copper (Total and dissolved*)
	Lead
	Nickel
	Zinc
	Cadmium

* indicates parameters used in the BLM to predict copper toxicity to freshwater mussels

Water samples were collected a total of eight times from each site over the course of the sampling period: once during each season, twice during a high-flow event (when flow at USGS gauge 0208773375 was >50% above the median daily statistic), and twice during a low-flow event (when flow at the same gauge was <50% below the median daily statistic) (Table 2). While extreme flow conditions were not observed, a range of flows are represented by the days on which sampling occurred.

Table 2. Dates of sampling events and approximate flows during each event

Date Sampled	Sites Sampled	Flow (in cfs)	Median Daily Discharge*	Flow Category**
Nov 4, 2014	NC 210, NC 50	30	33	Base
Nov 19, 2014	NC 210, SR 1555, NC 50	50	27	Base/High
Dec 16, 2014	SR 1555	38	34	Base
Feb 6, 2015	NC 210, SR 1555, NC 50	100	110	Base
April 7, 2015	NC 210, SR 1555, NC 50	47	79	Base/Low
May 7, 2015	NC 210, SR 1555, NC 50	39	112	Low
June 9, 2015	NC 210, SR 1555, NC 50	11	50	Low
July 1, 2015	NC 210, SR 1555, NC 50	53	11	High
July 10, 2015	NC 210, SR 1555, NC 50	127	15	High

*Median Daily Discharge is based on 6 years of data

**Flow at time of sampling varied slightly, so several samples were on the line between base flow and low flow or base flow and high flow. These values are approximate.

Field parameters were measured at the time of sampling by use of a multi-parameter meter (YSI Professional Plus, Yellow Spring, OH, USA). For all parameters, grab samples were collected from visibly flowing portions of the stream (not in stagnant pools), approximately one meter away from the bank toward mid-channel. All samples were stored on ice (at ~4°C) in the field and taken the same day to ENCO Laboratory (Cary, NC) for analysis.

Grab samples for ammonia were collected in chemically cleaned 250mL polyethylene bottles and acidified with concentrated sulfuric acid (H_2SO_4) to pH <2. Ammonia as nitrogen was measured by the semi-automated colorimetry method following protocols described in EPA

method 350.1 (USEPA 1993a). Quality control for ammonia measurements included analyses of reagent blanks, matrix spike, and duplicate matrix spike. The MDL was 0.045 mg/L.

Grab samples for copper were collected unfiltered in chemically cleaned 250 mL polyethylene bottles and acidified with nitric acid (HNO_3). Total copper and dissolved copper were measured by the inductively coupled plasma-atomic emission spectrometry method following protocols described in EPA method 6010C (USEPA 2000). Quality control for copper measurements included analyses of reagent blanks, a laboratory control sample, matrix spike, duplicate matrix spike, and post spike. The MDL was 1.60 ug/L.

Grab samples for dissolved organic carbon (DOC) were collected in chemically cleaned 250ml polyethylene bottles. Dissolved organic carbon was measured by the high-temperature combustion method described in Standard Method 5310 B (SM 5310B-2000). Quality control for DOC measurements included analyses of reagent blanks, a laboratory control sample, matrix spike, and duplicate matrix spike. The MDL was 0.32 mg/L.

Grab samples for cadmium, calcium, lead, magnesium, nickel, potassium, sodium, and zinc were collected in chemically cleaned bottles. These ions were measured by the inductively couple plasma-atomic emission spectrometry method following protocols described in EPA method 6010C (USEPA 2000). Quality control for these measurements included analyses of reagent blanks, a laboratory control sample, matrix spike, duplicate matrix spike and post spike. The MDL for cadmium was 0.36 ug/L. The MDL for calcium was 39.0 ug/L. The MDL for lead was 2.10 ug/L. The MDL for magnesium was 23.0 ug/L. The MDL for nickel was 1.80 ug/L. The MDL for potassium was 150 ug/L. The MDL for sodium was 400 ug/L. The MDL for zinc was 3.80 ug/L.

Grab samples for chloride and sulfate were collected in chemically cleaned bottles. These ions were measured by the ion chromatography method described in EPA method 300 (EPA 1993b). Quality control for the ion measurements included analyses of reagent blanks, a laboratory control sample, matrix spike, and duplicate matrix spike. The MDL for chloride was 2.2 mg/L. The MDL for sulfate was 2.9 mg/L.

2.2. Toxicity Analysis

The toxicity of ammonia and copper were analyzed using the most up to date methods. The first method simply compares the measured concentration of each parameter to the NC water quality standard (for copper, based on the EPA criteria for that parameter, "Aquatic Life Ambient Freshwater Quality Criteria – Copper, 2007 Revision") and the EPA criteria for ammonia ("Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater, 2013"). Additionally, the BLM method was used to evaluate the potential for copper toxicity.

Water samples collected for this study were evaluated using BLM in Water Quality Criteria Calculation mode. Using the model in this mode analyzes the parameters in Table 2 (with an asterisk) to adjust the EPA acute and chronic water quality criteria for protection of aquatic species to local water quality conditions. The criteria that the BLM predicts are then compared to dissolved copper concentrations. If dissolved copper was not detected in a sample, the total copper concentration was multiplied by a conversion factor of 0.96. If neither dissolved nor total copper was detected, then the model was not run.

3.0 RESULTS AND DISCUSSION

All water sample analyses were completed with quality control / quality assurance samples (blanks, spikes, duplicates). Review of quality assurance data indicates acceptable precision and accuracy for most analyses. The laboratory blank sample for copper analysis contained low levels of copper (2.56 ug/L and 3.11 ug/L for total and dissolved copper, respectively) on one of the sampling dates (April 7, 2015). The three samples from that day were reported with some of the highest concentrations of copper from the study (between 4.13 ug/L and 5.91 ug/L). The spiked and duplicate samples were reported with acceptable recovery. It is possible that some of the copper in these samples is a result of laboratory contamination, or that the laboratory blank was contaminated but the samples were accurate. It is impossible to know for sure. For data analysis purposes, we are assuming that all the copper in the April 7th samples is from Swift Creek. Another way to interpret these results is to assume an extra 2.56-3.11 ug/L of copper were in the samples and subtract that amount out of the final result. The significance of these results will be discussed further in Section 3.3.

The laboratory blank sample for zinc and nickel analysis contained low levels of zinc and nickel from samples taken on November 4, 2014. Samples did not contain high levels of zinc or nickel, so we assumed that those samples were not compromised. There was poor matrix spike and matrix spike duplicate recoveries for DOC, chloride, sulfate, magnesium, sodium, alkalinity, and ammonia on several occasions, but in each instance, the batch was accepted for these analytes based on the laboratory control spike recoveries. Laboratory reports provided by ENCO for sample analysis are in Appendix B.

3.1. Environmental Exposure Concentrations

Copper concentrations gathered for this report are summarized in Table 6 (along with BLM-derived criteria concentrations, which are discussed in Section 3.3). Total copper was detected in half of the samples, while dissolved copper was detected in about a third (MDL for both analyses is 1.60 ug/L). Four of these samples exceeded the chronic event-specific North Carolina water quality standard for copper (derived from hardness levels measured at each sampling event). Additionally, three of these samples exceeded the acute event-specific water quality standard for copper. The elevated concentrations of copper appear to occur during lower

flow rates, which is typically contrary to what would be expected; that copper levels spike during significant rain events when sediment loads into streams increases.

Ammonia concentrations gathered for this study are summarized in Table 3. Ammonia was detected in 11 of 24 samples collected (MDL is 0.045 mg/L). None of these samples exceeded the event-specific chronic or the acute criteria (USEPA 2013).

Table 3. Ammonia concentrations in Swift Creek during 2014-2015 sampling events and corresponding CMC and CCC values in mg/L (USEPA 2013).

Location	Flow	Sampling Date	Ammonia as N	pH (SU)	Temp (°C)	CMC	CCC
NC 50	Base	11/4/14	0.063	6.51	14.8	32.5	2.97
NC 50	Base/High	11/19/14	0.25	7.22	9.1	19.3	3.44
NC 50	Base	2/6/15	<0.045	7.15	6.6	20.8	4.20
NC 50	Base/Low	4/7/15	<0.045	7.32	18.4	13.6	1.77
NC 50	Low	5/7/15	0.051	6.86	22.5	15.2	1.68
NC 50	Low	6/9/15	0.072	7.01	25.7	10.4	1.30
NC 50	High	7/1/15	<0.045	7.42	29.7	4.64	0.80
NC 50	High	7/10/15	0.069	7.17	29.8	6.29	0.93
SR 1555	Base/High	11/19/14	0.35	7.23	5.9	19.1	4.20
SR 1555	Base	12/16/14	<0.045	-	-	-	-
SR 1555	Base	2/6/15	<0.045	7.28	5.2	17.9	4.26
SR 1555	Base/Low	4/7/15	<0.045	7.23	17.7	16.0	1.96
SR 1555	Low	5/7/15	0.078	6.81	21	17.8	1.88
SR 1555	Low	6/9/15	<0.045	7.05	24	11.5	1.43
SR 1555	High	7/1/15	0.073	7.14	26.2	8.76	1.19
SR 1555	High	7/10/15	0.06	7.02	27.7	8.70	1.14
NC 210	Base	11/4/14	<0.045	6.56	10	31.8	4.02
NC 210	Base/High	11/19/14	0.58	8.16	5.7	4.13	1.53
NC 210	Base	2/6/15	<0.045	7.56	5.2	12.1	3.43
NC 210	Base/Low	4/7/15	<0.045	7.38	17.6	13.3	1.79
NC 210	Low	5/7/15	0.06	7.12	20	15.0	1.79
NC 210	Low	6/9/15	<0.045	7.47	23.6	7.16	1.13
NC 210	High	7/1/15	<0.045	6.98	25.5	10.8	1.33
NC 210	High	7/10/15	<0.045	7.5	26.1	5.57	0.94

No sample exceeds the event-specific acute or chronic criteria according to USEPA 2013 recommended criteria.

Other metals and compounds were analyzed for this study, statistical information for which is provided in Table 4 along with corresponding North Carolina water quality standards (NCDWR 2003, NC Register 2014). As illustrated in Table 4, none of the provided parameters exceeded North Carolina water quality standards.

Table 4. Statistical information for other metals and compounds analyzed for this study, as compared to water quality standards (NCDWR 2003).

Parameter	Median concentration	Maximum concentration	NCDWR Water Quality Standard
Cadmium (ug/L)	0.36	0.36	2
Chloride (mg/L)	7.25	11	230
Lead (ug/L)	<2.10*	<2.10*	25
Nickel (ug/L)	2.02	2.02	88
Sulfate (mg/L)	3.85	4.9	250
Zinc (ug/L)	6.14	16.7	50

*indicates MDL

3.2. Ward et al. Ammonia Update

Ammonia concentrations documented in the 2007 Ward et al. study have been updated with the EPA 2013 water quality criteria, using both pH and temperature measurements. Table 5 provides the event-specific CMC and CCC for ammonia expected to be protective for freshwater mussels (USEPA 2013). None of these samples exceeded the event-specific chronic or the acute criteria (USEPA 2013).

Table 5. Ammonia concentrations measured in Ward et al. from 2002-2003 compared to CMC and CCC (USEPA 2013).

Sample Site	Date	Ammonia as N	pH (SU)	Temp (°C)	CMC	CCC
SC1	07/11/02	0.10	7.1	28.5	7.54	1.05
SC1	09/30/02	0.14	6.3	23.0	18.82	1.79
SC1	01/09/03	0.32	6.4	7.5	33.74	4.82
SC1	03/19/03	0.06	7.1	5.0	21.94	4.76
SC1	05/12/03	0.30	7.3	25.2	7.91	1.16
SC1	07/16/03	0.07	6.9	27.2	10.01	1.23
SC2	07/11/02	0.11	7.0	24.5	11.54	1.41
SC2	09/30/02	0.09	6.6	21.8	18.74	1.87
SC2	01/09/03	0.45	7.0	7.5	24.10	4.22
SC2	03/19/03	0.02	7.1	4.7	21.94	4.85
SC2	05/12/03	0.18	7.0	23.0	13.07	1.56
SC2	07/16/03	0.10	6.9	25.9	11.15	1.34
SC3	07/11/02	0.06	7.2	26.0	8.34	1.17
SC3	09/30/02	0.14	7.1	22.0	12.93	1.59
SC3	01/09/03	0.04	6.7	8.8	29.76	4.24
SC3	03/19/03	0.02	7.0	5.0	24.10	4.96
SC3	05/12/03	0.14	7.0	23.2	12.86	1.54
SC3	07/16/03	0.07	6.9	26.0	11.06	1.33
SC4	07/11/02	0.04	7.1	25.4	9.75	1.28
SC4	09/30/02	0.10	7.4	23.0	8.32	1.25
SC4	01/09/03	0.03	7.3	8.2	17.51	3.47
SC4	03/19/03	0.02	7.1	6.5	21.94	4.32
SC4	05/12/03	0.10	7.1	23.5	11.42	1.44
SC4	07/16/03	0.04	7.1	25.0	10.08	1.31
WO1	07/11/02	0.04	7.1	24.5	10.51	1.35
WO1	09/30/02	0.03	6.8	21.0	17.95	1.88
WO1	01/09/03	0.02	6.7	7.2	29.76	4.70
WO1	03/19/03	0.02	6.8	5.2	28.05	5.22
WO1	05/12/03	0.10	6.8	22.0	16.52	1.77
WO1	07/16/03	0.02	6.6	24.0	15.61	1.62
WO2	07/11/02	0.05	7.0	23.0	13.07	1.56

No sample exceeds the event-specific acute or chronic criteria according to USEPA 2013 recommendations.

3.3.BLM Analysis

Table 6 provides the copper concentrations for each sampling event and compares them to the state water quality standards, and also provides the BLM-derived event specific criteria for comparison. Only one sample result exceeded either the CMC or CCC, the NC 50 crossing of Swift Creek on November 19, 2014. The CMC and CCC values vary between sampling events, indicating changing conditions in the watershed over time (and throughout seasons), and between sampling sites.

Table 6. Comparison of Swift Creek total and dissolved copper concentrations to water quality criteria and BLM-derived CMC and CCC (in ug/L)

Location	Flow	Sampling Date	Total Copper	Dissolved Copper	NCDWR Acute std	NCDWR Chronic std	CMC	CCC
NC 50	Base	11/4/14	1.98	<1.60	3.10	2.36	4.79	2.98
	Base/High	11/19/14	<1.60	1.96**	3.35	2.54	1.96	1.22
	Base	2/6/15	2.46	2.24*	2.91	2.23	12.02	7.47
	Base/Low	4/7/15	5.91	4.92*	3.90	2.92	18.94	11.77
	Low	5/7/15	2.03	1.75	3.49	2.64	9.35	5.81
	Low	6/9/15	5.53	2.79	4.36	3.23	11.72	7.28
	High	7/1/15	<1.60	<1.60	4.12	3.06	21.89	13.59
	High	7/10/15	<1.60	<1.60	4.06	3.03	15.22	9.45
SR 1555	Base/High	11/19/14	<1.60	<1.60	3.56	2.68	1.21	0.75
	Base	12/16/14	<1.60	<1.60	3.39	2.57	12.32	7.66
	Base	2/6/15	2.75	<1.60	3.00	2.30	12.18	7.56
	Base/Low	4/7/15	4.13	4.17*	3.71	2.79	13.01	8.08
	Low	5/7/15	<1.60	<1.60	3.23	2.46	7.04	4.37
	Low	6/9/15	1.69	<1.60	3.79	2.84	8.85	5.50
	High	7/1/15	<1.60	<1.60	3.90	2.92	12.82	7.96
	High	7/10/15	<1.60	<1.60	3.48	2.63	10.59	6.58
NC 210	Base	11/4/14	<1.60	<1.60	3.82	2.86	4.20	2.61
	Base/High	11/19/14	<1.60	<1.60	3.82	2.86	3.14	1.96
	Base	2/6/15	<1.60	<1.60	3.03	2.32	17.75	11.03
	Base/Low	4/7/15	4.65	4.13*	4.05	3.02	17.11	10.63
	Low	5/7/15	2.01	<1.60	3.48	2.63	12.37	7.68
	Low	6/9/15	1.74	1.66	4.02	3.00	16.52	10.26
	High	7/1/15	<1.60	<1.60	3.97	2.96	10.84	6.74
	High	7/10/15	1.61	<1.60	3.34	2.53	21.53	13.37

* Dissolved copper concentrations exceed either the event-specific acute or chronic North Carolina Water Quality Standard

** Sample exceeds the BLM-derived event-specific CMC/CCC for copper.

As mentioned at the beginning of Section 3.0, the method blank associated with the copper samples taken April 7, 2015 contained low levels of copper. We have assumed that this blank was contaminated in the lab, and that the samples were not compromised. This assumption leads to state water quality standards for copper for acute and chronic levels being exceeded by all three of the April 7th samples, and yet these samples do not exceed the BLM-derived CMC or CCC. If, however, we were to think the samples were somehow contaminated and results reflected artificially high copper levels, we could subtract out the blank level of dissolved copper (3.11 ug/L). This would reduce the sample results significantly (1.81, 1.06, and 1.03 ug/L for NC 50, SR 1555, and NC 210, respectively) and put the results below the state water quality standards. However, there were other samples containing elevated levels of copper, and the other eight of the total of nine batches of samples had clean blanks. Therefore, we believe these results are accurate and yet show copper to be at safe levels according to the BLM results.

Table 7 provides statistics for the water quality parameters.

Table 7. Statistics for water quality parameters collected in Swift Creek (n=24 for all parameters)

Parameter	Median	Maximum	Minimum	10^{th} percentile	90^{th} percentile
Temperature (°C)	20	29.8	5.2	5.74	27.4
pH	7.17	8.16	6.51	6.82	7.49
DOC (mg/L)	5.1	6.2	0.44	1.81	5.97
Ca (mg/L)	6.38	8.18	5.01	5.26	7.27
Mg (mg/L)	2.22	2.66	1.74	1.85	2.48
Na (mg/L)	7.46	8.62	4.29	4.95	8.39
K (mg/L)	2.5	3.77	2.08	2.17	3.20
SO_4 (mg/L)	3.85	4.9	3.2	3.7	4.47
Cl (mg/L)	7.25	11	4.9	5.23	9.58
$CaCO_3$ (mg/L)	25.5	35	19	20.3	30.7

A sensitivity analysis was performed, in which the median of each parameter was used in the BLM. Then each parameter was individually changed to the maximum and minimum values observed to see how each parameter altered the outcome (CMC and CCC values). The results of this analysis (Table 8) indicate that, as reported by Augspurger (2012), pH and dissolved organic carbon have the most influence on the results of the model.

Table 8. Results of sensitivity analysis of Swift Creek water quality data in the BLM analysis of water quality criteria for copper. Dissolved organic carbon and pH (shaded) are the parameters with the most influence on the model output.

	CMC (ug/L)	**CCC (ug/L)**	**% Deviation from Median CCC**
All medians	**12.7823**	**7.9393**	
max T	13.1127	8.1445	2.6
min T	12.5694	7.8071	-1.7
max pH	42.5758	26.4446	233.1
min pH	4.0797	2.5339	-68.1
max DOC	15.6736	9.7352	22.6
min DOC	1.0844	0.6735	-91.5
max Ca	12.6425	7.8525	-1.1
min Ca	12.938	8.036	1.2
max Mg	12.7727	7.9334	-0.1
min Mg	12.795	7.9472	0.1
max Na	12.957	8.0478	1.4
min Na	12.2739	7.6235	-4.0
max K	12.7569	7.9235	-0.2
min K	12.7823	7.9393	0.0
max SO4	12.7569	7.9235	-0.2
min SO4	12.7918	7.9452	0.1
max Cl	12.7124	7.8959	-0.5
min Cl	12.8172	7.961	0.3
max Alk	12.6806	7.8762	-0.8
min Alk	12.8458	7.9788	0.5

3.4. USGS and City of Raleigh Water Quality Monitoring

There are limited datasets available with which to compare the information generated in this study. The data that are available include City of Raleigh and USGS datasets that cover some of

these parameters to varying degrees. The most common parameters that are monitored regularly include temperature, pH, and ammonia. The City of Raleigh has been monitoring water quality conditions below Lake Benson since 2009, corresponding to the opening of the Dempsey E. Benton Water Treatment Plant. A USGS gauge located below Lake Benson monitored water quality from 1989 to 1995 and then again from 2005 to 2011 (Figure 1). Analysis of ammonia and copper was performed using the available data from these organizations (Appendix C).

The City of Raleigh monitoring program includes collections measuring temperature, pH, DO, conductivity, fecal coliform, turbidity, ammonia, total nitrogen, and total phosphorous. The City monitors these parameters at a number of locations, in coordination with other local non-profits, including five stations in the Lower SCW. Though this information is broken down by site, it is apparent that measurements are fairly consistent throughout the watershed. During monthly sampling beginning August 2009 and continuing through the present, no sample exceeded the event-specific acute or chronic criteria according to USEPA 2013 recommendations at stations J4500000, J4510000, J4511000, and J4520000 for ammonia. Sampling for station J4580000 took place between May 2012 and present, with no sample exceeding the event-specific acute or chronic criteria according to USEPA 2013 recommendations.

The USGS station (02087701) collected water quality data, including temperature, pH, DO, ammonia, hardness, and copper, among other parameters. Ammonia was measured approximately four times per year between April and November. During this period, two samples exceeded the event-specific chronic criteria, according to USEPA 2013 recommendations (on August 30, 2006 and August 20, 2009). The recommended acute criteria was not exceeded at this station during the sampling period. This gauge also collected some hardness and copper data. Copper was measured above the NCDWR recommended event-specific chronic standard thirteen times during the sampling period, and was measured above the event-specific acute standard seven times during the sampling period (Appendix C). When the BLM is used to derive acute and chronic water quality standards, however, there is only one day on which the chronic standard is exceeded (April 15, 2010, Table 9). Interestingly, station 02087701 is directly downstream of the Lake Benson dam and the Dempsey E. Benton WTP (Figure 1), though the WTP was constructed in 2010, so it does not explain all of the elevated copper levels in Swift Creek during this sampling period.

Table 9. USGS Gauge 02087701 BLM results

Sample Date	Cu (ug/L)	CMC	CCC
10/18/1989	0.96	5.6969	3.5384
6/20/1990	2.88	23.4103	14.5406
8/14/1990	2.88	82.864	51.4683
9/5/1990	5.76	37.8734	23.5239
9/5/1990	2.88	33.2663	20.6623
10/24/1990	1.92	9.157	5.6876
4/25/1991	2.88	7.1966	4.4699
6/11/1991	1.92	134.4316	83.4979
7/23/1991	1.92	26.7688	16.6266
8/6/1991	3.84	20.0361	12.4448
9/17/1991	2.88	14.606	9.0721
4/16/1992	4.8	22.8607	14.1992
6/2/1992	0.96	15.1239	9.3938
8/13/1992	1.92	15.2669	9.4826
10/15/1992	0.96	30.4576	18.9178
4/26/1993	1.92	49.5023	30.7468
6/25/1993	1.92	8.0672	5.0107
8/4/1993	0.96	15.788	9.8062
10/14/1993	0.96	12.9189	8.0242
11/15/1993	0.96	15.7785	9.8003
4/22/1994	1.92	13.6179	8.4583
6/21/1994	1.92	19.6611	12.2119
8/2/1994	1.92	10.1102	6.2796
12/6/1994	3.84	12.5599	7.8012
5/1/1995	1.92	19.1845	11.9159
6/16/1995	1.92	8.9187	5.5396
10/19/2005	0.768	18.8636	11.7165
4/20/2006	1.248	7.7272	4.7995
10/15/2009	2.592	9.2269	5.731
4/15/2010	8.352*	10.2277	6.3526
10/14/2010	1.728	15.5847	9.6799
4/25/2011	1.344	11.0157	6.842

* Denotes copper exceeding BLM-derived chronic standard.

4.0 CONCLUSION

Both ammonia and copper have been detected in Swift Creek during the sampling period from November 2014 to July 2015. These parameters have been identified as the most significant toxicants to freshwater mussels (USEPA 2008), and the detection of them is cause for concern if detected at concentrations in excess of those thought to be safe for mussels. Whether or not the

levels of ammonia and copper are high enough to be detrimental to mussels is still in question. To fully answer the question of whether water quality conditions in Swift Creek are harmful to DWM, long-term toxicity analysis on DWM analyzing growth, survival, and reproduction is needed. In the absence of that data, similar analysis on other species of the same genus and/or associate species could be done instead. Such analysis is outside the scope of this report.

Considering that mussels still exist in Swift Creek suggests that they are not severely impacted by water quality conditions. Population trend analysis, however, suggests that the overall mussel fauna has been in a slow decline since the early 1990's when periodic monitoring began. This decline coincides with land use changes during this period in the SCW, most notably with increases in residential and commercial development (Catena 2014).

Copper concentrations in Swift Creek appear to be mostly dependent on organic carbon and pH. Since the potential for toxicity can be determined by measuring only a few additional water quality parameters, monitoring could continue at less cost into the future to examine how mussel populations respond to changing water quality conditions. Studying the watershed for less than a year cannot provide a full assessment of the relationship between water quality and mussel populations. Long-term monitoring is needed to get a clearer picture of this relationship.

Ammonia concentrations do not appear to be of concern in Swift Creek, with some elevated concentrations limited to directly below Lake Benson. The long-term monitoring of Swift Creek by the USGS has demonstrated that event-specific criteria for ammonia are rarely exceeded. Monitoring efforts, however, could be improved to fill in gaps and better understand how to best reduce ammonia contamination.

Other pollutants that were measured, including some heavy metals, did not appear to be at toxic levels to aquatic organisms. As has been discussed, metal toxicity is more complex than just a simple measurement of water conditions at a single sampling. Future analysis may be possible, particularly with the use of the BLM, to determine toxicity to freshwater mussels and other aquatic organisms.

5.0 RESOURCES

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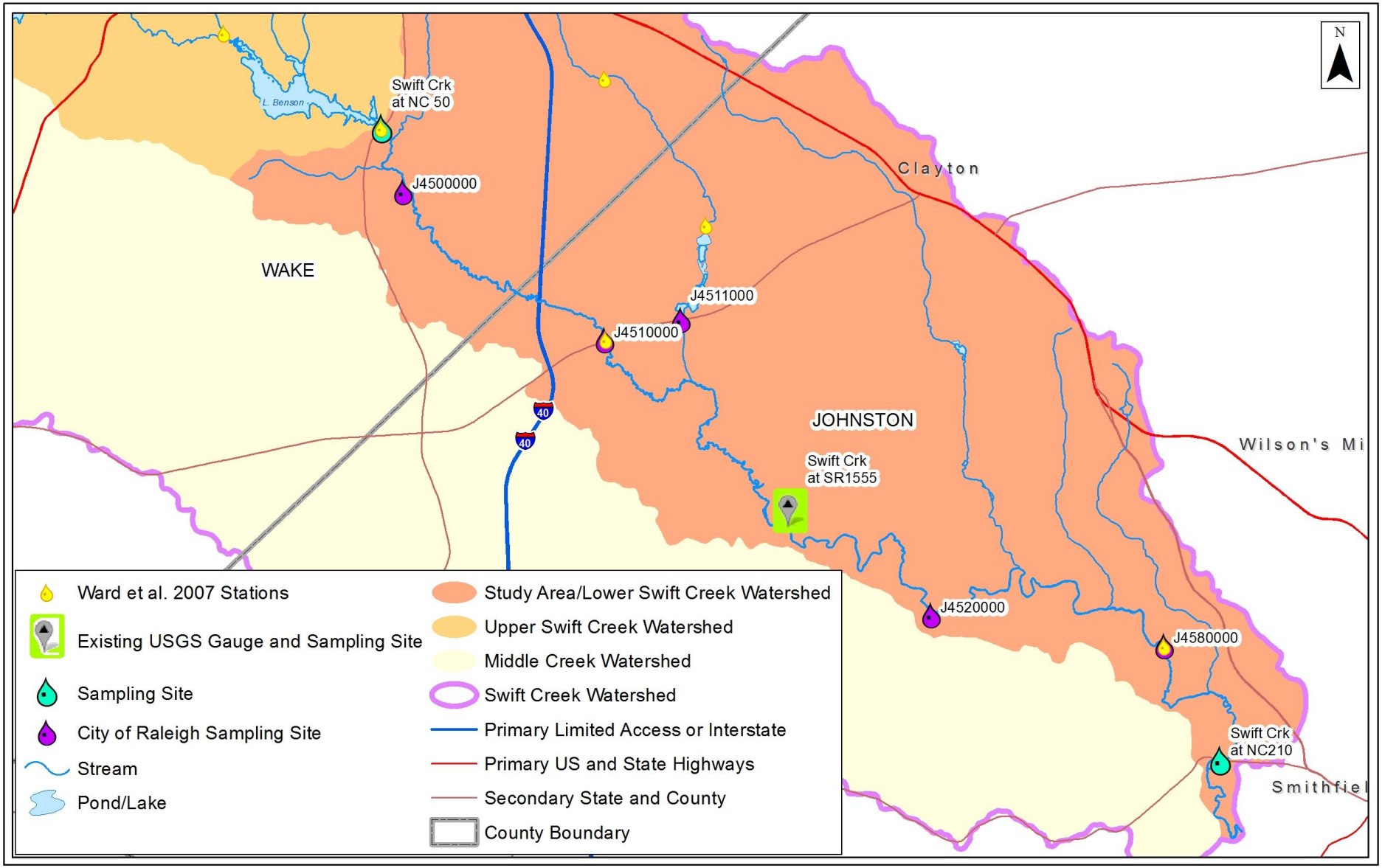

THREE OAKS ENGINEERING · THREE OAKS ENGINEERING · THREE OAKS ENGINEERING

The Catena Group

Client:

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

Dwarf Wedgemussel Viability Study: Phase 2

Water Quality Monitoring Stations
Lower Swift Creek Watershed

Wake & Johnston Counties, North Carolina

Date: August 2015

Scale: 0 0.5 1 Miles

Job No.: 1175

Figure 1

Appendix A – 2014-2015 Water Quality Laboratory Results

NC 50 (Benson Road) below Lake Benson in Garner								
Flow:	Baseflow (30 cfs)	High (50 cfs)	Baseflow (100 cfs)	Baseflow (47 cfs)	Low Flow (39 cfs)	Low Flow (11cfs)	High Flow (53 cfs)	High Flow (127 cfs)
Date of Sampling	11/4/2014	11/19/2014	2/6/2015	4/7/2015	5/7/2015	6/9/2015	7/1/2015	7/10/2015
Analyte	Result	Result	Result	Result	Result	Result	Result	Result
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (mg/L)	5.54	6.01	5.01	7	6.31	8.18	7.47	7.37
Copper (total, ug/L)	1.98	ND	2.46	5.91	2.03	5.53	ND	ND
Lead (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (mg/L)	1.74	1.91	1.74	2.29	1.97	2.4	2.4	2.37
Nickel (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Potassium (mg/L)	3.25	3.25	2.42	2.57	2.5	2.99	2.72	2.48
Sodium (mg/L)	4.35	4.76	4.29	8.62	7.01	8.24	7.8	7.76
Zinc (ug/L)	6.33	6.14	ND	ND	ND	16.7	4.09	ND
Ammonia (mg/L)	0.063	0.25	ND	ND	0.051	0.072	ND	0.069
Chloride (mg/L)	5	7.2	4.9	11	8.8	9.9	9.7	9.3
Sulfate (mg/L)	3.8	3.7	4.5	4.9	4.2	4.1	4.1	4
Total Alkalinity (mg/L)	26	26	20	29	19	30	27	23
Total Organic Carbon (mg/L)	6.2	0.79	5.1	6.1	6	5.9	5.9	5.9
Dissolved Copper (ug/L)	ND	1.96	2.24	4.92	1.75	2.79	ND	ND
Temperature (°C)	14.8	9.1	6.6	18.4	22.5	25.7	29.7	29.8
DO (%)	102.2	96.3	110	106.4	66	52.1	89.2	68.8
DO (mg/L)	10.2	11.29	13.25	9.9	5.72	4.16	6.82	5.25
Conductivity (us/cm)	71.5	73.7	65.1	93.2	90.9	103.8	9.99	96.8
pH	6.51	7.22	7.15	7.32	6.86	7.01	7.42	7.17

SR 1555 (Barber Mill Rd) in Clayton								
Flow:	High (50 cfs)	Baseflow (38 cfs)	Baseflow (100 cfs)	Baseflow (47 cfs)	Low flow (39 cfs)	Low Flow (11cfs)	High Flow (53 cfs)	High Flow (127 cfs)
Date of Sampling	11/19/2014	12/16/2014	2/6/2015	4/7/2015	5/7/2015	6/9/2015	7/1/2015	7/10/2015
Analyte	Result	Result	Result	Result	Result	Result	Result	Result
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (mg/L)	6.16	5.94	5.17	6.55	5.46	6.87	6.89	6.02
Copper (total, ug/L)	ND	ND	2.75	4.13	ND	1.69	ND	ND
Lead (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (mg/L)	2.2	2.03	1.82	2.23	2.03	2.18	2.35	2.13
Nickel (ug/L)	ND	ND	ND	ND	ND	2.02	ND	ND
Potassium (mg/L)	3.77	2.88	2.19	2.33	2.16	2.08	2.55	2.4
Sodium (mg/L)	7.79	6.91	5.5	8.04	7.5	8.52	7.55	7.34
Zinc (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Ammonia (mg/L)	0.35	ND	ND	ND	0.078	ND	0.073	0.06
Chloride (mg/L)	5.2	6.1	5.3	8.3	7.3	7.2	8.5	8
Sulfate (mg/L)	3.7	4	4.4	4	3.8	3.2	3.8	3.8
Total Alkalinity (mg/L)	26	20	22	30	21	32	29	22
Total Organic Carbon (mg/L)	0.46	4.2	4.3	4.8	4.9	4.2	5.3	5.2
Dissolved Copper (ug/L)	ND	ND	ND	4.17	ND	ND	ND	ND
Temperature (°C)	5.9		5.2	17.7	21	24	26.2	27.7
DO (%)	95.7		106.7	96.8	89.6	92.6	84.4	73.2
DO (mg/L)	11.87		13.35	9.2	8	7.8	6.74	5.77
Conductivity (us/cm)	92.1		70.2	78.4	84.9	90.5	96.1	84.5
pH	7.23		7.28	7.23	6.81	7.05	7.14	7.02

NC 210 upstream of Neuse River in Smithfield								
Flow:	Baseflow (30 cfs)	High (50 cfs)	Baseflow (100 cfs)	Baseflow (47 cfs)	Low Flow (39 cfs)	Low Flow (11cfs)	High Flow (53 cfs)	High Flow (127 cfs)
Date of Sampling	11/4/2014	11/19/2014	2/6/2015	4/7/2015	5/7/2015	6/9/2015	7/1/2015	7/10/2015
Analyte	Result	Result	Result	Result	Result	Result	Result	Result
Cadmium (mg/L)	ND	ND	ND	ND	ND	0.36	ND	ND
Calcium (mg/L)	6.44	6.46	5.05	6.85	5.79	7.03	7	5.59
Copper (total, ug/L)	ND	ND	ND	4.65	2.01	1.74	ND	1.61
Lead (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (mg/L)	2.48	2.47	1.95	2.66	2.27	2.49	2.42	2.15
Nickel (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND
Potassium (mg/L)	2.86	3.08	2.11	2.46	2.36	2.31	2.65	2.5
Sodium (mg/L)	6.95	7.42	5.39	8.46	7.07	8.03	7.64	6.62
Zinc (ug/L)	3.8	ND	ND	ND	ND	ND	ND	ND
Ammonia (mg/L)	ND	0.58	ND	ND	0.06	ND	ND	ND
Chloride (mg/L)	6.7	7.2	6	8.5	7.1	7.5	8.5	7
Sulfate (mg/L)	3.7	3.7	4.6	4.2	3.8	3.3	3.9	3.7
Total Alkalinity (mg/L)	31	35	22	26	25	23	23	22
Total Organic Carbon (mg/L)	4.8	0.44	4.4	5.1	5.3	4.3	5.7	5.3
Dissolved Copper (ug/L)	ND	ND	ND	4.13	ND	1.66	ND	ND
Temperature (°C)	10	5.7	5.2	17.6	20	23.6	25.5	26.1
DO (%)	99.4	102.6	104.1	93.35	84.9	73.5	85.7	75.2
DO (mg/L)	11.18	12.8	13.08	8.72	7.6	6.16	6.9	6.16
Conductivity (us/cm)	92.1	94.8	72.8	86.6	87.5	96.2	94.9	80
pH	6.56	8.16	7.56	7.38	7.12	7.47	6.98	7.5

Appendix B – ENCO Laboratory Reports

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Thursday, November 20, 2014
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C414241

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, November 4, 2014.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

www.encolabs.com

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: Swift Creek 210 **Lab ID: C414241-01** **Sampled: 11/04/14 14:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	12/02/14	11/06/14 07:22	11/06/14 14:51
EPA 350.1	12/02/14	11/07/14 08:56	11/07/14 13:24
EPA 6010C	05/03/15	11/11/14 14:04	11/13/14 10:33
SM 5310B-2000	12/02/14	11/12/14 08:06	11/12/14 15:00

Client ID: Swift Creek 210 **Lab ID: C414241-01RE1** **Sampled: 11/04/14 14:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 310.2	11/18/14	11/05/14 09:04	11/05/14 13:23

Client ID: Swift Creek 50 **Lab ID: C414241-02** **Sampled: 11/04/14 13:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	12/02/14	11/06/14 07:22	11/06/14 15:59
EPA 350.1	12/02/14	11/07/14 08:56	11/07/14 13:26
EPA 6010C	05/03/15	11/11/14 14:04	11/13/14 10:35
SM 5310B-2000	12/02/14	11/12/14 08:06	11/12/14 15:00

Client ID: Swift Creek 50 **Lab ID: C414241-02RE1** **Sampled: 11/04/14 13:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 310.2	11/18/14	11/05/14 09:04	11/05/14 13:24

Client ID: Swift Creek 210 Dissolved **Lab ID: C414241-03** **Sampled: 11/04/14 14:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	05/03/15	11/11/14 14:04	11/13/14 10:38

Client ID: Swift Creek 50 Dissolved **Lab ID: C414241-04** **Sampled: 11/04/14 13:05** **Received: 11/04/14 14:48**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	05/03/15	11/11/14 14:04	11/13/14 10:40

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SAMPLE DETECTION SUMMARY

Client ID: Swift Creek 210 **Lab ID:** C414241-01

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	6440		39.0	100	ug/L	EPA 6010C	R-05
Chloride	6.7		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2480		23.0	100	ug/L	EPA 6010C	R-05
Potassium - Total	2860		150	500	ug/L	EPA 6010C	R-05
Sodium - Total	6950		400	500	ug/L	EPA 6010C	R-05
Sulfate as SO4	3.7	J	2.9	5.0	mg/L	EPA 300.0	
Total Organic Carbon - Dissolved	4.8		0.32	1.0	mg/L	SM 5310B-2000	
Zinc - Total	3.80	JB	3.80	10.0	ug/L	EPA 6010C	J-01, R-05

Client ID: Swift Creek 210 **Lab ID:** C414241-01RE1

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Total Alkalinity as CaCO3	31		14	15	mg/L	EPA 310.2	

Client ID: Swift Creek 50 **Lab ID:** C414241-02

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.063	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	5540		39.0	100	ug/L	EPA 6010C	
Chloride	5.0		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	1.98	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	1740		23.0	100	ug/L	EPA 6010C	
Potassium - Total	3250		150	500	ug/L	EPA 6010C	
Sodium - Total	4350		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.8	J	2.9	5.0	mg/L	EPA 300.0	
Total Organic Carbon - Dissolved	6.2		0.32	1.0	mg/L	SM 5310B-2000	
Zinc - Total	6.33	JB	3.80	10.0	ug/L	EPA 6010C	J-01

Client ID: Swift Creek 50 **Lab ID:** C414241-02RE1

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Total Alkalinity as CaCO3	26		14	15	mg/L	EPA 310.2	

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ANALYTICAL RESULTS

Description: Swift Creek 210 | **Lab Sample ID:** C414241-01 | **Received:** 11/04/14 14:48

Matrix: Water | **Sampled:** 11/04/14 14:05 | **Work Order:** C414241

Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Calcium [7440-70-2]^	**6440**		ug/L	1	39.0	100	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Magnesium [7439-95-4]^	**2480**		ug/L	1	23.0	100	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Potassium [7440-09-7]^	**2860**		ug/L	1	150	500	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Sodium [7440-23-5]^	**6950**		ug/L	1	400	500	4K11023	EPA 6010C	11/13/14 10:33	JDH	R-05
Zinc [7440-66-6]^	**3.80**	JB	ug/L	1	3.80	10.0	4K11023	EPA 6010C	11/13/14 10:33	JDH	J-01, R-05

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	4K07017	EPA 350.1	11/07/14 13:24	SHA	
Chloride [16887-00-6]^	**6.7**		mg/L	1	2.2	5.0	4K06002	EPA 300.0	11/06/14 14:51	CV	
Sulfate as SO4 [14808-79-8]^	**3.7**	J	mg/L	1	2.9	5.0	4K06002	EPA 300.0	11/06/14 14:51	CV	
Total Alkalinity as CaCO3 [471-34-1]^	**31**		mg/L	1	14	15	4K05003	EPA 310.2	11/05/14 13:23	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.8**		mg/L	1	0.32	1.0	4K12005	SM 5310B-2000	11/12/14 15:00	RSA	

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ANALYTICAL RESULTS

Description: Swift Creek 50 **Lab Sample ID:** C414241-02 **Received:** 11/04/14 14:48
Matrix: Water **Sampled:** 11/04/14 13:05 **Work Order:** C414241
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Calcium [7440-70-2]^	**5540**		ug/L	1	39.0	100	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Copper [7440-50-8]^	**1.98**	J	ug/L	1	1.60	10.0	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Magnesium [7439-95-4]^	**1740**		ug/L	1	23.0	100	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Potassium [7440-09-7]^	**3250**		ug/L	1	150	500	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Sodium [7440-23-5]^	**4350**		ug/L	1	400	500	4K11023	EPA 6010C	11/13/14 10:35	JDH	
Zinc [7440-66-6]^	**6.33**	JB	ug/L	1	3.80	10.0	4K11023	EPA 6010C	11/13/14 10:35	JDH	J-01

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.063**	J	mg/L	1	0.045	0.10	4K07017	EPA 350.1	11/07/14 13:26	SHA	
Chloride [16887-00-6]^	**5.0**		mg/L	1	2.2	5.0	4K06002	EPA 300.0	11/06/14 15:59	CV	
Sulfate as SO4 [14808-79-8]^	**3.8**	J	mg/L	1	2.9	5.0	4K06002	EPA 300.0	11/06/14 15:59	CV	
Total Alkalinity as CaCO3 [471-34-1]^	**26**		mg/L	1	14	15	4K05003	EPA 310.2	11/05/14 13:24	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**6.2**		mg/L	1	0.32	1.0	4K12005	SM 5310B-2000	11/12/14 15:00	RSA	

Description: Swift Creek 210 Dissolved **Lab Sample ID:** C414241-03 **Received:** 11/04/14 14:48
Matrix: Water **Sampled:** 11/04/14 14:05 **Work Order:** C414241
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K11023	EPA 6010C	11/13/14 10:38	JDH	

Description: Swift Creek 50 Dissolved **Lab Sample ID:** C414241-04 **Received:** 11/04/14 14:48
Matrix: Water **Sampled:** 11/04/14 13:05 **Work Order:** C414241
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K11023	EPA 6010C	11/13/14 10:40	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K11023 - EPA 3005A

Blank (4K11023-BLK1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 09:48

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	2.10	U	10.0	ug/L							
Magnesium	23.0	U	100	ug/L							
Nickel	**9.60**	**J**	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	**4.00**	**J**	10.0	ug/L							

LCS (4K11023-BS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 09:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.2		1.00	ug/L	20.0		106	80-120			
Calcium	2140		100	ug/L	2000		107	80-120			
Copper	201		10.0	ug/L	200		101	80-120			
Lead	210		10.0	ug/L	200		105	80-120			
Magnesium	2090		100	ug/L	2000		105	80-120			
Nickel	213	B	10.0	ug/L	200		106	80-120			
Potassium	10600		500	ug/L	10000		106	80-120			
Sodium	10600		500	ug/L	10000		106	80-120			
Zinc	218	B	10.0	ug/L	200		109	80-120			

Matrix Spike (4K11023-MS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:00

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.8		1.00	ug/L	20.0	0.360 U	104	75-125			
Calcium	9870		100	ug/L	2000	7880	100	75-125			
Copper	199		10.0	ug/L	200	1.60 U	99	75-125			
Lead	208		10.0	ug/L	200	2.10 U	104	75-125			
Magnesium	4720		100	ug/L	2000	2690	102	75-125			
Nickel	211	B	10.0	ug/L	200	1.80 U	105	75-125			
Potassium	14200		500	ug/L	10000	3590	106	75-125			
Sodium	36500		500	ug/L	10000	26000	105	75-125			
Zinc	217	B	10.0	ug/L	200	3.80 U	108	75-125			

Matrix Spike Dup (4K11023-MSD1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:02

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.8		1.00	ug/L	20.0	0.360 U	104	75-125	0.07	20	
Calcium	9340		100	ug/L	2000	7880	73	75-125	6	20	QM-05
Copper	201		10.0	ug/L	200	1.60 U	100	75-125	1	20	
Lead	207		10.0	ug/L	200	2.10 U	104	75-125	0.4	20	
Magnesium	4520		100	ug/L	2000	2690	92	75-125	4	20	
Nickel	210	B	10.0	ug/L	200	1.80 U	105	75-125	0.2	20	
Potassium	13600		500	ug/L	10000	3590	100	75-125	4	20	
Sodium	34500		500	ug/L	10000	26000	85	75-125	6	20	
Zinc	217	B	10.0	ug/L	200	3.80 U	108	75-125	0.04	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K11023 - EPA 3005A - Continued

Post Spike (4K11023-PS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:05

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0194		0.00100	mg/L	0.0200	0.000144	96	80-120			
Calcium	9.18		0.100	mg/L	2.00	7.88	65	80-120			QM-08
Copper	0.183		0.0100	mg/L	0.200	0.000187	92	80-120			
Lead	0.193		0.0100	mg/L	0.200	-0.000900	96	80-120			
Magnesium	4.50		0.100	mg/L	2.00	2.69	91	80-120			
Nickel	0.199	B	0.0100	mg/L	0.200	-0.000247	99	80-120			
Potassium	12.7		0.500	mg/L	10.0	3.59	91	80-120			
Sodium	33.6		0.500	mg/L	10.0	26.0	76	80-120			QM-08
Zinc	0.203	B	0.0100	mg/L	0.200	0.00329	100	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K11023 - EPA 3005A

Blank (4K11023-BLK1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 09:48

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

Blank (4K11023-BLK2) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 09:52

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (4K11023-BS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 09:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	201		10.0	ug/L	200		101	80-120			

Matrix Spike (4K11023-MS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:00

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	199		10.0	ug/L	200	1.60 U	99	75-125			

Matrix Spike Dup (4K11023-MSD1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:02

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	201		10.0	ug/L	200	1.60 U	100	75-125	1	20	

Post Spike (4K11023-PS1) Prepared: 11/11/2014 14:04 Analyzed: 11/13/2014 10:05

Source: C414425-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.183		0.0100	mg/L	0.200	0.000187	92	80-120			

Classical Chemistry Parameters - Quality Control

Batch 4K05003 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4K05003 - NO PREP - Continued

Blank (4K05003-BLK1) Prepared: 11/05/2014 09:04 Analyzed: 11/05/2014 12:09

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (4K05003-BS1) Prepared: 11/05/2014 09:04 Analyzed: 11/05/2014 12:10

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	100		15	mg/L	100		103	80-120			

Matrix Spike (4K05003-MS1) Prepared: 11/05/2014 09:04 Analyzed: 11/05/2014 12:12

Source: C413508-04

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	680		75	mg/L	200	490	99	80-120			

Matrix Spike Dup (4K05003-MSD1) Prepared: 11/05/2014 09:04 Analyzed: 11/05/2014 12:14

Source: C413508-04

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	650		75	mg/L	200	490	82	80-120	5	25	

Batch 4K06002 - NO PREP

Blank (4K06002-BLK1) Prepared: 11/06/2014 07:22 Analyzed: 11/06/2014 08:36

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (4K06002-BS1) Prepared: 11/06/2014 07:22 Analyzed: 11/06/2014 09:10

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	48		5.0	mg/L	50.0		96	90-110			
Sulfate as SO4	47		5.0	mg/L	50.0		93	90-110			

Matrix Spike (4K06002-MS1) Prepared: 11/06/2014 07:22 Analyzed: 11/06/2014 11:27

Source: C413477-02

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	30		5.0	mg/L	20.0	12	95	90-110			
Sulfate as SO4	31		5.0	mg/L	20.0	13	90	90-110			

Matrix Spike Dup (4K06002-MSD1) Prepared: 11/06/2014 07:22 Analyzed: 11/06/2014 12:18

Source: C413477-02

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	31		5.0	mg/L	20.0	12	97	90-110	1	10	
Sulfate as SO4	31		5.0	mg/L	20.0	13	92	90-110	1	10	

Batch 4K07017 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4K07017 - NO PREP - Continued

Blank (4K07017-BLK1) Prepared: 11/07/2014 08:56 Analyzed: 11/07/2014 12:26

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (4K07017-BS1) Prepared: 11/07/2014 08:56 Analyzed: 11/07/2014 12:32

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	1.0		0.10	mg/L	0.997		101	90-110			

Matrix Spike (4K07017-MS1) Prepared: 11/07/2014 08:56 Analyzed: 11/07/2014 12:36

Source: C411942-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	11		1.0	mg/L	3.98	6.6	100	90-110			

Matrix Spike Dup (4K07017-MSD1) Prepared: 11/07/2014 08:56 Analyzed: 11/07/2014 12:38

Source: C411942-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	11		1.0	mg/L	3.98	6.6	100	90-110	0.2	10	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 4K12005 - NO PREP

Blank (4K12005-BLK1) Prepared: 11/12/2014 08:06 Analyzed: 11/12/2014 15:00

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.32	U	1.0	mg/L							

LCS (4K12005-BS1) Prepared: 11/12/2014 08:06 Analyzed: 11/12/2014 15:00

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	38		1.0	mg/L	40.0		96	85-115			

Matrix Spike (4K12005-MS1) Prepared: 11/12/2014 08:06 Analyzed: 11/12/2014 15:00

Source: A406493-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	34		1.0	mg/L	40.0	2.0	80	85-115			QM-07

Matrix Spike Dup (4K12005-MSD1) Prepared: 11/12/2014 08:06 Analyzed: 11/12/2014 15:00

Source: A406493-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	33		1.0	mg/L	40.0	2.0	77	85-115	3	21	QM-07

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
J-01	Result is estimated due to positive results in the associated method blank.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-08	Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test).
R-05	The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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Orlando, FL 32824
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102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

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Client Name	Project Number
The Catena Group (TH015)	[none]
Address	**Project Name/Desc**
410-B Millstone Drive	Swift Creek Water Quality
City/ST/Zip	**PO # / Billing Info**
Hillsborough, NC 27278	
Tel (919) 417-2732 / **Fax**	**Reporting Contact** Nancy Scott
Sampler(s) Name, Affiliation (Print) Nancy Scott	**Billing Contact** Nancy Scott
Sampler(s) Signature NScott	**Site Location / Time Zone**

Requested Analyses

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2,Chloride 300	Ammonia 350.1	Ca,Cd,Cu,K,Mg,Na,Ni,Pb,Zn	Cd/F	Sulfate 300	TOC SM5310B Dissolved				
	Swift Creek 210	11-4-14	1805		WA	6	X	X	X	X	X	X				
	11 50	11-4-14	1305		WA	6	X	X	X	X	X	X				

Preservation (See Codes) (Combine as necessary)

Sample Comments

<-- Total # of Containers

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder C414241

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
		NScott	11/4/14 2:45		11-4-14 1448
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt	19.8c 19.8c	Condition Upon Receipt	✓ Acceptable ___ Unacceptable

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments)

Preservation: **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Friday, December 12, 2014
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C414195

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Wednesday, November 19, 2014.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

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PROJECT NARRATIVE

Date: December 12, 2014
Client: The Catena Group (TH015)
Project: Swift Creek Water Quality
Lab ID: C414195

Overview

This report is an amendment to the original report for this work order. This report was revised to remove Mn results and report Mg.

Environmental Conservation Laboratories, Inc. (ENCO) analyzed all submitted samples in accordance with the methods referenced in the laboratory report. Any particular difficulties encountered during sample handling by ENCO are discussed in the QC Remarks section below.

Quality Control Samples

No Comments

Quality Control Remarks

No Comments

Other Comments

The analytical data presented in this report are consistent with the methods as referenced in the analytical report. Any exceptions or deviations are noted in the QC remarks section of this narrative or in the Flags/Notes and Definitions section of the report.

Released By:
Environmental Conservation Laboratories, Inc.

Bill Scott
Project Manager

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC-210 **Lab ID: C414195-01** **Sampled: 11/19/14 09:45** **Received: 11/19/14 11:20**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	12/17/14	11/21/14 09:08	11/25/14 00:33
EPA 310.2	12/03/14	11/25/14 08:44	11/25/14 11:17
EPA 350.1	12/17/14	11/21/14 09:21	11/21/14 10:21
EPA 6010C	05/18/15	11/20/14 09:17	11/21/14 12:43
EPA 6010C	05/18/15	11/25/14 18:27	12/03/14 09:03
SM 5310B-2000	12/17/14	11/21/14 14:06	11/21/14 16:57

Client ID: SR-1555 **Lab ID: C414195-02** **Sampled: 11/19/14 10:15** **Received: 11/19/14 11:20**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	12/17/14	11/21/14 09:08	11/25/14 00:50
EPA 310.2	12/03/14	11/25/14 08:44	11/25/14 11:18
EPA 350.1	12/17/14	11/21/14 09:21	11/21/14 10:28
EPA 6010C	05/18/15	11/20/14 09:17	11/21/14 12:53
EPA 6010C	05/18/15	11/25/14 18:27	12/03/14 09:15
SM 5310B-2000	12/17/14	11/21/14 14:06	11/21/14 16:57

Client ID: NC-50 **Lab ID: C414195-03** **Sampled: 11/19/14 10:50** **Received: 11/19/14 11:20**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	12/17/14	11/21/14 09:08	11/25/14 01:07
EPA 310.2	12/03/14	11/25/14 08:44	11/25/14 11:19
EPA 350.1	12/17/14	11/21/14 09:21	11/21/14 10:34
EPA 6010C	05/18/15	11/20/14 09:17	11/21/14 12:56
EPA 6010C	05/18/15	11/25/14 18:27	12/03/14 09:18
SM 5310B-2000	12/17/14	11/21/14 14:06	11/21/14 16:57

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SAMPLE DETECTION SUMMARY

Client ID: NC-210 **Lab ID: C414195-01**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.58		0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6460		39.0	100	ug/L	EPA 6010C	
Chloride	7.2		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2470		23.0	100	ug/L	EPA 6010C	
Potassium - Total	3080		150	500	ug/L	EPA 6010C	
Sodium - Total	7420		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.7	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	35		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	0.44	J	0.32	1.0	mg/L	SM 5310B-2000	

Client ID: SR-1555 **Lab ID: C414195-02**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.35		0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6160		39.0	100	ug/L	EPA 6010C	
Chloride	5.2		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2200		23.0	100	ug/L	EPA 6010C	
Potassium - Total	3770		150	500	ug/L	EPA 6010C	
Sodium - Total	7790		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.7	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	26		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	0.46	J	0.32	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID: C414195-03**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.25		0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6010		39.0	100	ug/L	EPA 6010C	
Chloride	7.2		2.2	5.0	mg/L	EPA 300.0	
Copper - Dissolved	1.96	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	1910		23.0	100	ug/L	EPA 6010C	
Potassium - Total	3250		150	500	ug/L	EPA 6010C	
Sodium - Total	4760		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.7	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	26		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	0.79	J	0.32	1.0	mg/L	SM 5310B-2000	
Zinc - Total	6.14	J	3.80	10.0	ug/L	EPA 6010C	

ANALYTICAL RESULTS

Description: NC-210 **Lab Sample ID:** C414195-01 **Received:** 11/19/14 11:20

Matrix: Water **Sampled:** 11/19/14 09:45 **Work Order:** C414195

Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Calcium [7440-70-2]^	**6460**		ug/L	1	39.0	100	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Magnesium [7439-95-4]^	**2470**		ug/L	1	23.0	100	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Potassium [7440-09-7]^	**3080**		ug/L	1	150	500	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Sodium [7440-23-5]^	**7420**		ug/L	1	400	500	4K21043	EPA 6010C	12/03/14 09:03	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	4K21043	EPA 6010C	12/03/14 09:03	JDH	

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K20007	EPA 6010C	11/21/14 12:43	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.58**		mg/L	1	0.045	0.10	4K20012	EPA 350.1	11/21/14 10:21	SHA	
Chloride [16887-00-6]^	**7.2**		mg/L	1	2.2	5.0	4K21005	EPA 300.0	11/25/14 00:33	AJB	
Sulfate as SO4 [14808-79-8]^	**3.7**	J	mg/L	1	2.9	5.0	4K21005	EPA 300.0	11/25/14 00:33	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**35**		mg/L	1	14	15	4K25010	EPA 310.2	11/25/14 11:17	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**0.44**	J	mg/L	1	0.32	1.0	4K21035	SM 5310B-2000	11/21/14 16:57	RSA	

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ANALYTICAL RESULTS

Description: SR-1555 **Lab Sample ID:** C414195-02 **Received:** 11/19/14 11:20

Matrix: Water **Sampled:** 11/19/14 10:15 **Work Order:** C414195

Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Calcium [7440-70-2]^	**6160**		ug/L	1	39.0	100	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Magnesium [7439-95-4]^	**2200**		ug/L	1	23.0	100	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Potassium [7440-09-7]^	**3770**		ug/L	1	150	500	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Sodium [7440-23-5]^	**7790**		ug/L	1	400	500	4K21043	EPA 6010C	12/03/14 09:15	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	4K21043	EPA 6010C	12/03/14 09:15	JDH	

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K20007	EPA 6010C	11/21/14 12:53	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.35**		mg/L	1	0.045	0.10	4K20012	EPA 350.1	11/21/14 10:28	SHA	
Chloride [16887-00-6]^	**5.2**		mg/L	1	2.2	5.0	4K21005	EPA 300.0	11/25/14 00:50	AJB	
Sulfate as SO4 [14808-79-8]^	**3.7**	J	mg/L	1	2.9	5.0	4K21005	EPA 300.0	11/25/14 00:50	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**26**		mg/L	1	14	15	4K25010	EPA 310.2	11/25/14 11:18	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**0.46**	J	mg/L	1	0.32	1.0	4K21035	SM 5310B-2000	11/21/14 16:57	RSA	

ANALYTICAL RESULTS

Description: NC-50 **Lab Sample ID:** C414195-03 **Received:** 11/19/14 11:20

Matrix: Water **Sampled:** 11/19/14 10:50 **Work Order:** C414195

Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Calcium [7440-70-2]^	**6010**		ug/L	1	39.0	100	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Magnesium [7439-95-4]^	**1910**		ug/L	1	23.0	100	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Potassium [7440-09-7]^	**3250**		ug/L	1	150	500	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Sodium [7440-23-5]^	**4760**		ug/L	1	400	500	4K21043	EPA 6010C	12/03/14 09:18	JDH	
Zinc [7440-66-6]^	**6.14**	J	ug/L	1	3.80	10.0	4K21043	EPA 6010C	12/03/14 09:18	JDH	

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**1.96**	J	ug/L	1	1.60	10.0	4K20007	EPA 6010C	11/21/14 12:56	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.25**		mg/L	1	0.045	0.10	4K20012	EPA 350.1	11/21/14 10:34	SHA	
Chloride [16887-00-6]^	**7.2**		mg/L	1	2.2	5.0	4K21005	EPA 300.0	11/25/14 01:07	AJB	
Sulfate as SO4 [14808-79-8]^	**3.7**	J	mg/L	1	2.9	5.0	4K21005	EPA 300.0	11/25/14 01:07	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**26**		mg/L	1	14	15	4K25010	EPA 310.2	11/25/14 11:19	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**0.79**	J	mg/L	1	0.32	1.0	4K21035	SM 5310B-2000	11/21/14 16:57	RSA	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K21043 - EPA 3005A

Blank (4K21043-BLK1) Prepared: 11/25/2014 18:27 Analyzed: 12/03/2014 08:56

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	2.10	U	10.0	ug/L							
Magnesium	23.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (4K21043-BS1) Prepared: 11/25/2014 18:27 Analyzed: 12/03/2014 09:00

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.9		1.00	ug/L	20.0		100	80-120			
Calcium	2110		100	ug/L	2000		105	80-120			
Copper	195		10.0	ug/L	200		97	80-120			
Lead	198		10.0	ug/L	200		99	80-120			
Magnesium	2040		100	ug/L	2000		102	80-120			
Nickel	201		10.0	ug/L	200		101	80-120			
Potassium	10100		500	ug/L	10000		101	80-120			
Sodium	10300		500	ug/L	10000		103	80-120			
Zinc	203		10.0	ug/L	200		101	80-120			

Matrix Spike (4K21043-MS1) Prepared: 11/25/2014 18:27 Analyzed: 12/03/2014 09:05

Source: C414195-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.2		1.00	ug/L	20.0	0.360 U	101	75-125			
Calcium	8280		100	ug/L	2000	6460	91	75-125			
Copper	198		10.0	ug/L	200	1.60 U	99	75-125			
Lead	203		10.0	ug/L	200	2.10 U	102	75-125			
Magnesium	4440		100	ug/L	2000	2470	98	75-125			
Nickel	203		10.0	ug/L	200	1.80 U	102	75-125			
Potassium	13000		500	ug/L	10000	3080	99	75-125			
Sodium	17400		500	ug/L	10000	7420	100	75-125			
Zinc	206		10.0	ug/L	200	3.80 U	103	75-125			

Matrix Spike Dup (4K21043-MSD1) Prepared: 11/25/2014 18:27 Analyzed: 12/03/2014 09:08

Source: C414195-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.0		1.00	ug/L	20.0	0.360 U	105	75-125	4	20	
Calcium	8440		100	ug/L	2000	6460	99	75-125	2	20	
Copper	197		10.0	ug/L	200	1.60 U	98	75-125	0.3	20	
Lead	204		10.0	ug/L	200	2.10 U	102	75-125	0.3	20	
Magnesium	4480		100	ug/L	2000	2470	100	75-125	0.9	20	
Nickel	210		10.0	ug/L	200	1.80 U	105	75-125	3	20	
Potassium	13300		500	ug/L	10000	3080	103	75-125	3	20	
Sodium	17800		500	ug/L	10000	7420	104	75-125	2	20	
Zinc	214		10.0	ug/L	200	3.80 U	107	75-125	4	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K21043 - EPA 3005A - Continued

Post Spike (4K21043-PS1) Prepared: 11/25/2014 18:27 Analyzed: 12/03/2014 09:10

Source: C414195-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0190		0.00100	mg/L	0.0200	5.18E-5	95	80-120			
Calcium	8.15		0.100	mg/L	2.00	6.46	84	80-120			
Copper	0.181		0.0100	mg/L	0.200	-0.000376	91	80-120			
Lead	0.182		0.0100	mg/L	0.200	-0.000727	91	80-120			
Magnesium	4.31		0.100	mg/L	2.00	2.47	92	80-120			
Nickel	0.190		0.0100	mg/L	0.200	-0.000524	95	80-120			
Potassium	12.2		0.500	mg/L	10.0	3.08	92	80-120			
Sodium	16.5		0.500	mg/L	10.0	7.42	91	80-120			
Zinc	0.195		0.0100	mg/L	0.200	0.00190	96	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 4K20007 - EPA 3005A

Blank (4K20007-BLK2) Prepared: 11/20/2014 09:17 Analyzed: 11/21/2014 11:29

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (4K20007-BS1) Prepared: 11/20/2014 09:17 Analyzed: 11/21/2014 11:32

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	200		10.0	ug/L	200		100	80-120			

Matrix Spike (4K20007-MS1) Prepared: 11/20/2014 09:17 Analyzed: 11/21/2014 12:19

Source: C414012-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	207		10.0	ug/L	200	1.60 U	104	75-125			

Matrix Spike Dup (4K20007-MSD1) Prepared: 11/20/2014 09:17 Analyzed: 11/21/2014 12:21

Source: C414012-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	206		10.0	ug/L	200	1.60 U	103	75-125	0.6	20	

Post Spike (4K20007-PS1) Prepared: 11/20/2014 09:17 Analyzed: 11/21/2014 12:24

Source: C414012-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.186		0.0100	mg/L	0.200	0.00104	92	80-120			

Classical Chemistry Parameters - Quality Control

Batch 4K20012 - NO PREP

Blank (4K20012-BLK1) Prepared: 11/21/2014 09:21 Analyzed: 11/21/2014 10:17

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4K20012 - NO PREP - Continued

LCS (4K20012-BS1) Prepared: 11/21/2014 09:21 Analyzed: 11/21/2014 10:19

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	1.0		0.10	mg/L	0.997		103	90-110			

Matrix Spike (4K20012-MS1) Prepared: 11/21/2014 09:21 Analyzed: 11/21/2014 10:24

Source: C414195-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.99		0.10	mg/L	0.387	0.58	104	90-110			

Matrix Spike Dup (4K20012-MSD1) Prepared: 11/21/2014 09:21 Analyzed: 11/21/2014 10:26

Source: C414195-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.99		0.10	mg/L	0.387	0.58	105	90-110	0.4	10	

Batch 4K21005 - NO PREP

Blank (4K21005-BLK1) Prepared: 11/21/2014 09:08 Analyzed: 11/24/2014 16:37

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (4K21005-BS1) Prepared: 11/21/2014 09:08 Analyzed: 11/24/2014 19:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	48		5.0	mg/L	50.0		96	90-110			
Sulfate as SO4	47		5.0	mg/L	50.0		95	90-110			

Matrix Spike (4K21005-MS1) Prepared: 11/21/2014 09:08 Analyzed: 11/24/2014 19:27

Source: C414319-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	20		5.0	mg/L	20.0	3.1	82	90-110			QM-05
Sulfate as SO4	19		5.0	mg/L	20.0	3.5	80	90-110			QM-05

Matrix Spike Dup (4K21005-MSD1) Prepared: 11/21/2014 09:08 Analyzed: 11/24/2014 20:18

Source: C414319-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	20		5.0	mg/L	20.0	3.1	86	90-110	3	10	QM-05
Sulfate as SO4	20		5.0	mg/L	20.0	3.5	83	90-110	3	10	QM-05

Batch 4K25010 - NO PREP

Blank (4K25010-BLK1) Prepared: 11/25/2014 08:44 Analyzed: 11/25/2014 11:05

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4K25010 - NO PREP - Continued

LCS (4K25010-BS1) Prepared: 11/25/2014 08:44 Analyzed: 11/25/2014 11:06

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	100		15	mg/L	100		102	80-120			

Matrix Spike (4K25010-MS1) Prepared: 11/25/2014 08:44 Analyzed: 11/25/2014 11:07

Source: C414111-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	43		15	mg/L	37.8	14 U	112	80-120			

Matrix Spike Dup (4K25010-MSD1) Prepared: 11/25/2014 08:44 Analyzed: 11/25/2014 11:08

Source: C414111-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	38		15	mg/L	37.8	14 U	101	80-120	11	25	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 4K21035 - NO PREP

Blank (4K21035-BLK1) Prepared: 11/21/2014 14:06 Analyzed: 11/21/2014 16:57

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.32	U	1.0	mg/L							

LCS (4K21035-BS1) Prepared: 11/21/2014 14:06 Analyzed: 11/21/2014 16:57

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	45		1.0	mg/L	40.0		112	85-115			

Matrix Spike (4K21035-MS1) Prepared: 11/21/2014 14:06 Analyzed: 11/21/2014 16:57

Source: A406381-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	53		1.0	mg/L	40.0	6.7	115	85-115			

Matrix Spike Dup (4K21035-MSD1) Prepared: 11/21/2014 14:06 Analyzed: 11/21/2014 16:57

Source: A406381-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	45		1.0	mg/L	40.0	6.7	96	85-115	16	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

www.encolabs.com

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Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

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Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Client Name	Project Number
The Catena Group	
Address: 410-B Millstone Drive	Project Name/Desc: Swift Creek Water Quality
City/ST/Zip: Hillsborough, NC 27278	PO # / Billing Info
Tel: 919 732-1300 / Fax	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print): Nancy Scott	Billing Contact: Nancy Scott
Sampler(s) Signature	Site Location / Time Zone

Requested Analyses

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C414195

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Ammonia	Cadmium Dissolved	Copper	Turbidity	Toc Dissolved						Sample Comments
	NC-210	11/19/14	9:45														
	SR-1555	11/19/14	10:15														
	NC-50	11/19/14	10:50														

Preservation (See Codes) (Combine as necessary)

<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
		NScott	11/19/14		11/19/14 1120
Comments/Special Reporting Requirements: repeat last		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 3.0c		Condition Upon Receipt: ✓ Acceptable ___ Unacceptable	

atrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments) **Preservation:** **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Wednesday, December 31, 2014
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C416681

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, December 16, 2014.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

www.encolabs.com

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: SR-1555 **Lab ID: C416681-01** **Sampled: 12/16/14 10:00** **Received: 12/16/14 15:42**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	01/13/15	12/17/14 09:44	12/17/14 14:45
EPA 310.2	12/30/14	12/26/14 10:07	12/26/14 12:00
EPA 350.1	01/13/15	12/19/14 09:26	12/19/14 13:16
EPA 6010C	06/14/15	12/23/14 14:27	12/24/14 14:29
SM 2130B-2001	12/18/14 10:00	12/17/14 18:24	12/17/14 18:24
SM 5310B-2000	01/13/15	12/22/14 12:18	12/22/14 14:31

Client ID: SR-1555 **Lab ID: C416681-01RE1** **Sampled: 12/16/14 10:00** **Received: 12/16/14 15:42**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	06/14/15	12/23/14 14:27	12/29/14 10:59

Client ID: SR-1555 Dissolved **Lab ID: C416681-02** **Sampled: 12/16/14 10:00** **Received: 12/16/14 15:42**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	06/14/15	12/23/14 14:27	12/24/14 14:33

SAMPLE DETECTION SUMMARY

Client ID: SR-1555 **Lab ID:** C416681-01

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Chloride	6.1		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2030		23.0	100	ug/L	EPA 6010C	
Potassium - Total	2880		150	500	ug/L	EPA 6010C	
Sodium - Total	6910		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.0	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	20		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.2		0.32	1.0	mg/L	SM 5310B-2000	
Turbidity	1.5		0.50	1.0	NTU	SM 2130B-2001	

Client ID: SR-1555 **Lab ID:** C416681-01RE1

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	5940		39.0	100	ug/L	EPA 6010C	

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ANALYTICAL RESULTS

Description: SR-1555 **Lab Sample ID:** C416681-01 **Received:** 12/16/14 15:42
Matrix: Water **Sampled:** 12/16/14 10:00 **Work Order:** C416681
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Calcium [7440-70-2]^	**5940**		ug/L	1	39.0	100	4L23025	EPA 6010C	12/29/14 10:59	VLO	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Magnesium [7439-95-4]^	**2030**		ug/L	1	23.0	100	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Potassium [7440-09-7]^	**2880**		ug/L	1	150	500	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Sodium [7440-23-5]^	**6910**		ug/L	1	400	500	4L23025	EPA 6010C	12/24/14 14:29	VLO	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	4L23025	EPA 6010C	12/24/14 14:29	VLO	

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4L23025	EPA 6010C	12/24/14 14:29	VLO	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	4L19023	EPA 350.1	12/19/14 13:16	AJB	
Chloride [16887-00-6]^	**6.1**		mg/L	1	2.2	5.0	4L17013	EPA 300.0	12/17/14 14:45	AJB	
Sulfate as SO4 [14808-79-8]^	**4.0**	J	mg/L	1	2.9	5.0	4L17013	EPA 300.0	12/17/14 14:45	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**20**		mg/L	1	14	15	4L26014	EPA 310.2	12/26/14 12:00	SHA	
Turbidity^	**1.5**		NTU	1	0.50	1.0	4L17045	SM 2130B-2001	12/17/14 18:24	JOC	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.2**		mg/L	1	0.32	1.0	4L22035	SM 5310B-2000	12/22/14 14:31	RSA	

Description: SR-1555 Dissolved **Lab Sample ID:** C416681-02 **Received:** 12/16/14 15:42
Matrix: Water **Sampled:** 12/16/14 10:00 **Work Order:** C416681
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	4L23025	EPA 6010C	12/24/14 14:33	VLO	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4L23025 - EPA 3005A

Blank (4L23025-BLK1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	2.10	U	10.0	ug/L							
Magnesium	23.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

Blank (4L23025-BLK3) Prepared: 12/23/2014 14:27 Analyzed: 12/29/2014 10:36

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	2.10	U	10.0	ug/L							
Magnesium	23.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (4L23025-BS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:25

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	22.3		1.00	ug/L	20.0		111	80-120			
Copper	206		10.0	ug/L	200		103	80-120			
Lead	213		10.0	ug/L	200		107	80-120			
Magnesium	2070		100	ug/L	2000		104	80-120			
Nickel	221		10.0	ug/L	200		110	80-120			
Potassium	10300		500	ug/L	10000		103	80-120			
Sodium	10400		500	ug/L	10000		104	80-120			
Zinc	222		10.0	ug/L	200		111	80-120			

LCS (4L23025-BS2) Prepared: 12/23/2014 14:27 Analyzed: 12/29/2014 10:39

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.9		1.00	ug/L	20.0		104	80-120			
Calcium	2090		100	ug/L	2000		105	80-120			
Copper	195		10.0	ug/L	200		97	80-120			
Lead	199		10.0	ug/L	200		99	80-120			
Magnesium	1990		100	ug/L	2000		100	80-120			
Nickel	206		10.0	ug/L	200		103	80-120			
Potassium	10100		500	ug/L	10000		101	80-120			
Sodium	10300		500	ug/L	10000		103	80-120			
Zinc	208		10.0	ug/L	200		104	80-120			

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4L23025 - EPA 3005A - Continued

Matrix Spike (4L23025-MS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:30

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.3		1.00	ug/L	20.0	0.360 U	107	75-125			
Copper	203		10.0	ug/L	200	1.60 U	102	75-125			
Lead	207		10.0	ug/L	200	2.10 U	103	75-125			
Magnesium	6150		100	ug/L	2000	4750	70	75-125			QM-05
Nickel	221		10.0	ug/L	200	8.89	106	75-125			
Potassium	11700		500	ug/L	10000	1790	99	75-125			
Sodium	45500		500	ug/L	10000	40500	51	75-125			QM-05
Zinc	246		10.0	ug/L	200	32.2	107	75-125			

Matrix Spike (4L23025-MS2) Prepared: 12/23/2014 14:27 Analyzed: 12/29/2014 10:44

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.8		1.00	ug/L	20.0	0.360 U	104	75-125			
Calcium	4840		100	ug/L	2000	3140	85	75-125			
Copper	196		10.0	ug/L	200	1.60 U	98	75-125			
Lead	198		10.0	ug/L	200	2.10 U	99	75-125			
Magnesium	5990		100	ug/L	2000	4750	62	75-125			QM-05
Nickel	215		10.0	ug/L	200	8.89	103	75-125			
Potassium	11900		500	ug/L	10000	1790	102	75-125			
Sodium	46700		500	ug/L	10000	40500	62	75-125			QM-05
Zinc	238		10.0	ug/L	200	32.2	103	75-125			

Matrix Spike Dup (4L23025-MSD1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:33

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.5		1.00	ug/L	20.0	0.360 U	108	75-125	0.9	20	
Copper	205		10.0	ug/L	200	1.60 U	103	75-125	1	20	
Lead	208		10.0	ug/L	200	2.10 U	104	75-125	0.7	20	
Magnesium	6460		100	ug/L	2000	4750	85	75-125	5	20	
Nickel	223		10.0	ug/L	200	8.89	107	75-125	0.7	20	
Potassium	12000		500	ug/L	10000	1790	102	75-125	3	20	
Sodium	47500		500	ug/L	10000	40500	70	75-125	4	20	QM-05
Zinc	247		10.0	ug/L	200	32.2	107	75-125	0.5	20	

Matrix Spike Dup (4L23025-MSD2) Prepared: 12/23/2014 14:27 Analyzed: 12/29/2014 10:46

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.6		1.00	ug/L	20.0	0.360 U	103	75-125	0.7	20	
Calcium	4860		100	ug/L	2000	3140	86	75-125	0.4	20	
Copper	196		10.0	ug/L	200	1.60 U	98	75-125	0.005	20	
Lead	198		10.0	ug/L	200	2.10 U	99	75-125	0.1	20	
Magnesium	6190		100	ug/L	2000	4750	72	75-125	3	20	QM-05
Nickel	214		10.0	ug/L	200	8.89	103	75-125	0.3	20	
Potassium	11800		500	ug/L	10000	1790	100	75-125	2	20	
Sodium	46700		500	ug/L	10000	40500	62	75-125	0.2	20	QM-05
Zinc	238		10.0	ug/L	200	32.2	103	75-125	0.04	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 4L23025 - EPA 3005A - Continued

Post Spike (4L23025-PS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:35

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0211		0.00100	mg/L	0.0200	0.000120	105	80-120			
Copper	0.202		0.0100	mg/L	0.200	0.000714	100	80-120			
Lead	0.205		0.0100	mg/L	0.200	-2.00E-5	102	80-120			
Magnesium	6.34		0.100	mg/L	2.00	4.75	80	80-120			
Nickel	0.219		0.0100	mg/L	0.200	0.00889	105	80-120			
Potassium	12.0		0.500	mg/L	10.0	1.79	102	80-120			
Sodium	47.5		0.500	mg/L	10.0	40.5	70	80-120			QM-08
Zinc	0.245		0.0100	mg/L	0.200	0.0322	106	80-120			

Post Spike (4L23025-PS2) Prepared: 12/23/2014 14:27 Analyzed: 12/29/2014 10:49

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0216		0.00100	mg/L	0.0200	0.000120	108	80-120			
Calcium	5.37		0.100	mg/L	2.00	3.14	112	80-120			
Copper	0.212		0.0100	mg/L	0.200	0.000714	105	80-120			
Lead	0.207		0.0100	mg/L	0.200	-2.00E-5	104	80-120			
Magnesium	6.65		0.100	mg/L	2.00	4.75	95	80-120			
Nickel	0.225		0.0100	mg/L	0.200	0.00889	108	80-120			
Potassium	12.8		0.500	mg/L	10.0	1.79	110	80-120			
Sodium	51.3		0.500	mg/L	10.0	40.5	109	80-120			
Zinc	0.252		0.0100	mg/L	0.200	0.0322	110	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 4L23025 - EPA 3005A

Blank (4L23025-BLK1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

Blank (4L23025-BLK2) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:23

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (4L23025-BS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:25

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	206		10.0	ug/L	200		103	80-120			

Matrix Spike (4L23025-MS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:30

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	203		10.0	ug/L	200	1.60 U	102	75-125			

QUALITY CONTROL DATA

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 4L23025 - EPA 3005A - Continued

Matrix Spike Dup (4L23025-MSD1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:33

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	205		10.0	ug/L	200	1.60 U	103	75-125	1	20	

Post Spike (4L23025-PS1) Prepared: 12/23/2014 14:27 Analyzed: 12/24/2014 13:35

Source: C415919-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.202		0.0100	mg/L	0.200	0.000714	100	80-120			

Classical Chemistry Parameters - Quality Control

Batch 4L17013 - NO PREP

Blank (4L17013-BLK1) Prepared: 12/17/2014 09:44 Analyzed: 12/17/2014 11:04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (4L17013-BS1) Prepared: 12/17/2014 09:44 Analyzed: 12/17/2014 11:21

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	48		5.0	mg/L	50.0		95	90-110			
Sulfate as SO4	47		5.0	mg/L	50.0		94	90-110			

Matrix Spike (4L17013-MS1) Prepared: 12/17/2014 09:44 Analyzed: 12/17/2014 13:37

Source: C414995-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	23		5.0	mg/L	20.0	5.4	89	90-110			QM-05
Sulfate as SO4	32		5.0	mg/L	20.0	13	91	90-110			

Matrix Spike Dup (4L17013-MSD1) Prepared: 12/17/2014 09:44 Analyzed: 12/17/2014 13:54

Source: C414995-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	23		5.0	mg/L	20.0	5.4	87	90-110	2	10	QM-05
Sulfate as SO4	31		5.0	mg/L	20.0	13	89	90-110	1	10	QM-05

Batch 4L17045 - NO PREP

Blank (4L17045-BLK1) Prepared & Analyzed: 12/17/2014 18:24

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Turbidity	0.50	U	1.0	NTU							

LCS (4L17045-BS1) Prepared & Analyzed: 12/17/2014 18:24

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Turbidity	19		1.0	NTU	20.0		96	90-110			

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4L17045 - NO PREP - Continued

Duplicate (4L17045-DUP1) Prepared & Analyzed: 12/17/2014 18:24

Source: C414671-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Turbidity	3.1		1.0	NTU		3.1			1	25	

Duplicate (4L17045-DUP2) Prepared & Analyzed: 12/17/2014 18:24

Source: C414671-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Turbidity	6.6		1.0	NTU		6.7			2	25	

Batch 4L19023 - NO PREP

Blank (4L19023-BLK1) Prepared: 12/19/2014 09:26 Analyzed: 12/19/2014 12:22

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (4L19023-BS1) Prepared: 12/19/2014 09:26 Analyzed: 12/19/2014 12:24

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.92		0.10	mg/L	0.997		92	90-110			

Matrix Spike (4L19023-MS1) Prepared: 12/19/2014 09:26 Analyzed: 12/19/2014 12:28

Source: C406162-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.36		0.10	mg/L	0.387	0.045 U	94	90-110			

Matrix Spike Dup (4L19023-MSD1) Prepared: 12/19/2014 09:26 Analyzed: 12/19/2014 12:30

Source: C406162-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.37		0.10	mg/L	0.387	0.045 U	96	90-110	2	10	

Batch 4L26014 - NO PREP

Blank (4L26014-BLK1) Prepared: 12/26/2014 10:07 Analyzed: 12/26/2014 11:38

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (4L26014-BS1) Prepared: 12/26/2014 10:07 Analyzed: 12/26/2014 11:38

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	99		15	mg/L	100		99	80-120			

Matrix Spike (4L26014-MS1) Prepared: 12/26/2014 10:07 Analyzed: 12/26/2014 11:40

Source: C415213-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	560		75	mg/L	200	320	121	80-120			QM-05

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 4L26014 - NO PREP - Continued

Matrix Spike Dup (4L26014-MSD1) Prepared: 12/26/2014 10:07 Analyzed: 12/26/2014 11:41

Source: C415213-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	540		75	mg/L	200	320	109	80-120	5	25	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 4L22035 - NO PREP

Blank (4L22035-BLK1) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.32	U	1.0	mg/L							

LCS (4L22035-BS1) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	37		1.0	mg/L	40.0		92	85-115			

Matrix Spike (4L22035-MS1) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Source: A407446-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	42		1.0	mg/L	40.0	0.32 U	106	85-115			

Matrix Spike (4L22035-MS2) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Source: A407540-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	42		1.0	mg/L	40.0	0.32 U	106	85-115			

Matrix Spike Dup (4L22035-MSD1) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Source: A407446-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	40		1.0	mg/L	40.0	0.32 U	100	85-115	6	21	

Matrix Spike Dup (4L22035-MSD2) Prepared: 12/22/2014 12:18 Analyzed: 12/22/2014 14:31

Source: A407540-03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	42		1.0	mg/L	40.0	0.32 U	106	85-115	0.1	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-08	Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test).

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

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(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page ___ of ___

Client Name: The Catena Group	Project Number:
Address: 410-B Millstone Drive	Project Name/Desc: Swift Creek Water Qual
City/State/Zip: Hillsborough, NC 27278	PO # / Billing Info:
Tel: (919) 732-1300 Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print):	Billing Contact:
Sampler(s) Signature:	Site Location / Time Zone:

Requested Analyses

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2 / Chloride 300	Ammonia 350.1	Ca, Cd, Cu, K, Mg, Na, Zn 6020	Cd/F	Sulfate 300	TOC SM5310B Dissolved					Sample Comments
	SR 1555	12-1-14	10:30		WA	6	X	X	X	X	X	X					

Preservation (Use Codes / Combine as necessary)

← Total # of Containers

Requested Turnaround Times

Note: Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C4/16681

Sample Kit Prepared By	Date/Time	Relinquished By	12-1-14 15:42	Received By	12/1/14 1542
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 2.5°		Condition Upon Receipt: X Acceptable ___ Unacceptable	

Matrix: GW-Groundwater SO-Soil DW-Drinking Water SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments) Preservation: H-or-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Friday, February 20, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C501626

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Friday, February 6, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC-50 **Lab ID: C501626-01** **Sampled: 02/06/15 11:15** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	03/06/15	02/10/15 08:50	02/10/15 12:08
EPA 310.2	02/20/15	02/19/15 07:58	02/19/15 11:06
EPA 350.1	03/06/15	02/11/15 07:06	02/11/15 09:33
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:14
SM 5310B-2000	03/06/15	02/20/15 10:00	02/20/15 18:10

Client ID: NC-50 **Lab ID: C501626-02** **Sampled: 02/06/15 11:15** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:17

Client ID: SR 1555 **Lab ID: C501626-03** **Sampled: 02/06/15 10:30** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	03/06/15	02/10/15 08:50	02/10/15 12:25
EPA 310.2	02/20/15	02/19/15 07:58	02/19/15 11:07
EPA 350.1	03/06/15	02/11/15 07:06	02/11/15 09:35
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:19
SM 5310B-2000	03/06/15	02/20/15 10:00	02/20/15 18:10

Client ID: SR 1555 **Lab ID: C501626-04** **Sampled: 02/06/15 10:30** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:22

Client ID: NC 210 **Lab ID: C501626-05** **Sampled: 02/06/15 09:45** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	03/06/15	02/10/15 08:50	02/10/15 12:42
EPA 310.2	02/20/15	02/19/15 07:58	02/19/15 11:10
EPA 350.1	03/06/15	02/11/15 07:06	02/11/15 09:37
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:24
SM 5310B-2000	03/06/15	02/20/15 10:00	02/20/15 18:10

Client ID: NC 210 **Lab ID: C501626-06** **Sampled: 02/06/15 09:45** **Received: 02/06/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	08/05/15	02/10/15 16:04	02/11/15 11:27

SAMPLE DETECTION SUMMARY

Client ID: NC-50 **Lab ID:** C501626-01

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	5010		39.0	100	ug/L	EPA 6010C	
Chloride	4.9	J	2.2	5.0	mg/L	EPA 300.0	
Copper - Total	2.46	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	1740		23.0	100	ug/L	EPA 6010C	
Potassium - Total	2420		150	500	ug/L	EPA 6010C	
Sodium - Total	4290		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.5	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	20		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.1		0.32	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID:** C501626-02

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	2.24	J	1.60	10.0	ug/L	EPA 6010C	

Client ID: SR 1555 **Lab ID:** C501626-03

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	5170		39.0	100	ug/L	EPA 6010C	
Chloride	5.3		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	2.75	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	1820		23.0	100	ug/L	EPA 6010C	
Potassium - Total	2190		150	500	ug/L	EPA 6010C	
Sodium - Total	5500		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.4	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	22		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.3		0.32	1.0	mg/L	SM 5310B-2000	

Client ID: NC 210 **Lab ID:** C501626-05

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	5050		39.0	100	ug/L	EPA 6010C	
Chloride	6.0		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	1950		23.0	100	ug/L	EPA 6010C	
Potassium - Total	2110		150	500	ug/L	EPA 6010C	
Sodium - Total	5390		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.6	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	22		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.4		0.32	1.0	mg/L	SM 5310B-2000	

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ANALYTICAL RESULTS

Description: NC-50 **Lab Sample ID:** C501626-01 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 11:15 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Calcium [7440-70-2]^	**5010**		ug/L	1	39.0	100	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Copper [7440-50-8]^	**2.46**	J	ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Magnesium [7439-95-4]^	**1740**		ug/L	1	23.0	100	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Potassium [7440-09-7]^	**2420**		ug/L	1	150	500	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Sodium [7440-23-5]^	**4290**		ug/L	1	400	500	5B10032	EPA 6010C	02/11/15 11:14	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5B10032	EPA 6010C	02/11/15 11:14	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5B11001	EPA 350.1	02/11/15 09:33	SHA	
Chloride [16887-00-6]^	**4.9**	J	mg/L	1	2.2	5.0	5B10013	EPA 300.0	02/10/15 12:08	AJB	
Sulfate as SO4 [14808-79-8]^	**4.5**	J	mg/L	1	2.9	5.0	5B10013	EPA 300.0	02/10/15 12:08	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**20**		mg/L	1	14	15	5B19002	EPA 310.2	02/19/15 11:06	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.1**		mg/L	1	0.32	1.0	5B19003	SM 5310B-2000	02/20/15 18:10	RSA	

Description: NC-50 **Lab Sample ID:** C501626-02 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 11:15 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**2.24**	J	ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:17	JDH	

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ANALYTICAL RESULTS

Description: SR 1555 **Lab Sample ID:** C501626-03 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 10:30 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Calcium [7440-70-2]^	**5170**		ug/L	1	39.0	100	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Copper [7440-50-8]^	**2.75**	J	ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Magnesium [7439-95-4]^	**1820**		ug/L	1	23.0	100	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Potassium [7440-09-7]^	**2190**		ug/L	1	150	500	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Sodium [7440-23-5]^	**5500**		ug/L	1	400	500	5B10032	EPA 6010C	02/11/15 11:19	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5B10032	EPA 6010C	02/11/15 11:19	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5B11001	EPA 350.1	02/11/15 09:35	SHA	
Chloride [16887-00-6]^	**5.3**		mg/L	1	2.2	5.0	5B10013	EPA 300.0	02/10/15 12:25	AJB	
Sulfate as SO4 [14808-79-8]^	**4.4**	J	mg/L	1	2.9	5.0	5B10013	EPA 300.0	02/10/15 12:25	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**22**		mg/L	1	14	15	5B19002	EPA 310.2	02/19/15 11:07	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.3**		mg/L	1	0.32	1.0	5B19003	SM 5310B-2000	02/20/15 18:10	RSA	

Description: SR 1555 **Lab Sample ID:** C501626-04 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 10:30 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:22	JDH	

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ANALYTICAL RESULTS

Description: NC 210 **Lab Sample ID:** C501626-05 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 09:45 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Calcium [7440-70-2]^	**5050**		ug/L	1	39.0	100	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Lead [7439-92-1]^	ND		ug/L	1	2.10	10.0	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Magnesium [7439-95-4]^	**1950**		ug/L	1	23.0	100	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Potassium [7440-09-7]^	**2110**		ug/L	1	150	500	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Sodium [7440-23-5]^	**5390**		ug/L	1	400	500	5B10032	EPA 6010C	02/11/15 11:24	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5B10032	EPA 6010C	02/11/15 11:24	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5B11001	EPA 350.1	02/11/15 09:37	SHA	
Chloride [16887-00-6]^	**6.0**		mg/L	1	2.2	5.0	5B10013	EPA 300.0	02/10/15 12:42	AJB	
Sulfate as SO4 [14808-79-8]^	**4.6**	J	mg/L	1	2.9	5.0	5B10013	EPA 300.0	02/10/15 12:42	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**22**		mg/L	1	14	15	5B19002	EPA 310.2	02/19/15 11:10	AJB	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.4**		mg/L	1	0.32	1.0	5B19003	SM 5310B-2000	02/20/15 18:10	RSA	

Description: NC 210 **Lab Sample ID:** C501626-06 **Received:** 02/06/15 15:30
Matrix: Water **Sampled:** 02/06/15 09:45 **Work Order:** C501626
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5B10032	EPA 6010C	02/11/15 11:27	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5B10032 - EPA 3005A

Blank (5B10032-BLK1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:07

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	2.10	U	10.0	ug/L							
Magnesium	23.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

Blank (5B10032-BLK2) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							

LCS (5B10032-BS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:13

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.5		1.00	ug/L	20.0		103	80-120			
Calcium	2110		100	ug/L	2000		105	80-120			
Copper	198		10.0	ug/L	200		99	80-120			
Lead	211		10.0	ug/L	200		105	80-120			
Magnesium	2060		100	ug/L	2000		103	80-120			
Nickel	206		10.0	ug/L	200		103	80-120			
Potassium	9950		500	ug/L	10000		100	80-120			
Sodium	10100		500	ug/L	10000		101	80-120			
Zinc	208		10.0	ug/L	200		104	80-120			

Matrix Spike (5B10032-MS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:19

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.3		1.00	ug/L	20.0	0.360 U	106	75-125			
Calcium	38900		100	ug/L	2000	37600	65	75-125			QM-05
Copper	201		10.0	ug/L	200	1.60 U	101	75-125			
Lead	209		10.0	ug/L	200	2.10 U	105	75-125			
Magnesium	9010		100	ug/L	2000	7190	91	75-125			
Nickel	212		10.0	ug/L	200	1.80 U	106	75-125			
Potassium	13200		500	ug/L	10000	3210	100	75-125			
Sodium	24400		500	ug/L	10000	14600	98	75-125			
Zinc	241		10.0	ug/L	200	25.2	108	75-125			

Matrix Spike Dup (5B10032-MSD1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:21

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.7		1.00	ug/L	20.0	0.360 U	104	75-125	3	20	
Calcium	39900		100	ug/L	2000	37600	112	75-125	2	20	
Copper	205		10.0	ug/L	200	1.60 U	102	75-125	2	20	
Lead	213		10.0	ug/L	200	2.10 U	106	75-125	2	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5B10032 - EPA 3005A - Continued

Matrix Spike Dup (5B10032-MSD1) Continued Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:21

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Magnesium	9420		100	ug/L	2000	7190	111	75-125	4	20	
Nickel	206		10.0	ug/L	200	1.80 U	103	75-125	3	20	
Potassium	13700		500	ug/L	10000	3210	105	75-125	3	20	
Sodium	25100		500	ug/L	10000	14600	105	75-125	3	20	
Zinc	235		10.0	ug/L	200	25.2	105	75-125	3	20	

Post Spike (5B10032-PS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:24

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0197		0.00100	mg/L	0.0200	0.000107	98	80-120			
Calcium	38.2		0.100	mg/L	2.00	37.6	26	80-120			QM-08
Copper	0.185		0.0100	mg/L	0.200	0.000744	92	80-120			
Lead	0.192		0.0100	mg/L	0.200	-0.00114	96	80-120			
Magnesium	8.64		0.100	mg/L	2.00	7.19	73	80-120			QM-08
Nickel	0.186		0.0100	mg/L	0.200	-0.000482	93	80-120			
Potassium	12.4		0.500	mg/L	10.0	3.21	92	80-120			
Sodium	23.3		0.500	mg/L	10.0	14.6	87	80-120			
Zinc	0.213		0.0100	mg/L	0.200	0.0252	94	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5B10032 - EPA 3005A

Blank (5B10032-BLK2) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (5B10032-BS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:13

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	198		10.0	ug/L	200		99	80-120			

Matrix Spike (5B10032-MS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:19

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	201		10.0	ug/L	200	1.60 U	101	75-125			

Matrix Spike Dup (5B10032-MSD1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:21

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	205		10.0	ug/L	200	1.60 U	102	75-125	2	20	

Post Spike (5B10032-PS1) Prepared: 02/10/2015 16:04 Analyzed: 02/11/2015 10:24

Source: C417026-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.185		0.0100	mg/L	0.200	0.000744	92	80-120			

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5B10013 - NO PREP

Blank (5B10013-BLK1) Prepared: 02/10/2015 08:50 Analyzed: 02/10/2015 10:11

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (5B10013-BS1) Prepared: 02/10/2015 08:50 Analyzed: 02/10/2015 10:28

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	48		5.0	mg/L	50.0		96	90-110			
Sulfate as SO4	47		5.0	mg/L	50.0		95	90-110			

Matrix Spike (5B10013-MS1) Prepared: 02/10/2015 08:50 Analyzed: 02/10/2015 12:59

Source: C500553-04

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	36		5.0	mg/L	20.0	17	96	90-110			
Sulfate as SO4	31		5.0	mg/L	20.0	13	89	90-110			QM-05

Matrix Spike Dup (5B10013-MSD1) Prepared: 02/10/2015 08:50 Analyzed: 02/10/2015 13:49

Source: C500553-04

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	37		5.0	mg/L	20.0	17	100	90-110	2	10	
Sulfate as SO4	32		5.0	mg/L	20.0	13	93	90-110	2	10	

Batch 5B11001 - NO PREP

Blank (5B11001-BLK1) Prepared: 02/11/2015 07:06 Analyzed: 02/11/2015 08:41

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5B11001-BS1) Prepared: 02/11/2015 07:06 Analyzed: 02/11/2015 08:43

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.96		0.10	mg/L	0.997		96	90-110			

Matrix Spike (5B11001-MS1) Prepared: 02/11/2015 07:06 Analyzed: 02/11/2015 08:48

Source: C416551-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	18		2.0	mg/L	7.96	10	96	90-110			

Matrix Spike Dup (5B11001-MSD1) Prepared: 02/11/2015 07:06 Analyzed: 02/11/2015 08:50

Source: C416551-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	18		2.0	mg/L	7.96	10	101	90-110	2	10	

Batch 5B19002 - NO PREP

Blank (5B19002-BLK1) Prepared: 02/19/2015 07:58 Analyzed: 02/19/2015 10:48

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5B19002 - NO PREP - Continued

Blank (5B19002-BLK1) Continued Prepared: 02/19/2015 07:58 Analyzed: 02/19/2015 10:48

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5B19002-BS1) Prepared: 02/19/2015 07:58 Analyzed: 02/19/2015 10:49

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	97		15	mg/L	100		97	80-120			

Matrix Spike (5B19002-MS1) Prepared: 02/19/2015 07:58 Analyzed: 02/19/2015 10:51

Source: C501868-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	710		75	mg/L	200	500	104	80-120			

Matrix Spike Dup (5B19002-MSD1) Prepared: 02/19/2015 07:58 Analyzed: 02/19/2015 10:52

Source: C501868-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	710		75	mg/L	200	500	104	80-120	0.01	25	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5B19003 - NO PREP

Blank (5B19003-BLK1) Prepared: 02/20/2015 10:00 Analyzed: 02/20/2015 18:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.32	U	1.0	mg/L							

LCS (5B19003-BS1) Prepared: 02/20/2015 10:00 Analyzed: 02/20/2015 18:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	37		1.0	mg/L	40.0		93	85-115			

Matrix Spike (5B19003-MS1) Prepared: 02/20/2015 10:00 Analyzed: 02/20/2015 18:10

Source: A500757-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	40		1.0	mg/L	40.0	0.39	99	85-115			

Matrix Spike Dup (5B19003-MSD1) Prepared: 02/20/2015 10:00 Analyzed: 02/20/2015 18:10

Source: A500757-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	39		1.0	mg/L	40.0	0.39	97	85-115	2	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-08	Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test).

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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Client Name: Catena Group	Project Number:
Address: 410-B Millstone Drive	Project Name/Desc: Swift Creek Water Quality
City/ST/Zip: Hillsborough NC 27278	PO # / Billing Info:
Tel: 919-732-1300 Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print): Nancy Scott	Billing Contact: Nancy Scott
Sampler(s) Signature: NScott	Site Location / Time Zone:

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due __/__/__

Lab Workorder: C501620

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2, Chloride 300	Ammonia 350.1	Ca, Cd, Cu, K, Mg, Na, Ni, Pb, Zn	Cu/F	Sulfate 300	TOC SM5310B Dissolved					Sample Comments
	NC 50	2/6/15	11:15		WA	6											
	SR 1555	2/6/15	10:30		WA	6											
	NC 210	2/6/15	9:45		WA	6											

Requested Analyses

Preservation (See Codes) (Combine as necessary)

<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By: NScott	Date/Time: 2/6/15 3:30	Received By:	Date/Time: 2-6-15 1530
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 3.4°c		Condition Upon Receipt: √ Acceptable ___ Unacceptable	

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments)

Preservation: **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

ENCO Laboratories

Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Wednesday, April 22, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C504461

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, April 7, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC-50 **Lab ID: C504461-01** **Sampled: 04/07/15 14:45** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	05/05/15	04/09/15 09:53	04/10/15 18:29
EPA 310.2	04/21/15	04/10/15 07:22	04/10/15 09:32
EPA 350.1	05/05/15	04/10/15 10:02	04/10/15 13:16
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 13:41
SM 5310B-2000	05/05/15	04/15/15 15:00	04/15/15 20:59

Client ID: NC-50 **Lab ID: C504461-02** **Sampled: 04/07/15 14:45** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 14:39

Client ID: SR 1555 **Lab ID: C504461-03** **Sampled: 04/07/15 14:15** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	05/05/15	04/09/15 09:53	04/10/15 18:47
EPA 310.2	04/21/15	04/10/15 07:22	04/10/15 09:33
EPA 350.1	05/05/15	04/10/15 10:02	04/10/15 13:18
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 14:42
SM 5310B-2000	05/05/15	04/15/15 15:00	04/15/15 20:59

Client ID: SR 1555 **Lab ID: C504461-04** **Sampled: 04/07/15 14:15** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 14:44

Client ID: NC 210 **Lab ID: C504461-05** **Sampled: 04/07/15 13:45** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	05/05/15	04/09/15 09:53	04/10/15 19:06
EPA 310.2	04/21/15	04/10/15 07:22	04/10/15 09:34
EPA 350.1	05/05/15	04/10/15 10:02	04/10/15 13:19
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 14:47
SM 5310B-2000	05/05/15	04/15/15 15:00	04/15/15 20:59

Client ID: NC 210 **Lab ID: C504461-06** **Sampled: 04/07/15 13:45** **Received: 04/07/15 15:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	10/04/15	04/16/15 11:48	04/17/15 14:49

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SAMPLE DETECTION SUMMARY

Client ID: NC-50 **Lab ID:** C504461-01

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	7000		39.0	100	ug/L	EPA 6010C	
Chloride	11		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	5.91	JB	1.60	10.0	ug/L	EPA 6010C	J-01
Magnesium - Total	2290		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2570		150	500	ug/L	EPA 6010C	
Sodium - Total	8620		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.9	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	29		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	6.1		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID:** C504461-02

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	4.92	JB	1.60	10.0	ug/L	EPA 6010C	J-01

Client ID: SR 1555 **Lab ID:** C504461-03

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	6550		39.0	100	ug/L	EPA 6010C	
Chloride	8.3		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	4.13	JB	1.60	10.0	ug/L	EPA 6010C	J-01
Magnesium - Total	2230		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2330		150	500	ug/L	EPA 6010C	
Sodium - Total	8040		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.0	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	30		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.8		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: SR 1555 **Lab ID:** C504461-04

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	4.17	JB	1.60	10.0	ug/L	EPA 6010C	J-01

Client ID: NC 210 **Lab ID:** C504461-05

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	6850		39.0	100	ug/L	EPA 6010C	
Chloride	8.5		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	4.65	JB	1.60	10.0	ug/L	EPA 6010C	J-01
Magnesium - Total	2660		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2460		150	500	ug/L	EPA 6010C	
Sodium - Total	8460		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.2	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	26		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.1		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC 210 **Lab ID:** C504461-06

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	4.13	JB	1.60	10.0	ug/L	EPA 6010C	J-01

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ANALYTICAL RESULTS

Description: NC-50 **Lab Sample ID:** C504461-01 **Received:** 04/07/15 15:30
Matrix: Water **Sampled:** 04/07/15 14:45 **Work Order:** C504461
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Calcium [7440-70-2]^	**7000**		ug/L	1	39.0	100	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Copper [7440-50-8]^	**5.91**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 13:41	JDH	J-01
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Magnesium [7439-95-4]^	**2290**		ug/L	1	29.0	100	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Potassium [7440-09-7]^	**2570**		ug/L	1	150	500	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Sodium [7440-23-5]^	**8620**		ug/L	1	400	500	5D16018	EPA 6010C	04/17/15 13:41	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5D16018	EPA 6010C	04/17/15 13:41	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5D10011	EPA 350.1	04/10/15 13:16	SHA	
Chloride [16887-00-6]^	**11**		mg/L	1	2.2	5.0	5D09010	EPA 300.0	04/10/15 18:29	SHA	
Sulfate as SO4 [14808-79-8]^	**4.9**	J	mg/L	1	2.9	5.0	5D09010	EPA 300.0	04/10/15 18:29	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**29**		mg/L	1	14	15	5D10001	EPA 310.2	04/10/15 09:32	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**6.1**		mg/L	1	0.34	1.0	5D15005	SM 5310B-2000	04/15/15 20:59	RSA	

Description: NC-50 **Lab Sample ID:** C504461-02 **Received:** 04/07/15 15:30
Matrix: Water **Sampled:** 04/07/15 14:45 **Work Order:** C504461
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**4.92**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 14:39	JDH	J-01

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ANALYTICAL RESULTS

Description: SR 1555 | **Lab Sample ID:** C504461-03 | **Received:** 04/07/15 15:30
Matrix: Water | **Sampled:** 04/07/15 14:15 | **Work Order:** C504461
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Calcium [7440-70-2]^	**6550**		ug/L	1	39.0	100	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Copper [7440-50-8]^	**4.13**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 14:42	JDH	J-01
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Magnesium [7439-95-4]^	**2230**		ug/L	1	29.0	100	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Potassium [7440-09-7]^	**2330**		ug/L	1	150	500	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Sodium [7440-23-5]^	**8040**		ug/L	1	400	500	5D16018	EPA 6010C	04/17/15 14:42	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5D16018	EPA 6010C	04/17/15 14:42	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5D10011	EPA 350.1	04/10/15 13:18	SHA	
Chloride [16887-00-6]^	**8.3**		mg/L	1	2.2	5.0	5D09010	EPA 300.0	04/10/15 18:47	SHA	
Sulfate as SO4 [14808-79-8]^	**4.0**	J	mg/L	1	2.9	5.0	5D09010	EPA 300.0	04/10/15 18:47	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**30**		mg/L	1	14	15	5D10001	EPA 310.2	04/10/15 09:33	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.8**		mg/L	1	0.34	1.0	5D15005	SM 5310B-2000	04/15/15 20:59	RSA	

Description: SR 1555 | **Lab Sample ID:** C504461-04 | **Received:** 04/07/15 15:30
Matrix: Water | **Sampled:** 04/07/15 14:15 | **Work Order:** C504461
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**4.17**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 14:44	JDH	J-01

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ANALYTICAL RESULTS

Description: NC 210 | **Lab Sample ID:** C504461-05 | **Received:** 04/07/15 15:30
Matrix: Water | **Sampled:** 04/07/15 13:45 | **Work Order:** C504461
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Calcium [7440-70-2]^	**6850**		ug/L	1	39.0	100	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Copper [7440-50-8]^	**4.65**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 14:47	JDH	J-01
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Magnesium [7439-95-4]^	**2660**		ug/L	1	29.0	100	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Potassium [7440-09-7]^	**2460**		ug/L	1	150	500	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Sodium [7440-23-5]^	**8460**		ug/L	1	400	500	5D16018	EPA 6010C	04/17/15 14:47	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5D16018	EPA 6010C	04/17/15 14:47	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5D10011	EPA 350.1	04/10/15 13:19	SHA	
Chloride [16887-00-6]^	**8.5**		mg/L	1	2.2	5.0	5D09010	EPA 300.0	04/10/15 19:06	SHA	
Sulfate as SO4 [14808-79-8]^	**4.2**	J	mg/L	1	2.9	5.0	5D09010	EPA 300.0	04/10/15 19:06	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**26**		mg/L	1	14	15	5D10001	EPA 310.2	04/10/15 09:34	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.1**		mg/L	1	0.34	1.0	5D15005	SM 5310B-2000	04/15/15 20:59	RSA	

Description: NC 210 | **Lab Sample ID:** C504461-06 | **Received:** 04/07/15 15:30
Matrix: Water | **Sampled:** 04/07/15 13:45 | **Work Order:** C504461
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**4.13**	JB	ug/L	1	1.60	10.0	5D16018	EPA 6010C	04/17/15 14:49	JDH	J-01

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5D16018 - EPA 3005A

Blank (5D16018-BLK1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:28

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	**2.56**	**J**	10.0	ug/L							
Lead	3.10	U	10.0	ug/L							
Magnesium	29.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (5D16018-BS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:38

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	22.3		1.00	ug/L	20.0		112	80-120			
Calcium	2320		100	ug/L	2000		116	80-120			
Copper	216	B	10.0	ug/L	200		108	80-120			
Lead	222		10.0	ug/L	200		111	80-120			
Magnesium	2190		100	ug/L	2000		110	80-120			
Nickel	221		10.0	ug/L	200		110	80-120			
Potassium	11200		500	ug/L	10000		112	80-120			
Sodium	10900		500	ug/L	10000		109	80-120			
Zinc	223		10.0	ug/L	200		111	80-120			

Matrix Spike (5D16018-MS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:43

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	22.6		1.00	ug/L	20.0	0.360 U	113	75-125			
Calcium	9020		100	ug/L	2000	7000	101	75-125			
Copper	223	B	10.0	ug/L	200	5.91	109	75-125			
Lead	223		10.0	ug/L	200	3.10 U	112	75-125			
Magnesium	4420		100	ug/L	2000	2290	106	75-125			
Nickel	224		10.0	ug/L	200	1.80 U	112	75-125			
Potassium	13600		500	ug/L	10000	2570	111	75-125			
Sodium	19300		500	ug/L	10000	8620	107	75-125			
Zinc	229		10.0	ug/L	200	3.80 U	114	75-125			

Matrix Spike Dup (5D16018-MSD1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:46

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	23.3		1.00	ug/L	20.0	0.360 U	116	75-125	3	20	
Calcium	8640		100	ug/L	2000	7000	82	75-125	4	20	
Copper	221	B	10.0	ug/L	200	5.91	107	75-125	1	20	
Lead	223		10.0	ug/L	200	3.10 U	111	75-125	0.1	20	
Magnesium	4290		100	ug/L	2000	2290	100	75-125	3	20	
Nickel	232		10.0	ug/L	200	1.80 U	116	75-125	3	20	
Potassium	13300		500	ug/L	10000	2570	108	75-125	2	20	
Sodium	18800		500	ug/L	10000	8620	102	75-125	3	20	
Zinc	236		10.0	ug/L	200	3.80 U	118	75-125	3	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5D16018 - EPA 3005A - Continued

Post Spike (5D16018-PS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:48

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0219		0.00100	mg/L	0.0200	-7.35E-5	109	80-120			
Calcium	8.61		0.100	mg/L	2.00	7.00	80	80-120			
Copper	0.209	B	0.0100	mg/L	0.200	0.00591	102	80-120			
Lead	0.208		0.0100	mg/L	0.200	2.07E-5	104	80-120			
Magnesium	4.20		0.100	mg/L	2.00	2.29	96	80-120			
Nickel	0.217		0.0100	mg/L	0.200	8.54E-5	108	80-120			
Potassium	12.7		0.500	mg/L	10.0	2.57	102	80-120			
Sodium	18.4		0.500	mg/L	10.0	8.62	98	80-120			
Zinc	0.222		0.0100	mg/L	0.200	0.00209	110	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5D16018 - EPA 3005A

Blank (5D16018-BLK2) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:35

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	**3.11**	**J**	10.0	ug/L							

LCS (5D16018-BS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:38

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	216	B	10.0	ug/L	200		108	80-120			

Matrix Spike (5D16018-MS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:43

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	223	B	10.0	ug/L	200	5.91	109	75-125			

Matrix Spike Dup (5D16018-MSD1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:46

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	221	B	10.0	ug/L	200	5.91	107	75-125	1	20	

Post Spike (5D16018-PS1) Prepared: 04/16/2015 11:48 Analyzed: 04/17/2015 13:48

Source: C504461-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.209	B	0.0100	mg/L	0.200	0.00591	102	80-120			

Classical Chemistry Parameters - Quality Control

Batch 5D09010 - NO PREP

Blank (5D09010-BLK1) Prepared: 04/09/2015 09:53 Analyzed: 04/10/2015 10:08

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5D09010 - NO PREP - Continued

LCS (5D09010-BS1) Prepared: 04/09/2015 09:53 Analyzed: 04/10/2015 12:00

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	53		5.0	mg/L	50.0		105	90-110			
Sulfate as SO4	50		5.0	mg/L	50.0		101	90-110			

Matrix Spike (5D09010-MS1) Prepared: 04/09/2015 09:53 Analyzed: 04/10/2015 12:18

Source: C502700-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	680		50	mg/L	200	450	117	90-110			QM-07
Sulfate as SO4	340		50	mg/L	200	140	100	90-110			

Matrix Spike (5D09010-MS2) Prepared: 04/09/2015 09:53 Analyzed: 04/10/2015 13:14

Source: C502701-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	680		50	mg/L	200	460	109	90-110			
Sulfate as SO4	330		50	mg/L	200	130	97	90-110			

Matrix Spike Dup (5D09010-MSD1) Prepared: 04/09/2015 09:53 Analyzed: 04/10/2015 12:37

Source: C502700-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	370		50	mg/L	200	450	NR	90-110	59	10	QM-07, QM-11
Sulfate as SO4	180		50	mg/L	200	140	19	90-110	62	10	QM-07, QM-11

Batch 5D10001 - NO PREP

Blank (5D10001-BLK1) Prepared: 04/10/2015 07:22 Analyzed: 04/10/2015 09:10

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5D10001-BS1) Prepared: 04/10/2015 07:22 Analyzed: 04/10/2015 09:11

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	100		15	mg/L	100		101	80-120			

Matrix Spike (5D10001-MS1) Prepared: 04/10/2015 07:22 Analyzed: 04/10/2015 09:13

Source: C503561-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	370		75	mg/L	200	170	101	80-120			

Matrix Spike Dup (5D10001-MSD1) Prepared: 04/10/2015 07:22 Analyzed: 04/10/2015 09:13

Source: C503561-04

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	350		75	mg/L	200	170	93	80-120	5	25	

Batch 5D10011 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5D10011 - NO PREP - Continued

Blank (5D10011-BLK1) Prepared: 04/10/2015 10:02 Analyzed: 04/10/2015 12:23

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5D10011-BS1) Prepared: 04/10/2015 10:02 Analyzed: 04/10/2015 12:25

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.97		0.10	mg/L	0.997		97	90-110			

Matrix Spike (5D10011-MS1) Prepared: 04/10/2015 10:02 Analyzed: 04/10/2015 12:30

Source: C502640-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.35		0.10	mg/L	0.387	0.045 U	91	90-110			

Matrix Spike (5D10011-MS2) Prepared: 04/10/2015 10:02 Analyzed: 04/10/2015 12:36

Source: C502681-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	150		10	mg/L	39.8	100	112	90-110			QM-05

Matrix Spike Dup (5D10011-MSD1) Prepared: 04/10/2015 10:02 Analyzed: 04/10/2015 12:32

Source: C502640-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.36		0.10	mg/L	0.387	0.045 U	94	90-110	4	10	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5D15005 - NO PREP

Blank (5D15005-BLK1) Prepared: 04/15/2015 15:00 Analyzed: 04/15/2015 20:59

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.34	U	1.0	mg/L							

LCS (5D15005-BS1) Prepared: 04/15/2015 15:00 Analyzed: 04/15/2015 20:59

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	41		1.0	mg/L	40.0		103	85-115			

Matrix Spike (5D15005-MS1) Prepared: 04/15/2015 15:00 Analyzed: 04/15/2015 20:59

Source: A502188-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	68		1.0	mg/L	40.0	30	94	85-115			

Matrix Spike Dup (5D15005-MSD1) Prepared: 04/15/2015 15:00 Analyzed: 04/15/2015 20:59

Source: A502188-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	72		1.0	mg/L	40.0	30	106	85-115	7	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
J-01	Result is estimated due to positive results in the associated method blank.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-11	Precision between duplicate matrix spikes of the same sample was outside acceptance limits.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
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102-A Woodwinds Industrial Ct
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

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Page ____ of ____

Client Name: The Catena Group	Project Number:
Address: 1000 Corporate Drive, Suite 101	Project Name/Desc: Swift Creek
City/ST/Zip: Hillsborough NC 27278	PO # / Billing Info:
Tel: 919-732-1300 Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print):	Billing Contact:
Sampler(s) Signature:	Site Location / Time Zone:

Requested Analyses

Alkalinity 310.2, Chloride 300 | Ammonia 350.1 | Ca, Cd, Cu, K, Mg, Na, Ni, Pb, Zn | Cu/F | Sulfate 300 | TOC SM5310B Dissolved

Preservation (See Codes) (Combine as necessary)

Requested Turnaround Times

Note: Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C504461

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Sample Comments
	NC 50	4/7/15	2:45			6	
	SR 1555	4/7/15	2:15			6	
	NC 210	4/7/15	1:45			6	
						18	<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By: Sarah Blutstein	Date/Time: 4/7/15 3:30	Received By:	Date/Time: 4/7/15 1550
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 4 @ 6 C		Condition Upon Receipt: X Acceptable ___ Unacceptable	

Matrix: GW-Groundwater SO-Soil DW-Drinking Water SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments) **Preservation:** N-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

ENCO Laboratories

Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Thursday, May 21, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C505742

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Thursday, May 7, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC 210 **Lab ID: C505742-01** **Sampled: 05/07/15 13:25** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	06/04/15	05/13/15 22:01	05/13/15 22:01
EPA 310.2	05/21/15	05/08/15 09:38	05/08/15 13:10
EPA 350.1	06/04/15	05/13/15 07:21	05/13/15 09:57
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 11:06
SM 5310B-2000	06/04/15	05/19/15 08:25	05/19/15 16:44

Client ID: SR 1555 **Lab ID: C505742-02** **Sampled: 05/07/15 13:55** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	06/04/15	05/13/15 22:19	05/13/15 22:19
EPA 310.2	05/21/15	05/08/15 09:38	05/08/15 13:10
EPA 350.1	06/04/15	05/13/15 07:21	05/13/15 09:59
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 12:03
SM 5310B-2000	06/04/15	05/19/15 08:25	05/19/15 16:44

Client ID: NC-50 **Lab ID: C505742-03** **Sampled: 05/07/15 14:30** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	06/04/15	05/13/15 22:36	05/13/15 22:36
EPA 310.2	05/21/15	05/08/15 09:38	05/08/15 13:11
EPA 350.1	06/04/15	05/13/15 07:21	05/13/15 10:01
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 12:06
SM 5310B-2000	06/04/15	05/19/15 08:25	05/19/15 16:44

Client ID: NC 210 Dissolved **Lab ID: C505742-04** **Sampled: 05/07/15 13:25** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 12:08

Client ID: SR 1555 Dissolved **Lab ID: C505742-05** **Sampled: 05/07/15 13:55** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 12:11

Client ID: NC 50 Dissolved **Lab ID: C505742-06** **Sampled: 05/07/15 14:30** **Received: 05/07/15 15:17**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	11/03/15	05/18/15 16:30	05/20/15 12:13

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SAMPLE DETECTION SUMMARY

Client ID: NC 210 **Lab ID: C505742-01**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.060	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	5790		39.0	100	ug/L	EPA 6010C	
Chloride	7.1		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	2.01	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	2270		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2360		150	500	ug/L	EPA 6010C	
Sodium - Total	7070		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.8	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	25		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.3		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: SR 1555 **Lab ID: C505742-02**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.078	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	5460		39.0	100	ug/L	EPA 6010C	
Chloride	7.3		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2030		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2160		150	500	ug/L	EPA 6010C	
Sodium - Total	7500		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.8	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	21		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.9		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID: C505742-03**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.051	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6310		39.0	100	ug/L	EPA 6010C	
Chloride	8.8		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	2.03	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	1970		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2500		150	500	ug/L	EPA 6010C	
Sodium - Total	7010		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.2	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	19		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	6.0		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC 50 Dissolved **Lab ID: C505742-06**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	1.75	J	1.60	10.0	ug/L	EPA 6010C	

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ANALYTICAL RESULTS

Description: NC 210 | **Lab Sample ID:** C505742-01 | **Received:** 05/07/15 15:17

Matrix: Water | **Sampled:** 05/07/15 13:25 | **Work Order:** C505742

Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Calcium [7440-70-2]^	**5790**		ug/L	1	39.0	100	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Copper [7440-50-8]^	**2.01**	J	ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Magnesium [7439-95-4]^	**2270**		ug/L	1	29.0	100	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Potassium [7440-09-7]^	**2360**		ug/L	1	150	500	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Sodium [7440-23-5]^	**7070**		ug/L	1	400	500	5E18026	EPA 6010C	05/20/15 11:06	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5E18026	EPA 6010C	05/20/15 11:06	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.060**	J	mg/L	1	0.045	0.10	5E13001	EPA 350.1	05/13/15 09:57	SHA	
Chloride [16887-00-6]^	**7.1**		mg/L	1	2.2	5.0	5E13007	EPA 300.0	05/13/15 22:01	AJB	
Sulfate as SO4 [14808-79-8]^	**3.8**	J	mg/L	1	2.9	5.0	5E13007	EPA 300.0	05/13/15 22:01	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**25**		mg/L	1	14	15	5E08009	EPA 310.2	05/08/15 13:10	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.3**		mg/L	1	0.34	1.0	5E19004	SM 5310B-2000	05/19/15 16:44	RSA	

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ANALYTICAL RESULTS

Description: SR 1555 | **Lab Sample ID:** C505742-02 | **Received:** 05/07/15 15:17

Matrix: Water | **Sampled:** 05/07/15 13:55 | **Work Order:** C505742

Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Calcium [7440-70-2]^	**5460**		ug/L	1	39.0	100	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Magnesium [7439-95-4]^	**2030**		ug/L	1	29.0	100	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Potassium [7440-09-7]^	**2160**		ug/L	1	150	500	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Sodium [7440-23-5]^	**7500**		ug/L	1	400	500	5E18026	EPA 6010C	05/20/15 12:03	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5E18026	EPA 6010C	05/20/15 12:03	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.078**	J	mg/L	1	0.045	0.10	5E13001	EPA 350.1	05/13/15 09:59	SHA	
Chloride [16887-00-6]^	**7.3**		mg/L	1	2.2	5.0	5E13007	EPA 300.0	05/13/15 22:19	AJB	
Sulfate as SO4 [14808-79-8]^	**3.8**	J	mg/L	1	2.9	5.0	5E13007	EPA 300.0	05/13/15 22:19	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**21**		mg/L	1	14	15	5E08009	EPA 310.2	05/08/15 13:10	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.9**		mg/L	1	0.34	1.0	5E19004	SM 5310B-2000	05/19/15 16:44	RSA	

ANALYTICAL RESULTS

Description: NC-50 **Lab Sample ID:** C505742-03 **Received:** 05/07/15 15:17
Matrix: Water **Sampled:** 05/07/15 14:30 **Work Order:** C505742
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Calcium [7440-70-2]^	**6310**		ug/L	1	39.0	100	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Copper [7440-50-8]^	**2.03**	J	ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Magnesium [7439-95-4]^	**1970**		ug/L	1	29.0	100	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Potassium [7440-09-7]^	**2500**		ug/L	1	150	500	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Sodium [7440-23-5]^	**7010**		ug/L	1	400	500	5E18026	EPA 6010C	05/20/15 12:06	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5E18026	EPA 6010C	05/20/15 12:06	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.051**	J	mg/L	1	0.045	0.10	5E13001	EPA 350.1	05/13/15 10:01	SHA	
Chloride [16887-00-6]^	**8.8**		mg/L	1	2.2	5.0	5E13007	EPA 300.0	05/13/15 22:36	AJB	
Sulfate as SO4 [14808-79-8]^	**4.2**	J	mg/L	1	2.9	5.0	5E13007	EPA 300.0	05/13/15 22:36	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**19**		mg/L	1	14	15	5E08009	EPA 310.2	05/08/15 13:11	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**6.0**		mg/L	1	0.34	1.0	5E19004	SM 5310B-2000	05/19/15 16:44	RSA	

Description: NC 210 Dissolved **Lab Sample ID:** C505742-04 **Received:** 05/07/15 15:17
Matrix: Water **Sampled:** 05/07/15 13:25 **Work Order:** C505742
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 12:08	JDH	

Description: SR 1555 Dissolved **Lab Sample ID:** C505742-05 **Received:** 05/07/15 15:17
Matrix: Water **Sampled:** 05/07/15 13:55 **Work Order:** C505742
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 12:11	JDH	

Description: NC 50 Dissolved **Lab Sample ID:** C505742-06 **Received:** 05/07/15 15:17
Matrix: Water **Sampled:** 05/07/15 14:30 **Work Order:** C505742
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**1.75**	J	ug/L	1	1.60	10.0	5E18026	EPA 6010C	05/20/15 12:13	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5E18026 - EPA 3005A

Blank (5E18026-BLK1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 10:48

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	3.10	U	10.0	ug/L							
Magnesium	29.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (5E18026-BS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.6		1.00	ug/L	20.0		98	80-120			
Calcium	2180		100	ug/L	2000		109	80-120			
Copper	198		10.0	ug/L	200		99	80-120			
Lead	208		10.0	ug/L	200		104	80-120			
Magnesium	2020		100	ug/L	2000		101	80-120			
Nickel	202		10.0	ug/L	200		101	80-120			
Potassium	10400		500	ug/L	10000		104	80-120			
Sodium	9990		500	ug/L	10000		100	80-120			
Zinc	207		10.0	ug/L	200		104	80-120			

Matrix Spike (5E18026-MS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:09

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	18.8		1.00	ug/L	20.0	0.360 U	94	75-125			
Calcium	7640		100	ug/L	2000	5790	93	75-125			
Copper	190		10.0	ug/L	200	2.01	94	75-125			
Lead	198		10.0	ug/L	200	3.10 U	99	75-125			
Magnesium	4200		100	ug/L	2000	2270	97	75-125			
Nickel	193		10.0	ug/L	200	1.80 U	96	75-125			
Potassium	12100		500	ug/L	10000	2360	98	75-125			
Sodium	16900		500	ug/L	10000	7070	98	75-125			
Zinc	199		10.0	ug/L	200	3.80 U	100	75-125			

Matrix Spike Dup (5E18026-MSD1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:11

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	18.7		1.00	ug/L	20.0	0.360 U	94	75-125	0.6	20	
Calcium	7600		100	ug/L	2000	5790	91	75-125	0.6	20	
Copper	190		10.0	ug/L	200	2.01	94	75-125	0.09	20	
Lead	197		10.0	ug/L	200	3.10 U	99	75-125	0.4	20	
Magnesium	4180		100	ug/L	2000	2270	96	75-125	0.4	20	
Nickel	193		10.0	ug/L	200	1.80 U	97	75-125	0.2	20	
Potassium	12100		500	ug/L	10000	2360	97	75-125	0.5	20	
Sodium	16700		500	ug/L	10000	7070	96	75-125	1	20	
Zinc	200		10.0	ug/L	200	3.80 U	100	75-125	0.5	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5E18026 - EPA 3005A - Continued

Post Spike (5E18026-PS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:14

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0187		0.00100	mg/L	0.0200	-0.000124	93	80-120			
Calcium	7.63		0.100	mg/L	2.00	5.79	92	80-120			
Copper	0.190		0.0100	mg/L	0.200	0.00201	94	80-120			
Lead	0.198		0.0100	mg/L	0.200	-0.000677	99	80-120			
Magnesium	4.16		0.100	mg/L	2.00	2.27	95	80-120			
Nickel	0.192		0.0100	mg/L	0.200	0.000347	96	80-120			
Potassium	12.0		0.500	mg/L	10.0	2.36	97	80-120			
Sodium	16.5		0.500	mg/L	10.0	7.07	95	80-120			
Zinc	0.200		0.0100	mg/L	0.200	0.00366	98	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5E18026 - EPA 3005A

Blank (5E18026-BLK1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 10:48

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

Blank (5E18026-BLK2) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 10:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (5E18026-BS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:03

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	198		10.0	ug/L	200		99	80-120			

Matrix Spike (5E18026-MS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:09

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	190		10.0	ug/L	200	2.01	94	75-125			

Matrix Spike Dup (5E18026-MSD1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:11

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	190		10.0	ug/L	200	2.01	94	75-125	0.09	20	

Post Spike (5E18026-PS1) Prepared: 05/18/2015 16:30 Analyzed: 05/20/2015 11:14

Source: C505742-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.190		0.0100	mg/L	0.200	0.00201	94	80-120			

Classical Chemistry Parameters - Quality Control

Batch 5E08009 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5E08009 - NO PREP - Continued

Blank (5E08009-BLK1) Prepared: 05/08/2015 09:38 Analyzed: 05/08/2015 12:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5E08009-BS1) Prepared: 05/08/2015 09:38 Analyzed: 05/08/2015 12:55

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	100		15	mg/L	100		101	80-120			

Matrix Spike (5E08009-MS1) Prepared: 05/08/2015 09:38 Analyzed: 05/08/2015 12:56

Source: C504821-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	J	15	mg/L	37.8	14 U		80-120			QM-05

Matrix Spike Dup (5E08009-MSD1) Prepared: 05/08/2015 09:38 Analyzed: 05/08/2015 12:58

Source: C504821-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	15		15	mg/L	37.8	14 U	39	80-120		25	QM-05

Batch 5E13001 - NO PREP

Blank (5E13001-BLK1) Prepared: 05/13/2015 07:21 Analyzed: 05/13/2015 09:05

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5E13001-BS1) Prepared: 05/13/2015 07:21 Analyzed: 05/13/2015 09:07

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.98		0.10	mg/L	0.997		99	90-110			

Matrix Spike (5E13001-MS1) Prepared: 05/13/2015 07:21 Analyzed: 05/13/2015 09:09

Source: C402499-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.58		0.10	mg/L	0.387	0.23	91	90-110			

Matrix Spike (5E13001-MS2) Prepared: 05/13/2015 07:21 Analyzed: 05/13/2015 09:17

Source: C503988-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	150		10	mg/L	39.8	120	85	90-110			QM-05

Matrix Spike Dup (5E13001-MSD1) Prepared: 05/13/2015 07:21 Analyzed: 05/13/2015 09:13

Source: C402499-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.57		0.10	mg/L	0.387	0.23	88	90-110	2	10	QM-05

Batch 5E13007 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5E13007 - NO PREP - Continued

Blank (5E13007-BLK1) Prepared & Analyzed: 05/13/2015 13:15

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (5E13007-BS1) Prepared & Analyzed: 05/13/2015 12:58

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	53		5.0	mg/L	50.0		106	90-110			
Sulfate as SO4	51		5.0	mg/L	50.0		101	90-110			

Matrix Spike (5E13007-MS2) Prepared & Analyzed: 05/14/2015 05:19

Source: C505175-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	73		5.0	mg/L	20.0	51	112	90-110			QM-05

Matrix Spike (5E13007-MS3) Prepared & Analyzed: 05/13/2015 14:43

Source: C504888-02RE1

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	710		50	mg/L	200	480	119	90-110			QM-05
Sulfate as SO4	340		50	mg/L	200	130	102	90-110			

Matrix Spike (5E13007-MS4) Prepared & Analyzed: 05/13/2015 15:18

Source: C505175-01RE1

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfate as SO4	1600		100	mg/L	400	1100	114	90-110			QM-05

Matrix Spike Dup (5E13007-MSD3) Prepared & Analyzed: 05/13/2015 15:01

Source: C504888-02RE1

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	700		50	mg/L	200	480	112	90-110	2	10	QM-05
Sulfate as SO4	330		50	mg/L	200	130	100	90-110	1	10	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5E19004 - NO PREP

Blank (5E19004-BLK1) Prepared: 05/19/2015 08:25 Analyzed: 05/19/2015 16:44

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.34	U	1.0	mg/L							

LCS (5E19004-BS1) Prepared: 05/19/2015 08:25 Analyzed: 05/19/2015 16:44

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	38		1.0	mg/L	40.0		96	85-115			

QUALITY CONTROL DATA

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5E19004 - NO PREP - Continued

Matrix Spike (5E19004-MS1) Prepared: 05/19/2015 08:25 Analyzed: 05/19/2015 16:44

Source: A502833-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	54		1.0	mg/L	40.0	6.9	119	85-115			QM-07

Matrix Spike Dup (5E19004-MSD1) Prepared: 05/19/2015 08:25 Analyzed: 05/19/2015 16:44

Source: A502833-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	56		1.0	mg/L	40.0	6.9	124	85-115	3	21	QM-07

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page ____ of ____

Client Name: The Catena Group	Project Number:
Address: 1000 Corporate Drive, Suite 101	Project Name/Desc: Swift Creek Water Quality
City/ST/Zip: Hillsborough, NC 27278	PO # / Billing Info:
Tel: (919) 732-1300 Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print):	Billing Contact:
Sampler(s) Signature: NScott	Site Location / Time Zone:

Requested Analyses

Preservation (See Codes) (Combine as necessary)

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2; Chloride 300	Ammonia 350.1	Ca, Cd, Cu, K, Mg, Na, Ni, Pb, Zn	Cu/F	Sulfate 300	TOC SM310B Dissolved	Sample Comments
	NC 210	5/7/15	13:25		SW	6	✓	✓	✓	✓	✓	✓	
	SR 1555	5/7/15	13:55		SW	6	✓	✓	✓	✓	✓	✓	
	NC 50	5/7/15	14:30		SW	6	✓	✓	✓	✓	✓	✓	

<-- Total # of Containers

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C505742

Sample Kit Prepared By	Date/Time	Relinquished By: NScott	Date/Time: 5/7/15 3:17	Received By	Date/Time: 5-7-15 1517
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 4.0°		Condition Upon Receipt: ✓ Acceptable ___ Unacceptable	

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments)

Preservation: **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

Sample Preservation Verification

ENCO Cary

Work Order:	C505742	Project:	Swift Creek Water Quality
Client:	The Catena Group (TH015)	Project #:	[none]
Logged In:	07-May-15 15:55	Logged By:	Andrew S Coons

C505742-01

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

C505742-02

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

C505742-03

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

	Reagent Name	ID		Reagent Name	ID		Reagent Name	ID
1			3			5		
2			4			6		

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Tuesday, June 23, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C505697

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, June 9, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC-210 **Lab ID: C505697-01** **Sampled: 06/09/15 12:05** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/07/15	06/11/15 08:53	06/11/15 14:29
EPA 310.2	06/23/15	06/15/15 07:48	06/15/15 09:22
EPA 350.1	07/07/15	06/17/15 10:24	06/17/15 12:43
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:46
SM 5310B-2000	07/07/15	06/18/15 11:15	06/18/15 12:09

Client ID: SR-1555 **Lab ID: C505697-02** **Sampled: 06/09/15 12:45** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/07/15	06/11/15 08:53	06/11/15 14:46
EPA 310.2	06/23/15	06/15/15 07:48	06/15/15 08:54
EPA 350.1	07/07/15	06/17/15 10:24	06/17/15 12:45
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:49
SM 5310B-2000	07/07/15	06/18/15 11:15	06/18/15 12:09

Client ID: NC-50 **Lab ID: C505697-03** **Sampled: 06/09/15 13:25** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/07/15	06/11/15 08:53	06/11/15 15:03
EPA 310.2	06/23/15	06/15/15 07:48	06/15/15 08:57
EPA 350.1	07/07/15	06/17/15 10:24	06/17/15 12:47
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:51
SM 5310B-2000	07/07/15	06/18/15 11:15	06/18/15 12:09

Client ID: NC-210 Dissolved **Lab ID: C505697-04** **Sampled: 06/09/15 12:05** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:54

Client ID: SR-1555 Dissolved **Lab ID: C505697-05** **Sampled: 06/09/15 12:45** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:56

Client ID: NC-50 Dissolved **Lab ID: C505697-06** **Sampled: 06/09/15 13:25** **Received: 06/09/15 14:30**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/06/15	06/15/15 11:10	06/18/15 13:59

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SAMPLE DETECTION SUMMARY

Client ID: NC-210 **Lab ID:** C505697-01

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Cadmium - Total	0.360	J	0.360	1.00	ug/L	EPA 6010C	
Calcium - Total	7030	B	39.0	100	ug/L	EPA 6010C	QB-01
Chloride	7.5		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	1.74	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	2490		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2310		150	500	ug/L	EPA 6010C	
Sodium - Total	8030		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.3	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	23		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.3		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: SR-1555 **Lab ID:** C505697-02

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	6870	B	39.0	100	ug/L	EPA 6010C	QB-01
Chloride	7.2		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	1.69	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	2180		29.0	100	ug/L	EPA 6010C	
Nickel - Total	2.02	J	1.80	10.0	ug/L	EPA 6010C	
Potassium - Total	2080		150	500	ug/L	EPA 6010C	
Sodium - Total	8520		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.2	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	32		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	4.2		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID:** C505697-03

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.072	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	8180	B	39.0	100	ug/L	EPA 6010C	QB-01
Chloride	9.9		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	5.53	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	2400		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2990		150	500	ug/L	EPA 6010C	
Sodium - Total	8240		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.1	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	30		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.9		0.34	1.0	mg/L	SM 5310B-2000	
Zinc - Total	16.7		3.80	10.0	ug/L	EPA 6010C	

Client ID: NC-210 Dissolved **Lab ID:** C505697-04

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	1.66	J	1.60	10.0	ug/L	EPA 6010C	

Client ID: NC-50 Dissolved **Lab ID:** C505697-06

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Copper - Dissolved	2.79	J	1.60	10.0	ug/L	EPA 6010C	

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ANALYTICAL RESULTS

Description: NC-210 | **Lab Sample ID:** C505697-01 | **Received:** 06/09/15 14:30

Matrix: Water | **Sampled:** 06/09/15 12:05 | **Work Order:** C505697

Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	**0.360**	J	ug/L	1	0.360	1.00	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Calcium [7440-70-2]^	**7030**	B	ug/L	1	39.0	100	5F15026	EPA 6010C	06/18/15 13:46	JDH	QB-01
Copper [7440-50-8]^	**1.74**	J	ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Magnesium [7439-95-4]^	**2490**		ug/L	1	29.0	100	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Potassium [7440-09-7]^	**2310**		ug/L	1	150	500	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Sodium [7440-23-5]^	**8030**		ug/L	1	400	500	5F15026	EPA 6010C	06/18/15 13:46	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5F15026	EPA 6010C	06/18/15 13:46	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5F17014	EPA 350.1	06/17/15 12:43	SHA	
Chloride [16887-00-6]^	**7.5**		mg/L	1	2.2	5.0	5F11013	EPA 300.0	06/11/15 14:29	AJB	
Sulfate as SO4 [14808-79-8]^	**3.3**	J	mg/L	1	2.9	5.0	5F11013	EPA 300.0	06/11/15 14:29	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**23**		mg/L	1	14	15	5F15009	EPA 310.2	06/15/15 09:22	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.3**		mg/L	1	0.34	1.0	5F18004	SM 5310B-2000	06/18/15 12:09	RSA	

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ANALYTICAL RESULTS

Description: SR-1555 | **Lab Sample ID:** C505697-02 | **Received:** 06/09/15 14:30

Matrix: Water | **Sampled:** 06/09/15 12:45 | **Work Order:** C505697

Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Calcium [7440-70-2]^	**6870**	B	ug/L	1	39.0	100	5F15026	EPA 6010C	06/18/15 13:49	JDH	QB-01
Copper [7440-50-8]^	**1.69**	J	ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Magnesium [7439-95-4]^	**2180**		ug/L	1	29.0	100	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Nickel [7440-02-0]^	**2.02**	J	ug/L	1	1.80	10.0	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Potassium [7440-09-7]^	**2080**		ug/L	1	150	500	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Sodium [7440-23-5]^	**8520**		ug/L	1	400	500	5F15026	EPA 6010C	06/18/15 13:49	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5F15026	EPA 6010C	06/18/15 13:49	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5F17014	EPA 350.1	06/17/15 12:45	SHA	
Chloride [16887-00-6]^	**7.2**		mg/L	1	2.2	5.0	5F11013	EPA 300.0	06/11/15 14:46	AJB	
Sulfate as SO4 [14808-79-8]^	**3.2**	J	mg/L	1	2.9	5.0	5F11013	EPA 300.0	06/11/15 14:46	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**32**		mg/L	1	14	15	5F15008	EPA 310.2	06/15/15 08:54	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**4.2**		mg/L	1	0.34	1.0	5F18004	SM 5310B-2000	06/18/15 12:09	RSA	

ANALYTICAL RESULTS

Description: NC-50 **Lab Sample ID:** C505697-03 **Received:** 06/09/15 14:30
Matrix: Water **Sampled:** 06/09/15 13:25 **Work Order:** C505697
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Calcium [7440-70-2]^	**8180**	B	ug/L	1	39.0	100	5F15026	EPA 6010C	06/18/15 13:51	JDH	QB-01
Copper [7440-50-8]^	**5.53**	J	ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Magnesium [7439-95-4]^	**2400**		ug/L	1	29.0	100	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Potassium [7440-09-7]^	**2990**		ug/L	1	150	500	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Sodium [7440-23-5]^	**8240**		ug/L	1	400	500	5F15026	EPA 6010C	06/18/15 13:51	JDH	
Zinc [7440-66-6]^	**16.7**		ug/L	1	3.80	10.0	5F15026	EPA 6010C	06/18/15 13:51	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.072**	J	mg/L	1	0.045	0.10	5F17014	EPA 350.1	06/17/15 12:47	SHA	
Chloride [16887-00-6]^	**9.9**		mg/L	1	2.2	5.0	5F11013	EPA 300.0	06/11/15 15:03	AJB	
Sulfate as SO4 [14808-79-8]^	**4.1**	J	mg/L	1	2.9	5.0	5F11013	EPA 300.0	06/11/15 15:03	AJB	
Total Alkalinity as CaCO3 [471-34-1]^	**30**		mg/L	1	14	15	5F15008	EPA 310.2	06/15/15 08:57	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.9**		mg/L	1	0.34	1.0	5F18004	SM 5310B-2000	06/18/15 12:09	RSA	

Description: NC-210 Dissolved **Lab Sample ID:** C505697-04 **Received:** 06/09/15 14:30
Matrix: Water **Sampled:** 06/09/15 12:05 **Work Order:** C505697
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**1.66**	J	ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:54	JDH	

Description: SR-1555 Dissolved **Lab Sample ID:** C505697-05 **Received:** 06/09/15 14:30
Matrix: Water **Sampled:** 06/09/15 12:45 **Work Order:** C505697
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:56	JDH	

Description: NC-50 Dissolved **Lab Sample ID:** C505697-06 **Received:** 06/09/15 14:30
Matrix: Water **Sampled:** 06/09/15 13:25 **Work Order:** C505697
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	**2.79**	J	ug/L	1	1.60	10.0	5F15026	EPA 6010C	06/18/15 13:59	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5F15026 - EPA 3005A

Blank (5F15026-BLK1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 12:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	**42.7**	**J**	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	3.10	U	10.0	ug/L							
Magnesium	29.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (5F15026-BS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.6		1.00	ug/L	20.0		98	80-120			
Calcium	2180	B	100	ug/L	2000		109	80-120			
Copper	193		10.0	ug/L	200		97	80-120			
Lead	200		10.0	ug/L	200		100	80-120			
Magnesium	2020		100	ug/L	2000		101	80-120			
Nickel	198		10.0	ug/L	200		99	80-120			
Potassium	10500		500	ug/L	10000		105	80-120			
Sodium	9740		500	ug/L	10000		97	80-120			
Zinc	199		10.0	ug/L	200		100	80-120			

Matrix Spike (5F15026-MS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:14

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.2		1.00	ug/L	20.0	0.360 U	96	75-125			
Calcium	21900	B	100	ug/L	2000	19800	105	75-125			
Copper	197		10.0	ug/L	200	1.60 U	99	75-125			
Lead	201		10.0	ug/L	200	3.10 U	101	75-125			
Magnesium	7200		100	ug/L	2000	5090	105	75-125			
Nickel	204		10.0	ug/L	200	5.00	100	75-125			
Potassium	13400		500	ug/L	10000	3080	103	75-125			
Sodium	42600		500	ug/L	10000	31200	114	75-125			
Zinc	201		10.0	ug/L	200	3.80 U	101	75-125			

Matrix Spike Dup (5F15026-MSD1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:17

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.3		1.00	ug/L	20.0	0.360 U	96	75-125	0.1	20	
Calcium	21700	B	100	ug/L	2000	19800	91	75-125	1	20	
Copper	195		10.0	ug/L	200	1.60 U	97	75-125	1	20	
Lead	202		10.0	ug/L	200	3.10 U	101	75-125	0.1	20	
Magnesium	7000		100	ug/L	2000	5090	96	75-125	3	20	
Nickel	201		10.0	ug/L	200	5.00	98	75-125	1	20	
Potassium	13200		500	ug/L	10000	3080	101	75-125	2	20	
Sodium	41600		500	ug/L	10000	31200	104	75-125	2	20	
Zinc	200		10.0	ug/L	200	3.80 U	100	75-125	0.6	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5F15026 - EPA 3005A - Continued

Post Spike (5F15026-PS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:41

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0190		0.00100	mg/L	0.0200	-0.000294	95	80-120			
Calcium	21.3	B	0.100	mg/L	2.00	19.8	71	80-120			QM-08
Copper	0.196		0.0100	mg/L	0.200	0.00137	97	80-120			
Lead	0.196		0.0100	mg/L	0.200	0.000683	98	80-120			
Magnesium	6.66		0.100	mg/L	2.00	5.09	79	80-120			QM-08
Nickel	0.199		0.0100	mg/L	0.200	0.00500	97	80-120			
Potassium	14.1		0.500	mg/L	10.0	3.08	110	80-120			
Sodium	42.8		0.500	mg/L	10.0	31.2	117	80-120			
Zinc	0.198		0.0100	mg/L	0.200	0.00284	98	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5F15026 - EPA 3005A

Blank (5F15026-BLK2) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 12:58

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (5F15026-BS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	193		10.0	ug/L	200		97	80-120			

Matrix Spike (5F15026-MS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:14

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	197		10.0	ug/L	200	1.60 U	99	75-125			

Matrix Spike Dup (5F15026-MSD1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:17

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	195		10.0	ug/L	200	1.60 U	97	75-125	1	20	

Post Spike (5F15026-PS1) Prepared: 06/15/2015 11:10 Analyzed: 06/18/2015 13:41

Source: C506306-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.196		0.0100	mg/L	0.200	0.00137	97	80-120			

Classical Chemistry Parameters - Quality Control

Batch 5F11013 - NO PREP

Blank (5F11013-BLK1) Prepared: 06/11/2015 08:53 Analyzed: 06/11/2015 11:12

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5F11013 - NO PREP - Continued

LCS (5F11013-BS1) Prepared: 06/11/2015 08:53 Analyzed: 06/11/2015 12:30

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	53		5.0	mg/L	50.0		106	90-110			
Sulfate as SO4	51		5.0	mg/L	50.0		101	90-110			

Matrix Spike (5F11013-MS1) Prepared: 06/11/2015 08:53 Analyzed: 06/12/2015 00:36

Source: C506986-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	45		5.0	mg/L	20.0	23	112	90-110			QM-05
Sulfate as SO4	57		5.0	mg/L	20.0	35	109	90-110			

Matrix Spike (5F11013-MS2) Prepared: 06/11/2015 08:53 Analyzed: 06/11/2015 13:21

Source: C502650-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	41		5.0	mg/L	20.0	19	109	90-110			
Sulfate as SO4	68		5.0	mg/L	20.0	46	112	90-110			QM-05

Matrix Spike Dup (5F11013-MSD1) Prepared: 06/11/2015 08:53 Analyzed: 06/11/2015 13:04

Source: C506986-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	45		5.0	mg/L	20.0	23	111	90-110	0.09	10	QM-05
Sulfate as SO4	57		5.0	mg/L	20.0	35	108	90-110	0.1	10	

Batch 5F15008 - NO PREP

Blank (5F15008-BLK1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 08:00

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5F15008-BS1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 08:11

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	97		15	mg/L	100		97	80-120			

Matrix Spike (5F15008-MS1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 08:54

Source: C506986-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	26		15	mg/L	37.8	14 U	68	80-120			QM-05

Matrix Spike Dup (5F15008-MSD1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 08:56

Source: C506986-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	23		15	mg/L	37.8	14 U	61	80-120	11	25	QM-05

Batch 5F15009 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5F15009 - NO PREP - Continued

Blank (5F15009-BLK1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 09:17

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5F15009-BS1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 09:18

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	95		15	mg/L	100		95	80-120			

Matrix Spike (5F15009-MS1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 10:01

Source: C504935-01RE1

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	25		15	mg/L	37.8	14 U	66	80-120			QM-05

Matrix Spike Dup (5F15009-MSD1) Prepared: 06/15/2015 07:48 Analyzed: 06/15/2015 10:03

Source: C504935-01RE1

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	27		15	mg/L	37.8	14 U	72	80-120	9	25	QM-05

Batch 5F17014 - NO PREP

Blank (5F17014-BLK1) Prepared: 06/17/2015 10:24 Analyzed: 06/17/2015 12:28

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5F17014-BS1) Prepared: 06/17/2015 10:24 Analyzed: 06/17/2015 12:30

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	1.1		0.10	mg/L	0.997		105	90-110			

Matrix Spike (5F17014-MS1) Prepared: 06/17/2015 10:24 Analyzed: 06/17/2015 12:32

Source: C402500-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.41		0.10	mg/L	0.387	0.070	87	90-110			QM-05

Matrix Spike (5F17014-MS2) Prepared: 06/17/2015 10:24 Analyzed: 06/17/2015 12:40

Source: C502677-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.93		0.10	mg/L	0.387	0.62	79	90-110			QM-05

Matrix Spike Dup (5F17014-MSD1) Prepared: 06/17/2015 10:24 Analyzed: 06/17/2015 12:36

Source: C402500-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.33		0.10	mg/L	0.387	0.070	66	90-110	22	10	QM-05, QM-11

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5F18004 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5F18004 - NO PREP - Continued

Blank (5F18004-BLK1) Prepared: 06/18/2015 11:15 Analyzed: 06/18/2015 12:09

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.34	U	1.0	mg/L							

LCS (5F18004-BS1) Prepared: 06/18/2015 11:15 Analyzed: 06/18/2015 12:09

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	37		1.0	mg/L	40.0		93	85-115			

Matrix Spike (5F18004-MS1) Prepared: 06/18/2015 11:15 Analyzed: 06/18/2015 12:09

Source: A503583-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	49		1.0	mg/L	40.0	8.9	101	85-115			

Matrix Spike Dup (5F18004-MSD1) Prepared: 06/18/2015 11:15 Analyzed: 06/18/2015 12:09

Source: A503583-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	49		1.0	mg/L	40.0	8.9	101	85-115	0.2	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QB-01	The method blank had a positive result for the analyte; however, the concentration in the method blank is less than 10% of the sample result, which minimizes the impact of the deviation.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-08	Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test).
QM-11	Precision between duplicate matrix spikes of the same sample was outside acceptance limits.

ENCO
10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 111
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN OF CUSTODY RECORD

www.enco-labs.com

Client Name	Project Number
The Catena Group (TH015)	[none]
Address: 1000 Corporate Dr. Suite 101 ~~410-B Millstone Drive~~	Project Name/Desc: Swift Creek Water Quality
City/ST/Zip: Hillsborough, NC 27278	PO # / Billing Info
Tel: (919) 417-2732 Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print): N. Scott	Billing Contact: Nancy Scott
Sampler(s) Signature: N Scott	Site Location / Time Zone

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder

C505697

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2,Chloride 300	Ammonia 350.1	Ca,Cd,Cu,K,Mg,Na,Ni,Pb,Zn	Cu/F	Sulfate 300	TOC SM5310B Dissolved					Sample Comments
					Preservation (See Codes) (Combine as necessary)												
	NC-210	6/9/15	12:05		WA	6	X	X	X	X	X	X					
	SR-1555	"	12:45		WA	6	X	X	X	X	X	X					
	NC-50	"	1:25		WA	6	X	X	X	X	X	X					
					WA	6	X	X	X	X	X	X					
					WA	6	X	X	X	X	X	X					
					WA	6	X	X	X	X	X	X					
					WA	6	X	X	X	X	X	X					
					WA	6	X	X	X	X	X	X					

<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
		N Scott	6/9/15 2:30		
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
					6/9/15 2:30
		Cooler #'s & Temps on Receipt: 2 C° c		Condition Upon Receipt: ✓ Acceptable ___ Unacceptable	

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments)

Preservation: **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

Sample Preservation Verification

ENCO Cary

Work Order:	C505697	Project:	Swift Creek Water Quality
Client:	The Catena Group (TH015)	Project #:	[none]
Logged In:	09-Jun-15 15:13	Logged By:	John C King

C505697-01

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
B	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

C505697-02

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
B	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

C505697-03

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
B	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

	Reagent Name	ID		Reagent Name	ID		Reagent Name	ID
1			3			5		
2			4			6		

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Thursday, July 16, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C508411

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Wednesday, July 1, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC 210 **Lab ID: C508411-01** **Sampled: 07/01/15 09:10** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/29/15	07/07/15 09:00	07/07/15 19:53
EPA 310.2	07/15/15	07/02/15 12:24	07/02/15 14:10
EPA 350.1	07/29/15	07/08/15 09:12	07/08/15 11:09
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 14:02
SM 5310B-2000	07/29/15	07/15/15 10:00	07/15/15 11:20

Client ID: SR1555 **Lab ID: C508411-02** **Sampled: 07/01/15 11:20** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/29/15	07/07/15 09:00	07/07/15 20:10
EPA 310.2	07/15/15	07/02/15 12:24	07/02/15 14:11
EPA 350.1	07/29/15	07/08/15 09:12	07/08/15 11:11
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 15:02
SM 5310B-2000	07/29/15	07/15/15 10:00	07/15/15 11:20

Client ID: NC 50 **Lab ID: C508411-03** **Sampled: 07/01/15 13:15** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	07/29/15	07/07/15 09:00	07/07/15 21:01
EPA 310.2	07/15/15	07/02/15 12:24	07/02/15 14:11
EPA 350.1	07/29/15	07/08/15 09:12	07/08/15 11:14
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 15:05
SM 5310B-2000	07/29/15	07/15/15 10:00	07/15/15 11:20

Client ID: NC 210 Dissolved **Lab ID: C508411-04** **Sampled: 07/01/15 09:10** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 15:08

Client ID: SR 1555 Dissolved **Lab ID: C508411-05** **Sampled: 07/01/15 11:20** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 15:10

Client ID: NC 50 Dissolved **Lab ID: C508411-06** **Sampled: 07/01/15 13:15** **Received: 07/01/15 14:36**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	12/28/15	07/02/15 08:40	07/06/15 15:13

SAMPLE DETECTION SUMMARY

Client ID: NC 210 **Lab ID: C508411-01**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	7000		39.0	100	ug/L	EPA 6010C	
Chloride	8.5		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2420	B	29.0	100	ug/L	EPA 6010C	QB-01
Potassium - Total	2650		150	500	ug/L	EPA 6010C	
Sodium - Total	7640		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.9	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	23		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.7		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: SR1555 **Lab ID: C508411-02**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.073	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6890		39.0	100	ug/L	EPA 6010C	
Chloride	8.5		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2350	B	29.0	100	ug/L	EPA 6010C	QB-01
Potassium - Total	2550		150	500	ug/L	EPA 6010C	
Sodium - Total	7550		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.8	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	29		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.3		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC 50 **Lab ID: C508411-03**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	7470		39.0	100	ug/L	EPA 6010C	
Chloride	9.7		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2400	B	29.0	100	ug/L	EPA 6010C	QB-01
Potassium - Total	2720		150	500	ug/L	EPA 6010C	
Sodium - Total	7800		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.1	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	27		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.9		0.34	1.0	mg/L	SM 5310B-2000	
Zinc - Total	4.09	J	3.80	10.0	ug/L	EPA 6010C	

ANALYTICAL RESULTS

Description: NC 210 | **Lab Sample ID:** C508411-01 | **Received:** 07/01/15 14:36
Matrix: Water | **Sampled:** 07/01/15 09:10 | **Work Order:** C508411
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Calcium [7440-70-2]^	**7000**		ug/L	1	39.0	100	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Magnesium [7439-95-4]^	**2420**	B	ug/L	1	29.0	100	5G02007	EPA 6010C	07/06/15 14:02	JDH	QB-01
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Potassium [7440-09-7]^	**2650**		ug/L	1	150	500	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Sodium [7440-23-5]^	**7640**		ug/L	1	400	500	5G02007	EPA 6010C	07/06/15 14:02	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5G02007	EPA 6010C	07/06/15 14:02	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5G08004	EPA 350.1	07/08/15 11:09	SHA	
Chloride [16887-00-6]^	**8.5**		mg/L	1	2.2	5.0	5G07010	EPA 300.0	07/07/15 19:53	SHA	
Sulfate as SO4 [14808-79-8]^	**3.9**	J	mg/L	1	2.9	5.0	5G07010	EPA 300.0	07/07/15 19:53	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**23**		mg/L	1	14	15	5G02027	EPA 310.2	07/02/15 14:10	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.7**		mg/L	1	0.34	1.0	5G15018	SM 5310B-2000	07/15/15 11:20	RSA	

ANALYTICAL RESULTS

Description: SR1555 **Lab Sample ID:** C508411-02 **Received:** 07/01/15 14:36

Matrix: Water **Sampled:** 07/01/15 11:20 **Work Order:** C508411

Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Calcium [7440-70-2]^	**6890**		ug/L	1	39.0	100	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Magnesium [7439-95-4]^	**2350**	B	ug/L	1	29.0	100	5G02007	EPA 6010C	07/06/15 15:02	JDH	QB-01
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Potassium [7440-09-7]^	**2550**		ug/L	1	150	500	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Sodium [7440-23-5]^	**7550**		ug/L	1	400	500	5G02007	EPA 6010C	07/06/15 15:02	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5G02007	EPA 6010C	07/06/15 15:02	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.073**	J	mg/L	1	0.045	0.10	5G08004	EPA 350.1	07/08/15 11:11	SHA	
Chloride [16887-00-6]^	**8.5**		mg/L	1	2.2	5.0	5G07010	EPA 300.0	07/07/15 20:10	SHA	
Sulfate as SO4 [14808-79-8]^	**3.8**	J	mg/L	1	2.9	5.0	5G07010	EPA 300.0	07/07/15 20:10	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**29**		mg/L	1	14	15	5G02027	EPA 310.2	07/02/15 14:11	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.3**		mg/L	1	0.34	1.0	5G15018	SM 5310B-2000	07/15/15 11:20	RSA	

ANALYTICAL RESULTS

Description: NC 50 **Lab Sample ID:** C508411-03 **Received:** 07/01/15 14:36
Matrix: Water **Sampled:** 07/01/15 13:15 **Work Order:** C508411
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Calcium [7440-70-2]^	**7470**		ug/L	1	39.0	100	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Magnesium [7439-95-4]^	**2400**	B	ug/L	1	29.0	100	5G02007	EPA 6010C	07/06/15 15:05	JDH	QB-01
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Potassium [7440-09-7]^	**2720**		ug/L	1	150	500	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Sodium [7440-23-5]^	**7800**		ug/L	1	400	500	5G02007	EPA 6010C	07/06/15 15:05	JDH	
Zinc [7440-66-6]^	**4.09**	J	ug/L	1	3.80	10.0	5G02007	EPA 6010C	07/06/15 15:05	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5G08004	EPA 350.1	07/08/15 11:14	SHA	
Chloride [16887-00-6]^	**9.7**		mg/L	1	2.2	5.0	5G07010	EPA 300.0	07/07/15 21:01	SHA	
Sulfate as SO4 [14808-79-8]^	**4.1**	J	mg/L	1	2.9	5.0	5G07010	EPA 300.0	07/07/15 21:01	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**27**		mg/L	1	14	15	5G02027	EPA 310.2	07/02/15 14:11	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.9**		mg/L	1	0.34	1.0	5G15018	SM 5310B-2000	07/15/15 11:20	RSA	

Description: NC 210 Dissolved **Lab Sample ID:** C508411-04 **Received:** 07/01/15 14:36
Matrix: Water **Sampled:** 07/01/15 09:10 **Work Order:** C508411
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 15:08	JDH	

Description: SR 1555 Dissolved **Lab Sample ID:** C508411-05 **Received:** 07/01/15 14:36
Matrix: Water **Sampled:** 07/01/15 11:20 **Work Order:** C508411
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 15:10	JDH	

Description: NC 50 Dissolved **Lab Sample ID:** C508411-06 **Received:** 07/01/15 14:36
Matrix: Water **Sampled:** 07/01/15 13:15 **Work Order:** C508411
Project: Swift Creek Water Quality **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G02007	EPA 6010C	07/06/15 15:13	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G02007 - EPA 3005A

Blank (5G02007-BLK1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 13:45

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	3.10	U	10.0	ug/L							
Magnesium	**38.9**	**J**	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (5G02007-BS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 13:58

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	21.2		1.00	ug/L	20.0		106	80-120			
Calcium	2270		100	ug/L	2000		113	80-120			
Copper	215		10.0	ug/L	200		108	80-120			
Lead	212		10.0	ug/L	200		106	80-120			
Magnesium	2120	B	100	ug/L	2000		106	80-120			
Nickel	213		10.0	ug/L	200		106	80-120			
Potassium	11100		500	ug/L	10000		111	80-120			
Sodium	10100		500	ug/L	10000		101	80-120			
Zinc	212		10.0	ug/L	200		106	80-120			

Matrix Spike (5G02007-MS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:04

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.4		1.00	ug/L	20.0	0.360 U	102	75-125			
Calcium	9000		100	ug/L	2000	7000	100	75-125			
Copper	210		10.0	ug/L	200	1.60 U	105	75-125			
Lead	204		10.0	ug/L	200	3.10 U	102	75-125			
Magnesium	4490	B	100	ug/L	2000	2420	103	75-125			
Nickel	205		10.0	ug/L	200	1.80 U	103	75-125			
Potassium	13300		500	ug/L	10000	2650	107	75-125			
Sodium	18100		500	ug/L	10000	7640	105	75-125			
Zinc	206		10.0	ug/L	200	3.80 U	103	75-125			

Matrix Spike Dup (5G02007-MSD1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:07

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.5		1.00	ug/L	20.0	0.360 U	102	75-125	0.3	20	
Calcium	8840		100	ug/L	2000	7000	92	75-125	2	20	
Copper	210		10.0	ug/L	200	1.60 U	105	75-125	0.2	20	
Lead	206		10.0	ug/L	200	3.10 U	103	75-125	1	20	
Magnesium	4430	B	100	ug/L	2000	2420	100	75-125	1	20	
Nickel	205		10.0	ug/L	200	1.80 U	102	75-125	0.1	20	
Potassium	13000		500	ug/L	10000	2650	103	75-125	2	20	
Sodium	18100		500	ug/L	10000	7640	104	75-125	0.3	20	
Zinc	205		10.0	ug/L	200	3.80 U	102	75-125	0.4	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G02007 - EPA 3005A - Continued

Post Spike (5G02007-PS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:10

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0193		0.00100	mg/L	0.0200	-6.72E-5	97	80-120			
Calcium	8.80		0.100	mg/L	2.00	7.00	90	80-120			
Copper	0.199		0.0100	mg/L	0.200	0.000951	99	80-120			
Lead	0.196		0.0100	mg/L	0.200	0.00116	98	80-120			
Magnesium	4.29	B	0.100	mg/L	2.00	2.42	94	80-120			
Nickel	0.195		0.0100	mg/L	0.200	-0.000109	97	80-120			
Potassium	12.7		0.500	mg/L	10.0	2.65	100	80-120			
Sodium	17.3		0.500	mg/L	10.0	7.64	97	80-120			
Zinc	0.195		0.0100	mg/L	0.200	0.00142	97	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G02007 - EPA 3005A

Blank (5G02007-BLK2) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 13:49

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (5G02007-BS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 13:58

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	215		10.0	ug/L	200		108	80-120			

Matrix Spike (5G02007-MS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:04

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	210		10.0	ug/L	200	1.60 U	105	75-125			

Matrix Spike Dup (5G02007-MSD1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:07

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	210		10.0	ug/L	200	1.60 U	105	75-125	0.2	20	

Post Spike (5G02007-PS1) Prepared: 07/02/2015 08:41 Analyzed: 07/06/2015 14:10

Source: C508411-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.199		0.0100	mg/L	0.200	0.000951	99	80-120			

Classical Chemistry Parameters - Quality Control

Batch 5G02027 - NO PREP

Blank (5G02027-BLK1) Prepared: 07/02/2015 12:24 Analyzed: 07/02/2015 13:57

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5G02027 - NO PREP - Continued

LCS (5G02027-BS1) Prepared: 07/02/2015 12:24 Analyzed: 07/02/2015 13:57

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	98		15	mg/L	100		98	80-120			

Matrix Spike (5G02027-MS1) Prepared: 07/02/2015 12:24 Analyzed: 07/02/2015 13:58

Source: C504934-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L	37.8	14 U		80-120			QM-05

Matrix Spike Dup (5G02027-MSD1) Prepared: 07/02/2015 12:24 Analyzed: 07/02/2015 14:00

Source: C504934-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L	37.8	14 U		80-120		25	QM-05

Batch 5G07010 - NO PREP

Blank (5G07010-BLK1) Prepared: 07/07/2015 09:00 Analyzed: 07/07/2015 10:32

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

LCS (5G07010-BS1) Prepared: 07/07/2015 09:00 Analyzed: 07/07/2015 10:49

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	54		5.0	mg/L	50.0		109	90-110			
Sulfate as SO4	52		5.0	mg/L	50.0		104	90-110			

Matrix Spike (5G07010-MS1) Prepared: 07/07/2015 09:00 Analyzed: 07/07/2015 11:06

Source: C502337-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	25		5.0	mg/L	20.0	5.5	97	90-110			
Sulfate as SO4	33		5.0	mg/L	20.0	14	99	90-110			

Matrix Spike (5G07010-MS3) Prepared: 07/07/2015 09:00 Analyzed: 07/07/2015 12:31

Source: C502337-02RE1

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	180		20	mg/L	80.0	92	113	90-110			QM-05
Sulfate as SO4	220		20	mg/L	80.0	130	112	90-110			QM-05

Matrix Spike Dup (5G07010-MSD1) Prepared: 07/07/2015 09:00 Analyzed: 07/07/2015 11:23

Source: C502337-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	26		5.0	mg/L	20.0	5.5	101	90-110	3	10	
Sulfate as SO4	34		5.0	mg/L	20.0	14	103	90-110	2	10	

Batch 5G08004 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5G08004 - NO PREP - Continued

Blank (5G08004-BLK1) Prepared: 07/08/2015 09:12 Analyzed: 07/08/2015 10:18

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5G08004-BS1) Prepared: 07/08/2015 09:12 Analyzed: 07/08/2015 10:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	1.0		0.10	mg/L	0.997		104	90-110			

Matrix Spike (5G08004-MS1) Prepared: 07/08/2015 09:12 Analyzed: 07/08/2015 10:22

Source: C505857-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	54		5.0	mg/L	19.9	35	91	90-110			

Matrix Spike (5G08004-MS2) Prepared: 07/08/2015 09:12 Analyzed: 07/08/2015 10:30

Source: C505857-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	11		1.0	mg/L	3.98	7.1	90	90-110			

Matrix Spike Dup (5G08004-MSD1) Prepared: 07/08/2015 09:12 Analyzed: 07/08/2015 10:26

Source: C505857-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	53		5.0	mg/L	19.9	35	87	90-110	2	10	QM-05

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5G15018 - NO PREP

Blank (5G15018-BLK1) Prepared: 07/15/2015 10:00 Analyzed: 07/15/2015 11:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.34	U	1.0	mg/L							

LCS (5G15018-BS1) Prepared: 07/15/2015 10:00 Analyzed: 07/15/2015 11:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	39		1.0	mg/L	40.0		98	85-115			

LCS Dup (5G15018-BSD1) Prepared: 07/15/2015 10:00 Analyzed: 07/15/2015 11:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	44		1.0	mg/L	40.0		111	85-115	12	21	

Matrix Spike (5G15018-MS1) Prepared: 07/15/2015 10:00 Analyzed: 07/15/2015 11:20

Source: A504277-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	46		1.0	mg/L	40.0	5.4	103	85-115			

QUALITY CONTROL DATA

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5G15018 - NO PREP - Continued

Matrix Spike Dup (5G15018-MSD1) Prepared: 07/15/2015 10:00 Analyzed: 07/15/2015 11:20

Source: A504277-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	44		1.0	mg/L	40.0	5.4	97	85-115	5	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QB-01	The method blank had a positive result for the analyte; however, the concentration in the method blank is less than 10% of the sample result, which minimizes the impact of the deviation.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.

ENCO
ENVIRONMENTAL CONSERVATION LABORATORIES
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102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

www.encolabs.com

CHAIN OF CUSTODY RECORD

Client Name	Project Number
The Catena Group	
Address	**Project Name/Desc**
1000 Corporate Dr. Suite 101	Swift Creek Water Qualty
City/ST/Zip	**PO # / Billing Info**
Hillsborough NC 27278	
Tel / **Fax**	**Reporting Contact**
919 732 1300	Naney Scott
Sampler(s) Name, Affiliation (Print)	**Billing Contact**
Naney Scott	
Sampler(s) Signature	**Site Location / Time Zone**
NScott	

Requested Analyses

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder

C508411

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alk 310.2, Chloride 300	Ammonia 350.1	Ca, Cd, Cu, K, Mg, Na, Ni, Pb, Zn	Cu/F	Sulfate 300	TOC SM5310B Dissolved	Sample Comments
	NC 210	7/1/15	9:10		SW	6	X	X	X	X	X	X	
	SR 1555	↓	11:20		↓	↓	X	X	↓	↓	↓	↓	
	NC 50	↓	1:15		↓	↓	X	X	↓	↓	↓	↓	

Preservation (See Codes) (Combine as necessary)

<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
			7/1/15 2360		7/1/15 1436
Comments/Special Reporting Requirements		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time
		Cooler #'s & Temps on Receipt: 4.2°c		Condition Upon Receipt: ✓ Acceptable ___ Unacceptable	

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments)

Preservation: **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

Sample Preservation Verification

ENCO Cary

Work Order:	C508411	Project:	Swift Creek Water Quality
Client:	The Catena Group (TH015)	Project #:	[none]
Logged In:	01-Jul-15 15:06	Logged By:	John C King

C508411-01

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

C508411-02

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

C508411-03

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	Y / N / NA	Y / N / NA		
D	250mLP+HNO3	<2	Y / N / NA	Y / N / NA		

C508411-04

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		

C508411-05

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		

C508411-06

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / NA	Y / N / NA		

	Reagent Name	ID		Reagent Name	ID		Reagent Name	ID
1			3			5		
2			4			6		

ENCO Laboratories
Accurate. Timely. Responsive. Innovative.

102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515

Thursday, July 23, 2015
The Catena Group (TH015)
Attn: Nancy Scott
410-B Millstone Drive
Hillsborough, NC 27278

RE: Laboratory Results for
Project Number: [none], Project Name/Desc: Swift Creek Water Quality
ENCO Workorder(s): C508904

Dear Nancy Scott,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Friday, July 10, 2015.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Bill Scott

Project Manager

Enclosure(s)

SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: NC 210 **Lab ID: C508904-01** **Sampled: 07/10/15 09:05** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	08/07/15	07/13/15 09:00	07/14/15 02:47
EPA 310.2	07/24/15	07/13/15 11:10	07/13/15 13:44
EPA 350.1	08/07/15	07/15/15 07:37	07/15/15 10:56
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 10:44
SM 5310B-2000	08/07/15	07/21/15 13:00	07/21/15 15:19

Client ID: NC 210 Dissolved **Lab ID: C508904-02** **Sampled: 07/10/15 09:05** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 10:46

Client ID: SR 1555 **Lab ID: C508904-03** **Sampled: 07/10/15 09:45** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	08/07/15	07/13/15 09:00	07/14/15 03:04
EPA 310.2	07/24/15	07/13/15 11:10	07/13/15 13:44
EPA 350.1	08/07/15	07/15/15 07:37	07/15/15 10:58
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 10:49
SM 5310B-2000	08/07/15	07/21/15 13:00	07/21/15 15:19

Client ID: SR 1555 Dissolved **Lab ID: C508904-04** **Sampled: 07/10/15 09:45** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 11:00

Client ID: NC-50 **Lab ID: C508904-05** **Sampled: 07/10/15 10:15** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 300.0	08/07/15	07/13/15 09:00	07/14/15 03:22
EPA 310.2	07/24/15	07/13/15 11:10	07/13/15 13:45
EPA 350.1	08/07/15	07/15/15 07:37	07/15/15 11:00
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 11:03
SM 5310B-2000	08/07/15	07/21/15 13:00	07/21/15 15:19

Client ID: NC-50 Dissolved **Lab ID: C508904-06** **Sampled: 07/10/15 10:15** **Received: 07/10/15 11:10**

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 6010C	01/06/16	07/13/15 14:19	07/17/15 11:06

SAMPLE DETECTION SUMMARY

Client ID: NC 210 **Lab ID: C508904-01**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Calcium - Total	5590		39.0	100	ug/L	EPA 6010C	
Chloride	7.0		2.2	5.0	mg/L	EPA 300.0	
Copper - Total	1.61	J	1.60	10.0	ug/L	EPA 6010C	
Magnesium - Total	2150		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2500		150	500	ug/L	EPA 6010C	
Sodium - Total	6620		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.7	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	22		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.3		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: SR 1555 **Lab ID: C508904-03**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.060	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	6020		39.0	100	ug/L	EPA 6010C	
Chloride	8.0		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2130		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2400		150	500	ug/L	EPA 6010C	
Sodium - Total	7340		400	500	ug/L	EPA 6010C	
Sulfate as SO4	3.8	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	22		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.2		0.34	1.0	mg/L	SM 5310B-2000	

Client ID: NC-50 **Lab ID: C508904-05**

Analyte	Results	Flag	MDL	PQL	Units	Method	Notes
Ammonia as N	0.069	J	0.045	0.10	mg/L	EPA 350.1	
Calcium - Total	7370		39.0	100	ug/L	EPA 6010C	
Chloride	9.3		2.2	5.0	mg/L	EPA 300.0	
Magnesium - Total	2370		29.0	100	ug/L	EPA 6010C	
Potassium - Total	2480		150	500	ug/L	EPA 6010C	
Sodium - Total	7760		400	500	ug/L	EPA 6010C	
Sulfate as SO4	4.0	J	2.9	5.0	mg/L	EPA 300.0	
Total Alkalinity as CaCO3	23		14	15	mg/L	EPA 310.2	
Total Organic Carbon - Dissolved	5.9		0.34	1.0	mg/L	SM 5310B-2000	

ANALYTICAL RESULTS

Description: NC 210 | **Lab Sample ID:** C508904-01 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 09:05 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Calcium [7440-70-2]^	**5590**		ug/L	1	39.0	100	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Copper [7440-50-8]^	**1.61**	J	ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Magnesium [7439-95-4]^	**2150**		ug/L	1	29.0	100	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Potassium [7440-09-7]^	**2500**		ug/L	1	150	500	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Sodium [7440-23-5]^	**6620**		ug/L	1	400	500	5G13040	EPA 6010C	07/17/15 10:44	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5G13040	EPA 6010C	07/17/15 10:44	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	ND		mg/L	1	0.045	0.10	5G15003	EPA 350.1	07/15/15 10:56	SHA	
Chloride [16887-00-6]^	**7.0**		mg/L	1	2.2	5.0	5G13017	EPA 300.0	07/14/15 02:47	SHA	
Sulfate as SO4 [14808-79-8]^	**3.7**	J	mg/L	1	2.9	5.0	5G13017	EPA 300.0	07/14/15 02:47	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**22**		mg/L	1	14	15	5G13030	EPA 310.2	07/13/15 13:44	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.3**		mg/L	1	0.34	1.0	5G21008	SM 5310B-2000	07/21/15 15:19	RSA	

Description: NC 210 Dissolved | **Lab Sample ID:** C508904-02 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 09:05 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 10:46	JDH	

ANALYTICAL RESULTS

Description: SR 1555 | **Lab Sample ID:** C508904-03 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 09:45 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Calcium [7440-70-2]^	**6020**		ug/L	1	39.0	100	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Magnesium [7439-95-4]^	**2130**		ug/L	1	29.0	100	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Potassium [7440-09-7]^	**2400**		ug/L	1	150	500	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Sodium [7440-23-5]^	**7340**		ug/L	1	400	500	5G13040	EPA 6010C	07/17/15 10:49	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5G13040	EPA 6010C	07/17/15 10:49	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.060**	J	mg/L	1	0.045	0.10	5G15003	EPA 350.1	07/15/15 10:58	SHA	
Chloride [16887-00-6]^	**8.0**		mg/L	1	2.2	5.0	5G13017	EPA 300.0	07/14/15 03:04	SHA	
Sulfate as SO4 [14808-79-8]^	**3.8**	J	mg/L	1	2.9	5.0	5G13017	EPA 300.0	07/14/15 03:04	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**22**		mg/L	1	14	15	5G13030	EPA 310.2	07/13/15 13:44	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.2**		mg/L	1	0.34	1.0	5G21008	SM 5310B-2000	07/21/15 15:19	RSA	

Description: SR 1555 Dissolved | **Lab Sample ID:** C508904-04 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 09:45 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 11:00	JDH	

ANALYTICAL RESULTS

Description: NC-50 | **Lab Sample ID:** C508904-05 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 10:15 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (total recoverable) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Cadmium [7440-43-9]^	ND		ug/L	1	0.360	1.00	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Calcium [7440-70-2]^	**7370**		ug/L	1	39.0	100	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Lead [7439-92-1]^	ND		ug/L	1	3.10	10.0	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Magnesium [7439-95-4]^	**2370**		ug/L	1	29.0	100	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Nickel [7440-02-0]^	ND		ug/L	1	1.80	10.0	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Potassium [7440-09-7]^	**2480**		ug/L	1	150	500	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Sodium [7440-23-5]^	**7760**		ug/L	1	400	500	5G13040	EPA 6010C	07/17/15 11:03	JDH	
Zinc [7440-66-6]^	ND		ug/L	1	3.80	10.0	5G13040	EPA 6010C	07/17/15 11:03	JDH	

Classical Chemistry Parameters

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Ammonia as N [7664-41-7]^	**0.069**	J	mg/L	1	0.045	0.10	5G15003	EPA 350.1	07/15/15 11:00	SHA	
Chloride [16887-00-6]^	**9.3**		mg/L	1	2.2	5.0	5G13017	EPA 300.0	07/14/15 03:22	SHA	
Sulfate as SO4 [14808-79-8]^	**4.0**	J	mg/L	1	2.9	5.0	5G13017	EPA 300.0	07/14/15 03:22	SHA	
Total Alkalinity as CaCO3 [471-34-1]^	**23**		mg/L	1	14	15	5G13030	EPA 310.2	07/13/15 13:45	SHA	

Classical Chemistry Parameters (Dissolved)

^ - ENCO Orlando certified analyte [NC 424]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Total Organic Carbon^	**5.9**		mg/L	1	0.34	1.0	5G21008	SM 5310B-2000	07/21/15 15:19	RSA	

Description: NC-50 Dissolved | **Lab Sample ID:** C508904-06 | **Received:** 07/10/15 11:10
Matrix: Water | **Sampled:** 07/10/15 10:15 | **Work Order:** C508904
Project: Swift Creek Water Quality | **Sampled By:** Nancy Scott

Metals (Dissolved) by EPA 6000/7000 Series Methods

^ - ENCO Cary certified analyte [NC 591]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	PQL	Batch	Method	Analyzed	By	Notes
Copper [7440-50-8]^	ND		ug/L	1	1.60	10.0	5G13040	EPA 6010C	07/17/15 11:06	JDH	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G13040 - EPA 3005A

Blank (5G13040-BLK1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 09:47

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.360	U	1.00	ug/L							
Calcium	39.0	U	100	ug/L							
Copper	1.60	U	10.0	ug/L							
Lead	3.10	U	10.0	ug/L							
Magnesium	29.0	U	100	ug/L							
Nickel	1.80	U	10.0	ug/L							
Potassium	150	U	500	ug/L							
Sodium	400	U	500	ug/L							
Zinc	3.80	U	10.0	ug/L							

LCS (5G13040-BS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 09:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.4		1.00	ug/L	20.0		97	80-120			
Calcium	2150		100	ug/L	2000		107	80-120			
Copper	194		10.0	ug/L	200		97	80-120			
Lead	206		10.0	ug/L	200		103	80-120			
Magnesium	2030		100	ug/L	2000		102	80-120			
Nickel	201		10.0	ug/L	200		100	80-120			
Potassium	10200		500	ug/L	10000		102	80-120			
Sodium	10200		500	ug/L	10000		102	80-120			
Zinc	200		10.0	ug/L	200		100	80-120			

Matrix Spike (5G13040-MS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:00

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	20.2		1.00	ug/L	20.0	0.360 U	101	75-125			
Calcium	23800		100	ug/L	2000	22300	76	75-125			
Copper	206		10.0	ug/L	200	1.60 U	103	75-125			
Lead	210		10.0	ug/L	200	3.10 U	105	75-125			
Magnesium	7620		100	ug/L	2000	5640	99	75-125			
Nickel	208		10.0	ug/L	200	1.80 U	104	75-125			
Potassium	13800		500	ug/L	10000	3240	105	75-125			
Sodium	16800		500	ug/L	10000	6330	105	75-125			
Zinc	224		10.0	ug/L	200	14.3	105	75-125			

Matrix Spike Dup (5G13040-MSD1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:03

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	19.3		1.00	ug/L	20.0	0.360 U	97	75-125	4	20	
Calcium	23400		100	ug/L	2000	22300	56	75-125	2	20	QM-05
Copper	196		10.0	ug/L	200	1.60 U	98	75-125	5	20	
Lead	207		10.0	ug/L	200	3.10 U	103	75-125	2	20	
Magnesium	7420		100	ug/L	2000	5640	89	75-125	3	20	
Nickel	200		10.0	ug/L	200	1.80 U	100	75-125	4	20	
Potassium	13400		500	ug/L	10000	3240	102	75-125	3	20	
Sodium	16500		500	ug/L	10000	6330	102	75-125	2	20	
Zinc	216		10.0	ug/L	200	14.3	101	75-125	4	20	

QUALITY CONTROL DATA

Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G13040 - EPA 3005A - Continued

Post Spike (5G13040-PS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:06

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Cadmium	0.0194		0.00100	mg/L	0.0200	-0.000121	97	80-120			
Calcium	23.1		0.100	mg/L	2.00	22.3	41	80-120			QM-08
Copper	0.198		0.0100	mg/L	0.200	0.000135	99	80-120			
Lead	0.201		0.0100	mg/L	0.200	-0.00206	101	80-120			
Magnesium	7.21		0.100	mg/L	2.00	5.64	78	80-120			QM-08
Nickel	0.202		0.0100	mg/L	0.200	-0.000361	101	80-120			
Potassium	13.0		0.500	mg/L	10.0	3.24	98	80-120			
Sodium	15.9		0.500	mg/L	10.0	6.33	96	80-120			
Zinc	0.221		0.0100	mg/L	0.200	0.0143	103	80-120			

Metals (Dissolved) by EPA 6000/7000 Series Methods - Quality Control

Batch 5G13040 - EPA 3005A

Blank (5G13040-BLK2) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 09:51

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	1.60	U	10.0	ug/L							

LCS (5G13040-BS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 09:54

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	194		10.0	ug/L	200		97	80-120			

Matrix Spike (5G13040-MS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:00

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	206		10.0	ug/L	200	1.60 U	103	75-125			

Matrix Spike Dup (5G13040-MSD1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:03

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	196		10.0	ug/L	200	1.60 U	98	75-125	5	20	

Post Spike (5G13040-PS1) Prepared: 07/13/2015 14:19 Analyzed: 07/17/2015 10:06

Source: C508500-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Copper	0.198		0.0100	mg/L	0.200	0.000135	99	80-120			

Classical Chemistry Parameters - Quality Control

Batch 5G13017 - NO PREP

Blank (5G13017-BLK1) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 14:32

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	2.2	U	5.0	mg/L							
Sulfate as SO4	2.9	U	5.0	mg/L							

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Batch 5G13017 - NO PREP - Continued

LCS (5G13017-BS1) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 15:27

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	54		5.0	mg/L	50.0		108	90-110			
Sulfate as SO4	52		5.0	mg/L	50.0		104	90-110			

Matrix Spike (5G13017-MS1) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 15:44

Source: C508205-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	25		5.0	mg/L	20.0	5.4	100	90-110			
Sulfate as SO4	29		5.0	mg/L	20.0	9.5	97	90-110			

Matrix Spike (5G13017-MS2) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 16:35

Source: C508205-02

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	77		5.0	mg/L	20.0	53	118	90-110			QM-05

Matrix Spike (5G13017-MS3) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 17:09

Source: C508205-02RE1

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Sulfate as SO4	320		50	mg/L	200	120	100	90-110			

Matrix Spike Dup (5G13017-MSD1) Prepared: 07/13/2015 09:00 Analyzed: 07/13/2015 16:01

Source: C508205-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Chloride	26		5.0	mg/L	20.0	5.4	101	90-110	0.8	10	
Sulfate as SO4	29		5.0	mg/L	20.0	9.5	98	90-110	0.6	10	

Batch 5G13030 - NO PREP

Blank (5G13030-BLK1) Prepared: 07/13/2015 11:10 Analyzed: 07/13/2015 13:20

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L							

LCS (5G13030-BS1) Prepared: 07/13/2015 11:10 Analyzed: 07/13/2015 13:21

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	100		15	mg/L	100		104	80-120			

Matrix Spike (5G13030-MS1) Prepared: 07/13/2015 11:10 Analyzed: 07/13/2015 13:22

Source: C508205-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	18		15	mg/L	37.8	14 U	46	80-120			QM-05

Matrix Spike Dup (5G13030-MSD1) Prepared: 07/13/2015 11:10 Analyzed: 07/13/2015 13:24

Source: C508205-01

Analyte	Result	Flag	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Alkalinity as CaCO3	14	U	15	mg/L	37.8	14 U		80-120		25	QM-05

Batch 5G15003 - NO PREP

QUALITY CONTROL DATA

Classical Chemistry Parameters - Quality Control

Blank (5G15003-BLK1)

Prepared: 07/15/2015 07:37 Analyzed: 07/15/2015 10:06

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.045	U	0.10	mg/L							

LCS (5G15003-BS1)

Prepared: 07/15/2015 07:37 Analyzed: 07/15/2015 10:08

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	1.0		0.10	mg/L	0.997		102	90-110			

Matrix Spike (5G15003-MS1)

Prepared: 07/15/2015 07:37 Analyzed: 07/15/2015 10:10

Source: C508051-02

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.37		0.10	mg/L	0.387	0.045 U	95	90-110			

Matrix Spike (5G15003-MS2)

Prepared: 07/15/2015 07:37 Analyzed: 07/15/2015 10:23

Source: C508123-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.77		0.10	mg/L	0.387	0.42	91	90-110			

Matrix Spike Dup (5G15003-MSD1)

Prepared: 07/15/2015 07:37 Analyzed: 07/15/2015 10:15

Source: C508051-02

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Ammonia as N	0.37		0.10	mg/L	0.387	0.045 U	95	90-110	0.05	10	

Classical Chemistry Parameters (Dissolved) - Quality Control

Batch 5G21008 - NO PREP

Blank (5G21008-BLK1)

Prepared: 07/21/2015 13:00 Analyzed: 07/21/2015 15:19

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	0.34	U	1.0	mg/L							

LCS (5G21008-BS1)

Prepared: 07/21/2015 13:00 Analyzed: 07/21/2015 15:19

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	44		1.0	mg/L	40.0		111	85-115			

Matrix Spike (5G21008-MS1)

Prepared: 07/21/2015 13:00 Analyzed: 07/21/2015 15:19

Source: A504272-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	45		1.0	mg/L	40.0	1.0	109	85-115			

Matrix Spike Dup (5G21008-MSD1)

Prepared: 07/21/2015 13:00 Analyzed: 07/21/2015 15:19

Source: A504272-01

Analyte	Result	Flag	POL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Total Organic Carbon	42		1.0	mg/L	40.0	1.0	103	85-115	6	21	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.
ND	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence (85% or greater confidence) to make a "tentative identification".
P	Greater than 25% concentration difference was observed between the primary and secondary GC column. The lower concentration is reported.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-08	Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test).

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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www.encolabs.com

Client Name: The Catena Group	Project Number:
Address: 1000 Corporate Dr. Suite 101	Project Name/Desc: Swift Creek Water Quality
City/ST/Zip: Hillsborough NC 27278	PO # / Billing Info:
Tel: 919 732 1300 / Fax:	Reporting Contact: Nancy Scott
Sampler(s) Name, Affiliation (Print): Nancy Scott	Billing Contact:
Sampler(s) Signature: NScott	Site Location / Time Zone:

Requested Analyses

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Alkalinity 310.2, Chloride 300	Ammania 350.1	Ca, Cd, Cu, K, Mg, Na, Ni, Pb, Zn	Cu/F	Sulfate 300	TOC SM 310B Dissolved
	NC 210	7/10/15	9:05		SW	6	X	X	X	X	X	X
	SR 1555	↓	9:45		↓	↓	↓	↓	↓	↓	↓	↓
	NC 50	↓	10:15		↓	↓	↓	↓	↓	↓	↓	↓

Preservation (See Codes) (Combine as necessary)

<-- Total # of Containers

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

___ Standard

___ Expedited

Due ___/___/___

Lab Workorder: CS0890 4

Sample Comments

Sample Kit Prepared By	Date/Time	Relinquished By: NScott	Date/Time: 7/10/15 11:10
Comments/Special Reporting Requirements		Relinquished By	Date/Time
		Relinquished By	Date/Time

Received By: Parker	Date/Time: 7/10/15 1110		
Received By	Date/Time		
Received By	Date/Time		

Cooler #'s & Temps on Receipt: 2.5c

Condition Upon Receipt: ✓ Acceptable ___ Unacceptable

Matrix : **GW**-Groundwater **SO**-Soil **DW**-Drinking Water **SE**-Sediment **SW**-Surface Water **WW**-Wastewater **A**-Air **O**-Other (detail in comments) **Preservation:** **I**-Ice **H**-HCl **N**-HNO3 **S**-H2SO4 **NO**-NaOH **O**-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

Sample Preservation Verification

ENCO Cary

Work Order:	C508904	Project:	Swift Creek Water Quality
Client:	The Catena Group (TH015)	Project #:	[none]
Logged In:	10-Jul-15 12:54	Logged By:	Jennifer L. Jackson

C508904-01

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

C508904-02

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / (NA)	Y / N / (NA)		

C508904-03

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

C508904-04

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / (NA)	Y / N / (NA)		

C508904-05

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
C	250mLP+H2SO4	<2	(Y) / N / NA	Y / (N) / NA		
D	250mLP+HNO3	<2	(Y) / N / NA	Y / (N) / NA		

C508904-06

Cont	Type	Pres (pH) Requirement	pH Checked / In Control	pH Adjusted	Date/Time Adjusted	Reagent Used/Comments
A	250mLP+HNO3 [F]	<2	Y / N / (NA)	Y / N / (NA)		

	Reagent Name	ID
1		
2		

	Reagent Name	ID
3		
4		

	Reagent Name	ID
5		
6		

Appendix C – Historical Water Quality Analysis

Table 1. Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at City of Raleigh monitoring station J4500000.

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/19/2009	25.2	7.1	0.08	9.86	1.29
9/2/2009	21.7	7.1	0.42	13.18	1.62
10/28/2009	16.1	7.3	0.02	16.68	2.08
11/24/2009	13.3	6.7	0.14	29.76	3.17
12/31/2009	4.9	6.4	0.03	33.74	5.70
1/22/2010	7.1	6.5	0.07	32.61	4.89
2/26/2010	5.4	7	0.01	24.10	4.84
3/31/2010	13.8	6.6	0.06	31.28	3.13
4/8/2010	20.1	7.1	0.13	15.05	1.80
5/27/2010	20.5	6.9	0.08	17.39	1.89
6/24/2010	26.7	7.1	0.23	8.71	1.17
7/23/2010	26.3	6.7	0.26	12.25	1.37
8/27/2010	24.4	7	0.17	11.59	1.42
9/10/2010	21.8	7.2	0.12	11.74	1.53
10/22/2010	13.5	7	0.08	24.10	2.87
11/19/2010	9.8	7.2	0.35	19.73	3.32
12/22/2010	5.3	7	0.01	24.10	4.87
1/20/2011	4.3	6.8	3.73	28.05	5.53
2/10/2011	6	7.1	0.22	21.94	4.46
3/3/2011	10.3	6.9	0.05	26.15	3.65
5/17/2011	20.4	7	0.11	16.15	1.84
6/10/2011	25.1	7	0.11	10.94	1.36
7/29/2011	26.8	7.3	0.51	6.87	1.05
8/11/2011	26.1	7.1	0.14	9.16	1.22
9/12/2011	22.5	7.3	0.14	9.81	1.38
10/21/2011	15.1	7.2	0.08	19.73	2.36
11/10/2011	11.8	7.3	0.05	17.51	2.75
12/30/2011	7.8	7.2	0.05	19.73	3.78
1/12/2012	7.6	7.1	0.07	21.94	4.03
2/23/2012	5.8	7.2	0.06	19.73	4.30
3/8/2012	8	7.1	0.04	21.94	3.92
4/26/2012	15.4	7.2	0.06	19.73	2.32
5/10/2012	18.9	7.2	0.05	14.93	1.85
7/31/2012	25.1	6.8	0.27	12.75	1.45
8/16/2012	22.8	6.9	0.19	14.37	1.63
9/11/2012	22.1	6.8	0.08	16.34	1.76
10/4/2012	21.6	7	1.88	14.62	1.70
11/12/2012	10.6	6.7	0.03	29.76	3.77
12/12/2012	11.5	6.9	0.07	26.15	3.38
1/23/2013	6.2	6.5	0.06	32.61	5.18
2/14/2013	9	6.8	0.10	28.05	4.08
3/14/2013	9.4	7.1	0.08	21.94	3.58
4/8/2013	14.5	6.9	0.05	26.15	2.79
5/7/2013	17.8	7.4	0.09	12.67	1.74
6/13/2013	25.1	7.1	0.11	9.95	1.30
7/10/2013	26.4	6.8	0.12	11.44	1.33

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/6/2013	25.6	6.8	0.11	12.23	1.40
9/10/2013	26.4	7.1	0.05	8.93	1.20
10/24/2013	12.9	7	0.10	24.10	2.98
11/7/2013	14.2	6.9	0.05	26.15	2.84
12/5/2013	10.4	7.2	0.08	19.73	3.20
1/16/2014	7.5	6.7	0.02	29.76	4.61
2/14/2014	2.7	6.9	0.02	26.15	5.96
3/10/2014	8.4	6.8	0.04	28.05	4.25
4/10/2014	15.4	6.9	0.04	26.15	2.63
5/13/2014	22.1	7	0.15	14.02	1.65
6/26/2014	27.3	7	0.13	9.11	1.18
7/24/2014	25.8	7.1	0.11	9.39	1.25
8/6/2014	25.2	7.1	0.08	9.86	1.29
9/3/2014	26.1	7.1	0.09	9.16	1.22
10/16/2014	20.2	7	0.08	16.42	1.86
11/17/2014	8.9	7.3	0.05	17.51	3.32
12/30/2014	9.9	7.4	0.03	15.34	2.90
1/12/2015	7	6.9	0.12	26.15	4.52
2/3/2015	7.5	7.2	0.05	19.73	3.85
3/3/2015	7.1	7.3	0.03	17.51	3.72
4/7/2015	17.1	7.4	0.06	13.42	1.82

Table 2. Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at City of Raleigh monitoring station J4510000.

Date	Temp(°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/19/2009	26.0	7.2	0.08	8.29	1.17
9/2/2009	22.9	7.1	0.20	11.94	1.50
10/28/2009	16.9	7.2	0.01	17.62	2.10
11/24/2009	13.5	6.6	0.18	31.28	3.19
12/31/2009	5.3	6.5	0.04	32.61	5.49
1/22/2010	7.5	6.6	0.41	31.28	4.69
2/26/2010	6.0	6.8	0.02	28.05	4.96
3/31/2010	14.4	6.6	0.05	31.28	3.01
4/8/2010	20.4	7.0	0.16	16.15	1.84
5/27/2010	21.0	6.9	0.11	16.68	1.83
6/24/2010	26.8	7.0	0.10	9.50	1.22
7/23/2010	26.4	7.0	0.09	9.82	1.25
8/27/2010	24.5	6.9	0.16	12.48	1.46
9/10/2010	22.1	7.1	0.13	12.75	1.58
10/22/2010	13.6	7.1	0.08	21.94	2.73
11/19/2010	10.2	7.2	0.18	19.73	3.24
12/22/2010	5.5	7.0	0.02	24.10	4.81
1/20/2011	4.4	7.0	0.40	24.10	5.16
2/10/2011	6.1	7.0	0.12	24.10	4.62
3/3/2011	10.6	6.9	0.07	26.15	3.58
5/17/2011	20.9	7.2	0.09	12.65	1.62
6/10/2011	25.0	6.9	0.11	11.97	1.42
7/29/2011	26.7	7.2	0.28	7.82	1.12
8/11/2011	26.4	7.0	0.10	9.82	1.25
9/12/2011	22.3	7.2	0.07	11.26	1.48
10/21/2011	14.8	7.1	0.04	21.94	2.53
11/10/2011	10.7	6.8	0.02	28.05	3.66
12/30/2011	7.3	6.9	0.04	26.15	4.43
1/12/2012	7.7	7.3	0.05	17.51	3.58
2/23/2012	5.9	7.2	0.09	19.73	4.27
3/8/2012	8	7.3	0.07	17.51	3.51
4/26/2012	15.3	7.1	0.11	21.94	2.45
5/10/2012	18.8	7.2	0.05	15.05	1.86
7/31/2012	24.9	6.9	0.1	12.07	1.42
8/16/2012	22.5	6.9	0.09	14.73	1.66
9/11/2012	21.2	6.8	0.06	17.61	1.86
10/4/2012	20.6	6.9	0.09	17.24	1.88
11/12/2012	10	6.9	0.09	26.15	3.72
12/12/2012	10.8	6.9	0.03	26.15	3.54
1/23/2013	4	6.9	0.07	26.15	5.48
2/14/2013	8.4	7	0.26	24.10	3.99
3/14/2013	9	6.9	0.05	26.15	3.97
4/8/2013	13.6	6.7	0.03	29.76	3.11
5/7/2013	17.3	6.9	0.15	22.67	2.33
6/13/2013	24.7	6.8	0.08	13.17	1.48
7/10/2013	24.3	6.8	0.12	13.62	1.52

Date	Temp(°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/6/2013	24.4	6.9	0.05	12.59	1.47
9/10/2013	24.7	6.8	0.03	13.17	1.48
10/24/2013	12.2	6.7	0.03	29.76	3.40
11/7/2013	14	6.7	0.04	29.76	3.03
12/5/2013	10.4	7.2	0.05	19.73	3.20
1/16/2014	7.1	6.6	0.04	31.28	4.82
2/14/2014	2.1	6.9	0.03	26.15	6.19
3/10/2014	8.1	6.8	0.09	28.05	4.33
4/10/2014	14.6	6.7	0.05	29.76	2.91
5/13/2014	21.4	7	0.09	14.86	1.72
6/26/2014	25	6.8	0.09	12.85	1.46
7/24/2014	24.1	6.9	0.08	12.90	1.50
8/6/2014	24.2	6.8	0.09	13.73	1.53
9/3/2014	24.4	6.9	0.08	12.59	1.47
10/16/2014	18.8	6.9	0.03	20.02	2.11
11/17/2014	7.8	7.2	0.07	19.73	3.78
12/30/2014	9.3	7.1	0.02	21.94	3.61
1/12/2015	5.4	7	0.1	24.10	4.84
2/3/2015	6.6	7.3	0.08	17.51	3.85
3/3/2015	6.6	7.2	0.03	19.73	4.08
4/7/2015	16	7.2	0.07	18.98	2.23

Table 3 Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at City of Raleigh monitoring station J4511000.

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/19/2009	26.3	7.1	0.27	9.01	1.21
9/2/2009	23.3	7.1	0.21	11.55	1.46
10/28/2009	17.2	7.1	0.01	19.14	2.17
11/24/2009	14.0	6.8	0.23	28.05	2.96
12/31/2009	5.9	6.6	0.05	31.28	5.20
1/22/2010	8.0	6.5	0.09	32.61	4.61
2/26/2010	6.2	6.7	0.01	29.76	5.01
3/31/2010	14.8	6.7	0.64	29.76	2.88
4/8/2010	21.1	7.1	0.04	13.86	1.69
5/27/2010	21.5	6.8	0.09	17.18	1.82
6/24/2010	27.3	6.8	0.20	10.62	1.26
7/23/2010	27.0	6.7	0.42	11.56	1.31
8/27/2010	24.2	7.0	0.18	11.78	1.44
9/10/2010	21.7	7.1	0.20	13.18	1.62
10/22/2010	13.1	7.0	0.10	24.10	2.94
11/19/2010	9.7	7.1	0.04	21.94	3.52
12/22/2010	5.1	7.2	0.02	19.73	4.50
1/20/2011	4.6	7.1	0.32	21.94	4.88
2/10/2011	6.3	7.1	0.10	21.94	4.38
3/3/2011	11.0	7.1	0.09	21.94	3.23
5/17/2011	20.7	6.9	0.10	17.10	1.87
6/10/2011	25.2	6.8	0.13	12.64	1.44
7/29/2011	27.0	7.1	0.86	8.50	1.15
8/11/2011	26.6	7.1	0.20	8.78	1.18
9/12/2011	22.5	7.2	0.18	11.08	1.46
10/21/2011	14.7	7.2	0.07	19.73	2.42
11/10/2011	13.2	7.0	0.05	24.10	2.93
12/30/2011	8.3	7.1	0.02	21.94	3.85
1/12/2012	8.1	7.2	0.02	19.73	3.71
2/23/2012	6.0	7.1	0.05	21.94	4.46
3/8/2012	8.4	7	0.02	24.10	3.99
4/26/2012	15.1	7.3	0.07	17.51	2.22
5/10/2012	19	7	0.05	18.13	2.01
7/31/2012	25.2	6.9	0.05	11.78	1.40
8/16/2012	22.3	6.8	0.28	16.07	1.73
9/11/2012	21.3	6.9	0.09	16.27	1.80
10/4/2012	20.6	6.9	0.04	17.24	1.88
11/12/2012	9.9	6.8	0.09	28.05	3.85
12/12/2012	10.9	6.8	0.03	28.05	3.61
1/23/2013	6.6	6.8	0.07	28.05	4.77
2/14/2013	8.9	7.1	0.09	21.94	3.70
3/14/2013	9.2	6.8	0.04	28.05	4.03
4/8/2013	13.4	6.9	0.09	26.15	2.99
5/7/2013	16.9	7	0.11	21.58	2.30
6/13/2013	24.5	6.8	0.28	13.39	1.50
7/10/2013	24.2	6.9	0.07	12.80	1.49

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/6/2013	24.3	6.9	0.06	12.69	1.48
9/10/2013	24.6	6.9	0.09	12.38	1.45
10/24/2013	12.3	6.8	0.02	28.05	3.30
11/7/2013	13.9	6.9	0.02	26.15	2.89
12/5/2013	8.8	7.1	0.08	21.94	3.73
1/16/2014	7	6.8	0.05	28.05	4.65
2/14/2014	2.2	6.9	0.02	26.15	6.16
3/10/2014	8.2	6.9	0.08	26.15	4.18
4/10/2014	14.7	6.8	0.02	28.05	2.83
5/13/2014	21.3	6.9	0.07	16.27	1.80
6/26/2014	25	6.9	0.09	11.97	1.42
7/24/2014	24.3	7	0.09	11.69	1.43
8/6/2014	24.4	6.8	0.07	13.51	1.51
9/3/2014	24.9	6.9	0.05	12.07	1.42
10/16/2014	19	6.8	0.09	21.13	2.14
11/17/2014	8.2	7.1	0.11	21.94	3.87
12/30/2014	9.7	6.9	0.05	26.15	3.80
1/12/2015	5.5	6.8	0.08	28.05	5.12
2/3/2015	6.7	7	0.1	24.10	4.45
3/3/2015	6.8	7	0.03	24.10	4.42
4/7/2015	16.2	7.1	0.04	20.80	2.31

Table 4 Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at City of Raleigh monitoring station J4520000.

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/19/2009	27.3	6.9	0.13	9.90	1.22
9/2/2009	23.8	7.0	0.23	12.18	1.48
10/28/2009	17.6	7.2	0.01	16.62	2.01
11/24/2009	14.2	6.7	0.22	29.76	2.99
12/31/2009	6.0	6.5	0.02	32.61	5.25
1/22/2010	8.2	6.6	0.08	31.28	4.49
2/26/2010	6.3	6.9	0.01	26.15	4.73
3/31/2010	15.1	6.8	0.04	28.05	2.76
4/8/2010	21.5	7.0	0.20	14.74	1.71
5/27/2010	21.7	6.9	0.09	15.74	1.75
6/24/2010	26.7	6.8	0.11	11.16	1.30
7/23/2010	26.2	6.8	0.13	11.63	1.35
8/27/2010	24.9	7.1	0.12	10.11	1.32
9/10/2010	22.4	7.0	0.15	13.68	1.62
10/22/2010	13.7	7.2	0.07	19.73	2.58
11/19/2010	10.3	7.2	0.06	19.73	3.22
12/22/2010	5.5	7.1	0.03	21.94	4.61
1/20/2011	4.9	7.0	0.45	24.10	5.00
2/10/2011	6.0	7.2	0.10	19.73	4.24
3/3/2011	11.3	7.1	0.05	21.94	3.17
5/17/2011	21.1	6.9	0.09	16.54	1.82
6/10/2011	25.4	6.7	0.08	13.20	1.45
7/29/2011	27.4	7.0	0.17	9.04	1.17
8/11/2011	26.3	7.0	0.09	9.90	1.26
9/12/2011	22.4	7.1	0.08	12.44	1.55
10/21/2011	15.1	7.0	0.05	24.10	2.59
11/10/2011	11.3	6.9	0.03	26.15	3.42
12/30/2011	7.6	7.0	0.05	24.10	4.20
1/12/2012	7.7	7.1	0.05	21.94	4.00
2/23/2012	5.9	7.3	0.07	17.51	4.02
3/8/2012	8.1	7.2	0.04	19.73	3.71
4/26/2012	15.6	7	0.24	24.03	2.51
5/10/2012	19.2	7	0.05	17.83	1.99
7/31/2012	25.5	6.8	0.08	12.33	1.41
8/16/2012	22.8	6.9	0.08	14.37	1.63
9/11/2012	21.4	6.6	0.05	19.34	1.92
10/4/2012	21	6.8	0.04	17.90	1.88
11/12/2012	10	6.7	0.02	29.76	3.92
12/12/2012	10.8	6.7	0.05	29.76	3.72
1/23/2013	4.3	6.8	0.05	28.05	5.53
2/14/2013	9.3	7.1	0.11	21.94	3.61
3/14/2013	9.5	6.7	0.07	29.76	4.05
4/8/2013	13.7	7	0.04	24.10	2.83
5/7/2013	17.4	7.1	0.1	18.83	2.14
6/13/2013	25.3	6.8	0.17	12.54	1.43
7/10/2013	24.5	6.9	0.1	12.48	1.46

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
8/6/2013	24.9	6.8	0.05	12.96	1.47
9/10/2013	25.3	7	0.02	10.76	1.34
10/24/2013	12.2	6.9	0.02	26.15	3.23
11/7/2013	14.2	7	0.05	24.10	2.74
12/5/2013	9.9	6.8	0.04	28.05	3.85
1/16/2014	7.2	6.9	0.07	26.15	4.46
2/14/2014	1.9	6.8	0.06	28.05	6.46
3/10/2014	8.4	6.8	0.07	28.05	4.25
4/10/2014	14.5	6.7	0.03	29.76	2.93
5/13/2014	21	7.1	0.07	13.97	1.70
6/26/2014	24.8	7.1	0.07	10.20	1.33
7/24/2014	24	7.1	0.05	10.90	1.40
8/6/2014	23.4	6.9	0.09	13.67	1.57
9/3/2014	24.3	7	0.06	11.69	1.43
10/16/2014	18.8	6.9	0.06	20.02	2.11
11/17/2014	7.8	7.3	0.03	17.51	3.56
12/30/2014	9.9	6.9	0.05	26.15	3.75
1/12/2015	5.3	6.8	0.11	28.05	5.19
2/3/2015	6.3	6.8	0.08	28.05	4.86
3/3/2015	6.4	7.1	0.14	21.94	4.35
4/7/2015	15.9	7	0.05	23.44	2.46

Table 5 Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at City of Raleigh monitoring station J4580000.

Date	Temp (°C	pH (SU)	NH3 as N (mg/L)	CMC	CCC
5/2/2012	21.50	6.9	0.07	16.00	1.77
7/19/2012	26.2	6.9	0.05	10.84	1.31
8/2/2012	25.60	6.9	0.07	11.39	1.36
9/13/2012	20.20	6.9	0.06	17.83	1.93
10/3/2012	21.20	6.9	0.07	16.41	1.81
11/28/2012	6.10	6.8	0.04	28.05	4.92
12/20/2012	8.60	6.7	0.02	29.76	4.29
1/11/2013	9.70	6.8	0.05	28.05	3.90
2/7/2013	7.00	7.0	0.06	24.10	4.36
3/13/2013	10.10	7.1	0.07	21.94	3.43
4/4/2013	10.80	6.9	0.03	26.15	3.54
5/8/2013	16.00	7.2	0.10	18.98	2.23
6/19/2013	22.10	7.2	0.05	11.45	1.50
7/2/2013	23.90	7.1	0.08	10.99	1.41
8/5/2013	24.10	7.1	0.05	10.81	1.39
9/9/2013	22.50	7.1	0.04	12.34	1.54
10/17/2013	17.90	6.7	0.02	24.58	2.36
11/6/2013	12.90	7.1	0.16	21.94	2.86
12/4/2013	8.20	6.7	0.08	29.76	4.40
1/8/2014	1.70	6.8	0.08	28.05	6.54
2/6/2014	6.60	6.9	0.07	26.15	4.63
3/6/2014	4.40	6.9	0.05	26.15	5.34
4/7/2014	14.10	6.8	0.02	28.05	2.94
5/12/2014	20.60	7.0	0.05	15.88	1.82
6/12/2014	22.70	7.1	0.04	12.14	1.52
7/17/2014	23.00	7.0	0.06	13.02	1.56
8/5/2014	23.10	6.9	0.10	14.02	1.60
9/2/2014	26.00	6.9	0.05	11.02	1.33
10/9/2014	19.20	7.2	0.02	14.56	1.81
11/6/2014	15.90	7.1	0.10	21.32	2.36
12/4/2014	10.20	7.1	0.04	21.94	3.40
1/14/2015	5.80	7.2	0.08	19.73	4.30
2/12/2015	6.10	7.3	0.06	17.51	3.97
3/18/2015	12.40	7.1	0.03	21.94	2.95
4/6/2015	14.10	7.2	0.02	19.73	2.52

Table 6. Ammonia measurements and event-specific acute and chronic criteria (USEPA 2013) at USGS monitoring station 02087701.

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
10/18/1989	22	6.6	0.05	18.43	1.84
4/4/1990	15	6.7	0.04	29.76	2.84
6/20/1990	28	7.2	0.02	7.07	1.03
8/14/1990	30	8.3	0.03	0.96	0.26
9/5/1990	27.6	7.8	0.01	3.00	0.62
10/24/1990	22	6.9	0.02	15.41	1.72
4/25/1991	18	6.7	0.06	24.43	2.34
6/11/1991	25	8.6	0.02	0.81	0.21
7/23/1991	33	7.3	0.04	4.14	0.70
8/6/1991	28	7.1	0.2	7.86	1.08
9/17/1991	27	7.2	0.02	7.68	1.10
11/13/1991	10	6.5	0.07	32.61	4.06
4/16/1992	16	7.2	0.02	19.11	2.23
6/2/1992	22	7	0.02	14.20	1.66
8/13/1992	30	6.5	0.14	9.90	1.12
10/15/1992	21	7.2	0.06	12.63	1.61
4/26/1993	18	7.2	0.03	16.19	1.96
6/25/1993	27.1	6.7	0.04	11.49	1.30
8/4/1993	28.8	7	0.05	8.08	1.07
10/14/1993	17.3	7	0.11	20.96	2.25
11/15/1993	14.3	7.1	0.01	21.94	2.61
4/22/1994	20.9	7	0.03	15.56	1.78
6/21/1994	28.8	7.2	0.02	6.61	0.98
8/2/1994	28.1	6.9	0.04	9.29	1.16
9/21/1994	23.3	6.6	0.19	16.55	1.69
6/16/1995	23.6	6.5	0.02	16.82	1.69
8/5/2005	29	6.9	0.015	8.62	1.09
8/5/2005	27.6	6.9	0.158	9.68	1.20
10/19/2005	19.9	6.7	0.044	20.87	2.07
4/20/2006	17.5	6.3	0.09	29.69	2.56
7/5/2006	29.6	6.7	0.012	9.34	1.11
7/5/2006	22.7	6.1	0.055	20.11	1.85
8/30/2006	31.7	8.5	0.014	0.56	0.16
8/30/2006	28.2	6.3	0.027	12.23	1.28
8/30/2006	23.8	6.7	1.74	15.10	1.61
4/26/2007	15.5	5.5	0.047	38.25	3.01
6/21/2007	26.2	6.4	0.042	14.03	1.44
6/21/2007	23.2	6.7	0.625	15.87	1.67
11/1/2007	16.7	6.8	0.067	25.64	2.49

Date	Temp (°C)	pH (SU)	NH3 as N (mg/L)	CMC	CCC
11/1/2007	16.5	6.7	0.075	27.66	2.58
11/1/2007	16.4	6.8	0.088	26.28	2.54
4/28/2008	17.5	6.6	0.029	26.76	2.46
6/25/2008	25.5	7	0.131	10.62	1.32
8/21/2008	25.9	6.9	0.07	11.15	1.34
6/25/2009	22.3	6.6	0.208	17.98	1.81
8/20/2009	28.2	6.6	0.155	11.02	1.24
8/20/2009	24.7	7	2.1	11.35	1.39
10/15/2009	19.4	6.8	0.048	20.50	2.09
10/15/2009	19.4	6.9	0.06	19.11	2.03
4/15/2010	17.5	6.5	0.118	27.90	2.50
6/10/2010	28.1	6.9	0.027	9.29	1.16
6/10/2010	20.8	7.2	1.28	12.84	1.63
8/12/2010	31.5	7.2	0.099	5.29	0.82
8/12/2010	29.6	6.8	0.195	8.80	1.08
10/14/2010	21.2	7	0.078	15.17	1.75
10/14/2010	21.1	6.8	0.079	17.80	1.87
4/25/2011	20.8	6.8	0.081	18.25	1.91
4/25/2011	19.4	6.6	0.107	22.86	2.18
6/28/2011	28.5	7	0.123	8.28	1.09
6/28/2011	28.5	6.9	0.137	8.99	1.13

Table 7 Copper measurements and event-specific acute and chronic water quality standards (USEPA 2007, NC Register 2014) at USGS monitoring station 02087701.

Date	Dissolved Cu (ug/L)	Hardness (as mg/L of $CaCO_3$)	CMC	CCC
10/18/1989	0.96	17.7	2.63	2.04
4/4/1990	2.88	22.5	3.30	2.50
6/20/1990	2.88	22.4	3.28	2.49
8/14/1990	2.88	19.6	2.89	2.23
9/5/1990	5.76	19.6	2.89	2.23
9/5/1990	2.88	18.6	2.75	2.13
10/24/1990	1.92	22.2	3.25	2.47
4/25/1991	2.88	22.9	3.35	2.54
6/11/1991	1.92	20.1	2.96	2.27
7/23/1991	1.92	21.6	3.17	2.42
8/6/1991	3.84	19.2	2.84	2.19
9/17/1991	2.88	19	2.81	2.17
4/16/1992	4.8	23.8	3.48	2.63
6/2/1992	0.96	22.9	3.35	2.54
8/13/1992	1.92	16.8	2.50	1.95
10/15/1992	0.96	17.5	2.60	2.02
4/26/1993	1.92	28.2	4.08	3.04
6/25/1993	1.92	30.5	4.39	3.25
8/4/1993	0.96	22.3	3.27	2.48
10/14/1993	0.96	20.5	3.02	2.31
11/15/1993	0.96	20.3	2.99	2.29
4/22/1994	1.92	25.6	3.72	2.80
6/21/1994	1.92	24.2	3.53	2.66
8/2/1994	1.92	19.6	2.89	2.23
12/6/1994	3.84	21.6	3.17	2.42
5/1/1995	1.92	15.9	2.38	1.86
6/16/1995	1.92	20.8	3.06	2.34
10/19/2005	0.768	22.6	3.31	2.51
4/20/2006	1.248	16.7	2.49	1.94
4/26/2007	1.536	26.1	3.79	2.84
10/15/2009	2.592	20.2	2.98	2.28
4/15/2010	8.352	22.1	3.24	2.47
10/14/2010	1.728	18.8	2.78	2.15
4/25/2011	1.344	22.7	3.32	2.52