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DETAILED HYDROGEOLOGIC CHARACTERIZATION AND EVALUATION

Proposed Wastewater Treatment Site
City of Afton, Minnesota

Prepared for:

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Table of Contents

1.0 INTRODUCTION 1-1

1.1 Purpose and Scope 1-1
1.2 Background 1-1

2.0 SITE DESCRIPTION 2-1

2.1 Site Location 2-1
2.2 Physical Setting 2-1
2.2.1 Site Topography 2-1
2.2.2 Regional Geologic Setting 2-1
2.2.3 Regional Hydrogeology 2-2
2.2.4 Regional Surface Waters and Wetlands 2-2

3.0 INVESTIGATION ACTIVITIES 3-1

3.1 Review of the County Well index inventory 3-1
3.2 Soil Borings 3-1
3.2.1 Utility Clearance 3-1
3.2.2 Drilling Activities 3-1
3.2.3 Soil Laboratory Testing 3-2
3.2.4 Geologic Interpretation 3-2
3.3 Permanent Groundwater Monitoring Wells 3-3
3.3.1 Installation Activities 3-3
3.3.2 Surveying 3-3
3.3.3 Groundwater Elevation Monitoring 3-3
3.3.4 Hydraulic Conductivity Testing 3-4
3.3.5 Estimated Groundwater Flow Velocity 3-4
3.4 Groundwater Sampling Activities 3-5
3.4.1 Initial Well Development Procedures 3-5
3.4.2 Groundwater Sampling Procedures 3-5
3.4.3 Discussion of Groundwater Quality Results 3-6
3.4.4 Quality Control 3-6

4.0 INVESTIGATION CONCLUSIONS 4-1

4.1 Site Geology/Hydrogeology 4-1
4.2 Site Water Quality 4-1
4.3 Assessment of Site Suitability 4-1

5.0 REFERENCES 5-1

TABLES

1 MDH County Well Index Summary – Wells within 500 Feet of the Property Boundary
2 Summary of Soil Boring Information
3 Summary of Soil Laboratory Testing
4 Summary of Groundwater Monitoring Well Construction
5 Summary of Groundwater Elevation Data
6 Summary of Hydraulic Conductivity Testing Results
7 Summary of Groundwater Quality Results

FIGURES

1 Site Location Map
2 Site Investigation Detail Map
3 MDH CWI Inventory Map
4 Geologic Cross Section A-A'
5 Geologic Cross Section B-B'
6 Groundwater Hydrograph
7 Potentiometric Surface Map (October 21, 2013)
8 Potentiometric Surface Map (November 1, 2013)
9 Potentiometric Surface Map (November 7, 2013)
10 Potentiometric Surface Map (November 18, 2013)
11 Potentiometric Surface Map (November 26, 2013)
12 Municipal Water Supply Connections

APPENDICES

A NRCS Web Soil Survey
B CWI Well Records
C Soil Boring Logs
D Soil Engineer Testing, Inc. Lab Soil Testing Reports
E MDH Well and Soil Boring Records (Mw-1 through MW-4)
F Hydraulic Conductivity Calculation Sheets
G Well Development Records
H Well Purging/Sampling Records
I ESC Lab Sciences Laboratory Reports and Chain-of-Custody Documentation – Groundwater Analytical Results
J Groundwater Inorganic Analysis Report

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This document presents findings of a hydrogeologic investigation of the property identified as the proposed City of Afton Large Subsurface Sewage Treatment System (LSTS), located in the NW ¼ of the NW ¼ of Section 14, Township 28 North, Range 20 West, Afton Minnesota (the Site). The purpose of this investigation was to provide a hydrogeologic assessment of Site conditions in support of a permit application for constructing an LSTS.

1.2 BACKGROUND

The City of Afton (City) proposes to construct and operate a new LSTS to be located on the Site. As part of the ongoing effort to design and permit the LSTS, this hydrogeologic investigation and report has been prepared for submission to the Minnesota Pollution Control Agency (MPCA) for their review. As part of this investigation, a review of site geology and sampling to determine background groundwater quality has been conducted to satisfy previous MPCA recommendations.

The Permit Application (i.e., design, etc. of the proposed facility) will be conducted separately from this evaluation, and will be submitted under separate cover.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The Site is located within the City of Afton, in east Central Minnesota, in a residential/semi-rural portion of the City. The Site is approximately 0.6 miles west of the Saint Croix River. More specifically, the project site is located south of the intersection of Putnam Boulevard South, 20th Street South, and Quant Avenue South (Figure 1). The Site is approximately 25 acres in size. The legal description of the Site is the NW ¼ of the NW ¼ of Section 14, Township 28 North, Range 20 West, Afton, Minnesota.

The approximate center of the Site has geographic coordinates 44 degrees 55.090 minutes north latitude (N 44° 55.090') and -92 degrees 46.682 minutes west longitude (W -103° 46.682'). The Site location is shown in Figure 1. A site detail map is provided in Figure 2.

2.2 PHYSICAL SETTING

2.2.1 Site Topography

The Site slopes from north to south approximately 40 feet. The north end of the Site sits at an approximate elevation of 730 feet. The southern portion of the Site sits at an approximate elevation of 690 feet NGVD. The very southern portion of the property is occupied by a small wetland (see Figure 2).

The Site is currently vacant. Natural vegetation consisting of grasses, trees, and shrubs, covers the majority of the property. An unoccupied single-family homestead currently resides on the southern portion of the project site.

2.2.2 Regional Geologic Setting

Soil information for the Site was obtained using the Natural Resources Conservation Service (NRCS) Web Soil Survey interactive website (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). A "Custom Soil Resources Report" was generated for the Site using the web-based interactive mapping tool. The report provided a variety of information related to soils, slope, and site use suitability and limitations. The full report generated is included in Appendix A, and is summarized below.

A soil unit map, as well as soil summary table, for the Site was provided as part of the custom soil resource report. As discussed in the report there are several soil complexes located on the Site, with the most common complex being the Burkhardt complex. The Burkhardt complex makes up approximately 49 percent of the Site and is described as a sandy loam with 0 to 3 percent slopes.

The other major soil unit present on the Site is the Mahtomedi complex. The Mahtomedi complex is a loamy sand and accounts for an additional 30 percent of the Site area. There is some variation within the complex on the Site due to minor morphogenic differences between the soil units. The variation largely lies with the topography of the Site (i.e., 0 to 3 percent slopes vs. 9 to 12 percent slopes).

The Algansee complex, a loamy sand, makes up the remaining approximately 21 percent of the Site area.

All complexes within the property boundaries are similar, and generally deep, well-drained soils deposited in outwash or alluvial environments.

According to available geologic references surficial geology at the site consists of unconsolidated Lower Terrace Deposits overlying Eau Claire Formation and Mt Simon Sandstone. The Lower Terrace Deposits are generally outwash deposits consisting of fine to coarse sands and gravels. Some areas are capped with loamy sand up to 10 feet in thickness (Swanson and Meyer, editors 1990).

Bedrock geology beneath the northern portion of the Site consists of the Eau Claire Formation. The Eau Claire Formation consists of siltstone, very-fine grained sandstone and shale. Bedrock geology beneath the southern portion of the Site consists of the Mt. Simon Sandstone. The Mt. Simon Sandstone consists of fine to coarse-grained quartzose sandstone. The contact between the Eau Claire Formation and the Mt. Simon Sandstone is abrupt and is commonly marked with a zone of iron-oxide cement. Based on the review of the geologic references caves and sinkhole features are common in the limestone and dolostone formations within the southeastern portion of Washington County. Due to the nature of the bedrock (i.e., shale and sandstone) present beneath the Site and in the vicinity it is unlikely these features exist or will develop in the future.

Nearby well logs show depth to bedrock ranges from approximately 30 feet (Minnesota Unique Well No. 457687) just north of the site to approximately 220 feet (Minnesota Unique Well No. 511760) just southwest of the site.

2.2.3 Regional Hydrogeology

According to the Geologic Atlas of Washington County surficial groundwater flow in the area of the Site is presumed to be to the east towards the St. Croix River (Swanson and Meyer, editors 1990). Nearby well records show static water levels near the site range from approximately 50 to 65 feet below grade. Several wells east of the site showed static water levels at approximately 15 to 20 feet below grade. These well logs also revealed the presence of clay layers lying between 37 to 50 feet below grade.

2.2.4 Regional Surface Waters and Wetlands

The Site contains within its boundaries an unnamed creek that generally flows south and discharges into Valley Creek, a Public Water Watercourse. Valley Creek flows east into the Saint Croix River, which flows south and is located approximately 0.6 miles east of the site.

3.0 INVESTIGATION ACTIVITIES

3.1 REVIEW OF THE COUNTY WELL INDEX INVENTORY

A search of the Minnesota Geological Survey's online County Well Index (CWI) was completed as part of the investigation. The CWI listed ten (10) field-verified supply wells within 500 feet of the Site. Most of these wells are private domestic water-supply wells. Table 1 lists the records of the CWI wells within 500 feet of the site. Figure 3 presents the findings of a review of the CWI records within 500 feet and 1,000 feet of the site. Copies of well records within 500 feet of the Site are included in Appendix B.

3.2 SOIL BORINGS

3.2.1 Utility Clearance

Prior to performing any drilling activities, "Gopher State One-Call" was notified to identify any underground lines or structures on the property. Any utility lines buried at the Site were located by the appropriate utility company and indicated on the ground surface. Further, a private utility locator was utilized the morning that drilling began to identify and locate any private underground utilities near the boring locations.

3.2.2 Drilling Activities

A total of four soil borings (MW-1 through MW-4) were advanced during the investigation conducted in October 2013. All four borings were converted into permanent groundwater monitoring wells as described in Section 3.3. The locations of the borings and groundwater monitoring wells are shown on Figure 2.

Wenck contracted the services of Bergerson-Caswell to perform the drilling and well construction activities for the project. The borings were generally advanced to approximately seven (7) feet below the observed top of the shallow unconfined groundwater table, using 8-inch outside diameter hollow-stem augers. Borings MW-1 through MW-4 were advanced to 60 feet bgs, 60 feet bgs, 47 feet bgs, and 48 feet bgs, respectively,

The soil borings were sampled continuously to sixteen (16) feet below grade. At sixteen (16) feet the sampling frequency was decreased to one 24-inch sample for every five (5) feet of drilling. This sampling frequency was continued to the end of the boring.

Soil classification was performed in the field in accordance with ASTM Method D2488, *Standard Practice for Description and Identification of Soils*. Wenck staff was on-site during the drilling activities to oversee the drilling and to make field decisions. Soil classification was performed in the field by Wenck staff. Soil boring logs were generated by Wenck and are included in Appendix C. A summary of the soil boring information provided in Table 2.

Drilling and well installation was performed by Bergerson-Caswell, Inc. Maple Plain, Minnesota. Bergerson-Caswell is a Minnesota-licensed drilling contractor. All drilling and well construction activities were conducted in accordance with applicable Minnesota Department of Health (MDH) codes.

3.2.3 Soil Laboratory Testing

During the field investigation activities several soil samples were collected for lab testing from each of the soil borings to determine soil physical properties. One soil sample was collected within the screened interval of each groundwater monitoring well:

- MW-1 at 55 feet bgs;
- MW-2 at 55 feet bgs;
- MW-3 at 45-feet bgs; and
- MW-4 at 45 feet bgs.

The following tests were completed on each sample:

- Grain Size Distribution using ASTM C136 and D422
- Effective Porosity using ASTM D7263
- Moisture Content using ASTM 2216

Two additional soil samples (10' bgs and 41.5' bgs) were taken from boring MW-1 and were analyzed for Grain Size Distribution to classify soil types near the center of the proposed LSTS. All soil samples were submitted to Soil Engineering Testing, Inc. (SET) of Richfield, Minnesota, for analysis. A summary of laboratory tests is provided in Table 3. Laboratory test records are included in Appendix D.

In summary, the soil types observed at the Site are fine to medium sand (SP) with gravel with thin discontinuous layers of lean clay (CL). Based on lab testing, calculated effective porosities within the saturated zone (i.e. upper portion of the shallow unconfined groundwater table aquifer) range from a low of 36% (MW-1 at 55' bgs) to a high of 40% (MW-2 at 55' bgs and MW-4 at 45' bgs). The average effective porosity is calculated to be approximately 38% which is typical for sand.

3.2.4 Geologic Interpretation

As mentioned above, four (4) permanent groundwater monitoring wells were installed on the property in October 2013 to evaluate the Site hydrogeologic setting. Soil boring and well locations related to the 2013 investigation activities are shown on Figure 2.

In general, the geological information gathered during the investigation shows typical outwash and alluvial deposits (i.e. sand, gravelly sand) consistent with the Lower Terrace Deposits overlying sandstone bedrock (Ironton and Galesville Sandstones, and Eau Claire Formation). A thin clay unit was observed at approximately 36 feet bgs in well MW-1, and was estimated to be less than two (2) feet thick. Another thin clay unit was observed in MW-1 at approximately 41 feet bgs and was estimated to be less than two (2) feet thick. No fine-grained units were logged in the other three wells (MW-2, MW-3, and MW-4). The fine-grained units observed in MW-1 do not appear to be continuous, and do not

appear to act as confining layers given the potentiometric surface measured during this investigation. Geologic cross-sections are presented in Figures 4 and 5. During the October 2013 investigation bedrock was encountered in boring MW-2 (northern-most boring location) approximately 49 feet below ground surface (bgs).

3.3 PERMANENT GROUNDWATER MONITORING WELLS

3.3.1 Installation Activities

As mentioned above, borings MW-1, MW-2, MW-3, and MW-4 were converted into permanent groundwater monitoring wells. The wells were installed for the purpose of collecting groundwater elevation, groundwater quality, and hydraulic conductivity data.

The groundwater monitoring wells were installed in compliance with Minnesota Rules Chapter 4725 (Wells and Borings). The wells were installed using a drilling rig equipped with 4¼-inch inside diameter (8½ -inch outside diameter) hollow-stem augers. The borings were generally advanced to approximately seven (7) feet below the observed top of the shallow unconfined groundwater table.

Each monitoring well was constructed with new, two-inch inside diameter, flush-threaded Schedule 40 steel casing and Schedule 40 PVC well screen (#10-slot or 0.010-inch). All monitoring wells were constructed with ten (10)-foot screens. In each monitoring well, an appropriately-sized sand pack was installed to no less than two (2) feet above the top of the screen. A two (2)-foot thick (minimum) bentonite pellet seal was installed above the sand pack to protect the screen and filter pack from grout intrusion. The remaining annular space was filled with high-solids bentonite grout. A steel (eight (8)-inch diameter by six (6)-foot long) protective pipe was placed over each well casing to add protection to the well. Each steel protective casing was cemented to a concrete apron to prevent the riser from damage. Each monitoring well was equipped with a vented riser cap and a locking cover.

The well construction details have been included on the soil boring logs (Appendix C) and in Table 4. An MDH Well and Soil Boring record was created by Bergerson-Caswell for each well and is included in Appendix E.

3.3.2 Surveying

All boring locations were measured with a horizontal and vertical accuracy of ±0.1 feet. All permanent well top of casing (TOC) elevations were surveyed with a horizontal accuracy of ±0.1 feet and a vertical accuracy of ±0.01 feet. Horizontal measurements were referenced to the US State Plane – Minnesota South Zone (NAD 83) coordinate system, while vertical measurements were referenced to the North American Vertical Datum (NAVD 88) coordinate system. Horizontal and vertical boring data are summarized in Table 2. TOC elevation data are summarized in Table 4.

3.3.3 Groundwater Elevation Monitoring

Water levels were measured on October 21, 2013, October 24, 2013, November 1, 2013, November 7, 2013, November 18, 2013, and November 26, 2013 in monitoring wells MW-1 through MW-4. The groundwater elevation data were collected to evaluate the local groundwater flow regime at the Site.

Groundwater elevations are summarized in Table 5 and a groundwater hydrograph is included as Figure 6. Groundwater contour maps are presented in Figures 7, 8, 9, 10, and 11.

In general, the groundwater elevations collected during the six (6) field events show consistent flow directions and gradients during the period of observation. Based on the flow regime observed at the Site the flow direction is northeast with a calculated gradient of 0.0030 ft/ft.

3.3.4 Hydraulic Conductivity Testing

Single well response tests (Slug tests) were performed on all four (4) monitoring wells on November 1, 2013, to obtain hydraulic conductivity estimates and to estimate aquifer heterogeneity. The slug tests involved displacing a volume of water within the monitoring well by inserting a slug (i.e., a 3-foot section of 1-inch diameter pipe capped at both ends) and measuring the rate at which the water level recovered to static conditions. Inserting the slug causes the water level inside the well to quickly rise, and then subsequently fall back to static water level over time, thus giving a "falling head test." Tests were also conducted when removing the slug and monitoring the static water level as it rises over the time of recovery.

Data obtained during testing of monitoring wells were recorded on a pressure transducer and a laptop computer. The slug test data were analyzed using the method of Bouwer and Rice (1976 and 1986), appropriate in unconfined water table formations. Output records from the software used in the analysis are included in Appendix F. The calculations were made using the following simplifying assumptions:

1. Aquifer properties are consistent from the top of the shallow water table to the base of the well screened interval (i.e., homogeneous aquifer),
2. Correction for effective casing radius applied appropriate for the Bouwer and Rice (1976) Method,
3. Effective porosity of the gravel pack was estimated to be 35%, and
4. Anisotropy ratio (Kv/Kh) estimated to be 0.1.

The slug test results are summarized in Table 6. The average hydraulic conductivity of the water table wells discussed above was calculated to be approximately 618.1 ft/day or approximately 2.2×10^{-1} cm/sec.

Slug tests offer an inexpensive method to develop an initial estimate of the hydraulic conductivity across a specific screened interval of the formation. Slug tests represent only the small portion of the aquifer immediately around the well screen. Slug tests do not measure porosity or specific yield, which have a large effect on the transient (or short term) behavior of the formation when stressed. Therefore, these results should be considered "order of magnitude" estimates and used with appropriate caution.

3.3.5 Estimated Groundwater Flow Velocity

Flow velocities were calculated from the following equations:

$V = Ki$ (Darcy Velocity or Flux)
$v = (K/n_e)*i$ (Seepage Velocity)

Where: V = Average groundwater flow velocity (ft/day) (cm/sec)
v = Average linear groundwater flow velocity (ft/day) (cm/sec)
K = Hydraulic conductivity (ft/day) (cm/sec)
n_e = Estimated porosity (site average approximately 38%)
i = Estimated hydraulic gradient (ft/ft)

The average hydraulic conductivity of the water table wells discussed above was calculated to be approximately 618 ft/day or 2.2 x 10-1 cm/sec. The average hydraulic gradients calculated over the same period were calculated to be 0.0030 ft/ft to the northeast.

Using the above equations the average groundwater flow (Darcy) velocity for the unconfined water table aquifer on the Site is estimated to be approximately 1.9 ft/day, or 6.5×10^{-3} cm/sec. This translates to a seepage velocity of approximately 4.9 ft/day, or 1.7×10^{-3} cm/sec.

3.4 GROUNDWATER SAMPLING ACTIVITIES

3.4.1 Initial Well Development Procedures

Wenck performed the initial well development activities on October 24, 2013. Each well was purged using a 12-volt submersible pump with dedicated tubing. A minimum of ten (10) well volumes of water were removed from each well during the initial development activities.

Stabilization parameters, temperature, conductivity, pH, dissolved oxygen (DO), oxygen reduction potential (ORP), and turbidity were collected at regular intervals during the development process. Each well was developed until the discharged water was relatively sediment-free, and the stabilization parameters had reached steady state. Well development records were completed for each well and are included in Appendix G.

3.4.2 Groundwater Sampling Procedures

Wenck performed the initial sampling activities on wells MW-1 through MW-4 on November 7 and 8, 2013. A second sampling was conducted on November 26, 2013. During the preparatory phase of the sampling efforts each well was purged of at least three (3) well volumes using a 12-volt submersible pump with dedicated tubing prior to sample collection. Stabilization parameters including temperature, conductivity, pH, dissolved oxygen (DO), oxygen reduction potential (ORP) and turbidity were collected at regular intervals during the purging process. A purging and sampling record for each well has been included in Appendix H.

During the November 2013 sampling events groundwater samples were collected from each well and submitted for groundwater quality analysis. Samples were collected and analyzed for the following parameters:

- Volatile Organic Compounds (VOCs)
- General Wet Chemistry Parameters (i.e., geochemicals)

- Nitrate-Nitrite
- Ammonia as N
- Total Phosphorous
- Chemical Oxygen Demand

All groundwater samples were collected using dedicated tubing. All labware and sample coolers were provided by the laboratory. Groundwater samples were sent on ice and under chain-of-custody to ESC Lab Sciences (ESC) located in Mount Juliet, Tennessee (Minnesota-certified laboratory # 047-999-395) for chemical analysis.

3.4.3 Discussion of Groundwater Quality Results

Groundwater analytical data are summarized in Tables 7 and 8. Complete laboratory reports and chain-of-custody documentation are included in Appendix I. The groundwater data were compared to the Environmental Protection Agency's (EPA) Maximum Contaminant Limits (MCL), MDH Health Risk Limits (HRLs) and if appropriate the EPA Secondary Drinking Water Standards (SDWS) in an effort to evaluate groundwater quality of the Site as it relates to human consumption. These values pertain to the Safe Drinking Water Act. The MCLs and HRLs are legally enforceable standards that apply to public potable water supplies. The SDWS values are non-enforceable guidelines regulating parameters that may cause cosmetic or aesthetic effects.

VOCs were not detected in any of the samples collected during either of the November 2013 sampling events.

The general wet chemistry analytical results were compared to appropriate HRLs and MCLs. No regulatory exceedances were observed during either of the November 2013 sampling events.

Nitrate was identified in all groundwater monitoring wells during the November 2013 sampling events. Nitrate concentrations ranged from a low of 0.3 mg/l in MW-4 to a high of 3.6 mg/l in MW-1. The average background Nitrate concentration observed at the Site is approximately 2.3 mg/l. Neither the MCL or HRL for nitrate were exceeded during the November 2013 sampling events. The MCL and HRL for nitrate is currently set at 10 mg/l.

Groundwater analytical results are summarized in Table 7.

3.4.4 Quality Control

Every effort was made to ensure all fieldwork and groundwater sampling throughout the investigation adhered to the highest industry-accepted QA/QC practices. This, of course, is vital to ensure high quality data is obtained so that accurate interpretations can be made. In order to ensure the volatile samples have not become contaminated with extraneous substances during storage and transport a trip blank was submitted to the laboratory with the sample coolers. Each trip blank was analyzed for VOCs. Neither trip blank submitted revealed the presence of any VOCs.

One (1) blind field duplicate groundwater sample was collected for each November 2013 groundwater sampling event. The blind duplicates are identified as follows:

Duplicate ID	Duplicate Sample of:	Sample Date
MW-5	MW-1	November 7, 2013
MW-5	MW-3	November 26, 2013

Duplicate sample MW-5 analytical data are presented in Tables 7 and 8 adjacent to the MW-1 and MW-3 analytical data. In general, the data demonstrate good agreement. The individual laboratory reports are presented in Appendix I.

In an attempt to better qualify the groundwater chemistry data, an analysis of the cation and anion balance was performed on samples collected during the November 2013 sampling event. A cation/anion balance can be used as a check against laboratory data. In general, groundwater should be in balance (within a percent difference of approximately 2 percent) for an aquifer without outside chemical influence. In the case of the samples collected at the Site during the November 2013 sampling event, all cation/anion balance calculations showed a bias towards cations. The percent difference ranged from a low of 1.84 percent in the sample from MW-2 on November 7, to a high of 14.05 percent in the sample from MW-3 on November 26. The inorganic analysis report along with Piper and Stiff diagrams are included in Appendix J.

This analysis indicates a larger proportional concentration of cations (Ca, Mg, Na, and K) versus typical anions in water (Alkalinity, Cl, NO_3, and SO_4). This may indicate a problem with the inorganic data reported in the lab results, or sampling error. The final laboratory reports for Alkalinity results (Appendix I) indicate that both the matrix spike and matrix spike duplicate returned a result for alkalinity that was 80 percent of the spiked value. While this result is within an acceptable range for the laboratory QA/QC, it could explain low anion values. Alkalinity is a major anion component in groundwater.

4.0 INVESTIGATION CONCLUSIONS

4.1 SITE GEOLOGY/HYDROGEOLOGY

An evaluation of Site Geology generally shows Lower Terrace deposits underlain by Eau Claire Formation and Mt Simon Sandstone bedrock (Figures 4 and 5). Several relatively thin laterally discontinuous layers of clay were encountered in borings MW-1 and MW-2. Soils on the Site are generally well-draining, and groundwater mounding from the LSTS is not anticipated. A complete investigation of the groundwater mounding caused by the LSTS will be part of the system design.

The hydrogeologic investigation found that groundwater is generally flowing northeast with a gradient of 0.0030 ft/ft. The hydraulic conductivity of the unconfined water table aquifer was calculated to be approximately 618 ft/day. The nearest potential receptor down-gradient from the proposed LSTS is Minnesota Unique Well # 139290, located approximately 600 feet from the LSTS. Well #139290 is approximately 75 feet northeast of the Site boundary. Given an estimated seepage velocity of 4.9 ft/day, under current conditions it will take groundwater approximately 123 days or approximately 4 months to travel from the proposed LSTS to Well #139290, not including infiltration time.

During a conversation with the City of Lake Saint Croix Beach, in which Well #139290 is located, along with the rest of the residences on Quant avenue, Mr. Matt Kline (Director of Public Works, City of Lakeland) indicated that the majority of residents are currently supplied by the City's municipal water supply. However, there are several property owner's that are currently served by a private well. Figure 12 includes a map provided by Mr. Kline showing properties connected to the city's water supply.

4.2 SITE WATER QUALITY

Based on the data collected during this investigation it appears groundwater quality for the Site is of relatively good quality. No VOCs were observed in groundwater samples taken from the Site.

Nitrate was identified in all groundwater monitoring wells during the November 2013 sampling events. Nitrate concentrations ranged from a low of 0.3 mg/l in MW-4 to a high of 3.6 mg/l in MW-1. The average background Nitrate concentration observed at the Site is approximately 2.3 mg/l. Neither the MCL or HRL for nitrate were exceeded during the November 2013 sampling events.

4.3 ASSESSMENT OF SITE SUITABILITY

The Site is a vacant property located within the City of Afton, in a residential/semi-rural portion of the City. The proposed LSTS will be situated near the center of the site as shown in Figure 2. This orientation and location will ensure that the LSTS is constructed no less than 300 feet from any water supply well, in accordance with Minnesota Administrative Rule 4725.2250. No other rules govern the placement of the LSTS based on environmental, geological, or hydrogeological factors. However, Wenck believes the Site is suitable for the construction of the LSTS and the characteristics of the site are beneficial to the protection of the environment and public health.

5.0 REFERENCES

Swanson, Lynn and Gary N. Meyer, Editors. 1990. *Minnesota Geological Survey, Geologic Atlas, Washington County, Minnesota. County Atlas Series C-5.* University of Minnesota.

Minnesota Department of Health, County Well Index http://www.health.state.mn.us/divs/eh/cwi/index.html

Wenck Associates, Inc., *Hydrogeological Investigation Work Plan,* prepared for The City of Afton, July 2013.

Tables

TABLE 1
MDH County Well Index Summary
Wells within 500 Feet of the Property Boundary
Hydrogeologic Investigation
Afton, Minnesota

Minnesota Unique Well No.	Well Owner's Name	Elevation (ft above MSL)	Well Completion Depth (ft below grade)	Date Drilled	Casing Diameter (in)	Casing Depth (ft below grade)	Depth to Bedrock (ft below grade)	Static Water Level at time of Installation (ft below grade)	Static Water Level at time of Installation (ft above MSL)
110406	ECKERSTROM, TY	725	75	3/5/1975	4	69	59	35	690
139290		731	120	2/13/1987	4	87	56	45	686
154454	KOHLER, CRAIG	720	89	4/6/1979	4	81	62	15	705
185781	BELZ, ROBERT	729	200	8/19/1982	4	188	120	50	679
410957		729	120	2/27/1987	4	90	58	-	-
457687		728	97	1/26/1989	4	84	31	55	673
511750	EASTWOOD, DAVID A	710	261	9/4/1990	4	230	220	65	645
599981	HOLMES, MARK	702	169	6/19/1998	4	166	-	30	672
649686	KITTLESON, KIP	702	165	2/26/2001	4	162	-	40	662
665332	PEARSON, ROGER	701	165	9/19/2001	4	162	-	30	671

TABLE 2
Summary of Soil Boring Information
Hydrogeologic Investigation
Afton, Minnesota

Boring ID	Northing Washington County, MN Coordinate System	Easting Washington County, MN Coordinate System	Ground Elevation (feet NAVD)	Total Depth Sampled (feet below ground surface)	Screened Interval (feet below ground surface)
MW-1	162888.78	514363.88	726.59	60	45.5 - 54.9
MW-2	163219.51	514548.23	729.96	60	47.0 - 56.5
MW-3	162577.34	514458.19	718.77	47	35.7 - 45.0
MW-4	162817.39	513941.76	724.48	48	37.0 - 46.5

Notes:
Horizontal control to US State Plane NAD 83 - ND North Zone
Boring and well locations are shown in Figure 2.
All elevations are referenced from North American Vertical Datum 1988 (NAVD)

TABLE 3
Summary of Soil Lab Testing
Hydrogeologic Investigation
Afton, Minnesota

Sample ID	Depth Sampled (feet below GS)	Grain Size Distribution (%)	Classification	Water Content (%)	Dry Density (pcf)	Estimated Porosity* (%)	Moisture Content
MW-1	10	Gravel=25.5%, Sand=74.5%, Fines=1.8%	SAND w/gravel, medium grained (SP)	4.2	----	----	4.2
MW-1	41.5	Gravel=0%, Sand=23.8%, Fines=76.2%	Lean CLAY w/sand (CL)	22.7	----	----	22.7
MW-1	55	Gravel=0.5%, Sand=96.1%, Fines=3.4%	SAND, fine grained (SP)	18.9	106.5	36	18.9
MW-2	55	Gravel=6.1%, Sand=26.9%, Fines=67.0%	Sandy Lean CLAY w/a little gravel (CL)	23.3	99.6	40	23.3
MW-3	45	Gravel=4.3%, Sand=94.3%, Fines=1.4%	SAND w/a little gravel, medium grained (SP)	19.3	105.2	37	19.3
MW-4	45	Gravel=20.1%, Sand=78.0%, Fines=1.9%	SAND w/a little gravel, medium grained (SP)	12.4	100.3	40	12.4

Fines = material passing #200 sieve, i.e. Silt and Clay
* Sample porosities were calculated using the following equation:

$$\phi = 1 - \frac{\rho_{\text{bulk}}}{\rho_{\text{particle}}}$$

TABLE 4
Summary of Groundwater Monitoring Well Construction
Hydrogeologic Investigation
Afton, Minnesota

	MW-1		MW-2		MW-3		MW-4	
Date Installed	October 15, 2013		October 14, 2013		October 16, 2013		October 16, 2013	
Well Driller	Bergerson Caswell		Bergerson Caswell		Bergerson Caswell		Bergerson Caswell	
Well Casing Material	SCH-40 steel		SCH-40 steel		SCH-40 steel		SCH-40 steel	
Well Screen Material	SCH-40 PVC (10-slot)		SCH-40 PVC (10-slot)		SCH-40 PVC (10-slot)		SCH-40 PVC (10-slot)	
Well Screen Length (feet)	10		10		10		10	
Well Protective Casing Material	8-in Dia x 6' Steel		8-in Dia x 6' Steel		8-in Dia x 6' Steel		8-in Dia x 6' Steel	
Protective Bumper Posts (Y or N)	N		N		N		N	
Diameter of Borehole	8-inches		8-inches		8-inches		8-inches	
	(feet below GS)	(feet NAVD)	(feet below GS)	(feet NAVD)	(feet below GS)	(feet NAVD)	(feet below GS)	(feet NAVD)
TOC Elevation	-	729.13	-	731.83	-	721.19	-	727.04
Ground Surface	-	726.59	-	729.96	-	718.77	-	724.48
Top of Bentonite Grout	1.0	725.6	1.0	-	1.0	717.8	1.0	723.5
Top of 3/8" Chipped Bentonite Seal	41.0	685.6	42.0	688.0	32.0	686.8	33.0	691.5
Top of Sand Pack	43.0	683.6	45.0	685.0	34.5	684.3	35.0	689.5
Top of Screen	45.5	681.1	47.0	683.0	35.7	683.1	37.0	687.5
Bottom of Screen	54.9	671.7	56.5	673.5	45.0	673.8	46.5	678.0
Bottom of Screen Sump	55.4	671.2	57.0	673.0	45.5	673.3	47.0	677.5
Top of Slough (cave in depth)	NA	NA	NA	NA	NA	NA	NA	NA
Boring Bottom (depth drilled)	60.0	666.6	60.0	670.0	47.0	671.8	48.0	676.5
Formation Screened	Fine to Coarse SAND		Fine to Medium SAND		Fine to Coarse SAND		Fine to Coarse SAND	

Notes

PVC = Polyvinyl Chloride
SCH-40 = Schedule 40 pipe
10-slot = 0.010 inches
NAVD = 1988 North American Vertical Datum
GS = ground surface

TABLE 5
Summary of Groundwater Elevation Data
Hydrogeologic Investigation
Afton, Minnesota

Well ID No.	**MW-1**	**MW-2**	**MW-3**	**MW-4**
TOC Elevation (ft above MSL)	729.132	731.825	721.187	727.042
Ground Elevation (ft above MSL)	726.6	730.0	718.8	724.5
Top of Screen Elevation (ft above MSL)	684.2	684.8	686.2	690.5
Bottom of Screen Elevation (ft above MSL)	674.232	674.825	676.187	680.542
Date	**MW-1**	**MW-2**	**MW-3**	**MW-4**
10/21/13	682.06	681.07	682.44	683.20
10/24/13	682.09	681.11	682.43	683.22
11/01/13	682.04	681.06	682.39	683.20
11/07/13	682.00	681.01	682.40	683.16
11/18/13	681.97	680.96	682.35	683.13
11/26/13	681.96	680.96	682.33	683.11

Average depth to water (from ground surface)	44.56	48.93	36.38	41.31
Minimum elevation of shallow groundwater table	681.96	680.96	682.33	683.11
Average elevation of shallow groundwater table	682.02	681.02	682.39	683.17
Maximum elevation of shallow groundwater table	682.09	681.11	682.44	683.22

TABLE 6
Summary of Hydraulic Conductivity Testing Results
Hydrogeologic Investigation
Afton, Minnesota

Well ID	Test ID	Test Type	Calculated Hydraulic Conductivity (K) in ft/day	Average Hydraulic Conductivity (K) in ft/day	Calculated Hydraulic Conductivity (K) in cm/sec	Average Hydraulic Conductivity (K) in cm/sec
MW-1	MW-1in	Falling Head	599	561	0.21	0.20
	MW-1out	Rising Head	523		0.18	
MW-2	MW-2in	Falling Head	292	318	0.10	0.11
	MW-2out	Rising Head	344		0.12	
MW-3	MW-3in	Falling Head	440	574	0.15	0.20
	MW-3out	Rising Head	707		0.25	
MW-4	MW-4in	Falling Head	889	1020	0.31	0.36
	MW-4out	Rising Head	1150		0.41	
			Average:	**618**	**Average:**	**0.22**

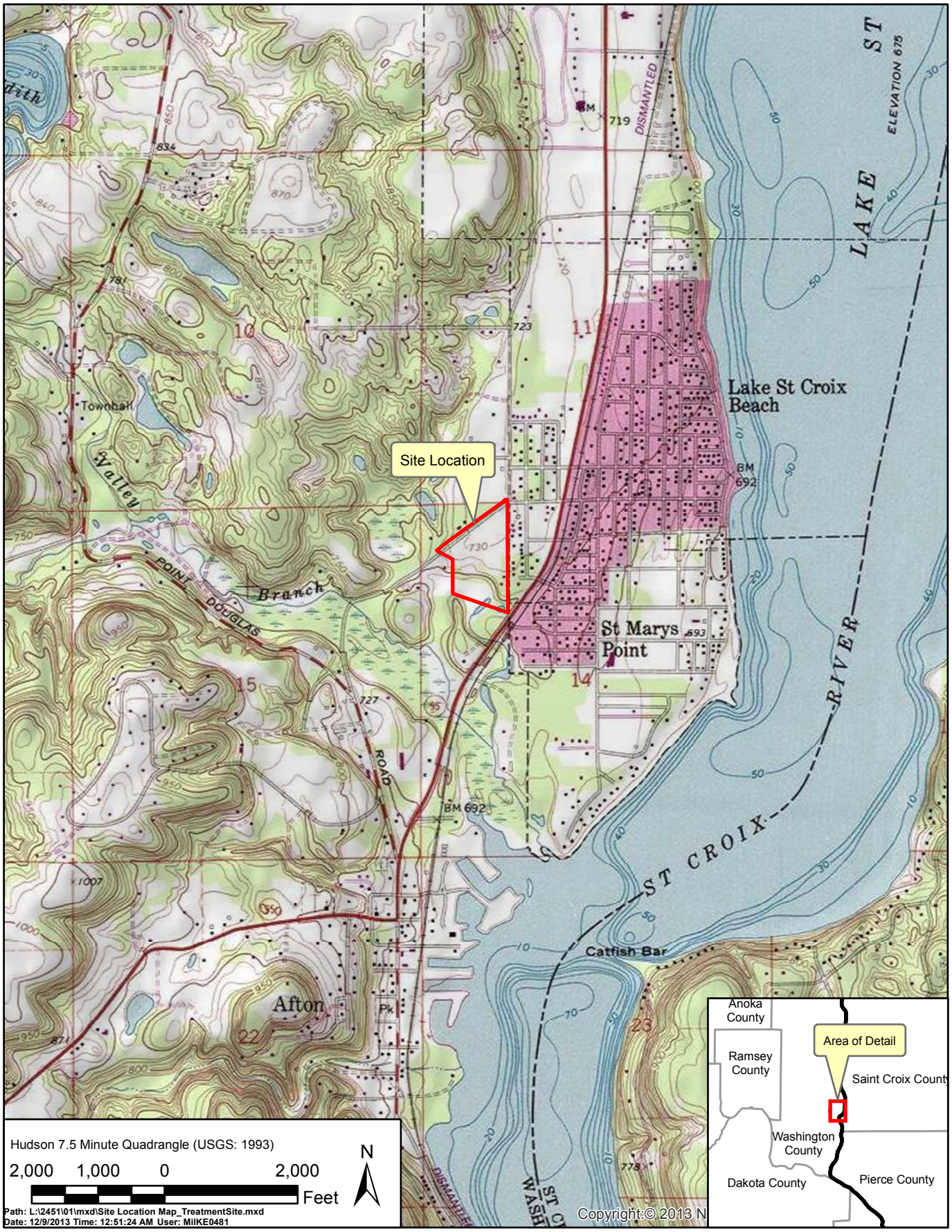
TABLE 7
Summary of Groundwater Quality Results
Hydrogeologic Investigation
Afton, Minnesota

Parameter	Method	Units	HRL	MCL	SDWR	MW-1 11/7/2013	MW-5 11/7/2013	MW-1 11/26/2013	MW-2 11/7/2013	MW-2 11/26/2013	MW-3 11/7/2013	MW-3 11/26/2013	MW-5 11/26/2013	MW-4 11/7/2013	MW-4 11/26/2013
							Duplicate of MW-1						Duplicate of MW-3		
Field Parameters															
pH - Field	SM2320-B	SU			6.5-8.5	6.12	6.12	7.57	6.39	7.82	5.91	7.46	7.46	5.80	7.24
Conductivity - Field	SM2320-B	umhos/cm				336	336	391	285	335	317	363	363	276	331
Disolved Oxygen - Field	SM2320-B	mg/l				7.57	7.57	15.48	7.74	20.98	1.29	9.07	9.07	1.00	7.72
Oxidation Reduction Potention - Field	SM2320-B	mV				157	157	171.5	176	218.2	204	182.7	182.7	207	189.8
Temperature - Field	SM2320-B	Degrees C				9.46	9.46	9.58	9.78	9.75	9.79	10.01	10.01	11.25	11.19
Turbidity - Field	SM2320-B	Degrees C				42.6	42.6	32.9	42.3	42.0	212	50.9	50.9	40.4	40.2
Volatile Organic Compounds (VOCs)															
Volatile Organic Compounds	8260	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
General Chemistry Parameters															
Alkalinity - Total (as CaCO3)	SM2320-B	mg/l				190	NA	190	180	180	200	190	NA	170	170
Bromide	9056	mg/l				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride	9056	mg/l			250	29	29	28	22	20	17	16	16	21	19
Fluoride	9056	mg/l		4	2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	9056	mg/l	10	10		3.4	3.4	3.0	1.6	1.6	3.3	3.0	3.0	0.31	0.68
Nitrite	9056	mg/l		1		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate-Nitrite	353.2	mg/l				3.6	3.6	3.4	1.7	1.8	3.3	3.4	3.4	0.390	0.930
Sulfate	9056	mg/l			250	14	14	14	11	11	11	11	11	<5.0	<5.0
Chemical Oxygen Demand (COD)	410.4	mg/l				75	<10	<10	17	24	18	16	<10	21	14
Ammonia Nitrogen	350.1	mg/l				0.130	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.130	0.140
Phosphate,Ortho	4500P F-2011	mg/l				0.120	0.140	0.048	0.470	0.046	0.520	0.040	0.042	0.120	0.780
Phosphorus,Total	365.4	mg/l				0.120	<0.10	0.120	0.260	2.3	0.350	0.190	0.180	0.150	0.210
Aluminum	6010B	mg/l			0.05-0.2	1.4	1.2	1.9	3.1	3.5	6.6	6.7	6.0	0.9	3.4
Calcium	6010B	mg/l				59	59	62	49	59	67	67	66	47	54
Magnesium	6010B	mg/l				25	24	27	22	28	27	28	28	19	26
Manganese	6010B	mg/l			0.05	0.220	0.220	0.350	0.140	0.530	0.660	0.600	0.520	1.7	3.0
Potassium	6010B	mg/l				1.8	1.8	1.9	4.4	4.6	3.2	3.1	3.0	1.6	2.6
Sodium	6010B	mg/l				7.8	7.6	9.0	6.3	6.6	6.4	6.6	6.6	6.8	8.2
Cation Summation	-	meq/l				5.37	NA	5.74	4.63	5.64	5.91	6.00	NA	4.23	5.24
Anion Summation	-	meq/l				4.95	NA	4.92	4.46	4.41	4.75	4.52	NA	4.04	3.99
Percent Error	-	%				4.08	NA	7.70	1.84	12.25	10.92	14.05	NA	2.38	13.56

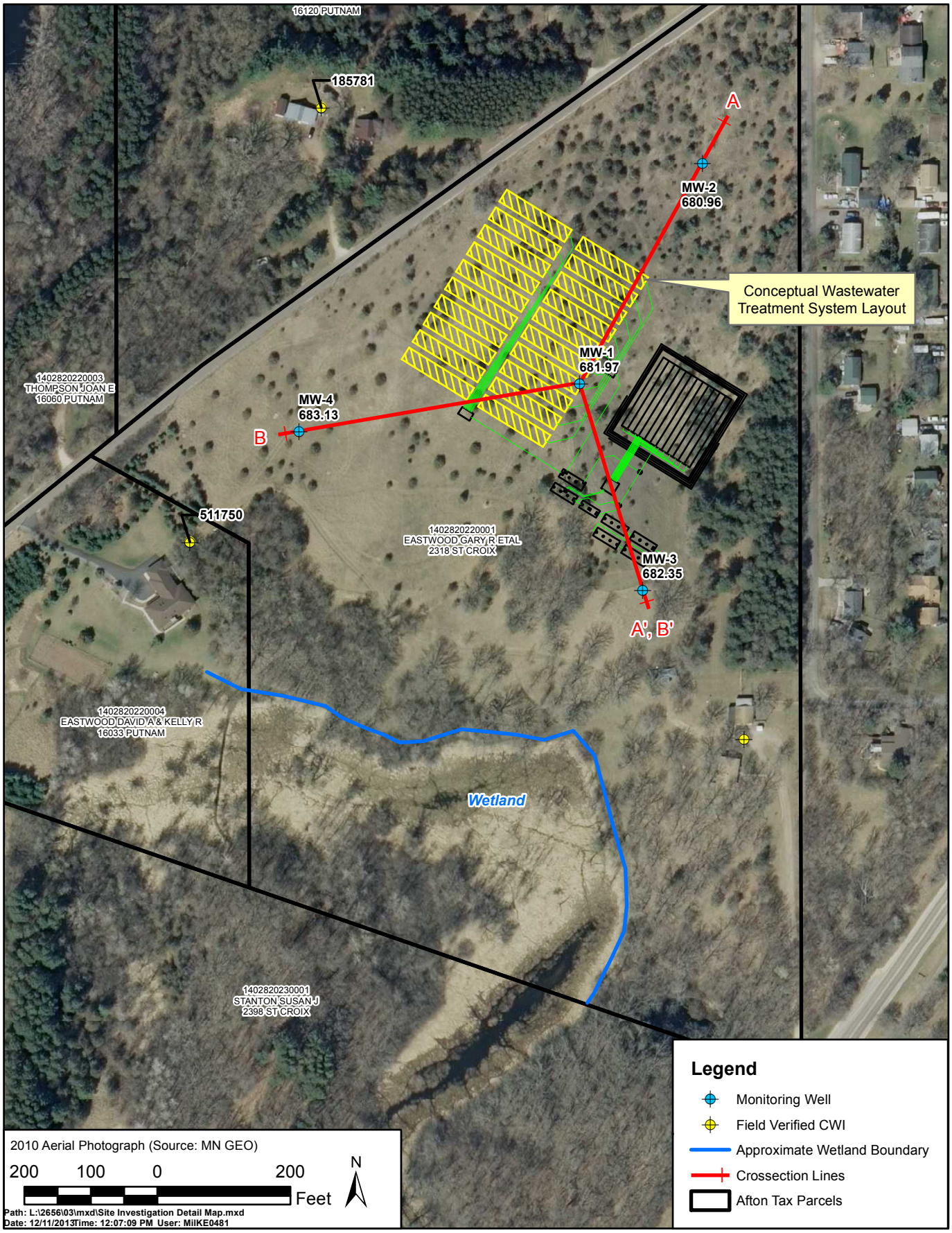
Notes:

HRL	= MDH Health Risk Limit
MCL	= EPA Maximum Contaminant Limit (from the Safe Drinking Water Act)
SMCL	= EPA Secondary Drinking Water Regulations (from the Safe Drinking Water Act)
ND	= not detected
NA	= not analyzed
<0.001	= analyte not detected above method reporting limit
0.0013	= analyte detected above method reporting limit
0.1525	= analyte detected above MCL
0.39	= analyte detected above SDWR
(1)	= TT (Action Level for treatment technique)
(2)	= MCL for Nitrate = 10 mg/l, MCL for nitrite = 1.0 mg/l)
mg/l	= milligrams per liter (parts per million)
SU	= standard units
meq/l	= milliequivalents per liter
umhos/cm	= micromhos per centimeter

Figures



CITY OF AFTON	Wenck Engineers - Scientists Business Professionals www.wenck.com 1800 Pioneer Creek Center Maple Plain, MN 55359-0429 1-800-472-2232	DEC 2013
Site Location Map		Figure 1



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Site Investigation Detail Map

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Figure 2

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MDH CWI Inventory Map

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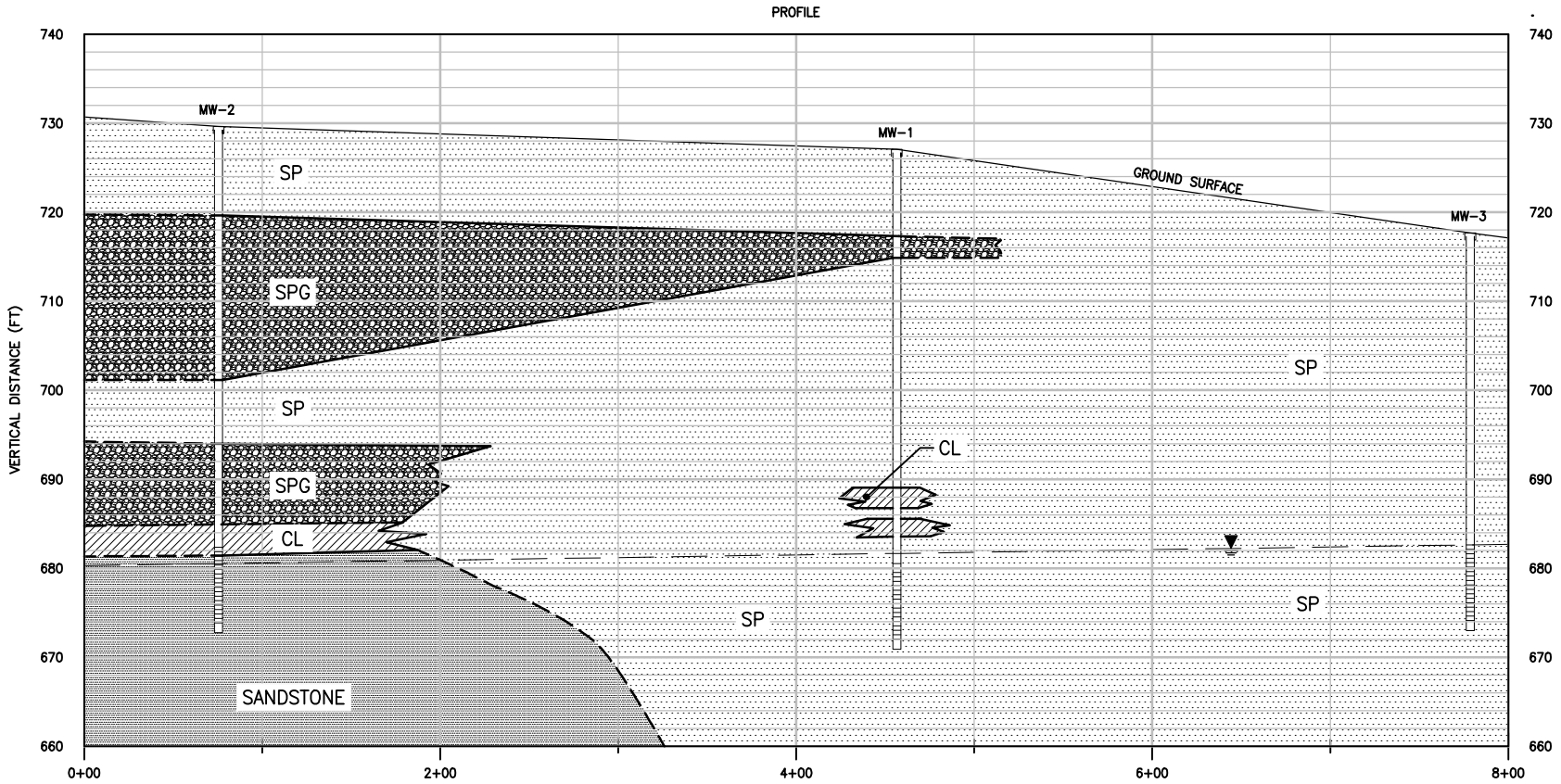
Figure 3



LEGEND

- CLAY (CL)
- SAND (SP)
- IRONTRON AND GALESVILLE SANDSTONES BEDROCK (SP)
- SANDSTONE
- GRAVELLY SAND (SP)
- GROUNDWATER ELEVATION (NOVEMBER 26, 2013)
- ESTIMATED WATER TABLE

NOTE:
NAVD 88 = 1988 NORTH AMERICAN VERTICAL DATUM.

VERT. 0 10 20
HORZ. 0 50 100
GRAPHIC SCALE IN FEET

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REV	DWN	APP	REV DATE	DWN BY	CHK'D	APP'D
				DTH		

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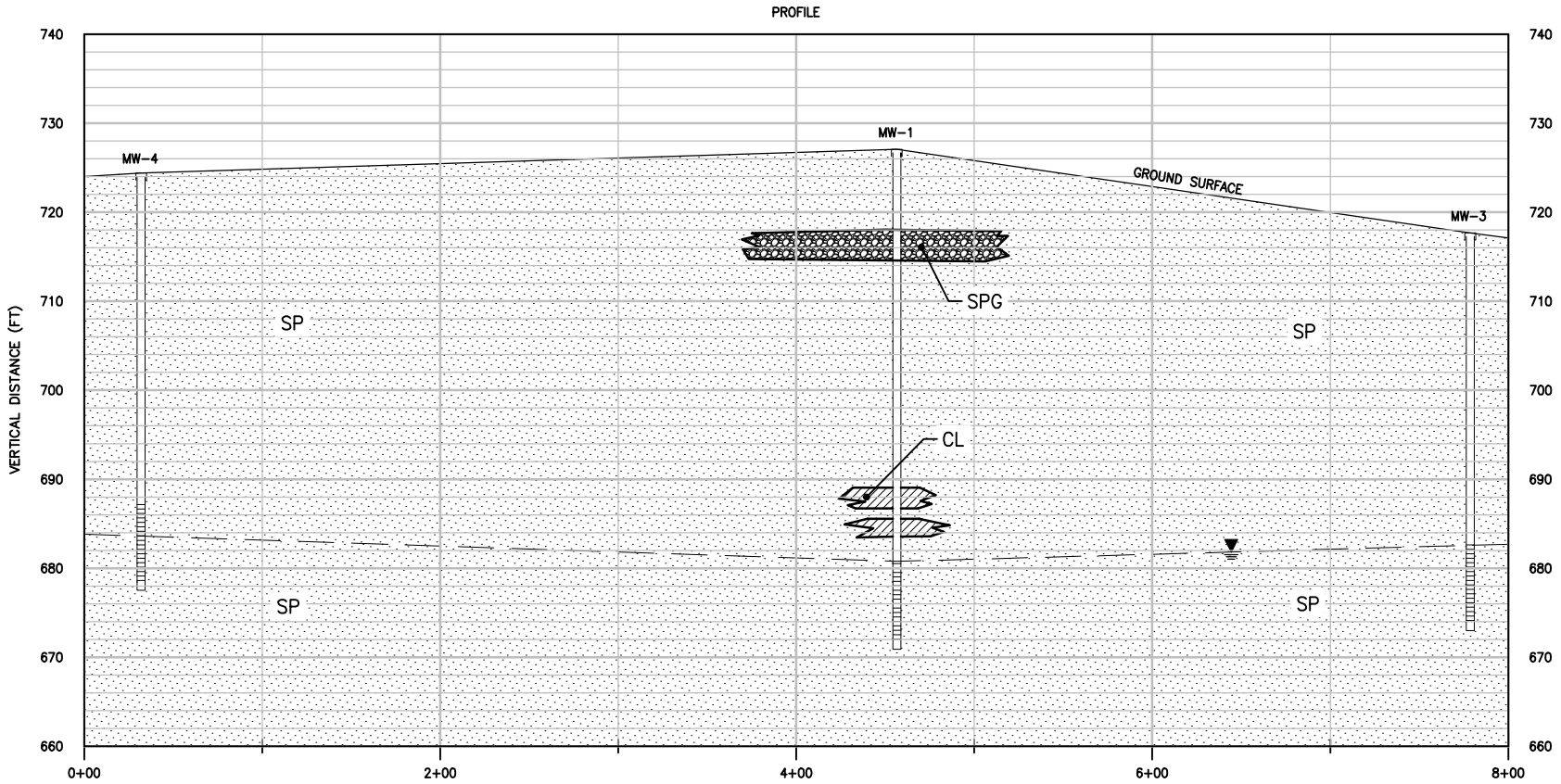
DWG DATE DEC 2013
SCALE AS SHOWN

PROJECT
AFTON HYDROGEOLOGIC INVESTIGATION

SHEET TITLE
PROFILE A-A'

PROJECT NO.	SHEET NO.	REV NO.
2656-03	FIGURE 4	—



LEGEND

- CLAY (CL)
- SAND (SP)
- SANDSTONE
- GRAVELLY SAND (SP)
- GROUNDWATER ELEVATION (NOVEMBER 26, 2013)
- ESTIMATED WATER TABLE

NOTE:
NAVD 88 = 1988 NORTH AMERICAN VERTICAL DATUM.

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DWG DATE DEC 2013
SCALE AS SHOWN

PROJECT
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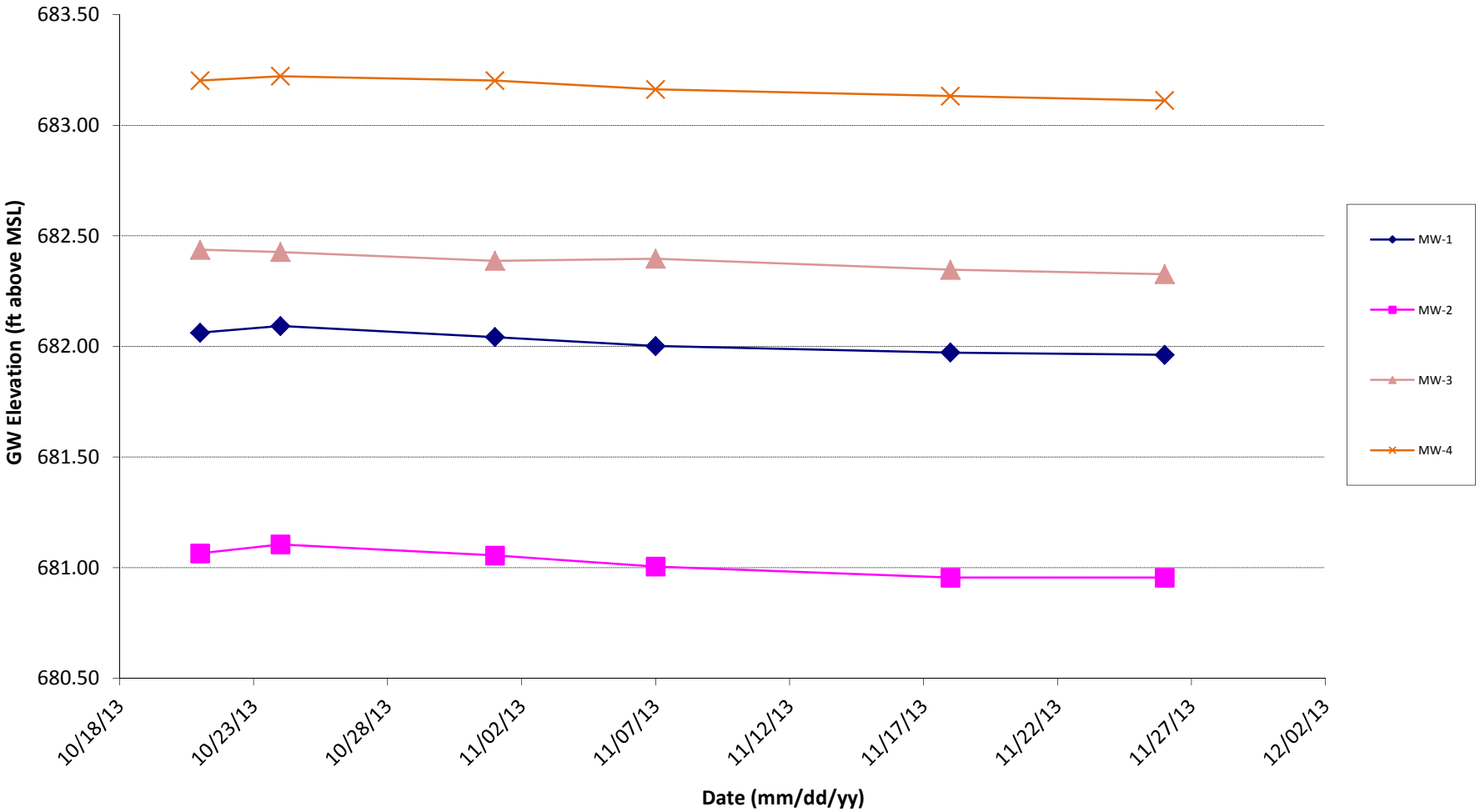
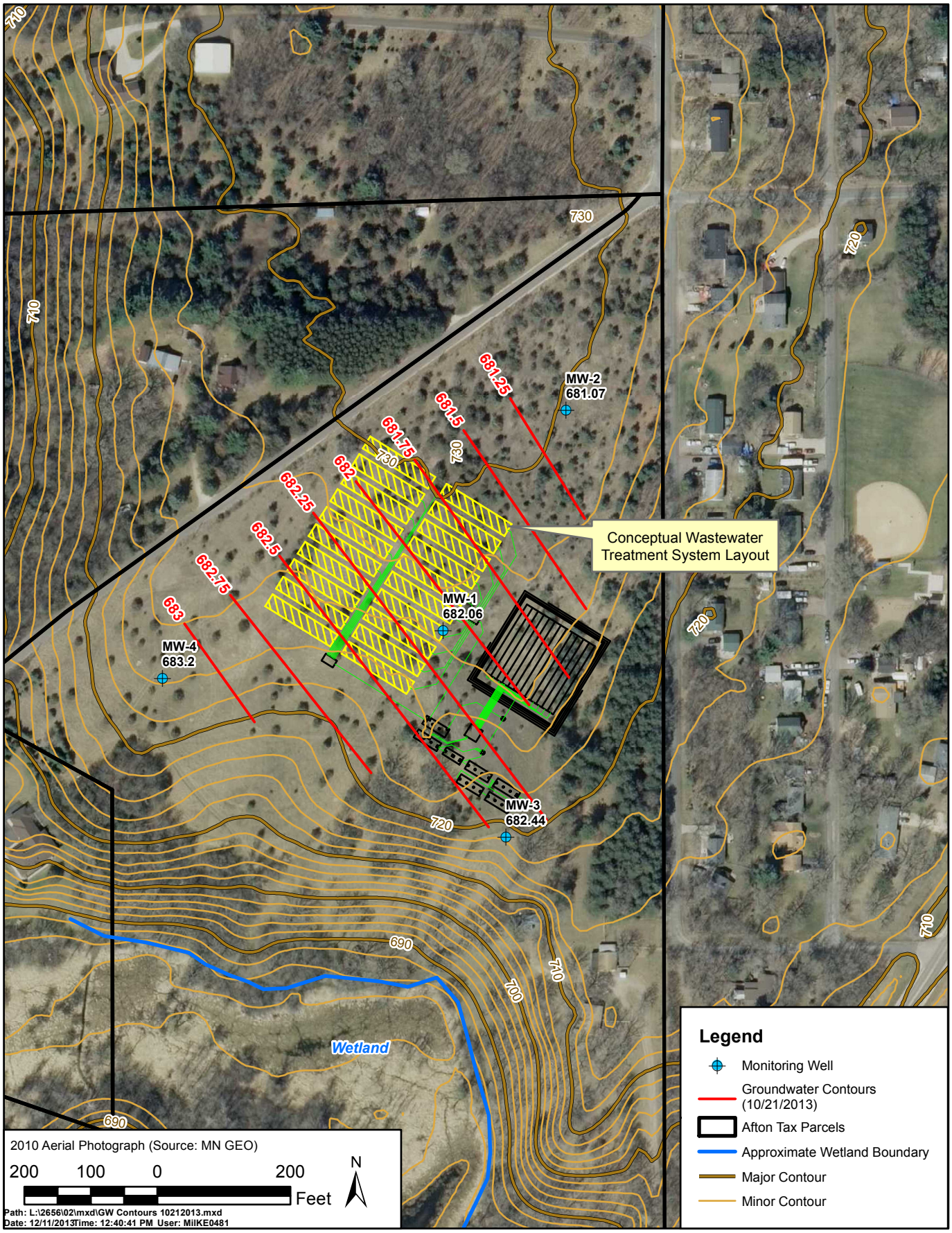
SHEET TITLE
PROFILE B-B'

PROJECT NO.	SHEET NO.	REV NO.
2656-03	FIGURE 5	—

Figure 6
Historical Groundwater Elevations
Hydrogeologic Investigation
Afton, MN





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Potentiometric Surface Map - October 21, 2013

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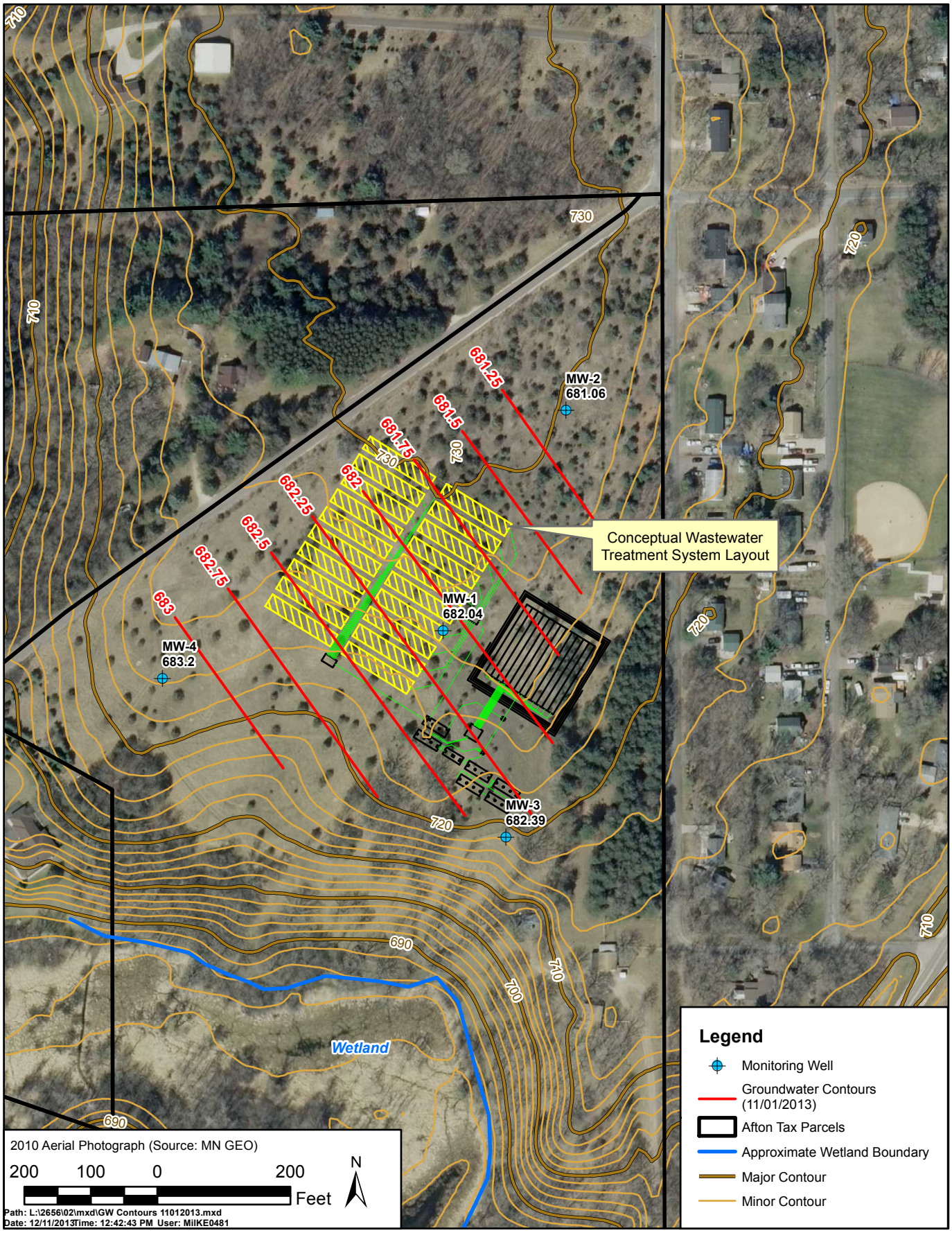
Figure 7



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Potentiometric Surface Map - November 1, 2013

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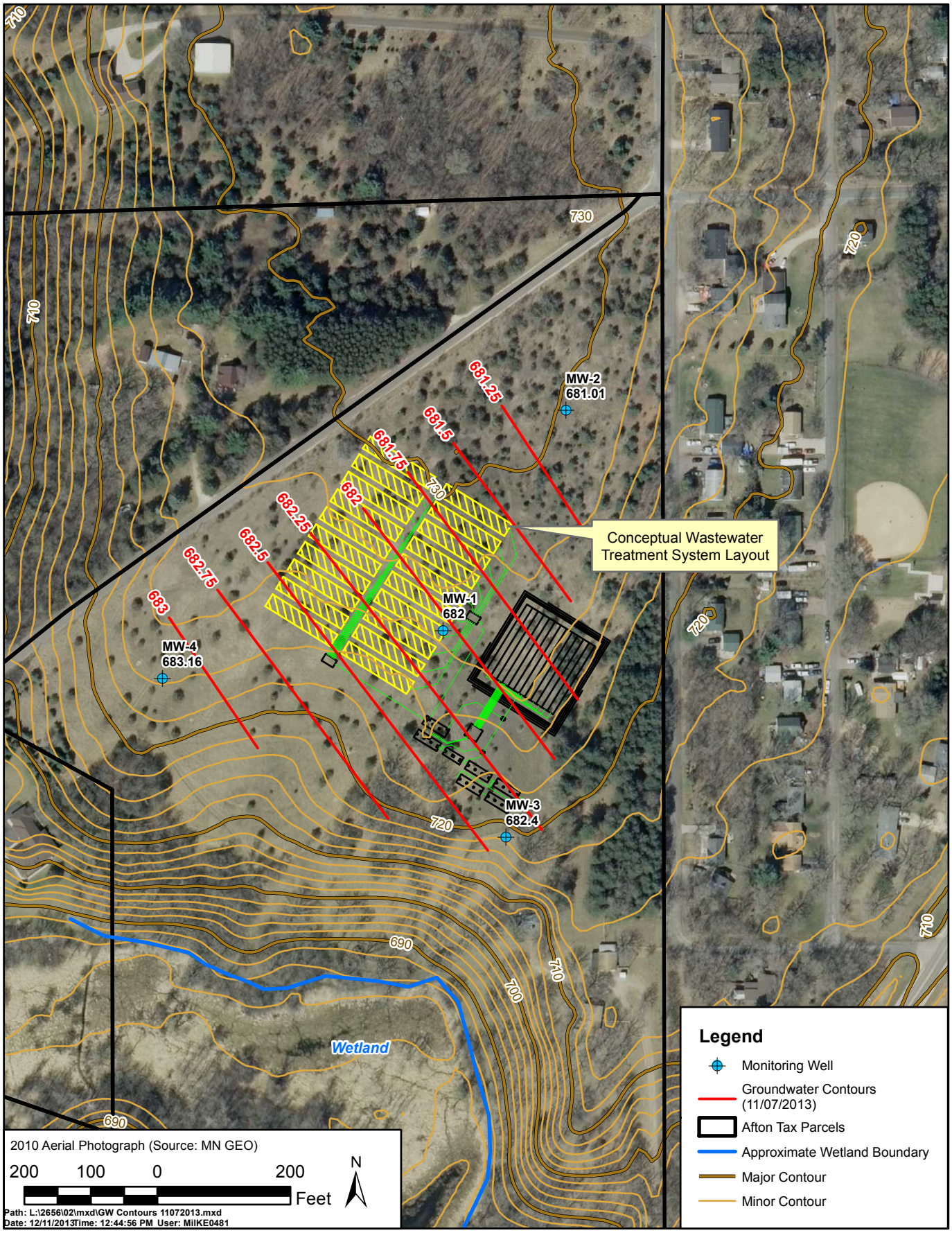
Figure 8



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Potentiometric Surface Map - November 7, 2013

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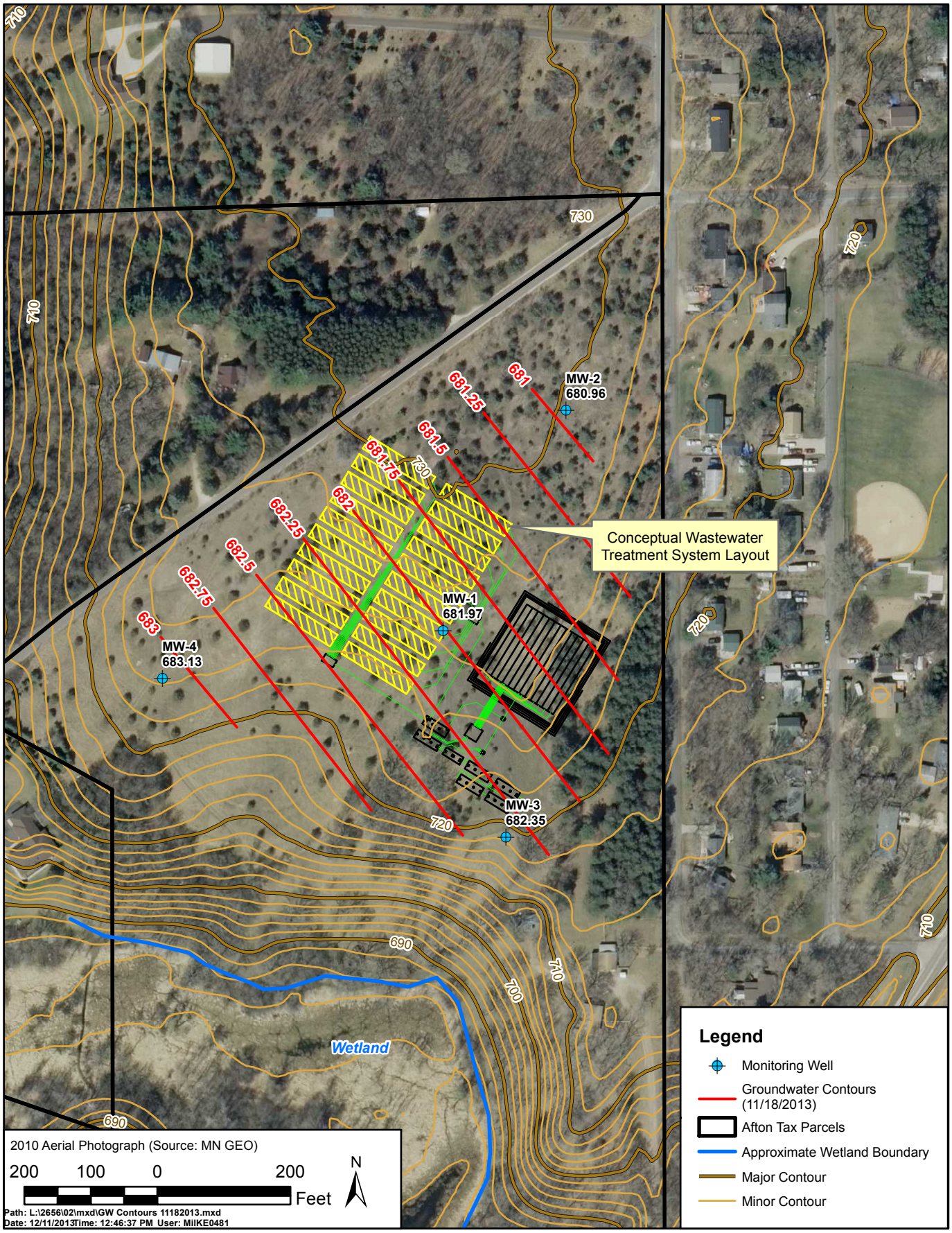
Figure 9



CITY OF AFTON

Potentiometric Surface Map - November 18, 2013

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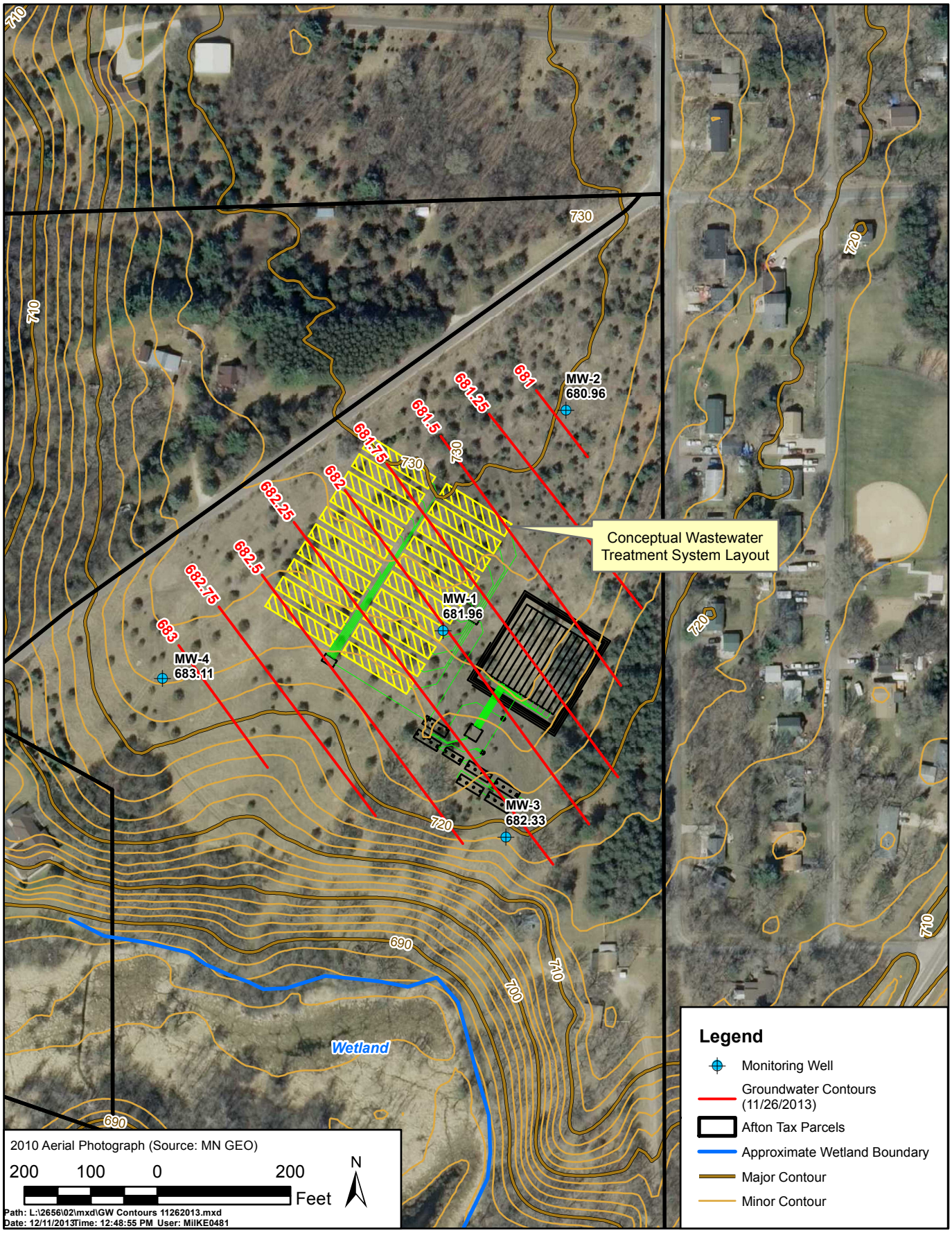
Figure 10



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Potentiometric Surface Map - November 26, 2013

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Figure 11

Blue highlighted properties are connected to municipal water supply system.

Map provided by Mr. Matt Kline, Director of Public Works, City of Lakeland

City of Afton	Wenck Engineers • Scientists, 1802 Wooddale Drive, Suite 100, Woodbury, MN 55125	DEC 2013
Municipal Water Supply Connections		FIGURE 12

Appendix A

NRCS Web Soil Survey

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Washington County, Minnesota

City of Afton Hydrogeologic Investigation

December 4, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map.....8
Legend.....9
Map Unit Legend.....10
Map Unit Descriptions.....10
Washington County, Minnesota.....12
151—Burkhardt sandy loam, 0 to 3 percent slopes.....12
454B—Mahtomedi loamy sand, 0 to 6 percent slopes.....13
454C—Mahtomedi loamy sand, 6 to 12 percent slopes.....14
454D—Mahtomedi loamy sand, 12 to 25 percent slopes.....15
1821—Algansee loamy sand.....16
References.....18

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

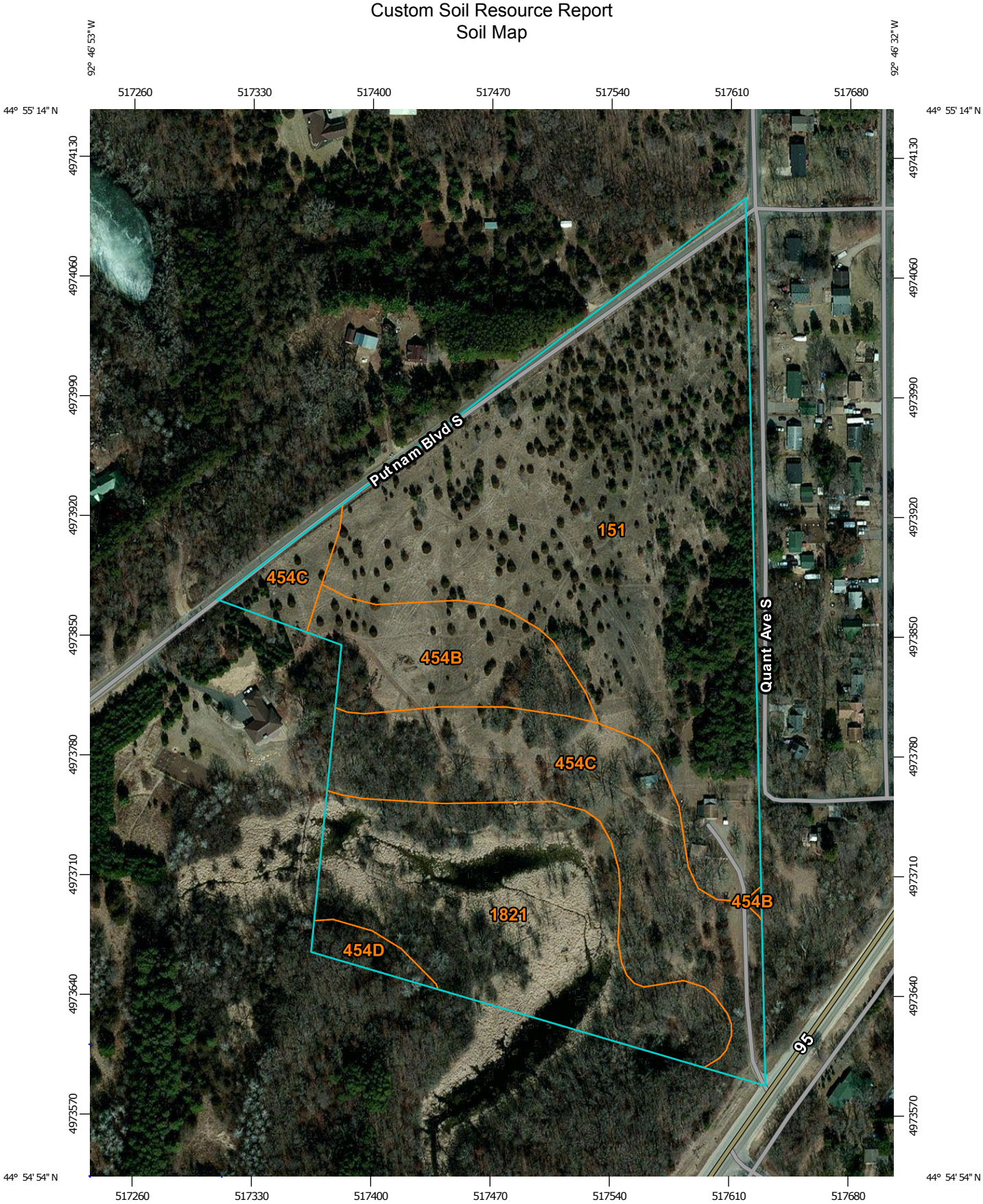
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,040 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Minnesota
Survey Area Data: Version 7, Jul 3, 2012

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2011—Apr 26, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Washington County, Minnesota (MN163)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
151	Burkhardt sandy loam, 0 to 3 percent slopes	12.1	48.8%
454B	Mahtomedi loamy sand, 0 to 6 percent slopes	2.2	8.7%
454C	Mahtomedi loamy sand, 6 to 12 percent slopes	5.0	20.0%
454D	Mahtomedi loamy sand, 12 to 25 percent slopes	0.3	1.3%
1821	Algansee loamy sand	5.3	21.2%
Totals for Area of Interest		**24.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, Minnesota

151—Burkhardt sandy loam, 0 to 3 percent slopes

Map Unit Setting

Elevation: 700 to 1,900 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition

Burkhardt and similar soils: 90 percent
Minor components: 10 percent

Description of Burkhardt

Setting

Landform: Outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy glaciofluvial deposits over outwash

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 2s
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile

0 to 13 inches: Sandy loam
13 to 16 inches: Sandy loam
16 to 60 inches: Gravelly coarse sand

Minor Components

Dickman

Percent of map unit: 4 percent

Hubbard

Percent of map unit: 3 percent

Sparta

Percent of map unit: 3 percent

454B—Mahtomedi loamy sand, 0 to 6 percent slopes

Map Unit Setting

Elevation: 670 to 1,600 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition

Mahtomedi and similar soils: 90 percent
Minor components: 10 percent

Description of Mahtomedi

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile

0 to 8 inches: Loamy sand
8 to 30 inches: Gravelly coarse sand
30 to 60 inches: Gravelly sand

Minor Components

Antigo

Percent of map unit: 3 percent

Brill

Percent of map unit: 3 percent

Demontreville
Percent of map unit: 2 percent

Kingsley
Percent of map unit: 2 percent

454C—Mahtomedi loamy sand, 6 to 12 percent slopes

Map Unit Setting
Elevation: 670 to 1,600 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition
Mahtomedi and similar soils: 90 percent
Minor components: 10 percent

Description of Mahtomedi

Setting
Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 4.3 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A

Typical profile
0 to 8 inches: Loamy sand
8 to 30 inches: Gravelly coarse sand
30 to 60 inches: Gravelly sand

Minor Components

Antigo
Percent of map unit: 3 percent

Brill
Percent of map unit: 3 percent

Demontreville
Percent of map unit: 2 percent

Kingsley
Percent of map unit: 2 percent

454D—Mahtomedi loamy sand, 12 to 25 percent slopes

Map Unit Setting
Elevation: 670 to 1,600 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition
Mahtomedi and similar soils: 90 percent
Minor components: 10 percent

Description of Mahtomedi

Setting
Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Properties and qualities
Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 4.2 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy sand
5 to 8 inches: Sand
8 to 30 inches: Gravelly coarse sand
30 to 60 inches: Gravelly sand

Minor Components

Antigo

Percent of map unit: 4 percent

Demontreville

Percent of map unit: 3 percent

Kingsley

Percent of map unit: 3 percent

1821—Algansee loamy sand

Map Unit Setting

Elevation: 600 to 900 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition

Algansee and similar soils: 95 percent
Minor components: 5 percent

Description of Algansee

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Low (about 5.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 3w

Hydrologic Soil Group: A/D

Typical profile

0 to 6 inches: Loamy sand
6 to 60 inches: Sand

Minor Components

Chaska

Percent of map unit: 5 percent
Landform: Depressions

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Appendix B

CWI Well Records

Minnesota Unique Well No.

110406

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 03/01/1989
Update Date 06/26/2012
Received Date

Well Name ECKERSTROM, TY

Township	Range	Dir	Section	Subsections	Elevation	Elevation Method
28	20	W	11	CDCDB	725 ft.	7.5 minute topographic map (+/- 5 feet)

Well Depth	Depth Completed	Date Well Completed
75 ft.	75 ft.	03/05/1975

Drilling Method Cable Tool

Well Address
1964 QUARTZ AV S
ST CROIX BEACH MN 55043

Geological Material	Color	Hardness	From	To
GRAVEL & SAND	BRN/RED		0	59
SANDROCK	GREEN	HARD	59	75

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 69 ft.	11 lbs./ft.	4 in. to 75 ft.

Open Hole from 69 ft. to 75 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
35 ft. from Land surface Date Measured 03/05/1975

PUMPING LEVEL (below land surface)
55 ft. after 2 hrs. pumping 20 g.p.m.

Well Head Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Located by: Minnesota Geological Survey
Method: Digitized - scale 1:24,000 or larger (Digitizing Table)
Unique Number
Verification: Address verification
Input Date: 01/01/1990
System: *UTM - Nad83, Zone15, Meters*
X: 517749 **Y:** 4974184

Grouting Information Well Grouted? ☐ Yes ☑ No

Nearest Known Source of Contamination
78 feet North East direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed 08/05/1976
Manufacturer's name REDA PUMP CO. Model number 9D9P051
HP 0.5 Volts 230
Length of drop Pipe 70 ft. Capacity 14 g.p.m
Type Submersible Material Galvanized

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Franconia
Last Strat Franconia
Aquifer Franconia
Depth to Bedrock 59 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	MANTYLA, E.

County Well Index Online Report **110406** Printed 6/6/2013
HE-01205-07

Minnesota Unique Well No.

139290

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 06/26/1990
Update Date 06/26/2012
Received Date

Well Name

Township Range Dir Section Subsections Elevation 731 **ft.**

28 20 W 11 CDCCCC **Elevation Method** 7.5 minute topographic map (+/- 5 feet)

Well Depth	Depth Completed	Date Well Completed
120 **ft.**	120 **ft.**	02/13/1987

Drilling Method Non-specified Rotary

Well Address
1995 QUANT AV
LAKELAND MN

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Geological Material	Color	Hardness	From	To
SAND	BROWN	SOFT	0	31
GRAVEL & CLAY	BROWN	SOFT	31	56
SANDROCK	WHITE	SOFT	56	79
SANDROCK	GREEN	HARD	79	120

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 87 ft.	lbs./ft.	

Open Hole from 87 ft. to 120 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
45 ft. from Land surface Date Measured 07/13/1987

PUMPING LEVEL (below land surface)
45 ft. after 2 hrs. pumping 40 g.p.m.

Well Head Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

REMARKS
CITY SECT. MAP.

Located by: Minnesota Geological Survey

Method: Digitized - scale 1:24,000 or larger (Digitizing Table)

Unique Number Verification: Address verification

Input Date: 01/01/1990

System: *UTM - Nad83, Zone15, Meters*

X: 517648 **Y:** 4974106

Grouting Information Well Grouted? ☐ Yes ☑ No

Nearest Known Source of Contamination
50 feet E direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed 00/00/1987
Manufacturer's name RED JACKET Model number 106PM
HP 0.5 Volts 220
Length of drop Pipe 60 ft. Capacity 12 g.p.m
Type Submersible Material Plastic

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Ironton-Galesville
Last Strat Eau Claire Formation
Aquifer Eau Claire
Depth to Bedrock 56 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Zuercher Well Co.	62028	ZUERCHER, A.

County Well Index Online Report **139290** Printed 6/6/2013
HE-01205-07

Minnesota Unique Well No.

154454

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 03/01/1989
Update Date 06/28/2012
Received Date

Well Name KOHLER, CRAIG

Township	Range	Dir	Section	Subsections	Elevation	Elevation Method
28	20	W	14	BACBAD	720 ft.	7.5 minute topographic map (+/- 5 feet)

Well Depth	Depth Completed	Date Well Completed
89 ft.	89 ft.	04/06/1979

Drilling Method Non-specified Rotary

Well Address
2127 QUARRY
ST CROIX BEACH MN

Geological Material	Color	Hardness	From	To
COARSE GRAVEL			0	55
CLAY			55	60
GRAVEL			60	62
SANDROCK			62	89

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** Welded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 81 ft.	11 lbs./ft.	

Open Hole from 81 ft. to 89 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
15 ft. from Land surface Date Measured 04/06/1979

PUMPING LEVEL (below land surface)
60 ft. after 2 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Located by: Minnesota Geological Survey **Method:** Digitized - scale 1:24,000 or larger (Digitizing Table)

Unique Number Verification: Lot Block **Input Date:** 01/01/1990

System: *UTM - Nad83, Zone15, Meters* **X:** 517735 **Y:** 4973862

Grouting Information Well Grouted? ☐ Yes ☑ No

Nearest Known Source of Contamination
50 feet S direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed 05/15/1979
Manufacturer's name GOULD Model number 10EX07 HP 0.75 Volts 220
Length of drop Pipe 60 ft. Capacity 15 g.p.m Type Submersible Material Steel (black or low carbon)

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Ironton-Galesville
Last Strat Ironton-Galesville-Eau Clai
Aquifer Eau Claire
Depth to Bedrock 62 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mccullough & Sons	82054	MCCULLOUGH, D

County Well Index Online Report **154454** Printed 6/3/2013
HE-01205-07

Minnesota Unique Well No.

185781

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 06/26/1990
Update Date 06/28/2012
Received Date

Well Name BELZ, ROBERT

Township Range Dir Section Subsections Elevation 729 **ft.**

28 20 W 14 BBBADD **Elevation Method** 7.5 minute topographic map (+/- 5 feet)

Well Depth	Depth Completed	Date Well Completed
200 **ft.**	200 **ft.**	08/19/1982

Drilling Method Non-specified Rotary

Well Address
16120 PUTMAN BL S
AFTON MN

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Geological Material	Color	Hardness	From	To
SAND & GRAVEL	BROWN	SFT-HRD	0	80
SAND	BROWN	SOFT	80	120
SANDROCK - SOAPSTONE	BLU/GRN	SFT-HRD	120	200

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 188 ft.	11 lbs./ft.	

Open Hole from 188 ft. to 200 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
50 ft. from Land surface Date Measured 08/19/1982

PUMPING LEVEL (below land surface)
65 ft. after 2 hrs. pumping 25 g.p.m.

Well Head Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Grouting Information Well Grouted? ☐ Yes ☑ No

Located by: Minnesota Geological Survey **Method:** Digitized - scale 1:24,000 or larger (Digitizing Table)

Unique Number
Verification: Information from neighbor **Input Date:** 01/01/1990
System: *UTM - Nad83, Zone15, Meters* **X:** 517415 **Y:** 4973997

Nearest Known Source of Contamination
90 feet E direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed 08/25/1982
Manufacturer's name GOULD PUMP CO. Model number 10EJ05412
HP 0.5 Volts 230
Length of drop Pipe 65 ft. Capacity 10 g.p.m
Type Submersible Material Galvanized

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Eau Claire Formation
Last Strat Eau Claire Formation
Aquifer Eau Claire
Depth to Bedrock 120 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	MANTYLA, E.

County Well Index Online Report **185781** Printed 6/3/2013
HE-01205-07

Minnesota Unique Well No.

410957

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 08/19/1991
Update Date 10/04/2004
Received Date 01/07/1998

Well Name

Township Range Dir Section Subsections Elevation 729 **ft.**

28 20 W 11 CDCCCB **Elevation Method** CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
120 **ft.**	120 **ft.**	02/27/1987

Drilling Method Non-specified Rotary

Well Address
1995 QUANT AV S
LAKELAND MN 55043

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Geological Material	Color	Hardness	From	To
SAND	BROWN	SOFT	0	32
CLAY	GRAY	SOFT	32	58
SANDROCK	GREEN	SOFT	58	77
SANDROCK	YELLOW	HARD	77	120

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 90 ft.	11 lbs./ft.	6 in. to 90 ft.

Open Hole from 90 ft. to 120 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
ft. from Date Measured

PUMPING LEVEL (below land surface)
50 ft. after 2 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Located by: Minnesota Geological Survey **Method:** Digitization (Screen) - Map (1:24,000)

Unique Number Verification: Address verification **Input Date:** 09/10/2004

System: *UTM - Nad83, Zone15, Meters* **X:** 517641 **Y:** 4974129

Grouting Information Well Grouted? ☐ Yes ☑ No

Nearest Known Source of Contamination
50 feet E direction Septic tank/drain field type
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed
Manufacturer's name WEBTROL Model number 10 HP 0.5 Volts 220
Length of drop Pipe 60 ft. Capacity 15 g.p.m
Type Submersible Material Plastic

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Franconia
Last Strat Ironton-Galesville
Aquifer Ironton-Galesville
Depth to Bedrock 58 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Zuercher Well Co.	62028	

County Well Index Online Report **410957** Printed 6/6/2013
HE-01205-07

Minnesota Unique Well No.

457687

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 08/19/1991
Update Date 01/21/2005
Received Date

Well Name

Township Range Dir Section Subsections Elevation 728 **ft.**

28 20 W 11 CDCCBC **Elevation Method** CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
97 **ft.**	97 **ft.**	01/26/1989

Drilling Method Non-specified Rotary

Well Address
1979 QUANT AV S
ST CROIX BEACH MN 55043

Drilling Fluid Foam

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Geological Material	Color	Hardness	From	To
SAND & GRAVEL	BROWN	SOFT	0	31
SAND ROCK	GRN/GRY	SOFT	31	78
SAND ROCK	YEL/GRY	MED-HRD	78	97

Casing Type Steel (black or low carbon) **Joint** Welded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** 1 **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 84 ft.	10.79 lbs./ft.	8 in. to 84 ft.

Open Hole from 84 ft. to 97 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
55 ft. from Land surface Date Measured 01/26/1989

PUMPING LEVEL (below land surface)
60 ft. after 2 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer WHITEWATER Model SU4
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Located by:

Method: Digitization (Screen) - Map (1:12,000)

Unique Number Verification: 8

Input Date: 12/12/2003

System: *UTM - Nad83, Zone15, Meters*

X: 517642 **Y:** 4974151

Grouting Information Well Grouted? ☑ Yes ☐ No

Grout Material: Neat Cement from 10 to 84 ft.

Nearest Known Source of Contamination
80 feet E direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed 02/02/1989
Manufacturer's name TRICO Model number 9D9P051 HP 0.5 Volts 230
Length of drop Pipe 63 ft. Capacity 10 g.p.m
Type Submersible Material Galvanized

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

First Bedrock Franconia
Last Strat Ironton-Galesville
Aquifer Ironton-Galesville
Depth to Bedrock 31 **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	COLE, M.

County Well Index Online Report **457687** Printed 6/4/2013
HE-01205-07

Minnesota Unique Well No.

511750

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 08/19/1991
Update Date 02/11/2004
Received Date 09/17/1990

Well Name EASTWOOD, DAVID A

Township Range Dir Section Subsections Elevation 710 **ft.**

28 20 W 14 BBCACA **Elevation Method** CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
261 **ft.**	261 **ft.**	09/04/1990

Drilling Method Non-specified Rotary

Well Address
16033 PUTMAN
AFTON MN 55001

Geological Material	Color	Hardness	From	To
GRAVEL	BROWN	SOFT	0	220
SANDROCK	BROWN	SOFT	220	230
SANDROCK	GRAY	HARD	230	261

Drilling Fluid Bentonite

Well Hydrofractured? ☐ Yes ☐ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 230 ft.	11 lbs./ft.	6.75 in. to 230 ft.

Open Hole from 230 ft. to 261 ft.

Screen NO **Make** **Type**

Diameter	Slot/Gauze	Length	Set Between

Static Water Level
65 ft. from Land surface Date Measured 09/04/1990

PUMPING LEVEL (below land surface)
150 ft. after 2 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer MAASS Model
☑ Casing Protection Y ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

NO REMARKS

Located by:

Method: Digitization (Screen) - Map (1:12,000)

Unique Number Verification: 8

Input Date: 12/12/2003

System: *UTM - Nad83, Zone15, Meters*

X: 517348 **Y:** 4973818

Grouting Information Well Grouted? ☑ Yes ☐ No

Grout Material: Bentonite from 0 to 230 ft.
Grout Material: Cuttings from to ft.

Nearest Known Source of Contamination
100 feet W direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed 09/07/1990
Manufacturer's name GPM Model number 87TS10 HP 0.5 Volts 230
Length of drop Pipe 74 ft. Capacity 10 g.p.m
Type Submersible Material Galvanized

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	MCCULLOUGH, L

First Bedrock Mt.Simon Sandstone
Last Strat Mt.Simon Sandstone
Aquifer Mt.Simon
Depth to Bedrock 220 **ft.**

County Well Index Online Report **511750** Printed 6/3/2013
HE-01205-07

Minnesota Unique Well No.

599981

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 09/25/1998
Update Date 02/11/2004
Received Date 07/14/1998

Well Name HOLMES, MARK

Township Range Dir Section Subsections Elevation 702 **ft.**

28 20 W 14 BDCBBD **Elevation Method** CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
169 **ft.**	169 **ft.**	06/19/1998

Drilling Method Non-specified Rotary

Well Address
16316 24TH ST S
ST MARY'S POINT MN 55043

Geological Material	Color	Hardness	From	To
SAND & GRAVEL	BROWN	SFT-MED	0	169

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☑ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** Threaded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 166 ft.	11 lbs./ft.	4 in. to 169 ft.

Open Hole from ft. to ft.

Screen YES **Make** JOHNSON **Type** stainless steel

Diameter	Slot/Gauze	Length	Set Between
2	12	5	164 ft. and 169 ft.

Static Water Level
30 ft. from Land surface Date Measured 06/19/1998

PUMPING LEVEL (below land surface)
115 ft. after 1 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer MAASS Model 4J1
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

REMARKS
CASING DRIVEN THROUGH MOUNDED BENTONITE
MN WELL SEALING #H114401, JUNE 23 1998, 226 FOOT DEPTH.

Located by:

Method: Digitization (Screen) - Map (1:12,000)

Unique Number Verification: 8

Input Date: 12/12/2003

System: *UTM - Nad83, Zone15, Meters*

X: 517668 **Y:** 4973444

Grouting Information Well Grouted? ☑ Yes ☐ No

Grout Material: Bentonite from to ft.

Nearest Known Source of Contamination
50 feet North West direction Septic tank/drain field type

Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed 06/22/1998
Manufacturer's name GPM Model number 10P071012 HP 0.75 Volts 230
Length of drop Pipe 115 ft. Capacity 10 g.p.m Type Submersible Material

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☑ No

First Bedrock

Last Strat sand +larger-brown

Aquifer Quat. Water Table Aquifer
Depth to Bedrock **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	

County Well Index Online Report **599981** Printed 6/6/2013
HE-01205-07

Minnesota Unique Well No.

649686

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 08/22/2001
Update Date 03/11/2005
Received Date

Well Name KITTLESON, KIP

Township Range Dir Section Subsections Elevation 702 **ft.**

28	20	W	14	BDBACC	**Elevation Method**	CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
165 **ft.**	165 **ft.**	02/26/2001

Drilling Method Non-specified Rotary

Well Address
16330 UPPER 23RD ST
ST MARYS POINT MN 55043

Geological Material	Color	Hardness	From	To
DRIFT	BROWN	SOFT	0	165

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☑ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** No Information **Drive Shoe?** ☑ Yes ☐ No **Above/Below** **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 162 ft.	11 lbs./ft.	4 in. to 165 ft.

Open Hole from ft. to ft.

Screen YES **Make** JOHNSON **Type** stainless steel

Diameter	Slot/Gauze	Length	Set Between
2	12	5	160 ft. and 165 ft.

Static Water Level
40 ft. from Land surface Date Measured 02/26/2001

PUMPING LEVEL (below land surface)
94 ft. after 1 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer MAASS Model 4J1
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

REMARKS
CASING DRIVEN THROUGH MOUNDED BENTONITE
WX 203 WELL-X-TROL PRESSURE TANK
OLD WELL SEALED 11/20/2000, 23' DEPTH MN WELL SEALING H169832
19'E, OF NE CORNER OF HOUSE

Grouting Information Well Grouted? ☑ Yes ☐ No

Grout Material: Bentonite from to ft.

Located by:

Method: Digitization (Screen) - Map (1:12,000)

Unique Number Verification: 8

Input Date: 12/12/2003

System: *UTM - Nad83, Zone15, Meters*

X: 517752 **Y:** 4973584

Nearest Known Source of Contamination
20 feet W direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed 03/14/2001
Manufacturer's name GPM Model number 10P050813 HP 0.1 Volts
Length of drop Pipe 94 ft. Capacity 10 g.p.m Type Submersible Material

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☑ No

First Bedrock

Last Strat Quat. deposit-brown

Aquifer Quaternary Undiff.
Depth to Bedrock **ft.**

Well Contractor Certification

Mantyla Well Co.	82084	SANDERS, G.
License Business Name	Lic. Or Reg. No.	Name of Driller

County Well Index Online Report **649686** Printed 6/6/2013
HE-01205-07

Minnesota Unique Well No.

665332

County Washington
Quad Hudson
Quad ID 102A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

Entry Date 03/12/2002
Update Date 03/11/2005
Received Date

Well Name PEARSON, ROGER

Township Range Dir Section Subsections Elevation 701 **ft.**

28 20 W 14 BDBACD **Elevation Method** CALC FROM 2-FOOT COUNTY DEM

Well Depth	Depth Completed	Date Well Completed
165 **ft.**	165 **ft.**	09/19/2001

Drilling Method Non-specified Rotary

Well Address
16360 UPPER 23RD ST
ST MARYS POINT MN 55043

Geological Material	Color	Hardness	From	To
SAND & GRAVEL	BROWN	SOFT	0	165

Drilling Fluid --

Well Hydrofractured? ☐ Yes ☑ No
From Ft. to Ft.

Use Domestic

Casing Type Steel (black or low carbon) **Joint** Welded **Drive Shoe?** ☑ Yes ☐ No **Above/Below** **ft.**

Casing Diameter	Weight	Hole Diameter
4 in. to 162 ft.	11 lbs./ft.	4 in. to 165 ft.

Open Hole from ft. to ft.

Screen YES **Make** JOHNSON **Type** stainless steel

Diameter	Slot/Gauze	Length	Set Between
2	12	5	160 ft. and 165 ft.

Static Water Level
30 ft. from Land surface Date Measured 09/19/2001

PUMPING LEVEL (below land surface)
94 ft. after 1 hrs. pumping 30 g.p.m.

Well Head Completion
Pitless adapter manufacturer MAASS Model 4J1
☐ Casing Protection ☑ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

REMARKS
CASING DRIVEN THRU MOUNDED BENTONITE.
MN WELL SEALING NO. H-183173, OCT. 2, 2001, 35' WELL SEALED PER STATE WELL CODE.
MAIL TO: MICHELLE CHAVES, N8075 850TH ST. RIVER FALLS, WI 54022.
13' W, 4' N OF NW CORNER OF HOUSE.

Grouting Information Well Grouted? ☑ Yes ☐ No

Grout Material: Bentonite from to ft.

Located by: Minnesota Geological Survey
Method: Digitization (Screen) - Map (1:24,000)
Unique Number Verification: Address verification
Input Date: 09/13/2004
System: *UTM - Nad83, Zone15, Meters*
X: 517758 **Y:** 4973591

Nearest Known Source of Contamination
50 feet South East direction Septic tank/drain field type
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed 10/02/2001
Manufacturer's name GPM Model number 10P050813 HP 0.5 Volts 230
Length of drop Pipe 94 ft. Capacity 10 g.p.m Type Submersible Material

Abandoned Wells Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

Variance Was a variance granted from the MDH for this well? ☐ Yes ☑ No

First Bedrock
Last Strat sand +larger-brown
Aquifer Quat. Water Table Aquifer
Depth to Bedrock **ft.**

Well Contractor Certification

License Business Name	Lic. Or Reg. No.	Name of Driller
Mantyla Well Co.	82084	SANDERS, G

County Well Index Online Report **665332** Printed 6/6/2013
HE-01205-07

Appendix C

Soil Boring Logs

Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-1

CLIENT City of Afton
PROJECT NAME Hydrogeologic Investigation
PROJECT NUMBER 2656-03
PROJECT LOCATION Afton, MN
DATE STARTED 10/15/13 **COMPLETED** 10/15/13
GROUND ELEVATION ____ **HOLE SIZE** 8-inches
DRILLING CONTRACTOR Bergerson Caswell
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 48.0 ft
LOGGED BY AMM **CHECKED BY** SAW
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0	SS 1		1-2-3-3 (5)	Start @ 1006	24	SP		0.5 TOPSOIL, black sand loam, wet (recent rain)	
	SS 2		2-3-5-8 (8)		24	SP		Sand (SP), yellowish brown, fine to coarse, rounded, low sphericity, dry	
5	SS 3		3-4-7-9 (11)		24			Alternating layers of fine to medium and fine to coarse sand ~6" thick	
	SS 4		3-6-8-9 (14)		24	SPG		6.0 Becomes reddish yellow-brown Gravelly Sand (SPG), reddish yellow-brown, gravel to 1.5" dia. larger grains are platey, fine to medium grains are spherical, dry	
10	SS 5		1-1-5-8 (6)		24			9.0 Gravel size increases to 2" dia. Sand (SP), fine to coarse sand, grains becoming more mafics in nature, dry	
	SS 6		2-5-8-8 (13)	Grain Size Distribution	24				
	SS 7		4-6-6-5 (12)		24				
15	SS 8		3-4-5-7 (9)		24				
20									
	SS 9		4-7		12	SP		Becomes yellowish brown, trace gravel to 2" dia.	High-Bentonite Soilds Grout
25									
	SS 10		2-3-4-5 (7)		24			Becomes mostly qtz, light brown, fine to coarse sand, trace gravel, moist	
30									
	SS 11		3-3-6-15 (9)		8			Becomes grayish brown. Finer (40%f, 50%m, 10%c)	
35									

(Continued Next Page)

Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

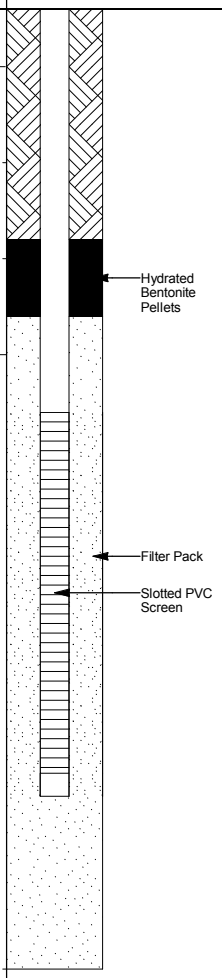
WELL NUMBER MW-1

CLIENT City of Afton **PROJECT NAME** Hydrogeologic Investigation

PROJECT NUMBER 2656-03 **PROJECT LOCATION** Afton, MN

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
35	SS 12		4-12-13-12 (25)		18	SP		Sand (SP), fine to coarse sand, grains becoming more mafics in nature, dry *(continued)*
						CL		36.5 Clay (CL), brown, low toughness, medium plasticity
40	SS 13		8-7-7-8 (14)	Grain Size Distribution	24	SP		39.0 Sand (SP), yellowish brown, moist
						ML		41.5 Clay (LC) with sand, light brown, low toughness, low plasticity, alternating layers of fines and fine sand 3-5mm thick, moist
45	SS 14		5-6-4-8 (10)		24	SP		44.0 Sand (SP), yellowish brown, fine to coarse, wet
50	SS 15		8-9-9-11 (18)		12			Trace gravel to 2" dia
55	SS 16		13-15-20-8 (35)	Grain Size Distribution / Effective Porosity	24			
60				TD @ 1158				60.0 E.O.B. @ 60.0 ' BGS.

WELL DIAGRAM



Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-2

CLIENT City of Afton
PROJECT NAME Hydrogeologic Investigation
PROJECT NUMBER 2656-03
PROJECT LOCATION Afton, MN
DATE STARTED 10/14/13 **COMPLETED** 10/14/13
GROUND ELEVATION ____ **HOLE SIZE** 8-inches
DRILLING CONTRACTOR Bergerson Caswell
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 49.7 ft
LOGGED BY AMM **CHECKED BY** SAW
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0	SS 1		2-2-4-4 (6)	Start @ 1100	24	SM		Topsoil, black, loamy sand, moist	
1.0						SP		Sand (SP), yellowish brown, fine to coarse, subangular to rounded, trace gravel to 1" dia., dry	
	SS 2		3-2-2-4 (4)		18				
5	SS 3		7-6-8-7 (14)		18			Trace gravel, grains are predominately qtz, subrounded to rounded	
	SS 4		5-6-10-12 (16)		24				
10	SS 5		10-6-18-13 (24)		24			Trace gravel to 1.5" dia.	
11.0	SS 6		4-11-15-26 (26)		24	SPG		Gravelly Sand (SPG), reddish brown, fine to coarse sand, trace gravel to 2"dia. rounded, gravel exhibits iron-staining	
	SS 7		8-8-10-13 (18)		24				
14.5								Stringer of fine sand with silt (SP-SM), yellowish reddish brown	
15	SS 8				24	SP		Transitions to Sand (SP), yellowish brown, fine to coarse sand, trace gravel to 0.75"dia. , more mafic minerals than above	
19.0						SPG		Gravelly Sand (SPG), yellowish brown, fine to coarse sand, gravels to 1" dia., moist	
20	SS 9				24				High-Bentonite Soilds Grout
25									
	SS 10		26-12-13-16 (25)		24			Gravel size increases to 2" dia.	
27.0								1/2" layer of brown Silt (ML)	
								Sand (SP) yellowish brown, fine to coarse sand, trace gravel to 2" dia., moist, fewer mafics than above	
30									
	SS 11		8-14-14-20 (28)		24	SP			
								Color change to reddish brown	
35									

(Continued Next Page)

Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-2

CLIENT City of Afton **PROJECT NAME** Hydrogeologic Investigation

PROJECT NUMBER 2656-03 **PROJECT LOCATION** Afton, MN

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35									
	SS 12		20-25-30-38 (55)		24	SPG		35.5 Gravelly Sand (SPG), grayish brown, fine to coarse sand, trace gravel to 1" dia., moist	
40									
	SS 13		45-100/3		6				Hydrated Bentonite Pellets
45								45.2	
	SS 14		40-48-100/2 (98)		24	MLS		Sandy Silt (MLS), greenish brown, fine sand, medium toughness, low plasticity, laminated (1-3mm laminae), moist @ 47' - contains enough moisture to be plastic -- not wet	
50								49.0	
	SS 15		35-35-45-100/3 (80)		24	SP		Sandstone, yellowish brown, weathered/weakly cemented, fine to medium grained, appears to be laminated with alternating layers of fine sand and silt ~5mm thick	Filter Pack; Slotted PVC Screen
55									
	SS 16		25-40-100/2 (90)	Grain Size Distribution / Effective Porosity	24			Continues as above with trace gravel	
60								60.0	
	SS 17			TD @ 1320	24			E.O.B. @ 60.0 ' BGS.	

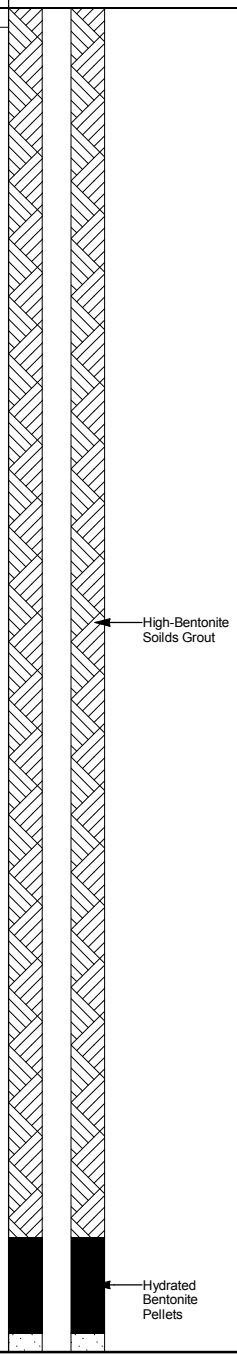
Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-3

CLIENT City of Afton
PROJECT NAME Hydrogeologic Investigation
PROJECT NUMBER 2656-03
PROJECT LOCATION Afton, MN
DATE STARTED 10/15/13 **COMPLETED** 10/16/13
GROUND ELEVATION ____ **HOLE SIZE** 8-inches
DRILLING CONTRACTOR Bergerson Caswell
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 40.1 ft
LOGGED BY AMM **CHECKED BY** SAW
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SS 1		3-4-6-6 (10)	Start @ 1455	24	SM		0.5 Topsoil, black, loamy sand
	SS 2		4-6-5-5 (11)		24			Sand (SP), yellowish brown, fine to coarse sand, rounded to subrounded, larger grains are platey, mostly qtz, dry
5	SS 3		4-6-3-9 (9)		24			Change in color to light brown
	SS 4		6-7-8-8 (15)		24			@7' -- 4" layer of Gravelly Sand (SPG), gravel to 1.5" dia
10	SS 5		4-6-5-4 (11)		24			Becomes finer, light reddish brown
	SS 6		6-9-3-8 (12)		24			Becomes fine to coarse sand with trace gravel
	SS 7		7-7-8-9 (15)		24			Becomes finer. fine to medium sand, trace coarse sand, mostly qtz. @13.5 - 0.5" dia. tree root
15	SS 8		6-7-5-6 (12)		24			
20						SP		
	SS 9		7-6-6-5 (12)		24			Contiunes as above, trace coarse sand
25								
	SS 10		4-6-9-10 (15)		24			Becomes light grayish brown, fine to coarse sand, gravel to 1" dia. more mafics than above
30								
	SS 11		5-7-8-12 (15)	Stop @ 1600, leave augers in hole overnight Resume @ 0843 on 10/16/13	24			
35								

WELL DIAGRAM



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Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-3

CLIENT City of Afton **PROJECT NAME** Hydrogeologic Investigation

PROJECT NUMBER 2656-03 **PROJECT LOCATION** Afton, MN

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35	SS 12				24			Sand (SP), yellowish brown, fine to coarse sand, rounded to subrounded, larger grains are platey, mostly qtz, dry *(continued)* @ 35' to 37' -- fining upwards sequence. Gravel to 2" dia Color change to dark brown, moist	
40	SS 13				12	SP		▽ Gravel becomes smaller, <0.75" dia and more rounded, wet	Filter Pack, Slotted PVC Screen
45	SS 14			Grain Size Distribution / Effective Porosity	24			47.0	
				TD @ 0919				E.O.B. @ 47.0 ' BGS.	

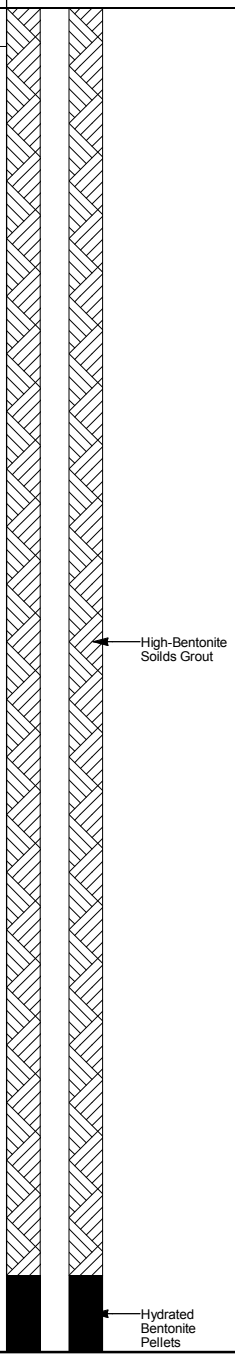
Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-4

CLIENT City of Afton
PROJECT NAME Hydrogeologic Investigation
PROJECT NUMBER 2656-03
PROJECT LOCATION Afton, MN
DATE STARTED 10/16/13 **COMPLETED** 10/16/13
GROUND ELEVATION ____ **HOLE SIZE** 8-inches
DRILLING CONTRACTOR Bergerson Caswell
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 42.0 ft
LOGGED BY AMM **CHECKED BY** SAW
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SS 1		1-2-1-1 (3)	Start @ 1135	24	SM		Topsoil, black, loamy sand
1.0						SP		Sand (SP), reddish yellow-brown, fine to coarse sand, predominately qtz, larger grains are platey, grains are subrounded
	SS 2		2-3-4-4 (7)		24			
5	SS 3		3-3-4-4 (7)		24			
	SS 4		4-5-6-8 (11)		24			
10	SS 5		4-4-4-4 (8)		24			Trace gravel to 1.5" dia.
	SS 6		5-7-8-10 (15)		24			@ 9.5' -- 0.5" layer of Sandy Silt (SM), yellow-brown, fine to medium sand, low toughness, low plasticity.
	SS 7		6-6-5-5 (11)		24			Grains become more spherical than above Color change to light brown
15	SS 8		6-7-6-7 (13)		24			
20								
	SS 9		6-7-5-4 (12)		24			
25								
	SS 10		8-7-6-7 (13)		24			Continues as above. moist
30								
	SS 11		10-11-11-13 (22)		24			Trace gravel to 1" dia.
35								

WELL DIAGRAM



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Wenck Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125
Telephone: 651-294-4580
Fax: 651-228-1969

WELL NUMBER MW-4

CLIENT City of Afton **PROJECT NAME** Hydrogeologic Investigation

PROJECT NUMBER 2656-03 **PROJECT LOCATION** Afton, MN

DEPTH (ft)	SAMPLE TYPE NUMBER	Moisture Content	BLOW COUNTS (N VALUE)	TESTS AND REMARKS	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35	SS 12		5-7-6-11 (13)		24	SP		Sand (SP), reddish yellow-brown, fine to coarse sand, predominately qtz, larger grains are platey, grains are subrounded *(continued)* Becomes coarser, light grayish brown, trace gravel to 0.75" dia.	Filter Pack; Slotted PVC Screen
40	SS 13				24				
45	SS 14				24			Becomes coarser, trace gravel to 1.5" dia.	
				TD @ 1253				48.0 E.O.B. @ 48.0 ' BGS.	
				Grain Size Distribution / Effective Porosity					

Appendix D

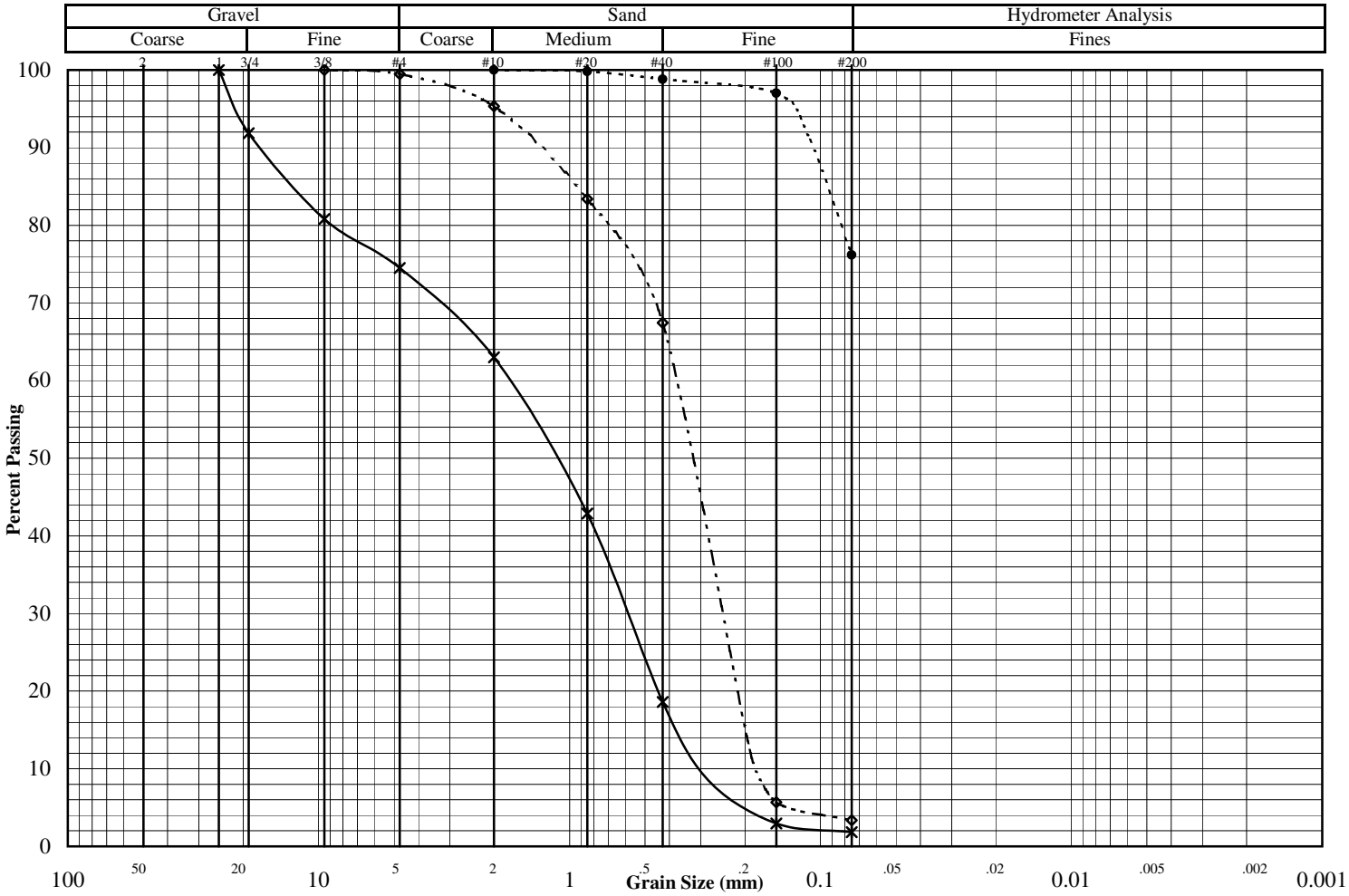
Soil Engineer Testing, Inc.
Lab Soil Testing Reports

Grain Size Distribution ASTM D422

Job No. : **9177**

Project:	Afton	Test Date:	10/21/13
Reported To:	Wenck Associates, Inc.	Report Date:	10/22/13

	Location / Boring No.	Sample No.	Depth (ft)	Sample Type	Soil Classification
*	MW-1		10	Bag	Sand w/gravel, medium grained (SP)
●	MW-1		41.5	Bag	Lean Clay w/sand (CL)
◇	MW-1		55	Bag	Sand, fine grained (SP)



	Other Tests *	●	◇
Liquid Limit			
Plastic Limit			
Plasticity Index			
Water Content	4.2	22.7	18.9
Dry Density (pcf)			106.5
Specific Gravity			2.67*
Porosity			0.36
Organic Content			
pH			
Shrinkage Limit			
Penetrometer			
Qu (psf)			

(* = assumed)

Percent Passing	*	●	◇
Mass (g)	867.7	201.2	293.8
2"			
1.5"			
1"	100.0		
3/4"	91.9		
3/8"	80.8		100.0
#4	74.5		99.5
#10	63.0	100.0	95.3
#20	42.9	99.8	83.4
#40	18.6	98.8	67.4
#100	3.0	97.0	5.7
#200	1.8	76.2	3.4

	*	●	◇
D_{60}			
D_{30}			
D_{10}			
C_U			
C_C			

Remarks:

2401 W 66th Street

SOIL ENGINEERING TESTING, INC.

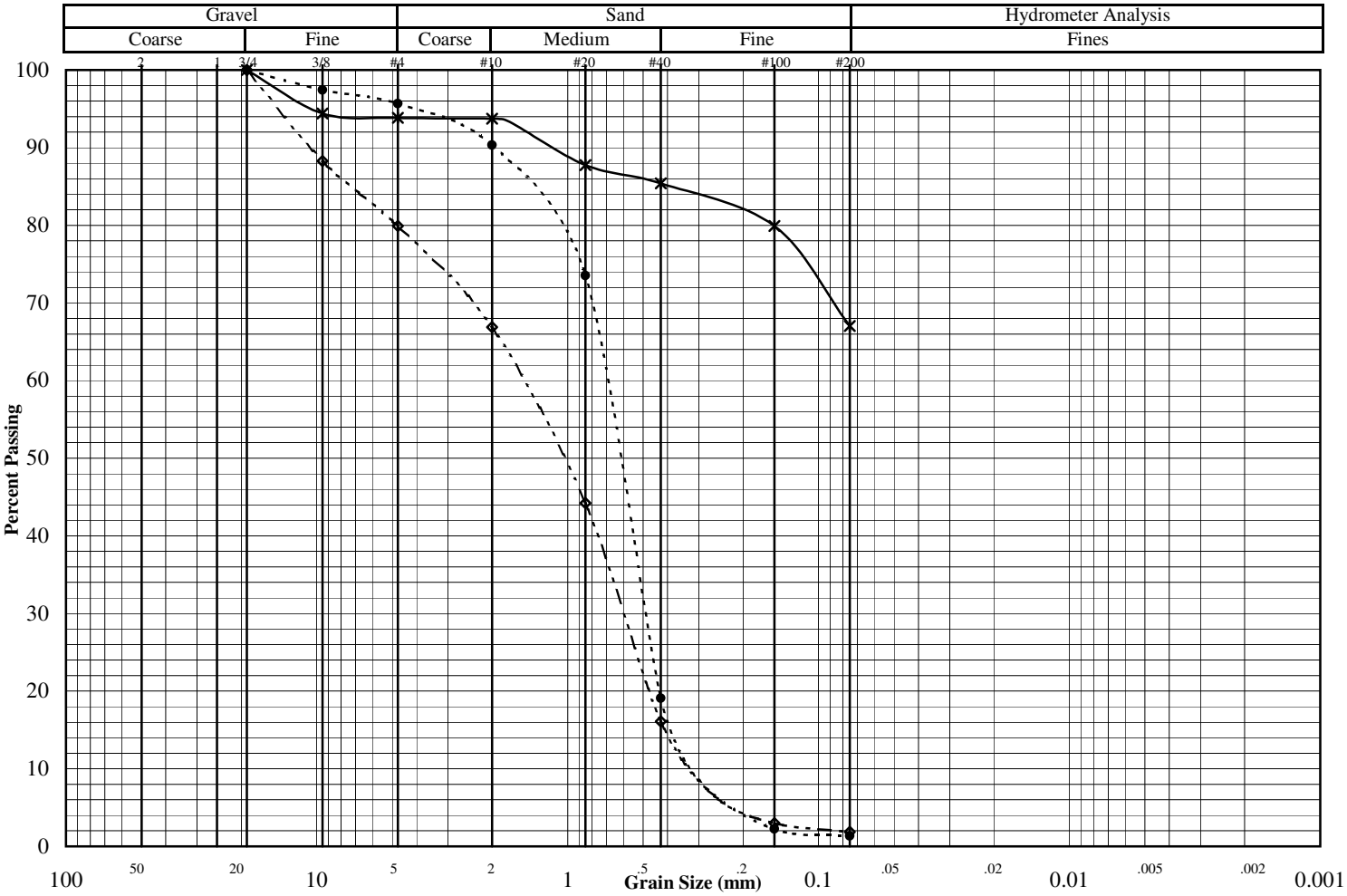
Richfield, Minnesota 55423-2031

Grain Size Distribution ASTM D422

Job No. : **9177**

Project:	Afton	Test Date:	10/21/13
Reported To:	Wenck Associates, Inc.	Report Date:	10/22/13

	Location / Boring No.	Sample No.	Depth (ft)	Sample Type	Soil Classification
*	MW-2		55	Bag	Sandy Lean Clay w/a little gravel (CL)
●	MW-3		45	Bag	Sand w/a little gravel, medium grained (SP)
◇	MW-4		45	Bag	Sand w/gravel, medium grained (SP)



	Other Tests *	●	◇
Liquid Limit			
Plastic Limit			
Plasticity Index			
Water Content	23.3	19.3	12.4
Dry Density (pcf)	99.6	105.2	100.3
Specific Gravity	2.67*	2.67*	2.67*
Porosity	0.40	0.37	0.40
Organic Content			
pH			
Shrinkage Limit			
Penetrometer			
Qu (psf)			

(* = assumed)

Percent Passing	*	●	◇
Mass (g)	391.0	261.3	444.5
2"			
1.5"			
1"			
3/4"	100.0	100.0	100.0
3/8"	94.4	97.4	88.3
#4	93.9	95.7	79.9
#10	93.7	90.3	66.9
#20	87.8	73.5	44.2
#40	85.4	19.1	16.1
#100	79.9	2.2	3.0
#200	67.0	1.4	1.9

	*	●	◇
D_{60}			
D_{30}			
D_{10}			
C_U			
C_C			

Remarks:

2401 W 66th Street

SOIL ENGINEERING TESTING, INC.

Richfield, Minnesota 55423-2031

Appendix E

MDH Monitoring Well and Soil Boring Records (MW-1 through MW-4)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes, Chapter 103I

MINNESOTA UNIQUE WELL AND BORING NO. 802701

WELL OR BORING LOCATION

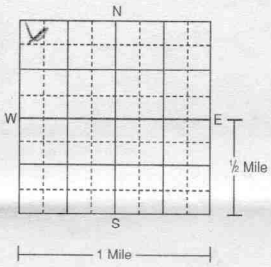
County Name: Washington

Township Name	Township No.	Range No.	Section No.	Fraction
Afton	28	20	14	NW ¼ NW ¼ NW ¼

GPS LOCATION: Latitude ____ degrees ____ minutes ____ seconds ____
Longitude ____ degrees ____ minutes ____ seconds ____

House Number, Street Name, City, and ZIP Code of Well Location: Vacant Lot Putnam Blvd & Quant Ave S, Afton

Show exact location of well/boring in section grid with "X."



Sketch map of well/boring location. Showing property lines, roads, buildings, and direction.

See Map

PROPERTY OWNER'S NAME/COMPANY NAME: City of Afton

Property owner's mailing address if different than well location address indicated above.
3033 St. Croix Trail South
Afton, MN 55001

WELL OWNER'S NAME/COMPANY NAME: Same as above

Well/boring owner's mailing address if different than property owner's address indicated above.

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
Sand	Brn	Med	0	47

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.
MW-11
13-E-32167

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY 802701

WELL/BORING DEPTH (completed): 47 ft.
DATE WORK COMPLETED: 10/16/13

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☑ Auger ☐ Rotary ☐ Other ____

DRILLING FLUID: None
WELL HYDROFRACTURED? ☐ Yes ☑ No From ____ ft. To ____ ft.

USE: ☐ Domestic ☑ Monitoring ☐ Heating/Cooling ☐ Noncommunity PWS ☐ Environ. Bore Hole ☐ Industry/Commercial ☐ Community PWS ☐ Irrigation ☐ Remedial ☐ Elevator ☐ Dewatering ☐ ____

CASING MATERIAL: ☑ Steel ☐ Plastic
Drive Shoe? ☐ Yes ☑ No ☑ Threaded ☐ Welded ☐ ____
HOLE DIAM.

CASING

Diameter		Weight	Specifications	HOLE DIAM.
2 in. To 37 ft.		____ lbs./ft.	____	8 in. To 47 ft.
____ in. To ____ ft.		____ lbs./ft.	____	____ in. To ____ ft.
____ in. To ____ ft.		____ lbs./ft.	____	____ in. To ____ ft.

SCREEN: PVC
Make: Johnson
Type: Slotted
Slot/Gauge: 1010
Set between 37 ft. and 47 ft.

OPEN HOLE: From ____ ft. To ____ ft.
Diam. 2"
Length 10'
FITTINGS ____

STATIC WATER LEVEL: 42 ft. ☑ Below ☐ Above land surface
Measured from: Surface
Date measured: 10/16/13

PUMPING LEVEL (below land surface): ____ ft. after ____ hrs. pumping ____ g.p.m.

WELLHEAD COMPLETION
☐ Pitless/adapter manufacturer ____ Model ____
☐ Casing protection ____ ☑ 12 in. above grade
☐ At-grade ☐ Well House ☐ Hand Pump

GROUTING INFORMATION (specify bentonite, cement-sand, neat-cement, concrete, cuttings, or other)
Material: BentGrout From 4 To 35 ft. 6 ☐ Yds. ☑ Bags
Material: Concrete From 0 To 4 ft. 1½ ☐ Yds. ☑ Bags
Material ____ From ____ To ____ ft. ____ ☐ Yds. ☐ Bags
Driven casing seal From ____ To ____ ____ Bags

NEAREST KNOWN SOURCE OF CONTAMINATION
____ feet ____ direction ____ type
Well disinfected upon completion? ☐ Yes ☑ No

PUMP
☑ Not installed Date installed ____
Manufacturer's name ____
Model Number ____ HP ____ Volts ____
Length of drop pipe ____ ft. Capacity ____ g.p.m.
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ ____

ABANDONED WELLS
Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

VARIANCE
Was a variance granted from the MDH for this well? ☐ Yes ☑ No TN# ____

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

Bergerson Caswell Inc — 1767
Licensee Business Name — Lic. or Reg. No.

[signature] — 1205 — 11/1/13
Certified Representative Signature — Certified Rep. No. — Date

Dustin Kluver
Name of Driller

IC 140-0020

HE-01205-14 (Rev. 5/12)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes, Chapter 103I

MINNESOTA UNIQUE WELL AND BORING NO. 797975

WELL OR BORING LOCATION

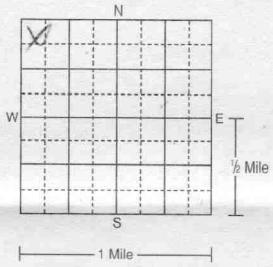
County Name: Washington

Township Name	Township No.	Range No.	Section No.	Fraction
Afton	28	20	14	NW ¼ NW ¼ NW ¼

GPS LOCATION: Latitude ____ degrees ____ minutes ____ seconds ____
Longitude ____ degrees ____ minutes ____ seconds ____

House Number, Street Name, City, and ZIP Code of Well Location: Vacant Lot Putnam Blvd + Quant Ave S, Afton

Show exact location of well/boring in section grid with "X." Sketch map of well/boring location. Showing property lines, roads, buildings, and direction.



See map

PROPERTY OWNER'S NAME/COMPANY NAME: City of Afton

Property owner's mailing address if different than well location address indicated above.
3033 St. Croix Trail South
Afton, MN 55001

WELL OWNER'S NAME/COMPANY NAME: Same as above

Well/boring owner's mailing address if different than property owner's address indicated above.

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
Sand	BRN	med	0	46

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.
MW-3
12-E-32167

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY 797975

WELL/BORING DEPTH (completed): 46 ft. DATE WORK COMPLETED: 10/15/13

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☑ Auger ☐ Rotary ☐ Other

DRILLING FLUID: None WELL HYDROFRACTURED? ☐ Yes ☑ No From ____ ft. To ____ ft.

USE: ☐ Domestic ☑ Monitoring ☐ Heating/Cooling ☐ Noncommunity PWS ☐ Environ. Bore Hole ☐ Industry/Commercial ☐ Community PWS ☐ Irrigation ☐ Remedial ☐ Elevator ☐ Dewatering ☐

CASING MATERIAL: ☑ Steel ☐ Plastic Drive Shoe? ☐ Yes ☑ No ☑ Threaded ☐ Welded

HOLE DIAM.

CASING Diameter	Weight	Specifications	HOLE DIAM.
2 in. To 36 ft.	____ lbs./ft.		8 in. To 46 ft.
____ in. To ____ ft.	____ lbs./ft.		____ in. To ____ ft.
____ in. To ____ ft.	____ lbs./ft.		____ in. To ____ ft.

SCREEN: PVC Make: Johnson Type: Slotted Diam. 2" Slot/Gauze: 010 Length: 10' Set between 36 ft. and 46 ft. FITTINGS

OPEN HOLE From ____ ft. To ____ ft.

STATIC WATER LEVEL: 38 ft. ☑ Below ☐ Above land surface Measured from surface Date measured 10/15/13

PUMPING LEVEL (below land surface): ____ ft. after ____ hrs. pumping ____ g.p.m.

WELLHEAD COMPLETION: ☐ Pitless/adapter manufacturer ____ Model ____ ☐ Casing protection ☑ 12 in. above grade ☐ At-grade ☐ Well House ☐ Hand Pump

GROUTING INFORMATION (specify bentonite, cement-sand, neat-cement, concrete, cuttings, or other)

Material	From	To		
Bent Grout	4	34	6	☐ Yds. ☑ Bags
Concrete	0	4	1½	☐ Yds. ☑ Bags
				☐ Yds. ☐ Bags

Driven casing seal From ____ To ____ ____ Bags

NEAREST KNOWN SOURCE OF CONTAMINATION: ____ feet ____ direction ____ type

Well disinfected upon completion? ☐ Yes ☑ No

PUMP: ☑ Not installed Date installed ____
Manufacturer's name ____
Model Number ____ HP ____ Volts ____
Length of drop pipe ____ ft. Capacity ____ g.p.m.
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

ABANDONED WELLS: Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

VARIANCE: Was a variance granted from the MDH for this well? ☐ Yes ☑ No TN# ____

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

Bergerson-Caswell Inc — Licensee Business Name — Lic. or Reg. No. 1767

Certified Representative Signature — Certified Rep. No. 1005 — Date 11/1/13

Dustin Kluver — Name of Driller

IC 140-0020 HE-01205-14 (Rev. 5/12)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes, Chapter 103I

MINNESOTA UNIQUE WELL AND BORING NO. 797973

WELL OR BORING LOCATION

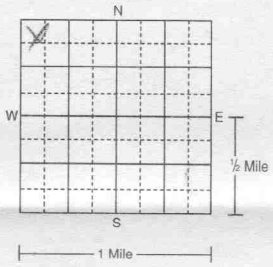
County Name: Washington

Township Name	Township No.	Range No.	Section No.	Fraction
Afton	28	20	14	NW NW NW

GPS LOCATION: Latitude ____ degrees ____ minutes ____ seconds ____
Longitude ____ degrees ____ minutes ____ seconds ____

House Number, Street Name, City, and ZIP Code of Well Location: Vacant Lot Putnam Blvd + Quant Ave S, Afton

Show exact location of well/boring in section grid with "X." Sketch map of well/boring location. Showing property lines, roads, buildings, and direction.



See map

PROPERTY OWNER'S NAME/COMPANY NAME: City of Afton

Property owner's mailing address if different than well location address indicated above.
3033 St. Croix Trail South
Afton, MN 55001

WELL OWNER'S NAME/COMPANY NAME: Same as above

Well/boring owner's mailing address if different than property owner's address indicated above.

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
Sand	BRN	Med	0	57

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.
MW-1
12E-32167

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY 797973

WELL/BORING DEPTH (completed): 55 ft. DATE WORK COMPLETED: 10/15/13

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☑ Auger ☐ Rotary ☐ Other ____

DRILLING FLUID: None WELL HYDROFRACTURED? ☐ Yes ☑ No From ____ ft. To ____ ft.

USE: ☐ Domestic ☑ Monitoring ☐ Heating/Cooling ☐ Noncommunity PWS ☐ Environ. Bore Hole ☐ Industry/Commercial ☐ Community PWS ☐ Irrigation ☐ Remedial ☐ Elevator ☐ Dewatering ☐ ____

CASING MATERIAL: ☑ Steel ☐ Plastic Drive Shoe? ☐ Yes ☑ No ☑ Threaded ☐ Welded ☐ ____

HOLE DIAM.

CASING

Diameter	Weight	Specifications	Hole Diam.
2 in. To 45 ft.	____ lbs./ft.	____	8 in. To 55 ft.
____ in. To ____ ft.	____ lbs./ft.	____	____ in. To ____ ft.
____ in. To ____ ft.	____ lbs./ft.	____	____ in. To ____ ft.

SCREEN: PVC
Make: Johnson
Type: Slotted
Slot/Gauze: 1010
Set between 45 ft. and 65 ft.

OPEN HOLE: From ____ ft. To ____ ft.
Diam. 2"
Length 10'
FITTINGS ____

STATIC WATER LEVEL: 48 ft. ☐ Below ☐ Above land surface
Measured from Surface
Date measured 10/15/13

PUMPING LEVEL (below land surface): ____ ft. after ____ hrs. pumping ____ g.p.m.

WELLHEAD COMPLETION: ☐ Pitless/adapter manufacturer ____ Model ____
☐ Casing protection ____ ☑ 12 in. above grade
☐ At-grade ☐ Well House ☐ Hand Pump

GROUTING INFORMATION (specify bentonite, cement-sand, neat-cement, concrete, cuttings, or other)

Material	From	To	ft.		
Bent Grout	4	42	7	☐ Yds.	☑ Bags
Concrete	0	4	1½	☐ Yds.	☑ Bags
				☐ Yds.	☐ Bags

Driven casing seal From ____ To ____ ____ Bags

NEAREST KNOWN SOURCE OF CONTAMINATION: ____ feet ____ direction ____ type

Well disinfected upon completion? ☐ Yes ☐ No

PUMP: ☑ Not installed Date installed ____
Manufacturer's name ____
Model Number ____ HP ____ Volts ____
Length of drop pipe ____ ft. Capacity ____ g.p.m.
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ ____

ABANDONED WELLS: Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

VARIANCE: Was a variance granted from the MDH for this well? ☐ Yes ☑ No TN# ____

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

Bergrison-Caswell Inc — Licensee Business Name
1767 — Lic. or Reg. No.
Certified Representative Signature
1205 — Certified Rep. No.
11/1/13 — Date
Dustin Kluver — Name of Driller

IC 140-0020

HE-01205-14 (Rev. 5/12)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes, Chapter 103I

MINNESOTA UNIQUE WELL AND BORING NO. 797974

WELL OR BORING LOCATION

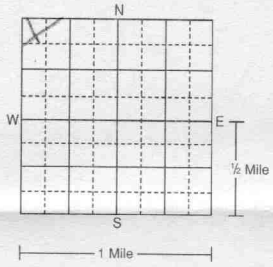
County Name: Washington

Township Name	Township No.	Range No.	Section No.	Fraction
Afton	28	20	14	NW NW NW

GPS LOCATION: Latitude ____ degrees ____ minutes ____ seconds ____
Longitude ____ degrees ____ minutes ____ seconds ____

House Number, Street Name, City, and ZIP Code of Well Location: Vacant Lot / Putnam Blvd + Quant Ave S, Afton

Show exact location of well/boring in section grid with "X."



Sketch map of well/boring location. Showing property lines, roads, buildings, and direction.

See Map

PROPERTY OWNER'S NAME/COMPANY NAME: City of Afton

Property owner's mailing address if different than well location address indicated above.
3033 St Croix Trail South
Afton, MN 55001

WELL OWNER'S NAME/COMPANY NAME: Same as above

Well/boring owner's mailing address if different than property owner's address indicated above.

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
Sand	Brn	Med	0	57

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.
MW-2
12-E-22167

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY 797974

WELL/BORING DEPTH (completed): 57 ft. DATE WORK COMPLETED: 10/14/13

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☑ Auger ☐ Rotary ☐ Other

DRILLING FLUID: None WELL HYDROFRACTURED? ☐ Yes ☑ No From ____ ft. To ____ ft.

USE: ☐ Domestic ☑ Monitoring ☐ Heating/Cooling ☐ Noncommunity PWS ☐ Environ. Bore Hole ☐ Industry/Commercial ☐ Community PWS ☐ Irrigation ☐ Remedial ☐ Elevator ☐ Dewatering ☐

CASING MATERIAL: ☑ Steel ☐ Plastic Drive Shoe? ☐ Yes ☑ No ☑ Threaded ☐ Welded

HOLE DIAM.

CASING

Diameter		Weight	Specifications	HOLE DIAM.
2 in. To 47 ft.		lbs./ft.		8 in. To 57 ft.
in. To ft.		lbs./ft.		in. To ft.
in. To ft.		lbs./ft.		in. To ft.

SCREEN: PVC
Make: Johnson
Type: Slotted Diam. 2"
Slot/Gauze: 10/0 Length: 10'
Set between 47 ft. and 57 ft. FITTINGS

OPEN HOLE From ____ ft. To ____ ft.

STATIC WATER LEVEL: 50 ft. ☑ Below ☐ Above land surface Measured from Surface Date measured 10/14/13

PUMPING LEVEL (below land surface) ____ ft. after ____ hrs. pumping ____ g.p.m.

WELLHEAD COMPLETION: ☐ Pitless/adapter manufacturer ____ Model ____ ☐ Casing protection ____ ☑ 12 in. above grade ☐ At-grade ☐ Well House ☐ Hand Pump

GROUTING INFORMATION (specify bentonite, cement-sand, neat-cement, concrete, cuttings, or other)

Material	From	To		
Cent grout	4	45 ft.	8	☐ Yds. ☑ Bags
Concrete	0	4 ft.	1½	☐ Yds. ☑ Bags
		ft.		☐ Yds. ☐ Bags

Driven casing seal From ____ To ____ ____ Bags

NEAREST KNOWN SOURCE OF CONTAMINATION: ____ feet ____ direction ____ type

Well disinfected upon completion? ☐ Yes ☑ No

PUMP: ☐ Not installed Date installed ____
Manufacturer's name ____
Model Number ____ HP ____ Volts ____
Length of drop pipe ____ ft. Capacity ____ g.p.m.
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

ABANDONED WELLS: Does property have any not in use and not sealed well(s)? ☐ Yes ☑ No

VARIANCE: Was a variance granted from the MDH for this well? ☐ Yes ☑ No TN# ____

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

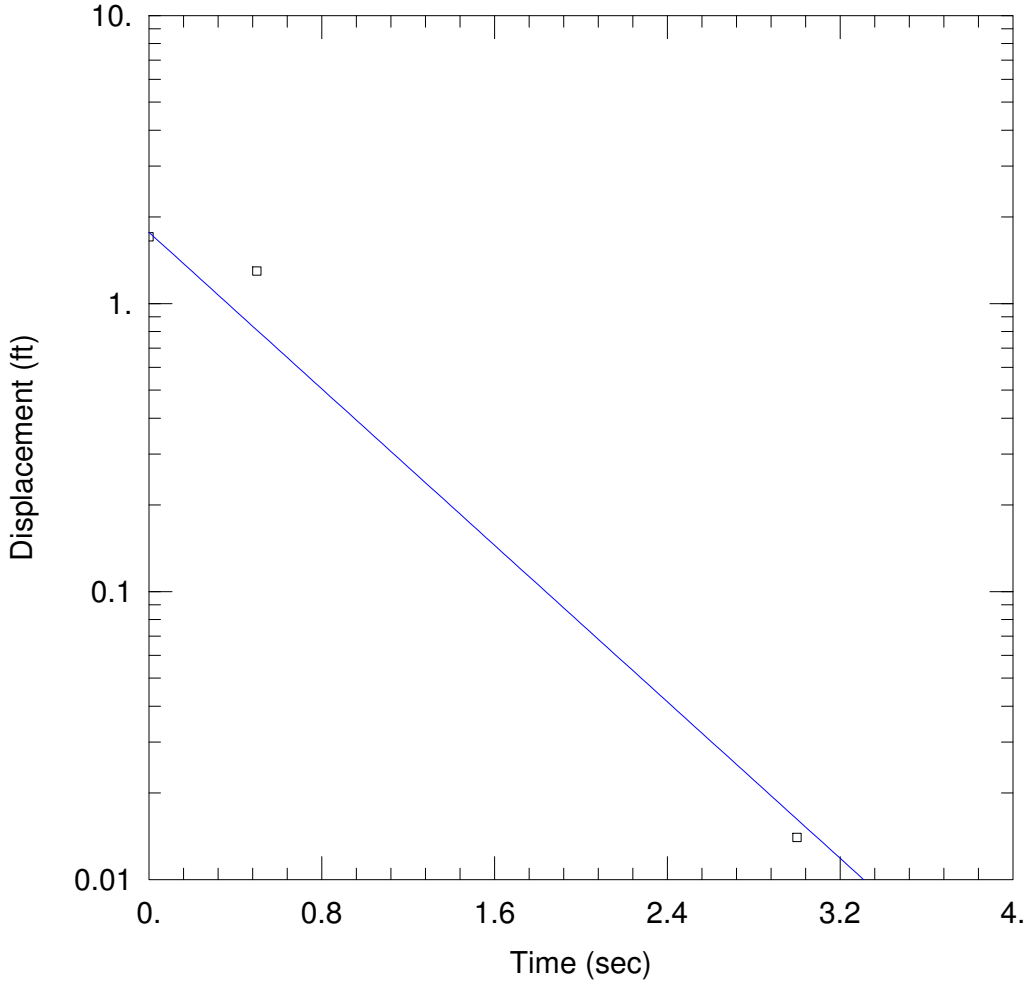
Bergerson-Caswell Inc — Licensee Business Name — Lic. or Reg. No. 1767
David Meech — Certified Representative Signature — Certified Rep. No. 1005 — Date 11/1/13
Andy Bailey — Name of Driller

IC 140-0020

HE-01205-14 (Rev. 5/12)

Appendix F

Hydraulic Conductivity Calculation Sheets



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW1_In2.aqt
Date: 12/04/13 Time: 11:10:45

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-1
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 10. ft
Anisotropy Ratio (Kz/Kr): 0.1

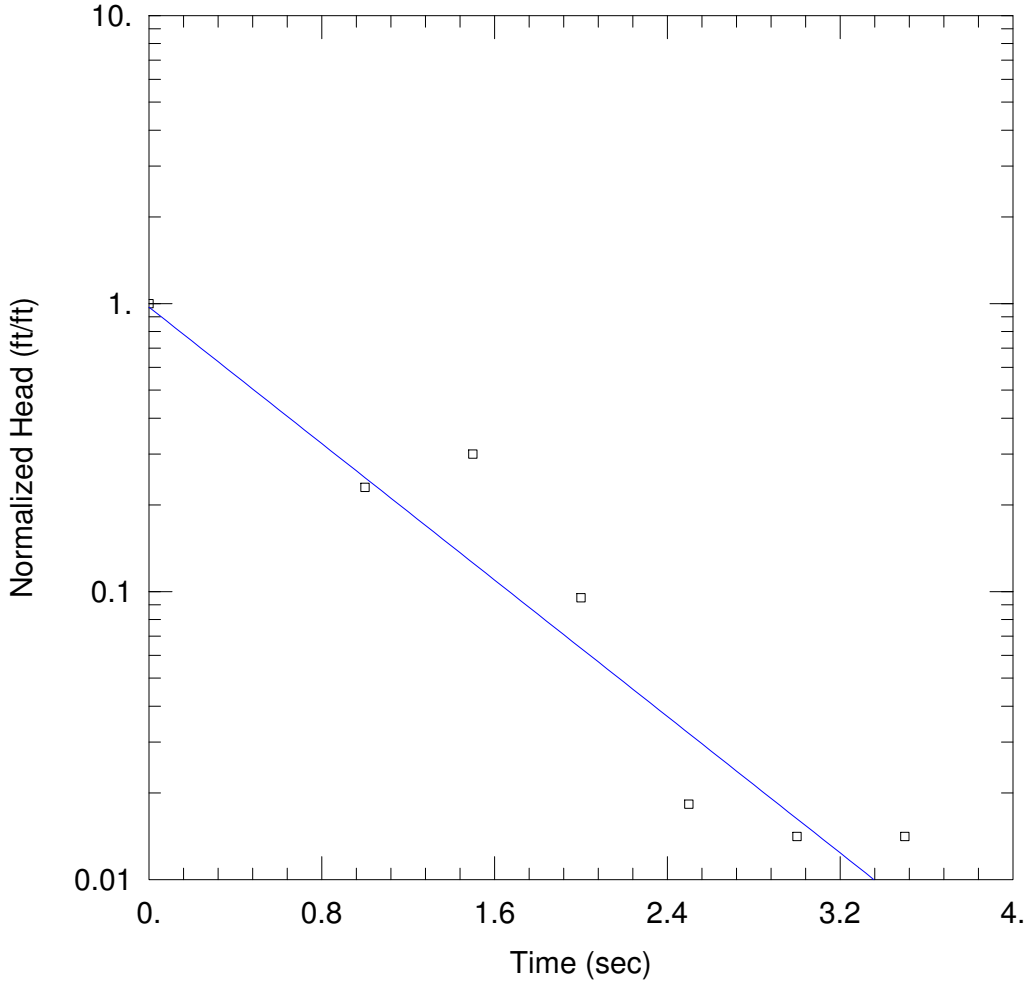
WELL DATA (MW-1)

Initial Displacement: 1.704 ft
Static Water Column Height: 10.84 ft
Total Well Penetration Depth: 10.84 ft
Screen Length: 10.84 ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 599.3 ft/day
y0 = 1.767 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW1_Out1.aqt
Date: 12/04/13 Time: 11:10:05

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-1
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 10. ft
Anisotropy Ratio (Kz/Kr): 0.1

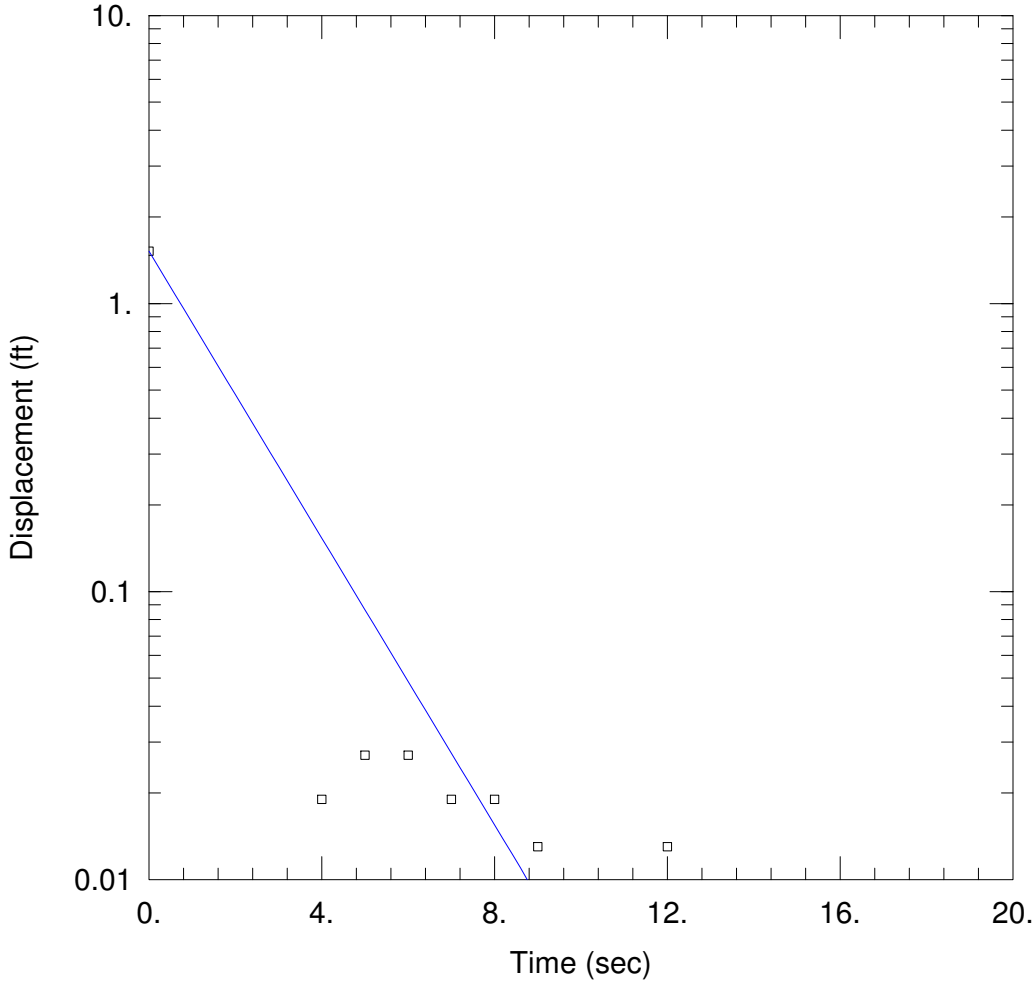
WELL DATA (MW-1)

Initial Displacement: 1.914 ft
Static Water Column Height: 10.84 ft
Total Well Penetration Depth: 10.84 ft
Screen Length: 10.84 ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 522.5 ft/day
y0 = 1.859 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW2_In2.aqt
Date: 12/04/13 Time: 11:12:24

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-2
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 0.1

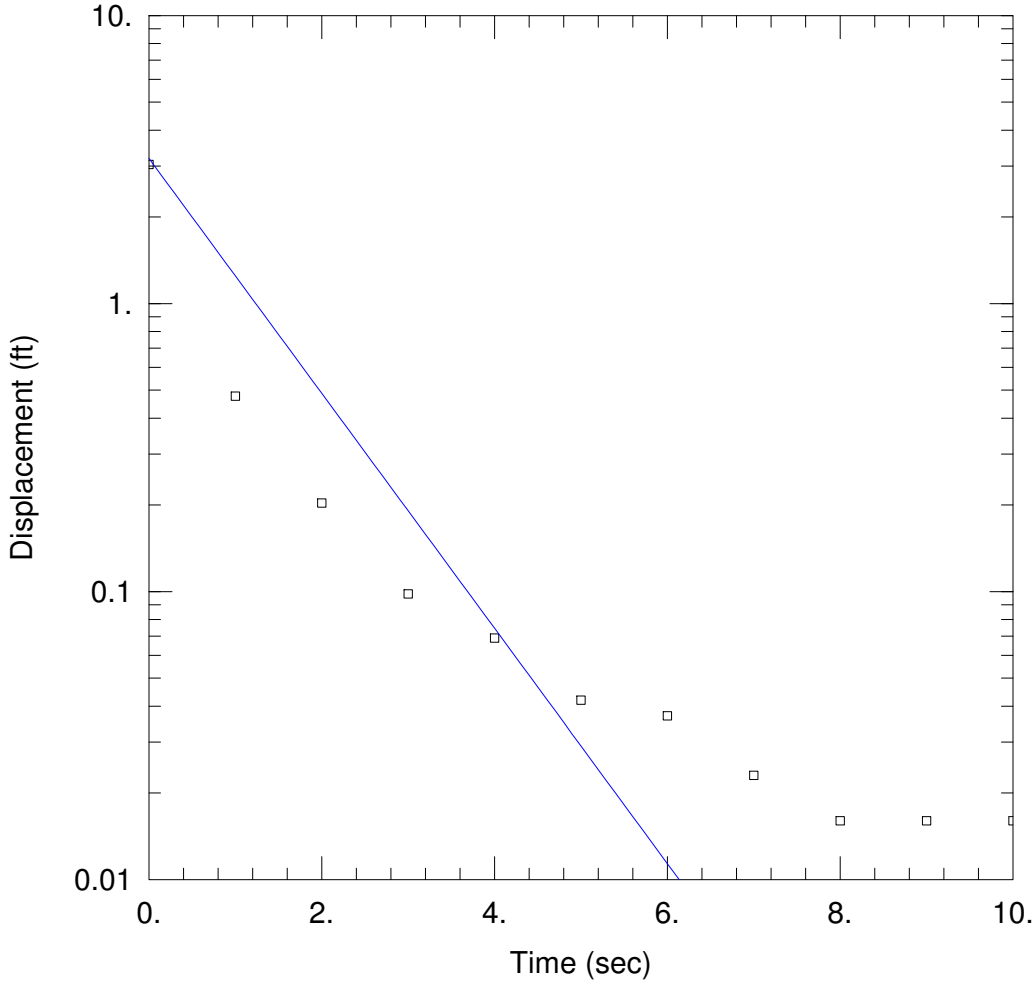
WELL DATA (MW-2)

Initial Displacement: 1.521 ft
Static Water Column Height: 8.07 ft
Total Well Penetration Depth: 8.07 ft
Screen Length: 8.07 ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 292.4 ft/day
y0 = 1.519 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW2_Out1.aqt
Date: 12/04/13 Time: 11:13:12

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-2
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft Anisotropy Ratio (Kz/Kr): 1.

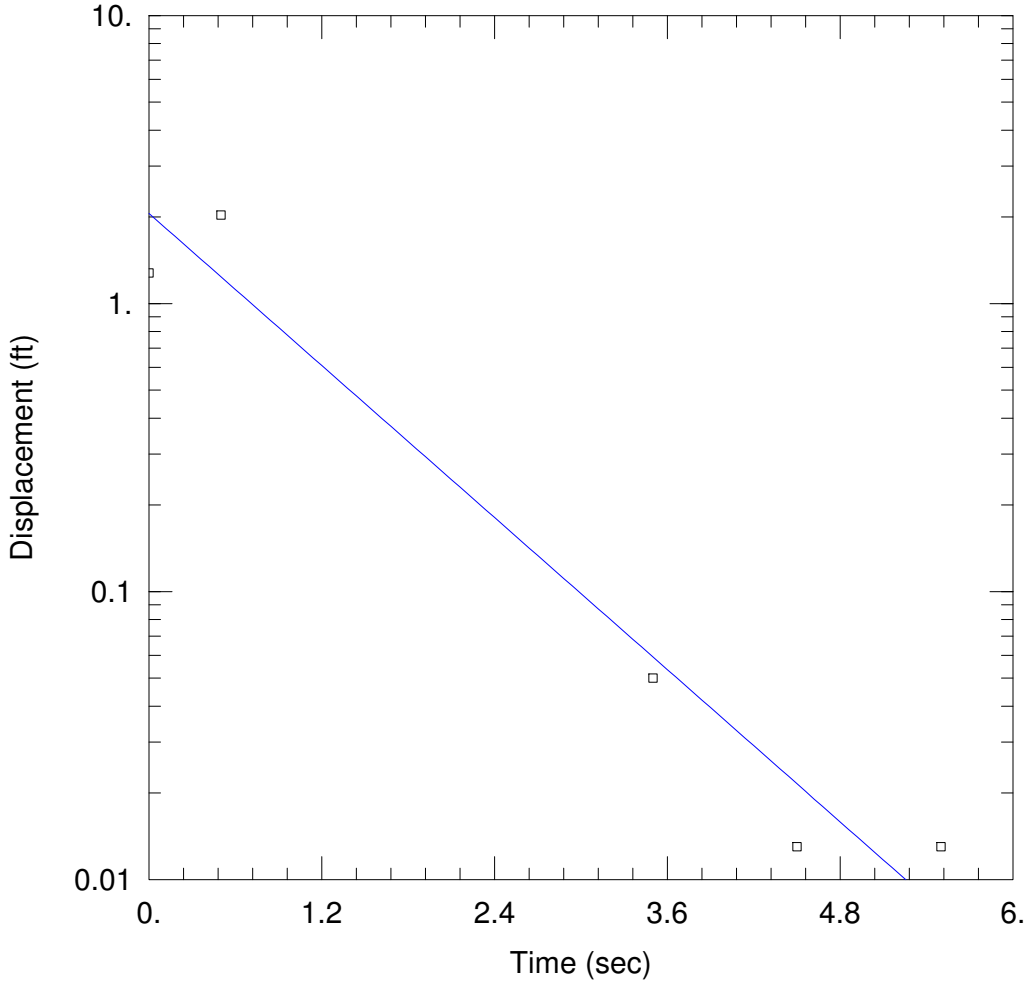
WELL DATA (MW-2)

Initial Displacement: 3.036 ft Static Water Column Height: 8.07 ft
Total Well Penetration Depth: 8.07 ft Screen Length: 8.07 ft
Casing Radius: 0.1667 ft Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 343.8 ft/day y0 = 3.189 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW3_In1.aqt
Date: 12/04/13 Time: 11:16:38

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-3
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 0.1

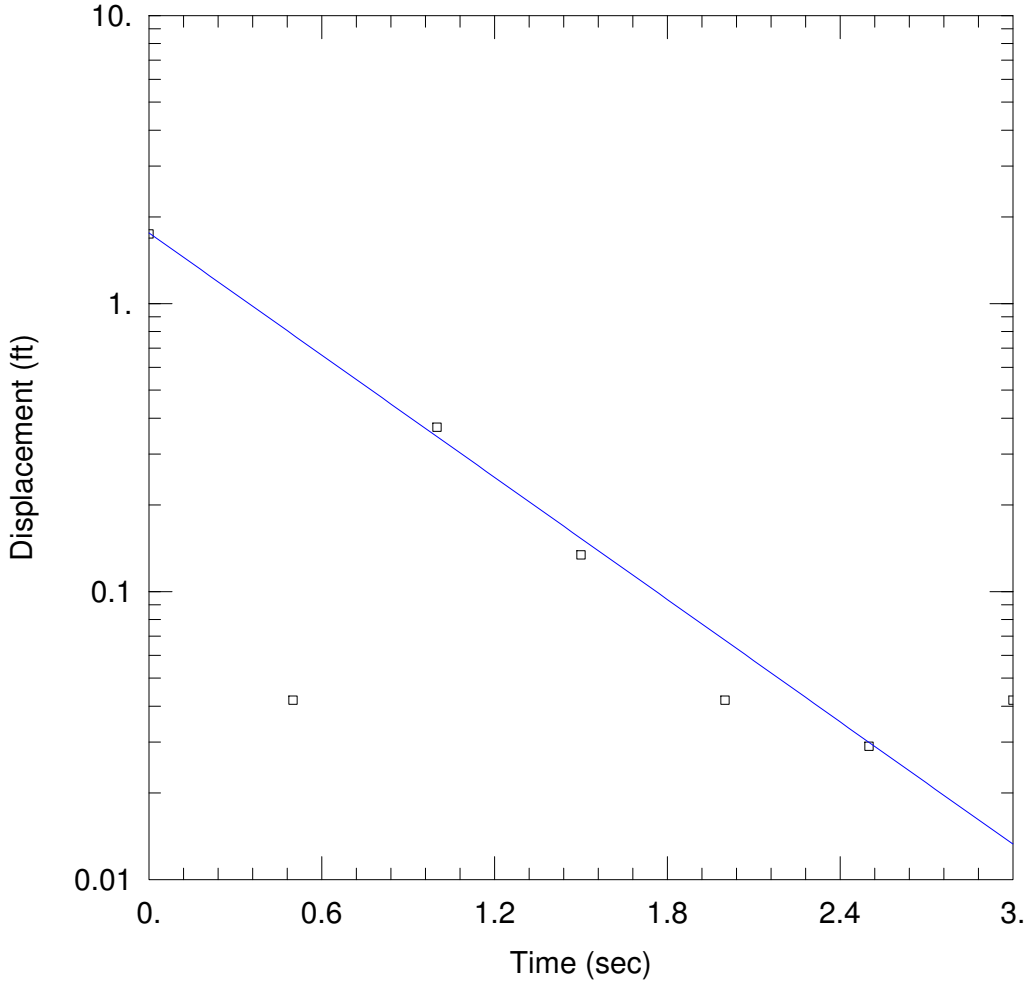
WELL DATA (MW-3)

Initial Displacement: 1.276 ft
Static Water Column Height: 9.09 ft
Total Well Penetration Depth: 10. ft
Screen Length: 10. ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 440. ft/day
y0 = 2.054 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW3_Out1.aqt
Date: 12/04/13 Time: 11:17:40

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-3
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 0.1

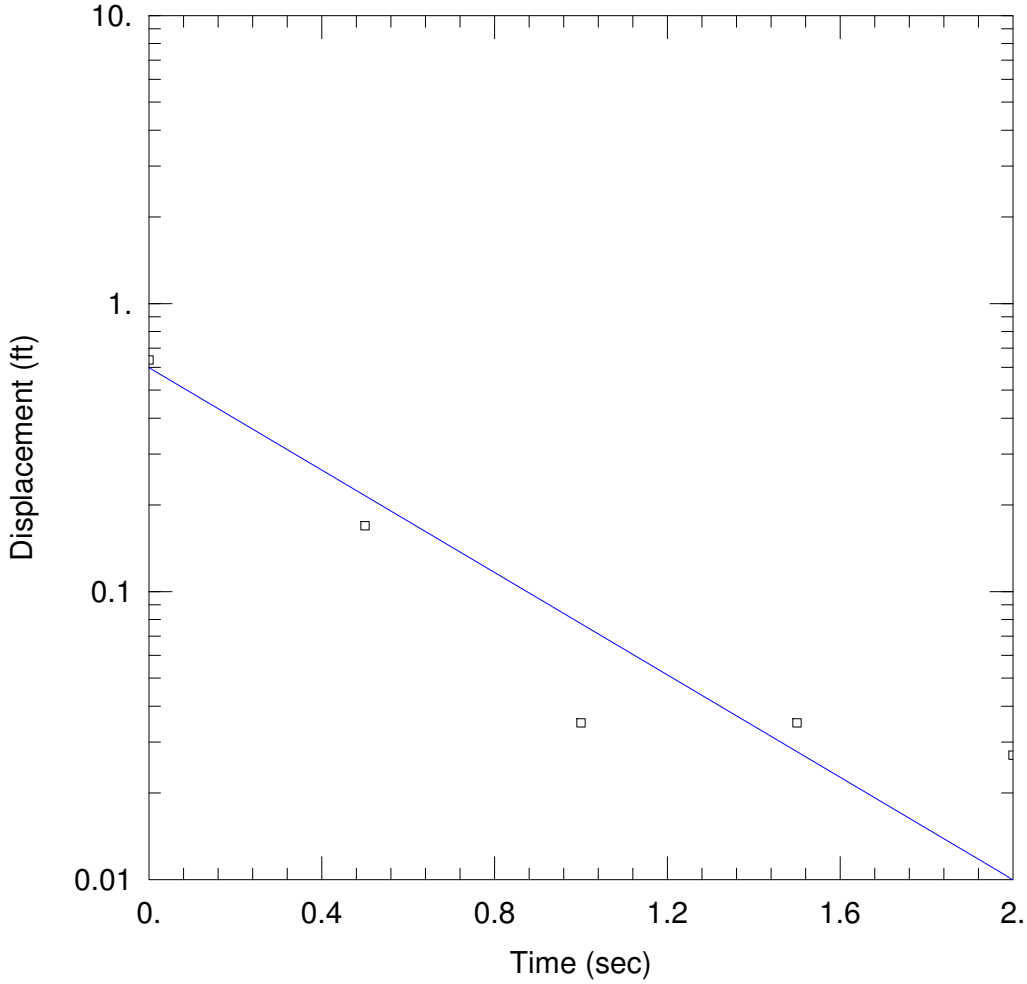
WELL DATA (MW-3)

Initial Displacement: 1.745 ft
Static Water Column Height: 9.09 ft
Total Well Penetration Depth: 10. ft
Screen Length: 10. ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 707.3 ft/day
y0 = 1.758 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW4_In2.aqt
Date: 12/04/13 Time: 11:18:50

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-4
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 0.1

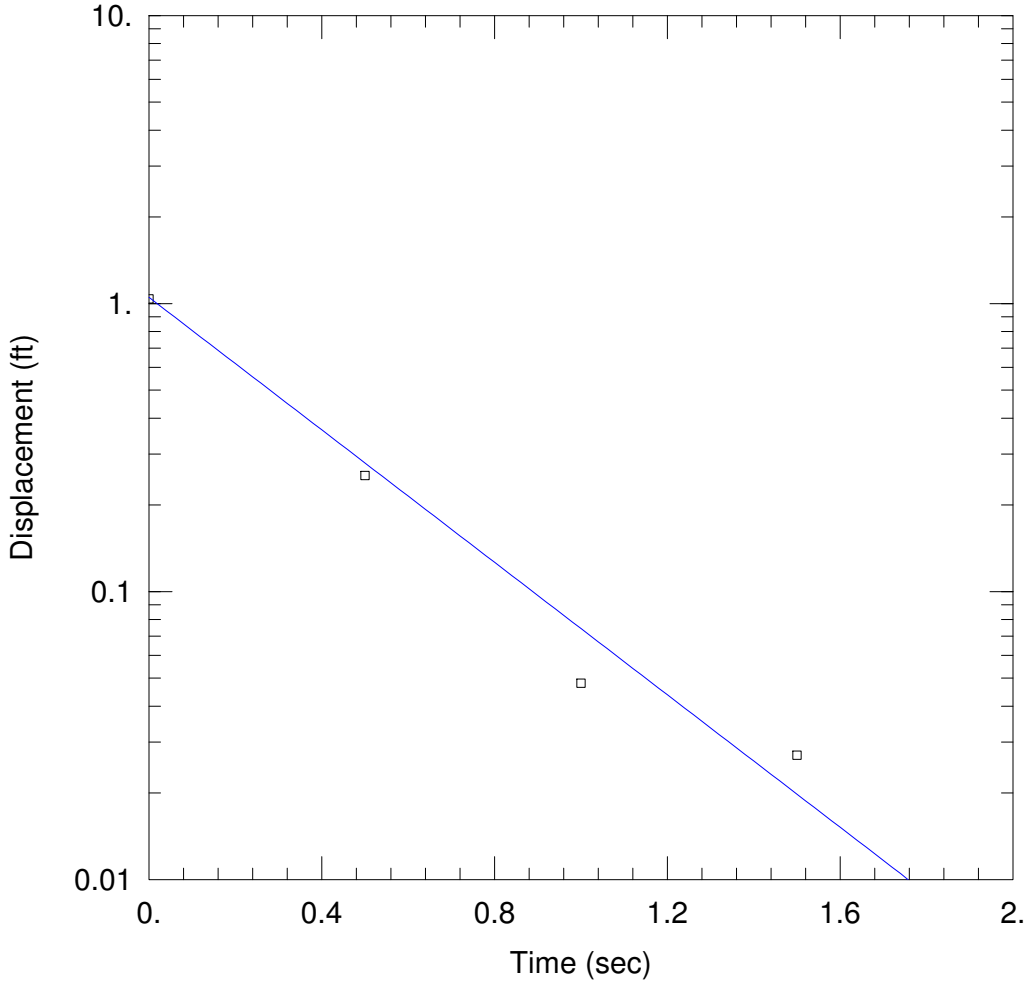
WELL DATA (MW-4)

Initial Displacement: 0.637 ft
Static Water Column Height: 5.67 ft
Total Well Penetration Depth: 10. ft
Screen Length: 10. ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 889.3 ft/day
y0 = 0.5992 ft



WELL TEST ANALYSIS

Data Set: T:\2656 Afton\03\Investigation Activities\SlugTesting\MW4_Out1.aqt
Date: 12/04/13 Time: 11:19:48

PROJECT INFORMATION

Client: City of Afton
Project: 2656-03
Test Well: MW-4
Test Date: 11/01/2013

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-4)

Initial Displacement: 1.037 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 5.67 ft
Screen Length: 10. ft
Well Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1150.1 ft/day
y0 = 1.05 ft

Appendix G

Well Development Records

Wenck
Engineers • Scientists

Well Development Record

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Clear, breezy, 40s
Field Technician(s): AMM

Date
10/24/13

Well ID (MW-1)			
MN Unique Well ID	797973	Average Purging Rate (g/m)	0.3
Casing Diameter (inches)	2	Volume Purged (gals.)	16
Top of Casing Elev. (feet)	729.13	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	47.04	Sampling Device	--
Groundwater Elev. (feet)	682.09	Time Sample Collected	--
Depth to Bottom of Well from TOC (feet)	57.44	Color	Brown
Volume of Water in Well (gals.)	1.7	Odor	None
10 Well Volumes (gals.)	17.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	1101	Damage to Well? (Y/N)	N
Purging Stop Time	1133		

Volume Purged (gallons)	**2.0**	**4.0**	**6.0**	**8.0**	**10.0**	**13.0**	**16.0**
Stabilization Readings							
Time	1106	1109	1114	1119	1123	1127	1133
Temperature (°C)	9.88	9.92	9.91	9.96	9.91	9.95	9.91
Specific Conductance (ms/cm)	0.503	0.504	0.511	0.504	0.511	0.507	0.510
pH	7.67	7.62	7.69	7.57	7.56	7.49	7.52
ORP (mV)	255	242	210	186	169	160	155
Dissolved Oxygen (mg/L)	20.26	8.23	7.55	7.54	7.57	7.57	7.57
Turbidity (NTU)	452	343	201	113.0	74.9	54.9	32.7

Comments:
SP = submersible pump

No silt purge prior to stabilization readings
After pumping (btc) : WL = 47.04 ; TD = 57.44

Wenck
Engineers • Scientists

Well Development Record

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Partly cloudy, calm, 40s
Field Technician(s): AMM

Date
10/24/13

Well ID (MW-2)			
MN Unique Well ID	797974	Average Purging Rate (g/m)	0.5
Casing Diameter (inches)	2	Volume Purged (gals.)	35
Top of Casing Elev. (feet)	731.83	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	50.72	Sampling Device	--
Groundwater Elev. (feet)	681.11	Time Sample Collected	--
Depth to Bottom of Well from TOC (feet)	58.36	Color	Brown
Volume of Water in Casing (gals.)	1.3	Odor	None
10 Well Volumes (gals.)	12.5	Well Capped & Locked (Y/N)	Y
Purging Device	Bailers	Lock Key #	2016
Purging Start Time	1234	Damage to Well? (Y/N)	N
Purging Stop Time	1430		

Volume Purged (gallons)	**2.0**	**5.0**	**7.5**	**10.0**	**15.0**	**20.0**	
Stabilization Readings							
Time	1245	1255	1305	1315	1340	1408	
Temperature (°C)	9.63	9.51	9.52	9.46	9.47	9.41	
Specific Conductance (ms/cm)	0.423	0.385	0.440	0.442	0.449	0.450	
pH	8.03	7.88	7.83	7.80	7.77	7.82	
ORP (mV)	232	249	251	253	256	259	
Dissolved Oxygen (mg/L)	21.64	8.53	9.30	8.91	8.55	7.98	
Turbidity (NTU)	>5999	>5999	>5999	>5999	>5999	>5999	

Comments:
Development pump only able to pump 50'-- developed using bailer
Turbidity still high after bailing 35 gallons. However, no more sand in the well-- can place a sampling pump
After bailing (btc): WL = 50.76 ; TD = 58.36

Wenck
Engineers • Scientists

Well Development Record

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Partly cloudy, calm, 40s
Field Technician(s): AMM

Date
10/24/13

Well ID (MW-3)			
MN Unique Well ID	797975	Average Purging Rate (g/m)	0.5
Casing Diameter (inches)	2	Volume Purged (gals.)	17
Top of Casing Elev. (feet)	721.19	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	38.76	Sampling Device	--
Groundwater Elev. (feet)	682.43	Time Sample Collected	--
Depth to Bottom of Well from TOC (feet)	46.89	Color	Brown
Volume of Water in Casing (gals.)	1.3	Odor	None
10 Well Volumes (gals.)	13.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	942	Damage to Well? (Y/N)	N
Purging Stop Time	1006		

Volume Purged (gallons)	**3.0**	**4.0**	**5.5**	**7.0**	**9.0**	**12.0**	**15.0**
Stabilization Readings							
Time	945	947	949	952	955	1000	1006
Temperature (°C)	9.85	9.86	9.91	9.90	9.92	9.90	9.91
Specific Conductance (ms/cm)	0.499	0.490	0.496	0.500	0.497	0.499	0.496
pH	7.48	7.41	7.40	7.40	7.41	7.42	7.42
ORP (mV)	277	274	266	245	229	212	203
Dissolved Oxygen (mg/L)	6.74	2.61	2.67	2.59	2.65	3.17	2.69
Turbidity (NTU)	>5999	2000	1937	250	139	79.3	45.3

Comments:
SP = submersible pump
2 gallon silt purge prior to stabilization readings
After pumping (btc): WL = 38.77 ; TD = 46.89

Wenck
Engineers • Scientists

Well Development Record

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Partly cloudy, calm, 40s
Field Technician(s): AMM

Date
10/24/13

Well ID (MW-4)			
MN Unique Well ID	802701	Average Purging Rate (g/m)	0.5
Casing Diameter (inches)	2	Volume Purged (gals.)	12
Top of Casing Elev. (feet)	727.04	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	43.82	Sampling Device	--
Groundwater Elev. (feet)	683.22	Time Sample Collected	--
Depth to Bottom of Well from TOC (feet)	48.55	Color	Brown
Volume of Water in Casing (gals.)	0.7	Odor	None
10 Well Volumes (gals.)	7.7	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	845	Damage to Well? (Y/N)	N
Purging Stop Time	920		

Volume Purged (gallons)	**3.0**	**4.0**	**5.0**	**6.0**	**7.0**	**8.0**	**10.0**
Stabilization Readings							
Time	900	902	904	906	910	912	915
Temperature (°C)	11.36	11.28	11.29	11.39	11.32	11.30	11.32
Specific Conductance (ms/cm)	0.459	0.444	0.442	0.442	0.441	0.434	0.435
pH	7.50	7.34	7.32	7.30	7.29	7.28	7.28
ORP (mV)	168	189	197	203	201	197	191
Dissolved Oxygen (mg/L)	4.67	2.06	2.00	2.02	1.86	1.82	1.80
Turbidity (NTU)	>5999	2000	1224	397	122	73.8	42.8

Comments:
SP = submersible pump
3 gallon silt purge prior to stabilization readings
After pumping (btc): WL = 43.84 ; TD = 48.64

Appendix H

Well Purging/Sampling Records

Wenck
Engineers • Scientists

Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Overcast, 30s
Field Technician(s): AMM

Date
11/7/13

Well ID (MW-1)			
MN Unique Well ID	797973	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	6
Top of Casing Elev. (feet)	729.13	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	47.13	Sampling Device	SP
Groundwater Elev. (feet)	682.00	Time Sample Collected (Duplicate)	0935 (0955)
Depth to Bottom of Well from TOC (feet)	57.44	Color	Brown
Volume of Water in Well (gals.)	1.7	Odor	None
10 Well Volumes (gals.)	5.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	925	Damage to Well? (Y/N)	N
Purging Stop Time	935		

Volume Purged (gallons)	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**		
Stabilization Readings							
Time	927	928	930	931	932		
Temperature (°C)	9.31	9.35	9.36	9.41	9.46		
Specific Conductance (ms/cm)	0.324	0.328	0.328	0.333	0.336		
pH	5.93	6.01	6.11	6.13	6.12		
ORP (mV)	199	191	182	174	157		
Dissolved Oxygen (mg/L)	10.44	8.96	8.03	7.94	7.57		
Turbidity (NTU)	624	176	124	48.9	42.6		

Comments:
SP = submersible pump

Duplicate Sample MW-5

Wenck
Engineers • Scientists

Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Overcast, 30s
Field Technician(s): AMM

Date
11/7/13

Well ID (MW-2)			
MN Unique Well ID	797974	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	10
Top of Casing Elev. (feet)	731.83	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	50.82	Sampling Device	SP
Groundwater Elev. (feet)	681.01	Time Sample Collected	900
Depth to Bottom of Well from TOC (feet)	58.36	Color	Light Brown
Volume of Water in Casing (gals.)	1.2	Odor	None
10 Well Volumes (gals.)	3.7	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	835	Damage to Well? (Y/N)	N
Purging Stop Time	850		

Volume Purged (gallons)	**6.0**	**7.0**	**8.0**	**9.0**			
Stabilization Readings							
Time	841	842	844	845			
Temperature (°C)	10.2	9.76	9.78	9.78			
Specific Conductance (ms/cm)	0.293	0.284	0.285	0.285			
pH	6.38	6.39	6.38	6.39			
ORP (mV)	129	170	176	176			
Dissolved Oxygen (mg/L)	8.66	7.81	7.73	7.74			
Turbidity (NTU)	800	124	86.2	42.3			

Comments:
SP = submersible pump
Start with silt purge to reduce turbidity. Purge ~5 gallons prior to taking readings.

Wenck
Engineers • Scientists

Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Overcast, 30s
Field Technician(s): AMM

Date
11/7/13

Well ID (MW-3)			
MN Unique Well ID	797975	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	9
Top of Casing Elev. (feet)	721.19	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	38.79	Sampling Device	SP
Groundwater Elev. (feet)	682.40	Time Sample Collected	1030
Depth to Bottom of Well from TOC (feet)	46.89	Color	Brown
Volume of Water in Casing (gals.)	1.3	Odor	None
10 Well Volumes (gals.)	4.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	1020	Damage to Well? (Y/N)	N
Purging Stop Time	1035		

Volume Purged (gallons)	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**		
Stabilization Readings							
Time	1021	1022	1024	1025	1026		
Temperature (°C)	9.20	9.55	9.62	9.75	9.79		
Specific Conductance (ms/cm)	0.320	0.319	0.320	0.317	0.317		
pH	6.05	5.94	5.93	5.91	5.91		
ORP (mV)	148	202	203	205	204		
Dissolved Oxygen (mg/L)	1.81	1.41	1.40	1.29	1.29		
Turbidity (NTU)	>5999	>5999	1832	1024	212		

Comments:
SP = submersible pump
Purge until Turbidity < 50 NTU, then sample

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Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Overcast, 30s
Field Technician(s): AMM

Date
11/8/13

Well ID (MW-4)			
MN Unique Well ID	802701	Average Purging Rate (g/m)	0.5
Casing Diameter (inches)	2	Volume Purged (gals.)	4
Top of Casing Elev. (feet)	727.04	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	43.88	Sampling Device	SP
Groundwater Elev. (feet)	683.16	Time Sample Collected	800
Depth to Bottom of Well from TOC (feet)	48.55	Color	Brown
Volume of Water in Casing (gals.)	0.8	Odor	None
10 Well Volumes (gals.)	2.3	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	749	Damage to Well? (Y/N)	N
Purging Stop Time	757		

Volume Purged (gallons)	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**		
Stabilization Readings							
Time	750	751	752	754	755		
Temperature (°C)	10.89	11.07	11.24	11.25	11.25		
Specific Conductance (ms/cm)	0.281	0.279	0.277	0.277	0.276		
pH	5.70	5.77	5.82	5.81	5.80		
ORP (mV)	267	262	253	232	207		
Dissolved Oxygen (mg/L)	1.61	1.40	1.13	1.03	1.00		
Turbidity (NTU)	>5999	120	97.6	78.9	40.4		

Comments:
SP = submersible pump
Could not sample 11/7/2013 due to equipment malfunction

Wenck
Engineers • Scientists

Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Clear, Windy, 20s
Field Technician(s): AMM

Date
11/26/13

Well ID (MW-1)			
MN Unique Well ID	797973	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	6
Top of Casing Elev. (feet)	729.13	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	47.17	Sampling Device	SP
Groundwater Elev. (feet)	681.96	Time Sample Collected	1002
Depth to Bottom of Well from TOC (feet)	57.44	Color	Brown
Volume of Water in Well (gals.)	1.7	Odor	None
10 Well Volumes (gals.)	5.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	955	Damage to Well? (Y/N)	N
Purging Stop Time	1002		

Volume Purged (gallons)	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**		
Stabilization Readings							
Time	956	957	958	959	1000		
Temperature (°C)	8.99	9.58	9.74	9.69	9.58		
Specific Conductance (ms/cm)	0.380	0.389	0.391	0.390	0.391		
pH	7.74	7.59	7.58	7.58	7.57		
ORP (mV)	178	184	181	180	172		
Dissolved Oxygen (mg/L)	16.31	15.76	29.93	15.73	15.48		
Turbidity (NTU)	>2000	1028	612	124.0	32.9		

Comments:
SP = submersible pump

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Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Clear, Windy, 20s
Field Technician(s): AMM

Date
11/26/13

Well ID (MW-2)			
MN Unique Well ID	797974	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	5
Top of Casing Elev. (feet)	731.83	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	50.87	Sampling Device	SP
Groundwater Elev. (feet)	680.96	Time Sample Collected	838
Depth to Bottom of Well from TOC (feet)	58.36	Color	Light Brown
Volume of Water in Casing (gals.)	1.2	Odor	None
10 Well Volumes (gals.)	3.7	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	833	Damage to Well? (Y/N)	N
Purging Stop Time	838		

Volume Purged (gallons)	**1.0**	**1.5**	**2.0**	**3.0**	**4.0**	**5.0**	
Stabilization Readings							
Time	833	834	834	835	836	837	
Temperature (°C)	9.43	9.33	9.86	9.76	9.79	9.75	
Specific Conductance (ms/cm)	0.332	0.332	0.335	0.334	0.335	0.335	
pH	7.79	7.79	7.83	7.81	7.81	7.82	
ORP (mV)	247	248	230	222	218	218	
Dissolved Oxygen (mg/L)	33.32	26.67	25.07	21.10	21.22	20.98	
Turbidity (NTU)	>2000	1028	998	1002	175	42	

Comments:
SP = submersible pump

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Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Clear, Windy, 20s
Field Technician(s): AMM

Date
11/26/13

Well ID (MW-3)			
MN Unique Well ID	797975	Average Purging Rate (g/m)	1.0
Casing Diameter (inches)	2	Volume Purged (gals.)	6
Top of Casing Elev. (feet)	721.19	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	38.86	Sampling Device	SP
Groundwater Elev. (feet)	682.33	Time Sample Collected (Duplicate)	1100 (1120)
Depth to Bottom of Well from TOC (feet)	46.89	Color	Brown
Volume of Water in Casing (gals.)	1.3	Odor	None
10 Well Volumes (gals.)	4.0	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	1047	Damage to Well? (Y/N)	N
Purging Stop Time	1100		

Volume Purged (gallons)	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**		
Stabilization Readings							
Time	1048	1049	1050	1051	1052		
Temperature (°C)	9.24	9.60	10.26	10.01	10.01		
Specific Conductance (ms/cm)	0.354	0.358	0.362	0.362	0.363		
pH	7.64	7.54	7.49	7.47	7.46		
ORP (mV)	195	194	194	190	183		
Dissolved Oxygen (mg/L)	24.27	14.16	14.09	9.96	9.07		
Turbidity (NTU)	>2000	>2000	512	122	50.9		

Comments:
SP = submersible pump
Duplicate sample MW-5

Wenck
Engineers • Scientists

Well Purging and Sampling Sheet

Project Name: City of Afton Hydrogeologic Investigation
Address: 3033 St. Croix Trail, Afton, Minnesota 55001
Weather Conditions: Clear, Windy, 20s
Field Technician(s): AMM

Date
11/26/13

Well ID (MW-4)			
MN Unique Well ID	802701	Average Purging Rate (g/m)	0.5
Casing Diameter (inches)	2	Volume Purged (gals.)	4
Top of Casing Elev. (feet)	727.04	Purged Dry (Y/N)	N
Depth to Water from TOC (feet)	43.93	Sampling Device	SP
Groundwater Elev. (feet)	683.11	Time Sample Collected	1155
Depth to Bottom of Well from TOC (feet)	48.55	Color	Brown
Volume of Water in Casing (gals.)	0.8	Odor	None
10 Well Volumes (gals.)	2.3	Well Capped & Locked (Y/N)	Y
Purging Device	SP	Lock Key #	2016
Purging Start Time	1145	Damage to Well? (Y/N)	N
Purging Stop Time	1155		

Volume Purged (gallons)	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**4.0**
Stabilization Readings							
Time	1146	1147	1148	1149	1150	1151	1153
Temperature (°C)	10.89	11.18	11.16	10.97	11.28	11.22	11.19
Specific Conductance (ms/cm)	0.311	0.312	0.311	0.310	0.312	0.312	0.311
pH	7.29	7.26	7.25	7.24	7.24	7.25	7.24
ORP (mV)	198	197	196	195	192	190	190
Dissolved Oxygen (mg/L)	32.00	9.47	9.31	7.53	8.82	7.68	7.72
Turbidity (NTU)	>2000	1032	668	146.0	63.9	44.8	40.2

Comments:
SP = submersible pump
Could not sample 11/7/2013 due to equipment malfunction

Appendix I

ESC Lab Sciences Laboratory Reports and Chain-of-Custody Documentation – Groundwater Analytical Results

12065 Lebanon Rd.
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Tax I.D. 62-0814289

Est. 1970

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Report Summary

Monday November 18, 2013

Report Number: L667762
Samples Received: 11/09/13
Client Project: 2656-03

Description: Afton Hydrogeo Study

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: John Hawkins

John Hawkins , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-01

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/07/13 09:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/09/13	1
Chloride	29000	1000	ug/l	9056	11/09/13	1
Fluoride	BDL	100	ug/l	9056	11/09/13	1
Nitrate	3400	100	ug/l	9056	11/09/13	1
Nitrite	BDL	100	ug/l	9056	11/09/13	1
Sulfate	14000	5000	ug/l	9056	11/09/13	1
COD	75000	10000	ug/l	410.4	11/16/13	1
Ammonia Nitrogen	130	100	ug/l	350.1	11/15/13	1
Nitrate-Nitrite	3600	100	ug/l	353.2	11/15/13	1
Phosphate,Ortho	120	25.	ug/l	4500P F-20	11/09/13	1
Phosphorus,Total	120	100	ug/l	365.4	11/18/13	1
Aluminum	1400	100	ug/l	6010B	11/14/13	1
Calcium	59000	500	ug/l	6010B	11/14/13	1
Magnesium	25000	100	ug/l	6010B	11/14/13	1
Manganese	220	10.	ug/l	6010B	11/14/13	1
Potassium	1800	500	ug/l	6010B	11/14/13	1
Sodium	7800	500	ug/l	6010B	11/14/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-01

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/07/13 09:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

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1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-01

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/07/13 09:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	105.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	105.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	97.4		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-02

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/07/13 09:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/09/13	1
Chloride	22000	1000	ug/l	9056	11/09/13	1
Fluoride	BDL	100	ug/l	9056	11/09/13	1
Nitrate	1600	100	ug/l	9056	11/09/13	1
Nitrite	BDL	100	ug/l	9056	11/09/13	1
Sulfate	11000	5000	ug/l	9056	11/09/13	1
COD	17000	10000	ug/l	410.4	11/16/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	11/15/13	1
Nitrate-Nitrite	1700	100	ug/l	353.2	11/15/13	1
Phosphate,Ortho	470	25.	ug/l	4500P F-20	11/09/13	1
Phosphorus,Total	260	100	ug/l	365.4	11/18/13	1
Aluminum	3100	100	ug/l	6010B	11/14/13	1
Calcium	49000	500	ug/l	6010B	11/14/13	1
Magnesium	22000	100	ug/l	6010B	11/14/13	1
Manganese	140	10.	ug/l	6010B	11/14/13	1
Potassium	4400	500	ug/l	6010B	11/14/13	1
Sodium	6300	500	ug/l	6010B	11/14/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-02

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/07/13 09:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-02

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/07/13 09:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	106.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	103.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	96.8		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-03

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/07/13 10:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/09/13	1
Chloride	17000	1000	ug/l	9056	11/09/13	1
Fluoride	BDL	100	ug/l	9056	11/09/13	1
Nitrate	3300	100	ug/l	9056	11/09/13	1
Nitrite	BDL	100	ug/l	9056	11/09/13	1
Sulfate	11000	5000	ug/l	9056	11/09/13	1
COD	18000	10000	ug/l	410.4	11/16/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	11/17/13	1
Nitrate-Nitrite	3300	100	ug/l	353.2	11/15/13	1
Phosphate,Ortho	520	25.	ug/l	4500P F-20	11/09/13	1
Phosphorus,Total	350	100	ug/l	365.4	11/18/13	1
Aluminum	6600	100	ug/l	6010B	11/14/13	1
Calcium	67000	500	ug/l	6010B	11/14/13	1
Magnesium	27000	100	ug/l	6010B	11/14/13	1
Manganese	660	10.	ug/l	6010B	11/14/13	1
Potassium	3200	500	ug/l	6010B	11/14/13	1
Sodium	6400	500	ug/l	6010B	11/14/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-03

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/07/13 10:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-03

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/07/13 10:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	106.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	105.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	96.8		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-04

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/08/13 08:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/09/13	1
Chloride	21000	1000	ug/l	9056	11/09/13	1
Fluoride	BDL	100	ug/l	9056	11/09/13	1
Nitrate	310	100	ug/l	9056	11/09/13	1
Nitrite	BDL	100	ug/l	9056	11/09/13	1
Sulfate	BDL	5000	ug/l	9056	11/09/13	1
COD	21000	10000	ug/l	410.4	11/16/13	1
Ammonia Nitrogen	130	100	ug/l	350.1	11/17/13	1
Nitrate-Nitrite	390	100	ug/l	353.2	11/15/13	1
Phosphate,Ortho	120	25.	ug/l	4500P F-20	11/09/13	1
Phosphorus,Total	150	100	ug/l	365.4	11/18/13	1
Aluminum	900	100	ug/l	6010B	11/14/13	1
Calcium	47000	500	ug/l	6010B	11/14/13	1
Magnesium	19000	100	ug/l	6010B	11/14/13	1
Manganese	1700	10.	ug/l	6010B	11/14/13	1
Potassium	1600	500	ug/l	6010B	11/14/13	1
Sodium	6800	500	ug/l	6010B	11/14/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

12065 Lebanon Rd.
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(615) 758-5858
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Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-04

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/08/13 08:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-04

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/08/13 08:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	105.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	104.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	97.0		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-05

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/07/13 09:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/09/13	1
Chloride	29000	1000	ug/l	9056	11/09/13	1
Fluoride	BDL	100	ug/l	9056	11/09/13	1
Nitrate	3400	100	ug/l	9056	11/09/13	1
Nitrite	BDL	100	ug/l	9056	11/09/13	1
Sulfate	14000	5000	ug/l	9056	11/09/13	1
COD	BDL	10000	ug/l	410.4	11/16/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	11/17/13	1
Nitrate-Nitrite	3600	100	ug/l	353.2	11/15/13	1
Phosphate,Ortho	140	25.	ug/l	4500P F-20	11/09/13	1
Phosphorus,Total	BDL	100	ug/l	365.4	11/18/13	1
Aluminum	1200	100	ug/l	6010B	11/14/13	1
Calcium	59000	500	ug/l	6010B	11/14/13	1
Magnesium	24000	100	ug/l	6010B	11/14/13	1
Manganese	220	10.	ug/l	6010B	11/14/13	1
Potassium	1800	500	ug/l	6010B	11/14/13	1
Sodium	7600	500	ug/l	6010B	11/14/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-05

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/07/13 09:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-05

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/07/13 09:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	105.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	105.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	95.6		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-06

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : TRIP BLANK

Collected By : Alex Martell
Collection Date : 11/08/13 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	11/11/13	1
Acrolein	BDL	50.	ug/l	8260B	11/11/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	11/11/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	11/11/13	1
Benzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	11/11/13	1
Bromoform	BDL	1.0	ug/l	8260B	11/11/13	1
Bromomethane	BDL	5.0	ug/l	8260B	11/11/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
Chloroethane	BDL	5.0	ug/l	8260B	11/11/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	11/11/13	1
Chloroform	BDL	5.0	ug/l	8260B	11/11/13	1
Chloromethane	BDL	2.5	ug/l	8260B	11/11/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	11/11/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	11/11/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	11/11/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

November 18,2013

ESC Sample # : L667762-06

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : TRIP BLANK

Collected By : Alex Martell
Collection Date : 11/08/13 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	11/11/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	11/11/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	11/11/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	11/11/13	1
2-Hexanone	BDL	10.	ug/l	8260B	11/11/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	11/11/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	11/11/13	1
Naphthalene	BDL	5.0	ug/l	8260B	11/11/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Styrene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	11/11/13	1
Toluene	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	11/11/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	11/11/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	11/11/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	11/11/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	11/11/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	11/11/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	11/11/13	1
Surrogate Recovery						
Toluene-d8	105.		% Rec.	8260B	11/11/13	1
Dibromofluoromethane	102.		% Rec.	8260B	11/11/13	1
4-Bromofluorobenzene	96.0		% Rec.	8260B	11/11/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
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Reported: 11/18/13 11:03 Printed: 11/18/13 11:03

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L667762-01	WG691571	SAMP	Nitrate	R2852084	T8
	WG691571	SAMP	Nitrite	R2852084	T8
	WG691660	SAMP	2-Chloroethyl vinyl ether	R2852802	J3
	WG691660	SAMP	Chloromethane	R2852802	J4
	WG691581	SAMP	Phosphate,Ortho	R2851246	T8
L667762-02	WG691571	SAMP	Nitrate	R2852084	T8
	WG691571	SAMP	Nitrite	R2852084	T8
	WG691660	SAMP	Chloromethane	R2852802	J4
	WG691581	SAMP	Phosphate,Ortho	R2851246	T8
L667762-03	WG691571	SAMP	Nitrate	R2852084	T8
	WG691571	SAMP	Nitrite	R2852084	T8
	WG691660	SAMP	Chloromethane	R2852802	J4
	WG691581	SAMP	Phosphate,Ortho	R2851246	T8
L667762-04	WG691571	SAMP	Nitrate	R2852084	T8
	WG691571	SAMP	Nitrite	R2852084	T8
	WG691660	SAMP	Chloromethane	R2852802	J4
	WG691581	SAMP	Phosphate,Ortho	R2851246	T8
L667762-05	WG691571	SAMP	Nitrate	R2852084	T8
	WG691571	SAMP	Nitrite	R2852084	T8
	WG691660	SAMP	Chloromethane	R2852802	J4
	WG691581	SAMP	Phosphate,Ortho	R2851246	T8
	WG692618	SAMP	Phosphorus,Total	R2856605	P1
L667762-06	WG691660	SAMP	Chloromethane	R2852802	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.
T8	(ESC) - Additional method/sample information: Sample(s) received past/too close to holding time expiration.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
11/18/13 at 11:03:55

TSR Signing Reports: 341
R5 - Desired TAT

Sample: L667762-01 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

Sample: L667762-02 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

Sample: L667762-03 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

Sample: L667762-04 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

Sample: L667762-05 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

Sample: L667762-06 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 11/15/13 00:00 RPT Date: 11/18/13 11:03

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Suite 100
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Quality Assurance Report
Level II

L667762

November 18, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Phosphate,Ortho	< .025	mg/l			WG691581	11/09/13 11:46
Bromide	< 1	mg/l			WG691571	11/09/13 09:02
Chloride	< 1	mg/l			WG691571	11/09/13 09:02
Fluoride	< .1	mg/l			WG691571	11/09/13 09:02
Nitrate	< .1	mg/l			WG691571	11/09/13 09:02
Nitrite	< .1	mg/l			WG691571	11/09/13 09:02
Sulfate	< 5	mg/l			WG691571	11/09/13 09:02
1,1,1,2-Tetrachloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1,1-Trichloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1,2-Trichloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1,2-Trichlorotrifluoroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1-Dichloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,1-Dichloroethene	< .001	mg/l			WG691660	11/11/13 12:16
1,1-Dichloropropene	< .001	mg/l			WG691660	11/11/13 12:16
1,2,3-Trichlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,2,3-Trichloropropane	< .001	mg/l			WG691660	11/11/13 12:16
1,2,3-Trimethylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,2,4-Trichlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,2,4-Trimethylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,2-Dibromo-3-Chloropropane	< .005	mg/l			WG691660	11/11/13 12:16
1,2-Dibromoethane	< .001	mg/l			WG691660	11/11/13 12:16
1,2-Dichlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,2-Dichloroethane	< .001	mg/l			WG691660	11/11/13 12:16
1,2-Dichloropropane	< .001	mg/l			WG691660	11/11/13 12:16
1,3,5-Trimethylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,3-Dichlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
1,3-Dichloropropane	< .001	mg/l			WG691660	11/11/13 12:16
1,4-Dichlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
2,2-Dichloropropane	< .001	mg/l			WG691660	11/11/13 12:16
2-Butanone (MEK)	< .01	mg/l			WG691660	11/11/13 12:16
2-Chloroethyl vinyl ether	< .05	mg/l			WG691660	11/11/13 12:16
2-Chlorotoluene	< .001	mg/l			WG691660	11/11/13 12:16
2-Hexanone	< .01	mg/l			WG691660	11/11/13 12:16
4-Chlorotoluene	< .001	mg/l			WG691660	11/11/13 12:16
4-Methyl-2-pentanone (MIBK)	< .01	mg/l			WG691660	11/11/13 12:16
Acetone	< .05	mg/l			WG691660	11/11/13 12:16
Acrolein	< .025	mg/l			WG691660	11/11/13 12:16
Acrylonitrile	< .01	mg/l			WG691660	11/11/13 12:16
Allyl chloride	< .005	mg/l			WG691660	11/11/13 12:16
Benzene	< .001	mg/l			WG691660	11/11/13 12:16
Bromobenzene	< .001	mg/l			WG691660	11/11/13 12:16
Bromochloromethane	< .001	mg/l			WG691660	11/11/13 12:16
Bromodichloromethane	< .001	mg/l			WG691660	11/11/13 12:16
Bromoform	< .001	mg/l			WG691660	11/11/13 12:16
Bromomethane	< .005	mg/l			WG691660	11/11/13 12:16
Carbon tetrachloride	< .001	mg/l			WG691660	11/11/13 12:16
Chlorobenzene	< .001	mg/l			WG691660	11/11/13 12:16
Chlorodibromomethane	< .001	mg/l			WG691660	11/11/13 12:16
Chloroethane	< .005	mg/l			WG691660	11/11/13 12:16
Chloroform	< .005	mg/l			WG691660	11/11/13 12:16
Chloromethane	< .0025	mg/l			WG691660	11/11/13 12:16
cis-1,2-Dichloroethene	< .001	mg/l			WG691660	11/11/13 12:16
cis-1,3-Dichloropropene	< .001	mg/l			WG691660	11/11/13 12:16
Di-isopropyl ether	< .001	mg/l			WG691660	11/11/13 12:16

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L667762

November 18, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Dibromomethane	< .001	mg/l			WG691660	11/11/13 12:16
Dichlorodifluoromethane	< .005	mg/l			WG691660	11/11/13 12:16
Ethyl ether	< .001	mg/l			WG691660	11/11/13 12:16
Ethylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
Hexachloro-1,3-butadiene	< .001	mg/l			WG691660	11/11/13 12:16
Isopropylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
Methyl tert-butyl ether	< .001	mg/l			WG691660	11/11/13 12:16
Methylene Chloride	< .005	mg/l			WG691660	11/11/13 12:16
n-Butylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
n-Propylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
Naphthalene	< .005	mg/l			WG691660	11/11/13 12:16
p-Isopropyltoluene	< .001	mg/l			WG691660	11/11/13 12:16
sec-Butylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
Styrene	< .001	mg/l			WG691660	11/11/13 12:16
tert-Butylbenzene	< .001	mg/l			WG691660	11/11/13 12:16
Tetrachloroethene	< .001	mg/l			WG691660	11/11/13 12:16
Tetrahydrofuran	< .005	mg/l			WG691660	11/11/13 12:16
Toluene	< .005	mg/l			WG691660	11/11/13 12:16
trans-1,2-Dichloroethene	< .001	mg/l			WG691660	11/11/13 12:16
trans-1,3-Dichloropropene	< .001	mg/l			WG691660	11/11/13 12:16
Trichloroethene	< .001	mg/l			WG691660	11/11/13 12:16
Trichlorofluoromethane	< .005	mg/l			WG691660	11/11/13 12:16
Vinyl chloride	< .001	mg/l			WG691660	11/11/13 12:16
Xylenes, Total	< .003	mg/l			WG691660	11/11/13 12:16
4-Bromofluorobenzene		% Rec.	94.70	71-126	WG691660	11/11/13 12:16
Dibromofluoromethane		% Rec.	103.0	78.3-121	WG691660	11/11/13 12:16
Toluene-d8		% Rec.	105.0	88.5-111	WG691660	11/11/13 12:16
Aluminum	< .1	mg/l			WG692079	11/14/13 13:00
Calcium	< .5	mg/l			WG692079	11/14/13 13:00
Magnesium	< .1	mg/l			WG692079	11/14/13 13:00
Manganese	< .01	mg/l			WG692079	11/14/13 13:00
Potassium	< .5	mg/l			WG692079	11/14/13 13:00
Sodium	< .5	mg/l			WG692079	11/14/13 13:00
Nitrate-Nitrite	< .1	mg/l			WG692405	11/15/13 09:58
Ammonia Nitrogen	< .1	mg/l			WG692453	11/15/13 15:08
COD	< 10	mg/l			WG692449	11/16/13 16:42
Ammonia Nitrogen	< .1	mg/l			WG692463	11/17/13 07:58
Phosphorus,Total	< .1	mg/l			WG692618	11/18/13 08:44

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Phosphate,Ortho	mg/l	0.120	0.120	0.0	20	L667762-01	WG691581
Nitrate	mg/l	1.40	1.40	0.0	20	L667687-01	WG691571

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L667762

November 18, 2013

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
			Duplicate				
Aluminum	mg/l	0.0	0.0469	6.00	20	L667717-02	WG692079
Calcium	mg/l	32.0	31.2	2.00	20	L667717-02	WG692079
Magnesium	mg/l	5.10	4.95	3.00	20	L667717-02	WG692079
Manganese	mg/l	0.620	0.609	3.00	20	L667717-02	WG692079
Potassium	mg/l	1.80	1.72	4.00	20	L667717-02	WG692079
Sodium	mg/l	7.80	7.63	2.00	20	L667717-02	WG692079
Nitrate-Nitrite	mg/l	0.380	0.390	2.60	20	L667762-04	WG692405
Nitrate-Nitrite	mg/l	0.0	0.0	0.0	20	L667730-01	WG692405
Ammonia Nitrogen	mg/l	0.560	0.640	13.3	20	L667730-08	WG692453
Ammonia Nitrogen	mg/l	14.0	15.0	6.90	20	L662384-06	WG692453
COD	mg/l	37.0	38.0	2.67	5	L667659-01	WG692449
COD	mg/l	150.	150.	0.0	5	L667855-09	WG692449
Ammonia Nitrogen	mg/l	0.0	0.0	0.0	20	L667600-16	WG692463
Ammonia Nitrogen	mg/l	0.0	0.120	NA	20	L667946-07	WG692463
Phosphorus,Total	mg/l	0.120	0.0	NA	20	L667762-05	WG692618
Phosphorus,Total	mg/l	0.580	0.530	9.01	20	L667605-01	WG692618

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
			Laboratory Control Sample			
Phosphate,Ortho	mg/l	.75	0.707	94.3	85-115	WG691581
Bromide	mg/l	40	40.1	100.	90-110	WG691571
Chloride	mg/l	40	40.2	101.	90-110	WG691571
Fluoride	mg/l	8	8.07	101.	90-110	WG691571
Nitrate	mg/l	8	8.20	103.	90-110	WG691571
Nitrite	mg/l	8	8.00	100.	90-110	WG691571
Sulfate	mg/l	40	40.0	100.	90-110	WG691571
1,1,1,2-Tetrachloroethane	mg/l	.025	0.0246	98.5	74.2-124	WG691660
1,1,1-Trichloroethane	mg/l	.025	0.0245	98.0	73.2-123	WG691660
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0245	97.9	70.7-122	WG691660
1,1,2-Trichloroethane	mg/l	.025	0.0239	95.7	77.7-118	WG691660
1,1,2-Trichlorotrifluoroethane	mg/l	.025	0.0282	113.	67.2-143	WG691660
1,1-Dichloroethane	mg/l	.025	0.0287	115.	70.7-126	WG691660
1,1-Dichloroethene	mg/l	.025	0.0261	105.	67.8-129	WG691660
1,1-Dichloropropene	mg/l	.025	0.0277	111.	73.1-125	WG691660
1,2,3-Trichlorobenzene	mg/l	.025	0.0277	111.	64.9-135	WG691660
1,2,3-Trichloropropane	mg/l	.025	0.0233	93.1	71.8-121	WG691660
1,2,3-Trimethylbenzene	mg/l	.025	0.0227	90.8	72.3-116	WG691660
1,2,4-Trichlorobenzene	mg/l	.025	0.0287	115.	69.7-136	WG691660
1,2,4-Trimethylbenzene	mg/l	.025	0.0247	98.8	75-123	WG691660
1,2-Dibromo-3-Chloropropane	mg/l	.025	0.0226	90.6	65.4-128	WG691660
1,2-Dibromoethane	mg/l	.025	0.0250	99.9	76.6-121	WG691660
1,2-Dichlorobenzene	mg/l	.025	0.0265	106.	78.4-117	WG691660
1,2-Dichloroethane	mg/l	.025	0.0253	101.	68.8-124	WG691660

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Est. 1970

WENCK Associates - St. Paul, MN
Alex Martell
1802 Wooddale Drive, Suite 100
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Quality Assurance Report
Level II

L667762

November 18, 2013

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
1,2-Dichloropropane	mg/l	.025	0.0291	117.	76.5-119	WG691660
1,3,5-Trimethylbenzene	mg/l	.025	0.0253	101.	75.6-124	WG691660
1,3-Dichlorobenzene	mg/l	.025	0.0260	104.	70.8-128	WG691660
1,3-Dichloropropane	mg/l	.025	0.0261	105.	77.4-117	WG691660
1,4-Dichlorobenzene	mg/l	.025	0.0256	102.	78.8-115	WG691660
2,2-Dichloropropane	mg/l	.025	0.0240	96.0	62.4-133	WG691660
2-Butanone (MEK)	mg/l	.125	0.110	87.8	55-149	WG691660
2-Chloroethyl vinyl ether	mg/l	.125	0.130	104.	43.8-150	WG691660
2-Chlorotoluene	mg/l	.025	0.0239	95.6	74.7-122	WG691660
2-Hexanone	mg/l	.125	0.115	92.3	65.6-144	WG691660
4-Chlorotoluene	mg/l	.025	0.0260	104.	77.5-120	WG691660
4-Methyl-2-pentanone (MIBK)	mg/l	.125	0.134	107.	70.5-133	WG691660
Acetone	mg/l	.125	0.0739	59.1	35.6-163	WG691660
Acrolein	mg/l	.125	0.158	126.	10-190	WG691660
Acrylonitrile	mg/l	.125	0.154	123.	55.2-130	WG691660
Benzene	mg/l	.025	0.0278	111.	74.8-121	WG691660
Bromobenzene	mg/l	.025	0.0247	98.9	77.5-116	WG691660
Bromochloromethane	mg/l	.025	0.0257	103.	77.6-119	WG691660
Bromodichloromethane	mg/l	.025	0.0246	98.4	75.1-116	WG691660
Bromoform	mg/l	.025	0.0227	90.9	67.5-130	WG691660
Bromomethane	mg/l	.025	0.0351	140.	49.9-162	WG691660
Carbon tetrachloride	mg/l	.025	0.0258	103.	70.2-123	WG691660
Chlorobenzene	mg/l	.025	0.0262	105.	78.1-119	WG691660
Chlorodibromomethane	mg/l	.025	0.0236	94.4	74-121	WG691660
Chloroethane	mg/l	.025	0.0275	110.	61.7-135	WG691660
Chloroform	mg/l	.025	0.0271	108.	76-121	WG691660
Chloromethane	mg/l	.025	0.0324	130.*	61.5-129	WG691660
cis-1,2-Dichloroethene	mg/l	.025	0.0258	103.	76-119	WG691660
cis-1,3-Dichloropropene	mg/l	.025	0.0264	106.	78.2-120	WG691660
Di-isopropyl ether	mg/l	.025	0.0283	113.	65.6-132	WG691660
Dibromomethane	mg/l	.025	0.0256	102.	79.5-118	WG691660
Dichlorodifluoromethane	mg/l	.025	0.0204	81.5	54.8-135	WG691660
Ethyl ether	mg/l	.025	0.0258	103.	62.4-134	WG691660
Ethylbenzene	mg/l	.025	0.0256	103.	78.8-122	WG691660
Hexachloro-1,3-butadiene	mg/l	.025	0.0255	102.	64.7-129	WG691660
Isopropylbenzene	mg/l	.025	0.0272	109.	78.6-132	WG691660
Methyl tert-butyl ether	mg/l	.025	0.0251	101.	71.2-126	WG691660
Methylene Chloride	mg/l	.025	0.0268	107.	70.3-120	WG691660
n-Butylbenzene	mg/l	.025	0.0275	110.	76.2-126	WG691660
n-Propylbenzene	mg/l	.025	0.0259	104.	78.2-122	WG691660
Naphthalene	mg/l	.025	0.0262	105.	68.4-128	WG691660
p-Isopropyltoluene	mg/l	.025	0.0261	104.	74-131	WG691660
sec-Butylbenzene	mg/l	.025	0.0252	101.	74.4-127	WG691660
Styrene	mg/l	.025	0.0261	105.	80.4-126	WG691660
tert-Butylbenzene	mg/l	.025	0.0253	101.	75.3-126	WG691660
Tetrachloroethene	mg/l	.025	0.0254	102.	72.6-126	WG691660
Tetrahydrofuran	mg/l	.025	0.0280	112.	54.4-137	WG691660
Toluene	mg/l	.025	0.0268	107.	79.7-116	WG691660
trans-1,2-Dichloroethene	mg/l	.025	0.0249	99.7	72.6-121	WG691660
trans-1,3-Dichloropropene	mg/l	.025	0.0243	97.1	74.3-123	WG691660
Trichloroethene	mg/l	.025	0.0267	107.	77.7-118	WG691660
Trichlorofluoromethane	mg/l	.025	0.0261	104.	63.5-135	WG691660
Vinyl chloride	mg/l	.025	0.0288	115.	65.9-128	WG691660
Xylenes, Total	mg/l	.075	0.0772	103.	78.7-121	WG691660
4-Bromofluorobenzene				96.30	71-126	WG691660
Dibromofluoromethane				100.0	78.3-121	WG691660
Toluene-d8				105.0	88.5-111	WG691660

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Quality Assurance Report
Level II

L667762

November 18, 2013

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Aluminum	mg/l	1	1.00	100.	85-115	WG692079
Calcium	mg/l	10	8.96	90.0	85-115	WG692079
Magnesium	mg/l	10	9.38	94.0	85-115	WG692079
Manganese	mg/l	1	0.927	93.0	85-115	WG692079
Potassium	mg/l	10	9.77	98.0	85-115	WG692079
Sodium	mg/l	10	9.69	97.0	85-115	WG692079
Nitrate-Nitrite	mg/l	5	4.94	98.8	90-110	WG692405
Ammonia Nitrogen	mg/l	7.5	7.67	102.	90-110	WG692453
COD	mg/l	183	193.	105.	90-110	WG692449
Ammonia Nitrogen	mg/l	7.5	7.68	102.	90-110	WG692463
Phosphorus,Total	mg/l	1	0.943	94.3	90-110	WG692618

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Phosphate,Ortho	mg/l	0.704	0.707	94.0	85-115	0.425	20	WG691581
Bromide	mg/l	40.2	40.1	100.	90-110	0.249	20	WG691571
Chloride	mg/l	40.3	40.2	101.	90-110	0.248	20	WG691571
Fluoride	mg/l	8.10	8.07	101.	90-110	0.371	20	WG691571
Nitrate	mg/l	8.20	8.20	102.	90-110	0.0	20	WG691571
Nitrite	mg/l	8.00	8.00	100.	90-110	0.0	20	WG691571
Sulfate	mg/l	40.1	40.0	100.	90-110	0.250	20	WG691571
1,1,1,2-Tetrachloroethane	mg/l	0.0235	0.0246	94.0	74.2-124	4.90	20	WG691660
1,1,1-Trichloroethane	mg/l	0.0229	0.0245	91.0	73.2-123	6.95	20	WG691660
1,1,2,2-Tetrachloroethane	mg/l	0.0238	0.0245	95.0	70.7-122	2.60	20	WG691660
1,1,2-Trichloroethane	mg/l	0.0229	0.0239	91.0	77.7-118	4.45	20	WG691660
1,1,2-Trichlorotrifluoroethane	mg/l	0.0260	0.0282	104.	67.2-143	8.34	20	WG691660
1,1-Dichloroethane	mg/l	0.0272	0.0287	109.	70.7-126	5.55	20	WG691660
1,1-Dichloroethene	mg/l	0.0242	0.0261	97.0	67.8-129	7.67	20	WG691660
1,1-Dichloropropene	mg/l	0.0257	0.0277	103.	73.1-125	7.38	20	WG691660
1,2,3-Trichlorobenzene	mg/l	0.0270	0.0277	108.	64.9-135	2.85	20	WG691660
1,2,3-Trichloropropane	mg/l	0.0229	0.0233	92.0	71.8-121	1.61	20	WG691660
1,2,3-Trimethylbenzene	mg/l	0.0214	0.0227	86.0	72.3-116	5.85	20	WG691660
1,2,4-Trichlorobenzene	mg/l	0.0269	0.0287	108.	69.7-136	6.40	20	WG691660
1,2,4-Trimethylbenzene	mg/l	0.0231	0.0247	92.0	75-123	6.64	20	WG691660
1,2-Dibromo-3-Chloropropane	mg/l	0.0220	0.0226	88.0	65.4-128	2.90	20	WG691660
1,2-Dibromoethane	mg/l	0.0241	0.0250	96.0	76.6-121	3.69	20	WG691660
1,2-Dichlorobenzene	mg/l	0.0255	0.0265	102.	78.4-117	3.87	20	WG691660
1,2-Dichloroethane	mg/l	0.0243	0.0253	97.0	68.8-124	3.99	20	WG691660
1,2-Dichloropropane	mg/l	0.0278	0.0291	111.	76.5-119	4.78	20	WG691660
1,3,5-Trimethylbenzene	mg/l	0.0237	0.0253	95.0	75.6-124	6.47	20	WG691660
1,3-Dichlorobenzene	mg/l	0.0242	0.0260	97.0	70.8-128	7.45	20	WG691660
1,3-Dichloropropane	mg/l	0.0255	0.0261	102.	77.4-117	2.52	20	WG691660
1,4-Dichlorobenzene	mg/l	0.0244	0.0256	97.0	78.8-115	4.88	20	WG691660
2,2-Dichloropropane	mg/l	0.0226	0.0240	90.0	62.4-133	6.07	20	WG691660

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Quality Assurance Report
Level II

L667762

November 18, 2013

		Laboratory Control Sample Duplicate						
Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
2-Butanone (MEK)	mg/l	0.106	0.110	85.0	55-149	3.65	20	WG691660
2-Chloroethyl vinyl ether	mg/l	0.119	0.130	95.0	43.8-150	9.18	20	WG691660
2-Chlorotoluene	mg/l	0.0228	0.0239	91.0	74.7-122	4.79	20	WG691660
2-Hexanone	mg/l	0.112	0.115	89.0	65.6-144	3.29	20	WG691660
4-Chlorotoluene	mg/l	0.0246	0.0260	98.0	77.5-120	5.23	20	WG691660
4-Methyl-2-pentanone (MIBK)	mg/l	0.126	0.134	101.	70.5-133	6.19	20	WG691660
Acetone	mg/l	0.0694	0.0739	56.0	35.6-163	6.21	23.9	WG691660
Acrolein	mg/l	0.155	0.158	124.	10-190	1.77	28.1	WG691660
Acrylonitrile	mg/l	0.151	0.154	120.	55.2-130	2.10	20	WG691660
Benzene	mg/l	0.0262	0.0278	105.	74.8-121	6.16	20	WG691660
Bromobenzene	mg/l	0.0238	0.0247	95.0	77.5-116	3.86	20	WG691660
Bromochloromethane	mg/l	0.0253	0.0257	101.	77.6-119	1.53	20	WG691660
Bromodichloromethane	mg/l	0.0230	0.0246	92.0	75.1-116	6.52	20	WG691660
Bromoform	mg/l	0.0219	0.0227	87.0	67.5-130	3.77	20	WG691660
Bromomethane	mg/l	0.0346	0.0351	138.	49.9-162	1.44	20	WG691660
Carbon tetrachloride	mg/l	0.0245	0.0258	98.0	70.2-123	5.44	20	WG691660
Chlorobenzene	mg/l	0.0250	0.0262	100.	78.1-119	4.83	20	WG691660
Chlorodibromomethane	mg/l	0.0227	0.0236	91.0	74-121	3.93	20	WG691660
Chloroethane	mg/l	0.0252	0.0275	101.	61.7-135	8.69	20	WG691660
Chloroform	mg/l	0.0260	0.0271	104.	76-121	4.38	20	WG691660
Chloromethane	mg/l	0.0300	0.0324	120.	61.5-129	7.66	20	WG691660
cis-1,2-Dichloroethene	mg/l	0.0245	0.0258	98.0	76-119	5.04	20	WG691660
cis-1,3-Dichloropropene	mg/l	0.0244	0.0264	98.0	78.2-120	7.68	20	WG691660
Di-isopropyl ether	mg/l	0.0273	0.0283	109.	65.6-132	3.64	20	WG691660
Dibromomethane	mg/l	0.0248	0.0256	99.0	79.5-118	3.17	20	WG691660
Dichlorodifluoromethane	mg/l	0.0189	0.0204	75.0	54.8-135	7.67	20	WG691660
Ethyl ether	mg/l	0.0247	0.0258	99.0	62.4-134	4.20	20	WG691660
Ethylbenzene	mg/l	0.0242	0.0256	97.0	78.8-122	5.59	20	WG691660
Hexachloro-1,3-butadiene	mg/l	0.0246	0.0255	98.0	64.7-129	3.44	20	WG691660
Isopropylbenzene	mg/l	0.0256	0.0272	102.	78.6-132	6.01	20	WG691660
Methyl tert-butyl ether	mg/l	0.0243	0.0251	97.0	71.2-126	3.33	20	WG691660
Methylene Chloride	mg/l	0.0248	0.0268	99.0	70.3-120	7.49	20	WG691660
n-Butylbenzene	mg/l	0.0257	0.0275	103.	76.2-126	6.83	20	WG691660
n-Propylbenzene	mg/l	0.0243	0.0259	97.0	78.2-122	6.47	20	WG691660
Naphthalene	mg/l	0.0254	0.0262	102.	68.4-128	3.33	20	WG691660
p-Isopropyltoluene	mg/l	0.0241	0.0261	96.0	74-131	7.90	20	WG691660
sec-Butylbenzene	mg/l	0.0233	0.0252	93.0	74.4-127	7.76	20	WG691660
Styrene	mg/l	0.0249	0.0261	100.	80.4-126	4.71	20	WG691660
tert-Butylbenzene	mg/l	0.0235	0.0253	94.0	75.3-126	7.11	20	WG691660
Tetrachloroethene	mg/l	0.0238	0.0254	95.0	72.6-126	6.47	20	WG691660
Tetrahydrofuran	mg/l	0.0265	0.0280	106.	54.4-137	5.42	20	WG691660
Toluene	mg/l	0.0248	0.0268	99.0	79.7-116	7.82	20	WG691660
trans-1,2-Dichloroethene	mg/l	0.0237	0.0249	95.0	72.6-121	5.05	20	WG691660
trans-1,3-Dichloropropene	mg/l	0.0223	0.0243	89.0	74.3-123	8.40	20	WG691660
Trichloroethene	mg/l	0.0241	0.0267	96.0	77.7-118	10.5	20	WG691660
Trichlorofluoromethane	mg/l	0.0242	0.0261	97.0	63.5-135	7.36	20	WG691660
Vinyl chloride	mg/l	0.0267	0.0288	107.	65.9-128	7.79	20	WG691660
Xylenes, Total	mg/l	0.0726	0.0772	97.0	78.7-121	6.18	20	WG691660
4-Bromofluorobenzene				98.10	71-126			WG691660
Dibromofluoromethane				101.0	78.3-121			WG691660
Toluene-d8				104.0	88.5-111			WG691660
Nitrate-Nitrite	mg/l	4.54	4.94	91.0	90-110	8.44	20	WG692405
Ammonia Nitrogen	mg/l	8.09	7.67	108.	90-110	5.33	20	WG692453

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Quality Assurance Report
Level II

L667762

November 18, 2013

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
COD	mg/l	197.	193.	108.	90-110	2.05	5	WG692449
Ammonia Nitrogen	mg/l	7.83	7.68	104.	90-110	1.93	20	WG692463
Phosphorus,Total	mg/l	0.942	0.943	94.0	90-110	0.106	20	WG692618

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Phosphate,Ortho	mg/l	0.587	0.120	.5	93.0	80-120	L667762-01	WG691581
Nitrate	mg/l	7.92	3.00	5	98.0	80-120	L667774-01	WG691571
1,1,1,2-Tetrachloroethane	mg/l	0.0214	0.0	.025	86.0	64-128	L667762-01	WG691660
1,1,1-Trichloroethane	mg/l	0.0213	0.0	.025	85.0	58.7-134	L667762-01	WG691660
1,1,2,2-Tetrachloroethane	mg/l	0.0225	0.0	.025	90.0	56-132	L667762-01	WG691660
1,1,2-Trichloroethane	mg/l	0.0209	0.0	.025	84.0	66.3-125	L667762-01	WG691660
1,1,2-Trichlorotrifluoroethane	mg/l	0.0248	0.0	.025	99.0	54.8-154	L667762-01	WG691660
1,1-Dichloroethane	mg/l	0.0253	0.0	.025	100.	58.5-132	L667762-01	WG691660
1,1-Dichloroethene	mg/l	0.0222	0.0	.025	89.0	51.1-140	L667762-01	WG691660
1,1-Dichloropropene	mg/l	0.0240	0.0	.025	96.0	57.3-136	L667762-01	WG691660
1,2,3-Trichlorobenzene	mg/l	0.0251	0.0	.025	100.	59.1-138	L667762-01	WG691660
1,2,3-Trichloropropane	mg/l	0.0218	0.0	.025	87.0	61.4-128	L667762-01	WG691660
1,2,3-Trimethylbenzene	mg/l	0.0195	0.0	.025	78.0	61.3-122	L667762-01	WG691660
1,2,4-Trichlorobenzene	mg/l	0.0252	0.0	.025	100.	63.6-143	L667762-01	WG691660
1,2,4-Trimethylbenzene	mg/l	0.0214	0.0	.025	86.0	57.4-137	L667762-01	WG691660
1,2-Dibromo-3-Chloropropane	mg/l	0.0210	0.0	.025	84.0	57.3-136	L667762-01	WG691660
1,2-Dibromoethane	mg/l	0.0221	0.0	.025	88.0	67.1-125	L667762-01	WG691660
1,2-Dichlorobenzene	mg/l	0.0232	0.0	.025	93.0	68.2-123	L667762-01	WG691660
1,2-Dichloroethane	mg/l	0.0223	0.0	.025	89.0	60-126	L667762-01	WG691660
1,2-Dichloropropane	mg/l	0.0253	0.0	.025	100.	64.2-123	L667762-01	WG691660
1,3,5-Trimethylbenzene	mg/l	0.0218	0.0	.025	87.0	63.6-132	L667762-01	WG691660
1,3-Dichlorobenzene	mg/l	0.0226	0.0	.025	90.0	63.1-131	L667762-01	WG691660
1,3-Dichloropropane	mg/l	0.0228	0.0	.025	91.0	67.9-121	L667762-01	WG691660
1,4-Dichlorobenzene	mg/l	0.0225	0.0	.025	90.0	68.6-123	L667762-01	WG691660
2,2-Dichloropropane	mg/l	0.0210	0.0	.025	84.0	50.5-144	L667762-01	WG691660
2-Butanone (MEK)	mg/l	0.0961	0.0	.125	77.0	22.4-138	L667762-01	WG691660
2-Chloroethyl vinyl ether	mg/l	0.0526	0.0	.125	42.0	10-155	L667762-01	WG691660
2-Chlorotoluene	mg/l	0.0205	0.0	.025	82.0	63.6-128	L667762-01	WG691660
2-Hexanone	mg/l	0.105	0.0	.125	84.0	43.3-137	L667762-01	WG691660
4-Chlorotoluene	mg/l	0.0224	0.0	.025	90.0	65.7-127	L667762-01	WG691660
4-Methyl-2-pentanone (MIBK)	mg/l	0.120	0.0	.125	96.0	60.8-140	L667762-01	WG691660
Acetone	mg/l	0.0545	0.00295	.125	41.0	10-130	L667762-01	WG691660
Acrolein	mg/l	0.143	0.0	.125	110.	10-200	L667762-01	WG691660
Acrylonitrile	mg/l	0.144	0.0	.125	120.	49.4-133	L667762-01	WG691660
Benzene	mg/l	0.0239	0.0	.025	96.0	54.3-133	L667762-01	WG691660
Bromobenzene	mg/l	0.0216	0.0	.025	86.0	63.9-124	L667762-01	WG691660
Bromochloromethane	mg/l	0.0232	0.0	.025	93.0	66.5-122	L667762-01	WG691660
Bromodichloromethane	mg/l	0.0209	0.0	.025	84.0	63.9-121	L667762-01	WG691660
Bromoform	mg/l	0.0202	0.0	.025	81.0	59.5-134	L667762-01	WG691660
Bromomethane	mg/l	0.0298	0.0	.025	120.	41.7-155	L667762-01	WG691660
Carbon tetrachloride	mg/l	0.0222	0.0	.025	89.0	55.7-134	L667762-01	WG691660
Chlorobenzene	mg/l	0.0227	0.0	.025	91.0	67-125	L667762-01	WG691660
Chlorodibromomethane	mg/l	0.0205	0.0	.025	82.0	64.3-125	L667762-01	WG691660
Chloroethane	mg/l	0.0236	0.0	.025	94.0	51.5-136	L667762-01	WG691660

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WENCK Associates - St. Paul, MN
Alex Martell
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Woodbury, MN 55125

Quality Assurance Report
Level II

L667762

November 18, 2013

Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Chloroform	mg/l	0.0235	0.0	.025	94.0	63-129	L667762-01	WG691660
Chloromethane	mg/l	0.0282	0.0	.025	110.	42.4-135	L667762-01	WG691660
cis-1,2-Dichloroethene	mg/l	0.0225	0.0	.025	90.0	59.2-129	L667762-01	WG691660
cis-1,3-Dichloropropene	mg/l	0.0223	0.0	.025	89.0	66.4-125	L667762-01	WG691660
Di-isopropyl ether	mg/l	0.0248	0.0	.025	99.0	56.9-136	L667762-01	WG691660
Dibromomethane	mg/l	0.0225	0.0	.025	90.0	68.2-124	L667762-01	WG691660
Dichlorodifluoromethane	mg/l	0.0177	0.0	.025	71.0	40.6-144	L667762-01	WG691660
Ethyl ether	mg/l	0.0218	0.0	.025	87.0	53.2-136	L667762-01	WG691660
Ethylbenzene	mg/l	0.0221	0.0	.025	88.0	61.4-133	L667762-01	WG691660
Hexachloro-1,3-butadiene	mg/l	0.0226	0.0	.025	90.0	55.1-136	L667762-01	WG691660
Isopropylbenzene	mg/l	0.0235	0.0	.025	94.0	66.8-141	L667762-01	WG691660
Methyl tert-butyl ether	mg/l	0.0225	0.0	.025	90.0	57.7-134	L667762-01	WG691660
Methylene Chloride	mg/l	0.0229	0.0	.025	92.0	58.1-122	L667762-01	WG691660
n-Butylbenzene	mg/l	0.0241	0.0	.025	96.0	62.7-140	L667762-01	WG691660
n-Propylbenzene	mg/l	0.0224	0.0	.025	90.0	65.9-131	L667762-01	WG691660
Naphthalene	mg/l	0.0235	0.0	.025	94.0	58-135	L667762-01	WG691660
p-Isopropyltoluene	mg/l	0.0226	0.0	.025	90.0	63.2-139	L667762-01	WG691660
sec-Butylbenzene	mg/l	0.0218	0.0	.025	87.0	62.2-136	L667762-01	WG691660
Styrene	mg/l	0.0227	0.0	.025	91.0	66.8-133	L667762-01	WG691660
tert-Butylbenzene	mg/l	0.0217	0.0	.025	87.0	63.3-134	L667762-01	WG691660
Tetrachloroethene	mg/l	0.0227	0.0	.025	91.0	53-139	L667762-01	WG691660
Tetrahydrofuran	mg/l	0.0259	0.0	.025	100.	40.9-145	L667762-01	WG691660
Toluene	mg/l	0.0228	0.0	.025	91.0	61.4-130	L667762-01	WG691660
trans-1,2-Dichloroethene	mg/l	0.0219	0.0	.025	88.0	56.5-129	L667762-01	WG691660
trans-1,3-Dichloropropene	mg/l	0.0205	0.0	.025	82.0	64.1-128	L667762-01	WG691660
Trichloroethene	mg/l	0.0223	0.0	.025	89.0	44.1-149	L667762-01	WG691660
Trichlorofluoromethane	mg/l	0.0224	0.0	.025	90.0	49.6-145	L667762-01	WG691660
Vinyl chloride	mg/l	0.0251	0.0	.025	100.	47.8-137	L667762-01	WG691660
Xylenes, Total	mg/l	0.0666	0.0	.075	89.0	63.3-131	L667762-01	WG691660
4-Bromofluorobenzene					97.10	71-126		WG691660
Dibromofluoromethane					103.0	78.3-121		WG691660
Toluene-d8					104.0	88.5-111		WG691660
Aluminum	mg/l	0.982	0.0469	1	93.0	75-125	L667717-02	WG692079
Calcium	mg/l	40.5	31.2	10	93.0	75-125	L667717-02	WG692079
Magnesium	mg/l	14.2	4.95	10	92.0	75-125	L667717-02	WG692079
Manganese	mg/l	1.49	0.609	1	88.0	75-125	L667717-02	WG692079
Potassium	mg/l	10.9	1.72	10	92.0	75-125	L667717-02	WG692079
Sodium	mg/l	16.9	7.63	10	93.0	75-125	L667717-02	WG692079
Nitrate-Nitrite	mg/l	7.55	2.70	5	97.0	90-110	L667730-03	WG692405
Ammonia Nitrogen	mg/l	10.3	0.0	10	100.	90-110	L667730-03	WG692453
COD	mg/l	430.	19.0	400	100.	90-110	L667734-01	WG692449
Ammonia Nitrogen	mg/l	15.2	4.60	10	110.	90-110	L667246-01	WG692463
Phosphorus,Total	mg/l	189.	170.	2.5	7.60*	90-110	L667769-01	WG692618

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Quality Assurance Report
Level II

L667762

November 18, 2013

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Phosphate,Ortho	mg/l	0.575	0.587	91.0	80-120	2.07	20	L667762-01	WG691581
Nitrate	mg/l	7.87	7.92	97.4	80-120	0.633	20	L667774-01	WG691571
1,1,1,2-Tetrachloroethane	mg/l	0.0224	0.0214	89.5	64-128	4.33	20	L667762-01	WG691660
1,1,1-Trichloroethane	mg/l	0.0224	0.0213	89.5	58.7-134	4.71	20	L667762-01	WG691660
1,1,2,2-Tetrachloroethane	mg/l	0.0221	0.0225	88.6	56-132	1.40	22.2	L667762-01	WG691660
1,1,2-Trichloroethane	mg/l	0.0218	0.0209	87.2	66.3-125	3.95	20	L667762-01	WG691660
1,1,2-Trichlorotrifluoroethane	mg/l	0.0252	0.0248	101.	54.8-154	1.56	22.5	L667762-01	WG691660
1,1-Dichloroethane	mg/l	0.0260	0.0253	104.	58.5-132	2.74	20	L667762-01	WG691660
1,1-Dichloroethene	mg/l	0.0232	0.0222	92.9	51.1-140	4.42	20.2	L667762-01	WG691660
1,1-Dichloropropene	mg/l	0.0254	0.0240	102.	57.3-136	5.56	20	L667762-01	WG691660
1,2,3-Trichlorobenzene	mg/l	0.0260	0.0251	104.	59.1-138	3.26	23.7	L667762-01	WG691660
1,2,3-Trichloropropane	mg/l	0.0211	0.0218	84.5	61.4-128	3.03	22.4	L667762-01	WG691660
1,2,3-Trimethylbenzene	mg/l	0.0207	0.0195	82.8	61.3-122	6.13	20	L667762-01	WG691660
1,2,4-Trichlorobenzene	mg/l	0.0269	0.0252	107.	63.6-143	6.23	21.9	L667762-01	WG691660
1,2,4-Trimethylbenzene	mg/l	0.0223	0.0214	89.1	57.4-137	4.01	20	L667762-01	WG691660
1,2-Dibromo-3-Chloropropane	mg/l	0.0202	0.0210	80.6	57.3-136	4.36	27	L667762-01	WG691660
1,2-Dibromoethane	mg/l	0.0225	0.0221	89.9	67.1-125	1.72	20	L667762-01	WG691660
1,2-Dichlorobenzene	mg/l	0.0243	0.0232	97.3	68.2-123	4.55	20	L667762-01	WG691660
1,2-Dichloroethane	mg/l	0.0231	0.0223	92.4	60-126	3.65	20	L667762-01	WG691660
1,2-Dichloropropane	mg/l	0.0258	0.0253	103.	64.2-123	2.24	20	L667762-01	WG691660
1,3,5-Trimethylbenzene	mg/l	0.0226	0.0218	90.6	63.6-132	3.62	20.5	L667762-01	WG691660
1,3-Dichlorobenzene	mg/l	0.0236	0.0226	94.3	63.1-131	4.28	20	L667762-01	WG691660
1,3-Dichloropropane	mg/l	0.0238	0.0228	95.1	67.9-121	4.24	20	L667762-01	WG691660
1,4-Dichlorobenzene	mg/l	0.0241	0.0225	96.2	68.6-123	6.88	20	L667762-01	WG691660
2,2-Dichloropropane	mg/l	0.0221	0.0210	88.3	50.5-144	4.94	21.9	L667762-01	WG691660
2-Butanone (MEK)	mg/l	0.0928	0.0961	74.2	22.4-138	3.54	27	L667762-01	WG691660
2-Chloroethyl vinyl ether	mg/l	0.0141	0.0526	11.2	10-155	116.*	20	L667762-01	WG691660
2-Chlorotoluene	mg/l	0.0216	0.0205	86.3	63.6-128	5.30	20	L667762-01	WG691660
2-Hexanone	mg/l	0.0990	0.105	79.2	43.3-137	5.74	25.5	L667762-01	WG691660
4-Chlorotoluene	mg/l	0.0237	0.0224	94.7	65.7-127	5.35	20	L667762-01	WG691660
4-Methyl-2-pentanone (MIBK)	mg/l	0.116	0.120	92.6	60.8-140	3.67	25.1	L667762-01	WG691660
Acetone	mg/l	0.0514	0.0545	38.7	10-130	5.95	27.9	L667762-01	WG691660
Acrolein	mg/l	0.141	0.143	113.	10-200	0.930	27.7	L667762-01	WG691660
Acrylonitrile	mg/l	0.140	0.144	112.	49.4-133	2.98	25.3	L667762-01	WG691660
Benzene	mg/l	0.0252	0.0239	101.	54.3-133	5.23	20	L667762-01	WG691660
Bromobenzene	mg/l	0.0223	0.0216	89.2	63.9-124	3.34	20	L667762-01	WG691660
Bromochloromethane	mg/l	0.0240	0.0232	96.2	66.5-122	3.54	20.8	L667762-01	WG691660
Bromodichloromethane	mg/l	0.0217	0.0209	86.7	63.9-121	3.52	20	L667762-01	WG691660
Bromoform	mg/l	0.0200	0.0202	80.1	59.5-134	0.730	20.5	L667762-01	WG691660
Bromomethane	mg/l	0.0317	0.0298	127.	41.7-155	6.11	21.9	L667762-01	WG691660
Carbon tetrachloride	mg/l	0.0238	0.0222	95.1	55.7-134	7.05	20	L667762-01	WG691660
Chlorobenzene	mg/l	0.0238	0.0227	95.0	67-125	4.38	20	L667762-01	WG691660
Chlorodibromomethane	mg/l	0.0213	0.0205	85.2	64.3-125	4.00	20.8	L667762-01	WG691660
Chloroethane	mg/l	0.0242	0.0236	96.7	51.5-136	2.41	40	L667762-01	WG691660
Chloroform	mg/l	0.0245	0.0235	97.9	63-129	4.02	20	L667762-01	WG691660
Chloromethane	mg/l	0.0291	0.0282	116.	42.4-135	2.99	20	L667762-01	WG691660
cis-1,2-Dichloroethene	mg/l	0.0240	0.0225	96.0	59.2-129	6.55	20	L667762-01	WG691660
cis-1,3-Dichloropropene	mg/l	0.0235	0.0223	93.9	66.4-125	5.23	20	L667762-01	WG691660
Di-isopropyl ether	mg/l	0.0256	0.0248	102.	56.9-136	3.25	20	L667762-01	WG691660
Dibromomethane	mg/l	0.0229	0.0225	91.4	68.2-124	1.68	20	L667762-01	WG691660
Dichlorodifluoromethane	mg/l	0.0185	0.0177	74.1	40.6-144	4.43	20.2	L667762-01	WG691660
Ethyl ether	mg/l	0.0230	0.0218	92.0	53.2-136	5.23	20	L667762-01	WG691660
Ethylbenzene	mg/l	0.0231	0.0221	92.2	61.4-133	4.15	20	L667762-01	WG691660
Hexachloro-1,3-butadiene	mg/l	0.0244	0.0226	97.4	55.1-136	7.70	23.6	L667762-01	WG691660
Isopropylbenzene	mg/l	0.0247	0.0235	98.7	66.8-141	4.92	20	L667762-01	WG691660
Methyl tert-butyl ether	mg/l	0.0228	0.0225	91.4	57.7-134	1.59	20	L667762-01	WG691660

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Quality Assurance Report
Level II

L667762

November 18, 2013

		Matrix Spike Duplicate							
Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Methylene Chloride	mg/l	0.0238	0.0229	95.2	58.1-122	3.67	20	L667762-01	WG691660
n-Butylbenzene	mg/l	0.0255	0.0241	102.	62.7-140	5.97	20.3	L667762-01	WG691660
n-Propylbenzene	mg/l	0.0236	0.0224	94.4	65.9-131	5.27	20	L667762-01	WG691660
Naphthalene	mg/l	0.0241	0.0235	96.5	58-135	2.45	25.5	L667762-01	WG691660
p-Isopropyltoluene	mg/l	0.0236	0.0226	94.6	63.2-139	4.55	20.4	L667762-01	WG691660
sec-Butylbenzene	mg/l	0.0226	0.0218	90.6	62.2-136	4.00	20.3	L667762-01	WG691660
Styrene	mg/l	0.0238	0.0227	95.3	66.8-133	4.78	20	L667762-01	WG691660
tert-Butylbenzene	mg/l	0.0229	0.0217	91.7	63.3-134	5.36	21	L667762-01	WG691660
Tetrachloroethene	mg/l	0.0234	0.0227	93.5	53-139	2.75	20	L667762-01	WG691660
Tetrahydrofuran	mg/l	0.0245	0.0259	97.9	40.9-145	5.67	27.3	L667762-01	WG691660
Toluene	mg/l	0.0239	0.0228	95.4	61.4-130	4.51	20	L667762-01	WG691660
trans-1,2-Dichloroethene	mg/l	0.0228	0.0219	91.3	56.5-129	4.05	20	L667762-01	WG691660
trans-1,3-Dichloropropene	mg/l	0.0215	0.0205	86.1	64.1-128	4.63	20	L667762-01	WG691660
Trichloroethene	mg/l	0.0238	0.0223	95.4	44.1-149	6.62	20	L667762-01	WG691660
Trichlorofluoromethane	mg/l	0.0233	0.0224	93.3	49.6-145	3.96	21.2	L667762-01	WG691660
Vinyl chloride	mg/l	0.0262	0.0251	105.	47.8-137	4.22	20	L667762-01	WG691660
Xylenes, Total	mg/l	0.0697	0.0666	93.0	63.3-131	4.64	20	L667762-01	WG691660
4-Bromofluorobenzene				95.80	71-126				WG691660
Dibromofluoromethane				101.0	78.3-121				WG691660
Toluene-d8				104.0	88.5-111				WG691660
Aluminum	mg/l	1.00	0.982	95.4	75-125	2.00	20	L667717-02	WG692079
Calcium	mg/l	40.8	40.5	95.7	75-125	1.00	20	L667717-02	WG692079
Magnesium	mg/l	14.4	14.2	94.7	75-125	2.00	20	L667717-02	WG692079
Manganese	mg/l	1.50	1.49	89.5	75-125	1.00	20	L667717-02	WG692079
Potassium	mg/l	11.0	10.9	93.2	75-125	1.00	20	L667717-02	WG692079
Sodium	mg/l	17.0	16.9	94.1	75-125	1.00	20	L667717-02	WG692079
Nitrate-Nitrite	mg/l	7.51	7.55	96.2	90-110	0.531	20	L667730-03	WG692405
Ammonia Nitrogen	mg/l	10.1	10.3	101.	90-110	1.96	20	L667730-03	WG692453
COD	mg/l	419.	430.	100.	90-110	2.59	5	L667734-01	WG692449
Ammonia Nitrogen	mg/l	14.7	15.2	101.	90-110	3.34	20	L667246-01	WG692463
Phosphorus,Total	mg/l	189.	189.	7.60*	90-110	0.0	20	L667769-01	WG692618

Post Spike

Serial Dilution

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Quality Assurance Report
Level II

L667762

November 18, 2013

Serial Dilution

Batch number /Run number / Sample number cross reference

WG691581: R2851246: L667762-01 02 03 04 05
WG691571: R2852084: L667762-01 02 03 04 05
WG691660: R2852802: L667762-01 02 03 04 05 06
WG692079: R2854441: L667762-01 02 03 04 05
WG692405: R2855083: L667762-01 02 03 04 05
WG692453: R2855401: L667762-01 02
WG692449: R2855920: L667762-01 02 03 04 05
WG692463: R2856080: L667762-03 04 05
WG692618: R2856605: L667762-01 02 03 04 05

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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WENCK Associates - St. Paul, MN
Alex Martell
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Quality Assurance Report
Level II

L667762

November 18, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

WENCK Associates - St. Paul, MN

1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Billing Information:
Accounts Payable
1800 Pioneer Creek Center P.O. BOX 249
Maple Plain, MN 55359

Report to: Alex Martell / shane Waterman

Email To: amartell@wenck.com
swaterman@wenck.com

Project Description: Afton Hydrogeo Study

City/State Collected: MN

Phone: 651-395-5239
Fax: 651-228-1969

Client Project # 2656-03

Lab Project # WENCKSMN-2656-03

Collected by (print): Alex Martell

Site/Facility ID # Afton

P.O. # 2656-03

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed: Std TAT

Email? ___No X__Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	COD NH3 PT NO2NO3 250mlHDPE-H2SO4 L2	Metals 500mlHDPE-HNO3 L2	V8260 40mlAmb-HCl	WetChem 125mlHDPE-NoPres	WetChem 250mlHDPE-H2SO4 L2	WetChem 250mlHDPE-NoPres	Rem./Contaminant	Sample # (lab only)
MW-1	Grab	GW		11/7/13	0935	6	X	X	X	X	X	X		01
MW-2		GW		11/7/13	0900	6	X	X	X	X	X	X		02
MW-3		GW		11/7/13	1030	6	X	X	X	X	X	X		03
MW-4		GW		11/8/13	0800	6	X	X	X	X	X	X		04
MW-5		GW		11/7/13	0955	6	X	X	X	X	X	X		05
Trip Blank		GW		11/8/13	—	1			X					06
		GW				3		X		X		X		
		GW				3		X		X		X		
		GW				3		X		X		X		
		GW				3		X		X		X		

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____
	11/8/2013	1000	5/51 0303 6577	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.4 °C Bottles Received: 31
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 11/9/13 Time: 0900

Hold #

Condition: (lab use only) G

COC Seal Intact: ___Y ___N ___NA

pH Checked: L2

NCF: X

Chain of Custody Page 1 of 2

ESC LAB SCIENCES
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L667762

Tab E004

Acctnum: WENCKSMN
Template: T90097
Prelogin: P447480
TSR: 341 - John Hawkins
PB: 10-28/28

Shipped Via: FedEX Ground

L667762

ESC
L·A·B S·C·I·E·N·C·E·S

Cooler Receipt Form

Client: WENLESMN

Cooler Received On: 11/9/13 and Opened On: 11/9/13 By: Adam Eakes

(Signature)

Temperature of cooler when opened: 2.4 Degrees Celsius/ Was sufficient ice used: Yes ☑ No ☐

What kind of packing material was used?

Bubblewrap	Peanuts	Other	None
☑	☐	☐	☐

	Yes	No
Were custody seals on outside of cooler and intact? NA	☐	☐
Were custody papers properly filled out (ink, signed, etc.)?	☑	☐
Did you sign the custody papers in the appropriate place?	☑	☐
Did all bottles arrive in good condition?	☑	☐
Were all bottle labels complete? (#, date, signed, pres, etc)?	☑	☐
Did all bottle labels and tags agree with custody papers?	☑	☐
Were correct bottles used for the analyses requested?	☑	☐
Was sufficient amount of sample sent in each bottle?	☑	☐
Were correct preservatives used?	☑	☐
If applicable, was an observable VOA headspace present?	☐	☑
Non Conformance Generated: *(See attached NCF if yes)*	☑	☐

ESC
L·A·B S·C·I·E·N·C·E·S

NON-CONFORMANCE FORM

Login No. : L667762

Date: 11/9/13

Evaluated by: AL E

Client: WENK SMN

Non-Conformance (check applicable items)

- ☑ Parameter(s) past holding time
- ☐ Improper temperature
- ☐ Improper container type
- ☐ Improper preservation
- ☐ Container lid not intact
- ☐ Login Clarification Needed
- ☐ Chain of custody is incomplete
- ☐ Chain of Custody is missing (see below)
- ☐ Broken container(s) (See below)
- ☐ Broken container: sufficient sample volume remains for analysis requested (See below)

If no COC: Received by_____
Date:_____ Time:_____
Temp:_____ Cont. Rec_____ pH:_____
☐ Fedex ☐ UPS ☐SWA ☐ Other_____
Tracking #_____

- ☐ Insufficient packing material around container
- ☐ Insufficient packing material inside cooler
- ☐ Improper handling by carrier (FedEx / UPS / Courier
- ☐ Sample was frozen

Comments: All samples collected 11/7/13 recieved out of hold.

Login Instructions:

TSR Initials: AAL

Client informed by call / email / fax / voice mail date: 11/10/13 time: _____

Client contact: T90097

Quick as needed
PROCEED with ANALysis of the following
COD, NH_3, PT, NO_2/NO_3, V8260/465
Anions : Br, CL, F, Nitrate, Nitrite, PORTO, Sulfate
CATIONS : CAICP, K.ICP, ALICP, MGICP, MNICP, NAICP

12065 Lebanon Rd.
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Est. 1970

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Report Summary

Friday December 06, 2013

Report Number: L670967
Samples Received: 11/27/13
Client Project: 2656-03

Description: Afton Site Investigation

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: John Hawkins

John Hawkins , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

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Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-01

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/26/13 08:38

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/27/13	1
Chloride	20000	1000	ug/l	9056	11/27/13	1
Fluoride	BDL	100	ug/l	9056	11/27/13	1
Nitrate	1600	100	ug/l	9056	11/27/13	1
Nitrite	BDL	100	ug/l	9056	11/27/13	1
Sulfate	11000	5000	ug/l	9056	11/27/13	1
COD	24000	10000	ug/l	410.4	12/05/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	12/05/13	1
Nitrate-Nitrite	1800	100	ug/l	353.2	12/05/13	1
Phosphate,Ortho	46.	25.	ug/l	4500P E-20	11/28/13	1
Phosphorus,Total	2300	100	ug/l	365.4	12/04/13	1
Aluminum	3500	100	ug/l	6010B	11/30/13	1
Calcium	59000	500	ug/l	6010B	11/30/13	1
Magnesium	28000	100	ug/l	6010B	11/30/13	1
Manganese	530	10.	ug/l	6010B	11/30/13	1
Potassium	4600	500	ug/l	6010B	11/30/13	1
Sodium	6600	500	ug/l	6010B	11/30/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/02/13	1
Acrolein	BDL	50.	ug/l	8260B	12/02/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/02/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/02/13	1
Benzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/02/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/02/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/02/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/02/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-01

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/26/13 08:38

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	12/02/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/02/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/02/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/02/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/02/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/02/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/02/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/02/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/02/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Styrene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/02/13	1
Toluene	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-01

Date Received : November 27, 2013
Description : Afton Site Investigation

Site ID :

Sample ID : MW-2

Project # : 2656-03

Collected By : Alex Martell
Collection Date : 11/26/13 08:38

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/02/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/02/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/02/13	1
Surrogate Recovery						
Toluene-d8	103.		% Rec.	8260B	12/02/13	1
Dibromofluoromethane	104.		% Rec.	8260B	12/02/13	1
4-Bromofluorobenzene	95.8		% Rec.	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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.
Reported: 12/06/13 09:57 Printed: 12/06/13 09:58

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Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-02

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/26/13 10:02

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/27/13	1
Chloride	28000	1000	ug/l	9056	11/27/13	1
Fluoride	BDL	100	ug/l	9056	11/27/13	1
Nitrate	3000	100	ug/l	9056	11/27/13	1
Nitrite	BDL	100	ug/l	9056	11/27/13	1
Sulfate	14000	5000	ug/l	9056	11/27/13	1
COD	BDL	10000	ug/l	410.4	12/05/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	12/05/13	1
Nitrate-Nitrite	3400	100	ug/l	353.2	12/05/13	1
Phosphate,Ortho	48.	25.	ug/l	4500P E-20	11/28/13	1
Phosphorus,Total	120	100	ug/l	365.4	12/04/13	1
Aluminum	1900	100	ug/l	6010B	11/30/13	1
Calcium	62000	500	ug/l	6010B	11/30/13	1
Magnesium	27000	100	ug/l	6010B	11/30/13	1
Manganese	350	10.	ug/l	6010B	11/30/13	1
Potassium	1900	500	ug/l	6010B	11/30/13	1
Sodium	9000	500	ug/l	6010B	11/30/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/02/13	1
Acrolein	BDL	50.	ug/l	8260B	12/02/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/02/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/02/13	1
Benzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/02/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/02/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/02/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/02/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-02

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/26/13 10:02

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	12/02/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/02/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/02/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/02/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/02/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/02/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/02/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/02/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/02/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Styrene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/02/13	1
Toluene	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

12065 Lebanon Rd.
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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-02

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/26/13 10:02

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/02/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/02/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/02/13	1
Surrogate Recovery						
Toluene-d8	104.		% Rec.	8260B	12/02/13	1
Dibromofluoromethane	104.		% Rec.	8260B	12/02/13	1
4-Bromofluorobenzene	94.1		% Rec.	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-03

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/26/13 11:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/27/13	1
Chloride	16000	1000	ug/l	9056	11/27/13	1
Fluoride	BDL	100	ug/l	9056	11/27/13	1
Nitrate	3000	100	ug/l	9056	11/27/13	1
Nitrite	BDL	100	ug/l	9056	11/27/13	1
Sulfate	11000	5000	ug/l	9056	11/27/13	1
COD	16000	10000	ug/l	410.4	12/05/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	12/05/13	1
Nitrate-Nitrite	3400	100	ug/l	353.2	12/05/13	1
Phosphate,Ortho	40.	25.	ug/l	4500P E-20	11/28/13	1
Phosphorus,Total	190	100	ug/l	365.4	12/04/13	1
Aluminum	6700	100	ug/l	6010B	11/30/13	1
Calcium	67000	500	ug/l	6010B	11/30/13	1
Magnesium	28000	100	ug/l	6010B	11/30/13	1
Manganese	600	10.	ug/l	6010B	11/30/13	1
Potassium	3100	500	ug/l	6010B	11/30/13	1
Sodium	6600	500	ug/l	6010B	11/30/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/02/13	1
Acrolein	BDL	50.	ug/l	8260B	12/02/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/02/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/02/13	1
Benzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/02/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/02/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/02/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/02/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-03

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/26/13 11:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	12/02/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/02/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/02/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/02/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/02/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/02/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/02/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/02/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/02/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Styrene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/02/13	1
Toluene	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Site ID :

Sample ID : MW-3

Project # : 2656-03

Collected By : Alex Martell
Collection Date : 11/26/13 11:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/02/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/02/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/02/13	1
Surrogate Recovery						
Toluene-d8	104.		% Rec.	8260B	12/02/13	1
Dibromofluoromethane	105.		% Rec.	8260B	12/02/13	1
4-Bromofluorobenzene	95.9		% Rec.	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-04

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/26/13 11:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/27/13	1
Chloride	16000	1000	ug/l	9056	11/27/13	1
Fluoride	BDL	100	ug/l	9056	11/27/13	1
Nitrate	3000	100	ug/l	9056	11/27/13	1
Nitrite	BDL	100	ug/l	9056	11/27/13	1
Sulfate	11000	5000	ug/l	9056	11/27/13	1
COD	BDL	10000	ug/l	410.4	12/05/13	1
Ammonia Nitrogen	BDL	100	ug/l	350.1	12/05/13	1
Nitrate-Nitrite	3400	100	ug/l	353.2	12/05/13	1
Phosphate,Ortho	42.	25.	ug/l	4500P E-20	11/28/13	1
Phosphorus,Total	180	100	ug/l	365.4	12/04/13	1
Aluminum	6000	100	ug/l	6010B	11/30/13	1
Calcium	66000	500	ug/l	6010B	11/30/13	1
Magnesium	28000	100	ug/l	6010B	11/30/13	1
Manganese	520	10.	ug/l	6010B	11/30/13	1
Potassium	3000	500	ug/l	6010B	11/30/13	1
Sodium	6600	500	ug/l	6010B	11/30/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/04/13	1
Acrolein	BDL	50.	ug/l	8260B	12/04/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/04/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/04/13	1
Benzene	BDL	1.0	ug/l	8260B	12/04/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/04/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/04/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/04/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/04/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/04/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/04/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/04/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/04/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-04

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/26/13 11:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	12/04/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/04/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/04/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/04/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/04/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/04/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/04/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/04/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/04/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/04/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/04/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/04/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Styrene	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/04/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/04/13	1
Toluene	BDL	5.0	ug/l	8260B	12/04/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

12065 Lebanon Rd.
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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-04

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-5

Collected By : Alex Martell
Collection Date : 11/26/13 11:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/04/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/04/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/04/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/04/13	1
Surrogate Recovery						
Toluene-d8	103.		% Rec.	8260B	12/04/13	1
Dibromofluoromethane	104.		% Rec.	8260B	12/04/13	1
4-Bromofluorobenzene	95.2		% Rec.	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-05

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/26/13 11:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromide	BDL	1000	ug/l	9056	11/27/13	1
Chloride	19000	1000	ug/l	9056	11/27/13	1
Fluoride	BDL	100	ug/l	9056	11/27/13	1
Nitrate	680	100	ug/l	9056	11/27/13	1
Nitrite	BDL	100	ug/l	9056	11/27/13	1
Sulfate	BDL	5000	ug/l	9056	11/27/13	1
COD	14000	10000	ug/l	410.4	12/05/13	1
Ammonia Nitrogen	140	100	ug/l	350.1	12/05/13	1
Nitrate-Nitrite	930	100	ug/l	353.2	12/05/13	1
Phosphate,Ortho	78.	25.	ug/l	4500P E-20	11/28/13	1
Phosphorus,Total	210	100	ug/l	365.4	12/04/13	1
Aluminum	3400	100	ug/l	6010B	11/30/13	1
Calcium	54000	500	ug/l	6010B	11/30/13	1
Magnesium	26000	100	ug/l	6010B	11/30/13	1
Manganese	3000	10.	ug/l	6010B	11/30/13	1
Potassium	2600	500	ug/l	6010B	11/30/13	1
Sodium	8200	500	ug/l	6010B	11/30/13	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/04/13	1
Acrolein	BDL	50.	ug/l	8260B	12/04/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/04/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/04/13	1
Benzene	BDL	1.0	ug/l	8260B	12/04/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/04/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/04/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/04/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/04/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/04/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/04/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/04/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/04/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-05

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/26/13 11:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloromethane	BDL	2.5	ug/l	8260B	12/04/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/04/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/04/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/04/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/04/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/04/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/04/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/04/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/04/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/04/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/04/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/04/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/04/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/04/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/04/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Styrene	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/04/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/04/13	1
Toluene	BDL	5.0	ug/l	8260B	12/04/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-05

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/26/13 11:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/04/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/04/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/04/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/04/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/04/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/04/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/04/13	1
Surrogate Recovery						
Toluene-d8	103.		% Rec.	8260B	12/04/13	1
Dibromofluoromethane	104.		% Rec.	8260B	12/04/13	1
4-Bromofluorobenzene	94.2		% Rec.	8260B	12/04/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-06

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : TRIP BLANK

Collected By : Alex Martell
Collection Date : 11/26/13 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	12/02/13	1
Acrolein	BDL	50.	ug/l	8260B	12/02/13	1
Acrylonitrile	BDL	10.	ug/l	8260B	12/02/13	1
Allyl chloride	BDL	5.0	ug/l	8260B	12/02/13	1
Benzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Bromochloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	12/02/13	1
Bromoform	BDL	1.0	ug/l	8260B	12/02/13	1
Bromomethane	BDL	5.0	ug/l	8260B	12/02/13	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
Chloroethane	BDL	5.0	ug/l	8260B	12/02/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	12/02/13	1
Chloroform	BDL	5.0	ug/l	8260B	12/02/13	1
Chloromethane	BDL	2.5	ug/l	8260B	12/02/13	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dibromo-3-Chloropropane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	12/02/13	1
Dibromomethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Dichlorodifluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	12/02/13	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	12/02/13	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Ethyl ether	BDL	1.0	ug/l	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 06,2013

ESC Sample # : L670967-06

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : TRIP BLANK

Collected By : Alex Martell
Collection Date : 11/26/13 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Hexachloro-1,3-butadiene	BDL	1.0	ug/l	8260B	12/02/13	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	12/02/13	1
2-Butanone (MEK)	BDL	10.	ug/l	8260B	12/02/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	12/02/13	1
2-Hexanone	BDL	10.	ug/l	8260B	12/02/13	1
4-Methyl-2-pentanone (MIBK)	BDL	10.	ug/l	8260B	12/02/13	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	12/02/13	1
Naphthalene	BDL	5.0	ug/l	8260B	12/02/13	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Styrene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2-Trichlorotrifluoroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Tetrahydrofuran	BDL	5.0	ug/l	8260B	12/02/13	1
Toluene	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	12/02/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	12/02/13	1
Trichlorofluoromethane	BDL	5.0	ug/l	8260B	12/02/13	1
1,2,3-Trichloropropane	BDL	2.5	ug/l	8260B	12/02/13	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,2,3-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	12/02/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	12/02/13	1
Xylenes, Total	BDL	3.0	ug/l	8260B	12/02/13	1
Surrogate Recovery						
Toluene-d8	104.		% Rec.	8260B	12/02/13	1
Dibromofluoromethane	104.		% Rec.	8260B	12/02/13	1
4-Bromofluorobenzene	96.7		% Rec.	8260B	12/02/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L670967-01	WG695096	SAMP	2-Chloroethyl vinyl ether	R2861802	J6J3
	WG695096	SAMP	Chloromethane	R2861802	J5
L670967-04	WG695297	SAMP	Chloromethane	R2862723	J4
L670967-05	WG695297	SAMP	Chloromethane	R2862723	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
12/06/13 at 09:58:17

TSR Signing Reports: 341
R5 - Desired TAT

Use WENCKSM for Woodbury, MN account, Please use cooler recept form

Sample: L670967-01 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

Sample: L670967-02 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

Sample: L670967-03 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

Sample: L670967-04 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

Sample: L670967-05 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

Sample: L670967-06 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/05/13 00:00 RPT Date: 12/06/13 09:57

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Alex Martell
1802 Wooddale Drive, Suite 100
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Woodbury, MN 55125

Quality Assurance Report
Level II

L670967

December 06, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Phosphate,Ortho	< .025	mg/l			WG694808	11/28/13 07:06
Bromide	< 1	mg/l			WG694641	11/27/13 07:24
Chloride	< 1	mg/l			WG694641	11/27/13 07:24
Fluoride	< .1	mg/l			WG694641	11/27/13 07:24
Nitrate	< .1	mg/l			WG694641	11/27/13 07:24
Nitrite	< .1	mg/l			WG694641	11/27/13 07:24
Sulfate	< 5	mg/l			WG694641	11/27/13 07:24
Bromide	< 1	mg/l			WG694677	11/27/13 07:28
Chloride	< 1	mg/l			WG694677	11/27/13 07:28
Fluoride	< .1	mg/l			WG694677	11/27/13 07:28
Nitrate	< .1	mg/l			WG694677	11/27/13 07:28
Nitrite	< .1	mg/l			WG694677	11/27/13 07:28
Sulfate	< 5	mg/l			WG694677	11/27/13 07:28
Aluminum	< .1	mg/l			WG694739	11/30/13 15:53
Calcium	< .5	mg/l			WG694739	11/30/13 15:53
Magnesium	< .1	mg/l			WG694739	11/30/13 15:53
Manganese	< .01	mg/l			WG694739	11/30/13 15:53
Potassium	< .5	mg/l			WG694739	11/30/13 15:53
Sodium	< .5	mg/l			WG694739	11/30/13 15:53
1,1,1,2-Tetrachloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1,1-Trichloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1,2-Trichloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1,2-Trichlorotrifluoroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1-Dichloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,1-Dichloroethene	< .001	mg/l			WG695096	12/02/13 09:59
1,1-Dichloropropene	< .001	mg/l			WG695096	12/02/13 09:59
1,2,3-Trichlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,2,3-Trichloropropane	< .001	mg/l			WG695096	12/02/13 09:59
1,2,3-Trimethylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,2,4-Trichlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,2,4-Trimethylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,2-Dibromo-3-Chloropropane	< .005	mg/l			WG695096	12/02/13 09:59
1,2-Dibromoethane	< .001	mg/l			WG695096	12/02/13 09:59
1,2-Dichlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,2-Dichloroethane	< .001	mg/l			WG695096	12/02/13 09:59
1,2-Dichloropropane	< .001	mg/l			WG695096	12/02/13 09:59
1,3,5-Trimethylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,3-Dichlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
1,3-Dichloropropane	< .001	mg/l			WG695096	12/02/13 09:59
1,4-Dichlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
2,2-Dichloropropane	< .001	mg/l			WG695096	12/02/13 09:59
2-Butanone (MEK)	< .01	mg/l			WG695096	12/02/13 09:59
2-Chloroethyl vinyl ether	< .05	mg/l			WG695096	12/02/13 09:59
2-Chlorotoluene	< .001	mg/l			WG695096	12/02/13 09:59
2-Hexanone	< .01	mg/l			WG695096	12/02/13 09:59
4-Chlorotoluene	< .001	mg/l			WG695096	12/02/13 09:59
4-Methyl-2-pentanone (MIBK)	< .01	mg/l			WG695096	12/02/13 09:59
Acetone	< .05	mg/l			WG695096	12/02/13 09:59
Acrolein	< .025	mg/l			WG695096	12/02/13 09:59
Acrylonitrile	< .01	mg/l			WG695096	12/02/13 09:59

* Performance of this Analyte is outside of established criteria.
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Quality Assurance Report
Level II

L670967

December 06, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Allyl chloride	< .005	mg/l			WG695096	12/02/13 09:59
Benzene	< .001	mg/l			WG695096	12/02/13 09:59
Bromobenzene	< .001	mg/l			WG695096	12/02/13 09:59
Bromochloromethane	< .001	mg/l			WG695096	12/02/13 09:59
Bromodichloromethane	< .001	mg/l			WG695096	12/02/13 09:59
Bromoform	< .001	mg/l			WG695096	12/02/13 09:59
Bromomethane	< .005	mg/l			WG695096	12/02/13 09:59
Carbon tetrachloride	< .001	mg/l			WG695096	12/02/13 09:59
Chlorobenzene	< .001	mg/l			WG695096	12/02/13 09:59
Chlorodibromomethane	< .001	mg/l			WG695096	12/02/13 09:59
Chloroethane	< .005	mg/l			WG695096	12/02/13 09:59
Chloroform	< .005	mg/l			WG695096	12/02/13 09:59
Chloromethane	< .0025	mg/l			WG695096	12/02/13 09:59
cis-1,2-Dichloroethene	< .001	mg/l			WG695096	12/02/13 09:59
cis-1,3-Dichloropropene	< .001	mg/l			WG695096	12/02/13 09:59
Di-isopropyl ether	< .001	mg/l			WG695096	12/02/13 09:59
Dibromomethane	< .001	mg/l			WG695096	12/02/13 09:59
Dichlorodifluoromethane	< .005	mg/l			WG695096	12/02/13 09:59
Ethyl ether	< .001	mg/l			WG695096	12/02/13 09:59
Ethylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
Hexachloro-1,3-butadiene	< .001	mg/l			WG695096	12/02/13 09:59
Isopropylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
Methyl tert-butyl ether	< .001	mg/l			WG695096	12/02/13 09:59
Methylene Chloride	< .005	mg/l			WG695096	12/02/13 09:59
n-Butylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
n-Propylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
Naphthalene	< .005	mg/l			WG695096	12/02/13 09:59
p-Isopropyltoluene	< .001	mg/l			WG695096	12/02/13 09:59
sec-Butylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
Styrene	< .001	mg/l			WG695096	12/02/13 09:59
tert-Butylbenzene	< .001	mg/l			WG695096	12/02/13 09:59
Tetrachloroethene	< .001	mg/l			WG695096	12/02/13 09:59
Tetrahydrofuran	< .005	mg/l			WG695096	12/02/13 09:59
Toluene	< .005	mg/l			WG695096	12/02/13 09:59
trans-1,2-Dichloroethene	< .001	mg/l			WG695096	12/02/13 09:59
trans-1,3-Dichloropropene	< .001	mg/l			WG695096	12/02/13 09:59
Trichloroethene	< .001	mg/l			WG695096	12/02/13 09:59
Trichlorofluoromethane	< .005	mg/l			WG695096	12/02/13 09:59
Vinyl chloride	< .001	mg/l			WG695096	12/02/13 09:59
Xylenes, Total	< .003	mg/l			WG695096	12/02/13 09:59
4-Bromofluorobenzene		% Rec.	96.60	71-126	WG695096	12/02/13 09:59
Dibromofluoromethane		% Rec.	104.0	78.3-121	WG695096	12/02/13 09:59
Toluene-d8		% Rec.	104.0	88.5-111	WG695096	12/02/13 09:59
Phosphorus,Total	< .1	mg/l			WG695202	12/04/13 09:34
1,1,1,2-Tetrachloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1,1-Trichloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1,2-Trichloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1,2-Trichlorotrifluoroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1-Dichloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,1-Dichloroethene	< .001	mg/l			WG695297	12/03/13 23:57
1,1-Dichloropropene	< .001	mg/l			WG695297	12/03/13 23:57
1,2,3-Trichlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,2,3-Trichloropropane	< .001	mg/l			WG695297	12/03/13 23:57
1,2,3-Trimethylbenzene	< .001	mg/l			WG695297	12/03/13 23:57

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Quality Assurance Report
Level II

L670967

December 06, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
1,2,4-Trichlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,2,4-Trimethylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,2-Dibromo-3-Chloropropane	< .005	mg/l			WG695297	12/03/13 23:57
1,2-Dibromoethane	< .001	mg/l			WG695297	12/03/13 23:57
1,2-Dichlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,2-Dichloroethane	< .001	mg/l			WG695297	12/03/13 23:57
1,2-Dichloropropane	< .001	mg/l			WG695297	12/03/13 23:57
1,3,5-Trimethylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,3-Dichlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
1,3-Dichloropropane	< .001	mg/l			WG695297	12/03/13 23:57
1,4-Dichlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
2,2-Dichloropropane	< .001	mg/l			WG695297	12/03/13 23:57
2-Butanone (MEK)	< .01	mg/l			WG695297	12/03/13 23:57
2-Chloroethyl vinyl ether	< .05	mg/l			WG695297	12/03/13 23:57
2-Chlorotoluene	< .001	mg/l			WG695297	12/03/13 23:57
2-Hexanone	< .01	mg/l			WG695297	12/03/13 23:57
4-Chlorotoluene	< .001	mg/l			WG695297	12/03/13 23:57
4-Methyl-2-pentanone (MIBK)	< .01	mg/l			WG695297	12/03/13 23:57
Acetone	< .05	mg/l			WG695297	12/03/13 23:57
Acrolein	< .025	mg/l			WG695297	12/03/13 23:57
Acrylonitrile	< .01	mg/l			WG695297	12/03/13 23:57
Allyl chloride	< .005	mg/l			WG695297	12/03/13 23:57
Benzene	< .001	mg/l			WG695297	12/03/13 23:57
Bromobenzene	< .001	mg/l			WG695297	12/03/13 23:57
Bromochloromethane	< .001	mg/l			WG695297	12/03/13 23:57
Bromodichloromethane	< .001	mg/l			WG695297	12/03/13 23:57
Bromoform	< .001	mg/l			WG695297	12/03/13 23:57
Bromomethane	< .005	mg/l			WG695297	12/03/13 23:57
Carbon tetrachloride	< .001	mg/l			WG695297	12/03/13 23:57
Chlorobenzene	< .001	mg/l			WG695297	12/03/13 23:57
Chlorodibromomethane	< .001	mg/l			WG695297	12/03/13 23:57
Chloroethane	< .005	mg/l			WG695297	12/03/13 23:57
Chloroform	< .005	mg/l			WG695297	12/03/13 23:57
Chloromethane	< .0025	mg/l			WG695297	12/03/13 23:57
cis-1,2-Dichloroethene	< .001	mg/l			WG695297	12/03/13 23:57
cis-1,3-Dichloropropene	< .001	mg/l			WG695297	12/03/13 23:57
Di-isopropyl ether	< .001	mg/l			WG695297	12/03/13 23:57
Dibromomethane	< .001	mg/l			WG695297	12/03/13 23:57
Dichlorodifluoromethane	< .005	mg/l			WG695297	12/03/13 23:57
Ethyl ether	< .001	mg/l			WG695297	12/03/13 23:57
Ethylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
Hexachloro-1,3-butadiene	< .001	mg/l			WG695297	12/03/13 23:57
Isopropylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
Methyl tert-butyl ether	< .001	mg/l			WG695297	12/03/13 23:57
Methylene Chloride	< .005	mg/l			WG695297	12/03/13 23:57
n-Butylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
n-Propylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
Naphthalene	< .005	mg/l			WG695297	12/03/13 23:57
p-Isopropyltoluene	< .001	mg/l			WG695297	12/03/13 23:57
sec-Butylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
Styrene	< .001	mg/l			WG695297	12/03/13 23:57
tert-Butylbenzene	< .001	mg/l			WG695297	12/03/13 23:57
Tetrachloroethene	< .001	mg/l			WG695297	12/03/13 23:57
Tetrahydrofuran	< .005	mg/l			WG695297	12/03/13 23:57
Toluene	< .005	mg/l			WG695297	12/03/13 23:57
trans-1,2-Dichloroethene	< .001	mg/l			WG695297	12/03/13 23:57
trans-1,3-Dichloropropene	< .001	mg/l			WG695297	12/03/13 23:57
Trichloroethene	< .001	mg/l			WG695297	12/03/13 23:57
Trichlorofluoromethane	< .005	mg/l			WG695297	12/03/13 23:57

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Quality Assurance Report
Level II

L670967

December 06, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Vinyl chloride	< .001	mg/l			WG695297	12/03/13 23:57
Xylenes, Total	< .003	mg/l			WG695297	12/03/13 23:57
4-Bromofluorobenzene		% Rec.	96.40	71-126	WG695297	12/03/13 23:57
Dibromofluoromethane		% Rec.	102.0	78.3-121	WG695297	12/03/13 23:57
Toluene-d8		% Rec.	103.0	88.5-111	WG695297	12/03/13 23:57
Ammonia Nitrogen	< .1	mg/l			WG695557	12/05/13 12:46
Nitrate-Nitrite	< .1	mg/l			WG695541	12/05/13 13:25
COD	< 10	mg/l			WG695347	12/05/13 13:54
COD	< 10	mg/l			WG695555	12/05/13 15:36

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Phosphate,Ortho	mg/l	0.0460	0.0420	9.09	20	L670967-04	WG694808
Nitrate	mg/l	0.830	0.770	7.50	20	L670896-01	WG694641
Chloride	mg/l	4.20	4.10	2.41	20	L670950-05	WG694641
Bromide	mg/l	0.0	0.0	0.0	20	L670973-01	WG694677
Chloride	mg/l	3.80	3.80	0.0	20	L670973-01	WG694677
Fluoride	mg/l	0.0	0.0	0.0	20	L670973-01	WG694677
Nitrate	mg/l	0.0	0.0	0.0	20	L670973-01	WG694677
Nitrite	mg/l	0.0	0.0	0.0	20	L670973-01	WG694677
Sulfate	mg/l	5.20	5.20	0.0	20	L670973-01	WG694677
Fluoride	mg/l	0.800	0.810	1.24	20	L670388-01	WG694677
Fluoride	mg/l	0.670	0.670	0.0	20	L670577-01	WG694677
Aluminum	mg/l	0.120	0.0727	50.0*	20	L670937-01	WG694739
Calcium	mg/l	51.0	50.4	2.00	20	L670937-01	WG694739
Magnesium	mg/l	50.0	48.5	2.00	20	L670937-01	WG694739
Manganese	mg/l	0.0770	0.0746	3.00	20	L670937-01	WG694739
Potassium	mg/l	1.60	1.65	0.0	20	L670937-01	WG694739
Sodium	mg/l	9.60	9.38	2.00	20	L670937-01	WG694739
Phosphorus,Total	mg/l	0.460	0.460	0.0	20	L671001-02	WG695202
Phosphorus,Total	mg/l	0.540	0.530	1.87	20	L670874-05	WG695202
Ammonia Nitrogen	mg/l	0.0	0.0	0.0	20	L671020-03	WG695557
Ammonia Nitrogen	mg/l	0.0	0.0	0.0	20	L670965-01	WG695557
Ammonia Nitrogen	mg/l	0.0	0.0	0.0	20	L670965-01	WG695557
Nitrate-Nitrite	mg/l	5.60	5.20	7.41	20	L670932-02	WG695541
Nitrate-Nitrite	mg/l	14.0	14.0	0.0	20	L671009-01	WG695541

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Quality Assurance Report
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December 06, 2013

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
			Duplicate				
COD	mg/l	490.	490.	0.0	5	L670985-01	WG695347
COD	mg/l	18.0	17.0	4.60	5	L670932-01	WG695347
COD	mg/l	46.0	46.0	0.0	5	L670242-03	WG695555
COD	mg/l	57.0	59.0	3.45	5	L670204-01	WG695555
COD	mg/l	23.0	24.0	4.26	5	L670242-01	WG695555

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
			Laboratory Control Sample			
Phosphate,Ortho	mg/l	.75	0.772	103.	85-115	WG694808
Bromide	mg/l	40	39.8	99.5	90-110	WG694641
Chloride	mg/l	40	40.1	100.	90-110	WG694641
Fluoride	mg/l	8	8.01	100.	90-110	WG694641
Nitrate	mg/l	8	8.14	102.	90-110	WG694641
Nitrite	mg/l	8	7.93	99.1	90-110	WG694641
Sulfate	mg/l	40	39.8	99.5	90-110	WG694641
Bromide	mg/l	40	40.2	101.	90-110	WG694677
Chloride	mg/l	40	40.5	101.	90-110	WG694677
Fluoride	mg/l	8	8.14	102.	90-110	WG694677
Nitrate	mg/l	8	8.33	104.	90-110	WG694677
Nitrite	mg/l	8	8.13	102.	90-110	WG694677
Sulfate	mg/l	40	39.9	99.8	90-110	WG694677
Aluminum	mg/l	1	1.10	110.	85-115	WG694739
Calcium	mg/l	10	9.77	98.0	85-115	WG694739
Magnesium	mg/l	10	10.6	106.	85-115	WG694739
Manganese	mg/l	1	1.05	105.	85-115	WG694739
Potassium	mg/l	10	9.94	99.0	85-115	WG694739
Sodium	mg/l	10	10.1	101.	85-115	WG694739
1,1,1,2-Tetrachloroethane	mg/l	.025	0.0247	98.9	74.2-124	WG695096
1,1,1-Trichloroethane	mg/l	.025	0.0254	102.	73.2-123	WG695096
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0258	103.	70.7-122	WG695096
1,1,2-Trichloroethane	mg/l	.025	0.0239	95.7	77.7-118	WG695096
1,1,2-Trichlorotrifluoroethane	mg/l	.025	0.0279	112.	67.2-143	WG695096
1,1-Dichloroethane	mg/l	.025	0.0250	99.8	70.7-126	WG695096
1,1-Dichloroethene	mg/l	.025	0.0263	105.	67.8-129	WG695096
1,1-Dichloropropene	mg/l	.025	0.0237	94.9	73.1-125	WG695096
1,2,3-Trichlorobenzene	mg/l	.025	0.0249	99.7	64.9-135	WG695096
1,2,3-Trichloropropane	mg/l	.025	0.0251	101.	71.8-121	WG695096
1,2,3-Trimethylbenzene	mg/l	.025	0.0212	84.9	72.3-116	WG695096
1,2,4-Trichlorobenzene	mg/l	.025	0.0262	105.	69.7-136	WG695096
1,2,4-Trimethylbenzene	mg/l	.025	0.0246	98.3	75-123	WG695096
1,2-Dibromo-3-Chloropropane	mg/l	.025	0.0234	93.6	65.4-128	WG695096
1,2-Dibromoethane	mg/l	.025	0.0235	93.9	76.6-121	WG695096
1,2-Dichlorobenzene	mg/l	.025	0.0240	96.2	78.4-117	WG695096
1,2-Dichloroethane	mg/l	.025	0.0258	103.	68.8-124	WG695096
1,2-Dichloropropane	mg/l	.025	0.0245	98.2	76.5-119	WG695096
1,3,5-Trimethylbenzene	mg/l	.025	0.0248	99.1	75.6-124	WG695096
1,3-Dichlorobenzene	mg/l	.025	0.0245	97.9	70.8-128	WG695096
1,3-Dichloropropane	mg/l	.025	0.0235	93.8	77.4-117	WG695096

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
1,4-Dichlorobenzene	mg/l	.025	0.0243	97.1	78.8-115	WG695096
2,2-Dichloropropane	mg/l	.025	0.0267	107.	62.4-133	WG695096
2-Butanone (MEK)	mg/l	.125	0.141	113.	55-149	WG695096
2-Chloroethyl vinyl ether	mg/l	.125	0.0869	69.5	43.8-150	WG695096
2-Chlorotoluene	mg/l	.025	0.0241	96.5	74.7-122	WG695096
2-Hexanone	mg/l	.125	0.128	103.	65.6-144	WG695096
4-Chlorotoluene	mg/l	.025	0.0246	98.5	77.5-120	WG695096
4-Methyl-2-pentanone (MIBK)	mg/l	.125	0.135	108.	70.5-133	WG695096
Acetone	mg/l	.125	0.119	95.2	35.6-163	WG695096
Acrolein	mg/l	.125	0.134	107.	10-190	WG695096
Acrylonitrile	mg/l	.125	0.130	104.	55.2-130	WG695096
Benzene	mg/l	.025	0.0237	94.9	74.8-121	WG695096
Bromobenzene	mg/l	.025	0.0242	96.9	77.5-116	WG695096
Bromochloromethane	mg/l	.025	0.0247	98.9	77.6-119	WG695096
Bromodichloromethane	mg/l	.025	0.0246	98.2	75.1-116	WG695096
Bromoform	mg/l	.025	0.0256	102.	67.5-130	WG695096
Bromomethane	mg/l	.025	0.0238	95.4	49.9-162	WG695096
Carbon tetrachloride	mg/l	.025	0.0254	102.	70.2-123	WG695096
Chlorobenzene	mg/l	.025	0.0239	95.7	78.1-119	WG695096
Chlorodibromomethane	mg/l	.025	0.0250	99.9	74-121	WG695096
Chloroethane	mg/l	.025	0.0227	90.6	61.7-135	WG695096
Chloroform	mg/l	.025	0.0259	103.	76-121	WG695096
Chloromethane	mg/l	.025	0.0276	111.	61.5-129	WG695096
cis-1,2-Dichloroethene	mg/l	.025	0.0248	99.1	76-119	WG695096
cis-1,3-Dichloropropene	mg/l	.025	0.0256	102.	78.2-120	WG695096
Di-isopropyl ether	mg/l	.025	0.0244	97.7	65.6-132	WG695096
Dibromomethane	mg/l	.025	0.0251	101.	79.5-118	WG695096
Dichlorodifluoromethane	mg/l	.025	0.0187	74.9	54.8-135	WG695096
Ethyl ether	mg/l	.025	0.0258	103.	62.4-134	WG695096
Ethylbenzene	mg/l	.025	0.0250	99.9	78.8-122	WG695096
Hexachloro-1,3-butadiene	mg/l	.025	0.0227	90.7	64.7-129	WG695096
Isopropylbenzene	mg/l	.025	0.0264	106.	78.6-132	WG695096
Methyl tert-butyl ether	mg/l	.025	0.0247	98.9	71.2-126	WG695096
Methylene Chloride	mg/l	.025	0.0216	86.3	70.3-120	WG695096
n-Butylbenzene	mg/l	.025	0.0264	106.	76.2-126	WG695096
n-Propylbenzene	mg/l	.025	0.0249	99.7	78.2-122	WG695096
Naphthalene	mg/l	.025	0.0231	92.5	68.4-128	WG695096
p-Isopropyltoluene	mg/l	.025	0.0261	105.	74-131	WG695096
sec-Butylbenzene	mg/l	.025	0.0251	100.	74.4-127	WG695096
Styrene	mg/l	.025	0.0255	102.	80.4-126	WG695096
tert-Butylbenzene	mg/l	.025	0.0245	97.9	75.3-126	WG695096
Tetrachloroethene	mg/l	.025	0.0226	90.6	72.6-126	WG695096
Tetrahydrofuran	mg/l	.025	0.0256	102.	54.4-137	WG695096
Toluene	mg/l	.025	0.0237	94.9	79.7-116	WG695096
trans-1,2-Dichloroethene	mg/l	.025	0.0216	86.4	72.6-121	WG695096
trans-1,3-Dichloropropene	mg/l	.025	0.0258	103.	74.3-123	WG695096
Trichloroethene	mg/l	.025	0.0236	94.5	77.7-118	WG695096
Trichlorofluoromethane	mg/l	.025	0.0241	96.3	63.5-135	WG695096
Vinyl chloride	mg/l	.025	0.0195	78.0	65.9-128	WG695096
Xylenes, Total	mg/l	.075	0.0724	96.6	78.7-121	WG695096
4-Bromofluorobenzene				98.10	71-126	WG695096
Dibromofluoromethane				105.0	78.3-121	WG695096
Toluene-d8				103.0	88.5-111	WG695096
Phosphorus,Total	mg/l	1	0.948	94.8	90-110	WG695202
1,1,1,2-Tetrachloroethane	mg/l	.025	0.0255	102.	74.2-124	WG695297

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
1,1,1-Trichloroethane	mg/l	.025	0.0262	105.	73.2-123	WG695297
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0262	105.	70.7-122	WG695297
1,1,2-Trichloroethane	mg/l	.025	0.0243	97.4	77.7-118	WG695297
1,1,2-Trichlorotrifluoroethane	mg/l	.025	0.0271	108.	67.2-143	WG695297
1,1-Dichloroethane	mg/l	.025	0.0262	105.	70.7-126	WG695297
1,1-Dichloroethene	mg/l	.025	0.0275	110.	67.8-129	WG695297
1,1-Dichloropropene	mg/l	.025	0.0257	103.	73.1-125	WG695297
1,2,3-Trichlorobenzene	mg/l	.025	0.0262	105.	64.9-135	WG695297
1,2,3-Trichloropropane	mg/l	.025	0.0257	103.	71.8-121	WG695297
1,2,3-Trimethylbenzene	mg/l	.025	0.0222	88.9	72.3-116	WG695297
1,2,4-Trichlorobenzene	mg/l	.025	0.0269	108.	69.7-136	WG695297
1,2,4-Trimethylbenzene	mg/l	.025	0.0260	104.	75-123	WG695297
1,2-Dibromo-3-Chloropropane	mg/l	.025	0.0256	103.	65.4-128	WG695297
1,2-Dibromoethane	mg/l	.025	0.0254	102.	76.6-121	WG695297
1,2-Dichlorobenzene	mg/l	.025	0.0255	102.	78.4-117	WG695297
1,2-Dichloroethane	mg/l	.025	0.0273	109.	68.8-124	WG695297
1,2-Dichloropropane	mg/l	.025	0.0256	103.	76.5-119	WG695297
1,3,5-Trimethylbenzene	mg/l	.025	0.0254	102.	75.6-124	WG695297
1,3-Dichlorobenzene	mg/l	.025	0.0253	101.	70.8-128	WG695297
1,3-Dichloropropane	mg/l	.025	0.0247	98.7	77.4-117	WG695297
1,4-Dichlorobenzene	mg/l	.025	0.0251	100.	78.8-115	WG695297
2,2-Dichloropropane	mg/l	.025	0.0267	107.	62.4-133	WG695297
2-Butanone (MEK)	mg/l	.125	0.0983	78.6	55-149	WG695297
2-Chloroethyl vinyl ether	mg/l	.125	0.0978	78.2	43.8-150	WG695297
2-Chlorotoluene	mg/l	.025	0.0250	100.	74.7-122	WG695297
2-Hexanone	mg/l	.125	0.116	93.0	65.6-144	WG695297
4-Chlorotoluene	mg/l	.025	0.0257	103.	77.5-120	WG695297
4-Methyl-2-pentanone (MIBK)	mg/l	.125	0.135	108.	70.5-133	WG695297
Acetone	mg/l	.125	0.0762	61.0	35.6-163	WG695297
Acrolein	mg/l	.125	0.136	108.	10-190	WG695297
Acrylonitrile	mg/l	.125	0.136	109.	55.2-130	WG695297
Benzene	mg/l	.025	0.0250	99.8	74.8-121	WG695297
Bromobenzene	mg/l	.025	0.0253	101.	77.5-116	WG695297
Bromochloromethane	mg/l	.025	0.0258	103.	77.6-119	WG695297
Bromodichloromethane	mg/l	.025	0.0252	101.	75.1-116	WG695297
Bromoform	mg/l	.025	0.0263	105.	67.5-130	WG695297
Bromomethane	mg/l	.025	0.0254	102.	49.9-162	WG695297
Carbon tetrachloride	mg/l	.025	0.0263	105.	70.2-123	WG695297
Chlorobenzene	mg/l	.025	0.0252	101.	78.1-119	WG695297
Chlorodibromomethane	mg/l	.025	0.0257	103.	74-121	WG695297
Chloroethane	mg/l	.025	0.0257	103.	61.7-135	WG695297
Chloroform	mg/l	.025	0.0267	107.	76-121	WG695297
Chloromethane	mg/l	.025	0.0334	134.*	61.5-129	WG695297
cis-1,2-Dichloroethene	mg/l	.025	0.0260	104.	76-119	WG695297
cis-1,3-Dichloropropene	mg/l	.025	0.0262	105.	78.2-120	WG695297
Di-isopropyl ether	mg/l	.025	0.0257	103.	65.6-132	WG695297
Dibromomethane	mg/l	.025	0.0269	108.	79.5-118	WG695297
Dichlorodifluoromethane	mg/l	.025	0.0235	94.0	54.8-135	WG695297
Ethyl ether	mg/l	.025	0.0270	108.	62.4-134	WG695297
Ethylbenzene	mg/l	.025	0.0259	104.	78.8-122	WG695297
Hexachloro-1,3-butadiene	mg/l	.025	0.0240	96.0	64.7-129	WG695297
Isopropylbenzene	mg/l	.025	0.0277	111.	78.6-132	WG695297
Methyl tert-butyl ether	mg/l	.025	0.0258	103.	71.2-126	WG695297
Methylene Chloride	mg/l	.025	0.0233	93.1	70.3-120	WG695297
n-Butylbenzene	mg/l	.025	0.0270	108.	76.2-126	WG695297
n-Propylbenzene	mg/l	.025	0.0258	103.	78.2-122	WG695297
Naphthalene	mg/l	.025	0.0243	97.2	68.4-128	WG695297
p-Isopropyltoluene	mg/l	.025	0.0266	106.	74-131	WG695297
sec-Butylbenzene	mg/l	.025	0.0259	104.	74.4-127	WG695297

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Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Styrene	mg/l	.025	0.0262	105.	80.4-126	WG695297
tert-Butylbenzene	mg/l	.025	0.0251	100.	75.3-126	WG695297
Tetrachloroethene	mg/l	.025	0.0240	96.1	72.6-126	WG695297
Tetrahydrofuran	mg/l	.025	0.0261	105.	54.4-137	WG695297
Toluene	mg/l	.025	0.0245	97.8	79.7-116	WG695297
trans-1,2-Dichloroethene	mg/l	.025	0.0245	98.2	72.6-121	WG695297
trans-1,3-Dichloropropene	mg/l	.025	0.0255	102.	74.3-123	WG695297
Trichloroethene	mg/l	.025	0.0243	97.1	77.7-118	WG695297
Trichlorofluoromethane	mg/l	.025	0.0259	104.	63.5-135	WG695297
Vinyl chloride	mg/l	.025	0.0233	93.2	65.9-128	WG695297
Xylenes, Total	mg/l	.075	0.0761	102.	78.7-121	WG695297
4-Bromofluorobenzene				98.50	71-126	WG695297
Dibromofluoromethane				105.0	78.3-121	WG695297
Toluene-d8				102.0	88.5-111	WG695297
Ammonia Nitrogen	mg/l	7.5	7.83	104.	90-110	WG695557
Nitrate-Nitrite	mg/l	5	5.04	101.	90-110	WG695541
COD	mg/l	183	189.	103.	90-110	WG695347
COD	mg/l	183	184.	101.	90-110	WG695555

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
Phosphate,Ortho	mg/l	0.758	0.772	101.	85-115	1.83	20	WG694808
Bromide	mg/l	39.7	39.8	99.0	90-110	0.252	20	WG694641
Chloride	mg/l	40.2	40.1	100.	90-110	0.249	20	WG694641
Fluoride	mg/l	8.05	8.01	101.	90-110	0.498	20	WG694641
Nitrate	mg/l	8.16	8.14	102.	90-110	0.245	20	WG694641
Nitrite	mg/l	8.01	7.93	100.	90-110	1.00	20	WG694641
Sulfate	mg/l	39.8	39.8	100.	90-110	0.0	20	WG694641
Bromide	mg/l	40.3	40.2	101.	90-110	0.248	20	WG694677
Chloride	mg/l	40.5	40.5	101.	90-110	0.0	20	WG694677
Fluoride	mg/l	8.19	8.14	102.	90-110	0.612	20	WG694677
Nitrate	mg/l	8.34	8.33	104.	90-110	0.120	20	WG694677
Nitrite	mg/l	8.14	8.13	102.	90-110	0.123	20	WG694677
Sulfate	mg/l	40.1	39.9	100.	90-110	0.500	20	WG694677
1,1,1,2-Tetrachloroethane	mg/l	0.0269	0.0247	107.	74.2-124	8.26	20	WG695096
1,1,1-Trichloroethane	mg/l	0.0275	0.0254	110.	73.2-123	8.09	20	WG695096
1,1,2,2-Tetrachloroethane	mg/l	0.0274	0.0258	110.	70.7-122	6.03	20	WG695096
1,1,2-Trichloroethane	mg/l	0.0257	0.0239	103.	77.7-118	7.27	20	WG695096
1,1,2-Trichlorotrifluoroethane	mg/l	0.0302	0.0279	121.	67.2-143	7.90	20	WG695096
1,1-Dichloroethane	mg/l	0.0267	0.0250	107.	70.7-126	6.83	20	WG695096
1,1-Dichloroethene	mg/l	0.0284	0.0263	114.	67.8-129	7.95	20	WG695096
1,1-Dichloropropene	mg/l	0.0260	0.0237	104.	73.1-125	9.17	20	WG695096
1,2,3-Trichlorobenzene	mg/l	0.0268	0.0249	107.	64.9-135	7.16	20	WG695096
1,2,3-Trichloropropane	mg/l	0.0271	0.0251	108.	71.8-121	7.34	20	WG695096

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Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,2,3-Trimethylbenzene	mg/l	0.0228	0.0212	91.0	72.3-116	7.24	20	WG695096
1,2,4-Trichlorobenzene	mg/l	0.0288	0.0262	115.	69.7-136	9.21	20	WG695096
1,2,4-Trimethylbenzene	mg/l	0.0263	0.0246	105.	75-123	6.72	20	WG695096
1,2-Dibromo-3-Chloropropane	mg/l	0.0266	0.0234	106.	65.4-128	12.6	20	WG695096
1,2-Dibromoethane	mg/l	0.0254	0.0235	102.	76.6-121	7.79	20	WG695096
1,2-Dichlorobenzene	mg/l	0.0260	0.0240	104.	78.4-117	7.88	20	WG695096
1,2-Dichloroethane	mg/l	0.0278	0.0258	111.	68.8-124	7.40	20	WG695096
1,2-Dichloropropane	mg/l	0.0264	0.0245	106.	76.5-119	7.35	20	WG695096
1,3,5-Trimethylbenzene	mg/l	0.0260	0.0248	104.	75.6-124	4.73	20	WG695096
1,3-Dichlorobenzene	mg/l	0.0260	0.0245	104.	70.8-128	6.08	20	WG695096
1,3-Dichloropropane	mg/l	0.0251	0.0235	100.	77.4-117	6.76	20	WG695096
1,4-Dichlorobenzene	mg/l	0.0261	0.0243	104.	78.8-115	7.11	20	WG695096
2,2-Dichloropropane	mg/l	0.0287	0.0267	115.	62.4-133	7.23	20	WG695096
2-Butanone (MEK)	mg/l	0.148	0.141	118.	55-149	4.52	20	WG695096
2-Chloroethyl vinyl ether	mg/l	0.0935	0.0869	75.0	43.8-150	7.36	20	WG695096
2-Chlorotoluene	mg/l	0.0258	0.0241	103.	74.7-122	6.56	20	WG695096
2-Hexanone	mg/l	0.141	0.128	112.	65.6-144	9.00	20	WG695096
4-Chlorotoluene	mg/l	0.0263	0.0246	105.	77.5-120	6.77	20	WG695096
4-Methyl-2-pentanone (MIBK)	mg/l	0.146	0.135	117.	70.5-133	7.50	20	WG695096
Acetone	mg/l	0.136	0.119	108.	35.6-163	13.0	23.9	WG695096
Acrolein	mg/l	0.148	0.134	118.	10-190	10.0	28.1	WG695096
Acrylonitrile	mg/l	0.144	0.130	116.	55.2-130	10.3	20	WG695096
Benzene	mg/l	0.0255	0.0237	102.	74.8-121	7.26	20	WG695096
Bromobenzene	mg/l	0.0254	0.0242	101.	77.5-116	4.52	20	WG695096
Bromochloromethane	mg/l	0.0262	0.0247	105.	77.6-119	5.90	20	WG695096
Bromodichloromethane	mg/l	0.0262	0.0246	105.	75.1-116	6.29	20	WG695096
Bromoform	mg/l	0.0275	0.0256	110.	67.5-130	7.13	20	WG695096
Bromomethane	mg/l	0.0247	0.0238	99.0	49.9-162	3.63	20	WG695096
Carbon tetrachloride	mg/l	0.0275	0.0254	110.	70.2-123	8.09	20	WG695096
Chlorobenzene	mg/l	0.0257	0.0239	103.	78.1-119	7.21	20	WG695096
Chlorodibromomethane	mg/l	0.0267	0.0250	107.	74-121	6.48	20	WG695096
Chloroethane	mg/l	0.0236	0.0227	94.0	61.7-135	4.10	20	WG695096
Chloroform	mg/l	0.0283	0.0259	113.	76-121	8.97	20	WG695096
Chloromethane	mg/l	0.0288	0.0276	115.	61.5-129	4.27	20	WG695096
cis-1,2-Dichloroethene	mg/l	0.0271	0.0248	108.	76-119	8.75	20	WG695096
cis-1,3-Dichloropropene	mg/l	0.0274	0.0256	109.	78.2-120	6.73	20	WG695096
Di-isopropyl ether	mg/l	0.0264	0.0244	106.	65.6-132	7.92	20	WG695096
Dibromomethane	mg/l	0.0274	0.0251	110.	79.5-118	8.59	20	WG695096
Dichlorodifluoromethane	mg/l	0.0203	0.0187	81.0	54.8-135	7.84	20	WG695096
Ethyl ether	mg/l	0.0282	0.0258	113.	62.4-134	8.94	20	WG695096
Ethylbenzene	mg/l	0.0263	0.0250	105.	78.8-122	5.18	20	WG695096
Hexachloro-1,3-butadiene	mg/l	0.0247	0.0227	99.0	64.7-129	8.57	20	WG695096
Isopropylbenzene	mg/l	0.0286	0.0264	114.	78.6-132	8.11	20	WG695096
Methyl tert-butyl ether	mg/l	0.0272	0.0247	109.	71.2-126	9.68	20	WG695096
Methylene Chloride	mg/l	0.0231	0.0216	92.0	70.3-120	6.77	20	WG695096
n-Butylbenzene	mg/l	0.0283	0.0264	113.	76.2-126	6.69	20	WG695096
n-Propylbenzene	mg/l	0.0264	0.0249	106.	78.2-122	5.67	20	WG695096
Naphthalene	mg/l	0.0252	0.0231	101.	68.4-128	8.50	20	WG695096
p-Isopropyltoluene	mg/l	0.0277	0.0261	111.	74-131	5.75	20	WG695096
sec-Butylbenzene	mg/l	0.0266	0.0251	106.	74.4-127	5.76	20	WG695096
Styrene	mg/l	0.0271	0.0255	108.	80.4-126	6.00	20	WG695096
tert-Butylbenzene	mg/l	0.0263	0.0245	105.	75.3-126	7.05	20	WG695096
Tetrachloroethene	mg/l	0.0243	0.0226	97.0	72.6-126	7.21	20	WG695096
Tetrahydrofuran	mg/l	0.0271	0.0256	108.	54.4-137	5.57	20	WG695096
Toluene	mg/l	0.0252	0.0237	101.	79.7-116	5.98	20	WG695096
trans-1,2-Dichloroethene	mg/l	0.0233	0.0216	93.0	72.6-121	7.66	20	WG695096
trans-1,3-Dichloropropene	mg/l	0.0276	0.0258	110.	74.3-123	6.42	20	WG695096
Trichloroethene	mg/l	0.0252	0.0236	101.	77.7-118	6.32	20	WG695096
Trichlorofluoromethane	mg/l	0.0259	0.0241	103.	63.5-135	7.11	20	WG695096

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
Vinyl chloride	mg/l	0.0211	0.0195	84.0	65.9-128	8.09	20	WG695096
Xylenes, Total	mg/l	0.0773	0.0724	103.	78.7-121	6.52	20	WG695096
4-Bromofluorobenzene				97.20	71-126			WG695096
Dibromofluoromethane				106.0	78.3-121			WG695096
Toluene-d8				102.0	88.5-111			WG695096
Phosphorus,Total	mg/l	0.923	0.948	92.0	90-110	2.67	20	WG695202
1,1,1,2-Tetrachloroethane	mg/l	0.0253	0.0255	101.	74.2-124	0.820	20	WG695297
1,1,1-Trichloroethane	mg/l	0.0259	0.0262	104.	73.2-123	1.40	20	WG695297
1,1,2,2-Tetrachloroethane	mg/l	0.0260	0.0262	104.	70.7-122	1.04	20	WG695297
1,1,2-Trichloroethane	mg/l	0.0248	0.0243	99.0	77.7-118	1.94	20	WG695297
1,1,2-Trichlorotrifluoroethane	mg/l	0.0276	0.0271	110.	67.2-143	1.99	20	WG695297
1,1-Dichloroethane	mg/l	0.0259	0.0262	104.	70.7-126	1.19	20	WG695297
1,1-Dichloroethene	mg/l	0.0270	0.0275	108.	67.8-129	2.00	20	WG695297
1,1-Dichloropropene	mg/l	0.0258	0.0257	103.	73.1-125	0.180	20	WG695297
1,2,3-Trichlorobenzene	mg/l	0.0264	0.0262	106.	64.9-135	0.870	20	WG695297
1,2,3-Trichloropropane	mg/l	0.0257	0.0257	103.	71.8-121	0.0800	20	WG695297
1,2,3-Trimethylbenzene	mg/l	0.0225	0.0222	90.0	72.3-116	1.13	20	WG695297
1,2,4-Trichlorobenzene	mg/l	0.0270	0.0269	108.	69.7-136	0.440	20	WG695297
1,2,4-Trimethylbenzene	mg/l	0.0257	0.0260	103.	75-123	1.15	20	WG695297
1,2-Dibromo-3-Chloropropane	mg/l	0.0253	0.0256	101.	65.4-128	1.36	20	WG695297
1,2-Dibromoethane	mg/l	0.0252	0.0254	101.	76.6-121	0.820	20	WG695297
1,2-Dichlorobenzene	mg/l	0.0254	0.0255	101.	78.4-117	0.370	20	WG695297
1,2-Dichloroethane	mg/l	0.0266	0.0273	106.	68.8-124	2.54	20	WG695297
1,2-Dichloropropane	mg/l	0.0253	0.0256	101.	76.5-119	1.45	20	WG695297
1,3,5-Trimethylbenzene	mg/l	0.0254	0.0254	102.	75.6-124	0.0100	20	WG695297
1,3-Dichlorobenzene	mg/l	0.0250	0.0253	100.	70.8-128	1.03	20	WG695297
1,3-Dichloropropane	mg/l	0.0248	0.0247	99.0	77.4-117	0.570	20	WG695297
1,4-Dichlorobenzene	mg/l	0.0249	0.0251	100.	78.8-115	0.830	20	WG695297
2,2-Dichloropropane	mg/l	0.0265	0.0267	106.	62.4-133	0.870	20	WG695297
2-Butanone (MEK)	mg/l	0.117	0.0983	94.0	55-149	17.6	20	WG695297
2-Chloroethyl vinyl ether	mg/l	0.0964	0.0978	77.0	43.8-150	1.39	20	WG695297
2-Chlorotoluene	mg/l	0.0249	0.0250	100.	74.7-122	0.420	20	WG695297
2-Hexanone	mg/l	0.117	0.116	93.0	65.6-144	0.400	20	WG695297
4-Chlorotoluene	mg/l	0.0255	0.0257	102.	77.5-120	0.400	20	WG695297
4-Methyl-2-pentanone (MIBK)	mg/l	0.133	0.135	107.	70.5-133	1.16	20	WG695297
Acetone	mg/l	0.0851	0.0762	68.0	35.6-163	11.0	23.9	WG695297
Acrolein	mg/l	0.134	0.136	107.	10-190	1.41	28.1	WG695297
Acrylonitrile	mg/l	0.133	0.136	106.	55.2-130	1.97	20	WG695297
Benzene	mg/l	0.0246	0.0250	98.0	74.8-121	1.29	20	WG695297
Bromobenzene	mg/l	0.0253	0.0253	101.	77.5-116	0.230	20	WG695297
Bromochloromethane	mg/l	0.0254	0.0258	101.	77.6-119	1.89	20	WG695297
Bromodichloromethane	mg/l	0.0248	0.0252	99.0	75.1-116	1.40	20	WG695297
Bromoform	mg/l	0.0258	0.0263	103.	67.5-130	1.64	20	WG695297
Bromomethane	mg/l	0.0237	0.0254	95.0	49.9-162	6.94	20	WG695297
Carbon tetrachloride	mg/l	0.0261	0.0263	104.	70.2-123	1.03	20	WG695297
Chlorobenzene	mg/l	0.0249	0.0252	99.0	78.1-119	1.46	20	WG695297
Chlorodibromomethane	mg/l	0.0258	0.0257	103.	74-121	0.260	20	WG695297
Chloroethane	mg/l	0.0254	0.0257	102.	61.7-135	1.14	20	WG695297
Chloroform	mg/l	0.0265	0.0267	106.	76-121	1.04	20	WG695297
Chloromethane	mg/l	0.0329	0.0334	132*	61.5-129	1.53	20	WG695297
cis-1,2-Dichloroethene	mg/l	0.0258	0.0260	103.	76-119	0.670	20	WG695297
cis-1,3-Dichloropropene	mg/l	0.0259	0.0262	104.	78.2-120	1.18	20	WG695297
Di-isopropyl ether	mg/l	0.0253	0.0257	101.	65.6-132	1.33	20	WG695297
Dibromomethane	mg/l	0.0266	0.0269	106.	79.5-118	1.21	20	WG695297
Dichlorodifluoromethane	mg/l	0.0231	0.0235	92.0	54.8-135	1.57	20	WG695297

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Alex Martell
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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
Ethyl ether	mg/l	0.0264	0.0270	106.	62.4-134	2.22	20	WG695297
Ethylbenzene	mg/l	0.0260	0.0259	104.	78.8-122	0.280	20	WG695297
Hexachloro-1,3-butadiene	mg/l	0.0249	0.0240	100.	64.7-129	3.65	20	WG695297
Isopropylbenzene	mg/l	0.0279	0.0277	112.	78.6-132	0.940	20	WG695297
Methyl tert-butyl ether	mg/l	0.0256	0.0258	102.	71.2-126	0.620	20	WG695297
Methylene Chloride	mg/l	0.0233	0.0233	93.0	70.3-120	0.330	20	WG695297
n-Butylbenzene	mg/l	0.0274	0.0270	110.	76.2-126	1.36	20	WG695297
n-Propylbenzene	mg/l	0.0257	0.0258	103.	78.2-122	0.510	20	WG695297
Naphthalene	mg/l	0.0246	0.0243	98.0	68.4-128	1.23	20	WG695297
p-Isopropyltoluene	mg/l	0.0268	0.0266	107.	74-131	0.560	20	WG695297
sec-Butylbenzene	mg/l	0.0258	0.0259	103.	74.4-127	0.620	20	WG695297
Styrene	mg/l	0.0259	0.0262	103.	80.4-126	1.43	20	WG695297
tert-Butylbenzene	mg/l	0.0253	0.0251	101.	75.3-126	0.940	20	WG695297
Tetrachloroethene	mg/l	0.0242	0.0240	97.0	72.6-126	0.720	20	WG695297
Tetrahydrofuran	mg/l	0.0263	0.0261	105.	54.4-137	0.470	20	WG695297
Toluene	mg/l	0.0240	0.0245	96.0	79.7-116	1.93	20	WG695297
trans-1,2-Dichloroethene	mg/l	0.0245	0.0245	98.0	72.6-121	0.0600	20	WG695297
trans-1,3-Dichloropropene	mg/l	0.0257	0.0255	103.	74.3-123	0.890	20	WG695297
Trichloroethene	mg/l	0.0241	0.0243	96.0	77.7-118	0.930	20	WG695297
Trichlorofluoromethane	mg/l	0.0255	0.0259	102.	63.5-135	1.46	20	WG695297
Vinyl chloride	mg/l	0.0236	0.0233	94.0	65.9-128	1.32	20	WG695297
Xylenes, Total	mg/l	0.0758	0.0761	101.	78.7-121	0.440	20	WG695297
4-Bromofluorobenzene				97.00	71-126			WG695297
Dibromofluoromethane				103.0	78.3-121			WG695297
Toluene-d8				100.0	88.5-111			WG695297
Ammonia Nitrogen	mg/l	8.23	7.83	110.	90-110	4.98	20	WG695557
Nitrate-Nitrite	mg/l	5.31	5.04	106.	90-110	5.22	20	WG695541
COD	mg/l	186.	189.	102.	90-110	1.60	5	WG695347
COD	mg/l	184.	184.	100.	90-110	0.0	5	WG695555

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Phosphate,Ortho	mg/l	0.552	0.0780	.5	95.0	80-120	L670967-05	WG694808
Nitrate	mg/l	4.81	0.0	5	96.0	80-120	L670956-02	WG694641
Nitrite	mg/l	5.02	0.0	5	100.	80-120	L670956-02	WG694641
Chloride	mg/l	352.	190.	50	65.0*	80-120	L670956-02	WG694641
Sulfate	mg/l	431.	270.	50	64.0*	80-120	L670956-02	WG694641
Bromide	mg/l	47.5	0.0	50	95.0	80-120	L670973-02	WG694677
Chloride	mg/l	54.7	4.80	50	100.	80-120	L670973-02	WG694677
Fluoride	mg/l	5.01	0.0	5	100.	80-120	L670973-02	WG694677
Nitrate	mg/l	4.89	0.0	5	98.0	80-120	L670973-02	WG694677
Nitrite	mg/l	5.09	0.0	5	100.	80-120	L670973-02	WG694677
Sulfate	mg/l	63.9	16.0	50	96.0	80-120	L670973-02	WG694677
Aluminum	mg/l	1.28	0.0727	1	120.	75-125	L670937-01	WG694739

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Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Calcium	mg/l	61.2	50.4	10	110.	75-125	L670937-01	WG694739
Magnesium	mg/l	62.4	48.5	10	140.*	75-125	L670937-01	WG694739
Manganese	mg/l	1.14	0.0746	1	110.	75-125	L670937-01	WG694739
Potassium	mg/l	12.1	1.65	10	100.	75-125	L670937-01	WG694739
Sodium	mg/l	20.2	9.38	10	110.	75-125	L670937-01	WG694739
1,1,1,2-Tetrachloroethane	mg/l	0.0253	0.0	.025	100.	64-128	L670967-01	WG695096
1,1,1-Trichloroethane	mg/l	0.0271	0.0	.025	110.	58.7-134	L670967-01	WG695096
1,1,2,2-Tetrachloroethane	mg/l	0.0267	0.0	.025	110.	56-132	L670967-01	WG695096
1,1,2-Trichloroethane	mg/l	0.0253	0.0	.025	100.	66.3-125	L670967-01	WG695096
1,1,2-Trichlorotrifluoroethane	mg/l	0.0301	0.0	.025	120.	54.8-154	L670967-01	WG695096
1,1-Dichloroethane	mg/l	0.0272	0.0	.025	110.	58.5-132	L670967-01	WG695096
1,1-Dichloroethene	mg/l	0.0302	0.0	.025	120.	51.1-140	L670967-01	WG695096
1,1-Dichloropropene	mg/l	0.0274	0.0	.025	110.	57.3-136	L670967-01	WG695096
1,2,3-Trichlorobenzene	mg/l	0.0266	0.0	.025	110.	59.1-138	L670967-01	WG695096
1,2,3-Trichloropropane	mg/l	0.0268	0.0	.025	110.	61.4-128	L670967-01	WG695096
1,2,3-Trimethylbenzene	mg/l	0.0221	0.0	.025	88.0	61.3-122	L670967-01	WG695096
1,2,4-Trichlorobenzene	mg/l	0.0276	0.0	.025	110.	63.6-143	L670967-01	WG695096
1,2,4-Trimethylbenzene	mg/l	0.0263	0.0	.025	100.	57.4-137	L670967-01	WG695096
1,2-Dibromo-3-Chloropropane	mg/l	0.0254	0.0	.025	100.	57.3-136	L670967-01	WG695096
1,2-Dibromoethane	mg/l	0.0256	0.0	.025	100.	67.1-125	L670967-01	WG695096
1,2-Dichlorobenzene	mg/l	0.0252	0.0	.025	100.	68.2-123	L670967-01	WG695096
1,2-Dichloroethane	mg/l	0.0286	0.0	.025	110.	60-126	L670967-01	WG695096
1,2-Dichloropropane	mg/l	0.0265	0.0	.025	110.	64.2-123	L670967-01	WG695096
1,3,5-Trimethylbenzene	mg/l	0.0262	0.0	.025	100.	63.6-132	L670967-01	WG695096
1,3-Dichlorobenzene	mg/l	0.0258	0.0	.025	100.	63.1-131	L670967-01	WG695096
1,3-Dichloropropane	mg/l	0.0250	0.0	.025	100.	67.9-121	L670967-01	WG695096
1,4-Dichlorobenzene	mg/l	0.0256	0.0	.025	100.	68.6-123	L670967-01	WG695096
2,2-Dichloropropane	mg/l	0.0286	0.0	.025	120.	50.5-144	L670967-01	WG695096
2-Butanone (MEK)	mg/l	0.104	0.0	.125	83.0	22.4-138	L670967-01	WG695096
2-Chloroethyl vinyl ether	mg/l	0.0459	0.0	.125	37.0	10-155	L670967-01	WG695096
2-Chlorotoluene	mg/l	0.0253	0.0	.025	100.	63.6-128	L670967-01	WG695096
2-Hexanone	mg/l	0.120	0.0	.125	96.0	43.3-137	L670967-01	WG695096
4-Chlorotoluene	mg/l	0.0264	0.0	.025	110.	65.7-127	L670967-01	WG695096
4-Methyl-2-pentanone (MIBK)	mg/l	0.145	0.0	.125	120.	60.8-140	L670967-01	WG695096
Acetone	mg/l	0.0707	0.00194	.125	55.0	10-130	L670967-01	WG695096
Acrolein	mg/l	0.128	0.0	.125	100.	10-200	L670967-01	WG695096
Acrylonitrile	mg/l	0.145	0.0	.125	120.	49.4-133	L670967-01	WG695096
Benzene	mg/l	0.0264	0.0	.025	110.	54.3-133	L670967-01	WG695096
Bromobenzene	mg/l	0.0258	0.0	.025	100.	63.9-124	L670967-01	WG695096
Bromochloromethane	mg/l	0.0275	0.0	.025	110.	66.5-122	L670967-01	WG695096
Bromodichloromethane	mg/l	0.0259	0.0	.025	100.	63.9-121	L670967-01	WG695096
Bromoform	mg/l	0.0268	0.0	.025	110.	59.5-134	L670967-01	WG695096
Bromomethane	mg/l	0.0269	0.0	.025	110.	41.7-155	L670967-01	WG695096
Carbon tetrachloride	mg/l	0.0273	0.0	.025	110.	55.7-134	L670967-01	WG695096
Chlorobenzene	mg/l	0.0256	0.0	.025	100.	67-125	L670967-01	WG695096
Chlorodibromomethane	mg/l	0.0253	0.0	.025	100.	64.3-125	L670967-01	WG695096
Chloroethane	mg/l	0.0287	0.0	.025	120.	51.5-136	L670967-01	WG695096
Chloroform	mg/l	0.0276	0.0	.025	110.	63-129	L670967-01	WG695096
Chloromethane	mg/l	0.0391	0.0	.025	160.*	42.4-135	L670967-01	WG695096
cis-1,2-Dichloroethene	mg/l	0.0275	0.0	.025	110.	59.2-129	L670967-01	WG695096
cis-1,3-Dichloropropene	mg/l	0.0275	0.0	.025	110.	66.4-125	L670967-01	WG695096
Di-isopropyl ether	mg/l	0.0263	0.0	.025	100.	56.9-136	L670967-01	WG695096
Dibromomethane	mg/l	0.0280	0.0	.025	110.	68.2-124	L670967-01	WG695096
Dichlorodifluoromethane	mg/l	0.0274	0.0	.025	110.	40.6-144	L670967-01	WG695096
Ethyl ether	mg/l	0.0293	0.0	.025	120.	53.2-136	L670967-01	WG695096
Ethylbenzene	mg/l	0.0262	0.0	.025	100.	61.4-133	L670967-01	WG695096
Hexachloro-1,3-butadiene	mg/l	0.0239	0.0	.025	96.0	55.1-136	L670967-01	WG695096

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1802 Wooddale Drive, Suite 100
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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Isopropylbenzene	mg/l	0.0281	0.0	.025	110.	66.8-141	L670967-01	WG695096
Methyl tert-butyl ether	mg/l	0.0272	0.0	.025	110.	57.7-134	L670967-01	WG695096
Methylene Chloride	mg/l	0.0245	0.0	.025	98.0	58.1-122	L670967-01	WG695096
n-Butylbenzene	mg/l	0.0277	0.0	.025	110.	62.7-140	L670967-01	WG695096
n-Propylbenzene	mg/l	0.0265	0.0	.025	110.	65.9-131	L670967-01	WG695096
Naphthalene	mg/l	0.0246	0.0	.025	99.0	58-135	L670967-01	WG695096
p-Isopropyltoluene	mg/l	0.0274	0.0	.025	110.	63.2-139	L670967-01	WG695096
sec-Butylbenzene	mg/l	0.0264	0.0	.025	110.	62.2-136	L670967-01	WG695096
Styrene	mg/l	0.0258	0.0	.025	100.	66.8-133	L670967-01	WG695096
tert-Butylbenzene	mg/l	0.0254	0.0	.025	100.	63.3-134	L670967-01	WG695096
Tetrachloroethene	mg/l	0.0252	0.0	.025	100.	53-139	L670967-01	WG695096
Tetrahydrofuran	mg/l	0.0279	0.0	.025	110.	40.9-145	L670967-01	WG695096
Toluene	mg/l	0.0256	0.0	.025	100.	61.4-130	L670967-01	WG695096
trans-1,2-Dichloroethene	mg/l	0.0263	0.0	.025	100.	56.5-129	L670967-01	WG695096
trans-1,3-Dichloropropene	mg/l	0.0267	0.0	.025	110.	64.1-128	L670967-01	WG695096
Trichloroethene	mg/l	0.0261	0.0	.025	100.	44.1-149	L670967-01	WG695096
Trichlorofluoromethane	mg/l	0.0287	0.0	.025	120.	49.6-145	L670967-01	WG695096
Vinyl chloride	mg/l	0.0264	0.0	.025	110.	47.8-137	L670967-01	WG695096
Xylenes, Total	mg/l	0.0774	0.0	.075	100.	63.3-131	L670967-01	WG695096
4-Bromofluorobenzene					98.10	71-126		WG695096
Dibromofluoromethane					106.0	78.3-121		WG695096
Toluene-d8					102.0	88.5-111		WG695096
Phosphorus,Total	mg/l	2.74	0.290	2.5	98.0	90-110	L670874-06	WG695202
1,1,1,2-Tetrachloroethane	mg/l	0.0271	0.0	.025	110.	64-128	L671145-02	WG695297
1,1,1-Trichloroethane	mg/l	0.0276	0.0	.025	110.	58.7-134	L671145-02	WG695297
1,1,2,2-Tetrachloroethane	mg/l	0.0290	0.0	.025	120.	56-132	L671145-02	WG695297
1,1,2-Trichloroethane	mg/l	0.0270	0.0	.025	110.	66.3-125	L671145-02	WG695297
1,1,2-Trichlorotrifluoroethane	mg/l	0.0293	0.0	.025	120.	54.8-154	L671145-02	WG695297
1,1-Dichloroethane	mg/l	0.0278	0.0	.025	110.	58.5-132	L671145-02	WG695297
1,1-Dichloroethene	mg/l	0.0290	0.0	.025	120.	51.1-140	L671145-02	WG695297
1,1-Dichloropropene	mg/l	0.0275	0.0	.025	110.	57.3-136	L671145-02	WG695297
1,2,3-Trichlorobenzene	mg/l	0.0274	0.0	.025	110.	59.1-138	L671145-02	WG695297
1,2,3-Trichloropropane	mg/l	0.0283	0.0	.025	110.	61.4-128	L671145-02	WG695297
1,2,3-Trimethylbenzene	mg/l	0.0232	0.0	.025	93.0	61.3-122	L671145-02	WG695297
1,2,4-Trichlorobenzene	mg/l	0.0288	0.0	.025	120.	63.6-143	L671145-02	WG695297
1,2,4-Trimethylbenzene	mg/l	0.0270	0.0	.025	110.	57.4-137	L671145-02	WG695297
1,2-Dibromo-3-Chloropropane	mg/l	0.0276	0.0	.025	110.	57.3-136	L671145-02	WG695297
1,2-Dibromoethane	mg/l	0.0279	0.0	.025	110.	67.1-125	L671145-02	WG695297
1,2-Dichlorobenzene	mg/l	0.0263	0.0	.025	100.	68.2-123	L671145-02	WG695297
1,2-Dichloroethane	mg/l	0.0290	0.0	.025	120.	60-126	L671145-02	WG695297
1,2-Dichloropropane	mg/l	0.0271	0.0	.025	110.	64.2-123	L671145-02	WG695297
1,3,5-Trimethylbenzene	mg/l	0.0272	0.0	.025	110.	63.6-132	L671145-02	WG695297
1,3-Dichlorobenzene	mg/l	0.0264	0.0	.025	100.	63.1-131	L671145-02	WG695297
1,3-Dichloropropane	mg/l	0.0272	0.0	.025	110.	67.9-121	L671145-02	WG695297
1,4-Dichlorobenzene	mg/l	0.0263	0.0	.025	100.	68.6-123	L671145-02	WG695297
2,2-Dichloropropane	mg/l	0.0291	0.0	.025	120.	50.5-144	L671145-02	WG695297
2-Butanone (MEK)	mg/l	0.109	0.0	.125	87.0	22.4-138	L671145-02	WG695297
2-Chloroethyl vinyl ether	mg/l	0.00387	0.0	.125	3.10*	10-155	L671145-02	WG695297
2-Chlorotoluene	mg/l	0.0271	0.0	.025	110.	63.6-128	L671145-02	WG695297
2-Hexanone	mg/l	0.135	0.0	.125	110.	43.3-137	L671145-02	WG695297
4-Chlorotoluene	mg/l	0.0270	0.0	.025	110.	65.7-127	L671145-02	WG695297
4-Methyl-2-pentanone (MIBK)	mg/l	0.154	0.0	.125	120.	60.8-140	L671145-02	WG695297
Acetone	mg/l	0.0743	0.00171	.125	58.0	10-130	L671145-02	WG695297
Acrolein	mg/l	0.135	0.0	.125	110.	10-200	L671145-02	WG695297
Acrylonitrile	mg/l	0.156	0.0	.125	120.	49.4-133	L671145-02	WG695297

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
		Matrix Spike						
Benzene	mg/l	0.0263	0.0	.025	100.	54.3-133	L671145-02	WG695297
Bromobenzene	mg/l	0.0269	0.0	.025	110.	63.9-124	L671145-02	WG695297
Bromochloromethane	mg/l	0.0278	0.0	.025	110.	66.5-122	L671145-02	WG695297
Bromodichloromethane	mg/l	0.0270	0.0	.025	110.	63.9-121	L671145-02	WG695297
Bromoform	mg/l	0.0289	0.0	.025	120.	59.5-134	L671145-02	WG695297
Bromomethane	mg/l	0.0244	0.0	.025	98.0	41.7-155	L671145-02	WG695297
Carbon tetrachloride	mg/l	0.0278	0.0	.025	110.	55.7-134	L671145-02	WG695297
Chlorobenzene	mg/l	0.0266	0.0	.025	110.	67-125	L671145-02	WG695297
Chlorodibromomethane	mg/l	0.0282	0.0	.025	110.	64.3-125	L671145-02	WG695297
Chloroethane	mg/l	0.0274	0.0	.025	110.	51.5-136	L671145-02	WG695297
Chloroform	mg/l	0.0288	0.0	.025	120.	63-129	L671145-02	WG695297
Chloromethane	mg/l	0.0357	0.0	.025	140.*	42.4-135	L671145-02	WG695297
cis-1,2-Dichloroethene	mg/l	0.0275	0.0	.025	110.	59.2-129	L671145-02	WG695297
cis-1,3-Dichloropropene	mg/l	0.0273	0.0	.025	110.	66.4-125	L671145-02	WG695297
Di-isopropyl ether	mg/l	0.0275	0.0	.025	110.	56.9-136	L671145-02	WG695297
Dibromomethane	mg/l	0.0286	0.0	.025	120.	68.2-124	L671145-02	WG695297
Dichlorodifluoromethane	mg/l	0.0282	0.0	.025	110.	40.6-144	L671145-02	WG695297
Ethyl ether	mg/l	0.0289	0.0	.025	120.	53.2-136	L671145-02	WG695297
Ethylbenzene	mg/l	0.0277	0.0	.025	110.	61.4-133	L671145-02	WG695297
Hexachloro-1,3-butadiene	mg/l	0.0247	0.0	.025	99.0	55.1-136	L671145-02	WG695297
Isopropylbenzene	mg/l	0.0295	0.0	.025	120.	66.8-141	L671145-02	WG695297
Methyl tert-butyl ether	mg/l	0.0284	0.0	.025	110.	57.7-134	L671145-02	WG695297
Methylene Chloride	mg/l	0.0250	0.0	.025	100.	58.1-122	L671145-02	WG695297
n-Butylbenzene	mg/l	0.0284	0.0	.025	110.	62.7-140	L671145-02	WG695297
n-Propylbenzene	mg/l	0.0272	0.0	.025	110.	65.9-131	L671145-02	WG695297
Naphthalene	mg/l	0.0263	0.0	.025	100.	58-135	L671145-02	WG695297
p-Isopropyltoluene	mg/l	0.0284	0.0	.025	110.	63.2-139	L671145-02	WG695297
sec-Butylbenzene	mg/l	0.0274	0.0	.025	110.	62.2-136	L671145-02	WG695297
Styrene	mg/l	0.0279	0.0	.025	110.	66.8-133	L671145-02	WG695297
tert-Butylbenzene	mg/l	0.0266	0.0	.025	110.	63.3-134	L671145-02	WG695297
Tetrachloroethene	mg/l	0.0256	0.0	.025	100.	53-139	L671145-02	WG695297
Tetrahydrofuran	mg/l	0.0298	0.0	.025	120.	40.9-145	L671145-02	WG695297
Toluene	mg/l	0.0255	0.0	.025	100.	61.4-130	L671145-02	WG695297
trans-1,2-Dichloroethene	mg/l	0.0253	0.0	.025	100.	56.5-129	L671145-02	WG695297
trans-1,3-Dichloropropene	mg/l	0.0277	0.0	.025	110.	64.1-128	L671145-02	WG695297
Trichloroethene	mg/l	0.0257	0.0	.025	100.	44.1-149	L671145-02	WG695297
Trichlorofluoromethane	mg/l	0.0282	0.0	.025	110.	49.6-145	L671145-02	WG695297
Vinyl chloride	mg/l	0.0258	0.0	.025	100.	47.8-137	L671145-02	WG695297
Xylenes, Total	mg/l	0.0803	0.0	.075	110.	63.3-131	L671145-02	WG695297
4-Bromofluorobenzene					99.90	71-126		WG695297
Dibromofluoromethane					107.0	78.3-121		WG695297
Toluene-d8					101.0	88.5-111		WG695297
Ammonia Nitrogen	mg/l	10.8	0.250	10	100.	90-110	L671002-01	WG695557
Nitrate-Nitrite	mg/l	8.65	3.90	5	95.0	90-110	L670932-01	WG695541
COD	mg/l	417.	23.0	400	98.0	90-110	L670932-02	WG695347
COD	mg/l	391.	0.0	400	98.0	90-110	L670993-02	WG695555

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
		Matrix Spike Duplicate							
Phosphate,Ortho	mg/l	0.582	0.552	101.	80-120	5.29	20	L670967-05	WG694808

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Nitrate	mg/l	4.85	4.81	97.0	80-120	0.828	20	L670956-02	WG694641
Nitrite	mg/l	5.05	5.02	101.	80-120	0.596	20	L670956-02	WG694641
Chloride	mg/l	348.	352.	63.2*	80-120	1.14	20	L670956-02	WG694641
Sulfate	mg/l	426.	431.	62.4*	80-120	1.17	20	L670956-02	WG694641
Bromide	mg/l	47.8	47.5	95.6	80-120	0.630	20	L670973-02	WG694677
Chloride	mg/l	54.9	54.7	100.	80-120	0.365	20	L670973-02	WG694677
Fluoride	mg/l	5.05	5.01	101.	80-120	0.795	20	L670973-02	WG694677
Nitrate	mg/l	4.91	4.89	98.2	80-120	0.408	20	L670973-02	WG694677
Nitrite	mg/l	5.12	5.09	102.	80-120	0.588	20	L670973-02	WG694677
Sulfate	mg/l	64.3	63.9	96.6	80-120	0.624	20	L670973-02	WG694677
Aluminum	mg/l	1.21	1.28	113.	75-125	6.00	20	L670937-01	WG694739
Calcium	mg/l	61.7	61.2	112.	75-125	1.00	20	L670937-01	WG694739
Magnesium	mg/l	62.8	62.4	143.*	75-125	1.00	20	L670937-01	WG694739
Manganese	mg/l	1.14	1.14	107.	75-125	0.0	20	L670937-01	WG694739
Potassium	mg/l	12.1	12.1	104.	75-125	0.0	20	L670937-01	WG694739
Sodium	mg/l	20.2	20.2	108.	75-125	0.0	20	L670937-01	WG694739
1,1,1,2-Tetrachloroethane	mg/l	0.0236	0.0253	94.6	64-128	6.95	20	L670967-01	WG695096
1,1,1-Trichloroethane	mg/l	0.0258	0.0271	103.	58.7-134	4.93	20	L670967-01	WG695096
1,1,2,2-Tetrachloroethane	mg/l	0.0258	0.0267	103.	56-132	3.56	22.2	L670967-01	WG695096
1,1,2-Trichloroethane	mg/l	0.0238	0.0253	95.2	66.3-125	6.00	20	L670967-01	WG695096
1,1,2-Trichlorotrifluoroethane	mg/l	0.0285	0.0301	114.	54.8-154	5.53	22.5	L670967-01	WG695096
1,1-Dichloroethane	mg/l	0.0256	0.0272	102.	58.5-132	5.90	20	L670967-01	WG695096
1,1-Dichloroethene	mg/l	0.0290	0.0302	116.	51.1-140	3.88	20.2	L670967-01	WG695096
1,1-Dichloropropene	mg/l	0.0256	0.0274	102.	57.3-136	6.92	20	L670967-01	WG695096
1,2,3-Trichlorobenzene	mg/l	0.0259	0.0266	104.	59.1-138	2.76	23.7	L670967-01	WG695096
1,2,3-Trichloropropane	mg/l	0.0254	0.0268	102.	61.4-128	5.63	22.4	L670967-01	WG695096
1,2,3-Trimethylbenzene	mg/l	0.0211	0.0221	84.4	61.3-122	4.73	20	L670967-01	WG695096
1,2,4-Trichlorobenzene	mg/l	0.0267	0.0276	107.	63.6-143	3.39	21.9	L670967-01	WG695096
1,2,4-Trimethylbenzene	mg/l	0.0240	0.0263	96.2	57.4-137	8.82	20	L670967-01	WG695096
1,2-Dibromo-3-Chloropropane	mg/l	0.0255	0.0254	102.	57.3-136	0.500	27	L670967-01	WG695096
1,2-Dibromoethane	mg/l	0.0247	0.0256	98.6	67.1-125	3.77	20	L670967-01	WG695096
1,2-Dichlorobenzene	mg/l	0.0241	0.0252	96.4	68.2-123	4.30	20	L670967-01	WG695096
1,2-Dichloroethane	mg/l	0.0274	0.0286	110.	60-126	4.24	20	L670967-01	WG695096
1,2-Dichloropropane	mg/l	0.0254	0.0265	101.	64.2-123	4.27	20	L670967-01	WG695096
1,3,5-Trimethylbenzene	mg/l	0.0236	0.0262	94.3	63.6-132	10.4	20.5	L670967-01	WG695096
1,3-Dichlorobenzene	mg/l	0.0236	0.0258	94.6	63.1-131	8.54	20	L670967-01	WG695096
1,3-Dichloropropane	mg/l	0.0236	0.0250	94.6	67.9-121	5.58	20	L670967-01	WG695096
1,4-Dichlorobenzene	mg/l	0.0245	0.0256	98.0	68.6-123	4.34	20	L670967-01	WG695096
2,2-Dichloropropane	mg/l	0.0268	0.0286	107.	50.5-144	6.52	21.9	L670967-01	WG695096
2-Butanone (MEK)	mg/l	0.126	0.104	101.	22.4-138	19.8	27	L670967-01	WG695096
2-Chloroethyl vinyl ether	mg/l	0.0104	0.0459	8.30*	10-155	126.*	20	L670967-01	WG695096
2-Chlorotoluene	mg/l	0.0233	0.0253	93.0	63.6-128	8.32	20	L670967-01	WG695096
2-Hexanone	mg/l	0.122	0.120	97.5	43.3-137	1.20	25.5	L670967-01	WG695096
4-Chlorotoluene	mg/l	0.0238	0.0264	95.4	65.7-127	10.2	20	L670967-01	WG695096
4-Methyl-2-pentanone (MIBK)	mg/l	0.150	0.145	120.	60.8-140	3.17	25.1	L670967-01	WG695096
Acetone	mg/l	0.0724	0.0707	56.4	10-130	2.40	27.9	L670967-01	WG695096
Acrolein	mg/l	0.129	0.128	103.	10-200	0.920	27.7	L670967-01	WG695096
Acrylonitrile	mg/l	0.147	0.145	118.	49.4-133	1.39	25.3	L670967-01	WG695096
Benzene	mg/l	0.0247	0.0264	99.0	54.3-133	6.46	20	L670967-01	WG695096
Bromobenzene	mg/l	0.0238	0.0258	95.3	63.9-124	7.82	20	L670967-01	WG695096
Bromochloromethane	mg/l	0.0260	0.0275	104.	66.5-122	5.66	20.8	L670967-01	WG695096
Bromodichloromethane	mg/l	0.0247	0.0259	98.9	63.9-121	4.78	20	L670967-01	WG695096
Bromoform	mg/l	0.0252	0.0268	101.	59.5-134	6.25	20.5	L670967-01	WG695096

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December 06, 2013

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Bromomethane	mg/l	0.0245	0.0269	97.9	41.7-155	9.60	21.9	L670967-01	WG695096
Carbon tetrachloride	mg/l	0.0263	0.0273	105.	55.7-134	3.54	20	L670967-01	WG695096
Chlorobenzene	mg/l	0.0236	0.0256	94.4	67-125	7.92	20	L670967-01	WG695096
Chlorodibromomethane	mg/l	0.0242	0.0253	96.9	64.3-125	4.17	20.8	L670967-01	WG695096
Chloroethane	mg/l	0.0271	0.0287	108.	51.5-136	5.53	40	L670967-01	WG695096
Chloroform	mg/l	0.0260	0.0276	104.	63-129	5.78	20	L670967-01	WG695096
Chloromethane	mg/l	0.0357	0.0391	143.*	42.4-135	9.26	20	L670967-01	WG695096
cis-1,2-Dichloroethene	mg/l	0.0259	0.0275	104.	59.2-129	6.13	20	L670967-01	WG695096
cis-1,3-Dichloropropene	mg/l	0.0256	0.0275	102.	66.4-125	6.95	20	L670967-01	WG695096
Di-isopropyl ether	mg/l	0.0250	0.0263	100.	56.9-136	5.06	20	L670967-01	WG695096
Dibromomethane	mg/l	0.0275	0.0280	110.	68.2-124	1.97	20	L670967-01	WG695096
Dichlorodifluoromethane	mg/l	0.0259	0.0274	103.	40.6-144	5.88	20.2	L670967-01	WG695096
Ethyl ether	mg/l	0.0284	0.0293	114.	53.2-136	3.04	20	L670967-01	WG695096
Ethylbenzene	mg/l	0.0245	0.0262	98.0	61.4-133	6.83	20	L670967-01	WG695096
Hexachloro-1,3-butadiene	mg/l	0.0229	0.0239	91.5	55.1-136	4.58	23.6	L670967-01	WG695096
Isopropylbenzene	mg/l	0.0257	0.0281	103.	66.8-141	9.04	20	L670967-01	WG695096
Methyl tert-butyl ether	mg/l	0.0264	0.0272	106.	57.7-134	3.11	20	L670967-01	WG695096
Methylene Chloride	mg/l	0.0231	0.0245	92.5	58.1-122	5.66	20	L670967-01	WG695096
n-Butylbenzene	mg/l	0.0262	0.0277	105.	62.7-140	5.79	20.3	L670967-01	WG695096
n-Propylbenzene	mg/l	0.0242	0.0265	96.8	65.9-131	9.20	20	L670967-01	WG695096
Naphthalene	mg/l	0.0248	0.0246	99.4	58-135	0.810	25.5	L670967-01	WG695096
p-Isopropyltoluene	mg/l	0.0252	0.0274	101.	63.2-139	8.52	20.4	L670967-01	WG695096
sec-Butylbenzene	mg/l	0.0240	0.0264	96.1	62.2-136	9.31	20.3	L670967-01	WG695096
Styrene	mg/l	0.0246	0.0258	98.2	66.8-133	4.85	20	L670967-01	WG695096
tert-Butylbenzene	mg/l	0.0233	0.0254	93.2	63.3-134	8.74	21	L670967-01	WG695096
Tetrachloroethene	mg/l	0.0229	0.0252	91.7	53-139	9.35	20	L670967-01	WG695096
Tetrahydrofuran	mg/l	0.0298	0.0279	119.	40.9-145	6.59	27.3	L670967-01	WG695096
Toluene	mg/l	0.0242	0.0256	96.6	61.4-130	5.74	20	L670967-01	WG695096
trans-1,2-Dichloroethene	mg/l	0.0245	0.0263	98.2	56.5-129	6.75	20	L670967-01	WG695096
trans-1,3-Dichloropropene	mg/l	0.0262	0.0267	105.	64.1-128	2.13	20	L670967-01	WG695096
Trichloroethene	mg/l	0.0247	0.0261	98.6	44.1-149	5.87	20	L670967-01	WG695096
Trichlorofluoromethane	mg/l	0.0273	0.0287	109.	49.6-145	5.10	21.2	L670967-01	WG695096
Vinyl chloride	mg/l	0.0255	0.0264	102.	47.8-137	3.42	20	L670967-01	WG695096
Xylenes, Total	mg/l	0.0707	0.0774	94.2	63.3-131	9.15	20	L670967-01	WG695096
4-Bromofluorobenzene				96.80	71-126				WG695096
Dibromofluoromethane				106.0	78.3-121				WG695096
Toluene-d8				101.0	88.5-111				WG695096
Phosphorus,Total	mg/l	2.69	2.74	96.0	90-110	1.84	20	L670874-06	WG695202
1,1,1,2-Tetrachloroethane	mg/l	0.0260	0.0271	104.	64-128	4.01	20	L671145-02	WG695297
1,1,1-Trichloroethane	mg/l	0.0267	0.0276	107.	58.7-134	3.49	20	L671145-02	WG695297
1,1,2,2-Tetrachloroethane	mg/l	0.0284	0.0290	114.	56-132	2.00	22.2	L671145-02	WG695297
1,1,2-Trichloroethane	mg/l	0.0267	0.0270	107.	66.3-125	1.26	20	L671145-02	WG695297
1,1,2-Trichlorotrifluoroethane	mg/l	0.0285	0.0293	114.	54.8-154	2.81	22.5	L671145-02	WG695297
1,1-Dichloroethane	mg/l	0.0274	0.0278	110.	58.5-132	1.21	20	L671145-02	WG695297
1,1-Dichloroethene	mg/l	0.0281	0.0290	112.	51.1-140	3.29	20.2	L671145-02	WG695297
1,1-Dichloropropene	mg/l	0.0260	0.0275	104.	57.3-136	5.53	20	L671145-02	WG695297
1,2,3-Trichlorobenzene	mg/l	0.0280	0.0274	112.	59.1-138	2.47	23.7	L671145-02	WG695297
1,2,3-Trichloropropane	mg/l	0.0279	0.0283	112.	61.4-128	1.28	22.4	L671145-02	WG695297
1,2,3-Trimethylbenzene	mg/l	0.0229	0.0232	91.6	61.3-122	1.45	20	L671145-02	WG695297
1,2,4-Trichlorobenzene	mg/l	0.0282	0.0288	113.	63.6-143	2.20	21.9	L671145-02	WG695297
1,2,4-Trimethylbenzene	mg/l	0.0260	0.0270	104.	57.4-137	4.07	20	L671145-02	WG695297
1,2-Dibromo-3-Chloropropane	mg/l	0.0284	0.0276	113.	57.3-136	2.64	27	L671145-02	WG695297
1,2-Dibromoethane	mg/l	0.0265	0.0279	106.	67.1-125	5.06	20	L671145-02	WG695297
1,2-Dichlorobenzene	mg/l	0.0261	0.0263	104.	68.2-123	0.740	20	L671145-02	WG695297
1,2-Dichloroethane	mg/l	0.0286	0.0290	114.	60-126	1.21	20	L671145-02	WG695297

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Quality Assurance Report
Level II

L670967

December 06, 2013

Analyte	Units	MSD	Matrix Spike Duplicate Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
1,2-Dichloropropane	mg/l	0.0263	0.0271	105.	64.2-123	3.17	20	L671145-02	WG695297
1,3,5-Trimethylbenzene	mg/l	0.0258	0.0272	103.	63.6-132	5.06	20.5	L671145-02	WG695297
1,3-Dichlorobenzene	mg/l	0.0253	0.0264	101.	63.1-131	4.25	20	L671145-02	WG695297
1,3-Dichloropropane	mg/l	0.0261	0.0272	104.	67.9-121	4.11	20	L671145-02	WG695297
1,4-Dichlorobenzene	mg/l	0.0258	0.0263	103.	68.6-123	1.59	20	L671145-02	WG695297
2,2-Dichloropropane	mg/l	0.0281	0.0291	112.	50.5-144	3.42	21.9	L671145-02	WG695297
2-Butanone (MEK)	mg/l	0.110	0.109	87.7	22.4-138	0.890	27	L671145-02	WG695297
2-Chloroethyl vinyl ether	mg/l	0.00407	0.00387	3.26*	10-155	4.99	20	L671145-02	WG695297
2-Chlorotoluene	mg/l	0.0252	0.0271	101.	63.6-128	7.22	20	L671145-02	WG695297
2-Hexanone	mg/l	0.133	0.135	106.	43.3-137	1.79	25.5	L671145-02	WG695297
4-Chlorotoluene	mg/l	0.0259	0.0270	104.	65.7-127	4.33	20	L671145-02	WG695297
4-Methyl-2-pentanone (MIBK)	mg/l	0.154	0.154	123.	60.8-140	0.460	25.1	L671145-02	WG695297
Acetone	mg/l	0.0754	0.0743	58.9	10-130	1.47	27.9	L671145-02	WG695297
Acrolein	mg/l	0.137	0.135	109.	10-200	1.01	27.7	L671145-02	WG695297
Acrylonitrile	mg/l	0.157	0.156	126.	49.4-133	1.04	25.3	L671145-02	WG695297
Benzene	mg/l	0.0256	0.0263	102.	54.3-133	2.88	20	L671145-02	WG695297
Bromobenzene	mg/l	0.0256	0.0269	102.	63.9-124	5.06	20	L671145-02	WG695297
Bromochloromethane	mg/l	0.0272	0.0278	109.	66.5-122	2.15	20.8	L671145-02	WG695297
Bromodichloromethane	mg/l	0.0255	0.0270	102.	63.9-121	5.61	20	L671145-02	WG695297
Bromoform	mg/l	0.0280	0.0289	112.	59.5-134	3.33	20.5	L671145-02	WG695297
Bromomethane	mg/l	0.0222	0.0244	89.0	41.7-155	9.44	21.9	L671145-02	WG695297
Carbon tetrachloride	mg/l	0.0273	0.0278	109.	55.7-134	1.77	20	L671145-02	WG695297
Chlorobenzene	mg/l	0.0253	0.0266	101.	67-125	4.93	20	L671145-02	WG695297
Chlorodibromomethane	mg/l	0.0267	0.0282	107.	64.3-125	5.73	20.8	L671145-02	WG695297
Chloroethane	mg/l	0.0268	0.0274	107.	51.5-136	2.03	40	L671145-02	WG695297
Chloroform	mg/l	0.0280	0.0288	112.	63-129	3.00	20	L671145-02	WG695297
Chloromethane	mg/l	0.0348	0.0357	139.*	42.4-135	2.48	20	L671145-02	WG695297
cis-1,2-Dichloroethene	mg/l	0.0265	0.0275	106.	59.2-129	3.79	20	L671145-02	WG695297
cis-1,3-Dichloropropene	mg/l	0.0260	0.0273	104.	66.4-125	5.15	20	L671145-02	WG695297
Di-isopropyl ether	mg/l	0.0269	0.0275	108.	56.9-136	2.07	20	L671145-02	WG695297
Dibromomethane	mg/l	0.0280	0.0286	112.	68.2-124	2.14	20	L671145-02	WG695297
Dichlorodifluoromethane	mg/l	0.0266	0.0282	106.	40.6-144	5.76	20.2	L671145-02	WG695297
Ethyl ether	mg/l	0.0285	0.0289	114.	53.2-136	1.24	20	L671145-02	WG695297
Ethylbenzene	mg/l	0.0262	0.0277	105.	61.4-133	5.75	20	L671145-02	WG695297
Hexachloro-1,3-butadiene	mg/l	0.0241	0.0247	96.5	55.1-136	2.25	23.6	L671145-02	WG695297
Isopropylbenzene	mg/l	0.0281	0.0295	112.	66.8-141	4.99	20	L671145-02	WG695297
Methyl tert-butyl ether	mg/l	0.0280	0.0284	112.	57.7-134	1.63	20	L671145-02	WG695297
Methylene Chloride	mg/l	0.0244	0.0250	97.5	58.1-122	2.51	20	L671145-02	WG695297
n-Butylbenzene	mg/l	0.0279	0.0284	112.	62.7-140	1.59	20.3	L671145-02	WG695297
n-Propylbenzene	mg/l	0.0259	0.0272	104.	65.9-131	4.81	20	L671145-02	WG695297
Naphthalene	mg/l	0.0272	0.0263	109.	58-135	3.58	25.5	L671145-02	WG695297
p-Isopropyltoluene	mg/l	0.0270	0.0284	108.	63.2-139	5.23	20.4	L671145-02	WG695297
sec-Butylbenzene	mg/l	0.0262	0.0274	105.	62.2-136	4.53	20.3	L671145-02	WG695297
Styrene	mg/l	0.0261	0.0279	104.	66.8-133	6.76	20	L671145-02	WG695297
tert-Butylbenzene	mg/l	0.0256	0.0266	102.	63.3-134	3.98	21	L671145-02	WG695297
Tetrachloroethene	mg/l	0.0240	0.0256	96.2	53-139	6.39	20	L671145-02	WG695297
Tetrahydrofuran	mg/l	0.0308	0.0298	123.	40.9-145	3.42	27.3	L671145-02	WG695297
Toluene	mg/l	0.0244	0.0255	97.8	61.4-130	4.03	20	L671145-02	WG695297
trans-1,2-Dichloroethene	mg/l	0.0250	0.0253	99.9	56.5-129	1.10	20	L671145-02	WG695297
trans-1,3-Dichloropropene	mg/l	0.0267	0.0277	107.	64.1-128	3.48	20	L671145-02	WG695297
Trichloroethene	mg/l	0.0245	0.0257	97.9	44.1-149	4.92	20	L671145-02	WG695297
Trichlorofluoromethane	mg/l	0.0279	0.0282	112.	49.6-145	1.25	21.2	L671145-02	WG695297
Vinyl chloride	mg/l	0.0254	0.0258	102.	47.8-137	1.74	20	L671145-02	WG695297
Xylenes, Total	mg/l	0.0764	0.0803	102.	63.3-131	4.97	20	L671145-02	WG695297
4-Bromofluorobenzene				97.60	71-126				WG695297
Dibromofluoromethane				106.0	78.3-121				WG695297
Toluene-d8				99.50	88.5-111				WG695297

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Quality Assurance Report
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Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Ammonia Nitrogen	mg/l	10.1	10.8	98.5	90-110	6.70	20	L671002-01	WG695557
Nitrate-Nitrite	mg/l	8.73	8.65	96.6	90-110	0.921	20	L670932-01	WG695541
COD	mg/l	417.	417.	98.5	90-110	0.0	5	L670932-02	WG695347
COD	mg/l	390.	391.	97.5	90-110	0.256	5	L670993-02	WG695555

Post Spike

Serial Dilution

Batch number /Run number / Sample number cross reference

WG694808: R2860640: L670967-01 02 03 04 05
WG694641: R2860663: L670967-01 02 03 04
WG694677: R2860664: L670967-05
WG694739: R2861640: L670967-01 02 03 04 05
WG695096: R2861802: L670967-01 02 03 06
WG695202: R2862560: L670967-01 02 03 04 05
WG695297: R2862723: L670967-04 05
WG695557: R2863121: L670967-01 02 03 04 05
WG695541: R2863148: L670967-01 02 03 04 05
WG695347: R2863182: L670967-01 02 03 05
WG695555: R2863400: L670967-04

* * Calculations are performed prior to rounding of reported values.
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The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

WENCK Associates - St. Paul, MN

1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Billing Information:
Accounts Payable / Melissa
1800 Pioneer Creek Center P.O. BOX 249
Maple Plain, MN 55359

Report to: Alex Martell / shane Waterman
Email To: amartell@wenck.com swaterman@wenck.com

Project Description: Afton Site Investigation
City/State Collected: Afton, MN

Phone: 651-294-4588
Fax: 651-228-1969
Client Project # 2656-03
Lab Project # WENCKSMN-AFTON

Collected by (print): Alex Martell
Site/Facility ID #
P.O. #

Collected by (signature):
Immediately Packed on Ice N ___ Y X
Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%
Date Results Needed: Std TAT
Email? ___No X__Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Metals 500mlHDPE-HNO3 L2	V8260/465 40mlAmb-HCl	WetChem 125mlHDPE-NoPres	WetChem 250mlHDPE-H2SO4 L2	WetChem 250mlHDPE-NoPres	Rem./Contaminant	Sample # (lab only)
MW-2	Grab	GW		11/26/13	0838	6	X	X	X	X	X		-01
MW-1		GW		11/26/13	1002	6	X	X	X	X	X		-02
MW-3		GW		11/26/13	1100	6	X	X	X	X	X		-03
MW-5		GW		11/26/13	1120	6	X	X	X	X	X		-04
MW-4		GW		11/26/13	1155	6	X	X	X	X	X		-05
TRIP BLANK				11/26/13	—	1		X					-06

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

5704 6070 8636

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
	11/26/13	1310	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☑ FedEx ☐ Courier ☐ _____
Temp: 3.1 °C Bottles Received: 31
Date: 11/27/13 Time: 09:30

Chain of Custody Page ___ of ___

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Mount Juliet, TN 37122
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Phone: 800-767-5859
Fax: 615-758-5859

L # L670967
Table I170
Acctnum: WENCKSMN
Template: T90608
Prelogin: P449781
TSR: 341 - John Hawkins
PB: 11-20 MG
Shipped Via: FedEx Ground

Hold #
Condition: (lab use only) M OK
COC Seal Intact: ✓ Y ___N ___NA
pH Checked: L2
NCF:

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Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Report Summary

Thursday December 05, 2013

Report Number: L671424
Samples Received: 11/09/13
Client Project: 2656-03

Description: Afton Hydrogeo Study

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: John Hawkins

John Hawkins , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

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Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671424-01

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/07/13 09:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	190	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671424-02

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/07/13 09:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	180	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671424-03

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/07/13 10:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	200	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671424-04

Site ID : Afton

Project # : 2656-03

Date Received : November 09, 2013
Description : Afton Hydrogeo Study

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/07/13 08:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	170	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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.
Reported: 12/05/13 16:09 Printed: 12/05/13 16:10

Summary of Remarks For Samples Printed
12/05/13 at 16:10:05

TSR Signing Reports: 341
R5 - Desired TAT

Sample: L671424-01 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L667762-01 run OOH per Alex Martell's instruction 12/2/13 TAH
Sample: L671424-02 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L667762-02 run OOH per Alex Martell's instruction 12/2/13 TAH
Sample: L671424-03 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L667762-03 run OOH per Alex Martell's instruction 12/2/13 TAH
Sample: L671424-04 Account: WENCKSMN Received: 11/09/13 09:00 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L667762-04 run OOH per Alex Martell's instruction 12/2/13 TAH

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Alex Martell
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Quality Assurance Report
Level II

L671424

December 05, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Alkalinity	< 20	mg/l			WG695517	12/05/13 07:55

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Alkalinity	mg/l	1000	1400	29.5*	20	L671491-01	WG695517
Alkalinity	mg/l	170.	170.	1.18	20	L671791-01	WG695517

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Alkalinity	mg/l	100	110.	110.	85-115	WG695517

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Alkalinity	mg/l	100.	110.	100.	85-115	9.52	20	WG695517

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Alkalinity	mg/l	210.	130.	100	80.0	80-120	L671597-01	WG695517

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Alkalinity	mg/l	210.	210.	80.0	80-120	0.0	20	L671597-01	WG695517

Batch number /Run number / Sample number cross reference

WG695517: R2863190: L671424-01 02 03 04

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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WENCK Associates - St. Paul, MN
Alex Martell
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Quality Assurance Report
Level II

L671424

December 05, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

WENCK Associates - St. Paul, MN

1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Billing Information:
Accounts Payable
1800 Pioneer Creek Center P.O. BOX 249
Maple Plain, MN 55359

Report to: Alex Martell / shane Waterman

Email To: amartell@wenck.com
swaterman@wenck.com

Project Description: Afton Hydrogeo Study

City/State Collected: MN

Phone: 651-395-5239
Fax: 651-228-1969

Client Project #: 2656-03

Lab Project #: WENCKSMN-2656-03

Collected by (print): Alex Martell

Site/Facility ID #: Afton

P.O. #: 2656-03

Collected by (signature):

Immediately Packed on Ice N ____ Y X

Rush? (Lab MUST Be Notified)
____ Same Day 200%
____ Next Day 100%
____ Two Day 50%
____ Three Day 25%

Date Results Needed: Std TAT

Email? ___No X__Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Chain of Custody Page 1 of 2

ESC LAB SCIENCES
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Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L667762
Tat E004 L671424
Acctnum: WENCKSMN
Template: T90097
Prelogin: P447480
TSR: 341 - John Hawkins
PB: 10-28-13
Shipped Via: FedEX Ground

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	COD NH3 PT NO2NO3 250mlHDPE-H2SO4 L1	Metals 500mlHDPE-HNO3 L2	V8260 40mlAmb-HCl	WetChem 125mlHDPE-NoPres	WetChem 250mlHDPE-H2SO4 L1	WetChem 250mlHDPE-NoPres					Rem./Contaminant	Sample # (lab only)
MW-1	Grab	GW		11/7/13	0935	6	X	X	X	X	X	X					-01	~~01~~
MW-2		GW		11/7/13	0900	6	X	X	X	X	X	X					-02	~~02~~
MW-3		GW		11/7/13	1030	6	X	X	X	X	X	X					03	~~03~~
MW-4		GW		11/8/13	0800	6	X	X	X	X	X	X					04	~~04~~
MW-5		GW		11/7/13	0955	6	X	X	X	X	X	X					05	~~05~~
Trip Blank		GW		11/8/13	—	1			X									~~06~~
		GW				3		X		X		X						
		GW				3		X		X		X						
		GW				3		X		X		X						
		GW				3		X		X		X						

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☑ FedEx ☐ Courier ☐ _____	Condition: (lab use only) OK
	11/8/2013	1000			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.4 °C Bottles Received: 31	COC Seal Intact: ____Y ____N ____NA
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 11/9/13 Time: 0900	pH Checked: L2 NCF: ~~X~~

Andy Vann

From: Alan Harvill
Sent: Monday, December 02, 2013 1:12 PM
To: Andy Vann; Login; Sample Storage
Cc: John V. Hawkins
Subject: RE: Alkalinity request L667762 and L670967
Attachments: RE: Alkalinity request L667762 and L670967

Login: Client has revised this request. They would like Total ALK instead of ALKBI and ALKCA.

MW5 from both L667762 and L670967 does not need to be relogged at all.

Please make these corrections and scan the attached email behind the COC.

Alan Harvill
Technical Service Representative
Phone: 615-773-9787
Toll Free: 1-800-767-5859 ext:9787
Email: aharvill@esclabsciences.com

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From: Andy Vann
Sent: Monday, December 02, 2013 12:54 PM
To: Alan Harvill; Login; Sample Storage
Cc: John V. Hawkins
Subject: RE: Alkalinity request L667762 and L670967

L667762 relogged to L671424
L670967 relogged to L671425

From: Alan Harvill
Sent: Monday, December 02, 2013 12:43 PM
To: Login
Cc: John V. Hawkins
Subject: FW: Alkalinity request L667762 and L670967
Importance: High

Please pull the containers and have these samples relogged for ALKBI and ALKCA.

L667762 samples run OOH per client instruction.

Please let me know if we do not have sufficient volume to run these additional analyses.

Sincerely,

Alan Harvill
Technical Service Representative
Phone: 615-773-9787
Toll Free: 1-800-767-5859 ext:9787
Email: aharvill@esclabsciences.com

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From: Alex M. Martell [mailto:amartell@wenck.com]
Sent: Monday, December 02, 2013 12:37 PM
To: Alan Harvill
Cc: Shane A. Waterman
Subject: Alkalinity request L667762 and L670967

Good afternoon, Aaron—

This is email is in reference to two sample sets, ESC #: L667762 and L670967

As we discussed on the phone, we need to run alkalinity (Bicarbonate and carbonate) on all samples (MW-1 through MW-5) for these two reports.

Please run the samples from L667762 out of hold time if there is enough volume to do so.

Can you provide a cost to run these additional parameters?

Do not hesitate to call me with any questions. Thank you,

Alex Martell
Alex Martell, EIT Geological Engineer
Wenck Associates Inc., 1802 Wooddale Drive, Suite 100, Woodbury, MN 55125
www.wenck.com | amartell@wenck.com | D 651.395.5239 | C 952.221.9669 | G 651.294.4580 |

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Est. 1970

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Report Summary

Thursday December 05, 2013

Report Number: L671425
Samples Received: 11/27/13
Client Project: 2656-03

Description: Afton Site Investigation

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: John Hawkins

John Hawkins , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671425-01

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-2

Collected By : Alex Martell
Collection Date : 11/26/13 08:38

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	180	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671425-02

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-1

Collected By : Alex Martell
Collection Date : 11/26/13 10:02

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	190	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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Reported: 12/05/13 16:09 Printed: 12/05/13 16:09

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671425-03

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-3

Collected By : Alex Martell
Collection Date : 11/26/13 11:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	190	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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.
Reported: 12/05/13 16:09 Printed: 12/05/13 16:09

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REPORT OF ANALYSIS

Alex Martell
WENCK Associates - St. Paul, MN
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125

December 05, 2013

ESC Sample # : L671425-05

Site ID :

Project # : 2656-03

Date Received : November 27, 2013
Description : Afton Site Investigation

Sample ID : MW-4

Collected By : Alex Martell
Collection Date : 11/26/13 11:55

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Alkalinity	170	20.	mg/l	2320 B-2011	12/05/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 12/05/13 16:09 Printed: 12/05/13 16:09

Summary of Remarks For Samples Printed
12/05/13 at 16:09:53

TSR Signing Reports: 341
R5 - Desired TAT

Use WENCKSM for Woodbury, MN account, Please use cooler recept form

Sample: L671425-01 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L670967-01
Sample: L671425-02 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L670967-02
Sample: L671425-03 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L670967-03
Sample: L671425-05 Account: WENCKSMN Received: 11/27/13 09:30 Due Date: 12/09/13 00:00 RPT Date: 12/05/13 16:09
Relogged from L670967-05

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

WENCK Associates - St. Paul, MN
Alex Martell
1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Quality Assurance Report
Level II

L671425

December 05, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Alkalinity	< 20	mg/l			WG695517	12/05/13 07:55

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Alkalinity	mg/l	1000	1400	29.5*	20	L671491-01	WG695517
Alkalinity	mg/l	170.	170.	1.18	20	L671791-01	WG695517

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Alkalinity	mg/l	100	110.	110.	85-115	WG695517

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Alkalinity	mg/l	100.	110.	100.	85-115	9.52	20	WG695517

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Alkalinity	mg/l	210.	130.	100	80.0	80-120	L671597-01	WG695517

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Alkalinity	mg/l	210.	210.	80.0	80-120	0.0	20	L671597-01	WG695517

Batch number /Run number / Sample number cross reference

WG695517: R2863190: L671425-01 02 03 05

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L671425

December 05, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

WENCK Associates - St. Paul, MN

1802 Wooddale Drive, Suite 100
Suite 100
Woodbury, MN 55125

Billing Information:
Accounts Payable / Melissa
1800 Pioneer Creek Center P.O. BOX 249
Maple Plain, MN 55359

Report to: Alex Martell / shane Waterman

Email To: amartell@wenck.com
swaterman@wenck.com

Project Description: Afton Site Investigation

City/State Collected: Afton, MN

Phone: 651-294-4588
Fax: 651-228-1969

Client Project #: 2656-03

Lab Project #: WENCKSMN-AFTON

Collected by (print): Alex Martell

Site/Facility ID #:

P.O. #:

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed: Std TAT

Email? ___No X__Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Metals 500mlHDPE-HNO3 ✓	V8260/465 40mlAmb-HCl	WetChem 125mlHDPE-NoPres	WetChem 250mlHDPE-H2SO4 ✓	WetChem 250mlHDPE-NoPres	Rem./Contaminant	Sample # (lab only)
MW-2	Grab	GW		11/26/13	0838	6	X	X	X	X	X	01	~~01~~
MW-1		GW		11/26/13	1002	6	X	X	X	X	X	02	~~02~~
MW-3		GW		11/26/13	1100	6	X	X	X	X	X	03	~~03~~
MW-5		GW		11/26/13	1120	6	X	X	X	X	X	04	~~04~~
MW-4		GW		11/26/13	1155	6	X	X	X	X	X	05	~~05~~
TRIP BLANK				11/26/13	—	1		X					~~06~~

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

5704 6070 8636

Hold #

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
	11/26/13	1310	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☒ FedEx ☐ Courier ☐ _____

Temp: 3.1 °C Bottles Received: 31

Date: 11/27/13 Time: 09:30

Condition: (lab use only) M

COC Seal Intact: ✓ Y ___N ___NA

pH Checked: L2

NCF:

Chain of Custody Page ___ of ___

ESC LAB SCIENCES

YOUR LAB OF CHOICE

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# ~~L670467~~

Table 1170
L671425

Acctnum: WENCKSMN
Template: T90608
Prelogin: P449781
TSR: 341 - John Hawkins
PB: 11-20 MO
Shipped Via: FedEx Ground

Andy Vann

From: Alan Harvill
Sent: Monday, December 02, 2013 1:12 PM
To: Andy Vann; Login; Sample Storage
Cc: John V. Hawkins
Subject: RE: Alkalinity request L667762 and L670967
Attachments: RE: Alkalinity request L667762 and L670967

Login: Client has revised this request. They would like Total ALK instead of ALKBI and ALKCA.

MW5 from both L667762 and L670967 does not need to be relogged at all.

Please make these corrections and scan the attached email behind the COC.

Alan Harvill
Technical Service Representative
Phone: 615-773-9787
Toll Free: 1-800-767-5859 ext:9787
Email: aharvill@esclabsciences.com

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From: Andy Vann
Sent: Monday, December 02, 2013 12:54 PM
To: Alan Harvill; Login; Sample Storage
Cc: John V. Hawkins
Subject: RE: Alkalinity request L667762 and L670967

L667762 relogged to L671424
L670967 relogged to L671425

From: Alan Harvill
Sent: Monday, December 02, 2013 12:43 PM
To: Login
Cc: John V. Hawkins
Subject: FW: Alkalinity request L667762 and L670967
Importance: High

Please pull the containers and have these samples relogged for ALKBI and ALKCA.

L667762 samples run OOH per client instruction.

Please let me know if we do not have sufficient volume to run these additional analyses.

Sincerely,

Alan Harvill
Technical Service Representative
Phone: 615-773-9787
Toll Free: 1-800-767-5859 ext:9787
Email: aharvill@esclabsciences.com

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From: Alex M. Martell [mailto:amartell@wenck.com]
Sent: Monday, December 02, 2013 12:37 PM
To: Alan Harvill
Cc: Shane A. Waterman
Subject: Alkalinity request L667762 and L670967

Good afternoon, Aaron—

This is email is in reference to two sample sets, ESC #: L667762 and L670967

As we discussed on the phone, we need to run alkalinity (Bicarbonate and carbonate) on all samples (MW-1 through MW-5) for these two reports.

Please run the samples from L667762 out of hold time if there is enough volume to do so.

Can you provide a cost to run these additional parameters?

Do not hesitate to call me with any questions. Thank you,

Alex Martell
Alex Martell, EIT Geological Engineer
Wenck Associates Inc., 1802 Wooddale Drive, Suite 100, Woodbury, MN 55125
www.wenck.com | amartell@wenck.com | D 651.395.5239 | C 952.221.9669 | G 651.294.4580 |

Appendix J

Groundwater Inorganic Analysis Report

MW-1

Water Type	Ca-HCO_3		
Dissolved Solids	383.47 mg/kg	382.44 mg/L	Calculated
Density	0.99732 g/cm^3		Calculated
Conductivity	336 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	250.27 mg/kg	249.6 mg/L	Calculated
Carbonate	250.27	249.6	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	4.95	
Cations	5.37	
% Difference	4.080	Not within ± 2%
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	383.466	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	336.000	
Calculated	467.475	
Ratio	0.719	Not within range 0.9 to 1.1

Secondary Tests

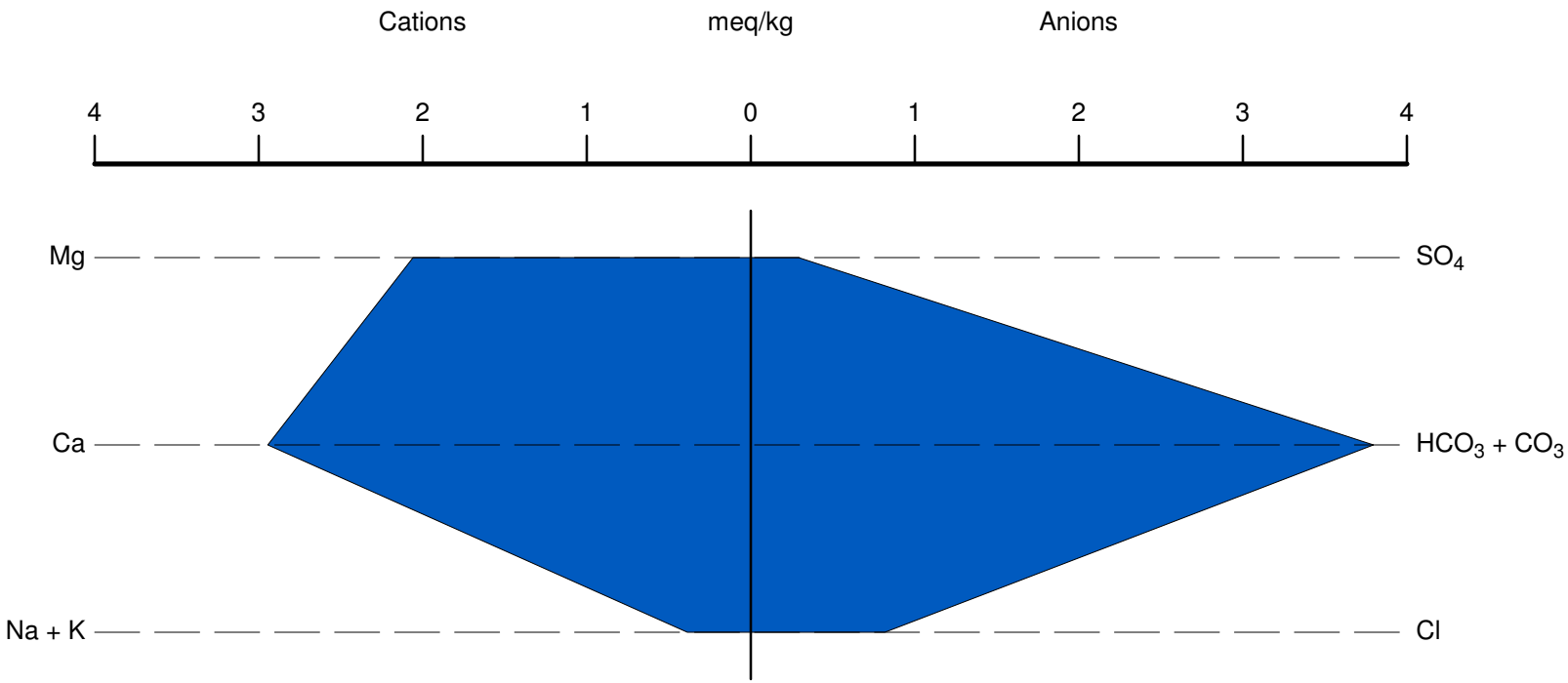
Measured EC and Ion Sums:		
Anions (0.9-1.1)	1.473568	Not within preferred range
Cations (0.9-1.1)	1.598918	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.141	Not within preferred range
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-1 11/7/2013 Stiff Diagram



MW-1

Water Type	Ca-HCO_3		
Dissolved Solids	388.54 mg/kg	387.5 mg/L	Calculated
Density	0.99732 g/cm^3		Calculated
Conductivity	391 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	266 mg/kg	265.29 mg/L	Calculated
Carbonate	266	265.29	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance

Anions	4.92	
Cations	5.74	
% Difference	7.697	Not within ± 2%

Measured TDS = Calculated TDS

Measured	N/A
Calculated	388.537
Ratio	N/A

Measured EC = Calculated EC

Measured	391.000	
Calculated	480.803	
Ratio	0.813	Not within range 0.9 to 1.1

Secondary Tests

Measured EC and Ion Sums:

Anions (0.9-1.1)	1.258276	Not within preferred range
Cations (0.9-1.1)	1.468142	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	0.994	Not within preferred range

Measured TDS to EC ratio

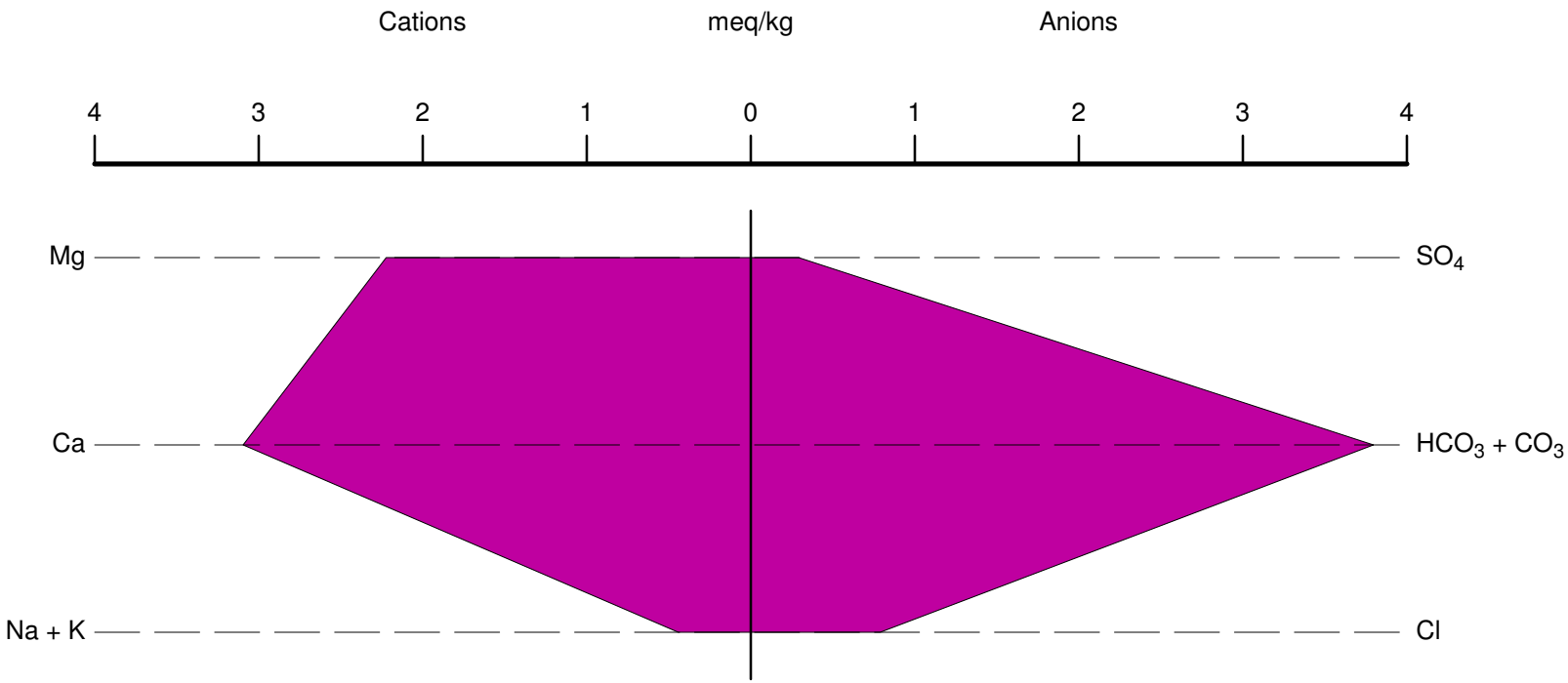
Measured TDS unavailable

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-1 11/26/2013 Stiff Diagram



MW-2

Water Type	$Ca\text{-}HCO_3$		
Dissolved Solids	339.02 mg/kg	338.1 mg/L	Calculated
Density	0.99729 g/cm^3		Calculated
Conductivity	285 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	212.95 mg/kg	212.37 mg/L	Calculated
Carbonate	212.95	212.37	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	4.46	
Cations	4.63	
% Difference	1.839	OK
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	339.018	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	285.000	
Calculated	412.439	
Ratio	0.691	Not within range 0.9 to 1.1

Secondary Tests

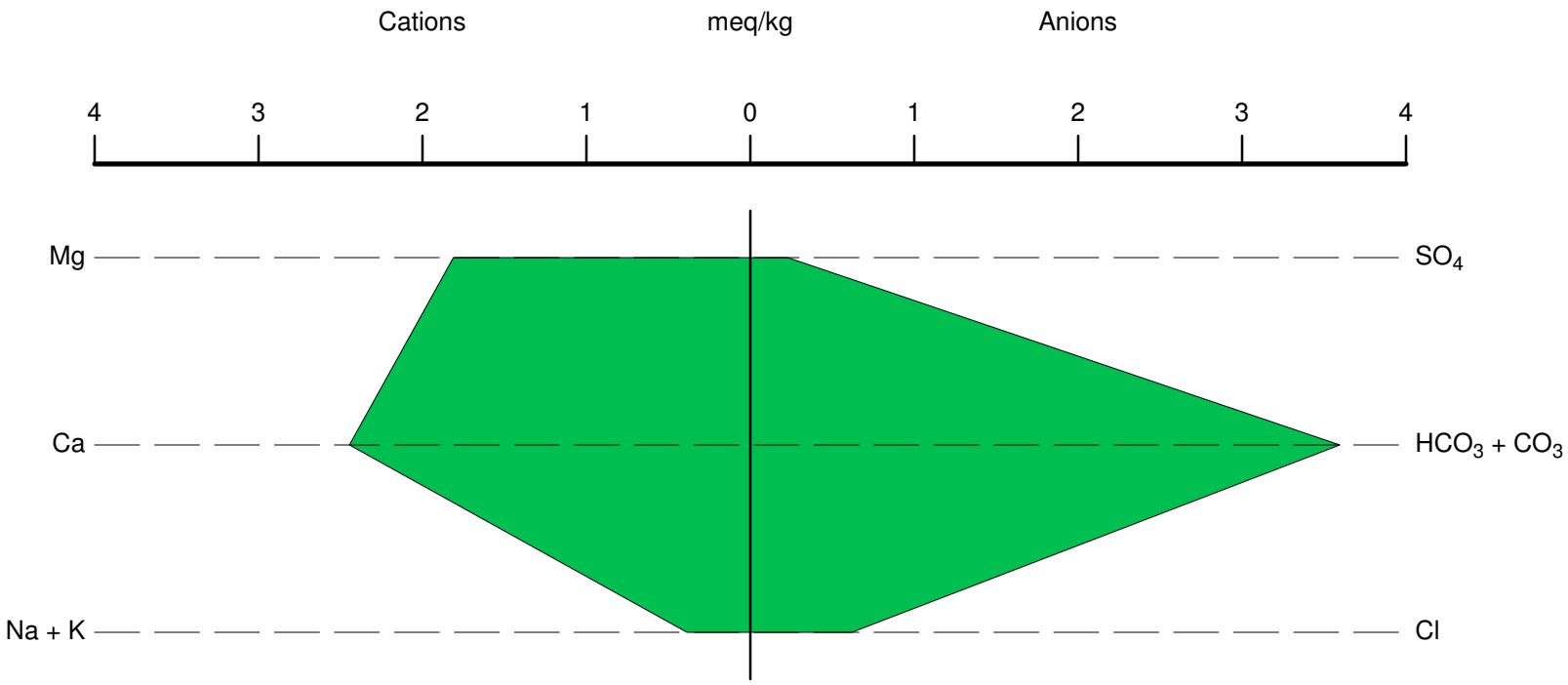
Measured EC and Ion Sums:		
Anions (0.9-1.1)	1.565728	Not within preferred range
Cations (0.9-1.1)	1.624404	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.190	Not within preferred range
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-2 11/7/2013 Stiff Diagram



MW-2

Water Type	Ca-HCO_3		
Dissolved Solids	353.56 mg/kg	352.61 mg/L	Calculated
Density	0.9973 g/cm^3		Calculated
Conductivity	335 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	262.63 mg/kg	261.92 mg/L	Calculated
Carbonate	262.63	261.92	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	4.41	
Cations	5.64	
% Difference	12.245	Not within ± 2%
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	353.565	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	335.000	
Calculated	451.751	
Ratio	0.742	Not within range 0.9 to 1.1

Secondary Tests

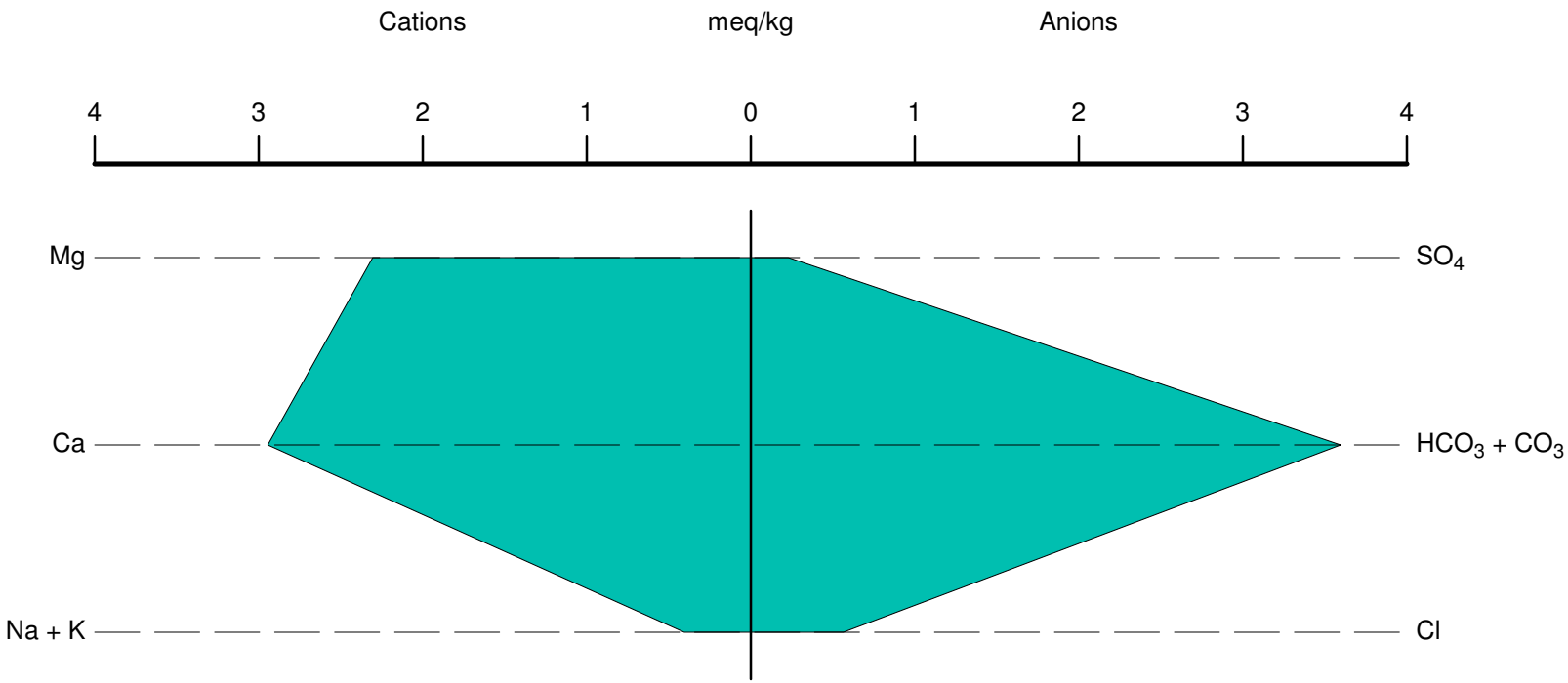
Measured EC and Ion Sums:		
Anions (0.9-1.1)	1.315739	Not within preferred range
Cations (0.9-1.1)	1.682922	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.055	Not within preferred range
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-2 11/26/2013 Stiff Diagram



MW-3

Water Type	Ca-HCO_3		
Dissolved Solids	390.93 mg/kg	389.89 mg/L	Calculated
Density	0.99733 g/cm^3		Calculated
Conductivity	317 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	278.48 mg/kg	277.74 mg/L	Calculated
Carbonate	278.48	277.74	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance

Anions	4.75	
Cations	5.91	
% Difference	10.923	Not within ± 2%

Measured TDS = Calculated TDS

Measured	N/A
Calculated	390.931
Ratio	N/A

Measured EC = Calculated EC

Measured	317.000	
Calculated	473.519	
Ratio	0.669	Not within range 0.9 to 1.1

Secondary Tests

Measured EC and Ion Sums:

Anions (0.9-1.1)	1.497103	Not within preferred range
Cations (0.9-1.1)	1.864247	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.233	Not within preferred range

Measured TDS to EC ratio

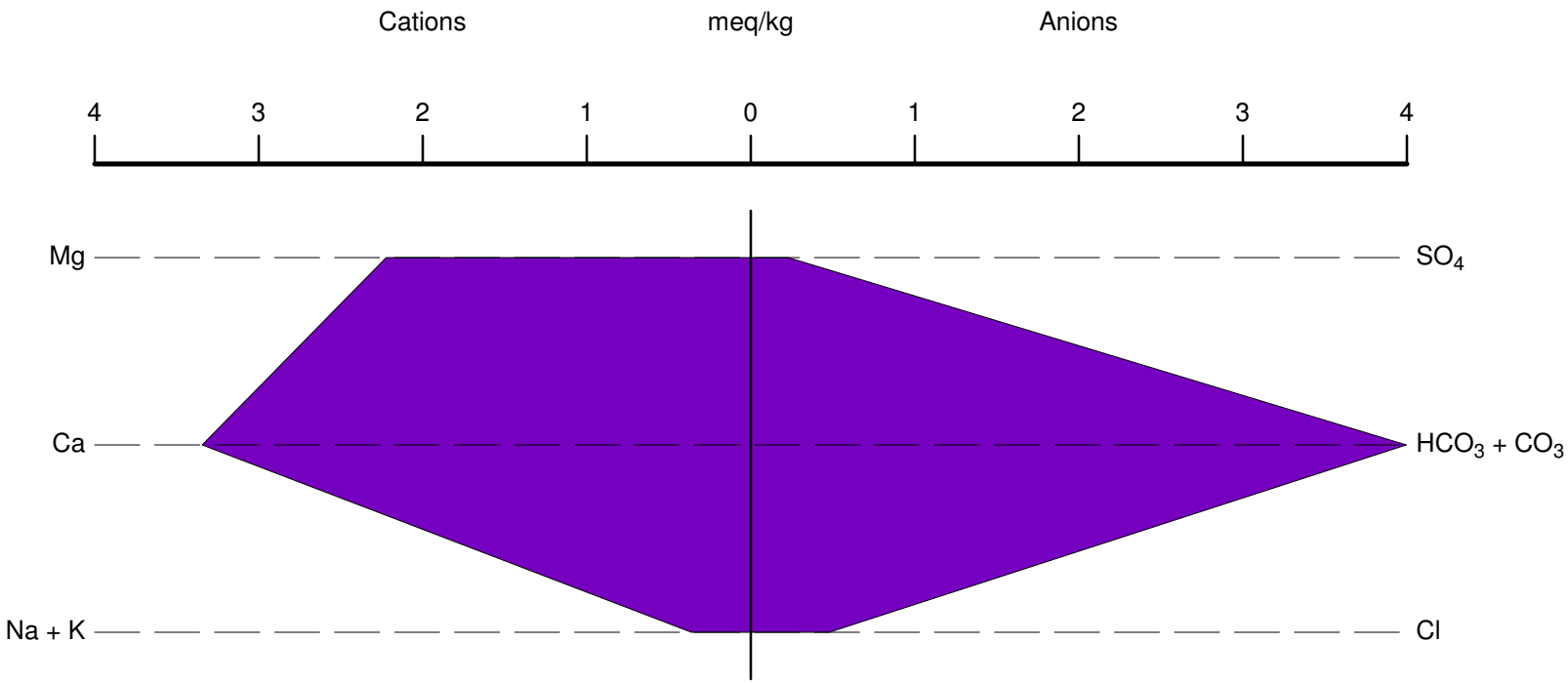
Measured TDS unavailable

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-3 11/7/2013 Stiff Diagram



MW-3

Water Type	Ca-HCO_3		
Dissolved Solids	378.33 mg/kg	377.32 mg/L	Calculated
Density	0.99732 g/cm^3		Calculated
Conductivity	363 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	282.6 mg/kg	281.84 mg/L	Calculated
Carbonate	282.6	281.84	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	4.52	
Cations	6	
% Difference	14.051	Not within ± 2%
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	378.332	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	363.000	
Calculated	468.425	
Ratio	0.775	Not within range 0.9 to 1.1

Secondary Tests

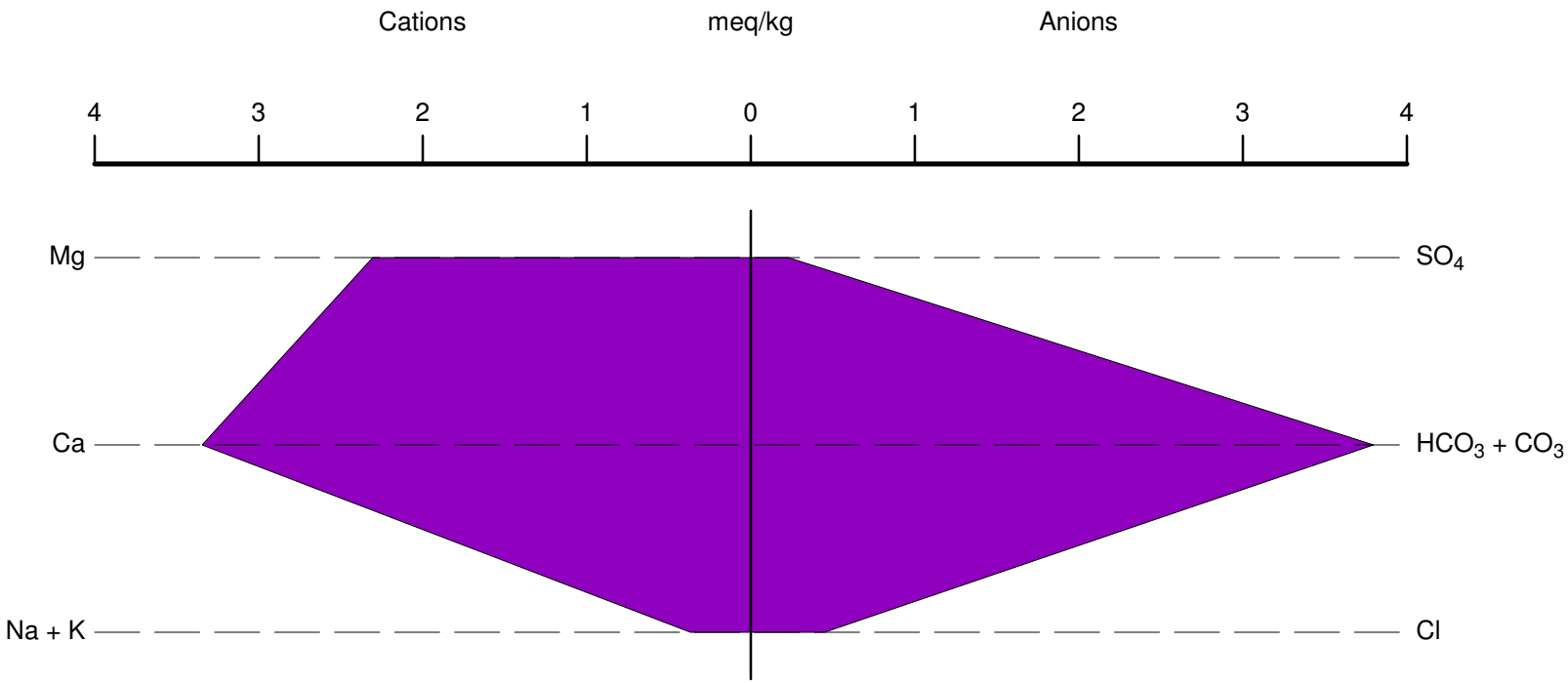
Measured EC and Ion Sums:		
Anions (0.9-1.1)	1.245168	Not within preferred range
Cations (0.9-1.1)	1.652286	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.042	Not within preferred range
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-3 11/26/2013 Stiff Diagram



MW-4

Water Type	$Ca\text{-}HCO_3$		
Dissolved Solids	330.58 mg/kg	329.68 mg/L	Calculated
Density	0.99728 g/cm^3		Calculated
Conductivity	276 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	195.6 mg/kg	195.07 mg/L	Calculated
Carbonate	195.6	195.07	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	4.04	
Cations	4.23	
% Difference	2.383	Not within ± 2%
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	330.579	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	276.000	
Calculated	373.105	
Ratio	0.740	Not within range 0.9 to 1.1

Secondary Tests

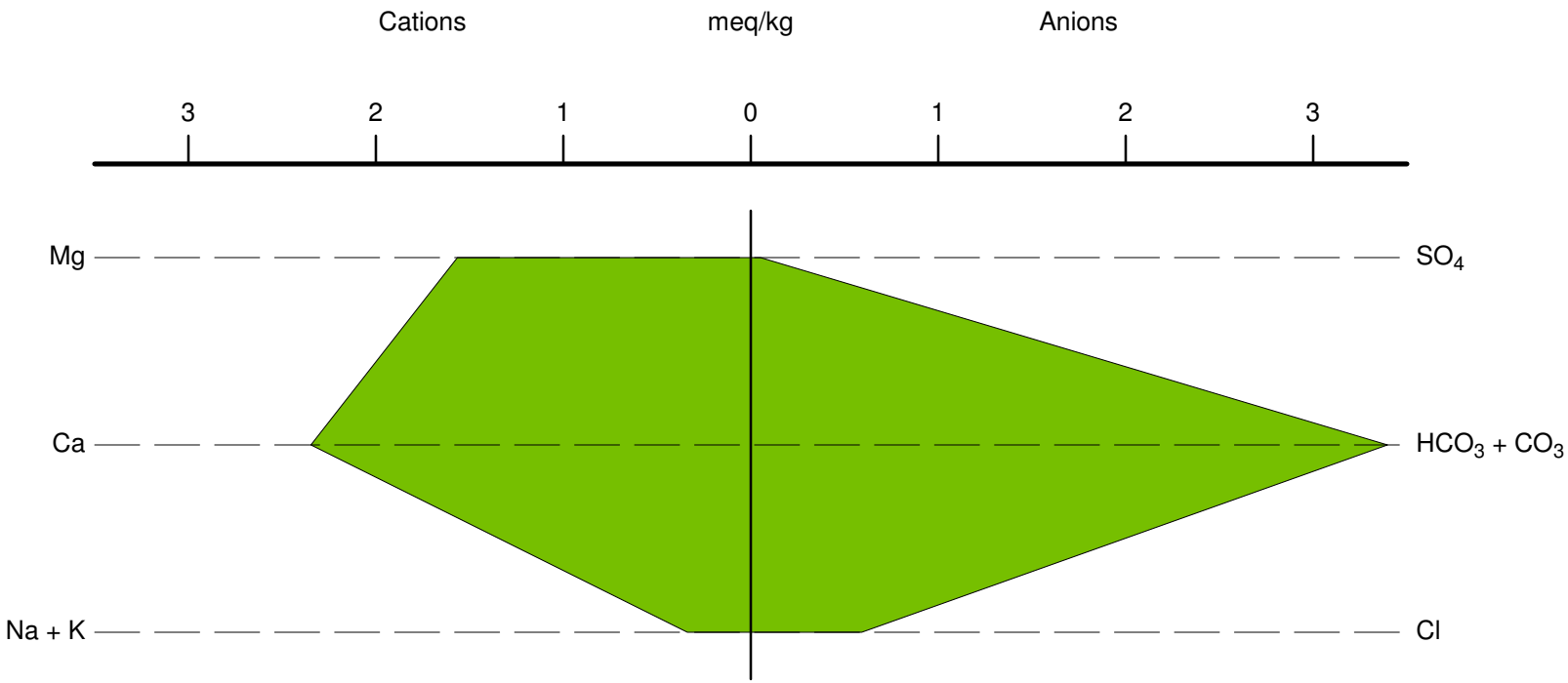
Measured EC and Ion Sums:		
Anions (0.9-1.1)	1.462673	Not within preferred range
Cations (0.9-1.1)	1.534100	Not within preferred range
Calculated TDS to EC ratio (0.55-0.7)	1.198	Not within preferred range
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

DOC ≥ Sum of Organics

DOC unavailable

MW-4 11/8/2013 Stiff Diagram



MW-4

Water Type	Ca-HCO_3		
Dissolved Solids	345.32 mg/kg	344.38 mg/L	Calculated
Density	0.99729 g/cm^3		Calculated
Conductivity	331 µmho/cm		Measured
Hardness (as $CaCO_3$)			
Total	241.91 mg/kg	241.25 mg/L	Calculated
Carbonate	241.91	241.25	
Non-Carbonate	0.0	0.0	

Primary Tests

Anion-Cation Balance		
Anions	3.99	
Cations	5.24	
% Difference	13.588	Not within ± 2%
Measured TDS = Calculated TDS		
Measured	N/A	
Calculated	345.320	
Ratio	N/A	
Measured EC = Calculated EC		
Measured	331.000	
Calculated	412.909	
Ratio	0.802	Not within range 0.9 to 1.1

Secondary Tests

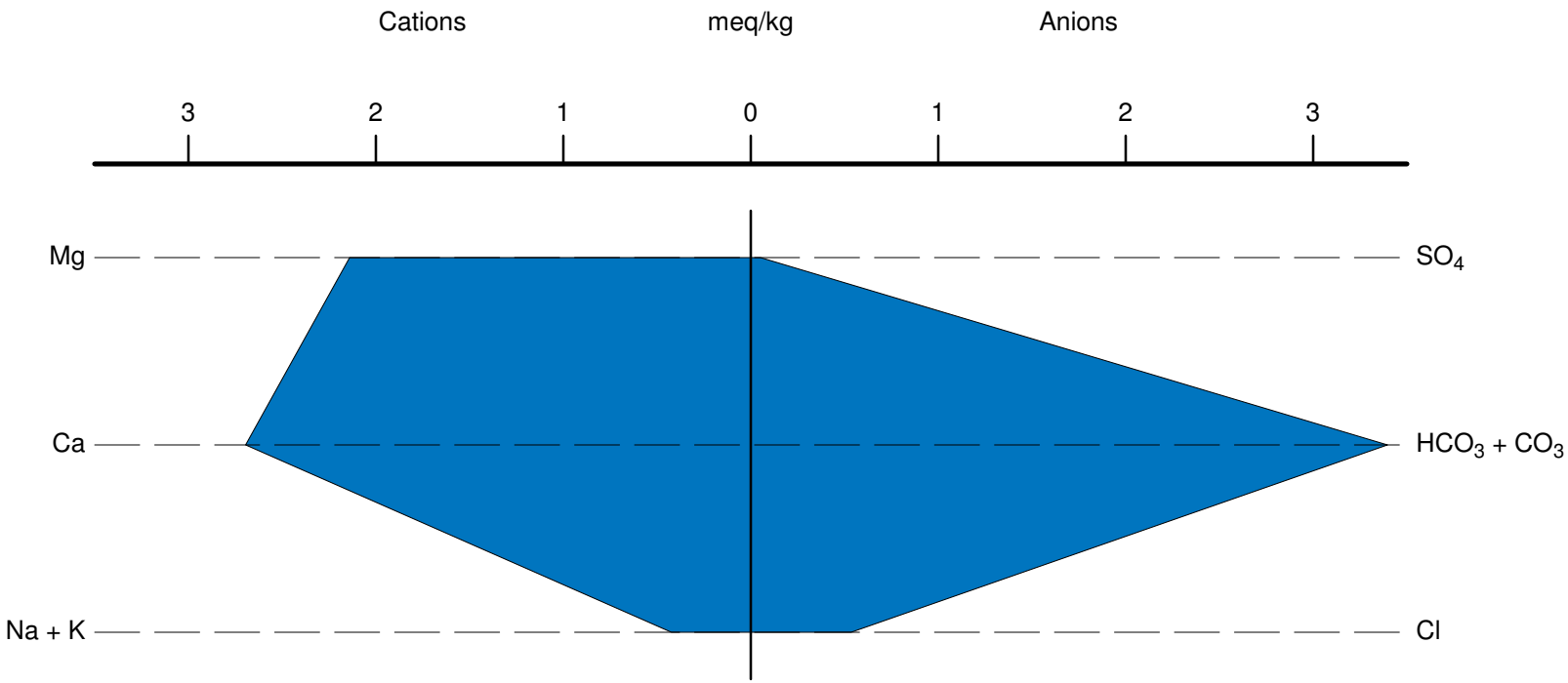
Measured EC and Ion Sums:		
Anions	1.205077	Not within preferred range (0.9-1.1)
Cations	1.584057	Not within preferred range (0.9-1.1)
Calculated TDS to EC ratio	1.043	Not within preferred range (0.55-0.7)
Measured TDS to EC ratio		
Measured TDS unavailable		

Organic Mass Balance

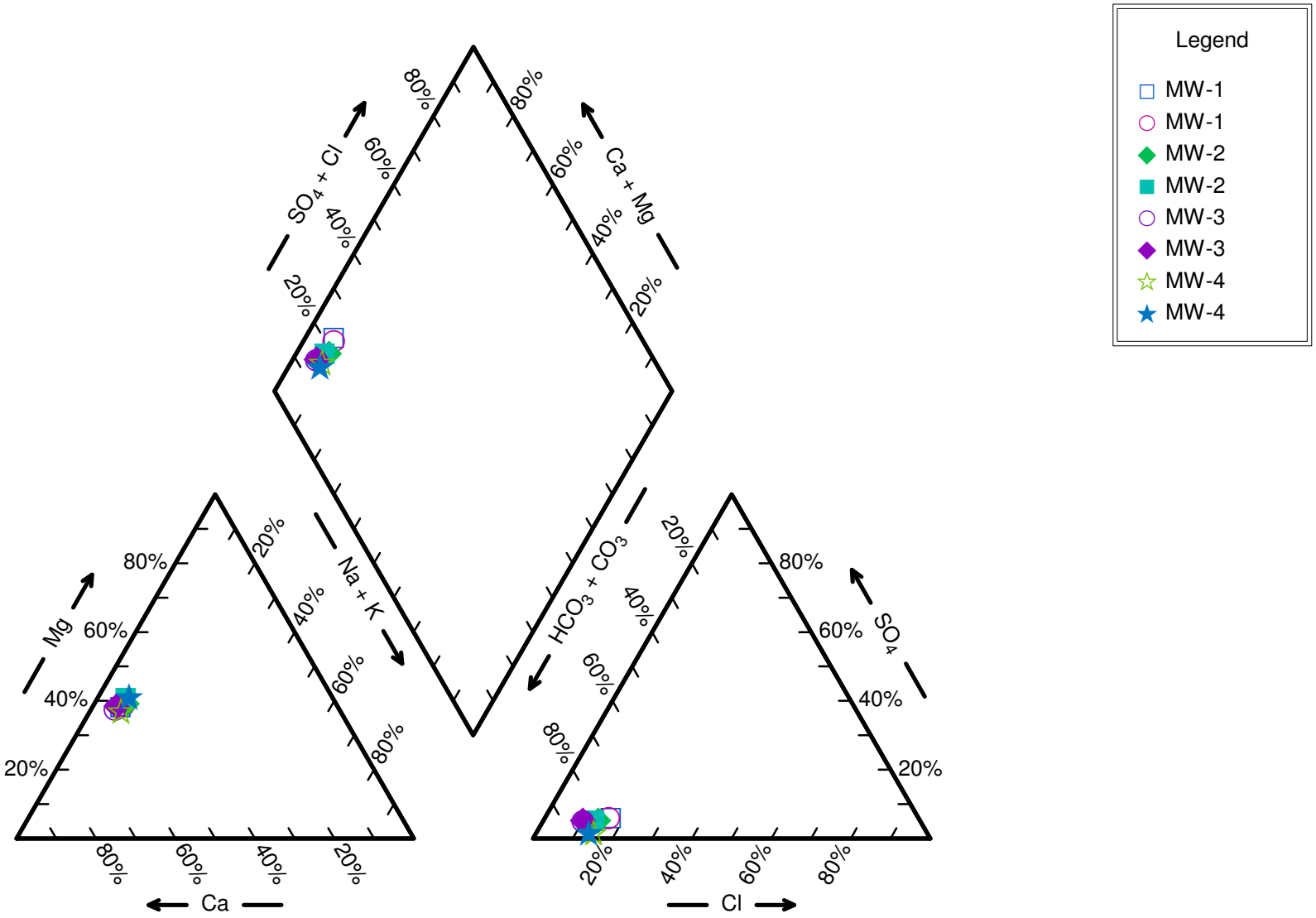
DOC ≥ Sum of Organics

DOC unavailable

MW-4 11/26/2013 Stiff Diagram



Piper Diagram



Wenck

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Business Professionals