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May 29, 2019

Mr. David Gertsch
Planning Director
Albany County
1002 South Third Street
Laramie, WY 82070

Re: Albany County Septic System Impact Assessment
Final Reports - Wenck Project – B7218-0001 WYALB101

Dear David:

Please find enclosed eight hard copies of the final report. I will also email you a searchable PDF of this final document for your use and distribution. Thank you for the opportunity to work with you on this project.

Sincerely,
WENCK ASSOCIATES

Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Encl: Final Reports
Send by: Fedex Ground

Wenck Associates, Inc. | 1800 Pioneer Creek Center | P.O. Box 249 | Maple Plain, MN 55359-0249
Toll Free 800-472-2232 Main 763-479-4200 Email wenckmp@wenck.com Web wenck.com

ALBANY COUNTY SEPTIC SYSTEM IMPACT ANALYSIS

Prepared for:

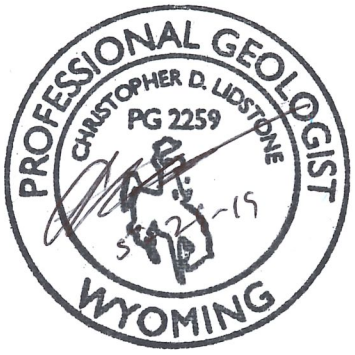
Albany County
525 Grand Avenue
Laramie, WY 82070

and

Wyoming Department of Environmental Quality
Groundwater Pollution Control Program
200 West 17th Street, 4th Floor
Cheyenne, WY 82002

Prepared by:

Wenck Associates
4025 Automation Way, Building E
Fort Collins, CO 80525



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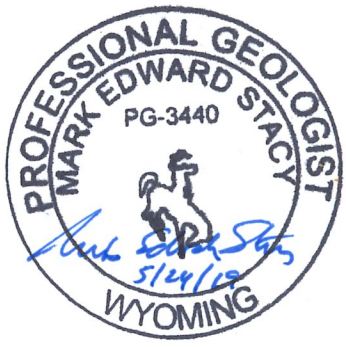

May 2019

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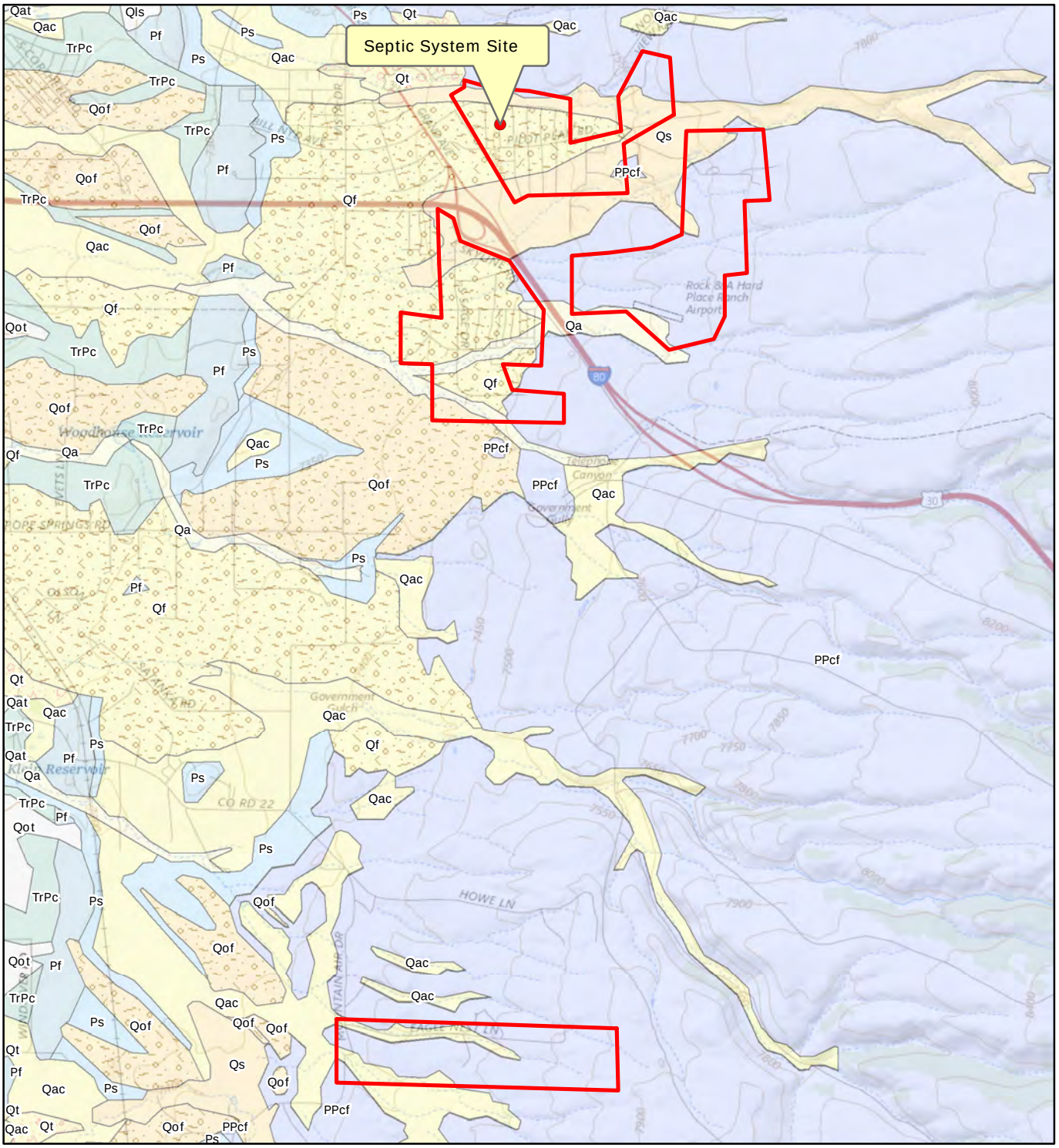
1.0 Introduction

Nitrogen exists in many other forms in our environment and changes forms as it moves through the nitrogen cycle. The main source of nitrogen in soils is from plant and animal residues but is also introduced through septic systems. When changed into nitrate, a nitrogen/oxygen ion becomes an important plant food. Nitrate is highly leachable and under certain circumstances will be leached below the plant-root zone and may reach groundwater. Although nitrogen is an essential component of protein in our bodies, excessive concentrations of nitrate in drinking water can be hazardous to health, for infants and pregnant women. The U.S. Environmental Protection Agency (EPA) has determined that levels of nitrate in drinking water should not exceed 10 parts per million or milligrams per liter (mg/L).

The principal health concern with nitrate is methemoglobinemia, sometimes referred to as "blue baby syndrome." This occurs when bacteria in the digestive system transforms nitrate to nitrite. The nitrite oxidizes iron in the hemoglobin of red blood cells to form methemoglobin, which lacks the oxygen-carrying ability of hemoglobin. The transformation of nitrate to nitrite is more likely to occur when the pH level in the digestive tract is high (low acidity), allowing bacteria levels to rise. This condition typically affects infants under six months of age because the digestive system has an underdeveloped capability to secrete gastric acid, and the bacteria count in the digestive system may rise. The condition may also be of concern for anyone with a gastrointestinal condition producing high pH or an impaired enzyme system for metabolizing methemoglobin back to hemoglobin (American Ground Water Trust, 2019).

The purpose of this report is to present the approach and results of the Septic System Impact Analysis that has been performed in the Casper Aquifer Protection Area (CAPA) for Albany County east of Laramie, Wyoming. Albany County initiated this study due to potential contamination of the Casper Aquifer from septic systems, particularly nitrate. The Casper Aquifer consists of saturated portions of the Casper Formation that crops out east of Laramie. The vadose zone consists of the unsaturated sediments and rock that overlie the aquifer. To assess the water quality conditions beneath one septic system, Wenck Associates (Wenck) installed a vadose zone monitoring network to monitor septic leach field denitrification over Casper Formation outcrop.

While analysis of several septic systems would have been preferred for this evaluation, funding for this project only allowed the completion and evaluation of one septic system within the CAPA. To that end, this investigation relied on the willingness of an existing landowner to allow monitoring of their septic system. Wenck collaborated with Albany County to identify a landowner willing to allow the installation and monitoring of this system. As shown on **Figure 1**, the monitored system is located southeast of Laramie within the Sherman Hills Estates subdivision. This was one of the subdivisions that had been identified as potentially suitable for the study. This investigation was completed in accordance with the work plan that was submitted to the Wyoming Department of Environmental Quality (DEQ) Water Quality Division in January 2018. That work plan is included as **Appendix A**.



Legend

Source: Ver Ploeg, A.J., and Boyd, C.S., 2007, Geologic map of the Laramie 30' x 60' Quadrangle, Albany and Laramie Counties, Southeastern Wyoming: Wyoming State Geological Survey, Map Series MS-77, scale 1:100,000

- Potential Subdivision Outlines
- Qa - Alluvium
- Qs - Wind-blown Deposits
- Qac - Alluvium and Colluvium
- Qf - Alluvial Fan Deposits
- Qt - Terrace Deposits
- Qof - Older Alluvial Fan Deposits
- TrPc - Chugwater Formation
- Pf - Forelle Limestone
- Ps - Satanka Shale
- PPcf - Casper and Fountain Formations

3,500 1,750 0 3,500 Feet

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ALBANY COUNTY SEPTIC SYSTEM IMPACT ANALYSIS

Geologic and Site Location Map

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APR 2019

Figure 1

Site Hydrogeology

The Casper Aquifer consists of saturated portions of the Casper Formation along the western margin of the Laramie Range east of the City of Laramie. This aquifer provides high quality drinking water to the City of Laramie. While its saturated thickness varies, the Casper Formation includes up to 800 feet of interbedded sandstone and limestone with minor siltstone and shale (Ver Ploeg and Boyd, 2007). In this portion of Albany County, the formation is made up of approximately 85% sandstone, with the remainder being composed of limestone. Groundwater is primarily stored and transmitted through the intergranular permeability of the sandstone. Various fractures and faults that cut through the sandstone and limestone sequence hydraulically connect the different rock types with the Casper Aquifer (WWC, 2006). The local geology of the Casper Formation is shown relative to the rural subdivisions southeast of Laramie on **Figure 1**.

The Casper Formation is recharged through its outcrop area shown on the east half of **Figure 1** and yields groundwater to local domestic and public supply wells. Its outcrop extends from the Wyoming state line on the south to Wyoming Highway 34 on the north, and dips about 3 to 5 degrees west into the Laramie Basin. The aquifer is principally recharged through snowmelt runoff over outcrop areas in March and April (WWC, 2015), and may receive some component of recharge from the underlying Precambrian Granite along fractures. Recharge due to these runoff events typically occurs within days to weeks indicating rapid movement through the unsaturated zone. Groundwater production from the Casper Aquifer is generally limited to 5 to 50 gallons per minute where intergranular permeability is predominant but ranges up to 2,000 gallons per minute where aquifer permeability has been enhanced by geologic structures, faults, fractures, and bedding surfaces. It is this high capacity production that renders the aquifer suitable for use by the City of Laramie at its Turner, Pope, and Soldier Springs wellfields (WWC, 2006).

As shown on **Figure 1**, the Casper Aquifer is confined by several formations as it dips westward into the Laramie Basin. These geologic formations in ascending stratigraphic order are the Satanka Shale, Forelle Limestone, and the Chugwater Formation. As a result, the Casper Aquifer responds as an unconfined aquifer through its recharge area, semi-confined where the confining units first appear, and confined where overlain by these geologic formations. Groundwater generally flows from the recharge area on the east in a westward direction into the Laramie Basin (WWC, 2006). In the vicinity of the Laramie Plains subdivision, the Satanka Shale is present and overlies the Casper. At the Sherman Hills Estates and the monitored septic system site, the Casper Formation is directly overlain by a veneer of alluvial fan deposits and soil. According to Ver Ploeg and Boyd (2007), these deposits range from 0 to 25 feet thick.

Nitrates in Groundwater

Recent water quality testing near the Turner Wellfield and East Grand subdivisions has indicated the presence of high nitrate groundwater in upgradient areas of the Casper Aquifer (WWC, 2015). Water quality data collected annually at the City of Laramie municipal wellfields since the early 1970s indicate background nitrate levels in the aquifer of 2 mg/L. Although nitrate concentrations at the wells appear stable, nitrate concentrations in upgradient areas to the east suggest the Casper Aquifer has been affected by local septic system use. In 2009, 29% of the wells sampled in the East Grand area had nitrate-nitrogen levels greater than 5 mg/L, and three of the wells had results above the 10 mg/L drinking

water standard (City of Laramie, 2009). In 2015, nitrate concentrations at some residences near Sherman Hills Estates subdivision were found to range from 7 to 9.4 mg/L (WWC, 2015). The elevated nitrate concentrations have been attributed to the high density of septic systems (City of Laramie, 2009). Groundwater generally flows to the northwest through these areas, toward City Springs, and is unobstructed by the Sherman Hills Fault Zone. Nitrate concentrations in the downgradient City's Turner Wells remain at approximately 2 mg/L but could potentially be impacted in the future.

Project Objectives

Because of the Casper Aquifer's vital role in providing water to Albany County and the City of Laramie, Wenck understands the importance of protecting the aquifer for current and future generations. The CAPA is particularly susceptible to contamination from septic systems due to the permeability characteristics of the aquifer, exposure of the Casper Formation at land surface, and thin soil cover as the formation dips westward toward the Laramie Basin.

The purpose of this study has been to evaluate how effective septic systems and the underlying strata (vadose or unsaturated zone) are in removing nitrate prior to reaching the Casper Aquifer. Our objectives for this study included the following:

1. Assess the effectiveness of a septic system and the underlying low carbon soils in removing nitrate and other associated contaminants from septic effluent prior to reaching the Casper Aquifer;

2. Identify nitrate concentrations that will exist after treatment by the septic system, leach field, and shallow soils; and,

3. Provide a specific analysis of the performance of the monitored septic facility.

Wenck has had several additional goals associated with this project. One principal goal has been to provide a portion of the data that Albany County needs to determine the appropriate density of septic systems for future development within the CAPA and further establish septic system design or modified design requirements for this area. Another goal has been to assist the City of Laramie in an effort to protect their water supply, and perhaps address the need for extension of wastewater service outside City limits.

3.0 Monitoring Network Siting and Construction

This section provides pertinent details regarding the drilling and completion of the vadose zone monitoring network. The vadose zone includes both the unsaturated unconsolidated sand/alluvial fan deposits and underlying unsaturated Casper Formation sandstone below the site. While the Casper Formation is saturated below the site, saturated conditions were not encountered during drilling for this project. The monitoring network was installed in February 2018 and sampled through December 2018. Wenck subcontracted Authentic Drilling (Authentic) of Kiowa, Colorado, to complete the drilling and completion of the monitoring network with a CME 75 drill rig.

Monitoring Network Siting

Wenck installed a vadose zone monitoring network below a septic system within the Sherman Hills Estates subdivision at the western edge of the CAPA. This site was identified through Wenck's collaboration with Albany County personnel. The selection criteria for the particular septic system included the following:

1. Located over Casper Formation outcrop or subcrop east of where the Satanka Shale is present.
2. Located east or southeast of Laramie and part of a subdivision built in this area.
3. Landowner willingness to allow access, installation, and monitoring of the system during 2018.
4. A conventional septic system built within the last 10 years if possible, for which we have detailed construction records on file with Albany County.
5. Preferably used by a family of 4 to 5 people.

In January 2018, Wenck initiated the site selection process by providing Albany County with geologic data on an area east and southeast of Laramie where suitable septic systems might be located. Based on that area, Albany County created a list of potential landowners through review of their records and contact with local residents. Wenck also contacted several residents to discuss additional possibilities and provided that information to Albany County. By late January, the potential site list included 19 different properties. Wenck reviewed and updated the list based on the physical properties of the site, the criteria listed above, and the type of septic system. Wenck's principal concerns with respect to the physical properties of the site included the soil type, soil thickness, geologic formation underlying the site, and the particular type of septic system that was installed. Sites with 10 or more feet of soil directly overlying Casper Formation outcrop were preferred, which reduced the site list to 11. Albany County then researched its septic system records and provided details for those systems. Based on the geologic and system information, Wenck recommended Albany County contact seven of the landowners to ascertain their willingness to allow installation of the monitoring network and provided an advisory letter of intent to share with residents. Two of those seven expressed interest, and ultimately, Albany County was able to obtain consent from a landowner in the Sherman Hills Estates Subdivision on February 6, 2018.

The septic system well met the site selection criteria for this project. As shown on **Figure 1**, the site is located over Casper Formation outcrop east of Laramie and is directly overlain by alluvial fan deposits. While this particular system was constructed in 1999 and is typically

used by two people, the system was built with infiltrators which are commonly used in Albany County for septic systems, had detailed permit documents, and most importantly, included a landowner willing to allow and support the study. The location of this property and the layout of the septic system and monitoring network are shown on **Figure 2**. The two septic system infiltrators are located in a vacant lot south of the house, extend approximately 75 feet, and are buried approximately 3.5 feet. The residents obtain their water supply through a 176-foot-deep Casper Aquifer well (Wyoming State Engineer's Office Permit No. U.W. 3166) that is completed at the northeast corner of their house, upgradient of the septic system. Depth to water in this well is reportedly 50 feet, but the depth at which groundwater was encountered in the Casper Aquifer is not noted on the completion report. **Appendix B** includes details on this septic system from its application, a scaled site plan, and information on the residential water well.

Test Hole Drilling

At the locations shown on **Figure 2**, two test holes, B-1 and B-2, were drilled on February 12, 2018, east of the septic system. Groundwater was not encountered in either test hole. Both of these holes were drilled outside the septic system footprint. B-1 was drilled to initially assess the subsurface conditions. B-2 was drilled to determine the thickness and composition of the soil, unconsolidated sand, and Casper Formation material; obtain samples of the unconsolidated sand and Casper Formation; and evaluate shallow groundwater conditions close to the septic system. Because groundwater was not encountered in either test hole, monitoring wells were not installed. Given the reported depth to water in the residential well, the Casper Aquifer (saturated Casper Formation) underlies the site, but the depth at which groundwater would have been encountered is uncertain. Wenck discussed the possibility of completing a monitoring well west and downgradient of the septic system to monitor nitrate concentrations in near surface groundwater, but Albany County and the City of Laramie opted not to pursue its completion. Lithologic logs of these two test holes are included in **Appendix C**.

Drilled to a depth of 34 feet, Test Hole B-1 confirmed that the Casper Formation at the site is overlain only by unconsolidated deposits. Test Hole B-2 that was drilled to a depth of 46.5 feet revealed similar conditions in greater detail closer to the septic system. Driven split spoon samples were collected at B-2 every 5 feet, but only one driven sample was collected at B-1 at a depth of 29 feet. For this reason, the depths and lithology noted for B-2 are considered most representative of the subsurface. The split spoon samples from B-2 were submitted for soils analysis and testing. At both test holes, Authentic only encountered 1 foot of poorly developed soil composed of light reddish-brown sandy silt. The underlying alluvial fan deposit extended to a depth of approximately 25 feet and was composed of either sand or sand with gravel. The sand was fine to coarse grained in texture, poorly sorted, calcareous, unconsolidated, loose, and dry to slightly moist. It did not appear to contain organic matter and appeared to be porous and permeable. Casper Formation sandstone was encountered from 25 to 46.5 feet below ground surface. This sandstone was porous and permeable to 46 feet, but at that depth, was well cemented and prevented further drilling below 46.5 feet with the CME 75 drill rig.

The geologic and soils data from the test holes were used along with vegetation conditions and the scaled septic system layout map to plan the surface location and drilling angles of the lysimeter holes, as well as the lysimeter installation depths.

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CLIENT: ALBANY COUNTY

PROJECT: SEPTIC SYSTEM IMPACT ANALYSIS

SHEET TITLE: LYSIMETER AND BOREHOLE LOCATION MAP

REV	DWN	APP	REV DATE	DWN BY	CHK'D	APP'D
				RDC	MES	

DWG DATE: 4/11/2019
SCALE: AS SHOWN

PROJECT NO.: WYALB101
SHEET NO.: FIGURE 2
REV NO.:

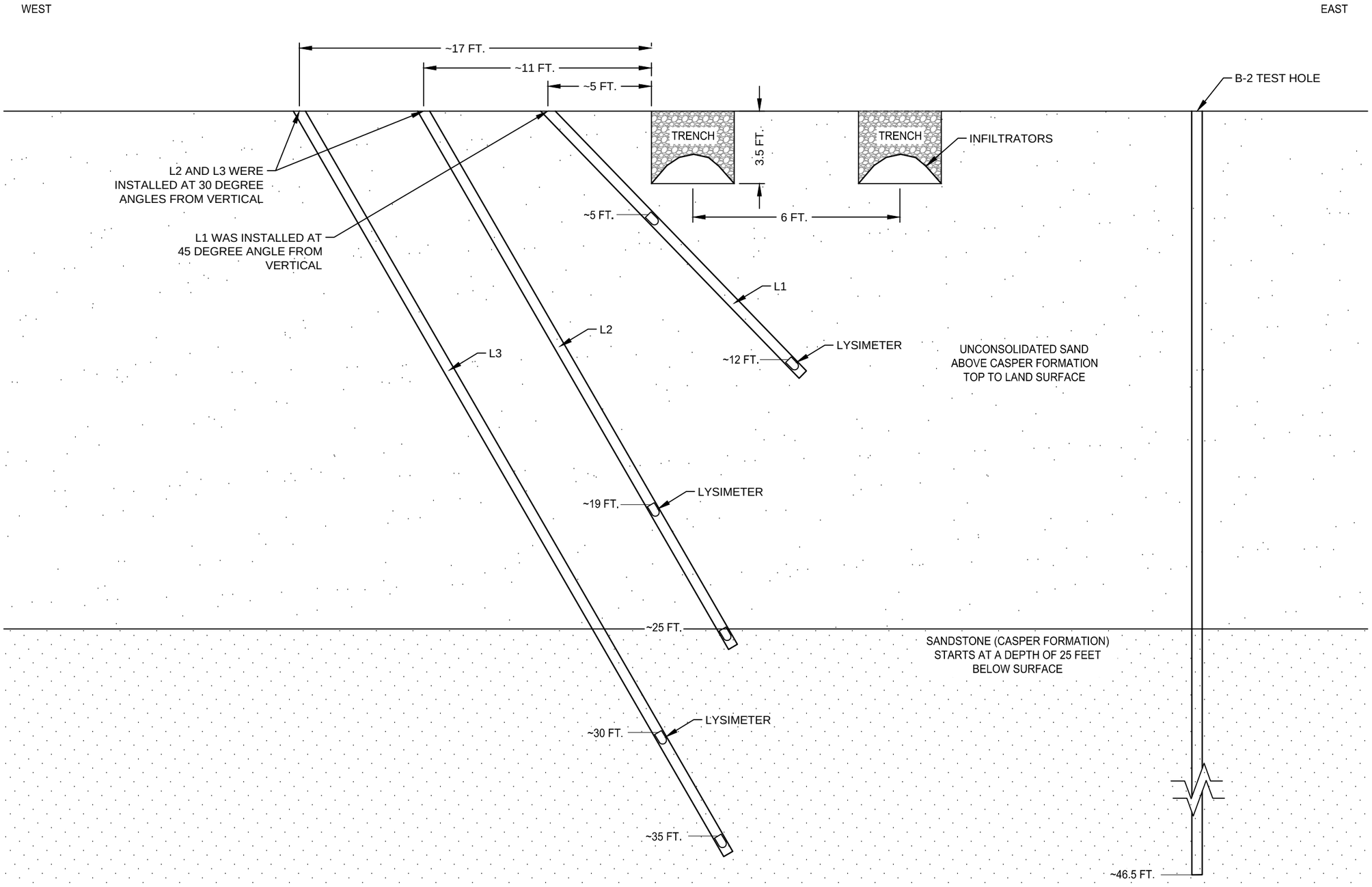
Lysimeter Drilling and Construction

Monitoring of the vadose (unsaturated) zone was an essential part of this investigation. The ability to detect contaminants as they travel through the vadose zone toward the water table is possible with the use of lysimeters. Model 1920 lysimeters from Soilmoisture Equipment Corporation were used in this study. Lysimeters are soil moisture (pore water) collection devices that are designed for installation beneath the ground surface. Each lysimeter is a closed tubular device with a porous ceramic cup at one end and is equipped with two ports on the other end: one to allow application of a vacuum or pressure, the other to allow delivery of collected water samples to the surface.

Lysimeters operate by establishing continuity between the soil pores and those on the porous ceramic cup of the lysimeter. Surrounding the lysimeter with a fine mesh silica flour enhances contact with the surrounding soil and effectively increases the operating range. An equilibrium is established between the water in the soil pores, the silica flour, and the porous ceramic cup. Application of a vacuum to the inside of the lysimeter causes the pore water to flow from the soil pores through the silica flour and porous cup into the lysimeter body. The soil pore water may then be transferred to the ground surface via the sample recovery line, by pressurizing the vacuum/pressure line.

The locations and installation depths of the lysimeters were established from discussions with Authentic regarding their angle drilling capabilities, drilling of the test holes, and the configuration of the septic system infiltrators. Wenck determined that the shallowest lysimeter hole would be drilled at a 45-degree angle, and that the two deeper lysimeter holes would be completed at 30-degree angles from vertical. L-1 was set back approximately 5 feet from the western infiltrator, while L-2 and L-3 were set back approximately 11 and 17 feet, respectively. These offsets and angles would allow for lysimeter placement at the respective vertical depths of 5, 12, 19, 25, 30 and 35 feet below land surface. The purpose of installing these lysimeter holes at different angles and offsets was to allow for collection of vadose zone moisture samples at six different depths below the septic system infiltrators within either the unconsolidated alluvial fan deposits (above 25 feet) or the Casper Formation (below 25 feet). The lysimeter locations shown on **Figure 2** were selected because it was anticipated that most of the effluent would likely infiltrate on the down slope western side close to the discharge head of the infiltrator due to the permeable sand composition of the near surface sediments.

As shown on **Figures 2** and **3**, four lysimeter holes were drilled west of the western infiltrator at the site for the vadose zone monitoring network. Between February 13 and 14, 2018, Authentic completed the installation of the lysimeters in L-1 through L-4. L-4 was drilled first but was plugged and abandoned after damaging the western infiltrator. All In One Septic Systems and Plumbing Service (All In One) excavated and repaired the damaged infiltrator after the other lysimeters had been installed. The lysimeter holes were drilled with new 8.25-inch diameter hollow stem augers that had not been used prior to this project. Each auger was decontaminated between holes. Bulk soil samples from each lysimeter hole (L-1 through L-3 only) were also collected for laboratory testing and analysis. At L-1 and L-2 beneath approximately 1 foot of silty sand or sandy silt soil, unconsolidated sand of the alluvial fan deposits was encountered to the bottom of each lysimeter hole as shown on **Figure 3**. L-1 was completed with lysimeters set at vertical depths of 5 and 12 feet below ground surface in the unconsolidated sand. L-2 was completed with lysimeters set at depths of 19 and 25 feet, respectively, in the unconsolidated sand. However, the lysimeter at 25 feet was set at or near the interface between the unconsolidated sand and Casper Formation. At L-3, similar sediments were observed to a depth of 33 feet, at which point a



REV	REVISION DESCRIPTION	DWN	APP	REV DATE

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DWN BY	CHK'D	APP'D
RDC	MES	

DWG DATE 4/11/2019
SCALE NOT TO SCALE

PROJECT SEPTIC SYSTEM IMPACT ANALYSIS
CLIENT ALBANY COUNTY

SHEET TITLE AS-BUILT LYSIMETER INSTALLATION

PROJECT NO.	SHEET NO.	REV NO.
WYALB101	FIGURE 3	

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sandstone of the Casper Formation was encountered. L-3 was completed with lysimeters set at depths of 30 and 35 feet, both in the unsaturated Casper Formation. Lysimeter completion diagrams and lysimeter materials information are included in **Appendix D**.

Within each lysimeter hole, Wenck directed the construction of the six porous tension-cup lysimeters at the depths noted above. No water was placed into the lysimeter holes during construction, and all materials were installed under dry conditions through the hollow stem augers. The respective details for each lysimeter hole are shown on the completion diagrams in **Appendix D**. Two, 2-foot-long, 2 bar cup lysimeters were installed in each of the three lysimeter holes, L-1 through L-3, at the site. Two lengths of ¼-inch O.D. polyethylene nylon access tubing (black for pressure/vacuum and green for sample recovery) were securely connected to each lysimeter and extended to land surface as the lysimeter was installed point down in the lysimeter hole. Each lysimeter was surrounded with 200 mesh silica flour. The two lysimeters in each hole were separated from each other by 10X20 silica sand and bentonite pellets that filled the annular space. The lysimeter and annular materials were installed as the hollow stem augers were progressively removed from each hole. Above the uppermost layer of bentonite pellets, drill cuttings were placed to land surface. The access tubing was terminated at land surface in 6-inch neoprene tubing that was clamped, colored, and taped to distinguish between pressure/vacuum and sampling ends and labeled with the lysimeter location and depth below the infiltrator. The access tubing at each lysimeter hole was placed within a flush mounted well cover that was installed at grade. As of this report, the lysimeters have not been abandoned.

4.0 Monitoring Network Sampling Methods

Using the vadose zone monitoring network at the site described in Section 3.0, Wenck collected vadose zone moisture samples on six occasions, septic tank water samples on two occasions, and soil samples on one occasion in 2018 as noted in **Table 4.1**. To assess the seasonality of Casper Aquifer recharge influences and potential changes in nitrate concentrations, moisture samples were collected from the lysimeters during February, April, May, June, September, and December 2018.

Table 4-1: Sample Collection Events

Sample Collection Date	Vadose Zone Moisture Samples Collected	Septic Tank Samples Collected	Soil Samples Collected
02/15/2018			X
02/26/2018	X	X	
04/04/2018	X		
05/15/2018	X		
06/25/2018	X		
09/05/2018	X		
12/04/2018	X	X	

Soil Sample Collection

During drilling of the test and lysimeter holes, soil samples were collected using directly driven split spoons and bulk auger samples from different depths for laboratory analysis. A total of three samples were collected from both the septic impacted area at each lysimeter hole (L-1, L-2 and L-3) and the non-septic impacted area at Test Hole B-2 (B2-1, B2-2 and B2-3). A summary of these samples is presented in **Table 4.2**. All soil samples and soil intervals were logged by a Wyoming licensed geologist in the field and notes were made regarding color, texture, and visible constituents including organic matter, gypsum and calcium carbonate. Samples were then sealed in Ziploc plastic bags and shipped to the University of Wisconsin-Stout Discovery Center Laboratory following standard chain-of-custody procedures.

At the University of Wisconsin-Stout Laboratory, the soil samples were analyzed for the following parameters: sediment total Kjeldahl nitrogen (TKN), sediment nitrate+nitrite-N, dry bulk density, organic content, ammonium-N maximum adsorption and nitrate+nitrite-N maximum adsorption. The sediment TKN and nitrate+nitrite-N laboratory analyses were performed by Pace Analytical Services in Minneapolis, Minnesota. The sediment samples for these analyses were packaged and sent by the University of Wisconsin-Stout Laboratory to Pace Analytical according to the chain-of-custody procedures.

Dry bulk density and organic matter content were assessed by University of Wisconsin–Stout Laboratory by drying a known volume of sediment at 105 degrees C and 550 degrees C, respectively. For the ammonium-N and nitrate+nitrite-N adsorption analyses, the sediment samples were subjected to a range of ammonium-N and nitrate-nitrite N concentrations to examine Langmuir-type adsorption isotherms and potential maximum adsorption capacity using a modification of Pierzynski (2000). Ammonium-N and nitrate-nitrite N stock solutions ranging between 0 and 500 mg/L (0 mg/L, 50 mg/L, 100 mg/L, 250 mg/L, and 500 mg/L) were prepared using a 0.01 M $CaCl_2$ solution to preserve ionic integrity. Ten grams of subsoil and 100 milliliter (mL) of standard solution were added to 125 mL glass assay tubes to create a soil to solution ratio of 10:1. Assay tubes were gently

shaken for 24 hours, centrifuged, decanted, and filtered through a type A/E glass fiber filter (Pall). Samples were preserved with sulfuric acid to a pH < 2 and shipped to Pace Analytical for analysis of ammonium-N and nitrate-nitrite N. Additional standards were also shipped to Pace Analytical for analysis. **Appendix E** contains a more detailed description of the University of Wisconsin-Stout's Laboratory methods along with the Langmuir equation calculations and chain-of-custody laboratory results from Pace Analytical.

Table 4-2: Description of Soil Samples and Laboratory Analyses

Soil Sample ID	Depth (ft)	Description	Laboratory Analyses
L-1	7-10.5	Unconsolidated sand, septic impacted area (lysimeter hole)	Dry bulk density, organic content, TKN, NO_3+NO_2, NH_4-N max adsorption, NO_3+NO_2 max adsorption
L-2	23-28	Unconsolidated sand, septic impacted area (lysimeter hole)	
L-3	33-38	Sandstone (Casper Formation), septic impacted area (lysimeter hole)	
B2-1	4-10.5	Unconsolidated sand, non-septic impacted area (Test Hole B2)	
B2-2	14-20.5	Unconsolidated sand, non-septic impacted area (Test Hole B2)	
B2-3	>29	Sandstone (Casper Formation), non-septic impacted area (Test Hole B2)	

Septic Tank Water Sampling

Wenck collected effluent samples from the septic tank during the first and last sampling events on February 26 and December 4, 2018. The samples were collected from the middle zone of the septic tank, between the scum and sludge layers. Wenck tried to disturb the water as little as possible prior to or during sampling. Both samples were collected using new bailers and sample containers. After the final sampling event, the landowner's septic tank was pumped out by All In One. Temperature, electrical conductance, and pH were analyzed in the field during the December 4, 2018, sampling event using an Extech DO700 meter.

During sample collection, Wenck observed that bailers captured more suspended materials in the top and bottom quarters of the withdrawn water column. Therefore, sample bottles were filled with water from the middle of the bailer water column to minimize scum and sludge content in the samples. Samples for laboratory analysis were sealed, labeled, and placed into a cooler and shipped to Inter-Mountain Labs in Sheridan, Wyoming, following chain-of-custody procedures.

Vadose Zone Moisture Sample Collection

Wenck attempted to collect vadose zone moisture samples from each of the six lysimeters during all six of the sampling events noted in **Table 4.1**. To protect samples from contamination, the sampler wore clean nitrile gloves, and cleaned the pump prior to applying vacuum or pressurizing the lysimeters. Samples were not filtered, resulting in total (rather than dissolved) results for constituent analysis. When sufficient sample volume was obtained from a lysimeter, field water quality parameters including temperature, electrical conductance, and pH were measured using calibrated field instruments.

Vadose zone moisture samples were collected using the following standard procedure. As noted in Section 3.3, each lysimeter was connected to land surface by two tubes, one for applying vacuum/pressure and the other for obtaining sample water from the lysimeter. First, a vacuum of 45 to 50 centibars (cBar) was applied to each lysimeter using a hand

pump. The vacuum/pressure tube was then sealed with a clamp and removed from the hand pump. The lysimeters were kept under vacuum for approximately 5 to 6 hours during the last five sampling events. During the first sampling event, the lysimeters remained under vacuum for a cumulative time of nearly 30 hours. During this time, samples were collected intermittently to determine the vacuum duration required to collect sufficient sample volume for submittal to the lab. Our results indicated that, if a lysimeter did not produce sample water after six hours under vacuum, additional time did not improve sample collection. After applying vacuum to all lysimeters, the sampler left the site and returned later the same day to recover sample moisture.

Upon return to the site, the sampler measured the remaining vacuum at the lysimeter prior to pressurizing the lysimeter for sample recovery. To recover sample moisture, the vacuum was released, the sample recovery tube was unclamped, and the hand pump was connected to the vacuum/pressure tube. Before pressurizing the lysimeter, the sample collection tube was cleaned to prevent sample contamination. The sample collection tube was then placed in the sample bottle and the lysimeter was pressurized to approximately 50 cBar with the hand pump. Pressure was maintained by pumping until the full sample volume was recovered.

The volume of sample recovered varied widely between lysimeters during individual sample events and for individual lysimeters across sampling events. The tables presented in **Appendix F** provide details on the volumes of sample recovered as well as field water quality parameters measured at the lysimeters and septic tank. For a single lysimeter, the volume of sample recovered during a sampling event ranged from zero to 100 mL. The cumulative sample volume recovered from all lysimeters during a sampling event ranged from 15 to 300 mL. When greater than 30 mL of sample volume was recovered from a lysimeter, sample pH, conductivity, and temperature were measured using an Extech DO700 meter. To measure field parameters, a portion of the sample was transferred to a new container where parameters were measured. The remaining sample was sealed, labeled, and placed in a cooler on ice for shipment to Inter-Mountain Labs in Sheridan, Wyoming.

At Inter-Mountain Labs, samples were analyzed for nitrate, nitrite, TKN, phosphorus, and chloride. If insufficient sample volume was obtained to analyze all five constituents, analytes were prioritized in the following order: Nitrate, nitrite, chloride, TKN, and phosphorus. Analytical methods and reporting limits are reported in **Table 4.3**.

Table 4-3: Analytes, Method, and Reporting Limit for Vadose Zone Moisture Sampling

Parameter	Method	Reporting Limit
Nitrogen, Nitrate (As N)	EPA 300.0	0.05 mg/L
Nitrogen, Nitrite (As N)	EPA 300.0	0.05 mg/L
Nitrogen, Total Kjeldahl (TKN)	EPA 351.2	1 mg/L
Chloride	EPA 300.0	1 mg/L
Phosphorus	EPA 200.7	0.1 mg/L

5.0 Monitoring Network Results and Discussion

Septic Tank Water Sampling Results

Septic tank sample results for the February 26 and October 4, 2018, sample events are presented in **Table 5.1**. As expected, nitrate+nitrite concentrations were below method detection limits, which indicates anaerobic conditions are present within the septic tank. Average TKN concentration (sum of organic-nitrogen and ammonia-nitrogen) was 84.5 mg/L, which was slightly higher than the average ammonia-nitrogen concentration (82.7 mg/L). Thus, it can be assumed that nearly all of the total nitrogen (TN; sum of TKN and nitrate+nitrite) in the septic tank is in an ammonia form prior to being discharged to the drain field. Laboratory analytical reports on the septic tank samples are included in **Appendix G**.

Water quality data from two Casper Aquifer wells completed in Sherman Hills Estates subdivision to depths of 163 and 300 feet are also included in **Table 5.1**. These wells were sampled by the U.S. Geological Survey in 2012 and 2016 (NWIS, 2018). Neither of these wells had detectable concentrations of ammonia, but the 163-foot-deep well at the northwestern margin of the subdivision had a nitrate concentration of 6.29 mg/L. The deeper 300-foot well at the southeastern edge of the subdivision had no detectable nitrate.

Vadose Zone Moisture Sampling Results

Presented in **Table 5.2**, lab analytical data for the vadose zone moisture samples obtained from the lysimeters indicate effluent from the septic system is affecting the vadose zone moisture quality. Laboratory analytical reports on the lysimeter samples are included in **Appendix H**. **Figure 4** displays the nitrate+nitrite, TKN and TN results for each lysimeter and sample date. Notice in **Table 5.2** that the sampled concentrations that exceed DEQ limits for Class I domestic groundwater use are highlighted in bold (DEQ, 2014). Nitrate concentrations generally exceeded these limits through both the unconsolidated sand alluvial fan deposits and in the Casper Formation below a depth of 25 feet. Nitrite concentrations exceeded these limits at the 5 and 25-foot depths in the unconsolidated sands. Given 0.7 to 41 mg/L concentrations in the septic tank and nearby Casper Aquifer wells, elevated chloride concentrations were present throughout the vadose zone, and exceeded DEQ limits at depths of 19 and 30 feet in both the unconsolidated sand and Casper Formation.

As discussed in in the previous section, nearly all of the nitrogen in the septic tank is in ammonia form prior to being discharged to the infiltrators. The lysimeter profiles shown on **Figure 4** indicate that TKN concentrations decrease significantly in the top 12-feet of the vadose zone as the average TKN concentration (all sample events) for the lysimeter located 12-feet below grade is approximately 92% lower (6.5 mg/L) than the average TKN concentration in the septic tank (84.5 mg/L). TKN levels continue to decrease between the 12-foot and 35-foot lysimeters, however, not as dramatically as the TKN decrease in the upper 12 feet of the vadose zone. Average TKN concentrations decrease from 6.5 mg/L at the 12-foot lysimeter to 0.8 mg/L at the 35-foot lysimeter, suggesting nitrification and/or ammonia adsorption continues to occur throughout this part of the vadose zone.

Table 5.1: Septic Tank Water Quality Data

Septic Tank Water Quality vs. Local Casper Aquifer Water Quality						
Analyte		Wyoming DEQ, Chapter 8 Domestic Water Quality Standards	Septic Tank Results (mg/L)		USGS Well 1 (mg/L)	USGS Well 2 (mg/L)
Sample Date			2/26/2018	12/4/2018	9/11/2012	9/13/2016
General Parameters	Total Dissolved Solids (180)	500.0	440	460	227	276
	Alkalinity, Total (as CaCO3)	--	586	530	204	186
	Nitrogen, Ammonia (as N)	0.5	**94.4**	**70.9**	ND	ND
	Nitrogen, Total Kjeldahl	--	89	80	NM	NM
Anions	Alkalinity, Bicarbonate as HCO3	--	714	646	252	199
	Alkalinity, Carbonate as CO3	--	ND	ND	ND	ND
	Chloride	250.0	41	30	0.7	31
	Flouride	4.0	0.1	0.1	ND	ND
	Nitrogen, Nitrate-Nitrite (as N)	10.0	ND	ND	ND	6.29
	Sulfate	250.0	12	2	7.1	26
Cations	Calcium	--	57	57	60	67
	Magnesium	--	17	18	15	17
	Potassium	--	24	23	ND	1.1
	Sodium	--	37	40	1.7	12
Dissolved Metals	Aluminum	--	ND	ND	ND	ND
	Arsenic	0.05	ND	ND	ND	0.002
	Barium	2.0	0.2	0.2	0.19	0.26
	Boron	0.75	ND	ND	ND	ND
	Cadmium	0.005	ND	ND	ND	ND
	Chromium	0.1	ND	ND	ND	ND
	Copper	1.0	0.01	0.01	ND	ND
	Iron	0.3	ND	0.06	ND	ND
	Lead	0.015	ND	ND	ND	ND
	Mercury	0.002	ND	ND	NM	NM
	Molybdenum	--	ND	ND	ND	ND
	Nickel	--	ND	ND	ND	ND
	Selenium	0.05	0.003	ND	ND	0.0017
	Zinc	5.0	ND	ND	ND	ND
Total Metals	Iron	0.3	0.18	**1.82**	ND	ND
	Manganese	0.05	ND	**0.07**	ND	ND
	Phosphorus	--	5.2	11.0	NM	NM

Footnotes: ND = Not Detected; NM = Not Measured; -- = No Standard; **Bold** = Exceeds Standard

USGS Well 1	
ID:	USGS 411727105305901 15-072-07bba01
Latitude:	41°17'27.2"
Longitude:	105°30'59.3"
Well Depth:	300 ft.
Source:	https://nwis.waterdata.usgs.gov/nwis/qwdata?

USGS Well 2	
ID:	USGS 411754105314601 15-073-01caa01
Latitude:	41°17'54.0"
Longitude:	105°31'46.1"
Well Depth:	163 ft.
Source:	https://nwis.waterdata.usgs.gov/nwis/qwdata?

Table 5.2 - Lysimeter Moisture Quality Data

Water Quality Data Summary for Lysimeters						
Lysimeter Depth (ft)	Date Collected	Nitrogen, Nitrate (as N) (mg/L)	Nitrogen, Nitrite (as N) (mg/L)	Nitrogen, Total Kjedahl (TKN) (mg/L)	Chloride (mg/L)	Phosphorus (mg/L)
Wyoming DEQ, Chapter 8 Domestic Water Quality Standards		10.0	1.0	--	250.0	--
L-1 5'	2/27/2018	2.74	0.85	56	61	6.9
	4/4/2018	0.11	0.1	61	NM	NM
	5/15/2018	6.92	0.2	53	26	8.4
	6/25/2018	**49.2**	**6.44**	30	227	5.9
	9/5/2018	**26.3**	**5.18**	20	27	4.5
L-1 12'	6/25/2018	**91.8**	ND	NM	52	NM
	9/5/2018	**69.0**	ND	6	75	1.9
	12/4/2018	**69.7**	0.06	7	121	NM
L-2 19'	5/15/2018	**75.9**	ND	5	**366**	0.9
	6/25/2018	**69.3**	ND	6	**366**	1
	9/5/2018	**65.9**	ND	1	224	1.5
L-2 25'	2/27/2018	**66**	0.08	3	101	1.1
	4/4/2018	**72.5**	0.08	2	NM	NM
	5/15/2018	**74.7**	0.17	2	202	1.4
	6/25/2018	**72.3**	**1.41**	3	210	1.2
	9/5/2018	**70.6**	ND	ND	187	1.3
L-3 30'	2/27/2018	**63**	ND	4	**2540**	1
	6/25/2018	**55.5**	ND	10	**489**	2
	9/5/2018	**54.7**	ND	7	**321**	2.3
	12/4/2018	**55.4**	0.16	4	**291**	NM
L-3 35'	2/27/2018	**51.2**	0.09	ND	142	1.4
	4/4/2018	**51**	0.09	1	NM	NM
	5/15/2018	**53.1**	ND	1	238	1.3
	6/25/2018	**54.1**	ND	2	239	1.2
	9/5/2018	**55.9**	ND	ND	211	1.3

Footnotes

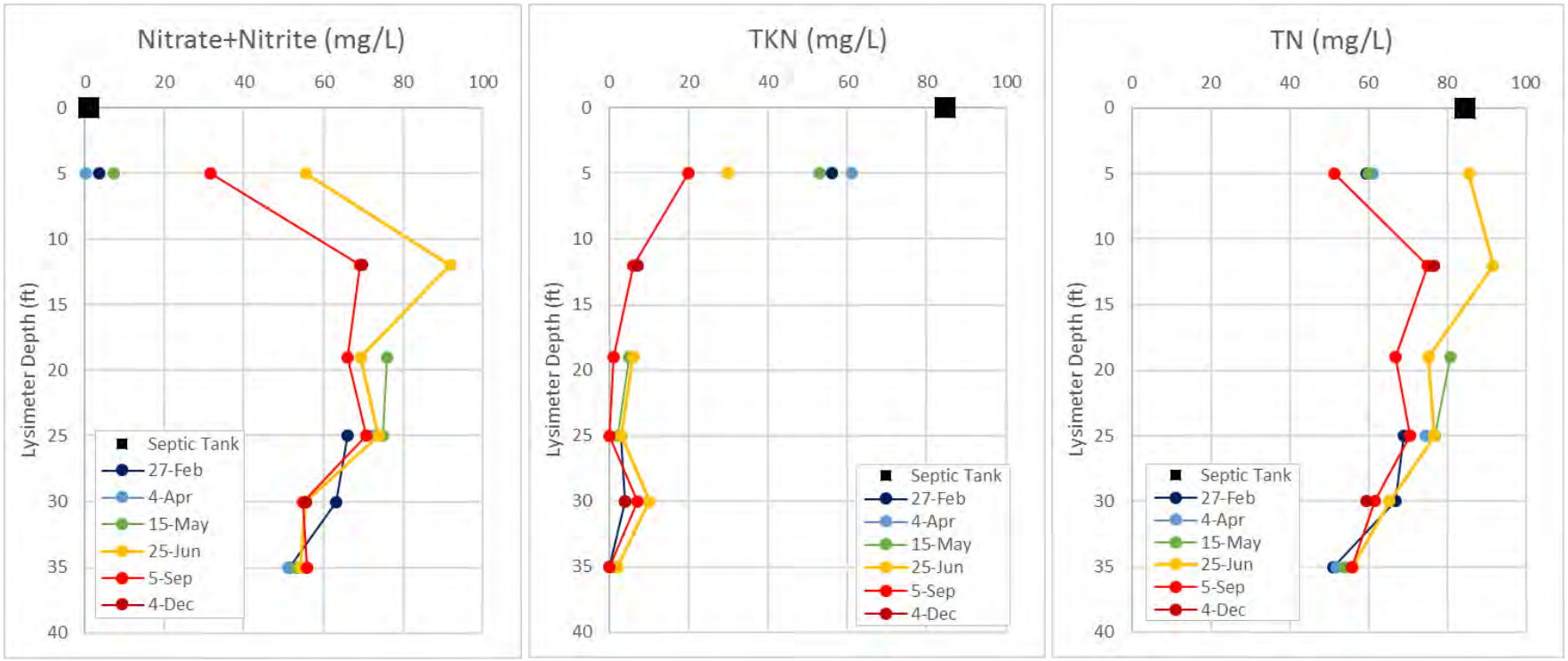
ND = Not Detected

NM = Not Measured

Bold = Exceeds WY DEQ Domestic Water Quality Standard

-- = No standard

Figure 4: Lysimeter Moisture Quality Depth Profiles



The lysimeter profiles also indicate that the TKN changes in the upper 12-feet of the vadose zone coincide with significant increases in nitrate+nitrite concentrations. As discussed in Section 5.1, nitrate+nitrite concentrations in the septic tank were below laboratory reporting limits. Nitrate+nitrite concentrations for the samples collected within the unconsolidated sand at the 5-foot and 12-foot lysimeters averaged 19.6 mg/L and 76.9 mg/L, respectively. These increases indicate a majority of the TKN (i.e. ammonia) discharged from the septic tank is adsorbed to the soil and/or converted to nitrate in the upper 12-feet of the vadose zone. The data shows these processes occur more rapidly in the upper 5-feet of the vadose zone during the warmer summer months, because the June and September nitrate+nitrite samples (55.6 mg/L and 31.5 mg/L) were significantly higher than the nitrate+nitrite samples collected in the 5-foot lysimeter in February, April, and May (3.6 mg/L, 0.2 mg/L and 7.1 mg/L, respectively).

The lysimeter profiles show that nitrate+nitrite levels begin to decrease in the deeper part of the vadose zone below 12 feet. Average nitrate+nitrite concentrations go from 76.9 mg/L at the 12-foot lysimeter to 53.1 mg/L at the 35-foot lysimeter (~31% reduction), suggesting that some denitrification and/or dilution with non-septic water occurs as water moves through this portion of the vadose zone. Unlike the upper vadose zone, the TKN and nitrate+nitrite changes in the deeper vadose zone appear to be relatively consistent between the six sample events which suggests that denitrification rates in the lower vadose zone are relatively consistent throughout the year. Nitrate concentrations in the upper 10 feet of the Casper Formation (i.e. lysimeter depths 30 and 35 feet) range from 51 to 63 mg/L.

Soil Sample Results

Physical and chemical analysis results for the vadose zone soil samples collected from the lysimeter holes beneath the septic infiltrators and the non-septic impacted area east of the leach field (Test Hole B-2) are presented in **Tables 5.3** and **5.4**, respectively. **Figures 5** and **6** display vertical profiles of the soil dry bulk density, organic content, TKN, nitrate+nitrite, and ammonia sorption maximum for the septic and non-septic impacted areas. **Appendix E** contains a more detailed laboratory report of the analytical methods along with a brief discussion of the results.

Soil dry bulk density was measured in three layers at the lysimeter holes (L1, L2 and L3) and ranged from 2.41 g/cm^3 to 2.46 g/cm^3 suggesting soil physical properties are very similar throughout the entire vadose zone beneath the infiltrators. Soil bulk density was also measured in three layers at B-2 (B2-1, B2-2 and B2-3) east of the leach field. Results ranged from 2.32 g/cm^3 to 2.60 g/cm^3 indicating soil physical characteristics were also consistent through the vadose zone in this area and spatially between the two areas.

Soil sample results show that soil organic content, TKN and nitrate+nitrite concentrations at the lysimeter holes were higher in the upper vadose zone (L1) compared to the deeper vadose zone layers (L2 and L3). Organic content went from 1.07% at station L1 (7-10.5 feet depth) to 0.50% and 0.52% at stations L2 (23-28 feet depth) and L3 (33-38 feet depth), respectively. TKN concentration at station L1 was 209 mg/kg but was below detection limit at stations L2 and L3. Nitrate+nitrite content was approximately 38% to 41% higher at station L1 (3.2 mg/L) compared to stations L2 (2.9 mg/L) and L3 (2.0 mg/L).

Table 5.3: Soil Sampling Results for the Lysimeter Holes Beneath the Infiltrators

Station	Depth (ft)	Dry Bulk Density (g/cm^3)	Organic Content (%)	TKN (mg/kg)	Nitrate+Nitrite (mg/kg)	Ammonia Sorption Max (mg/kg)	Nitrate+Nitrite Sorption Max (mg/kg)
L1	7-10.5	2.44	1.07	209	3.2	645	<RL
L2	23-28	2.46	0.50	<RL	1.9	170	<RL
L3	33-38	2.41	0.52	<RL	2.0	171	<RL
Note: <RL indicates concentration was less than the reporting limit.							

Table 5.4: Soil Sampling Results for the B-2 Test East of the Infiltrators

Station	Depth (ft)	Dry Bulk Density (g/cm^3)	Organic Content (%)	TKN (mg/kg)	Nitrate+Nitrite (mg/kg)	Ammonia Sorption Max (mg/kg)	Nitrate+Nitrite Sorption Max (mg/kg)
B2-1	4-10.5	2.60	0.39	<RL	<RL	158	<RL
B2-2	14-20.5	2.55	0.41	<RL	<RL	458	<RL
B2-3	>29	2.32	0.49	<RL	<RL	329	<RL

Figure 5: Soil Sampling Laboratory Results for the Lysimeter Holes

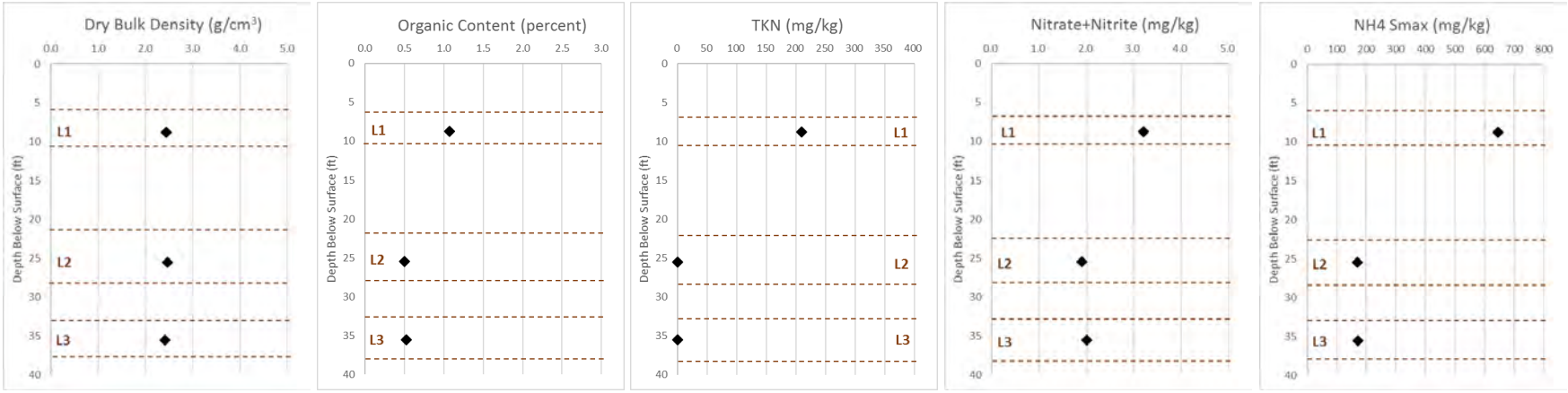
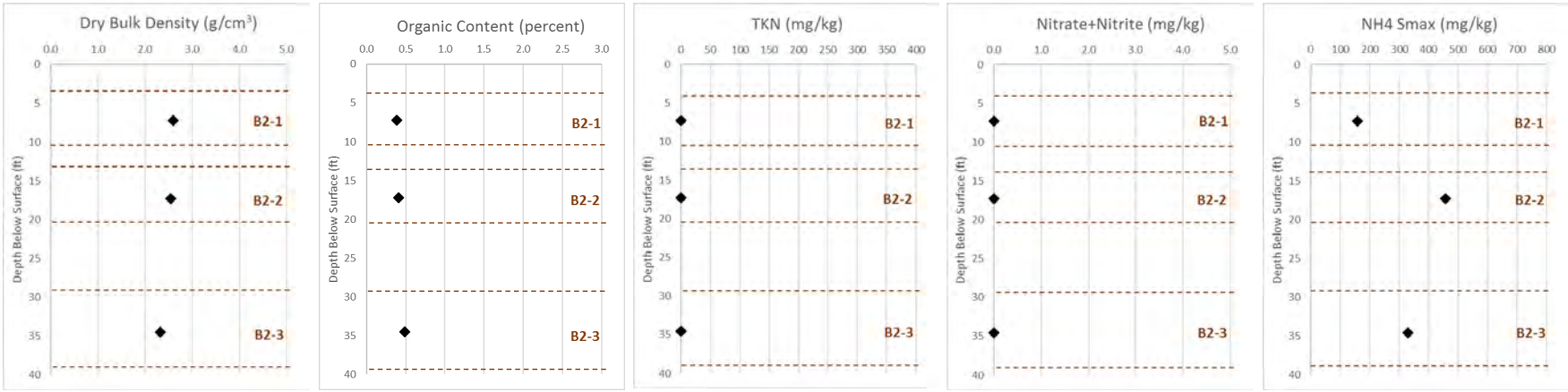


Figure 6: Soil Sampling Results for Test Hole B-2 East of the Infiltrators (non-septic impacted area)



Soil sample results at Test Hole B-2, which reflects the non-septic impacted area, did not show any variability in organic content, TKN and nitrate+nitrite concentrations throughout the vadose zone. Soil organic content was consistently low at all three stations (B2-1, B2-2 and B2-3) throughout the vadose zone. Similarly, TKN and nitrate+nitrite concentrations were below reporting limits at all three stations.

Not surprisingly, laboratory analyses of nitrate+nitrite sorption capacity suggests very little, if any, nitrate+nitrite adsorbs to the soils at both the lysimeter holes beneath the infiltrators and at Test Hole B-2. As discussed in **Appendix E**, nitrate is an anion and therefore does not typically adsorb to soil/sand sorption sites which are also negatively-charged (Gaines & Gaines, 1994). As a result, nitrate+nitrite generally remains soluble throughout the vadose zone and, aside from losses via denitrification, leaches into groundwater.

Soil results did show that the vadose zone beneath the infiltrators is able to adsorb some ammonia. Ammonia sorption maximums are relatively low as less than 15% of the ammonia in the laboratory standard was adsorbed to the soil. Ammonia sorption maximum for the upper vadose zone (station L1) was approximately four times higher (645 mg/kg) than the deeper vadose zone (stations L2 and L3) beneath the infiltrators.

Soils at Test Hole B-2 also showed some capacity to adsorb ammonia. Ammonia sorption maximums were generally low and less than 10% of the ammonia standard was adsorbed. Unlike the septic impacted area beneath the infiltrators, ammonia sorption maximums were higher in the deeper vadose zone.

Final Results and Conclusions

Using the vadose zone monitoring network, Wenck evaluated trends, transformations, and changes in nitrogen levels of septic tank effluent as it moves through the vadose zone and enters the unsaturated Casper Formation beneath the leach field. This effort included: septic tank effluent sampling, monitoring of vadose zone moisture, and analysis of soil physical and chemical properties both below the leach field and below an unimpacted area adjacent to the leach field. Below is a summary of the principal findings of Wenck's septic system impact analysis:

Septic tank sampling:

- Total nitrogen levels of the effluent in the septic tank are high (~80-85 mg/L).
- Nearly all (>85%) of the nitrogen in the septic tank effluent is in ammonia form.

Vadose zone water monitoring:

- Nearly all of the ammonia from the septic tank effluent is converted to nitrate in the upper (top ~12 feet) vadose zone.
- Nitrate removal (20 to 39%) occurs in the lower (12 to 35 feet) vadose zone. This is likely driven by denitrification and/or dilution with non-septic vadose zone water.
- Soil moisture with nitrate concentrations in excess of EPA and DEQ Class I domestic water quality standards (51 to 63 mg/L) is percolating through the unconsolidated sand alluvial fan deposits into the unsaturated Casper Formation beneath the leach field.

Soil physical and chemical properties:

- Organic content, TKN and nitrate+nitrite in the upper (top ~10.5 feet) vadose zone beneath the infiltrators are elevated compared to the deeper (23 to 38 feet) vadose zone. Soils in the upper vadose zone adsorb nitrogen from the septic effluent.
- Soils throughout the vadose zone have limited capacity to adsorb nitrate.
- Beneath the infiltrators, soils in the upper vadose zone have higher capacity to adsorb ammonia compared to the deeper vadose zone; adsorption capacity at all depths is limited.

Final Conclusions:

- The vadose zone, on average, at this particular site is approximately 39% efficient in removing nitrogen (all forms) from the septic tank to a depth of 35 feet through a combination of adsorption, denitrification processes, and/or dilution at different depths.
- While both the vadose zone moisture monitoring data and the soil sampling results indicate the vadose zone is capable of removing some nitrogen from the septic effluent, nitrate concentrations entering the unsaturated Casper Formation 25 feet below ground surface are consistently high (51 to 63 mg/L). These conditions indicate that the vadose zone does not remove sufficient nitrogen to protect the Casper Formation and by inference the Casper Aquifer from nitrate contamination.

6.0 Recommendations

Based on the results and conclusions of this investigation, Wenck offers the following recommendations for Albany County's consideration:

1. Continue monitoring the vadose zone sampling network for the same water quality parameters. The intent of this recommendation is to develop a longer-term data set to further evaluate any changes through time. Given the low variability in sample results, Wenck anticipates that sampling twice a year in May and September for two to three more years would provide adequate data.

2. Install several vadose zone monitoring networks at different properties with an effort to evaluate the behavior of different soil types and/or septic systems. While this investigation's findings indicate that the soils at this property are inadequate to protect the Casper Aquifer, the results reflect a limited data set. It would be interesting to see how these results compare with those of an "enhanced treatment" septic system in the area.

3. Use these data to evaluate septic system design requirements in the CAPA. While additional data should be obtained, the results of this investigation indicate that further consideration to development in the CAPA is warranted and may require amending existing development practices to protect the Casper Aquifer.

4. To the extent possible, the City of Laramie should consider extension of City wastewater service to the rural subdivisions, or perhaps consider regional collection and treatment systems.

5. Estimate nitrate loading to the Casper Aquifer in the area for the purpose of evaluating appropriate residential density for future development as warranted. This study did not focus on volumetric loading to the Casper Aquifer, but such calculations could now be made with these data.

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Appendix A

Work Plan

ALBANY COUNTY SEPTIC SYSTEM IMPACT ANALYSIS WORK PLAN

Prepared for:

Wyoming Department of Environmental Quality
Groundwater Pollution Control Program
200 West 17th Street, 4th Floor
Cheyenne, Wyoming 82002

Prepared by:

Wenck Associates
4025 Automation Way, Building E
Fort Collins, Colorado 80525

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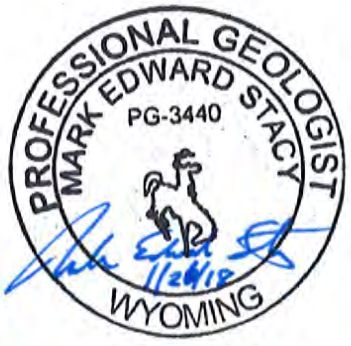

January 2018

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Appendices

1.0 Summary

The purpose of this report is to present both the Sampling and Analysis Plan, and Quality Control and Quality Assurance Plan for the Septic System Impact Analysis to be performed in the Casper Aquifer Protection Area (CAPA) for Albany County east and southeast of the City of Laramie. Wenck Associates (Wenck) has prepared this work plan for the installation of a vadose zone sampling network to monitor septic leach field denitrification over Casper Aquifer outcrop. Wenck is currently working with Albany County to identify a landowner willing to allow the installation and monitoring of this system. The monitored system will be located somewhere within the area shown on the geologic map in **Figure 1**. This work plan is also presented to document the activities performed at the site for compliance with the requirements of the Wyoming Department of Environmental Quality (DEQ). These monitoring and reporting activities will also be performed in accordance with the rules and regulations pertaining to the projects funded under Wyoming Nonpoint Source Section 205(j) grants.

This work plan is composed of seven sections and two appendices. The regional geologic and hydrogeologic setting is described in Section 2. Proposed vadose zone monitoring network installation activities are described in Section 3, and proposed soil and water sampling and analysis activities are described in Section 4. Section 5 addresses the quality assurance and quality control plan. Deliverables and project schedule are presented in Section 6, and references cited are presented in Section 7. Details on planned suppliers and equipment specifications are presented in **Appendix A.**

2.0 Site Characterization

2.1 SITE HYDROGEOLOGY

The Casper Aquifer consists of sufficiently saturated portions of the Casper Formation along the western margin of the Laramie Range east of Laramie. The aquifer is rated as a Class 1 aquifer by the DEQ and provides high quality drinking water to the City of Laramie. The aquifer includes up to 700 feet of interbedded sandstone and limestone with minor siltstone and shale. In this portion of Albany County, the aquifer is made up of approximately 85% sandstone. Groundwater is primarily stored and transmitted through the intergranular permeability of the sandstones, but various fractures and faults that cut through the sandstone and limestone sequence hydraulically connect the different rock units.

The Casper Formation is recharged through its outcrop and yields groundwater to local domestic and public supply wells. Its outcrop extends from the Wyoming state line on the south to Wyoming Highway 34 on the north, and dips about 3 to 5 degrees west into the Laramie Basin. The aquifer is principally recharged through snowmelt runoff over outcrop areas in March and April and may receive some component of recharge from the underlying Precambrian Granite along fractures. Recharge due to these runoff events typically occurs within days to weeks indicating rapid movement through the unsaturated zone. Groundwater production from the Casper Aquifer is generally limited to 5 to 50 gpm where intergranular permeability is predominant but ranges up to 2,000 gpm where aquifer permeability has been enhanced by faults, geologic structures, fractures, and along bedding surfaces. It is this high capacity production that renders the aquifer suitable for use by the City of Laramie at its Turner, Pope, and Soldier Springs wellfields.

The Casper Aquifer is confined by several formations as it dips westward into the Laramie Basin. These geologic formations in ascending stratigraphic order are the Satanka Shale, Forelle Limestone, and the Chugwater Formation. As a result, the Casper Aquifer responds as an unconfined aquifer through its recharge area, semi-confined where the confining units first appear, and confined where overlain by these geologic formations. Groundwater generally flows from the recharge area on the east in a westward direction into the Laramie Basin. In the vicinity of the Laramie Plains subdivision, the Satanka Shale is present and overlies the Casper. Several other subdivisions to the east are underlain directly by the Casper Formation that is covered by a thin veneer of alluvium and soil. This veneer may be only 10 to 15 feet thick depending upon location and depths to bedrock.

2.2 NITRATES IN GROUNDWATER

Recent water quality testing near the Turner Wellfield and East Grand subdivisions has indicated the presence of high nitrate groundwater in upgradient areas of the Casper Aquifer (WWC, 2015). Water quality data collected annually at the City of Laramie municipal wellfields since the early 1970s indicates background nitrate levels in the aquifer of around 2 mg/L. Although nitrate concentrations at the wells appear stable, nitrate concentrations in upgradient areas suggest the Casper Aquifer has been affected by local septic system use. In 2009 29% of the wells sampled in the East Grand area had nitrate-nitrogen levels over 5 mg/L, and three of the wells had results above the 10 mg/L drinking water standard (City of Laramie, 2009). In 2015, nitrate concentrations at the nearby Sherman Hills subdivision were found to range from 7 to 9.4 mg/L (WWC, 2015). The elevated nitrate concentrations have been attributed to the high density of septic systems, many of which were installed too

deeply to function properly (City of Laramie, 2009). Groundwater generally flows to the northwest through these areas, toward City Springs, and is unobstructed by the Sherman Hills Fault Zone. Nitrate concentrations in the downgradient City's Turner Wells remain around 2 mg/L but could potentially be impacted in the future.

3.0 Monitoring Network Installation

This section provides pertinent details regarding the drilling and completion of the vadose zone monitoring network. Wenck intends to install this system in early to mid-February so that we can collect the first soil moisture samples in late February.

3.1 PROPOSED MONITORING NETWORK

Wenck plans to install a vadose zone monitoring system below one individual septic system within a rural subdivision to evaluate the effectiveness of the system and the underlying soils in removing nitrates and other contaminants from effluent prior to reaching the Casper Aquifer. The selection criteria for the particular septic system includes the following:

1. Located over Casper Formation outcrop or subcrop east of where the Satanka is present.
2. East or southeast of Laramie in the subdivisions built in this area.
3. Landowner willingness to allow access, installation, and monitoring of the system over the next year.
4. A conventional septic system built within the last 10 years if possible for which we have detailed construction records.
5. Preferably used by a family of 4-5 people.

To characterize the subsurface conditions and thickness of the soil and unconsolidated material at the selected site, a vertical investigation borehole will first be drilled outside the leach field footprint. This borehole will be drilled to a depth of up to 50 feet and will be completed as a monitoring well if groundwater is encountered. Albany County may opt to install a nitrate monitoring well at the site assuming landowner consent and funding from a separate source.

Geologic and soils data from the investigation hole will be used to plan the surface location and drilling angle of the vertical or angled lysimeter holes, as well as the lysimeter installation depths. The monitoring system will consist of six nested lysimeters installed in three lysimeter boreholes, with two lysimeters in each hole installed at various depths. The lysimeter holes will be drilled from different sides of the selected leach field and drilled such that lysimeters can be installed beneath the leach field pipes. A conceptual plan for the arrangement of the lysimeters beneath the chosen septic field is presented in **Figure 2**.

Wenck's goal is to place lysimeters at various depths in the unsaturated soil or unconsolidated material below the leach field pipes. The locations of the proposed boreholes are shown relative to the conceptual site layout on **Figure 3**. The monitoring well in the investigation borehole is to be constructed with up to 40 feet of 2-inch diameter PVC casing and 10 feet of well screen. Wenck anticipates that all three lysimeter boreholes will be completed either within the thin overlying soil or unconsolidated material or in the upper 15 feet of the Casper Formation, depending upon specific site conditions. The three lysimeter holes will be drilled at angles up to 45 degrees and installed with two nested lysimeters each. The drilling and installation procedures to be followed for the investigation

borehole/monitoring well and the lysimeter boreholes are described in Section 3.2 through Section 3.5.

Six sampling events covering all four quarters of the calendar year are proposed for monitoring of the six lysimeters and a groundwater monitoring well, as described in Section 4.0 of this work plan. At the first and final sampling event, base samples of effluent will also be collected from the septic tank. Following the successful conclusion of the analysis and reporting, which are described in Sections 5.0 and 6.0, respectively, the monitoring wells and lysimeters will be abandoned in place pending negotiation between Albany County and the landowner.

3.2 DRILLING PROCEDURES

Wenck will contact One-Call of Wyoming and the landowner to obtain access and utility clearances for the drill site. Any underground utility locations will be marked on the ground in the vicinity (within 50 feet) of the drill location by the utility locators. Drilling will generally not be performed within 5 feet of any known underground utility. Any overhead obstructions will also be avoided during the drilling of the vertical and angled holes.

The drilling rig and equipment will be decontaminated before and after drilling at each location in accordance with Section 3.6. Soil cuttings resulting from drilling will be used for sample analysis, as backfill during completion, or spread on the ground in the vicinity of each hole location, at the landowner's discretion. Any cuttings that cannot be used as backfill or left onsite will be collected in suitable containers and disposed of off-site.

Wenck will administer the drilling contract and plans to complete the drilling using 4 ¼ inch hollow stem as the unconsolidated and geologic formation conditions allow. All drilling will be conducted with a truck or track mounted CME 75 drill rig. All drilling activities will conform to state and local regulations and will be supervised by a Wyoming registered professional geologist. Each of the holes will be drilled starting from the surface to their total depth, to be determined at the time of drilling. Wenck will survey the locations of the vertical and angled boreholes using a Wide Area Augmentation System (WAAS) enabled handheld GPS with a minimum horizontal accuracy of 6 feet.

Wenck field personnel will maintain a log of drilling activities, including the date and time on site, personnel, weather, down time, and other pertinent information. A boring log will be completed to record lithologic descriptions, sample identification and intervals, depth to groundwater, total boring depth, moisture and organic carbon content, changes in drilling penetration rate, presence of fractures and/or voids, locations of low permeability layers, and other pertinent observations. Split spoon samples will be collected and logged at 5-foot increments or at lithologic or textural changes. Given the anticipated thickness of the unconsolidated material over the Casper bedrock, the split spoon samples will be concentrated in the surficial materials. Unconsolidated materials encountered in the boreholes will be described in accordance with the American Society for Testing and Materials 02488, Standard Practice for Description and Identification of Soils Visual-Manual Procedure. Soil units will be identified by Unified Soil Classification System group symbol. Consolidated sedimentary rocks will be described and classified according to currently accepted geologic formation names.

Soil samples for laboratory analysis will be collected from the boreholes, in agreement with the procedures outlined in Section 4.4. An estimated total of 6 soil samples will be collected for final analysis: three from the vertical exploratory hole and one from each of the angled

boreholes. It is likely that additional samples will be logged and collected during the field investigation, but not necessarily analyzed.

3.3 MONITORING WELL CONSTRUCTION

Within the vertical exploration borehole, Wenck will direct the construction of a monitoring well, if groundwater is encountered. A conceptual well diagram is presented in **Figure 4**. The well will be constructed of 2-inch diameter, flush threaded Schedule 40 PVC screen and blank casing. The monitoring well will consist of 10 feet of 0.010-inch, factory-slotted PVC screen installed across the water table and flush threaded Schedule 40 PVC blank casing, with a flush mounted surface completion. A filter pack consisting of new clean, inert, well-rounded, #10-20 silica sand will be installed such that the filter pack fills the annular space from the bottom of the borehole to at least 2 feet above the top of the screen interval. To create a bentonite seal immediately above the filter pack, the contractor will install bentonite chips into the annular space to a depth of 2 feet from ground surface. The bentonite chip seal will be hydrated with water during installation to ensure complete hydration of the seal. The flush mount completion will be placed from 2 feet below to ground surface and secured with soil.

3.4 WELL DEVELOPMENT

After installation, Wenck will develop the monitoring well using a submersible pump or bailer, if water levels in the well allow. The monitoring well will be developed following well construction and possibly prior to the installation of the flush mount surface seal. Wenck will allow sufficient set time for the bentonite to seal before starting development activities. Developing the wells as soon as possible after drilling will help remove the fine silt and clay that can impede the flow of groundwater into the well. It will also facilitate the removal of any drilling fluids used during exploration borehole drilling and well construction. No detergents, soaps, acids, bleaches, or other additives will be used during well development.

To facilitate the development of the entire length of the well screen, Wenck will move the submersible pump or bailer thorough the screened interval while pumping. Such movement of the pump or bailer will also create a surging action through the water column which will help facilitate the removal of fine grained materials and development of the gravel pack. Development operations will commence approximately 5 feet below the static water level in the screen and proceed to the bottom of the well. Wenck will ensure that the wells are developed until temperature, pH, and electrical conductivity have, respectively, stabilized to within ±1ºC, 0.1, ±10%, and ±3% on three successive readings. During this process, Wenck will ensure that at least three well volumes of water have been removed from the well; or until six well volumes have been removed from the well if parameter stabilization is not achieved; or until the well has been pumped dry.

All well development equipment will be decontaminated in accordance with Section 3.6. Groundwater produced during well development will be allowed to infiltrate into the ground within the property, pending the landowner's approval. Wenck will collect water level measurements in the monitoring well prior to and subsequent to development. Well development activities and results will be recorded in a field notebook or on separate well development forms.

3.5 LYSIMETER CONSTRUCTION

Within the lysimeter boreholes, Wenck will direct the construction of the six porous tension-cup lysimeters. Details on the lysimeters to be used are included in **Appendix A**. Two

lysimeters will be installed in each of the three boreholes at the leachfield. Two lengths of ¼-inch O.D. polyethylene nylon access tubing will be securely connected to each lysimeter and, if needed, cut at an angle to prevent suction to the lysimeter wall. Prior to installation the lysimeter will be soaked in water and subjected to pressure testing to insure no leaks or loose parts. Each lysimeter will be placed within the auger hole, point down, and surrounded with silica flour and sand. Wenck personnel will oversee installation and insure lysimeters are securely settled in the silica flour. The two lysimeters in each borehole will be separated from each other by sand and bentonite filled annular space. The access tubing will be terminated in 6-inch neoprene tubing, colored to distinguish between vacuum and discharge ends, connected to the sampling vault, and labeled with the lysimeter location and depth below the leach field pipe. The sampling vault will be a typical irrigation control box installed below grade. To create a bentonite seal immediately above the upper lysimeter, the contractor will install bentonite chips or slurry into the annular space and hydrate with water as needed. The drill hole will then be filled with compacted drill cuttings to 2 feet below the surface and completed with a flush mount surface cover, secured with soil. The soil surrounding the surface cover will be kept free from obstructions to avoid reducing infiltration.

3.6 DECONTAMINATION

Wenck will ensure that its personnel and subcontractors appropriately decontaminate drilling, well development, and sampling equipment prior to and after use. Samples and decontaminated equipment will be prevented from contacting potentially contaminated substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

Large pieces of drilling equipment including drill rods, bits, and coring tools will be washed with high pressure hot water, and if necessary, scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, and other deleterious materials have been removed. The equipment will then be rinsed with potable water.

Sampling and down hole measuring equipment, and smaller devices such as sample bottles, will be rinsed and cleaned on both the inside and outside before collection. External surfaces of submersible pumps will be scrubbed and rinsed in potable water and the pump interior will be cleaned by pumping potable water or detergent solution through the pump and any non-dedicated tubing for at least five minutes. A pre-wash of isopropyl alcohol may be used during equipment decontamination at the discretion of the field sampling crew to remove oily or other adhering contamination. The equipment will be air dried on a clean surface or rack, to the extent possible. Decontamination fluids should remain free of contaminants and will be replaced as necessary.

Used detergent wash water, rinse water, and accumulated sediment generated during decontamination will be allowed to infiltrate on the ground surface within the property, pending the landowner's consent. Isopropyl alcohol, if used will be containerized and disposed of offsite. Trash and debris generated during well installation and sampling activities will be contained and disposed of properly.

4.0 Sampling Plan

Wenck will collect water and soil moisture samples at six sampling events throughout one year. To capture the seasonality of Casper Aquifer recharge and potential changes in nitrate concentrations, sampling events will occur in or around the months of February, April, May, June, September, and December 2018. Samples will be analyzed for the parameters specified in Section 4.5. The depth to water in the monitoring well will be measured during each sampling event in accordance with Section 4.1.

4.1 WATER LEVEL MEASUREMENTS

During each sampling run, the water level in the monitoring well will be measured, if possible, to determine the volume of water in the well casing. The depth to water in the monitoring well will be measured no earlier than 24 hours after well construction or well development, to allow the water levels in the well to recover. The groundwater level in the monitoring well will be measured to the nearest 0.01 foot using an electric Solinst® water level indicator. A notch or casing marking will be made on the north side of the casing using a metal file or permanent marker for current and future water level measurements. During each field visit, the water level will be measured from this reference point on the well casing and recorded in a field notebook or groundwater sampling sheet.

4.2 VADOSE WATER SAMPLE COLLECTION

Wenck will collect vadose zone samples from each of the lysimeters for laboratory analysis during all six of the above sampling events. Before collecting water samples, the sampler will utilize clean nitrile protective gloves. Samples will not be filtered, resulting in total (rather than dissolved) results for constituent analysis. Wenck will also collect a number of field water quality control (QC) samples throughout the life of the test, in accordance with Section 5.4. Temperature, electrical conductance, and pH will be analyzed in the field during sampling using calibrated field instruments, if a sufficient amount of water can be obtained.

4.3 SEPTIC TANK SAMPLING

Wenck will collect base effluent samples from the septic tank twice during the test. On the first and last sampling event, respectively, an effluent sample will be collected from the middle zone of the septic tank, between the scum and sludge layers. An effort will be made to disturb water as little as possible prior to or during sampling. Samples will be collected in clean containers and laboratory tested for the constituents specified in Section 4.5. After the final sampling event, a honey truck will be used to pump clean the landowner's septic tank. Temperature, electrical conductance, and pH will be analyzed in the field during sampling using calibrated field instruments.

4.4 SOIL SAMPLE COLLECTION

During drilling of the investigation and lysimeter boreholes, soil samples will be collected for laboratory analysis. In the vertical exploratory borehole, a total of three samples will be collected at intervals to be determined in the field. In the three angled holes one sample each will be collected at a representative location via either Shelby Tube or Dry Core System. All soils samples and soil intervals will be logged by a licensed geologist and will describe color, texture, visible constituents including organic matter, gypsum and calcium carbonate. Samples for laboratory analysis will be collected from the boreholes, logged,

placed into Ziploc plastic bags, and shipped to the laboratory, following chain-of-custody procedures detailed in Section 5.3.

4.5 LABORATORY ANALYSIS

Wenck will ship the water and soil samples for this project to Inter-Mountain Labs in Sheridan, Wyoming, a commercial analytical laboratory, for analysis of the following parameters.

Septic Tank Water:

- LQD Guideline 8 with no radionuclides

Soil Moisture:

- Chloride
- Total Phosphorus
- Nitrate
- Nitrite
- Total Kjeldahl Nitrogen

Soil:

- Adsorption
- Total Nitrogen
- Nitrate
- Organic Matter

Soils will only be analyzed for the first sampling event, immediately after drilling and equipment installation. Base (septic tank) effluent samples will only be analyzed during the first and last sampling event. Vadose water samples will be analyzed for all six lysimeters for each sampling event. Control limits for precision and accuracy will be based on (in order of precedence) analytical method requirements, and laboratory-established control limits, and will be determined prior to sampling.

5.0 Quality Assurance Plan

This section describes the field, quality control (QC), and analytical procedures to be followed throughout the site monitoring.

5.1 GENERAL SAMPLE COLLECTION AND HANDLING PROCEDURES

All water samples will be placed in containers provided by the analytical laboratory, and the container caps will be securely fastened for shipment. Container and preservation requirements, as dictated by the laboratory providing the sample bottles, will be met.

5.2 FIELD EQUIPMENT CALIBRATION

Collection of data in the field requires the use of equipment having acceptable limits of accuracy and precision. Functionality of all equipment that is used in the field will be checked and routinely calibrated. Calibration and repair logs will be maintained on all of the equipment that is used. Calibration and maintenance will follow manufacturer specifications.

5.3 SAMPLE CUSTODY

Procedures to ensure the chain-of-custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records. Chain-of-custody records will be maintained for all field and field QC samples from time of collection to its arrival at the laboratory. A sample is defined as being under a person's custody if any of the following conditions exist: 1) it is in their possession; 2) it is in their view, after being in their possession; 3) it was in their possession and they locked it up, or 4) it was in a designated secure area.

When the samples are shipped, the person in custody of them will relinquish the samples by signing the chain-of-custody and noting the date and time. The sample control officer at the laboratory will verify sample integrity and confirm that it was collected in the proper container, preserved correctly, and that there is an adequate volume for analysis. If these conditions are met, the sample will be assigned a unique log number for identification throughout the analysis and reporting. The log number will be recorded on the chain-of-custody form and in the legally required logbook maintained by the laboratory.

The information documented on the chain-of-custody form will also include the sample identification, the date and time of sample collection, the analysis required, the name of the sampler, and custody transfer signatures (along with date and times) for sample transfer from the field to the analytical laboratory. Samples will be uniquely identified, labeled, and documented in the field at the time of collection, and will be transported to the laboratory as expeditiously as possible. The samples will be packed in ice to keep them cooled to less than 4º Celsius during collection and transportation.

5.4 SAMPLE IDENTIFICATION

Each sample container submitted for analysis will have a securely fixed label to identify the job number, sampler, date and time of collection and a unique sample number. This information, in addition to a description of the sample, field measurements made, sample

methodology, names of on-site personnel and any other pertinent field observations will be recorded on the field sampling records.

5.5 ANALYTICAL QUALITY ASSURANCE

In addition to routine calibration of the analytical instruments with standards and blanks, Wenck will collect field water QC samples for 10 percent of the analyses throughout the life of the test. These samples will include field duplicates (to assess field precision) and field blanks (to check the decontamination method) as an added measure of precision and accuracy. Accuracy is also verified through the following:

1) U.S. Environmental Protection Agency and state certification programs.

2) Participation in an inter-laboratory quality assurance program.

3) Verification of results with an alternative method. For example, calcium may be determined by atomic absorption, ion chromatography or titrimetric methods. Volatile organics may be determined through either purge and trap or liquid-liquid extraction methods.

5.6 MISCELLANEOUS CHECKS OF ACCURACY

Where trace analysis is involved, purity of the solvents, reagents, and gases employed is of great concern. The laboratory maintains a service contract on all major instrumentation; gas chromatographs, atomic absorption, ion chromatography and total organic carbon analyzers are all served and maintained regularly. The laboratory may also provide additional quality assurance documentation including method blanks, spikes and duplicates on the lot of samples analyzed.

6.0 Reporting

The following sections detail the site contacts, proposed costs and deliverables, and project schedule for implementing the septic system impact analysis for Albany County.

6.1 ADDITIONAL ANALYSIS

Following collection of the vadose water sampling results, Wenck plans to perform geochemical modeling using programs such as Geochemist's Workbench, PHREEQC, or Acuchem, depending on the primary nitrate removal mechanism that is identified. Based on the data that are obtained in this investigation and any other relevant background data, Wenck will provide (1) a review of nitrate removal mechanisms at work in the project area; and (2) predictions of nitrate removal capacity under various scenarios. These data may be helpful for comparison with future studies of this type.

6.2 CONTACTS

Albany County

David Gertsch
Planning Director
1002 South Third Street
Laramie, WY 82070
(307) 721-2568
Email: dgertsch@co.albany.wy.us

Consultant

Chris Lidstone, PG, Regional Manager
Mark Stacy, PG, Senior Hydrogeologist
Wenck Associates
4025 Automation Way, Bldg. E
Fort Collins, CO 80525
(970) 223-4705
Fax (970) 223-4706
Email: clidstone@wenck.com
mstacy@wenck.com

Regulatory Agency

Nicole Twing, Geology Supervisor
Wyoming Department of Environmental Quality
Groundwater Pollution Control Program
200 West 17th Street, 4th Floor
Cheyenne, WY 82002
(307) 777-8275
Email: nicole.twing@wyo.gov

6.3 DELIVERABLES

In addition to this work plan, the following deliverables will be generated for this project:

A final report which will include the following:

- Description of all field activities including lysimeter and monitoring well construction, well development, and sampling;
- Well completion and lithologic logs for each borehole;
- Summary of water level data;
- Summary of analytical data for all water, soil moisture, and soil sampling events with a comparison to DEQ's protection standards, and analytical data sheets provided in an appendix;
- Recommendations for additional testing;
- Electronic submittal of analytical data in DEQ's format; and,
- Conclusions based on the monitoring results, including predictions of nitrate removal capacity under various scenarios.

Ten copies of the final report will be prepared and submitted to Albany County along with a digital copy. Wenck will also prepare interim letter reports with invoices for the sampling events for use with applying for cost reimbursement from DEQ throughout the course of the project.

6.4 SCHEDULE

Following is the proposed schedule for equipment installation and sampling, which is contingent upon approvals from Albany County and DEQ:

- Work plan approved by DEQ: Early February 2018.
- Drilling, monitoring well and lysimeter installation, and development completed by the end of February 2018 (estimated to take three days). Drilling is contingent upon weather conditions and will be expedited if possible.
- First round of groundwater sampling: February 2018 (1 day).
- Second round of groundwater sampling: April 2018 (1 day).
- Third round of groundwater sampling: May 2018 (1 day).
- Fourth round of groundwater sampling: June 2018 (1 day)
- Fifth round of groundwater sampling: September 2018 (1 day).
- Sixth round of groundwater sampling: December 2018 (1 day).
- Submit final report: May 2019.
- Submit close-out files: June 2019.

This schedule is sufficient to provide DEQ and Albany County with the required data in advance of the May 15, 2019 deadline.

7.0 References

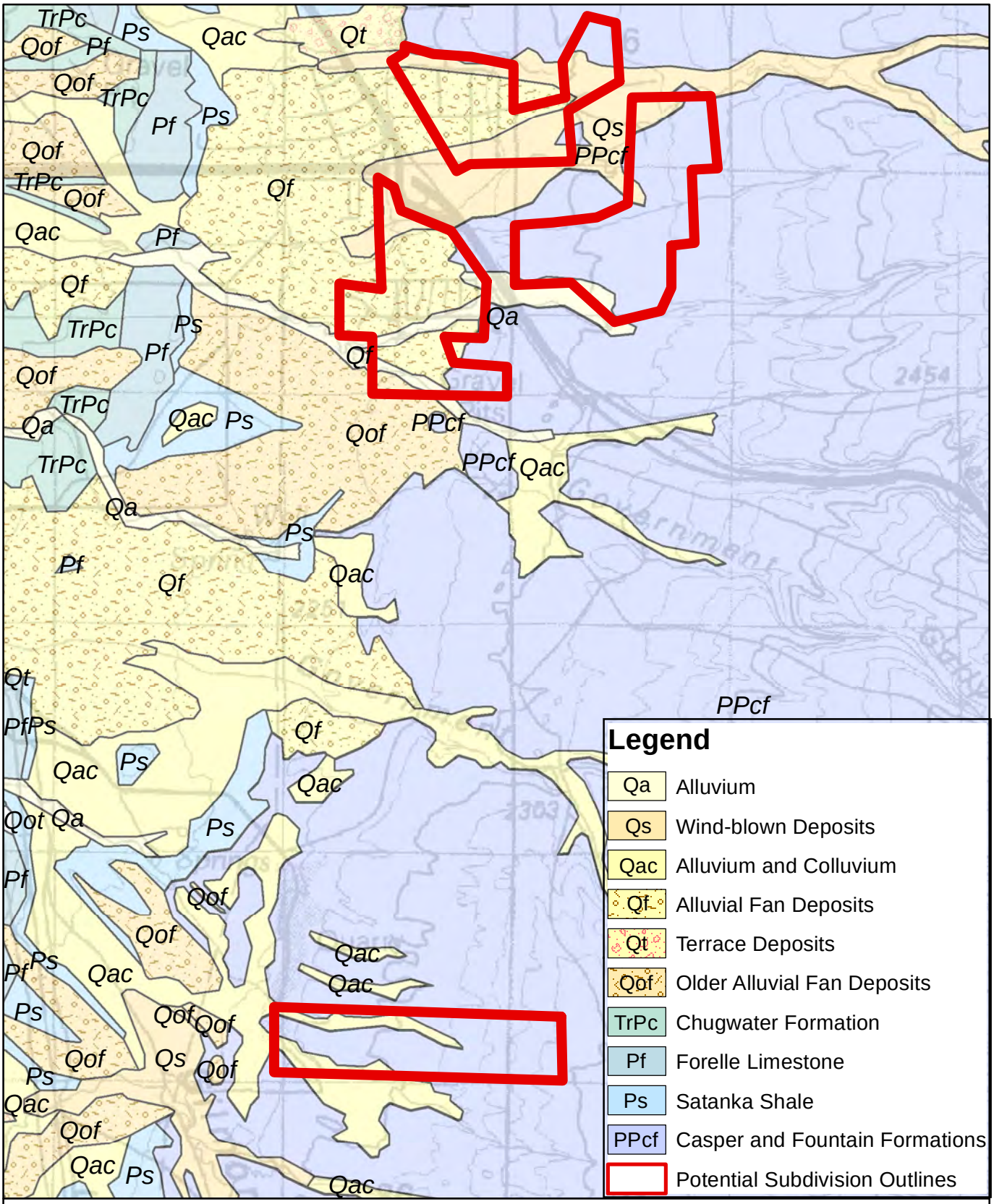
City of Laramie, 2009, Report on Summer/Fall 2009 Nitrate-Nitrogen Monitoring in the Casper Aquifer Protection Area. City of Laramie staff report to the Laramie City Council.

Tempo, 1979, Monitoring in the Vadose Zone: A Review of Technical Elements and Methods: U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory.

Western Water Consultant, Inc. (WWC), 2015, 2015 Laramie Water Master Plain, Level I, Report to Wyoming Water Development Commission, December 2015, Volume II.

Figures

1. Geologic Map
2. Conceptual Lysimeter Installation Design
3. Conceptual Borehole Locations
4. Conceptual Well Diagram



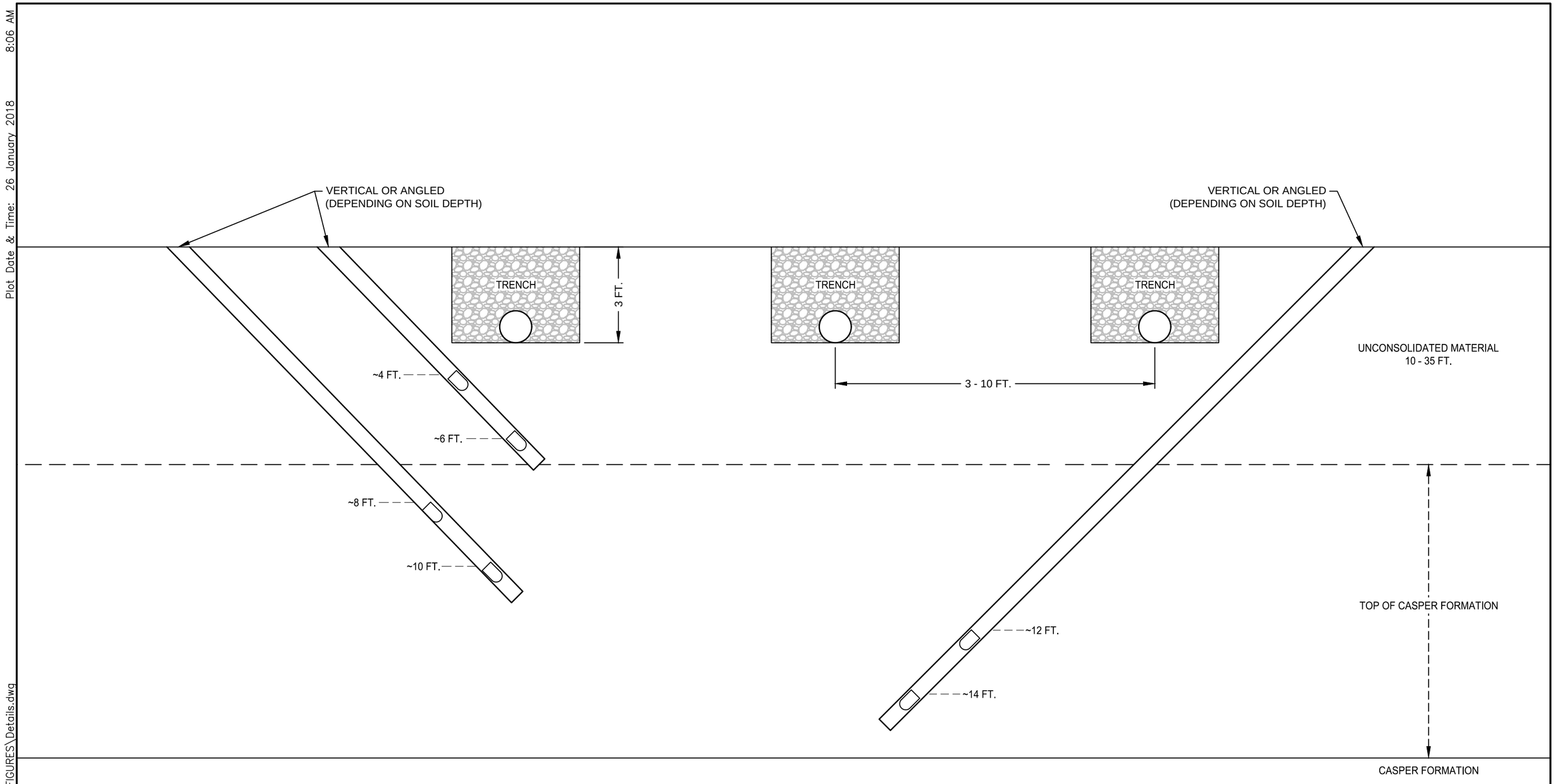
ALBANY COUNTY SEPTIC SYSTEM IMPACT ANALYSIS

Site Location Map

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

JAN 2018

Figure 1



Plot Date & Time: 26 January 2018 8:06 AM

Z:\project\WYALB101 - B7218\CAD\FIGURES\Details.dwg

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

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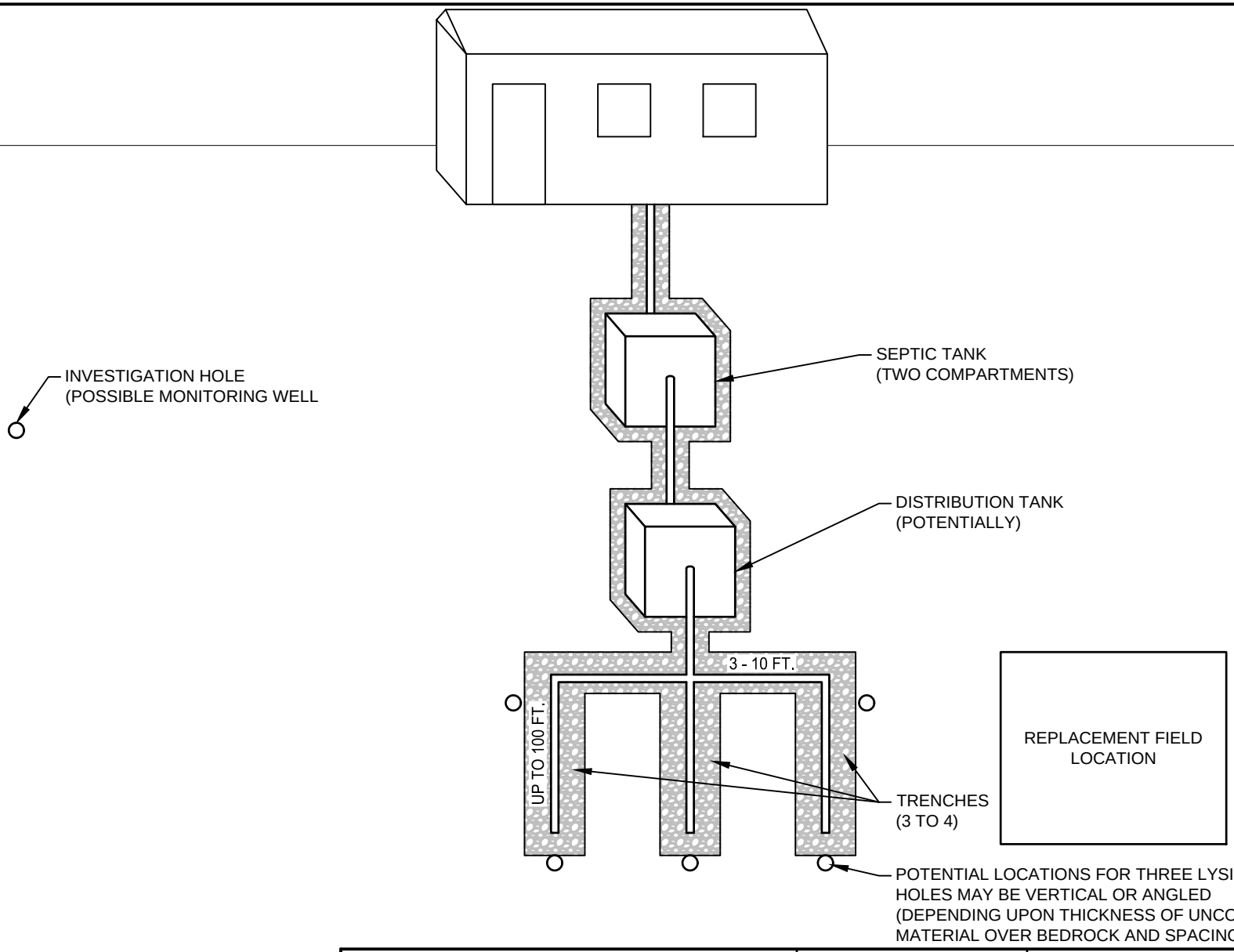
DWN BY	CHK'D	APP'D
DJW	CEC	

DWG DATE 1/25/2018
SCALE

PROJECT SEPTIC SYSTEM IMPACT ANALYSIS
CLIENT ALBANY COUNTY

SHEET TITLE CONCEPTUAL LYSIMETER INSTALLATION

PROJECT NO.	SHEET NO.	REV NO.
WYALB101	FIGURE 2	



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REV	DWN	APP	REV DATE	DWN BY	CHK'D	APP'D
				DJW	CEC	

CLIENT: ALBANY COUNTY

PROJECT: SEPTIC SYSTEM IMPACT ANALYSIS

SHEET TITLE: CONCEPTUAL BOREHOLE LOCATIONS

DWG DATE: 1/25/2018

SCALE:

PROJECT NO.: WYALB101

SHEET NO.: FIGURE 3

REV NO.:

WENCK

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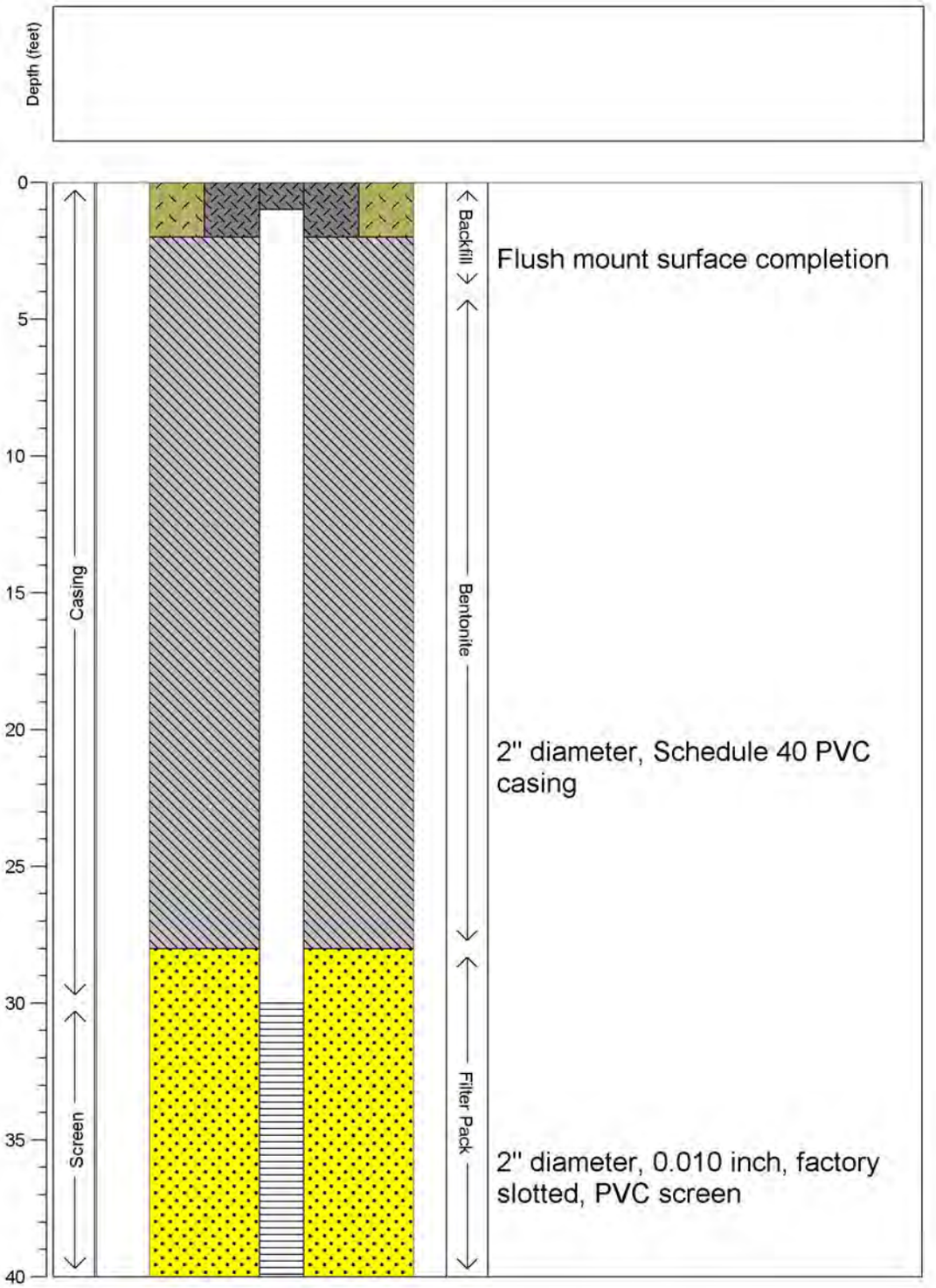
Project: Albany County
Location: Albany County
Drilled by:
Date started:
Date completed:

Well Name:
Drilling Method:
Total depth: 40'
Elev.:



Notes:

FIGURE 4

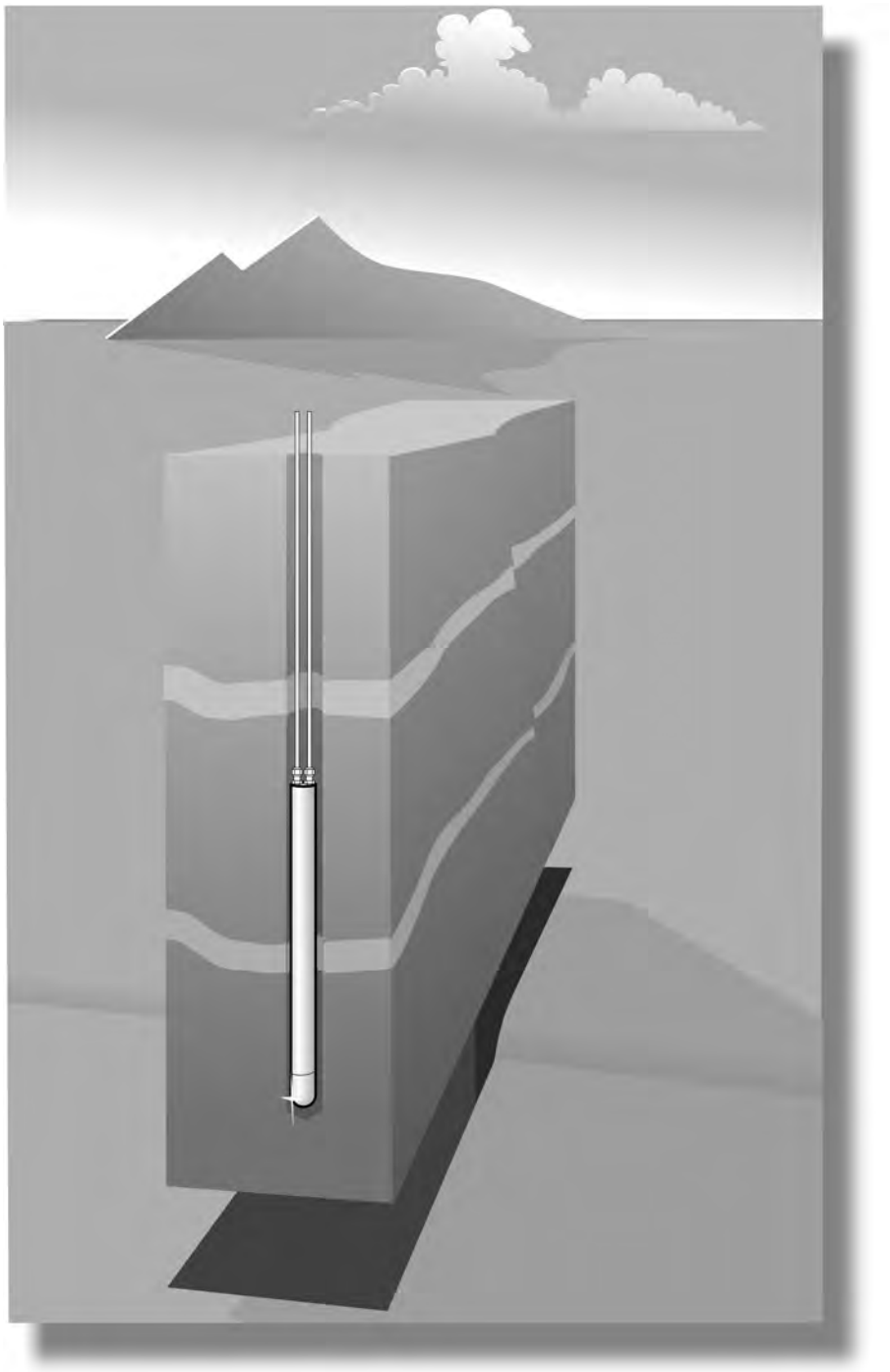
Appendix A

Lysimeter Instructions

1920F1

OPERATING INSTRUCTIONS

1920F1 Pressure-Vacuum Soil Water Samplers **March 2017**



SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93130 USA
Phone: (805) 964-3525 • Fax: (805) 683-2189
e-mail: sales@soilmoisture.com • Web www.soilmoisture.com

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HISTORY/GENERAL USES

Soil Water Samplers had their origin back in 1961 when we cooperated with Dr. George H. Wagner at the University of Missouri to manufacture a porous ceramic cup for collecting soil water samples. The outgrowth of this work was our first commercial Soil Water Sampler, Model 1900 Soil Water Sampler. Since that time, these samplers have been generally accepted as an ideal tool for in situ collection of soil water samples for a great variety of soil moisture monitoring work.

The initial and most extensive use of these Samplers was made by Pennsylvania State University, largely under the direction of Dr. L. T. Kardos and others, on the Pennsylvania Waste Water Project. Modifications of the original 1900 Soil Water Sampler by Richard R. Parizek and Burke E. Lane at Pennsylvania State University, reported on in the Journal of Hydrology, produced a pressure-vacuum type unit. Since that time, we have made available commercially the Model 1920 Pressure-Vacuum Soil Water Sampler. Some of our Soil Water Samplers have been in continuous use for several years and still yield satisfactory soil moisture samples.

All of our ceramics are made from formulations which contain various proportions of kaolin, talc, alumina, ball clay, and other feldspathic materials, using proprietary formulas developed through research and experience accumulated over more than 4 decades.

Our samplers find applications not only in research work such as quantitative chemical analysis of soil water, but also for pollution control purposes in monitoring moisture under sanitary landfills, irrigated areas with wastewater, and areas where reclaimed or recycled water is used on a routine basis to assure compliance with government standards.

Soilmoisture's line of Soil Water Samplers has proven to be an excellent and reliable means for obtaining soil water samples from both saturated and unsaturated soils at depths ranging up to several hundred feet.
Soilmoisture's Soil Water Samplers, which are also referred to as

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"suction lysimeters" or "lysimeters", have been in general use around the world for many years.

Soil water is held largely under a state of tension (negative pressure) within the soil by capillary forces. The capillary force is the sum of the adhesive and cohesive forces. The adhesive force is characterized as the attraction of water for soil solids (soil and organic matter). Cohesive force is characterized as the attraction of water for itself. Adhesive force is far greater than the cohesive force.

Water is naturally attracted to soil particles (by its adhesive quality) and "sticks" to the surface of each particle and in the various sized "capillary" spaces or "pores" between the soil particles. When the soil is very wet, the large pores fill with water. This "excess" water has no direct surface contact with the soil and is held cohesively, one water molecule to another, and can move quite freely. As a soil dries out, the "excess" water first evaporates as it requires less energy to break the cohesive bonds. The remaining water, held tightly inside the capillary spaces by adhesive qualities, requires more energy to remove it from the soil.

The following illustration (see Figure 1) shows the increasing force required to remove water from the small-sized capillary pores compared to the large pores as the soil dries out. When the remaining water is held only in extremely small pore spaces, it requires more energy to remove the water from these pores. Even though there may be a considerable volume of water in the soil, the tension that holds the water determines how readily it can be removed.

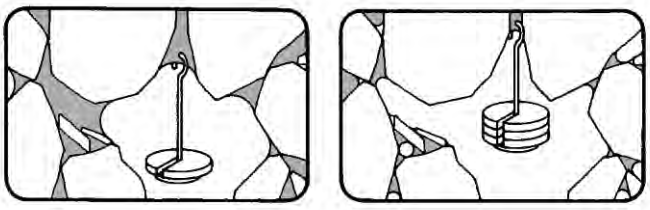

Figure 1

This tension that determines how moisture moves in the soil is referred to as "soil water tension", "negative pore pressure", or "soil suction". For simplicity's sake we refer to this tension as "soil suction" in these instructions, but keep in mind that negative pressure is the most descriptive term.

The following graph shows the relationship between the percent of moisture in a soil and the soil suction required to remove the moisture from three types of soil: clay, loam, and sand.
The graph (see Figure 2) illustrates that it is easier to remove water

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e-mail: sales@soilmoisture.com • Web www.soilmoisture.com

from a sandy soil with 10% moisture, than it is to remove water from a clay soil with 30% moisture. This is because the water in the clay soil is held in very small capillary spaces within the soil particles under a higher soil suction, whereas the sandy soil holds water in large capillary spaces under a lower soil suction.

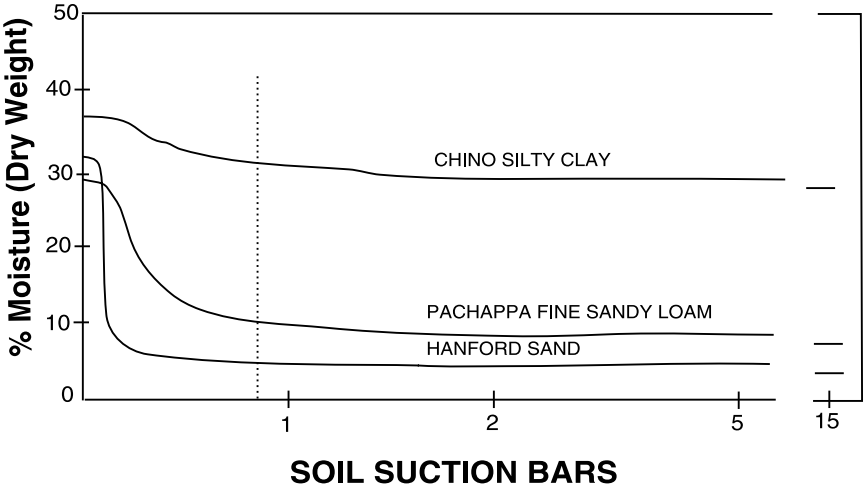

Figure 2.

Soilmoisture's Soil Water Samplers allow water to be removed from the soil by creating a vacuum (negative pressure or suction) inside the sampler greater than the soil suction holding the water in the capillary spaces. This establishes a hydraulic gradient for the water to flow through the porous ceramic cup and into the sampler. Note: when evaluating soil suction ratings of a ceramic plate or cup, a positive pressure rating is used. Water can be held at tensions far greater than 1 atm (the limit for vacuum-type measurements). Positive pressure can force water out of capillary pores equivalently as negative pressures, and is the practical method for evaluation of soil suction.

In practice, a vacuum is drawn in the Soil Water Sampler that exceeds the soil water tension. Then liquid water will flow to the ceramic cup due to the potential gradient (i.e. water will move from less negative potential to more negative potential). The practical limit for water flow in soils is about 65 cb (centibar) (although in some soils, the value can approach 85 cb). When soil moisture tensions exceed 2 bars, the wetted meniscus in the ceramic pores will break and the Soil Water Sampler will appear to be unable to hold vacuum. The ceramic cup will have to be rewetted to hold a vacuum and soil moisture tensions will have to decrease to less than 85 cb before water can again be moved toward the ceramic cup.

Additional information on the advantages and disadvantages of Soil

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Water Samplers in general can be found in Chapter 19, “Compendium of In Situ Pore-Liquid Samplers for Vadose Zone” (Dorrance et al.), of the ACS Symposium on Groundwater Residue Sampling Design (April 22-27, 1990) and the ASTM Designation D4696-92 “Standard Guide for Pore-Liquid Sampling from the Vadose Zone" (Vol. 04.08 Soil and Rock (I): D4696).

Remove all packing materials and check the Soil Water Sampler for

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YOUR NEW PRESSURE-VACUUM SOIL WATER SAMPLER

Unpacking

any damage that may have occurred during shipment.

If the Sampler is damaged, call the carrier immediately to report it. Keep the shipping container and all evidence to support your claim.

Assembly

The standard 1920F1 Pressure-Vacuum Soil Water Sampler was assembled and testedprior to shipment.

All other accessory items necessary for proper use are discussed later in these instructions and are listed on page 16. Please read all instructions thoroughly before installing the Sampler. To assure optimum cleanliness of the assembly, no grease or organic solvents have been used in its manufacture.

Not Liable for Improper Use

Soilmoisture Equipment Corp. is not responsible for any damage, actual or inferred, for misuse or improper handling of this equipment. The Pressure-Vacuum Soil Water Samplers, Models 1920F1, are to be used solely as directed by a prudent individual under normal conditions in the applications intended for this equipment.

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ACQUAINT YOURSELF WITH THE PARTS

The Pressure-Vacuum Soil Water Sampler (Model 1920F1) comes fully assembled. The Pressure-Vacuum Soil Water Sampler (see Figure 3) is constructed of a 1.9 inch O.D. PVC tube (made of FDA-approved material) with a 2 bar porous ceramic cup bonded to one end. The serviceable end of the Sampler is completely sealed and two 1/4-inch tube connectors protrude from the top. The white tube connector indicates the "Pressure/Vacuum" side and is used exclusively for pressurizing and evacuating the Sampler. The green tube connector is used to recover the collected sample.

Two 1/4-inch O.D. polyethylene access tubes are used for pressurizing and recovering samples which are terminated in neoprene tubing. Clamping rings are used to clamp the neoprene to keep the Sampler

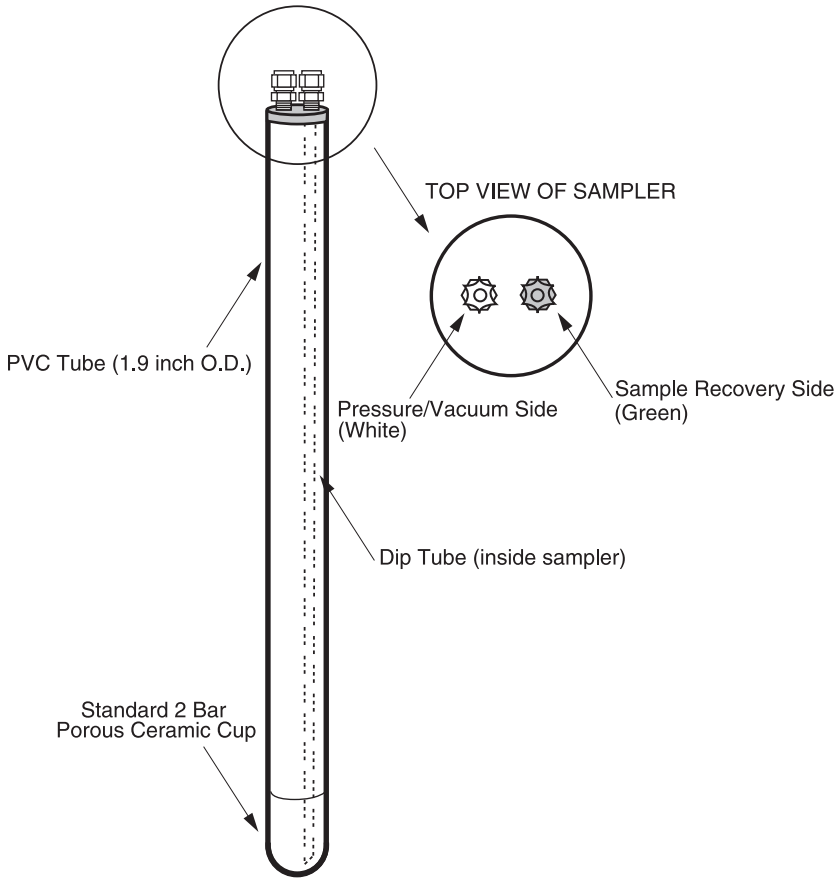

Figure 3. Pressure-Vacuum Soil Water Sampler

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REQUIREMENTS PRIOR TO USE AND HOW TO OPERATE

Attaching the Access Tubes

under negative pressure (not shown here).
Once the depth and location for the Pressure-Vacuum Soil Water Sampler have been established, you must determine the required length for the access tubes before they are cut and attached to the Soil Water Sampler.

The access tubes are generally made of 1/4-inch O.D. polyethylene, nylon tubing. Each access tube is inserted into the loosened top portion of the tube connector located on the serviceable end of the Soil Water Sampler. Tighten the fittings to finger tightness. We recommend using 2 different colors of tubing to differentiate between the two connectors in order to eliminate mistakes in identifying the access tubes once the Sampler is placed in the soil. Soilmoisture offers both black and green polyethylene tubing, models 1903L and 1904L respectively.

Pressure Testing Before Installation

We highly recommend pressure testing the complete Sampler assembly prior to installation. Your prior testing will confirm the integrity of all joints and components.

After allowing the ceramic portion of the Sampler to soak in water for approximately two hours, a sustained pressure of 20 psi can be applied to the submerged Sampler, associated tubing, and connectors. Continuous bubble formation indicates leakage and shows the exact location of any leak.

Coring the Hole

The Pressure-Vacuum Soil Water Sampler, Model 1920F1, may be installed at any depth up to a maximum of 50 feet.

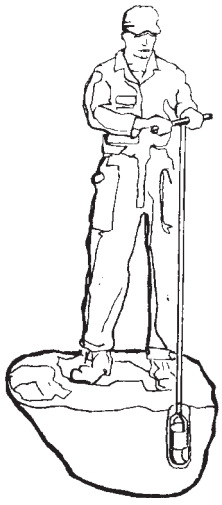

Figure 4a.

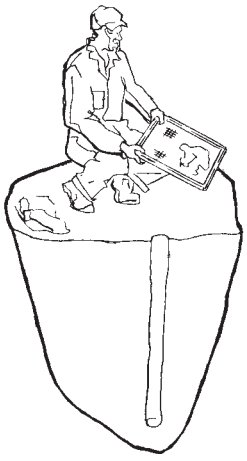

Figure 4b.

In rock-free, uniform soils at shallow depths, use a 2-inch screw or bucket auger for coring the hole (Figure 4a). If the soil is rocky, a 4-inch auger should be used. The soil is then sifted (Figure 4b) through a 2mm mesh screen or 2mm sieve to free it of pebbles and rocks.

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This will provide a reasonably uniform backfill soil for filling in around the Soil Water Sampler. Soilmoisture has suitable soil augers for this purpose (234 Series augers). There are other methods for installing the Soil Water Sampler to be used, largely dictated by the type of soil you are dealing with and the tools available. The primary concern in any method of installation is that the porous ceramic cup of the Sampler be in tight, intimate contact with the soil so that soil water can move readily from the pores of the soil through the pores in the ceramic cup and into the Soil Water Sampler.

Preparing The Hole Using a Slurry and Backfilling The Hole

After the hole has been cored, mix sifted soil with water to make a slurry which has a consistency of cement mortar. This slurry is then poured down to the bottom of the cored hole to insure a good soil contact with the porous ceramic cup (see Figure 5a).

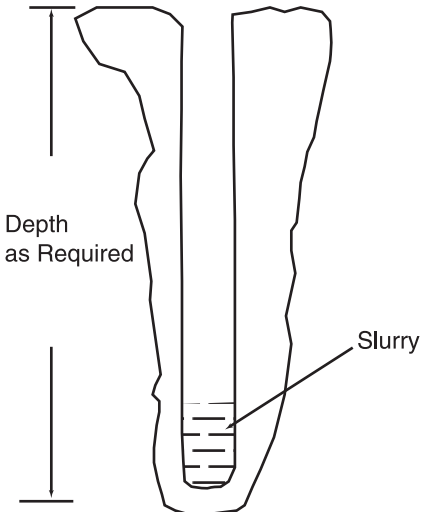

Figure 5a.

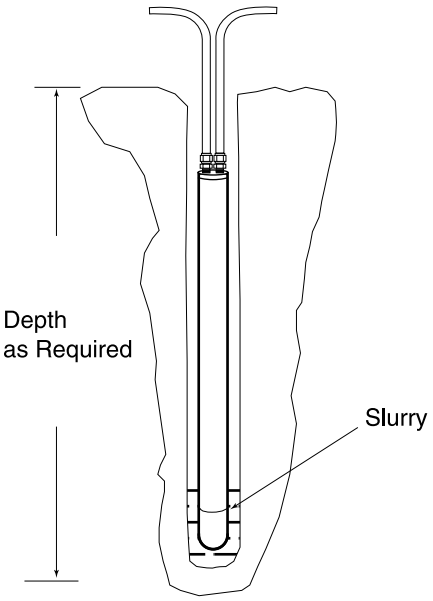

Figure 5b.

Immediately after the slurry has been poured, insert the Soil Water Sampler down into the hole so that the porous ceramic cup is completely embedded in the soil slurry (see Figure 5b).

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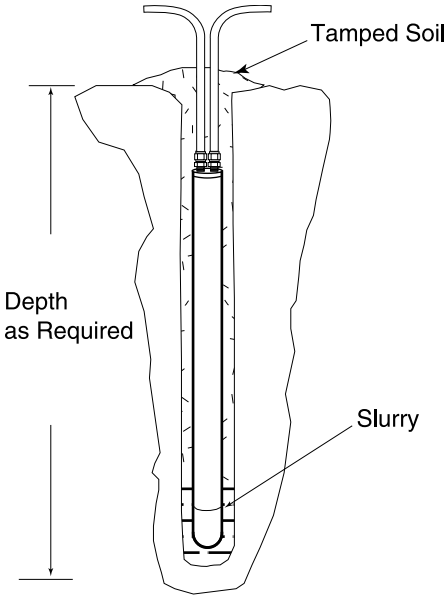

Figure 6.

Backfill the remaining area around the Sampler with sifted soil which is free of pebbles and rocks, a 2mm sieve is popular for this. Tamp the soil firmly to prevent surface water from running down the cored hole, or make a bentonite seal. (see Fig. 6)

Alternate Methods for Sampler Installation

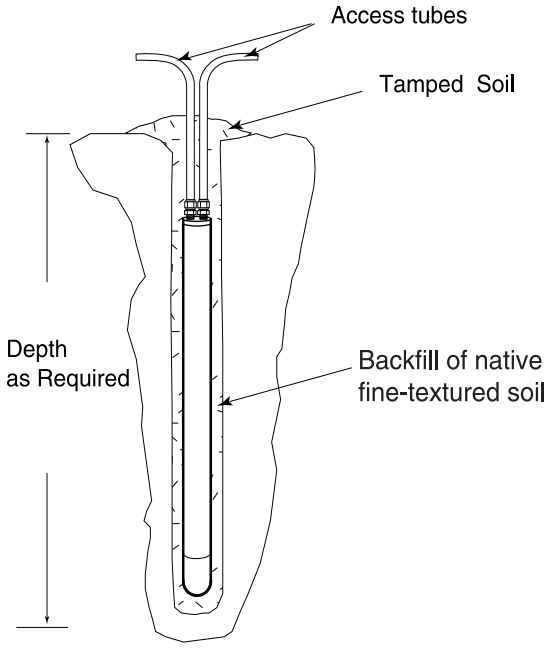

Figure 7.

If the soil into which the Sampler is being installed is fine-textured and free of rocks, a slurry may not be necessary. Core the hole to the desired depth, insert the Soil Water Sampler and backfill the hole with native soil, tamping continuously to insure good soil contact with the porous ceramic cup and complete sealing of the cored hole (see Figure 7).

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In a coarse-textured or rocky soil, it may be difficult to make a suitable slurry from the existing soil. A slurry can be made using silica flour, which is then used to establish good contact between the ceramic cup and the soil. For a 2-inch diameter hole, 1 lb. of silica flour is needed, while a 4-inch diameter hole will require 4 lbs. of silica. Mix the silica with water to produce a slurry with a consistency of cement mortar.

Core the hole to the desired depth, and pour in about 1/4 of the silica slurry. Insert the Soil Water Sampler and pour in the remainder of the slurry so that the slurry completely covers the ceramic cup. Backfill the hole with sifted soil (free of pebbles and rocks), tamping continuously with a metal rod to prevent surface water from channeling down between the soil and the body tube of the Sampler (see Figure 8).

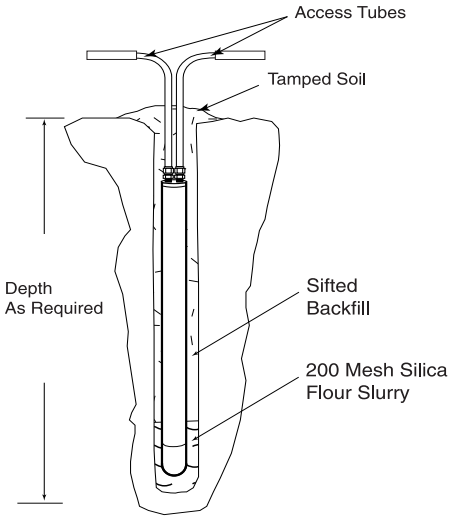

Figure 8.

To ensure that disturbed soil resulting from the installation of the Sampler does not affect the movement of water to the Sampler, Bentonite clay plugs can be installed. Core the hole a few inches deeper than the desired depth, and pour in several inches of wet Bentonite clay (see Fig. 9). This will isolate the Sampler from the soil below. Pour in 1/4 of the slurry, either of soil or of Silica, and insert the Soil Water Sampler. Pour the remainder of the slurry around the cup of the Soil Water Sampler. Backfill with native soil to a level just above the Soil Water Sampler and again add sufficient Bentonite as a plug to further isolate the Soil Water Sampler and guard against possible channeling of water down the hole. Backfill the remainder of the hole slowly, tamping continuously with a metal rod using native soil, free of pebbles and rocks.

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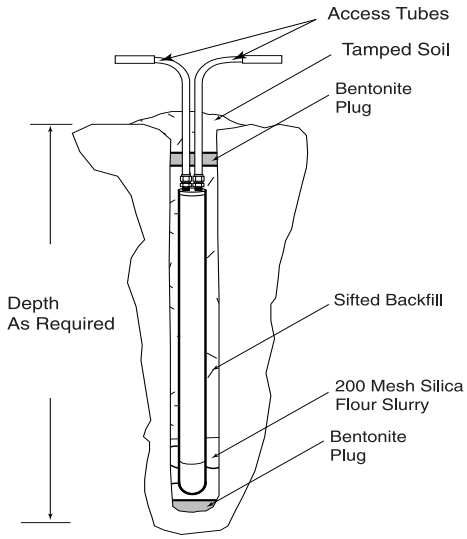

Figure 9.

Protecting the Access Tubes

After installation, the access tubes from the Sampler are terminated with a 6-inch length of neoprene tubing (MRT003)above the Sampler installation. Or, if conditions require, place the neoprene-terminated access tubes in a trench, terminating above the soil surface at a remote location. We recommend that the access tubes be protected inside a conduit tube running from the top of the Sampler to the termination at the surface. At the surface level, take care that the access tubes are safe from damage by mechanical equipment or animals. Do not cover the surface area directly above the Sampler in any manner that would interfere with the normal percolation of soil water down to the depth of the Sampler, otherwise the obstruction could have an adverse affect on your soil water sample.

Collecting A Sample in the Sampler

To collect a sample, the discharge access tube is closed using a clamping ring, and the vacuum port of the hand pump is connected to the Pressure-Vacuum access tube. The pump is then used to create a vacuum of about 60 cb inside the Sampler, which is indicated on the gauge connected to the pump (see Fig. 10).

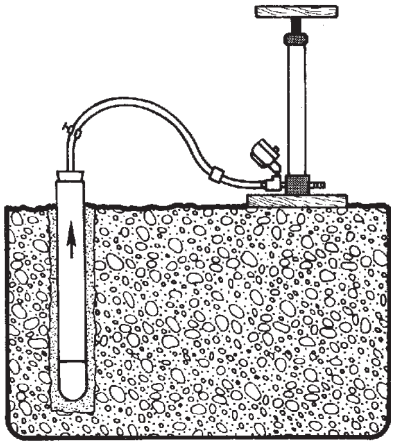

Figure 10.

The vacuum within the Sampler causes the water to move from the soil,

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through the pores of the porous ceramic cup, and into the Sampler. The rate at which the soil solution will collect within the Sampler depends on the capillary conductivity of the soil, the soil suction value within the soil (as measured with tensiometers), and the amount of vacuum within the Sampler. In moist soils of good conductivity, at field capacity (10 to 30 cb of soil suction as read on a tensiometer) substantial soil water samples can be collected within a few hours. Under more difficult conditions it may require several days to collect an adequate sample.

Recovering a Sample from the Soil Water Sampler

In general, a vacuum of 50 to 85 cb is normally applied to the Soil Water Sampler. In very sandy soils, however, it has been noted that very high vacuums applied to the Soil Water Sampler seem to result in a lower rate of collection of the sample than a lower vacuum. It is our opinion that in these coarse, sandy soils, the high vacuum within the Sampler may deplete the moisture in the immediate vicinity of the porous ceramic cup reducing the capillary conductivity, which creates a barrier to the flow of water to the cup. In loams and gravelly clay loams, users have reported collection of 300 to 500 ml of solution over a period of a day with an applied vacuum of 50 cb, when soils are at field capacity. At waste water disposal sites, users have obtained 1500 ml of sample solution in 24 hours following cessation of irrigation with 1 to 2 inches of waste water on sandy or clay loam soil.

To recover a soil water sample, remove the Pressure-Vacuum tube from the vacuum port of the pump, and attach the tube to the pressure port. Place the discharge access tube in a small collection bottle and remove both clamping rings. Apply a few strokes on the hand pump to develop enough pressure within the Sampler to force the collected water out of the Sampler and into the collection bottle (see Fig. 11).

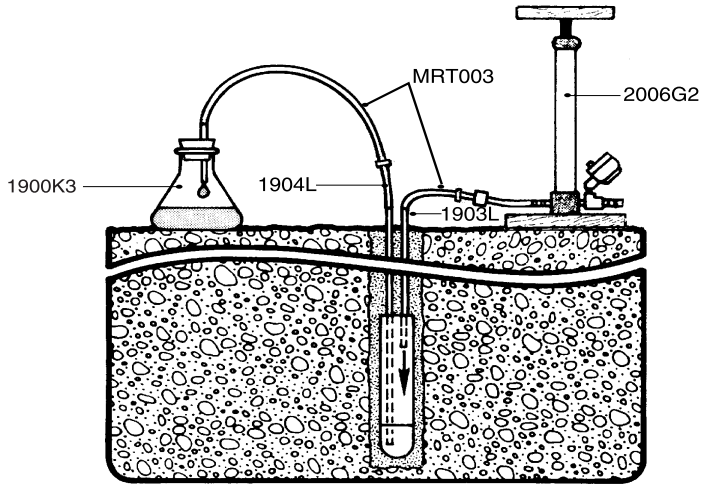

Figure 11

Subsequent ... uum within the Sampler and following the steps as outlined above.

There are no maintenance requirements for the Pressure-Vacuum Soil Water Sampler other than protecting the access tubes from damage.

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Tube ends should be covered or plugged to prevent debris from entering the tubes and later contaminating the Sampler.

Freezing conditions will not damage the subsurface parts of the Samplers. The Samplers are normally left permanently in place all year round. Water may freeze in the sample line near the surface during saturated freezing conditions. Be sure all the water is removed from the sample line before clamping it for the next sample.

Rewetting The Sampler

If the soil suction exceeds 2 bars, the ceramic cup may need to be rewetted to obtain a sample. This is accomplished by pouring approximately 250 ml of deionized water down the sample line (both the pressure-vacuum and the sample lines must be open). After waiting approximately one hour, pressurize the pressure-vacuum line to remove any excess water. A vacuum can be applied after the ceramic cup has been rewetted. If no sample is obtained after following the above rewetting procedure, the soil suction is probably in excess of 85 cb.

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SPARE PARTS AND ACCESSORIES LIST

0922W_	Bentonite (5 lb., 10 lb., or 50 lb. bag sizes)
0930W_	Silica Flour (5 lb., 10 lb., or 50 lb. bag sizes)
1900K4	Wide-mouth Sample Bottle, polypropylene - 1,000 ml (autoclavable)
1902K3	Centralizer with Centralizer Adapter Kit
1902K4	1-1/2" Stainless Steel Coupling Assembly
1903L_	Black Polyethylene Tubing (100 ft., 500 ft., or 1,000 ft. rolls)
1904L_	Green Polyethylene Tubing (100 ft., 500 ft., or 1,000 ft. rolls)
2006G2	Pressure-Vacuum Hand Pump (with gauge)
2031G2	Clamping Rings (per doz.)
MRT003	Neoprene Tubing, 3/16-inch I.D. x 1/16-inch wall (10ft, 25ft, or 50ft, rolls)

Note:
All Pressure-Vacuum Soil Water Samplers come in 6-inch, 12-inch, 24-inch or 36-inch lengths. They can also be special ordered with either a 1 Bar High Flow (30 ft. maximum depth range) or 1/2 Bar Standard (15 ft. maximum depth range) porous cup instead of the standard 2 Bar cup. Please contact our Sales Department for further details.

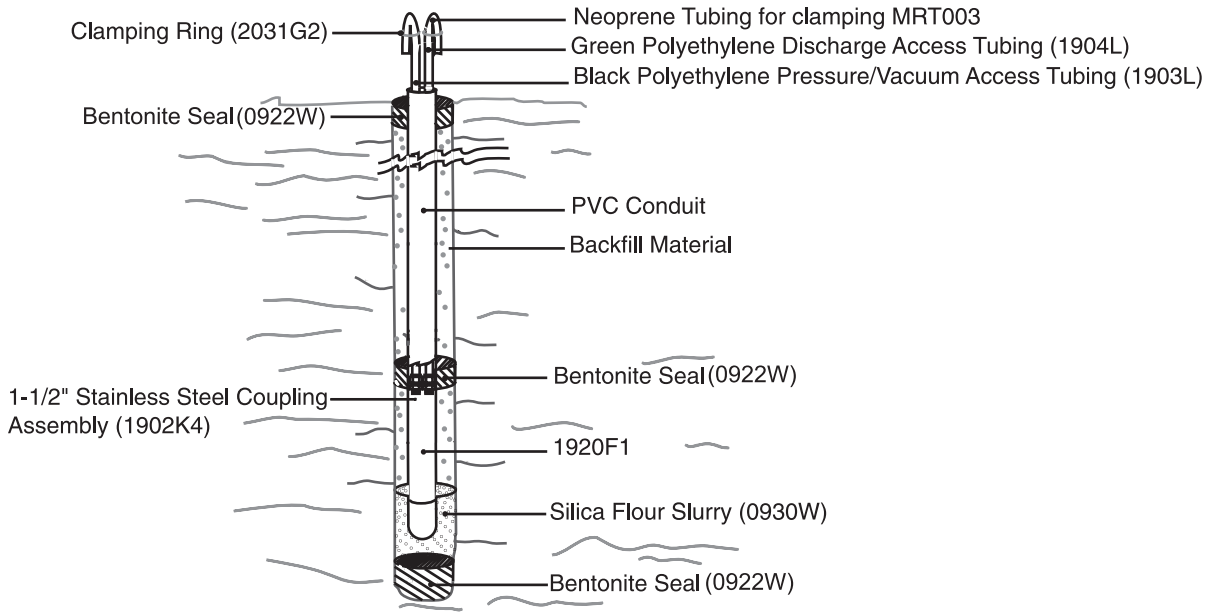

Figure 12. Complete sampler installation with accessories

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Appendix B

Site Leachfield Information

Copy to USGS 11-7-69

Form U.W. 7

**Completed Prior to May 24, 1969 ☒

NOTE: Do not fold this form. Use typewriter or ball point pen.

STATE OF WYOMING

OFFICE OF THE STATE ENGINEER

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

for Domestic or Stock Watering Use Only

A preferred water right is given to such use when the yield or flow does not exceed .056 cubic feet per second or 25 gallons per minute. Domestic use refers to household use and the watering of lawns and gardens for family use, not to exceed one acre.

Permit No. U.W. 3166 Temporary Filing No. 3-1-136

Water Division No. 1

U.W. District LARAMIE

Name of Well Boswell No. 1

IF WELL IS TO BE ABANDONED, SEE ITEM 21

1. Owner ~~Kent Boswell~~ Wm. E. Bittner & Barbara A. Bittner
2. Address ~~Sherman Hills Estate~~ Box 676 Laramie, Wyo. 82070
3. Agent to receive correspondence same
4. Name & address of driller M & B Drilling Cheyenne, Wyoming
5. Well is constructed on lands owned by Kent Boswell
   (Obtaining of easement or right of way is the responsibility of the applicant's. Include copy if land is privately owned and owner is not a co-applicant.)
6. Type of construction: Dug ☐ Drilled ☒ _____ Type of Rig
   Driven ☒ Jet ☐ Other _____
7. Use of Water—Domestic ☒ Stock ☐
8. Means of conveyance, distance and direction to point of use
   To house 25' N - by 1" underground pipe
9. Date started ~~May~~ April 21, 1969.
10. Date completed April 27, 1969. (including pump)
11. Date after completion when water was used May 16, 1969.
12. **WELL DESCRIPTION**
    Total Depth 176' Depth to Static Water Level 50'
13. **TEST DATA**
    Yield _____ How Tested Air
    Drawdown _____ Length of Test 2 hours
14. **PUMP DATA**
    Type Submersible (Turbine, Centrifugal, etc.) Power Source elect. (Elec., Gas, etc.)
    Horsepower 3/4 Yield 9-15 (Gallons per Minute)
15. **CASING RECORD**

Plain Casing

Size 5 9/16	Kind Steel	from 0	ft. to 176	ft.
Size _____	Kind _____	from _____	ft. to _____	ft.
Size _____	Kind _____	from _____	ft. to _____	ft.

Perforated Casing

Size _____	Kind _____	from _____	ft. to _____	ft.
Size _____	Kind _____	from _____	ft. to _____	ft.

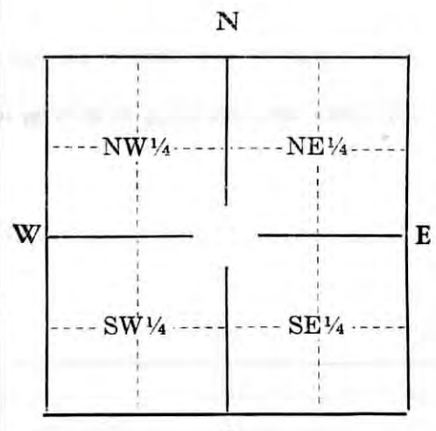
16. **CONSTRUCTION**
    Was surface seal provided? Yes ☒ No ☐ To What Depth 40 Material used: Cement plug
    Was surface casing used? Yes ☒ No ☐ Was it cemented in place? Yes ☐ No ☐
17. FLOWING WELL (Owner is responsible for installing control device on flowing well.)
    Controlled by: Valve ☐ Cap ☐ Plug ☐ Does well leak around casing? Yes ☐ No ☒

WELL LOCATION

Albany County

NW ¼ of SE ¼ of Sec. 1

T. 15 N., R. 73 W.



Scale: 2" = 1 mile

Above diagram represents one full section. Locate well accurately in small square representing 40 ac.
or
if the above does not apply fill in the following:

Lot 3 Block 11

City, Town or Subdivision:

Sherman Hill Estates, Albany County, Wyoming

(Include filing or number)

Book #171, Pg. #325

**For wells constructed after May 24, 1969, Application Form U.W. 5 must be submitted prior to construction.

Permit No. U.W. 3166 Book No. 21 Page No. 11

THE MILLS COMPANY, SHERIDAN 124861

18. Ground Elevation, if known _____ U.W. 3166

19. **LOG OF WELL**—Clearly indicate **first** water bearing material and **principal** water bearing material.

From Feet	To Feet	Material Type, Texture, Color	REMARKS (Cementing, Shutoff, Packing, etc.)	Indicate Water Bearing Formation	Indicate Perforated Casing Location
0	20	Top soil & rock			
20	35	Sand & rock			
35	55	Hard Pink Limestone	cement plug at 40'		
55	75	Red Limestone			
75	95	Rock			
95	115	"			
115	135	"			
135	150	"			
150	170	Sandstone			
170	176	Red Limestone			

20. **QUALITY OF WATER INFORMATION**

Was a chemical analysis made? Yes ☐ No ☒
If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☒ Acceptable ☐ Poor ☐ Unusable ☐

Was a bacteriological analysis made? Yes ☐ No ☒

If a domestic well, was the well disinfected by the driller? Yes ☒ No ☐

21. **IF WELL IS TO BE ABANDONED**, complete Items 1 through 6, Item 10 and Item 19 (Log of Well) and state reason for abandonment below.

It is the responsibility of the owner to properly plug or fill in the well in order to prevent contamination of ground water and to cover or cap the well at ground level.

REMARKS: _____

(Signed) Kent Boswell
(Owner)

THE STATE OF WYOMING
County of Laramie } ss.

I hereby certify that the foregoing statement was signed in my presence and sworn to before me by Kent Boswell this 11th day of September, 19 69.

My Commission Expires March 15, 1972. James L. Ponsa
Notary Public

Date of Receipt: October 1, 1969. Date of Priority: ~~May 16~~ April 27, 1969

Date of Approval: October 21, 1969.

Daniel L. Simmons
for State Engineer

November 13, 1972 - Assignment of all right, title and interest in and to this permit transferred from Kent Boswell to Wm. E. Bittner and Barbara A. Bittner

MICRO-FILMED NOV 20 '72

SCANNED OCT 20 2011

WSF 191
3-17-66

RECORD OF WELL DRILLED

19 69 AC PROGRAM

{Range View Lane}

Imperial Homes, Inc. _____ _____
(Name of Operator) (Farm No.) (County)

_____ 176' 5 9/16
(Location of Well) (Total Depth of Well) (Depth of Casing)

Cased: _____ ft. to _____ ft. Type _____ Size I.D. _____ Wt.Casing-Lbs./ft. _____

Cased _____ ft. to _____ ft. Type _____ Size _____ Wt.Casing-Lbs./ft. _____

Cased: _____ ft. to _____ ft. Type _____ Size _____ Wt.Casing-Lbs./ft. _____

Perforated: ft. _____ to _____ ft; ft. _____ to _____ ft.

Type of Perforation _____

Artesian Well [ ] Flow _____ GPM; Was cut-off device installed? _____

Pump Well [xx] Type pumping equipment provided Submersible pump

Static Water Level 90'; Pumping or Bailing Water Level 100 ft. at 15 GPM

How Tested Air Length of Test 2 hours

Describe Quality of Water (taste, odor, color, fitness, etc.) good

---

Driller's Statement: I HEREBY CERTIFY, that the statements entered above concerning this well are true and correct, and that the well log on the reverse side of this form records accurately the depth of the well and the description of formations drilled. I authorize this record to be used to support the producer's claim for cost-sharing under the Agricultural Conservation Program

A Lail 29-69 _____
(Date) (Signature of Driller)

Producer's Statement: I HEREBY CERTIFY, that I observed periodically the drilling operations of the above well and to the best of my knowledge I believe that the statements entered above by the driller are true and correct, and that the well log on the reverse side hereof records accurately the depth of the well and description of formations drilled I hereby submit this information to the County ASC Committee in support of my claim for cost-sharing for the above well under the Agricultural Conservation Program.

_____ _____
(Date) (Signature of Producer)

(Put formation log on reverse side)

LOG OF WELL

(Method of Drilling)	April 21, 1969 (Date Started)	April 27, 1969 (Date Completed)

From Feet	To Feet	Description of Material Drilled; and Water Sources Encountered
0	20	Top soil and rock
20	35	Sand and rock
35	55	Hard pink limestone
55	75	Red limestone
75	95	Rock
95	115	Rock
115	135	Rock
135	150	Rock
150	170	Sandstone
170	176	Red limestone
		COMMENTS:
		176' 5 9/16 Casing
		50' Water
		Cement plug at 40'

Preparation and distribution: It is required that the driller prepare this form in the original only and give same to the producer. Copies may be prepared as desired.

1. OWNER/INSTALLER INFORMATION 5/98

Owner:	LANNY & MARYANN GOYN
Mailing Address:	2225 RANGE VIEW LANE
Phone: (Work)	Lanny - (307) 777-6353 Maryann - (307) 742-2141 (Home) (307) 745-3877
Installer (if other than above):	Martin Excavation Inc.
Mailing Address:	4285 Soldier Springs Rd.
Phone: (Work)	745-4661 (Home)

2. **TYPE OF CONSTRUCTION:** New System _____ Replacement X

3. **PROPERTY INFORMATION**

Location of system site by County address:	2225 Range View Lane Sherman Hill Estates
Location of system site by legal description:	Lots 3 and 4, W½ Block 11, SE¼ Sect. 1, T15N, R73W
Dimensions:	Lot 3 - 135.0' x 290.0' ; Lot 4 - 135.0' x 290.0'
Area of property:	Total Lots 3 and 4 = 78,300 ft² (1.8 acres)

4. **WATER SUPPLY**

Source of water supply:	Well ☒ ; Surface Water ☐ ; Cistern ☐ ; Other ☐
If a well, give State permit number and depth:	U.W. 3166 - 176 ft. total depth, 90 ft. static water level
If surface water, give name of creek/stream/lake:	N/A
If "other", please describe:	ephemeral drainages around Sherman Hill Estates

5. **TOPOGRAPHY OF SITE**

Topography of wastewater: Flat ☒ (2-3% →) ; Gently Sloped ☐ ; Moderately Sloped ☐ ; Steeply Sloped ☐

If sloped, does facility lie above or below the site for the residence?
Above ☐ ; Below ☒

6. **LEACHFIELD SITE SOILS**

A. Soil size: Large Gravel (+½") ☐; Small Gravel (Pea Gravel) ☐; Sand ☒; Sandy Loam ☒; Loamy Clay ☐; Clay ☐ Upper 2' - sandy loam Below 2' - sand w/ gravel & cobble interspersed

B. Depth to bedrock or highest impervious layer: 35 ft
How was depth to bedrock determined? (check one): Exploration hole ☐ ; Well driller's log ☒ ; Geologic data ☐
Date depth to bedrock determined: 4/27/69 - See attached drill log

C. Depth to seasonal high groundwater: 90'
How was depth to groundwater determined? (check one): Exploration hole ☐ ; Well driller's log ☒ ; Geologic data ☐ ; Soil analysis* ☐
Date groundwater depth determined: 4/27/69

7. BUILDING INFORMATION

Number of buildings to be connected to septic system: One

If there is to be more than one roof for the units served, a professional engineer must design the system.

System is for (Check all that apply):
single family dwelling ☒ # of bedrooms: 3
multiple family dwelling ☐ # of bedrooms: _____
commercial business ☐ # of employees: _____ type of waste: Household Sewage and Greywater

8. PERCOLATION TEST INFORMATION - For perc test instructions see "Design and Construction Standards for Small Wastewater Facilities."

Perc rate in minutes/inch. Complete a minimum of three holes.

Hole #1 2.75	Hole #3 2.50	Hole #5 2.50
Hole #2 2.00	Hole #4 2.00	Hole #6 2.75

If three to five holes tested, indicate slowest rate (largest #):

If six holes tested, indicate average: 2.42

To determine soil loading rate: Use Figure 7, in the "Design and Construction Standards," find your perc rate value on bottom of the graph, follow the vertical line to the sloped curve line, then follow the horizontal line that intersects to the left to find soil loading rate (for example: a perc rate of 15 min/inch has a loading rate of .52 gallons/sq ft/day).

Soil loading rate: 0.80 gallons/sq. ft./day

To compute minimum leachfield size: Multiply the number of bedrooms times 150, then divide by your soil loading rate.

$$\frac{\text{\# of bedrooms} \times 150}{\text{soil loading rate}} = 562.5 \text{ sq. ft. (minimum leach field required)}$$

Minimum leachfield required: 562.5 square feet.

- This is the minimum square footage of leachfield required for your system. Additional calculation is needed for an Infiltrator system.

9. SEPTIC TANK INFORMATION

Manufacturer's name: Unknown - Existing tank installed in 1969

Tank constructed of (Check one): concrete ☒ ; fiberglass ☐ ; polyethylene ☐ ; other (specify):

Tank liquid capacity: 1000 Gal.

Tank dimensions: length: 10' ; width: 4' ; height: 6'

Type of baffles - Specify (tee, insert, etc.):

- Inlet pipe size: 4" ; schedule: 40 ; length: 5'
- Outlet pipe size: 4" ; schedule: 40 ; length: 5'
- For minimums see "Design and Construction Standards"

Access to surface from tank to be provided by (Check one):
Manways ☒ ; 2-6" cleanouts ☐

10. **LEACHFIELD INFORMATION**

A. Type of system (Check one):

Trench	☐ Complete Section B
Bed	☐ Complete Section C
Infiltrator	☒ Complete Section D
Mound	☐ Additional application required
Holding tank	☐ Additional application required
Other	☐

Specify: _____

If system requires a pump for pressure - additional application required.

B. TRENCH

a. Minimum sq ft of leachfield required (as determined in #8):

b. Width of trench:

c. Total linear feet of trench:

d. Depth of stone below perforated pipe (minimum 6"):

e. Total square footage of drainfield: sq ft
To compute: (2d + b) x c = square feet (b, c & d measured in feet)

f. Depth of stone above perforated pipe (minimum 2"):

g. Depth of trench below surface (minimum 1 ft cover):

h. Size of leachfield stone diameter (½" - 2½")

i. Type of material placed over stone (Specify: hay, straw, untreated building paper, filter cloth, etc.):

C. BED

a. Minimum sq ft of leachfield required (as determined in #8):

b. Width of bed:

c. Length of bed:

d. Depth of stone below perforated pipe (minimum 6"):

e. Bottom Surface area (b x c) = sq ft

f. Sidewall area (b + b + c + c) x d = sq ft

g. Total square footage of leachfield (e + f) = sq ft

h. Distance between perforated pipe laterals:

i. Depth of stone above perforated pipe (minimum 2"):

j. Size of leachfield stone diameter (½" - 2½"):

k. Type of material placed over stone (Specify: hay, straw, untreated building paper, filter cloth, etc.):

D. INFILTRATOR

a. Minimum sq ft of leachfield required (from #8): 562.5

b. Minimum sq ft of Infiltrator required (a x .6): 337.5

c. Minimum linear feet of Infiltrator required (b ÷ 3): 112.5

d. Minimum number of Infiltrator sections (c ÷ 6.25): 18

e. Depth of trench below the surface: 3 ft. to 3.5 ft.

INFILTRATOR GUIDELINES

- Infiltrators may be used in a trench, bed or mound system.
- When using an Infiltrator you may reduce the required square footage for a standard system by 40% (minimum sq ft x .6 = minimum sq ft) of infiltration required.
- Any Infiltrator system which is under pressure must be equipped with a distribution box (d-box).
- The D-box must be installed at the head of the leachfield to assure equal distribution of effluent. A distance of at least 10 feet between the D-box and the head of each Infiltrator trench must be maintained to avoid saturating the soil immediately around the D-box. Saturation of the soil around theD-box could lead to settling.
- A minimum of 3 feet of undisturbed soil must be maintained between Infiltration trenches (not applicable to bed system).
- The Infiltrator trenches must be level and scarified prior to installation.
- The Infiltrators must have splash & end plates.
- The backfill must be a minimum of 12" of soil.

2 trenches 75' long
150 linear ft.

11. ISOLATION DISTANCES

Listed below are minimum distances with spaces to provide the distances for your system. Fill in completely and transfer all distances for your system to the blank site plan provided.

Note: Wells must be 50 feet from all property lines.

FROM	TO SEPTIC TANK OR EQUIV Minimum	Your System	TO ABSORPTION SYSTEM Minimum	Your System
Wells (includes neighboring wells)	50	106	100	140
Property Lines	50	62	50	50
Building Foundation w/out foundation drain	5	14	10	48
Building Foundation with foundation drains	5	N/A	25	N/A
Potable Water Pipes	25	87- from water well line @ NE corner of house	25	115
Septic Tank	N/A	N/A	10	26
Stream or Surface Body of Water including seasonal & intermittent (ditches, sloughs, etc)	50	70	50	68

12. **SITE PLAN REQUIREMENTS**

This permit requires a site plan. An example is provided for your assistance. Refer to "General Notes" on blank site plan provided. Be sure to include all isolation distances for your system as listed above.

13. **INSTALLATION**

Expected Date of Installation: 7-2-99
(Month/Day/Year)

14. **RIGHT OF INGRESS/APPLICANT CERTIFICATION**

I hereby grant authorized personnel the right of ingress and egress from said lands for any and all inspection purposes necessary to the exercise of this permit. I certify that, to the best of my knowledge, that the aforementioned information and material is true and correct, and I understand that authorization of this permit does not guarantee successful operation.

201 IGA Warning: If your property is located within "Planning Area Boundary" as shown on Exhibit 1 of the Intergovernmental Agreement for Laramie Wastewater Treatment Facilities and Collections System, you may be required to abandon this system and connect to a collector/interceptor line if one is installed contiguous to your property.

APPLICANT'S SIGNATURE: Larry Hoyn Maryann Hoyn

DATE: 6/28/99

CONSENT OF OWNER OF RECORD (if different from applicant)

OWNER'S SIGNATURE: _____

DATE: _____

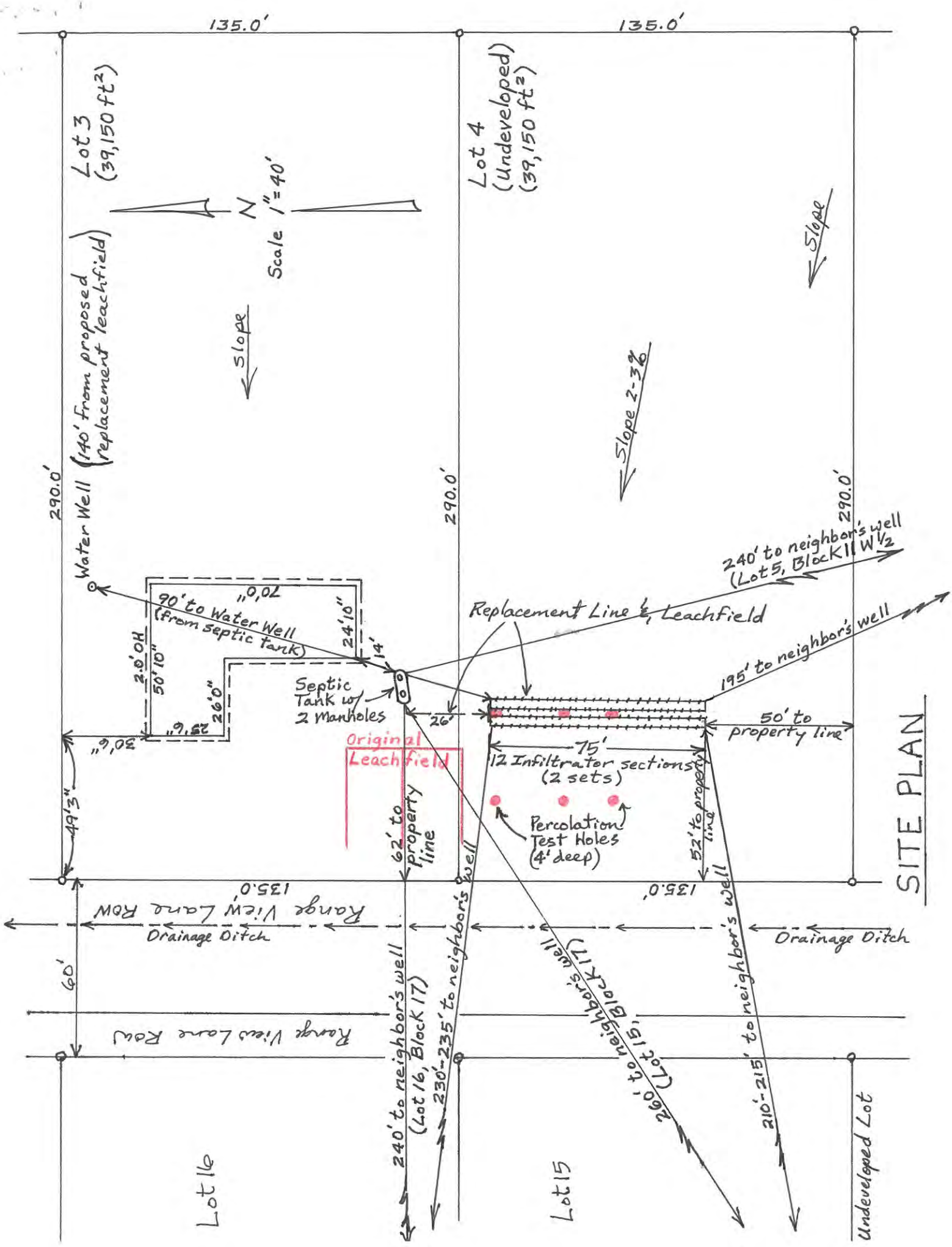
NOTE:

A LETTER OF CERTIFICATION OF COMPLIANCE WHICH STATES THAT THE SYSTEM WAS INSTALLED WITH NO CHANGES TO THE APPROVED DESIGN MUST BE FILED WITH THE REVIEWER AFTER BACKFILL

-OR-

AS BUILT DRAWINGS SHOWING ANY CHANGES MADE DURING INSTALLATION OF THE SYSTEM FROM THE DESIGN APPROVED IN THE PERMIT APPLICATION.

EXPIRATION DATE OF THIS PERMIT IS TWO (2) YEARS FROM THE DATE OF APPROVAL BY THE REVIEWER.


135.0'
135.0'
Lot 3
(39,150 ft²)
Lot 4
(Undeveloped)
(39,150 ft²)
N
Scale 1" = 40'
Slope
Slope
Slope 2-3%
290.0'
290.0'
290.0'
Water Well (140' from proposed replacement leachfield)
90' to Water Well (from septic tank)
240' to neighbor's well (Lot 5, Block II W 1/2)
Replacement Line & Leachfield
195' to neighbor's well
50' to property line
Septic Tank w/ 2 Manholes
Original Leachfield
26'
75'
12 Infiltrator sections (2 sets)
Percolation Test Holes (4' deep)
62' to property line
52' to property line
49'3"
135.0'
135.0'
Range View Lane ROW
Drainage Ditch
Drainage Ditch
60'
Range View Lane ROW
240' to neighbor's well (Lot 16, Block 17)
230'-235' to neighbor's well
260' to neighbor's well (Lot 15, Block 17)
210'-215' to neighbor's well
Lot 16
Lot 15
Undeveloped Lot
SITE PLAN

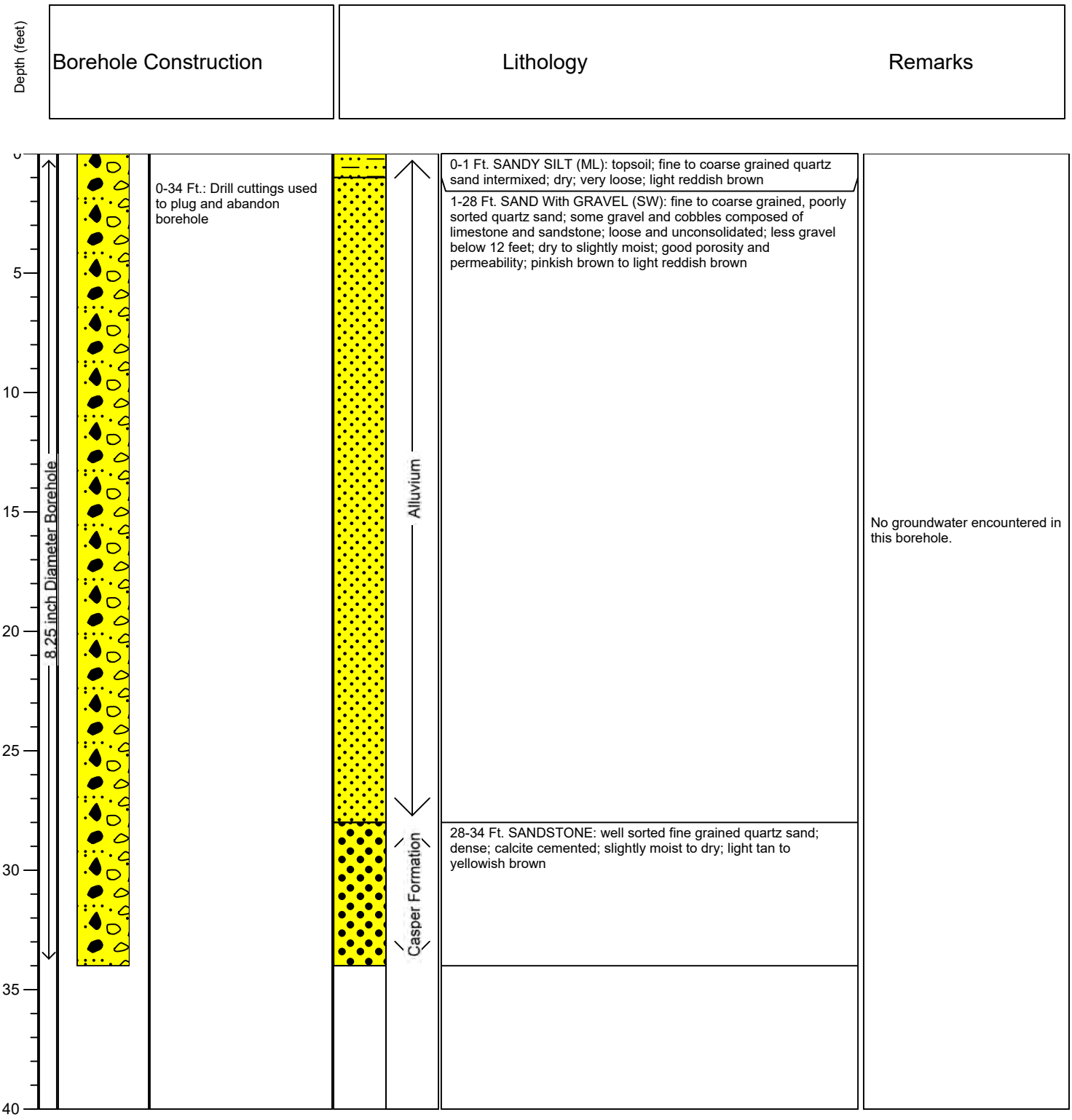
Appendix C

Test Hole Logs

WENCK

Project: Albany County Septic System Impact
Location: N41.296264°, W105.524537° NAD83
Drilled by: Authentic Drilling
Date started: February 12, 2018
Date completed: February 12, 2018

Well Name: B-1
Drilling Method: Solid Stem Auger
Logged by: M. Stacy
Total depth: 34 Ft.
Elevation: 7,459 Ft.

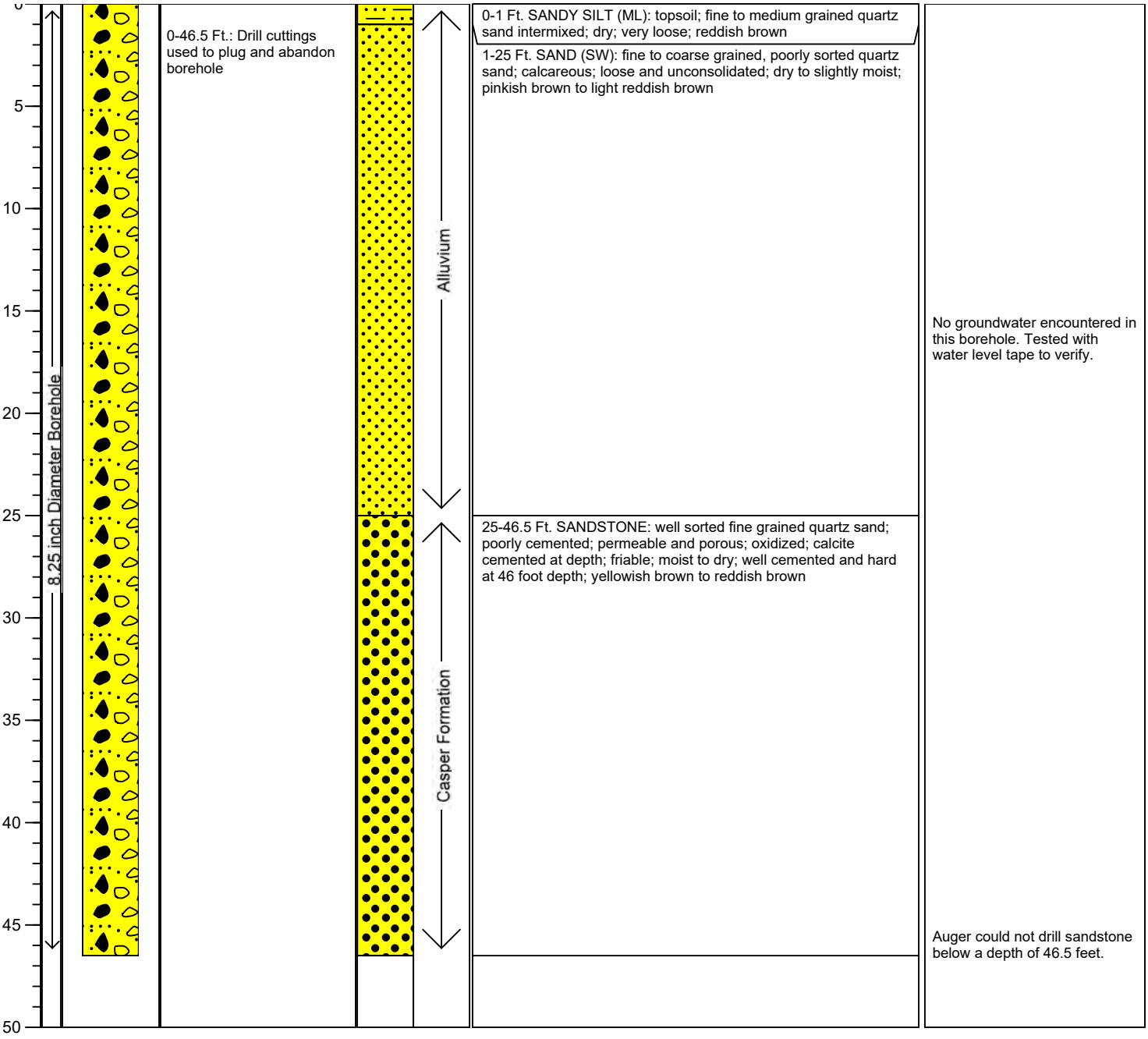


Notes: This figure presents the completion details for the BH-1 test hole. The borehole was drilled east of the septic system at 2225 Range View Lane in Laramie, Wyoming. This hole was drilled to initially investigate soil thickness, depth to bedrock, and saturation conditions adjacent to the septic system. Authentic Drilling drilled the test hole utilizing hollow stem auger methods. Upon completion of drilling, the borehole was backfilled with drill cuttings and abandoned.

WENCK

Project: Albany County Septic System Impact
Location: N41.296267°, W105.524574° NAD83
Drilled by: Authentic Drilling
Date started: February 12, 2018
Date completed: February 12, 2018

Well Name: B-2
Drilling Method: Solid Stem Auger
Logged by: M. Stacy
Total depth: 46.5 Ft.
Elevation: 7,459 Ft.



Notes: This figure presents the completion details for the BH-2 test hole. The borehole was drilled east of the septic system at 2225 Range View Lane in Laramie, Wyoming. Located closer to the septic system than BH-1, this hole was drilled to further investigate soil thickness, depth to bedrock, and saturation conditions adjacent to the septic system. Authentic Drilling drilled the test hole utilizing hollow stem auger methods. Upon completion of drilling, the borehole was backfilled with drill cuttings and abandoned.

Appendix D

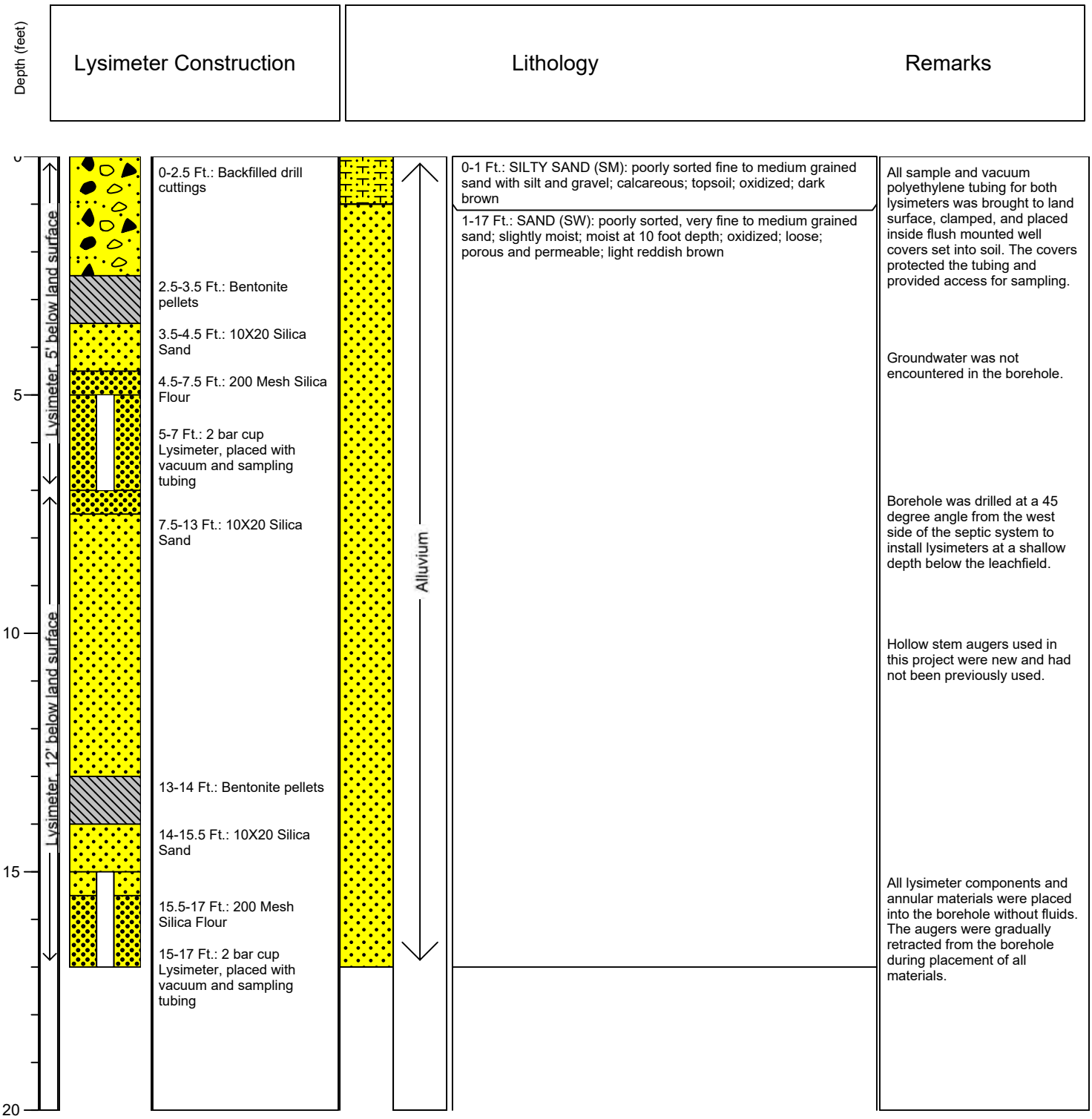
Lysimeter As-Builts

WENCK

Responsive partner.
Exceptional outcomes.

Project: Albany County Septic System Impact
Location: N41.29633, W105.52477 NAD83
Drilled by: Authentic Drilling
Date started: February 14, 2018
Date completed: February 14, 2018

Well Name: L-1
Drilling Method: Hollow Stem Auger
Logged by: M. Stacy
Total depth: 17 Ft.
Elevation: 7,457 Ft.



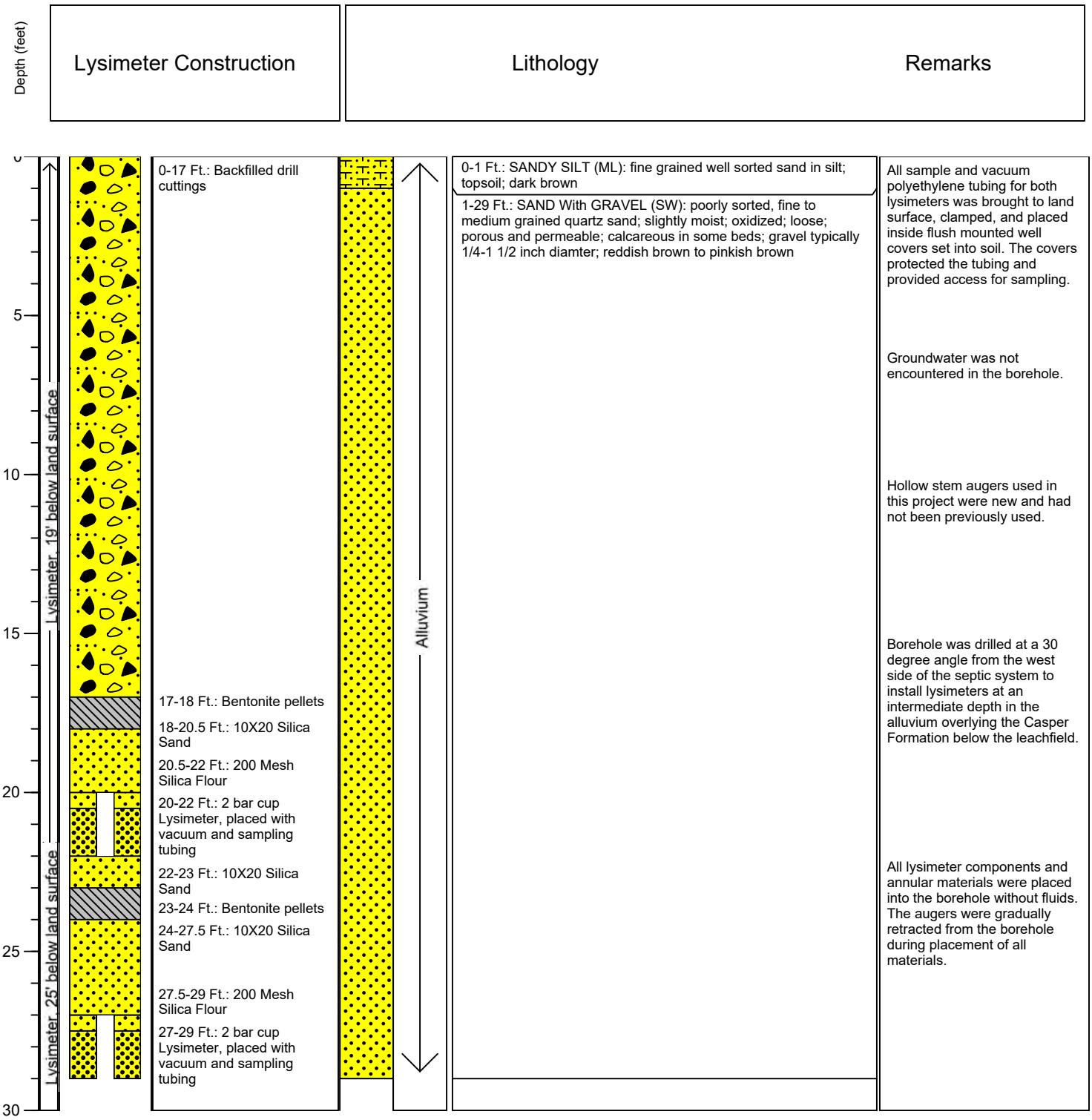
Notes: This figure presents the as-built details for the L-1 lysimeter completed west of the septic system at 2225 Range View Lane in Laramie, Wyoming. This borehole was drilled at a 45 degree angle from vertical to install two, two foot long lysimeters in this one borehole at two different depths below the septic system.

WENCK

Responsive partner.
Exceptional outcomes.

Project: Albany County Septic System Impact
Location: N41.29633, W105.52476 NAD83
Drilled by: Authentic Drilling
Date started: February 13, 2018
Date completed: February 13, 2018

Well Name: L-2
Drilling Method: Hollow Stem Auger
Logged by: M. Stacy
Total depth: 29 Ft.
Elevation: 7,457 Ft.



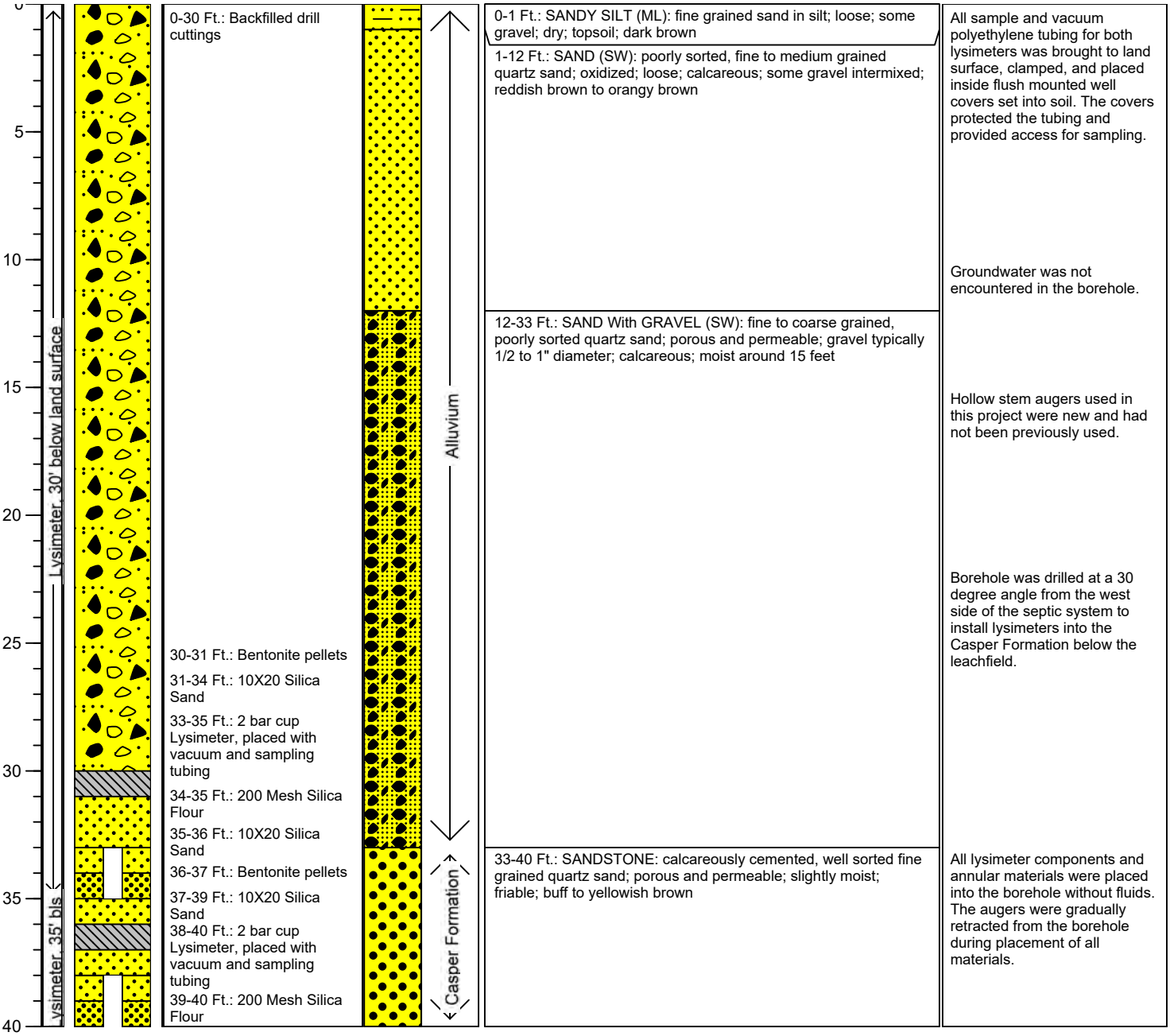
Notes: This figure presents the as-built details for the L-2 lysimeter completed west of the septic system at 2225 Range View Lane in Laramie, Wyoming. This borehole was drilled at a 30 degree angle from vertical to install two, two foot long lysimeters in this one borehole at two different depths below the septic system.

WENCK

Responsive partner.
Exceptional outcomes.

Project: Albany County Septic System Impact
Location: N41.29633, W105.52483 NAD83
Drilled by: Authentic Drilling
Date started: February 13, 2018
Date completed: February 13, 2018

Well Name: L-3
Drilling Method: Hollow Stem Auger
Logged by: M. Stacy
Total depth: 40 Ft.
Elevation: 7,457 Ft.



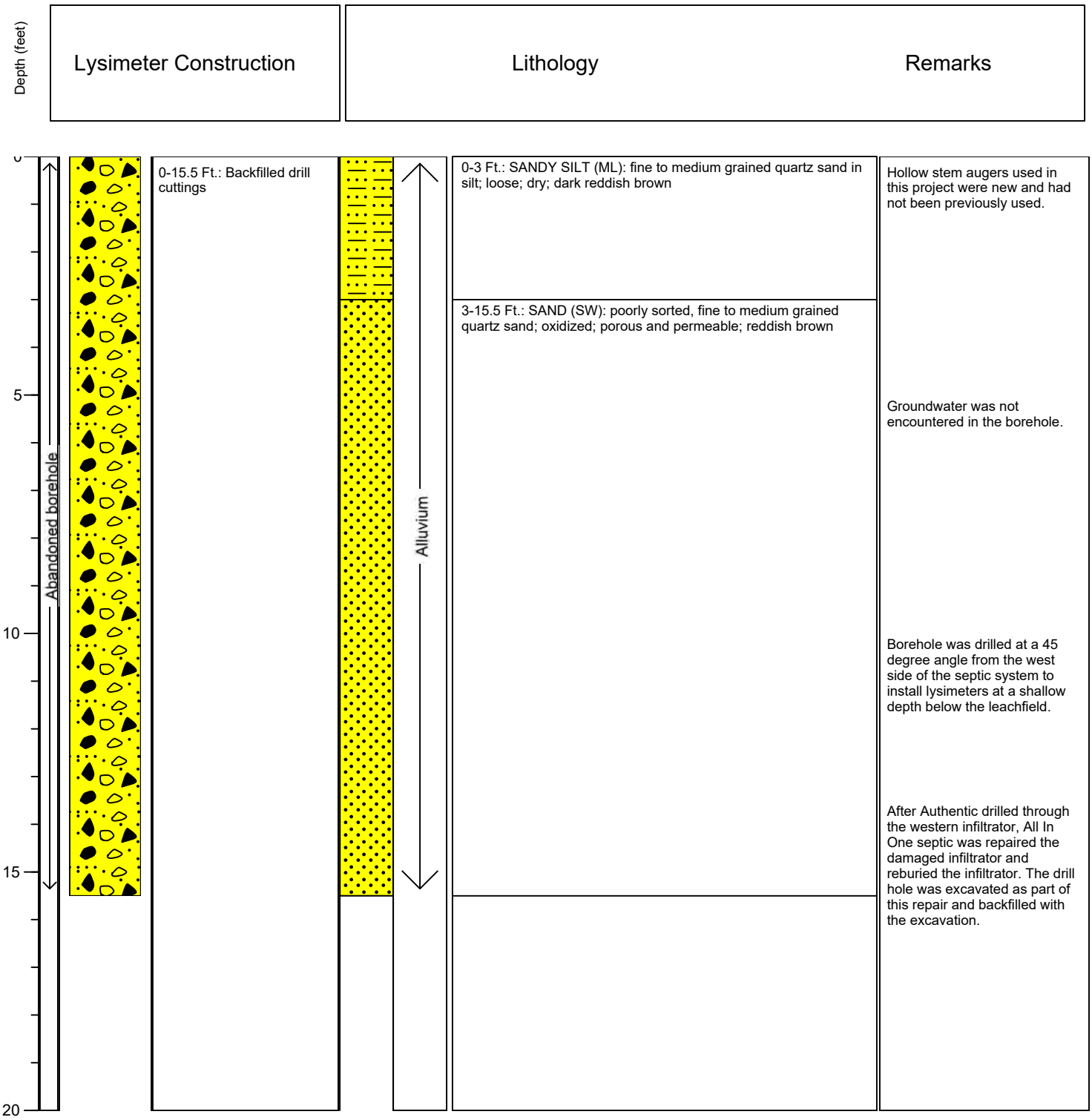
Notes: This figure presents the as-built details for the L-3 lysimeter completed west of the septic system at 2225 Range View Lane in Laramie, Wyoming. This borehole was drilled at a 30 degree angle from vertical to install two, two foot long lysimeters in this one borehole at two different depths below the septic system.

WENCK

Responsive partner.
Exceptional outcomes.

Project: Albany County Septic System Impact
Location: N41.29638, W105.52474 NAD83
Drilled by: Authentic Drilling
Date started: February 13, 2018
Date completed: February 13, 2018

Well Name: L-4
Drilling Method: Hollow Stem Auger
Logged by: M. Stacy
Total depth: 15.5 Ft.
Elevation: 7,457 Ft.



Notes: This figure presents the as-built details for the L-4 lysimeter hole that was drilled north of the L-1 through L-3 lysimeters and west of the septic system at 2225 Range View Lane in Laramie, Wyoming. This hole was drilled before L-1 through L-3. This borehole was drilled at a 45 degree angle from vertical to install two, two foot long lysimeters in this one borehole. However, no lysimeters were installed in this hole after the western infiltrator was drilled through from the west side. All In One was called to the site, excavated down to and around the infiltrator, and repaired and reburied the damaged infiltrator.

SOILMOISTURE EQUIPMENT CORP.
instruments for the extraction and measurement of soil moisture
PLANT AND OFFICE LOCATION:
801 SOUTH KELLOGG AVE., GOLETA, CA. 93117

SALES ORDER

Order Date: 02/02/18
Print Date: 02/05/18

Bill-To WENCK01
WENCK
4025 Automation Way, Bldg. E
Fort Collins, CO 80525
USA

TEL:970.691.3259
ATTN:Mark Stacy

Ship-To WENCK01S
AUTHENTIC DRILLING
33555 COUNTY RD 37
KIOWA, CO 80117
USA

TEL: 720-465-1450

Order Number: 18S0602A
Order Date: 02/02/18
Credit Terms: CC
CREDIT CARD

Ship Date:
Purchase Order:
Ship Via: UPS GROUND
INCO Terms: FOB SANTA BARBARA

Remarks: ATTN: SHERRI MEIKLEJOHN

FIN: 95-2454953

********** ORDER CONFIRMATION**********
**********THIS IS NOT AN INVOICE **********

:
SHIPMENT SCHEDULED FOR FEBRUARY 5, 2018
:
THANK YOU FOR YOUR ORDER
SOILMOISTURE EQUIPMENT CORP
:
NOTE: FOB SANTA BARBARA - ALL FREIGHT CHARGES WILL BE PREPAID AND ADDED TO THE INVOICE. THE PACKING & HANDLING CHARGE IS BASED ON 3% OF TOTAL PRICE OF THE GOODS, WITH A $5.00 MINIMUM FEE.

Ln	Item Number	UM	Quantity	Tax	Unit Price	Net Price
1	1920F1L24-B02M2	EA	6	no	$212.00	$1,272.00
	PRESS/VAC SOIL WATER SAMPLER, 24", 2 BAR CUP					
2	2006G3	EA	1	no	$680.00	$680.00
	PRESSURE VACUUM HAND PUMP WITH P + V GAUGES					
3	0930W050	EA	6	no	$92.00	$552.00
	SILICA FLOUR, 200 MESH, 50 LB. BAG					
4	0922W010	EA	2	no	$40.00	$80.00
	BENTONITE, 10 LB. BAG 30-50 MESH					

SOILMOISTURE EQUIPMENT CORP.
instruments for the extraction and measurement of soil moisture
PLANT AND OFFICE LOCATION:
801 SOUTH KELLOGG AVE., GOLETA, CA. 93117

SALES ORDER

Bill-To WENCK01
WENCK
4025 Automation Way, Bldg. E
Fort Collins, CO 80525
USA

Ship-To WENCK01S
AUTHENTIC DRILLING
33555 COUNTY RD 37
KIOWA, CO 80117
USA

TEL:970.691.3259
ATTN:Mark Stacy

TEL: 720-465-1450

Order Number: 18S0602A
Order Date: 02/02/18
Credit Terms: CC
CREDIT CARD

Ship Date:
Purchase Order:
Ship Via: UPS GROUND
INCO Terms: FOB SANTA BARBARA

Remarks: ATTN: SHERRI MEIKLEJOHN

Ln	Item Number	UM	Quantity	Tax	Unit Price	Net Price
5	2031G2	EA	2	no	$14.00	$28.00
	CLAMPING RING, ONE DOZ.					
6	MRT003L10	EA	1	no	$32.00	$32.00
	EPDM TUBING, 3/16"I.D X 1/8" WALL, 10 FT.					
8	1901PECGL0100	EA	2	no	$135.00	$270.00
	GREEN POLYETHYLENE TUBING, 1/4" O.D., 100 F					
9	1901PECNL0100	EA	2	no	$135.00	$270.00
	BLACK POLYETHYLENE TUBING, 1/4" O.D., 100 F					

Line Total:	$3,184.00
Order Discount:	$0.00
UPS GROUND:	$0.00
PACKING & HANDLING:	$95.52
SPECIAL:	$0.00
Total Tax:	$0.00
Total (USD):	$3,279.52

Appendix E

Soil Testing Results

Ammonium-N and nitrate-nitrite N adsorption and desorption characteristics for subsoils (University of Wisconsin-Stout Laboratory)

Methods

Subsoils representing layers L1, L2, L3, B2-1, B2-2, and B2-3 were analyzed for the variables listed in Table 1. A known volume of sediment was dried at 105 °C for determination of dry bulk density and burned at 550 °C for determination of loss-on-ignition organic matter content (Avnimelech et al. 2001, Håkanson and Jansson 2002). Additional sediment was dried and shipped to Pace Analytical Laboratory (1800 Elm St. SE, Minneapolis, MN) for analysis of total Kjeldahl nitrogen (TKN) and sediment nitrate-nitrite N.

Table 1. Variable list

Variable	Units
Dry bulk density	g/cm^3
Organic content	(%)
Sediment Total Kjeldahl Nitrogen	%
Sediment Nitrate-Nitrite N	mg/kg
Ammunium-N maximum adsorption	mg/kg
Nitrate-nitrite N maximum adsorption	mg/kg

Additional wet subsoils were subjected to a range of ammonium-N and nitrate-nitrite N concentrations to examine Langmuir-type adsorption isotherms and potential maximum adsorption capacity using a modification of Pierzynski (2000, Phosphorus sorption isotherm determination, Graetz and Nair, p 35). Ammonium-N and nitrate-nitrite N concentrations ranging between 0 and 500 mg/L (0 mg/L, 50 mg/L, 100 mg/L, 250 mg/L, and 500 mg/L) were prepared using a 0.01 M $CaCl_2$ solution to preserve ionic integrity. Ten g of subsoil and 100 mL of standard solution were added to 125 mL glass assay tubes to create a soil:solution ratio of 10:1. Assay tubes were gently shaken for 24 hours, centrifuged, decanted, and filtered through a type A/E glass fiber filter (Pall). Samples were preserved with sulfuric acid to a pH < 2 and shipped to Pace Analytical for analysis of ammonium-N and nitrate-nitrite N. Additional standards were also shipped for analysis.

The linear Langmuir equation is,

$$\frac{C}{S} = \frac{1}{kS_{max}} + \frac{C}{S_{max}}$$

where:

S = Dissolved inorganic nitrogen species adsorbed (mg/kg)

C = Dissolved inorganic nitrogen species concentration after 24 h shaking

S_{max} = N sorption capacity (mg/kg)

K = Bonding energy constant (L/mg)

An example Langmuir isotherm is shown in Figure 1 for ammonium-N adsorption onto L2 subsoil. In this

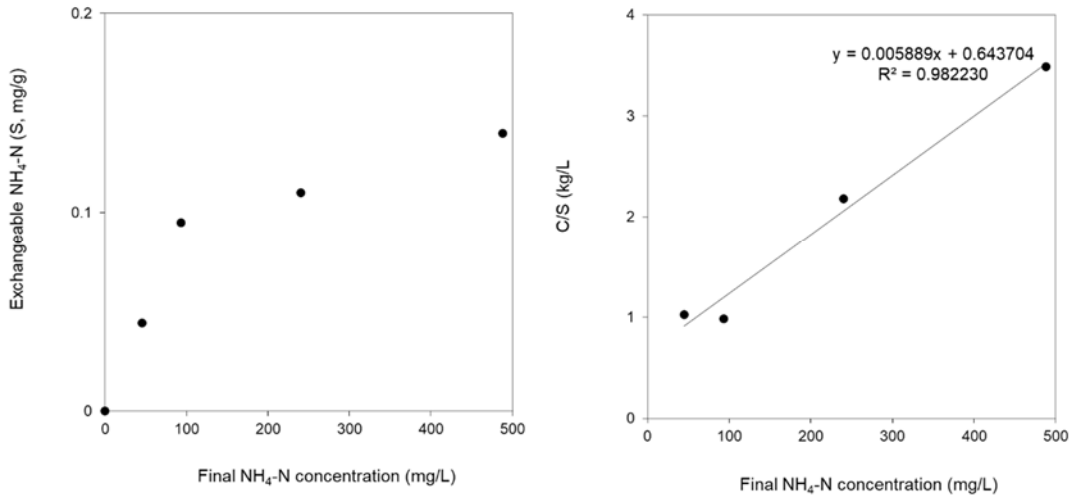


Figure 1. Changes in adsorbed ammonium-N (i.e., exchangeable NH_4-N, left panel) and C/S versus final equilibrium NH_4-N concentration (right panel). The inverse of the C/S:S slope approximates S_{max} (1/0.005889 = ~ 170 mg/kg).

example, ammonium-N adsorption reached an asymptote at an equilibrium concentration of ~ 500 mg/L and the sorption capacity was ~ 170 mg/kg (i.e., S_{max}).

Summary of Results

Dry bulk densities were relatively high, ranging between 2.3 g/cm^2 and 2.6 g/cm^3. Organic matter contents were very low, ranging between 0.40 % and 1.1 %. Sediment TKN concentrations were below detection limits in all subsoils except L1 (Table 2). Sediment nitrate-nitrite N concentrations were also low to undetected in all subsoil samples.

Table 2. Subsoil physical-textural characteristics, sediment total Kjeldahl nitrogen (TKN), sediment nitrate-nitrite (NO_3NO_2-N, and maximum sorption capacity (S_{max}) for various subsoil layers.

Stations	Depth	Dry bulk Density	Organic content	TKN	NO3NO2-N	Smax NH4-N	Smax NO3NO2-N
	(ft)	(g/cm3)	(%)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
L1	7-10.5	2.44	1.07	209	3.2	645	ND
L2	23-28	2.46	0.50	ND	1.9	170	ND
L3	33-38	2.41	0.52	ND	2	171	ND
B2-1	4-10.5	2.60	0.39	ND	ND	158	ND
B2-2	14-20.5	2.55	0.41	ND	ND	458	ND
B2-3	>29	2.32	0.49	ND	ND	329	ND

ND= not detected

Overall, subsoils tended to adsorb some ammonium-N over the range of concentrations and exhibited Langmuir isotherm sorption characteristics (Figure 3). However, ammonium-N adsorption was relatively low; typically < 15% of the initial standard was adsorbed by subsoils. Ammonium-N sorption maxima (S_{max}) ranged between 158 mg/kg and 645 mg/kg (Table 2). In contrast, adsorption of nitrate-nitrite N by subsoils was negligible (Figure 3). Subsoils adsorbed < 6% of the initial standard and did not follow Langmuir sorption patterns (Figure 3). Thus, a distinct S_{max} was not observed for nitrate-nitrite N because very little, if any, nitrate-nitrite was adsorbed by subsoils. Because nitrate-nitrite N is an anion,

it does not typically adsorb to negatively-charged soil sites or sands, and instead, remains soluble and leaches into groundwater (Gaines & Gaines 1994).

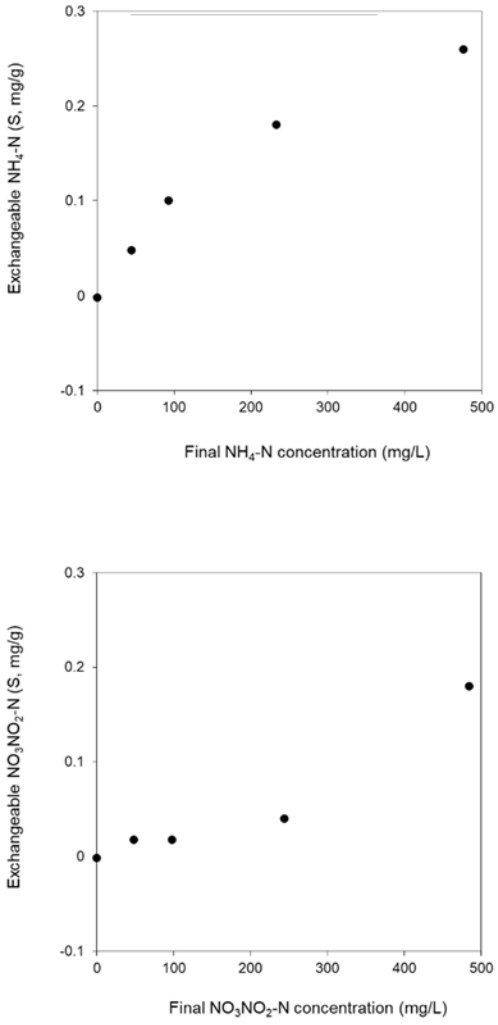


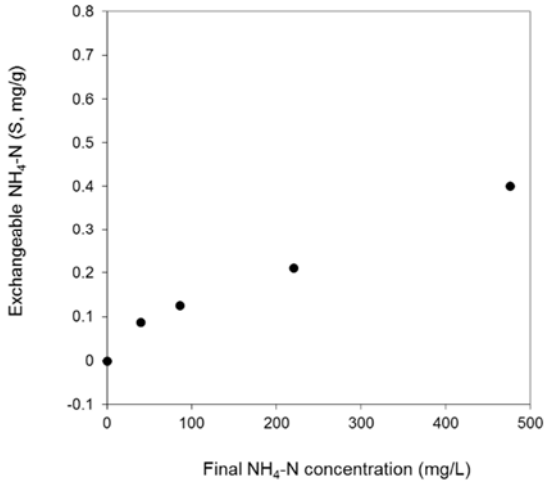
Figure 2. An example of changes in adsorbed ammonium-N (i.e., exchangeable NH_4-N, upper panel) and adsorbed nitrate-nitrite N (i.e., exchangeable NO_2NO_3-N) for B2-2 subsoil.

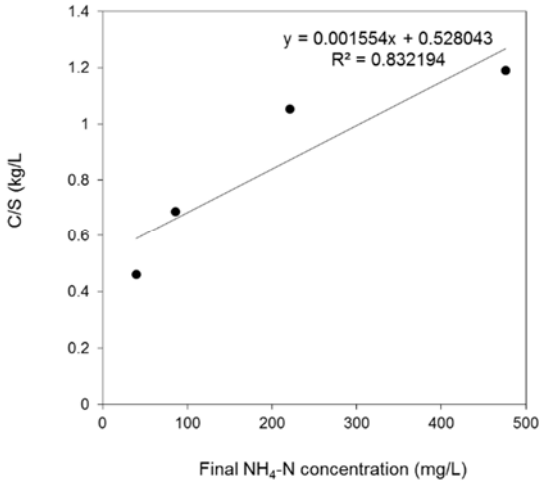
References

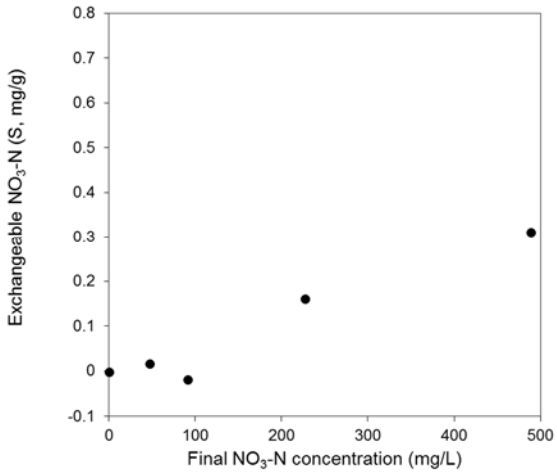
Gaines TP & Gaines ST. 1994. Soil texture effect on nitrate leaching in soil percolates. Commu Soil Sci Plant Anal 25:2561-2570.

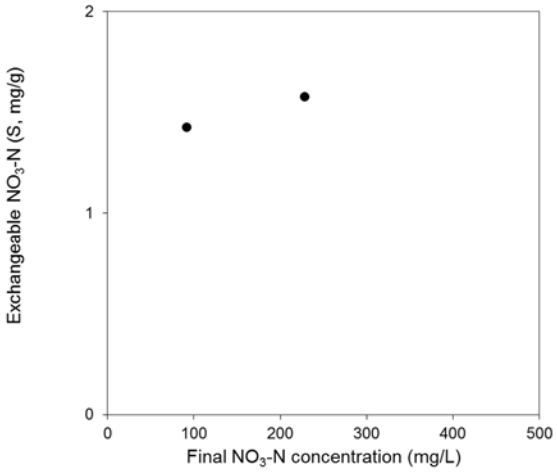
Pierzynski GM (Editor). 2000. Methods of phosphorus analysis for soils, sediment, residuals, and waters. Southern Cooperative Series Bulletin No. 396. June 2000. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.454.4558&rep=rep1&type=pdf

L1 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations

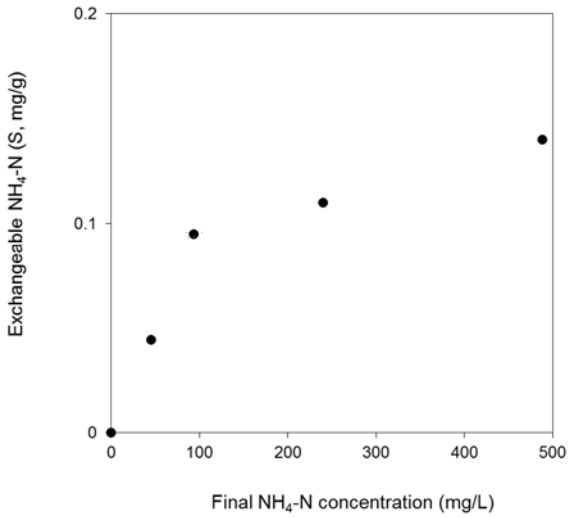


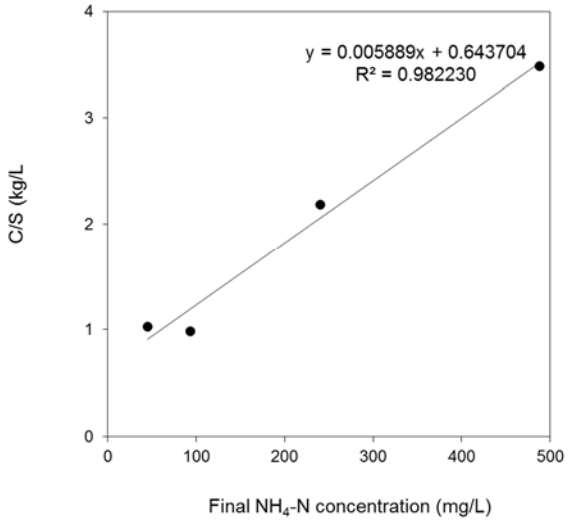


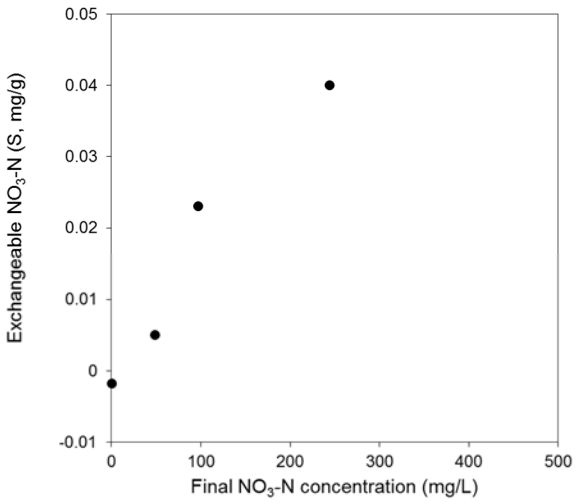


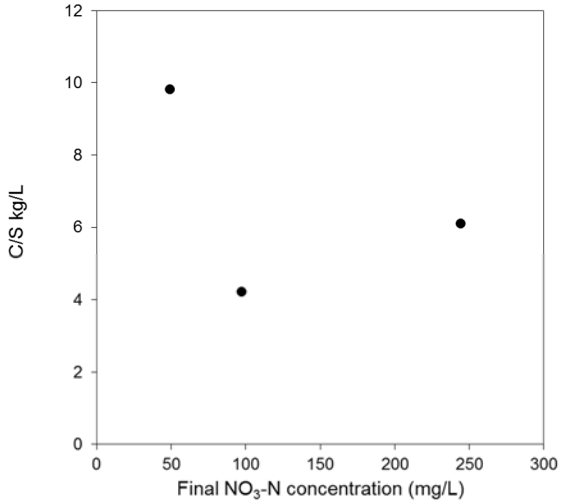


L2 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations

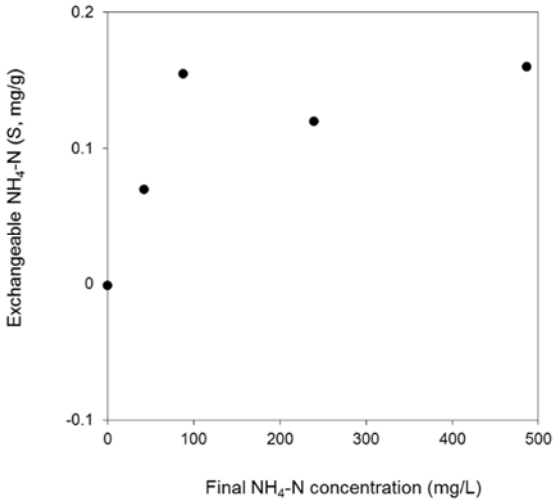


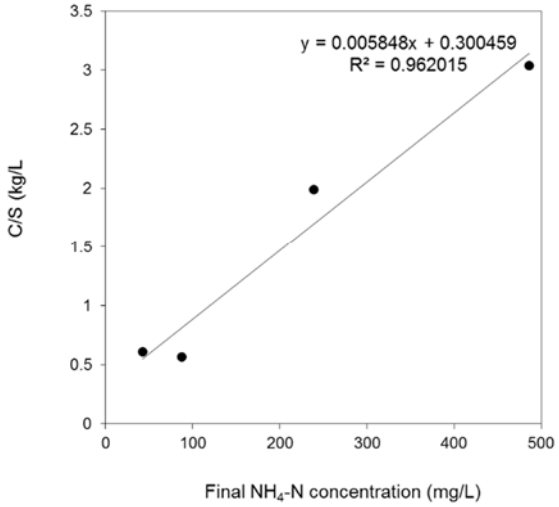


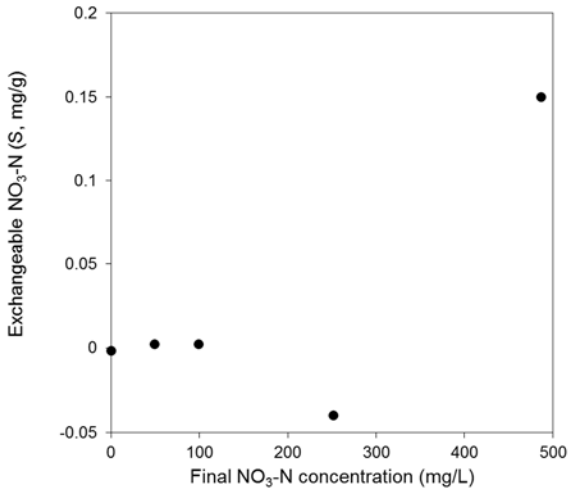


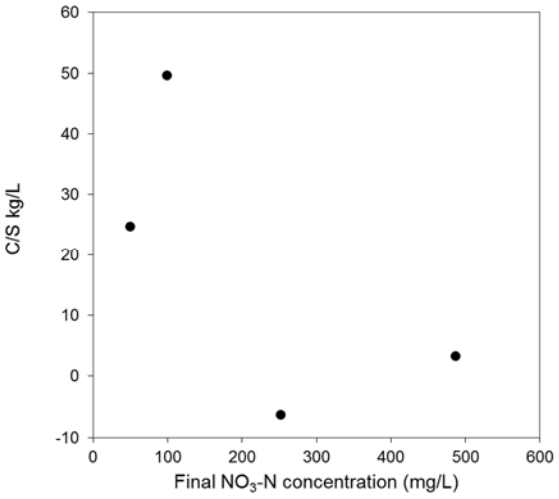


L3 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations

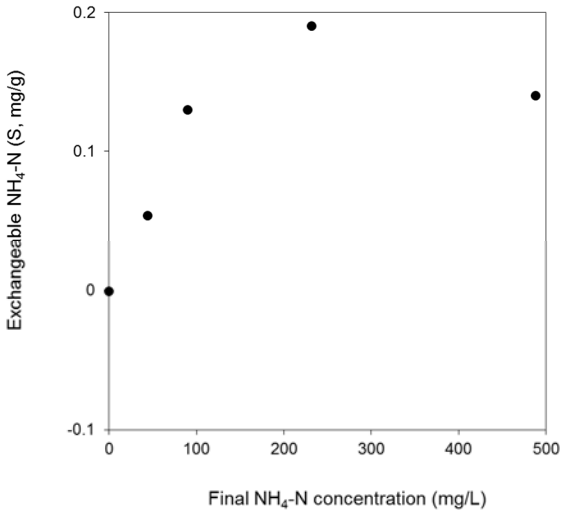


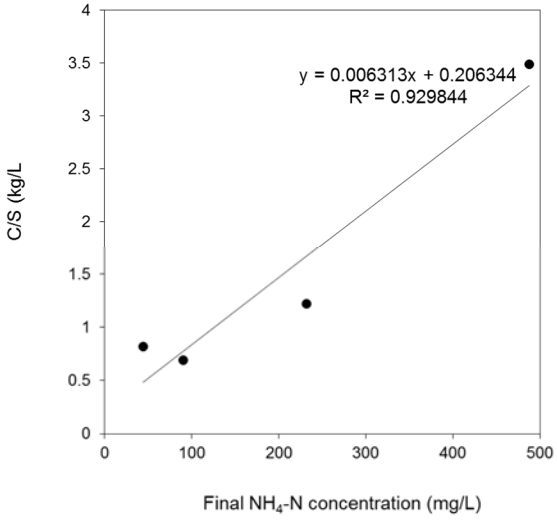


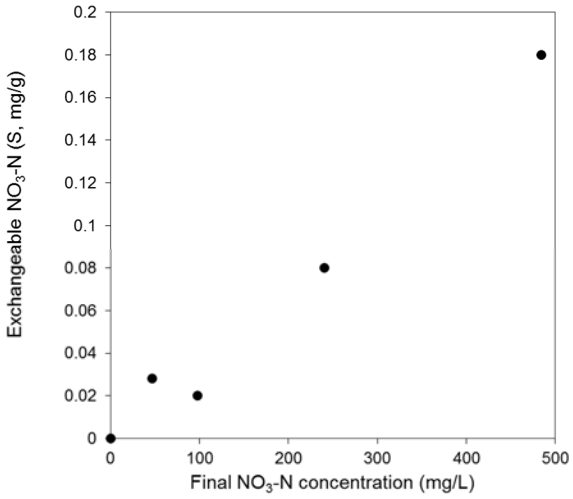


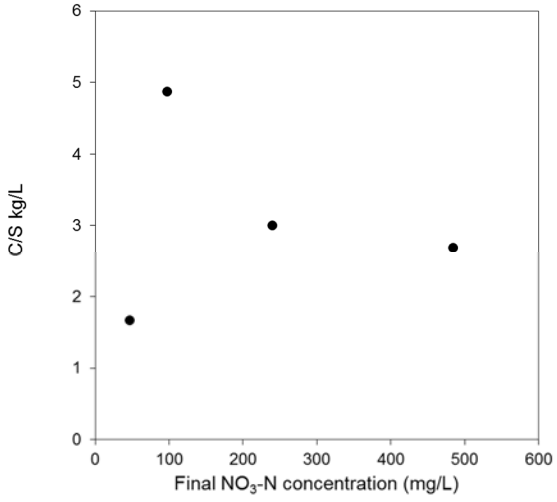


B2-1 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations

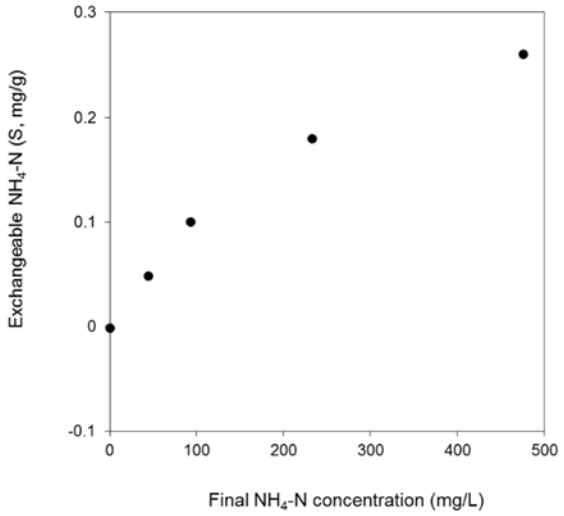


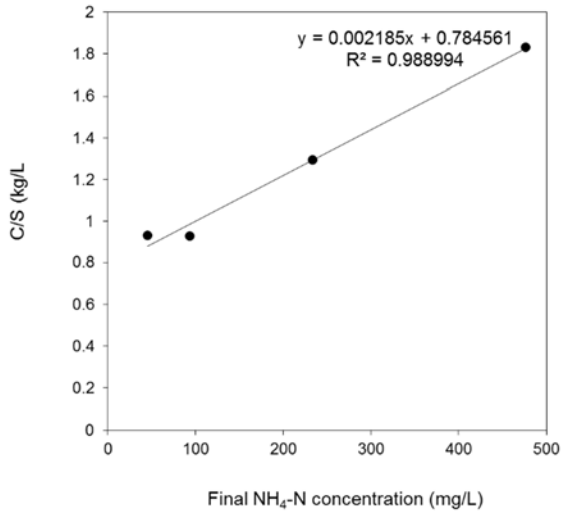


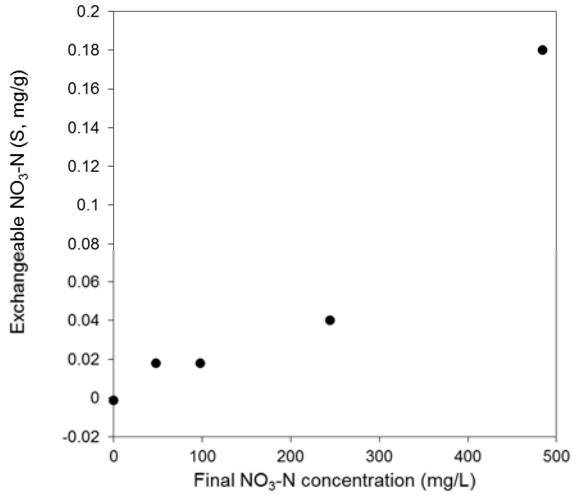


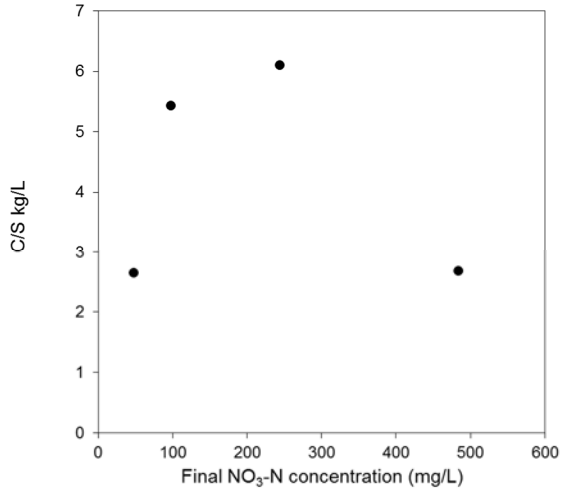


B2-2 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations

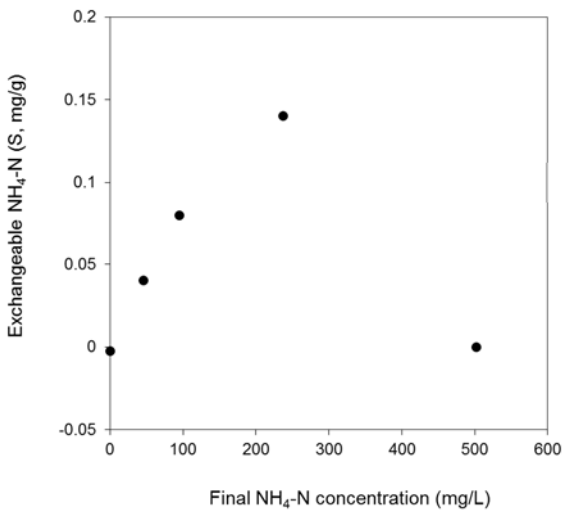


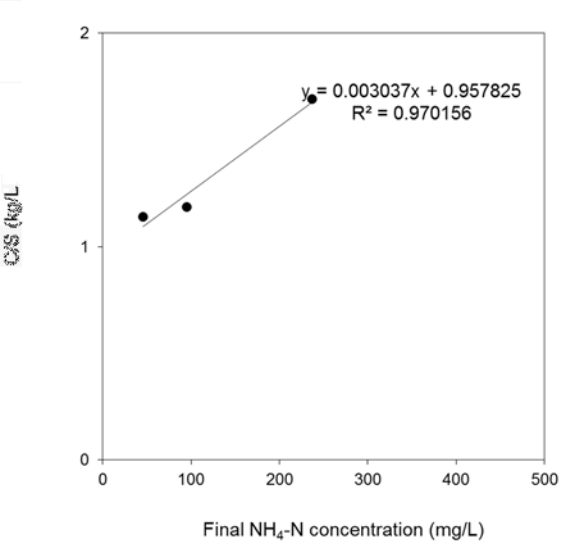


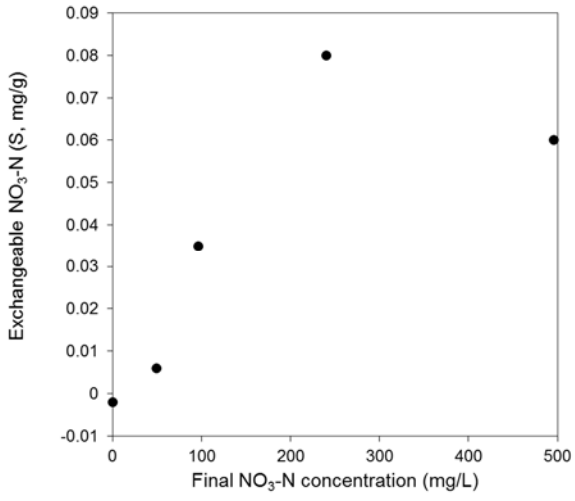


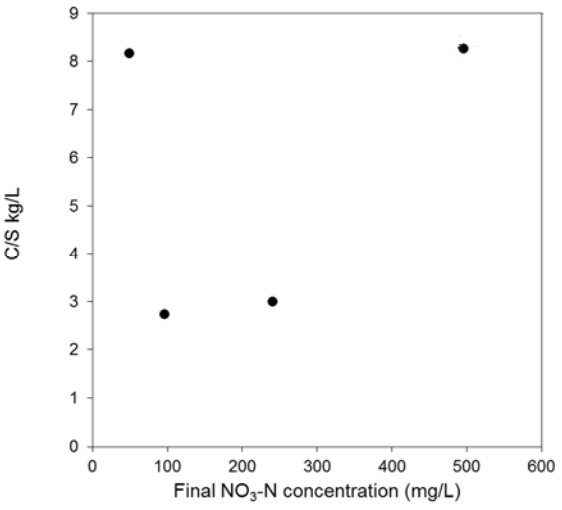


B2-3 Ammonium and Nitrate+Nitrite Plots Used for Langmuir Calculations









Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

November 29, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: Sediment N colorado
Pace Project No.: 10456152

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on November 20, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: Sediment N colorado
Pace Project No.: 10456152

Virginia Minnesota Certification ID's

315 Chestnut Street, Virginia, MN 55792
Montana Certificate #CERT0103
Alaska Certification UST-107
Minnesota Dept of Health Certification #: 027-137-445
North Dakota Certification: # R-203
Wisconsin DNR Certification # : 998027470
WA Department of Ecology Lab ID# C1007

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: Sediment N colorado
Pace Project No.: 10456152

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10456152001	**1**	Solid	11/19/18 11:00	11/20/18 09:00
10456152002	**2**	Solid	11/19/18 11:00	11/20/18 09:00
10456152003	**3**	Solid	11/19/18 11:00	11/20/18 09:00
10456152004	**4**	Solid	11/19/18 11:00	11/20/18 09:00
10456152005	**5**	Solid	11/19/18 11:00	11/20/18 09:00
10456152006	**6**	Solid	11/19/18 11:00	11/20/18 09:00

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: Sediment N colorado
Pace Project No.: 10456152

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10456152001	**1**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
10456152002	**2**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
10456152003	**3**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
10456152004	**4**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
10456152005	**5**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
10456152006	**6**	ASTM D 2974-13 (2013)	JK1	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V

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Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Sediment N colorado
Pace Project No.: 10456152

Sample: 1 **Lab ID: 10456152001** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**2.5**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	**209**	mg/kg	103	44.9	1	11/26/18 08:17	11/27/18 08:09	7727-37-9	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**3.2**	mg/kg	0.51	0.12	1	11/26/18 10:15	11/27/18 12:09		N3

Sample: 2 **Lab ID: 10456152002** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**31.0**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	ND	mg/kg	132	57.7	1	11/26/18 08:17	11/27/18 08:12	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**1.9**	mg/kg	0.72	0.17	1	11/26/18 10:15	11/27/18 12:10		N3

Sample: 3 **Lab ID: 10456152003** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**3.4**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	ND	mg/kg	103	45.3	1	11/26/18 08:17	11/27/18 08:14	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**2.0**	mg/kg	0.51	0.12	1	11/26/18 10:15	11/27/18 12:12		N3

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Sediment N colorado
Pace Project No.: 10456152

Sample: 4 **Lab ID: 10456152004** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**0.52**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	ND	mg/kg	101	44.0	1	11/26/18 08:17	11/27/18 08:15	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/kg	0.50	0.12	1	11/26/18 10:15	11/27/18 12:13		N3

Sample: 5 **Lab ID: 10456152005** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**5.1**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	ND	mg/kg	111	48.6	1	11/26/18 08:17	11/27/18 08:16	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/kg	0.53	0.13	1	11/26/18 10:15	11/27/18 12:20		N3

Sample: 6 **Lab ID: 10456152006** Collected: 11/19/18 11:00 Received: 11/20/18 09:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight	Analytical Method: ASTM D 2974-13 (2013)								
Percent Moisture	**4.9**	%	0.10	0.10	1		11/29/18 13:47		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Nitrogen, Kjeldahl, Total	ND	mg/kg	95.6	41.9	1	11/26/18 08:17	11/27/18 08:17	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/kg	0.52	0.12	1	11/26/18 10:15	11/27/18 12:22		N3

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Sediment N colorado
Pace Project No.: 10456152

QC Batch: 157523 Analysis Method: ASTM D 2974-13 (2013)
QC Batch Method: ASTM D 2974-13 (2013) Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 10456152001, 10456152002, 10456152003, 10456152004, 10456152005, 10456152006

SAMPLE DUPLICATE: 623915

Parameter	Units	12119172002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	9.3	9.3	0	5	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Sediment N colorado
Pace Project No.: 10456152

QC Batch: 157302 Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN
Associated Lab Samples: 10456152001, 10456152002, 10456152003, 10456152004, 10456152005, 10456152006

METHOD BLANK: 622627 Matrix: Solid
Associated Lab Samples: 10456152001, 10456152002, 10456152003, 10456152004, 10456152005, 10456152006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	ND	100	43.8	11/27/18 08:07	

LABORATORY CONTROL SAMPLE: 622626

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	1050	979	93	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 622628 622629

Parameter	Units	10456152001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	209	1030	976	1120	1050	89	87	90-110	6	15	M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 622630 622631

Parameter	Units	12119020003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	4410	1020	1020	5610	5500	118	107	90-110	2	15	P6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Sediment N colorado
Pace Project No.: 10456152

QC Batch: 157315 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite
Associated Lab Samples: 10456152001, 10456152002, 10456152003, 10456152004, 10456152005, 10456152006

METHOD BLANK: 622653 Matrix: Solid
Associated Lab Samples: 10456152001, 10456152002, 10456152003, 10456152004, 10456152005, 10456152006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	ND	0.49	0.12	11/27/18 12:01	N3

LABORATORY CONTROL SAMPLE: 622652

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	9.8	9.7	98	90-110	N3

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 622654 622655

Parameter	Units	10455920001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	1.0	11.5	11.4	12.8	12.6	102	102	90-110	1	10	N3

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 622656 622657

Parameter	Units	10455920005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	1.2	9.9	9.8	11.0	10.8	99	97	90-110	2	10	N3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: Sediment N colorado
Pace Project No.: 10456152

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-V	Pace Analytical Services - Virginia

ANALYTE QUALIFIERS

M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N3	Accreditation is not offered by the relevant laboratory accrediting body for this parameter.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Sediment N colorado
Pace Project No.: 10456152

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10456152001	**1**	ASTM D 2974-13 (2013)	157523		
10456152002	**2**	ASTM D 2974-13 (2013)	157523		
10456152003	**3**	ASTM D 2974-13 (2013)	157523		
10456152004	**4**	ASTM D 2974-13 (2013)	157523		
10456152005	**5**	ASTM D 2974-13 (2013)	157523		
10456152006	**6**	ASTM D 2974-13 (2013)	157523		
10456152001	**1**	EPA 351.2	157302	EPA 351.2	157311
10456152002	**2**	EPA 351.2	157302	EPA 351.2	157311
10456152003	**3**	EPA 351.2	157302	EPA 351.2	157311
10456152004	**4**	EPA 351.2	157302	EPA 351.2	157311
10456152005	**5**	EPA 351.2	157302	EPA 351.2	157311
10456152006	**6**	EPA 351.2	157302	EPA 351.2	157311
10456152001	**1**	EPA 353.2	157315	EPA 353.2	157331
10456152002	**2**	EPA 353.2	157315	EPA 353.2	157331
10456152003	**3**	EPA 353.2	157315	EPA 353.2	157331
10456152004	**4**	EPA 353.2	157315	EPA 353.2	157331
10456152005	**5**	EPA 353.2	157315	EPA 353.2	157331
10456152006	**6**	EPA 353.2	157315	EPA 353.2	157331

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Docu

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accu

WO# : 10456152

10456152

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Wenck Associates Jeff Strom	Report To:	same	Attention:	Jeff Strom
Address:	7500 Olson Memorial Hwy	Copy To:		Company Name:	Wenck Associates
	Suite 300, Golden Valley, MN 55427			Address:	same
Email To:	jstrom@wenck.com	Purchase Order No.:		Pace Quote Reference:	
Phone:	763-252-6833 Fax:	Project Name:	Sediment N colorado	Pace Project Manager:	Oyeyemi Odijole
Requested Due Date/TAT:	std TAT	Project Number:		Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Valid Matrix Codes: MATRIX / CODE — DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Sediment TKN	Sediment nitrate-nitrite-N	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	1		SL	G	11/19118	11:00	11/19118	11:00	20	1	X									X	X		001
2	2		SL	G	11/19118	11:00	11/19118	11:00	20	1	X									X	X		002
3	3		SL	G	11/19118	11:00	11/19118	11:00	20	1	X									X	X		003
4	4		SL	G	11/19118	11:00	11/19118	11:00	20	1	X									X	X		004
5	5		SL	G	11/19118	11:00	11/19118	11:00	20	1	X									X	X		005
6	6		SL	G	11/19118	11:00	11/19118	11:00	20	1	X												006
7																							
8																							
9																							
10																							
11																							
12																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
				Pace	11/20/18	900	3.5	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 11/18/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: F-MIN-L-213-rev.24	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wench

Project #: **WO#: 10456152**

PM: OEO **Due Date: 11/29/18**

CLIENT: WENCK

Courier: ☐Fed Ex ☑UPS ☐USPS ☐Client ☐Commercial ☐Pace ☐SpeeDee ☐Other:

Tracking Number: 1Z 575 03203 5347 1825

Custody Seal on Cooler/Box Present? ☐Yes ☑No **Seals Intact?** ☐Yes ☑No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☑Bubble Wrap ☐Bubble Bags ☐None ☐Other: **Temp Blank?** ☐Yes ☑No

Thermometer Used: ☐G87A9170600254 ☑G87A9155100842 **Type of Ice:** ☑Wet ☐Blue ☐None ☐Dry ☐Melted

Cooler Temp Read (°C): 3.5 **Cooler Temp Corrected (°C):** 3.5 **Biological Tissue Frozen?** ☐Yes ☐No ☑N/A

Temp should be above freezing to 6°C **Correction Factor:** 0.0 **Date and Initials of Person Examining Contents:** 11/20/18 CS

USDA Regulated Soil (☐ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐Yes ☑No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☑No

If Yes to either question, fill out a Regulated Soil Checklist (F-MIN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☑Yes ☐No	1.
Chain of Custody Filled Out?	☑Yes ☐No	2.
Chain of Custody Relinquished?	☐Yes ☑No	3.
Sampler Name and/or Signature on COC?	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time?	☑Yes ☐No	5.
Short Hold Time Analysis (<72 hr)?	☐Yes ☑No	6.
Rush Turn Around Time Requested?	☐Yes ☑No	7.
Sufficient Volume?	☑Yes ☐No	8.
Correct Containers Used? -Pace Containers Used?	☑Yes ☐No ☑Yes ☐No	9.
Containers Intact?	☑Yes ☐No	10.
Filtered Volume Received for Dissolved Tests?	☐Yes ☐No ☑N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: SL	☑Yes ☐No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☐Yes ☐No ☑N/A ☐Yes ☐No ☑N/A ☐Yes ☐No ☑N/A	13. ☐HNO_3 ☐H_2SO_4 ☐NaOH Positive for Res. Chlorine? Y N Sample # Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐Yes ☐No ☑N/A	14.
Trip Blank Present? Trip Blank Custody Seals Present? Pace Trip Blank Lot # (if purchased): NA	☐Yes ☐No ☑N/A ☐Yes ☐No ☑N/A	15.

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: Jeff Strom Date/Time: 11/20/18

Comments/Resolution: Samples collected in MN.

Project Manager Review: OyeyemiOdujole Date: 11/20/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: CS

WO#: 12119087

PM: CLJ Due Date: 11/28/18
CLIENT: PACE MPLS

Chain of Custody

☐ Samples were sent directly to the Subcontracting Laboratory.

State Of Origin: MN
Cert. Needed: [X] Yes [ ]
Owner Received Date: 11/20/2018 Results Requested By: 11/29/2018

Workorder: 10456152 Workorder Name: Sediment N colorado

Report To	Subcontract To
Oyeyemi Odujole Pace Analytical Minnesota 1700 Elm Street Suite 200 Minneapolis, MN 55414 Phone (612)607-6402	Pace Analytical Virginia MN 315 Chestnut Street Virginia, MN 55792 Phone (218)742-1042

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	Preserved Containers: Other	N+N	TKN	LAB USE ONLY
1	1	PS	11/19/2018 11:00	10456152001	Solid	1	X	X	
2	2	PS	11/19/2018 11:00	10456152002	Solid	1	X	X	
3	3	PS	11/19/2018 11:00	10456152003	Solid	1	X	X	
4	4	PS	11/19/2018 11:00	10456152004	Solid	1	X	X	
5	5	PS	11/19/2018 11:00	10456152005	Solid	1	X	X	
6	6	PS	11/19/2018 11:00	10456152006	Solid	1	X	X	

Transfers	Released By	Date/Time	Received By	Date/Time
1	[signature] Pace	11/20/18 1445	[signature]	11/21/18 10:30
2				
3				

Comments: Dry weight in VM

Cooler Temperature on Receipt 3.1 °C | Custody Seal (Y) or N | Received on Ice (Y) or N | Samples Intact (Y) or N

****In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document. This chain of custody is considered complete as is since this information is available in the owner laboratory.*

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 15Mar2016 Page 1 of 1
	Document No.: F-VM-C-001-Rev.10	Issuing Authority: Pace Virginia, Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Pace Mids

Project #: WO# : 12119087

12119087

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☒ Other: SD

Tracking Number:

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No Seals Intact? ☒ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other: Temp Blank? ☒ Yes ☐ No

Thermometer Used: ☒ 140792808 Type of Ice: ☒ Wet ☐ Blue ☐ None ☐ Samples on ice, cooling process has begun

Cooler Temp Read °C: 2.6 Cooler Temp Corrected °C: 3.1 Biological Tissue Frozen? ☐ Yes ☐ No ☒ NA

Temp should be above freezing to 6°C Correction Factor: +0.3 Date and Initials of Person Examining Contents: RH 11/21/18

Comments:

Chain of Custody Present?	☒ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☒ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☒ Yes	☐ No	☐ N/A	3.
Sampler Name and Signature on COC?	☐ Yes	☒ No	☐ N/A	4.
Samples Arrived within Hold Time?	☒ Yes	☐ No	☐ N/A	5. If Fecal: ☐ <8 hours ☐ >8, <24 hours ☐ >24 hours
Short Hold Time Analysis (<72 hr)?	☐ Yes	☒ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☒ No	☐ N/A	7.
Sufficient Volume?	☒ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☒ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☒ Yes	☐ No	☐ N/A	
Containers Intact?	☒ Yes	☐ No	☐ N/A	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☒ N/A	11. Note if sediment is visible in the dissolved containers.
Sample Labels Match COC?	☒ Yes	☐ No	☐ N/A	12.
-Includes Date/Time/ID/Analysis Matrix: SL				
All containers needing acid/base preservation will be checked and documented in the pH logbook.	☐ Yes	☐ No	☒ N/A	See pH log for results and additional preservation documentation
Headspace in Methyl Mercury Container	☐ Yes	☐ No	☒ N/A	13.
Headspace in VOA Vials (>6mm)?	☐ Yes	☐ No	☒ N/A	14.
Trip Blank Present?	☐ Yes	☐ No	☒ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☒ N/A	
Pace Trip Blank Lot # (if purchased):				

CLIENT NOTIFICATION/RESOLUTION Field Data Required? ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

FECAL WAIVER ON FILE Y N TEMPERATURE WAIVER ON FILE Y N

Project Manager Review: Date: 11/21/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

October 30, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: Colorado
Pace Project No.: 10452713

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on October 23, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: Colorado
Pace Project No.: 10452713

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: Colorado
Pace Project No.: 10452713

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10452713001	**CONTROL 0mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452713002	**CONTROL 50mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452713003	**CONTROL 100mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452713004	**CONTROL 250mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452713005	**CONTROL 500mg/L**	Water	10/19/18 11:00	10/23/18 09:30

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: Colorado
Pace Project No.: 10452713

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10452713001	**CONTROL 0mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452713002	**CONTROL 50mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452713003	**CONTROL 100mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452713004	**CONTROL 250mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452713005	**CONTROL 500mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Colorado
Pace Project No.: 10452713

Sample: CONTROL 0mg/L **Lab ID: 10452713001** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	ND	mg/L	0.10	0.030	1		10/26/18 11:11	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/L	0.036	0.011	1		10/30/18 07:30		

Sample: CONTROL 50mg/L **Lab ID: 10452713002** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**48.2**	mg/L	2.0	0.60	20		10/26/18 11:12	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**49.1**	mg/L	1.8	0.54	50		10/30/18 07:31		

Sample: CONTROL 100mg/L **Lab ID: 10452713003** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**98.5**	mg/L	5.0	1.5	50		10/26/18 11:14	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**89.6**	mg/L	3.6	1.1	100		10/30/18 07:32		

Sample: CONTROL 250mg/L **Lab ID: 10452713004** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**242**	mg/L	10.1	3.0	100		10/26/18 11:15	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**244**	mg/L	7.1	2.1	200		10/30/18 07:33		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Colorado
Pace Project No.: 10452713

Sample: CONTROL 500mg/L **Lab ID: 10452713005** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**516**	mg/L	20.1	6.0	200		10/26/18 11:16	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**520**	mg/L	17.8	5.4	500		10/30/18 07:35		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Colorado
Pace Project No.: 10452713

QC Batch: 571465 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10452713001, 10452713002, 10452713003, 10452713004, 10452713005

METHOD BLANK: 3100336 Matrix: Water
Associated Lab Samples: 10452713001, 10452713002, 10452713003, 10452713004, 10452713005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	10/26/18 11:08	

LABORATORY CONTROL SAMPLE: 3100337

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.5	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3100338 3100339

Parameter	Units	10452832002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	14.6	25	25	40.6	40.2	104	102	90-110	1	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3100340 3100341

Parameter	Units	10452836001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.4	2.5	97	99	90-110	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Colorado
Pace Project No.: 10452713

QC Batch: 572080 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10452713001, 10452713002, 10452713003, 10452713004, 10452713005

METHOD BLANK: 3104086 Matrix: Water
Associated Lab Samples: 10452713001, 10452713002, 10452713003, 10452713004, 10452713005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.036	10/30/18 07:58	

LABORATORY CONTROL SAMPLE: 3104087

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	0.97	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3104088 3104089

Parameter	Units	10452260001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	0.96	0.96	95	94	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3104090 3104091

Parameter	Units	10452260003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.1	99	99	90-110	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: Colorado
Pace Project No.: 10452713

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor and percent moisture.

LOQ - Limit of Quantitation adjusted for dilution factor and percent moisture.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Colorado
Pace Project No.: 10452713

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10452713001	**CONTROL 0mg/L**	EPA 350.1	571465		
10452713002	**CONTROL 50mg/L**	EPA 350.1	571465		
10452713003	**CONTROL 100mg/L**	EPA 350.1	571465		
10452713004	**CONTROL 250mg/L**	EPA 350.1	571465		
10452713005	**CONTROL 500mg/L**	EPA 350.1	571465		
10452713001	**CONTROL 0mg/L**	EPA 353.2	572080		
10452713002	**CONTROL 50mg/L**	EPA 353.2	572080		
10452713003	**CONTROL 100mg/L**	EPA 353.2	572080		
10452713004	**CONTROL 250mg/L**	EPA 353.2	572080		
10452713005	**CONTROL 500mg/L**	EPA 353.2	572080		

WO# : 10452713

10452713

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Wenck Assoc. Jeff Strom	Report To:	Attention: Jeff Strom
Address: 7500 Olson Memorial Hwy Suite 300, Golden Valley MN	Copy To:	Company Name: Wenck Associates
Email To: jstrom@wenck.com	Purchase Order No.:	Address:
Phone: 763-252-6833 Fax:	Project Name: Colorado	Pace Quote Reference:
Requested Due Date/TAT:	Project Number:	Pace Project Manager: Oyegemi Odigoli
		Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER_____

SITE LOCATION ☐ GA ☐ IL ☐ IN ☐ MI ☐ NC ☐ OH ☐ SC ☑ WI ☐ OTHER____

Filtered (Y/N)

Requested

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

ITEM #	Section D Required Client Information SAMPLE ID One Character per box. (A-Z, 0-9 / ,-) Samples IDs MUST BE UNIQUE	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	#OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Ammonium-N	Nitrate-Nitrite-N	Residual Chlorine (Y/N)	Pace Project Number Lab I.D.
1	CONTROL 0 mg/L	WT	G	10/19/18					1												001
2	CONTROL 50 mg/L																				002
3	CONTROL 100 mg/L																				003
4	CONTROL 250 mg/L																				004
5	CONTROL 500 mg/L																				005
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
			Fedex - PACE	10/23/18	9:30	4.5

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
PRINT Name of SAMPLER:	William James		Y/N	Y/N	Y/N
SIGNATURE of SAMPLER:	DATE Signed (MM / DD / YY): 10/22/18		Y/N	Y/N	Y/N
			Y/N	Y/N	Y/N

E-File,(ALLQ020rev.3,31Mar05), 13Jun2005

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 02May2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.23	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10452713**

PM: OEO **Due Date: 10/30/18**

CLIENT: WENCK

Courier: ☐ Fed Ex ☑ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 12 575 032 03 5411 1366

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other:

Temp Blank? ☑ Yes ☐ No

Thermometer Used: ☑ G87A9170600254 ☐ G87A9155100842

Type of Ice: ☑ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

10/23/18 LJ

Cooler Temp Read (°C): 4.3 **Cooler Temp Corrected (°C):** 4.5

Temp should be above freezing to 6°C **Correction Factor:** +0.2

Biological Tissue Frozen? ☐ Yes ☐ No ☑ N/A

Date and Initials of Person Examining Contents: 10/23/18 LJ

USDA Regulated Soil (☑ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☑ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☑ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☑ Yes ☐ No	1.
Chain of Custody Filled Out?	☑ Yes ☐ No	2.
Chain of Custody Relinquished?	☑ Yes ☐ No	3. no time on coc/samples
Sampler Name and/or Signature on COC?	☑ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes ☐ No	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☑ No	6.
Rush Turn Around Time Requested?	☐ Yes ☑ No	7.
Sufficient Volume?	☑ Yes ☐ No	8.
Correct Containers Used?	☑ Yes ☐ No	9.
-Pace Containers Used?	☑ Yes ☐ No	
Containers Intact?	☑ Yes ☐ No	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☑ N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☑ Yes ☐ No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☑ Yes ☐ No ☐ N/A ☑ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☑ N/A	13. ☐ HNO_3 ☑ H_2SO_4 ☐ NaOH Positive for Res. Chlorine? Y N Sample # 1-5, V1 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes ☐ No ☑ N/A	14.
Trip Blank Present?	☐ Yes ☐ No ☑ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes ☐ No ☑ N/A	
Pace Trip Blank Lot # (if purchased):		

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Jeff (email) Date/Time: 10/23/18

Comments/Resolution: Samples collected at 11:00 am per the client.

Project Manager Review: Sylvia Hunter Date: 10/23/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

LB LW

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

October 30, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: Colorado
Pace Project No.: 10452717

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on October 23, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: Colorado
Pace Project No.: 10452717

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: Colorado
Pace Project No.: 10452717

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10452717001	**L1 WET 0mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452717002	**L1 WET 50mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452717003	**L1 WET 100mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452717004	**L1 WET 250mg/L**	Water	10/19/18 11:00	10/23/18 09:30
10452717005	**L1 WET 500mg/L**	Water	10/19/18 11:00	10/23/18 09:30

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Minneapolis, MN 55414
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SAMPLE ANALYTE COUNT

Project: Colorado
Pace Project No.: 10452717

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10452717001	**L1 WET 0mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452717002	**L1 WET 50mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452717003	**L1 WET 100mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452717004	**L1 WET 250mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M
10452717005	**L1 WET 500mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	KEO	1	PASI-M

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Colorado
Pace Project No.: 10452717

Sample: L1 WET 0mg/L **Lab ID: 10452717001** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**0.10**	mg/L	0.10	0.030	1		10/26/18 12:34	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.35**	mg/L	0.036	0.011	1		10/30/18 07:44		

Sample: L1 WET 50mg/L **Lab ID: 10452717002** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**39.6**	mg/L	2.0	0.60	20		10/26/18 12:36	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**47.6**	mg/L	1.8	0.54	50		10/30/18 07:45		

Sample: L1 WET 100mg/L **Lab ID: 10452717003** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**86.0**	mg/L	5.0	1.5	50		10/26/18 12:37	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**91.7**	mg/L	3.6	1.1	100		10/30/18 07:46		

Sample: L1 WET 250mg/L **Lab ID: 10452717004** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**221**	mg/L	10.1	3.0	100		10/26/18 12:38	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**228**	mg/L	7.1	2.1	200		10/30/18 07:47		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: Colorado
Pace Project No.: 10452717

Sample: L1 WET 500mg/L **Lab ID: 10452717005** Collected: 10/19/18 11:00 Received: 10/23/18 09:30 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**476**	mg/L	20.1	6.0	200		10/26/18 12:40	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**489**	mg/L	17.8	5.4	500		10/30/18 07:48		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Colorado
Pace Project No.: 10452717

QC Batch: 571465 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10452717001, 10452717002, 10452717003, 10452717004, 10452717005

METHOD BLANK: 3100336 Matrix: Water
Associated Lab Samples: 10452717001, 10452717002, 10452717003, 10452717004, 10452717005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	10/26/18 11:08	

LABORATORY CONTROL SAMPLE: 3100337

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.5	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3100338 3100339

Parameter	Units	10452832002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	14.6	25	25	40.6	40.2	104	102	90-110	1	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3100340 3100341

Parameter	Units	10452836001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.4	2.5	97	99	90-110	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: Colorado
Pace Project No.: 10452717

QC Batch: 572080 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10452717001, 10452717002, 10452717003, 10452717004, 10452717005

METHOD BLANK: 3104086 Matrix: Water
Associated Lab Samples: 10452717001, 10452717002, 10452717003, 10452717004, 10452717005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.036	10/30/18 07:58	

LABORATORY CONTROL SAMPLE: 3104087

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	0.97	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3104088 3104089

Parameter	Units	10452260001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	0.96	0.96	95	94	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3104090 3104091

Parameter	Units	10452260003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.1	99	99	90-110	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: Colorado
Pace Project No.: 10452717

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor and percent moisture.

LOQ - Limit of Quantitation adjusted for dilution factor and percent moisture.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Colorado
Pace Project No.: 10452717

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10452717001	**L1 WET 0mg/L**	EPA 350.1	571465		
10452717002	**L1 WET 50mg/L**	EPA 350.1	571465		
10452717003	**L1 WET 100mg/L**	EPA 350.1	571465		
10452717004	**L1 WET 250mg/L**	EPA 350.1	571465		
10452717005	**L1 WET 500mg/L**	EPA 350.1	571465		
10452717001	**L1 WET 0mg/L**	EPA 353.2	572080		
10452717002	**L1 WET 50mg/L**	EPA 353.2	572080		
10452717003	**L1 WET 100mg/L**	EPA 353.2	572080		
10452717004	**L1 WET 250mg/L**	EPA 353.2	572080		
10452717005	**L1 WET 500mg/L**	EPA 353.2	572080		

WO# : 10452717

10452717

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Wenck Assoc Jeff Strom	Report To: Jeff Strom	Attention: Jeff Strom
Address: 7500 Olson Memorial Hwy Ste 300, Golden Valley MN	Copy To:	Company Name: Wenck Assoc
		Address: Same
Email To: JStrom@wenck.com	Purchase Order No.:	Pace Quote Reference:
Phone: 763-252-6835 Fax:	Project Name: Colorado	Pace Project Manager: Oyeyemi Odeyale
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER_____

SITE LOCATION ☐ GA ☐ IL ☐ IN ☐ MI ☐ NC ☐ OH ☐ SC ☑ WI ☐ OTHER____

Section D Required Client Information

SAMPLE ID

One Character per box. (A-Z, 0-9 / ,-)

Samples IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL WP
WIPE	AR
AIR	OT
OTHER	TS
TISSUE	

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	#OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Filtered (Y/N)	Requested: Analysis Test Y/N	Residual Chlorine (Y/N)	Pace Project Number / Lab I.D.
1	Li WET 0 mg/L	WT	G	10/19/18					1												001
2	Li WET 50 mg/L																				002
3	Li WET 100 mg/L																				003
4	Li WET 250 mg/L																				004
5	Li WET 500 mg/L																				005
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
			Fedex - PACE	10/23/18	9:30	4.5	Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE			
PRINT Name of SAMPLER:	William F James		
SIGNATURE of SAMPLER:		DATE Signed (MM / DD / YY):	10/22/18

Temp in °C | Received on Ice | Custody Sealed Cooler | Samples Intact

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 02May2018 Page 1 of 2
	Document No.: **F-MN-L-213-rev.23**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10452717**

PM: OEO **Due Date: 10/30/18**

CLIENT: WENCK

Courier: ☐Fed Ex ☑UPS ☐USPS ☐Client ☐Commercial ☐Pace ☐SpeeDee ☐Other:

Tracking Number: 12 575 032 035410 1366

Custody Seal on Cooler/Box Present? ☐Yes ☑No **Seals Intact?** ☐Yes ☑No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑Bubble Wrap ☐Bubble Bags ☐None ☐Other:

Temp Blank? ☑Yes ☐No 10/23/18 LJ

Thermometer Used: ☑G87A9170600254 ☐G87A9155100842

Type of Ice: ☑Wet ☐Blue ☐None ☐Dry ☐Melted

Cooler Temp Read (°C): 4.3 **Cooler Temp Corrected (°C):** 4.5

Biological Tissue Frozen? ☐Yes ☐No ☑N/A

Temp should be above freezing to 6°C **Correction Factor:** +0.2 **Date and Initials of Person Examining Contents:** 10/23/18 LJ

USDA Regulated Soil (☑N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☑Yes ☐No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☑Yes ☐No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☑Yes	☐No		1.
Chain of Custody Filled Out?	☑Yes	☐No		2.
Chain of Custody Relinquished?	☑Yes	☐No		3.
Sampler Name and/or Signature on COC?	☑Yes	☐No	☐N/A	4.
Samples Arrived within Hold Time?	☑Yes	☐No		5.
Short Hold Time Analysis (<72 hr)?	☐Yes	☑No		6.
Rush Turn Around Time Requested?	☐Yes	☑No		7.
Sufficient Volume?	☑Yes	☐No		8.
Correct Containers Used? -Pace Containers Used?	☑Yes ☑Yes	☐No ☐No		9.
Containers Intact?	☑Yes	☐No		10.
Filtered Volume Received for Dissolved Tests?	☐Yes	☐No	☑N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☑Yes	☐No		12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☑Yes ☑Yes ☐Yes	☐No ☐No ☐No	☐N/A ☐N/A ☑N/A	13. ☐HNO_3 ☑H_2SO_4 ☐NaOH Positive for Res. Chlorine? Y N Sample # 1-5,7,11 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐Yes	☐No	☑N/A	14.
Trip Blank Present?	☐Yes	☐No	☑N/A	15.
Trip Blank Custody Seals Present?	☐Yes	☐No	☑N/A	
Pace Trip Blank Lot # (if purchased):				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: Jeff (email) Date/Time: 10/23/18

Comments/Resolution: Samples collected at 11:00 am per the client.

Project Manager Review: Sylvia Hunter **Date:** 10/23/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

UB:W

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 10, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457424

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457424

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457424

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457424001	**STD 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457424002	**STD 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457424003	**STD 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457424004	**STD 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457424005	**STD 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

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SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457424

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457424001	**STD 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457424002	**STD 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457424003	**STD 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457424004	**STD 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457424005	**STD 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

Pace Analytical Services, LLC
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Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457424

Sample: STD 0 mg/L **Lab ID: 10457424001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	ND	mg/L	0.10	0.030	1		12/07/18 17:13	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	0.018	1		12/08/18 15:51		

Sample: STD 50 mg/L **Lab ID: 10457424002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**49.6**	mg/L	2.0	0.60	20		12/07/18 17:17	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**49.6**	mg/L	5.0	0.88	50		12/08/18 15:54		

Sample: STD 100 mg/L **Lab ID: 10457424003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**103**	mg/L	5.0	1.5	50		12/07/18 17:19	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**99.5**	mg/L	10.0	1.8	100		12/08/18 15:55		

Sample: STD 250 mg/L **Lab ID: 10457424004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**251**	mg/L	10.0	3.0	100		12/07/18 17:23	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**248**	mg/L	20.0	3.5	200		12/08/18 15:56		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457424

Sample: STD 500 mg/L **Lab ID: 10457424005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**502**	mg/L	20.0	6.0	200		12/07/18 17:25	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**402**	mg/L	50.0	8.8	500		12/08/18 15:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457424

QC Batch: 579601 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457424001, 10457424002, 10457424003, 10457424004, 10457424005

METHOD BLANK: 3143669 Matrix: Water
Associated Lab Samples: 10457424001, 10457424002, 10457424003, 10457424004, 10457424005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:57	

LABORATORY CONTROL SAMPLE: 3143670

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.5	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143671 3143672

Parameter	Units	10457424001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.5	2.5	100	100	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143673 3143674

Parameter	Units	10457588001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.4	2.4	97	95	90-110	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457424

QC Batch: 579733 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457424001, 10457424002, 10457424003, 10457424004, 10457424005

METHOD BLANK: 3144848 Matrix: Water
Associated Lab Samples: 10457424001, 10457424002, 10457424003, 10457424004, 10457424005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 16:01	FS

LABORATORY CONTROL SAMPLE: 3144849

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	0.99	99	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144850 3144851

Parameter	Units	10457424001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.1	106	107	90-110	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457424

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457424

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457424001	**STD 0 mg/L**	EPA 350.1	579601		
10457424002	**STD 50 mg/L**	EPA 350.1	579601		
10457424003	**STD 100 mg/L**	EPA 350.1	579601		
10457424004	**STD 250 mg/L**	EPA 350.1	579601		
10457424005	**STD 500 mg/L**	EPA 350.1	579601		
10457424001	**STD 0 mg/L**	EPA 353.2	579733		
10457424002	**STD 50 mg/L**	EPA 353.2	579733		
10457424003	**STD 100 mg/L**	EPA 353.2	579733		
10457424004	**STD 250 mg/L**	EPA 353.2	579733		
10457424005	**STD 500 mg/L**	EPA 353.2	579733		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:

Company:	Wenck Associates Brian Beck
Address:	7500 Olson Memorial Hwy
	Suite 300, Golden Valley, MN 55427
Email To:	jstrom@wenck.com
Phone: 763-252-6833	Fax:
Requested Due Date/TAT:	std TAT

Section B Required Project Information:

Report To:	same
Copy To:	
Purchase Order No.:	
Project Name:	N adsorption 3
Project Number:	

Section C Invoice Information:

Attention:	Jeff Strom
Company Name:	Wenck Associates
Address:	same
Pace Quote Reference:	
Pace Project Manager:	Oyeyemi Odijole
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location
STATE: _____

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

WO#: 10457424

10457424

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: Ammonium-N	Nitrate-nitrite-N	Re	Pace Project No./ Lab I.D.
1	STD 0 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		001
2	STD 50 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		002
3	STD 100 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		003
4	STD 250 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		004
5	STD 500 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		005
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
					12/4/18	945	5.6	4	4	4

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER:

DATE Signed (MM/DD/YY): 12/3/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.24	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10457424**

PM: OEO **Due Date: 12/11/18**

CLIENT: WENCK

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☒ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☒ Yes ☐ No

Thermometer Used: ☐ G87A9170600254 ☒ G87A9155100842 **Type of Ice:** ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6 **Biological Tissue Frozen?** ☐ Yes ☐ No ☒ N/A

Temp should be above freezing to 6°C **Correction Factor:** none **Date and Initials of Person Examining Contents:** CW 12/4/18

USDA Regulated Soil (☒ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒ Yes ☐ No	1.
Chain of Custody Filled Out?	☒ Yes ☐ No	2.
Chain of Custody Relinquished?	☐ Yes ☒ No	3.
Sampler Name and/or Signature on COC?	☒ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time?	☒ Yes ☐ No	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☒ No	6.
Rush Turn Around Time Requested?	☐ Yes ☒ No	7.
Sufficient Volume?	☒ Yes ☐ No	8.
Correct Containers Used?	☒ Yes ☐ No	9.
-Pace Containers Used?	☒ Yes ☐ No	
Containers Intact?	☒ Yes ☐ No	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☒ N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒ Yes ☐ No	12.
All containers needing acid/base preservation have been checked?	☒ Yes ☐ No ☐ N/A	13. ☐ HNO_3 ☒ H_2SO_4 ☐ NaOH Positive for Res. Chlorine? Y N
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	☒ Yes ☐ No ☐ N/A	Sample # 1-5
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☐ Yes ☐ No ☒ N/A	Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes ☐ No ☒ N/A	14.
Trip Blank Present?	☐ Yes ☐ No ☒ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes ☐ No ☒ N/A	
Pace Trip Blank Lot # (if purchased): NA		

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Jeff Strom Date/Time: 12/4/18

Comments/Resolution: Samples collected in MN

Project Manager Review: Oyeyemi Odujole Date: 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: CW

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 10, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457416

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457416

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
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Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457416

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457416001	**L2 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457416002	**L2 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457416003	**L2 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457416004	**L2 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457416005	**L2 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

Pace Analytical Services, LLC
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Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457416

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457416001	**L2 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457416002	**L2 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457416003	**L2 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457416004	**L2 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457416005	**L2 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457416

Sample: L2 0 mg/L **Lab ID: 10457416001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	ND	mg/L	0.10	0.030	1		12/07/18 16:17	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.18**	mg/L	0.10	0.018	1		12/08/18 15:09		FS

Sample: L2 50 mg/L **Lab ID: 10457416002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**45.2**	mg/L	2.0	0.60	20		12/07/18 16:21	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**49.1**	mg/L	5.0	0.88	50		12/08/18 15:10		

Sample: L2 100 mg/L **Lab ID: 10457416003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**93.5**	mg/L	5.0	1.5	50		12/07/18 16:22	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**97.2**	mg/L	10.0	1.8	100		12/08/18 15:11		

Sample: L2 250 mg/L **Lab ID: 10457416004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**240**	mg/L	10.0	3.0	100		12/07/18 16:24	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**244**	mg/L	20.0	3.5	200		12/08/18 15:13		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457416

Sample: L2 500 mg/L **Lab ID: 10457416005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**488**	mg/L	20.0	6.0	200		12/07/18 16:25	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**505**	mg/L	50.0	8.8	500		12/08/18 15:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457416

QC Batch: 579600 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457416001, 10457416002, 10457416003, 10457416004, 10457416005

METHOD BLANK: 3143662 Matrix: Water
Associated Lab Samples: 10457416001, 10457416002, 10457416003, 10457416004, 10457416005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:14	

LABORATORY CONTROL SAMPLE: 3143663

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.3	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143664 3143665

Parameter	Units	10457416001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.6	2.7	100	104	90-110	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143666 3143667

Parameter	Units	10457417001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	0.11	2.5	2.5	2.6	2.6	98	101	90-110	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457416

QC Batch: 579732 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457416001, 10457416002, 10457416003, 10457416004, 10457416005

METHOD BLANK: 3144842 Matrix: Water
Associated Lab Samples: 10457416001, 10457416002, 10457416003, 10457416004, 10457416005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 15:41	FS

LABORATORY CONTROL SAMPLE: 3144843

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	1.0	100	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144844 3144845

Parameter	Units	10457419001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.0	100	97	90-110	3	20	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144846 3144847

Parameter	Units	10457422001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	0.12	1	1	1.1	1.1	94	101	90-110	6	20	FS

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457416

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457416

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457416001	**L2 0 mg/L**	EPA 350.1	579600		
10457416002	**L2 50 mg/L**	EPA 350.1	579600		
10457416003	**L2 100 mg/L**	EPA 350.1	579600		
10457416004	**L2 250 mg/L**	EPA 350.1	579600		
10457416005	**L2 500 mg/L**	EPA 350.1	579600		
10457416001	**L2 0 mg/L**	EPA 353.2	579732		
10457416002	**L2 50 mg/L**	EPA 353.2	579732		
10457416003	**L2 100 mg/L**	EPA 353.2	579732		
10457416004	**L2 250 mg/L**	EPA 353.2	579732		
10457416005	**L2 500 mg/L**	EPA 353.2	579732		

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:

Company:	Wenck Associates Brian Beck
Address:	7500 Olson Memorial Hwy
	Suite 300, Golden Valley, MN 55427
Email To:	jstrom@wenck.com
Phone: 763-252-6833	Fax:
Requested Due Date/TAT:	std TAT

Section B Required Project Information:

Report To:	same
Copy To:	
Purchase Order No.:	
Project Name:	N adsorption 3
Project Number:	

Section C Invoice Information:

Attention:	Jeff Strom
Company Name:	Wenck Associates
Address:	same
Pace Quote Reference:	
Pace Project Manager:	Oyeyemi Odijole
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

WO#: 10457416

ITEM #	Sample ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: Ammonium-N	Nitrate-nitrite-N	Residl	Pace Project No./ Lab I.D.
1	L2 0 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			001
2	L2 50 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			002
3	L2 100 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			003
4	L2 250 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			004
5	L2 500 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			005
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
					12/4/18	945	5.6	4	4	4

SAMPLER NAME AND SIGNATURE				
PRINT Name of SAMPLER:				
SIGNATURE of SAMPLER:		DATE Signed (MM/DD/YY):	12/3/18	

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: **F-MN-L-213-rev.24**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10457416**

PM: OEO **Due Date: 12/11/18**

CLIENT: WENCK

Courier: ☐Fed Ex ☒UPS ☐USPS ☐Client ☐Commercial ☐Pace ☐SpeeDee ☐Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☒Yes ☐No **Seals Intact?** ☒Yes ☐No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒Bubble Wrap ☐Bubble Bags ☐None ☐Other: **Temp Blank?** ☒Yes ☐No

Thermometer Used: ☐G87A9170600254 ☒G87A9155100842

Type of Ice: ☒Wet ☐Blue ☐None ☐Dry ☐Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6 **Biological Tissue Frozen?** ☐Yes ☐No ☒N/A

Temp should be above freezing to 6°C **Correction Factor:** tmc **Date and Initials of Person Examining Contents:** lev 12/4/18

USDA Regulated Soil (☒N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐Yes ☐No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☐No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒Yes ☐No	1.
Chain of Custody Filled Out?	☒Yes ☐No	2.
Chain of Custody Relinquished?	☐Yes ☒No	3.
Sampler Name and/or Signature on COC?	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time?	☒Yes ☐No	5.
Short Hold Time Analysis (<72 hr)?	☐Yes ☒No	6.
Rush Turn Around Time Requested?	☐Yes ☒No	7.
Sufficient Volume?	☒Yes ☐No	8.
Correct Containers Used? -Pace Containers Used?	☒Yes ☐No ☒Yes ☐No	9.
Containers Intact?	☒Yes ☐No	10.
Filtered Volume Received for Dissolved Tests?	☐Yes ☐No ☒N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒Yes ☐No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☒Yes ☐No ☐N/A ☒Yes ☐No ☐N/A ☐Yes ☐No ☒N/A	13. ☐HNO_3 ☒H_2SO_4 ☐NaOH Positive for Res. Chlorine? Y N Sample # 1-5 1/1 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐Yes ☐No ☒N/A	14.
Trip Blank Present? Trip Blank Custody Seals Present? Pace Trip Blank Lot # (if purchased): NA	☐Yes ☐No ☒N/A ☐Yes ☐No ☒N/A	15.

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: Jeff Strom Date/Time: 12/4/18

Comments/Resolution: Samples taken in MN

Project Manager Review: Oyeyemi Odejole **Date:** 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: VV

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 10, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457417

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457417

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457417

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457417001	**L3 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457417002	**L3 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457417003	**L3 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457417004	**L3 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457417005	**L3 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457417

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457417001	**L3 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457417002	**L3 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457417003	**L3 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457417004	**L3 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457417005	**L3 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457417

Sample: L3 0 mg/L **Lab ID: 10457417001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**0.11**	mg/L	0.10	0.030	1		12/07/18 16:27	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.18**	mg/L	0.10	0.018	1		12/08/18 15:15		FS

Sample: L3 50 mg/L **Lab ID: 10457417002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**42.6**	mg/L	2.0	0.60	20		12/07/18 16:34	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**49.4**	mg/L	5.0	0.88	50		12/08/18 15:16		

Sample: L3 100 mg/L **Lab ID: 10457417003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**87.5**	mg/L	5.0	1.5	50		12/07/18 16:35	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**99.3**	mg/L	10.0	1.8	100		12/08/18 15:17		

Sample: L3 250 mg/L **Lab ID: 10457417004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**239**	mg/L	10.0	3.0	100		12/07/18 16:37	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**252**	mg/L	20.0	3.5	200		12/08/18 15:20		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457417

Sample: L3 500 mg/L **Lab ID: 10457417005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**486**	mg/L	20.0	6.0	200		12/07/18 16:38	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**487**	mg/L	50.0	8.8	500		12/08/18 15:22		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457417

QC Batch: 579600 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457417001, 10457417002, 10457417003, 10457417004, 10457417005

METHOD BLANK: 3143662 Matrix: Water
Associated Lab Samples: 10457417001, 10457417002, 10457417003, 10457417004, 10457417005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:14	

LABORATORY CONTROL SAMPLE: 3143663

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.3	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143664 3143665

Parameter	Units	10457416001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.6	2.7	100	104	90-110	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143666 3143667

Parameter	Units	10457417001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	0.11	2.5	2.5	2.6	2.6	98	101	90-110	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457417

QC Batch: 579732 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457417001, 10457417002, 10457417003, 10457417004, 10457417005

METHOD BLANK: 3144842 Matrix: Water
Associated Lab Samples: 10457417001, 10457417002, 10457417003, 10457417004, 10457417005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 15:41	FS

LABORATORY CONTROL SAMPLE: 3144843

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	1.0	100	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144844 3144845

Parameter	Units	10457419001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.0	100	97	90-110	3	20	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144846 3144847

Parameter	Units	10457422001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	0.12	1	1	1.1	1.1	94	101	90-110	6	20	FS

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457417

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457417

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457417001	**L3 0 mg/L**	EPA 350.1	579600		
10457417002	**L3 50 mg/L**	EPA 350.1	579600		
10457417003	**L3 100 mg/L**	EPA 350.1	579600		
10457417004	**L3 250 mg/L**	EPA 350.1	579600		
10457417005	**L3 500 mg/L**	EPA 350.1	579600		
10457417001	**L3 0 mg/L**	EPA 353.2	579732		
10457417002	**L3 50 mg/L**	EPA 353.2	579732		
10457417003	**L3 100 mg/L**	EPA 353.2	579732		
10457417004	**L3 250 mg/L**	EPA 353.2	579732		
10457417005	**L3 500 mg/L**	EPA 353.2	579732		

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:

Company:	Wenck Associates Brian Beck
Address:	7500 Olson Memorial Hwy
	Suite 300, Golden Valley, MN 55427
Email To:	jstrom@wenck.com
Phone: 763-252-6833	Fax:
Requested Due Date/TAT:	std TAT

Section B Required Project Information:

Report To:	same
Copy To:	
Purchase Order No.:	
Project Name:	N adsorption 3
Project Number:	

Section C Invoice Information:

Attention:	Jeff Strom
Company Name:	Wenck Associates
Address:	same
Pace Quote Reference:	
Pace Project Manager:	Oyeyemi Odijole
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

WO#: 10457417

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: Ammonium-N	Nitrate-nitrite-N	Residual	Pace Project No./ Lab I.D.
1	L3 0 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			001
2	L3 50 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			002
3	L3 100 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			003
4	L3 250 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			004
5	L3 500 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			005
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
					12/4/18	9:45

SAMPLE CONDITIONS: 5.6 | Y | Y | Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 12/3/18

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.24	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: WO#: 10457417

PM: OEO Due Date: 12/11/18

CLIENT: WENCK

Courier: ☐Fed Ex ☒UPS ☐USPS ☐Client ☐Commercial ☐Pace ☐SpeeDee ☐Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☒Yes ☐No **Seals Intact?** ☒Yes ☐No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒Bubble Wrap ☐Bubble Bags ☐None ☐Other: **Temp Blank?** ☒Yes ☐No

Thermometer Used: ☐G87A9170600254 ☒G87A9155100842 **Type of Ice:** ☒Wet ☐Blue ☐None ☐Dry ☐Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6 **Biological Tissue Frozen?** ☐Yes ☐No ☒N/A

Temp should be above freezing to 6°C **Correction Factor:** true **Date and Initials of Person Examining Contents:** 12/4/18

USDA Regulated Soil (☒N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐Yes ☐No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☐No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒Yes ☐No	1.
Chain of Custody Filled Out?	☒Yes ☐No	2.
Chain of Custody Relinquished?	☐Yes ☒No	3.
Sampler Name and/or Signature on COC?	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time?	☒Yes ☐No	5.
Short Hold Time Analysis (<72 hr)?	☐Yes ☒No	6.
Rush Turn Around Time Requested?	☐Yes ☒No	7.
Sufficient Volume?	☒Yes ☐No	8.
Correct Containers Used? -Pace Containers Used?	☒Yes ☐No ☒Yes ☐No	9.
Containers Intact?	☒Yes ☐No	10.
Filtered Volume Received for Dissolved Tests?	☐Yes ☐No ☒N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒Yes ☐No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☒Yes ☐No ☐N/A ☒Yes ☐No ☐N/A ☐Yes ☐No ☒N/A	13. ☐HNO_3 ☒H_2SO_4 ☐NaOH Positive for Res. Chlorine? Y N Sample # 1-5 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐Yes ☐No ☒N/A	14.
Trip Blank Present? Trip Blank Custody Seals Present? Pace Trip Blank Lot # (if purchased): NA	☐Yes ☐No ☒N/A ☐Yes ☐No ☒N/A	15.

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: Jeff Strom Date/Time: 12/4/18 **Field Data Required?** ☐Yes ☐No

Comments/Resolution: Samples collected in MN

Project Manager Review: OyeyemiOdujole Date: 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: VV

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 11, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457419

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457419

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457419

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457419001	**L4 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457419002	**L4 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457419003	**L4 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457419004	**L4 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457419005	**L4 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

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Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457419

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457419001	**L4 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457419002	**L4 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457419003	**L4 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457419004	**L4 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457419005	**L4 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

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1700 Elm Street - Suite 200
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ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457419

Sample: L4 0 mg/L **Lab ID: 10457419001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**0.15**	mg/L	0.10	0.030	1		12/07/18 16:40	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	0.018	1		12/08/18 15:23		FS

Sample: L4 50 mg/L **Lab ID: 10457419002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**44.2**	mg/L	2.0	0.60	20		12/07/18 16:41	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**46.8**	mg/L	5.0	0.88	50		12/08/18 15:26		

Sample: L4 100 mg/L **Lab ID: 10457419003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**90.0**	mg/L	5.0	1.5	50		12/07/18 16:43	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**97.5**	mg/L	10.0	1.8	100		12/08/18 15:27		

Sample: L4 250 mg/L **Lab ID: 10457419004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**232**	mg/L	10.0	3.0	100		12/07/18 16:44	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**240**	mg/L	20.0	3.5	200		12/08/18 15:28		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457419

Sample: L4 500 mg/L **Lab ID: 10457419005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**488**	mg/L	20.0	6.0	200		12/07/18 16:48	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**484**	mg/L	50.0	8.8	500		12/08/18 15:29		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457419

QC Batch: 579600 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457419001, 10457419002, 10457419003, 10457419004, 10457419005

METHOD BLANK: 3143662 Matrix: Water
Associated Lab Samples: 10457419001, 10457419002, 10457419003, 10457419004, 10457419005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:14	

LABORATORY CONTROL SAMPLE: 3143663

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.3	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143664 3143665

Parameter	Units	10457416001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.6	2.7	100	104	90-110	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143666 3143667

Parameter	Units	10457417001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	0.11	2.5	2.5	2.6	2.6	98	101	90-110	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457419

QC Batch: 579732 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457419001, 10457419002, 10457419003, 10457419004, 10457419005

METHOD BLANK: 3144842 Matrix: Water
Associated Lab Samples: 10457419001, 10457419002, 10457419003, 10457419004, 10457419005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 15:41	FS

LABORATORY CONTROL SAMPLE: 3144843

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	1.0	100	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144844 3144845

Parameter	Units	10457419001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.0	100	97	90-110	3	20	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144846 3144847

Parameter	Units	10457422001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	0.12	1	1	1.1	1.1	94	101	90-110	6	20	FS

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457419

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457419

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457419001	**L4 0 mg/L**	EPA 350.1	579600		
10457419002	**L4 50 mg/L**	EPA 350.1	579600		
10457419003	**L4 100 mg/L**	EPA 350.1	579600		
10457419004	**L4 250 mg/L**	EPA 350.1	579600		
10457419005	**L4 500 mg/L**	EPA 350.1	579600		
10457419001	**L4 0 mg/L**	EPA 353.2	579732		
10457419002	**L4 50 mg/L**	EPA 353.2	579732		
10457419003	**L4 100 mg/L**	EPA 353.2	579732		
10457419004	**L4 250 mg/L**	EPA 353.2	579732		
10457419005	**L4 500 mg/L**	EPA 353.2	579732		

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Wenck Associates Brian Beck	Report To:	same	Attention:	Jeff Strom
Address:	7500 Olson Memorial Hwy	Copy To:		Company Name:	Wenck Associates
	Suite 300, Golden Valley, MN 55427			Address:	same
Email To:	jstrom@wenck.com	Purchase Order No.:		Pace Quote Reference:	
Phone:	763-252-6833 Fax:	Project Name:	N adsorption 3	Pace Project Manager:	Oyeyemi Odijole
Requested Due Date/TAT:	std TAT	Project Number:		Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location
STATE: _____

WO#: 10457419

10457419

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Valid Matrix Codes: MATRIX / CODE — DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Ammonium-N	Nitrate-nitrite-N	Resi	Pace Project No./ Lab I.D.
1	L4 0 mg/L		WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		061
2	L4 50 mg/L		WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		W2
3	L4 100 mg/L		WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		W3
4	L4 250 mg/L		WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		W4
5	L4 500 mg/L		WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X		W05
6																							
7																							
8																							
9																							
10																							
11																							
12																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
					12/4/18	945	5.6	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 12/3/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10457419**

PM: OEO **Due Date: 12/11/18**

CLIENT: WENCK

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No **Seals Intact?** ☒ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☒ Yes ☐ No

Thermometer Used: ☐ G87A9170600254 ☒ G87A9155100842 **Type of Ice:** ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6 **Biological Tissue Frozen?** ☐ Yes ☐ No ☒ N/A

Temp should be above freezing to 6°C **Correction Factor:** true **Date and Initials of Person Examining Contents:** VW 12/4/18

USDA Regulated Soil (☒ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒ Yes ☐ No	1.
Chain of Custody Filled Out?	☒ Yes ☐ No	2.
Chain of Custody Relinquished?	☐ Yes ☒ No	3.
Sampler Name and/or Signature on COC?	☒ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time?	☒ Yes ☐ No	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☒ No	6.
Rush Turn Around Time Requested?	☐ Yes ☒ No	7.
Sufficient Volume?	☒ Yes ☐ No	8.
Correct Containers Used? -Pace Containers Used?	☒ Yes ☐ No ☒ Yes ☐ No	9.
Containers Intact?	☒ Yes ☐ No	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☒ N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒ Yes ☐ No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☒ N/A	13. ☐ HNO_3 ☒ H_2SO_4 ☐ NaOH Positive for Res. Chlorine? Y N Sample # 1-5 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes ☐ No ☒ N/A	14.
Trip Blank Present? Trip Blank Custody Seals Present? Pace Trip Blank Lot # (if purchased): N/A	☐ Yes ☐ No ☒ N/A ☐ Yes ☐ No ☒ N/A	15.

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: Jeff Strom Date/Time: 12/4/18 **Field Data Required?** ☐ Yes ☐ No

Comments/Resolution: Samples collected in MN

Project Manager Review: Oyeyemi Odeyole Date: 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: VW

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 10, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457422

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457422

Minnesota Certification IDs

1700 Elm Street SE, Minneapolis, MN 55414-2485
A2LA Certification #: 2926.01
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
CNMI Saipan Certification #: MP0003
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
Guam EPA Certification #: MN00064
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: 03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Certifcation #: via MN 027-053-137
Minnesota Petrofund Certification #: 1240
Mississippi Certification #: MN00064
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
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Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457422

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457422001	**L5 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457422002	**L5 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457422003	**L5 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457422004	**L5 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457422005	**L5 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457422

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457422001	**L5 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457422002	**L5 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457422003	**L5 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457422004	**L5 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457422005	**L5 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457422

Sample: L5 0 mg/L **Lab ID: 10457422001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**0.18**	mg/L	0.10	0.030	1		12/07/18 16:50	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.12**	mg/L	0.10	0.018	1		12/08/18 15:31		FS

Sample: L5 50 mg/L **Lab ID: 10457422002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**44.8**	mg/L	2.0	0.60	20		12/07/18 16:51	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**47.8**	mg/L	5.0	0.88	50		12/08/18 15:36		

Sample: L5 100 mg/L **Lab ID: 10457422003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**93.0**	mg/L	5.0	1.5	50		12/07/18 16:53	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**97.7**	mg/L	10.0	1.8	100		12/08/18 15:37		

Sample: L5 250 mg/L **Lab ID: 10457422004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**233**	mg/L	10.0	3.0	100		12/07/18 16:54	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**244**	mg/L	20.0	3.5	200		12/08/18 15:38		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457422

Sample: L5 500 mg/L **Lab ID: 10457422005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**476**	mg/L	20.0	6.0	200		12/07/18 16:56	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**484**	mg/L	50.0	8.8	500		12/08/18 15:40		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457422

QC Batch: 579600 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457422001, 10457422002, 10457422003, 10457422004, 10457422005

METHOD BLANK: 3143662 Matrix: Water
Associated Lab Samples: 10457422001, 10457422002, 10457422003, 10457422004, 10457422005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:14	

LABORATORY CONTROL SAMPLE: 3143663

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.3	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143664 3143665

Parameter	Units	10457416001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.6	2.7	100	104	90-110	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143666 3143667

Parameter	Units	10457417001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	0.11	2.5	2.5	2.6	2.6	98	101	90-110	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457422

QC Batch: 579732 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457422001, 10457422002, 10457422003, 10457422004, 10457422005

METHOD BLANK: 3144842 Matrix: Water
Associated Lab Samples: 10457422001, 10457422002, 10457422003, 10457422004, 10457422005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 15:41	FS

LABORATORY CONTROL SAMPLE: 3144843

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	1.0	100	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144844 3144845

Parameter	Units	10457419001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.0	100	97	90-110	3	20	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144846 3144847

Parameter	Units	10457422001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	0.12	1	1	1.1	1.1	94	101	90-110	6	20	FS

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(612)607-1700

QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457422

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457422

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457422001	**L5 0 mg/L**	EPA 350.1	579600		
10457422002	**L5 50 mg/L**	EPA 350.1	579600		
10457422003	**L5 100 mg/L**	EPA 350.1	579600		
10457422004	**L5 250 mg/L**	EPA 350.1	579600		
10457422005	**L5 500 mg/L**	EPA 350.1	579600		
10457422001	**L5 0 mg/L**	EPA 353.2	579732		
10457422002	**L5 50 mg/L**	EPA 353.2	579732		
10457422003	**L5 100 mg/L**	EPA 353.2	579732		
10457422004	**L5 250 mg/L**	EPA 353.2	579732		
10457422005	**L5 500 mg/L**	EPA 353.2	579732		

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:

Company:	Wenck Associates Brian Beck
Address:	7500 Olson Memorial Hwy
	Suite 300, Golden Valley, MN 55427
Email To:	jstrom@wenck.com
Phone: 763-252-6833	Fax:
Requested Due Date/TAT:	std TAT

Section B Required Project Information:

Report To:	same
Copy To:	
Purchase Order No.:	
Project Name:	N adsorption 3
Project Number:	

Section C Invoice Information:

Attention:	Jeff Strom
Company Name:	Wenck Associates
Address:	same
Pace Quote Reference:	
Pace Project Manager:	Oyeyemi Odijole
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Ammonium-N	Nitrate-nitrite-N	Re:	Pace Project No./ Lab I.D.
1	L5 0 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X			001
2	L5 50 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X			002
3	L5 100 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X			003
4	L5 250 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X			004
5	L5 500 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X							X	X			005
6																						
7																						
8																						
9																						
10																						
11																						
12																						

Requested Analysis Filtered (Y/N)

WO# : 10457422

10457422

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
					12/4/18	0945	5.6	4	4	4

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 12/3/18

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.24	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10457422**

PM: OEO **Due Date: 12/11/18**

CLIENT: WENCK

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No **Seals Intact?** ☒ Yes ☐ No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☒ Yes ☐ No

Thermometer Used: ☐ G87A9170600254 ☒ G87A9155100842 **Type of Ice:** ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6 **Biological Tissue Frozen?** ☐ Yes ☐ No ☒ N/A

Temp should be above freezing to 6°C **Correction Factor:** true **Date and Initials of Person Examining Contents:** VW 12/4/18

USDA Regulated Soil (☒ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒ Yes ☐ No	1.
Chain of Custody Filled Out?	☒ Yes ☐ No	2.
Chain of Custody Relinquished?	☐ Yes ☒ No	3.
Sampler Name and/or Signature on COC?	☒ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time?	☒ Yes ☐ No	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☒ No	6.
Rush Turn Around Time Requested?	☐ Yes ☒ No	7.
Sufficient Volume?	☒ Yes ☐ No	8.
Correct Containers Used? -Pace Containers Used?	☒ Yes ☐ No ☒ Yes ☐ No	9.
Containers Intact?	☒ Yes ☐ No	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☒ N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒ Yes ☐ No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☒ N/A	13. ☐ HNO_3 ☒ H_2SO_4 ☐ NaOH Positive for Res. Chlorine? Y N Sample # 1-5 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes ☐ No ☒ N/A	14.
Trip Blank Present?	☐ Yes ☐ No ☒ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes ☐ No ☒ N/A	
Pace Trip Blank Lot # (if purchased): NA		

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: Jeff Strom Date/Time: 12/4/18 **Field Data Required?** ☐ Yes ☐ No

Comments/Resolution: Samples collected in MN

Project Manager Review: OyeyemiOdujole Date: 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: VW

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 10, 2018

Jeff Strom
Wenck Associates, Inc.
7500 Olson Memorial
Golden Valley, MN 55427

RE: Project: N adsorption 3
Pace Project No.: 10457423

Dear Jeff Strom:
Enclosed are the analytical results for sample(s) received by the laboratory on December 04, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Oyeyemi Odujole
oyeyemi.odujole@pacelabs.com
(612)607-6402
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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CERTIFICATIONS

Project: N adsorption 3
Pace Project No.: 10457423

Minnesota Certification IDs

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A2LA Certification #: 2926.01
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Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8+Wyoming DW Certification #: via MN 027-053-137
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Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
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Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
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Massachusetts Certification #: M-MN064
Michigan Certification #: 9909
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Minnesota Dept of Ag Certifcation #: via MN 027-053-137
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Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon NwTPH Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DW Certification #: 9952 C
West Virginia DEP Certification #: 382
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
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SAMPLE SUMMARY

Project: N adsorption 3
Pace Project No.: 10457423

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10457423001	**L6 0 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457423002	**L6 50 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457423003	**L6 100 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457423004	**L6 250 mg/L**	Water	12/03/18 11:00	12/04/18 09:45
10457423005	**L6 500 mg/L**	Water	12/03/18 11:00	12/04/18 09:45

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Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: N adsorption 3
Pace Project No.: 10457423

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10457423001	**L6 0 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457423002	**L6 50 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457423003	**L6 100 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457423004	**L6 250 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M
10457423005	**L6 500 mg/L**	EPA 350.1	JFP	1	PASI-M
		EPA 353.2	JFP	1	PASI-M

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457423

Sample: L6 0 mg/L **Lab ID: 10457423001** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**0.25**	mg/L	0.10	0.030	1		12/07/18 17:06	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.21**	mg/L	0.10	0.018	1		12/08/18 15:43		FS

Sample: L6 50 mg/L **Lab ID: 10457423002** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**45.6**	mg/L	2.0	0.60	20		12/07/18 17:07	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**49.0**	mg/L	5.0	0.88	50		12/08/18 15:44		

Sample: L6 100 mg/L **Lab ID: 10457423003** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**95.0**	mg/L	5.0	1.5	50		12/07/18 17:09	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**96.0**	mg/L	10.0	1.8	100		12/08/18 15:47		

Sample: L6 250 mg/L **Lab ID: 10457423004** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**237**	mg/L	10.0	3.0	100		12/07/18 17:10	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**240**	mg/L	20.0	3.5	200		12/08/18 15:49		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: N adsorption 3
Pace Project No.: 10457423

Sample: L6 500 mg/L **Lab ID: 10457423005** Collected: 12/03/18 11:00 Received: 12/04/18 09:45 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	**502**	mg/L	20.0	6.0	200		12/07/18 17:12	7664-41-7	
353.2 Nitrate + Nitrite	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**496**	mg/L	50.0	8.8	500		12/08/18 15:50		

REPORT OF LABORATORY ANALYSIS

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Minneapolis, MN 55414
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QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457423

QC Batch: 579601 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 10457423001, 10457423002, 10457423003, 10457423004, 10457423005

METHOD BLANK: 3143669 Matrix: Water
Associated Lab Samples: 10457423001, 10457423002, 10457423003, 10457423004, 10457423005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	0.030	12/07/18 16:57	

LABORATORY CONTROL SAMPLE: 3143670

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	2.5	2.5	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143671 3143672

Parameter	Units	10457424001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.5	2.5	100	100	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3143673 3143674

Parameter	Units	10457588001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	2.5	2.5	2.4	2.4	97	95	90-110	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: N adsorption 3
Pace Project No.: 10457423

QC Batch: 579733 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 10457423001, 10457423002, 10457423003, 10457423004, 10457423005

METHOD BLANK: 3144848 Matrix: Water
Associated Lab Samples: 10457423001, 10457423002, 10457423003, 10457423004, 10457423005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	0.018	12/08/18 16:01	FS

LABORATORY CONTROL SAMPLE: 3144849

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	1	0.99	99	90-110	FS

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3144850 3144851

Parameter	Units	10457424001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/L	ND	1	1	1.1	1.1	106	107	90-110	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: N adsorption 3
Pace Project No.: 10457423

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

FS	The sample was filtered in the laboratory prior to analysis.

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: N adsorption 3
Pace Project No.: 10457423

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10457423001	**L6 0 mg/L**	EPA 350.1	579601		
10457423002	**L6 50 mg/L**	EPA 350.1	579601		
10457423003	**L6 100 mg/L**	EPA 350.1	579601		
10457423004	**L6 250 mg/L**	EPA 350.1	579601		
10457423005	**L6 500 mg/L**	EPA 350.1	579601		
10457423001	**L6 0 mg/L**	EPA 353.2	579733		
10457423002	**L6 50 mg/L**	EPA 353.2	579733		
10457423003	**L6 100 mg/L**	EPA 353.2	579733		
10457423004	**L6 250 mg/L**	EPA 353.2	579733		
10457423005	**L6 500 mg/L**	EPA 353.2	579733		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:

Company:	Wenck Associates Brian Beck
Address:	7500 Olson Memorial Hwy
	Suite 300, Golden Valley, MN 55427
Email To:	jstrom@wenck.com
Phone: 763-252-6833	Fax:
Requested Due Date/TAT:	std TAT

Section B Required Project Information:

Report To:	same
Copy To:	
Purchase Order No.:	
Project Name:	N adsorption 3
Project Number:	

Section C Invoice Information:

Attention:	Jeff Strom
Company Name:	Wenck Associates
Address:	same
Pace Quote Reference:	
Pace Project Manager:	Oyeyemi Odijole
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: Ammonium-N	Nitrate-nitrite-N	Res	Pace Project No./ Lab I.D.
1	L6 0 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			(A) 1
2	L6 50 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			02
3	L6 100 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			03
4	L6 250 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			04
5	L6 500 mg/L	WT	G	12/3/18	11:00	12/3/18	11:00	20	1		X						X	X			05
6																					
7																					
8																					
9																					
10																					
11																					
12																					

WO# : 10457423

10457423

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
					12/4/18	9:45	5.6	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 12/3/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 31Oct2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.24	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck

Project #: **WO#: 10457423**

PM: OEO **Due Date: 12/11/18**

CLIENT: WENCK

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 1Z 575 032 03 5536 0992

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No **Seals Intact?** ☒ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other:

Temp Blank? ☒ Yes ☐ No

Thermometer Used: ☐ G87A9170600254 ☒ G87A9155100842

Type of Ice: ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Cooler Temp Read (°C): 5.6 **Cooler Temp Corrected (°C):** 5.6

Temp should be above freezing to 6°C **Correction Factor:** true

Biological Tissue Frozen? ☐ Yes ☐ No ☒ N/A

Date and Initials of Person Examining Contents: 12/4/18

USDA Regulated Soil (☒ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present?	☒ Yes ☐ No	1.
Chain of Custody Filled Out?	☒ Yes ☐ No	2.
Chain of Custody Relinquished?	☐ Yes ☒ No	3.
Sampler Name and/or Signature on COC?	☒ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time?	☒ Yes ☐ No	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☒ No	6.
Rush Turn Around Time Requested?	☐ Yes ☒ No	7.
Sufficient Volume?	☒ Yes ☐ No	8.
Correct Containers Used? -Pace Containers Used?	☒ Yes ☐ No ☒ Yes ☐ No	9.
Containers Intact?	☒ Yes ☐ No	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☒ N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: WT	☒ Yes ☐ No	12.
All containers needing acid/base preservation have been checked? All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A	13. ☐ HNO_3 ☒ H_2SO_4 ☐ NaOH Positive for Res. Chlorine? Y N Sample # 1-5 1/1 Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes ☐ No ☒ N/A	14.
Trip Blank Present?	☐ Yes ☐ No ☒ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes ☐ No ☒ N/A	
Pace Trip Blank Lot # (if purchased): N/A		

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: Jeff Strom Date/Time: 12/4/18

Field Data Required? ☐ Yes ☐ No

Comments/Resolution: Samples collected in MN

Project Manager Review: Oyeyemi Odujole Date: 12/4/18

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: VV

Appendix F

Field Lysimeter and Septic WQ Results

February 26, 2018 Sampling Event

02/26/2018	Vacuum		Time Under Vacuum	Sample Recovered	Field Parameters*		
~40 ºF	Initial	Final			pH	Cond	Temp
Calm	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	ºC
1-5'	-45	-38	29:55	80	-	-	-
1-12'	-45	-42	29:55	15	-	-	-
2-19'	-45	0	29:55	7	-	-	-
2-25'	-45	0	29:55	0	-	-	-
3-30'	-45	-44	29:55	0	-	-	-
3-35'	-45	-38	29:55	100	-	-	-
Septic Tank	n/a	n/a	n/a	Bottles Filled	-	-	-

*Field parameters were not collected on 02/06/2018

April 4th, 2018 Sampling Event

04/04/2018	Vacuum		Time Under Vacuum	Sample Recovered	Field Parameters*		
~40 ºF	Initial	Final			pH	Cond	Temp
High Winds	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	*ºC*
1-5'	-50	-44	07:45	50	7.08	698	13.1
1-12'	-50	-47	07:45	0	-	-	-
2-19'	-50	-48	07:45	3	-	-	-
2-25'	-50	-42	07:45	80	7.28	864	12.2
3-30'	-50	-2	07:45	2	-	-	-
3-35'	-50	-42	07:45	100	7.2	967	12.7

*Field parameters measured only when sufficient sample volume (>30 mL) was recovered

May 15th, 2018 Sampling Event

05/15/2018	Vacuum		Time Under Vacuum	Sample Recovered	Field Parameters*		
~60 ºF	Initial	Final			pH	Cond	Temp
Calm	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	ºC
1-5'	-50	-40	06:20	40	7.79	587	10
1-12'	-50	-48	06:20	0	-	-	-
2-19'	-50	-47	06:20	20	-	-	-
2-25'	-50	-46	06:20	100	7.66	951	10
3-30'	-50	0	06:20	0	-	-	-
3-35'	-50	-38	06:20	100	7.57	917	10

*Field parameters measured only when sufficient sample volume (>30 mL) was recovered

June 25th, 2018 Sampling Event

06/25/2018	Vacuum		Time Under Vacuum	Sample Recovered	Field Parameters*		
~70 ºF	Initial	Final			pH	Cond	Temp
Calm	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	ºC
1-5'	-50	-44	05:00	30	7.27	1273	-
1-12'	-50	-44	05:00	0	-	-	-
2-19'	-50	-42	05:00	20	7.79	877	-
2-25'	-50	-40	05:00	50	-	-	-
3-30'	-50	-26	05:00	10	-	-	-
3-35'	-50	-38	05:00	90	-	-	-

*Field parameters were not measured below 19' on 06/25/18 due to an instrument malfunction

September 5th, 2018 Sampling Event

09/05/2018	Vacuum		Time Under Vacuum	Sample Recovered	Field Parameters*		
~65 ºF	Initial	Final			pH	Cond	Temp
Breezy	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	ºC
1-5'	-50	-48	06:05	40	7.78	1467	10.3
1-12'	-50	-48	06:05	30	-	-	-
2-19'	-50	-46	06:05	40	7.44	1322	10.3
2-25'	-50	-44	06:05	80	7.36	1225	10.4
3-30'	-50	-46	06:05	30	-	-	-
3-35'	-50	-42	06:05	80	7.51	1331	10.3

*Field parameters measured only when sufficient sample volume (>30 mL) was recovered

December 4th, 2018 Sampling Event

12/04/2018	Vacuum		Time Under Vacuum	Sample Recovered*	Field Parameters**		
~20 ºF	Initial	Final			pH	Cond	Temp
Breezy	*cBar*	*cBar*	*HH:MM*	*ml*	-	*uS/cm*	ºC
1-5'	-50	-48	05:00	0	-	-	-
1-12'	-50	-48	05:00	5	-	-	-
2-19'	-50	-46	04:10	0	-	-	-
2-25'	-50	-48	04:10	0	-	-	-
3-30'	-50	-46	05:00	10	-	-	-
3-35'	-50	-***	05:00	0	-	-	-
Septic Tank	n/a	n/a	n/a	Bottles Filled	6.75	1006	8.2

*Sample recovery on 12/4/18 was poor because ice blockages developed in the sample collection tubes due to cold tempertures and moderate winds

**Field parameters measured only when sufficient sample volume (>30 mL) was recovered

***Final vacuum not recorded

Lysimeter and Septic Tank Field Parameter - pH

Lysimeter	02/26/2018	04/04/2018	05/15/2018	06/25/2018	09/05/2018	12/04/2018
1-5'	-	7.08	7.79	7.27	7.78	-
1-12'	-	-	-	-	-	-
2-19'	-	-	-	7.79	7.44	-
2-25'	-	7.28	7.66	-	7.36	-
3-30'	-	-	-	-	-	-
3-35'	-	7.2	7.57	-	7.51	-
Septic Tank	-	n/a	n/a	n/a	n/a	6.75

Note: No field parameters were collected on 02/26/18. For all other sampling events, field parameters were recorded for any sample of sufficient volume (>30 mL)

Lysimeter and Septic Tank Field Parameter - Conductivity (uS/cm)

Lysimeter	02/26/2018	04/04/2018	05/15/2018	06/25/2018	09/05/2018	12/04/2018
1-5'	-	698	587	1273	1467	-
1-12'	-	-	-	-	-	-
2-19'	-	-	-	877	1322	-
2-25'	-	864	951	-	1225	-
3-30'	-	-	-	-	-	-
3-35'	-	967	917	-	1331	-
Septic Tank	-	n/a	n/a	n/a	n/a	1006

Note: No field parameters were collected on 02/26/18. For all other sampling events, field parameters were recorded for any sample of sufficient volume (>30 mL)

Appendix G

Septic Tank WQ Results

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 3/19/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1802306

CASE NARRATIVE

Report ID: S1802306002
(Replaces S1802306001)

Sample Septic Tank was received on February 27, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

This report, S1802306002, is being issued to replace S1802306001 in order to combine emailed preliminary data with the final report which had data logged in using DEQ GL-8 guidelines per customer request.

Qualifiers by sample
TDS was ran out of holding because of a clerical error.
S1802306-001 - General Parameters/Total Dissolved Solids (180) - Holding times for preparation or analysis exceeded

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1802306-001
Client Sample ID: Septic Tank

Date Reported: 3/19/2018
Report ID: S1802306002
(Replaces S1802306001)
Work Order: S1802306
Collection Date: 2/26/2018 9:30:00 AM
Date Received: 2/27/2018 11:00:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	440	10	H	mg/L	03/09/2018 1459 NLG	SM 2540
Alkalinity, Total (As CaCO3)	586	5		mg/L	03/09/2018 2213 IBS	SM 2320B
Nitrogen, Ammonia (as N)	94.4	0.1		mg/L	03/12/2018 1331 AMB	EPA 350.1
Nitrogen, Total Kjeldahl (TKN)	89	1		mg/L	03/05/2018 1058 AMB	EPA 351.2
Anions						
Alkalinity, Bicarbonate as HCO3	714	5		mg/L	03/09/2018 2213 IBS	SM 2320B
Alkalinity, Carbonate as CO3	ND	5		mg/L	03/09/2018 2213 IBS	SM 2320B
Chloride	41	1		mg/L	02/28/2018 0926 AB	EPA 300.0
Fluoride	0.1	0.1		mg/L	03/09/2018 2213 IBS	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	03/12/2018 1254 AMB	EPA 353.2
Sulfate	12	1		mg/L	02/27/2018 1502 AB	EPA 300.0
Cations						
Calcium	57	1		mg/L	03/13/2018 1023 DG	EPA 200.7
Magnesium	17	1		mg/L	03/13/2018 1023 DG	EPA 200.7
Potassium	24	1		mg/L	03/13/2018 1023 DG	EPA 200.7
Sodium	37	1		mg/L	03/13/2018 1023 DG	EPA 200.7
Dissolved Metals						
Aluminum	ND	0.1		mg/L	03/13/2018 1023 DG	EPA 200.7
Arsenic	ND	0.005		mg/L	03/12/2018 2119 MS	EPA 200.8
Barium	0.2	0.1		mg/L	03/12/2018 2119 MS	EPA 200.8
Boron	ND	0.1		mg/L	03/13/2018 1023 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	03/12/2018 2119 MS	EPA 200.8
Chromium	ND	0.01		mg/L	03/13/2018 1023 DG	EPA 200.7
Copper	0.01	0.01		mg/L	03/12/2018 2119 MS	EPA 200.8
Iron	ND	0.05		mg/L	03/13/2018 1023 DG	EPA 200.7
Lead	ND	0.02		mg/L	03/12/2018 2119 MS	EPA 200.8
Mercury	ND	0.001		mg/L	03/14/2018 0911 AW	EPA 245.1
Molybdenum	ND	0.02		mg/L	03/12/2018 2119 MS	EPA 200.8
Nickel	ND	0.01		mg/L	03/13/2018 1023 DG	EPA 200.7
Selenium	0.003	0.001		mg/L	03/12/2018 2119 MS	EPA 200.8
Zinc	ND	0.01		mg/L	03/13/2018 1023 DG	EPA 200.7
Total Metals						
Iron	0.18	0.05		mg/L	03/02/2018 1449 DG	EPA 200.7
Manganese	ND	0.02		mg/L	03/02/2018 1449 DG	EPA 200.7
Phosphorus	5.2	0.1		mg/L	03/02/2018 1449 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Inter-Mountain Labs

Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

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All shaded fields must be completed.

This is a legal document; any misrepresentation may be construed as fraud.

#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001		970-223-4705

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy
	Email: mstacy@wenck.com
Invoice Address	Phone: (O) 970-223-4705; (C) 970-691-3259
4025 Automation Way, Bldg. E Fort Collins CO 80525	Purchase Order #: Quote #: 1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	LQD Guidline 8	ANALYSES / PARAMETERS	REMARKS
1	1902306-01	02/26/18	9:30	Septic Tank	WT	4	X		Raw septic system H2O
2									No radionuclides
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
2.5°C		02/26/18	17:00	Kathy Boyd	2.27.18	11AM

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / (N)	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 241-25
pH strip lot # HC730269
Thermometer SN# 217130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? Yes No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	2.5							
Temps Corrected (°C):	2.1							

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): WRB			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
7 Total Metals	1 Total Metals	HNO_3	#2: 2.27.19 @ 12:20
Diss Metals	Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
7 Nutrient	1 Nutrient	H_2SO_4	
Cyanide	Cyanide	NaOH	
Sulfide	Sulfide	ZnAcet	
Phenol	Phenol	H_2SO_4	

Preservative Lot #
1:1 HNO3-M-100417-2
H2SO4-2509H29
NaOH-Wet-2-41-3

5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: 518023206

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 12/21/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1812062

CASE NARRATIVE

Report ID: S1812062002
(Replaces S1812062001)

Sample Septic Tank was received on December 5, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

This report, S1812062002, is being issued to replace S1812062001. DRO, GRO, and uranium have been removed from the report. TKN and total phosphorus have been added to the reported list of constituents.

Reviewed by: Lisa Balstad
Lisa Balstad, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1812062-001
Client Sample ID: Septic Tank

Date Reported: 12/21/2018
Report ID: S1812062002
(Replaces S1812062001)
Work Order: S1812062
Collection Date: 12/4/2018 10:30:00 AM
Date Received: 12/5/2018 12:30:00 PM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	460	10		mg/L	12/07/2018 1005 NLG	SM 2540
Alkalinity, Total (As CaCO3)	530	5		mg/L	12/06/2018 1825 AB	SM 2320B
Nitrogen, Ammonia (as N)	70.9	0.1		mg/L	12/11/2018 0911 AMB	EPA 350.1
Nitrogen, Total Kjeldahl (TKN)	80	1		mg/L	12/26/2018 1112 AMB	EPA 351.2
Anions						
Alkalinity, Bicarbonate as HCO3	646	5		mg/L	12/06/2018 1825 AB	SM 2320B
Alkalinity, Carbonate as CO3	ND	5		mg/L	12/06/2018 1825 AB	SM 2320B
Chloride	30	1		mg/L	12/06/2018 1500 AB	EPA 300.0
Fluoride	0.1	0.1		mg/L	12/06/2018 1825 AB	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	12/07/2018 1209 AMB	EPA 353.2
Sulfate	2	1		mg/L	12/06/2018 1500 AB	EPA 300.0
Cations						
Calcium	57	1		mg/L	12/06/2018 1418 DG	EPA 200.7
Magnesium	18	1		mg/L	12/06/2018 1418 DG	EPA 200.7
Potassium	23	1		mg/L	12/06/2018 1418 DG	EPA 200.7
Sodium	40	1		mg/L	12/06/2018 1418 DG	EPA 200.7
Dissolved Metals						
Aluminum	ND	0.1		mg/L	12/06/2018 1418 DG	EPA 200.7
Arsenic	ND	0.005		mg/L	12/05/2018 2335 MS	EPA 200.8
Barium	0.2	0.1		mg/L	12/05/2018 2335 MS	EPA 200.8
Boron	ND	0.1		mg/L	12/06/2018 1418 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	12/05/2018 2335 MS	EPA 200.8
Chromium	ND	0.01		mg/L	12/06/2018 1418 DG	EPA 200.7
Copper	0.01	0.01		mg/L	12/05/2018 2335 MS	EPA 200.8
Iron	0.06	0.05		mg/L	12/06/2018 1418 DG	EPA 200.7
Lead	ND	0.02		mg/L	12/05/2018 2335 MS	EPA 200.8
Mercury	ND	0.001		mg/L	12/12/2018 0841 AW	EPA 245.1
Molybdenum	ND	0.02		mg/L	12/05/2018 2335 MS	EPA 200.8
Nickel	ND	0.01		mg/L	12/06/2018 1418 DG	EPA 200.7
Selenium	ND	0.001		mg/L	12/05/2018 2335 MS	EPA 200.8
Zinc	ND	0.01		mg/L	12/06/2018 1418 DG	EPA 200.7
Total Metals						
Iron	1.82	0.05		mg/L	12/10/2018 1706 DG	EPA 200.7
Manganese	0.07	0.02		mg/L	12/10/2018 1706 DG	EPA 200.7
Phosphorus	11.0	0.1		mg/L	12/10/2018 1706 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Lisa Balstad
Lisa Balstad, Water Lab Supervisor

Inter-Mountain Labs

Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

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All shaded fields must be completed.

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#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Adam Marsh	970-223-4705

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy
	Email: mstacy@wenck.com
Invoice Address	Phone: (O) 970-223-4705; (C) 970-691-3259
4025 Automation Way, Bldg. E Fort Collins CO 80525	Purchase Order #: Quote #: 1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME	SAMPLE IDENTIFICATION	Matrix	# of Containers	LQD Guidline 8	No Radionuclides	ANALYSES / PARAMETERS	REMARKS
1	S1812062 001	~~12/03/18~~ 12/04/18	10:30	Septic Tank	WT	10	x			No Radionuclides RAW SEPTIC WATER
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
1.2°C RO1	Adam Marsh Adam Marsh	12/4/18	17:00	Kathy Boyd	12.5.18	12:30

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / (N)	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

Survey Meter # 2241-2
pH strip lot # HC739245
Thermometer SN# S/N 27130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? Yes No

*Note as "**OTC**" if samples are received over the counter, unpackaged*

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	1.2						
Temps Corrected (°C):	2.2						

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	~~N/A~~
4 COC Number (If applicable): UPB			
5 Do the number of bottles agree with the COC?	Yes	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	Yes	No	N/A
7 Were the sample custody seals intact?	Yes	No	N/A
8 Is the COC properly completed, legible, and signed?	Yes	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	Yes	No	
2 Did the bottle labels correspond with the COC information?	Yes	No	
3 Samples collected in method-prescribed containers?	Yes	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
2 Total Metals	2 Total Metals	HNO_3	12.5.18 1259
2 Diss Metals	2 Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
2 Nutrient	____ Nutrient	H_2SO_4	
____ Cyanide	____ Cyanide	NaOH	
____ Sulfide	____ Sulfide	ZnAcet	
____ Phenol	____ Phenol	H_2SO_4	
____ SDWA Rads	____ SDWA Rads	HNO_3	

Preserved samples for Rad analysis accompanied by Field Blank?	Yes	No	
5 VOA vials have <6mm headspace?	Yes	No	N/A
6 Were all analyses within holding time at the time of receipt?	Yes	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	N/A
8 Have rush or project due dates been checked and accepted?	Yes	No	N/A
9 Do samples require subcontracted analyses?	Yes	No	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S1812062

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution:

Appendix H

Lysimeter Water Quality Results

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 3/14/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1803020

CASE NARRATIVE

Report ID: S1803020001

Samples L-1 5', L-2 25', L-3 30' and L-3 35' were received on March 1, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1803020-001
Client Sample ID: L-1 5'

Date Reported: 3/14/2018
Report ID: S1803020001

Work Order: S1803020
Collection Date: 2/27/2018 3:50:00 PM
Date Received: 3/1/2018 11:55:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	2.74	0.05		mg/L	03/01/2018 1212 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.85	0.05		mg/L	03/01/2018 1212 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	56	1		mg/L	03/05/2018 1041 AMB	EPA 351.2
Anions						
Chloride	61	1		mg/L	03/01/2018 1339 AB	EPA 300.0
Total Metals						
Phosphorus	6.9	0.1		mg/L	03/06/2018 1826 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1803020-002
Client Sample ID: L-2 25'

Date Reported: 3/14/2018
Report ID: S1803020001

Work Order: S1803020
Collection Date: 2/27/2018 3:40:00 PM
Date Received: 3/1/2018 11:55:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	66.0	0.05		mg/L	03/01/2018 1351 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.08	0.05		mg/L	03/01/2018 1225 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	3	1		mg/L	03/05/2018 1005 AMB	EPA 351.2
Anions						
Chloride	101	1		mg/L	03/01/2018 1351 AB	EPA 300.0
Total Metals						
Phosphorus	1.1	0.1		mg/L	03/06/2018 1828 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1803020-003
Client Sample ID: L-3 30'

Date Reported: 3/14/2018
Report ID: S1803020001

Work Order: S1803020
Collection Date: 2/27/2018 3:20:00 PM
Date Received: 3/1/2018 11:55:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	63.0	0.05		mg/L	03/01/2018 1404 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	03/01/2018 1237 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	4	1		mg/L	03/05/2018 1005 AMB	EPA 351.2
Anions						
Chloride	2540	1		mg/L	03/01/2018 1441 AB	EPA 300.0
Total Metals						
Phosphorus	1.0	0.1		mg/L	03/06/2018 1831 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1803020-004
Client Sample ID: L-3 35'

Date Reported: 3/14/2018
Report ID: S1803020001

Work Order: S1803020
Collection Date: 2/27/2018 3:20:00 PM
Date Received: 3/1/2018 11:55:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	51.2	0.05		mg/L	03/01/2018 1428 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.09	0.05		mg/L	03/01/2018 1249 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	ND	1		mg/L	03/05/2018 1008 AMB	EPA 351.2
Anions						
Chloride	142	1		mg/L	03/01/2018 1428 AB	EPA 300.0
Total Metals						
Phosphorus	1.4	0.1		mg/L	03/06/2018 1833 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs

Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

Page of

All shaded fields must be completed.

This is a legal document; any misrepresentation may be construed as fraud.

#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Adam Marsh	970-223-4705

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy Email mstacy@wenck.com Phone (O) 970-223-4705; (C) 970-691-3259

Invoice Address	Purchase Order #	Quote #
4025 Automation Way, Bldg. E Fort Collins CO 80525		1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	ANALYSES / PARAMETERS: See Attached Email	LQD Guidline 8							REMARKS
1	B183020-001	02/27/18	15:50	L-1 5'	WT	1	x								See attached emails
2	002	02/27/18	15:40	L-2 25'	WT	1	x								See attached emails
3	003	02/27/18	15:20	L-3 30'	WT	1	x								See attached emails
4	004	02/27/18	15:20	L-3 35'	WT	1	x								See attached emails
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
2.3 °C RO 1	Adam Marsh	02/28/18	10:30	Kathy Boyd	3.1.18	11:55

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / (N)	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 241-25A
pH strip lot # HC730269
Thermometer SN# 217130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? (Yes) No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	2.3							
Temps Corrected (°C):								

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): WEB			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
_____ Nutrient	_____ Nutrient	H_2SO_4 _____	
_____ Cyanide	_____ Cyanide	NaOH _____	
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	

Severe Vol 1554

5 VOA vials have <6mm headspace?	Yes	No	N/A
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned? KB 3.7.13	(Yes)	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S18030260

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 4/19/2018

CLIENT: Wenck Associates
Project: Lysimeter Sampling B7218-0001
Lab Order: S1804069

CASE NARRATIVE

Report ID: S1804069001

Samples L-1 5', L-2 25' and L-3 35' were received on April 6, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
7000 Yellowtail Rd, Suite 230
Cheyenne, WY 82009

Date Reported: 4/19/2018
Report ID: S1804069001

Work Order: S1804069
Collection Date: 4/4/2018 1:30:00 PM
Date Received: 4/6/2018 9:56:00 AM
Sampler: SW
Matrix: Water
COC: 174853

Project: Lysimeter Sampling B7218-0001
Lab ID: S1804069-001
Client Sample ID: L-1 5'

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	0.11	0.05		mg/L	04/06/2018 1017 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.10	0.05		mg/L	04/06/2018 1017 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	61	1		mg/L	04/11/2018 0941 AMB	EPA 351.2

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
7000 Yellowtail Rd, Suite 230
Cheyenne, WY 82009

Date Reported: 4/19/2018
Report ID: S1804069001

Work Order: S1804069
Collection Date: 4/4/2018 1:30:00 PM
Date Received: 4/6/2018 9:56:00 AM
Sampler: SW
Matrix: Water
COC: 174853

Project: Lysimeter Sampling B7218-0001
Lab ID: S1804069-002
Client Sample ID: L-2 25'

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	72.5	0.05		mg/L	04/06/2018 1132 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.08	0.05		mg/L	04/06/2018 1029 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	2	1		mg/L	04/11/2018 0941 AMB	EPA 351.2

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
7000 Yellowtail Rd, Suite 230
Cheyenne, WY 82009

Date Reported: 4/19/2018
Report ID: S1804069001

Work Order: S1804069
Collection Date: 4/4/2018 1:30:00 PM
Date Received: 4/6/2018 9:56:00 AM
Sampler: SW
Matrix: Water
COC: 174853

Project: Lysimeter Sampling B7218-0001
Lab ID: S1804069-003
Client Sample ID: L-3 35'

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	51.0	0.05		mg/L	04/06/2018 1145 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.09	0.05		mg/L	04/06/2018 1042 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	1	1		mg/L	04/11/2018 0944 AMB	EPA 351.2

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

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This is a legal document: any misrepresentation may be construed as fraud.

174853

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Skylor Wade	307-634-7848

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins, CO 80525	Mark Stacy
Invoice Address	**Email** mstacy@wenck.com
Same as above	**Phone** 970-223-4705

Purchase Order #

Quote # 1800

ANALYSES / PARAMETERS

Preservative Lot #
1:1 HNO_3-M-100417-2
H_2SO_4-2509H29
NaOH-Wet-2-41-3

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	See attached Excel	LOD guidline 8						REMARKS
1	S1804069-001	4/4/18	13:30	L-1 5'	WT	1	X							no preservatives added
2	002	4/4/18	13:30	L-2 25'	WT	1	X							no preservatives added
3	003	4/4/18	13:30	L-3 35'	WT	1	X							no preservatives added
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
0.7 °C R01	Skylor Wade Skylor Wade	4/5/18	13:00	Kathy Bopp	4.6.18	9:54

SHIPPING INFO	MATRIX CODES		TURNAROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	**Check desired service**	Compliance Monitoring? Y / (N)	
☒ Fed Express	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ US Mail	Solid	SD	☐ **RUSH - 5 Working Days**	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ **URGENT** - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other _____	Other	OT	***Rush & Urgent Surcharges will be applied***	Sample Disposal: Lab / Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 241-25A
pH strip lot # HC730269
Thermometer SN# 217130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? (Yes) No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	0.7							
Temps Corrected (°C):	2.0							

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): 174853			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

Per Lisa

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
7 Nutrient	1 Nutrient	H_2SO_4 _____	
_____ Cyanide	_____ Cyanide	NaOH _____	Vol 1554
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	

5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S1804069

Discrepancy Documentation ***(use back of sheet for notes on discrepancies)***

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 5/25/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1805305

CASE NARRATIVE

Report ID: S1805305001

Samples 1-5, 2-19, 2-25 and 3-35 were received on May 17, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Qualifiers by sample
S1805305-003 - General Parameters/Nitrogen, Nitrate (As N) - Holding times for preparation or analysis exceeded by 14 minutes. Sample ran within holding time initially. Value exceeded calibration curve and was re-ran at a greater dilution.
S1805305-004 - General Parameters/Nitrogen, Nitrate (As N) - Holding times for preparation or analysis exceeded by 29 minutes. Sample ran within holding time initially. Value exceeded calibration curve and was re-ran at a greater dilution.

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1805305-001
Client Sample ID: 1-5

Date Reported: 5/25/2018
Report ID: S1805305001

Work Order: S1805305
Collection Date: 5/15/2018 3:30:00 PM
Date Received: 5/17/2018 12:33:00 PM
Sampler: AM
Matrix: Water
COC: 176089

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	6.92	0.05		mg/L	05/17/2018 1434 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.20	0.05		mg/L	05/17/2018 1434 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	53	1		mg/L	05/22/2018 1142 AMB	EPA 351.2
Anions						
Chloride	26	1		mg/L	05/17/2018 1613 AB	EPA 300.0
Total Metals						
Phosphorus	8.4	0.1		mg/L	05/23/2018 1717 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1805305-002
Client Sample ID: 2-19

Date Reported: 5/25/2018
Report ID: S1805305001

Work Order: S1805305
Collection Date: 5/15/2018 3:30:00 PM
Date Received: 5/17/2018 12:33:00 PM
Sampler: AM
Matrix: Water
COC: 176089

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	75.9	0.05		mg/L	05/17/2018 1530 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	05/17/2018 1448 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	5	1		mg/L	05/22/2018 1142 AMB	EPA 351.2
Anions						
Chloride	366	1		mg/L	05/17/2018 1530 AB	EPA 300.0
Total Metals						
Phosphorus	0.9	0.1		mg/L	05/23/2018 1719 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1805305-003
Client Sample ID: 2-25

Date Reported: 5/25/2018
Report ID: S1805305001

Work Order: S1805305
Collection Date: 5/15/2018 3:30:00 PM
Date Received: 5/17/2018 12:33:00 PM
Sampler: AM
Matrix: Water
COC: 176089

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	74.7	0.05	H	mg/L	05/17/2018 1544 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.17	0.05		mg/L	05/17/2018 1502 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	2	1		mg/L	05/22/2018 1143 AMB	EPA 351.2
Anions						
Chloride	202	1		mg/L	05/17/2018 1544 AB	EPA 300.0
Total Metals						
Phosphorus	1.4	0.1		mg/L	05/23/2018 1721 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1805305-004
Client Sample ID: 3-35

Date Reported: 5/25/2018
Report ID: S1805305001

Work Order: S1805305
Collection Date: 5/15/2018 3:30:00 PM
Date Received: 5/17/2018 12:33:00 PM
Sampler: AM
Matrix: Water
COC: 176089

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	53.1	0.05	H	mg/L	05/17/2018 1559 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	05/17/2018 1516 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	1	1		mg/L	05/22/2018 1143 AMB	EPA 351.2
Anions						
Chloride	238	1		mg/L	05/17/2018 1559 AB	EPA 300.0
Total Metals						
Phosphorus	1.3	0.1		mg/L	05/23/2018 1730 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: Bill Courtney
Bill Courtney, Project Manager

Inter-Mountain Labs

Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

Page of

All shaded fields must be completed.
This is a legal document: any misrepresentation may be construed as fraud.

176089

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Adam Marsh	208-590-9478

Report Address	Contact Name	Purchase Order #	Quote #
4025 Automation Way, Bldg E Fort Collins, CO 80525	Mark Stacy Email: mstacy@wenck.com Phone: (o) 970-223-4705 (c) 970-691-3259		1800

Invoice Address
4025 Automation Way, Bldg E Fort Collins, CO 80525

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	ANALYSES / PARAMETERS: IC- NO_2, NO_3	TKN	Tot P	Total Metals					REMARKS
1	S1805305-001	05/15/18	15:30	1-5'			X	X	X	X					Not preserved.
2	002	05/15/18	15:30	2-19'			X	X	X	X					limited
3	003	05/15/18	15:30	2-25'			X	X	X	X					Volume
4	004	05/15/18	15:30	3-35'			X	X	X	X					
5															Please ~~to~~ measure
6															all parameters
7															listed on Quote
8															1800 (attached)
9															
10															If sample volume is insufficient
11															to measure all parameters, please
12															prioritize parameters in the
13															following order: (1) NO_2, NO_3, Cl^-
14															(2) TKN (3) Tot P (4) Total Metals

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
	Adam Marsh	05/16/18	16:30	Kathy Boyd	5.17.18	12:33

SHIPPING INFO	MATRIX CODES		TURNAROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	**Check desired service**	Compliance Monitoring? Y / (N)	
☐ Fed Express	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ US Mail	Solid	SD	☐ **RUSH - 5 Working Days**	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ **URGENT** - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other _____	Other	OT	***Rush & Urgent Surcharges will be applied***	Sample Disposal: Lab X Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 2241-2; SN 182115
pH strip lot # HC7302269
Thermometer SN# 27130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? Yes No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	3.1							
Temps Corrected (°C):	4.0							

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): 176089			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
7 Nutrient	_____ Nutrient	H_2SO_4 _____	severe NO issue
_____ Cyanide	_____ Cyanide	NaOH _____	
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	
_____ SDWA Rads	_____ SDWA Rads	HNO_3 _____	_____

Preserved samples for Rad analysis accompanied by Field Blank?	Yes	No	
5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	Yes	No	
7 Specially requested detection limits (RLs) assigned?	(Yes)	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? General Customer-Specified Certified

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB *Set ID:* 5180S305

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 7/9/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1806434

CASE NARRATIVE

Report ID: S1806434001

Samples L-1 12', L-1 5', L-2 19', L-2 25', L-3 30' and L-3 35' were received on June 26, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-001
Client Sample ID: L-1 5'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 3:00:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	49.2	0.05		mg/L	06/27/2018 0923 AB	EPA 300.0
Nitrogen, Nitrite (As N)	6.44	0.05		mg/L	06/26/2018 1718 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	30	1		mg/L	07/03/2018 0949 AMB	EPA 351.2
Anions						
Chloride	227	1		mg/L	06/27/2018 0923 AB	EPA 300.0
Total Metals						
Phosphorus	5.9	0.2		mg/L	07/06/2018 0925 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-002
Client Sample ID: L-1 12'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 3:15:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	91.8	0.05		mg/L	06/26/2018 1730 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	06/26/2018 1730 AB	EPA 300.0
Anions						
Chloride	52	1		mg/L	06/26/2018 1730 AB	EPA 300.0

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-003
Client Sample ID: L-2 19'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 3:25:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	69.3	0.05		mg/L	06/27/2018 0936 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	06/26/2018 1743 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	6	1		mg/L	07/03/2018 0952 AMB	EPA 351.2
Anions						
Chloride	366	1		mg/L	06/27/2018 0936 AB	EPA 300.0
Total Metals						
Phosphorus	1	1		mg/L	07/06/2018 0927 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-004
Client Sample ID: L-2 25'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 3:35:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	72.3	0.05		mg/L	06/27/2018 0949 AB	EPA 300.0
Nitrogen, Nitrite (As N)	1.41	0.05		mg/L	06/26/2018 1755 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	3	1		mg/L	07/03/2018 0952 AMB	EPA 351.2
Anions						
Chloride	210	1		mg/L	06/27/2018 0949 AB	EPA 300.0
Total Metals						
Phosphorus	1.2	0.1		mg/L	07/06/2018 0929 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-005
Client Sample ID: L-3 30'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 3:45:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	55.5	0.05		mg/L	06/27/2018 1001 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	06/26/2018 1808 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	10	1		mg/L	07/03/2018 0952 AMB	EPA 351.2
Anions						
Chloride	489	1		mg/L	06/27/2018 1001 AB	EPA 300.0
Total Metals						
Phosphorus	2	1		mg/L	07/06/2018 0931 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1806434-006
Client Sample ID: L-3 35'

Date Reported: 7/9/2018
Report ID: S1806434001

Work Order: S1806434
Collection Date: 6/25/2018 4:00:00 PM
Date Received: 6/26/2018 11:25:00 AM
Sampler: MS
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	54.1	0.05		mg/L	06/27/2018 1014 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	06/26/2018 1821 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	2	1		mg/L	07/03/2018 0952 AMB	EPA 351.2
Anions						
Chloride	239	1		mg/L	06/27/2018 1014 AB	EPA 300.0
Total Metals						
Phosphorus	1.2	0.1		mg/L	07/06/2018 0934 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

Page 1 of 1

All shaded fields must be completed.
This is a legal document; any misrepresentation may be construed as fraud.

#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001		970-223-4705

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy
	Email: mstacy@wenck.com
Invoice Address	Phone: (O) 970-223-4705; (C) 970-691-3259
4025 Automation Way, Bldg. E Fort Collins CO 80525	Purchase Order #: Quote #: 1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	Nitrate (as N)	Nitrite (as N)	Total Kjeldahl N	Phosphorus	Chloride	Total Metals			REMARKS
1	5180643401	6/25/18	1500	L-1 5'	WT	1	x	x	x	x	x	x			Please see attached
2	002		1515	L-1 12'	WT	1	x	x	x	x	x	x			quote for more details
3	003		1525	L-2 19'	WT	1	x	x	x	x	x	x			about parameters
4	004		1535	L-2 25'	WT	1	x	x	x	x	x	x			
5	005		1545	L-3 30'	WT	1	x	x	x	x	x	x			If sample volume is
6	006		1600	L-3 35'	WT	1	x	x	x	x	x	x			insufficient to measure
7															all parameters, please
8															prioritize parameters
9															in the following order:
10															(1) Nitrate, nitrite, chloride
11															(2) TKN
12															(3) Phosphorus
13															(4) Total Metals
14															

ANALYSES / PARAMETERS

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
3.4°C RO1	Mark Stacy	6/25/18	1620	UPS	6/25/18	1620
				Kathy Bays	6.26 AB	11:25

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☒ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / N	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / N	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 2241-2; SN 182115
pH strip lot # HC730269
Thermometer SN# 27130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? (Yes) No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	3.4							
Temps Corrected (°C):	4.1							

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): WCB			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
_____ Nutrient	_____ Nutrient	H_2SO_4 _____	
_____ Cyanide	_____ Cyanide	NaOH _____	
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	
_____ SDWA Rads	_____ SDWA Rads	HNO_3 _____	_____

Preserved samples for Rad analysis accompanied by Field Blank? Yes No

5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? General Customer-Specified Certified

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S1806434

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem: severe VOA issue, especially 002 - only a few drops

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 9/21/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1809066

CASE NARRATIVE

Report ID: S1809066001

Samples L-1 12', L-1 5', L-2 19', L-2 25', L-3 30' and L-3 35' were received on September 6, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-001
Client Sample ID: L-1 5'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	26.3	0.05		mg/L	09/06/2018 1339 AB	EPA 300.0
Nitrogen, Nitrite (As N)	5.18	0.05		mg/L	09/06/2018 1339 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	20	1		mg/L	09/13/2018 0857 AMB	EPA 351.2
Anions						
Chloride	27	1		mg/L	09/06/2018 1339 AB	EPA 300.0
Total Metals						
Phosphorus	4.5	0.1		mg/L	09/18/2018 1929 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-002
Client Sample ID: L-1 12'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	69.0	0.05		mg/L	09/07/2018 1012 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	09/06/2018 1351 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	6	1		mg/L	09/13/2018 0858 AMB	EPA 351.2
Anions						
Chloride	75	1		mg/L	09/07/2018 1012 AB	EPA 300.0
Total Metals						
Phosphorus	1.9	0.1		mg/L	09/18/2018 1931 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-003
Client Sample ID: L-2 19'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	65.9	0.05		mg/L	09/07/2018 1024 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	09/06/2018 1404 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	1	1		mg/L	09/13/2018 0900 AMB	EPA 351.2
Anions						
Chloride	224	1		mg/L	09/07/2018 1024 AB	EPA 300.0
Total Metals						
Phosphorus	1.5	0.1		mg/L	09/18/2018 1933 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-004
Client Sample ID: L-2 25'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	70.6	0.05		mg/L	09/07/2018 1037 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	09/06/2018 1416 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	ND	1		mg/L	09/13/2018 0901 AMB	EPA 351.2
Anions						
Chloride	187	1		mg/L	09/07/2018 1037 AB	EPA 300.0
Total Metals						
Phosphorus	1.3	0.1		mg/L	09/18/2018 1942 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-005
Client Sample ID: L-3 30'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	54.7	0.05		mg/L	09/07/2018 1049 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	09/06/2018 1429 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	7	1		mg/L	09/13/2018 0901 AMB	EPA 351.2
Anions						
Chloride	321	1		mg/L	09/07/2018 1049 AB	EPA 300.0
Total Metals						
Phosphorus	2.3	0.1		mg/L	09/18/2018 1944 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1809066-006
Client Sample ID: L-3 35'

Date Reported: 9/21/2018
Report ID: S1809066001

Work Order: S1809066
Collection Date: 9/5/2018 3:00:00 PM
Date Received: 9/6/2018 10:29:00 AM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	55.9	0.05		mg/L	09/07/2018 1102 AB	EPA 300.0
Nitrogen, Nitrite (As N)	ND	0.05		mg/L	09/06/2018 1441 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	ND	1		mg/L	09/13/2018 0901 AMB	EPA 351.2
Anions						
Chloride	211	1		mg/L	09/07/2018 1102 AB	EPA 300.0
Total Metals						
Phosphorus	1.3	0.1		mg/L	09/18/2018 1947 DG	EPA 200.7

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs

Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

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#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Adam Marsh	970-223-4705

Report Address	Contact Name
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy
Invoice Address	Email: mstacy@wenck.com
4025 Automation Way, Bldg. E Fort Collins CO 80525	Phone: (O) 970-223-4705; (C) 970-691-3259
	Purchase Order # / Quote #: 1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	Nitrate (as N)	Nitrite (as N)	Total Kjeldahl N	Phosphorus	Chloride	Total Metals			REMARKS
1	1809066-001	9/5/18	15:00	L-1 5'	WT	1	x	x	x	x	x	x			Please see attached
2	002			L-1 12'	WT	1	x	x	x	x	x	x			quote for more details
3	003			L-2 19'	WT	1	x	x	x	x	x	x			about parameters
4	004			L-2 25'	WT	1	x	x	x	x	x	x			
5	005			L-3 30'	WT	1	x	x	x	x	x	x			If sample volume is
6	006			L-3 35'	WT	1	x	x	x	x	x	x			insufficient to measure
7															all parameters, please
8															prioritize parameters
9															in the following order:
10															(1) Nitrate, nitrite, chloride
11															(2) TKN
12															(3) Phosphorus
13															(4) Total Metals
14															

ANALYSES / PARAMETERS

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
1.2°C R01	Adam Marsh	09/05/18	17:30	Kathy Boyd	9.6.18	10:29

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / (N)	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

INTER-MOUNTAIN LABS

Survey Meter # Model 2241-2; SN 182115
pH strip lot # HC7302269
Thermometer SN# 27130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? (Yes) No

Note as "OTC" if samples are received over the counter, unpackaged

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	1.2							
Temps Corrected (°C):	2.2							

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): WLB			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	Yes	(No)	- No sample date or Time on COC

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
_____ Nutrient	_____ Nutrient	H_2SO_4 _____	
_____ Cyanide	_____ Cyanide	NaOH _____	
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	
_____ SDWA Rads	_____ SDWA Rads	HNO_3 _____	_____

Preserved samples for Rad analysis accompanied by Field Blank?	Yes	No	
5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S1809064

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem: Vol. ISSUE!

Resolution:

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 12/19/2018

CLIENT: Wenck Associates
Project: B7218-0001
Lab Order: S1812063

CASE NARRATIVE

Report ID: S1812063001

Samples L-1 12' and L-3 30' were received on December 5, 2018.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1812063-001
Client Sample ID: L-1 12'

Date Reported: 12/19/2018
Report ID: S1812063001

Work Order: S1812063
Collection Date: 12/4/2018 4:40:00 PM
Date Received: 12/5/2018 12:30:00 PM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	69.7	0.05		mg/L	12/06/2018 0936 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.06	0.05		mg/L	12/06/2018 0100 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	7	1		mg/L	12/13/2018 1112 AMB	EPA 351.2
Anions						
Chloride	121	1		mg/L	12/06/2018 0936 AB	EPA 300.0

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Wenck Associates
4025 Automation Way
Bldg E
Fort Collins, CO 80525

Project: B7218-0001
Lab ID: S1812063-002
Client Sample ID: L-3 30'

Date Reported: 12/19/2018
Report ID: S1812063001

Work Order: S1812063
Collection Date: 12/4/2018 4:40:00 PM
Date Received: 12/5/2018 12:30:00 PM
Sampler: AM
Matrix: Water
COC: WEB

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Nitrogen, Nitrate (As N)	55.4	0.05		mg/L	12/06/2018 0949 AB	EPA 300.0
Nitrogen, Nitrite (As N)	0.16	0.05		mg/L	12/06/2018 0113 AB	EPA 300.0
Nitrogen, Total Kjeldahl (TKN)	4	1		mg/L	12/13/2018 1112 AMB	EPA 351.2
Anions						
Chloride	291	1		mg/L	12/06/2018 0949 AB	EPA 300.0

These results apply only to the samples tested.

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
X	Matrix Effect

RL - Reporting Limit

C	Calculated Value
G	Analyzed at IML Gillette laboratory
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
U	Analysis reported under the reporting limit

Reviewed by: John M. Jacobs
John Jacobs, Project Manager

Inter-Mountain Labs
Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

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#WEB

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
Albany County	B7218-0001	Adam Marsh	970-223-4705

Report Address	Contact Name	
4025 Automation Way, Bldg. E Fort Collins CO 80525	Mark Stacy	
	Email	mstacy@wenck.com
Invoice Address	Phone	(O) 970-223-4705; (C) 970-691-3259
4025 Automation Way, Bldg. E Fort Collins CO 80525	Purchase Order #	Quote # 1800

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	Nitrate (as N)	Nitrite (as N)	Total Kjeldahl N	Phosphorus	Chloride	Total Metals			REMARKS
							ANALYSES / PARAMETERS								
1		~~12/03/18~~		~~L-1 5'~~	WT	1	x	x	x	x	x	x			Please see attached
2	S18120631	~~12/04/18~~ ~~12/03/18~~	16:40	L-1 12'	WT	1	x	x	x	x	x	x			quote for more details
3		~~12/03/18~~		~~L-2 19'~~	~~WT~~	~~1~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			about parameters
4		~~12/03/18~~		~~L-2 25'~~	~~WT~~	~~1~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
5	002	~~12/04/18~~ ~~12/03/18~~	16:40	L-3 30'	WT	1	x	x	x	x	x	x			If sample volume is
6		~~12/03/18~~		~~L-3 35'~~	~~WT~~	~~1~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			insufficient to measure
7															all parameters, please
8		L-1 5', L-2 19', L-2 25', L-3 30' did not produce any water.													prioritize parameters
9		No samples collected from these wells													in the following order:
10															(1) Nitrate, nitrite, chloride
11															(2) TKN
12															(3) Phosphorus
13															(4) Total Metals
14															

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
1.2 °C Rol	Adam Marsh	12/4/18	17:00	Kathy Buys	12.5.18	12:30

SHIPPING INFO	MATRIX CODES		TURN AROUND TIMES	COMPLIANCE INFORMATION	ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring ? Y / (N)	
☒ FedEx	Soil	SL	☒ Standard turnaround	Program (SDWA, NPDES,...)	
☐ USPS	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #	
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated? Y / (N)	
☐ Other	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab x Client	

Survey Meter # 2241-2
pH strip lot # HC739245
Thermometer SN# S/N 27130475

Condition Upon Receipt (Attach to COC)

Sample Receipt

1 Number of ice chests/packages received: 1 ROI? (Yes) No

*Note as "**OTC**" if samples are received over the counter, unpackaged*

2 Temperature of cooler/samples. *(If more than 8 coolers, please write on back)*

Temps Observed (°C):	1.2						
Temps Corrected (°C):	2.2						

***Acceptable is: 0.1° to 10°C** for Bacteria; and 0.1° to 6°C for most other water parameters. Samples may not have had adequate time to cool following collection. Indicate ROI (Received on Ice) for iced samples received on the same day as sampled, in addition to temperature at receipt.*

Client contact for temperatures outside method criteria must be documented below.

3 Emission rate of samples for radiochemical analyses < 0.5mR/hr?	Yes	No	(N/A)
4 COC Number (If applicable): WeB			
5 Do the number of bottles agree with the COC?	(Yes)	No	N/A
6 Were the samples received intact? *(no broken bottles, leaks, etc.)*	(Yes)	No	N/A
7 Were the sample custody seals intact?	Yes	No	(N/A)
8 Is the COC properly completed, legible, and signed?	(Yes)	No	

Sample Verification, Labeling & Distribution

1 Were all requested analyses understood and appropriate?	(Yes)	No	
2 Did the bottle labels correspond with the COC information?	(Yes)	No	
3 Samples collected in method-prescribed containers?	(Yes)	No	

4 Sample Preservation:

pH at Receipt:	Final pH (if added in lab):	Preservative/Lot#	Date/Time Added:
_____ Total Metals	_____ Total Metals	HNO_3 _____	_____
_____ Diss Metals	_____ Diss Metals	*Filtered and preserved in metals*	*Filtered and preserved in metals*
_____ Nutrient	_____ Nutrient	H_2SO_4 _____	
_____ Cyanide	_____ Cyanide	NaOH _____	
_____ Sulfide	_____ Sulfide	ZnAcet _____	
_____ Phenol	_____ Phenol	H_2SO_4 _____	
_____ SDWA Rads	_____ SDWA Rads	HNO_3 _____	_____

Preserved samples for Rad analysis accompanied by Field Blank?	Yes	No	
5 VOA vials have <6mm headspace?	Yes	No	(N/A)
6 Were all analyses within holding time at the time of receipt?	(Yes)	No	
7 Specially requested detection limits (RLs) assigned?	Yes	No	(N/A)
8 Have rush or project due dates been checked and accepted?	Yes	No	(N/A)
9 Do samples require subcontracted analyses?	Yes	(No)	

If "Yes", which type of subcontracting is required? **General** **Customer-Specified** **Certified**

Sample Receipt, Verification, Login, Labeling & Distribution completed by *(initials)*: KB

Set ID: S1812063

Discrepancy Documentation *(use back of sheet for notes on discrepancies)*

Any items listed above with a response of "No" or do not meet specifications must be resolved.

Person Contacted: _____ Method of Contact: __ Phone: _____

Initiated By: _____ Date/Time: _____ __ Email: _____

Problem:

Resolution: