MEMORANDUM

Project No. 180249

June 19, 2020

To: Mike Hermanson, Spokane County Environmental Services

From:

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Re: **Managed Aquifer Recharge Field Investigation**
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

The passage of Engrossed Substitute Senate Bill (ESSB) 6091, as codified by RCW 90.94, requires that an update to the existing Watershed Plan for Water Resource Inventory Area (WRIA) 55, the Little Spokane Watershed, be approved by the Washington Department of Ecology (Ecology) by February 1, 2021. Spokane County Environmental Services is serving as the lead agency for this process. The WRIA 55 Initiating Governments for the watershed planning process are Spokane County, Stevens County, Pend Oreille County, the City of Spokane, and Whitworth Water District. The process is supported by convening the WRIA 55 Planning Unit to review technical tasks and memorandums, policy decisions, and the pending watershed plan update. Aspect Consulting, LLC (Aspect) has been contracted by Spokane County to facilitate planning unit meetings, conduct supporting technical tasks, and prepare the Watershed Plan update.

As part of technical tasks associated with the WRIA 55 Watershed Plan update, Aspect assisted with development of water offset projects, including managed aquifer recharge (MAR) projects. A MAR site optimization and selection process was previously conducted in WRIA 55 by Aspect and EarthFX (a consulting group specializing in groundwater modeling). Details of the screening and selection analysis were documented in a December 2019 memorandum (Aspect, 2019a) that was distributed to the WRIA 55 Planning Unit. Based on the screening criteria discussed in that memorandum, 18 sites were targeted for further evaluation, with three sites ultimately selected for the field investigations summarized in this memorandum. All three sites are owned by Spokane County.

The two primary sites were Milan Road-Bear Creek (Bear Creek) and Feryn Conservation Area-Deadman Creek (Deadman Creek), and the alternative site was Dry Creek. This technical memorandum summarizes the findings from field investigations to evaluate site conditions (infiltration rates, water quality, and aquifer transmissivity) to inform preliminary design and permitting for potential construction of MAR facilities at select sites.

Summary of Findings

Field investigations occurred over three weeks between October and December 2019. The following observations and conclusions were made during the field investigation:

- Infiltration rates of the receptor unit(s) at:
  - The Deadman Creek site are too low (0.01 inches per hour [in/hr]) to feasibly implement surface infiltration; therefore, the alternative Dry Creek site was evaluated.
  - Dry Creek and the Bear Creek site have adequate subsurface conditions for surface infiltration.
- Surface water and groundwater quality and aquifer characteristics at Deadman Creek were not evaluated further due to limited feasibility for surface infiltration.
- Dry Creek was evaluated for surface water parameters only due to unsaturated conditions above a confining unit (competent bedrock). No surface water quality criteria were exceeded. The thickness of the overlying unconsolidated sand unit (coarse-grained outburst flood deposit) is 52 feet.
- Bear Creek was evaluated for surface water and groundwater quality. No surface water quality criteria were exceeded; however, groundwater quality criteria were exceeded for total dissolved solids (TDS), chloride, and total iron. Groundwater quality has likely been affected by storage of road salt on the ground without cover at the County gravel pit.
- The depth to the water table aquifer at Bear Creek is 71 feet below ground surface (bgs). The aquifer transmissivity is estimated at 2,300 square feet per day ($feet^2$/day) based on the aquifer testing conducted in this study. The aquifer thickness is approximately 12 feet resulting in a horizontal hydraulic conductivity of 194 feet/day.

The Bear and Dry Creek sites appear suitable for surficial infiltration of diverted surface water based on the raw infiltration rates and depth to water table or confining units. The groundwater quality at the Bear Creek site should see water quality improvement with infiltration of surface water if best management practices (BMPs) are implemented to prevent further infiltration of road salts.

Aspect recommends Spokane County Environmental Services continuously monitor groundwater levels in monitoring well MB1 at the Bear Creek site to better understand seasonal changes to the water table aquifer. In addition, surface water quality monitoring at Bear and Dry Creek during peak runoff is recommended to provide additional characterization of the water source for MAR infiltration. Lastly, additional investigation at the Bear Creek site should occur as part of final design work to determine if diversion of surface water with large capacity wells adjacent to the creek is feasible, as this would simplify permitting by eliminating a surface diversion structure and reduce infrastructure required for settling solids in the source water prior to infiltration.

Project Location

The project is located within Spokane County, Little Spokane River watershed (WRIA 55) as shown on Figure 1. Detail study locations for individual projects are shown on Figures 2, 3, and 4.

Methodology

The objectives of this field investigation are to characterize each selected MAR site in terms of physical attributes (infiltration rates, depth to water table or confining unit, water quality). An adaptive management approach based on the results of infiltration testing was implemented to control costs and move forward with potential MAR implementation sites. The investigation process is described below.

Soils and Geology

Subsurface investigations were conducted at all three project sites. Shallow subsurface conditions were investigated using a small excavator (Caterpillar 304E and Bobcat E50) and deeper excavations (greater than 5 feet below ground surface [bgs]) were obtained using an air rotary drill rig (Speedstar 50K). Shallow subsurface samples were collected from the excavator bucket; whereas, drill cuttings were collected either directly from the rotary swivel (Bear Creek) or from a cyclone (Dry Creek).

Samples were described in the field and bagged for analysis. Per the QAPP (Aspect, 2019b), the soils were analyzed for grain size, cation exchange capacity, percent organic matter, major cations and anions, plus nitrate and phosphorous.

Infiltration

Infiltration rates were measured following the small-scale pilot infiltration (PIT) tests as described in the QAPP (Aspect, 2019b). At each site a test pit was excavated. Due to the coarse-grained nature of the Dry and Bear Creek sites a new, never-used, bottom-less, 55-gallon drum was set into the receptor unit. This allowed for the PIT to occur over a known area and eliminate potential for sidewalls to slough into the excavation. A staff gage and stilling well (equipped with a Van Essen Diver and Baro) instrumented the test pit to allow for manual observations and collection of continuous pressure data.

A 2,000-gallon water truck was used as a water source for the PIT. A 2-inch discharge line was used to convey water from the truck through a 2-inch Seametrics MJ series water meter and into the test pit. Manual reads were made from the water meter during the duration of the PIT.

The continuous pressure and flowrate data were managed in EXCEL to perform the analysis. The barometrically compensated pressure data was reduced to determine water levels in the test pit. These water levels were then associated with an observed flowrate to evaluate the constant head portion of the test and determine when the falling head portion of the test began. Both the constant head and falling head tests were used to determine the infiltration rate. Depending on the quality of the test either the constant or falling head portion of the test was used to calculate a raw infiltration rate.

Pumping Test

A step rate pumping test was performed on the Bear Creek monitoring well (MB1, BKW220) using a contractor supplied submersible test pump and the flowrate was measured using a 5-gallon bucket and a stopwatch. The flowrate during the pumping test was controlled using a ball valve. Pumped water was conveyed downhill away from MB1 and discharged onto the ground.

Groundwater levels during the pumping test were measured using an electronic water level indicator, and continuous pressure measurements were collected using an Instrument Northwest PT2X gaged pressure transducer.

The step rate test consisted of three one-hour long steps followed by a 2-hour last step.

Manually collected flow rate and depth to water measurements were compiled with the continuous pressure measurements from the PT2X in EXCEL. The manual measurements and continuous pressure measurements were evaluated graphically for quality control and assurance.

Recovery measurements were used to calculate aquifer transmissivity using the Theis recovery method for an unconfined aquifer. The Theis method is appropriate for determining transmissivity using the late-time recovery measurements only (Kruseman and deRidder, 2001).

Water Quality

Surface water was collected from Dry and Bear Creek at locations shown on Figure 3 and 4, respectively. Due to the shallow depth, a peristaltic pump was used to collect samples, as shown on Photograph 1 of Attachment 2. Clean low-density polythene (LDPE) tubing and silicone tubing were used at each site. Samples were pumped directly into lab supplied bottles. Filtered samples were filtered through a 0.45-micron (um) filter cartridge. Preservative was added to bottles as necessary prior to placing sample bottles into a cooler. A calibrated YSI Pro Series multi-parameter water meter (YSI) was used to collect field parameters during sample collection.

Groundwater samples were collected from MB1 using a submersible pump (12V stainless steel Hurricane XL) and LDPE tubing. Samples were collected using low-flow sampling techniques. Groundwater was pumped through a flow-cell connected to the calibrated YSI and field parameters were measured every 5 minutes until the parameters stabilized. Pumped water was discharged onto the ground. Samples were collected and stored in the same manner as the surface water samples for transport to the respective laboratories for analysis.

All samples were received at the respective laboratory within holding times and in good condition.

QAPP Deviations

The Quality Assurance Project Plan (QAPP) planned for 6-hour pre-wetting phase during the pilot infiltration tests (PIT). A shorter pre-wetting phase was conducted to control costs for mobilizing multiple water trucks and labor. Therefore, each PIT was limited to a single water truck capacity of 2,000 gallons. This deviation is not expected to affect the quality of the results. Pre-wetting of the soil profile is conducted to demonstrate if infiltration rates are limited by strata underlying the receptor unit. The Deadman Creek site has very low infiltration rates, therefore wetting exceeded the 6-hour timeframe due to ponding. The Bear Creek and Dry Creek sites were over-excavated, which demonstrated the underlying strata are consistent with the receptor unit. In addition, further subsurface investigation via drilling with air rotary indicated that a boundary condition due to poorly transmissive material was unlikely to occur that would limit infiltration into the shallow subsurface.

Deadman Creek

The Deadman Creek site subsurface consists of a thick (greater than 200 feet) glaciolacustrine deposit underlain by a thin sandy water bearing unit that is underlain by granitic bedrock. The upper glaciolacustrine deposit is characterized as fine-grained glacial deposit (Kahle et. al., 2013) in the project area and turns to a coarse-grained glacial deposit downstream of the project site.

Domestic water use in the area targets the thin sandy water bearing unit underlying the fine-grained glacial deposit. Static water levels in this water bearing unit vary from 60 to 140 feet bgs depending on location. The aquifer is in a confined to semi-confined condition with recharge occurring along the glacial deposit and bedrock contact and higher elevations to the east of the Peone Prairie, and groundwater discharge toward the west and the Little Spokane River.

Soils

A 7 x 9-foot test pit was excavated to a total depth of 13 feet bgs. The surficial soils (1 to 10 feet bgs) are a very soft, brown, silt (ML) that transitions to a stiff, platy, clay (CH) with some calcium precipitate between peds. A soils log (FD-S) is presented in Attachment 1 and a photograph of the soil profile is included on Photograph 2 of Attachment 2.

Analytical results from soils analysis of major cations and anions plus nitrate and phosphorous are presented in Table 1.

Infiltration

As shown on Figure 5, an average of 22 gallons per minute (gpm) was introduced into the test pit over a 4-minute period rapidly raising the water level in the test pit to 28 inches. The flow rate was then reduced to 8 gpm for the next 45 minutes raising the water level to 33 inches. The flow rate was further reduced to 4.5 gpm for 15 minutes, then further reduced to 1.75 gpm to obtain a constant head of 3 feet in the test pit. A near constant head was maintained for 30 minutes at 1.75 gpm; however, incremental increase in head (0.5 inches) was observed.

Following the constant head portion of the test the water was shut-off and the falling head portion of the test was measured over a 12-hour period using pressure transducers, as shown on Figure 6.

Reduction of the constant head and falling head data result in a raw infiltration of 3 and 0.25 in/hr, respectively. The raw infiltration rate of 0.25 in/hr from the falling head portion of the test likely better represents the long-term infiltration rate and the high water-entry-pressure necessary to infiltrate water into the tight material.

Dry Creek

The Dry Creek subsurface consists of a 50 to 150 feet thick layer of coarse-grained glacial deposits that overlay a weathered granitic bedrock. Domestic water use in the area targets fracture zones within the granitic bedrock at depths of 200 to 550 feet bgs. Static water levels range from 100 to 180 feet bgs. Recharge is expected to occur on the higher surrounding elevations creating a semi-confined to confined groundwater condition in the fractured water bearing zones. Discharge likely occurs down valley toward the west and ultimately to the Little Spokane River. Interflow at the site is expected to mimic the local topography.

Soils and Geology

A 5 x 5-foot test pit was excavated to a total depth of 4 feet bgs. The soils are a medium dense, gray brown sand (SW) with crossbedding across the entire excavated depth. A profile of the excavation is shown in Photograph 3 of Attachment 2.

A nominal 8-inch drill bit and casing were driven to 57 feet bgs. The subsurface was consistent with the well sorted sand deposit observed in the test pit to a depth of 45 feet where some gravel was encountered. This is interpreted as a weathered granite (gruss) zone from 45 to 52 feet bgs. At 52 feet bgs a hard, granitic, basement rock was encountered.

A soil log (ND-S) and borehole log (ND1) with schematic of monitoring well are shown in Attachment 1. No water was encountered while drilling; however, a monitoring well was installed with a completion above the granitic basement rock for future monitoring of infiltrated water. The monitoring well construction consists of a screen interval between 42 to 52 feet bgs, immediately above the competent bedrock. A bentonite seal was installed from ground surface to 38 feet bgs and a filter pack of 10/20 silica sand was installed from 38 to 57 feet bgs.

Analytical results from soils analysis of major cations and anions plus nitrate and phosphorous are presented in Table 1. A copy of the laboratory data deliverables is provided in Attachment 3.

Infiltration

As shown on Figure 7, an average of 20 gpm was introduced into the 400 square inch infiltration ring. Minor adjustments to the flowrate resulted in 3 small (approximately 1 to 1.5 inch each) increases in head over the 2.7-hour PIT.

Following the infiltration of 2,000 gallons of water into the infiltration ring, the falling head portion of the test was measured over a 3-minute period until the infiltration ring drained, as shown on Figure 8.

Reduction of the constant head and falling head data result in a raw infiltration of 700 and 165 in/hr, respectively. The more conservative raw infiltration rate of 165 in/hr was selected as representative of a long-term infiltration rate.

Water Quality

Surface water samples were collected at the location shown on Figure 3. No surface water quality criteria were exceeded. A summary of the detected analytes and field parameters are presented in Tables 2 and 3, respectively. A copy of the laboratory data deliverables is provided in Attachment 3.

Bear Creek

The Bear Creek site consists of a vertically stratified coarse-grained glacial deposit that overlays a granitic bedrock. Groundwater in the area may occur as a multilayer aquifer system. A water table aquifer (unconfined) was encountered at 71 feet bgs in a sandy unit that is comprised of both coarse-grained glacial deposit and weathered granite (gruss). Domestic water use in the area targets fractured or weathered zones of granitic bedrock at a depth of 100 to 200 feet bgs, or the shallower weathered granitic surface at 50 to 70 feet bgs.

Regional recharge of the upper unconfined aquifer in the Bear Creek area likely occurs from the north-northwest with limited local recharge occurring in the lowland area near the Bear Creek site. Discharge of groundwater from the local area is expected to occur toward the south-southwest mimicking the Bear Creek drainage. The Bear Creek drainage appears to follow a glacial outburst channel carved into the underlying granitic bedrock. The flow of groundwater in the unconfined aquifer is expected to follow the buried surface of the granitic bedrock.

Soil and Geology

A 6 x 6-foot test pit was excavated to a depth of 6 feet bgs. The top 2 feet of the subsurface consisted of a brown silty gravel. At 2-feet bgs a cemented layer is encountered, and the gravels are oxidized. Below 3 feet the subsurface is gravel with silt and cobbles becoming more course with depth. Boulders were present at total depth. A soil log (MB-S) is presented in Attachment 1 and a photograph of the soil profile is shown on Photograph 4 of Attachment 2.

A nominal 8-inch drill bit and casing were driven to 87 feet bgs. The subsurface was consistent with the observations in the test pit with coarse grained glacial deposits coarser (boulders and gravels) than the Dry Creek site (sand). The upper 9 feet consists predominantly of a gravel with silt, cobbles and boulders. Below the very coarse unit of boulders, the subsurface material fines to a 13-foot gravelly unit underlain by a 4-foot clayey unit (23 to 27 feet bgs). Below the clayey unit the subsurface is predominantly sand. At 47 feet bgs the subsurface material changes to a sandy unit (gruss) derived from weathered granitic bedrock. Groundwater was encountered at 76 feet bgs during drilling. At 83 feet bgs competent granitic bedrock was encountered. The drill bit and casing were advanced to 87 feet bgs, which sealed-off the overlying water bearing unit, so drilling ceased, and a monitoring well was installed with a completion above the granitic basement rock for monitoring of infiltrated water.

The static water level raised to 71 feet bgs after completion of drilling. The borehole log (MB1) and monitoring well construction are presented in Attachment 1. The monitoring well construction consists of a screen interval between 72.5 to 82.5 feet bgs, immediately above the competent bedrock. A bentonite seal was installed from ground surface to 67 feet bgs and a filter pack of 10/20 silica sand was installed from 67 to 87 feet bgs. The monitoring well was developed by pumping until the discharged water ran clear.

Analytical results from soils analysis of major cations and anions plus nitrate and phosphorous are presented in Table 1. A copy of the laboratory data deliverables are provided in Attachment 3.

Infiltration

As shown on Figure 9, an initial flow rate of 30 gpm was introduced in the first 3 minutes into the 400 square inch infiltration ring. An average of 23 gpm was introduced for 1 hour and 22 minutes. Then the flow rate was increased to 50 gpm over the final 25 minutes. The flow rate was insufficient to exceed the time to ponding for the gravel, cobble, boulder subsurface during the PIT, indicating excellent infiltration capacity.

Following the infiltration of 2,000 gallons of water into the infiltration ring, no falling head portion of the test was measured due to the rapid infiltration.

Reduction of the constant head data result in a raw infiltration greater than 770 in/hr.

Water Quality

Surface water samples were collected at the location shown on Figure 4. No surface water quality criteria were exceeded. A summary of the field parameters and detects are presented in Tables 2 and 3, respectively. A copy of the laboratory data deliverables are provided in Attachment 3.

Groundwater samples were collected from the monitoring well (MB1). Groundwater quality results are shown in Table 2. Groundwater quality criteria were exceeded for TDS, chloride, and total iron. It is presumed the source of TDS and chloride is from road salt stockpiled on bare ground without cover. The road salt provided an opportunity to determine if the 4-foot clayey unit behaves as a confining unit impeding recharge of the underlying aquifer with surface infiltration. The detection of apparent road salt elements suggests the clayey unit does not impede recharge from surface infiltration, supporting the suitability of the site for MAR infiltration.

An equipment blank for total and dissolved metals was collected by pumping distilled water through the submersible pump used to collect groundwater samples. Total calcium was detected (0.104 mg/L) in the equipment blank sample. The detect in the equipment blank suggest the groundwater result for total calcium (517 mg/L) may be biased high; however, this represents a small fraction of the concentration compared to the observed groundwater concentration.

Aquifer Characteristics

The extended step rate pumping test hydrograph and associated flow rates are presented on Figure 10. The upward trending drawdown measurements along the first step (1 gpm) indicates some well development may have occurred. Subsequent steps (2.5, 5, and 18 gpm) show the typical downward trend with drawdown over time for each step. At later pumping times, as seen in the final step, the drawdown curve typically approaches an asymptotic horizontal slope until a boundary condition is encountered (recharge or barrier). Neither a recharge nor barrier boundary to groundwater flow is evident in the drawdown curve.

Care was taken in conducting the initial step at lower flow rates due to the uncertainty of well performance and aquifer extent. The first three steps (1, 2.5, and 5 gpm) resulted in minimal drawdown. Therefore, the final step was conducted at the maximum flow rate possible with a submersible pump installed. The final step ran for a total of two hours, then recovery was measured. The recovery portion of the test was used to determine the aquifer transmissivity.

A comparison of the manual and continuously measured drawdown revealed an average difference of 0.03 feet, ranging from 0.00 to 0.07 feet, as shown on Figure 10. This variability is within the expected total field and measurement error.

Figure 11 presents the residual drawdown versus ratio of t/t', which is the ratio of the time since pumping started (t) and the time since pumping stopped (t'). Late time recovery data was selected for calculating the transmissivity (Kruseman and deRidder, 2001). Transmissivity was calculated using the Cooper-Jacob Straight-line Method (Driscoll, 1986) which states:

$T = \frac{264Q}{\Delta(s-s')}$ where;

$T = transmissivity$

$Q = pumping\ rate$, and

$\Delta(s - s') = water\ level\ recovery\ per \log cycle.$

For a calculated transmissivity of 2,300 square feet per day (ft^2/day), or 17,400 gallons per day per foot (gpd/ft).

The hydraulic conductivity of the water bearing unit was calculated using the relationship that the transmissivity is the product of the effective hydraulic conductivity and the saturated thickness of the aquifer given by:

$T = Kb$ where;

$K = hydraulic\ conductivity, and$

$b = aquifer\ thickness.$

The total aquifer thickness is 12 feet; therefore, the effective hydraulic conductivity is approximately 7 x 10^{-2} centimeters per second (cm/s), or 194 feet per day (feet/day). This hydraulic conductivity is consistent with literature values for a well sorted sand (Fetter, 2001) and observed conditions.

The aquifer is unconfined, therefore the storativity (specific yield) is equivalent to the effective porosity of the aquifer, or approximately 0.25.

References

Aspect Consulting, LLC, 2019. Memorandum: Managed Aquifer Recharge Site Optimization and Selection WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update, December 2, 2019.

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Fetter, C.W, 2001, Applied Hydrogeology, Prentice-Hall Upper Saddle River, NJ.

Kahle, S.C., Olsen, T.D., and Fasser, E.T., 2013, Hydrogeology of the Little Spokane River Basin, Spokane, Stevens, and Pend Oreille Counties, Washington: U.S. Geological Survey Scientific Investigations Report 2013–5124, 52 p.

Kruseman, G.P. and N.A. de Ridder, 2001, Analysis and Evaluation of Pumping Test Data, Second Edition, International Institute for Land Reclamation and Improvement, The Netherlands.

Limitations

Work for this project was performed for the Spokane County Environmental Services (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Attachments:
Table 1 – Soil Laboratory Results
Table 2 – Surface Water and Groundwater Laboratory Results for Detects
Table 3 – Surface Water and Groundwater Field Parameters
Figure 1 – Field Investigation Locations
Figure 2 – Feryn Conservation Area - Deadman Creek
Figure 3 – Dry Creek
Figure 4 – Milan Road - Bear Creek
Figure 5 – Deadman Creek Constant Head
Figure 6 – Deadman Creek Falling Head
Figure 7 – Dry Creek Constant Head
Figure 8 – Dry Creek Falling Head
Figure 9 – Bear Creek Constant Head
Figure 10 – Bear Creek Pumping Test Hydrograph
Figure 11 – Bear Creek Theis Recovery Analysis
Attachment 1 – Exploration Logs
Attachment 2 – Photograph Log
Attachment 3 – Laboratory Results

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TABLES

Table 1. Soil Laboratory Results

Project No. 180249, Spokane County, Washington

		Project Site Name	Bear Creek	Dry Creek	
		Location	MB-S	ND1-S	ND-S
		Date	10/21/2019	12/13/2019	10/23/2019
		Sample	MB-S-03	ND1-S-45	ND-S-03
		Depth	3 ft	45 ft	3 ft
Analyte	CAS_RN	Unit			
Conventionals					
Cation-exchange capacity (CEC)	CEC	meq/100g	**12.1**	**5.3**	**7.6**
Chloride	16887-00-6	mg/kg	< 2.1 U	< 2.1 U	< 2.0 U
Nitrate as Nitrogen	14797-55-8	mg/kg	< 0.52 U	< 0.52 U	< 0.51 U
Phosphorus	7723-14-0	mg/kg	**298 J**	**480**	**420**
Organic Matter	OMC	%	**1.96**	**1.6**	**0.86**
Sulfate	14808-79-8	mg/kg	**6**	< 3.1 U	< 3.1 U
Total Solids	TS	%	**96**	**96.9**	**97.9**
Metals					
Calcium	7440-70-2	mg/kg	**1810 J**	**2640**	**1980**
Magnesium	7439-95-4	mg/kg	**3550**	**4240**	**4190**
Potassium	7440-09-7	mg/kg	**1480 J**	**3050**	**2520**
Sodium	7440-23-5	mg/kg	< 52.1 U	**100**	**65.8**

Bold - detected

U - Analyte not detected at or above Reporting Limit (RL) shown

J - Result value estimated

Table 2. Surface Water and Groundwter Laboratory Results for Detects

Project No. 180249 , Spokane County, Washington

						Project Site Name	Bear Creek		Dry Creek
						Location	MB1-GW	MB-SW	ND-SW
						Date	12/18/2019	12/18/2019	12/18/2019
						Sample	MB1-GW-191218	MB-SW-191218	ND-SW-191218
				Surface Water WAC 173-201A-200 & 240		Groundwater			
Analyte	CAS_RN	Fraction	Unit	Acute	Chronic	WAC 173-200-040			
Bacteria									
E.Coli	68583-22-2	N	MPN/100mL				< 1.8 U	**2**	**79**
Total Coliform	ColiTot	N	MPN/100mL			1	< 1.8 U	**350**	**170**
Conventionals									
Alkalinity, Total	ALKT	T	mg/L as CaCO3				**78.4**	**149**	**42.6**
Chloride	16887-00-6	T	mg/L			250	**2140**	**3.91**	**3.34**
Nitrate as Nitrogen	14797-55-8	T	mg/L			10	**1.69**	**1.47**	**0.102**
Nitrate-Nitrite	NO3NO2N	T	mg/L				**1.69**	**1.48**	**0.102**
Nitrogen	7727-37-9	T	mg/L				**1.69**	**1.48**	< 0.600 U
Orthophosphate	14265-44-2	T	mg/L				**0.016**	**0.016**	**0.039**
Phosphorus	7723-14-0	T	mg/L				**0.018**	< 0.010 U	**0.046**
Sulfate	14808-79-8	T	mg/L			250	**23.7**	**6.46**	**4.6**
Total Dissolved Solids	TDS	T	mg/L	10000	10000	500	**3900**	**172**	**125**
Total Suspended Solids	TSS	T	mg/L				**11**	< 5.0 U	< 5.0 U
Destination									
Hardness (destination)	Hard_MixZone	N	mg/L				**1940**	**147**	**33.7**
Field Parameters									
Temperature	Temp	N	deg C				**11.4**	**1**	**1.6**
Specific Conductance	Cond	N	uS/cm			700	**5866**	**289.8**	**96.2**
Dissolved Oxygen	DO	N	mg/L				**9.87**	**10.64**	**12.54**
pH	pH	N	pH units		6.5-8.5	6.5-8.5	**7.65**	**7.85**	**7.84**
Oxidation Reduction Potential	ORP	N	mV				**140.4**	**234.7**	**206.1**
Turbidity	Turb	N	NTU				**10**	--	--
Metals									
Calcium	7440-70-2	T	mg/L				**517**	**44.7**	**9.84**
Chromium	7440-47-3	T	mg/L	ND = 0.225; MB = 0.752	ND = 0.073; MB = 0.244	0.05	**0.0068**	< 0.0060 U	< 0.0060 U
Iron	7439-89-6	D	mg/L				< 0.100 U	< 0.100 U	**0.164**
Iron	7439-89-6	T	mg/L			0.3	**0.936**	< 0.100 U	**0.464**
Magnesium	7439-95-4	T	mg/L				**157**	**8.71**	**2.23**
Potassium	7440-09-7	T	mg/L				**10**	**2.29**	**1.48**
Sodium	7440-23-5	T	mg/L				**504**	**4.85**	**7.64**
Zinc	7440-66-6	D	mg/L	ND = 0.045; MB = 0.159	ND = 0.042; MB = 0.145		**0.04**	< 0.010 U	< 0.010 U
Zinc	7440-66-6	T	mg/L			5	**0.054**	< 0.010 U	< 0.010 U

Bold - detected
Blue Shaded - Detected result exceeded Acute Aquatic Life level (if WS) or WAC-173-200 (if WG)
Red Text - Detected result exceeded Chronic Aquatic Life Level
U - Analyte not detected at or above Reporting Limit (RL) shown
D - Dissolved Fraction (filtered) sample result
T - Total Fraction (unfiltered) sample result
N - Fraction Not Applicable

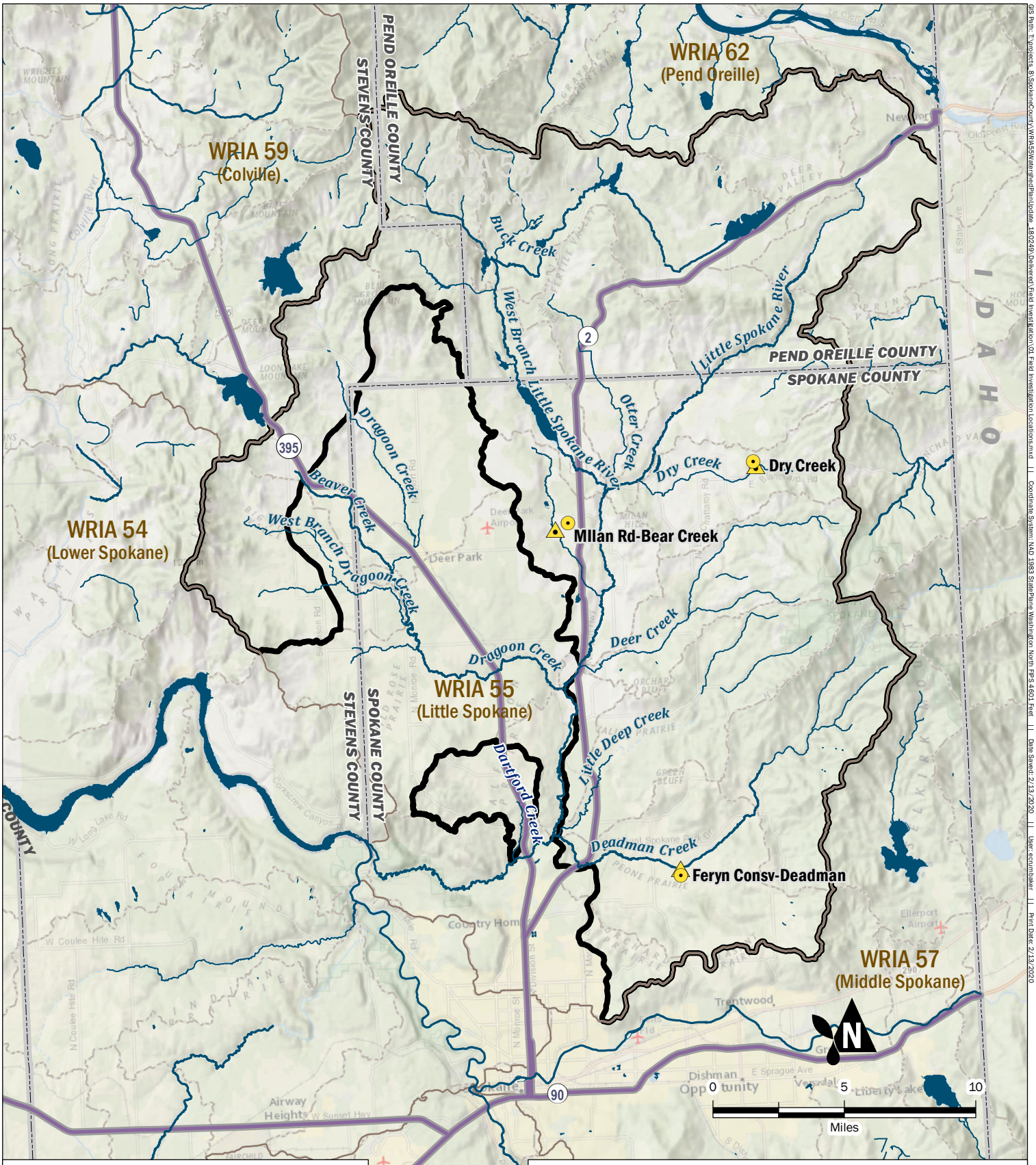
Table 3. Surface Water and Groundwater Field Parameters

Project No. 180249 , Spokane County, Washington

			Project Site Name	Bear Creek		Dry Creek
			Location	MB1-GW	MB-SW	ND-SW
			Date	12/18/2019	12/18/2019	12/18/2019
			Sample	MB1-GW-191218	MB-SW-191218	ND-SW-191218
Analyte	CAS_RN	Fraction	Unit			
Field Parameters						
Temperature	Temp	N	deg C	**11.4**	**1**	**1.6**
Specific Conductance	Cond	N	uS/cm	**5866**	**289.8**	**96.2**
Dissolved Oxygen	DO	N	mg/L	**9.87**	**10.64**	**12.54**
pH	pH	N	pH units	**7.65**	**7.85**	**7.84**
Oxidation Reduction Potential	ORP	N	mV	**140.4**	**234.7**	**206.1**
Turbidity	Turb	N	NTU	**10**	--	--

Bold - detected

FIGURES



Study Area

Potential Diversion Site Location

Potential Infiltration Site Location

Field Investigation Locations

Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update
Spokane County, Washington

Aspect Consulting	FEB-2020	BY: JS / EAC	FIGURE NO. 1
	PROJECT NO. 180249-06	REVISED BY: ---	

Basemap Layer Credits || Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

GIS Path: T:\projects_8\SpokaneCounty\WRIA55WatershedPlanUpdate_180249\Deliverable\Field Investigation\02 Feryn Conservation Area Deadman Creek.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 2/13/2020 || User: scrumbaker || Print Date: 2/13/2020

Pilot Infiltration Test

Feryn Conservation Area
Deadman Creek

Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update
Spokane County, Washington

Aspect Consulting	FEB-2020	BY: JS / EAC	FIGURE NO. 2
	PROJECT NO. 180249-06	REVISED BY: ---	

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

- Monitoring Well
- Pilot Infiltration Test
- Surface Water Gaging/Sampling Location
- Potential Diversion Site Location

Dry Creek

Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update
Spokane County, Washington

Aspect Consulting	FEB-2020	BY: JS / EAC	FIGURE NO. 3
	PROJECT NO. 180249-06	REVISED BY: ---	

GIS Path: T:\projects_8\SpokaneCounty\WRIA55WatershedPlanUpdate_180249\Deliverable\Field Investigation\03 Dry Creek.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 2/13/2020 || User: ecrumbaker || Print Date: 2/13/2020

- Monitoring Well
- Pilot Infiltration Test
- Surface Water Gaging/Sampling Location
- Potential Point of Diversion

Milan Road - Bear Creek

Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update
Spokane County, Washington

Aspect Consulting	FEB-2020	BY: JS / EAC	FIGURE NO. 4
	PROJECT NO. 180249-06	REVISED BY: ---	

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

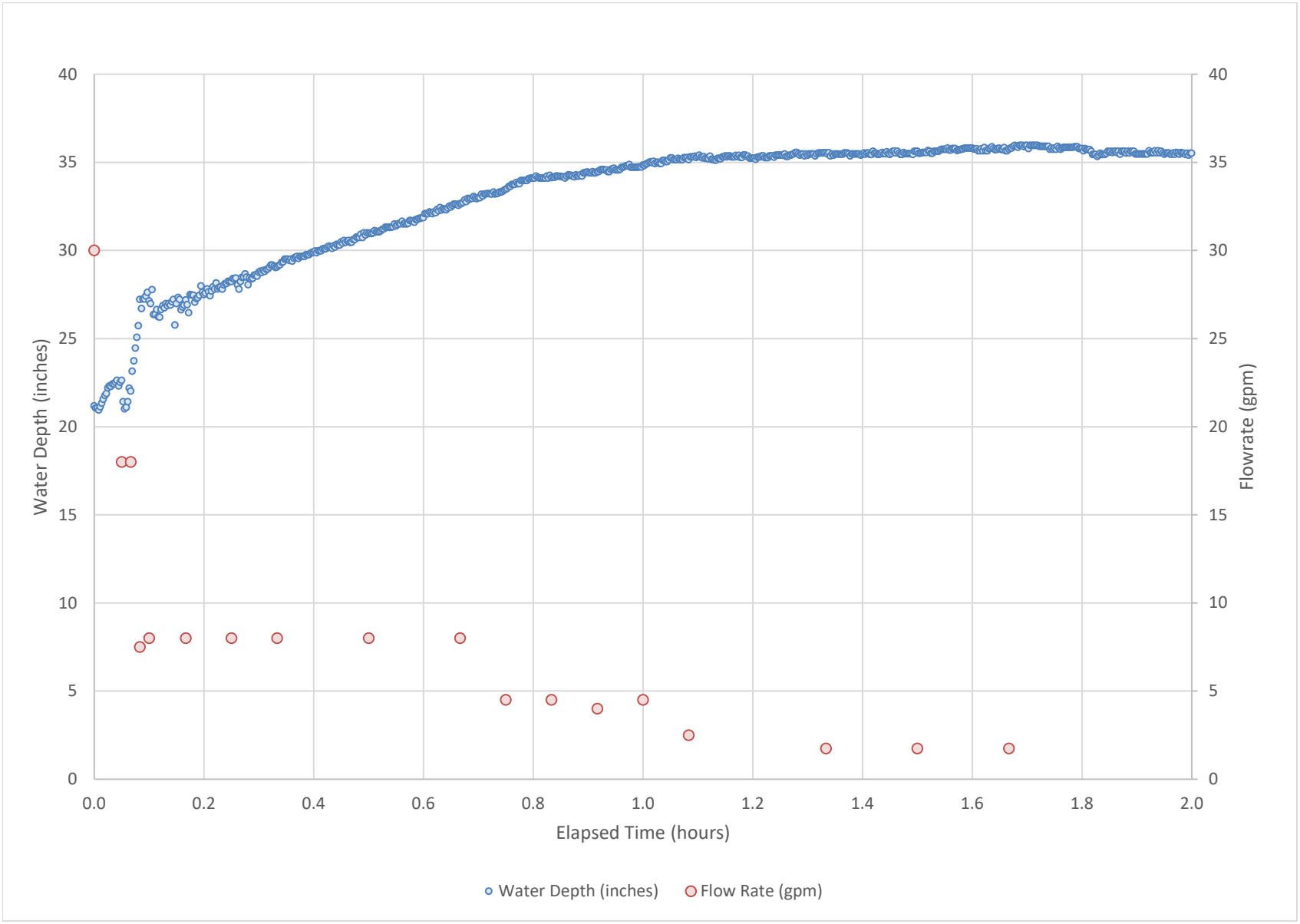


Figure 5

Deadman Creek Constant Head

Managed Aquifer Recharge Field Investigation

WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting

6/19/2020

V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

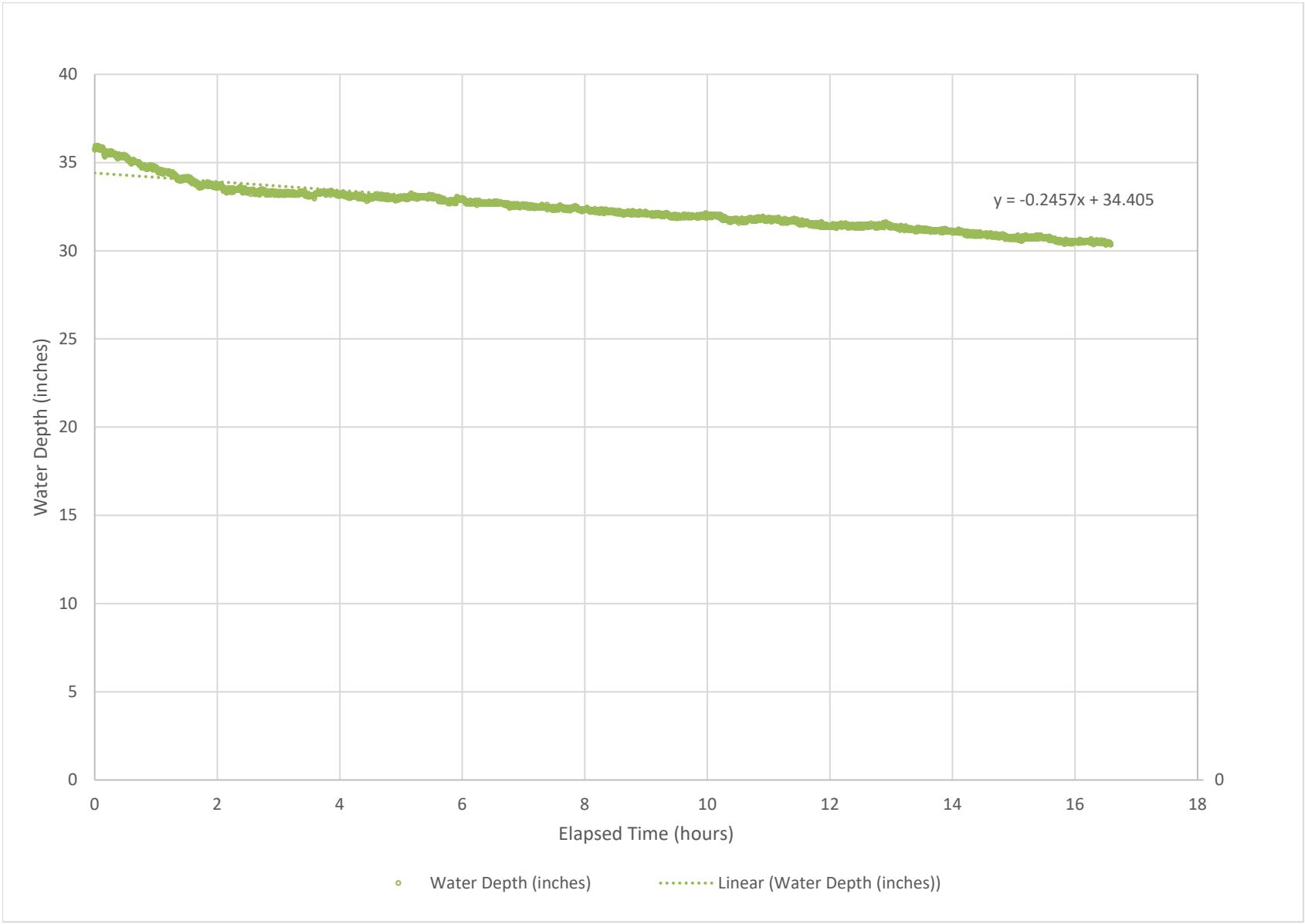


Figure 6
Deadman Creek Falling Head
Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting
6/19/2020
V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

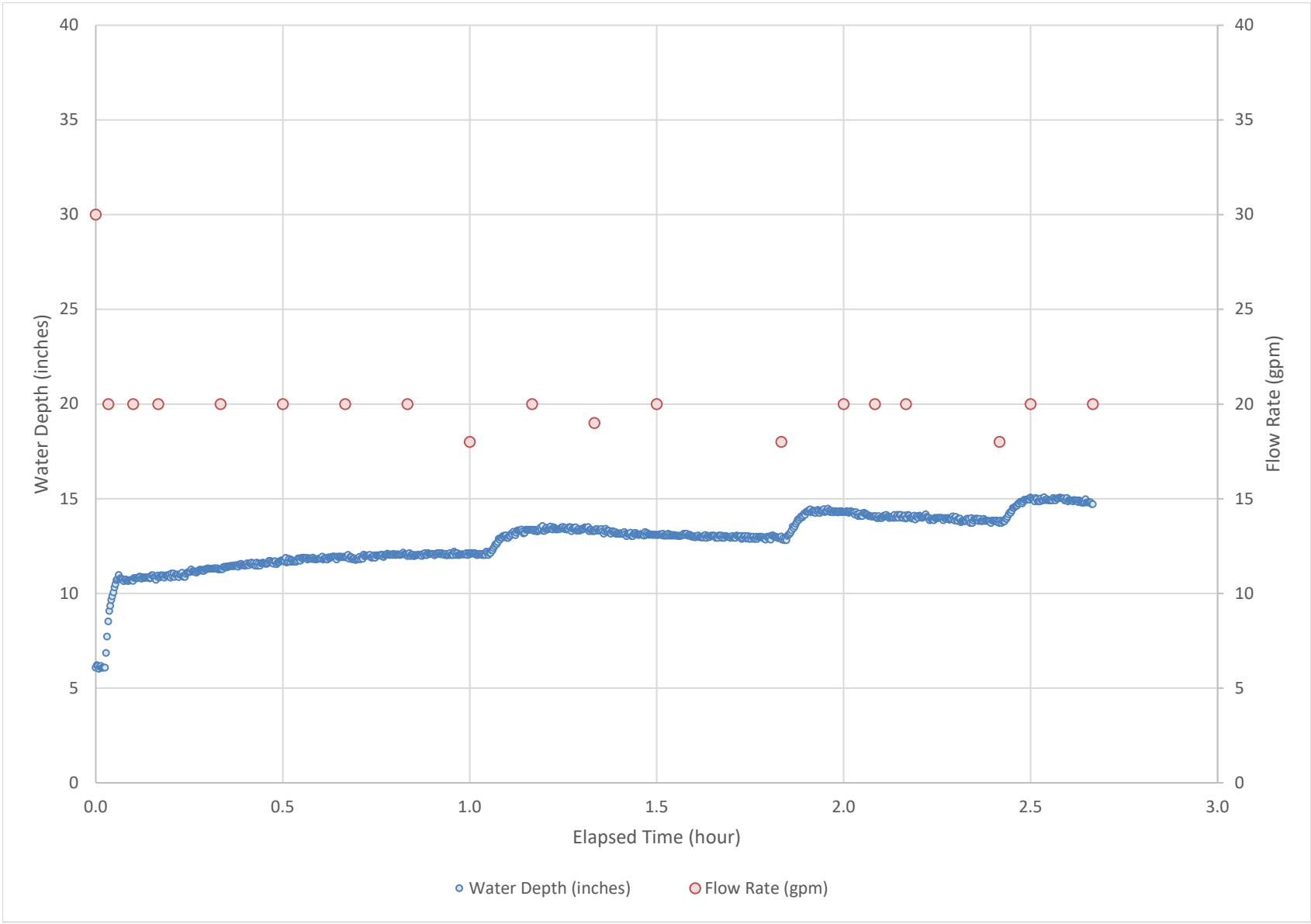


Figure 7

Dry Creek Constant Head

Managed Aquifer Recharge Field Investigation

WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting

6/19/2020

V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

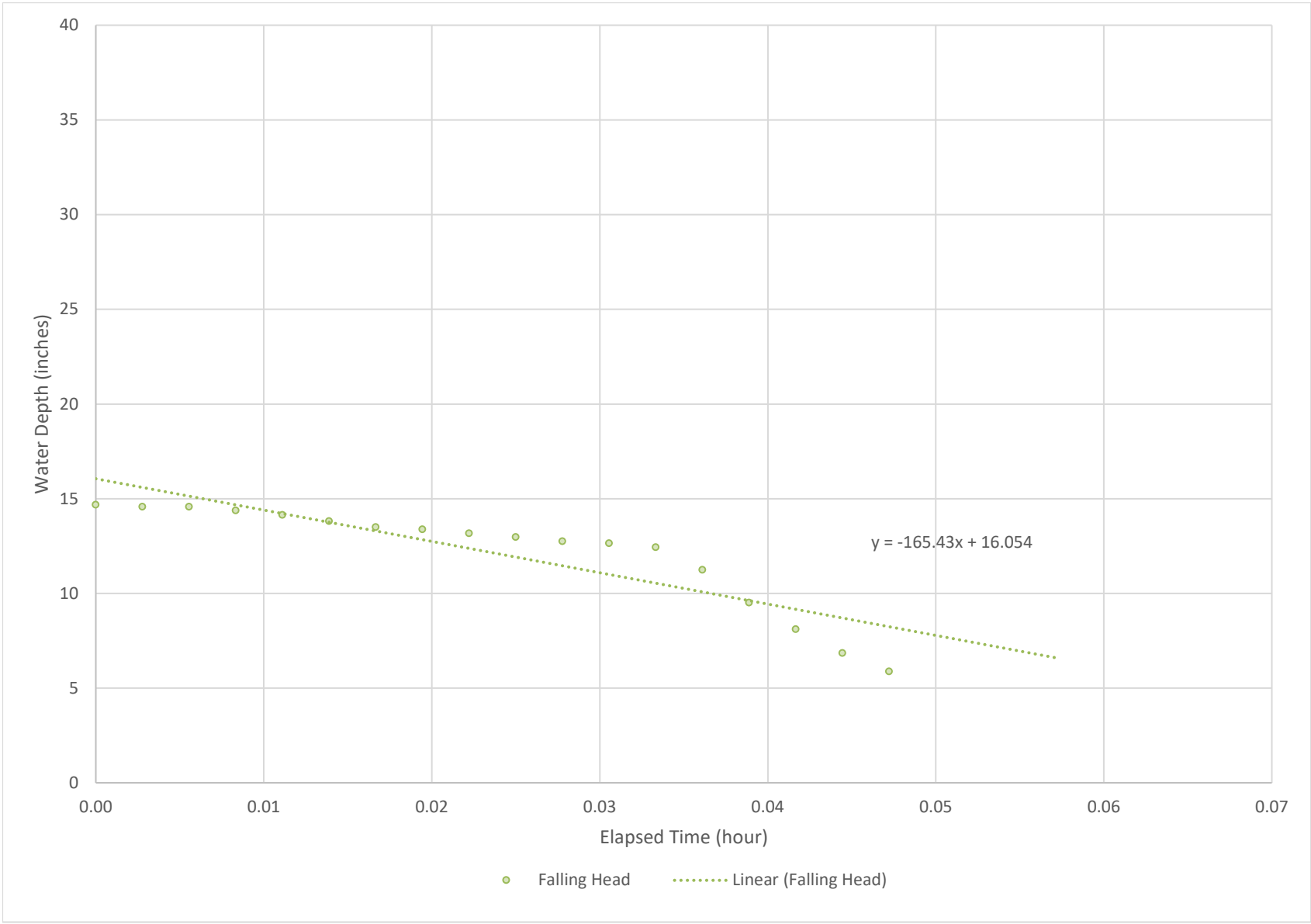


Figure 8
Dry Creek Falling Head
Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting
6/19/2020
V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

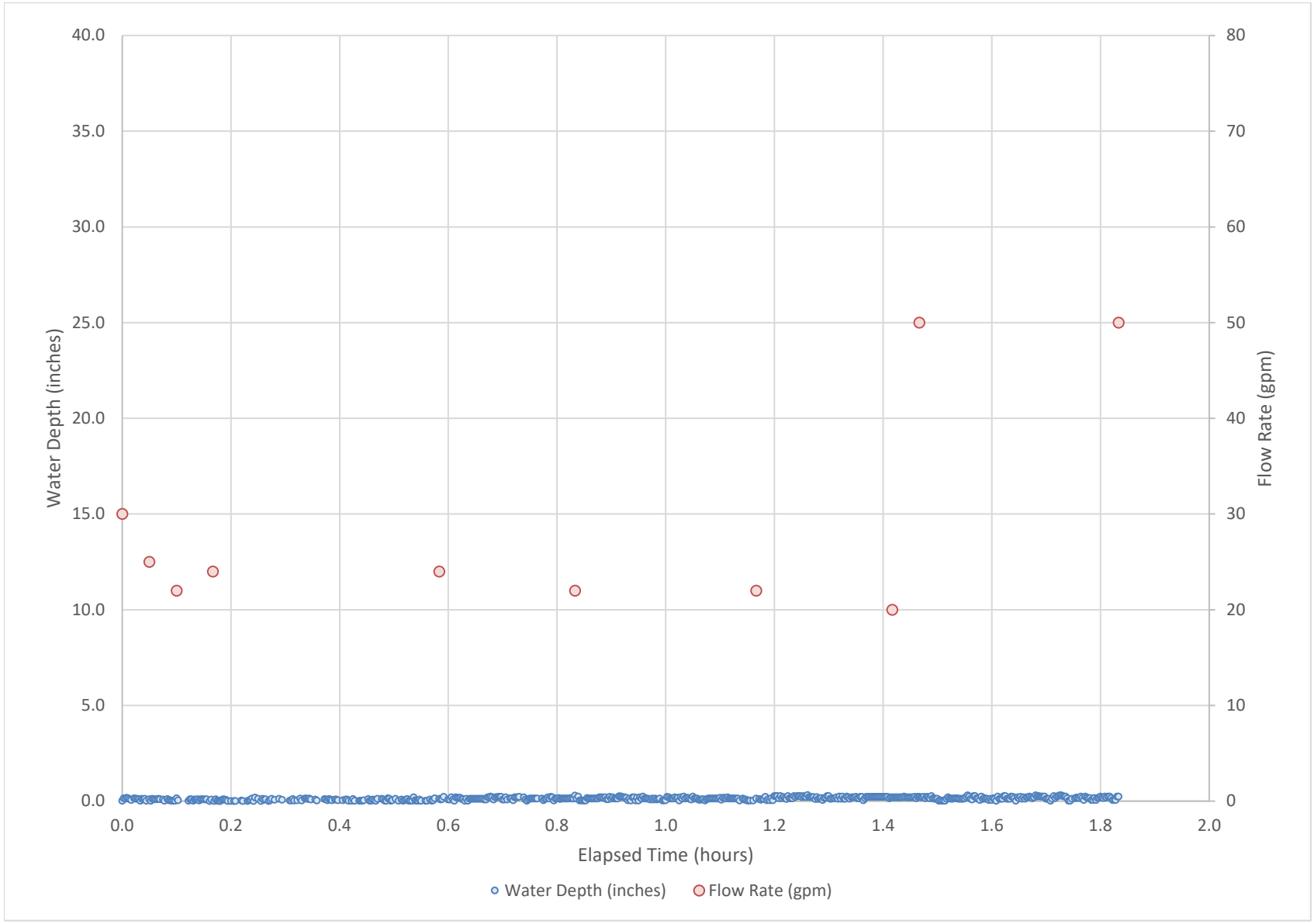


Figure 9

Bear Creek Constant Head

Managed Aquifer Recharge Field Investigation

WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting

6/19/2020

V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

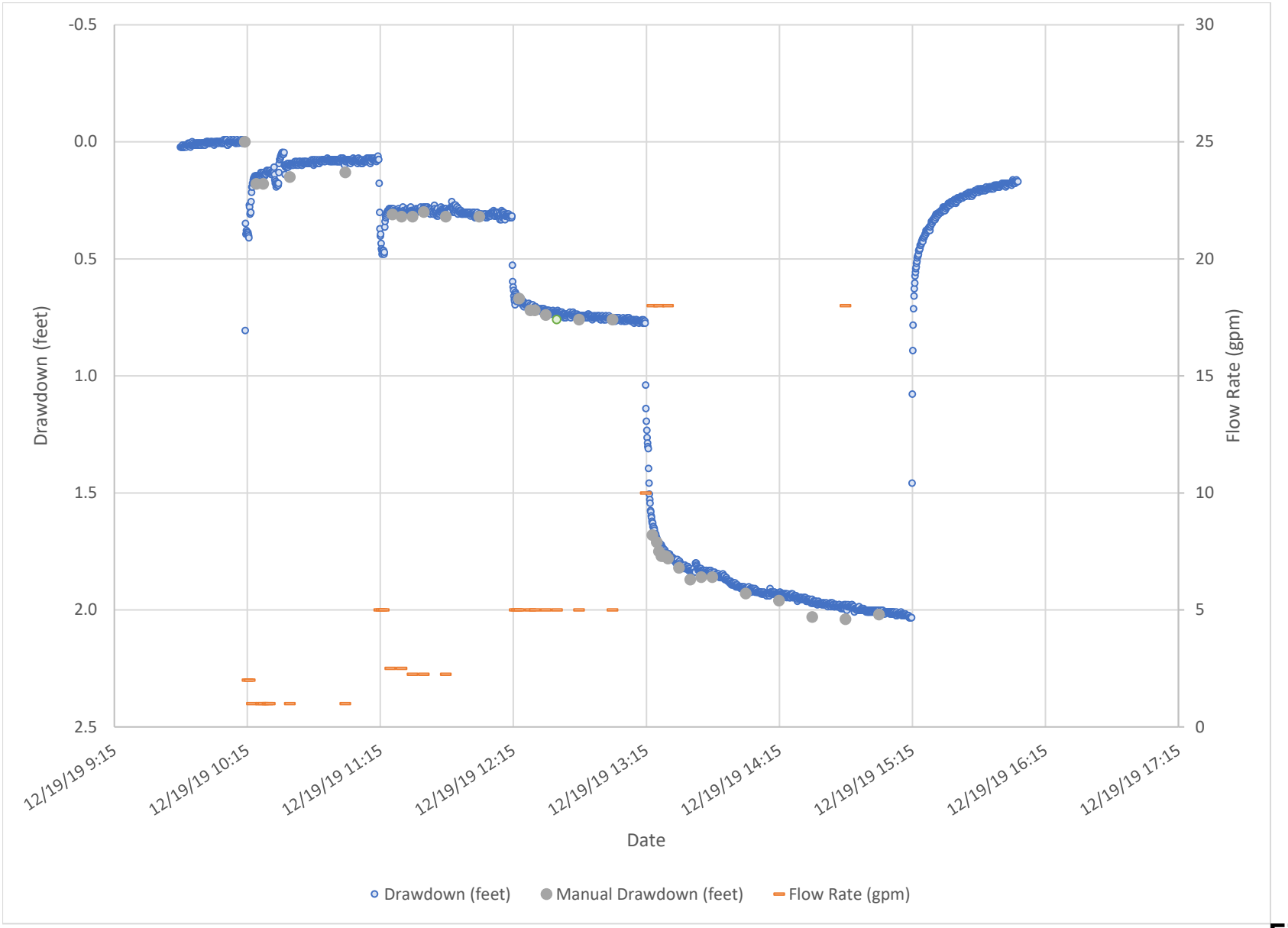


Figure 10

Bear Creek Pumping Test Hydrograph

Managed Aquifer Recharge Field Investigation

WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting

6/19/2020

V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

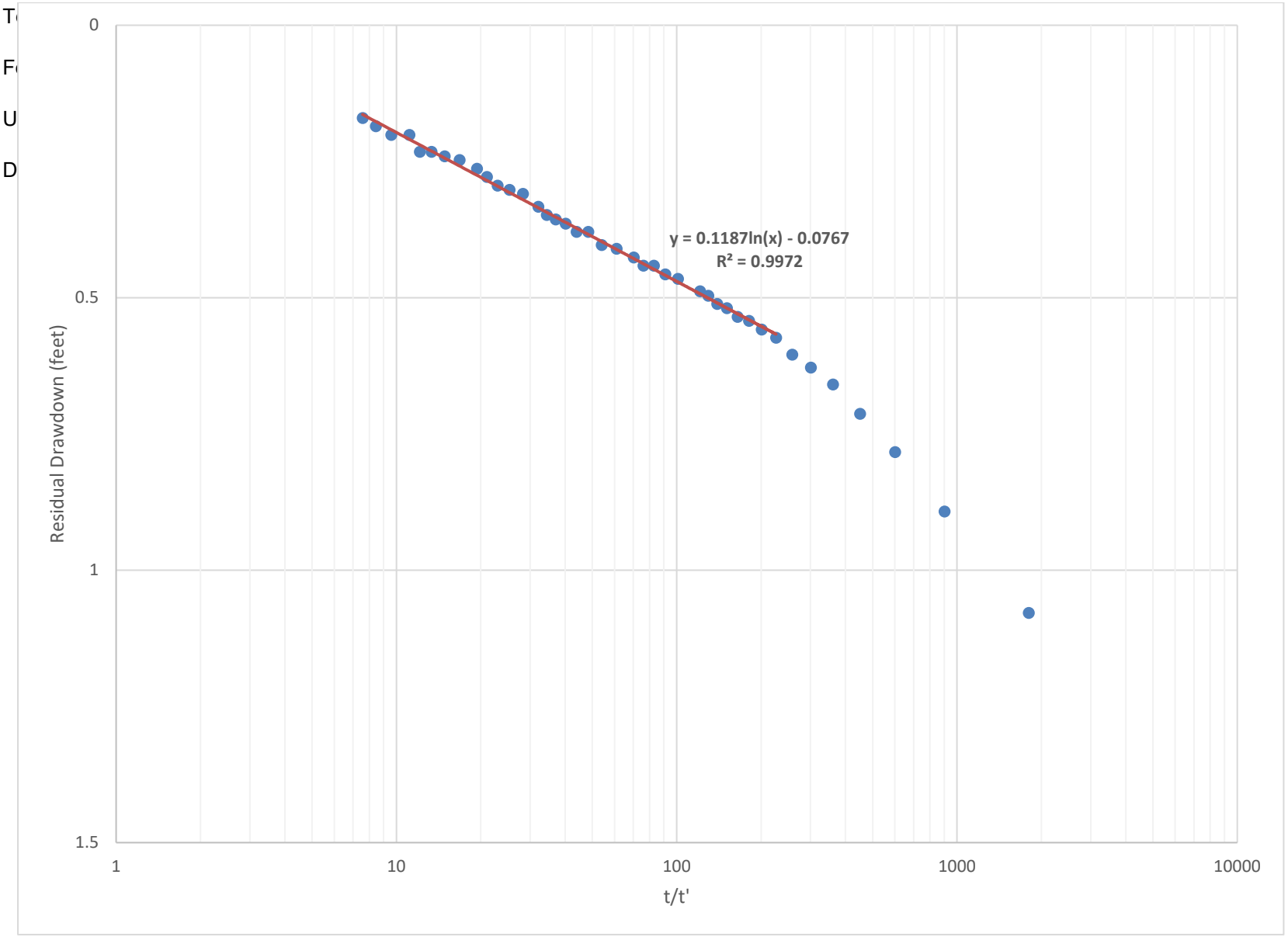


Figure 11
Bear Creek Theis Recovery Analysis
Managed Aquifer Recharge Field Investigation
WRIA 55 ESSB 6091/RCW 90.94 Watershed Plan Update

Aspect Consulting
6/19/2020
V:\180249 WRIA 55 Watershed Plan Update\Deliverables\MAR Field Report\Final\Figures\05 - 11 Figures_jms

ATTACHMENT 1

Exploration Logs

DEPARTMENT OF ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:

☒ Construction
☐ Decommission ⇨ Original NOI No. _____

Ecology Well ID Tag No. BKW - 221

Site Well Name _____

Consulting Firm _____

Was a variance approved for this well/boring? ☐ Yes ☒ No

If yes, what was the variance for? _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer

Name (Print Last, First Name) Jim McLeslie

Driller/Engineer/Trainee Signature Jim McLeslie

License No. 2871

Company Name H2O Well Service Inc.

If trainee box is checked, sponsor's license number: _____

Sponsor's signature _____

Notice of Intent No. RE18500

Type of Well:

☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other _____
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling

Property Owner Spokane County

Well Street Address E. Nelson Rd.

City Elk County Spokane

Tax Parcel No. 49231.9056

Location (see instructions): WWM ☐ or EWM ☒

SW ¼-¼ NE ¼, Section 23 Town 29N Range 44E

Latitude (Example: 47.12345) _____

Longitude (Example: -120.12345) _____

(WGS 84 Coordinate System)

Borehole diameter 8" inches Casing diameter 4" inches

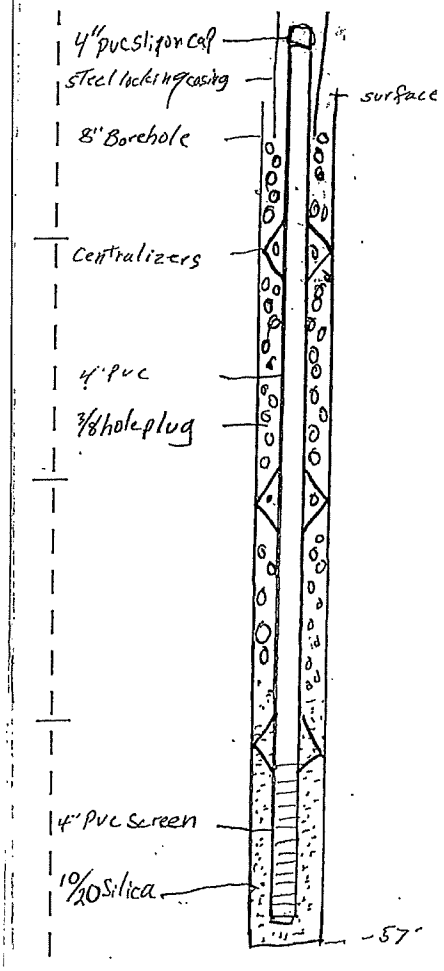
Static water level 0' ft below top of casing Date 12/13/19

☒ Above-ground completion with bollards ☐ Flush monument

↳ Stick-up of top of well casing 3 ft above ground surface

Start Date 12/12//2019 Completed Date 12/13/2019

Construction Design



Well Data

8" Bore Hole to 57'

4" PVC +3 to 52'

4" PVC Screen .10 Slot set @ 42' to 52'

4" PVC Threaded end cap

4" PVC Slip on cap

(3) 4" Centralizers

10/20 Silica sand -38' to 57'

3/8 Holeplug from surface to -38' to 0'

Monument, 6" Steel +3' to -3'

Driller's Log

0' - 3'	Top Soil
3' - 27'	Tan Sand
27' - 52'	Sand & Some Gravel
52' - 57'	Granite

modation including materials in a format for the visually impaired, call Ecology Water Resources
' hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

DEPARTMENT OF ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:

☒ Construction
☐ Decommission ⇨ Original NOI No. _____

Ecology Well ID Tag No. BKW - 220

Site Well Name _____

Consulting Firm _____

Was a variance approved for this well/boring? ☐ Yes ☒ No

If yes, what was the variance for? _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer

Name (Print Last, First Name) Jim McLeslie

Driller/Engineer/Trainee Signature Jim McLeslie

License No. 2871

Company Name H2O Well Service Inc.

If trainee box is checked, sponsor's license number: _____

Sponsor's signature _____

Notice of Intent No. RE18501

Type of Well:

☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other _____
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling

Property Owner Spokane County

Well Street Address S. Deer Park Milan Rd.

City Deer Park County Spokane

Tax Parcel No. 39342.9072

Location (see instructions): WWM ☐ or EWM ☒

SE ¼-¼ NW ¼, Section 34 Town 29N Range 43E

Latitude (Example: 47.12345) 47.96775

Longitude (Example: -120.12345) 117.36412

(WGS 84 Coordinate System)

Borehole diameter 8" inches Casing diameter 4" inches

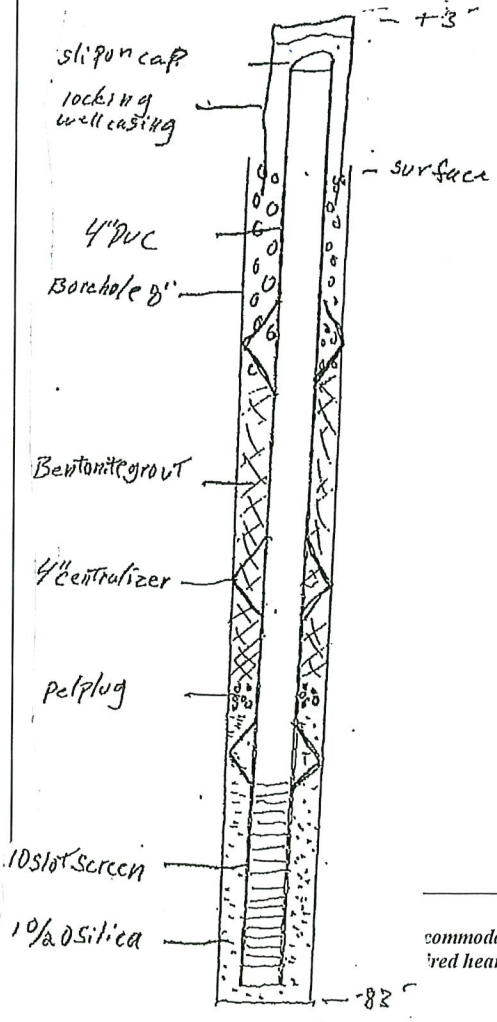
Static water level 73' ft below top of casing Date 12/12/2019

☒ Above-ground completion with bollards ☐ Flush monument

↳ Stick-up of top of well casing 3 ft above ground surface

Start Date 12/9/2019 Completed Date 12/12/2019

Construction Design



Well Data

8" Bore Hole completed at 83'

4" PVC +3 to 72.5'

4" PVC Screen .10 Slot set @ 72.5' to 82.5'

4" PVC Threaded end cap

4" PVC Slip on cap

(4) 4" Centralizers

10/20 Silica sand -68' to 83'

Pel Plug -67' to 68'

Bentonite grout -5' to 67'

3/8 Holeplug from surface to -5'

Driller's Log

0' - 1'	Top Soil
1' - 6'	Gravels
6' - 7'	Boulder
7'-23'	Large Gravels
23'-27'	Clay & Sand
27'-48'	Sand & Some Gravels
48'-55'	Fine Sand
55'-85'	Coarse Sand
85'-87'	Granite

commodation including materials in a format for the visually impaired, call Ecology Water Resources
ired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Excavation Log	
	Project Address & Site Specific Location Spokane, Deadman Creek		*Coordinates (Lat,Lon WGS84)* 47.7704, -117.2827 (est)	*Exploration Number* **FD-S**
Contractor SES	*Equipment* Excavator or Backhoe	*Sampling Method* Grab	*Ground Surface Elev.* 1875' (est)	
Operator	*Exploration Method(s)* Backhoe or trackhoe	*Work Start/Completion Dates* 10/20/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
1	1874						SILT (ML); soft, dry, brown	1
2	1873							2
3	1872						SILT (ML); soft, dry, yellow-brown	3
4	1871							4
5	1870	Open hole, backfilled with excavator.						5
6	1869							6
7	1868						SILT WITH SAND (ML); stiff, slight moisture, yellow-brown; minor calcium precipitate, platty structure.	7
8	1867							8
9	1866							9
10	1865						CLAY (CH); stiff, slight moisture, yellow-brown; granular/massive.	10
11	1864							11
12	1863							12
13	1862						Bottom of exploration at 13 ft. bgs.	13
14	1861							14
15	1860							15
16	1859							16
17	1858							17
18	1857							18
19	1856							19
20	1855							20
21	1854							21
22	1853							22
23	1852							23
24	1851							24

Legend

Sample Type

Water Level — No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log FD-S
Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING

Little Spokane Watershed Planning - 180249

Excavation Log

Project Address & Site Specific Location	Coordinates (Lat,Lon WGS84)	Exploration Number
Spokane, Nelson Rd and Dry Creek	47.9970, -117.2081 (est)	**ND-S**

Contractor	Equipment	Sampling Method	Ground Surface Elev.
SES	Excavator or Backhoe	Grab	2373' (est)

Operator	Exploration Method(s)	Work Start/Completion Dates	Top of Casing Elev.	Depth to Water (Below GS)
	Backhoe or trackhoe	10/22/2019	NA	No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
1	2372						SAND WITH GRAVEL (SP); loose, dry, light brown; trace silt.	1
2	2371	Open hole, backfilled with excavator.						2
3	2370		ND-S-03	150275 PS	OC=0.86% FC=1.1% D50=5.8mm			3
4	2369						Bottom of exploration at 4 ft. bgs.	4
5	2368							5
6	2367							6
7	2366							7
8	2365							8
9	2364							9
10	2363							10
11	2362							11
12	2361							12
13	2360							13
14	2359							14
15	2358							15
16	2357							16
17	2356							17
18	2355							18
19	2354							19
20	2353							20
21	2352							21
22	2351							22
23	2350							23
24	2349							24

Legend

Sample Type: Grab sample

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log ND-S

Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Little Spokane Watershed Planning - 180249

Monitoring Well Log

Aspect CONSULTING

Project Address & Site Specific Location	Coordinates (Lat,Lon WGS84)	Exploration Number
Spokane, Nelson Rd and Dry Creek	47.9969, -117.2081 (est)	**ND1**

Contractor	Equipment	Sampling Method	Ground Surface Elev.
H2O Drilling	Rotary drill rig	Grab	2370' (est)

Operator	Exploration Method(s)	Work Start/Completion Dates	Top of Casing Elev.	Depth to Water (Below GS)
	Air rotary	12/13/2019	NA	No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
							hard, dry, brown; bare ground.	
1	2369						SAND (SW); loose, dry, gray brown	1
2	2368							2
3	2367	4" PVC from +3' to 52'						3
4	2366							4
5	2365							5
6	2364							6
7	2363							7
8	2362							8
9	2361							9
10	2360							10
11	2359						SAND WITH GRAVEL (SW); loose, dry, gray brown; thin gravel bed, angular fine gravel.	11
12	2358							12
13	2357							13
14	2356							14
15	2355							15
16	2354						SAND (SW); loose, dry, gray brown; fine to coarse, subangular gravel.	16
17	2353							17
18	2352							18
19	2351							19
20	2350							20
21	2349						SAND (SW); loose, dry, gray brown	21
22	2348							22
23	2347							23
24	2346							24

Legend

Sample Type: ☑ Grab sample

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log ND1

Sheet 1 of 3

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Nelson Rd and Dry Creek		*Coordinates (Lat,Lon WGS84)* 47.9969, -117.2081 (est)	*Exploration Number* **ND1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 2370' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/13/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
26	2344						SAND WITH GRAVEL (SW); loose, dry, gray brown; angular, fine gravel.	26
27	2343							27
28	2342							28
29	2341							29
30	2340							30
31	2339						SAND WITH GRAVEL (SW); medium dense, dry, gray brown	31
32	2338							32
33	2337							33
34	2336							34
35	2335							35
36	2334						SAND WITH GRAVEL (SW); dense, dry, gray brown; [GRUSS].	36
37	2333							37
38	2332							38
39	2331							39
40	2330							40
41	2329							41
42	2328							42
43	2327							43
44	2326	0.10 screen slot						44
45	2325	10/20 Sand	ND1-S-45	ND1-S-45 PS	OC=1.6% FC=7.9% D50=5.8mm			45
46	2324							46
47	2323							47
48	2322							48
49	2321							49

Legend

Sample Type: Grab sample

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log ND1

Sheet 2 of 3

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Nelson Rd and Dry Creek		*Coordinates (Lat,Lon WGS84)* 47.9969, -117.2081 (est)	*Exploration Number* **ND1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 2370' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/13/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
51	2319						SAND WITH GRAVEL (SW); dense, dry, gray brown; [GRUSS]. (continued)	51
52	2318						FELSIC IGNEOUS BEDROCK; dense, dry; granite.	52
53	2317							53
54	2316							54
55	2315							55
56	2314							56
57	2313						Bottom of exploration at 57 ft. bgs.	57
58	2312							58
59	2311							59
60	2310							60
61	2309							61
62	2308							62
63	2307							63
64	2306							64
65	2305							65
66	2304							66
67	2303							67
68	2302							68
69	2301							69
70	2300							70
71	2299							71
72	2298							72
73	2297							73
74	2296							74

Legend

Sample Type: ☑ Grab sample

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log ND1

Sheet 3 of 3

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Excavation Log	
	Project Address & Site Specific Location Spokane, Deer Park and N. Finley RD		*Coordinates (Lat,Lon WGS84)* 47.9676, -117.3645 (est)	*Exploration Number* **MB-S**
Contractor SES	*Equipment* Excavator or Backhoe	*Sampling Method* Grab	*Ground Surface Elev.* 1962' (est)	
Operator	*Exploration Method(s)* Backhoe or trackhoe	*Work Start/Completion Dates* 10/21/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
1	1961						GRAVEL WITH SAND AND COBBLES (GP); loose, dry, brown; oxidized hardpan.	1
2	1960							2
3	1959	Open hole, backfilled with excavator.	MB-S-03	PS	OC=1.96% FC=11% D50=5.8mm			3
4	1958							4
5	1957							5
6	1956						GRAVEL WITH COBBLES AND BOULDERS (GW); loose, dry, brown Bottom of exploration at 6 ft. bgs.	6
7	1955							7
8	1954							8
9	1953							9
10	1952							10
11	1951							11
12	1950							12
13	1949							13
14	1948							14
15	1947							15
16	1946							16
17	1945							17
18	1944							18
19	1943							19
20	1942							20
21	1941							21
22	1940							22
23	1939							23
24	1938							24

Legend

Sample Type: Grab sample

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log MB-S

Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Deer Park and N. Finley RD		*Coordinates (Lat,Lon WGS84)* 47.9674, -117.3649 (est)	*Exploration Number* **MB1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 1956' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/9/2019 to 12/12/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 70.95' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
1	1955	4" PVC form +3' to 82.5'					GRAVEL (GP); dense, dry, brown; gravel lot.	1
2	1954						GRAVEL WITH SILT (GP-GM); dense, dry, brown; minor silt.	2
3	1953						GRAVEL WITH SILT AND COBBLES (GP-GM); dense, dry, brown	3
4	1952							4
5	1951							5
6	1950							6
7	1949						GRAVEL WITH COBBLES AND BOULDERS (GW); dense, dry, brown; granitic boulders.	7
8	1948						GRAVEL WITH SILT (GW-GM); dense, dry, brown; fine to coarse, basaltic and granitic gravel.	8
9	1947							9
10	1946							10
11	1945							11
12	1944							12
13	1943							13
14	1942							14
15	1941							15
16	1940							16
17	1939							17
18	1938							18
19	1937							19
20	1936							20
21	1935							21
22	1934							22
23	1933						CLAY WITH SAND (CH); soft, moist, red brown; trace medium, sub angular sand.	23
24	1932							24

Legend

Sample Type

Water Level
- Static Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log MB1
Sheet 1 of 4

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Deer Park and N. Finley RD		*Coordinates (Lat,Lon WGS84)* 47.9674, -117.3649 (est)	*Exploration Number* **MB1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 1956' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/9/2019 to 12/12/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 70.95' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
26	1930						CLAY WITH SAND (CH); soft, moist, red brown; trace medium, sub angular sand. (continued)	26
27	1929						CLAYEY SAND (SC); soft, slight moisture, brown-yellow; trace non-plastic fines; subangular sand.	27
28	1928							28
29	1927							29
30	1926							30
31	1925							31
32	1924							32
33	1923							33
34	1922							34
35	1921							35
36	1920							36
37	1919							37
38	1918							38
39	1917							39
40	1916							40
41	1915							41
42	1914							42
43	1913							43
44	1912							44
45	1911							45
46	1910							46
47	1909						CLAYEY SAND (SC); soft, dry; weathered granite, [GRUSS].	47
48	1908							48
49	1907						SAND (SW); med. dense, slight moisture, light brown; fine to coarse, subangular sand; trace medium gravel; [GRUSS]	49

Legend

Sample Type

Water Level
- Static Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log MB1

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Deer Park and N. Finley RD		*Coordinates (Lat,Lon WGS84)* 47.9674, -117.3649 (est)	*Exploration Number* **MB1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 1956' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/9/2019 to 12/12/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 70.95' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
51	1905						SAND (SW); med. dense, slight moisture, light brown; fine to coarse, subangular sand; trace medium gravel; [GRUSS] (continued)	51
52	1904							52
53	1903							53
54	1902							54
55	1901							55
56	1900						CLAYEY SAND (SC); medium stiff, slight moisture, brown; thin beds of clay throught unit [GRUSS]	56
57	1899							57
58	1898							58
59	1897							59
60	1896							60
61	1895							61
62	1894							62
63	1893							63
64	1892							64
65	1891						SAND (SW); med. dense, moist to very moist, brown; fine to medium, subangular sand; [GRUSS].	65
66	1890							66
67	1889							67
68	1888							68
69	1887							69
70	1886							70
71	1885	▼ 12/16/2019						71
72	1884							72
73	1883							73
74	1882							74

Legend

Sample Type

Water Level
- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log MB1

Aspect CONSULTING	Little Spokane Watershed Planning - 180249		Monitoring Well Log	
	Project Address & Site Specific Location Spokane, Deer Park and N. Finley RD		*Coordinates (Lat,Lon WGS84)* 47.9674, -117.3649 (est)	*Exploration Number* **MB1**
Contractor H2O Drilling	*Equipment* Rotary drill rig	*Sampling Method* Grab	*Ground Surface Elev.* 1956' (est)	
Operator	*Exploration Method(s)* Air rotary	*Work Start/Completion Dates* 12/9/2019 to 12/12/2019	*Top of Casing Elev.* NA	*Depth to Water (Below GS)* 70.95' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
76	1880	▽ 12/9/2019					SAND (SW); med. dense, moist to very moist, brown; fine to medium, subangular sand; [GRUSS]. (continued)	76
77	1879						SAND (SW); med. dense, wet, brown; [GRUSS]	77
78	1878							78
79	1877							79
80	1876	0.10 screen slot						80
81	1875	10/20 Sand						81
82	1874							82
83	1873							83
84	1872						FELSIC IGNEOUS BEDROCK; Granite	84
85	1871							85
86	1870							86
87	1869						Bottom of exploration at 87 ft. bgs.	87
88	1868							88
89	1867							89
90	1866							90
91	1865							91
92	1864							92
93	1863							93
94	1862							94
95	1861							95
96	1860							96
97	1859							97
98	1858							98
99	1857							99

Legend

Sample Type

Water Level
- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: Jason Shira
Approved by:

Exploration Log MB1
Sheet 4 of 4

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\180249-LITTLESPOKANE.GPJ February 12, 2020

ATTACHMENT 2

Photograph Log

Photograph 1. Bear Creek surface water station. The photograph shows the use of a peristaltic pump to collect total and field filtered water quality samples.

Photograph 2. Deadman Creek Site Soil Profile. Changes in color correspond with change from sandy silt to silt to fat clay with depth.

Photograph 3. Dry Creek Site Soil Profile. Photo shows crossbedding in the top portion of photo. Over excavation revealed lateral spreading of the wetting front in the soil profile. The water spread at the contact between forest and bottom set likely due to a change in vertical hydraulic conductivity.

Photograph 4. Bear Creek Site Soil Profile. The photo shows the coarsening with depth and relatively clean gravels below a surface horizon that contained a hardpan layer comprised of iron oxides at 2 feet bgs.

ATTACHMENT 3

Laboratory Results

Anatek Labs, Inc.

E 504 Sprague Ave., Suite D
Spokane WA 99202
(509) 838-3999 F: (509) 838-4433

Invoice

DATE	12/24/2019
INVOICE #	191218097
TERMS	Due on receipt
DUE DATE	12/24/2019

PAID 12/31/2019

BILL TO

ASPECT CONSULTING LLC
123 E. YAKIMA AVE SUITE 200
YAKIMA WA 98902

PROJECT MANAGER	PURCHASE ORDER	Account #	PROJECT
	180249		LITTLE SPOKANE RIVER OFF...

ITEM	DESCRIPTION	QUANTITY	RATE	AMOUNT
WS COLIFOR...	TOTAL COLIFORM BACTERIA IN WATER BY SM 9221B MPN/MTF	3	40.00	120.00
WS ECOLI	E. COLI (MPN/MTF) IN WATER BY SM 9221B/SM 9221E	3	20.00	60.00

THANK YOU FOR YOUR BUSINESS!

Total	$180.00
Payments/Credits	-$180.00
Balance Due	$0.00

PLEASE REFERENCE INVOICE NUMBER WITH YOUR PAYMENT. 1.75% MONTHLY INTEREST CHARGED ON OVERDUE INVOICES.

Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	ASPECT CONSULTING, LLC.	**Batch #:**	191218097
Address:	123 E YALINA AVE, STE 200 YAKIMA, WA 98902	**Project Name:**	LITTLE SPOKANE RIVER OFFSET 180249
Attn:	CARL EINBERGER		

Analytical Results Report

Sample Number	191218097-001	**Sampling Date**	12/18/2019	**Date/Time Received**	12/18/2019 4:40 PM
Client Sample ID	MB-SW-191218	**Sampling Time**	10:45 AM	**Extraction Date**	
Matrix	Water	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
E. Coli	2.0	MPN/100 mL	1.8	12/21/2019 2:06:00 PM	MMS	SM9221F	
Total Coliform	350	MPN/100mL	1.8	12/23/2019 9:00:00 AM	TLM	SM9221B	

Sample Number	191218097-002	**Sampling Date**	12/18/2019	**Date/Time Received**	12/18/2019 4:40 PM
Client Sample ID	MB2-GW-191218	**Sampling Time**	1:00 PM	**Extraction Date**	
Matrix	Water	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
E. Coli	<1.8	MPN/100 mL	1.8	12/20/2019 4:05:00 PM	MMS	SM9221F	
Total Coliform	<1.8	MPN/100mL	1.8	12/20/2019 4:05:00 PM	MMS	SM9221B	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: ASPECT CONSULTING, LLC.
Address: 123 E YALINA AVE, STE 200
YAKIMA, WA 98902
Attn: CARL EINBERGER

Batch #: 191218097
Project Name: LITTLE SPOKANE RIVER OFFSET 180249

Analytical Results Report

Sample Number	191218097-003	**Sampling Date**	12/18/2019	**Date/Time Received**	12/18/2019 4:40 PM
Client Sample ID	MD-SW-191218	**Sampling Time**	3:00 PM	**Extraction Date**	
Matrix	Water	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
E. Coli	79	MPN/100 mL	1.8	12/21/2019 2:06:00 PM	MMS	SM9221F	
Total Coliform	170	MPN/100mL	1.8	12/23/2019 9:00:00 AM	TLM	SM9221B	

Authorized Signature Kathleen A. Sattler

Kathleen A. Sattler, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

This report shall not be reproduced except in full, without the written approval of the laboratory.
The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Login Report

Customer Name: ASPECT CONSULTING, LLC.
123 E YALINA AVE, STE 200
YAKIMA WA 98902

Order ID: 191218097
Order Date: 12/18/2019

Contact Name: CARL EINBERGER
Comment:

Project Name: LITTLE SPOKANE RIVER OFFICE 180249

Sample #: 191218097-001 **Customer Sample #:** MB-SW-191218

Recv'd: ☑ **Matrix:** Water **Collector:** JASON SCHIVA **Date Collected:** 12/18/2019
Quantity: 1 **Date Received:** 12/18/2019 4:40:00 PM **Time Collected:** 10:45 AM
Comment:

Test	Lab	Method	Due Date	Priority
BACT - E COLI	S	SM9221F	12/31/2019	***Normal (~10 Days)***
BACT - TOTAL COLIFORMS	S	SM9221B	12/31/2019	***Normal (~10 Days)***

Sample #: 191218097-002 **Customer Sample #:** MB2-GW-191218

Recv'd: ☑ **Matrix:** Water **Collector:** JASON SCHIVA **Date Collected:** 12/18/2019
Quantity: 1 **Date Received:** 12/18/2019 4:40:00 PM **Time Collected:** 1:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
BACT - E COLI	S	SM9221F	12/31/2019	***Normal (~10 Days)***
BACT - TOTAL COLIFORMS	S	SM9221B	12/31/2019	***Normal (~10 Days)***

Sample #: 191218097-003 **Customer Sample #:** MD-SW-191218

Recv'd: ☑ **Matrix:** Water **Collector:** JASON SCHIVA **Date Collected:** 12/18/2019
Quantity: 1 **Date Received:** 12/18/2019 4:40:00 PM **Time Collected:** 3:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
BACT - E COLI	S	SM9221F	12/31/2019	***Normal (~10 Days)***
BACT - TOTAL COLIFORMS	S	SM9221B	12/31/2019	***Normal (~10 Days)***

Customer Name: ASPECT CONSULTING, LLC.

123 E YALINA AVE, STE 200

YAKIMA WA 98902

Order ID: 191218097

Order Date: 12/18/2019

Contact Name: CARL EINBERGER

Project Name: LITTLE SPOKANE RIVER OFFICE 180249

Comment:

SAMPLE CONDITION RECORD

Samples received in a cooler?	No
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	12.6
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Labels and chain agree?	Yes
Total number of containers?	3

Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

91218 097 ASPT Last Due 12/31/2019
1st SAMP 12/18/201 1st RCVD 12/18/2019
LITTLE SPOKANE RIVER OFFSET
180249

Company Name: Aspect Consulting, LLC	Project Manager: Carl Einberger
Address: 123 E. Yakima Ave Suite 200	Project Name & #: Little Spokane River Offset 180249
City: Yakima State: WA Zip: 98902	Email Address: jshira@aspectconsulting.com
Phone: (509) 895-5470	Purchase Order #:
Fax:	Sampler Name & phone: Jason Shira 509 895-5470

Turn Around Time & Reporting

Please refer to our normal turn around times at:
http://www.anateklabs.com/services/guidelines/reporting.asp

✓Normal
__Next Day*
__2nd Day*
__Other*_____

*All rush order requests must be prior approved.

__Phone
__Mail
__Fax
✓Email

Note Special Instructions/Comments

SWBS

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Preservative: Total (o)	Preservative: E.C. Li
	MB-SW-191218	12/18/19	10:45 W	1			
	MB1-GW-191218	"	13:00	1			
	MD-SW-191218	"	15100	1		↓	↓

Inspection Checklist

Received Intact?	(Y)	N
Labels & Chains Agree?	(Y)	N
Containers Sealed?	(Y)	N
VOC Head Space?	~~Y~~	~~N~~

wl/ice/ni:
Temperature (°C): 12.6 °D3-04 Rm
Preservative:
Date & Time: 12-18-19 1700
Inspected By: WG

	Printed Name	Signature	Company	Date	Time
Relinquished by	Jason Shira		Aspect	12/18/19	16:40
Received by	Brock Grenger	Brock Grenger	Anatek	12-18-19	1640
Relinquished by					
Received by					
Relinquished by					
Received by					

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil.	**W.O. #:**	156031
Source:	ND-S-03	**Lab #:**	150275

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"			
1"			
3/4"			
5/8"			
1/2"	100%		
3/8"	98.5%		
1/4"			
#4	84.1%		
#8			
#10	50.5%		
#16			
#20	14.8%		
#30			
#40	4.1%		
#50			
#60			
#80	1.7%		
#100	1.5%		
#200	1.1%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:	
% Gravel:	15.9
% Sand:	83.0
% Silt & Clay:	1.1
Moisture Content:	

Organic Matter ASTM D2974

0.86%

Cation Exchange Capacity EPA 9081

7.6 meq/100g

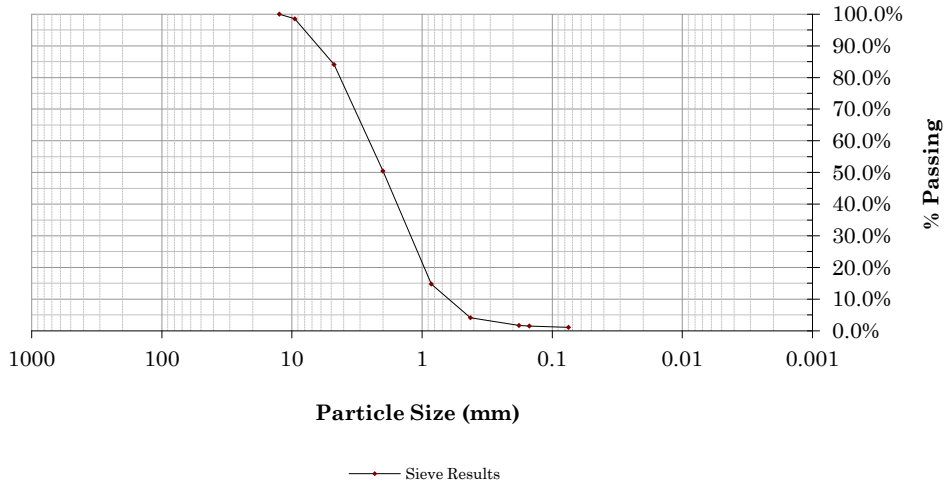
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil	**W.O. #:**	156031
Source:	MD-S-03	**Lab #:**	150276

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"	100%		
1"	92%		
3/4"	81%		
5/8"			
1/2"	69%		
3/8"	57.6%		
1/4"			
#4	36.9%		
#8			
#10	20.6%		
#16			
#20	14.9%		
#30			
#40	13.5%		
#50			
#60			
#80	12.3%		
#100	12.1%		
#200	11.0%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:

% Gravel: 63.1

% Sand: 25.9

% Silt & Clay: 11.0

Moisture Content:

Organic Matter ASTM D2974

1.96%

Cation Exchange Capacity EPA 9081

12.1 meq/100g

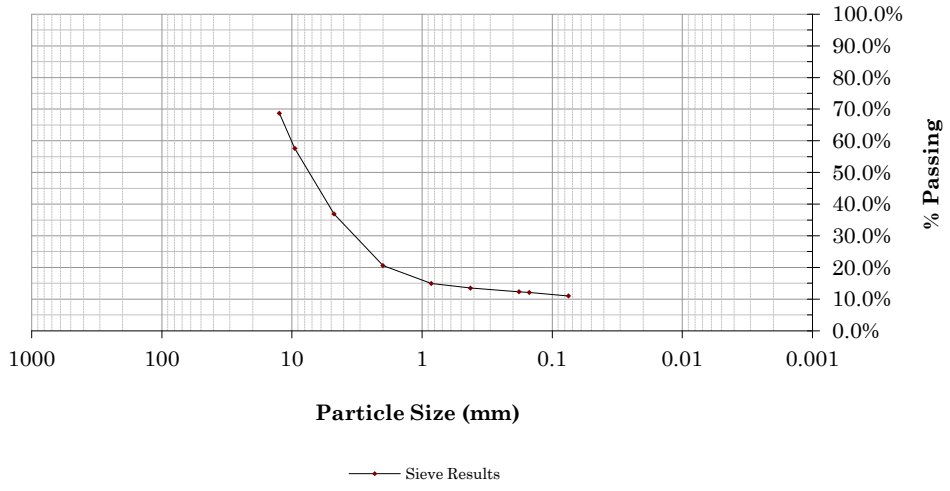
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil	**W.O. #:**	156031
Source:	ND-S-45	**Lab #:**	150277

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"			
1"			
3/4"			
5/8"			
1/2"			
3/8"			
1/4"	100.0%		
#4	97.7%		
#8			
#10	76.1%		
#16			
#20	42.1%		
#30			
#40	23.7%		
#50			
#60			
#80	12.4%		
#100	11.0%		
#200	7.9%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:	
% Gravel:	2.3
% Sand:	89.8
% Silt & Clay:	7.9
Moisture Content:	

Organic Matter ASTM D2974

1.60^%

Cation Exchange Capacity EPA 9081

5.3 meq/100g

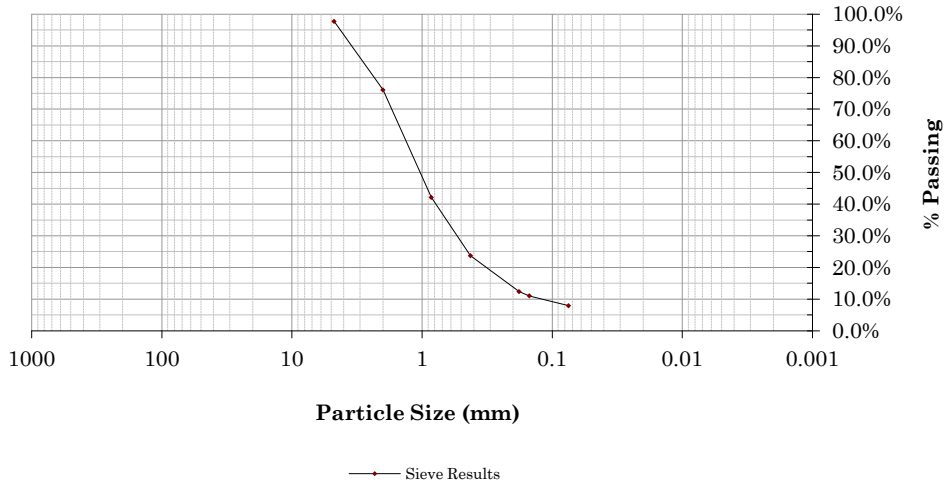
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil.	**W.O. #:**	156031
Source:	ND-S-03	**Lab #:**	150275

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"			
1"			
3/4"			
5/8"			
1/2"	100%		
3/8"	98.5%		
1/4"			
#4	84.1%		
#8			
#10	50.5%		
#16			
#20	14.8%		
#30			
#40	4.1%		
#50			
#60			
#80	1.7%		
#100	1.5%		
#200	1.1%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:	
% Gravel:	15.9
% Sand:	83.0
% Silt & Clay:	1.1
Moisture Content:	

Organic Matter ASTM D2974

0.86%

Cation Exchange Capacity EPA 9081

7.6 meq/100g

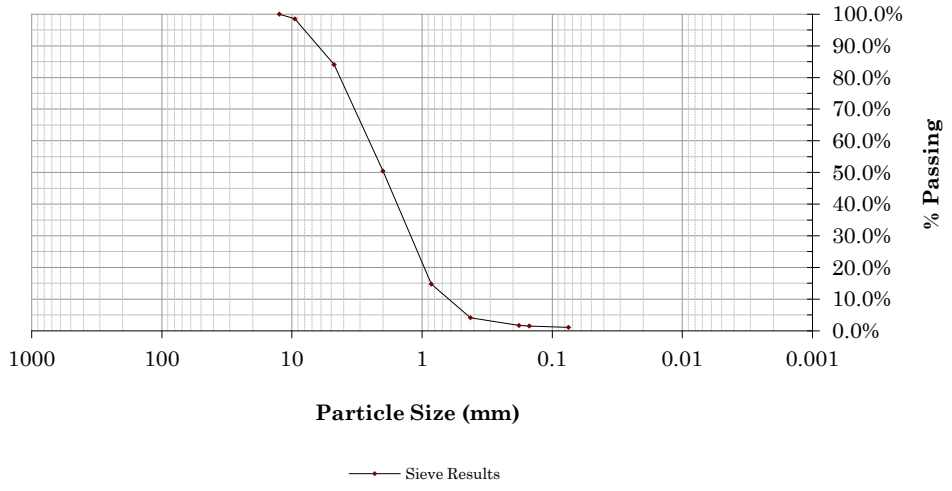
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil	**W.O. #:**	156031
Source:	MD-S-03	**Lab #:**	150276

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"	100%		
1"	92%		
3/4"	81%		
5/8"			
1/2"	69%		
3/8"	57.6%		
1/4"			
#4	36.9%		
#8			
#10	20.6%		
#16			
#20	14.9%		
#30			
#40	13.5%		
#50			
#60			
#80	12.3%		
#100	12.1%		
#200	11.0%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:

% Gravel: 63.1

% Sand: 25.9

% Silt & Clay: 11.0

Moisture Content:

Organic Matter ASTM D2974

1.96%

Cation Exchange Capacity EPA 9081

12.1 meq/100g

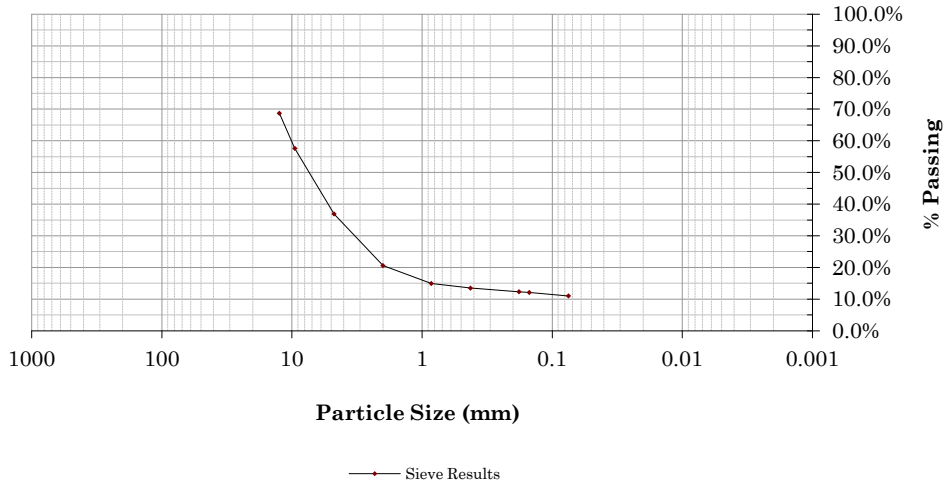
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

LABORATORY SIEVE ANALYSIS

Northern, Inc.

Project:	# 180249	**Date Sampled:**	1/6/20
Client:	Aspect Consulting	**Job #:**	Y19-450
Material:	Soil	**W.O. #:**	156031
Source:	ND-S-45	**Lab #:**	150277

Sieve Size	Percent Passing	Specifications Minimum	Specifications Maximum
4"			
3"			
2"			
1 3/4"			
1 1/2"			
1 1/4"			
1"			
3/4"			
5/8"			
1/2"			
3/8"			
1/4"	100.0%		
#4	97.7%		
#8			
#10	76.1%		
#16			
#20	42.1%		
#30			
#40	23.7%		
#50			
#60			
#80	12.4%		
#100	11.0%		
#200	7.9%		

Sieve Analysis Data: ASTM D6913/ D1140

Fineness Modulus:	
% Gravel:	2.3
% Sand:	89.8
% Silt & Clay:	7.9
Moisture Content:	

Organic Matter ASTM D2974

1.60^%

Cation Exchange Capacity EPA 9081

5.3 meq/100g

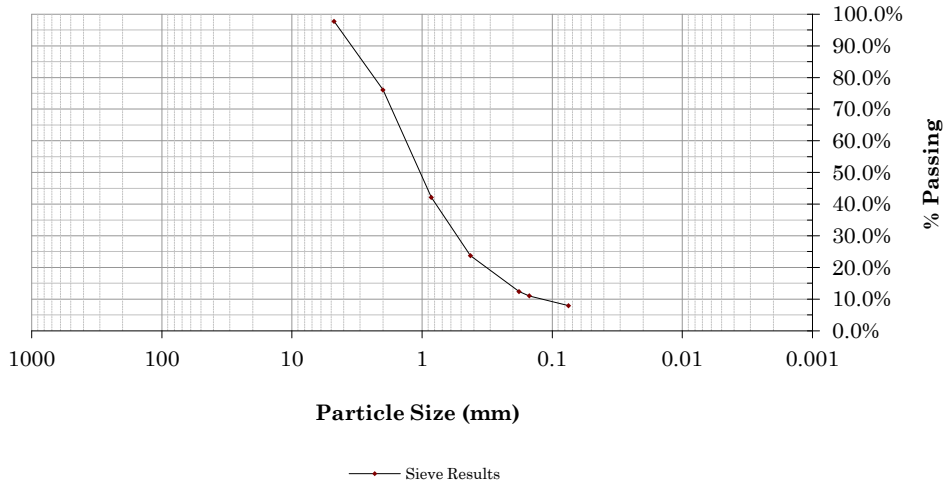
Gradation Coeffecient of Uniformity Cu

%passing	sieve (mm)
D10 :	0.5
D30 :	2.2
D60 :	5.8

C_u: 11.6

C_c: 1.7

Grain Size Distribution



Reviewed by: _____ **Date:** _____

One Government Gulch - PO Box 929
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(208) 784-1258
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Aspect Consulting	**Project Name: Routine / No Project**
123 E Yakima Avenue Suite 200	Work Order: **X9L0363**
Yakima, WA 98901	Reported: 10-Feb-20 16:45

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received	Notes
MB-SW-191218	X9L0363-01	Surface Water	18-Dec-19 10:15	JS	19-Dec-2019	
MB1-GW-191218	X9L0363-02	Ground Water	18-Dec-19 13:00	JS	19-Dec-2019	
ND-SW-191218	X9L0363-03	Surface Water	18-Dec-19 15:00	JS	19-Dec-2019	
MB-S-03	X9L0363-04	Soil	21-Oct-19 00:00	JS	19-Dec-2019	
ND-S-03	X9L0363-05	Soil	23-Oct-19 00:00	JS	19-Dec-2019	
ND1-S-45	X9L0363-06	Soil	13-Dec-19 00:00	JS	19-Dec-2019	
SCWR01-191218	X9L0363-07	Water	18-Dec-19 13:30	JS	19-Dec-2019	

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.
Sample preparation is defined by the client as per their Data Quality Objectives.
This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.
Analyses were performed in accordance with SVL standard operating procedures and calibrations were performed and met SVL internal QC criteria.
The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted.

Case Narrative: X9L0363

SVL is not accredited in the state of Washington for T 6010D P.

CRW 1/16/20 This report is reissued, adding 200.7 TR and D Sn for sample -02.

CRW 2/10/20 This report is reissued, changing the solid samples to report on a dry-weight basis.

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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **MB-SW-191218**
SVL Sample ID: **X9L0363-01 (Surface Water)**

Sampled: 18-Dec-19 10:15
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953018	JFB	01/03/20 13:27	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		X952158	KH	01/03/20 14:43	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0004		X952158	KH	01/03/20 14:43	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0008		X952158	KH	01/03/20 14:43	
EPA 200.7	**Calcium**	44.7	mg/L	0.100	0.035		X952158	KH	01/03/20 14:43	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0010		X952158	KH	01/03/20 14:43	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0014		X952158	KH	01/03/20 14:43	
EPA 200.7	Iron	< 0.100	mg/L	0.100	0.028		X952158	KH	01/03/20 14:43	
EPA 200.7	**Magnesium**	8.71	mg/L	0.50	0.04		X952158	KH	01/03/20 14:43	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0012		X952158	KH	01/03/20 14:43	
EPA 200.7	**Potassium**	2.29	mg/L	0.50	0.09		X952158	KH	01/03/20 14:43	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0010		X952158	KH	01/06/20 12:32	
EPA 200.7	**Sodium**	4.85	mg/L	0.50	0.06		X952158	KH	01/03/20 14:43	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.003		X952158	KH	01/03/20 14:43	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021	2	X952008	AS	01/03/20 11:55	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014	2	X952008	AS	01/03/20 11:55	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002	2	X952008	AS	01/03/20 11:55	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008	2	X952008	AS	01/03/20 11:55	
Metals (Dissolved)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.009		X952154	KH	01/03/20 15:17	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0008		X952154	KH	01/03/20 16:23	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0016		X952154	KH	01/03/20 16:23	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0020		X952154	KH	01/03/20 15:17	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0027		X952154	KH	01/03/20 15:17	
EPA 200.7	Iron	< 0.100	mg/L	0.100	0.056		X952154	KH	01/03/20 15:17	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0023		X952154	KH	01/03/20 15:17	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0019		X952154	KH	01/03/20 15:17	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.005		X952154	KH	01/03/20 15:17	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021		X952011	AS	01/03/20 10:56	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014		X952011	AS	01/03/20 10:56	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002		X952011	AS	01/03/20 10:56	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008		X952011	AS	01/03/20 10:56	
Metals (Filtered)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953023	JFB	01/02/20 15:08	
Classical Chemistry Parameters										
Calculation	**Nitrogen, Total as N**	1.48	mg/L	0.600	0.381		N/A		12/31/19 16:31	
EPA 351.2	TKN	< 0.50	mg/L	0.50	0.31		X952170	DT	12/31/19 16:31	
SM 2320 B	**Total Alkalinity**	149	mg/L as CaCO3	1.0			X951065	KAG	12/20/19 14:00	
SM 2540 C	**Total Diss. Solids**	172	mg/L	10			X951195	TL	12/20/19 12:40	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			X951196	TL	12/20/19 12:40	
SM 4500-P-E	**Orthophosphate as P**	0.016	mg/L	0.010	0.004		X951177	MH	12/19/19 15:56	
SM 4500-P-E	Phosphorus	< 0.010	mg/L	0.010	0.003		X952095	MH	12/26/19 12:47	

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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **MB-SW-191218**
SVL Sample ID: **X9L0363-01 (Surface Water)**

Sampled: 18-Dec-19 10:15
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Anions by Ion Chromatography										
EPA 300.0	**Chloride**	3.91	mg/L	0.20	0.14		X951160	RS	12/19/19 16:52	
EPA 300.0	**Nitrate as N**	1.47	mg/L	0.050	0.043		X951160	RS	12/19/19 16:52	
EPA 300.0	**Nitrate/Nitrite as N**	1.48	mg/L	0.100	0.074		X951160	RS	12/19/19 16:52	
EPA 300.0	Nitrite as N	< 0.050	mg/L	0.050	0.031		X951160	RS	12/19/19 16:52	
EPA 300.0	**Sulfate as SO4**	6.46	mg/L	0.30	0.18		X951160	RS	12/19/19 16:52	

Cation/Anion Balance and TDS Ratios

Cation Sum: 3.22 meq/L Anion Sum: 3.33 meq/L C/A Balance: -1.68 % Calculated TDS: 167 TDS/cTDS: 1.03

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Connor Williams
Project Manager

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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **MB1-GW-191218**
SVL Sample ID: **X9L0363-02 (Ground Water)**

Sampled: 18-Dec-19 13:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953018	JFB	01/03/20 13:29	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		X952158	KH	01/03/20 14:46	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0004		X952158	KH	01/03/20 14:46	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0008		X952158	KH	01/03/20 14:46	
EPA 200.7	**Calcium**	517	mg/L	0.500	0.345	10	X952158	KH	01/03/20 16:04	D2,M4
EPA 200.7	**Chromium**	0.0068	mg/L	0.0060	0.0010		X952158	KH	01/03/20 14:46	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0014		X952158	KH	01/03/20 14:46	
EPA 200.7	**Iron**	0.936	mg/L	0.100	0.028		X952158	KH	01/03/20 14:46	
EPA 200.7	**Magnesium**	157	mg/L	0.50	0.04		X952158	KH	01/03/20 14:46	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0012		X952158	KH	01/03/20 14:46	
EPA 200.7	**Potassium**	10.0	mg/L	0.50	0.09		X952158	KH	01/03/20 14:46	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0010		X952158	KH	01/06/20 12:36	
EPA 200.7	**Sodium**	504	mg/L	2.50	0.60	10	X952158	KH	01/03/20 16:04	D2,M4
EPA 200.7	Tin	< 0.050	mg/L	0.050	0.003		X952158	KH	01/03/20 14:46	
EPA 200.7	**Zinc**	0.054	mg/L	0.010	0.003		X952158	KH	01/03/20 14:46	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021	2	X952008	AS	01/03/20 12:04	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014	2	X952008	AS	01/03/20 12:04	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002	2	X952008	AS	01/03/20 12:04	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008	2	X952008	AS	01/03/20 12:04	
Metals (Dissolved)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.009		X952154	KH	01/03/20 15:21	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0008		X002072	KH	01/07/20 13:27	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0016		X002072	KH	01/07/20 13:27	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0020		X952154	KH	01/03/20 15:21	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0027		X952154	KH	01/03/20 15:21	
EPA 200.7	Iron	< 0.100	mg/L	0.100	0.056		X952154	KH	01/03/20 15:21	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0023		X952154	KH	01/03/20 15:21	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0019		X952154	KH	01/03/20 15:21	
EPA 200.7	Tin	< 0.050	mg/L	0.050	0.007		X952154	KH	01/03/20 15:21	
EPA 200.7	**Zinc**	0.040	mg/L	0.010	0.005		X952154	KH	01/03/20 15:21	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021		X952011	AS	01/03/20 11:05	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014		X952011	AS	01/03/20 11:05	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002		X952011	AS	01/03/20 11:05	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008		X952011	AS	01/03/20 11:05	
Metals (Filtered)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953023	JFB	01/02/20 15:10	
Classical Chemistry Parameters										
Calculation	**Nitrogen, Total as N**	1.69	mg/L	0.600	0.381		N/A		12/31/19 16:38	
EPA 351.2	TKN	< 0.50	mg/L	0.50	0.31		X952170	DT	12/31/19 16:38	
SM 2320 B	**Total Alkalinity**	78.4	mg/L as CaCO3	1.0			X951065	KAG	12/20/19 14:06	
SM 2540 C	**Total Diss. Solids**	3900	mg/L	100			X951195	TL	12/20/19 12:40	D2
SM 2540 D	**Total Susp. Solids**	11.0	mg/L	5.0			X951196	TL	12/20/19 12:40	
SM 4500-P-E	**Orthophosphate as P**	0.016	mg/L	0.010	0.004		X951177	MH	12/19/19 15:56	
SM 4500-P-E	**Phosphorus**	0.018	mg/L	0.010	0.003		X952095	MH	12/26/19 12:47	

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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **MB1-GW-191218**
SVL Sample ID: **X9L0363-02 (Ground Water)**

Sampled: 18-Dec-19 13:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Anions by Ion Chromatography										
EPA 300.0	**Chloride**	2140	mg/L	50.0	35.0	250	X951160	RS	12/19/19 17:39	D2
EPA 300.0	**Nitrate as N**	1.69	mg/L	0.500	0.430	10	X951160	RS	12/19/19 17:23	D
EPA 300.0	**Nitrate/Nitrite as N**	1.69	mg/L	0.100	0.074		X951160	RS	12/19/19 17:23	
EPA 300.0	Nitrite as N	< 0.500	mg/L	0.500	0.310	10	X951160	RS	12/19/19 17:23	D
EPA 300.0	**Sulfate as SO4**	23.7	mg/L	3.00	1.80	10	X951160	RS	12/19/19 17:23	D
Cation/Anion Balance and TDS Ratios										

Cation Sum: 60.9 meq/L Anion Sum: 62.6 meq/L C/A Balance: -1.34 % Calculated TDS: 3406 TDS/cTDS: 1.14

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Connor Williams
Project Manager

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Kellogg, ID 83837-0929
(208) 784-1258
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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **ND-SW-191218**
SVL Sample ID: **X9L0363-03 (Surface Water)**

Sampled: 18-Dec-19 15:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953018	JFB	01/02/20 16:56	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		X952158	KH	01/03/20 14:55	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0004		X952158	KH	01/03/20 14:55	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0008		X952158	KH	01/03/20 14:55	
EPA 200.7	**Calcium**	9.84	mg/L	0.100	0.035		X952158	KH	01/03/20 14:55	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0010		X952158	KH	01/03/20 14:55	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0014		X952158	KH	01/03/20 14:55	
EPA 200.7	**Iron**	0.464	mg/L	0.100	0.028		X952158	KH	01/03/20 14:55	
EPA 200.7	**Magnesium**	2.23	mg/L	0.50	0.04		X952158	KH	01/03/20 14:55	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0012		X952158	KH	01/03/20 14:55	
EPA 200.7	**Potassium**	1.48	mg/L	0.50	0.09		X952158	KH	01/03/20 14:55	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0010		X952158	KH	01/06/20 12:49	
EPA 200.7	**Sodium**	7.64	mg/L	0.50	0.06		X952158	KH	01/03/20 14:55	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.003		X952158	KH	01/03/20 14:55	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021	2	X952008	AS	01/03/20 12:07	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014	2	X952008	AS	01/03/20 12:07	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002	2	X952008	AS	01/03/20 12:07	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008	2	X952008	AS	01/03/20 12:07	
Metals (Dissolved)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.009		X952154	KH	01/03/20 15:32	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0008		X952154	KH	01/03/20 16:36	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0016		X952154	KH	01/03/20 16:36	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0020		X952154	KH	01/03/20 15:32	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0027		X952154	KH	01/03/20 15:32	
EPA 200.7	**Iron**	0.164	mg/L	0.100	0.056		X952154	KH	01/03/20 15:32	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0023		X952154	KH	01/03/20 15:32	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0019		X952154	KH	01/03/20 15:32	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.005		X952154	KH	01/03/20 15:32	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021		X952011	AS	01/03/20 11:08	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014		X952011	AS	01/03/20 11:08	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002		X952011	AS	01/03/20 11:08	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008		X952011	AS	01/03/20 11:08	
Metals (Filtered)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953023	JFB	01/02/20 15:12	
Classical Chemistry Parameters										
Calculation	Nitrogen, Total as N	< 0.600	mg/L	0.600	0.381		N/A		12/31/19 16:39	
EPA 351.2	TKN	< 0.50	mg/L	0.50	0.31		X952170	DT	12/31/19 16:39	
SM 2320 B	**Total Alkalinity**	42.6	mg/L as CaCO3	1.0			X951065	KAG	12/20/19 14:10	
SM 2540 C	**Total Diss. Solids**	125	mg/L	10			X951195	TL	12/20/19 12:40	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			X951196	TL	12/20/19 12:40	
SM 4500-P-E	**Orthophosphate as P**	0.039	mg/L	0.010	0.004		X951177	MH	12/19/19 15:56	
SM 4500-P-E	**Phosphorus**	0.046	mg/L	0.010	0.003		X952095	MH	12/26/19 12:47	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **ND-SW-191218**
SVL Sample ID: **X9L0363-03 (Surface Water)**

Sampled: 18-Dec-19 15:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Anions by Ion Chromatography										
EPA 300.0	**Chloride**	3.34	mg/L	0.20	0.14		X951160	RS	12/19/19 17:54	
EPA 300.0	**Nitrate as N**	0.102	mg/L	0.050	0.043		X951160	RS	12/19/19 17:54	
EPA 300.0	**Nitrate/Nitrite as N**	0.102	mg/L	0.100	0.074		X951160	RS	12/19/19 17:54	
EPA 300.0	Nitrite as N	< 0.050	mg/L	0.050	0.031		X951160	RS	12/19/19 17:54	
EPA 300.0	**Sulfate as SO4**	4.60	mg/L	0.30	0.18		X951160	RS	12/19/19 17:54	
Cation/Anion Balance and TDS Ratios										

Cation Sum: 1.05 meq/L Anion Sum: 1.05 meq/L C/A Balance: 0.05 % Calculated TDS: 55 TDS/cTDS: 2.26

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **MB-S-03**
SVL Sample ID: **X9L0363-04 (Soil)**

Sampled: 21-Oct-19 00:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010D	**Calcium**	1810	mg/kg dry	20.8	5.1		X952139	KH	01/03/20 10:07	M2,R2B
EPA 6010D	**Magnesium**	3550	mg/kg dry	104	12.5		X952139	KH	01/03/20 10:07	
EPA 6010D	**Phosphorus**	298	mg/kg dry	5.2	2.2		X952139	JFB	01/06/20 12:34	M1,M2,R2B
EPA 6010D	**Potassium**	1480	mg/kg dry	52.1	15.6		X952139	JFB	01/06/20 12:34	M2
EPA 6010D	Sodium	< 52.1	mg/kg dry	52.1	14.6		X952139	KH	01/03/20 10:07	
Anions by Ion Chromatography										
EPA 300.0	Chloride	< 2.1	mg/kg dry	2.1	1.4		X951182	RS	12/31/19 16:24	
EPA 300.0	Nitrate as N	< 0.52	mg/kg dry	0.52	0.22		X951182	RS	12/31/19 16:24	
EPA 300.0	**Sulfate as SO4**	6.0	mg/kg dry	3.1	2.6		X951182	RS	12/31/19 16:24	
Percent Solids / Percent Moisture										
Percent Solids	**% Solids**	96.0	%	0.1			X006231	WW/NT	02/10/20 07:45	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **ND-S-03**
SVL Sample ID: **X9L0363-05 (Soil)**

Sampled: 23-Oct-19 00:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010D	**Calcium**	1980	mg/kg dry	20.4	5.0		X952139	KH	01/03/20 10:17	
EPA 6010D	**Magnesium**	4190	mg/kg dry	102	12.3		X952139	KH	01/03/20 10:17	
EPA 6010D	**Phosphorus**	420	mg/kg dry	5.1	2.1		X952139	JFB	01/06/20 12:45	
EPA 6010D	**Potassium**	2520	mg/kg dry	51.1	15.3		X952139	JFB	01/06/20 12:45	
EPA 6010D	**Sodium**	65.8	mg/kg dry	51.1	14.3		X952139	KH	01/03/20 10:17	
Anions by Ion Chromatography										
EPA 300.0	Chloride	< 2.0	mg/kg dry	2.0	1.3		X951182	RS	12/31/19 17:14	
EPA 300.0	Nitrate as N	< 0.51	mg/kg dry	0.51	0.21		X951182	RS	12/31/19 17:14	
EPA 300.0	Sulfate as SO4	< 3.1	mg/kg dry	3.1	2.6		X951182	RS	12/31/19 17:14	
Percent Solids / Percent Moisture										
Percent Solids	**% Solids**	97.9	%	0.1			X006231	WW/NT	02/10/20 07:45	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **ND1-S-45**
SVL Sample ID: **X9L0363-06 (Soil)**

Sampled: 13-Dec-19 00:00
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010D	**Calcium**	2640	mg/kg dry	20.6	5.1		X952139	KH	01/03/20 10:20	
EPA 6010D	**Magnesium**	4240	mg/kg dry	103	12.4		X952139	KH	01/03/20 10:20	
EPA 6010D	**Phosphorus**	480	mg/kg dry	5.2	2.2		X952139	JFB	01/06/20 12:49	
EPA 6010D	**Potassium**	3050	mg/kg dry	51.6	15.5		X952139	JFB	01/06/20 12:49	
EPA 6010D	**Sodium**	100	mg/kg dry	51.6	14.5		X952139	KH	01/03/20 10:20	
Anions by Ion Chromatography										
EPA 300.0	Chloride	< 2.1	mg/kg dry	2.1	1.3		X951182	RS	12/31/19 17:31	
EPA 300.0	Nitrate as N	< 0.52	mg/kg dry	0.52	0.22		X951182	RS	12/31/19 17:31	
EPA 300.0	Sulfate as SO4	< 3.1	mg/kg dry	3.1	2.6		X951182	RS	12/31/19 17:31	
Percent Solids / Percent Moisture										
Percent Solids	**% Solids**	96.9	%	0.1			X006231	WW/NT	02/10/20 07:45	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Client Sample ID: **SCWR01-191218**
SVL Sample ID: **X9L0363-07 (Water)**

Sampled: 18-Dec-19 13:30
Received: 19-Dec-19
Sampled By: JS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953018	JFB	01/03/20 13:34	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		X952158	KH	01/03/20 14:57	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0004		X952158	KH	01/03/20 14:57	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0008		X952158	KH	01/03/20 14:57	
EPA 200.7	**Calcium**	0.104	mg/L	0.100	0.035		X952158	KH	01/03/20 14:57	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0010		X952158	KH	01/03/20 14:57	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0014		X952158	KH	01/03/20 14:57	
EPA 200.7	Iron	< 0.100	mg/L	0.100	0.028		X952158	KH	01/03/20 14:57	
EPA 200.7	Magnesium	< 0.50	mg/L	0.50	0.04		X952158	KH	01/03/20 14:57	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0012		X952158	KH	01/03/20 14:57	
EPA 200.7	Potassium	< 0.50	mg/L	0.50	0.09		X952158	KH	01/03/20 14:57	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0010		X952158	KH	01/06/20 12:53	
EPA 200.7	Sodium	< 0.50	mg/L	0.50	0.06		X952158	KH	01/03/20 14:57	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.003		X952158	KH	01/03/20 14:57	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021	2	X952008	AS	01/03/20 12:10	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014	2	X952008	AS	01/03/20 12:10	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002	2	X952008	AS	01/03/20 12:10	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008	2	X952008	AS	01/03/20 12:10	
Metals (Dissolved)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.009		X952154	KH	01/03/20 15:36	
EPA 200.7	Beryllium	< 0.0020	mg/L	0.0020	0.0008		X952154	KH	01/03/20 16:39	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0016		X952154	KH	01/03/20 16:39	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0020		X952154	KH	01/03/20 15:36	
EPA 200.7	Copper	< 0.0100	mg/L	0.0100	0.0027		X952154	KH	01/03/20 15:36	
EPA 200.7	Iron	< 0.100	mg/L	0.100	0.056		X952154	KH	01/03/20 15:36	
EPA 200.7	Nickel	< 0.0100	mg/L	0.0100	0.0023		X952154	KH	01/03/20 15:36	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0019		X952154	KH	01/03/20 15:36	
EPA 200.7	Zinc	< 0.010	mg/L	0.010	0.005		X952154	KH	01/03/20 15:36	
EPA 200.8	Arsenic	< 0.00300	mg/L	0.00300	0.00021		X952011	AS	01/03/20 11:11	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.00014		X952011	AS	01/03/20 11:11	
EPA 200.8	Selenium	< 0.0030	mg/L	0.0030	0.0002		X952011	AS	01/03/20 11:11	
EPA 200.8	Thallium	< 0.00100	mg/L	0.00100	0.00008		X952011	AS	01/03/20 11:11	
Metals (Filtered)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000093		X953023	JFB	01/02/20 15:21	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Metals (Total)								
EPA 245.1	Mercury	mg/L	<0.00020	0.000093	0.00020	X953018	02-Jan-20	
Metals (Total) by EPA 6000/7000 Methods								
EPA 6010D	Calcium	mg/kg	<20.0	4.9	20.0	X952139	03-Jan-20	
EPA 6010D	Magnesium	mg/kg	<100	12.0	100	X952139	03-Jan-20	
EPA 6010D	Phosphorus	mg/kg	<5.0	2.1	5.0	X952139	06-Jan-20	
EPA 6010D	Potassium	mg/kg	<50.0	15.0	50.0	X952139	06-Jan-20	
EPA 6010D	Sodium	mg/kg	<50.0	14.0	50.0	X952139	03-Jan-20	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)								
EPA 200.7	Antimony	mg/L	<0.020	0.004	0.020	X952158	03-Jan-20	
EPA 200.7	Beryllium	mg/L	<0.0020	0.0004	0.0020	X952158	03-Jan-20	
EPA 200.7	Cadmium	mg/L	<0.0020	0.0008	0.0020	X952158	03-Jan-20	
EPA 200.7	Calcium	mg/L	<0.100	0.035	0.100	X952158	03-Jan-20	
EPA 200.7	Chromium	mg/L	<0.0060	0.0010	0.0060	X952158	03-Jan-20	
EPA 200.7	Copper	mg/L	<0.0100	0.0014	0.0100	X952158	03-Jan-20	
EPA 200.7	Iron	mg/L	<0.100	0.028	0.100	X952158	03-Jan-20	
EPA 200.7	Magnesium	mg/L	<0.50	0.04	0.50	X952158	03-Jan-20	
EPA 200.7	Nickel	mg/L	<0.0100	0.0012	0.0100	X952158	03-Jan-20	
EPA 200.7	Potassium	mg/L	<0.50	0.09	0.50	X952158	03-Jan-20	
EPA 200.7	Silver	mg/L	<0.0050	0.0010	0.0050	X952158	06-Jan-20	
EPA 200.7	Sodium	mg/L	<0.50	0.06	0.50	X952158	03-Jan-20	
EPA 200.7	Tin	mg/L	<0.050	0.003	0.050	X952158	03-Jan-20	
EPA 200.7	Zinc	mg/L	<0.010	0.003	0.010	X952158	03-Jan-20	
EPA 200.8	Arsenic	mg/L	<0.00300	0.00021	0.00300	X952008	03-Jan-20	
EPA 200.8	Lead	mg/L	<0.00300	0.00014	0.00300	X952008	03-Jan-20	
EPA 200.8	Selenium	mg/L	<0.0030	0.0002	0.0030	X952008	03-Jan-20	
EPA 200.8	Thallium	mg/L	<0.00100	0.00008	0.00100	X952008	03-Jan-20	
Metals (Dissolved)								
EPA 200.7	Antimony	mg/L	<0.020	0.009	0.020	X952154	03-Jan-20	
EPA 200.7	Beryllium	mg/L	<0.0020	0.0008	0.0020	X002072	07-Jan-20	
EPA 200.7	Beryllium	mg/L	<0.0020	0.0008	0.0020	X952154	03-Jan-20	
EPA 200.7	Cadmium	mg/L	<0.0020	0.0016	0.0020	X002072	07-Jan-20	
EPA 200.7	Cadmium	mg/L	<0.0020	0.0016	0.0020	X952154	03-Jan-20	
EPA 200.7	Chromium	mg/L	<0.0060	0.0020	0.0060	X952154	03-Jan-20	
EPA 200.7	Copper	mg/L	<0.0100	0.0027	0.0100	X952154	03-Jan-20	
EPA 200.7	Iron	mg/L	<0.100	0.056	0.100	X952154	03-Jan-20	
EPA 200.7	Nickel	mg/L	<0.0100	0.0023	0.0100	X952154	03-Jan-20	
EPA 200.7	Silver	mg/L	<0.0050	0.0019	0.0050	X952154	03-Jan-20	
EPA 200.7	Tin	mg/L	<0.050	0.007	0.050	X952154	03-Jan-20	
EPA 200.7	Zinc	mg/L	<0.010	0.005	0.010	X952154	03-Jan-20	
EPA 200.8	Arsenic	mg/L	<0.00300	0.00021	0.00300	X952011	03-Jan-20	
EPA 200.8	Lead	mg/L	<0.00300	0.00014	0.00300	X952011	03-Jan-20	
EPA 200.8	Selenium	mg/L	<0.0030	0.0002	0.0030	X952011	03-Jan-20	
EPA 200.8	Thallium	mg/L	<0.00100	0.00008	0.00100	X952011	03-Jan-20	
Metals (Filtered)								
EPA 245.1	Mercury	mg/L	<0.00020	0.000093	0.00020	X953023	02-Jan-20	
Classical Chemistry Parameters								
EPA 351.2	TKN	mg/L	<0.50	0.31	0.50	X952170	31-Dec-19	
SM 2320 B	Total Alkalinity	mg/L as CaCO3	<1.0		1.0	X951065	20-Dec-19	
SM 2540 C	Total Diss. Solids	mg/L	<10		10	X951195	20-Dec-19	
SM 2540 D	Total Susp. Solids	mg/L	<5.0		5.0	X951196	20-Dec-19	
SM 4500-P-E	Orthophosphate as P	mg/L	<0.010	0.004	0.010	X951177	19-Dec-19	
SM 4500-P-E	Phosphorus	mg/L	<0.010	0.003	0.010	X952095	26-Dec-19	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - BLANK Data (Continued)

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Anions by Ion Chromatography								
EPA 300.0	Chloride	mg/kg	<2.0	1.3	2.0	X951182	31-Dec-19	
EPA 300.0	Nitrate as N	mg/kg	<0.50	0.21	0.50	X951182	31-Dec-19	
EPA 300.0	Sulfate as SO4	mg/kg	<3.0	2.5	3.0	X951182	31-Dec-19	
EPA 300.0	Chloride	mg/L	<0.20	0.14	0.20	X951160	19-Dec-19	
EPA 300.0	Nitrate as N	mg/L	<0.050	0.043	0.050	X951160	19-Dec-19	
EPA 300.0	Nitrate/Nitrite as N	mg/L	<0.100	0.074	0.100	X951160	19-Dec-19	
EPA 300.0	Nitrite as N	mg/L	<0.050	0.031	0.050	X951160	19-Dec-19	
EPA 300.0	Sulfate as SO4	mg/L	<0.30	0.18	0.30	X951160	19-Dec-19	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total)									
EPA 245.1	Mercury	mg/L	0.00507	0.00500	101	85 - 115	X953018	02-Jan-20	
Metals (Total) by EPA 6000/7000 Methods									
EPA 6010D	Calcium	mg/kg	1860	2000	93.2	80 - 120	X952139	03-Jan-20	
EPA 6010D	Magnesium	mg/kg	1820	2000	91.1	80 - 120	X952139	03-Jan-20	
EPA 6010D	Phosphorus	mg/kg	104	100	104	80 - 120	X952139	06-Jan-20	
EPA 6010D	Potassium	mg/kg	1960	2000	98.2	80 - 120	X952139	06-Jan-20	
EPA 6010D	Sodium	mg/kg	1750	1900	92.2	80 - 120	X952139	03-Jan-20	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)									
EPA 200.7	Antimony	mg/L	1.06	1.00	106	85 - 115	X952158	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.04	1.00	104	85 - 115	X952158	03-Jan-20	
EPA 200.7	Cadmium	mg/L	1.04	1.00	104	85 - 115	X952158	03-Jan-20	
EPA 200.7	Calcium	mg/L	19.5	20.0	97.3	85 - 115	X952158	03-Jan-20	
EPA 200.7	Chromium	mg/L	1.05	1.00	105	85 - 115	X952158	03-Jan-20	
EPA 200.7	Copper	mg/L	1.02	1.00	102	85 - 115	X952158	03-Jan-20	
EPA 200.7	Iron	mg/L	9.83	10.0	98.3	85 - 115	X952158	03-Jan-20	
EPA 200.7	Magnesium	mg/L	19.8	20.0	99.2	85 - 115	X952158	03-Jan-20	
EPA 200.7	Nickel	mg/L	1.02	1.00	102	85 - 115	X952158	03-Jan-20	
EPA 200.7	Potassium	mg/L	20.7	20.0	104	85 - 115	X952158	03-Jan-20	
EPA 200.7	Silver	mg/L	0.0514	0.0500	103	85 - 115	X952158	06-Jan-20	
EPA 200.7	Sodium	mg/L	18.9	19.0	99.6	85 - 115	X952158	03-Jan-20	
EPA 200.7	Tin	mg/L	1.08	1.00	108	85 - 115	X952158	03-Jan-20	
EPA 200.7	Zinc	mg/L	1.05	1.00	105	85 - 115	X952158	03-Jan-20	
EPA 200.8	Arsenic	mg/L	0.0242	0.0250	96.8	85 - 115	X952008	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0232	0.0250	92.8	85 - 115	X952008	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0217	0.0250	86.8	85 - 115	X952008	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0250	0.0250	100	85 - 115	X952008	03-Jan-20	
Metals (Dissolved)									
EPA 200.7	Antimony	mg/L	0.936	1.00	93.6	85 - 115	X952154	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.01	1.00	101	85 - 115	X952154	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.00	1.00	100	85 - 115	X002072	07-Jan-20	
EPA 200.7	Cadmium	mg/L	1.03	1.00	103	85 - 115	X952154	03-Jan-20	
EPA 200.7	Cadmium	mg/L	0.998	1.00	99.8	85 - 115	X002072	07-Jan-20	
EPA 200.7	Chromium	mg/L	1.04	1.00	104	85 - 115	X952154	03-Jan-20	
EPA 200.7	Copper	mg/L	0.989	1.00	98.9	85 - 115	X952154	03-Jan-20	
EPA 200.7	Iron	mg/L	8.96	10.0	89.6	85 - 115	X952154	03-Jan-20	
EPA 200.7	Nickel	mg/L	0.935	1.00	93.5	85 - 115	X952154	03-Jan-20	
EPA 200.7	Silver	mg/L	0.0488	0.0500	97.5	85 - 115	X952154	03-Jan-20	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Dissolved) (Continued)									
EPA 200.7	Tin	mg/L	0.977	1.00	97.7	85 - 115	X952154	03-Jan-20	
EPA 200.7	Zinc	mg/L	0.975	1.00	97.5	85 - 115	X952154	03-Jan-20	
EPA 200.8	Arsenic	mg/L	0.0232	0.0250	92.9	85 - 115	X952011	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0244	0.0250	97.5	85 - 115	X952011	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0222	0.0250	88.7	85 - 115	X952011	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0250	0.0250	100	85 - 115	X952011	03-Jan-20	
Metals (Filtered)									
EPA 245.1	Mercury	mg/L	0.00522	0.00500	104	85 - 115	X953023	02-Jan-20	
Classical Chemistry Parameters									
EPA 351.2	TKN	mg/L	7.82	8.00	97.7	90 - 110	X952170	31-Dec-19	
SM 2320 B	Total Alkalinity	mg/L as CaCO3	102	99.3	103	94.3 - 106	X951065	20-Dec-19	
SM 4500-P-E	Orthophosphate as P	mg/L	0.728	0.743	98.0	90 - 110	X951177	19-Dec-19	
SM 4500-P-E	Phosphorus	mg/L	0.382	0.374	102	90 - 110	X952095	26-Dec-19	D
Anions by Ion Chromatography									
EPA 300.0	Chloride	mg/kg	29.9	30.0	99.6	80 - 120	X951182	31-Dec-19	
EPA 300.0	Nitrate as N	mg/kg	20.4	20.0	102	80 - 120	X951182	31-Dec-19	
EPA 300.0	Sulfate as SO4	mg/kg	102	100	102	80 - 120	X951182	31-Dec-19	
EPA 300.0	Chloride	mg/L	3.08	3.00	103	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate as N	mg/L	2.11	2.00	106	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate/Nitrite as N	mg/L	4.79	4.50	106	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrite as N	mg/L	2.68	2.50	107	90 - 110	X951160	19-Dec-19	
EPA 300.0	Sulfate as SO4	mg/L	10.5	10.0	105	90 - 110	X951160	19-Dec-19	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Classical Chemistry Parameters									
SM 2320 B	Total Alkalinity	mg/L as CaCO3	16.3	15.7	4.0	20	X951065	20-Dec-19	
SM 2540 C	Total Diss. Solids	mg/L	296	291	1.7	10	X951195	20-Dec-19	
SM 2540 D	Total Susp. Solids	mg/L	18.0	17.0	5.7	10	X951196	20-Dec-19	
Percent Solids / Percent Moisture									
Percent Solids	% Solids	%	95.3	96.0	0.8	20	X006231	10-Feb-20	

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Recovery	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	mg/L	0.00100	<0.00020	0.00100	99.7	70 - 130	X953018	02-Jan-20	
EPA 245.1	Mercury	mg/L	0.00103	<0.00020	0.00100	103	70 - 130	X953018	02-Jan-20	
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010D	Calcium	mg/kg	2650	1810	2080	40.5	75 - 125	X952139	03-Jan-20	M2,R2B
EPA 6010D	Magnesium	mg/kg	5300	3550	2080	84.4	75 - 125	X952139	03-Jan-20	
EPA 6010D	Phosphorus	mg/kg	264	298	104	-32.2	75 - 125	X952139	06-Jan-20	M2,R2B
EPA 6010D	Potassium	mg/kg	2990	1480	2080	72.4	75 - 125	X952139	06-Jan-20	M2
EPA 6010D	Sodium	mg/kg	1850	<52.1	1980	91.1	75 - 125	X952139	03-Jan-20	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	mg/L	1.06	<0.020	1.00	105	70 - 130	X952158	03-Jan-20	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - MATRIX SPIKE Data (Continued)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Recovery	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136) (Continued)										
EPA 200.7	Antimony	mg/L	1.53	0.444	1.00	109	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Beryllium	mg/L	1.01	<0.0020	1.00	101	70 - 130	X952158	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.22	0.165	1.00	106	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Cadmium	mg/L	0.960	<0.0020	1.00	96.0	70 - 130	X952158	03-Jan-20	
EPA 200.7	Cadmium	mg/L	3.87	2.82	1.00	105	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Calcium	mg/L	324	140	20.0	0.30R>S	70 - 130	X952158	03-Jan-20	D1,M4
EPA 200.7	Calcium	mg/L	514	517	20.0	0.30R>S	70 - 130	X952158	03-Jan-20	D2,M4
EPA 200.7	Chromium	mg/L	1.00	0.0068	1.00	99.8	70 - 130	X952158	03-Jan-20	
EPA 200.7	Chromium	mg/L	1.15	0.124	1.00	102	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Copper	mg/L	1.08	<0.0100	1.00	107	70 - 130	X952158	03-Jan-20	
EPA 200.7	Copper	mg/L	275	278	1.00	0.30R>S	70 - 130	X952158	03-Jan-20	D2,M4
EPA 200.7	Iron	mg/L	10.4	0.936	10.0	94.8	70 - 130	X952158	03-Jan-20	
EPA 200.7	Iron	mg/L	145	133	10.0	117	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Magnesium	mg/L	175	157	20.0	88.6	70 - 130	X952158	03-Jan-20	
EPA 200.7	Magnesium	mg/L	2360	2270	20.0	0.30R>S	70 - 130	X952158	03-Jan-20	D2,M4
EPA 200.7	Nickel	mg/L	0.953	<0.0100	1.00	94.7	70 - 130	X952158	03-Jan-20	
EPA 200.7	Nickel	mg/L	9.42	8.59	1.00	83.8	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Potassium	mg/L	32.5	10.0	20.0	113	70 - 130	X952158	03-Jan-20	
EPA 200.7	Potassium	mg/L	23.0	<2.50	20.0	104	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Silver	mg/L	0.0559	<0.0050	0.0500	112	70 - 130	X952158	06-Jan-20	
EPA 200.7	Silver	mg/L	0.0681	<0.0250	0.0500	106	70 - 130	X952158	06-Jan-20	
EPA 200.7	Sodium	mg/L	37.6	18.1	19.0	103	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Sodium	mg/L	502	504	19.0	0.30R>S	70 - 130	X952158	03-Jan-20	D2,M4
EPA 200.7	Tin	mg/L	1.01	<0.050	1.00	101	70 - 130	X952158	03-Jan-20	
EPA 200.7	Tin	mg/L	1.09	<0.250	1.00	109	70 - 130	X952158	03-Jan-20	D1
EPA 200.7	Zinc	mg/L	1.08	0.054	1.00	103	70 - 130	X952158	03-Jan-20	
EPA 200.7	Zinc	mg/L	659	667	1.00	0.30R>S	70 - 130	X952158	03-Jan-20	D2,M4
EPA 200.8	Arsenic	mg/L	0.0248	<0.00300	0.0250	94.5	70 - 130	X952008	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0224	<0.00300	0.0250	89.7	70 - 130	X952008	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0220	<0.0030	0.0250	88.1	70 - 130	X952008	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0235	<0.00100	0.0250	94.1	70 - 130	X952008	03-Jan-20	
Metals (Dissolved)										
EPA 200.7	Antimony	mg/L	0.948	<0.020	1.00	94.8	70 - 130	X952154	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.03	0.0051	1.00	102	70 - 130	X952154	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.01	<0.0020	1.00	101	70 - 130	X002072	07-Jan-20	
EPA 200.7	Cadmium	mg/L	1.07	0.0044	1.00	106	70 - 130	X952154	03-Jan-20	
EPA 200.7	Cadmium	mg/L	1.00	<0.0020	1.00	100	70 - 130	X002072	07-Jan-20	
EPA 200.7	Chromium	mg/L	1.02	<0.0060	1.00	102	70 - 130	X952154	03-Jan-20	
EPA 200.7	Copper	mg/L	0.986	<0.0100	1.00	98.3	70 - 130	X952154	03-Jan-20	
EPA 200.7	Iron	mg/L	8.94	<0.100	10.0	89.4	70 - 130	X952154	03-Jan-20	
EPA 200.7	Nickel	mg/L	0.906	<0.0100	1.00	90.3	70 - 130	X952154	03-Jan-20	
EPA 200.7	Silver	mg/L	0.0490	<0.0050	0.0500	98.1	70 - 130	X952154	03-Jan-20	
EPA 200.7	Tin	mg/L	0.963	<0.050	1.00	96.3	70 - 130	X952154	03-Jan-20	
EPA 200.7	Zinc	mg/L	1.00	0.040	1.00	96.2	70 - 130	X952154	03-Jan-20	
EPA 200.8	Arsenic	mg/L	0.0254	<0.00300	0.0250	97.1	70 - 130	X952011	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0216	<0.00300	0.0250	86.6	70 - 130	X952011	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0263	<0.0030	0.0250	105	70 - 130	X952011	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0221	<0.00100	0.0250	88.4	70 - 130	X952011	03-Jan-20	
Metals (Filtered)										
EPA 245.1	Mercury	mg/L	0.00101	<0.00020	0.00100	101	70 - 130	X953023	02-Jan-20	
EPA 245.1	Mercury	mg/L	0.00094	<0.00020	0.00100	94.1	70 - 130	X953023	02-Jan-20	
Classical Chemistry Parameters										
EPA 351.2	TKN	mg/L	8.93	0.84	8.00	101	90 - 110	X952170	31-Dec-19	
EPA 351.2	TKN	mg/L	8.61	0.77	8.00	98.0	90 - 110	X952170	31-Dec-19	

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Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - MATRIX SPIKE Data (Continued)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Recovery	Acceptance Limits	Batch ID	Analyzed	Notes
Classical Chemistry Parameters (Continued)										
SM 4500-P-E	Orthophosphate as P	mg/L	0.517	0.016	0.500	100	75 - 125	X951177	19-Dec-19	
SM 4500-P-E	Phosphorus	mg/L	0.508	<0.020	0.500	102	75 - 125	X952095	26-Dec-19	D
Anions by Ion Chromatography										
EPA 300.0	Chloride	mg/kg	31.2	<2.1	31.3	99.7	75 - 125	X951182	31-Dec-19	
EPA 300.0	Nitrate as N	mg/kg	21.6	<0.52	20.8	102	75 - 125	X951182	31-Dec-19	
EPA 300.0	Sulfate as SO4	mg/kg	109	6.0	104	99.1	75 - 125	X951182	31-Dec-19	
EPA 300.0	Chloride	mg/L	3.68	0.48	3.00	107	90 - 110	X951160	19-Dec-19	
EPA 300.0	Chloride	mg/L	6.60	3.34	3.00	109	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate as N	mg/L	2.19	<0.050	2.00	109	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate as N	mg/L	2.31	0.102	2.00	110	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate/Nitrite as N	mg/L	4.37	<0.100	4.00	109	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrate/Nitrite as N	mg/L	4.47	0.102	4.00	109	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrite as N	mg/L	2.18	<0.050	2.00	109	90 - 110	X951160	19-Dec-19	
EPA 300.0	Nitrite as N	mg/L	2.16	<0.050	2.00	108	90 - 110	X951160	19-Dec-19	
EPA 300.0	Sulfate as SO4	mg/L	18.5	7.77	10.0	107	90 - 110	X951160	19-Dec-19	
EPA 300.0	Sulfate as SO4	mg/L	15.2	4.60	10.0	106	90 - 110	X951160	19-Dec-19	

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	% Rec.	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total)											
EPA 245.1	Mercury	mg/L	0.00097	0.00103	0.00100	97.4	5.7	20	X953018	02-Jan-20	
Metals (Total) by EPA 6000/7000 Methods											
EPA 6010D	Calcium	mg/kg	3830	2650	2080	97.2	36.4	20	X952139	03-Jan-20	R2B
EPA 6010D	Magnesium	mg/kg	5690	5300	2080	103	7.0	20	X952139	03-Jan-20	
EPA 6010D	Phosphorus	mg/kg	530	264	104	223	67.0	20	X952139	06-Jan-20	M1,R2B
EPA 6010D	Potassium	mg/kg	3650	2990	2080	104	19.8	20	X952139	06-Jan-20	
EPA 6010D	Sodium	mg/kg	1890	1850	1980	93.1	2.1	20	X952139	03-Jan-20	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)											
EPA 200.7	Antimony	mg/L	1.07	1.06	1.00	106	0.5	20	X952158	03-Jan-20	
EPA 200.7	Beryllium	mg/L	1.01	1.01	1.00	101	0.4	20	X952158	03-Jan-20	
EPA 200.7	Cadmium	mg/L	0.963	0.960	1.00	96.3	0.3	20	X952158	03-Jan-20	
EPA 200.7	Calcium	mg/L	515	514	20.0	0.30R>S	0.1	20	X952158	03-Jan-20	D2,M4
EPA 200.7	Chromium	mg/L	0.996	1.00	1.00	98.9	0.8	20	X952158	03-Jan-20	
EPA 200.7	Copper	mg/L	1.07	1.08	1.00	106	0.8	20	X952158	03-Jan-20	
EPA 200.7	Iron	mg/L	10.4	10.4	10.0	94.5	0.3	20	X952158	03-Jan-20	
EPA 200.7	Magnesium	mg/L	176	175	20.0	97.5	1.0	20	X952158	03-Jan-20	
EPA 200.7	Nickel	mg/L	0.955	0.953	1.00	94.9	0.2	20	X952158	03-Jan-20	
EPA 200.7	Potassium	mg/L	32.3	32.5	20.0	112	0.6	20	X952158	03-Jan-20	
EPA 200.7	Silver	mg/L	0.0545	0.0559	0.0500	109	2.7	20	X952158	06-Jan-20	
EPA 200.7	Sodium	mg/L	502	502	19.0	0.30R>S	0.0	20	X952158	03-Jan-20	D2,M4
EPA 200.7	Tin	mg/L	1.02	1.01	1.00	101	0.7	20	X952158	03-Jan-20	
EPA 200.7	Zinc	mg/L	1.08	1.08	1.00	103	0.2	20	X952158	03-Jan-20	
EPA 200.8	Arsenic	mg/L	0.0250	0.0248	0.0250	95.5	1.0	20	X952008	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0236	0.0224	0.0250	94.3	5.0	20	X952008	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0221	0.0220	0.0250	88.2	0.2	20	X952008	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0251	0.0235	0.0250	100	6.6	20	X952008	03-Jan-20	
Metals (Dissolved)											
EPA 200.7	Antimony	mg/L	0.964	0.948	1.00	96.4	1.7	20	X952154	03-Jan-20	

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Aspect Consulting
123 E Yakima Avenue Suite 200
Yakima, WA 98901

Project Name: Routine / No Project
Work Order: **X9L0363**
Reported: 10-Feb-20 16:45

Quality Control - MATRIX SPIKE DUPLICATE Data (Continued)

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	% Rec.	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Dissolved) (Continued)											
EPA 200.7	Beryllium	mg/L	1.03	1.01	1.00	103	1.7	20	X002072	07-Jan-20	
EPA 200.7	Beryllium	mg/L	1.01	1.03	1.00	101	1.5	20	X952154	03-Jan-20	
EPA 200.7	Cadmium	mg/L	1.02	1.00	1.00	102	1.3	20	X002072	07-Jan-20	
EPA 200.7	Cadmium	mg/L	1.06	1.07	1.00	105	0.9	20	X952154	03-Jan-20	
EPA 200.7	Chromium	mg/L	1.03	1.02	1.00	103	1.1	20	X952154	03-Jan-20	
EPA 200.7	Copper	mg/L	1.00	0.986	1.00	100	1.8	20	X952154	03-Jan-20	
EPA 200.7	Iron	mg/L	9.10	8.94	10.0	91.0	1.9	20	X952154	03-Jan-20	
EPA 200.7	Nickel	mg/L	0.907	0.906	1.00	90.4	0.1	20	X952154	03-Jan-20	
EPA 200.7	Silver	mg/L	0.0505	0.0490	0.0500	101	2.8	20	X952154	03-Jan-20	
EPA 200.7	Tin	mg/L	0.967	0.963	1.00	96.7	0.4	20	X952154	03-Jan-20	
EPA 200.7	Zinc	mg/L	0.998	1.00	1.00	95.8	0.4	20	X952154	03-Jan-20	
EPA 200.8	Arsenic	mg/L	0.0282	0.0254	0.0250	108	10.4	20	X952011	03-Jan-20	
EPA 200.8	Lead	mg/L	0.0244	0.0216	0.0250	97.6	12.0	20	X952011	03-Jan-20	
EPA 200.8	Selenium	mg/L	0.0277	0.0263	0.0250	111	5.3	20	X952011	03-Jan-20	
EPA 200.8	Thallium	mg/L	0.0258	0.0221	0.0250	103	15.4	20	X952011	03-Jan-20	
Metals (Filtered)											
EPA 245.1	Mercury	mg/L	0.00101	0.00101	0.00100	101	0.0	20	X953023	02-Jan-20	
Classical Chemistry Parameters											
EPA 351.2	TKN	mg/L	8.94	8.93	8.00	101	0.0	20	X952170	31-Dec-19	
SM 4500-P-E	Orthophosphate as P	mg/L	0.499	0.517	0.500	96.7	3.4	20	X951177	19-Dec-19	
SM 4500-P-E	Phosphorus	mg/L	0.505	0.508	0.500	101	0.6	20	X952095	26-Dec-19	D
Anions by Ion Chromatography											
EPA 300.0	Chloride	mg/kg	30.8	31.2	31.3	98.6	1.2	20	X951182	31-Dec-19	
EPA 300.0	Nitrate as N	mg/kg	21.4	21.6	20.8	101	1.0	20	X951182	31-Dec-19	
EPA 300.0	Sulfate as SO4	mg/kg	108	109	104	98.2	0.8	20	X951182	31-Dec-19	
EPA 300.0	Chloride	mg/L	3.78	3.68	3.00	110	2.6	20	X951160	19-Dec-19	
EPA 300.0	Nitrate as N	mg/L	2.27	2.19	2.00	114	3.8	20	X951160	19-Dec-19	M1
EPA 300.0	Nitrate/Nitrite as N	mg/L	4.47	4.37	4.00	112	2.2	20	X951160	19-Dec-19	M1
EPA 300.0	Nitrite as N	mg/L	2.19	2.18	2.00	110	0.6	20	X951160	19-Dec-19	
EPA 300.0	Sulfate as SO4	mg/L	18.8	18.5	10.0	110	1.7	20	X951160	19-Dec-19	

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Notes and Definitions

D	The reported value is from a dilution.
D1	Sample required dilution due to matrix.
D2	Sample required dilution due to high concentration of target analyte.
M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M2	Matrix spike recovery was low, but the LCS recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The LCS recovery was acceptable.
R2B	RPD exceeded the laboratory acceptance limit.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
0.30R>S	% recovery not applicable; spike level is less than 30% of the sample concentration
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable