WATER YEAR 2019 REPORT

TAYLOR CREEK FLOW AND SEDIMENT TRANSPORT MONITORING PROJECT

Prepared for
Seattle Public Utilities

Prepared by
Herrera Environmental Consultants, Inc.

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WATER YEAR 2019 REPORT

TAYLOR CREEK
FLOW AND SEDIMENT TRANSPORT MONITORING
PROJECT

Prepared for
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INTRODUCTION

Taylor Creek drains a 640-acre urbanized watershed located near the southwest end of Lake Washington (Figure 1). The creek originates in unincorporated King County and passes through a natural area known as Dead Horse Canyon within Lakeridge Park. It then passes through residential yards and a culvert under Rainer Avenue South before discharging into Lake Washington. Sediment export from Taylor Creek is elevated due to local geology and urbanization of the basin (Perkins Geosciences 2007). Sediment deposition in the delta at the mouth of Taylor Creek in Lake Washington has resulted in restricted fish passage and reduced accessibility to nearby docks. In addition, localized residential flooding in the reach immediately upstream from the delta has been attributed to increased sedimentation (Perkins Geosciences 2003). To improve stream channel habitat and address storm-related flooding, the City of Seattle (City) is designing sediment control features upstream of the creek's crossing on Rainier Avenue South and potentially further upstream in Dead Horse Canyon.

In order to inform the design of these sediment control features, the City is implementing a monitoring project to develop a baseline understanding of sediment transport, deposition, and sources in Taylor Creek and its tributaries. Data collected as part of this project will provide City staff with critical information for the design, operations, and maintenance of the new sediment control features.

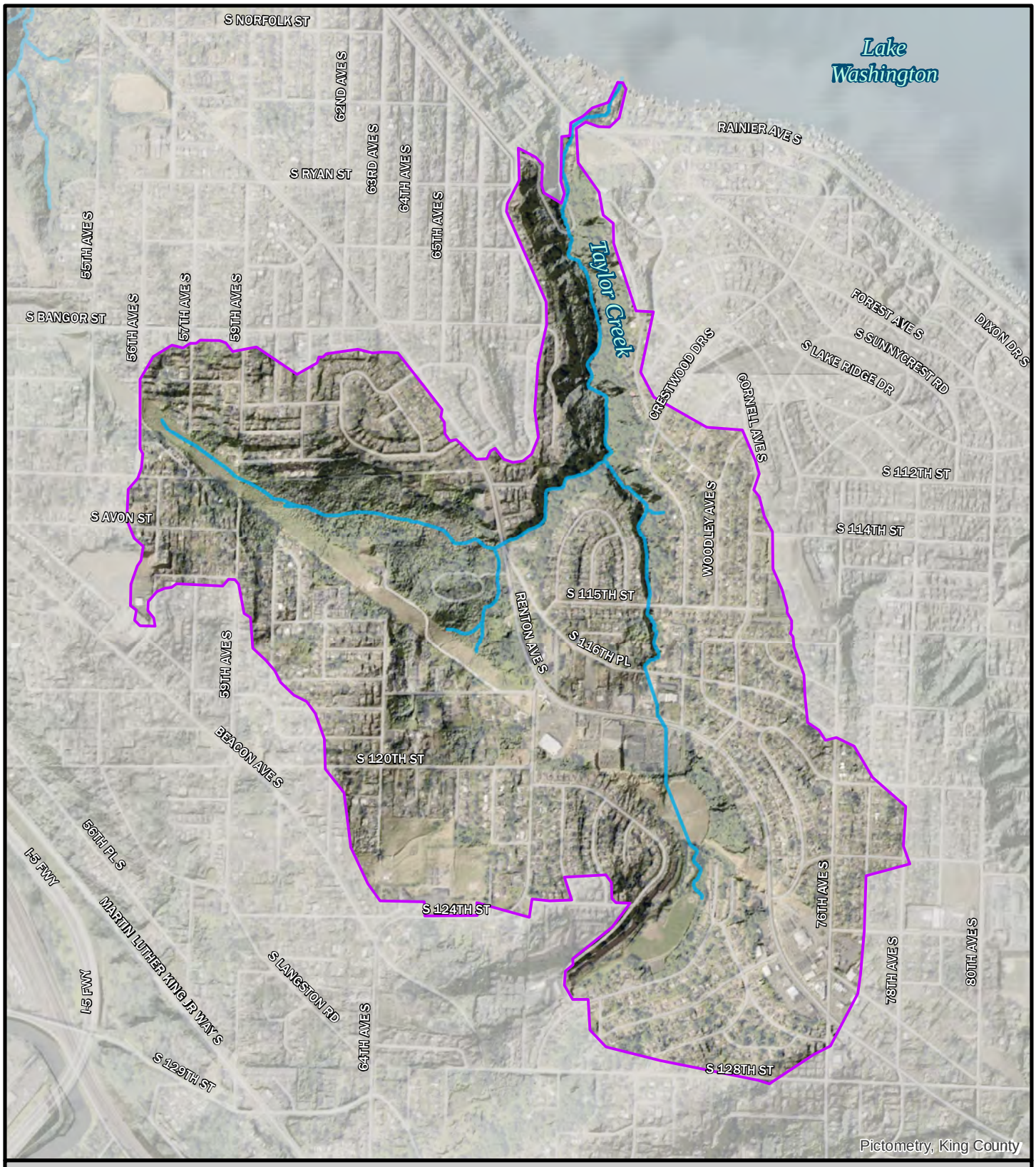
Given these project goals, the following objectives have been defined for the monitoring:

- Characterize flow and suspended sediment loading in the mainstem of Taylor Creek and its upstream west and east forks.
- Construct bedload rating curves correlating sediment transport and flow to identify locations where bedload originates.

To meet these objectives, the experimental design for the monitoring project involves continuous flow monitoring at three monitoring stations; one on the mainstem and one on each fork (Figure 2). Water quality sample collection and measurements of stream discharge are also performed at these stations during targeted storm events. The water quality samples are collected by automated samplers and analyzed for suspended sediment concentration (SSC) for use in estimating suspended sediment export in the creek across different sized storms. Turbidity sensors were also installed at each of the three monitoring stations to collect turbidity continuously on a 15-minute interval. Finally, the bed load at each station is quantified using pit traps.

This report summarizes the results from monitoring for this project that was implemented over the period from October 1, 2018 through September 30, 2019, or Water Year 2019 (WY2019). It begins with a brief description of the experimental design that was used for this monitoring.

Results from the monitoring are then presented for each major component of the experimental design. Finally, sediment transport estimates that were derived using the results from this monitoring are presented for suspended sediment and bedload, respectively.



Legend

- Watershed boundary
- Stream
- Street

Figure 1.
Catchment Area for Taylor Creek in Seattle, Washington.

N

0 600 1,200 2,400 Feet

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King County, Aerial (2017)

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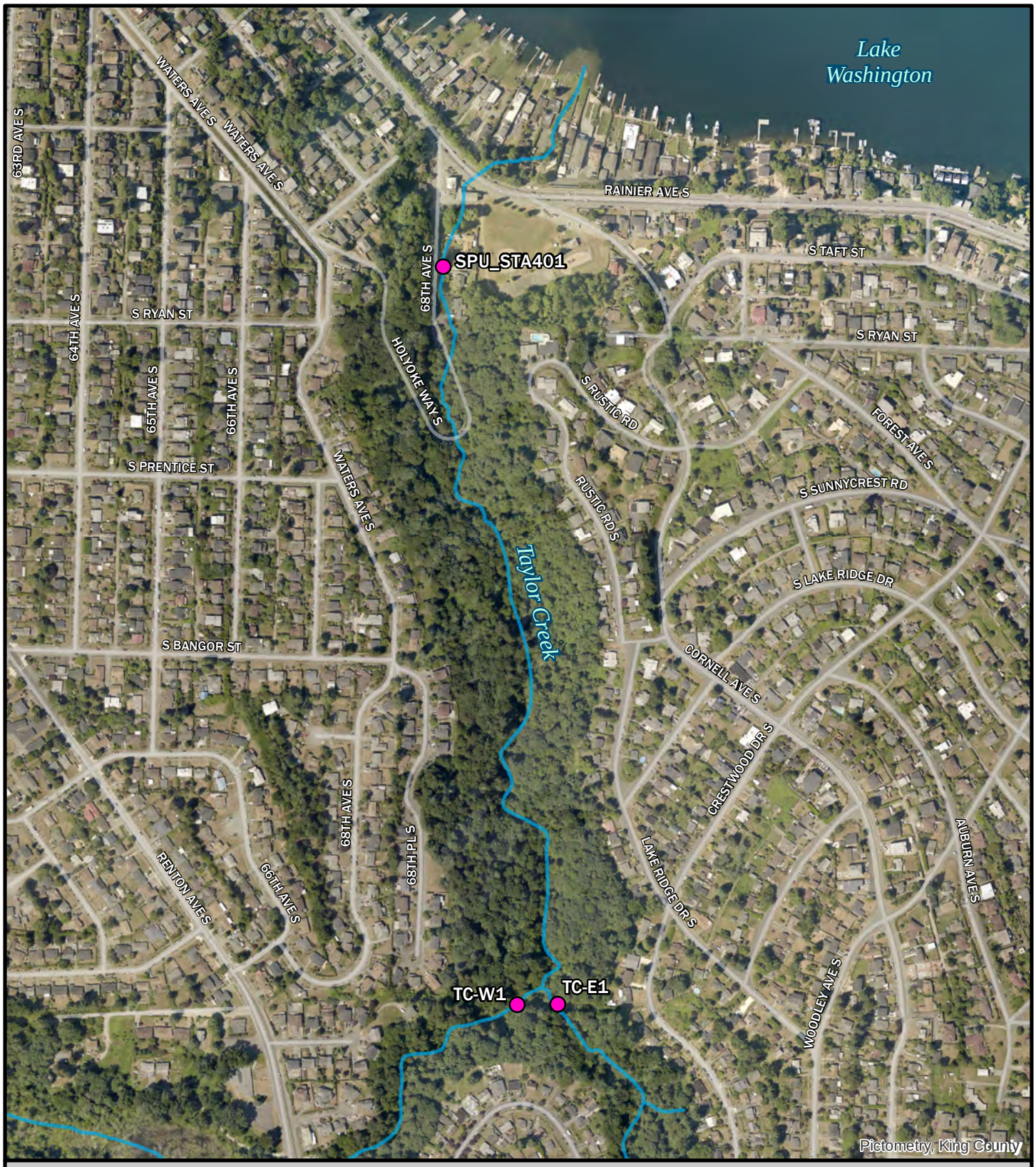

Legend

- Sampling site location
- Stream
- Street

Figure 2.
Monitoring Locations for Taylor Creek in Lakeridge Park.

0 250 500 1,000 Feet

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King County, Aerial (2017)

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EXPERIMENTAL DESIGN

This section describes the experimental design that was used for the project including monitoring locations, monitoring equipment, and field data collection procedures. A more detailed description of these procedures is provided in the project Sampling and Analysis Plan (SAP) (Herrera 2019).

MONITORING LOCATIONS

Monitoring occurred at the existing SPU stream gauge on Tayler Creek near Rainier Avenue South (SPU_STA401) and at two new stream gauges established for the project in October 2018 on the east and west forks of the creek. The monitoring stations are named as follows and their locations are shown in Figure 2.

- Main stem station near Rainier Avenue South: SPU_STA401
- Upstream station in the west fork: TC-W1
- Upstream station in the east fork: TC-E1

MONITORING EQUIPMENT

Each monitoring station was equipped with a staff gauge and a water level sensor mounted within a stilling well. The water level sensors were programmed to continuously record water level (stage) with a 15-minute logging interval for the duration of the monitoring. Station SPU_STA401 utilized an existing Campbell CS450L water level sensor interfaced with a CR800 datalogger that was installed by the City (Figure 3). Stations TC-W1 (Figure 4) and TC-E1 (Figure 5) were equipped with In-Situ RuggedTroll 100 non-vented water level sensors and In-Situ BaroTroll 100 sensors for barometric correction.

Figure 3. SPU_STA401 Monitoring Station.

Figure 4. TC-W1 Monitoring Station.

Figure 5. TC-E1 Monitoring Station.

To facilitate development of stream discharge rating curves at each monitoring station, rebar was driven into the bank on either side of the creek to mark a cross sectional area for making manual measurements of discharge. The rebar was used to anchor a graduated tape that was stretched across the creek during these measurements.

Each station was also equipped with an Isco 6700 compact automated sampler to facilitate collection of composite water samples for SSC analysis. Intake strainers for the samplers were positioned 2 inches above the bed of the creek near the thalweg to ensure they were continuously submerged but not suctioning bedload.

YSI 600 OMS Sondes with 6136 Turbidity Sensors were installed at SPU_STA401 on December 4, 2018; and at TC-W1 and TC-E1 on March 8, 2019. The sondes were installed in vented stilling wells and programmed to continuously record turbidity with a 15-minute logging interval.

Finally, bed load pit traps were installed in the streambed at all three monitoring stations. The pit traps consisted of two 5-gallon buckets buried so their openings were flush with the streambed. Before targeted storm events, the lids of the pit traps were removed and the buckets were allowed to fill with bedload.

Field Data Collection Procedures

Field data collection procedures are described herein for water quality sampling, discharge and water level measurements, and bed load monitoring.

Water Quality Sampling Procedures

Twenty-four time paced water quality samples were collected during discrete storm events at the three monitoring stations. Before each targeted storm event, field staff conducted site visits to set up the automated samplers at the monitoring stations. The automated samplers were programmed to collect twenty-four 500 milliliter (mL) samples at 30 minute intervals over a 12 hour period, though this interval was adjusted slightly depending on the anticipated duration of the incoming storm event. If sampling criteria were met, field personnel returned to remove the 24-bottle rack from each automated sampler and selected four representative sample bottles based on visual inspection of turbidity, including the bottle with the highest turbidity. The goal was to obtain a sample set which represented the entire range of storm suspended solids concentrations with as few samples as possible. The selected samples were transported on ice to Analytical Resources Inc. in Tukwila, Washington and analyzed for SSC (ASTM D3977-97B). Additional samples were also collected through the course of the monitoring for quality assurance purposes (e.g., one field duplicate (split sample) for each site.

Discharge and Water Level Measurement Procedures

Stream discharge was measured at the three monitoring stations using a handheld Marsh McBirney electromagnetic velocity meter and the mid-section velocity method. Detailed descriptions of the procedures used for these measurements are provided in the project SAP (Herrera 2019). A total of ten discharge events were targeted for stream discharge measurements.

Data from the water level sensors at stations TC-E1 and TC-W1 were downloaded on a one to two month basis and stored in an Aquarius™ continuous data management database. Data from the water level sensor at station SPU_STA401 was remotely downloaded via a Raven XTV cellular modem on a daily basis. These data were also stored in the Aquarius™ continuous data management database along with the data from TC-E1 and TC-W1.

Bedload Sampling Procedures

Two pit traps were installed at each monitoring station. One trap was located in the channel thalweg to ensure the sediment transport is captured during events with limited bed mobility. The second was in the same cross-section but outside the thalweg to capture the bulk of sediment moving during large storms with full bed mobility. Before targeted storm events, field personnel visited each pit trap and removed the lids from the traps. Burlap sacks were then placed in each trap and affixed to the buckets. After the storm event, field personnel revisited

each site and collected the sacks. The contents were submitted to Analytical Resources Inc. for weighing and grain size (ASTM D422) analysis per the project SAP (Herrera 2019).

Turbidity Measurement Procedures

Data from the turbidity sensors were downloaded and the batteries changed on a monthly basis. The turbidity data were subsequently uploaded to the Aquarius™ continuous data management database and stored with the water level data and rating curve results.

RESULTS AND DISCUSSION

This section presents results from monitoring conducted over WY2019 under the following subheadings for key components of the experimental design:

- Water Quality Sampling Results
- Discharge and Water Level Measurement Results
- Bedload Sampling Results
- Turbidity Measurement Results
- Sediment Transport Results

Sediment transport estimates that were derived using the results from this monitoring are then presented in a separate subsection for suspended sediment and bedload, respectively. Supporting data from this monitoring is also presented in the following appendices to this report:

- Appendix A: laboratory reports for SSC and bedload grain size
- Appendix B: field forms from targeted events for bedload and water quality sampling
- Appendix C: field forms from flow measurements
- Appendix D: water level measurement correction history
- Appendix E: storm event hydrographs and summary statistics

WATER QUALITY SAMPLING RESULTS

This section presents results from water quality sampling that was conducted over WY2019. It begins by summarizing the quality of data collected through this sampling; detailed information on the analytical results from this sampling are then presented.

Data Quality

The project SAP called for a method blank, laboratory control standard, and a laboratory duplicate to be run with each set of submitted samples for SCC analyses. Guidance obtained from the project laboratory (Materials Testing and Consulting, Inc. [MTC]) on December 20, 2019 indicated these quality assurance (QA) samples were not required pursuant to the analytical

method for SCC; hence, they were not analyzed with field samples that were submitted to the laboratory in WY2019. In addition, no field duplicates were submitted with field samples in WY2019 because there was not enough volume to split the samples in the field. As described in the *Water Quality Sampling Procedures* section above, each sample in the 24-bottle rack had a volume of 500 mL which is the minimum volume required for SSC analysis. In WY2020 the samplers will be reprogrammed to collect two sequential 500 ml samples for each 30-minute time step. This will result in half as many samples (12 instead of 24), but it will provide sufficient volume for duplicate analysis. The project SAP will be updated for WY2020 to reflect these new QA procedures.

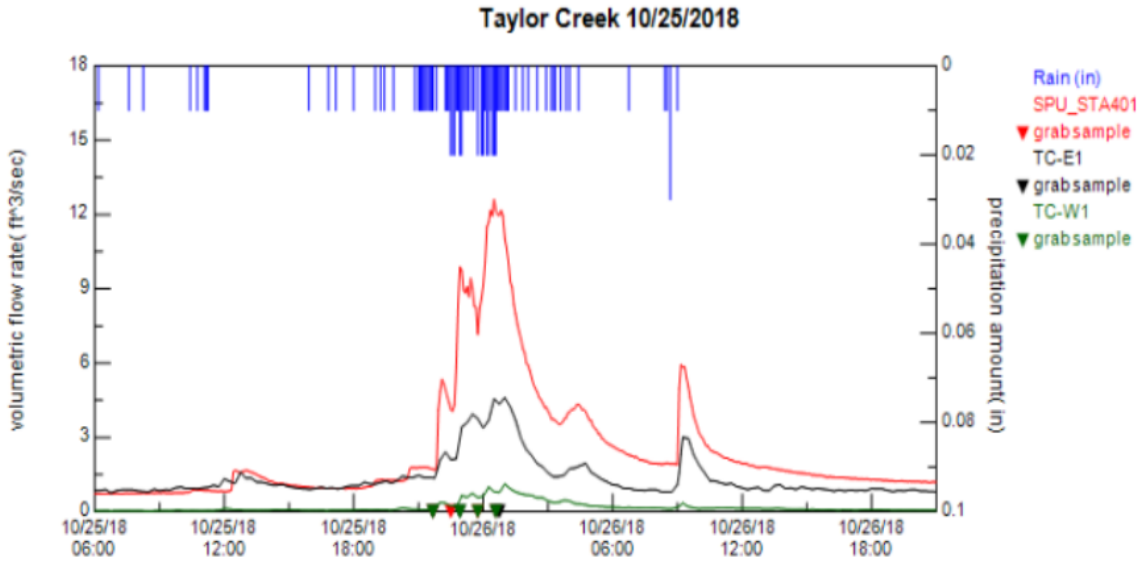
The holding time for samples pursuant to the analytical method for SSC (ASTM D3977-97B) is seven days. This holding time was not exceeded for any of the submitted water quality samples (Appendix A). Field preservation requirements in the SAP also required samples to be held on ice and kept below 6 degrees Celsius. Again, all submitted water quality samples met this criterion (Appendix A).

Results

The project SAP established a goal of collecting samples during up to five events from the start of the project through the end of the 2019 calendar year; samples were actually collected during four events over this period. Two of these four events occurred during WY2019 (ending September 30, 2019) while the remaining two events occurred in Water Year 2020 (WY2020). This report only presents results from the two events that occurred in WY2019; results from the events that occurred in WY2020 will be presented in in next year's project report.

The two events sampled in WY2019 occurred on October 25, 2018 and January 23, 2019, respectively. The hydrographs for each of these events are presented in Figures 6 and 7. Twenty-four samples were collected across each of these hydrographs, beginning on the rising limb and continuing to the falling limb. Field personnel selected 4 samples of the 24 samples (Figures 6 and 7) for SCC analyses based on visual observations to capture a range of water quality from the least to the most turbid. The corresponding SSC concentrations and collection times for these samples are presented in Table 1.

As shown in Table 1, the highest SSC concentrations (average of 1,888 milligrams per liter [mg/L]) were observed in the East Fork tributary (TC-EF). This is consistent with historical observations for this reach that have shown it has the highest potential for sediment export (Confluence 2012). The West Fork (TC-WF) exhibited the lowest SSC concentrations (average of 215 mg/L), while concentrations measured at the downstream mainstem station (SPU_STA401) averaged 1,347 mg/L. The West Fork is fed by a wetland and has fewer sediment source areas than the other reaches; hence, the lower SSC concentrations observed at this station during the sampled events are consistent with the existing geomorphology.



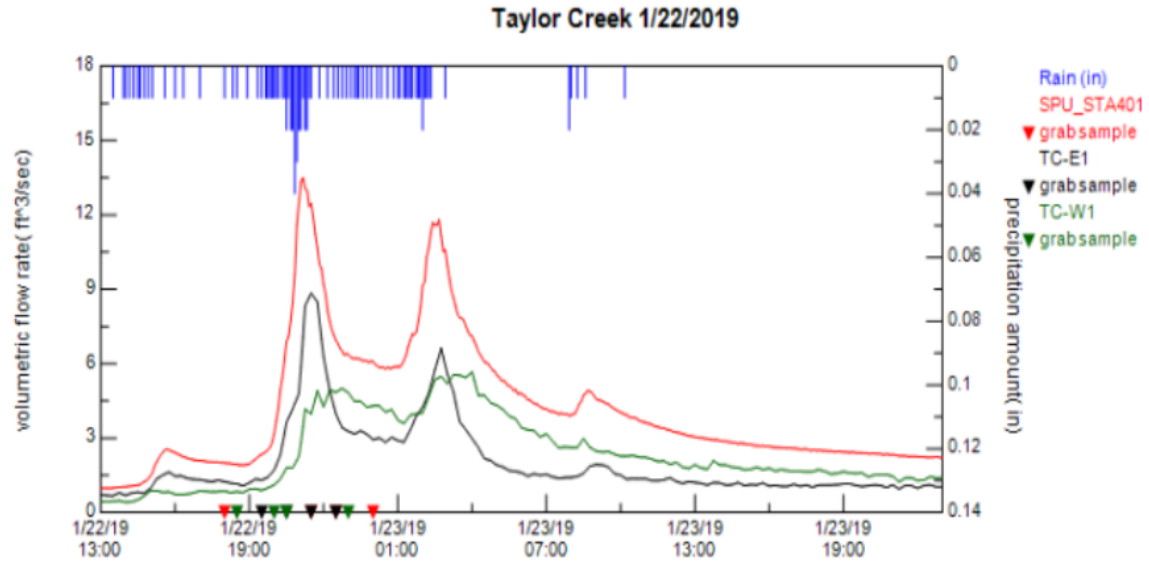
Precipitation Statistics		
	Units	Value
Start		10/25/2018 06:10
Stop		10/26/2018 09:00
Duration	hour	26.8333
Total	in	0.92
Average Intensity	in/hr	0.0343
Maximum	in	0.03
Maximum Intensity	in/hr	0.36
Antecedent Dry Period	hour	35.5

Flow Statistics				
	Units	SPU_STA401	TC-E1	TC-W1
Start		10/25/2018 06:10	10/25/2018 06:10	10/25/2018 06:10
Stop		10/26/2018 20:55	10/26/2018 20:55	10/26/2018 20:55
Duration	hour	38.8333	38.8333	38.8333
Average	ft^3/sec	2.4767	1.3719	0.1816
Maximum	ft^3/sec	12.5968	4.6066	1.1216
Volume	cf	346247.7	191786.2	25393.93
Sample Count	count	0	0	0

Figure 6. Event Hydrographs and Storm Statistics for the October 25, 2018 Sampling Event.

There is little SCC data available from other local urbanized creeks for comparison to these data because total suspended solids (TSS) is more commonly measured. Based on comparisons to available TSS data, the SSC concentrations measured in Taylor Creek are relatively high. For example, the maximum TSS concentration from 50 storm grab samples collected in Thornton Creek in north Seattle from 1986 to 1997 was only 290 mg/L (SPU 2000), 23 times lower than the maximum SSC concentration (6,694 mg/L at the TC-EF station) observed in samples collected from Taylor Creek in WY2019.

The high SCC concentrations measured in Taylor Creek can be explained by several factors. In general, the SSC concentration obtained for a given sample tends to be elevated relative to the TSS concentration due to bias introduced by the associated laboratory methods. This bias is introduced because the TSS laboratory method involves pipetting from a mixed sample into the filter apparatus used for the method, a procedure that is not effective at capturing large particles and thus excludes them from the analysis (Chan et al. 2008). Conversely, the SSC method involves pouring the entire sample through the filter apparatus and thus captures all particles regardless of their size.



Precipitation Statistics		
	Units	Value
Start		1/22/2019 13:30
Stop		1/23/2019 10:10
Duration	hour	20.6667
Total	in	0.94
Average Intensity	in/hr	0.0455
Maximum	in	0.04
Maximum Intensity	in/hr	0.48
Antecedent Dry Period	hour	30.8

Flow Statistics				
	Units	SPU_STA401	TC-E1	TC-W1
Start		1/22/2019 13:25	1/22/2019 13:25	1/22/2019 13:25
Stop		1/23/2019 22:05	1/23/2019 22:05	1/23/2019 22:05
Duration	hour	32.75	32.75	32.75
Average	ft^3/sec	4.2477	2.0417	2.4337
Maximum	ft^3/sec	13.4986	8.8467	5.6716
Volume	cf	500804.5	240713.9	286938
Sample Count	count	0	0	0

Figure 7. Event Hydrographs and Storm Statistics for the January 22, 2019 Sampling Event.

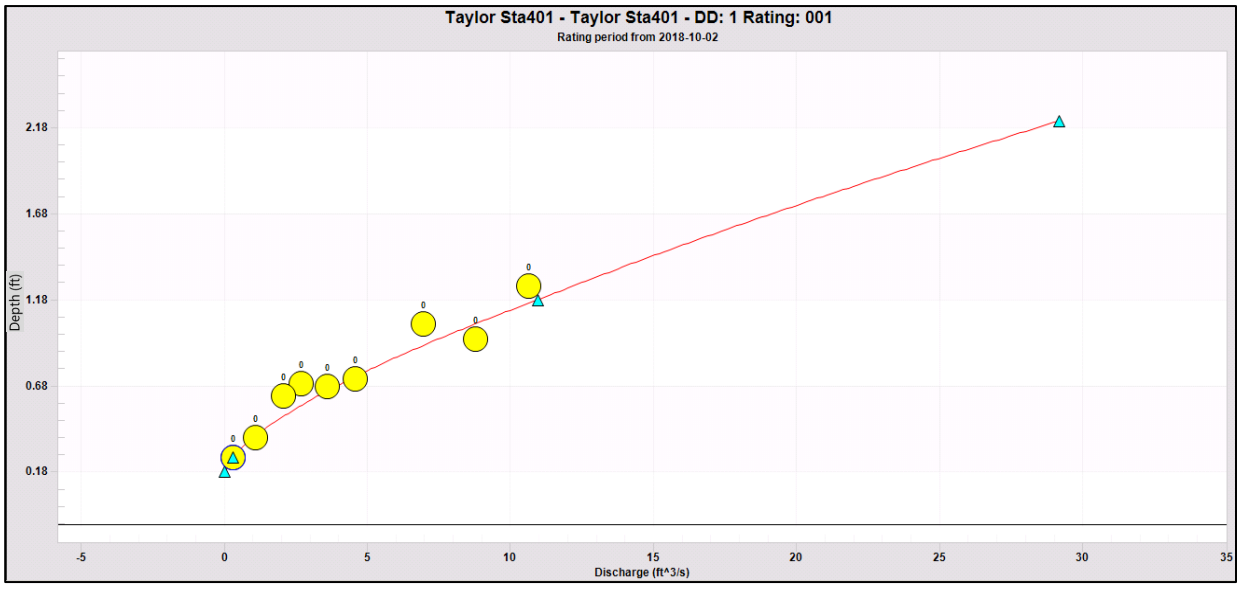


Figure 8. SPU_STA401 WY2019 Rating Curve.

Table 1. SSC Results for the WY2019 Sampled Events.						
	SPU_STA401		TC-WF		TC-EF	
Date and Time	Q (cfs)	SSC (mg/L)	Q (cfs)	SSC (mg/L)	Q (cfs)	SSC (mg/L)
Sampled Event 1						
10/25/2018 21:40	1.7		0.2	405	1.4	
10/25/2018 22:55	9.9		0.5	102	3.0	
10/25/2018 23:45	7.2		0.6	674	3.8	
10/26/2018 0:35	12.2		0.8	110	4.5	
10/25/2018 21:40	1.7		0.2		1.4	2,074
10/25/2018 22:55	9.9		0.5		3.0	3,908
10/26/2018 0:45	12.0		0.8		4.4	585
10/26/2018 0:35	12.2		0.8		4.5	35
10/25/2018 21:40	1.7	38	0.2		1.4	
10/25/2018 22:30	4.1	579	0.2		2.1	
10/25/2018 23:45	7.2	978	0.6		3.8	
10/26/2018 0:35	12.2	567	0.8		4.5	
Sampled Event 2						
1/22/2019 18:30	1.9		0.8	11	1.2	
1/22/2019 20:00	3.2		1.1	44	1.7	
1/22/2019 20:30	6.9		1.8	266	3.6	
1/22/2019 23:00	6.4		4.8	109	3.3	
1/22/2019 19:30	2.3		0.9		1.3	18
1/22/2019 20:30	6.9		1.8		3.6	196
1/22/2019 21:30	12.5		4.0		8.8	6,574
1/22/2019 22:30	6.9		4.9		4.0	1,716
1/22/2019 18:00	2.0	21	0.9		1.2	
1/22/2019 21:30	12.5	6,694	4.0		8.8	
1/22/2019 22:30	6.9	1,777	4.9		4.0	
1/23/2019 0:00	6.1	126	4.3		2.9	
Minimum	**1.7**	**21**	**0.2**	**11**	**1.2**	**18**
Maximum	**12.5**	**6,694**	**4.9**	**674**	**8.8**	**6,574**
Average	**6.9**	**1,347**	**1.7**	**215**	**3.4**	**1,888**
Median	**6.9**	**573**	**0.8**	**110**	**3.5**	**1,151**

Q = discharge rate in stream

cfs = cubic feet per second

mg/L = milligrams per liter

Additional bias in suspended solids concentrations can come from the field sample collection technique. For example, sampling for this monitoring project involved the use of automated samplers to collect samples within 3 inches of the streambed of Taylor Creek. To collect the samples referenced above in Thornton Creek, grab samples were typically collected at the thalweg by dipping a bottle at the surface. Ideally sampling would be done in a depth and width integrated fashion per USGS protocol (USGS 2003), but this method is typically reserved for large rivers.

Finally, the time paced automated sampling approach used for this monitoring project ensured that samples would be collected near the peak period of sediment transport during each targeted storm event. A routine grab sampling approach during storm events (even over 50 storms, as was the case with the Thornton Creek dataset) is not likely to capture this peak.

Despite the biases introduced by the laboratory and sampling methods used for this monitoring project, it still appears as if Taylor Creek is exporting a large amount of suspended sediment relative to Thornton Creek. The SSC concentrations obtained from this sampling were subsequently used to quantify suspended sediment transport through the Taylor Creek system as described in the *Sediment Transport Results* section below.

Discharge and Water Level Measurement Results

This section presents results from discharge and water level measurements that were collected over WY2019. It begins by summarizing the quality of data collected through these measurements; detailed information on the estimated flows from these measurements are then presented.

Data Quality

Discrete flow measurements were correlated with water level data to construct stream discharge rating curves. The rating curves were then used to estimate continuous flow based on the continuous water level data that were collected at each station with a 15-minute logging interval. This section assesses the quality of first the rating curves and then the water level data.

Rating Curves

The project SAP established a goal of collecting 10 discrete flow measurements across as wide a range of flows as possible at each of the three monitoring stations over WY2019. Assessing flows in small urban creeks can be exceedingly difficult because channel control elements (downstream hard features which hold the relationship between water level and flow at the gauging location) frequently shift when the channel either aggrades or degrades.

The discrete flow measurement data used to develop rating curves for the SPU_STA401, TC-WF, and TC-EF monitoring stations are presented in Tables 2, 3, and 4, respectively. Graphical

representations of the rating curves developed from these data are also provided in Figures 8, 9, and 10, respectively, for each station. The rating curves for stations TC-WF and SPU_STA401 include two flow measurements that were collected in WY2020 (Tables 2 and 3) to increase their accuracy for predicting flows in WY2019. Including those points, there were 9 data points available to develop the rating curves for each station.

Table 2. Rating Table for SPU_STA401.

Date/Time	Depth (ft)	Discharge (cfs)	Made By	Error %	Error Value (cfs)
10/26/2018 0:35	1.26286	10.63	GK, VW	-13	-1.59
1/22/2019 20:46	1.0407	6.95	GK, VW	-20.8	-1.82
2/1/2019 13:25	0.675965	3.6	DSA, KB	-7.18	-0.278
2/12/2019 8:13	0.723572	4.59	DSA, KB	3.33	0.148
2/12/2019 15:10	0.954928	8.78	KB	16.9	1.27
3/27/2019 10:22	0.377601	1.08	KB NM, GK	8.72	0.087
9/6/2019 12:48	0.265565	0.29	KB, NM	0.507	0.001
10/21/2019 21:38	0.691222	2.68	GK, LS	-33.9	-1.38
11/15/2019 7:25	0.620497	2.05	GK, RP	-37	-1.2

Table 3. Rating Table for TC-WF.

Date/Time	Depth (ft)	Discharge (cfs)	Made By	Error %	Error Value (cfs)
10/4/2018 14:02	0.692	0.03	AV	-0.485	0
10/25/2018 22:10	0.886722	0.48	GK, VW	36.1	0.127
1/22/2019 19:11	0.999277	1.54	GK, VW	62	0.59
2/1/2019 12:41	1.06949	1.16	DSA, KB	-24.8	-0.383
2/12/2019 16:35	1.31219	5.39	KB	0.317	0.017
3/27/2019 11:45	0.833742	0.21	GK, NM	6.45	0.013
10/21/2019 21:06	0.998227	0.66	GK	-30	-0.283
11/15/2019 6:51	0.912809	0.28	GK, RP	-38.8	-0.178

Table 4. Rating Table for TC-EF.

Date/Time	Depth (ft)	Discharge (cfs)	Made By	Error %	Error Value (cfs)
10/25/2018 22:39	0.636789	2.033	GK, VW	-4.51	-0.096
1/22/2019 19:49	0.567565	1.588	GK, VW	5.3	0.08
2/1/2019 11:56	0.616017	1.786	DSA, KB	-7.53	-0.145
2/12/2019 9:01	0.67179	1.656	DSA, KB	-33.3	-0.827
2/12/2019 16:00	0.866132	4.953	KB	0.11	0.005
9/6/2019 13:27	0.342979	0.229	KB, NM	0.173	0

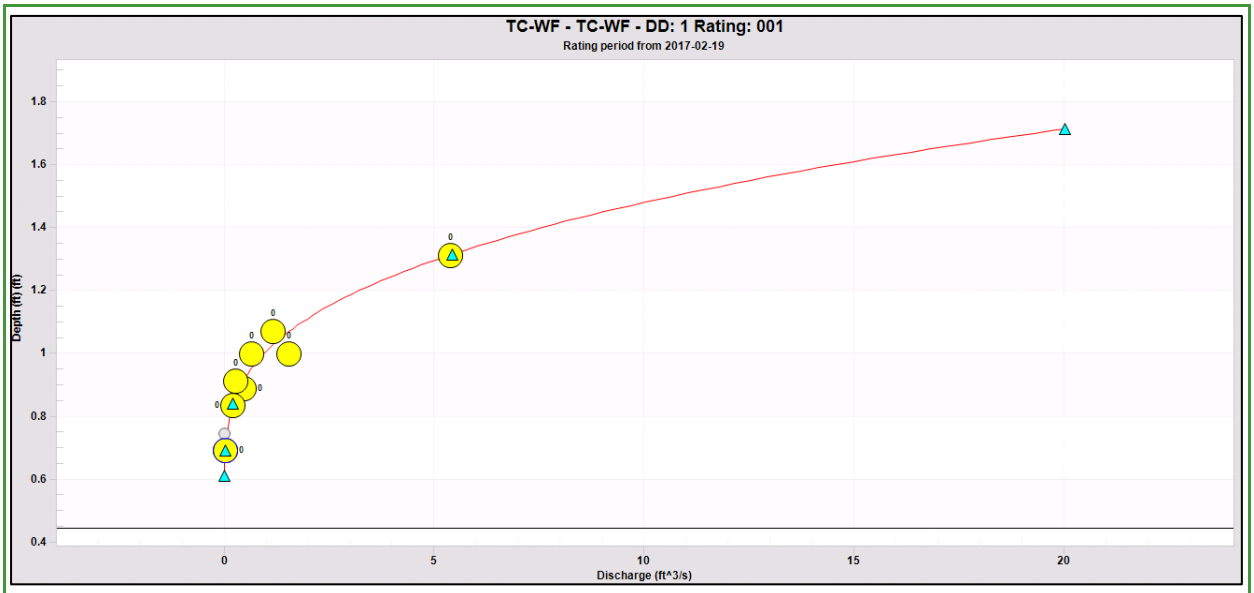


Figure 9. TC-WF WY2019 Rating Curve.

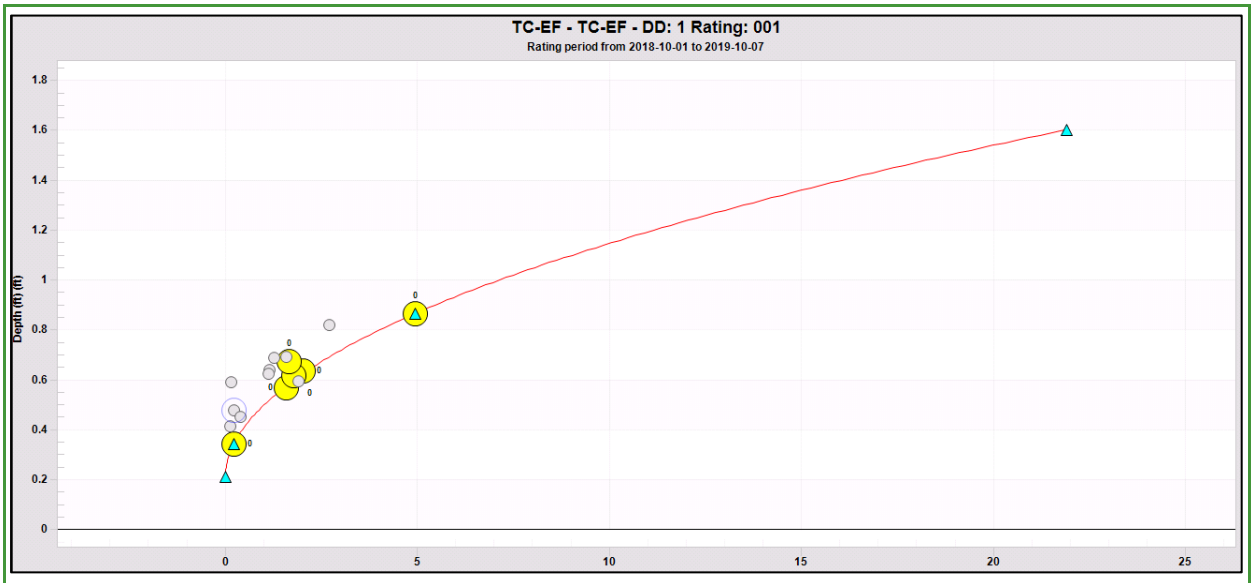


Figure 10. TC-EF WY2019 Rating Curve.

The root mean square error of the rating curve developed for the SPU_STA401 station was 19.8 percent, a value that is generally considered acceptable for rating curves in urban creeks. As shown in Table 2, the highest flow measured at the SPU_STA401 station was 10.63 cubic feet per second (cfs) at a water level of 1.26 feet. The highest measured water level from the continuous measurements described below in WY2019 was 2.23 feet; the estimated flow at this water level by extrapolation from the rating curve shown in Figure 8 was 29.2 cfs. This flow value is nearly 3 times greater than the highest measured flow identified above. In general, any flow value greater than 1.2 times the highest measured flow is considered a marginal estimate that should

be used with caution. In WY2020, larger events will be targeted to refine the upper end of the rating curve.

Following an examination of the 9 discrete flow measurements obtained for developing a rating curve for the TC-WF station, one outlier was removed to improve the accuracy of the rating curve. This point is greyed out in Figure 9 and not included in Table 3. The root means square error of the resultant rating curve was 32 percent, the highest among the 3 sites. This was likely due to aggradation across the channel control from both sediment and the large amount of organic debris which is typical for this reach. The highest measured flow at the TC-WF station was 5.39 cfs, while the highest estimated flow was 7.5 cfs; a factor of 1.39. Again, in WY2020 larger events will be targeted to refine the upper end of this rating.

Rating curve development at the TC-EF station was made difficult by repeated erosion of the channel control during large storm events on April 12, 2019 and September 7, 2019. To provide a more stable channel control for developing rating curves, the stilling well and level sensor were moved upstream on October 7, 2019; consequently, flow measurements made after this date could not be used to develop the rating curve for WY2019. Out of the nine discrete flow measurements collected prior to this date, three measurements (collected on October 4, 2018, March 27, 2019, and July 29, 2019) were excluded because the results were affected by channel incision and therefore considered outliers. After removal of these outliers, the root mean square error of the rating curve (Figure 10) developed using the remaining flow measurements (Table 4) was 14.2 percent.

Water Level Measurements

The raw and corrected continuous water level measurements for stations SPU_STA401, TC-WF, and TC-EF are presented in Figures 11, 12, and 13, respectively. A complete summary of the water level measurement correction history for each station is provided in Appendix D. The following corrections are specifically noted due to their large influence on the quality of the data:

- There is a shift in the water level measurements for the SPU_STA401 station from February 2019 to May 2019 (see difference between raw and corrected data in Figure 11) that was caused by logging measurements with an incorrect offset during this period. The correction fixed this issue resulting in an overall grade of "Good" for the water level measurements at this station over WY2019.

- Figure 12 shows a prorated downward vertical shift in the water level measurements for the TC-WF station over the monitoring period. This shift was applied to correct for progressive aggradation that was observed at the control for this station. Figure 12 also shows there was substantially more "noise" in the water level measurement record for the TC-WF station when compared to the record for the SPU_STA401 station (Figure 11). This noise was introduced because there was no stable pool available at this station to dampen flows around the stilling well. Due to the aggradation issues and turbulence

near the stilling well, water level measurements for the TC-WF station were graded "Fair" over WY2019.

- As noted previously, the TC-EF station posed the most challenges for flow gauging. The incising channel at this station resulted in periodic shifts in the level record. As shown in Figure 13, the most notable shifts occurred in April 2019 and again in September 2019. Despite the corrections that were applied to account for these shifts, the water level measurements for the TC-EF station were nonetheless graded "Poor" for WY2019. This site was also influenced by turbulence at the stilling well.

Results

The rating curves developed for each station were applied to the corrected continuous water level measurements to generate estimates of flow. The final hydrographs derived from these flow estimates are presented in Figure 14 for all three stations while computed summary statistics from these estimates are provided in Table 5 for WY2019.

The final hydrographs were disaggregated into 63 individual storm events based on rainfall using a custom-built program (Storm 3.0). Specifically, an inter-event period of 12 hours with no rain was used to define the start and stop of each event in the period of record. Events smaller than 0.1 inches were excluded because an examination of the hydrograph indicated that these events typically did not result in a flow response at the monitoring stations. Hydrologic summary statistics for each storm event were automatically generated and stored in a SQL database. The resultant storm event hydrographs and summary statistics are presented in Appendix E.

Table 5. WY2019 Hydrologic Summary Statistics.

Station	Number of Events	Peak WY2019 Flow (cfs)	WY2019 Flow Volume (MG)	Maximum Rainfall Intensity (in/hr)	Total Rainfall (in)
SPU_STA401	63	29.2	275	-	-
TC-WF	63	9	94	-	-
TC-EF	63	14.1	152	-	-
RG30	63	-	-	1.92	34.4

cfs = cubic feet per second

MG = million gallons

in/hr = inches per hour

in = inches

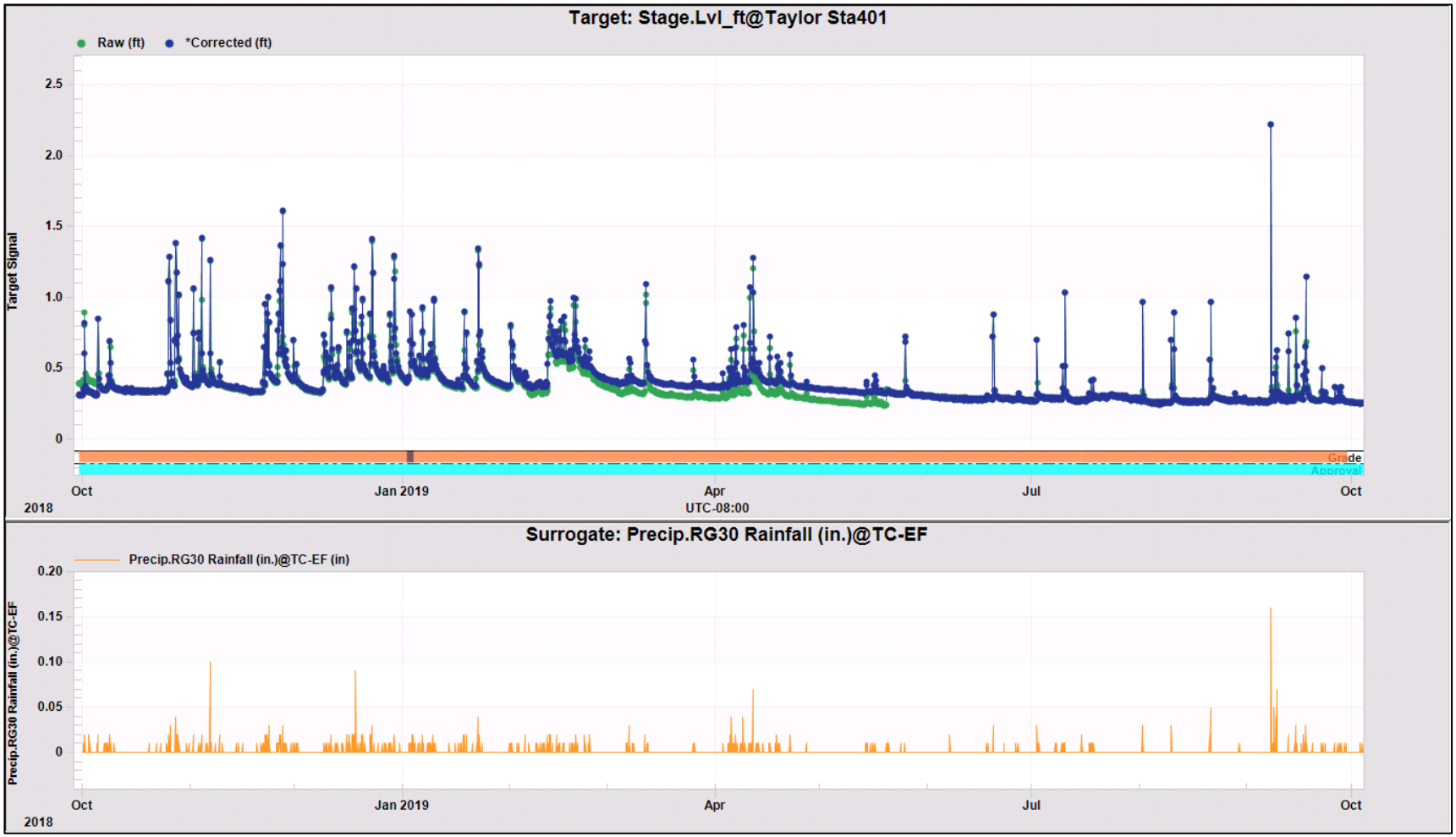


Figure 11. Raw and Corrected Water Level Data from SPU_STA401.

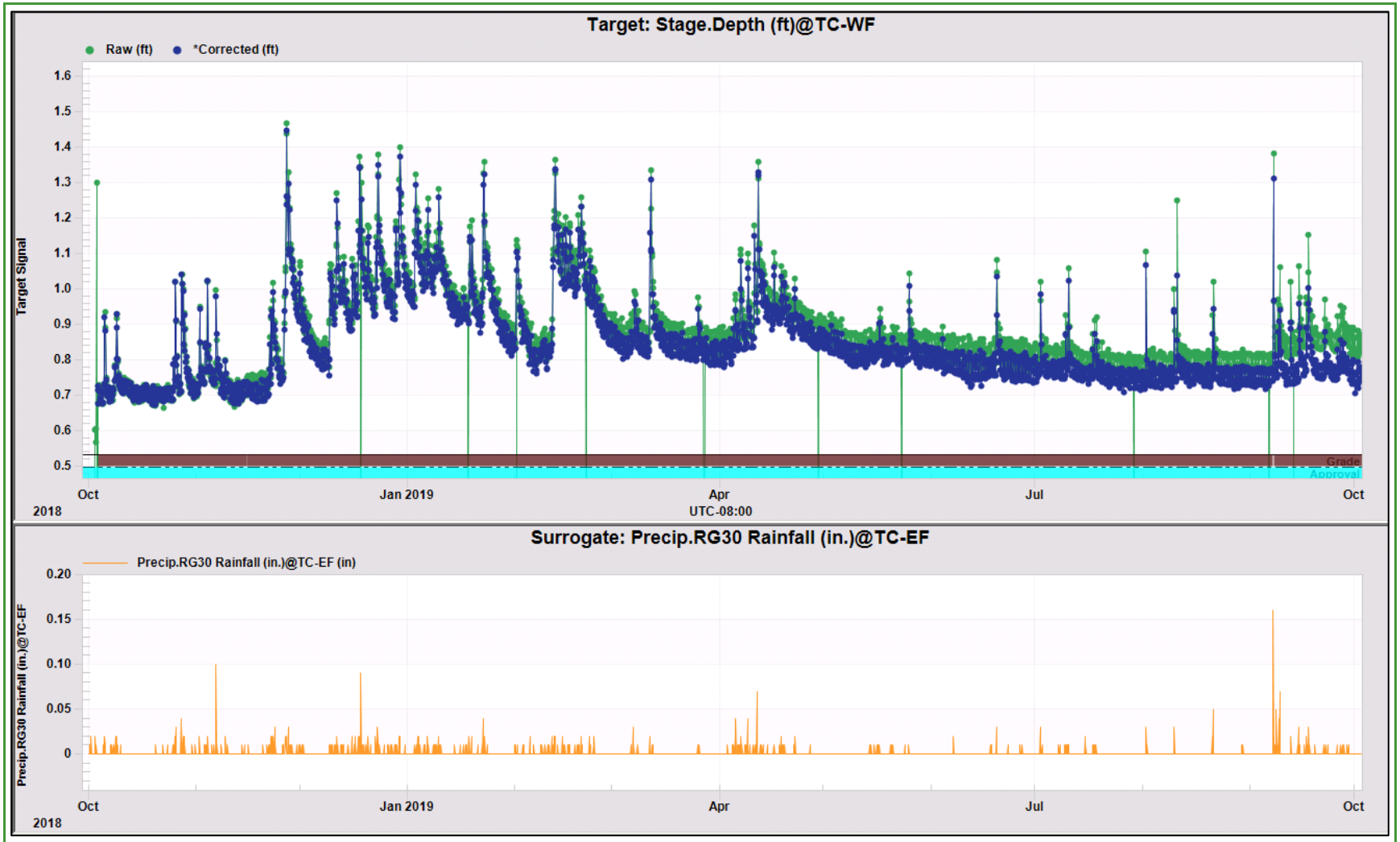


Figure 12. Raw and Corrected Water Level Data from TC-WF.

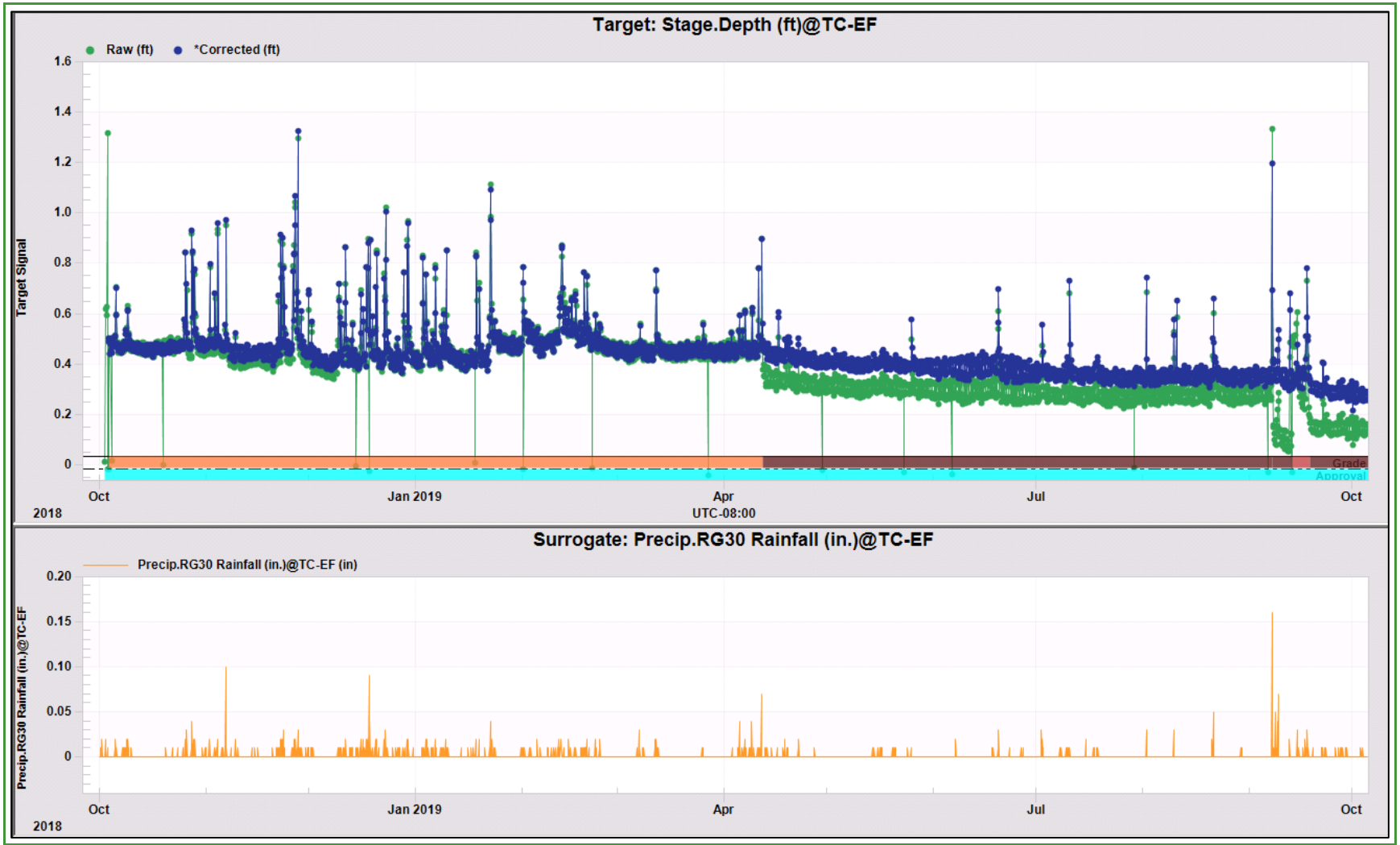


Figure 13. Raw and Corrected Water Level Data from TC-EF.

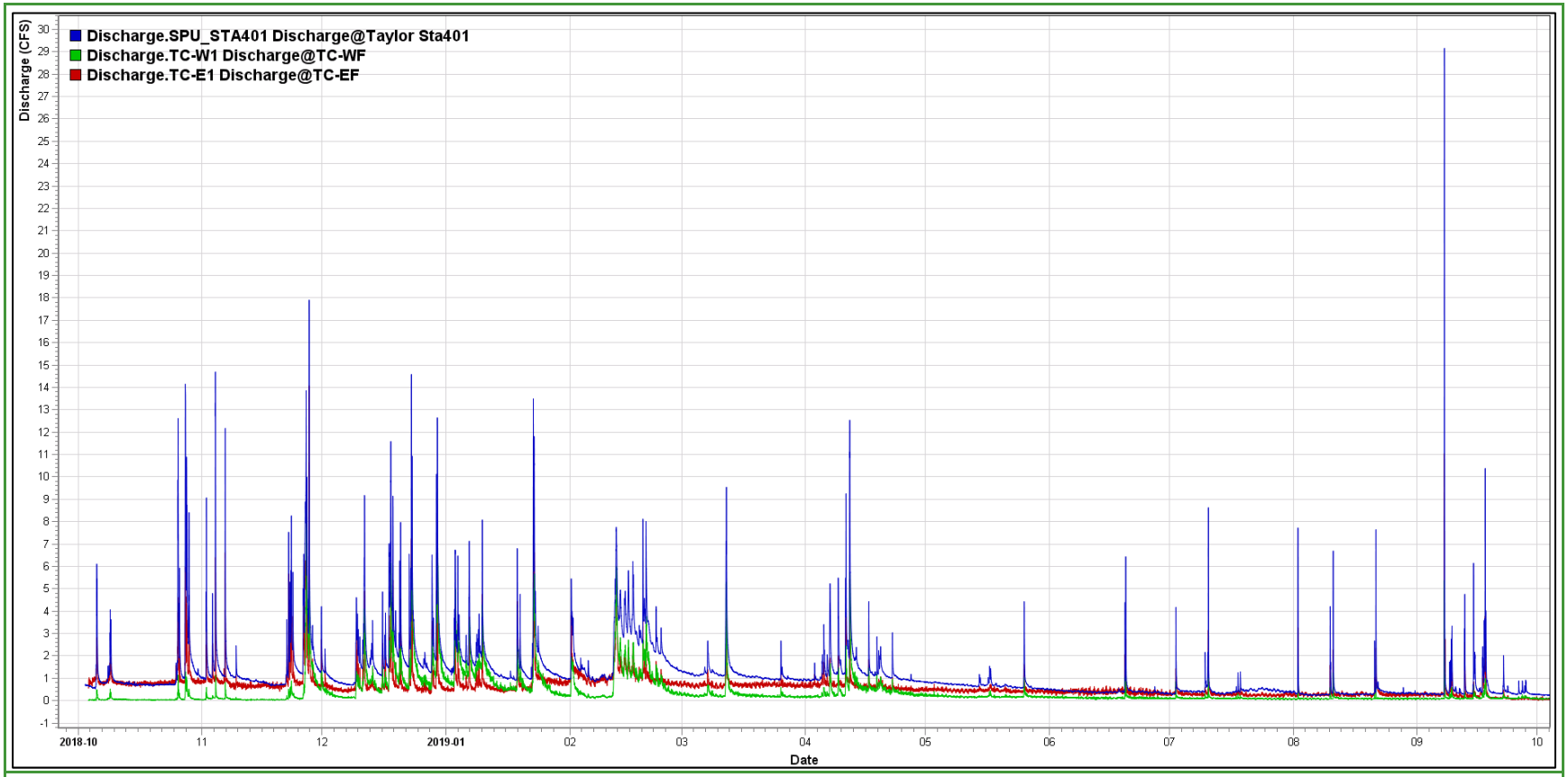


Figure 14. WY2019 Hydrographs for Each Monitoring Station.

BEDLOAD SAMPLING RESULTS

This section presents results from bedload sampling that was conducted over WY2019. It begins by summarizing the quality of data collected through this sampling; detailed information on the analytical results from this sampling are then presented.

Data Quality

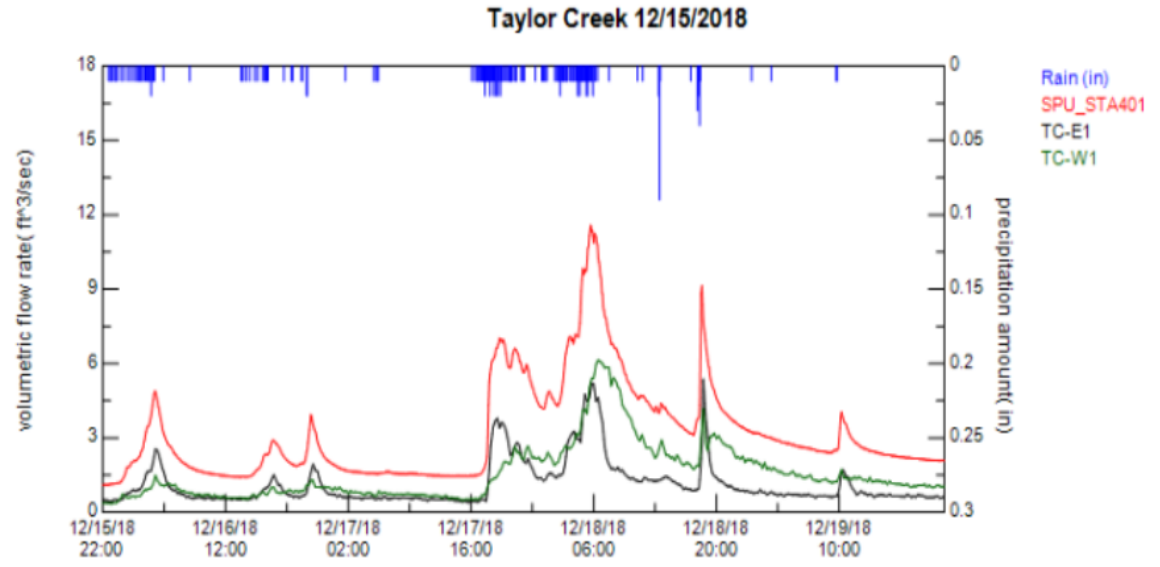
The project SAP called for a method blank, laboratory control standard, and a laboratory duplicate to be run with each set of submitted bedload samples. Guidance obtained from the project laboratory (MTC]) on December 20, 2019 indicated these QA samples were not required pursuant to the analytical method; hence, they were not analyzed with bedload samples that were submitted to the laboratory in WY2019. In addition, no field duplicates were submitted in WY2019 because samples were only collected during two of the five storm events targeted for sampling. Field duplicates will be collected in WY2020 and the results of the duplicate QA analysis will be presented in the associated summary report.

Bedload samples were collected during storm events on December 18, 2018 and January 23, 2019 using two pit traps installed at each of the three monitoring stations; a total of 12 samples were collected over these events (2 events x 2 pit traps per station x 3 stations). Due to an inadvertent technical error while processing samples from the December 18, 2018 event, the laboratory lost one of the two samples from the SPU_STA401 station; consequently, the total sample count for that station is three instead of four.

All bedload samples were analyzed within the 6-month holding time. Field preservation requirements in the SAP also required samples to be held on ice and kept below 6 degrees Celsius. Although samples were delivered to the laboratory on ice, the samples obtained from the December 18, 2019 event exceeded this criterion by 5.8 degrees. Despite this exceedance, the data were not qualified because temperature preservation does not have a large effect on sediment grain size analysis.

Results

To aid in the interpretation of the bedload sample results, hydrographs and summary statistics for the storm events sampled on December 18, 2018 and January 22, 2019 are provided in Figures 7 and 15, respectively. Based on flow data compiled at the SPU-STA401 station over WY2019, these events had the second and eleventh highest flow volumes out of the 63 events (Appendix E) that occurred over this period, respectively. These events also had the eleventh and sixth highest peak discharges, respectively, over this same period. Consequently, these events were considered relatively large and would typically be associated with a mobile substrate.



Precipitation Statistics		
	Units	Value
Start		12/15/2018 22:40
Stop		12/19/2018 09:45
Duration	hour	83.0833
Total	in	1.86
Average Intensity	in/hr	0.0224
Maximum	in	0.09
Maximum Intensity	in/hr	1.08
Antecedent Dry Period	hour	18.2

Flow Statistics				
	Units	SPU_STA401	TC-E1	TC-W1
Start		12/15/2018 22:40	12/15/2018 22:40	12/15/2018 22:40
Stop		12/19/2018 21:40	12/19/2018 21:40	12/19/2018 21:40
Duration	hour	95.0833	95.0833	95.0833
Average	ft^3/sec	3.2086	1.1451	1.5735
Maximum	ft^3/sec	11.5704	5.3697	6.1537
Volume	cf	1098294	391977.5	538624.6

Figure 15. Event Hydrographs and Storm Statistics for the December 18, 2018 Sampling Event.

Table 6 presents the mass of sediment caught in each trap (thalweg and bank) for each station. These results indicate that the greatest bedload transport occurs at the SPU_STA401 and TC-EF stations, with the TC-WF station exporting about half as much sediment by mass. The TC-EF station exported nearly as much sediment as the SPU_STA401 station during the 2 sampled events (Table 6). This is noteworthy because the peak flows at the SPU-STA401 station were 77 percent greater than at the TC-EF station during these two events (average of 12.6 versus 7.1 cfs). Hence, the East Fork exported nearly as much sediment as the downstream mainstem station despite having lower flow rates. This is again more evidence that the east fork is the primary source of sediment in the basin.

In addition to sediment mass, a grain size analysis was conducted on each sample. Figure 16 presents the average distributions for each station. The median particle diameter (D50) was 2,461 (fine gravel), 543 (coarse sand), and 676 (coarse sand) microns for the SPU_STA401, TC-WF, and TC-EF stations, respectively. This relationship matched field observations with the finest substrate noted at the TC-WF station and the coarsest observed at the SPU_STA401 station.

Table 6. Mass of Sediment Caught in Pit Traps.						
Storm Date	**SPU_STA401 (kg)**		**TC-WF (kg)**		**TC-EF (kg)**	
	Thalweg	**Bank**	**Thalweg**	**Bank**	**Thalweg**	**Bank**
12/15/2018	9.8	2.0	2.9	1.0	7.0	6.4
1/22/2019	9.7	2.2	5.0	0.4	5.6	0.9
Average	**9.8**	**2.1**	**4.0**	**0.7**	**6.3**	**3.7**
Total	**23.7**		**9.3**		**19.9**	

kg = kilograms

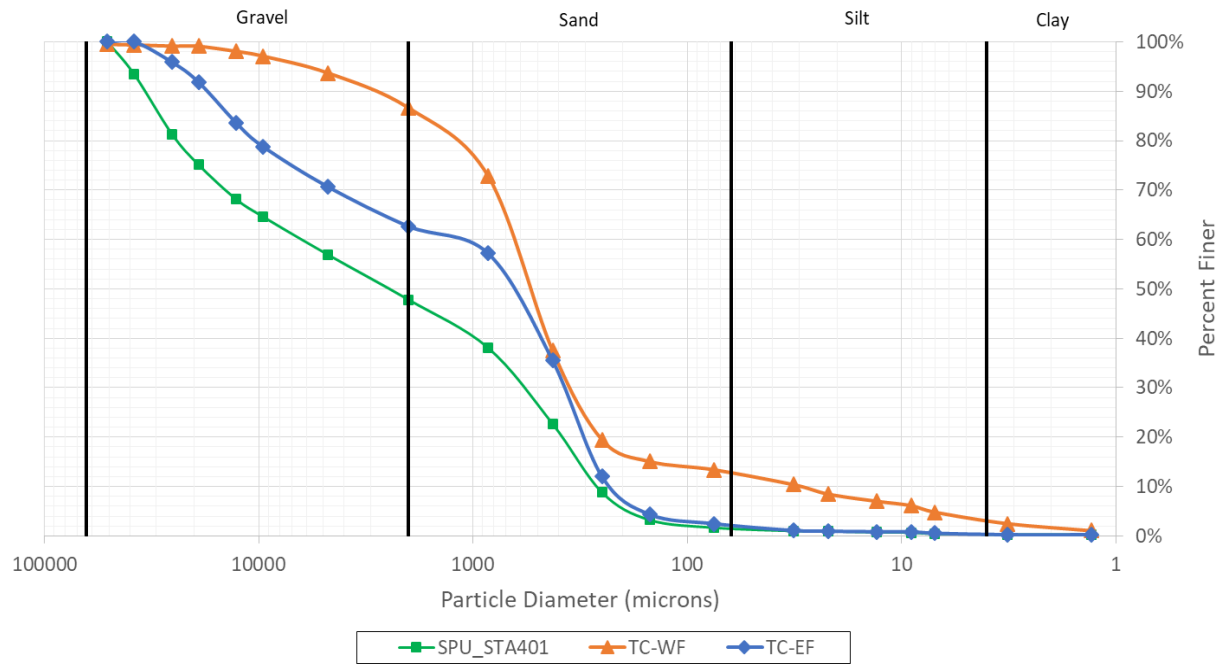


Figure 16. Average Grain Size Distribution for Load Samples Collected in WY2019.

TURBIDITY MEASUREMENT RESULTS

This section presents results from turbidity measurements that were collected over WY2019. It begins by summarizing the quality of data collected through these measurements; detailed information on the results from these measurements are then presented. The turbidity sensor at the SPU-STA401 station was installed on December 4, 2018, while the sensors at the TC-WF and TC-EF stations were installed 3 months later on March 8, 2019. Consequently, turbidity measurements at stations are not available for all of WY2019. T

Data Quality

On a monthly basis, field personnel checked the accuracy of the turbidity sensors at each station and then performed a two point calibration (0 NTU and 126 NTU) on each sensor . These checks

showed all sensors were accurate within 5 to 10 percent prior to each calibration. However, the turbidity sensors would occasionally log slightly negative values for a period after these calibrations during base flow conditions. This was likely due to bubbles entrained in the deionized water which was used as the zero reference during calibration. This error was corrected during post processing of the data in Aquarius (Appendix D).

The quality of the turbidity measurement at each stations over WY2019 were also impacted by sediment accumulating in the stilling wells that housed the associated sensors. This issue was most prevalent at the TC-EF station. Once the sensor was buried it would report spurious values until field personnel were able to remove the sediment. In instances when this occurred, the turbidity measurements for the effected station were estimated using data from another unaffected station based on modeled relationships between the turbidity measurements at the two stations. These adjustments are documented in Appendix D and can be seen graphically in Figures 17, 18, and 19.

Overall, the quality of the turbidity measurements at each station were graded "Fair" to "Good'" for use in developing suspended solids loading estimations (see *Sediment Transport Results* section).

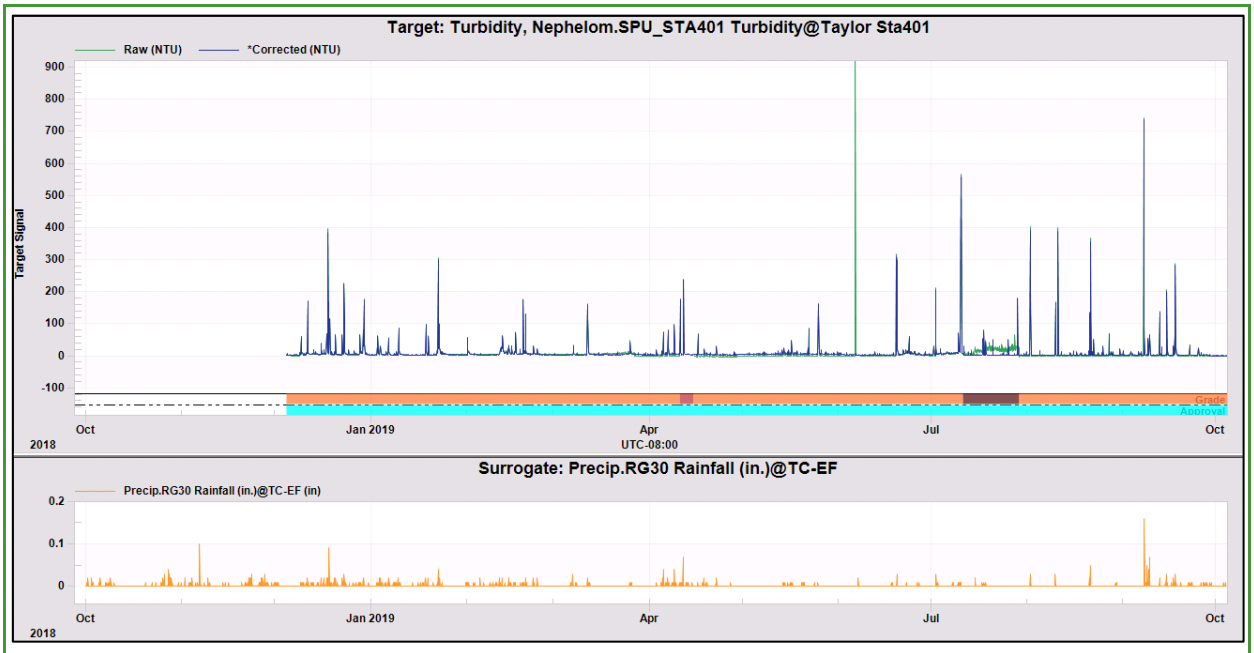


Figure 17. Raw and Corrected Turbidity Data from SPU_STA401.

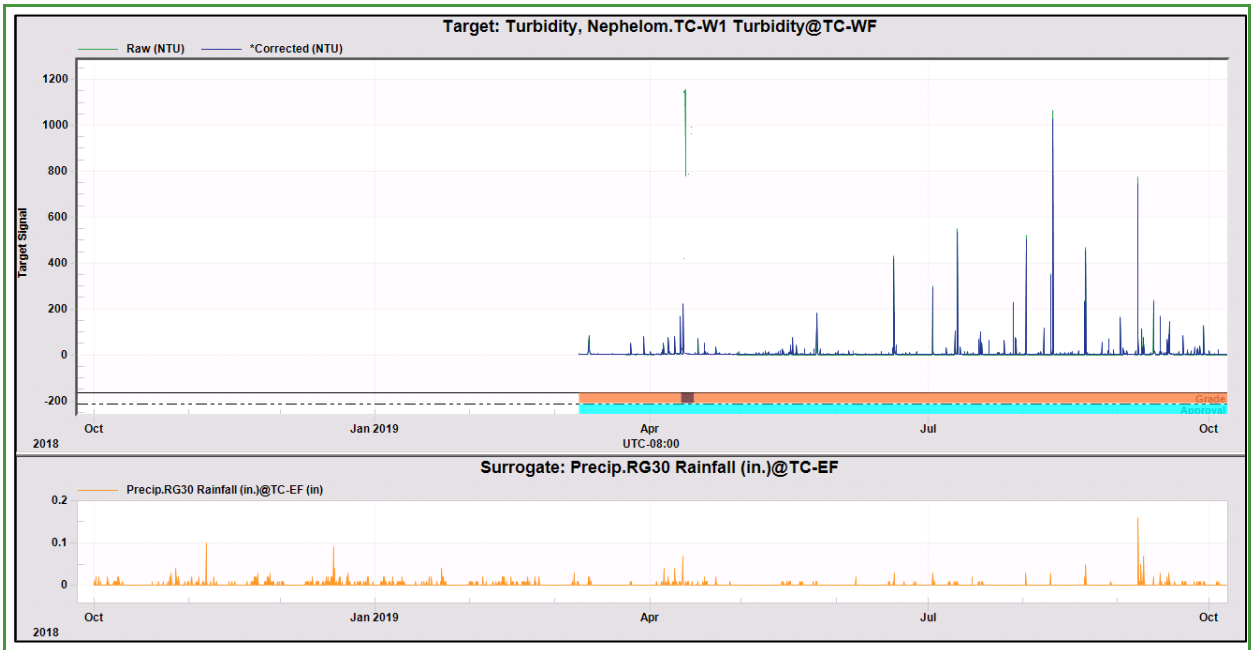


Figure 18. Raw and Corrected Turbidity Data from TC-WF.

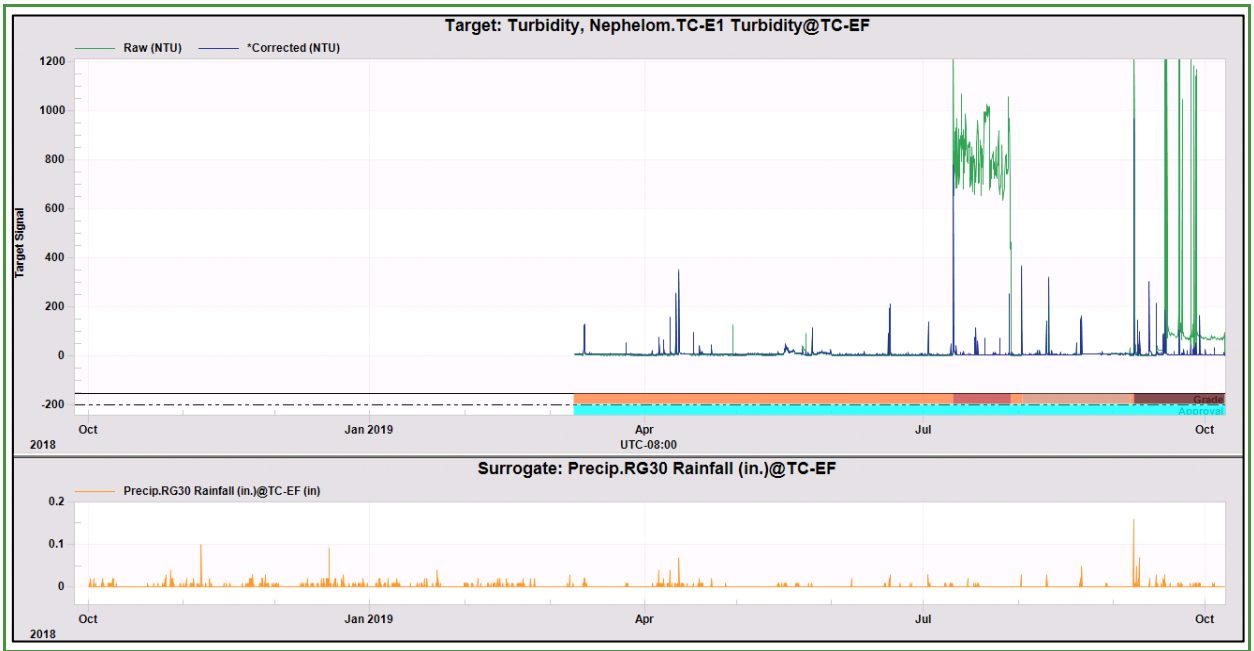


Figure 19. Raw and Corrected Turbidity Data from TC-EF.

Results

As shown in Table 7, turbidity was highest at the TC-EF station with a maximum recorded turbidity of 1,156.5 NTU, an average maximum storm turbidity of 163.4 NTU, and an average storm turbidity of 11.8 NTU. The results from the TC-WF station were remarkably similar to those from the TC-EF station. Of the three stations, SPU_STA401 exhibited the lowest turbidity with a maximum recorded turbidity of 808.9 NTU, an average maximum storm turbidity of 103.7 NTU, and an average storm turbidity of 9.5 NTU. These results are not consistent with the SSC results reported in the *Water Quality Results* section. Specifically, SSC concentrations measured at the SPU_STA401 station were substantially higher than those measured at the TC-WF station (Table 1).

It should be noted that there are many factors other than suspended sediment concentration which affect turbidity, these factors include tannin concentration, entrained air bubbles, phytoplankton, and other microscopic organisms and organic compounds (Mukundan et al. 2013). The headwaters of the West Fork is also a wetland that may be a source of organic compounds that increase the overall turbidity of this reach independent of sediment concentrations. Based on these considerations, regression models developed for predicting sediment transport as function of turbidity (see description in the *Sediment Transport Results* section) will be unique for each station.

Table 7. WY2019 Turbidity Summary Statistics.

Station	Number of Events	Maximum Recorded Turbidity (NTU)	Average Max Storm Turbidity (NTU)	Average Storm Turbidity (NTU)
SPU_STA401	103	808.9	103.7	9.5
TC-WF	103	1,152.3	162.6	9.8
TC-EF	103	1,156.5	163.4	11.8

NTU = nephelometric turbidity units

SEDIMENT TRANSPORT RESULTS

Sediment transport estimates that were derived using the monitoring results described above are presented in a separate subsection below for suspended sediment and bedload, respectively.

Suspended Sediment Transport

The project SAP proposes two alternate methods for calculating suspended sediment export in Taylor Creek. The first method relies on regression models developed using the log transformed flow rate and log transformed SSC load at the time each sample was collected. If a statistically significant relationship is identified, these models can be used to estimate SCC loading as a function of the continuous flow data from each station (after un-transforming and applying a correction factor following Helsel and Hirsch [1992]). The annual load is then calculated by

simply summing the load for each time step. The second method also uses regression, but instead of developing models to predict SCC load as a function of flow, regression models are developed using SCC concentrations and turbidity recorded at the time each SSC sample was collected. These regression models would then be used to convert continuous turbidity to continuous SSC concentrations. The concentrations would then be multiplied by the associated flow to generate an estimate of continuous SSC loading, which can be summed to estimate annual load.

For these methods to be valid, the slope coefficients for the regression models must be statistically significant. Figure 20 presents the regression models developed from the log transformed SSC loading and log transformed flow for each station. As is apparent, this relationship is only significant (α=0.05) for the SPU-STA401 station; consequently, this method cannot be used. In theory, the relationship between turbidity and SSC should be much stronger. Figure 21 suggest this may be the case based on the limited data available from the SPU_STA401 station when turbidity data overlapped with SSC sample collection. However, the turbidity sensors were not installed when the SSC sampling occurred at the TC-WF and TC-EF stations; hence, there is insufficient data to apply this method at all stations.

To estimate suspended sediment loading for WY2019 in a consistent manner at all stations an alternate method was used from those described in the SAP. This method involved averaging the SSC concentrations for each station and making the assumption that this concentration is representative of the SSC concentration across all storms. This average SSC concentration is then multiplied by the total storm volume of the 63 delineated storm events. This approach assumes there is zero suspended sediment export during base flow, a valid assumption given observations of very low turbidity during base flow conditions in the basin.

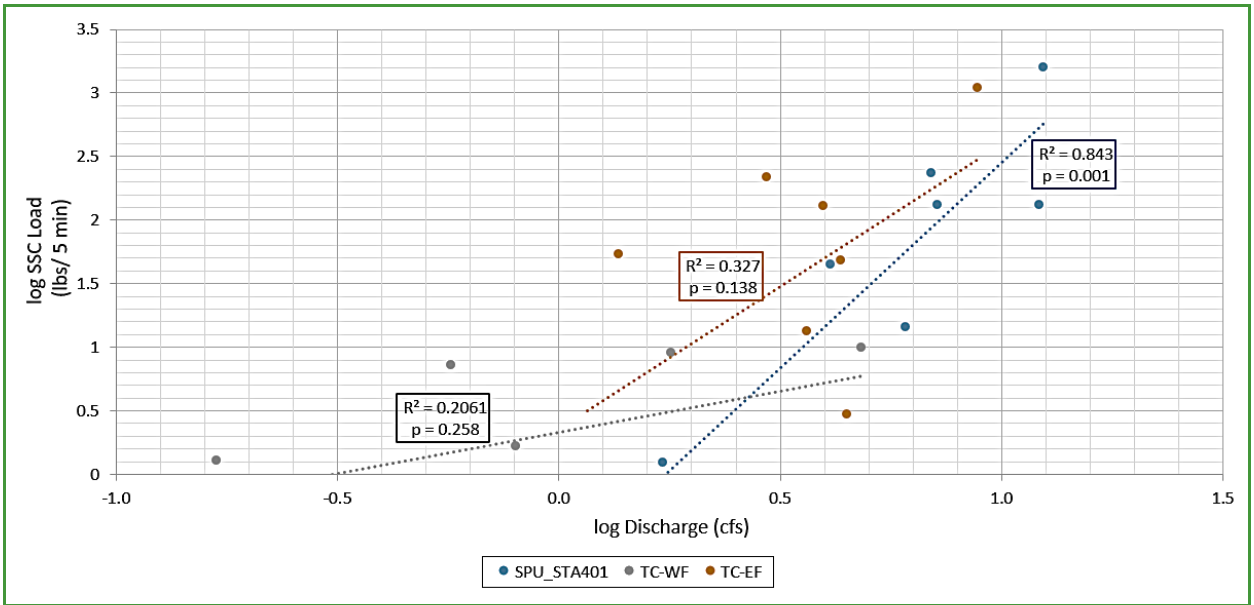


Figure 20. Regression Between Log Transformed Flow and Instantaneous SSC Load.

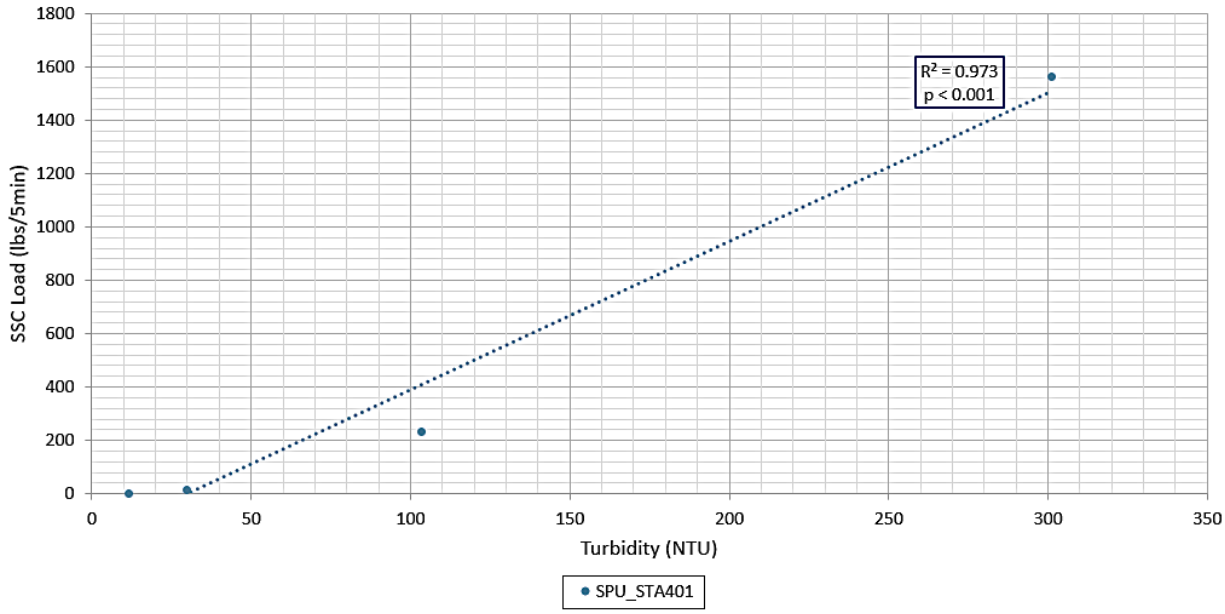


Figure 21. Regression Between Turbidity and SSC 4 Loading at SPU_STA401

The results obtained using this alternate load assessment approach are presented in Table 8; included are the volumetric yields for all suspended sediment and the volumetric yield for sand and gravel alone. Volumetric yield of sand and gravel was calculated by multiplying the annual SSC load by the sand/gravel versus silt/clay ratios identified in Figure 22. The mass loading values were then converted to volumetric yield with an assumed sediment density of 1,497 cy/kg. Sand and gravel yield is an important value for basin managers as it is a measure of the total volume of sediment which may end up in any downstream sediment retention facility, should one be built in the future. The analysis indicates that 293 cubic yards per year (cy/yr) of sand and gravel were exported from the basin in the suspended fraction in WY2019.

Table 8. Loading Estimation Results for each Station for WY2019.

Station	Average SSC (mg/L)	Storm Volume (cf/yr)	SSC Load (kg/yr)	Basin Area (ha)	SSC Areal Load (kg/ha/yr)	SSC sand/ gravel yield (cy/yr)	Bedload Transport (kg/yr)	Bedload Yield (cy/yr)
SPU_STA401	1,347	17,696,106	675,129	263	421	293	4,478	3.0
TC-WF	215	7,198,268	43,890	117	62	14	1,166	1.7
TC-EF	1,888	8,138,437	435,163	108	660	212	2,521	0.8
Dead Horse Canyon	-	2,359,402	196,076	38	853	67	791	0.5

SSC: suspended sediment concentration
mg/L = milligrams per liter
cf/yr = cubic feet per year
kg/yr = kilograms per year
cy/yr = cubic yards per year
ha = hectare
kg/ha/yr = kilogram per hectare per year

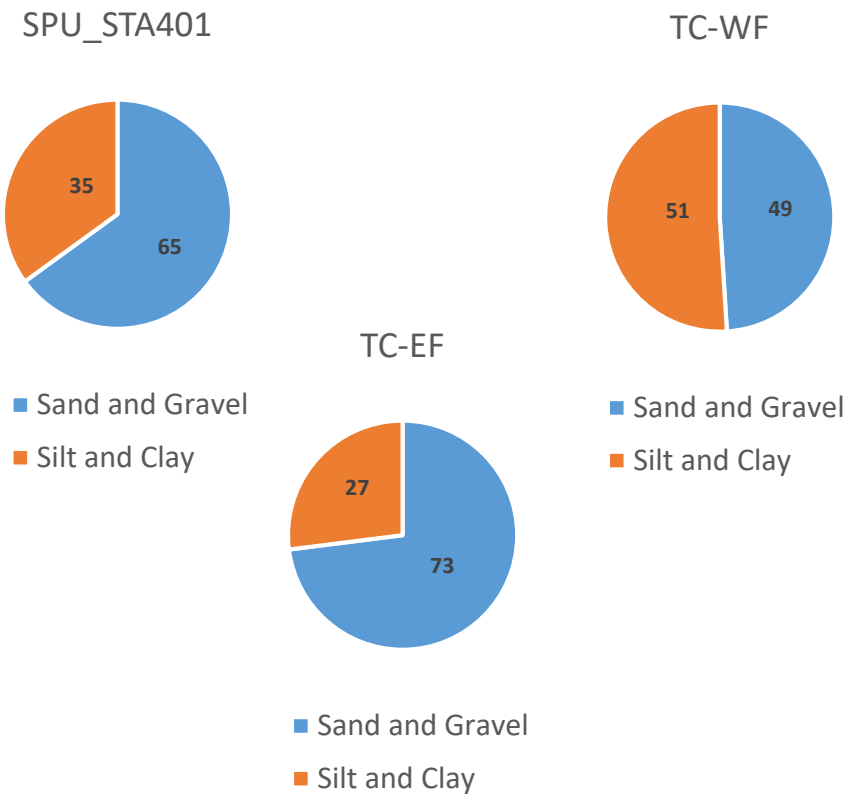


Figure 22. Sand/Gravel to Silt/Clay Ratios for Each Station.

Table 8 also shows the sediment contribution from each reach: TC-EF, TC-WF, and Dead Horse Canyon. Dead Horse Canyon is the reach located between SPU_STA401 and TC-EF and TC-WF (Figure 2); the values for this reach were calculated by subtracting the inputs from the east and west forks from the loading values calculated for the SPU_STA401 station. The area of each of the sub-basins is also provided in Table 8. When the loading from each reach is normalized by area it becomes apparent that the East Fork and Dead Horse Canyon reaches are the primary sources of sediment. In WY2019, 62 kg/ha/yr of SCC loading was estimated for TC-WF, while 660 and 853 kg/ha/yr of sediment loading were attributed to TC-EF and Dead Horse Canyon, respectively. High sediment transport from the East Fork was expected based on historical analyses. While the basin area of 38 ha for Dead Horse Canyon may need refinement to account for the many storm drain outfalls in this reach, it is notable that Dead Horse canyon reach also appears to be a substantial source of sediment.

Bedload Transport

The SAP indicated the estimation of bedload transport would be based on the Wilcock – Crowe (2003) model. This model generated spurious results indicating that TC-WF was exporting the greatest amount of bedload. Based on visual observations and the analysis of the SSC data, this

result was deemed inaccurate. In WY2020, the model will be reconstructed when there is a more robust input dataset. In the interim, an estimate of bedload transport was generated by assuming that the mass captured in the pit traps at each location was representative of every event in WY2019. The ratio of the width of the traps to the width of the channel at bankfull was used to scale up the average mass captured for each of the two sampled events. The result was an average of 71, 19, and 40 kg of bedload transported for each event at station SPU_STA401, TC-WF, and TC-EF, respectively. These values were multiplied by the 63 delineated events, to generate an estimate of annual bedload transport for each station. These results are reported in Table 8 along with the volumetric yield (assuming a density of 1,497 kilogram per cubic yard). As is apparent, the volumetric yields of bedload at each station are an order of magnitude less than the yields from suspended solids. It is typical for suspended load to be much greater than bedload in fluvial systems, but the disparity here may be a relic of the bed load calculation method. As mentioned previously, these estimates will be improved in WY2020.

Estimates of sediment yield from Taylor Creek were previously derived using measures of delta growth in Lake Washington (Perkins Geosciences 2007). Based on delta growth rate, it was estimated that Taylor Creek was exporting 250 cy/yr of sediment. The estimate for WY2019 is 296 cy/yr (suspended sand and gravel plus bedload in Table 8). Given variation among water years and the inherent error associated with loading calculations, these values are close and provide a degree of confidence in the results presented herein.

CONCLUSIONS

Sediment export from Taylor Creek has resulted in numerous issues (e.g., flooding, deposition around docks) for adjacent land owners in the lower reaches. This study was conducted by SPU to develop improved estimates of sediment transport through the watershed. The data from this study will help inform future management decisions within the watershed.

Water level, turbidity, SSC, and bedload transport were measured at three locations in the watershed in WY2019. There are two main branches to Taylor Creek, the East Fork, and West Fork. Stations on each branch were establish within 30 meters of the confluence of these tributaries (TC-EF and TC-WF). A third station (SPU_STA401) was established immediately upstream of the culvert passing under Rainier Avenue near the terminus of the channel in Lake Washington.

Accurately measuring flows at the TC-EF and TC-WF stations was challenging due to the dynamic nature of the channels and mobile substrate. Numerous corrections to the level data and rating curves were required at these locations. The resultant data indicate the majority of flow in the upper watershed is generated from the East Fork (152 million gallons [MG] versus 94 MG at the West Fork). The total estimated flow volume at the SPU_STA401 station was 275 MG, indicating that 29 MG is generated in the Dead Horse Canyon reach located between these stations.

The highest SSC concentrations in the basin were observed at the TC-EF station on the East Fork (average = 1,888 mg/L). The West Fork, which is fed by a wetland and is more geomorphically stable than the East Fork, exhibited a lower SCC concentrations (TS-WF station average = 674 mg/L). The average SSC concentration at the SPU_STA401 station was 1,347 mg/L. These values along with the flow data were used to generate estimates of annual suspended sediment load. In WY2019, the Taylor Creek yielded and estimated 293 cy/yr of suspended sand and gravel with an additional 3 cy of bedload. The resultant estimate of annual depositable solids from the watershed is (296 cy/yr) is comparable with the 250 cy/yr estimated previously by Perkins Geosciences (2007). The East Fork and Dead Horse Canyon were the reaches with the highest suspended solids yields at 660 and 853 kg/ha/yr, respectively.

Due to incomplete data sets, the loading calculation methods used herein differed from those described in the project SAP. It is expected that in WY2020, estimates of sediment transport through the system will be improved because there will be a full year of turbidity data and additional SSC and bedload measurements. These additional data will allow the use of more accurate loading estimation methods.

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USGS. 2003. National Field Manual for the Collection of Water-Quality Data. U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia.

Wilcock, P.R. and Crowe, J.C., 2003. Surface-based transport model for mixed-size sediment. Journal of Hydraulic Engineering, 129(2), pp.120-128.

APPENDIX A

Laboratory Reports

Analytical Resources, Incorporated
Analytical Chemists and Consultants

04 December 2018

Dylan Ahearn
Herrera Environmental Consultants
2200 6th Avenue, Suite 1100
Seattle, WA 98121

RE: Taylor Creek Flow and Sediment Monitoring

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
18J0480	N/A

Amanda Volgardsen

Digitally signed by Amanda Volgardsen
DN: c=US, st=Washington, l=Tukwila, o=Analytical Resources, Inc., ou=Project Manager, cn=Amanda Volgardsen, email=amanda.volgardsen@arilabs.com
Date: 2018.12.04 13:11:02 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in it" entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

1830480

HERRERA
2200 Sixth Avenue | Suite 1100
Seattle, Washington | 98121
p 206 441 9080 | f 206 441 9108

Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn

Page: 1/1

Sampled By: Alex Svendsen / Gretchen Kayser

Delivery Method: IN COOLER W/ICE

Laboratory: Analytical Resources Inc.

Requested Completion Date:

Total No. of Containers: 12

Lab Use:

Sample ID	Date	Time	Sample Type (see codes)	Preservative? (Y/N)	Matrix (see codes)	Analyses Requested: Suspended Sediment Concentration – SM D3977-97B
TC-WF 20181025 2240	10/25/18	2240	G	N	SW	X
TC-WF 20181025 2355	10/25/18	2355	G	N	SW	X
TC-WF 20181026 0045	10/26/18	0045	G	N	SW	X
TC-WF 20181026 0135	10/26/18	0135	G	N	SW	X
TC-EF 20181025 2240	10/25/18	2240	G	N	SW	X
TC-EF 20181025 2355	10/25/18	2355	G	N	SW	X
TC-EF 20181026 0045	10/26/18	0045	G	N	SW	X
TC-EF 20181026 0135	10/26/18	0135	G	N	SW	X
TC-MS 20181025 2240	10/25/18	2240	G	N	SW	X
TC-MS 20181025 2330	10/25/18	2330	G	N	SW	X
TC-MS 20181026 0045	10/26/18	0045	G	N	SW	X
TC-MS 20181026 0135	10/26/18	~~0135~~ 0135	G	N	SW	X

Comments/Special Instructions:

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Alex Svendsen/HEC		10/26/18 1613		ARI	A. Volgardsen	10/26/18 1613
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: G=Grab C=Composite

Matrix Codes: A=Air GW=Groundwater SE=Sediment SO=Soil SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
TC-WF201810252240	18J0480-01	Water	25-Oct-2018 22:40	26-Oct-2018 16:13
TC-WF201810252355	18J0480-02	Water	25-Oct-2018 23:55	26-Oct-2018 16:13
TC-WF201810260045	18J0480-03	Water	26-Oct-2018 00:45	26-Oct-2018 16:13
TC-WF201810260135	18J0480-04	Water	26-Oct-2018 01:35	26-Oct-2018 16:13
TC-EF201810252240	18J0480-05	Water	25-Oct-2018 22:40	26-Oct-2018 16:13
TC-EF201810252355	18J0480-06	Water	25-Oct-2018 23:55	26-Oct-2018 16:13
TC-EF201810260045	18J0480-07	Water	26-Oct-2018 00:45	26-Oct-2018 16:13
TC-EF201810260135	18J0480-08	Water	26-Oct-2018 01:35	26-Oct-2018 16:13
TC-MS201810252240	18J0480-09	Water	25-Oct-2018 22:40	26-Oct-2018 16:13
TC-MS201810252330	18J0480-10	Water	25-Oct-2018 23:30	26-Oct-2018 16:13
TC-MS201810260045	18J0480-11	Water	26-Oct-2018 00:45	26-Oct-2018 16:13
TC-MS201810260135	18J0480-12	Water	26-Oct-2018 01:35	26-Oct-2018 16:13

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

Work Order Case Narrative

Sample receipt

Samples as listed on the preceding page were received October 26, 2018 under ARI work order 18J0480. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Suspended Sediment Concentration - Method ASTM D3977

The samples were submitted to Materials Testing & Consulting, Inc. (MTC) for SSC analysis. The MTC report is included here in its entirety.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Herrera

Project Name: Taylor Creek Flow & Sed. Monitoring

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier (Hand Delivered) Other: _____

Assigned ARI Job No: 18J0480

Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry): 2.8

Time: 1613

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D0052006

Cooler Accepted by: AV Date: 10/26/18 Time: 1613

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap (Wet Ice) Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	(NA)		

Was Sample Split by ARI : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

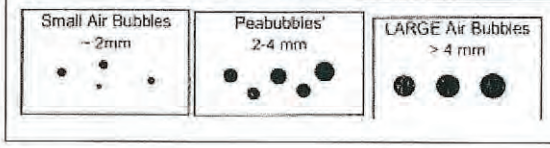
Samples Logged by: SRS Date: 10/27/18 Time: 1055

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project:	Taylor Creek Flow and Sediment (18J0480)	**Date Received:**	October 30, 2018
Project #:	18S010-77	**Sampled By:**	Others
Client :	Analytical Resources, Inc.	**Date Reported:**	December 4, 2018
Source:	Multiple	**Tested By:**	K. DeChurch
MTC Sample#:	Multiple		

CASE NARRATIVE

1. Twelve samples were submitted for sediment concentration by ASTM D3977, Method C.
2. The coarse material was screened over a No. 230 sieve.
3. The suspended solids are reported in mg/L.
4. The data is provided in a summary table.
5. There were no other noted anomalies in this project.

Reviewed by: _____

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Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (18J0480)
Project #: 18S010-77
Date Received: October 30, 2018
Date Tested: November 1, 2018

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: K. DeChurch

Suspended Sediment Concentration
ASTM D3977 Method C

Client Sample ID	MTC Sample ID	Sampling Date	Coarse Fraction SSC (>63µm) (mg/L)	FineFraction SSC (<63µm) (mg/L)	Total Suspended Sediment Concentration (mg/L)
TC-WF201810252240	S18-2493	10/25/2018	267.6	137.6	405.2
TC-WF201810252355	S18-2494	10/25/2018	49.5	52.8	102.3
TC-WF201810260045	S18-2495	10/26/2018	370.2	304.3	674.4
TC-WF201810260135	S18-2496	10/26/2018	51.3	59.0	110.3
TC-EF201810252240	S18-2497	10/25/2018	1,833.8	239.9	2,073.7
TC-EF201810252355	S18-2498	10/25/2018	3,763.8	143.8	3,907.6
TC-EF201810260045	S18-2499	10/26/2018	306.9	278.2	585.1
TC-EF201810260135	S18-2500	10/26/2018	22.2	12.9	35.2
TC-MS201810252240	S18-2501	10/25/2018	20.0	17.9	37.9
TC-MS201810252330	S18-2502	10/25/2018	240.5	338.2	578.8
TC-MS201810260045	S18-2503	10/26/2001	542.4	435.2	977.6
TC-MS201810260135	S18-2504	10/26/2018	391.5	175.5	567.0

Reviewed by:

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Visit our website: www.mtc-inc.net

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

Method:

Sample Preparation: Preparation Method:
Preparation Batch:
Prepared: Final Volume:

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

Certified Analyses included in this Report

Analyte	Certifications

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	02/07/2019
CALAP	California Department of Public Health CAELAP	2748	06/30/2019
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
DoD-ELAP DW	DoD-Environmental Laboratory Accreditation - Drinking Water	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-011	05/12/2019
WADOE	WA Dept of Ecology	C558	06/30/2019
WA-DW	Ecology - Drinking Water	C558	06/30/2019

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	04-Dec-2018 13:10

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

16 January 2019

Dylan Ahearn
Herrera Environmental Consultants
2200 6th Avenue, Suite 1100
Seattle, WA 98121

RE: Taylor Creek Flow and Sediment Monitoring

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
18L0337	N/A

Amanda Volgardsen

Digitally signed by Amanda Volgardsen
DN: c=US, st=Washington, l=Tukwila, o=Analytical Resources, Inc., ou=Project Manager, cn=Amanda Volgardsen, email=amanda.volgardsen@arilabs.com
Date: 2019.01.16 15:27:14 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in it entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

HERRERA
2200 Sixth Avenue | Suite 1100
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1810337

Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To:	Page:
Dylan Ahearn / Jennifer Arthur	1/1
Sampled By:	**Delivery Method:**
Alex Svendsen / Gretchen Kayser	
Laboratory:	**Requested Completion Date:**
Analytical Resources Inc.	

Total No. of Containers: 6

Lab Use:

Sample ID (ex. TC-WF-Bed-YYYYMMDD)	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Grain Size - ASTM D422 and total sample dry weight
TC-WF-Bed-R-20181217	12/18/18	1352	PES	SED-T	SE	X
TC-WF-Bed-L-20181217	12/18/18	1353	PES	SED-T	SE	X
TC-EF-Bed-R-20181217	12/18/18	1357	PES	SED-T	SE	X
TC-EF-Bed-L-20181217	12/18/18	1355	PES	SED-T	SE	X
TC-MS-Bed-R-20181217	12/18/18	1425	PES	SED-T	SE	X
TC-MS-Bed-L-20181217	12/18/18	1427	PES	SED-T	SE	X

Comments/Special Instructions:
In addition to ASTM D422 we need the dry weight of each entire sample that we submit. Please call 206-407-9538 if you have any questions

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Gretchen Kayser		12/18/18	15:00	Jacobsen ARI		12/18/18 1500 11.8°C
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample FSS- Field Split Sample **Method Type:** SED-T= sediment trap **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
TC-WF-Bed-R-20181217	18L0337-01	Solid	18-Dec-2018 13:52	18-Dec-2018 15:00
TC-WF-Bed-L-20181217	18L0337-02	Solid	18-Dec-2018 13:53	18-Dec-2018 15:00
TC-EF-Bed-R-20181217	18L0337-03	Solid	18-Dec-2018 13:57	18-Dec-2018 15:00
TC-EF-Bed-L-20181217	18L0337-04	Solid	18-Dec-2018 13:55	18-Dec-2018 15:00
TC-MS-Bed-R-20181217	18L0337-05	Solid	18-Dec-2018 14:25	18-Dec-2018 15:00
TC-MS-Bed-L-20181217	18L0337-06	Solid	18-Dec-2018 14:27	18-Dec-2018 15:00

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

Work Order Case Narrative

Sample receipt

Samples as listed on the preceding page were received December 18, 2018 under ARI work order 18L0337. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Grainsize

The samples were submitted to Materials Testing & Consulting, Inc. (MTC) for grainsize analysis. The MTC report is included here in its entirety.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Herrera Environmental Project Name: Taylor Creek

COC No(s): (NA) Delivered by: Fed-Ex UPS Courier Hand Delivered Other:

Assigned ARI Job No: 180332 Tracking No: (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES (NO)

Were custody papers included with the cooler? ..... (YES) NO

Were custody papers properly filled out (ink, signed, etc.) ..... (YES) NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 11.8°C

Time: 1500

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 000520b

Cooler Accepted by: SJS Date: 12/18/18 Time: 1500

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? ..... YES (NO)

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other:

Was sufficient ice used (if appropriate)? ..... NA YES (NO)

Were all bottles sealed in individual plastic bags? ..... YES (NO)

Did all bottles arrive in good condition (unbroken)? ..... (YES) NO

Were all bottle labels complete and legible? ..... (YES) NO

Did the number of containers listed on COC match with the number of containers received? ..... (YES) NO

Did all bottle labels and tags agree with custody papers? ..... (YES) NO

Were all bottles used correct for the requested analyses? ..... (YES) NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... (NA) YES NO

Were all VOC vials free of air bubbles? ..... (NA) YES NO

Was sufficient amount of sample sent in each bottle? ..... (YES) NO

Date VOC Trip Blank was made at ARI..... (NA)

Was Sample Split by ARI : (NA) YES Date/Time: Equipment: Split by:

Samples Logged by: SJS Date: 12/18/18 Time: 1538

** ***Notify Project Manager of discrepancies or concerns*** **

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Small → "sm" (< 2 mm)

Peabubbles → "pb" (2 to < 4 mm)

Large → "lg" (4 to < 6 mm)

Headspace → "hs" (> 6 mm)

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Temperature Compliance Form

ARI Work Order: 18L0337

Cooler#: _____ **Temperature(°C):** 11.8°C

Sample ID	Bottle Count	Bottle Type
Samples received above 6°C		

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Completed by: _____ Date: 12/18/18 Time: 1500

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project:	Taylor Creek Flow and Sediment (18L0337)	**Date Received:**	December 20, 2018
Project #:	18S010-77	**Sampled By:**	Others
Client :	Analytical Resources, Inc.	**Date Tested:**	January 11, 2019
Source:	Multiple	**Tested By:**	B. Goble, K .DeChurch
MTC Sample#:	Multiple		

CASE NARRATIVE

1. Six samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421. An assumed specific gravity of 2.65 was used in the hydrometer calculations. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
2. Total dry sample weight has been reported at the request of the client.
3. Due to inadvertent technician error, sample TC-MS-Bed-L-20181217 was compromised. There is no grain size data reported for this sample.
5. The data is provided in summary tables and plots.
6. There were no other noted anomalies during this testing.

Reviewed by: EGabriel Goble

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Materials Testing & Consulting, Inc.

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Project: Taylor Creek Flow and Sediment (18L0337)
Project #: 18S010-77
Date Received: December 20, 2018
Date Tested: January 11, 2019

Client: Analytical Resources, Inc.

Sampled by: Others
Tested by: B. Goble, K .DeChurch

Percent Finer (Passing) Than the Indicated Size - ASTM D422

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
TC-WF-Bed-R-20181217	100.0	100.0	100.0	99.6	99.6	98.9	97.0	92.9	86.1	74.1	40.8	22.4	17.8	15.9	12.9	10.6	8.7	7.6	6.1	3.8	1.5
TC-WF-Bed-L-20181217	100.0	98.0	97.4	97.2	97.0	96.4	96.0	94.5	89.7	86.6	49.5	25.0	18.0	15.2	12.7	10.3	8.7	7.1	6.3	3.2	1.6
TC-EF-Bed-R-20181217	100.0	100.0	100.0	99.9	99.8	99.4	99.0	96.5	86.1	79.5	42.1	13.1	6.2	4.4	1.5	1.1	0.8	0.8	0.8	0.8	0.8
TC-EF-Bed-L-20181217	100.0	100.0	100.0	86.6	76.6	58.4	48.7	36.2	27.9	25.5	15.3	6.0	3.0	2.2	0.7	0.5	0.5	0.5	0.4	0.2	0.2
TC-MS-Bed-R-20181217	100.0	100.0	100.0	98.2	98.2	97.5	97.1	95.0	85.6	70.7	42.8	17.4	6.5	3.0	1.5	1.5	1.1	1.1	0.7	0.7	0.7

Reviewed by: EGabe Goble

Corporate ~ 777 Chrysler Drive • Burlington, WA 98233 • Phone (360) 755-1990 • Fax (360) 755-1980
Regional Offices: Olympia ~ 360.534.9777 Bellingham ~ 360.647.6111 Silverdale ~ 360.698.6787 Tukwila ~ 206.241.1974
Visit our website: www.mtc-inc.net

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (18L0337)
Project #: 18S010-77
Date Received: December 20, 2018
Date Tested: January 11, 2019

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: B. Goble, K .DeChurch

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
Particle Size (microns)	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	3.2-1.3	<1.3
TC-WF-Bed-R-20181217	0.0	0.0	0.4	0.0	0.6	1.9	4.1	6.8	12.0	33.3	18.4	4.7	1.9	3.0	2.3	1.9	1.1	1.5	2.3	2.3	1.5
TC-WF-Bed-L-20181217	2.0	0.5	0.3	0.2	0.6	0.4	1.5	4.8	3.0	37.1	24.5	7.0	2.8	2.5	2.4	1.6	1.6	0.8	3.2	1.6	1.6
TC-EF-Bed-R-20181217	0.0	0.0	0.1	0.1	0.4	0.4	2.6	10.4	6.5	37.4	29.1	6.8	1.8	2.9	0.4	0.4	0.0	0.0	0.0	0.0	0.8
TC-EF-Bed-L-20181217	0.0	0.0	13.4	10.0	18.1	9.7	12.5	8.3	2.4	10.2	9.4	2.9	0.9	1.4	0.2	0.0	0.0	0.1	0.1	0.0	0.2
TC-MS-Bed-R-20181217	0.0	0.0	1.8	0.0	0.7	0.4	2.0	9.5	14.9	27.8	25.4	10.9	3.5	1.5	0.0	0.4	0.0	0.4	0.0	0.0	0.7

Reviewed by:

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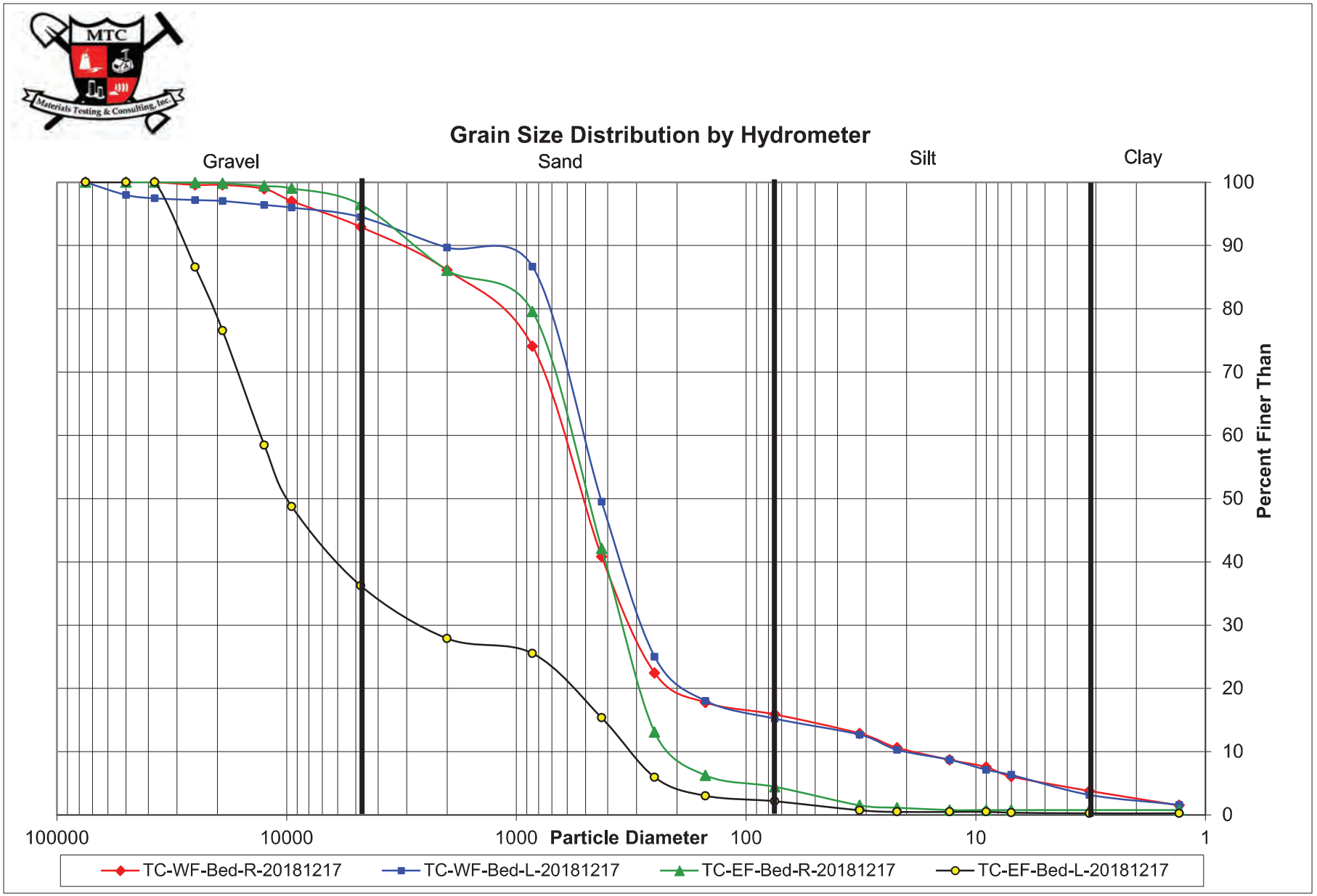
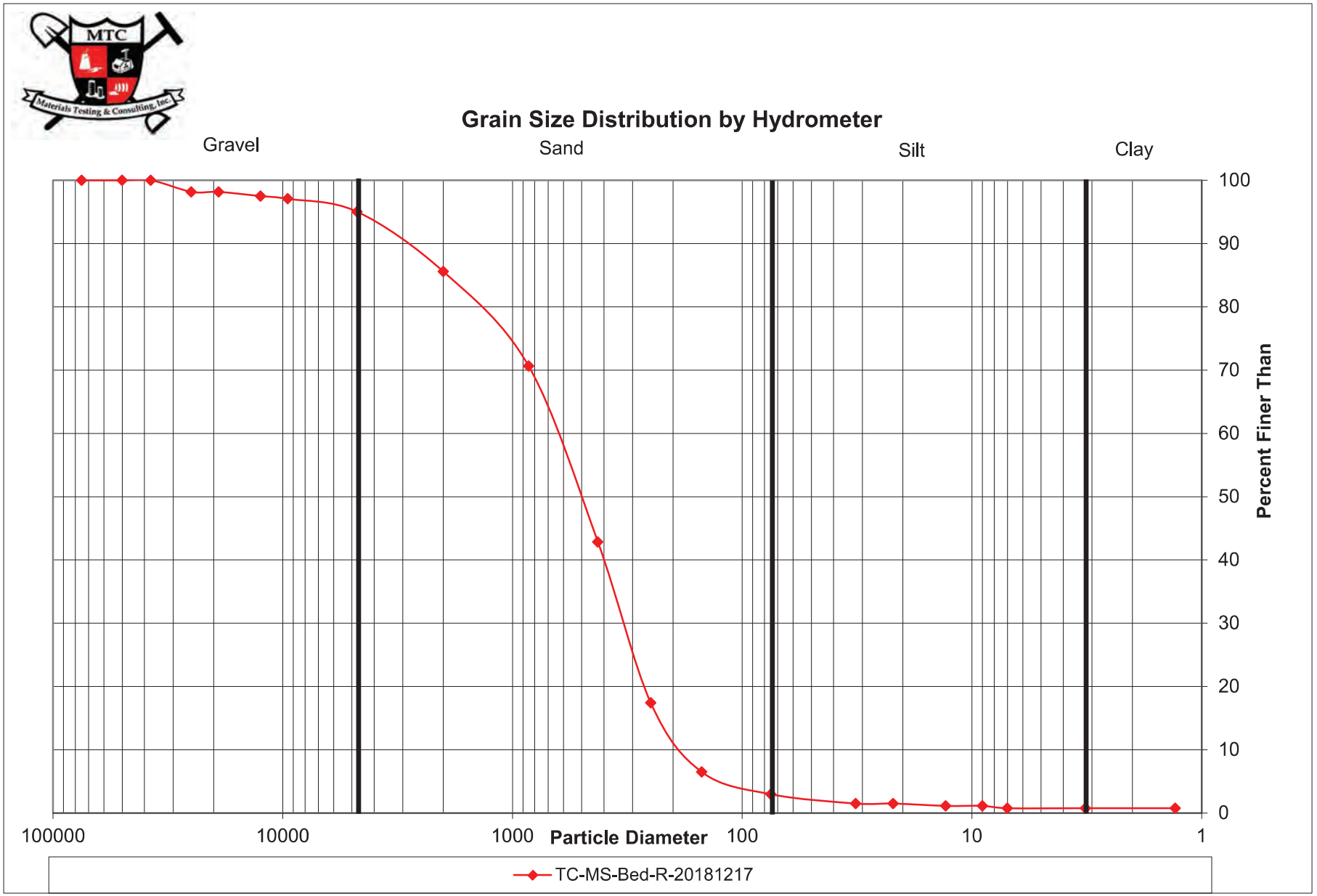

MTC
Materials Testing & Consulting, Inc.
Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
Particle Diameter
100
10
1
TC-WF-Bed-R-20181217
TC-WF-Bed-L-20181217
TC-EF-Bed-R-20181217
TC-EF-Bed-L-20181217


MTC
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Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
Particle Diameter
100
10
1
TC-MS-Bed-R-20181217

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (18L0337)
Project #: 18S010-77
Date Received: December 20, 2018
Date Tested: January 11, 2019

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: B. Goble, K. DeChurch

Total Dry Weight

Sample #	Source	Total Dry Weight (g)
S18-2866	TC-WF-Bed-R-20181217	952.1
S18-2867	TC-WF-Bed-L-20181217	2937.1
S18-2868	TC-EF-Bed-R-20181217	6448.5
S18-2869	TC-EF-Bed-L-20181217	7044.9
S18-2870	TC-MS-Bed-R-20181217	1967.4
S18-2871	TC-MS-Bed-L-20181217	9782.5

Reviewed by: EGabi Goble

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Visit our website: www.mtc-inc.net

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

TC-WF-Bed-R-20181217

18L0337-01 (Solid)

Geochemical Methods

Method: ASTM D421/422 — Sampled: 12/18/2018 13:52

Instrument: MT&C Analyst: — Analyzed: 01/11/2019 00:00

Analysis by: Materials Testing & Consulting, Inc. (Olympia)

Sample Preparation: Preparation Method: No Prep Geo
Preparation Batch: B011119
Prepared: 11-Jan-2019 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
2 Inches (Percent Retained)	GS_2IN	1	0.1	**0.0**	%	
1.5 Inches (Percent Retained)	GS_1.5IN	1	0.1	**0.0**	%	
1 Inches (Percent Retained)	GS_1IN	1	0.1	**0.4**	%	
3/4 Inches (Percent Retained)	GS_3/4IN	1	0.1	**0.0**	%	
1/2 Inches (Percent Retained)	GS_1/2IN	1	0.1	**0.6**	%	
3/8 Inches (Percent Retained)	GS_3/8IN	1	0.1	**1.9**	%	
4750 microns (percent retained)	GS_4750	1	0.1	**4.1**	%	
2000 microns (percent retained)	GS_2000	1	0.1	**6.8**	%	
850 microns (percent retained)	GS_850	1	0.1	**12.0**	%	
425 microns (percent retained)	GS_425	1	0.1	**33.3**	%	
250 microns (percent retained)	GS_250	1	0.1	**18.4**	%	
150 microns (percent retained)	GS_150	1	0.1	**4.7**	%	
75 microns (percent retained)	GS_75	1	0.1	**1.9**	%	
32 microns (percent retained)	GS_32	1	0.1	**3.0**	%	
22 microns (percent retained)	GS_22	1	0.1	**2.3**	%	
13 microns (percent retained)	GS_13	1	0.1	**1.9**	%	
9 microns (percent retained)	GS_9	1	0.1	**1.1**	%	
7 microns (percent retained)	GS_7	1	0.1	**1.5**	%	
3.2 microns (percent retained)	GS_3.2	1	0.1	**2.3**	%	
1.3 microns (percent retained)	GS_1.3	1	0.1	**2.3**	%	
<1.3 Microns	GS_<1.3	1	0.1	**1.5**	%	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

TC-WF-Bed-L-20181217

18L0337-02 (Solid)

Geochemical Methods

Method: ASTM D421/422 — Sampled: 12/18/2018 13:53

Instrument: MT&C Analyst: — Analyzed: 01/11/2019 00:00

Analysis by: Materials Testing & Consulting, Inc. (Olympia)

Sample Preparation: Preparation Method: No Prep Geo
Preparation Batch: B011119
Prepared: 11-Jan-2019 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
2 Inches (Percent Retained)	GS_2IN	1	0.1	**2.0**	%	
1.5 Inches (Percent Retained)	GS_1.5IN	1	0.1	**0.5**	%	
1 Inches (Percent Retained)	GS_1IN	1	0.1	**0.3**	%	
3/4 Inches (Percent Retained)	GS_3/4IN	1	0.1	**0.2**	%	
1/2 Inches (Percent Retained)	GS_1/2IN	1	0.1	**0.6**	%	
3/8 Inches (Percent Retained)	GS_3/8IN	1	0.1	**0.4**	%	
4750 microns (percent retained)	GS_4750	1	0.1	**1.5**	%	
2000 microns (percent retained)	GS_2000	1	0.1	**4.8**	%	
850 microns (percent retained)	GS_850	1	0.1	**3.0**	%	
425 microns (percent retained)	GS_425	1	0.1	**37.1**	%	
250 microns (percent retained)	GS_250	1	0.1	**24.5**	%	
150 microns (percent retained)	GS_150	1	0.1	**7.0**	%	
75 microns (percent retained)	GS_75	1	0.1	**2.8**	%	
32 microns (percent retained)	GS_32	1	0.1	**2.5**	%	
22 microns (percent retained)	GS_22	1	0.1	**2.4**	%	
13 microns (percent retained)	GS_13	1	0.1	**1.6**	%	
9 microns (percent retained)	GS_9	1	0.1	**1.6**	%	
7 microns (percent retained)	GS_7	1	0.1	**0.8**	%	
3.2 microns (percent retained)	GS_3.2	1	0.1	**3.2**	%	
1.3 microns (percent retained)	GS_1.3	1	0.1	**1.6**	%	
<1.3 Microns	GS_<1.3	1	0.1	**1.6**	%	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

TC-EF-Bed-R-20181217

18L0337-03 (Solid)

Geochemical Methods

Method: ASTM D421/422 — Sampled: 12/18/2018 13:57

Instrument: MT&C Analyst: — Analyzed: 01/11/2019 00:00

Analysis by: Materials Testing & Consulting, Inc. (Olympia)

Sample Preparation: Preparation Method: No Prep Geo
Preparation Batch: B011119
Prepared: 11-Jan-2019 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
2 Inches (Percent Retained)	GS_2IN	1	0.1	**0.0**	%	
1.5 Inches (Percent Retained)	GS_1.5IN	1	0.1	**0.0**	%	
1 Inches (Percent Retained)	GS_1IN	1	0.1	**0.1**	%	
3/4 Inches (Percent Retained)	GS_3/4IN	1	0.1	**0.1**	%	
1/2 Inches (Percent Retained)	GS_1/2IN	1	0.1	**0.4**	%	
3/8 Inches (Percent Retained)	GS_3/8IN	1	0.1	**0.4**	%	
4750 microns (percent retained)	GS_4750	1	0.1	**2.6**	%	
2000 microns (percent retained)	GS_2000	1	0.1	**10.4**	%	
850 microns (percent retained)	GS_850	1	0.1	**6.5**	%	
425 microns (percent retained)	GS_425	1	0.1	**37.4**	%	
250 microns (percent retained)	GS_250	1	0.1	**29.1**	%	
150 microns (percent retained)	GS_150	1	0.1	**6.8**	%	
75 microns (percent retained)	GS_75	1	0.1	**1.8**	%	
32 microns (percent retained)	GS_32	1	0.1	**2.9**	%	
22 microns (percent retained)	GS_22	1	0.1	**0.4**	%	
13 microns (percent retained)	GS_13	1	0.1	**0.4**	%	
9 microns (percent retained)	GS_9	1	0.1	**0.0**	%	
7 microns (percent retained)	GS_7	1	0.1	**0.0**	%	
3.2 microns (percent retained)	GS_3.2	1	0.1	**0.0**	%	
1.3 microns (percent retained)	GS_1.3	1	0.1	**0.0**	%	
<1.3 Microns	GS_<1.3	1	0.1	**0.8**	%	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

TC-EF-Bed-L-20181217

18L0337-04 (Solid)

Geochemical Methods

Method: ASTM D421/422 — Sampled: 12/18/2018 13:55

Instrument: MT&C Analyst: — Analyzed: 01/11/2019 00:00

Analysis by: Materials Testing & Consulting, Inc. (Olympia)

Sample Preparation: Preparation Method: No Prep Geo
Preparation Batch: B011119
Prepared: 11-Jan-2019 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
2 Inches (Percent Retained)	GS_2IN	1	0.1	**0.0**	%	
1.5 Inches (Percent Retained)	GS_1.5IN	1	0.1	**0.0**	%	
1 Inches (Percent Retained)	GS_1IN	1	0.1	**13.4**	%	
3/4 Inches (Percent Retained)	GS_3/4IN	1	0.1	**10.0**	%	
1/2 Inches (Percent Retained)	GS_1/2IN	1	0.1	**18.1**	%	
3/8 Inches (Percent Retained)	GS_3/8IN	1	0.1	**9.7**	%	
4750 microns (percent retained)	GS_4750	1	0.1	**12.5**	%	
2000 microns (percent retained)	GS_2000	1	0.1	**8.3**	%	
850 microns (percent retained)	GS_850	1	0.1	**2.4**	%	
425 microns (percent retained)	GS_425	1	0.1	**10.2**	%	
250 microns (percent retained)	GS_250	1	0.1	**9.4**	%	
150 microns (percent retained)	GS_150	1	0.1	**2.9**	%	
75 microns (percent retained)	GS_75	1	0.1	**0.9**	%	
32 microns (percent retained)	GS_32	1	0.1	**1.4**	%	
22 microns (percent retained)	GS_22	1	0.1	**0.2**	%	
13 microns (percent retained)	GS_13	1	0.1	**0.0**	%	
9 microns (percent retained)	GS_9	1	0.1	**0.0**	%	
7 microns (percent retained)	GS_7	1	0.1	**0.1**	%	
3.2 microns (percent retained)	GS_3.2	1	0.1	**0.1**	%	
1.3 microns (percent retained)	GS_1.3	1	0.1	**0.0**	%	
<1.3 Microns	GS_<1.3	1	0.1	**0.2**	%	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

TC-MS-Bed-R-20181217

18L0337-05 (Solid)

Geochemical Methods

Method: ASTM D421/422 — Sampled: 12/18/2018 14:25

Instrument: MT&C Analyst: — Analyzed: 01/11/2019 00:00

Analysis by: Materials Testing & Consulting, Inc. (Olympia)

Sample Preparation: Preparation Method: No Prep Geo
Preparation Batch: B011119
Prepared: 11-Jan-2019 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
2 Inches (Percent Retained)	GS_2IN	1	0.1	**0.0**	%	
1.5 Inches (Percent Retained)	GS_1.5IN	1	0.1	**0.0**	%	
1 Inches (Percent Retained)	GS_1IN	1	0.1	**1.8**	%	
3/4 Inches (Percent Retained)	GS_3/4IN	1	0.1	**0.0**	%	
1/2 Inches (Percent Retained)	GS_1/2IN	1	0.1	**0.7**	%	
3/8 Inches (Percent Retained)	GS_3/8IN	1	0.1	**0.4**	%	
4750 microns (percent retained)	GS_4750	1	0.1	**2.0**	%	
2000 microns (percent retained)	GS_2000	1	0.1	**9.5**	%	
850 microns (percent retained)	GS_850	1	0.1	**14.9**	%	
425 microns (percent retained)	GS_425	1	0.1	**27.8**	%	
250 microns (percent retained)	GS_250	1	0.1	**25.4**	%	
150 microns (percent retained)	GS_150	1	0.1	**10.9**	%	
75 microns (percent retained)	GS_75	1	0.1	**3.5**	%	
32 microns (percent retained)	GS_32	1	0.1	**1.5**	%	
22 microns (percent retained)	GS_22	1	0.1	**0.0**	%	
13 microns (percent retained)	GS_13	1	0.1	**0.4**	%	
9 microns (percent retained)	GS_9	1	0.1	**0.0**	%	
7 microns (percent retained)	GS_7	1	0.1	**0.4**	%	
3.2 microns (percent retained)	GS_3.2	1	0.1	**0.0**	%	
1.3 microns (percent retained)	GS_1.3	1	0.1	**0.0**	%	
<1.3 Microns	GS_<1.3	1	0.1	**0.7**	%	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

Certified Analyses included in this Report

Analyte	Certifications

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	02/07/2019
CALAP	California Department of Public Health CAELAP	2748	06/30/2019
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	01/01/2021
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-011	05/12/2019
WADOE	WA Dept of Ecology	C558	06/30/2019
WA-DW	Ecology - Drinking Water	C558	06/30/2019

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	16-Jan-2019 15:24

Notes and Definitions

0.0	0.0
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

05 March 2019

Dylan Ahearn
Herrera Environmental Consultants
2200 6th Avenue, Suite 1100
Seattle, WA 98121

RE: Taylor Creek Flow and Sediment Monitoring

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
19A0344	N/A

Amanda Volgardsen

Digitally signed by Amanda Volgardsen
DN: c=US, st=Washington, l=Tukwila, o=Analytical Resources, Inc., ou=Project Manager, cn=Amanda Volgardsen, email=amanda.volgardsen@arilabs.com
Date: 2019.03.05 12:44:15 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in it" entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

HERRERA
2200 Sixth Avenue | Suite 1100
Seattle, Washington | 98121
p 206 441 9080 | f 206 441 9108

Chain of Custody Record

19A0344

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: ~~Gretchen Kayser~~ / Kyle Bliss

Delivery Method: Cooler w/ Ice

Laboratory: Analytical Resources Inc.

Requested Completion Date: 1-WK

Total No. of Containers: 12

Lab Use:

Analyses Requested

Sample ID	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Suspended Sediment Concentration – SM D3977-97B
TC-WF 20190122 1830	1/22/19	18:30	PES	GRB-A	SW	X
TC-WF 20190122 2000		20:00	PES	GRB-A	SW	X
TC-WF 20190122 2030		20:30	PES	GRB-A	SW	X
TC-WF 20190122 2300		23:00	PES	GRB-A	SW	X
TC-EF 20190122 1930		19:30	PES	GRB-A	SW	X
TC-EF 20190122 2030		20:30	PES	GRB-A	SW	X
TC-EF 20190122 2130		21:30	PES	GRB-A	SW	X
TC-EF 20190122 2230		22:30	PES	GRB-A	SW	X
TC-MS 20190122 1800		18:00	PES	GRB-A	SW	X
TC-MS 20190122 2130		21:30	PES	GRB-A	SW	X
TC-MS 20190122 2230		22:30	PES	GRB-A	SW	X
TC-MS 20190123 0000	1/23/19	00:00	PES	GRB-A	SW	X

Comments/Special Instructions:

Relinquished by (Name/CO/	Signature	Date/Time	Received By (Name/CO)	Signature	Date/Time
Kyle Bliss		1-23-19 1630	Stephanie Flint	Stephanie Flint	1-23-19 1630
Relinquished by (Name/CO/	Signature	Date/Time	Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample C=Composite Sample Method: GRB-A= Grab Automatic **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
TC-WF201901221830	19A0344-01	Water	22-Jan-2019 18:30	23-Jan-2019 16:30
TC-WF201901222000	19A0344-02	Water	22-Jan-2019 20:00	23-Jan-2019 16:30
TC-WF201901222030	19A0344-03	Water	22-Jan-2019 20:30	23-Jan-2019 16:30
TC-WF201901222300	19A0344-04	Water	22-Jan-2019 23:00	23-Jan-2019 16:30
TC-EF201901221930	19A0344-05	Water	22-Jan-2019 19:30	23-Jan-2019 16:30
TC-EF201901222030	19A0344-06	Water	22-Jan-2019 20:30	23-Jan-2019 16:30
TC-EF201901222130	19A0344-07	Water	22-Jan-2019 21:30	23-Jan-2019 16:30
TC-EF201901222230	19A0344-08	Water	22-Jan-2019 22:30	23-Jan-2019 16:30
TC-MS201901221800	19A0344-09	Water	22-Jan-2019 18:00	23-Jan-2019 16:30
TC-MS201901222130	19A0344-10	Water	22-Jan-2019 21:30	23-Jan-2019 16:30
TC-MS201901222230	19A0344-11	Water	22-Jan-2019 22:30	23-Jan-2019 16:30
TC-MS201901230000	19A0344-12	Water	23-Jan-2019 00:00	23-Jan-2019 16:30

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

Work Order Case Narrative

Sample receipt

Samples as listed on the preceding page were received January 23, 2019 under ARI work order 19A0344. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Suspended Sediment Concentration ASTM D3977

The samples were submitted to Materials Testing & Consulting, Inc. (MTC) for SSC analysis. The MTC report is included here in its entirety.

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Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Herrera Project Name: Taylor Creek

COC No(s): _____ (NA) Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 19A0344 Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1630 5.0 ___ ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: D00259

Cooler Accepted by: SF Date: 1-23-1 Time: 1630

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap (Wet Ice) Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	(NA)		

Was Sample Split by ARI : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JVB Date: 1/24/19 Time: 942 Labels checked by: _____

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project:	Taylor Creek Flow and Sediment (19A0344)	**Date Received:**	January 25, 2019
Project #:	18S010-77	**Sampled By:**	Others
Client :	Analytical Resources, Inc.	**Date Reported:**	March 5, 2019
Source:	Multiple	**Tested By:**	B. Goble
MTC Sample#:	Multiple		

CASE NARRATIVE

1. Twelve samples were submitted for sediment concentration by ASTM D3977, Method C.
2. The coarse material was screened over a No. 230 sieve.
3. The suspended solids are reported in mg/L.
4. The data is provided in a summary table.
5. There were no other noted anomalies in this project.

Reviewed by: _____

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Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (19
Project #: 18S010-77
Date Received: January 25, 2019
Date Reported: March 5, 2019

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: B. Goble

Suspended Sediment Concentration
ASTM D3977 Method C

Client Sample ID	MTC Sample ID	Sampling Date	Coarse Fraction SSC (>63µm) (mg/L)	FineFraction SSC (<63µm) (mg/L)	Total Suspended Sediment Concentration (mg/L)
TC-WF201901221830	S19-0130	1/22/2019	6.4	4.7	11.1
TC-WF201901222000	S19-0131	1/22/2019	14.6	29.3	43.9
TC-WF201901222030	S19-0132	1/22/2019	96.7	169.5	266.3
TC-WF201901222300	S19-0133	1/22/2019	55.6	53.5	109.1
TC-EF201901221930	S19-0134	1/22/2019	9.1	8.9	18.0
TC-EF201901222030	S19-0135	1/22/2019	88.1	107.8	195.9
TC-EF201901222130	S19-0136	1/22/2019	6,264.3	310.0	6,574.2
TC-EF201901222230	S19-0137	1/22/2019	1,632.0	84.4	1,716.5
TC-MS201901221800	S19-0138	1/22/2019	10.3	10.5	20.7
TC-MS201901222130	S19-0139	1/22/2019	6,187.7	506.1	6,693.8
TC-MS201901222230	S19-0140	1/22/2019	1,591.2	185.4	1,776.6
TC-MS201901230000	S19-0141	1/23/2019	83.6	42.4	126.0

Reviewed by: EGabe Goble

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

Method:

Sample Preparation:	Preparation Method:		Extract ID:
	Preparation Batch:		
	Prepared:	Final Volume:	

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

Certified Analyses included in this Report

Analyte **Certifications**

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	02/07/2019
CALAP	California Department of Public Health CAELAP	2748	06/30/2019
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	01/01/2021
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-011	05/12/2019
WADOE	WA Dept of Ecology	C558	06/30/2019
WA-DW	Ecology - Drinking Water	C558	06/30/2019

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	05-Mar-2019 12:43

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

07 March 2019

Dylan Ahearn
Herrera Environmental Consultants
2200 6th Avenue, Suite 1100
Seattle, WA 98121

RE: Taylor Creek Flow and Sediment Monitoring

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
19A0345	N/A

Amanda Volgardsen

Digitally signed by Amanda Volgardsen
DN: c=US, st=Washington, l=Tukwila, o=Analytical Resources, Inc., ou=Project Manager, cn=Amanda Volgardsen, email=amanda.volgardsen@arilabs.com
Date: 2019.03.07 15:02:00 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in it" entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

HERRERA
2200 Sixth Avenue | Suite 1100
Seattle, Washington | 98121
p 206 441 9080 | f 206 441 9108

Chain of Custody Record

19A0345

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: ~~Alex Svendsen / Gretchen Kayser~~ K. Bliss

Delivery Method: Burlap bags in Buckets

Laboratory: Analytical Resources Inc.

Requested Completion Date: 1 wk

Total No. of Containers: 6

Lab Use:

Sample ID (ex. TC-WF-Bed-YYYYMMDD)	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Grain Size - ASTM D422 and total sample dry weight
TC-WF-Bed- R-20190122	1/23/19	13:45	PES	SED-T	SE	X
TC-WF-Bed- L-20190122	"	13:46	PES	SED-T	SE	X
TC-EF-Bed- R-20190122	"	13:10	PES	SED-T	SE	X
TC-EF-Bed- L-20190122	"	13:11	PES	SED-T	SE	X
TC-MS-Bed- R-20190122	"	14:45	PES	SED-T	SE	X
TC-MS-Bed- L-20190122	↓	14:46	PES	SED-T	SE	X

Comments/Special Instructions:
In addition to ASTM D422 we need the dry weight of each entire sample that we submit. Please call 206-407-9538 if you have any questions

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Kyle Bliss		1.23.19 16:30		Stephanie Fish	Stephanie Fish	01-23-19 1630
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample FSS- Field Split Sample **Method Type:** SED-T= sediment trap **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
TC-WF-Bed-R-20190122	19A0345-01	Solid	23-Jan-2019 13:45	23-Jan-2019 16:30
TC-WF-Bed-L-20190122	19A0345-02	Solid	23-Jan-2019 13:46	23-Jan-2019 16:30
TC-EF-Bed-R-20190122	19A0345-03	Solid	23-Jan-2019 13:10	23-Jan-2019 16:30
TC-EF-Bed-L-20190122	19A0345-04	Solid	23-Jan-2019 13:11	23-Jan-2019 16:30
TC-MS-Bed-R-20190122	19A0345-05	Solid	23-Jan-2019 14:45	23-Jan-2019 16:30
TC-MS-Bed-L-20190122	19A0345-06	Solid	23-Jan-2019 14:46	23-Jan-2019 16:30

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

Work Order Case Narrative

Sample receipt

Samples as listed on the preceding page were received January 23, 2019 under ARI work order 19A0345. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Grainsize

The samples were submitted to Materials Testing & Consulting, Inc. (MTC) for grainsize analysis. The MTC report is included here in its entirety.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Herrera

COC No(s): _____ NA

Assigned ARI Job No: 19A0345

Project Name: Taylor Creek

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1630 5.0 ____ ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: D00258

Cooler Accepted by: Sef Date: 1-23-19 Time: 1630

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA		_____

Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JB Date: 11/24/19 Time: 1014 Labels checked by: JBm

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project:	Taylor Creek Flow and Sediment (19A0345)	**Date Received:**	January 25, 2019
Project #:	18S010-77	**Sampled By:**	Others
Client :	Analytical Resources, Inc.	**Date Tested:**	March 6, 2019
Source:	Multiple	**Tested By:**	B. Goble
MTC Sample#:	Multiple		

CASE NARRATIVE

1. Six samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421. An assumed specific gravity of 2.65 was used in the hydrometer calculations. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
2. The data is provided in summary tables and plots.
3. There were no noted anomalies in this project.

Reviewed by: 

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Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (19A0345)
Project #: 18S010-77
Date Received: January 25, 2019
Date Tested: March 6, 2019

Client: Analytical Resources, Inc.

Sampled by: Others
Tested by: B. Goble

Percent Finer (Passing) Than the Indicated Size - ASTM D422

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
TC-WF-Bed-R-20190122	100.0	100.0	100.0	99.8	99.8	99.6	98.9	94.3	83.2	63.3	27.0	11.6	8.7	7.7	5.8	4.4	2.9	2.9	2.2	0.7	0.0
TC-WF-Bed-R-20190122	100.0	100.0	100.0	100.0	100.0	97.3	96.4	92.9	87.4	67.1	32.4	18.5	15.5	14.5	9.9	8.4	7.6	6.9	4.6	2.3	1.1
TC-EF-Bed-R-20190122	100.0	100.0	100.0	100.0	100.0	99.0	98.7	97.8	96.8	92.7	69.6	24.8	6.7	2.6	1.7	1.7	1.7	1.7	0.8	0.0	0.0
TC-EF-Bed-L-20190122	100.0	100.0	100.0	97.1	90.9	77.3	68.6	52.2	39.9	31.0	15.0	4.4	1.6	1.0	0.7	0.7	0.7	0.7	0.3	0.0	0.0
TC-MS-Bed-R-20190122	100.0	100.0	88.9	64.7	56.5	49.1	46.3	42.6	37.1	30.1	19.4	7.1	2.3	1.3	1.0	1.0	0.8	0.6	0.3	0.2	0.0
TC-MS-Bed-L-20190122	100.0	100.0	91.4	81.0	70.5	57.6	50.3	33.1	20.8	13.4	5.9	1.8	0.8	0.6	0.4	0.2	0.2	0.2	0.2	0.0	0.0

Reviewed by: EGabriel Goble

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Materials Testing & Consulting, Inc.

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Project: Taylor Creek Flow and Sediment (19A0345)
Project #: 18S010-77
Date Received: January 25, 2019
Date Tested: March 6, 2019

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: B. Goble

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
Particle Size (microns)	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	3.2-1.3	<1.3
TC-WF-Bed-R-20190122	0.0	0.0	0.2	0.0	0.2	0.7	4.6	11.1	19.9	36.3	15.4	2.9	1.0	1.9	1.5	1.5	0.0	0.7	1.5	0.7	0.0
TC-WF-Bed-R-20190122	0.0	0.0	0.0	0.0	2.7	0.9	3.4	5.5	20.3	34.7	13.8	3.0	1.0	4.6	1.5	0.8	0.8	2.3	2.3	1.1	1.1
TC-EF-Bed-R-20190122	0.0	0.0	0.0	0.0	1.0	0.3	0.9	1.0	4.1	23.1	44.8	18.2	4.1	0.9	0.0	0.0	0.0	0.8	0.8	0.0	0.0
TC-EF-Bed-L-20190122	0.0	0.0	2.9	6.2	13.6	8.7	16.4	12.3	8.9	16.0	10.6	2.7	0.7	0.3	0.0	0.0	0.0	0.3	0.3	0.0	0.0
TC-MS-Bed-R-20190122	0.0	11.1	24.2	8.2	7.4	2.8	3.7	5.5	6.9	10.8	12.2	4.8	1.0	0.3	0.0	0.2	0.2	0.3	0.2	0.2	0.0
TC-MS-Bed-L-20190122	0.0	8.6	10.3	10.5	12.9	7.3	17.3	12.3	7.4	7.6	4.0	1.0	0.2	0.2	0.2	0.0	0.0	0.0	0.2	0.0	0.0

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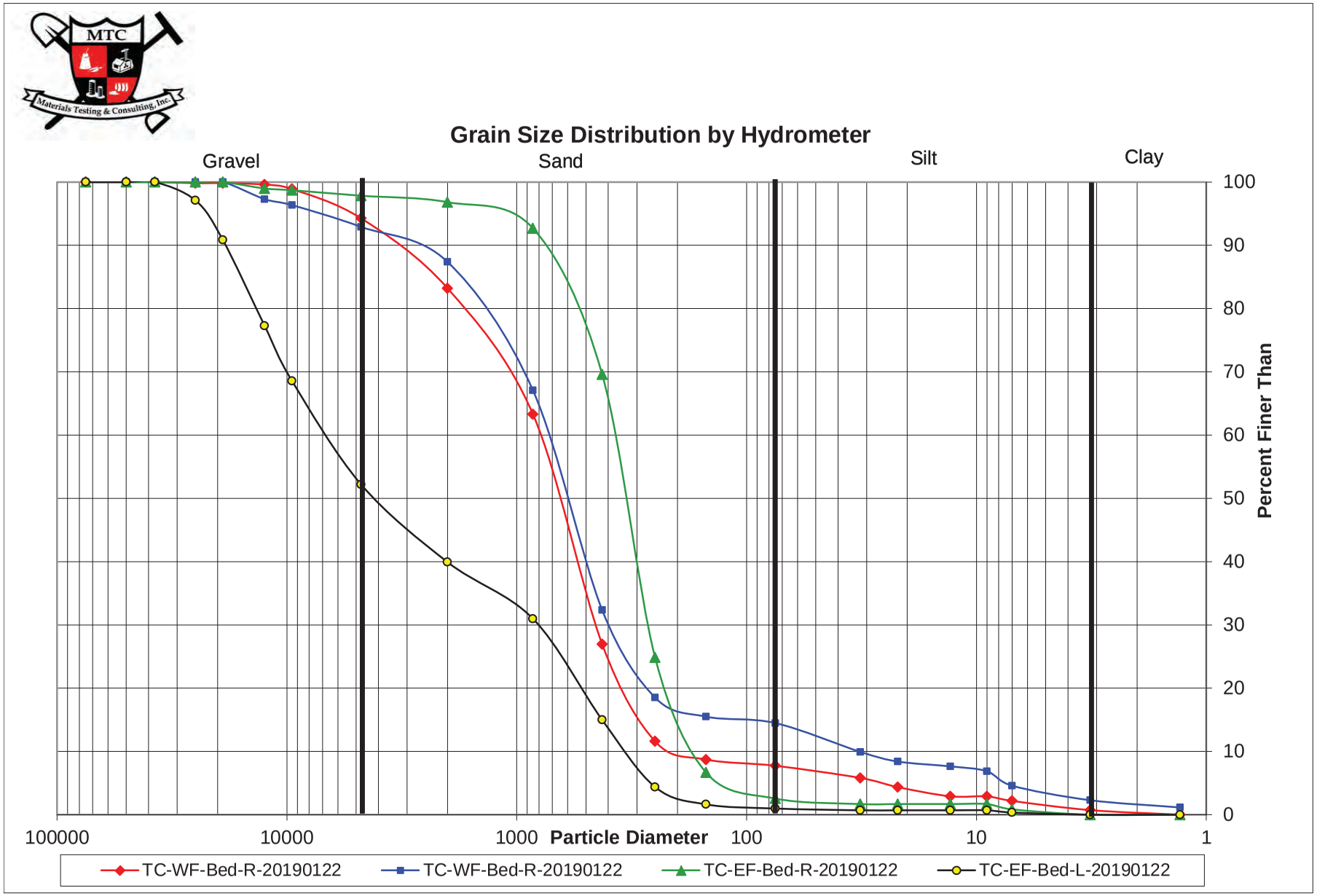
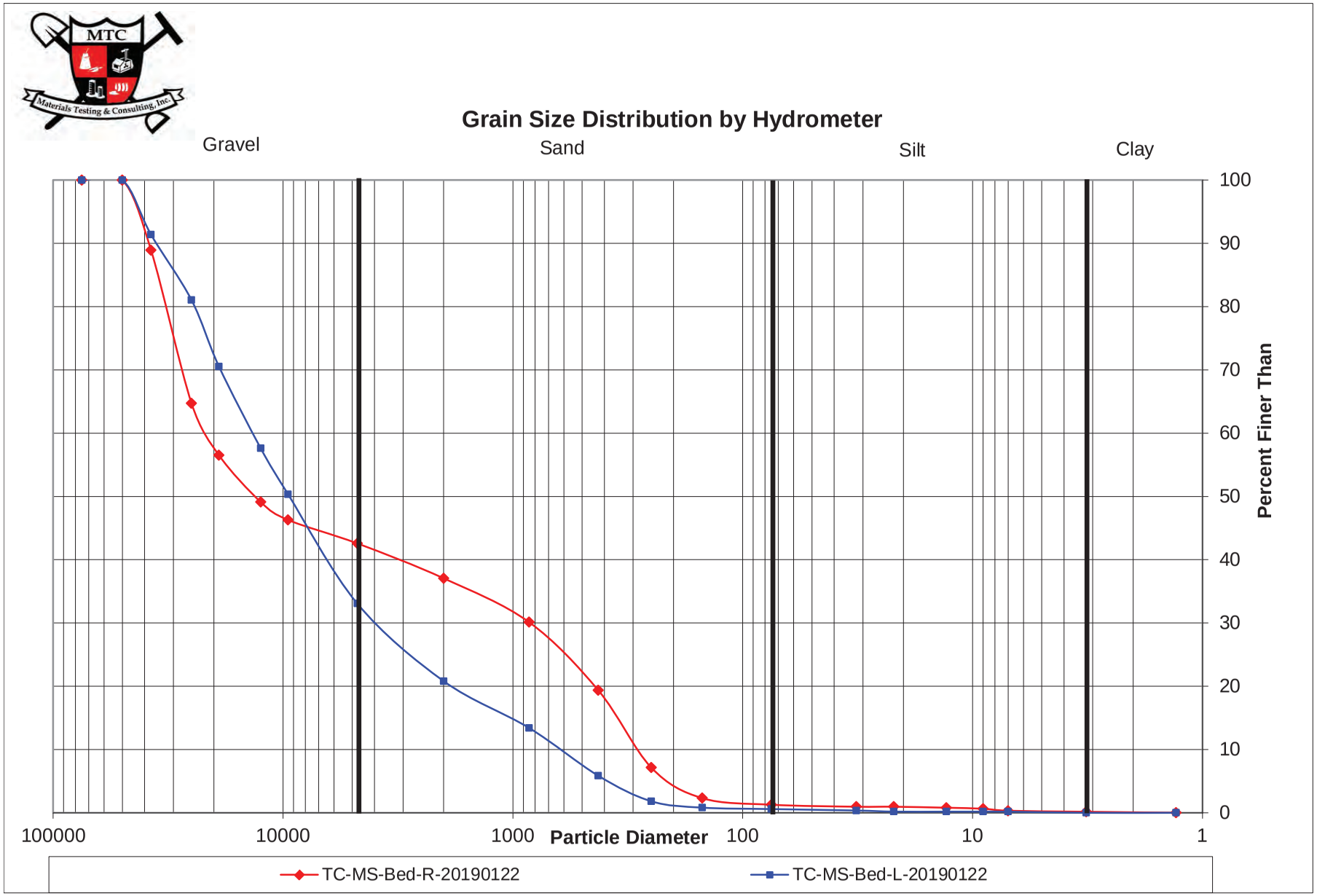

MTC
Materials Testing & Consulting, Inc.
Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
Particle Diameter
100
10
1
TC-WF-Bed-R-20190122
TC-WF-Bed-R-20190122
TC-EF-Bed-R-20190122
TC-EF-Bed-L-20190122


Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
Particle Diameter
100
10
1
TC-MS-Bed-R-20190122
TC-MS-Bed-L-20190122

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Project: Taylor Creek Flow and Sediment (19A0345)
Project #: 18S010-77
Date Received: January 25, 2019
Date Tested: February 18, 2019

Client: Analytical Resources, Inc.
Sampled by: Others
Tested by: B. Goble

Total Dry Weight

Sample #	Source	Total Dry Weight (g)
S19-0142	TC-WF-Bed-R-20190122	4969.7
S19-0143	TC-WF-Bed-L-20190122	392.41
S19-0144	TC-EF-Bed-R-20190122	905.89
S19-0145	TC-EF-Bed-L-20190122	5606.6
S19-0146	TC-MS-Bed-R-20190122	2200.4
S19-0147	TC-MS-Bed-L-20190122	9744.1

Reviewed by: EGabriel Goble

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

Method:

Sample Preparation:	Preparation Method:		Extract ID:
	Preparation Batch:		
	Prepared:	Final Volume:	

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

Certified Analyses included in this Report

Analyte	Certifications

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	02/07/2019
CALAP	California Department of Public Health CAELAP	2748	06/30/2019
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	01/01/2021
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-011	05/12/2019
WADOE	WA Dept of Ecology	C558	06/30/2019
WA-DW	Ecology - Drinking Water	C558	06/30/2019

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Herrera Environmental Consultants	Project: Taylor Creek Flow and Sediment Monitoring	
2200 6th Avenue, Suite 1100	Project Number: 17-06530-005	**Reported:**
Seattle WA, 98121	Project Manager: Dylan Ahearn	07-Mar-2019 15:01

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

APPENDIX B

Sampling Field Forms

FIELD LOG SHEET

Project Name: Taylor Creek Flow and Sediment Monitoring **Project #:** 17-06530-005

Site Location: Taylor Creek **Client:** Seattle Public Utilities

Event ID: 20181025

Pre-Storm Visit

Date: 10/25/19 Time: 13:10 Field Staff: AS, GK Weather: Cloudy

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Sampler Battery Volt. (V):	12.67	Sampler Battery Volt. (V):	12.43	Sampler Battery Volt. (V):	12.35
Actual Pump Vol (ml):	—	Actual Pump Vol (ml)	—	Actual Pump Vol (ml)	—
Pump Vol Before Adj. (ml):	—	Pump Vol Before Adj. (ml)	—	Pump Vol Before Adj. (ml)	—
Pump Vol After Adj. (ml):	—	Pump Vol After Adj. (ml)	—	Pump Vol After Adj. (ml)	—
Intake Checked?	(Yes) No	Intake Checked?	(Yes) No	Intake Checked?	(Yes) No
Desiccant Dry?	(Yes) No	Desiccant Dry?	(Yes) No	Desiccant Dry?	(Yes) No
Sample Line Rinsed?	(Yes) No	Sample Line Rinsed?	(Yes) No	Sample Line Rinsed?	(Yes) No
Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No
Pacing (minutes):	3015	Pacing (minutes):	15	Pacing (minutes):	15
Ice Added?	(Yes) No	Ice Added?	(Yes) No	Ice Added?	(Yes) No
Program Started?	(Yes) No	Program Started?	(Yes) No	Program Started?	(Yes) No
Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)

Post-Storm Visit

Date: 10/26/19 Time: 10:20 Field Staff: AS, GK Weather: Cloudy

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Date/Time End:	10/26 04:00	Date/Time End:	10/26 04:00	Date/Time End:	10/26 04:00
# of Samples:	24	# of Samples:	24	# of Samples:	24
Sampled Without Error?	(Yes) No	Sampled Without Error?	(Yes) No	Sampled Without Error?	(Yes) No
Est. Sample Vol (L):	450	Est. Sample Vol (L):	450	Est. Sample Vol (L):	450
select 5 bottles to characterize the storm		select 5 bottles to characterize the storm		select 5 bottles to characterize the storm	
time of selected bottle 1:	10/25 23:30	time of selected bottle 1:	10/25 22:40	time of selected bottle 1:	10/25 22:40
time of selected bottle 2:	10/25 22:40	time of selected bottle 2:	10/25 23:55	time of selected bottle 2:	10/25 23:55
time of selected bottle 3:	10/26 00:45	time of selected bottle 3:	10/26 00:45	time of selected bottle 3:	10/26 00:45
time of selected bottle 4:	10/26 01:35	time of selected bottle 4:	10/26 01:35	time of selected bottle 4:	10/26 01:35
time of selected bottle 5:	—	time of selected bottle 5:	—	time of selected bottle 5:	
Peak turbidity bottle time:	00:45	Peak turbidity bottle time:	00:45	Peak turbidity bottle time:	23:55
Pit Trap % Full	L: R:	Pit Trap % Full	L: R:	Pit Trap % Full	L: R:
5 bottles sent to Lab?	4 (Yes) No	5 bottles sent to Lab?	4 (Yes) No	5 bottles sent to Lab?	4 (Yes) No
Duplicate Samples?	Yes (No)	Duplicate Samples?	Yes (No)	Duplicate Samples?	Yes (No)
Duplicate Bottle(s):	—	Duplicate Bottle(s):	—	Duplicate Bottle(s):	—
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)

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Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn

Page: 1/1

Sampled By: Alex Svendsen / Gretchen Kayser

Delivery Method: ICE COOLER W/ICE

Laboratory: Analytical Resources Inc.

Requested Completion Date:

Total No. of Containers: 12

Lab Use:

Sample ID	Date	Time	Sample Type (see codes)	Preservative? (Y/N)	Matrix (see codes)	Analyses Requested: Suspended Sediment Concentration – SM D3977-97B
TC-WF 20181025 2240	10/25/18	2240	G	N	SW	X
TC-WF 20181025 2355	10/25/18	2355	G	N	SW	X
TC-WF 20181026 0045	10/26/18	0045	G	N	SW	X
TC-WF 20181026 0135	10/26/18	0135	G	N	SW	X
TC-EF 20181025 2240	10/25/18	2240	G	N	SW	X
TC-EF 20181025 2355	10/25/18	2355	G	N	SW	X
TC-EF 20181026 0045	10/26/18	0045	G	N	SW	X
TC-EF 20181026 0135	10/26/18	0135	G	N	SW	X
TC-MS 20181025 2240	10/25/18	2240	G	N	SW	X
TC-MS 20181025 2330	10/25/18	2330	G	N	SW	X
TC-MS 20181026 0045	10/26/18	0045	G	N	SW	X
TC-MS 20181026 0135	10/26/18	0135	G	N	SW	X

Comments/Special Instructions:

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Alex Svendsen/HERR		10/26/18 1613		ARI	A. Volgarsen	10/26/18 1613
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: G=Grab C=Composite

Matrix Codes: A=Air GW=Groundwater SE=Sediment SO=Soil SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

FIELD LOG SHEET

Project Name: Taylor Creek Flow and Sediment Monitoring **Project #:** 17-06530-005

Site Location: Taylor Creek **Client:** Seattle Public Utilities

Event ID: 20181215

Pre-Storm Visit

Date: 12/17/18 Time: 10:16 Field Staff: AS Weather: Cloudy

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Sampler Battery Volt. (V):	—	Sampler Battery Volt. (V):	—	Sampler Battery Volt. (V):	—
Actual Pump Vol (ml):	—	Actual Pump Vol (ml)	—	Actual Pump Vol (ml)	—
Pump Vol Before Adj. (ml):	—	Pump Vol Before Adj. (ml)	—	Pump Vol Before Adj. (ml)	—
Pump Vol After Adj. (ml):	—	Pump Vol After Adj. (ml)	—	Pump Vol After Adj. (ml)	—
Intake Checked?	(Yes) No	Intake Checked?	(Yes) No	Intake Checked?	(Yes) No
Desiccant Dry?	(Yes) No	Desiccant Dry?	(Yes) No	Desiccant Dry?	(Yes) No
Sample Line Rinsed?	(Yes) No	Sample Line Rinsed?	(Yes) No	Sample Line Rinsed?	(Yes) No
Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No
Pacing (minutes):	30	Pacing (minutes):	30	Pacing (minutes):	30
Ice Added?	(Yes) No	Ice Added?	(Yes) No	Ice Added?	(Yes) No
Program Started?	(Yes) No	Program Started?	(Yes) No	Program Started?	(Yes) No
Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)

Post-Storm Visit

Date: 12/18/18 Time: 13:00 Field Staff: AS Weather: Cloudy

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Date/Time End:	—	Date/Time End:	—	Date/Time End:	—
# of Samples:	12	# of Samples:	6	# of Samples:	1
Sampled Without Error?	Yes (No)	Sampled Without Error?	Yes (No)	Sampled Without Error?	Yes (No)
Est. Sample Vol (L):	—	Est. Sample Vol (L):	—	Est. Sample Vol (L):	—
select 5 bottles to characterize the storm		select 5 bottles to characterize the storm		select 5 bottles to characterize the storm	
time of selected bottle 1:		time of selected bottle 1:		time of selected bottle 1:	
time of selected bottle 2:	Dumped	time of selected bottle 2:	Dumped	time of selected bottle 2:	Dumped
time of selected bottle 3:		time of selected bottle 3:		time of selected bottle 3:	
time of selected bottle 4:		time of selected bottle 4:		time of selected bottle 4:	
time of selected bottle 5:		time of selected bottle 5:		time of selected bottle 5:	
Peak turbidity bottle time:	—	Peak turbidity bottle time:	—	Peak turbidity bottle time:	—
Pit Trap % Full	L: — R: —	Pit Trap % Full	L: — R: —	Pit Trap % Full	L: — R: —
5 bottles sent to Lab?	Yes (No)	5 bottles sent to Lab?	Yes (No)	5 bottles sent to Lab?	Yes (No)
Duplicate Samples?	Yes No	Duplicate Samples?	Yes No	Duplicate Samples?	Yes No
Duplicate Bottle(s):		Duplicate Bottle(s):		Duplicate Bottle(s):	
Turbidity sensor calibrated?	(Yes) No				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)

tubing kinked at SPU_STA401
only 6 bottles filled at TC-WF, water in sampler
TC-EF: sampler arm jammed

Only pit traps submitted

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1810337

Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To:	Page:
Dylan Ahearn / Jennifer Arthur	1/1
Sampled By:	**Delivery Method:**
Alex Svendsen / Gretchen Kayser	

Laboratory:	Requested Completion Date:	Total No. of Containers:
Analytical Resources Inc.		6

Analyses Requested

Lab Use:						Grain Size - ASTM D422 and total sample dry weight											
Sample ID (ex. TC-WF-Bed-YYYYMMDD)	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)												
TC-WF-Bed-R-20181217	12/18/18	1352	PES	SED-T	SE	X											
TC-WF-Bed-L-20181217	12/18/18	1353	PES	SED-T	SE	X											
TC-EF-Bed-R-20181217	12/18/18	1357	PES	SED-T	SE	X											
TC-EF-Bed-L-20181217	12/18/18	1355	PES	SED-T	SE	X											
TC-MS-Bed-R-20181217	12/18/18	1425	PES	SED-T	SE	X											
TC-MS-Bed-L-20181217	12/18/18	1427	PES	SED-T	SE	X											

Comments/Special Instructions:
In addition to ASTM D422 we need the dry weight of each entire sample that we submit. Please call 206-407-9538 if you have any questions

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Gretchen Kayser		12/18/18	15:00	Jennifer Arthur, AHI		12/18/18 1500 11.8°C
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample FSS- Field Split Sample **Method Type:** SED-T= sediment trap **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

FIELD LOG SHEET

Project Name: ~~StormGarden Bio-Filtration System~~ Taylor Creek Flow & Sediment Monitoring **Project #:** 17-06530-005

Site Location: Taylor Creek **Client:** Seattle Public Utilities

Site ID: WB **Event ID:** 20190122

Pre-Storm Visit

Date: 1/22/19 **Time:** 10:55 **Field Staff:** K. Bliss, D. Ahearn **Weather:** Overcast

Station Name: SUP-STA401		Station Name: TC-W1		Station Name: TC-E1	
Sampler Battery Volt. (V):	~~N/A (3 batteries)~~ KB	Sampler Battery Volt. (V):	12.8	Sampler Battery Volt. (V):	12.8
Actual Pump Vol (ml):	—	Actual Pump Vol (ml)	—	Actual Pump Vol (ml)	—
Pump Vol Before Adj. (ml):	—	Pump Vol Before Adj. (ml)	—	Pump Vol Before Adj. (ml)	—
Pump Vol After Adj. (ml):	—	Pump Vol After Adj. (ml)	—	Pump Vol After Adj. (ml)	—
Intake Checked?	(Yes) No	Intake Checked?	(Yes) No	Intake Checked?	(Yes) No
Desiccant Dry?	~~Yes~~ ~~No~~	Desiccant Dry?	~~Yes~~ ~~No~~	Desiccant Dry?	~~Yes~~ ~~No~~
Sample Line Rinsed?	Yes (No)	Sample Line Rinsed?	Yes (No)	Sample Line Rinsed?	Yes (No)
Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No
Pacing (minutes):	30	Pacing (minutes):	30	Pacing (minutes):	30
Ice Added?	Yes (No)	Ice Added?	Yes (No)	Ice Added?	Yes (No)
Program Started?	(Yes) No	Program Started?	(Yes) No	Program Started?	(Yes) No
Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No
Turbidity sensor calibrated?	(Yes) No				
Flow Conditions: base	Rise Fall Peak None	Flow Conditions: base	Rise Fall Peak None	Flow Conditions: base	Rise Fall Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)
YSI Turb. discrepancy calibration: Ø = 1.3 NTU before, Ø.0 After. 126 NTU Standard = 121.8 NTU, 125.9 NTU after. Note to Stake/secure both forks' Samplers, and move WF to higher ground. Longer gloves might be helpful for buckets. Turbidimeter battery has 32.9 days remaining; Outlook reminder set for 2/25.

Post-Storm Visit

Date: 1/23/19 **Time:** 13:00 **Field Staff:** K. Bliss **Weather:** Overcast

Station Name: SUP-STA401		Station Name: TC-W1		Station Name: TC-E1	
Date/Time End:	1/23/19 00:30	Date/Time End:	1/23/19 00:30	Date/Time End:	1/23/19 00:30
# of Samples:	24	# of Samples:	21	# of Samples:	23 3/4
Sampled Without Error?	Yes (No)	Sampled Without Error?	Yes (No)	Sampled Without Error?	Yes (No)
Est. Sample Vol (L):	12 L	Est. Sample Vol (L):	10.5L	Est. Sample Vol (L):	11.9 L
select 4 bottles to characterize the storm		select 4 bottles to characterize the storm		select 4 bottles to characterize the storm KB	
time of selected bottle 1: 13	1/22 19:00	time of selected bottle 1: 12	1/22 18:30	time of selected bottle 1: 14	1/22 19:30
time of selected bottle 2: 18	21:30	time of selected bottle 2: 15	20:00	time of selected bottle 2: 16	20:30
time of selected bottle 3: 20	22:30	time of selected bottle 3: 16	20:30	time of selected bottle 3: 18	21:30
time of selected bottle 4: 23	1/23 00:00	time of selected bottle 4: 21	23:00	time of selected bottle 4: 20	22:30
Peak turbidity bottle time:	21:30	Peak turbidity bottle time:	* 20:30	Peak turbidity bottle time:	21:30
Pit Trap % Full	L: 100% R: ~20%	Pit Trap % Full	L: <5% R: ~5%	Pit Trap % Full	L: ~25% R: ~5%
4 bottles sent to Lab?	(Yes) No	4 bottles sent to Lab?	(Yes) No	4 bottles sent to Lab?	(Yes) No
Duplicate Sample?	Yes (No)	Duplicate Sample?	Yes (No)	Duplicate Sample?	Yes (No)
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)
EF: Error bottle 19 (@22:00) "No More Liquid", only filled ~3/4 bottle.
WF: Error bottles 18-20 "Distributor arm jammed", Esco base filled, still filled bottles 21-24
*Peak actually 21:00, but did not take as was disturbed during flow monitoring.
MS: Error bottle 19 (21:30) "No More Liquid", but bottle full (poss. bit over-filled).

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Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: ~~Gretchen Kayser~~ / Kyle Bliss

Delivery Method: Cooler w/ Ice

Laboratory: Analytical Resources Inc.

Requested Completion Date: 1-WK

Total No. of Containers: 12

Lab Use:

Analyses Requested

Sample ID	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Suspended Sediment Concentration - SM D3977-97B
TC-WF 20190122 1830	1/22/19	18:30	PES	GRB-A	SW	X
TC-WF 20190122 2000		20:00	PES	GRB-A	SW	X
TC-WF 20190122 2030		20:30	PES	GRB-A	SW	X
TC-WF 20190122 2300		23:00	PES	GRB-A	SW	X
TC-EF 20190122 1930		19:30	PES	GRB-A	SW	X
TC-EF 20190122 2030		20:30	PES	GRB-A	SW	X
TC-EF 20190122 2130		21:30	PES	GRB-A	SW	X
TC-EF 20190122 2230		22:30	PES	GRB-A	SW	X
TC-MS 20190122 1800		18:00	PES	GRB-A	SW	X
TC-MS 20190122 2130		21:30	PES	GRB-A	SW	X
TC-MS 20190122 2230		22:30	PES	GRB-A	SW	X
TC-MS 20190123 0000	1/23/19	00:00	PES	GRB-A	SW	X

Comments/Special Instructions:

Relinquished by (Name/CO/	Signature	Date/Time	Received By (Name/CO)	Signature	Date/Time
Kyle Bliss		1-23-19 1630	Stephanie Fish	Stephanie Fish	1-23-19 1630
Relinquished by (Name/CO/	Signature	Date/Time	Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample C=Composite **Sample Method:** GRB-A= Grab Automatic **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

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Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: ~~Alex Svendsen / Gretchen Kayser~~ K. Bliss

Delivery Method: Burlap bags in Buckets

Laboratory: Analytical Resources Inc.

Requested Completion Date: 1 wk

Total No. of Containers: 6

Lab Use:

Sample ID (ex. TC-WF-Bed-YYYYMMDD)	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Grain Size - ASTM D422 and total sample dry weight
TC-WF-Bed- R - 20190122	1/23/19	13:45	PES	SED-T	SE	X
TC-WF-Bed- L - 20190122	"	13:46	PES	SED-T	SE	X
TC-EF-Bed- R - 20190122	"	13:10	PES	SED-T	SE	X
TC-EF-Bed- L - 20190122	"	13:11	PES	SED-T	SE	X
TC-MS-Bed- R - 20190122	"	14:45	PES	SED-T	SE	X
TC-MS-Bed- L - 20190122	↓	14:46	PES	SED-T	SE	X

Comments/Special Instructions:

In addition to ASTM D422 we need the dry weight of each entire sample that we submit. Please call 206-407-9538 if you have any questions

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Kyle Bliss		1.23.19 16:30		Stephanie Fahl	Stephanie Fahl	1-23-19 1630
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample FSS- Field Split Sample **Method Type:** SED-T= sediment trap **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

FIELD LOG SHEET

Project Name: Taylor Creek Flow and Sediment Monitoring **Project #:** 17-06530-005

Site Location: Taylor Creek **Client:** Seattle Public Utilities

Event ID: 2019 1115

Pre-Storm Visit

Date: 11/14/19 Time: 13:00 Field Staff: GK, NM Weather: Cloudy

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Sampler Battery Volt. (V):	[illegible]	Sampler Battery Volt. (V):	12.8	Sampler Battery Volt. (V):	12.8
Actual Pump Vol (ml):	—	Actual Pump Vol (ml)	—	Actual Pump Vol (ml)	—
Pump Vol Before Adj. (ml):	—	Pump Vol Before Adj. (ml)	—	Pump Vol Before Adj. (ml)	—
Pump Vol After Adj. (ml):	—	Pump Vol After Adj. (ml)	—	Pump Vol After Adj. (ml)	—
Intake Checked?	(Yes) No	Intake Checked?	(Yes) No	Intake Checked?	(Yes) No
Desiccant Dry?	Yes No	Desiccant Dry?	Yes No	Desiccant Dry?	~~Yes~~ No
Sample Line Rinsed?	Yes (No)	Sample Line Rinsed?	Yes (No)	Sample Line Rinsed?	Yes (No)
Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No	Pit Traps Deployed?	(Yes) No
Pacing (minutes):	20	Pacing (minutes):	20	Pacing (minutes):	20
Ice Added?	Yes (No)	Ice Added?	Yes (No)	Ice Added?	Yes (No)
Program Started?	(Yes) No	Program Started?	(Yes) No	Program Started?	(Yes) No
Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No	Tubing Connected?	(Yes) No
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions: base	Rise Fall Peak None	Flow Conditions: base	Rise Fall Peak None	Flow Conditions: base	Rise Fall Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)
- redug buckets @ EF

Post-Storm Visit

Date: 11.15.19 Time: 12:00 Field Staff: KB, NM Weather: Mostly Sunny

Station Name: SPU-STA401		Station Name: TC-WF		Station Name: TC-EF	
Date/Time End:	11.15.19 11:40	Date/Time End:	11.15.19 11:40	Date/Time End:	11.15.19 11:40
# of Samples:	24	# of Samples:	24	# of Samples:	24
Sampled Without Error?	(Yes) No	Sampled Without Error?	(Yes) No	Sampled Without Error?	(Yes) No
Est. Sample Vol (L):		Est. Sample Vol (L):		Est. Sample Vol (L):	
select 5 bottles to characterize the storm		select 5 bottles to characterize the storm		select 5 bottles to characterize the storm	
time of selected bottle 1: 4	0500	time of selected bottle 1: 2	0420	time of selected bottle 1: 3	0440
time of selected bottle 2: 6	0540	time of selected bottle 2: 4	0500	time of selected bottle 2: 5	0520
time of selected bottle 3: 8	0620	time of selected bottle 3: 6	0540	time of selected bottle 3: 7	0600
time of selected bottle 4: 10	0700	time of selected bottle 4: 9	0640	time of selected bottle 4: 9	0640
time of selected bottle 5: 14	0820	time of selected bottle 5: 14	0820	time of selected bottle 5: 12	0740
Peak turbidity bottle time:		Peak turbidity bottle time:		Peak turbidity bottle time:	
Pit Trap % Full	L: 0 R: 0	Pit Trap % Full	L: 0 R: 0	Pit Trap % Full	L: 0.5 R: 1
5 bottles sent to Lab?	(Yes) No	5 bottles sent to Lab?	(Yes) No	5 bottles sent to Lab?	(Yes) No
Duplicate Samples?	Yes (No)	Duplicate Samples?	Yes (No)	Duplicate Samples?	Yes (No)
Duplicate Bottle(s):		Duplicate Bottle(s):		Duplicate Bottle(s):	
Turbidity sensor calibrated?	Yes (No)				
Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None	Flow Conditions:	Rise (Fall) Peak None

Notes/Visual Conditions: (if 'no' to any questions above, explain why and remedial actions taken)

HERRERA

HERRERA
2200 Sixth Avenue | Suite 1100
Seattle, Washington | 98121
p 206 441 9080 | f 206 441 9108

Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: N. Maas Gretchen Kayser / Kyle Bliss

Delivery Method:

Laboratory: Analytical Resources Inc.

Requested Completion Date:

Total No. of Containers:

Lab Use:

Sample ID	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Suspended Sediment Concentration – SM D3977-97B
TC-WF 20191115	11/15/19	0420	PES	GRB-A	SW	X
TC-WF		0500	PES	GRB-A	SW	X
TC-WF		0540	PES	GRB-A	SW	X
TC-WF		0640	PES	GRB-A	SW	X
TC-EF		0600	PES	GRB-A	SW	X
TC-EF		0520	PES	GRB-A	SW	X
TC-EF		0640	PES	GRB-A	SW	X
TC-EF		0440	PES	GRB-A	SW	X
TC-MS 20191115		0620 0640 KB	PES	GRB-A	SW	X
TC-MS		0500	PES	GRB-A	SW	X
TC-MS		0540	PES	GRB-A	SW	X
TC-MS		0700	PES	GRB-A	SW	X

Comments/Special Instructions:
** RETURN BOTTLES TO HERRERA **

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Nina Maas		11/15/19	1438	Kenny Daney ARI		11/15/19 1438
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample C=Composite Sample Method: GRB-A= Grab Automatic Matrix Codes: GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

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Seattle, Washington | 98121
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Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1 2/2

Sampled By: N. Meas Gretchen Kayser / Kyle Bliss

Delivery Method:

Laboratory: Analytical Resources Inc.

Requested Completion Date:

Total No. of Containers:

Lab Use:

Sample ID	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Suspended Sediment Concentration – SM D3977-97B
TC-WF 20191115	11/15/19	0820	PES	GRB-A	SW	X
~~TC-WF~~			PES	GRB-A	SW	X
~~TC-WF~~			PES	GRB-A	SW	X
~~TC-WF~~			PES	GRB-A	SW	X
TC-EF 20191115	11/15/19	0740	PES	GRB-A	SW	X
~~TC-EF~~			PES	GRB-A	SW	X
~~TC-EF~~			PES	GRB-A	SW	X
~~TC-EF~~			PES	GRB-A	SW	X
TC-MS 20191115	11/15/19	0820	PES	GRB-A	SW	X
~~TC-MS~~			PES	GRB-A	SW	X
~~TC-MS~~			PES	GRB-A	SW	X
~~TC-MS~~			PES	GRB-A	SW	X

Comments/Special Instructions:

Return Bottle to Herrera!!

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Nina Meas		11/15/19	1488	Kenny Dang ARI		11/15/19 1438
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample C=Composite Sample Method: GRB-A= Grab Automatic Matrix Codes: GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

HERRERA
2200 Sixth Avenue | Suite 1100
Seattle, Washington | 98121
p 206 441 9080 | f 206 441 9108

Chain of Custody Record

Project Name:	Project Number:	Client:
Taylor Creek Flow and Sediment Monitoring	17-06530-005	Herrera Environmental

Report To: Dylan Ahearn / Jennifer Arthur

Page: 1/1

Sampled By: ~~Alex Svendsen / Gretchen Kayser~~ N. Maas / K. Bliss

Delivery Method: 2 Burlap Bags in Bucket

Laboratory: Analytical Resources Inc.

Requested Completion Date: Std TAT

Total No. of Containers:

Lab Use:

Sample ID (ex. TC-WF-Bed-YYYYMMDD)	Date	Time	Sample Type (see codes)	Sample Method (see codes)	Matrix (see codes)	Analyses Requested: Grain Size - ASTM D422 and total sample dry weight
~~TC-WF-Bed~~			~~PES~~	~~SED-T~~	~~SE~~	X
~~TC-WF-Bed~~			~~PES~~	~~SED-T~~	~~SE~~	X
TC-EF-Bed-20191115	11/15/19	1300	PES	SED-T	SE	X
~~TC-EF-Bed~~			~~PES~~	~~SED-T~~	~~SE~~	X
~~TC-MS-Bed~~			~~PES~~	~~SED-T~~	~~SE~~	X
~~TC-MS-Bed~~			~~PES~~	~~SED-T~~	~~SE~~	X

Comments/Special Instructions:

In addition to ASTM D422 we need the dry weight of each entire sample that we submit. Please call 206-407-9538 if you have any questions

Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time
Nina Maas		11/15/19	1438	Kenny Dang ART		11/15/19 1438
Relinquished by (Name/CO/	Signature	Date/Time		Received By (Name/CO)	Signature	Date/Time

Sample Type: PES= Primary Environmental Sample FSS- Field Split Sample **Method Type:** SED-T= sediment trap **Matrix Codes:** GW=Groundwater SE=Sediment SW=Surface Water W=Water (blanks) M=Material O=Other (specify)

APPENDIX C

Flow Measurement Field Forms

Herrera - Ballinger Creek - Stream Flow Data Sheet

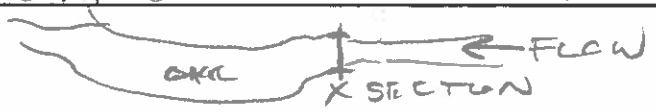
Flow Station #: TAYLOR WF	Gauge Start Height: 0.66	Stream: Taylor Creek WF
Date: 10/4/18	Start Time: 1500	Client: SPU
Observer Initials: AS	Gauge End Height: 0.66	Method: **Wading** / Culvert
	End Time: 1505	

Gauging Assessment: ~~Circle One~~ *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
DISCHARGE VERY LOW & CLEAR; BASE FLOW CONDITIONS
NO TURBULENCE AROUND GAGE

Cross Section Location: ~5 FT UPSTREAM OF GAGE

Sketch of XS Location:



Control Feature/Condition: POOL / OK

Weather: OVERCAST + MILD

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
DOWNLOADED DATA; DATA SET COMPLETE

Measurement Data		RB Distance (ft): 0		LB Distance (ft): 1.0	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0	0	0	19		
2 0.3	0.20	0.18	20		
3 0.5	0.22	0.31	21		
4 0.7	0.20	0.21	22		
5 1.0	0	0	23		
6			24		
7			25		
8			26		
9			27		
Time / SG:			Time / SG:		
10			28		
11			29		
12			30		
13			31		
14			32		
15			33		
16			34		
17			35		
18			36		
Time / SG:			Time / SG:		

Flow (cfs): 0.03

Entered into Taylor Creek Database?
Date: 10/8/18 Initials: AS

Herrera - Ballinger Creek - Stream Flow Data Sheet

Flow Station #: TAYLOR EF	Gauge Start Height: 0.49	Stream: Taylor Creek EF
Date: 10/4/18	Start Time: 1420	Client: SPU
Observer Initials: AS	Gauge End Height: 0.49	Method: Wading / Culvert
	End Time: 1433	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
LOW, CLEAR FLOW; BASE FLOW CONDITIONS

Cross Section Location: ~ 10 FEET UPSTREAM OF GAGE

Sketch of XS Location:

Control Feature/Condition: SND DAM ~15 FT DOWNSTREAM / OK

Weather: OVERCAST + MILD

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
DOWNLOADED DATA FROM ET + BAROMETRIC P. DATA LOGGER; DATA COMPLETE

Measurement Data		RB Distance (ft): 0.5		LB Distance (ft): 5.9	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.5	0	0	19 5.9	0	0
2 0.8	0.3	0	20		
3 1.1	0.25	0.12	21		
4 1.4	0.25	-0.01	22		
5 1.7	0.25	0.27	23		
6 2.0	0.32	0.61	24		
7 2.3	0.15	0.29	25		
8 2.6	0.22	0.10	26		
9 2.9	0.20	0	27		
Time / SG:	1425 / 0.49		Time / SG:		
10 3.2	0.23	-0.04	28		
11 3.5	0.22	0.12	29		
12 3.8	0.20	0.49	30		
13 4.1	0.20	0.65	31		
14 4.4	0.15	0.58	32		
15 4.7	0.10	0.29	33		
16 5.0	0.10	0.06	34		
17 5.3	0.05	0.03	35		
18 5.6	0.05	0.0	36		
Time / SG:			Time / SG:		

Flow (cfs): 0.218

Entered into Taylor Creek Database?
Date: 10/8/18 Initials: AS

MS

Herrera - Taylor Creek ~~WF~~ - Stream Flow Data Sheet

MS

Flow Station #: Main Stem	Gauge Start Height: 1.0 ft from ~~metal~~ plate	Stream: Taylor Creek ~~WF~~
Date: 10/26/18	Start Time: 12:30 am	Client: SPU
Observer Initials: VW GK	Gauge End Height: 12:46 am	Method: (Wading) / Culvert
	End Time: 0.98 ft	

Gauging Assessment: Circle One — *(within _% deviation from actual discharge)
Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
deep / fast flow

Cross Section Location: 1 ft DS fern

Sketch of XS Location: from gazebo

Control Feature/Condition: N/A

Weather: Rainy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
could not take S.G. readings and sample since ~~GK~~ didn't bring two tapes

Measurement Data — RB Distance (ft): 0.4 — LB Distance (ft): 7.4

Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 7.0	0.7	-0.16	19 1.6	0.7	2.53
2 6.7	0.7	1.16	20 1.3	0.5	1.93
3 6.4	0.6	2.96	21 1.0	0.9	1.00
4 6.1	0.6	2.88	22 0.7	0.2	0.86
5 5.8	0.6	3.45	23 0.4	0.1	N/A
6 5.5	0.6	2.58	24		
7 5.2	0.7	2.04	25		
8 4.9	0.7	3.20	26		
9 4.6	0.8	3.46	27		
Time / SG:			Time / SG:		
10 4.3	0.7	2.56	28		
11 4.0	0.7	3.22	29		
12 3.7	0.7	3.09	30		
13 3.4	0.8	3.28	31		
14 3.1	0.7	2.35	32		
15 2.8	0.6	3.16	33		
16 2.5	0.7	2.76	34		
17 2.2	0.7	2.79	35		
18 1.9	0.7	1.95	36		
Time / SG:			Time / SG:		

Flow (cfs):

Entered into Taylor Creek Database?
Date: Initials: GK

Herrera - Taylor Creek WF - Stream Flow Data Sheet

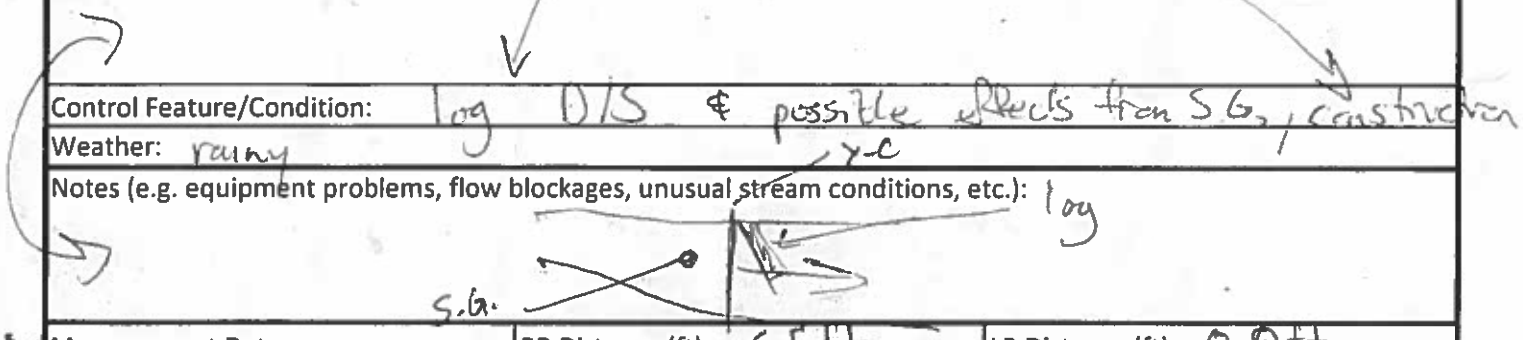
Flow Station #: West Fork	Gauge Start Height: 0.86 ft	Stream: Taylor Creek WF
Date: 10/25/18	Start Time: 10:04 pm	Client: SPU
Observer Initials: GK, VW	Gauge End Height: 0.85 ft	Method: **Wading** / Culvert
	End Time: 11:17 pm	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) **Fair (8%*)** Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
~~Dead zone~~ ◦ Dead zone RB
◦ Back eddy LB

Cross Section Location: ~~[illegible]~~ 2 ft DIS of stream gage

Sketch of XS Location:



Control Feature/Condition: log DIS & possible effects from SG, construction
Weather: rainy
Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data — RB Distance (ft): 6.5 ft — LB Distance (ft): 0.8 ft

Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.8	0.1	N/A	19 6.2	0.1	N/A
2 1.1	0.2	-0.18	20		
3 1.5	0.2	-0.22	21		
4 1.7	0.3	-0.18	22		
5 2.0	0.4	-0.13	23		
6 2.3	0.4	-0.10	24		
7 2.6	0.5	-0.14	25		
8 2.9	0.5	-0.13	26		
9 3.2	0.7	0.09	27		
Time / SG:			Time / SG:		
10 3.5	0.7	0.13	28		
11 3.8	0.6	0.72	29		
12 4.1	0.6	0.85	30		
13 4.4	0.6	0.76	31		
14 4.7	0.4	0.47	32		
15 5.0	0.4	0.40	33		
16 5.3	0.4	0.15	34		
17 5.6	0.3	0.01	35		
18 5.9	0.2	0.00	36		
Time / SG:			Time / SG:		

Flow (cfs): 0.481

Entered into Taylor Creek Database?
Date: 10/26/18 Initials: GK

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #: East Fork	Gauge Start Height: 0.75	Stream: Taylor Creek EF
Date: 10/25/18	Start Time: 11:33 pm	Client: SPU
Observer Initials: VW / GK	Gauge End Height: 0.75	Method: (Wading) / Culvert
	End Time: 11:45 pm	

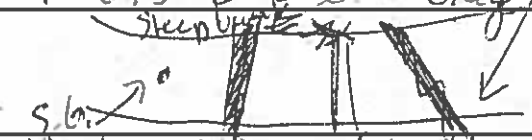
Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.): Representative X-C

- Flow @ angle across S.G.

Cross Section Location: ~8 ft U/S of Steel Gage

Sketch of XS Location:



Control Feature/Condition: Unobstructed (boulders / rocks on RB)

Weather: Rainy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft): 7.2 ft		LB Distance (ft): 0.5 ft	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.5	N/A	N/A	19 5.9	0.6	0.08 " "
2 0.8	0.1	N/A	20 6.2	0.5	-0.05 " "
3 1.1	0.2	-0.02	21 6.5	0.4	-0.25
4 1.4	0.2	0.06	22 6.8	0.4	-0.34
5 1.7	0.4	0.61	23 7.2	0.05	N/A
6 2.0	0.3	0.98	24		
7 2.3	0.3	1.14	25		
8 2.6	0.3	1.34	26		
9 2.9	0.4	1.50	27		
Time / SG: 11:37 pm 0.76 ft			Time / SG:		
10 3.2	0.4	1.75	28		
11 3.5	0.5	1.86	29		
12 3.8	0.5	1.95	30		
13 4.1	0.5	1.09	31		
14 4.4	0.4	0.90 rock	32		
15 4.7	0.4	1.76	33		
16 5.0	0.6	1.68	34		
17 5.3	0.5	0.05 rock	35		
18 5.6	0.6	0.10 " "	36		
Time / SG: 11:42 pm 0.76 ft			Time / SG:		

Flow (cfs):

Entered into Taylor Creek Database?
Date: Initials:

Herrera - Taylor Creek MS - Stream Flow Data Sheet

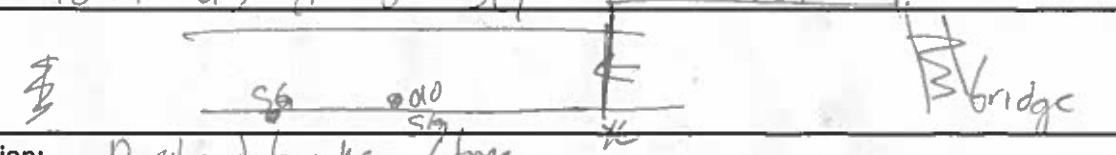
Flow Station #: Taylor Creek MS	Gauge Start Height: 14 3/4 inches	Stream: Taylor Creek MS
Date: 01/22/19	Start Time: 8:41 PM	Client: SPU
Observer Initials: GK+VW	Gauge End Height: 14 inches	Method: Wading / Culvert
	End Time: 8:51 PM	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Tape measurer @ angle slightly off by 6" vert.

Cross Section Location: 40 FT U/S of SPU SG

Sketch of XS Location:



Control Feature/Condition: Riparian banks / trees

Weather: Raining

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
FREE

Measurement Data		RB Distance (ft): 0.5		LB Distance (ft): 8.0	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.5	0.2	0.6 +	19 7.1	0.5	-0.07
2 0.9	0.2	1.15	20 8.0	NA	NA
3 1.3	0.3	1.45	21		
4 1.7	0.3	1.41	22		
5 2.1	0.4	1.65	23		
6 2.5	0.4	1.68	24		
7 2.9	0.45	1.71	25		
8 3.3	0.45	2.46	26		
9 3.7	0.6	3.17	27		
Time / SG:	14"8 in	8:47 PM	Time / SG:		
10 4.1	0.6	3.02	28		
11 4.5	0.5	3.24	29		
12 4.9	0.6	2.69	30		
13 5.3	0.6	2.66	31		
14 5.7	0.5	2.89	32		
15 6.1	0.5	2.90	33		
16 6.5	0.45	2.78	34		
17 6.9	0.5	0.50	35		
18 7.3	0.6	0.14	36		
Time / SG:			Time / SG:		

Flow (cfs): 6.976

Entered into Taylor Creek Database?
Date: 1/23/19 Initials: GK

Tree Climb

Herrera - Taylor Creek WF - Stream Flow Data Sheet

Flow Station #: Taylor Creek WF	Gauge Start Height: 1.00	Stream: Taylor Creek WF
Date: 01/22/19	Start Time: ~~21:00~~ 21:04	Client: SPU
Observer Initials: GK+VW	Gauge End Height: 1.05	Method: Wading / Culvert
	End Time: 21:19	

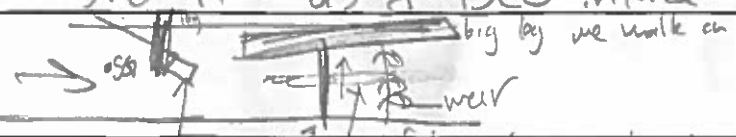
Gauging Assessment: Circle One *(within ~% deviation from actual discharge)

Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.): U/S of weir; leaf island (some flow breaking across leave island)

Cross Section Location: ~516 ft U/S of ISCO intake

Sketch of XS Location:



Control Feature/Condition: ISCO intake island of leaves (island of leaves) U/S of weir ~2-ft

Weather: Rainy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.): leaf island

Measurement Data		RB Distance (ft): 0.8			LB Distance (ft): 10.3
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.8	NA	NA	19 8.0	0.3	0.28
2 1.2	0.4	0.27	20 8.4	0.4	0.23
3 1.6	0.4	0.28	21 8.8	0.4	0.30
4 2.0	0.6	0.47	22 9.2	0.5	0.68
5 2.4	0.7	0.34	23 9.6	0.5	0.74
6 2.8	0.6	0.32	24 10.0	0.5	0.55
7 3.2	0.5	0.51	25 10.3	0.5	0.30
8 3.6	0.4	0.56	26		
9 4.0	0.35	0.69	27		
Time / SG: 21:09		1.02	Time / SG:		
10 4.4	0.3	0.68	28		
11 4.8	0.3	0.54	29		
12 5.2	0.25	0.62	30		
13 5.6	0.2	0.59	31		
14 6.0	0.2	0.53	32		
15 6.4	0.2	~~0.23~~	33		
16 6.8	NA	NA	34		
17 7.2			35		
18 7.6			36		
Time / SG: 21:14		1.04	Time / SG:		

leaves end 2/ 7.7

Flow (cfs): 1,513

Entered into Taylor Creek Database?

Date: 1/22/19 Initials: GK

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #: Taylor Creek EF	Gauge Start Height: 0.56	Stream: Taylor Creek EF
Date: 01/22/19	Start Time: 7:44 PM	Client: SPU
Observer Initials: GK + VW	Gauge End Height: 7:55 PM	Method: ~~Wading~~ / Culvert
	End Time: 0.58	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

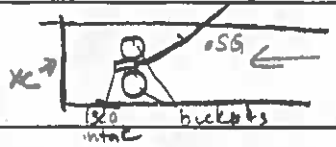
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

OPEN FLOW

Cross Section Location: a few feet DIS of ISCO intake / buckets

Sketch of XS Location:



Control Feature/Condition:

Weather: rainy but lightly @ present

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Representative X-C ; no unusual conditions

Measurement Data		RB Distance (ft): 0.0		LB Distance (ft): 7.2	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.0	NA	NA	19 7.2	NA	NA
2 0.4	0.35	0.35	20		
3 0.8	0.4	1.01	21		
4 1.2	0.35	1.56	22		
5 1.6	0.4	1.45	23		
6 2.0	0.4	0.96	24		
7 2.4	0.4	0.66	25		
8 2.8	0.4	0.71	26		
9 3.2	0.4	1.12	27		
Time / SG: 7:51 PM 0.57			Time / SG:		
10 3.6	0.4	1.02	28		
11 4.0	0.3	0.81	29		
12 4.4	0.2	0.65	30		
13 4.8	0.2	0.47	31		
14 5.2	0.2	0.30	32		
15 5.6	0.25	0.06	33		
16 6.0	0.25	0.05	34		
17 6.4	0.3	0.04	35		
18 6.8	0.3	-0.01	36		
Time / SG: 7:54 PM 0.58			Time / SG:		
Flow (cfs): 1.588			Entered into Taylor Creek Database? Date: 1/23/19 Initials: GK		

Herrera - Taylor Creek MS - Stream Flow Data Sheet

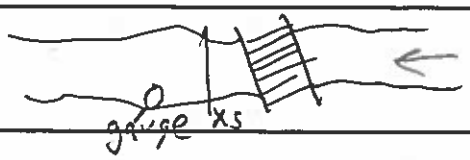
Flow Station #: MS	Gauge Start Height: 15"	Stream: Taylor Creek MS
Date: 2/1/19	Start Time: 13:21	Client: SPU
Observer Initials: DSA / KB	Gauge End Height: 14.8"	Method: (Wading) / Culvert
	End Time: 13:30	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Swapped battery @ 401
new bat: 12.56
old bat: 12.1

Measurement Data		RB Distance (ft): 1' 8"		LB Distance (ft): 9' 2"	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1' 10"	.28	1.25	19 7' 10"	.3	-.27
2 2' 2"	.25	1.27	20 8' 2"	.21	-.43
3 2' 6"	.25	0.74	21 8' 6"	.18	-.33
4 2' 10"	.20	1.68	22 8' 10"	.15	-.12
5 3' 2"	.01	(rock) NA	23		
6 3' 6"	.21	1.60	24		
7 3' 10"	.30	1.57	25		
8 4' 2"	.30	1.44	26		
9 4' 6"	.25	1.63	27		
Time / SG:			Time / SG:		
10 4' 10"	.35	1.93	28		
11 5' 2"	.58	1.46	29		
12 5' 6"	.65	1.63	30		
13 5' 10"	.65	1.76	31		
14 6' 2"	.68	1.92	32		
15 6' 6"	.70	1.81	33		
16 6' 10"	.52	1.74	34		
17 7' 2"	.48	1.68	35		
18 7' 6"	.32	.90	36		
Time / SG:			Time / SG:		

Flow (cfs): 3.890

Entered into Taylor Creek Database?
Date: 02/04/19 Initials: GK

WF

Herrera - Taylor Creek ~~MS~~ - Stream Flow Data Sheet

Flow Station #: WF	Gauge Start Height: 1.3	Stream: Taylor Creek MS
Date: 2/1/19	Start Time: 12:37	Client: SPU
Observer Initials: DSA / KCB	Gauge End Height: 1.3	Method: (Wading) / Culvert
	End Time: 12:46	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location:

Sketch of XS Location:

Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
mucked out sticks. Good xs location for WF
level data downloaded

Measurement Data		RB Distance (ft): 1' 3"			LB Distance (ft): 10' 2"
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1' 7"	.3'	1.1	19 7' 7"	.30	.01
2 1' 11"	.7'	.96	20 7' 11"	.30	.06
3 2' 3"	.7'	.45	21 8' 3"	.30	.01
4 2' 7"	.65'	.33	22 8' 7"	.40	.06
5 2' 11"	.55'	.42	23 8' 11"	.50	.01
6 3' 3"	.52'	.29	24 9' 3"	.50	.06
7 3' 7"	.47'	.40	25 9' 7"	.50	.11
8 3' 11"	.47'	.23	26 9' 11"	.48	.10
9 4' 3"	.45'	.23	27		
Time / SG:			Time / SG:		
10 4' 7"	.41	.27	28		
11 4' 11"	.40	.28	29		
12 5' 3"	.31	.40	30		
13 5' 7"	.30	.49	31		
14 5' 11"	.30	.47	32		
15 6' 3"	.35	.40	33		
16 6' 7"	.35	.43	34		
17 6' 11"	.30	.13	35		
18 7' 3"	.30	.04	36		
Time / SG:			Time / SG:		

Flow (cfs): 1.364	Entered into Taylor Creek Database? Date: 6/04/19 Initials: GK

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #:	Gauge Start Height: 0.65	Stream: Taylor Creek EF
Date: 2/5/19	Start Time: 11:50	Client: SPU
Observer Initials: DSA / KB	Gauge End Height: 0.63	Method: (Wading) / Culvert
	End Time: 12:03	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

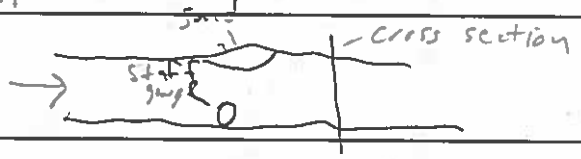
Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

low hanging branches

Cross Section Location: EF

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

need to bring a second stake

level data downloaded (+ barotrol)

Measurement Data		RB Distance (ft): 8' 6"		LB Distance (ft): 1ft 6"	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1' 10"	1"	N/A	19 7' 10"	.05'	1.16
2 2' 2"	.2'	0.56	20 8' 2"	.05'	.33
3 2' 6"	.22'	0.20	21		
4 2' 10"	.25'	0.42	22		
5 3' 2"	.30'	1.07	23		
6 3' 6"	.38'	0.83	24		
7 3' 10"	.4'	1.16	25		
8 4' 2"	.4'	0.96	26		
9 4' 6"	.35'	1.46	27		
Time / SG:			Time / SG:		
10 4' 10"	.35'	1.48	28		
11 5' 2"	.3'	1.31	29		
12 5' 6"	.3'	1.33	30		
13 5' 10"	.35'	1.10	31		
14 6' 2"	.3'	1.18	32		
15 6' 6"	.25'	1.38	33		
16 6' 10"	.25'	1.42	34		
17 7' 2"	.1'	1.48	35		
18 7' 6"	.1'	1.29	36		
Time / SG:			Time / SG:		

Flow (cfs): 1.706

Entered into Taylor Creek Database?

Date: 02/04/19 Initials: GK

Herrera - Taylor Creek MS - Stream Flow Data Sheet

Flow Station #: MS Stn 401	Gauge Start Height: 14"	Stream: Taylor Creek MS
Date: 2/12/19	Start Time: 8:05	Client: SPU
Observer Initials: DSA / KB	Gauge End Height: 14"	Method: (Wading) / Culvert
	End Time: 8:22	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Snow melt event, turbid water - gauge is a measure down from metal plate

Cross Section Location:

Sketch of XS Location:

Control Feature/Condition:

Weather: light rain

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Snow melt event

Measurement Data		RB Distance (ft): 1.1'		LB Distance (ft): 7.7	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.4	0.21	0.18	19 6.8	0.39	1.84
2 1.7	0.20	0.17	20 7.1	0.5	1.17
3 2.0	0.20	0.19	21 7.4	0.15	0.57
4 2.3	0.21	0.40	22 7.7		
5 2.6	0.25	0.56	23		
6 2.9	0.25	0.66	24		
7 3.2	0.31	0.84	25		
8 3.5	0.45	1.21	26		
9 3.8	0.40	2.3	27		
Time / SG: 8:13			Time / SG:		
10 4.1	0.49	2.89	28		
11 4.4	0.6	2.83	29		
12 4.7	0.58	2.61	30		
13 5.0	0.6	1.59	31		
14 5.3	0.6	1.82	32		
15 5.6	0.65	1.77	33		
16 5.9	0.58	2.24	34		
17 6.2	0.65	2.49	35		
18 6.5	0.61	1.53	36		
Time / SG: 8:19			Time / SG:		

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #: EF	Gauge Start Height: 0.69	Stream: Taylor Creek EF
Date: 2/12/19	Start Time: 8:56	Client: SPU
Observer Initials: DSA KB	Gauge End Height: 0.68	Method: Wading / Culvert
	End Time: 9:07	

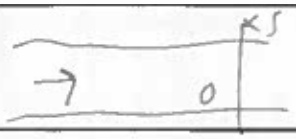
Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

snow melt conditions

Measurement Data		RB Distance (ft): 1.3			LB Distance (ft): 9.8
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.6	0.20	.3	19 7.0	0.26	0.44
2 1.9	0.25	.40	20 7.3	0.25	0.46
3 2.2	0.27	.94	21 7.6	0.20	0.07
4 2.5	0.28	1.3	22 7.9	0.15	0.07
5 2.8	0.29	1.49	23 8.2	0.12	-.03
6 3.1	0.3	1.25	24 8.5	0.05	NA
7 3.4	0.3	.77	25 8.8	0.02	NA
8 3.7	0.12	.39	26 9.1	0.02	NA
9 4.0	0.35	.43	27 9.4	0.02	NA
Time / SG:			Time / SG:		
10 4.3	0.38	0.93	28 9.7	0.02	NA
11 4.6	0.39	1.01	29		
12 4.9	0.37	1.54	30		
13 5.2	0.29	1.48	31		
14 5.5	0.31	1.19	32		
15 5.8	0.31	1.37	33		
16 6.1	0.31	0.99	34		
17 6.4	0.30	0.97	35		
18 6.7	0.29	0.48	36		
Time / SG:			Time / SG:		

on gauge

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

MS

Herrera - Taylor Creek EF - Stream Flow Data Sheet

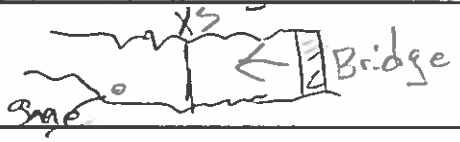
Flow Station #: ST401 / MS	Gauge Start Height: 1.0' from metal plate	Stream: Taylor Creek EF
Date: 2/12/19	Start Time: 14:56	Client: SPU
Observer Initials: KB	Gauge End Height: 1.0'	Method: (Wading) / Culvert
	End Time: 15:10	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: w 10' ds of bridge

Sketch of XS Location:



Control Feature/Condition:

Weather: light rain

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Snow melt conditions

Measurement Data		RB Distance (ft): 1.7		LB Distance (ft): 8.5	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 2.0	.40	.58	19 7.3	.53	2.55
2 2.3	.31	.54	20 7.6	.67	2.01
3 2.6	.34	.37	21 7.9	.35	.87
4 2.9	.40	.64	22 8.2	.10	.50
5 3.2	.47	.85	23 8.5	———	LB
6 3.5	.49	1.61	24		
7 3.8	.50	1.96	25		
8 4.1	.55	1.95	26		
9 4.4	.42	2.40	27		
Time / SG:	14:59 / 1.0'		Time / SG:	15:10 / 1.0'	
10 4.7	.63	3.64	28		
11 5.0	.72	3.61	29		
12 5.3	.77	3.23	30		
13 5.6	.77	2.85	31		
14 5.9	.80	2.40	32		
15 6.1	.76	2.90	33		
16 6.4	.69	3.39	34		
17 6.7	.81	3.73	35		
18 7.0	.78	3.20	36		
Time / SG:			Time / SG:		

Flow (cfs): 6.78	Entered into Taylor Creek Database? Date: 2/14/19 Initials: KB

EF

Herrera - Taylor Creek ~~MS~~ Stream Flow Data Sheet

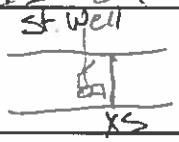
Flow Station #: EF	Gauge Start Height: 0.45	Stream: Taylor Creek MS
Date: 2/12/19	Start Time: 15:47	Client: SPU
Observer Initials: KB	Gauge End Height: 16:01	Method: Wading / Culvert
	End Time: 0.96	

Gauging Assessment: Circle One — *(within _% deviation from actual discharge)
Excellent (2%*) ~~Good (5%*)~~ Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: ~ 2' ds of Wr 11

Sketch of XS Location:



Control Feature/Condition:

Weather: lt rain

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Snow melt conditions.

Measurement Data		RB Distance (ft): 1.2		LB Distance (ft): 9.9	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.5	.19	.44	19 6.9	.51	1.8
2 1.8	.34	.44	20 7.2	.47	1.25
3 2.1	.42	.47	21 7.5	.46	1.09
4 2.4	.44	.43	22 7.8	.40	1.03
5 2.7	.42	.75	23 8.1	.37	1.00
6 3.0	.47	1.49	24 8.4	.32	.78
7 3.3	.47	1.9	25 9.7	.33	.39
8 3.6	.42	1.58	26 9.0	.23	.16
9 3.9	.45	1.56	27 9.3	.23	.07
Time / SG:	15:51 / 0.85		Time / SG:		
10 4.2	.53	2.39	28 9.6	.21	-0.03
11 4.5	.54	2.34	29 9.9	———	CB
12 4.8	.51	2.33	30		
13 5.1	.45	2.09	31		
14 5.4	.46	2.06	32		
15 5.7	.43	2.18	33		
16 6.0	.47	2.22	34		
17 6.3	.52	2.23	35		
18 6.6	.30	2.19	36		
Time / SG:	15:55 / 0.85		Time / SG:	16:01 / .96	

Flow (cfs): 4.95	Entered into Taylor Creek Database? Date: 2/14/19 Initials: KB

5.271

Herrera - Taylor Creek WF - Stream Flow Data Sheet

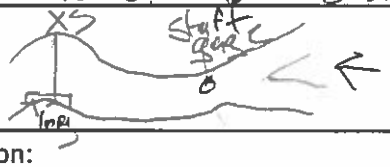
Flow Station #: WF	Gauge Start Height: 1.35	Stream: Taylor Creek WF
Date: 02/12/2019	Start Time: 16:27	Client: SPU
Observer Initials: KB	Gauge End Height: 1.36	Method: (Wading) / Culvert
	End Time: 16:43	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Snow has weighed down branches into stream.

Cross Section Location: ~ 10' ds. of staff gage

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Took 2 measurements @ 6.1' averaged them in final cfs calc, Changed flow from 5.591 to 5.389,

Measurement Data		RB Distance (ft): 0.7		LB Distance (ft): 9.9	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.0	0.29	0.48	19 ~~6.1~~	.45	~~1.46~~ (Avg'd w/ Record)
2 1.3	.41	.77	20 6.4	.32	1.39
3 1.6	.60	.97	21 6.7	.37	.57
4 1.9	.65	1.74	22 7.0	.38	.85
5 2.2	.64	1.36	23 7.3	.46	.70
6 2.5	.60	1.35	24 7.6	.53	.40
7 2.8	.59	1.58	25 7.9	.59	.37
8 3.1	.62	1.74	26 8.1	.63	.16
9 3.4	.58	2.07	27 8.4	.64	.15
Time / SG:			Time / SG:		
10 3.7	.60	1.79	28 8.7	.72	.11
11 4.0	.60	2.24	29 9.0	.83	.03
12 4.3	.62	2.21	30 9.3	.76	.04
13 4.6	.61	7.06	31 9.6	.29	-.03
14 4.9	.64	1.65	32 9.9		L Bank
15 5.2	.60	1.46	33		
16 5.5	.52	1.65	34		
17 5.8	.52	1.46	35		
18 6.1	.42	1.41	36		
Time / SG:	16:36 1.35		Time / SG:	16:43/1.36	

Flow (cfs): 5.39

Entered into Taylor Creek Database?
Date: 2/14/19 Initials: KB

MS

Herrera - Taylor Creek ~~EF~~ - Stream Flow Data Sheet

Flow Station #: ST401 / MS	Gauge Start Height: 1.0' from metal plate	Stream: Taylor Creek EF
Date: 2/12/19	Start Time: 14:56	Client: SPU
Observer Initials: KB	Gauge End Height: 1.0'	Method: (Wading) / Culvert
	End Time: 15:10	

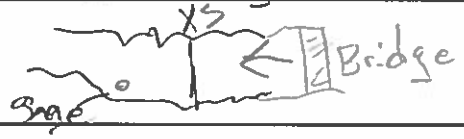
Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) (Good (5%*)) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: ~ 10' ds of bridge

Sketch of XS Location:



Control Feature/Condition:

Weather: light rain

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Snow melt conditions

Measurement Data		RB Distance (ft): 1.7		LB Distance (ft): 8.5	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 2.0	.40	.58	19 7.3	.53	2.55
2 2.3	.31	.54	20 7.6	.67	2.01
3 2.6	.34	.37	21 7.9	.35	.87
4 2.9	.40	.64	22 8.2	.10	.50
5 3.2	.47	.85	23 8.5		LB
6 3.5	.49	1.61	24		
7 3.8	.50	1.96	25		
8 4.1	.55	1.95	26		
9 4.4	.42	2.40	27		
Time / SG:	14:59 / 1.0'		Time / SG:	15:10 / 1.0'	
10 4.7	.63	3.64	28		
11 5.0	.72	3.61	29		
12 5.3	.77	3.23	30		
13 5.6	.77	2.85	31		
14 5.9	.80	2.40	32		
15 6.1	.76	2.90	33		
16 6.4	.69	3.39	34		
17 6.7	.81	3.73	35		
18 7.0	.78	3.20	36		
Time / SG:			Time / SG:		

Flow (cfs): 6.78

Entered into Taylor Creek Database?
Date: 2/14/19 Initials: KB

EF

Herrera - Taylor Creek ~~MS~~ Stream Flow Data Sheet

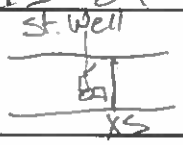
Flow Station #: EF	Gauge Start Height: 0.85	Stream: Taylor Creek MS
Date: 2/12/19	Start Time: 15:47	Client: SPU
Observer Initials: KB	Gauge End Height: 16:01	Method: Wading / Culvert
	End Time: 0.86	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) ~~Good (5%*)~~ Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: ~ 2' ds of Wr 11

Sketch of XS Location:



Control Feature/Condition:

Weather: lt rain

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Snow melt conditions.

Measurement Data		RB Distance (ft): 1.2		LB Distance (ft): 9.9	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.5	.19	.44	19 6.9	.51	1.8
2 1.8	.34	.44	20 7.2	.47	1.25
3 2.1	.42	.47	21 7.5	.46	1.09
4 2.4	.44	.43	22 7.8	.40	1.03
5 2.7	.42	.75	23 8.1	.37	1.00
6 3.0	.47	1.49	24 8.4	.32	.78
7 3.3	.47	1.9	25 8.7	.33	.39
8 3.6	.42	1.58	26 9.0	.23	.16
9 3.9	.45	1.56	27 9.3	.23	.07
Time / SG:	15:51 / 0.85		Time / SG:		
10 4.2	.53	2.39	28 9.6	.21	-0.03
11 4.5	.54	2.34	29 9.9	———	CB
12 4.8	.51	2.33	30		
13 5.1	.45	2.09	31		
14 5.4	.46	2.06	32		
15 5.7	.43	2.14	33		
16 6.0	.47	2.22	34		
17 6.3	.52	2.23	35		
18 6.6	.30	2.19	36		
Time / SG:	15:55 / 0.85		Time / SG:	16:01 / .86	

Flow (cfs): 4.95	Entered into Taylor Creek Database? Date: 2/14/19 Initials: KB

5.391

Herrera - Taylor Creek WF - Stream Flow Data Sheet

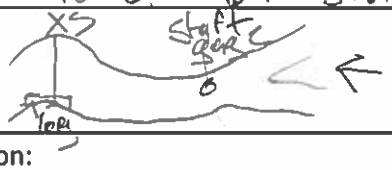
Flow Station #: WF	Gauge Start Height: 1.35	Stream: Taylor Creek WF
Date: 02/12/2019	Start Time: 16:27	Client: SPU
Observer Initials: KB	Gauge End Height: 1.36	Method: (Wading) / Culvert
	End Time: 16:43	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Snow has weighed down branches into stream.

Cross Section Location: ~ 10' ds. of staff gage

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
Took 2 measurements @ 6.1' ; averaged them in final cfs calc, changed flow from 5.391 to 5.384.

Measurement Data — RB Distance (ft): 0.7 — LB Distance (ft): 9.9

	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)		Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1	1.0	0.29	0.48	19	~~6.1~~	.45	~~1.46~~ (Avg'd w/ second)
2	1.3	.41	.77	20	6.4	.32	1.39
3	1.6	.60	.97	21	6.7	.37	.57
4	1.9	.65	1.74	22	7.0	.38	.85
5	2.2	.64	1.36	23	7.3	.46	.70
6	2.5	.60	1.35	24	7.6	.53	.40
7	2.8	.59	1.58	25	7.9	.59	.37
8	3.1	.62	1.74	26	8.1	.63	.16
9	3.4	.58	2.07	27	8.4	.64	.15
Time / SG:				Time / SG:			
10	3.7	.60	1.79	28	8.7	.72	.11
11	4.0	.60	2.24	29	9.0	.83	.03
12	4.3	.62	2.21	30	9.3	.76	.04
13	4.6	.61	2.06	31	9.6	.29	-.03
14	4.9	.64	1.65	32	9.9		L Bank
15	5.2	.60	1.46	33			
16	5.5	.52	1.65	34			
17	5.8	.52	1.46	35			
18	6.1	.42	1.41	36			
Time / SG:		16:36 1.35		Time / SG:		16:43/1.36	

Flow (cfs): 5.39

Entered into Taylor Creek Database?
Date: 2/14/19 Initials: KB

Note: NONAME2.txt → TaylorCk_EF

Herrera - Taylor Creek EF - Stream Flow Data Sheet

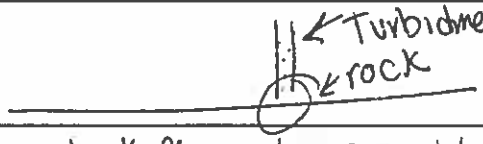
Flow Station #: EF	Gauge Start Height: 0.47	Stream: Taylor Creek EF
Date: 03/27/19	Start Time: 12:14	Client: SPU
Observer Initials: KB + NM	Gauge End Height: 0.47	Method: ~~Wading~~ / Culvert
	End Time: 12:23	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition: none, rock ½ ft upstream right bank

Weather: sunny/cloudy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft): 8.5		LB Distance (ft): 5.1	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 5.1	n/a	n/a	19		
2 5.3	0.2	0.21	20		
3 5.5	0.225	0.55	21		
4 5.7	0.25	0.44	22		
5 5.9	0.225	0.41	23		
6 6.1	0.225	0.64	24		
7 6.3	0.25	0.78	25		
8 6.5	0.20	1.01	26		
9 6.7	0.225	0.83	27		
Time / SG: 0.47/ 1219			Time / SG:		
10 6.9	0.25	0.56	28		
11 7.1	0.30	0.32	29		
12 7.3	0.425	0.28	30		
13 7.5	0.30	0.54	31		
14 7.7	0.25	0.52	32		
15 7.9	0.175	0.73	33		
16 8.1	0.175	0.68	34		
17 8.3	n/a	n/a	35		
18 8.5	n/a	n/a	36		
Time / SG: 12:23/ 0.47			Time / SG:		

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

Herrera - Taylor Creek WF - Stream Flow Data Sheet

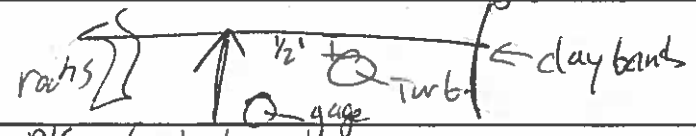
Flow Station #: WF	Gauge Start Height: 0.92	Stream: Taylor Creek WF
Date: 03/27/19	Start Time: 12:40	Client: SPU
Observer Initials: NM & GK	Gauge End Height: 0.92	Method: Wading / Culvert
	End Time: 1250	

Gauging Assessment: Circle One *(within % deviation from actual discharge)
Excellent (2%*) Good (5%*) ~~Fair (8%*)~~ Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Not much turb around gauge but XC close to gage
~~-~~ -water level V low

Cross Section Location: ½' D/S of turb. gage

Sketch of XS Location:



Control Feature/Condition: D/S of turb gage

Weather: sunny ~60°F

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
V low water depth
Right near gage → picked up turb. → hard to find good spot for XS → switch to 4.4

Measurement Data			RB Distance (ft): 0.4		LB Distance (ft): 4.4
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.4	NA	NA	19 4.0	NA	N/A
2 0.6	0.2	0.08	20 4.2	NA	NA
3 0.8	0.175	0.10	21 4.4	NA	NA
4 1.0	0.225	0.23	22		
5 1.2	0.25	0.33	23		
6 1.4	0.3	0.39	24		
7 1.6	0.3	0.29	25		
8 1.8	0.325	-0.08	26		
9 2.0	0.275	0.54	27		
Time / SG:	12:47	0.92	Time / SG:		
10 2.2	0.275	0.68	28		
11 2.4	0.275	0.76	29		
12 2.6	0.225	0.16	30		
13 2.8	0.25	0.27	31		
14 3.0	0.2	0.39	32		
15 3.2	0.2	0.14	33		
16 3.4	N/A	N/A	34		
17 3.6	N/A	N/A	35		
18 3.8	N/A	N/A	36		
Time / SG:	1250	0.92	Time / SG:		

8 - turb. from gage

Flow (cfs):

Entered into Taylor Creek Database?
Date: Initials:

Herrera - Taylor Creek MS - Stream Flow Data Sheet

Flow Station #: MS	Gauge Start Height: 19.80	Stream: Taylor Creek MS
Date: 03/27/19	Start Time: 11:15	Client: SPU
Observer Initials: NM & GK	Gauge End Height: 11.30	Method: (Wading) / Culvert
	End Time: 1899	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

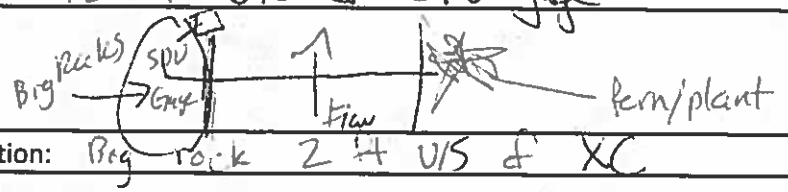
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

some debris in channel (ie sticks + leaves)

Cross Section Location: 1/2 ft U/S of SPU gage

Sketch of XS Location:



Control Feature/Condition: Big rock 2 ft U/S of XC

Weather: sunny

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

-Control feature is ~1.5ft diameter rock 2ft US XC

Measurement Data 1:9		RB Distance (ft): 6.2		LB Distance (ft):	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.9	0	0	19 5.5	n/a	n/a
2 2.1	0.45	1.16	20 5.7	n/a	n/a
3 2.3	0.45	1.69	21 5.9	n/a	n/a
4 2.5	0.45	1.72	22 6.1	n/a	n/a
5 2.7	0.45	1.53	23		
6 2.9	0.35	1.52	24		
7 3.1	0.325	0.99	25		
8 3.3	0.275	1.99	26		
9 3.5	0.3	1.71	27		
Time / SG: 11:24 / 19.0			Time / SG:		
10 3.7	0.2	1.01	28		
11 3.9	0.2	0.52	29		
12 4.1	0.2	0.45	30		
13 4.3	0.2	0.81	31		
14 4.5	n/a	n/a	32		
15 4.7	n/a	n/a	33		
16 4.9	0.175	0.36	34		
17 5.1	0.175	0.46	35		
18 5.3	0.175	0.35	36		
Time / SG: 11:30 / 18.99			Time / SG:		
Flow (cfs):			Entered into Taylor Creek Database? Date: Initials:		

Herrera - Taylor Creek MS - Stream Flow Data Sheet

Flow Station #: main stem	Gauge Start Height: 1.8	Stream: Taylor Creek MS
Date: 6/19/19	Start Time: 1150	Client: SPU
Observer Initials: NM	Gauge End Height: 1.8	Method: (Wading) Culvert
	End Time: 1200	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

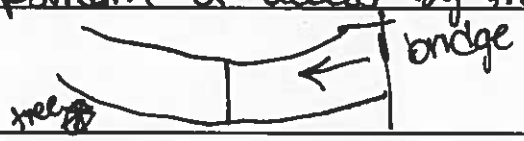
Excellent (2%*) (Good (5%*)) (Fair (8%*)) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

low water conditions, moderate flow

Cross Section Location: 1 ft upstream of access by tree

Sketch of XS Location:



Control Feature/Condition: N/A

Weather: Cloudy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft): 0.4		LB Distance (ft): 5.3	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0.4	N/A	N/A	19 4.0	N/A	N/A
2 0.6	↓	↓	20 4.2	N/A	N/A
3 0.8			21 4.6	0.2	0.34
4 1.0			22 4.8	0.24	0.69
5 1.2			23 5.0	N/A	N/A
6 1.4			24 5.2	N/A	N/A
7 1.6			25		
8 1.8			26		
9 2.0	↓	↓	27		
Time / SG: 1153 1.8			Time / SG:		
10 2.2	NA/	N/A	28		
11 2.4	↓	↓	29		
12 2.6			30		
13 2.8			31		
14 3.0			32		
15 3.2			33		
16 3.4			34		
17 3.6	↓	↓	35		
18 3.8	N/A	N/A	36		
Time / SG: 1154 1.8			Time / SG:		

Flow (cfs):

Entered into Taylor Creek Database?

Date: 6/19/19 Initials: NM

Herrera - Taylor Creek EF - Stream Flow Data Sheet

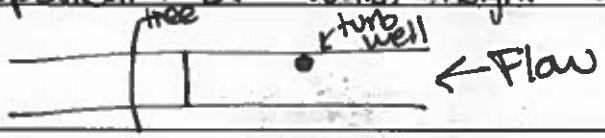
Flow Station #: East Fork	Gauge Start Height:	Stream: Taylor Creek EF
Date: 6/19/19	Start Time: 1230	Client: SPU
Observer Initials: NM	Gauge End Height:	Method: Wading / Culvert
	End Time: 1238	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: 1 ft upstream of waist height log crossing stream

Sketch of XS Location:



Control Feature/Condition:

Weather: cloudy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft): 1.0		LB Distance (ft): 9.2	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.0	N/A	N/A	19 6.4	↓	↓
2 1.3	↓	↓	20 6.7	↓	↓
3 1.6	↓	↓	21 7.0	N/A	N/A
4 1.9	↓	↓	22 9.2	N/A	N/A
5 2.2	↓	↓	23	↓	↓
6 2.5	↓	↓	24	↓	↓
7 2.8	↓	↓	25	↓	↓
8 3.1	↓	↓	26	↓	↓
9 3.4	↓	↓	27	↓	↓
Time / SG:			Time / SG:		
10 3.7	↓	↓	28	↓	↓
11 4.0	↓	↓	29	↓	↓
12 4.3	0.2	0.12	30	↓	↓
13 4.66	0.23	0.5	31	↓	↓
14 4.9	0.23	0.7	32	↓	↓
15 5.12	0.2	0.37	33	↓	↓
16 5.35	↓	↓	34	↓	↓
17 5.8	↓	↓	35	↓	↓
18 6.1	↓	↓	36	↓	↓
Time / SG:			Time / SG:		
Flow (cfs):			Entered into Taylor Creek Database? Date: 6/19/19 Initials: NM		

Herrera - Taylor Creek WF - Stream Flow Data Sheet

Flow Station #: West Fork	Gauge Start Height:	Stream: Taylor Creek WF
Date: 6/19/19	Start Time: 1252	Client: SPU
Observer Initials: NM	Gauge End Height:	Method: (Wading) / Culvert
	End Time: 1257	

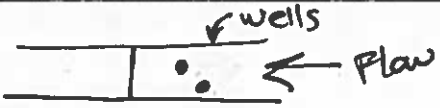
Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) Good (5%*) (Fair (8%*)) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: 2 1 ft downstream wells

Sketch of XS Location:



Control Feature/Condition:

Weather: cloudy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Flow very low, only points deep enough for flows near wells

Measurement Data — RB Distance (ft): 5.6 — LB Distance (ft): 0.4

	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)		Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1	0.4	0	0		19		
2	0.6	0.2	0.01		20		
3	0.8	0.2	-0.03		21		
4	1.0	0.2	0.02 ~~0.07~~		22		
5	1.2	0.2	0.07		23		
6	1.4	N/A	N/A		24		
7	1.6	↓	↓		25		
8	1.8				26		
9	2.0				27		
Time / SG:					Time / SG:		
10	2.2	↓	↓		28		
11	2.4				29		
12	2.6				30		
13	2.8				31		
14	3.0				32		
15	5.6	↓	↓		33		
16					34		
17					35		
18					36		
Time / SG:					Time / SG:		

Flow (cfs):

Entered into Taylor Creek Database?
Date: 6/19/19 Initials: NM

Staff Gauge Photo? Y

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #: EF	Gauge Start Height: 1.35'	Stream: **Taylor Creek EF**
Date: 9/6/19	Start Time: 1420	Client: SPU
Observer Initials: KB, NM	Gauge End Height: 0.35	Method: **Wading** / Culvert
	End Time: 1434	

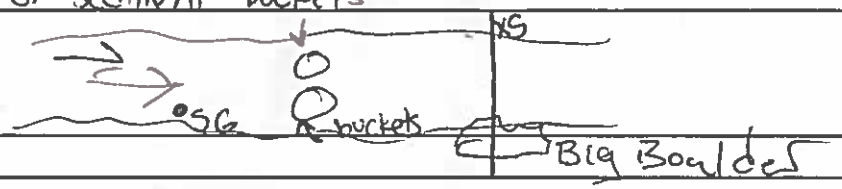
Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) **Good (5%*)** Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: Just north of sediment buckets

Sketch of XS Location:



Control Feature/Condition:

Weather: sunny

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data — RB Distance (ft): 0 — LB Distance (ft): 3.8

	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)		Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1	0	0	–	19			
2	0.3	0.15	0.2	20			
3	0.6	0.16	0.41	21			
4	0.9	0.17	0.89	22			
5	1.2	0.18	1.22	23			
6	1.5	0.17	0.21	24			
7	1.8	0.16	0.07	25			
8	2.1	0.11	0.83	26			
9	2.4	0.18	0.56	27			
Time / SG:				Time / SG:			
10	2.7	0.2	0.3	28			
11	3.0	0.17	0.01	29			
12	3.3	0.16	0	30			
13	3.6	0.14	0.01	31			
14	3.8	0	–	32			
15				33			
16				34			
17				35			
18				36			
Time / SG:				Time / SG:			

Flow (cfs): 0.23

Entered into Taylor Creek Database?
Date: 9/10/19 Initials: KB

Staff Gauge Photo? Y

Herrera - Taylor Creek WF - Stream Flow Data Sheet

Flow Station #: WF	Gauge Start Height: 0.74	Stream: Taylor Creek WF
Date: 9/6/19	Start Time: 14:55	Client: SPU
Observer Initials: KB, NM	Gauge End Height: 0.74	Method: **Wading** / Culvert
	End Time: 15:05	

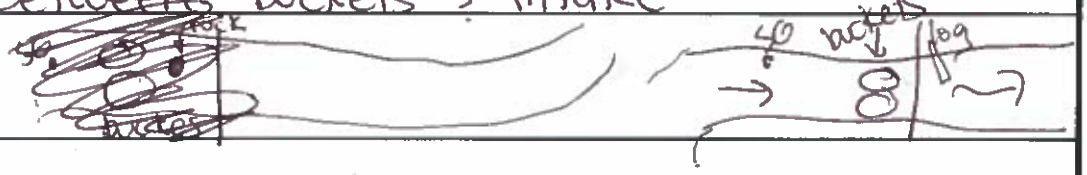
Gauging Assessment: Circle One *(within % deviation from actual discharge)

Excellent (2%*) Good (5%*) **Fair (8%*)** Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: Between buckets 3 intake

Sketch of XS Location:



Control Feature/Condition:

Weather: sunny

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Only place to do XS behind buckets due to very low flow conditions, likely underestimated flows due to eddies (see pic) Guesstimate ~15-30 GPM

Measurement Data			RB Distance (ft): 0		LB Distance (ft): 3.0
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0	0	—	19		
2 0.3	0.02	NA	20		
3 0.6	0.21	0.01	21		
4 0.9	0.22	-.03	22		
5 1.2	0.22	0.01	23		
6 1.5	0.17	0.11	24		
7 1.8	0.13	-.01	25		
8 2.1	0.09	-0.02	26		
9 2.4	0.07	0.02	27		
Time / SG:			Time / SG:		
10 2.7	NA	NA	28		
11 3.0	0	—	29		
12			30		
13			31		
14			32		
15			33		
16			34		
17			35		
18			36		
Time / SG:			Time / SG:		

Flow (cfs): .004

Entered into Taylor Creek Database?

Date: 9/10/19 Initials: KB

Staff Gauge photo? NA

Herrera - Taylor Creek MS - Stream Flow Data Sheet

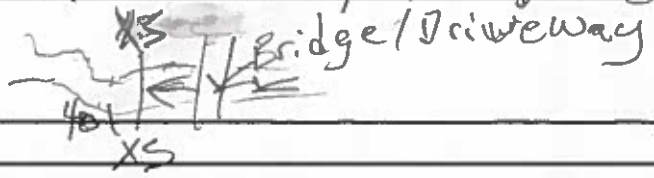
Flow Station #: SPU STA. 4	Gauge Start Height: 19.5" (1.63')	Stream: Taylor Creek MS
Date: 9/6/18	Start Time: 13:40	Client: SPU
Observer Initials: KB, NM	Gauge End Height: 19.5" (1.63')	Method: **Wading** / Culvert
	End Time: 13:57	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Base flow

Cross Section Location: ~ 15' US of 401, 10' DS of driveway

Sketch of XS Location:



Control Feature/Condition:

Weather: Sunny

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft):		LB Distance (ft):	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 0	0	0	19		
2 0.4	0.20	-0.03	20		
3 0.8	0.34	-0.03	21		
4 1.2	0.42	0.18	22		
5 1.6	0.36	0.57	23		
6 2.0	0.40	0.46	24		
7 2.4	0.36	0.40	25		
8 2.8	0.40	0.24	26		
9 3.2	0.31	0.07	27		
Time / SG:			Time / SG:		
10 3.6	0.27 KB	0.02 KB	28		
11 4.0	~~270~~	~~.020~~	29		
12 4.4	0	0	30		
13			31		
14			32		
15			33		
16			34		
17			35		
18			36		
Time / SG:			Time / SG:		

Flow (cfs): 0.286 (0.29)

Entered into Taylor Creek Database?
Date: 9/10/18 Initials: KB

Staff Gauge Photo? 1-K13

Herrera - Taylor Creek MS - Stream Flow Data Sheet

Station #: East Fork	Gauge Start Height: 0.72	Stream: Taylor Creek MS
e: 10/7/19	Start Time: 1247	Client: SPU
erver Initials: NM, GK	Gauge End Height: 0.71	Method: Wading / Culvert
	End Time: 1308	

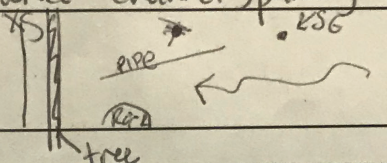
uging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

ow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

ross Section Location: US / right by downed channel spanning log

ketch of XS Location:



Control Feature/Condition:

Weather: dry cloudy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

dry base flow

Measurement Data		RB Distance (ft): 7.0		LB Distance (ft): 1.5	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/s
1 1.5	0	0	19 6.9	0	0
2 1.8	0	0	20 7.0	0	0
3 2.1	0	0	21		
4 2.4	0	0	22		
5 2.7	0.02	0	23		
6 3.0	0.1	0	24		
7 3.3	0.12	0	25		
8 3.6	0	0	26		
9 3.9	0.2	0.39	27		
Time / SG: 13:00 / 0.71			Time / SG:		
10 4.2	0.2	0.51	28		
11 4.5	0.1	0	29		
12 4.8	0.21	0.14	30		
13 51	0.25	0.23	31		
14 5.4	0.3	0.32	32		
15 5.7	0.21	0.05	33		
16 6.0	0.21	0.28	34		
17 6.3	0.20	0.36	35		
18 6.6	0.1	0	36		
Time / SG: 13:08 / 0.71			Time / SG:		

Flow (cfs):

Entered into Taylor Creek Database?

Date: Initials:

Taylor

Herrera - ~~SR167~~ - Stream Flow Data Sheet

Station #: East Fork	Gauge Start Height: 0.71	Stream: Taylor
Date: 10/2/19	Start Time: 9:24	Client: WSDOT
Observer Initials: GK / LC	Gauge End Height: 0.725	Method: ~~Wading~~ / Culvert
	End Time: 9:43	

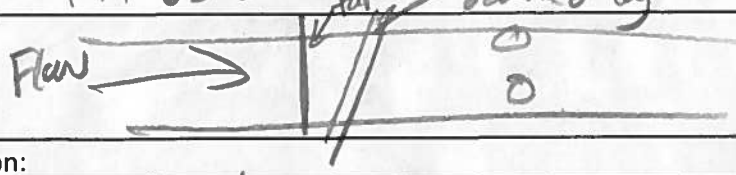
Gauging Assessment: Circle One *(within _% deviation from actual discharge)

Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: ~1 ft US of dammed channel spanning log

Sketch of XS Location:



Control Feature/Condition:

Weather: Rainy + Night

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

A few scour holes / bog rocks affected a few flows

Measurement Data — RB Distance (ft): 9.1 — LB Distance (ft): 2.3

	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)		Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1	2.3	0.30	0.26	19		0.	
2	2.6	0.30	0.54	20			
3	2.9	0.35	0.69	21			
4	3.2	0.30	0.90	22			
5	3.5	0.30	0.27	23			
6	3.8	0.30	0.68	24			
7	4.1	0.30	0.37	25			
8	4.4	0.45	0.13→behind rock	26			
9	4.7	0.45	0.79	27			
Time / SG:		9:34 / 0.72		Time / SG:			
10	5	0.45	1.24	28			
11	5.3	0.25	2.53	29			
12	5.6	0.30	1.66	30			
13	5.9	0.25	0.76	31			
14	6.2	0.35	0.13	32			
15	6.5	0.40	0.16→small scour hole	33			
16	6.8	0.16 0.4	2.31	34			
17	7.1	0.35	2.20	35			
18	7.4	0.35	1.24	36			
Time / SG:		9:43 0.725		Time / SG:			

Flow (cfs):

Entered into SR167 Database?

Date: Initials:

7.7 0.3 1.01

8 0.3 1.36

8.3 0.1 N/A

Taylor

Herrera - ~~SR167~~ - Stream Flow Data Sheet

Station #: West Fork (tree)	Gauge Start Height: 1.09	Stream: Taylor
Date: 10/21/19	Start Time: 9:58	Client: WSDOT
Observer Initials: LC / GK	Gauge End Height: 1.08	Method: (Wading) / Culvert
	End Time: 10:09	

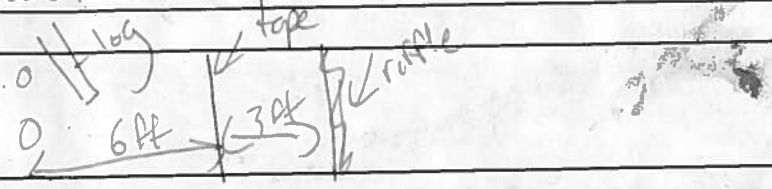
Gauging Assessment: Circle One *(within % deviation from actual discharge)

Excellent (2%*) Good (5%*) (Fair (8%*)) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):
Gravel bar prevented flows, but water moving at 0.8 - 0.1 CFS over gravel bar

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition:

Weather: Light rain, night

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

Measurement Data		RB Distance (ft): 10.4		LB Distance (ft): 2	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 2	0.2	0.47	19 9.2	0.2	0.54
2 2.4	0.25	0.44	20 9.6	0.2	0.93
3 2.8	0.4	0.27	21 10.0	0.25	0.17
4 3.2	0.35	0.17 → 0.09 left/right of 10.4	22		
5 3.6	0.3	0.42	23		
6 4	0.3	0.52	24		
7 4.4	0.3	0.85	25		
8 4.8	0.2	0.98	26		
9 5.2	0.2	1.1	27		
Time / SG: 10:05 / 1.09			Time / SG:		
10 5.6	0.1	N/A	28		
11 6	0.1	N/A	29		
12 6.4			30		
13 6.8			31		
14 7.2			32		
15 7.6			33		
16 8			34		
17 8.4			35		
18 8.8			36		
Time / SG:			Time / SG:		
Flow (cfs):			Entered into SR167 Database? Date: Initials:		

GRAVEL BAR

Taylor

Herrera - ~~SR167~~ - Stream Flow Data Sheet

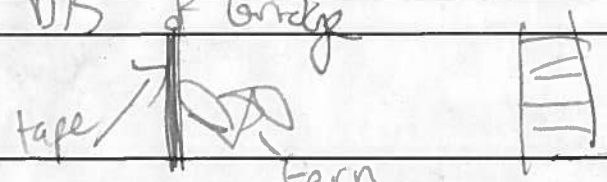
Station #: Main Stem	Gauge Start Height: 1.31	Stream: Taylor
Date: 10/21/19	Start Time: 10:32	Client: WSDOT
Observer Initials: LC / BK	Gauge End Height: 1.35	Method: Wading / Culvert
	End Time: 10:45	

Gauging Assessment: Circle One *(within _% deviation from actual discharge)
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Cross Section Location: L 15ft DS of bridge

Sketch of XS Location:



Control Feature/Condition:

Weather: Sprinkling, light

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):
water dropped

Measurement Data		RB Distance (ft): 9		LB Distance (ft): 2	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 2	0.2	0.5	19 7.4	0.25	1.01
2 2.3	0.25	0.06	20 7.7	0.25	0.72
3 2.6	0.35	0.14	21 8	0.2	0.60
4 2.9	0.35	0.27	22 8.3	0.2	0.49
5 3.2	0.5	0.92	23 8.6	0.1	N/A
6 3.5	0.5	1.1	24		
7 ~~3.8~~	0.5	1.25	25		
8 4.1	0.3→top of rock	1.41	26		
9 4.4	0.4	1.57	27		
Time / SG: 10:39 / 1.34			Time / SG: 10:45 / 1.35		
10 4.7	0.45	1.68	28		
11 ~~5~~	0.5	1.8	29		
12 5.3	0.5	1.91	30		
13 5.6	0.4	1.99	31		
14 5.9	0.3	2.02	32		
15 6.2	0.4	1.02	33		
16 6.5	0.3	1.65	34		
17 6.8	0.2	0.91	35		
18 7.1	0.25	1.01	36		
Time / SG:			Time / SG:		

Flow (cfs):

Entered into SR167 Database?
Date: Initials:

Herrera - Taylor Creek WF - Stream Flow Data Sheet

Flow Station #: MC	Gauge Start Height: ~~2.20~~ 1.36	Stream: Taylor Creek MS
Date: 11/15/19	Start Time: 7:20	Client: SPU
Observer Initials: GK, RP	Gauge End Height: 1.42	Method: Wading / Culvert
	End Time: 7:30	Staff Gauge Photo? YES NO

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

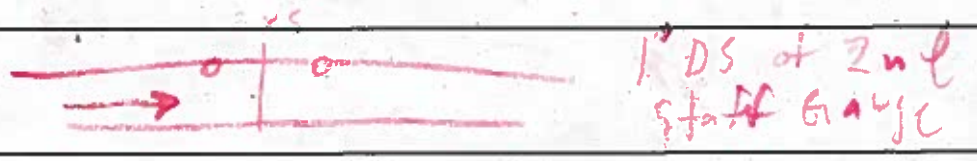
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Leaves, small rapid left bank

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

2.3 - Top of rock

Measurement Data		RB Distance (ft): 1.5		LB Distance (ft): 5.3	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 1.5	0	0	19 5.1	.4	2.07
2 1.7	.35	.45	20 5.3	.40	2.02
3 1.9	.35	1.19	21		
4 2.1	.20	2.28	22		
5 2.3	.15	0	23		
6 2.5	.40	2.43	24		
7 2.7	.50	.30	25		
8 2.9	.50	.51	26		
9 3.1	~~.50~~ .45	.76	27		
Time / SG: 7:25 / 1.38			Time / SG:		
10 3.3	.40	.62	28		
11 3.5	.45	1.14	29		
12 3.7	.45	1.36	30		
13 3.9	.50	1.49	31		
14 4.1	.50	1.21	32		
15 4.3	.40	1.27	33		
16 4.5	.50	1.97	34		
17 4.7	.55	.89	35		
18 4.9	.50	1.55	36		
Time / SG:			Time / SG:		

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

Herrera - Taylor Creek EF - Stream Flow Data Sheet

Flow Station #: EF Taylor	Gauge Start Height: 0.98	Stream: Taylor Creek MS
Date: 11/15/19	Start Time: 6:21	Client: SPU
Observer Initials: GK + RP	Gauge End Height: 0.95	Method: Wading / Culvert
	End Time: 6:35	Staff Gauge Photo? YES NO

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

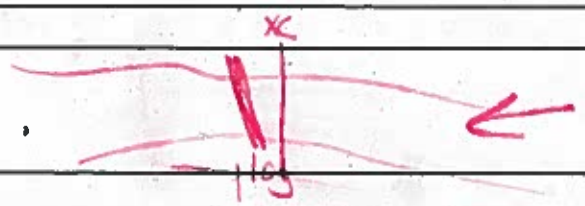
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

*leaves in water

Cross Section Location:

Sketch of XS Location:



Control Feature/Condition:

Weather: rainy

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

No unusual conditions; back eddy on LB

Measurement Data		RB Distance (ft): 9.7		LB Distance (ft): 1.0	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 9.3	.15	N/A	19 3.9	.30	.79
2 9.0	.20	.31	20 3.6	.22	0
3 8.7	.40	.85	21 3.5	.20	NA Top
4 8.4	.40	1.34	22 3.1	.20	NA of
5 8.1	.45	1.56	23 2.7	.40	.09 Sat Bar
6 7.8	.40	2.22	24 2.4	.40	.84
7 7.5	.45	2.46	25 2.1	.40	.18
8 7.2	.45	0.80	26 1.8	.35	-0.06 Back Edd
9 6.9	.40	0.79 Next	27 to rock	1.5 .2	NA
Time / SG: 6:25 / .97			Time / SG: 6:35 / .95		
10 6.6	.40	1.39	28 1.0	0	0
11 6.3	.35	1.15	29		
12 6.0	.35	1.31	30		
13 5.7	.35	1.80	31		
14 5.4	.40	1.89	32		
15 5.1	.45	1.62	33		
16 4.8	.40	1.15	34		
17 4.5	.50	.69	35		
18 4.2	.35	.35	36		
Time / SG: 6:31 / .96			Time / SG:		

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

Herrera - Taylor Creek WF - Stream Flow Data Sheet

Flow Station #: WF Taylor	Gauge Start Height: .75	Stream: Taylor Creek MS
Date: 11/15/19	Start Time: 6:45	Client: SPU
Observer Initials: GK RP	Gauge End Height: .94	Method: Wading / Culvert
	End Time: 6:57	Staff Gauge Photo? YES NO

Gauging Assessment: Circle One *(within _% deviation from actual discharge)

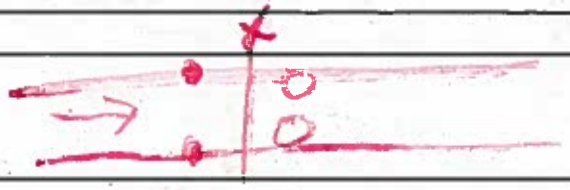
Excellent (2%*) Good (5%*) Fair (8%*) Poor (10%*)

Flow Comments (e.g. turbulence around gauge, lots of material in water, etc.):

Obstructions due to staff gauges

Cross Section Location:

Sketch of XS Location:



1 ft upstream of buckets

1' ds of gauge

Control Feature/Condition:

Weather:

Notes (e.g. equipment problems, flow blockages, unusual stream conditions, etc.):

1.9 – 3.5 affected by SG

Measurement Data		RB Distance (ft): 6.1		LB Distance (ft): 0.9	
Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)	Horizon. Dist. (ft)	Water Depth (ft)	Velocity (ft/sec)
1 6.1	.05	.03	19 2.5	.4	0
2 5.9	.1	0	20 2.3	.4	.05
3 5.7	.1	0	21 2.1	.4	0
4 5.5	.1	0	22 1.9	.4	0
5 5.3	.15	0	23 1.7	.4	0
6 5.1	.15	0	24 1.5	.2	0
7 4.9	.15	0	25 1.3	.4	.35
8 4.7	.20	.56	26 1.1	.35	.43
9 4.5	.20	1.1	27 0.9	.35	.27
Time / SG: 6:49 .96			Time / SG: 6:57		
10 4.3	.20	.58	28 0.7		
11 4.1	.25	.45	29 0.5		
12 3.9	.25	.51	30		
13 3.7	.25	.29	31		
14 3.5	.25	.39	32		
15 3.3	.25	.25	33		
16 3.1	.20	.12	34		
17 2.9	.30	.13	35		
18 2.7	.35	.10	36		
Time / SG: 6:55 / .95			Time / SG:		

Flow (cfs):	Entered into Taylor Creek Database? Date: Initials:

APPENDIX D

Continuous Data Correction Histories

Table D-1. SPU_STA401 Level Correction History.						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Drift Correction	kbliss	Drift Correction with Calibration Drift value of 0.03ft and Fouling Drift value of 0.00ft. calibration offset 5/20	9/30/2018 0:30	5/20/2019 8:55	7/24/2019 17:44	66332
Amplification	kbliss	Amplification Correction -- Simple with start factor of 1.27 and end factor of 1.32	10/5/2018 8:05	10/5/2018 8:30	7/24/2019 23:27	6
Copy and Paste	kbliss	Copy and Paste from Stage. Depth (ft)@TC-EF. Filling data gap	1/2/2019 9:35	1/4/2019 10:00	7/24/2019 23:23	582
Amplification	kbliss	Amplification Correction -- Simple with start factor of 1.00 and end factor of 1.21	1/2/2019 9:35	1/4/2019 10:00	7/24/2019 23:24	582
Offset Correction	kbliss	Offset Correction with value of -0.005ft. offset changed to 0 from -.005 prior to inaccurately changing offset to -.039	2/6/2019 12:55	2/6/2019 12:55	7/24/2019 17:06	1
Resample	kbliss	Resample (Interpolation Type) with interval: 5.00 min. Logger offline while changing battery.	2/6/2019 12:15	2/6/2019 13:00	7/24/2019 23:11	10
Offset Correction	kbliss	Offset Correction with value of 0.034ft. adjusting for inaccurate offset change 2/6. offset was -.005, changed to -.039 through 3/4.	2/6/2019 13:00	3/4/2019 9:15	7/24/2019 17:09	7444
Offset Correction	kbliss	Offset Correction with value of -0.005ft	3/4/2019 9:20	3/4/2019 10:00	7/24/2019 17:10	9
Offset Correction	kbliss	Offset Correction with value of 0.053ft. adjusting for inaccurate/unknown offset change 3/4 of -.058. last known accurate offset was -.005 through 2/6. next known accurate offset is on 5/20, of .029	3/4/2019 10:05	5/20/2019 8:55	7/24/2019 17:22	22163
Copy and Paste	kbliss	Freehand Correction without generating points. Sensor disturbed during calibration.	5/20/2019 9:00	5/20/2019 9:40	7/5/2019 16:29	9
Resample	kbliss	Resample (Linear) with interval: 5.00 min. Fill data gap.	6/4/2019 20:05	6/5/2019 6:10	7/24/2019 21:26	122

Table D-2. SPU_STA401 Turbidity Correction History.						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-01-03 03:15:32 0.00NTU) (2019-01-11 10:00:32 -2.50NTU) sediment buildup in well	1/3/2019 3:15	1/11/2019 10:00	7/5/2019 12:01	796
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-01-22 21:30:31 -2.60NTU) (2019-03-27 09:45:32 -3.30NTU). Fouling of well	1/22/2019 21:30	3/27/2019 9:45	7/5/2019 12:18	6098
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-03-12 04:45:32 0.00NTU) (2019-03-27 09:45:32 -3.00NTU). Fouling in well.	3/12/2019 4:45	3/27/2019 9:45	7/5/2019 12:26	1461
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-03-27 10:00:31 3.50NTU) (2019-06-06 11:30:32 2.90NTU). Calibration adjustment.	3/27/2019 10:00	6/6/2019 11:30	7/5/2019 13:02	6391
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-06-06 11:45:32 -1015.50NTU) (2019-06-06 12:00:32 -128.10NTU). Spike during calibration.	6/6/2019 11:45	6/6/2019 12:00	7/5/2019 13:25	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-06-07 06:00:32 0.20NTU) (2019-06-19 10:00:32 0.50NTU). Calibration adjustment.	6/7/2019 6:00	6/19/2019 10:00	7/5/2019 13:32	1169
Resample	kbliss	Resample (Linear) with interval: 15.00 min. For export timestamp matching.	12/4/2018 17:00	Open	7/18/2019 16:16	34837
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-W1 Turbidity@TC-WF - sensor was buried in sediment	7/11/2019 10:15	7/29/2019 16:00	12/5/2019 13:52	1752
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.80 and end factor of 0.80	7/11/2019 10:15	7/29/2019 15:15	12/5/2019 13:56	1749
Clock Drift Correction	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	7/29/2019 15:15	7/29/2019 16:15	12/5/2019 16:14	5
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	7/11/2019 10:00	7/11/2019 11:00	12/5/2019 16:19	0
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-E1 Turbidity@TC-EF - battery died	4/10/2019 23:15	4/15/2019 11:45	12/5/2019 18:55	435

Table D-2 (continued). SPU_STA401 Turbidity Correction History.						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.70 and end factor of 0.70	4/10/2019 23:15	4/15/2019 11:45	12/5/2019 18:59	435
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min. batteries died	4/15/2019 0:15	4/15/2019 12:00	12/5/2019 19:19	46
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min. batteries died	10/6/2019 14:15	10/7/2019 14:15	12/5/2019 19:19	95
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-E1 Turbidity@TC-EF - sensor was buried in sediment	10/8/2019 12:00	11/7/2019 15:15	12/5/2019 19:28	2894
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.70 and end factor of 0.70	10/8/2019 12:00	11/7/2019 15:00	12/5/2019 19:32	2893
Clock Drift Correction	dahearn	Clock Drift Correction with start offset of 30.000 and end offset of 30.000	10/8/2019 12:00	11/7/2019 15:00	12/5/2019 19:34	2893
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	10/8/2019 11:45	10/8/2019 12:30	12/5/2019 19:35	2
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	7/29/2019 15:30	7/29/2019 16:30	12/5/2019 22:29	3
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	11/7/2019 14:30	11/7/2019 15:15	12/5/2019 22:30	0
Clock Drift Correction	dahearn	Clock Drift Correction with start offset of 45.000 and end offset of 45.000	7/11/2019 10:00	7/29/2019 16:15	12/6/2019 15:12	1754
Fill Data Gaps	dahearn	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	7/11/2019 9:45	7/11/2019 10:45	12/6/2019 15:14	3
Offset Correction	kbliss	Offset Correction with value of 1.50NTU. adjust for negative values due to calibration error	12/4/2018 17:00	12/2/2019 14:00	12/16/2019 11:31	34837

Table D-3. TC-WF Level Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Delete Region	kbliss	Delete Region: Testing in office.	10/2/2018 13:15	10/3/2018 14:35	5/1/2019 13:00	293
Clock Drift Correction	kbliss	PDT to PST until DST, loggers account for DST. Clock Drift Correction with start offset of -60.000 and end offset of -60.000	10/2/2018 13:15	11/4/2018 2:55	5/2/2019 18:17	9369
Delete Region	kbliss	Delete Region: Testing in office.	10/3/2018 13:40	10/3/2018 14:30	5/2/2019 18:29	11
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2018-11-15 18:30:00 -0.02ft) (2019-09-07 19:15:00 -0.04ft). Account for aggradation of control	11/15/2018 18:30	9/7/2019 19:15	12/9/2019 21:48	85258
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	12/18/2018 12:20	12/18/2018 12:40	5/1/2019 12:43	5
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	12/18/2018 13:20	12/18/2018 13:40	6/12/2019 14:26	5
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	1/18/2019 10:50	1/18/2019 11:00	5/1/2019 12:41	3
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	1/18/2019 11:50	1/18/2019 12:00	6/12/2019 14:27	3
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	2/1/2019 12:50	2/1/2019 13:00	6/12/2019 14:28	3
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	2/21/2019 14:35	2/21/2019 14:45	6/12/2019 14:28	3
Clock Drift Correction	kbliss	PDT to PST until DST, loggers account for DST. Clock Drift Correction with start offset of -60.000 and end offset of -60.000	3/10/2019 3:00	4/29/2019 14:50	5/2/2019 18:27	14543
Copy and Paste	kbliss	Freehand Correction without generating points. Sensor taken out of water for data download.	3/27/2019 11:40	3/27/2019 12:00	7/16/2019 10:22	5

Table D-3 (continued). TC-WF Level Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	4/29/2019 14:30	4/29/2019 14:50	6/12/2019 14:31	5
Clock Drift Correction	kbliss	PDT to PST. Clock Drift Correction with start offset of -60.000 and end offset of -60.000	4/29/2019 14:55	6/6/2019 14:30	6/12/2019 14:31	10940
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	5/23/2019 13:00	5/23/2019 13:30	6/12/2019 14:32	7
Copy and Paste	kbliss	Freehand Correction without generating points.	7/29/2019 15:45	7/29/2019 16:15	9/23/2019 12:38	7
Copy and Paste	kbliss	Freehand Correction without generating points.	9/6/2019 14:00	9/6/2019 14:30	9/23/2019 12:39	7
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-07 20:20:00 -0.08ft) (2019-12-12 14:25:00 -0.12ft). account for aggradation of control	9/7/2019 20:20	12/12/2019 14:25	12/9/2019 21:51	27566
Resample	kbliss	Resample (Interpolation Type) with interval: 15.00 min. Noise reduction step 1.	Open	Open	7/16/2019 10:54	83685
Resample	kbliss	Resample (Linear) with interval: 5.00 min. Noise reduction step 2	Open	Open	7/16/2019 10:58	125571

Table D-4. TC-WF Turbidity Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Delete Region	kbliss	Delete Region. Battery dying and fouling of well, then battery died.	4/11/2019 4:00	4/14/2019 14:30	7/5/2019 14:44	131
Copy and Paste	kbliss	Freehand Correction without generating points. Disturbance during calibration.	4/29/2019 13:30	4/29/2019 15:00	7/5/2019 14:57	7
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-04-29 15:15:33 1.20NTU) (2019-06-06 13:15:34 2.50NTU). Calibration correction.	4/29/2019 15:15	6/6/2019 13:15	7/5/2019 15:04	3641
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-03-27 11:45:33 1.31NTU) (2019-03-27 12:00:33 -0.58NTU). Disturbance due to downloading data.	3/27/2019 11:45	3/27/2019 12:00	7/5/2019 15:09	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-05-03 08:45:34 1.72NTU) (2019-05-03 09:00:33 1.98NTU). Disturbance for battery swap.	5/3/2019 8:45	5/3/2019 9:00	7/18/2019 17:05	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-05-23 13:00:33 1.14NTU) (2019-05-23 13:15:33 1.17NTU). battery swap.	5/23/2019 13:00	5/23/2019 13:15	7/18/2019 17:31	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-06-06 14:15:33 -0.05NTU) (2019-06-19 11:45:34 0.18NTU). Calibration correction.	6/6/2019 14:15	6/19/2019 11:45	7/18/2019 17:50	1239
Copy and Paste	kbliss	Freehand Correction without generating points. Disturbed during field visit.	6/6/2019 13:15	6/6/2019 15:30	7/18/2019 17:55	10
Resample	kbliss	Resample (Linear) with interval: 15.00 min. For export timestamp matching.	3/8/2019 17:45	Open	7/18/2019 18:07	25820
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-E1 Turbidity@TC-EF. data gap due to dead battery.	4/11/2019 3:15	4/15/2019 13:45	12/9/2019 19:48	427
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.70 and end factor of 0.43	4/11/2019 3:15	4/15/2019 13:45	12/9/2019 19:52	427

Table D-4 (continued). TC-WF Turbidity Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-E1 Turbidity@TC-EF batteries died	9/4/2019 8:15	9/6/2019 14:30	12/9/2019 19:59	218
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.55 and end factor of 0.29	9/4/2019 4:45	9/6/2019 14:30	12/9/2019 20:04	232
Amplification	kbliss	Amplification Correction -- Simple with start factor of 0.10 and end factor of 0.97	9/4/2019 5:00	9/6/2019 14:30	12/9/2019 20:14	231
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-E1 Turbidity@TC-EF - sensor buried	10/7/2019 12:15	11/8/2019 11:45	12/9/2019 20:22	3071
Clock Drift Correction	kbliss	Clock Drift Correction with start offset of -15.000 and end offset of -15.000	10/7/2019 12:15	11/8/2019 11:45	12/9/2019 20:23	3071
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	4/21/2019 15:30	4/21/2019 16:15	12/9/2019 20:26	2
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	9/13/2019 13:30	9/13/2019 14:15	12/9/2019 20:26	2
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	11/8/2019 11:30	11/8/2019 12:00	12/9/2019 20:26	1
Offset Correction	kbliss	Offset Correction with value of 1.50NTU. adjust for slight negative values due to calibration errors.	3/8/2019 17:45	12/2/2019 16:30	12/16/2019 11:27	25820
Multi-Point Drift Correction	dahearn	Multi-Point Drift Correction of (Date/Time, Diff)(2019-10-07 12:15:00 -3.50000NTU) (2019-11-08 11:45:00 -6.20000NTU) - adjustment after copy paste from TC-EF	10/7/2019 12:15	11/8/2019 11:45	12/22/2019 12:23	3071

Table D-5. TC-EF Level Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Delete Region	kbliss	Delete Region: Testing in office.	10/2/2018 13:15	10/3/2018 13:15	5/1/2019 19:07	289
Clock Drift Correction	kbliss	Clock Drift Correction with start offset of -60.000 and end offset of -60.000. PDT to PST until DST, loggers account for DST.	10/2/2018 14:15	11/4/2018 2:55	5/1/2019 18:08	9369
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	10/4/2018 13:30	10/4/2018 13:50	5/1/2019 19:04	5
Copy and Paste	kbliss	Freehand Correction without generating points. Sensor out of water for download.	10/19/2018 13:35	10/19/2018 13:55	7/16/2019 16:15	5
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2018-10-19 13:35:00 -0.02ft) (2018-10-27 17:55:00 0.01ft)	10/19/2018 13:35	10/27/2018 17:55	12/10/2019 18:56	2357
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2018-10-26 09:10:00 0.02ft) (2018-12-09 11:05:00 0.03ft)	10/26/2018 9:10	12/9/2018 11:05	12/10/2019 18:43	12696
Revert to Raw data	kbliss	Revert to Raw data, filling gap created from DST	11/4/2018 1:55	11/4/2018 3:00	5/2/2019 15:36	14
Multi-Point Drift Correction	kbliss	Fill Data Gap - spike/drop fill	12/14/2018 14:15	12/14/2018 14:20	2/5/2019 17:06	2
Fill Data Gaps	kbliss	Fill Data Gap - spike/drop fill	12/18/2018 13:00	12/18/2018 13:15	2/5/2019 17:04	2
Delete Region	kbliss	Delete Region	12/18/2018 13:05	12/18/2018 13:10	2/5/2019 17:03	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2018-12-18 13:05:00 -0.00355ft) (2018-12-18 13:15:00 -0.03605ft)	12/18/2018 13:05	12/18/2018 13:15	2/5/2019 17:05	3
Multi-Point Drift Correction	kbliss	Fill Data Gap - spike/drop fill	1/18/2019 11:35	1/18/2019 11:40	2/5/2019 17:09	2
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	2/1/2019 12:05	2/1/2019 12:35	5/1/2019 19:01	7
Copy and Paste	kbliss	Freehand Correction generating points every 5.0 minutes. Sensor taken out of water for data upload.	2/21/2019 13:45	2/21/2019 13:59	5/1/2019 19:10	5
Clock Drift Correction	kbliss	Clock Drift Correction with start offset of -60.000 and end offset of -60.000. adjust for PDT until log restarted on 6/6	3/10/2019 2:00	6/6/2019 13:45	12/13/2019 18:51	25486
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 5.00 min. sensor out for download	3/27/2019 10:40	3/27/2019 11:25	12/13/2019 20:56	8

Table D-5 (continued). TC-EF Level Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Delete Region	kbliss	Delete Region	3/27/2019 10:45	3/27/2019 11:20	12/13/2019 20:55	8
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-04-12 04:25:00 0.10ft) (2019-09-07 23:20:00 0.07ft)	4/12/2019 4:25	9/7/2019 23:20	12/9/2019 21:12	42852
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 5.00 min. sensor out for DL	4/29/2019 13:45	4/29/2019 14:45	12/13/2019 21:00	11
Delete Region	kbliss	Delete Region Sensor out for download	4/29/2019 13:50	4/29/2019 14:25	12/13/2019 20:59	8
Delete Region	kbliss	Delete Region Sensor out for download	4/29/2019 13:50	4/29/2019 14:40	12/13/2019 21:00	11
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 5.00 min	5/23/2019 12:10	5/23/2019 13:05	12/13/2019 19:21	10
Delete Region	kbliss	Delete Region. sensor out of water for DL	5/23/2019 12:15	5/23/2019 13:00	12/13/2019 19:20	10
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 5.00 min. sensor out for DL	7/29/2019 15:15	7/29/2019 15:45	12/14/2019 21:52	5
Delete Region	kbliss	Delete Region Sensor out for download	7/29/2019 15:20	7/29/2019 15:40	12/14/2019 21:52	5
Copy and Paste	kbliss	Freehand Correction without generating points.	9/6/2019 13:15	9/6/2019 13:45	9/23/2019 12:31	7
Copy and Paste	kbliss	Freehand Correction without generating points.	9/6/2019 13:15	9/6/2019 14:10	9/23/2019 12:31	12
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-07 20:45:00 0.07ft) (2019-09-08 00:20:00 0.17ft). smoothing transition	9/7/2019 20:45	9/8/2019 0:20	12/14/2019 19:21	44
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-07 23:25:00 0.25ft) (2019-10-07 09:45:00 0.21ft)	9/7/2019 23:25	10/7/2019 9:45	12/9/2019 21:23	8477
Multi-Point Drift Correction	dahearn	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-13 15:05:00 0.23149ft) (2019-09-13 15:15:00 0.00000ft)	9/13/2019 15:05	9/13/2019 15:15	12/16/2019 11:47	3
Multi-Point Drift Correction	dahearn	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-13 15:05:00 -0.35237ft) (2019-09-13 16:10:00 -0.39802ft)	9/13/2019 15:05	9/13/2019 16:10	12/16/2019 11:47	14
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-13 16:15:00 -0.40ft) (2019-09-15 02:45:00 -0.40ft)	9/13/2019 16:15	9/15/2019 2:45	12/14/2019 15:19	415
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-09-15 02:50:00 -0.16ft) (2019-09-17 10:00:00 -0.04ft)	9/15/2019 2:50	9/17/2019 10:00	12/14/2019 15:29	663

Table D-5 (continued). TC-EF Level Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Offset Correction	dahearn	Offset Correction with value of -0.08000ft - control blew out	9/15/2019 2:50	10/7/2019 9:30	12/16/2019 12:05	6417
Resample	kbliss	Resample (Interpolation Type) with interval: 15.00 min. Step 1. Smoothing to reduce noise.	Open	Open	7/16/2019 14:52	83711
Resample	kbliss	Resample (Interpolation Type) with interval: 5.00 min. Noise reduction step 2. Smoothing to reduce noise.	Open	Open	7/16/2019 14:54	125571

Table D-6 TC-EF Turbidity Correction History

Correction Type	Creator	Comment	From Time	To Time	Date Applied	Points Modified
Offset Correction	kbliss	Offset Correction with value of 3.00NTU. Adjust for negative values due to using DI for 0 cal	Open	Open	7/5/2019 13:56	25771
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-04-10 21:00:33 -0.40NTU) (2019-04-15 00:45:33 -5.77NTU). Fouling of well.	4/10/2019 21:00	4/15/2019 0:45	7/5/2019 13:39	399
Offset Correction	kbliss	Offset Correction with value of -90.50NTU. Spike during calibration.	5/23/2019 12:45	5/23/2019 12:45	7/5/2019 13:46	1
Offset Correction	kbliss	Offset Correction with value of -125.41NTU. Spike during calibration.	4/29/2019 14:15	4/29/2019 14:15	7/5/2019 13:52	1
Offset Correction	kbliss	Offset Correction with value of -25.20NTU. Fouling of well.	5/22/2019 9:30	5/23/2019 12:15	7/5/2019 14:07	108
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-05-22 09:30:33 3.80NTU) (2019-05-23 12:15:32 0.30NTU). Further adjustments due to fouling and calibration.	5/22/2019 9:30	5/23/2019 12:15	7/5/2019 14:11	108
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-05-17 00:00:32 0.00NTU) (2019-05-17 20:45:33 -8.58NTU). Suspect fouling.	5/17/2019 0:00	5/17/2019 20:45	7/5/2019 14:38	84
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-05-17 17:45:33 -6.56NTU) (2019-05-20 00:15:33 -5.36NTU). Suspected fouling.	5/17/2019 17:45	5/20/2019 0:15	7/5/2019 14:40	219
Resample	kbliss	Resample (Linear) with interval: 15.00 min	3/8/2019 17:45	Open	7/18/2019 16:27	25816
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	4/15/2019 0:15	4/15/2019 12:15	12/5/2019 22:14	47
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.SPU_STA401 Turbidity@Taylor Sta401 - sensor buried	7/10/2019 17:00	7/29/2019 17:15	12/5/2019 22:23	1826
Amplification	kbliss	Amplification Correction -- Simple with start factor of 1.40 and end factor of 1.40	7/10/2019 17:00	7/29/2019 17:15	12/5/2019 22:24	1826
Clock Drift Correction	dahearn	Clock Drift Correction with start offset of -30.000 and end offset of -30.000	7/10/2019 17:00	7/29/2019 17:15	12/6/2019 15:17	1826

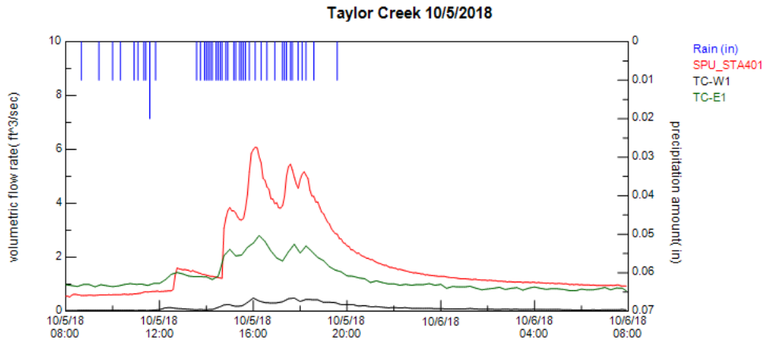
Table D-6 (continued). TC-EF Turbidity Correction History						
Correction Type	**Creator**	**Comment**	**From Time**	**To Time**	**Date Applied**	**Points Modified**
Fill Data Gaps	dahearn	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	7/29/2019 16:45	7/29/2019 17:30	12/6/2019 15:18	2
Offset Correction	kbliss	Offset Correction with value of -31.57NTU. spike due to well maintenance	9/6/2019 13:15	9/6/2019 13:15	12/9/2019 15:32	1
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-08-02 08:00:00 -0.70NTU) (2019-09-06 13:00:00 -7.25NTU) correcting for fouling of well	8/2/2019 8:00	9/6/2019 13:00	12/9/2019 15:41	3381
Copy and Paste	kbliss	Copy and Paste from Turbidity, Nephelom.TC-W1 Turbidity@TC-WF. EF well filled in.	9/7/2019 18:15	10/7/2019 10:30	12/9/2019 17:22	2850
Amplification	kbliss	Amplification Correction -- Simple with start factor of 1.30 and end factor of 1.30. adjust for copy from WF	9/7/2019 18:15	10/7/2019 10:30	12/9/2019 17:24	2850
Clock Drift Correction	kbliss	Clock Drift Correction with start offset of 15.000 and end offset of 15.000. account for 15 min lag between WF and EF	9/7/2019 18:15	10/7/2019 10:30	12/9/2019 17:30	2850
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	9/7/2019 18:00	9/7/2019 18:30	12/9/2019 17:30	1
Fill Data Gaps	kbliss	Fill Data Gaps (Linear) with gap resample rate of 15.00 min	9/13/2019 13:45	9/13/2019 14:30	12/9/2019 17:31	2
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-11-07 16:00:00 1.10NTU) (2019-12-02 15:30:00 1.10NTU) adjusted for cal 12/2	11/7/2019 16:00	12/2/2019 15:30	12/9/2019 18:11	2399
Multi-Point Drift Correction	kbliss	Multi-Point Drift Correction of (Date/Time, Diff)(2019-07-10 17:00:00 0.30NTU) (2019-07-29 16:15:00 0.70NTU). well filled in	7/10/2019 17:00	7/29/2019 16:15	12/9/2019 18:33	1822
Offset Correction	kbliss	Offset Correction with value of 1.00NTU. adjust for negative values due to calibration error	3/8/2019 17:45	12/2/2019 15:30	12/16/2019 11:28	25816

APPENDIX E

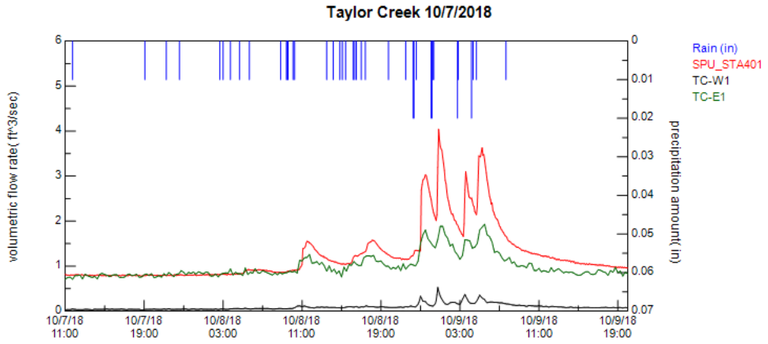
Delineated Storm Events

Table E-1. Delineated Storm Events

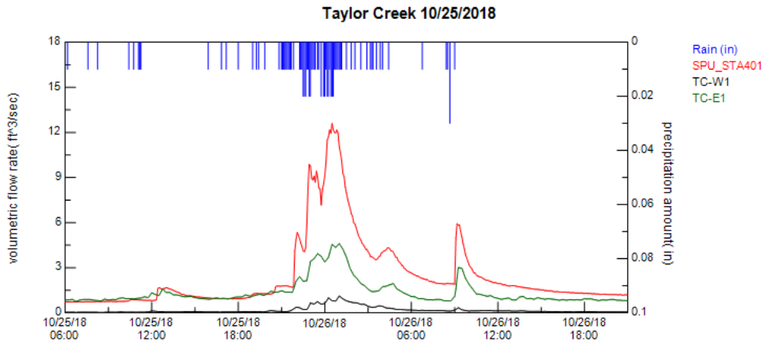
pms



Event 1					
Rainfall Statistics		Flow/Sample Statistics			
Start	10/5/2018 8:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	10/5/2018 19:35	Start	10/5/2018 8:35	10/5/2018 8:35	10/5/2018 8:35
Duration (hour)	10.917	Stop	10/6/2018 7:30	10/6/2018 7:35	10/6/2018 7:30
Total (in)	0.45	Duration (hour)	23	23.0833	23
Average Intensity (in/hr)	0.041	Average (ft^3/sec)	1.851	0.1424	1.2509
Maximum (in)	0.02	Maximum (ft^3/sec)	6.0895	0.4945	2.8113
Maximum Intensity (in/hr)	0.24	Volume (cf)	153264.4844	11837.1904	103572.7266
Antecedent Dry Period (hour)	50.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

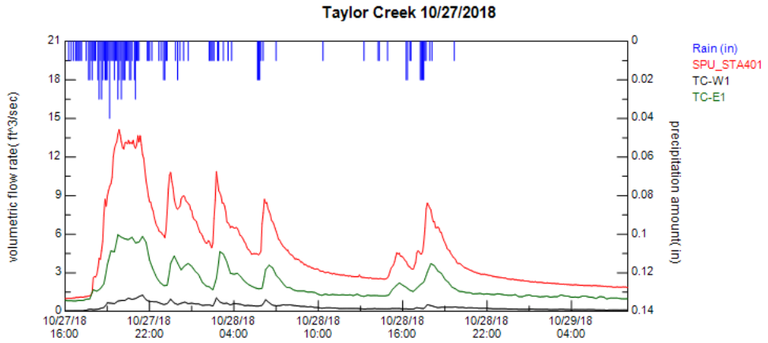


Event 2					
Rainfall Statistics		Flow/Sample Statistics			
Start	10/7/2018 11:45	Station	SPU_STA401	TC-W1	TC-E1
Stop	10/9/2018 7:40	Start	10/7/2018 11:45	10/7/2018 11:45	10/7/2018 11:45
Duration (hour)	43.917	Stop	10/9/2018 19:40	10/9/2018 19:40	10/9/2018 19:40
Total (in)	0.46	Duration (hour)	56	56	56
Average Intensity (in/hr)	0.01	Average (ft^3/sec)	1.254	0.0933	0.998
Maximum (in)	0.02	Maximum (ft^3/sec)	4.0435	0.5275	1.9313
Maximum Intensity (in/hr)	0.24	Volume (cf)	252810.2812	18815.4609	201205.7969
Antecedent Dry Period (hour)	40.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

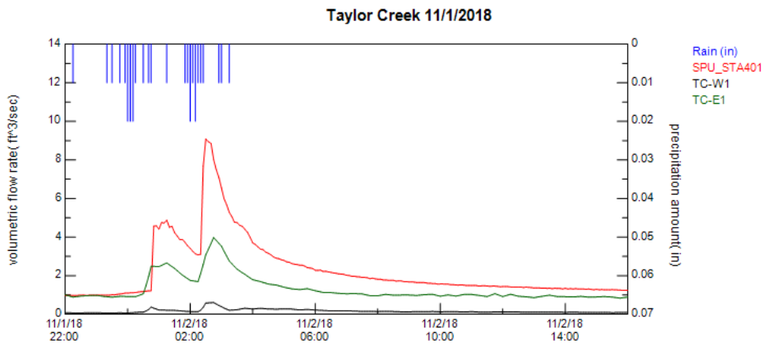


Event 3					
Rainfall Statistics		Flow/Sample Statistics			
Start	10/25/2018 6:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	10/26/2018 9:00	Start	10/25/2018 6:10	10/25/2018 6:10	10/25/2018 6:10
Duration (hour)	26.833	Stop	10/26/2018 20:55	10/26/2018 20:55	10/26/2018 20:55
Total (in)	0.92	Duration (hour)	38.8333	38.8333	38.8333
Average Intensity (in/hr)	0.034	Average (ft^3/sec)	2.4767	0.1816	1.3719
Maximum (in)	0.03	Maximum (ft^3/sec)	12.5968	1.1216	4.6066
Maximum Intensity (in/hr)	0.36	Volume (cf)	346247.6562	25393.9277	191786.1875
Antecedent Dry Period (hour)	35.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

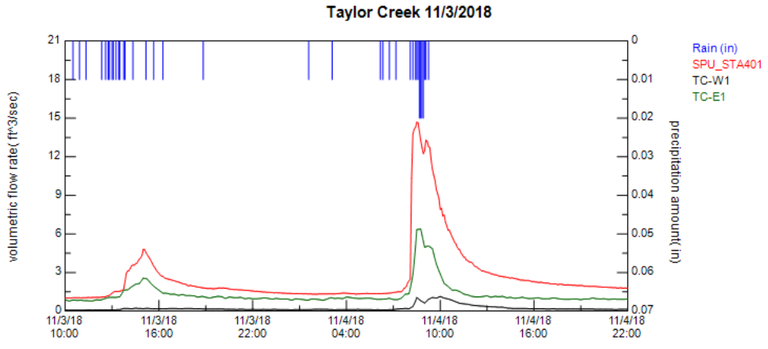
Table E-1. Delineated Storm Events



Event 4					
Rainfall Statistics		Flow/Sample Statistics			
Start	10/27/2018 16:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	10/28/2018 19:40	Start	10/27/2018 16:15	10/27/2018 16:15	10/27/2018 16:15
Duration (hour)	27.417	Stop	10/29/2018 7:40	10/29/2018 7:40	10/29/2018 7:40
Total (in)	1.42	Duration (hour)	39.5	39.5	39.5
Average Intensity (in/hr)	0.052	Average (ft^3/sec)	4.7032	0.3636	2.0964
Maximum (in)	0.04	Maximum (ft^3/sec)	14.1426	1.271	5.9623
Maximum Intensity (in/hr)	0.48	Volume (cf)	668795.0625	51704.4531	298114.3438
Antecedent Dry Period (hour)	31.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

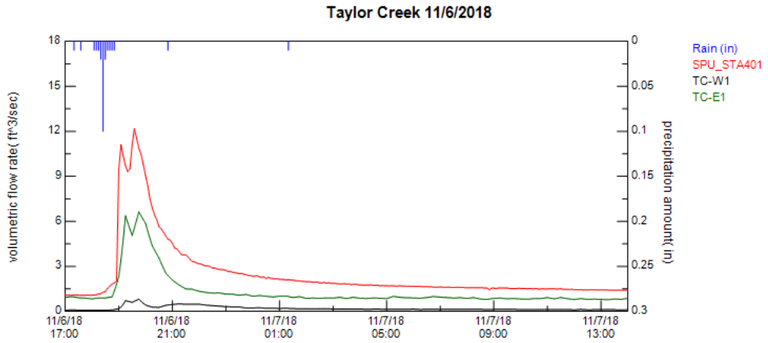


Event 5					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/1/2018 22:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	11/2/2018 3:15	Start	11/1/2018 22:15	11/1/2018 22:15	11/1/2018 22:15
Duration (hour)	5	Stop	11/2/2018 15:10	11/2/2018 15:10	11/2/2018 15:10
Total (in)	0.29	Duration (hour)	17	17	17
Average Intensity (in/hr)	0.058	Average (ft^3/sec)	2.3221	0.1681	1.3394
Maximum (in)	0.02	Maximum (ft^3/sec)	9.0796	0.6084	3.9818
Maximum Intensity (in/hr)	0.24	Volume (cf)	142111.2188	10288.7686	81969.7578
Antecedent Dry Period (hour)	22.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

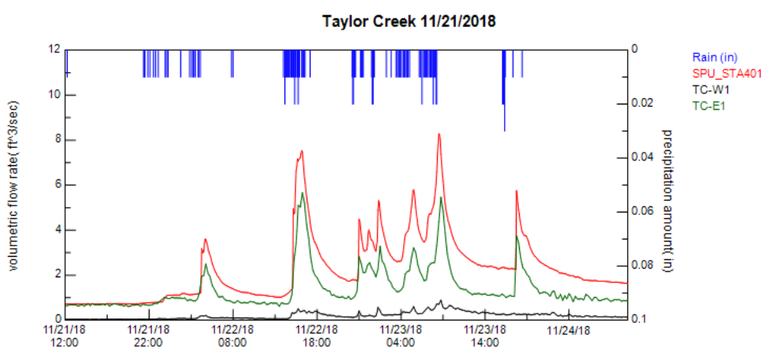


Event 6					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/3/2018 10:30	Station	SPU_STA401	TC-W1	TC-E1
Stop	11/4/2018 9:15	Start	11/3/2018 10:25	11/3/2018 10:25	11/3/2018 10:25
Duration (hour)	22.75	Stop	11/4/2018 21:10	11/4/2018 21:15	11/4/2018 21:10
Total (in)	0.41	Duration (hour)	34.8333	34.9167	34.8333
Average Intensity (in/hr)	0.018	Average (ft^3/sec)	2.6869	0.2314	1.3222
Maximum (in)	0.02	Maximum (ft^3/sec)	14.6935	1.1376	6.3885
Maximum Intensity (in/hr)	0.24	Volume (cf)	336936.375	29081.8477	165809.75
Antecedent Dry Period (hour)	31.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

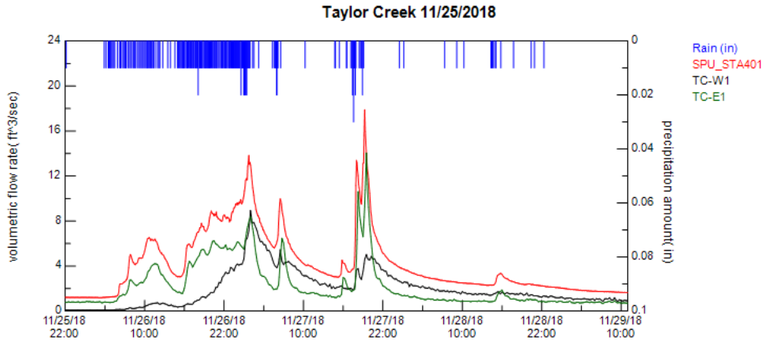
Table E-1. Delineated Storm Events



Event 7					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/6/2018 17:20	Station	SPU_STA401	TC-W1	TC-E1
Stop	11/7/2018 1:20	Start	11/6/2018 17:15	11/6/2018 17:15	11/6/2018 17:15
Duration (hour)	8	Stop	11/7/2018 13:15	11/7/2018 13:15	11/7/2018 13:15
Total (in)	0.25	Duration (hour)	20.0833	20.0833	20.0833
Average Intensity (in/hr)	0.031	Average (ft^3/sec)	2.5411	0.2084	1.3322
Maximum (in)	0.1	Maximum (ft^3/sec)	12.1836	0.8195	6.6363
Maximum Intensity (in/hr)	1.2	Volume (cf)	183720.5	15064.0205	96316.7422
Antecedent Dry Period (hour)	15.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

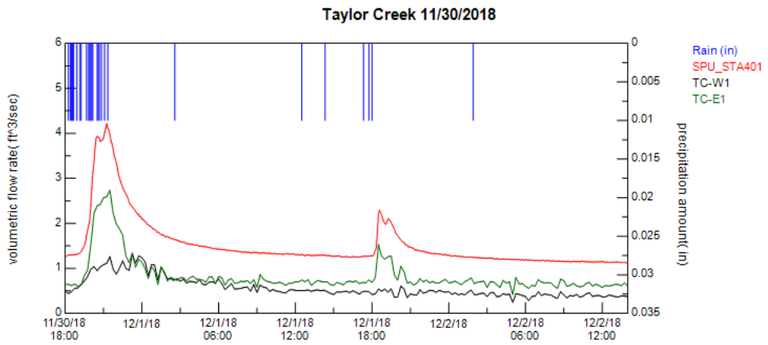


Event 8					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/21/2018 12:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	11/23/2018 18:25	Start	11/21/2018 12:10	11/21/2018 12:10	11/21/2018 12:10
Duration (hour)	54.167	Stop	11/24/2018 6:20	11/24/2018 6:20	11/24/2018 6:20
Total (in)	1.23	Duration (hour)	66.25	66.25	66.25
Average Intensity (in/hr)	0.023	Average (ft^3/sec)	2.2984	0.2059	1.3999
Maximum (in)	0.03	Maximum (ft^3/sec)	8.278	0.8959	5.6705
Maximum Intensity (in/hr)	0.36	Volume (cf)	548172.75	49112.6719	333884.0312
Antecedent Dry Period (hour)	30.9	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

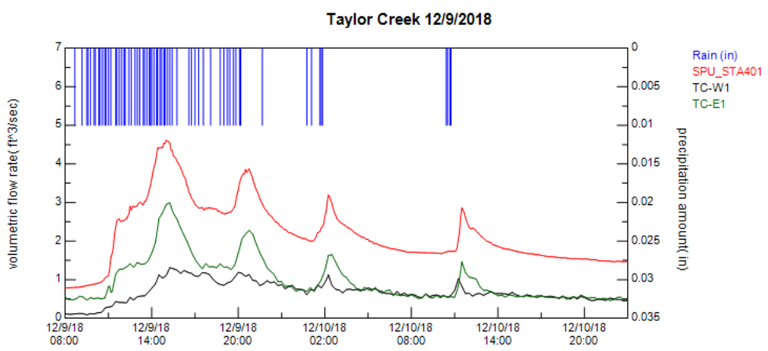


Event 9					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/25/2018 22:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	11/28/2018 22:20	Start	11/25/2018 22:10	11/25/2018 22:05	11/25/2018 22:05
Duration (hour)	72.167	Stop	11/29/2018 10:15	11/29/2018 10:15	11/29/2018 10:20
Total (in)	2.15	Duration (hour)	84.1667	84.25	84.3333
Average Intensity (in/hr)	0.03	Average (ft^3/sec)	4.1956	1.9727	2.2422
Maximum (in)	0.03	Maximum (ft^3/sec)	17.8963	8.9502	14.0562
Maximum Intensity (in/hr)	0.36	Volume (cf)	1271254	598331.5	680742.0625
Antecedent Dry Period (hour)	51.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

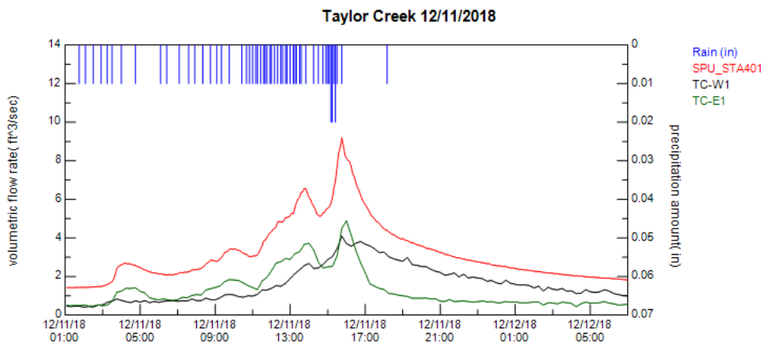
Table E-1. Delineated Storm Events



Event 10					
Rainfall Statistics		Flow/Sample Statistics			
Start	11/30/2018 18:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/2/2018 1:55	Start	11/30/2018 18:10	11/30/2018 18:10	11/30/2018 18:10
Duration (hour)	31.667	Stop	12/2/2018 13:50	12/2/2018 13:50	12/2/2018 13:50
Total (in)	0.27	Duration (hour)	43.75	43.75	43.75
Average Intensity (in/hr)	0.009	Average (ft^3/sec)	1.5293	0.5707	0.8325
Maximum (in)	0.01	Maximum (ft^3/sec)	4.2159	1.3145	2.7342
Maximum Intensity (in/hr)	0.12	Volume (cf)	240868.9844	89892.7109	131113.0938
Antecedent Dry Period (hour)	16.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

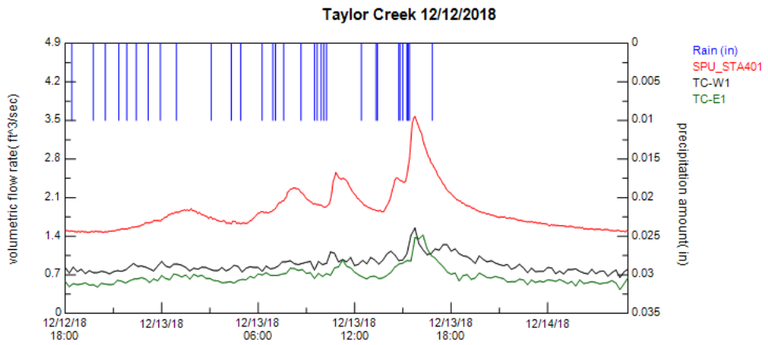


Event 11					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/9/2018 8:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/10/2018 10:45	Start	12/9/2018 8:35	12/9/2018 8:35	12/9/2018 8:40
Duration (hour)	26.083	Stop	12/10/2018 22:40	12/10/2018 22:40	12/10/2018 22:40
Total (in)	0.66	Duration (hour)	38.1667	38.1667	38.0833
Average Intensity (in/hr)	0.025	Average (ft^3/sec)	2.2265	0.6949	0.9987
Maximum (in)	0.01	Maximum (ft^3/sec)	4.6153	1.3093	2.9932
Maximum Intensity (in/hr)	0.12	Volume (cf)	305914.7812	95479.3672	136916.9531
Antecedent Dry Period (hour)	174.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

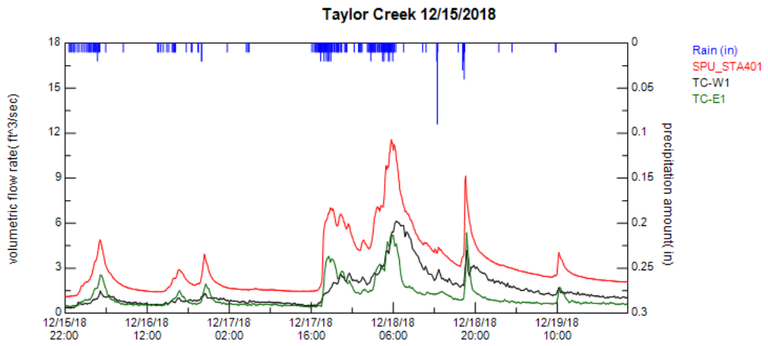


Event 12					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/11/2018 1:45	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/11/2018 18:10	Start	12/11/2018 1:40	12/11/2018 1:40	12/11/2018 1:40
Duration (hour)	16.417	Stop	12/12/2018 6:10	12/12/2018 6:10	12/12/2018 6:10
Total (in)	0.59	Duration (hour)	28.5833	28.5833	28.5833
Average Intensity (in/hr)	0.036	Average (ft^3/sec)	3.3194	1.6732	1.338
Maximum (in)	0.02	Maximum (ft^3/sec)	9.1856	4.0919	4.8864
Maximum Intensity (in/hr)	0.24	Volume (cf)	341570.5938	172174.125	137678.5469
Antecedent Dry Period (hour)	15	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

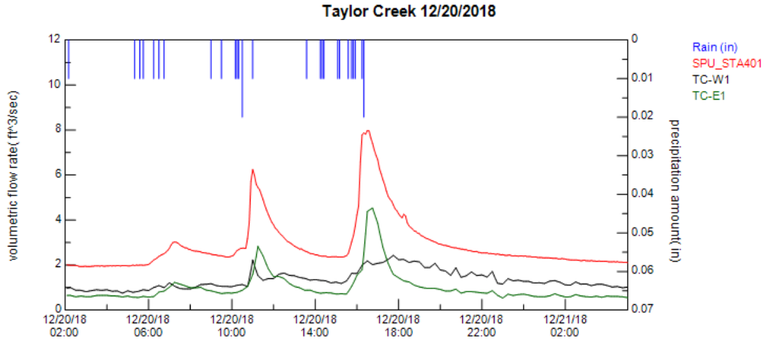
Table E-1. Delineated Storm Events



Event 13					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/12/2018 18:25	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/13/2018 16:50	Start	12/12/2018 18:20	12/12/2018 18:20	12/12/2018 18:20
Duration (hour)	22.417	Stop	12/14/2018 4:50	12/14/2018 4:50	12/14/2018 4:50
Total (in)	0.32	Duration (hour)	34.5833	34.5833	34.5833
Average Intensity (in/hr)	0.014	Average (ft^3/sec)	1.8721	0.8873	0.676
Maximum (in)	0.01	Maximum (ft^3/sec)	3.574	1.5496	1.4227
Maximum Intensity (in/hr)	0.12	Volume (cf)	233077.875	110469.6875	84166.5312
Antecedent Dry Period (hour)	24.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

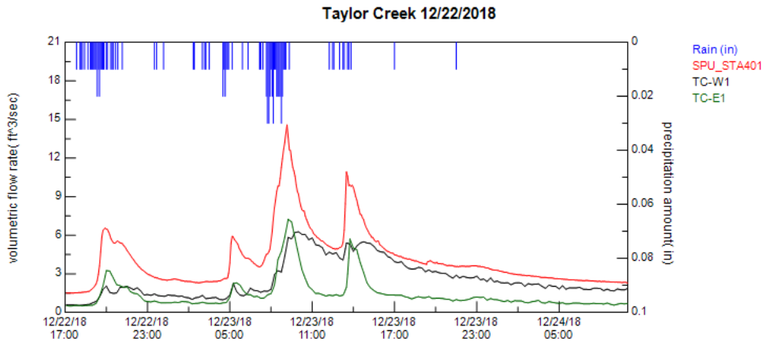


Event 14					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/15/2018 22:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/19/2018 9:45	Start	12/15/2018 22:40	12/15/2018 22:40	12/15/2018 22:40
Duration (hour)	83.083	Stop	12/19/2018 21:40	12/19/2018 21:40	12/19/2018 21:40
Total (in)	1.86	Duration (hour)	95.0833	95.0833	95.0833
Average Intensity (in/hr)	0.022	Average (ft^3/sec)	3.2086	1.5735	1.1451
Maximum (in)	0.09	Maximum (ft^3/sec)	11.5704	6.1537	5.3697
Maximum Intensity (in/hr)	1.08	Volume (cf)	1098293.5	538624.625	391977.5312
Antecedent Dry Period (hour)	18.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

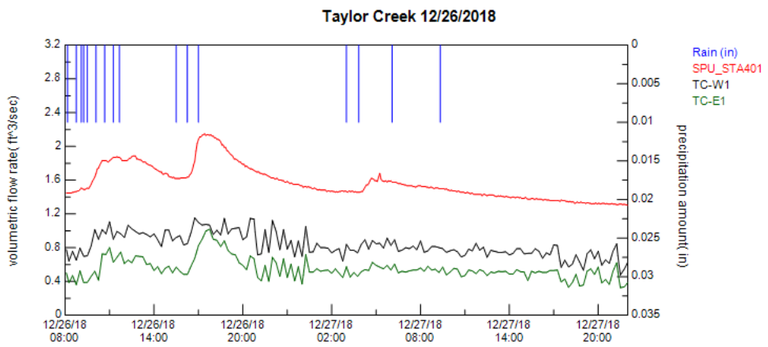


Event 15					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/20/2018 2:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/20/2018 16:20	Start	12/20/2018 2:10	12/20/2018 2:10	12/20/2018 2:10
Duration (hour)	14.167	Stop	12/21/2018 4:15	12/21/2018 4:15	12/21/2018 4:15
Total (in)	0.28	Duration (hour)	26.1667	26.1667	26.1667
Average Intensity (in/hr)	0.02	Average (ft^3/sec)	2.9163	1.3524	1.0149
Maximum (in)	0.02	Maximum (ft^3/sec)	7.9751	2.4337	4.5389
Maximum Intensity (in/hr)	0.24	Volume (cf)	274714.4375	127397.8125	95602.1953
Antecedent Dry Period (hour)	16.4	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

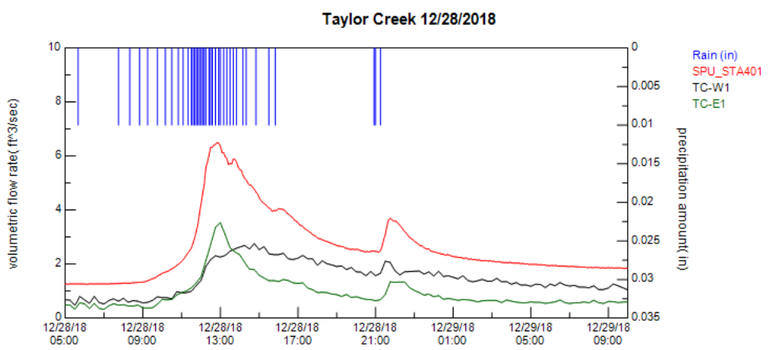
Table E-1. Delineated Storm Events



Event 16					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/22/2018 17:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/23/2018 21:30	Start	12/22/2018 17:45	12/22/2018 17:45	12/22/2018 17:50
Duration (hour)	27.667	Stop	12/24/2018 9:30	12/24/2018 9:30	12/24/2018 9:30
Total (in)	0.98	Duration (hour)	39.8333	39.8333	39.75
Average Intensity (in/hr)	0.035	Average (ft^3/sec)	4.208	2.62	1.4504
Maximum (in)	0.03	Maximum (ft^3/sec)	14.5814	6.2671	7.2407
Maximum Intensity (in/hr)	0.36	Volume (cf)	603432.25	375703.3125	207546.1875
Antecedent Dry Period (hour)	34.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

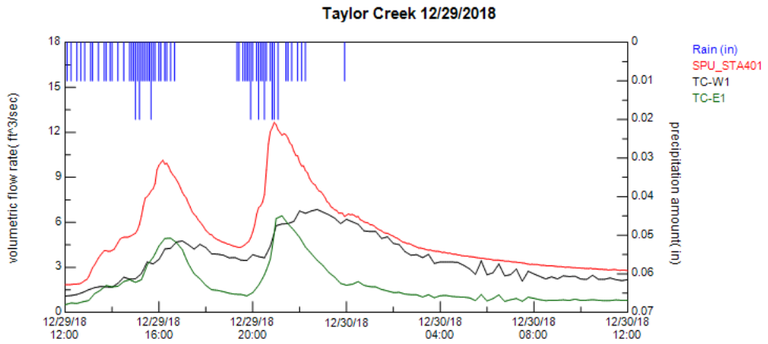


Event 17					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/26/2018 8:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/27/2018 9:20	Start	12/26/2018 8:10	12/26/2018 8:10	12/26/2018 8:10
Duration (hour)	25.167	Stop	12/27/2018 21:20	12/27/2018 21:20	12/27/2018 21:20
Total (in)	0.16	Duration (hour)	37.25	37.25	37.25
Average Intensity (in/hr)	0.006	Average (ft^3/sec)	1.5753	0.8343	0.5543
Maximum (in)	0.01	Maximum (ft^3/sec)	2.1503	1.1557	1.0185
Maximum Intensity (in/hr)	0.12	Volume (cf)	211247.75	111882.4297	74325.2188
Antecedent Dry Period (hour)	26.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

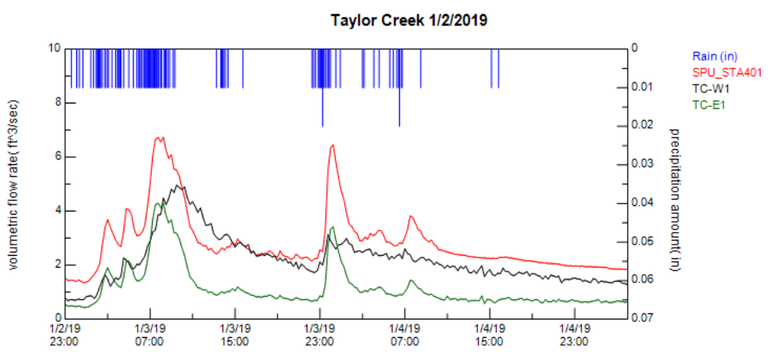


Event 18					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/28/2018 5:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/28/2018 21:15	Start	12/28/2018 5:35	12/28/2018 5:35	12/28/2018 5:35
Duration (hour)	15.583	Stop	12/29/2018 9:10	12/29/2018 9:15	12/29/2018 9:10
Total (in)	0.4	Duration (hour)	27.6667	27.75	27.6667
Average Intensity (in/hr)	0.026	Average (ft^3/sec)	2.6816	1.5051	0.9599
Maximum (in)	0.01	Maximum (ft^3/sec)	6.5021	2.7601	3.5353
Maximum Intensity (in/hr)	0.12	Volume (cf)	267089.75	150356.6562	95608.6641
Antecedent Dry Period (hour)	20.3	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

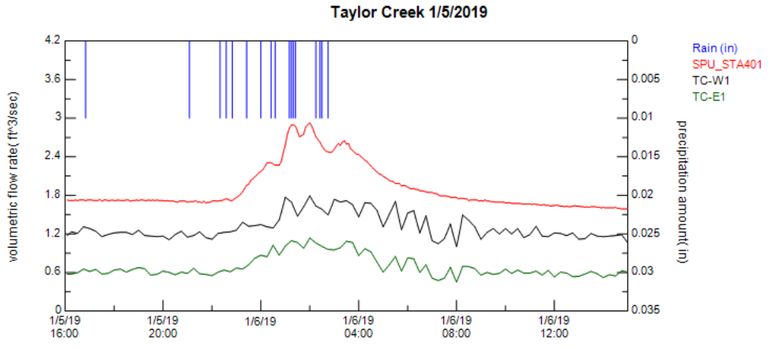
Table E-1. Delineated Storm Events



Event 19					
Rainfall Statistics		Flow/Sample Statistics			
Start	12/29/2018 12:05	Station	SPU_STA401	TC-W1	TC-E1
Stop	12/29/2018 23:55	Start	12/29/2018 12:00	12/29/2018 12:00	12/29/2018 12:00
Duration (hour)	11.833	Stop	12/30/2018 11:55	12/30/2018 11:55	12/30/2018 11:55
Total (in)	0.68	Duration (hour)	24	24	24
Average Intensity (in/hr)	0.058	Average (ft^3/sec)	5.2636	3.6153	1.8807
Maximum (in)	0.02	Maximum (ft^3/sec)	12.6609	6.8629	6.4385
Maximum Intensity (in/hr)	0.24	Volume (cf)	454776.0938	312358.1562	162490.875
Antecedent Dry Period (hour)	14.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

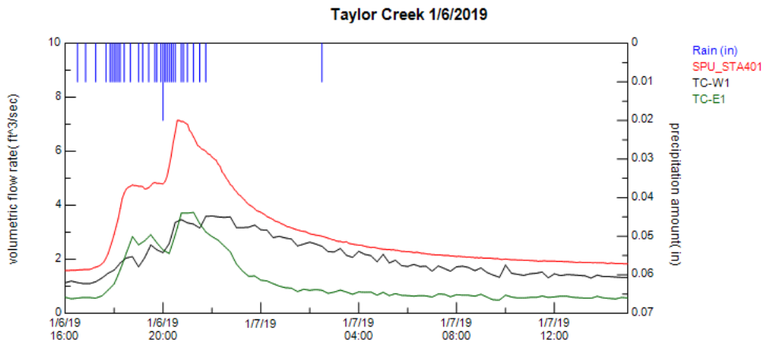


Event 20					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/2/2019 23:35	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/4/2019 15:50	Start	1/2/2019 23:35	1/2/2019 23:35	1/2/2019 23:35
Duration (hour)	40.25	Stop	1/5/2019 3:50	1/5/2019 3:45	1/5/2019 3:45
Total (in)	0.99	Duration (hour)	52.3333	52.25	52.25
Average Intensity (in/hr)	0.025	Average (ft^3/sec)	2.8501	2.2179	1.1521
Maximum (in)	0.02	Maximum (ft^3/sec)	6.7423	4.9664	4.3004
Maximum Intensity (in/hr)	0.24	Volume (cf)	536957.5625	417193.0625	216715.5781
Antecedent Dry Period (hour)	63.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

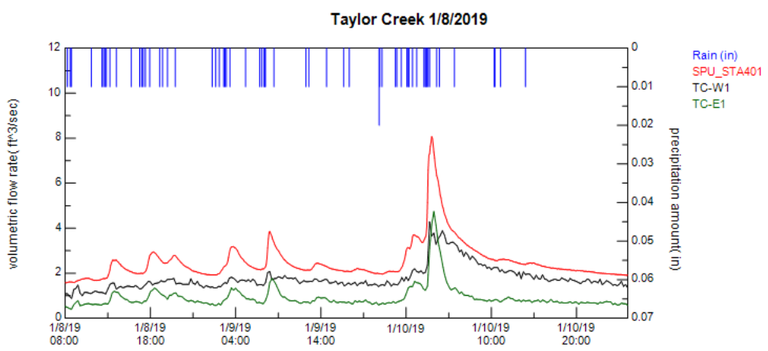


Event 21					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/5/2019 16:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/6/2019 2:45	Start	1/5/2019 16:50	1/5/2019 16:50	1/5/2019 16:50
Duration (hour)	9.917	Stop	1/6/2019 14:45	1/6/2019 14:45	1/6/2019 14:45
Total (in)	0.17	Duration (hour)	22	22	22
Average Intensity (in/hr)	0.017	Average (ft^3/sec)	1.9153	1.3146	0.6987
Maximum (in)	0.01	Maximum (ft^3/sec)	2.9288	1.7923	1.1362
Maximum Intensity (in/hr)	0.12	Volume (cf)	151689.6719	104116.5625	55335.8594
Antecedent Dry Period (hour)	25	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

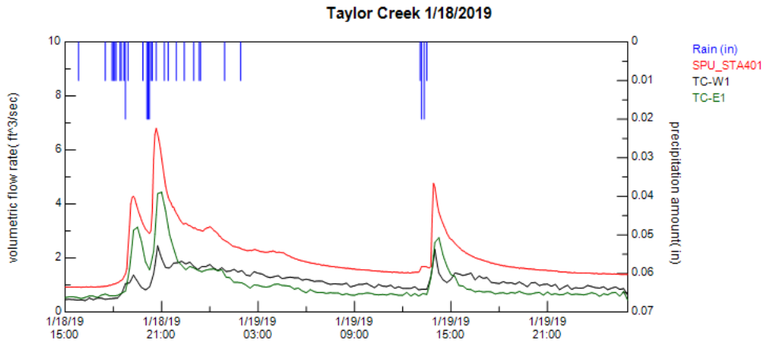
Table E-1. Delineated Storm Events



Event 22					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/6/2019 16:30	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/7/2019 2:30	Start	1/6/2019 16:30	1/6/2019 16:25	1/6/2019 16:25
Duration (hour)	10	Stop	1/7/2019 14:25	1/7/2019 14:25	1/7/2019 14:30
Total (in)	0.33	Duration (hour)	22	22.0833	22.1667
Average Intensity (in/hr)	0.033	Average (ft^3/sec)	3.0719	2.1069	1.1921
Maximum (in)	0.02	Maximum (ft^3/sec)	7.1438	3.608	3.7389
Maximum Intensity (in/hr)	0.24	Volume (cf)	243298.0156	167496.0938	95127.3203
Antecedent Dry Period (hour)	13.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

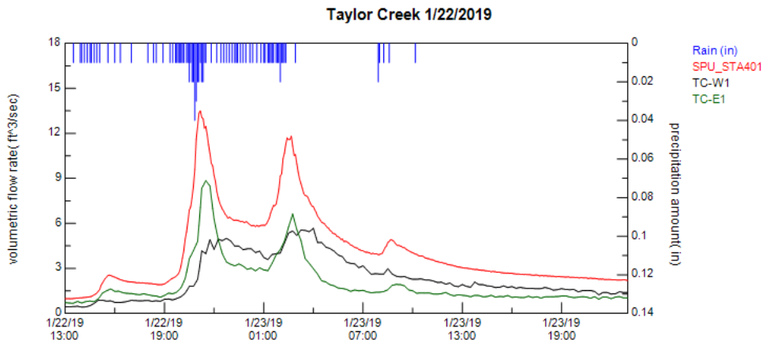


Event 23					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/8/2019 8:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/10/2019 14:00	Start	1/8/2019 8:10	1/8/2019 8:10	1/8/2019 8:10
Duration (hour)	53.75	Stop	1/11/2019 2:00	1/11/2019 2:00	1/11/2019 2:00
Total (in)	0.64	Duration (hour)	65.9167	65.9167	65.9167
Average Intensity (in/hr)	0.012	Average (ft^3/sec)	2.5143	1.7749	0.9201
Maximum (in)	0.02	Maximum (ft^3/sec)	8.071	4.2834	4.74
Maximum Intensity (in/hr)	0.24	Volume (cf)	596653.4375	421174.375	218330.7344
Antecedent Dry Period (hour)	29.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

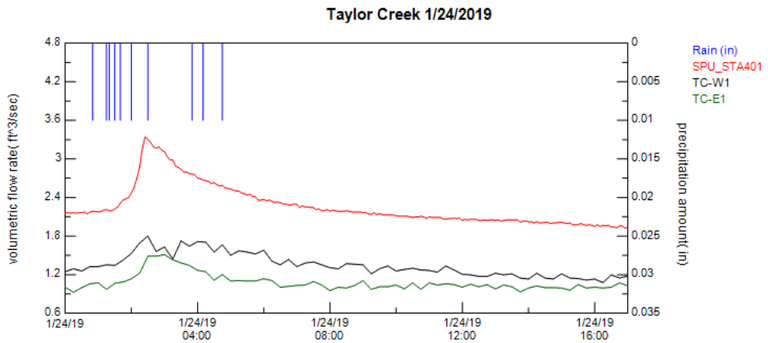


Event 24					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/18/2019 15:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/19/2019 13:30	Start	1/18/2019 15:45	1/18/2019 15:45	1/18/2019 15:50
Duration (hour)	21.667	Stop	1/20/2019 1:25	1/20/2019 1:25	1/20/2019 1:25
Total (in)	0.37	Duration (hour)	33.75	33.75	33.6667
Average Intensity (in/hr)	0.017	Average (ft^3/sec)	2.1072	1.1502	1.0657
Maximum (in)	0.02	Maximum (ft^3/sec)	6.8008	2.4609	4.4399
Maximum Intensity (in/hr)	0.24	Volume (cf)	256018.7969	139751.1719	129159.1016
Antecedent Dry Period (hour)	15.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

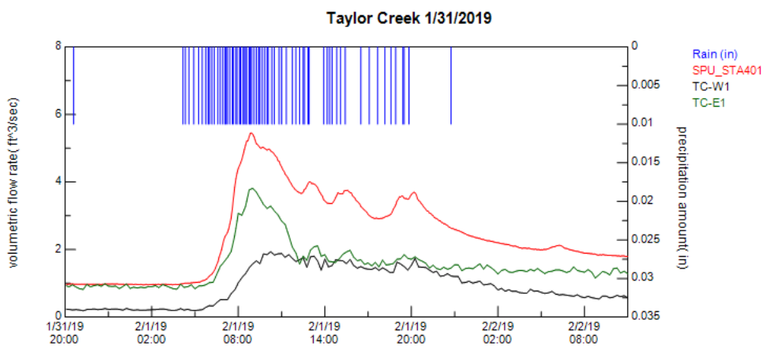
Table E-1. Delineated Storm Events



Event 25					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/22/2019 13:30	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/23/2019 10:10	Start	1/22/2019 13:25	1/22/2019 13:30	1/22/2019 13:25
Duration (hour)	20.667	Stop	1/23/2019 22:05	1/23/2019 22:05	1/23/2019 22:05
Total (in)	0.94	Duration (hour)	32.75	32.6667	32.75
Average Intensity (in/hr)	0.045	Average (ft^3/sec)	4.2477	2.4388	2.0417
Maximum (in)	0.04	Maximum (ft^3/sec)	13.4986	5.6716	8.8467
Maximum Intensity (in/hr)	0.48	Volume (cf)	500804.4688	286802.875	240713.9219
Antecedent Dry Period (hour)	30.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

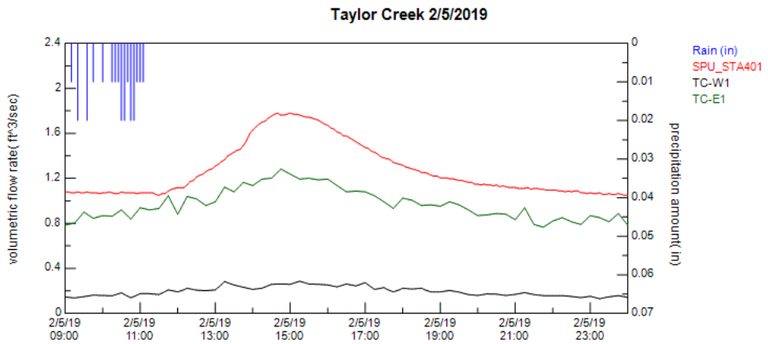


Event 26					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/24/2019 0:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	1/24/2019 4:45	Start	1/24/2019 0:45	1/24/2019 0:45	1/24/2019 0:50
Duration (hour)	3.917	Stop	1/24/2019 16:40	1/24/2019 16:40	1/24/2019 16:40
Total (in)	0.1	Duration (hour)	16	16	15.9167
Average Intensity (in/hr)	0.025	Average (ft^3/sec)	2.2756	1.3545	1.0847
Maximum (in)	0.01	Maximum (ft^3/sec)	3.3418	1.8008	1.5117
Maximum Intensity (in/hr)	0.12	Volume (cf)	131072.6094	78020.1719	62151.293
Antecedent Dry Period (hour)	14.7	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

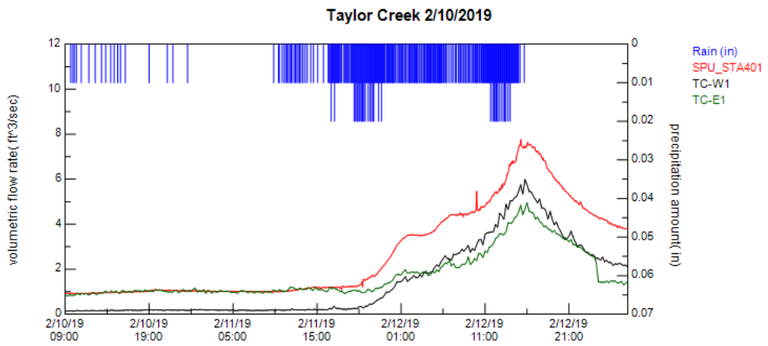


Event 27					
Rainfall Statistics		Flow/Sample Statistics			
Start	1/31/2019 20:35	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/1/2019 22:45	Start	1/31/2019 20:35	1/31/2019 20:35	1/31/2019 20:35
Duration (hour)	26.167	Stop	2/2/2019 10:40	2/2/2019 10:40	2/2/2019 10:40
Total (in)	0.69	Duration (hour)	38.1667	38.1667	38.1667
Average Intensity (in/hr)	0.026	Average (ft^3/sec)	2.4689	0.9268	1.5478
Maximum (in)	0.01	Maximum (ft^3/sec)	5.4552	1.9399	3.8167
Maximum Intensity (in/hr)	0.12	Volume (cf)	339225.1875	127342.0938	212674.1875
Antecedent Dry Period (hour)	183.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

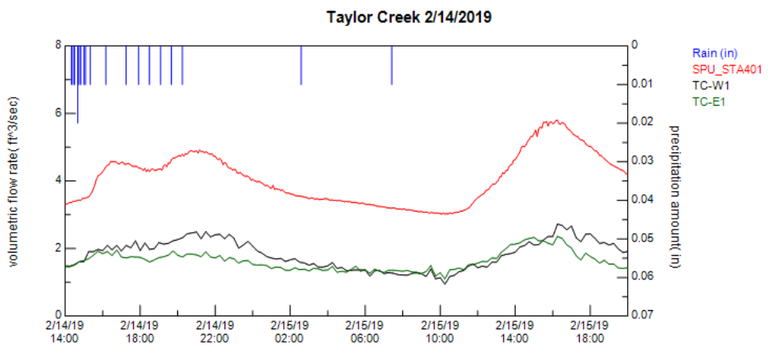
Table E-1. Delineated Storm Events



Event 28					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/5/2019 9:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/5/2019 11:05	Start	2/5/2019 9:10	2/5/2019 9:10	2/5/2019 9:10
Duration (hour)	1.917	Stop	2/5/2019 23:00	2/5/2019 23:05	2/5/2019 23:00
Total (in)	0.22	Duration (hour)	13.9167	14	13.9167
Average Intensity (in/hr)	0.115	Average (ft^3/sec)	1.291	0.2007	0.9842
Maximum (in)	0.02	Maximum (ft^3/sec)	1.7801	0.2864	1.283
Maximum Intensity (in/hr)	0.24	Volume (cf)	64681.1172	10113.4521	49306.5234
Antecedent Dry Period (hour)	40.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

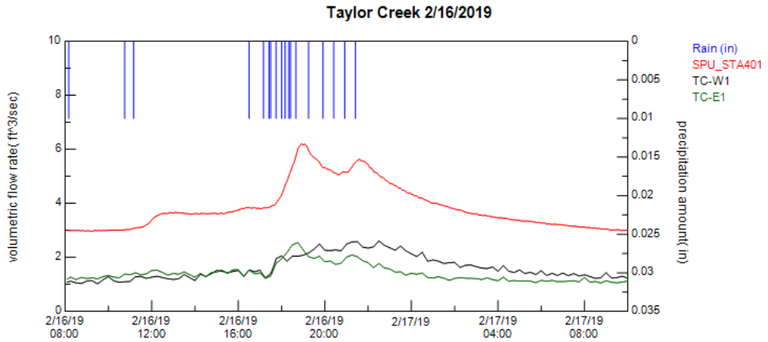


Event 29					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/10/2019 9:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/12/2019 15:40	Start	2/10/2019 9:40	2/10/2019 9:40	2/10/2019 9:40
Duration (hour)	54	Stop	2/13/2019 3:40	2/13/2019 3:40	2/13/2019 3:40
Total (in)	2.99	Duration (hour)	66.0833	66.0833	66.0833
Average Intensity (in/hr)	0.055	Average (ft^3/sec)	2.7235	1.462	1.7456
Maximum (in)	0.02	Maximum (ft^3/sec)	7.7673	5.9901	4.9604
Maximum Intensity (in/hr)	0.24	Volume (cf)	647926.125	347808.625	415275.4375
Antecedent Dry Period (hour)	17.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

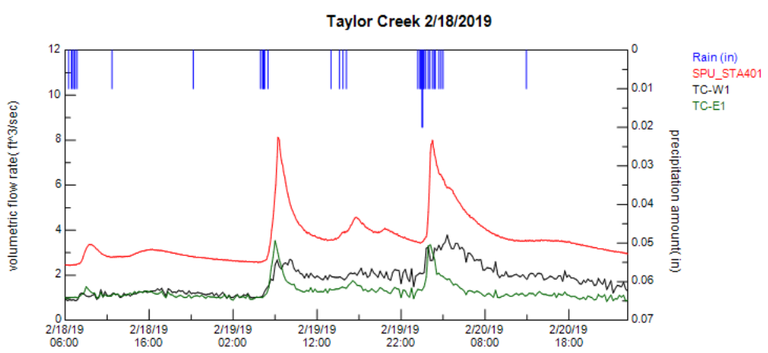


Event 30					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/14/2019 14:20	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/15/2019 7:25	Start	2/14/2019 14:20	2/14/2019 14:15	2/14/2019 14:20
Duration (hour)	17.083	Stop	2/15/2019 19:25	2/15/2019 19:25	2/15/2019 19:25
Total (in)	0.19	Duration (hour)	29.1667	29.25	29.1667
Average Intensity (in/hr)	0.011	Average (ft^3/sec)	4.0901	1.8335	1.6408
Maximum (in)	0.02	Maximum (ft^3/sec)	5.805	2.7267	2.361
Maximum Intensity (in/hr)	0.24	Volume (cf)	429461.5938	193071.9375	172278.9219
Antecedent Dry Period (hour)	29.9	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

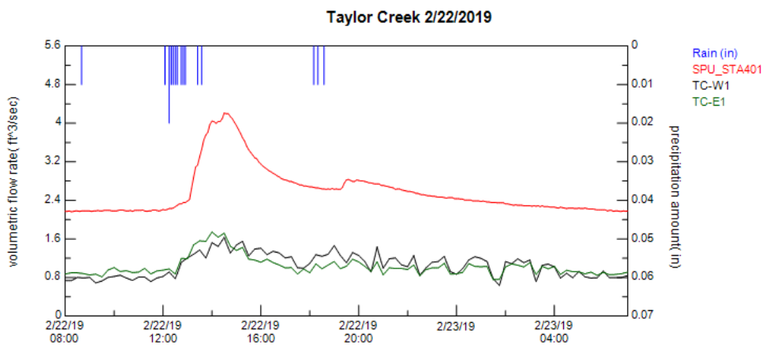
Table E-1. Delineated Storm Events



Event 31					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/16/2019 8:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/16/2019 21:25	Start	2/16/2019 8:10	2/16/2019 8:10	2/16/2019 8:10
Duration (hour)	13.25	Stop	2/17/2019 9:20	2/17/2019 9:20	2/17/2019 9:20
Total (in)	0.18	Duration (hour)	25.25	25.25	25.25
Average Intensity (in/hr)	0.014	Average (ft^3/sec)	3.8818	1.634	1.4245
Maximum (in)	0.01	Maximum (ft^3/sec)	6.207	2.6121	2.5492
Maximum Intensity (in/hr)	0.12	Volume (cf)	352854.8438	148528.2344	129485.9688
Antecedent Dry Period (hour)	24.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

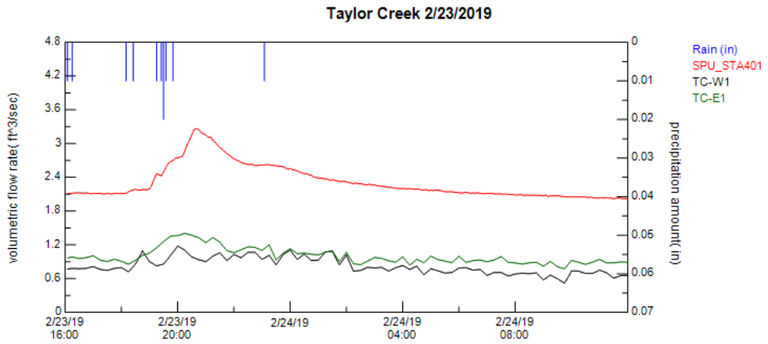


Event 32					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/18/2019 6:25	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/20/2019 12:55	Start	2/18/2019 6:20	2/18/2019 6:20	2/18/2019 6:20
Duration (hour)	54.5	Stop	2/21/2019 0:55	2/21/2019 0:55	2/21/2019 0:55
Total (in)	0.38	Duration (hour)	66.6667	66.6667	66.6667
Average Intensity (in/hr)	0.007	Average (ft^3/sec)	3.6424	1.7888	1.2781
Maximum (in)	0.02	Maximum (ft^3/sec)	8.1301	3.7842	3.5353
Maximum Intensity (in/hr)	0.24	Volume (cf)	874187.8125	429310.1875	306737.5625
Antecedent Dry Period (hour)	33	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

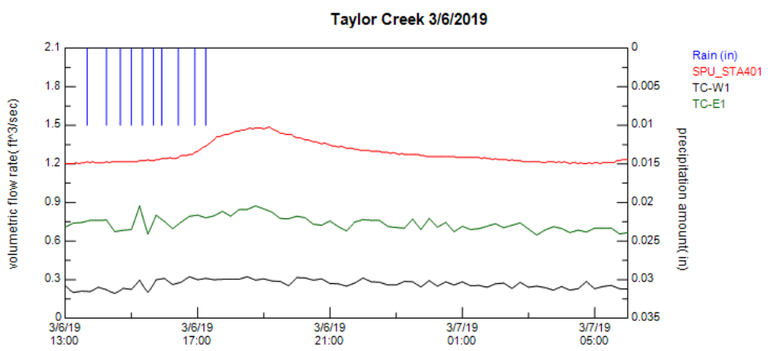


Event 33					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/22/2019 8:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/22/2019 18:35	Start	2/22/2019 8:35	2/22/2019 8:35	2/22/2019 8:40
Duration (hour)	9.917	Stop	2/23/2019 6:30	2/23/2019 6:30	2/23/2019 6:30
Total (in)	0.16	Duration (hour)	22	22	21.9167
Average Intensity (in/hr)	0.016	Average (ft^3/sec)	2.5997	1.0645	1.039
Maximum (in)	0.02	Maximum (ft^3/sec)	4.2093	1.632	1.7438
Maximum Intensity (in/hr)	0.24	Volume (cf)	205894.375	84306.0703	81973.9375
Antecedent Dry Period (hour)	43.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

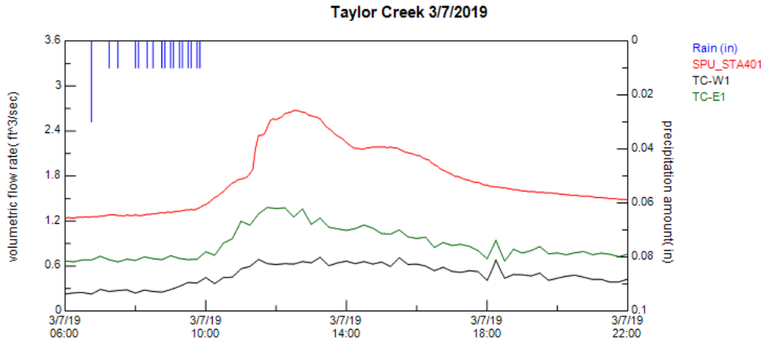
Table E-1. Delineated Storm Events



Event 34					
Rainfall Statistics		Flow/Sample Statistics			
Start	2/23/2019 16:05	Station	SPU_STA401	TC-W1	TC-E1
Stop	2/23/2019 23:05	Start	2/23/2019 16:05	2/23/2019 16:05	2/23/2019 16:05
Duration (hour)	7	Stop	2/24/2019 11:05	2/24/2019 11:00	2/24/2019 11:00
Total (in)	0.11	Duration (hour)	19.0833	19	19
Average Intensity (in/hr)	0.016	Average (ft^3/sec)	2.328	0.8356	1.0047
Maximum (in)	0.02	Maximum (ft^3/sec)	3.2631	1.1802	1.4058
Maximum Intensity (in/hr)	0.24	Volume (cf)	159932.8125	57155.4609	68722.4141
Antecedent Dry Period (hour)	21.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

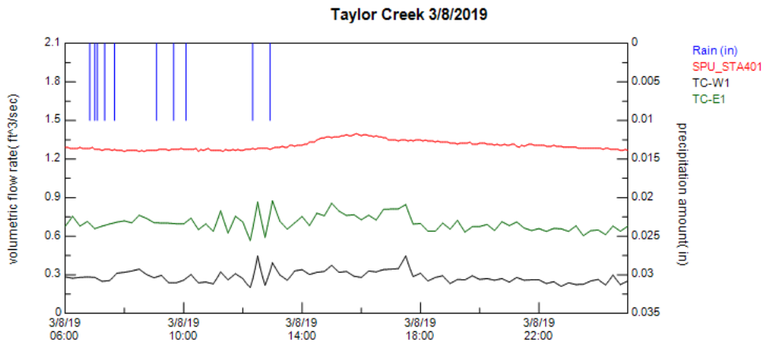


Event 35					
Rainfall Statistics		Flow/Sample Statistics			
Start	3/6/2019 13:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	3/6/2019 17:15	Start	3/6/2019 13:40	3/6/2019 13:40	3/6/2019 13:40
Duration (hour)	3.583	Stop	3/7/2019 5:10	3/7/2019 5:10	3/7/2019 5:10
Total (in)	0.1	Duration (hour)	15.5833	15.5833	15.5833
Average Intensity (in/hr)	0.028	Average (ft^3/sec)	1.2913	0.2689	0.7419
Maximum (in)	0.01	Maximum (ft^3/sec)	1.4886	0.3233	0.874
Maximum Intensity (in/hr)	0.12	Volume (cf)	72444.6641	15083.8096	41619.2578
Antecedent Dry Period (hour)	254.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

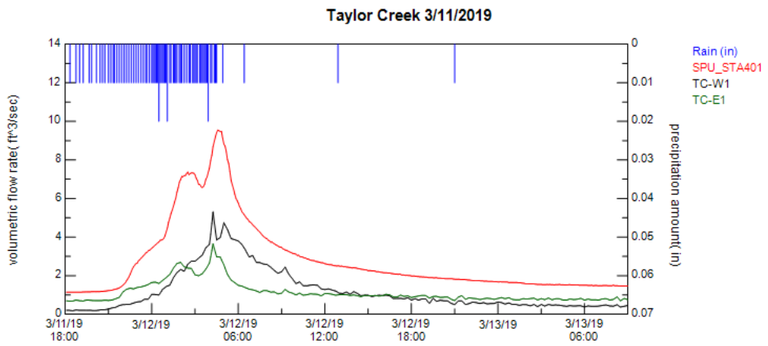


Event 36					
Rainfall Statistics		Flow/Sample Statistics			
Start	3/7/2019 6:45	Station	SPU_STA401	TC-W1	TC-E1
Stop	3/7/2019 9:50	Start	3/7/2019 6:40	3/7/2019 6:40	3/7/2019 6:40
Duration (hour)	3.083	Stop	3/7/2019 21:45	3/7/2019 21:45	3/7/2019 21:45
Total (in)	0.19	Duration (hour)	15.1667	15.1667	15.1667
Average Intensity (in/hr)	0.062	Average (ft^3/sec)	1.7957	0.4928	0.912
Maximum (in)	0.03	Maximum (ft^3/sec)	2.6741	0.7172	1.3816
Maximum Intensity (in/hr)	0.36	Volume (cf)	98047.3281	26905.3594	49795.2617
Antecedent Dry Period (hour)	13.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

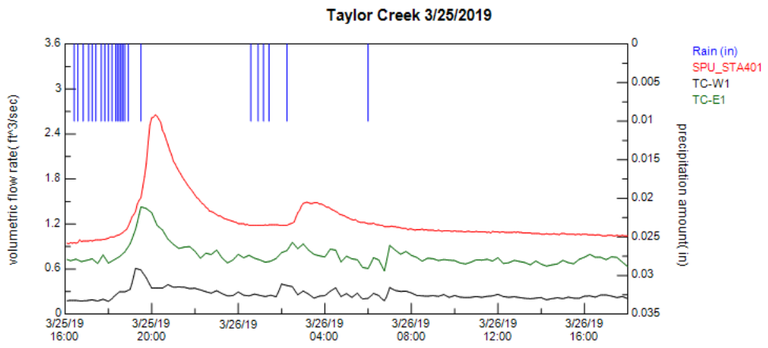
Table E-1. Delineated Storm Events



Event 37					
Rainfall Statistics		Flow/Sample Statistics			
Start	3/8/2019 6:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	3/8/2019 12:55	Start	3/8/2019 6:50	3/8/2019 6:50	3/8/2019 6:45
Duration (hour)	6.083	Stop	3/9/2019 0:55	3/9/2019 0:55	3/9/2019 0:55
Total (in)	0.1	Duration (hour)	18.1667	18.1667	18.25
Average Intensity (in/hr)	0.016	Average (ft^3/sec)	1.3067	0.2841	0.7033
Maximum (in)	0.01	Maximum (ft^3/sec)	1.3981	0.4472	0.8762
Maximum Intensity (in/hr)	0.12	Volume (cf)	85455.2188	18580.084	46208.6836
Antecedent Dry Period (hour)	21	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

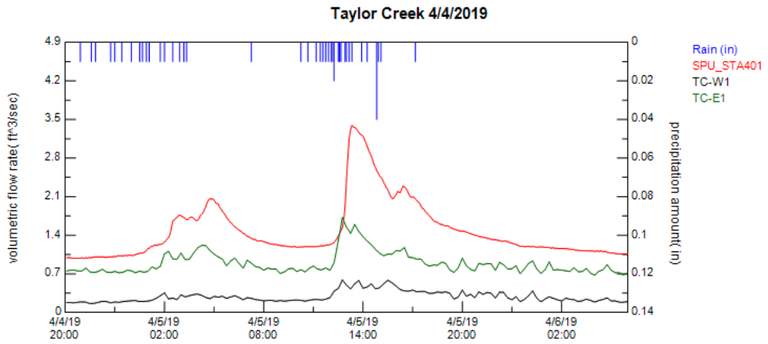


Event 38					
Rainfall Statistics		Flow/Sample Statistics			
Start	3/11/2019 18:20	Station	SPU_STA401	TC-W1	TC-E1
Stop	3/12/2019 21:00	Start	3/11/2019 18:20	3/11/2019 18:20	3/11/2019 18:20
Duration (hour)	26.667	Stop	3/13/2019 9:00	3/13/2019 8:55	3/13/2019 8:55
Total (in)	0.81	Duration (hour)	38.75	38.6667	38.6667
Average Intensity (in/hr)	0.03	Average (ft^3/sec)	2.8354	1.2105	1.1394
Maximum (in)	0.02	Maximum (ft^3/sec)	9.5446	5.3043	3.6486
Maximum Intensity (in/hr)	0.24	Volume (cf)	395536.125	168502.2031	158601.4844
Antecedent Dry Period (hour)	77.4	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

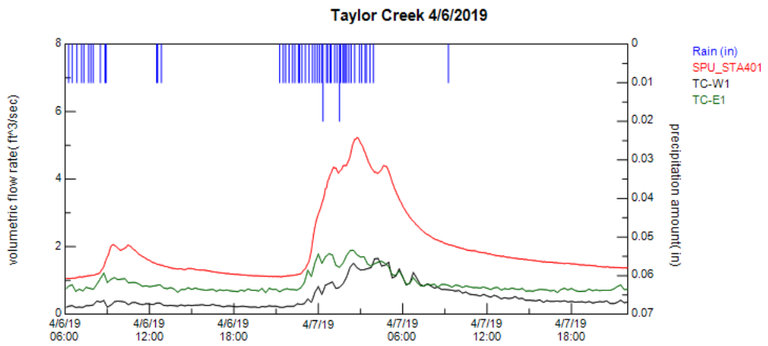


Event 39					
Rainfall Statistics		Flow/Sample Statistics			
Start	3/25/2019 16:25	Station	SPU_STA401	TC-W1	TC-E1
Stop	3/26/2019 6:00	Start	3/25/2019 16:25	3/25/2019 16:25	3/25/2019 16:25
Duration (hour)	13.583	Stop	3/26/2019 17:55	3/26/2019 17:55	3/26/2019 18:00
Total (in)	0.24	Duration (hour)	25.5833	25.5833	25.6667
Average Intensity (in/hr)	0.018	Average (ft^3/sec)	1.2579	0.2667	0.7842
Maximum (in)	0.01	Maximum (ft^3/sec)	2.6565	0.6095	1.43
Maximum Intensity (in/hr)	0.12	Volume (cf)	115849.9844	24561.8223	72459.1172
Antecedent Dry Period (hour)	307.4	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

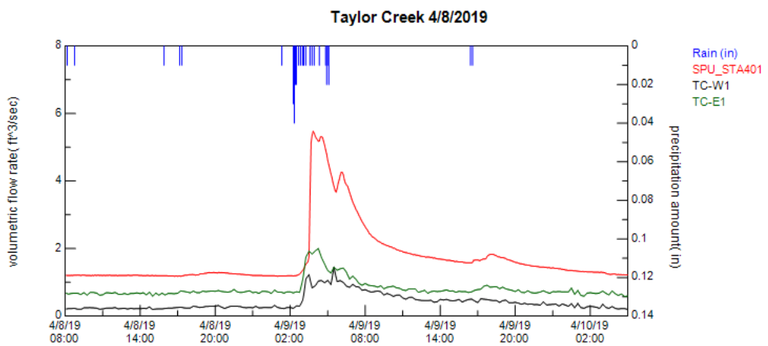
Table E-1. Delineated Storm Events



Event 40					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/4/2019 20:55	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/5/2019 17:10	Start	4/4/2019 20:55	4/4/2019 20:55	4/4/2019 20:55
Duration (hour)	20.25	Stop	4/6/2019 5:10	4/6/2019 5:10	4/6/2019 5:10
Total (in)	0.45	Duration (hour)	32.3333	32.3333	32.3333
Average Intensity (in/hr)	0.022	Average (ft^3/sec)	1.496	0.2917	0.8989
Maximum (in)	0.04	Maximum (ft^3/sec)	3.3962	0.59	1.7223
Maximum Intensity (in/hr)	0.48	Volume (cf)	174131.3438	33948.3594	104629.6797
Antecedent Dry Period (hour)	36.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

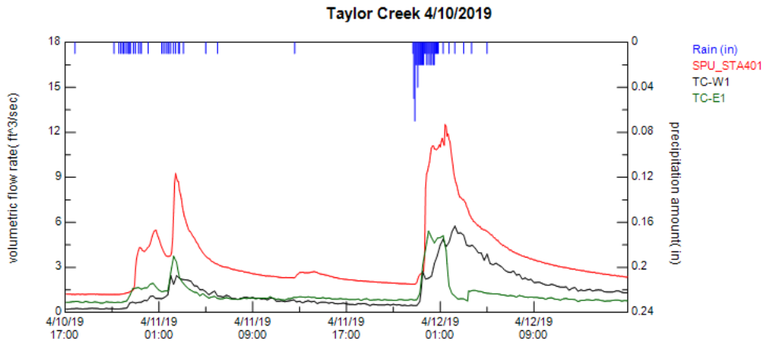


Event 41					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/6/2019 6:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/7/2019 9:15	Start	4/6/2019 6:10	4/6/2019 6:15	4/6/2019 6:10
Duration (hour)	27	Stop	4/7/2019 21:10	4/7/2019 21:10	4/7/2019 21:10
Total (in)	0.55	Duration (hour)	39.0833	39	39.0833
Average Intensity (in/hr)	0.02	Average (ft^3/sec)	1.9934	0.5271	0.918
Maximum (in)	0.02	Maximum (ft^3/sec)	5.2379	1.6531	1.8957
Maximum Intensity (in/hr)	0.24	Volume (cf)	280477.5	74010.5391	129164.0234
Antecedent Dry Period (hour)	13.1	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

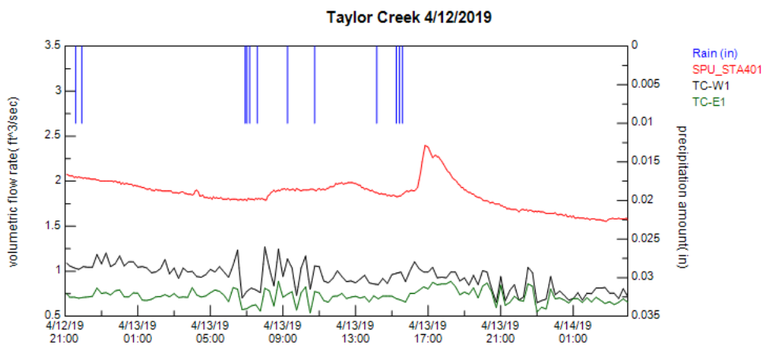


Event 42					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/8/2019 8:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/9/2019 16:35	Start	4/8/2019 8:10	4/8/2019 8:10	4/8/2019 8:10
Duration (hour)	32.417	Stop	4/10/2019 4:30	4/10/2019 4:30	4/10/2019 4:30
Total (in)	0.34	Duration (hour)	44.4167	44.4167	44.4167
Average Intensity (in/hr)	0.01	Average (ft^3/sec)	1.7067	0.4149	0.8058
Maximum (in)	0.04	Maximum (ft^3/sec)	5.4725	1.4542	2.0025
Maximum Intensity (in/hr)	0.48	Volume (cf)	272899.5	66342.0391	128844.8828
Antecedent Dry Period (hour)	22.9	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

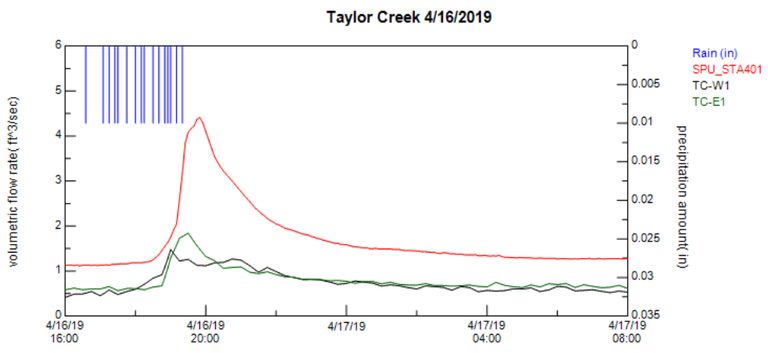
Table E-1. Delineated Storm Events



Event 43					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/10/2019 17:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/12/2019 5:00	Start	4/10/2019 17:45	4/10/2019 17:45	4/10/2019 17:45
Duration (hour)	35.167	Stop	4/12/2019 17:00	4/12/2019 17:00	4/12/2019 17:00
Total (in)	0.91	Duration (hour)	47.3333	47.3333	47.3333
Average Intensity (in/hr)	0.026	Average (ft^3/sec)	3.554	1.4942	1.2133
Maximum (in)	0.07	Maximum (ft^3/sec)	12.5182	5.7562	5.4257
Maximum Intensity (in/hr)	0.84	Volume (cf)	605602.25	254615.3438	206752.7188
Antecedent Dry Period (hour)	25.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

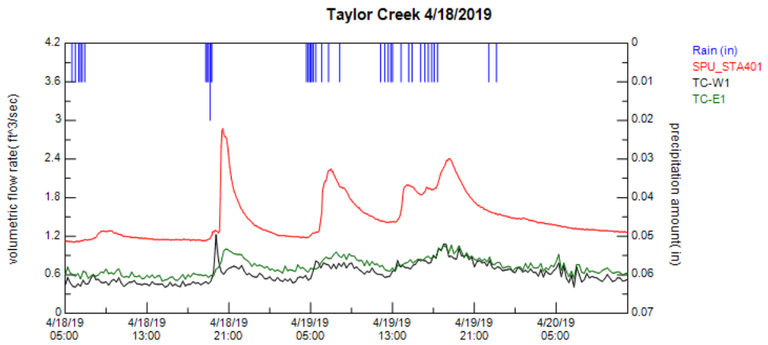


Event 44					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/12/2019 21:35	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/13/2019 15:35	Start	4/12/2019 21:30	4/12/2019 21:30	4/12/2019 21:30
Duration (hour)	18	Stop	4/14/2019 3:30	4/14/2019 3:30	4/14/2019 3:30
Total (in)	0.12	Duration (hour)	30.0833	30.0833	30.0833
Average Intensity (in/hr)	0.007	Average (ft^3/sec)	1.8577	0.9319	0.7239
Maximum (in)	0.01	Maximum (ft^3/sec)	2.3982	1.2707	0.8883
Maximum Intensity (in/hr)	0.12	Volume (cf)	201183.7031	100927.1016	78403.2656
Antecedent Dry Period (hour)	16.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

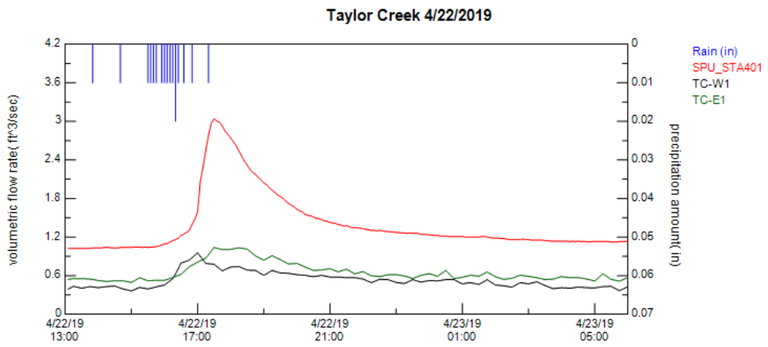


Event 45					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/16/2019 16:35	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/16/2019 19:20	Start	4/16/2019 16:30	4/16/2019 16:30	4/16/2019 16:30
Duration (hour)	2.75	Stop	4/17/2019 7:15	4/17/2019 7:15	4/17/2019 7:15
Total (in)	0.16	Duration (hour)	14.8333	14.8333	14.8333
Average Intensity (in/hr)	0.058	Average (ft^3/sec)	1.7417	0.768	0.8147
Maximum (in)	0.01	Maximum (ft^3/sec)	4.4086	1.4779	1.8418
Maximum Intensity (in/hr)	0.12	Volume (cf)	93005.2734	41013.4727	43504.1641
Antecedent Dry Period (hour)	44.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

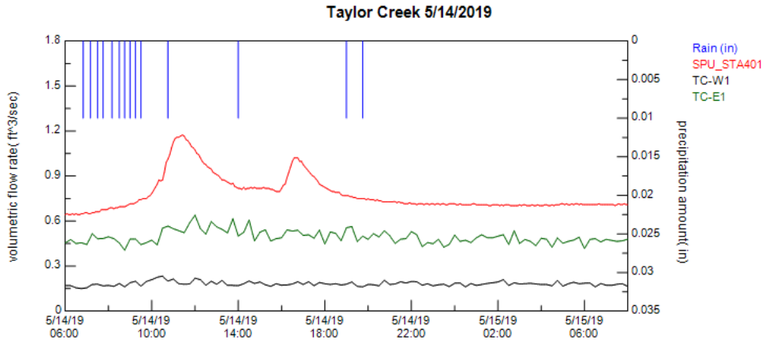
Table E-1. Delineated Storm Events



Event 46					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/18/2019 5:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/19/2019 23:10	Start	4/18/2019 5:35	4/18/2019 5:35	4/18/2019 5:35
Duration (hour)	41.5	Stop	4/20/2019 11:10	4/20/2019 11:10	4/20/2019 11:10
Total (in)	0.39	Duration (hour)	53.6667	53.6667	53.6667
Average Intensity (in/hr)	0.009	Average (ft^3/sec)	1.4839	0.6274	0.7279
Maximum (in)	0.02	Maximum (ft^3/sec)	2.8743	1.2248	1.0622
Maximum Intensity (in/hr)	0.24	Volume (cf)	286680.8438	121214.4531	140631.125
Antecedent Dry Period (hour)	34.3	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

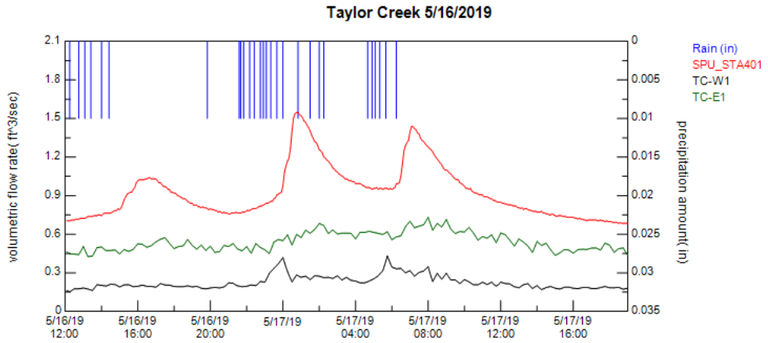


Event 47					
Rainfall Statistics		Flow/Sample Statistics			
Start	4/22/2019 13:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	4/22/2019 17:20	Start	4/22/2019 13:50	4/22/2019 13:50	4/22/2019 13:50
Duration (hour)	3.5	Stop	4/23/2019 5:15	4/23/2019 5:15	4/23/2019 5:15
Total (in)	0.17	Duration (hour)	15.5	15.5	15.5
Average Intensity (in/hr)	0.049	Average (ft^3/sec)	1.4241	0.5414	0.6607
Maximum (in)	0.02	Maximum (ft^3/sec)	3.0384	0.9579	1.0381
Maximum Intensity (in/hr)	0.24	Volume (cf)	79465.2344	30210.9824	36866
Antecedent Dry Period (hour)	62.7	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

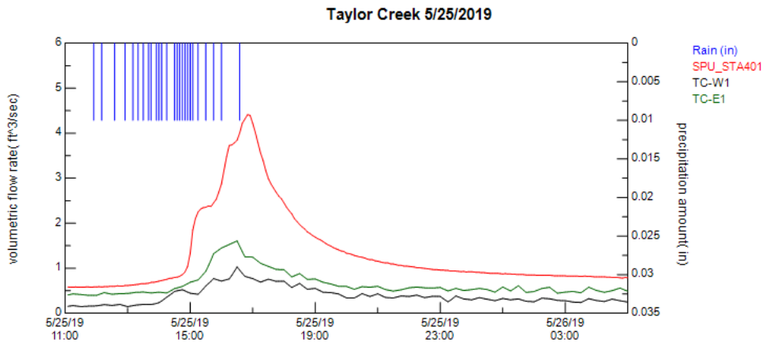


Event 48					
Rainfall Statistics		Flow/Sample Statistics			
Start	5/14/2019 6:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	5/14/2019 19:45	Start	5/14/2019 6:45	5/14/2019 6:45	5/14/2019 6:45
Duration (hour)	12.917	Stop	5/15/2019 7:40	5/15/2019 7:40	5/15/2019 7:40
Total (in)	0.14	Duration (hour)	25	25	25
Average Intensity (in/hr)	0.011	Average (ft^3/sec)	0.7826	0.1827	0.4952
Maximum (in)	0.01	Maximum (ft^3/sec)	1.1745	0.2336	0.6398
Maximum Intensity (in/hr)	0.12	Volume (cf)	70431.6094	16447.0293	44563.9297
Antecedent Dry Period (hour)	408.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

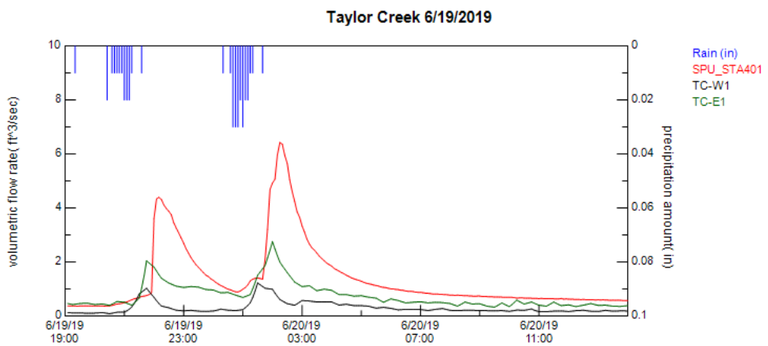
Table E-1. Delineated Storm Events



Event 49					
Rainfall Statistics		Flow/Sample Statistics			
Start	5/16/2019 12:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	5/17/2019 6:15	Start	5/16/2019 12:10	5/16/2019 12:10	5/16/2019 12:10
Duration (hour)	18	Stop	5/17/2019 18:10	5/17/2019 18:10	5/17/2019 18:10
Total (in)	0.28	Duration (hour)	30.0833	30.0833	30.0833
Average Intensity (in/hr)	0.016	Average (ft^3/sec)	0.9319	0.2277	0.5461
Maximum (in)	0.01	Maximum (ft^3/sec)	1.5474	0.4314	0.7315
Maximum Intensity (in/hr)	0.12	Volume (cf)	100922.6562	24663.9121	59137.7227
Antecedent Dry Period (hour)	16.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

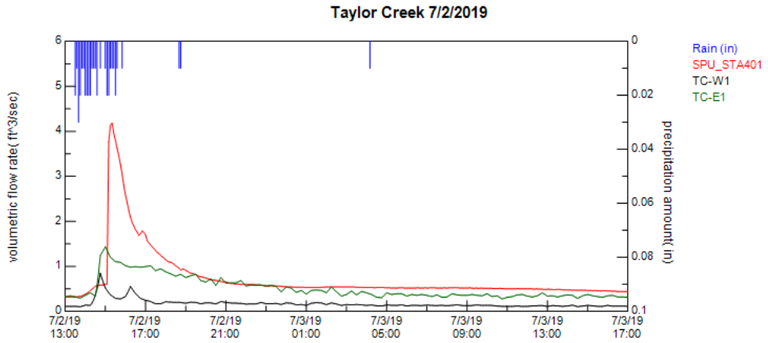


Event 50					
Rainfall Statistics		Flow/Sample Statistics			
Start	5/25/2019 11:55	Station	SPU_STA401	TC-W1	TC-E1
Stop	5/25/2019 16:35	Start	5/25/2019 11:55	5/25/2019 11:55	5/25/2019 11:55
Duration (hour)	4.667	Stop	5/26/2019 4:30	5/26/2019 4:30	5/26/2019 4:30
Total (in)	0.26	Duration (hour)	16.6667	16.6667	16.6667
Average Intensity (in/hr)	0.056	Average (ft^3/sec)	1.3885	0.4082	0.66
Maximum (in)	0.01	Maximum (ft^3/sec)	4.4109	1.0296	1.6078
Maximum Intensity (in/hr)	0.12	Volume (cf)	83309.9453	24491.6152	39597.4727
Antecedent Dry Period (hour)	24.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

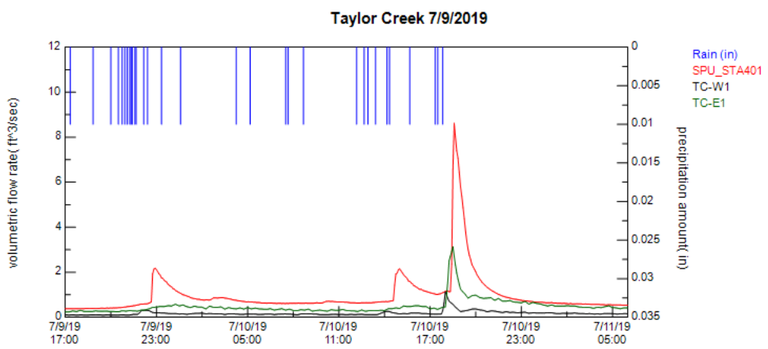


Event 51					
Rainfall Statistics		Flow/Sample Statistics			
Start	6/19/2019 19:20	Station	SPU_STA401	TC-W1	TC-E1
Stop	6/20/2019 1:40	Start	6/19/2019 19:15	6/19/2019 19:15	6/19/2019 19:15
Duration (hour)	6.333	Stop	6/20/2019 13:40	6/20/2019 13:40	6/20/2019 13:40
Total (in)	0.39	Duration (hour)	18.5	18.5	18.5
Average Intensity (in/hr)	0.062	Average (ft^3/sec)	1.3942	0.3189	0.764
Maximum (in)	0.03	Maximum (ft^3/sec)	6.4315	1.2315	2.7569
Maximum Intensity (in/hr)	0.36	Volume (cf)	92851.4922	21239.8848	50883.8828
Antecedent Dry Period (hour)	30.3	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

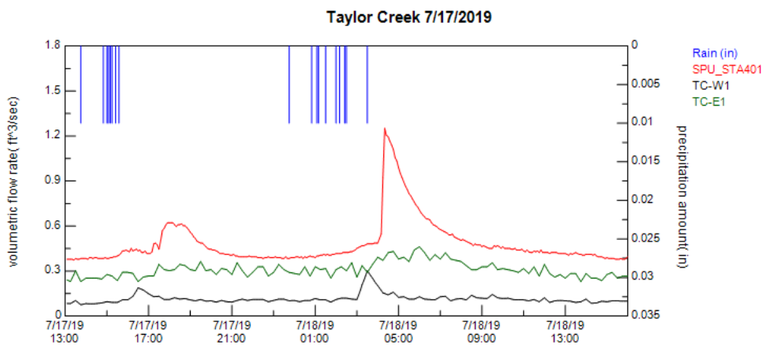
Table E-1. Delineated Storm Events



Event 52					
Rainfall Statistics		Flow/Sample Statistics			
Start	7/2/2019 13:30	Station	SPU_STA401	TC-W1	TC-E1
Stop	7/3/2019 4:10	Start	7/2/2019 13:25	7/2/2019 13:25	7/2/2019 13:25
Duration (hour)	14.667	Stop	7/3/2019 16:05	7/3/2019 16:05	7/3/2019 16:05
Total (in)	0.39	Duration (hour)	26.75	26.75	26.75
Average Intensity (in/hr)	0.027	Average (ft^3/sec)	0.7387	0.1755	0.524
Maximum (in)	0.03	Maximum (ft^3/sec)	4.1836	0.8492	1.4353
Maximum Intensity (in/hr)	0.36	Volume (cf)	71138.6406	16905.0117	50460.082
Antecedent Dry Period (hour)	126.6	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

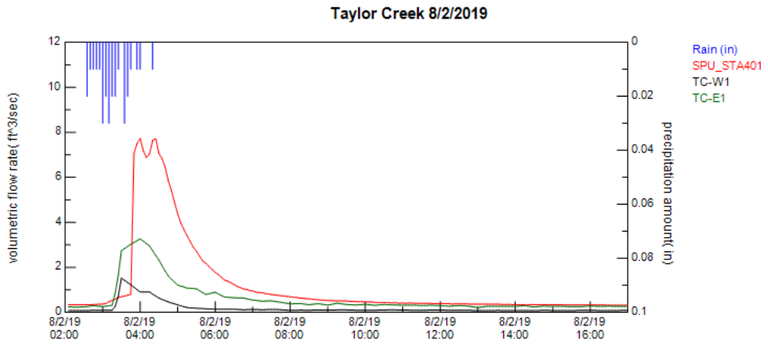


Event 53					
Rainfall Statistics		Flow/Sample Statistics			
Start	7/9/2019 17:20	Station	SPU_STA401	TC-W1	TC-E1
Stop	7/10/2019 17:50	Start	7/9/2019 17:15	7/9/2019 17:15	7/9/2019 17:20
Duration (hour)	24.5	Stop	7/11/2019 5:45	7/11/2019 5:45	7/11/2019 5:45
Total (in)	0.31	Duration (hour)	36.5833	36.5833	36.5
Average Intensity (in/hr)	0.013	Average (ft^3/sec)	0.9704	0.1778	0.4874
Maximum (in)	0.01	Maximum (ft^3/sec)	8.6239	1.1295	3.1326
Maximum Intensity (in/hr)	0.12	Volume (cf)	127805.4766	23419.248	64042.6797
Antecedent Dry Period (hour)	35.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

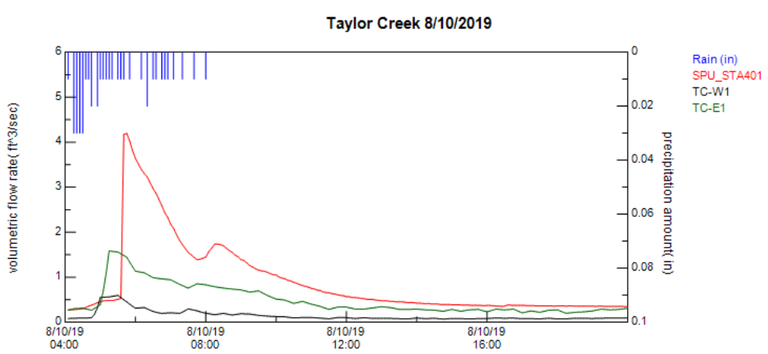


Event 54					
Rainfall Statistics		Flow/Sample Statistics			
Start	7/17/2019 13:45	Station	SPU_STA401	TC-W1	TC-E1
Stop	7/18/2019 3:30	Start	7/17/2019 13:40	7/17/2019 13:40	7/17/2019 13:45
Duration (hour)	13.75	Stop	7/18/2019 15:30	7/18/2019 15:30	7/18/2019 15:30
Total (in)	0.18	Duration (hour)	25.9167	25.9167	25.8333
Average Intensity (in/hr)	0.013	Average (ft^3/sec)	0.4838	0.1161	0.3121
Maximum (in)	0.01	Maximum (ft^3/sec)	1.2517	0.3028	0.4625
Maximum Intensity (in/hr)	0.12	Volume (cf)	45143.082	10832.6074	29028.498
Antecedent Dry Period (hour)	50.5	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

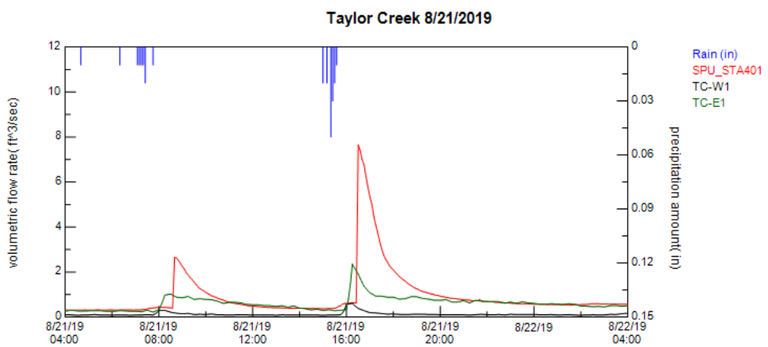
Table E-1. Delineated Storm Events



Event 55					
Rainfall Statistics		Flow/Sample Statistics			
Start	8/2/2019 2:35	Station	SPU_STA401	TC-W1	TC-E1
Stop	8/2/2019 4:20	Start	8/2/2019 2:35	8/2/2019 2:35	8/2/2019 2:35
Duration (hour)	1.75	Stop	8/2/2019 16:15	8/2/2019 16:20	8/2/2019 16:15
Total (in)	0.28	Duration (hour)	13.75	13.8333	13.75
Average Intensity (in/hr)	0.16	Average (ft^3/sec)	1.2445	0.1953	0.6554
Maximum (in)	0.03	Maximum (ft^3/sec)	7.7249	1.5237	3.2697
Maximum Intensity (in/hr)	0.36	Volume (cf)	61605.1211	9728.2266	32443.3809
Antecedent Dry Period (hour)	339.1	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

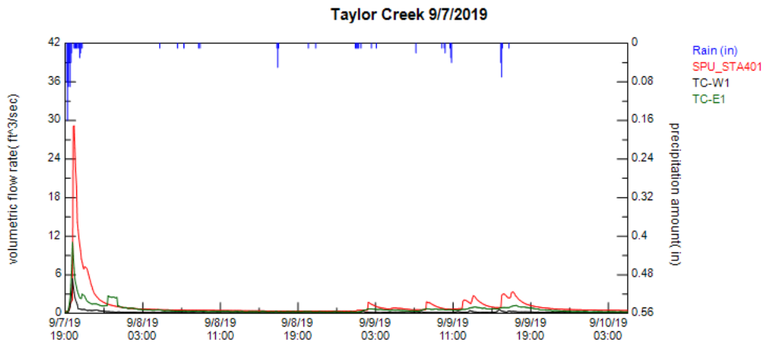


Event 56					
Rainfall Statistics		Flow/Sample Statistics			
Start	8/10/2019 4:00	Station	SPU_STA401	TC-W1	TC-E1
Stop	8/10/2019 8:00	Start	8/10/2019 3:55	8/10/2019 3:55	8/10/2019 3:55
Duration (hour)	4	Stop	8/10/2019 20:00	8/10/2019 20:00	8/10/2019 20:00
Total (in)	0.41	Duration (hour)	16.1667	16.1667	16.1667
Average Intensity (in/hr)	0.102	Average (ft^3/sec)	0.8861	0.1468	0.489
Maximum (in)	0.03	Maximum (ft^3/sec)	4.1954	0.5975	1.5848
Maximum Intensity (in/hr)	0.36	Volume (cf)	51570.2422	8542.249	28460.8066
Antecedent Dry Period (hour)	191.7	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

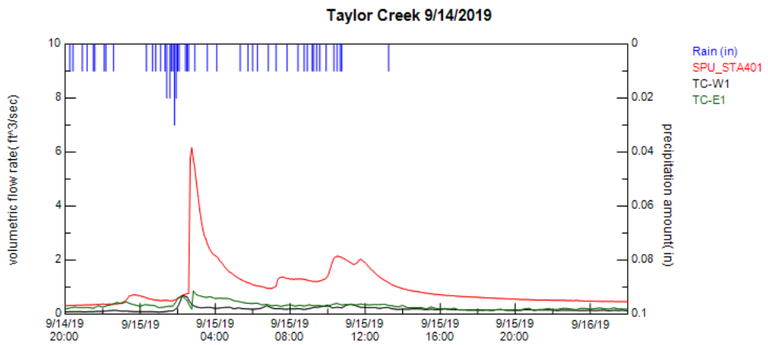


Event 57					
Rainfall Statistics		Flow/Sample Statistics			
Start	8/21/2019 4:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	8/21/2019 15:35	Start	8/21/2019 4:40	8/21/2019 4:40	8/21/2019 4:40
Duration (hour)	10.917	Stop	8/22/2019 3:30	8/22/2019 3:30	8/22/2019 3:30
Total (in)	0.24	Duration (hour)	22.9167	22.9167	22.9167
Average Intensity (in/hr)	0.022	Average (ft^3/sec)	0.9479	0.127	0.6242
Maximum (in)	0.05	Maximum (ft^3/sec)	7.6527	0.6092	2.3557
Maximum Intensity (in/hr)	0.6	Volume (cf)	78203.1484	10480.291	51499.25
Antecedent Dry Period (hour)	260.7	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

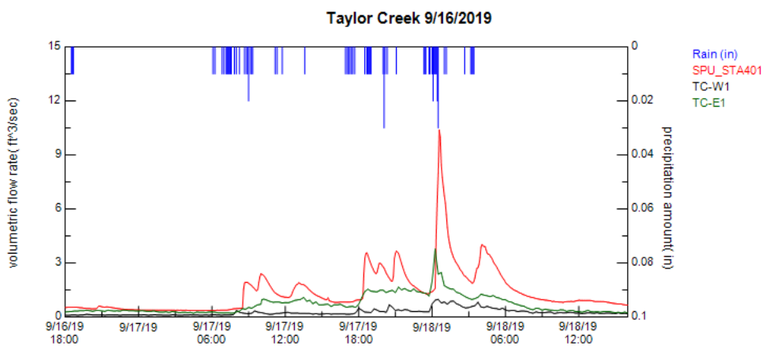
Table E-1. Delineated Storm Events



Event 58					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/7/2019 19:10	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/9/2019 16:45	Start	9/7/2019 19:05	9/7/2019 19:05	9/7/2019 19:10
Duration (hour)	45.583	Stop	9/10/2019 4:40	9/10/2019 4:40	9/10/2019 4:40
Total (in)	1.14	Duration (hour)	57.6667	57.6667	57.5833
Average Intensity (in/hr)	0.025	Average (ft^3/sec)	1.1852	0.2129	0.6519
Maximum (in)	0.16	Maximum (ft^3/sec)	29.1703	5.3687	11.0529
Maximum Intensity (in/hr)	1.92	Volume (cf)	246050.3594	44202.6445	135144.5625
Antecedent Dry Period (hour)	212.1	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

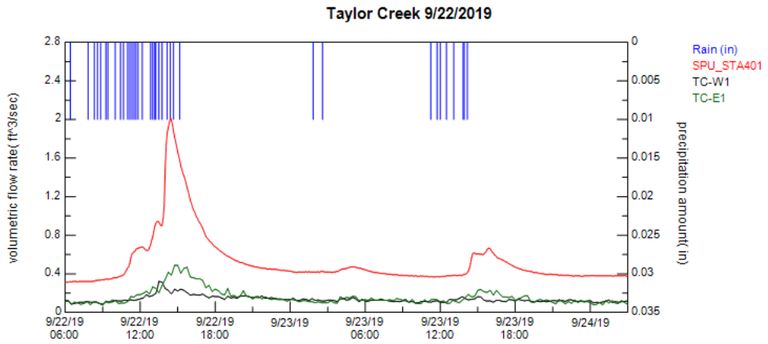


Event 59					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/14/2019 20:15	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/15/2019 13:15	Start	9/14/2019 20:10	9/14/2019 20:10	9/14/2019 20:10
Duration (hour)	17	Stop	9/16/2019 1:15	9/16/2019 1:15	9/16/2019 1:15
Total (in)	0.53	Duration (hour)	29.1667	29.1667	29.1667
Average Intensity (in/hr)	0.031	Average (ft^3/sec)	1.0134	0.1903	0.3069
Maximum (in)	0.03	Maximum (ft^3/sec)	6.1606	0.6946	0.8619
Maximum Intensity (in/hr)	0.36	Volume (cf)	106410.8281	19983.1758	32224.6953
Antecedent Dry Period (hour)	46.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

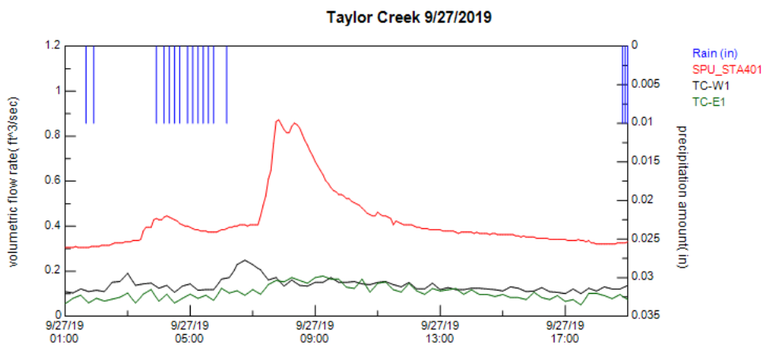


Event 60					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/16/2019 18:30	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/18/2019 3:25	Start	9/16/2019 18:30	9/16/2019 18:30	9/16/2019 18:30
Duration (hour)	32.917	Stop	9/18/2019 15:20	9/18/2019 15:20	9/18/2019 15:20
Total (in)	0.71	Duration (hour)	44.9167	44.9167	44.9167
Average Intensity (in/hr)	0.022	Average (ft^3/sec)	1.4053	0.2713	0.7264
Maximum (in)	0.03	Maximum (ft^3/sec)	10.3876	0.988	3.781
Maximum Intensity (in/hr)	0.36	Volume (cf)	227241.6094	43865.5898	117454.7891
Antecedent Dry Period (hour)	29.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0

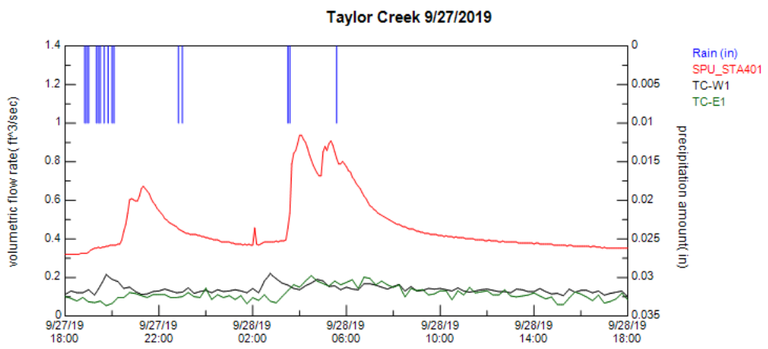
Table E-1. Delineated Storm Events



Event 61					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/22/2019 6:25	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/23/2019 14:10	Start	9/22/2019 6:20	9/22/2019 6:25	9/22/2019 6:20
Duration (hour)	31.75	Stop	9/24/2019 2:10	9/24/2019 2:10	9/24/2019 2:10
Total (in)	0.37	Duration (hour)	43.9167	43.8333	43.9167
Average Intensity (in/hr)	0.012	Average (ft^3/sec)	0.5251	0.1361	0.1589
Maximum (in)	0.01	Maximum (ft^3/sec)	2.0183	0.3216	0.4892
Maximum Intensity (in/hr)	0.12	Volume (cf)	83012.6875	21484.0723	25119.4707
Antecedent Dry Period (hour)	58.8	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0



Event 62					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/27/2019 1:40	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/27/2019 6:10	Start	9/27/2019 1:40	9/27/2019 1:40	9/27/2019 1:40
Duration (hour)	4.5	Stop	9/27/2019 18:10	9/27/2019 18:10	9/27/2019 18:10
Total (in)	0.14	Duration (hour)	16.5833	16.5833	16.5833
Average Intensity (in/hr)	0.031	Average (ft^3/sec)	0.4321	0.1392	0.1077
Maximum (in)	0.01	Maximum (ft^3/sec)	0.8724	0.2492	0.1783
Maximum Intensity (in/hr)	0.12	Volume (cf)	25798.4688	8308.9004	6427.1978
Antecedent Dry Period (hour)	17.2	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0



Event 63					
Rainfall Statistics		Flow/Sample Statistics			
Start	9/27/2019 18:50	Station	SPU_STA401	TC-W1	TC-E1
Stop	9/28/2019 5:35	Start	9/27/2019 18:50	9/27/2019 18:45	9/27/2019 18:45
Duration (hour)	10.75	Stop	9/28/2019 17:35	9/28/2019 17:35	9/28/2019 17:35
Total (in)	0.15	Duration (hour)	22.8333	22.9167	22.9167
Average Intensity (in/hr)	0.014	Average (ft^3/sec)	0.4729	0.1406	0.117
Maximum (in)	0.01	Maximum (ft^3/sec)	0.9374	0.2222	0.2097
Maximum Intensity (in/hr)	0.12	Volume (cf)	38874.4492	11598.6592	9652.5391
Antecedent Dry Period (hour)	12.7	Sample Count (count)	0	0	0
		First Sample Time			
		Last Sample Time			
		Sample Duration (hour)	0	0	0
		Sampled Volume (cf)	0	0	0
		Sample Coverage % (%)	0	0	0
		Average Sampled Flow (ft^3/sec)	0	0	0
		Pacing Volume	0	0	0