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TECHNICAL MEMO

WEST ELK MINE

SUMMARY OF WATER YEAR 2022 SURFACE WATER AND GROUNDWATER QUANTITY AND QUALITY DATA

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1.0 INTRODUCTION

This Mountain Coal Company, LLC (MCC) West Elk Mine 2022 Summary of Water Quantity and Quality Data technical memo summarizes Hydrogeology Solutions Inc.'s (HSI's) hydrologic monitoring activities and pertinent data associated with the West Elk Mine mining operations for the Water Year (WY) 2022 (October 1, 2021 through September 30, 2022). The hydrologic monitoring activities were performed in accordance with the Colorado Division of Reclamation, Mining and Safety (CDRMS) Permit C-1980-007.

2.0 HYDROLOGIC MONITORING PLAN

The MCC hydrologic monitoring program is designed to collect the monitoring data needed to assess mining related impacts on hydrologic resources. CDRMS approved a revised hydrologic monitoring plan for the West Elk Mine permit area in June 2006 (CDRMS, 2006), that was implemented from the latter months of WY 2006 through WY 2016. The hydrologic monitoring plan was again revised (Technical Revision No. 139), was approved by CDRMS in October 2016 (CDRMS, 2016) and was implemented in WYs 2017 to 2022. The Sunset Trail hydrology monitoring plan was added with Permit Revision No. PR-15 in 2018.

The hydrologic monitoring plan for the permit area includes monitoring surface water resources, springs and seeps, groundwater resources, the coal refuse pile underdrains, and pertinent mine water resources. The locations of these hydrologic resources are shown on Permit Map 34 (CDRMS, 2016). Routine monitoring, i.e., subsequent to the baseline monitoring period, includes collecting field water quality data (pH, electrical conductivity [EC], and temperature) and collecting a sample for independent laboratory analysis annually. Flow or water level measurements are collected three times per year corresponding with the rising limb period between April 3rd and May 13th; the peak flow period between April 21st and June 26th; and the low flow period between July 10th and October 8th, as shown on Table 1. The chemical analyte suite for the first five years of sampling for both groundwater and surface water samples, including one year of baseline sampling, is presented in Table 2.

The current hydrologic monitoring plan for MCC incorporates a separate baseline monitoring schedule for all new monitoring sites for approximately one year prior to the time when mine development operations expand into new potentially affected areas. The baseline monitoring schedule protocols stipulate collecting monthly field water quality data, flow or water level measurements, and collecting samples for laboratory analysis for the year prior to initiation of mining and potential impacts (Table 2). Site-specific baseline schedules are dependent on site accessibility and mine development timing. In general, baseline monitoring is conducted for at least six months, usually from April through September, in order to provide adequate data to show seasonal variations in water quality and quantity. Winter access to most sites within the MCC permit area is impractical and not feasible, so baseline monthly monitoring is generally not performed from October through March. A summary of the approved baseline and routine monitoring program frequencies is presented in Table 1.

Table 1. Baseline and Routine Monitoring Frequencies

Routine Monitoring	Baseline Monitoring			
	Month	Flow / Level	Field Parameters	Laboratory Analysis
Rising Limb April 3 to May 13 Peak Flow April 21 to June 26 Low Flow July 10 to October 8	January			
	February			
	March			
	April	X	X	X
	May	X	X	X
	June	X	X	X
	July	X	X	X
	August	X	X	X
	September	X	X	X
	October			
	November			
	December			

Adapted from CDRMS (2006)

After monitoring sites have been monitored for five years (including approximately one year of baseline monitoring), the analytical parameter suite list is typically reduced and samples are submitted for laboratory analysis of total suspended solids (TSS), total dissolved solids (TDS), EC, pH, dissolved iron, and total iron. Field parameters (pH, EC, temperature, and flow or water level) are also recorded.

The Upper and Lower North Fork and Middle Sylvester Gulch monitoring sites have expanded analytical parameter suite lists, in order to provide data for the on-going characterization of the North Fork of the Gunnison River (North Fork). The North Fork and Middle Sylvester Gulch lab parameters include those listed in Table 2, plus chromium, nickel, silver (total), cyanide (total), iron (total recoverable), alkalinity (total CaCO₃), bicarbonate, carbonate, hydroxide, nitrogen (ammonia), ortho-phosphorus (dissolved), and sodium adsorption ratio (SAR).

Table 2. Laboratory Parameters for First Five Years of Monitoring (including Baseline Period)

Springs/Surface Water ^{3,4}	
pH (lab and field) ¹	Sodium (Na ⁺)
Electrical conductivity at 25 ⁰ C (lab and field)	Sulfate (SO ₄ ⁻)
Temperature (field) ¹	Aluminum (Al)
Total Dissolved Solids ¹ (TDS)	Arsenic (As) (Total Recoverable)
Total Suspended Solids ¹ (TSS)	Cadmium (Cd)
Sodium Adsorption Ratio (SAR)	Copper (Cu)
Bicarbonate (HCO ₃ ⁻)	Iron (Fe) ¹ (Total and Dissolved)
Calcium (Ca ⁺²)	Lead (Pb)
Chloride (Cl ⁻)	Manganese (Mn) ¹ (Total and Dissolved)
Hardness ²	Mercury (Hg) (Total Recoverable)
Magnesium (Mg ⁺²)	Molybdenum (Mo)
Nitrate/Nitrite	Selenium (Se) (Total Recoverable)
Phosphate (PO ₄ ⁻³ as P)	Zinc (Zn)
Potassium	Boron (B)
Groundwater ³	
pH (lab and field) ¹	Nitrate/Nitrite
Electrical conductivity at 25 ⁰ C (lab and field) ¹	Phosphate (PO ₄ ⁻³ as P)
Temperature (field) ¹	Potassium
Total Dissolved Solids ¹	Turbidity ¹
Sodium Adsorption Ratio (SAR)	Sodium (Na)
Bicarbonate (HCO ₃ ⁻)	Sulfate (SO ₄ ⁻)
Calcium (Ca ⁺²)	Arsenic (As)
Carbonate (CO ₃ ⁻)	Cadmium (Cd)
Chloride (Cl ⁻)	Iron (Fe) ¹ (Total and Dissolved)
Hardness ²	Manganese (Mn) ¹ (Total and Dissolved)
Magnesium (Mg ⁺²)	Lead (Pb)
Ammonia (NH ₃)	Mercury (Hg)
Selenium (Se)	Zinc (Zn)
	Boron (B)

Adapted from CDRMS (2006)

- Parameters monitored as a result of PR-10
- Added to baseline analyses in 1996, not for analyses completed prior to 1996.
- All metals analyzed for their dissolved form unless noted otherwise.
- North Fork of the Gunnison and Middle Sylvester Gulch expanded parameters include those listed in Table 2 for surface water, plus chromium, nickel, silver (total), cyanide (total), iron (total recoverable), alkalinity (Total CaCO₃), bicarbonate, carbonate, hydroxide; nitrogen (ammonia), ortho-phosphorus (dissolved), and sodium adsorption ratio (SAR).

2.1 SURFACE WATER MONITORING PROGRAM

The surface water monitoring program for the permit area includes 27 stations comprised of 11 stream stations with continuous recording devices, 11 stream stations where flow is recorded instantaneously, two stream stations where flow is not recorded by HSI, and three ponds. A detailed discussion of monitored surface water stations can be found in the 2014 Annual Hydrology Report (HydroGeo, 2015), and their locations are shown on Permit Map 34 (CDRMS, 2016). The surface water monitoring locations are shown on Permit Map 34 (CDRMS, 2016). A summary of the surface water monitoring program details is presented in Table 3. The surface water flow data and surface water hydrographs for the period of record are presented in Appendix A and B, respectively. The water quality data for the period of record for all of the surface water monitoring stations are summarized in Appendix C.

In July 2018, four stream monitoring locations, three ponds, and one spring in the Sunset Trail Lease Modification Area of the Minnesota Creek Drainage Basin were added to the monitoring program. These new monitoring stations underwent monthly baseline sampling from July through September 2018, and May through July 2019 (the sites are inaccessible between October and April). Beginning in WY 2020, these sites are sampled at the routine monitoring frequency (Table 1). A detailed description of the Sunset Trail area monitoring sites can be found in the Sunset Trail Lease Area Baseline Monitoring Recommendations Technical Memo (HSI, 2018), and a summary of the new monitoring station location details is presented in Table 4.

There are eight temperature data loggers in Sylvester Gulch and in the North Fork, in order to monitor the effects of mine discharge from Sylvester Gulch on the water temperature of the North Fork of the Gunnison. Details of the temperature monitoring program can be found in the 2014 Annual Hydrology Report (HydroGeo, 2015). The temperature monitoring data and graphs are presented in Appendices I and J, respectively.

Table 3. Summary of the Surface Water Monitoring Program

Monitoring Station ⁽¹⁾	Monitored Area	Flow Measurement	Field WQ (pH, EC, T)	Annual Lab Water Quality	Period of Record
Surface Water Stations Upper North Fork of the Gunnison River Drainage Basin					
Upper Deep Creek	Up-gradient of SE mine panels; down-gradient of SOD mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present
Lower Deep Creek	Down-gradient of SE mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present
Box Canyon	Down-gradient of Box Canyon mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1999 to present
North Fork Upper (USGS 09132500)	Up-gradient of mine facilities and mine discharge points	Continuous	3 x Year	Low Flow Period, Peak Irrigation Season ⁽³⁾	1977 to present
Upper Sylvester Gulch	Up-gradient of mine surface facilities area and NE mine panels	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Middle Sylvester Gulch	Down-gradient of mine water discharge point and NE mine panels	Continuous	3 x Year	Peak Flow Period ⁽³⁾	1977 to present
Lower Sylvester Gulch	Down-gradient of mine surface facilities area and NE mine panels	Not Measured	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Surface Water Stations Lower North Fork of the Gunnison River Drainage Basin					
North Fork Lower	Down-gradient of mine facilities and mine discharge.	Not Measured	3 x Year	Low Flow Period, Peak Irrigation Season ⁽³⁾	1935-present
Surface Water Stations Minnesota Creek Drainage Basin					
Lick Creek Flume	Up-gradient of SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Upper Dry Fork Flume	SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Middle Dry Fork Flume	SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Lower Dry Fork Flume	Down-gradient of SW and SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Minnesota Reservoir Flume	Down-gradient of SW and SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Deep Creek Ditch Flume	Up-gradient of SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Poison Gulch	SOD mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2005 to present
Deer Creek	SOD mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2005 to present
Horse Gulch	Down-gradient of the SW mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
East Gulch, East of Horse Gulch	SOD and SW mine panels area	Instantaneous, 3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Upper Minnesota Creek (USFS)	SOD mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Lower Minnesota Creek (USGS)	Down-gradient of SOD and SW mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	1937-1947 and 1985 to April 2, 2014
Lower Minnesota Creek (CDWR)	Down-gradient of SOD and SW mine panels area	Continuous	3 x Year	Peak Flow Period ⁽¹⁾	April 30, 2014 to present
South Prong Creek	Mouth of South Prong Creek	Continuous	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present
North Fork of South Prong Creek	Sunset Trail Area	Instantaneous, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present
South Fork of South Prong Creek	Sunset Trail Area	Instantaneous, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present
Stream ST-SW-1	Sunset Trail Area	Instantaneous, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present
Pond ST-P-1	Sunset Trail Area	Water Level, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	August 2018 to Present
Pond ST-P-2	Sunset Trail Area	Water Level, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present

Table 3. Summary of the Surface Water Monitoring Program (continued)

Pond ST-P-3	Sunset Trail Area	Water Level, 6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to Present
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SW mine panels area – southwest B-seam longwall panels; SE mine panels area - southeast B-seam longwall panels

Box Canyon mine panels area - Box Canyon B-seam longwall panels; West Flatiron mine panels area - West Flatiron B-seam longwall panels

SOD mine panels area - South of the Divide E-seam longwall panels

1. For sites with more than 5 years of data, lab parameters include TSS, TDS, EC, pH, and Fe (dissolved & total)
2. For sites with 5 years or less data see Table 2
3. North Fork of the Gunnison and Middle Sylvester Gulch expanded parameters include those listed in Table 2 for surface water, plus chromium, nickel, silver (total), cyanide (total), iron (total recoverable), nitrate/nitrite (as N), alkalinity (Total CaCO₃), bicarbonate, carbonate, hydroxide; nitrogen (ammonia), phosphorous-ortho (dissolved), and sodium adsorption ratio (SAR).

Table 4. Summary of Sunset Trail Area Surface Water Monitoring Stations

Monitoring Station	Location Description	Latitude (NAD 83 dd)	Longitude (NAD 83 dd)
South Prong Creek	Upstream of Confluence with Minnesota Creek	38.839794	-107.451729
North Fork of South Prong Creek	About ½ mile upstream of South Prong Creek Station	38.839970	-107.444520
South Fork of South Prong Creek	About ½ mile upstream of South Prong Creek Station	38.839974	-107.444393
Stream ST-SW-1	Unnamed Tributary to South Prong Creek. About 1.5 miles upstream of So South Prong Creek Station	38.833121	-107.426038
Pond ST-P-1	Headwaters of Unnamed Tributary to Lick Creek	38.848707	-107.424765
Pond ST-P-2	Upland Area to the North of South Prong Creek	38.842051	-107.426975
Pond ST-P-3	Upland Area to the North of South Prong Creek	38.841420	-107.424671
Spring ST-S-1	Located in the N. Fork of South Prong Drainage, about one mile upstream of the NFSPC Station	38.847033	-107.434802

2.2 SPRING AND SEEP MONITORING PROGRAM

The spring monitoring program for the permit area includes 28 spring and seep locations. A detailed discussion of monitored springs and seeps can be found in the 2014 Annual Hydrology Report (HydroGeo, 2015), and their locations are shown on Permit Map 34 (CDRMS, 2016). A summary of the spring and seep monitoring program details is presented in Table 5. Spring hydrographs and water quality data for the period of record are presented in Appendix D and E, respectively.

Table 5. Summary of the Spring and Seep Monitoring Program

Monitoring Station	Monitored Area	Flow Measurement	Field WQ (pH, EC, T)	Annual Lab Water Quality	Period of Record
<i>Springs above the F-seam in the North Fork of the Gunnison River Drainage Basin</i>					
Spring 26-1	Deep Creek, SE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present
Spring 27-1 (two ponds)	Upper Syl. Gulch, SE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present
Spring G-7	Upper Syl. Gulch, NE and SW mine panels areas	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Spring G-16	Syl. Gulch, east of NE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1979 to present
Spring G-24 (decreed spring #8)	Syl. Gulch, east of NE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1979 to present
Spring G-14 (decreed spring #7)	Syl. Gulch, east of NE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Spring G-22 (decreed spring #3)	Syl. Gulch, north of NE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1977 to present
Spring 35-3	U. Deep Creek, east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
96-2-2 Area Spring	U Deep Creek, SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2007 to present
Deep Creek Spring # 2	U Deep Creek, SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2007 to present
Deep Creek Trail Spring	U Deep Creek, south of SE mine panels area and east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2007 to present
Spring 2012-1	U Deep Creek, south of SE mine panels area and east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽²⁾	2013 to present
Spring 2012-2	U Deep Creek, south of SE mine panels area and east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽²⁾	2013 to present
Spring 2012-3	U Deep Creek, south of SE mine panels area and east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽²⁾	2013 to present
Spring 2012-4	U Deep Creek, south of SE mine panels area and east of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽²⁾	2013 to present
<i>Springs in or below the F-seam in the North Fork of the Gunnison River Drainage Basin</i>					
Spring 11-2	Unnamed drainage east of Box Canyon, north of Box Canyon mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2000 to present
Spring 10-1	Lower Box Canyon, north of Box Canyon mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1999 to present
Spring E10-2	Unnamed drainage east of Syl. Gulch, north of Box Canyon mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present
Spring 15-1	Unnamed drainage east of Syl. Gulch, north of Box Canyon mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1996 to present

Table 5. Summary of the Spring and Seep Monitoring Program (continued)

Monitoring Station	Monitored Area	Flow Measurement	Field WQ (pH, EC, T)	Annual Lab Water Quality	Period of Record
Spring G-1a	Syl. Gulch, north of NE mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1983 to present
Spring G-20	Middle Syl. Gulch, east of mine facilities	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1979 to present
<i>Springs above the E-seam in the Dry Fork Drainage Basin</i>					
Spring J-4	M. Dry Fork, SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	1981 to present
Deer Creek Spring	Deer Creek, SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Spring WCC-24	Lower Dry Fork, west of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Spring J-2	Lick Creek, south of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Spring J-7	Poison Gulch, SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2006 to present
Spring J-10	Dry Fork, west of SOD mine panels area	3 x Year	3 x Year	Peak Flow Period ⁽¹⁾	2011 to present
Spring ST-S-1	N. Fork of S. Prong Creek area	6 x Year	6 x Year	Peak Flow Period ⁽²⁾	July 2018 to present

SW mine panels area – southwest B-seam longwall panels; SE mine panels area – southeast B-seam longwall panels

Box Canyon mine panels area – Box Canyon B-seam longwall panels; W. Flatiron mine panels area – West Flatiron B-seam longwall panels

SOD mine panels area – South of the Divide E-seam longwall panels

1. For sites with more than 5 years of data, lab parameters include TSS, TDS, EC, pH, and Fe (dissolved & total).
2. For sites with 5 or less years of data, see Table 2

2.3 GROUNDWATER MONITORING PROGRAM

In WY 2022, a total of 13 wells were monitored as part of the MCC groundwater monitoring program (Tables 6 and 7).

A detailed discussion of the groundwater monitoring wells can be found in the 2014 Annual Hydrology Report (HydroGeo, 2015), and their locations are shown on Permit Map 34 (CDRMS, 2016). A summary of the groundwater monitoring well characteristics is presented in Table 6, and a summary of the groundwater monitoring program, including mining areas monitored is presented in Table 7. The water level elevation graphs and water quality data for the period of record for all of the groundwater monitoring wells are summarized in Appendix F and G, respectively.

Table 6. Summary of the Groundwater Monitoring Well Characteristics

Monitoring Well	Location	Ground Elevation (Toc, ft.)	Screened Interval Depth (ft)	Total Depth (ft)	Formation of Completion
Facility Area Wells and Alluvial Wells					
GP-3 (MW-8)	T13S, R90W, Sec. 10, SW,SW	6145.5	25-30	33.8	Colluvium
GP-4 (MW-9)	T13S, R90W, Sec. 10, SW,SW	6147.5	25-30	33.0	Colluvium
GP-6	T13S, R90W, Sec. 10, SW,SW	6204.8	78-83	83.0	Alluvium (Syl. Gulch)
GP-7	T13S, R90W, Sec. 15, SW,SW	6205.7	50-55	55	Alluvium (Syl. Gulch)
RPE-1	T13S, R90W, Sec. 10, SW,SE	6187.0	n.a.	30.0	Colluvium
RPE-7	T13S, R90W, Sec. 10, SE,SW	6116.3	12-32	32.0	Colluvium
Upper Dry Fork Alluvial	T14S, R90W, Sec. 2, SW,NW	8100	24-29	29	Alluvium
Lower Dry Fork Alluvial	T13S, R90W, Sec. 33, NE,NW	7640	17.5-22.5	22.5	Alluvium
Permit Area Wells Completed in the Barren Member above F-Seam					
SOM-80	T13S, R90W, Sec. 21, NW,NE	6854.4	50-90	142.5	Barren Mbr. Mesa Verde Fm.
SOM-45-H1	T13S, R90W, Sec. 29, NE,SW	7703.8	160-260	260.0	Barren Mbr. Mesa Verde Fm.
Permit Area Wells Completed in the F-Seam					
SOM C-76	T13S, R90W, Sec. 33, NW,NE	7579.6	444-457	457.0	F-Seam
Permit Area Wells Completed in the E-Seam					
03-11-1	T13S, R90W, Sec. 11, SE,SE	6281	240-250	250	E-Seam
Permit Area Wells Completed in B-Seam					
01-11-1	T13S, R90W, Sec. 11, SE,NE	6281.3	489-499	509.0	B-Seam

toc – top of casing

Table 7. Summary of the Groundwater Monitoring Program

Monitored Station	Monitored Area	Water Level Measurement	Field WQ (pH, EC, temp)	Annual Lab Water Quality	Period of Record
Facility Area Wells and Alluvial Wells					
GP-3 (MW-8)	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1985 to present
GP-4 (MW-9)	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1985 to present
GP-6	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1997 to present
GP-7	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1997 to present
RPE-1	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1996 to present
RPE-7	Mine facility area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1999 to present
Upper Dry Fork Alluvial ⁽¹⁾	SOD mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	2003 to present
Lower Dry Fork Alluvial ⁽¹⁾	SOD mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	2003 to present
Wells Completed in the Barren Member above F-Seam					
SOM-80	NE mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1979 to present
SOM-45-H1	SW mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1979 to present
Wells Completed in the F-Seam					
SOM-C-76	SOD mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	1978 to present
Wells Completed in the E-Seam					
03-11-1	North of Box Canyon mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	2003 to present
Wells Completed in –B-Seam					
01-11-1	North of Box Canyon mine panels area	3 x Year	3 x Year	Low Flow Period ⁽¹⁾	2001 to present

SW mine panels area – southwest B-seam longwall panels

SE mine panels area – southeast B-seam longwall panels

Box Canyon mine panels area – Box Canyon B-seam longwall panels

W. Flatiron mine panels area – West Flatiron B-seam longwall panels

SOD mine panels area – South of the Divide E-seam longwall panels

Shaded cells indicate wells with compromised, blocked, or collapsed casing.

1. For sites with >5 years of data, lab parameters include TSS, TDS, EC, pH, and Fe (dissolved & total).

2.4 UNDERDRAIN AND MINE WATER MONITORING

Two underdrains were monitored in WY 2022. The underdrains are located at the lower refuse pile (LRP) and at the refuse pile expansion (RPE) area. The LRP underdrain is located above the sediment ditch at the base of the pile, east of the stacktube #5 coal stockpile. The RPE underdrain is located just south of, and drains into the RPE sediment pond.

A discussion of the underdrain monitoring sites, mine inflow water sampling criteria, and a map showing the location of the sites can be found in the 2014 Annual Hydrology Report (HydroGeo, 2015). The underdrain monitoring program details are summarized in Table 8 and the underdrain water quality data are presented in Appendix H. In WY 2022, no mine inflows met the monitoring and sampling criteria.

Table 8. Summary of the Underdrain and Mine Inflow Monitoring Program

Monitoring Site	Flow Measurement	Field WQ (pH, EC, temp)	Annual Lab Water Quality
Underdrains			
LRP	3 x Year	3 x Year	Low Flow Period ⁽¹⁾
RPE	3 x Year	3 x Year	Low Flow Period ⁽¹⁾
Mine Inflows (if sampling criteria are met)⁽²⁾			

(1) Lab parameters include TDS, EC, pH, Ca, Mg, Na, K, SAR, hardness, bicarbonate, Cl, Nitrite/Nitrate, PO₄, SO₄, Fe (tot & dissolved), Mn (tot & dissolved), Al, As (tot), Cd, Cu, Pb, Hg (tot), Mb, Se (tot), Bo, Zn.

(2) See Section 3.4 of the WY 2014 AHR (HydroGeo, 2015) for mine inflow sampling criteria.

3.0 ASSESSMENT OF MINE-INDUCED HYDROLOGIC IMPACTS IN WY 2022 AND ANTICIPATED IMPACTS IN WY 2023

3.1 SURFACE WATER

MCC maintains a network of 22 stream flow gauging stations, 3 ponds, and eight temperature monitoring stations throughout the permit and lease areas (Table 3). Daily mean surface water flow summary tables are presented in Appendix A. Surface water flow hydrographs are presented in Appendix B and the field and laboratory surface water quality data are summarized in Appendix C. Tables and graphs of the Sylvester Gulch and North Fork temperature monitoring data are presented in Appendix I and Appendix J, respectively.

3.1.1 IMPACTS TO AREA SURFACE WATER QUALITY

Surface water quality data are collected for permit-specified parameters at monitoring stations throughout the permit area, in order to detect potential impacts of mining activities to surface water resources. Potential impacts to water quality in area streams are determined by comparing recent water quality and flow data to baseline values while considering the effects of climatological factors, such as drought or high precipitation in areas near mining activity. Monitoring sites with values greater than 10 percent over comparable baseline maximums (or outside of 6.0-9.5 standard units for pH) are noted in Table 9. Field pH values are used for comparison when they are available, as the holding time for lab pH is typically exceeded, due to the shipping time required for samples to reach the analytical lab. In general, water quality parameters that are above 10 percent over baseline maximums are likely due to natural variations in climate or flow conditions on the day the sample was collected. Impacts that appear to be directly linked to mining activities are noted. It should also be noted that baseline values are based on limited data and only give a general indication of seasonal variability. The surface water quality data for stream monitoring stations in WY 2022 are presented in Appendix C.

In WY 2022 none of the tested parameters were elevated 10 percent or more above maximum baseline values at the following surface water monitoring locations: Upper North Fork, Lower North Fork, Lower Minnesota Creek, Lick Creek, Deep Creek Ditch, and South Prong Creek. The Upper Sylvester Gulch, Lower Dry Fork, Horse Gulch, East Gulch East of Horse Gulch, Box Canyon, Deer Creek, and Poison Gulch sites were dry, so there are no water quality data for these sites in WY 2022. There are no baseline data for comparison for Upper Minnesota Creek (WWE, 2001).

Surface water monitoring sites where tested parameters were elevated 10 percent or more above maximum baseline values are summarized in Table 9. These exceedances are not likely mining related, since mining discharges have not and are not occurring in the vicinity of the monitoring sites. The elevated measurements are likely due to natural physical and or seasonal variations.

Table 9. Summary of Surface Water Quality Parameters Elevated 10 Percent or More above Baseline Maximum Values

Site Name	Sample Date	Parameter	Units	Result	Baseline Maximum
Middle Sylvester Gulch	5/31/2022	Chloride	mg/L	73.5	10
		Conductivity @25C	µmhos/cm	1,270	800
		Residue, Filterable (TDS) @180C	mg/L	800	584
Lower Sylvester Gulch	5/5/2022	Conductivity (Field)	µmhos/cm	1,187	700
	5/31/2022			1,371	
	5/31/2022	Conductivity @25C	µmhos/cm	1,280	597
	5/31/2022	Iron, Total	mg/L	3.03	0.17
	5/31/2022	Residue, Filterable (TDS) @180C	mg/L	796	430
Middle Dry Fork Flume	5/27/2022	Conductivity @25C	µmhos/cm	84	76
Upper Dry Fork Flume	5/27/2022	Iron, Total	mg/L	4.07	3.64
	5/27/2022	Residue, Non-Filterable (TSS) @105C	mg/L	106	88
Upper Deep Creek	9/5/2022	Conductivity (Field)	µmhos/cm	572	310
Lower Deep Creek	9/5/2022	Conductivity (Field)	µmhos/cm	562	380
Minnesota Reservoir Flume	5/30/2022	Iron, Total	mg/L	4.48	3.62
S. Fork of South Prong Ck.	5/30/2022	Chloride	mg/L	1.09	0.6
			mg/L	1.14	
	5/30/2022	Zinc, dissolved	mg/L	0.109	<0.01
N. Fork of South Prong Ck.	5/30/2022	Carbonate as CaCO ₃	mg/L	16.7	11.7
	5/30/2022	Lead, dissolved	mg/L	0.033	<0.03
Stream ST-SW-1	5/30/2022	Chloride	mg/L	1.44	0.9
Pond ST-P-1	5/30/2022	Sulfate	mg/L	12.9	6.1
Pond ST-P-2	5/30/2022	Lead, dissolved	mg/L	0.042	<0.03
	5/30/2022	Sulfate	mg/L	6.5	<1
Pond ST-P-3	6/8/2021	Chloride	mg/L	1.86	1.0
		Lead, dissolved	mg/L	0.038	<0.03
		Potassium, Dissolved	mg/L	1.86	1.4

3.1.2 IMPACTS TO AREA STREAM WATER QUANTITY

Stream flows at the monitoring sites for the Upper North Fork (USGS), Middle Sylvester Gulch, Lower Minnesota Creek, Upper Minnesota Creek Flume (USGS), Upper, Lower and Middle Dry Fork Flume, Lick Creek Flume, Deep Creek Ditch, Minnesota Reservoir Flume, and the South Prong Creek stations are measured with data loggers that collect data continuously. Stream flows of the other monitored streams (Upper and Lower Sylvester Gulch, Horse Gulch; East Gulch east of Horse Gulch, Upper and Lower Deep Creek, Box Canyon, Deer Creek, Poison Gulch, South Fork of South Prong Creek, North Fork of South Prong Creek, and ST-SW-1) are measured as instantaneous flow three times per year, corresponding with rising limb, peak flow, and low flow monitoring periods. No specific flow data are available for the Lower North Fork, although no mining related stream flow impacts are expected. Flow at Lower Sylvester Gulch is not measured, because of its close proximity to the Middle Sylvester Gulch Flume. Water depth is estimated three times per year at the monitored ponds (ST-P-1, ST-P-2, ST-P-3). Potential mining related impacts to stream flows and pond volume are based on dramatic decreases or total loss of stream flow due to subsidence.

Based on the flow monitoring data in WY 2022 (Appendices A and B), there were no mining induced impacts to the water quantity of any of the monitored streams. Several of the monitored

streams have lower than long-term average flows in WY 2022, likely as a result of ongoing drought conditions.

3.2 SPRINGS AND SEEPS

MCC currently monitors 28 springs and seeps (Table 5). Hydrographs of the spring and seep flows are presented in Appendix D and spring and seep water quality data are presented in Appendix E.

3.2.1 IMPACTS TO SPRING AND SEEP WATER QUALITY

Spring water quality data are collected for permit-specified parameters at monitored springs and seeps throughout the permit area, in order to detect potential impacts of mining activities. Typically, underground coal mining does not impact spring water quality, but it can reduce or eliminate flows due to subsidence or dewatering.

Water quality data from WY 2022 do not indicate significant changes from baseline conditions for most of the monitored springs. However, some of the springs had elevated TDS/TSS, and/or conductivity values that were also noted in WYs 2004 through 2021. These elevated values are likely the result of physical and or seasonal variations and are not related to mining operations.

Potential mining impacts to area spring and seep water quality are determined by comparing current water quality data to maximum baseline values and climatological conditions such as drought or high precipitation periods at monitored sites hydraulically connected to areas with mining activities. Field pH values are used for comparison when they were available, as the holding time for the lab pH is typically exceeded due to the shipping time required for samples to reach the analytical lab. The discussion below includes monitoring locations where one or more parameters had values 10 percent or higher than comparable maximum (or outside of 6.0-9.5 standard units for pH) baseline values. Spring water quality parameters that are 10 percent or more above the baseline maximum are typically the result of natural variations in climate or flow conditions the day the sample was collected. It should also be noted that baseline values are derived from limited data and only give a general indication of seasonal variability.

Springs G-16, WCC-24, 2012-1, 2012-3, and 2012-4 did not have any parameters elevated 10 percent or more over baseline maximums in WY 2022. Springs G-1A, G-20, Deer Creek Spring, J-7, and Deep Creek Spring # 2 were dry or did not have sufficient flow to collect a laboratory sample. Spring J-10 was covered by a beaver pond and could not be accessed. There are no baseline water quality data for comparison for the following springs: 11-2, and 10-1, and E10-2 (WWE, 2001; HydroGeo, 2015).

Several springs had one or more parameters that were 10 percent or higher in WY 2022 than the comparable maximum baseline value (Table 10).

Table 10. Summary of Spring and Seep Water Quality Parameters Elevated 10 Percent or More above Baseline Maximum Values

Site Name	Sample Date	Parameter	Units	Result	Baseline Maximum Value
Spring 26-1	9/5/2022	Conductivity (Field)	µmhos/cm	877	640
	5/26/2022	Conductivity @25C	µmhos/cm	654	548
		Residue, Non-Filterable (TSS) @105C	mg/L	30.0	16
Spring 27-1	5/4/2022	Conductivity (Field)	µmhos/cm	695	460
	5/27/2022			718	
	9/6/2022			893	
	5/27/2022	Conductivity @25C	µmhos/cm	676	437
		Residue, Filterable (TDS) @180C	mg/L	406	300
Spring G-7	5/27/2022	Conductivity @25C	µmhos/cm	599	414
		Residue, Filterable (TDS) @180C	mg/L	366	230
Spring G-24	5/27/2022	Conductivity @25C	µmhos/cm	867	564
Spring G-14	5/27/2022	Conductivity @25C	µmhos/cm	1,040	682
Spring G-22	5/31/2022	Conductivity @25C	µmhos/cm	1,210	640
		Residue, Filterable (TDS) @180C	mg/L	738	516
Spring 15-1	5/5/2022	Conductivity (Field)	µmhos/cm	2,540	1,240
	5/31/2022			2,480	
	5/31/2022	Conductivity @25C	µmhos/cm	2,270	1,120
		Residue, Filterable (TDS) @180C	mg/L	1,590	730
Spring J-4	5/4/2022	Conductivity (Field)	µmhos/cm	625	480
Spring 35-3	5/26/2022	Residue, Filterable (TDS) @180C	mg/L	310	250
Spring J-2	5/30/2022	Conductivity @25C	µmhos/cm	1,590	1,190
		Residue, Filterable (TDS) @180C	mg/L	1,100	910
Deep Creek Trail Spring	5/26/2022	Conductivity (Field)	µmhos/cm	509	479
	9/5/2022			512	
96-2-2 Area Spring	5/6/2022	Conductivity (Field)	µmhos/cm	509	430
	5/26/2022			524	
	5/26/2022	Residue, Filterable (TDS) @180C	mg/L	284	240
Spring 2012-2	5/26/2022	Iron, Total	mg/L	1.63	1.04
		Residue, Filterable (TDS) @180C	mg/L	106	80
		Residue, Non-Filterable (TSS) @105C	mg/L	5.0	<5
Spring ST-S-1	5/30/2022	Carbonate as CaCO ₃	mg/L	14.9	7
		Phosphate	mg/L	0.33	0.19
		Phosphorus, ortho dissolved	mg/L	0.106	0.06

3.2.2 IMPACTS TO SPRING AND SEEP WATER QUANTITY

Routine (post-baseline) monitoring of spring and seep flow is conducted three times per year, corresponding with rising limb, peak flow, and low flow periods. As a result, spring and seep flows may be highly variable from year to year. However, subsidence associated with coal mining can reduce or eliminate spring flows, or alter spring locations due to stratigraphic changes.

The spring flow hydrographs are presented in Appendix D. In general, spring and seep flows in WY 2022 were higher than in WY 2021, but below or near the range of historical averages due to regional long-term drought conditions.

Springs G-1a, G-20, Deer Creek Spring, J-7, and Deep Creek Spring # 2 have been continuously dry or damp at the time of monitoring for multiple years including WY 2022 and may have been originally impacted by mining. Springs J-4, 96-2-2 Area Spring, and 2012-1 were dry or nearly dry in WY 2022, likely as a result of drought conditions.

3.3 GROUNDWATER

In WY 2022, MCC's groundwater monitoring program included 13 monitoring wells throughout the permit and lease areas. Field water quality and the depth to water are recorded three times annually, corresponding to the rising limb, peak flow, and low flow sampling rounds. The Lower and Upper Dry Fork Alluvial Wells are equipped with continuous water level loggers. Routine monitoring (post-baseline) includes collecting a sample for laboratory analysis one time per year during the low flow monitoring round. The well water elevation and depth to water data are presented in Appendix F and the groundwater quality data are presented in Appendix G.

3.3.1 IMPACTS TO GROUNDWATER QUALITY

Groundwater quality data are collected for permit-specified parameters at monitoring wells throughout the permit area, in order to detect potential impacts of mining activities to groundwater resources. Potential impacts to groundwater are determined by comparison to baseline values and consideration of climatic conditions. Field pH values were used for comparison when they were available, as the holding time for the lab pH is typically exceeded, due to the shipping time required for samples to reach the analytical lab. Overall, there were only minor notable water quality changes in a few of the groundwater monitoring wells during WY 2022 (Appendix G). These changes are likely the result of sediment in the wells, and not related to mining induced effects.

No water quality data are available in WY 2022 for the following wells because they were dry or did not have enough water to collect samples during the low flow sampling period: GP-3, GP-4, RPE-1, RPE-7, and SOM-C76. Wells GP-6 and GP-7 do not have baseline data for comparison (WWE, 2001).

Well 01-11-1 and the Lower Dry Fork Alluvial Well did not have any parameters elevated 10 percent or more over baseline maximums in WY 2022. Wells where tested parameters were elevated 10 percent or more above maximum baseline values are summarized in Table 11.

Table 11. Summary of Well Water Quality Parameters Elevated 10 Percent or More above Baseline Maximum Values

Site Name	Sample Date	Parameter	Units	Result	Baseline Maximum Value
Upper Dry Fork Alluvial Well	9/5/2022	Conductivity @25C	µmhos/cm	847	509
		Residue, Filterable (TDS) @180C	mg/L	526	390
Well SOM-80	9/6/2022	Conductivity @25C	µmhos/cm	1,190	897
Well SOM-45-H-1	5/9/2022	Conductivity (Field)	µmhos/cm	2,170	1,626
	5/27/2022			2,240	
	9/6/2022			1,938	
	9/6/2022	Conductivity @25C	µmhos/cm	1,980	1,390
Well 03-11-1	9/6/2022	Conductivity @25C	µmhos/cm	3,170	2,730

3.3.2 IMPACTS TO GROUNDWATER QUANTITY

Routine (post-baseline) monitoring of groundwater levels in the monitoring wells is conducted three times per year, corresponding with rising limb, peak flow, and low flow periods. Groundwater level and elevation data for the monitoring wells for the period of record are summarized in Appendix F.

Mining operations appear to have impacted long-term groundwater levels in wells SOM 45-H-1, SOM C-76, and 03-11-1. Water levels likely have also been impacted by drought conditions in recent years. Wells GP-3, GP-4, and RPE-7 have been dry or nearly dry through the period of record due to the intentional up-gradient diversion of surface water runoff.

4.0 ADEQUACY OF THE MONITORING PROGRAM

MCC's hydrologic monitoring program operates in accordance with CDRMS Permit No. C-1980-007, as revised by Permit Revision Nos. PR-10 and PR-15, and Technical Revision No. TR-139. PR-10 included a revised comprehensive hydrologic monitoring plan for the entire permit area including the SOD mine plan area. PR-15 included the monitoring plan for the Sunset Trail mining area. The plan is presented in Exhibits 71 and 71A in the permit document (CDRMS, 2006; CDRMS 2016; CDRMS 2018).

4.1 MINING RELATED HYDROLOGIC IMPACTS

In WY 2022 the West Elk Mine hydrologic monitoring program was conducted in accordance with all permit requirements. The data collected in WY 2022 from sites in the current monitoring program were adequate to assess potential mine-induced impacts to the area's hydrologic system. These potential impacts are summarized in the previous sections.

During WY 2022, MCC operations were in compliance with Permit CO-0038776 requirements (Section 4.6.1). There are no anticipated mining related impacts in WY 2023.

5.0 REFERENCES

Colorado Division of Reclamation, Mining and Safety (CDRMS), formerly CDMG.

- 2006 Approval of Permit Revision 10, SOD area, June 2006.
- 2016 West Elk Mine (Permit No. C-1980-007) Technical Revision No. 139, TR-139) Initial Adequacy Review, October 12, 2016.
- 2018 Exhibit 71A, “Sunset Trail Lease Area Baseline Monitoring Recommendations” PR-15 - approved September 2018.

HydroGeo, Inc. (HydroGeo)

- 2002 2001 Annual Hydrology Report, Mountain Coal Company, West Elk Mine. August 2002.
- 2003 2002 Annual Hydrology Report, Mountain Coal Company, West Elk Mine. April 2003.
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- 2015 2014 Annual Hydrology Report, Mountain Coal Company, West Elk Mine. June 2015.
- 2016 West Elk Mine 2015 Surface Water and Groundwater Quantity and Quality Data Summary. June 2016.
- 2017 West Elk Mine 2016 Surface Water and Groundwater Quantity and Quality Data Summary. June 2017.

Hydrogeology Solutions, Inc. (HSI)

- 2018 Sunset Trail Lease Area Baseline Monitoring Recommendations Technical Memo. July 2018.
- 2018a West Elk Mine 2017 Surface Water and Groundwater Quantity and Quality Data Summary. June 2018.
- 2019 West Elk Mine 2018 Surface Water and Groundwater Quantity and Quality Data Summary. June 2019.
- 2020 West Elk Mine 2019 Surface Water and Groundwater Quantity and Quality Data Summary. June 2020.
- 2021 West Elk Mine 2020 Surface Water and Groundwater Quantity and Quality Data Summary. June 2021.
- 2022 West Elk Mine 2021 Surface Water and Groundwater Quantity and Quality Data Summary. June 2022.

Wright Water Engineers, Inc. (WWE)

- 2001 2000 Annual Hydrology Report, Mountain Coal Company, West Elk Mine. September 2001.

APPENDICES (Attached)

APPENDIX A	SURFACE WATER - FLOW DATA
APPENDIX B	SURFACE WATER - HYDROGRAPHS
APPENDIX C	SURFACE WATER - LABORATORY AND FIELD WATER QUALITY DATA
APPENDIX D	SPRINGS - HYDROGRAPHS
APPENDIX E	SPRINGS - LABORATORY AND FIELD WATER QUALITY DATA
APPENDIX F	WELLS - WATER LEVEL ELEVATION GRAPHS
APPENDIX G	WELLS - LABORATORY AND FIELD WATER QUALITY DATA
APPENDIX H	MINE WATER – LABORATORY AND FIELD WATER QUALITY DATA
APPENDIX I	SURFACE WATER - TEMPERATURE DATA
APPENDIX J	SURFACE WATER - TEMPERATURE GRAPHS

APPENDIX A

SURFACE WATER - FLOW DATA

Upper North Fork (USGS) Daily Mean Discharge Values (cubic feet per second)

Day	Oct-21	Q ¹	Nov-21	Q ¹	Dec-21	Q ¹	Jan-22	Q ¹	Feb-22	Q ¹	Mar-22	Q ¹	Apr-22	Q ¹	May-22	Q ¹	Jun-22	Q ¹	Jul-22	Q ¹	Aug-22	Q ¹	Sep-22	Q ¹
1	64.7	A	81.4	A	54.8	A	65.1	A:e	92.1	A:e	39.2	A:e	272.0	A	1440.0	A	1000.0	A	342.0	A	256.0	A	251.0	A
2	71.4	A	86.5	A	52.7	A	64.8	A:e	81.0	A:e	46.1	A:e	274.0	A	1390.0	A	1120.0	A	312.0	A	259.0	A	242.0	A
3	67.4	A	91.5	A	51.3	A	65.9	A:e	61.3	A:e	55.4	A:e	299.0	A	1290.0	A	1320.0	A	313.0	A	241.0	A	236.0	A
4	64.3	A	85.9	A	49.7	A	70.1	A:e	58.4	A:e	67.2	A:e	291.0	A	1110.0	A	1340.0	A	290.0	A	240.0	A	116.0	A
5	61.8	A	84.6	A	48.1	A	78.9	A:e	62.7	A:e	73.8	A:e	353.0	A	961.0	A	1450.0	A	295.0	A	246.0	A	76.7	A
6	59.7	A	82.6	A	56.9	A:e	92.8	A:e	73.6	A:e	72.4	A:e	358.0	A	1190.0	A	1530.0	A	296.0	A	254.0	A	74.5	A
7	58.6	A	82.4	A	65.4	A:e	95.9	A:e	72.2	A:e	69.1	A:e	347.0	A	1580.0	A	1660.0	A	289.0	A	248.0	A	73.0	A
8	57.9	A	80.5	A	51.1	A	93.0	A:e	65.1	A:e	63.7	A:e	403.0	A	1850.0	A	1670.0	A	264.0	A	251.0	A	72.2	A
9	93.4	A	79.6	A	65.5	A	83.4	A:e	61.5	A:e	61.1	A:e	479.0	A	1970.0	A	1660.0	A	277.0	A	252.0	A	71.4	A
10	88.0	A	87.8	A	48.5	A	79.8	A:e	53.9	A:e	55.5	A:e	528.0	A	1930.0	A	1640.0	A	276.0	A	256.0	A	70.3	A
11	77.4	A	82.9	A	17.5	A:e	81.0	A:e	53.4	A:e	43.7	A:e	494.0	A	2020.0	A	1630.0	A	270.0	A	257.0	A	69.4	A
12	75.2	A	79.5	A	30.0	A:e	83.8	A:e	52.3	A:e	44.6	A:e	540.0	A	2060.0	A	1560.0	A	270.0	A	254.0	A	68.4	A
13	75.9	A	78.5	A	37.1	A:e	88.8	A:e	51.9	A:e	56.0	A:e	498.0	A	1930.0	A	1420.0	A	277.0	A	253.0	A	69.3	A
14	76.0	A	76.6	A	38.4	A:e	93.6	A:e	51.6	A:e	63.0	A:e	458.0	A	1910.0	A	1250.0	A	277.0	A	253.0	A	74.9	A
15	75.7	A	76.4	A	49.4	A:e	94.2	A:e	54.2	A:e	65.3	A:e	444.0	A	2080.0	A	1040.0	A	278.0	A	260.0	A	91.1	A
16	74.9	A	76.8	A	75.7	A:e	93.2	A:e	54.3	A:e	78.4	A:e	454.0	A	2260.0	A	842.0	A	273.0	A	251.0	A	83.1	A
17	82.6	A	77.6	A	79.0	A:e	91.4	A:e	51.9	A:e	96.6	A:e	489.0	A	2220.0	A	810.0	A	271.0	A	251.0	A	77.9	A
18	86.8	A	74.8	A	80.6	A:e	90.1	A:e	44.4	A:e	94.6	A	597.0	A	2230.0	A	851.0	A	272.0	A	248.0	A	74.4	A
19	94.6	A	78.9	A	77.1	A:e	90.7	A:e	43.7	A:e	94.3	A	825.0	A	2240.0	A	970.0	A	276.0	A	265.0	A	71.9	A
20	87.5	A	59.5	A	74.4	A:e	91.1	A:e	46.2	A:e	99.5	A	1140.0	A	2180.0	A	786.0	A	269.0	A	255.0	A	70.7	A
21	83.6	A	54.5	A	77.1	A:e	90.5	A:e	51.3	A:e	101.0	A	1440.0	A	1800.0	A	659.0	A	265.0	A	254.0	A	72.3	A
22	80.3	A	46.2	A	83.8	A:e	89.4	A:e	52.0	A:e	99.9	A	1610.0	A	1450.0	A	561.0	A	258.0	A	245.0	A	94.4	A
23	78.7	A	57.9	A	95.0	A:e	79.0	A:e	46.1	A:e	97.8	A	1400.0	A	1190.0	A	498.0	A	253.0	A	251.0	A	100.0	A
24	81.1	A	60.0	A	111.0	A:e	69.1	A:e	39.7	A:e	106.0	A	1180.0	A	1060.0	A	475.0	A	257.0	A	248.0	A	85.6	A
25	78.6	A	35.5	A	117.0	A:e	63.5	A:e	35.0	A:e	139.0	A	1080.0	A	990.0	A	436.0	A	257.0	A	255.0	A	80.7	A
26	93.2	A	49.2	A	102.0	A:e	59.3	A:e	31.9	A:e	197.0	A	1090.0	A	1130.0	A	429.0	A	253.0	A	262.0	A	77.6	A
27	92.1	A	61.6	A	85.8	A:e	57.3	A:e	31.7	A:e	280.0	A	1200.0	A	1470.0	A	448.0	A	250.0	A	252.0	A	76.4	A
28	85.9	A	63.6	A	83.5	A:e	57.0	A:e	34.7	A:e	371.0	A	1310.0	A	1680.0	A	397.0	A	245.0	A	245.0	A	74.3	A
29	83.9	A	62.9	A	80.7	A:e	57.9	A:e	--	--	429.0	A	1400.0	A	1580.0	A	362.0	A	244.0	A	248.0	A	73.4	A
30	83.8	A	60.2	A	74.8	A:e	75.1	A:e	--	--	342.0	A	1380.0	A	1440.0	A	365.0	A	259.0	A	250.0	A	75.5	A
31	82.2	A	--	--	67.1	A:e	91.5	A:e	--	--	281.0	A	--	--	1120.0	A	--	--	256.0	A	247.0	A	--	--

Mean	78.0	--	71.9	--	67.1	--	79.9	--	53.9	--	122.0	--	754.4	--	1637.1	--	1006.0	--	273.7	--	251.8	--	94.8	--
Min	57.9	--	35.5	--	17.5	--	57.0	--	31.7	--	39.2	--	272.0	--	961.0	--	362.0	--	244.0	--	240.0	--	68.4	--
Max	94.6	--	91.5	--	117.0	--	95.9	--	92.1	--	429.0	--	1610.0	--	2260.0	--	1670.0	--	342.0	--	265.0	--	251.0	--

¹ USGS Qualifiers: A = Period of approved data, e = Estimated value



Lower Minnesota Creek Discharge and Gage Height

Daily Mean Streamflow (cfs)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.4	2.4	4.1	7.5	6.3	5.0	11.0	21.0	78.0	24.0	10.0	8.5
2	0.5	2.5	3.9	13.0	7.2	4.7	10.0	23.0	71.0	23.0	10.0	7.8
3	0.6	2.7	3.9	19.0	10.0	4.5	9.2	24.0	68.0	21.0	9.2	6.9
4	0.7	2.7	3.9	16.0	8.1	4.3	8.9	24.0	68.0	21.0	9.2	6.6
5	0.8	2.7	3.7	12.0	6.9	5.0	9.2	23.0	70.0	19.0	9.2	5.5
6	0.9	2.7	3.9	8.9	6.3	5.2	11.0	22.0	73.0	17.0	9.2	4.7
7	0.9	2.5	3.7	8.1	6.3	5.5	10.0	25.0	78.0	16.0	9.2	4.3
8	1.1	2.4	3.7	7.2	5.5	6.3	11.0	29.0	82.0	15.0	8.9	3.7
9	1.4	2.5	3.3	8.5	4.3	5.2	13.0	32.0	82.0	13.0	8.5	3.1
10	1.9	2.7	4.3	8.5	3.7	5.5	15.0	34.0	84.0	12.0	8.1	2.7
11	2.0	3.0	6.3	8.1	3.9	6.6	15.0	37.0	82.0	12.0	8.5	2.5
12	2.2	2.8	11.0	7.5	4.3	6.6	16.0	42.0	82.0	12.0	8.9	2.2
13	2.5	2.8	26.0	6.0	4.3	6.0	16.0	44.0	80.0	11.0	8.5	2.1
14	2.8	2.8	35.0	5.7	3.9	6.0	14.0	44.0	75.0	11.0	8.5	2.1
15	3.1	2.5	33.0	6.9	3.1	5.5	12.0	47.0	68.0	11.0	8.5	2.2
16	3.1	2.5	24.0	6.6	3.0	5.0	11.0	53.0	60.0	11.0	8.9	2.4
17	2.7	2.8	16.0	6.0	3.7	6.0	10.0	59.0	50.0	10.0	9.6	2.2
18	2.7	3.0	17.0	5.5	3.9	6.3	11.0	68.0	47.0	11.0	10.0	1.9
19	3.5	2.5	29.0	5.7	3.9	6.0	13.0	78.0	45.0	11.0	9.6	1.6
20	3.9	2.5	30.0	5.7	3.7	5.5	16.0	96.0	43.0	12.0	10.0	1.5
21	3.7	3.1	24.0	4.7	3.3	6.0	19.0	118.0	40.0	12.0	11.0	1.6
22	3.7	3.1	16.0	5.2	3.7	6.9	23.0	125.0	37.0	12.0	11.0	1.8
23	3.5	3.0	9.6	5.5	3.5	6.9	25.0	118.0	34.0	11.0	11.0	2.0
24	3.5	3.3	10.0	5.2	3.9	6.0	23.0	106.0	30.0	12.0	11.0	2.0
25	2.2	3.9	14.0	4.5	3.9	6.0	21.0	96.0	28.0	12.0	11.0	2.0
26	1.9	3.9	12.0	5.5	4.5	6.3	17.0	84.0	29.0	12.0	13.0	1.8
27	2.5	4.1	9.6	5.2	5.2	7.2	16.0	73.0	28.0	12.0	13.0	1.4
28	2.5	4.1	8.5	6.6	5.2	8.5	18.0	73.0	26.0	12.0	11.0	1.4
29	2.5	4.1	7.8	6.0	--	11.0	21.0	80.0	25.0	12.0	11.0	1.3
30	2.4	4.1	6.9	6.3	--	12.0	23.0	87.0	23.0	12.0	10.0	1.3
31	2.4	--	6.0	6.6	--	12.0	--	86.0	--	11.0	9.6	--

Measured Streamflow

Date	Streamflow (cfs)
10/25/2021	4.7
11/8/2021	6.9
12/10/2021	3.3
1/7/2022	3.5
2/9/2022	3.9
3/10/2022	6.0
4/8/2022	8.1
5/2/2022	23.0
5/27/2022	82.0
7/6/2022	20.0
8/10/2022	8.1
9/2/2022	8.1

Mean	2.2	3.0	12.8	7.6	4.8	6.3	14.9	59.5	56.2	13.6	9.8	3.0
Min	0.4	2.4	3.3	4.5	3.0	4.3	8.9	21.0	23.0	10.0	8.1	1.3
Max	3.9	4.1	35.0	19.0	10.0	12.0	25.0	125.0	84.0	24.0	13.0	8.5

0.01 Stream Ice Affected or Frozen.



Upper Minnesota Creek (USFS) Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	3.03	3.48	2.88	5.92	4.38	3.51	7.75	22.11	52.03	26.74	17.28	5.76
2	2.93	3.48	2.82	7.21	4.51	3.35	7.57	23.60	51.53	24.57	22.26	5.46
3	2.86	3.64	2.87	6.86	ND	3.38	7.57	23.51	52.47	24.12	21.23	5.31
4	2.83	3.53	2.84	5.68	ND	3.26	7.65	21.61	52.54	22.22	22.42	5.24
5	2.73	3.47	2.84	5.13	ND	3.52	7.80	18.82	52.98	20.51	22.24	4.86
6	2.87	3.35	2.86	4.67	ND	3.72	8.58	22.67	54.48	20.13	21.55	4.78
7	2.80	3.29	2.76	4.48	ND	3.91	8.57	30.34	56.53	15.22	21.12	4.84
8	2.77	3.18	2.81	3.95	ND	4.95	8.29	36.00	58.71	14.18	20.71	4.79
9	3.07	3.32	2.56	4.84	ND	4.06	8.22	38.76	58.89	13.39	19.04	4.56
10	3.22	3.40	3.43	5.29	ND	4.39	9.04	40.21	59.26	12.56	21.47	4.43
11	3.04	3.43	4.99	5.69	ND	8.27	9.23	42.79	58.91	10.19	24.67	4.56
12	3.18	3.32	ND	5.41	ND	5.16	9.73	46.28	59.12	7.89	22.34	4.54
13	3.28	3.27	ND	4.81	ND	4.81	9.92	44.86	56.20	7.22	21.38	4.54
14	3.28	3.25	ND	4.61	ND	4.22	9.40	45.30	52.85	6.94	21.20	4.81
15	3.53	3.12	7.89	5.29	ND	4.28	8.47	48.57	48.69	6.86	22.44	5.26
16	3.29	3.03	6.22	5.21	ND	4.00	8.07	52.72	44.30	6.64	20.85	5.35
17	2.96	3.28	5.62	4.92	4.05	4.65	7.86	54.94	41.61	9.38	21.59	5.01
18	2.90	3.40	6.78	4.69	4.15	5.11	8.35	57.78	41.38	13.60	22.15	4.88
19	3.15	2.97	6.95	4.71	4.70	4.99	10.46	61.23	41.93	14.37	23.06	4.85
20	3.20	2.96	8.56	4.76	3.96	4.14	13.60	65.72	38.53	15.07	22.72	4.93
21	3.11	3.38	8.13	4.19	2.77	4.48	16.73	67.77	35.14	13.91	24.33	5.16
22	2.93	3.29	6.52	4.64	2.94	4.98	19.62	63.93	32.05	13.43	23.02	5.92
23	2.85	2.98	4.94	4.85	2.83	5.03	20.70	59.54	29.96	12.92	21.88	5.19
24	2.85	3.03	ND	4.56	3.07	4.73	20.62	54.98	30.29	13.32	21.05	5.19
25	3.17	3.47	ND	4.14	2.99	4.87	19.00	51.77	33.44	13.30	22.98	5.21
26	3.81	3.23	5.69	4.77	3.22	5.89	16.69	50.04	32.99	13.58	18.59	5.11
27	3.89	3.10	5.36	4.60	6.80	6.29	16.04	53.37	31.41	14.98	6.16	4.89
28	3.76	3.05	5.38	5.31	3.68	6.72	17.57	57.44	29.71	14.91	5.54	5.06
29	3.74	2.95	5.48	5.07	--	7.46	20.80	59.89	28.34	13.97	5.56	5.09
30	3.57	2.94	5.38	4.91	--	7.92	21.68	59.57	28.41	13.53	6.12	5.17
31	3.46	--	5.17	5.04	--	7.81	--	54.83	--	13.12	5.91	--
Mean	3.16	3.25	4.91	5.04	3.86	4.96	12.19	46.16	44.82	14.28	19.12	5.03
Min	2.73	2.94	2.56	3.95	2.77	3.26	7.57	18.82	28.34	6.64	5.54	4.43
Max	3.89	3.64	8.56	7.21	6.80	8.27	21.68	67.77	59.26	26.74	24.67	5.92

Measured Streamflow

Date	Streamflow (CFS)
10/25/2021	2.92
11/8/2021	7.53
12/10/2021	3.19
1/7/2022	2.78
2/9/2022	2.78
3/10/2022	3.92
4/8/2022	7.72
5/2/2022	23.33
5/27/2022	flooded
7/6/2022	21.90
8/10/2022	21.33
9/2/2022	5.70

0.01 Flume Ice Affected or Frozen.

ND No Data. Stilling Well Frozen.

Note: When height of water in flume is above 1.57 feet (32.60 cfs), bypass spillways overflow and flow through flume is less than total flow in stream.



Middle Sylvester Gulch Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.04	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.02	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.01	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.01	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.01	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.02	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.01	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.01	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.01	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.01	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.01	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.03	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.03	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.06	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.05	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79	0.03	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.03	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.03	0.00	0.00	0.00
26	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.02	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.02	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.03	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	--	0.00	0.38	0.06	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	--	0.00	0.39	0.06	0.00	0.00	0.00	0.00
31	0.00	--	0.00	0.00	--	0.00	--	0.02	--	0.00	0.00	--
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.07	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Max	0.03	0.00	0.00	0.00	0.00	0.00	0.79	0.42	0.00	0.00	0.00	0.00

Measured Streamflow

Date	Streamflow (CFS)
10/25/2021	0.000
11/23/2021	0.000
12/10/2021	0.000
1/7/2022	0.000
2/9/2022	0.000
3/10/2022	0.000
4/8/2022	0.294
5/4/2022	0.201
5/31/2022	0.042
7/6/2022	0.000
8/10/2022	0.000
9/7/2022	0.000

0.01 Flume Ice Affected or Frozen.

Note: Water Level in flume below 0.02 feet not connected to stilling well.



Lower Dry Fork Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)												
Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.81	1.05								3.56	1.17	0.84
2	0.64	1.14								3.90	1.02	0.80
3	0.62	1.35							3.07	3.81	1.03	0.83
4	1.20	1.07							4.14	3.61	1.15	1.37
5	1.87	1.00							4.08	3.56	1.24	0.64
6	1.14	0.91							3.83	2.92	1.23	0.56
7	1.70	0.91							3.54	2.71	1.24	0.47
8	0.86	0.89							3.33	3.75	1.06	0.45
9	1.48	0.95							3.12	4.46	0.82	0.44
10	1.09	0.96	0.42						3.00	5.61	0.72	0.45
11	0.79	0.50							2.78	7.52	0.78	0.44
12	1.35								2.57	6.98	0.82	0.41
13	1.23								2.85	6.46	0.59	0.40
14	1.24								2.82	6.25	0.76	0.55
15	0.87								3.07	6.23	1.03	0.63
16	1.05								3.20	5.92	1.12	0.46
17	1.03								3.07	5.65	0.61	0.48
18	1.13								2.73	5.75	0.54	0.43
19	1.35								3.26	5.68	1.58	0.42
20	1.12								3.41	5.46	1.23	0.51
21	1.20								3.35	5.25	1.18	0.65
22	1.00								3.36	5.25	1.23	0.69
23	0.93								3.04	5.33	1.04	0.63
24	0.74								1.90	4.98	1.17	0.15
25	0.85								2.08	4.84	1.36	0.45
26	1.81								2.04	4.53	1.28	0.46
27	1.45								2.51	4.43	1.03	0.27
28	1.23								3.36	4.31	0.96	0.44
29	1.09				--	0.66			3.28	2.85	0.89	0.48
30	1.11				--				3.24	1.15	0.89	0.85
31	1.05	--			--		--		--	0.64	0.84	--
Mean	1.13	0.98	0.42			0.66			3.07	4.62	1.02	0.56
Min	0.62	0.50	0.42			0.66			1.90	0.64	0.54	0.15
Max	1.87	1.35	0.42			0.66			4.14	7.52	1.58	1.37

Measured Streamflow	
Date	Streamflow (CFS)
10/25/2021	0.69
11/23/2021	0.00
12/10/2021	0.09
1/7/2022	0.00
2/9/2022	0.00
3/10/2022	0.00
4/8/2022	0.00
5/2/2022	0.00
5/26/2022	0.00
7/6/2022	3.83
8/10/2022	0.94
9/5/2022	0.63

0.01 - Flume likely ice affected or frozen.
 - Indicates daily average flow less than 0.28 cfs. Stilling well inlet is 0.10 feet above flume bottom, and data logger does not record flows between 0.00 (dry) and 0.28 cfs.



Middle Dry Fork Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.77	0.74	0.85	ND	ND	ND	0.45	1.04	6.66	4.47	2.02	0.73
2	0.74	0.73	0.91	ND	ND	ND	0.55	2.04	7.00	4.12	2.23	0.80
3	0.73	0.73	ND	ND	ND	ND	0.54	2.26	7.09	4.02	1.37	0.86
4	0.73	0.70	ND	ND	ND	ND	0.65	1.63	6.96	3.93	1.21	1.12
5	0.70	0.72	ND	ND	ND	ND	0.97	1.20	6.90	4.02	1.42	0.88
6	0.57	0.73	ND	ND	ND	ND	0.75	2.94	6.93	3.28	1.27	0.72
7	0.55	0.75	ND	ND	ND	ND	0.60	5.41	6.70	2.22	0.98	0.87
8	0.56	0.78	ND	ND	ND	ND	0.68	6.70	5.90	1.99	1.08	0.97
9	0.89	0.89	ND	ND	ND	ND	0.91	5.78	5.75	1.87	0.86	0.91
10	0.81	0.93	ND	ND	ND	ND	0.83	5.00	5.65	1.78	0.63	0.67
11	0.82	0.79	ND	ND	ND	ND	0.75	5.33	5.75	1.67	0.40	0.71
12	0.73	0.83	ND	ND	ND	ND	0.71	4.91	5.72	1.57	0.39	0.82
13	0.70	0.90	ND	ND	ND	ND	0.53	4.26	5.76	1.36	0.40	0.74
14	0.71	0.91	ND	ND	ND	ND	0.50	4.33	5.44	1.28	1.11	0.88
15	0.63	0.91	ND	ND	ND	ND	0.51	4.78	5.20	1.57	1.25	0.94
16	0.83	0.95	ND	ND	ND	ND	0.55	5.12	5.31	1.30	1.44	0.81
17	0.92	0.86	ND	ND	ND	ND	0.77	4.69	5.30	1.22	1.21	0.85
18	0.99	0.83	ND	ND	ND	ND	1.14	5.90	5.08	1.12	1.13	0.79
19	0.97	0.72	ND	ND	ND	ND	1.29	6.32	4.98	1.11	0.99	0.79
20	0.77	0.84	ND	ND	ND	ND	1.25	5.83	4.42	1.03	2.01	0.77
21	0.76	0.80	ND	ND	ND	ND	1.12	5.98	4.28	0.96	1.33	0.83
22	0.82	0.83	ND	ND	ND	ND	1.13	6.00	4.27	0.89	1.20	1.09
23	0.84	0.74	ND	ND	ND	ND	0.94	5.71	5.83	1.06	1.28	0.93
24	0.83	0.76	ND	ND	ND	ND	0.79	5.49	5.50	1.72	1.20	0.78
25	0.90	0.54	ND	ND	ND	0.00	0.73	5.54	5.16	2.15	1.12	0.80
26	1.09	0.15	ND	ND	ND	0.03	0.79	6.24	4.97	2.54	1.29	0.81
27	0.75	0.46	ND	ND	ND	0.19	0.93	6.32	4.72	2.56	1.20	0.74
28	0.71	0.60	ND	ND	ND	0.26	0.99	6.39	4.66	2.46	0.93	0.79
29	0.79	0.72	ND	ND	--	0.41	0.92	6.22	4.58	1.85	0.97	0.85
30	0.79	0.74	ND	ND	--	0.44	0.84	6.18	4.69	1.50	0.93	0.87
31	0.79	--	ND	ND	--	0.37	--	6.07	--	1.44	0.87	--
Mean	0.78	0.75	0.88	ND	ND	0.24	0.80	4.89	5.57	2.07	1.15	0.84
Min	0.55	0.15	0.85	ND	ND	0.00	0.45	1.04	4.27	0.89	0.39	0.67
Max	1.09	0.95	0.91	ND	ND	0.44	1.29	6.70	7.09	4.47	2.23	1.12

Measured Streamflow

Date	Streamflow (CFS)
10/5/2021	0.69
11/8/2021	0.63
5/4/2022	1.69
5/27/2022	6.39
7/6/2022	4.16
8/10/2022	1.15
9/6/2022	0.88

0.01 Flume Ice Affected or Frozen.
ND No Data. Stilling Well Frozen.



Upper Dry Fork Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.97	0.88	ND	ND	ND	ND	ND	0.42	7.91	5.90	1.92	1.46
2	0.97	0.81	ND	ND	ND	ND	ND	1.55	8.41	5.45	2.14	1.54
3	0.97	0.76	ND	ND	ND	ND	ND	1.67	8.53	5.45	1.89	1.47
4	1.01	0.76	ND	ND	ND	ND	ND	1.33	8.42	5.39	1.80	1.45
5	1.07	0.81	ND	ND	ND	ND	ND	1.83	8.20	5.21	1.82	1.46
6	1.00	0.85	ND	ND	ND	ND	ND	3.90	8.32	4.66	1.79	1.44
7	1.01	0.86	ND	ND	ND	ND	ND	6.98	8.76	4.08	1.69	1.37
8	1.03	0.80	ND	ND	ND	ND	ND	8.88	8.38	3.85	1.62	1.39
9	1.41	0.72	ND	ND	ND	ND	ND	8.01	7.84	3.70	1.56	1.41
10	1.09	0.59	ND	ND	ND	ND	ND	6.31	7.78	3.47	1.65	1.16
11	1.11	0.59	ND	ND	ND	ND	ND	6.68	7.90	3.45	1.83	1.03
12	0.89	0.60	ND	ND	ND	ND	ND	5.82	7.92	3.40	1.69	1.07
13	0.82	0.68	ND	ND	ND	ND	ND	5.06	7.84	3.14	1.67	1.06
14	0.66	0.84	ND	ND	ND	ND	ND	5.22	7.29	3.13	1.68	1.17
15	0.87	0.76	ND	ND	ND	ND	ND	6.01	7.27	3.18	2.03	1.17
16	1.56	0.73	ND	ND	ND	ND	ND	6.26	7.52	2.83	2.11	1.03
17	1.26	0.60	ND	ND	ND	ND	0.15	5.82	7.68	2.78	2.01	1.13
18	1.14	0.34	ND	ND	ND	ND	0.29	6.87	7.42	2.70	2.01	1.20
19	0.90	0.90	ND	ND	ND	ND	0.39	7.37	6.94	2.64	2.17	1.17
20	0.85	0.66	ND	ND	ND	ND	0.36	6.64	6.35	2.57	2.78	1.11
21	0.90	0.69	ND	ND	ND	ND	0.36	6.85	6.01	2.47	1.96	1.16
22	0.93	1.15	ND	ND	ND	ND	0.24	6.70	6.21	2.46	1.85	1.30
23	0.95	1.20	ND	ND	ND	ND	0.31	6.24	8.07	2.40	1.75	1.22
24	0.98	0.80	ND	ND	ND	ND	0.08	6.04	7.77	2.24	1.71	1.03
25	1.11	0.40	ND	ND	ND	ND	0.08	6.35	7.52	2.26	1.62	1.02
26	1.01	1.20	ND	ND	ND	ND	0.17	7.37	7.01	2.36	1.63	1.03
27	0.78	0.75	ND	ND	ND	ND	0.28	7.70	6.63	2.27	1.58	1.00
28	0.75	0.67	ND	ND	ND	ND	0.33	7.82	6.48	2.09	1.56	1.05
29	0.80	0.71	ND	ND	--	ND	0.22	6.97	6.40	2.01	1.50	1.04
30	0.85	0.88	ND	ND	--	ND	0.19	6.99	6.50	2.00	1.47	1.02
31	0.88	--	ND	ND	--	ND	--	7.14	--	1.95	1.48	--

Mean	0.98	0.77	ND	ND	ND	ND	0.25	5.77	7.51	3.27	1.81	1.21
Min	0.66	0.34	ND	ND	ND	ND	0.08	0.42	6.01	1.95	1.47	1.00
Max	1.56	1.20	ND	ND	ND	ND	0.39	8.88	8.76	5.90	2.78	1.54

0.01 Flume Ice Affected or Frozen.
ND No Data. Stilling Well Frozen.

Measured Streamflow

Date	Streamflow (CFS)
10/25/2021	1.22
5/6/2022	2.30
5/27/2022	7.76
7/6/2022	4.99
8/10/2022	1.69
9/6/2022	1.37



Lick Creek Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.00	0.00	0.00	ND	ND	ND	0.03	0.31	0.00	0.01	0.00	0.01
2	0.00	0.00	0.00	ND	ND	ND	0.05	0.30	0.00	0.01	0.00	0.00
3	0.00	0.00	0.00	ND	ND	ND	0.08	0.35	0.01	0.02	0.00	0.00
4	0.00	0.00	0.00	ND	ND	ND	0.08	0.12	0.04	0.02	0.00	0.00
5	0.00	0.00	0.00	ND	ND	ND	0.05	0.03	0.05	0.02	0.00	0.00
6	0.00	0.00	0.00	0.01	ND	ND	0.01	0.09	0.03	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	ND	ND	0.01	0.21	0.03	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	ND	ND	0.02	0.41	0.03	0.00	0.00	0.00
9	0.00	0.00	0.00	ND	ND	ND	0.05	0.52	0.03	0.00	0.00	0.00
10	0.00	0.00	0.00	ND	ND	ND	0.04	0.54	0.03	0.00	0.00	0.00
11	0.00	0.00	0.00	ND	ND	ND	0.06	0.71	0.03	0.00	0.00	0.00
12	0.00	0.00	ND	ND	ND	ND	0.04	0.66	0.04	0.00	0.04	0.00
13	0.00	0.00	ND	ND	ND	ND	0.03	0.46	0.06	0.00	0.03	0.00
14	0.00	0.00	0.00	ND	ND	ND	0.09	0.45	0.02	0.00	0.05	0.00
15	0.00	0.00	0.00	ND	ND	ND	0.09	0.63	0.00	0.00	0.05	0.00
16	0.00	0.00	ND	ND	ND	ND	0.08	0.78	0.01	0.00	0.04	0.00
17	0.00	0.00	ND	ND	ND	ND	0.06	0.80	0.01	0.00	0.03	0.00
18	0.00	0.00	ND	ND	ND	ND	0.08	0.80	0.01	0.00	0.03	0.00
19	0.00	0.00	ND	ND	ND	ND	0.16	0.88	0.01	0.00	0.03	0.00
20	0.00	0.00	ND	ND	ND	ND	0.29	0.69	0.01	0.00	0.01	0.00
21	0.00	0.00	ND	ND	ND	ND	0.32	0.48	0.00	0.00	0.02	0.00
22	0.00	0.00	ND	ND	ND	ND	0.34	0.45	0.01	0.00	0.02	0.00
23	0.00	0.00	ND	ND	ND	ND	0.19	0.41	0.00	0.00	0.03	0.00
24	0.00	0.00	ND	ND	ND	ND	0.18	0.34	0.00	0.00	0.03	0.00
25	0.00	0.00	0.00	ND	ND	ND	0.18	0.30	0.01	0.00	0.02	0.00
26	0.00	0.00	ND	ND	ND	ND	0.21	0.33	0.00	0.00	0.01	0.00
27	0.00	0.00	ND	ND	ND	0.00	0.28	0.36	0.00	0.00	0.01	0.00
28	0.00	0.00	ND	ND	ND	0.00	0.33	0.41	0.00	0.00	0.01	0.00
29	0.00	0.00	ND	ND	--	0.06	0.31	0.35	0.01	0.00	0.01	0.00
30	0.00	0.00	ND	ND	--	0.04	0.25	0.16	0.01	0.00	0.01	0.00
31	0.00	--	ND	ND	--	0.03	--	0.00	--	0.00	0.02	--

Measured Streamflow

Date	Streamflow (CFS)
5/2/2022	0.29
5/30/2022	0.26
7/6/2022	0.01
8/10/2022	0.00
9/2/2022	0.00

Mean	0.00	0.00	0.00	0.00	ND	0.02	0.13	0.44	0.02	0.00	0.02	0.00
Min	0.00	0.00	0.00	0.00	ND	0.00	0.01	0.03	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.01	ND	0.06	0.34	0.88	0.06	0.02	0.05	0.01

ND No Data. Stilling well frozen.
Note: Water Level below 0.02 feet not connected to stilling well. Flows below 0.02 cfs are approximate.



Deep Creek Ditch Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.21	0.24	0.12	ND	ND	ND	ND	0.30	1.51	0.97	0.28	0.26
2	0.23	0.18	0.15	ND	ND	ND	ND	0.66	1.59	0.94	0.34	0.30
3	0.28	0.16	0.13	ND	ND	ND	ND	0.76	1.39	0.93	0.29	0.28
4	0.30	0.17	0.12	ND	ND	ND	ND	0.46	1.50	0.98	0.28	0.27
5	0.32	0.19	0.10	ND	ND	ND	ND	0.56	1.52	0.96	0.28	0.27
6	0.27	0.19	ND	ND	ND	ND	ND	1.08	1.42	0.75	0.28	0.26
7	0.27	0.21	ND	ND	ND	ND	ND	1.49	1.24	0.61	0.26	0.22
8	0.28	0.21	ND	ND	ND	ND	ND	2.07	1.19	0.65	0.24	0.22
9	0.33	0.17	ND	ND	ND	ND	ND	2.01	1.26	0.61	0.24	0.23
10	0.24	0.10	ND	ND	ND	ND	ND	1.86	1.25	0.56	0.27	0.16
11	0.28	0.27	ND	ND	ND	ND	ND	1.96	1.30	0.55	0.29	0.12
12	0.18	0.15	ND	ND	ND	ND	ND	1.70	1.33	0.51	0.26	0.15
13	0.15	0.14	ND	ND	ND	ND	ND	1.52	1.34	0.47	0.26	0.13
14	0.11	0.21	ND	ND	ND	ND	ND	1.67	1.13	0.51	0.28	0.13
15	0.12	0.15	ND	ND	ND	ND	ND	1.85	1.06	0.50	0.31	0.13
16	0.13	0.19	ND	ND	ND	ND	ND	1.96	1.20	0.47	0.31	0.12
17	0.24	0.15	ND	ND	ND	ND	ND	1.92	1.22	0.50	0.31	0.14
18	0.32	0.34	ND	ND	ND	ND	ND	2.06	1.12	0.47	0.32	0.17
19	0.18	0.14	ND	ND	ND	ND	ND	2.18	1.03	0.48	0.33	0.17
20	0.28	0.11	ND	ND	ND	ND	ND	1.70	0.98	0.44	0.41	0.14
21	0.24	0.33	ND	ND	ND	ND	ND	1.37	0.98	0.43	0.30	0.15
22	0.23	0.16	ND	ND	ND	ND	ND	1.85	0.98	0.45	0.28	0.16
23	0.26	0.28	ND	ND	ND	ND	ND	2.14	1.28	0.42	0.28	0.15
24	0.25	0.13	ND	ND	ND	ND	ND	1.90	1.24	0.34	0.29	0.11
25	0.34	0.25	ND	ND	ND	ND	ND	1.95	1.23	0.33	0.25	0.11
26	0.22	0.45	ND	ND	ND	ND	ND	1.97	1.06	0.37	0.23	0.12
27	0.18	0.38	ND	ND	ND	ND	0.08	1.66	1.03	0.34	0.24	0.12
28	0.16	0.42	ND	ND	ND	ND	0.16	1.53	1.09	0.30	0.25	0.11
29	0.17	0.28	ND	ND	--	ND	0.12	1.41	1.11	0.29	0.24	0.10
30	0.22	0.13	ND	ND	--	ND	0.10	1.31	1.07	0.28	0.25	0.09
31	0.24	--	ND	ND	--	ND	--	1.32	--	0.28	0.26	--
Mean	0.23	0.22	0.12	ND	ND	ND	0.12	1.55	1.22	0.54	0.28	0.17
Min	0.11	0.10	0.10	ND	ND	ND	0.08	0.30	0.98	0.28	0.23	0.09
Max	0.34	0.45	0.15	ND	ND	ND	0.16	2.18	1.59	0.98	0.41	0.30

Measured Streamflow

Date	Streamflow (CFS)
5/6/2022	1.71
5/27/2022	1.45
7/6/2022	0.95
8/10/2022	0.46
9/5/2022	0.35

0.01 Flume Ice Affected or Frozen.
ND No Data. Stilling Well Frozen.



Minnesota Reservoir Flume Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.46	ND	ND	ND	ND	ND	ND	ND	1.44	0.30	1.05	0.82
2	0.46	ND	ND	ND	ND	ND	ND	0.52	1.51	1.20	0.86	
3	0.48	ND	ND	ND	ND	ND	ND	1.55	1.45	1.05	0.84	
4	0.49	ND	ND	ND	ND	ND	ND	1.59	1.40	1.06	0.85	
5	0.50	ND	ND	ND	ND	ND	ND	1.13	1.37	1.07	0.85	
6	0.46	ND	ND	ND	ND	ND	ND	1.81	1.32	1.89	1.07	0.85
7	0.47	ND	ND	ND	ND	ND	ND	2.70	1.74	3.64	1.05	0.81
8	0.47	ND	ND	ND	ND	ND	ND	2.83	2.72	3.39	1.04	0.78
9	0.56	ND	ND	ND	ND	ND	ND	2.29	2.20	3.18	1.01	0.77
10	0.56	ND	ND	ND	ND	ND	ND	1.87	2.16	2.40	0.94	0.67
11	0.60	ND	ND	ND	ND	ND	ND	1.85	1.90	2.34	0.77	0.60
12	0.57	ND	ND	ND	ND	ND	ND	1.69	1.58	2.26	0.72	0.59
13	0.51	ND	ND	ND	ND	ND	ND	1.51	1.45	1.72	0.72	0.56
14	0.53	ND	ND	ND	ND	ND	ND	1.53	1.24	1.30	0.77	0.54
15	0.51	ND	ND	ND	ND	ND	ND	1.66	1.06	1.41	0.76	0.56
16	0.57	ND	ND	ND	ND	ND	ND	1.78	1.10	1.23	0.80	0.60
17	0.67	ND	ND	ND	ND	ND	ND	1.72	1.11	1.20	0.74	0.69
18	0.70	ND	ND	ND	ND	ND	ND	2.37	1.00	1.20	0.77	0.74
19	0.90	ND	ND	ND	ND	ND	ND	2.39	0.96	1.21	0.75	0.70
20	0.67	ND	ND	ND	ND	ND	ND	2.13	0.70	1.32	0.98	0.67
21	0.68	ND	ND	ND	ND	ND	ND	1.98	0.45	1.24	0.76	0.67
22	0.79	ND	ND	ND	ND	ND	ND	2.02	0.37	1.20	0.78	0.66
23	0.69	ND	ND	ND	ND	ND	ND	2.00	0.66	1.15	0.82	0.69
24	0.76	ND	ND	ND	ND	ND	ND	1.85	0.61	1.10	0.82	0.69
25	0.39	ND	ND	ND	ND	ND	ND	1.88	0.50	1.10	0.78	0.70
26	ND	ND	ND	ND	ND	ND	ND	2.14	0.49	1.04	0.76	0.69
27	ND	ND	ND	ND	ND	ND	ND	2.22	0.38	1.10	0.77	0.65
28	ND	ND	ND	ND	ND	ND	ND	2.21	0.35	1.02	0.76	0.68
29	ND	ND	ND	ND	--	ND	ND	2.14	0.33	0.97	0.79	0.67
30	ND	ND	ND	ND	--	ND	ND	2.10	0.34	0.97	0.77	0.67
31	ND	--	ND	ND	--	ND	--	1.82	--	0.94	0.81	--

Measured Streamflow

Date	Streamflow (CFS)
10/25/2021	0.94
11/23/2021	1.15
12/9/2021	0.00
5/2/2022	1.53
5/30/2022	2.21
7/6/2022	1.95
8/10/2022	0.81
9/6/2022	0.37

Mean	0.58	#DIV/0!	#DIV/0!	ND	ND	ND	#DIV/0!	1.91	1.13	1.55	0.87	0.70
Min	0.39	0.00	0.00	ND	ND	ND	0.00	0.52	0.33	0.30	0.72	0.54
Max	0.90	0.00	0.00	ND	ND	ND	0.00	2.83	2.72	3.64	1.20	0.86

0.01 Flume Ice Affected or Frozen.

ND No Data. Stilling Well Frozen.

Indicates daily average flow less than 0.28 cfs. Stilling well inlet is 0.10 feet above flume bottom, and data logger does not record flows between 0.00 (dry) and 0.28 cfs.

Note: A portion of total streamflow diverted around flume by beaver activity.

West Elk Mine - Water Year 2022



South Prong Creek Streamflow (cubic feet per second)

Daily Mean Streamflow (CFS)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	0.29	ND	ND	ND	ND	ND	0.26	1.71	3.40	3.43	0.60	ND2
2	0.27	ND	ND	ND	ND	ND	0.29	1.61	5.25	3.05	1.02	ND2
3	0.26	ND	ND	ND	ND	ND	0.36	1.78	6.56	3.15	1.00	0.29
4	0.27	ND	ND	ND	ND	ND	0.44	1.87	6.76	3.07	0.53	0.27
5	0.27	ND	ND	ND	ND	ND	0.61	2.22	6.84	3.25	0.55	0.25
6	0.28	ND	ND	ND	ND	ND	0.65	2.46	7.47	2.42	1.18	0.26
7	0.29	ND	ND	ND	ND	ND	0.84	2.90	8.58	1.37	1.66	0.23
8	0.30	ND	ND	ND	ND	ND	0.54	3.39	8.94	1.23	1.46	0.22
9	0.52	ND	ND	ND	ND	ND	0.61	3.43	9.09	1.14	1.23	0.24
10	0.33	ND	ND	ND	ND	ND	0.54	3.01	10.07	1.05	0.84	0.19
11	0.36	ND	ND	ND	ND	ND	0.70	3.12	10.24	0.97	ND2	0.15
12	0.34	ND	ND	ND	ND	ND	0.74	2.92	9.36	0.91	ND2	0.16
13	ND	ND	ND	ND	ND	ND	ND1	3.51	8.79	0.84	ND2	0.20
14	ND	ND	ND	ND	ND	ND	ND1	4.16	7.65	1.58	ND2	0.33
15	ND	ND	ND	ND	ND	ND	0.61	5.59	6.99	2.42	ND2	0.46
16	ND	ND	ND	ND	ND	ND	0.62	6.82	6.27	1.51	ND2	0.43
17	ND	ND	ND	ND	ND	ND	0.77	6.54	6.32	1.70	ND2	0.45
18	ND	ND	ND	ND	ND	ND	1.08	7.09	6.36	2.51	ND2	0.47
19	ND	ND	ND	ND	ND	ND	1.69	8.22	6.46	2.18	ND2	0.43
20	ND	ND	ND	ND	ND	ND	2.10	7.79	5.75	1.81	ND2	0.43
21	ND	ND	ND	ND	ND	ND	1.92	4.72	4.98	1.71	ND2	0.47
22	ND	ND	ND	ND	ND	ND	1.60	3.28	4.64	1.73	ND2	0.55
23	ND	ND	ND	ND	ND	ND	1.19	2.69	4.21	1.80	ND2	0.50
24	ND	ND	ND	ND	ND	ND	1.00	2.38	4.16	1.61	ND2	0.45
25	ND	ND	ND	ND	ND	ND	0.92	2.37	4.03	0.82	ND2	0.43
26	ND	ND	ND	ND	ND	ND	1.08	3.09	4.04	0.63	ND2	0.42
27	ND	ND	ND	ND	ND	0.43	1.34	4.91	3.74	0.61	ND2	0.38
28	ND	ND	ND	ND	ND	0.52	1.40	6.30	3.60	0.57	ND2	0.40
29	ND	ND	ND	ND	--	0.51	1.40	5.69	3.51	0.53	ND2	0.44
30	ND	ND	ND	ND	--	0.33	1.39	5.00	3.73	0.44	ND2	0.51
31	ND	--	ND	ND	--	0.40	--	3.80	--	0.45	ND2	--
Mean	0.31	ND	ND	ND	ND	0.44	0.95	4.01	6.26	1.63	1.01	0.36
Min	0.26	ND	ND	ND	ND	0.33	0.26	1.61	3.40	0.44	0.53	0.15
Max	0.52	ND	ND	ND	ND	0.52	2.10	8.22	10.24	3.43	1.66	0.55

Measured Streamflow

Date	Streamflow (CFS)
10/25/2021	0.48
11/23/2021	0.97
5/2/2022	1.75
5/30/2022	4.81
7/6/2022	3.57
8/10/2022	0.56
9/2/2022	0.44

0.01 Flume Ice Affected or Frozen.

ND No Data. Stilling Well Frozen.

ND1 No Data. Logger Malfunction.

ND2 No Data. Flume Clogged by Mudslide.

Note: Water Level below 0.02 feet not connected to stilling well. Flows below 0.02 cfs are approximate.

Note: When height of water in flume is above 1.50 feet (11.19 cfs), bypass spillways overflow and flow through flume is less than total flow in stream.



Upper Sylvester Gulch Measured Flow

Date	GPM	CFS	Comments
4/30/2000	0.00	0.00	Dry
9/19/2000	0.00	0.00	Dry
4/28/2001	0.00	0.00	Dry
6/24/2001	0.00	0.00	Dry
9/28/2001	0.00	0.00	Dry
4/29/2002	0.00	0.00	Dry
6/18/2002	0.00	0.00	Dry
9/9/2002	0.00	0.00	Dry
4/10/2003	0.00	0.00	Dry
6/2/2003	0.00	0.00	Dry
9/18/2003	0.00	0.00	Dry
4/25/2004	0.00	0.00	Dry
5/29/2004	0.00	0.00	Dry
8/31/2004	0.00	0.00	Dry
5/3/2005	0.00	0.00	Dry
6/4/2005	0.00	0.00	No flow
9/20/2005	0.00	0.00	Dry
5/1/2006	0.00	0.00	Dry
5/16/2006	0.00	0.00	Dry
9/12/2006	0.00	0.00	Dry
5/30/2007	0.00	0.00	Dry
8/24/2007	0.00	0.00	Dry
4/25/2007	136	0.30	
5/30/2007	0.00	0.00	Dry
8/24/2007	0.00	0.00	Dry
5/9/2008	887.29	1.98	
6/6/2008	155.22	0.35	
8/20/2008	0.00	0.00	Dry
5/7/2009	155.22	0.35	
5/24/2009	75.62	0.17	
8/10/2009	0.00	0.00	Dry
5/4/2010	0.00	0.00	Dry
6/1/2010	0.00	0.00	Dry
9/1/2010	0.00	0.00	Dry
5/10/2011	365.42	0.81	
6/1/2011	175.44	0.39	
8/10/2011	1.20	0.003	
4/30/2012	0.00	0.00	Dry
5/15/2012	0.00	0.00	Dry
8/20/2012	0.00	0.00	Dry
5/2/2013	0.00	0.00	Dry
5/23/2013	0.00	0.00	Dry
8/20/2013	0.00	0.00	Dry
5/1/2014	0.00		
5/21/2014	18.46	0.04	
9/23/2014	0.00	0.00	Dry
4/24/2015	0.00	0.00	Dry
5/27/2015	2.24	0.01	
8/29/2015	2.24	0.01	
5/5/2016	34.70	0.08	
5/25/2016	23.62	0.05	
9/7/2016	14.12	0.03	
5/12/2017	18.66	0.04	
6/6/2017	3.47	0.01	
9/5/2017	0.00	0.00	Dry
5/12/2018	0.00	0.00	Dry
6/10/2018	0.00	0.00	Dry
9/29/2018	0.00	0.00	Dry
5/7/2019	28.98	0.06	
6/20/2019	1.20	0.00	
9/12/2019	0.00	0.00	Dry
5/11/2020	0.00	0.00	Dry
6/8/2020	0.00	0.00	Dry
9/23/2020	0.00	0.00	Dry
5/6/2021	0.00	0.00	Dry
6/7/2021	0.00	0.00	Dry
9/28/2021	0.00	0.00	Dry
5/4/2022	0.00	0.00	Dry
5/27/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



Horse Gulch Measured Flow

Date	GPM	CFS	Comments
5/7/2000	0.00	0.00	Dry
6/14/2000	0.00	0.00	Dry
9/17/2000	0.00	0.00	Dry
5/2/2001	0.00	0.00	Dry
6/25/2001	0.00	0.00	Dry
9/26/2001	0.00	0.00	Dry
4/25/2002	0.00	0.00	Dry
6/17/2002	0.00	0.00	Dry
9/10/2002	0.00	0.00	Dry
4/12/2003	0.00	0.00	Dry
6/2/2003	0.00	0.00	Dry
9/18/2003	0.00	0.00	Dry
4/25/2004	0.00	0.00	Dry
5/30/2004	0.00	0.00	Dry
9/2/2004	0.00	0.00	Dry
5/10/2005	0.00	0.00	Dry
6/5/2005	0.00	0.00	Dry
9/13/2005	0.00	0.00	Dry
5/1/2006	0.00	0.00	Dry
5/24/2006	0.00	0.00	Dry
9/6/2006	0.00	0.00	Dry
4/27/2007	0.00	0.00	Dry
5/30/2007	0.00	0.00	Dry
8/24/2007	0.00	0.00	Dry
5/5/2008	275	0.61	
6/7/2008	0.00	0.00	Dry
8/23/2008	0.00	0.00	Dry
5/8/2009	0.00	0.00	Dry
6/2/2009	0.00	0.00	Dry
8/11/2009	0.00	0.00	Dry
5/6/2010	0.00	0.00	Dry
6/2/2010	0.00	0.00	Dry
9/1/2010	0.00	0.00	Dry
5/5/2011	0.00	0.00	Dry
6/1/2011	0.00	0.00	Dry
8/11/2011	0.00	0.00	Dry
4/24/2012	0.00	0.00	Dry
5/15/2012	0.00	0.00	Dry
8/22/2012	0.00	0.00	Dry
5/2/2013	0.00	0.00	Dry
5/21/2013	0.00	0.00	Dry
8/23/2013	0.00	0.00	Dry
4/30/2014	0.00	0.00	Dry
5/21/2014		0.00	Dry
9/23/2014	0.00	0.00	Dry
4/25/2015	0.00	0.00	Dry
5/25/2015	0.00	0.00	Dry
8/18/2015	0.00	0.00	Dry
5/5/2016	0.00	0.00	Dry
5/24/2016	0.00	0.00	Dry
9/5/2016	0.00	0.00	Dry
5/10/2017	0.00	0.00	Dry
6/8/2017	0.00	0.00	Dry
9/7/2017	0.00	0.00	Dry
5/11/2018	0.00	0.00	Dry
6/11/2018	0.00	0.00	Dry
9/27/2018	0.00	0.00	Dry
5/1/2019	0.00	0.00	Dry
6/20/2019	0.00	0.00	Dry
9/11/2019	0.00	0.00	Dry
5/11/2020	0.00	0.00	Dry
6/8/2020	0.00	0.00	Dry
9/3/2020	0.00	0.00	Dry
5/7/2021	0.00	0.00	Dry
6/10/2021	0.00	0.00	Dry
9/21/2021	0.00	0.00	Dry
5/6/2022	0.00	0.00	Dry
5/26/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site
GPM - gallons per minute
CFS - cubic feet per second



East Gulch East of Horse Gulch Measured Flow

Date	GPM	CFS	Comments
5/7/2000	3.00	0.01	
6/14/2000	2.50	0.01	
9/17/2000	0.00	0.00	Seep
5/2/2001	3.75	0.01	
6/25/2001	3.75	0.01	
9/26/2001	0.00	0.00	Dry
4/25/2002	0.00	0.00	Dry
6/17/2002	0.00	0.00	Dry
9/10/2002	0.00	0.00	Dry
4/12/2003	0.00	0.00	Dry
6/3/2003	0.00	0.00	Dry
9/18/2003	0.00	0.00	Dry
4/25/2004	0.00	0.00	Dry
5/29/2004	0.00	0.00	Dry
9/2/2004	0.00	0.00	Dry
5/1/2005	45	0.10	
6/5/2005	0.68	0.002	
10/2/2005	0.00	0.00	Wet
5/4/2006	0.00	0.00	Dry
5/23/2006	0.00	0.00	Dry
9/6/2006	0.00	0.00	Dry
4/27/2007	0.00	0.00	Dry
5/30/2007	0.00	0.00	Dry
8/24/2007	0.00	0.00	Dry
5/5/2008	0.00	0.00	Dry
6/7/2008	0.00	0.00	Dry
8/23/2008	0.00	0.00	Dry
5/8/2009	0.00	0.00	Dry
6/2/2009	0.00	0.00	Dry
8/11/2009	0.00	0.00	Dry
5/6/2010	0.00	0.00	Dry
6/2/2010	0.10	0.0002	Trickle
9/1/2010	0.00	0.00	Dry
5/5/2011	88.42	0.20	
6/3/2011	43.55	0.10	
8/12/2011	0.10	0.0002	Trickle
4/30/2012	0.00	0.00	Dry
5/14/2012	0.00	0.00	Dry
8/22/2012	0.00	0.00	Dry
5/1/2013	0.00	0.00	Dry
5/21/2013	0.00	0.00	Dry
8/23/2013	0.00	0.00	Dry
5/2/2014	4.04	0.01	Dry
5/19/2014	0.00	0.00	Wet
9/23/2014	0.00	0.00	Dry
5/28/2015	0.00	0.00	Dry
8/18/2015	0.00	0.00	Dry
4/25/2015	0.00	0.00	Dry
5/2/2016	25.28	0.06	
5/24/2016	2.45	0.01	
9/6/2016	0.00	0.00	Dry
5/10/2017	25.96	0.06	
6/8/2017	0.62	0.00	
9/5/2017	0.00	0.00	Dry
5/11/2018	0.00	0.00	Dry
6/11/2018	0.00	0.00	Dry
9/27/2018	0.00	0.00	Dry
5/1/2019	119	0.27	
6/20/2019	0.00	0.00	Dry
9/11/2019	0.00	0.00	Dry
5/12/2020	0.00	0.00	Dry
6/8/2020	0.00	0.00	Dry
9/4/2020	0.00	0.00	Dry
5/6/2021	0.00	0.00	Dry
6/11/2021	0.00	0.00	Dry
9/21/2021	0.00	0.00	Dry
5/4/2022	0.00	0.00	Dry
5/27/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site
GPM - gallons per minute
CFS - cubic feet per second



Upper Deep Creek Measured Flow

Date	GPM	CFS	Comments
5/4/2006	5,251	11.70	
5/24/2006	2,567	5.72	
8/17/2006	1,634	3.64	
4/28/2007	5,332	11.88	
5/29/2007	1,400	3.12	
9/11/2007	353	0.79	
5/11/2008	17,504	39	
6/8/2008	7,181	16	
8/21/2008	368	0.82	
5/9/2009	5,911	13.17	
6/4/2009	1,445	3.22	
8/9/2009	49.37	0.11	
5/7/2010	2,249	5.01	
6/3/2010	1,014	2.26	
8/31/2010	35.91	0.08	
5/9/2011	8,209	18.29	
6/1/2011	8,824	19.66	
8/11/2011	130	0.29	
4/26/2012	730	1.63	
5/16/2012	321	0.72	
8/22/2012	15.83	0.04	
5/3/2013	1,549	3.45	
5/21/2013	1,582	3.53	
8/21/2013	603	1.34	
5/3/2014	1,773	3.95	
5/20/2014	2,869	6.40	
9/24/2014	147	0.33	
4/23/2015	801	1.79	
5/27/2015	2,568	5.73	
8/19/2015	132	0.30	
5/4/2016	2,720	6.07	
5/24/2016	1,627	3.63	
9/5/2016	113	0.25	
5/11/2017	2,029	4.52	
6/7/2017	1,367	3.05	
9/7/2017	116	0.26	
5/10/2018	643	1.43	
6/11/2018	95	0.21	
9/28/2018	51	0.11	
5/6/2019	3,214	7.17	
6/17/2019	1,585	3.53	
9/11/2019	54	0.12	
5/13/2020	971	2.17	
6/7/2020	179	0.40	
9/25/2020	31.8	0.07	
5/6/2021	650	1.45	
6/10/2021	92	0.21	
9/21/2021	32.7	0.07	
5/6/2022	1,748	3.90	
5/26/2022	1,012	2.26	
9/5/2022	23.9	0.05	

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second

West Elk Mine - Water Year 2022



Lower Deep Creek Measured Flow

Date	GPM	CFS	Comments
5/4/2006	5,745	12.80	
5/24/2006	2,437	5.43	
8/17/2006	1,557	3.47	
4/28/2007	8,039	17.91	
5/29/2007	2,298	5.12	
9/11/2007	467	1.04	
5/11/2008	16,607	37.00	
6/8/2008	8,079	18.00	
8/21/2008	368	0.82	
5/9/2009	3,793	8.45	
6/4/2009	1,423	3.17	
8/9/2009	53.86	0.12	
5/7/2010	3,039	6.77	
6/3/2010	1,346	3.00	
8/31/2010	67.32	0.15	
5/9/2011	11,800	26.29	
6/1/2011	10,067	22.43	
8/11/2011	171	0.38	
4/28/2012	1,061	2.37	
5/16/2012	437	0.97	
8/22/2012	13.44	0.03	
5/3/2013	2,401	5.35	
5/22/2013	1,547	3.45	
8/21/2013	983	2.19	
5/3/2014	2,933	6.54	
5/20/2014	3,283	7.32	
9/24/2014	157	0.35	
4/23/2015	849	1.89	
5/26/2015	2,456	5.48	
8/19/2015	100	0.22	
5/4/2016	2,846	6.35	
5/25/2016	3,670	8.18	
9/5/2016	143	0.32	
5/11/2017	2,939	6.55	
6/7/2017	1,397	3.12	
9/7/2017	119	0.27	
5/10/2018	1,065	2.37	
6/11/2018	90	0.20	
9/28/2018	53	0.12	
5/6/2019	5,840	13.02	
6/17/2019	2,222	4.96	
9/11/2019	149	0.33	
5/13/2020	708	1.58	
6/7/2020	506	1.13	
9/25/2020	22.6	0.05	
5/6/2021	467	1.04	
6/10/2021	118	0.26	
9/21/2021	19.1	0.04	
5/6/2022	1,812	4.04	
5/26/2022	1,101	2.46	
9/5/2022	38.9	0.09	

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second

West Elk Mine - Water Year 2022



Box Canyon Measured Flow

Date	GPM	CFS	Comments
5/6/2000	0.00	0.00	Damp
6/12/2000	0.00	0.00	No Flow
9/18/2000	0.00	0.00	Dry
4/28/2001	0.00	0.00	Dry
6/24/2001	0.00	0.00	Dry
9/30/2001	0.00	0.00	Dry
4/23/2002	0.00	0.00	Dry
6/18/2002	0.00	0.00	Dry
9/9/2002	0.00	0.00	Dry
4/10/2003	0.00	0.00	Dry
6/4/2003	0.00	0.00	Dry
9/18/2003	0.00	0.00	Dry
4/25/2004	0.00	0.00	Dry
5/29/2004	0.00	0.00	Dry
8/31/2004	0.00	0.00	Dry
5/2/2005	0.00	0.00	Dry
6/4/2005	0.00	0.00	Dry
9/20/2005	0.00	0.00	Dry
4/29/2006	0.00	0.00	Dry
5/15/2006	0.00	0.00	Dry
9/6/2006	0.00	0.00	Dry
4/26/2007	0.00	0.00	Dry
5/24/2007	0.00	0.00	Dry
8/24/2007	0.00	0.00	Dry
5/6/2008	4.40	0.01	4.40
6/6/2008	9.60	0.02	9.60
8/23/2008	0.00	0.00	Trickle
5/7/2009	5.74	0.01	5.74
5/24/2009	1.08	0.00	1.08
8/10/2009	0.23	0.00	0.23
5/4/2010	0.00	0.00	Dry
6/1/2010	0.00	0.00	Dry
8/29/2010	0.00	0.00	Dry
5/6/2011	0.00	0.00	Dry
6/2/2011	0.00	0.00	Dry
8/12/2011	0.00	0.00	Dry
4/25/2012	0.00	0.00	Dry
5/15/2012	0.00	0.00	Dry
8/19/2012	0.00	0.00	Dry
5/1/2013	0.00	0.00	Dry
5/22/2013	0.00	0.00	Dry
8/23/2013	0.00	0.00	Dry
5/1/2014	0.00	0.00	Dry
5/21/2014		0.00	Dry
9/23/2014	0.00	0.00	Dry
4/26/2015	0.00	0.00	Dry
5/29/2015	0.00	0.00	Dry
8/29/2015	0.00	0.00	Dry
5/3/2016	0.00	0.00	Dry
5/26/2016	0.00	0.00	Dry
9/8/2016	0.00	0.00	Dry
5/12/2017	0.00	0.00	Dry
6/6/2017	0.00	0.00	Dry
9/7/2017	0.00	0.00	Dry
5/12/2018	0.00	0.00	Dry
6/10/2018	0.00	0.00	Dry
9/29/2018	0.00	0.00	Dry
5/2/2019	0.00	0.00	Dry
6/22/2019	0.00	0.00	Dry
9/10/2019	0.00	0.00	Dry
5/12/2020	0.00	0.00	Dry
6/8/2020	0.00	0.00	Dry
9/25/2020	0.00	0.00	Dry
5/5/2021	0.00	0.00	Dry
6/7/2021	0.00	0.00	Dry
9/27/2021	0.00	0.00	Dry
5/4/2022	0.00	0.00	Dry
5/31/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



Deer Creek Measured Flow

Date	GPM	CFS	Comments
5/3/2005	53	0.12	
5/9/2005	114	0.25	
6/6/2005	11.2	0.02	
7/5/2005	0.72	0.00	
8/4/2005	0.00	0.00	Damp
9/6/2005	0.00	0.00	Dry
10/2/2005	0.00	0.00	Dry
5/1/2006	0.00	0.00	Dry
7/22/2006	0.00	0.00	Dry
8/18/2006	0.00	0.00	Dry
4/27/2007	22.20	0.05	
5/30/2007	46.98	0.10	
8/23/2007	0.00	0.00	Dry
4/27/2007	22.20	0.05	
5/30/2007	46.98	0.10	
8/23/2007	0.00	0.00	Dry
5/5/2008	550	1.23	
6/8/2008	92	0.21	
8/22/2008	0	0.00	Dry
5/8/2009	0.00	0.00	Dry
6/3/2009	25.98	0.06	
8/10/2009	0.00	0.00	Dry
5/6/2010	0.00	0.00	Dry
6/2/2010	0.00	0.00	Dry
8/31/2010	0.00	0.00	Dry
5/5/2011	155	0.35	
6/3/2011	122	0.27	
8/12/2011	0.00	0.00	Dry
4/24/2012	0.00	0.00	Dry
5/17/2012	0.00	0.00	Dry
8/22/2012	0.00	0.00	Dry
5/1/2013	0.00	0.00	Dry
5/21/2013	0.00	0.00	Dry
8/23/2013	0.00	0.00	Dry
5/2/2014	3.66	0.01	
5/19/2014	12.20	0.03	
9/23/2014	0.00	0.00	Dry
4/24/2015	0.00	0.00	Dry
5/25/2015	0.00	0.00	Dry
8/19/2015	0.00	0.00	Dry
5/2/2016	83.48	0.19	
5/24/2016	33.05	0.07	
9/7/2016	0.00	0.00	Dry
5/10/2017	0.00	0.00	Dry
6/8/2017	0.00	0.00	Dry
9/7/2017	0.00	0.00	Dry
5/11/2018	0.00	0.00	Dry
6/12/2018	0.00	0.00	Dry
9/27/2018	0.00	0.00	Dry
5/1/2019	269	0.60	
6/20/2019	0.25	0.00	
9/11/2019	0.00	0.00	Dry
5/12/2020	0.00	0.00	Dry
6/8/2020	0.00	0.00	Dry
9/3/2020	0.00	0.00	Dry
5/6/2021	0.00	0.00	Dry
6/8/2021	0.00	0.00	Dry
9/6/2021	0.00	0.00	Dry
5/6/2022	0.00	0.00	Dry
5/27/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



Poison Gulch Measured Flow

Date	GPM	CFS	Comments
5/9/2005	97	0.22	
6/6/2005	12.5	0.03	
7/5/2005	0.00	0.00	Wet
8/4/2005	0.00	0.00	Dry
9/6/2005	0.00	0.00	Dry
10/2/2005	0.00	0.00	Dry
5/1/2006	31.33	0.07	
5/22/2006	4.01	0.01	
8/18/2006	0.00	0.00	Dry
4/27/2007	15	0.03	
5/30/2007	60	0.13	
8/23/2007	0.00	0.00	Dry
4/27/2007	15	0.03	
5/30/2007	60	0.13	
8/23/2007	0.00	0.00	Dry
5/5/2008	530	1.18	
6/8/2008	56	0.12	
8/22/2008	0.1	0.00	Trickle
5/9/2009	65.81	0.15	
6/3/2009	75	0.17	
8/9/2009	0.00	0.00	Dry
5/6/2010	38.89	0.09	
6/2/2010	5.39	0.01	
8/31/2010	0.00	0.00	Damp
5/9/2011	351	0.78	
6/1/2011	145	0.32	
8/11/2011	1.26	0.00	
4/30/2012	5.53	0.01	
5/16/2012	3.24	0.01	
8/22/2012	0.00	0.00	Dry
5/1/2013	22.40	0.05	
5/21/2013	0.78	0.00	
8/23/2013	0.00	0.00	Dry
5/2/2014	12.04	0.03	
5/19/2014	6.71	0.01	
9/24/2014	0.00	0.00	Dry
4/25/2015	0.00	0.00	Seep
5/28/2015	0.00	0.00	Seep
8/19/2015	0.00	0.00	Dry
5/4/2016	27.75	0.06	
5/24/2016	18.75	0.04	
9/5/2016	0.00	0.00	Dry
5/11/2017	16.29	0.04	
6/7/2017	0.80	0.00	
9/7/2017	0.00	0.00	Dry
5/11/2018	0.00	0.00	Dry
6/11/2018	0.00	0.00	Dry
9/27/2018	0.00	0.00	Dry
5/6/2019	45.2	0.10	
6/20/2019	0.00	0.00	Dry
9/11/2019	0.00	0.00	Dry
5/13/2020	0.00	0.00	Dry
6/7/2020	0.00	0.00	Dry
9/4/2020	0.00	0.00	Dry
5/6/2021	0.00	0.00	Dry
6/11/2021	0.00	0.00	Dry
9/21/2021	0.00	0.00	Dry
5/6/2022	0.00	0.00	Dry
5/27/2022	0.00	0.00	Dry
9/6/2022	0.00	0.00	Dry

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



South Fork of South Prong Creek Measured Flow

Date	GPM	CFS	Comments
7/19/2018	236.9	0.53	
8/30/2018	100.9	0.23	
9/25/2018	117.9	0.26	
5/8/2019	1,603	3.57	
6/19/2019	5,147	11.48	
7/30/2019	1,322	2.95	
9/9/2019	345.5	0.77	
5/14/2020	1,418	3.16	
6/11/2020	1,031	2.30	
9/3/2020	175	0.39	
5/7/2021	436	0.97	
6/8/2021	2,269	5.06	
9/6/2021	172	0.38	
5/9/2022	1,497	3.34	
5/30/2022	2,030	4.53	
9/2/2022	322	0.72	

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



North Fork of South Prong Creek Measured Flow

Date	GPM	CFS	Comments
7/19/2018	0.00	0.00	Dry
8/30/2018	0.00	0.00	Dry
9/25/2018	0.00	0.00	Dry
5/8/2019	27.99	0.06	
6/19/2019	134.14	0.30	
7/30/2019	9.95	0.02	
9/9/2019	0.00	0.00	Dry
5/14/2020	21.58	0.05	
6/11/2020	7.64	0.02	
9/3/2020	0.00	0.00	Dry
5/7/2021	0.00	0.00	Dry
6/8/2021	0.00	0.00	Dry
9/6/2021	0.00	0.00	Dry
5/9/2022	78.33	0.17	
5/30/2022	24.26	0.05	
9/2/2022	0.00	0.00	Dry

Non-data logger site

GPM - gallons per minute

CFS - cubic feet per second



**Stream ST-SW-1
Measured Flow**

Date	GPM	CFS	Comments
7/18/2018	7.75	0.02	
8/29/2018	8.75	0.02	
9/25/2018	12.98	0.03	
6/19/2019	77.97	0.17	
7/30/2019	174.7	0.39	
9/9/2019	48.87	0.11	
5/14/2020	60.18	0.13	
6/11/2020	35.94	0.08	
9/3/2020	11.03	0.02	
5/7/2021	47.40	0.11	
6/8/2021	16.89	0.04	
9/6/2021	8.90	0.02	
5/9/2022	191.50	0.43	
5/30/2022	56.71	0.13	
9/2/2022	12.97	0.03	

Non-data logger site

GPM - gallons per minute

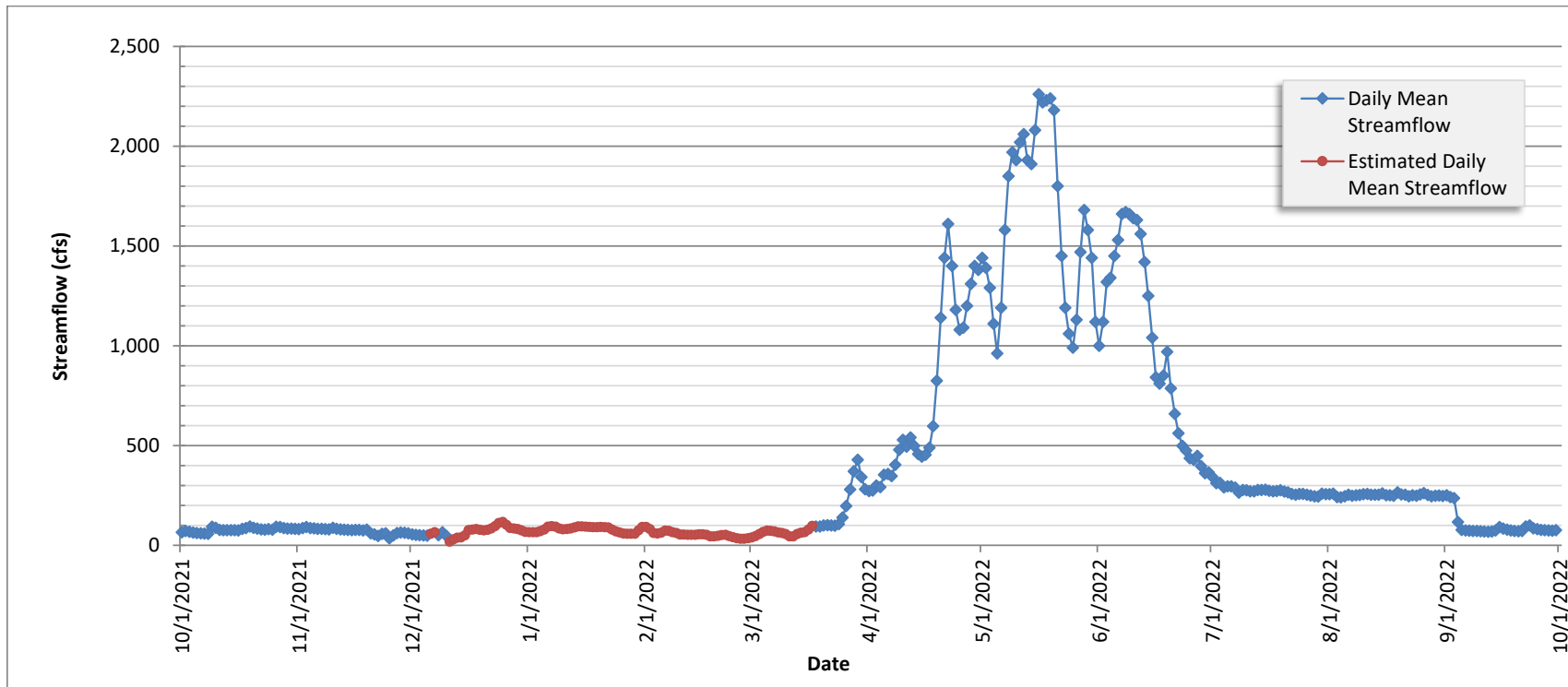
CFS - cubic feet per second



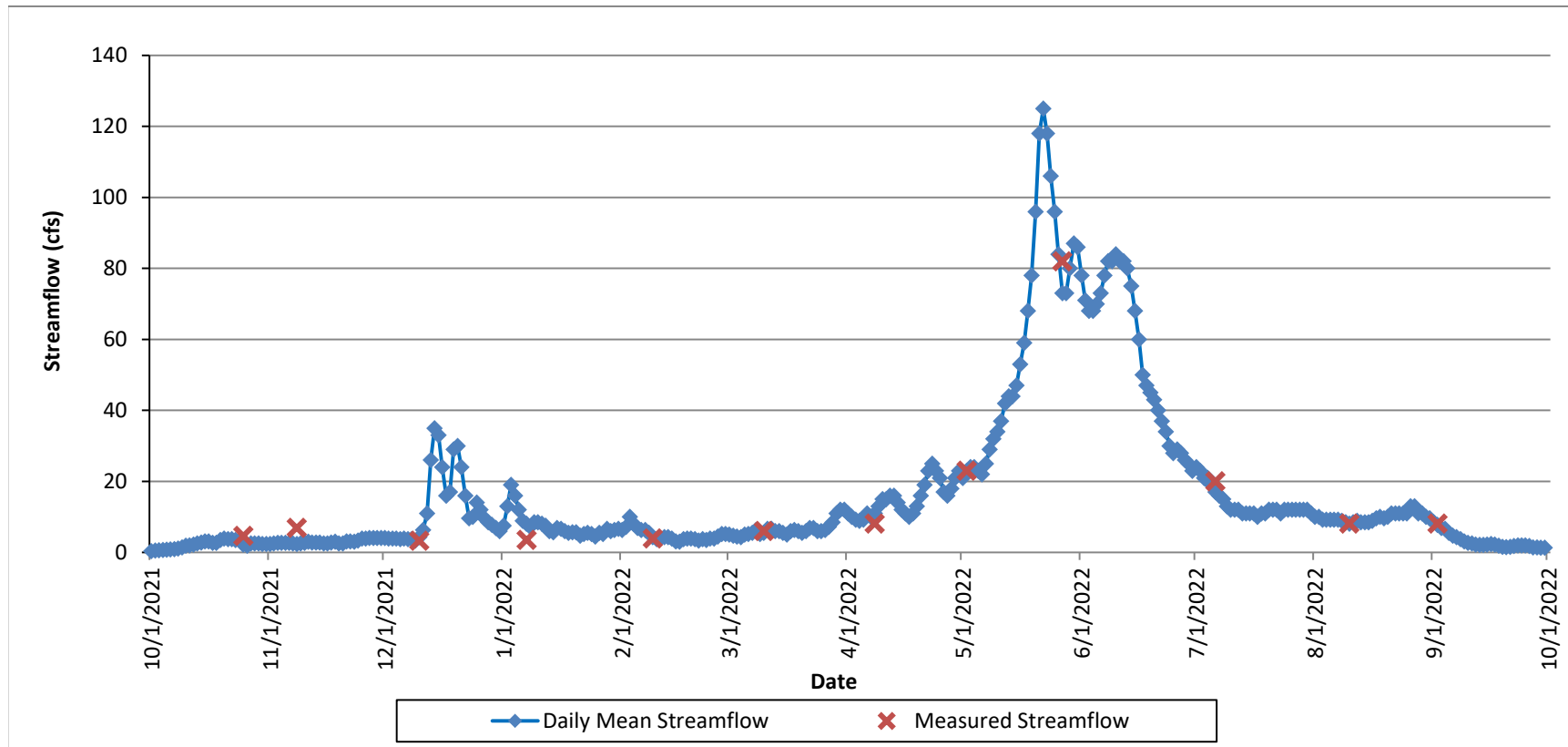
APPENDIX B

SURFACE WATER - HYDROGRAPHS

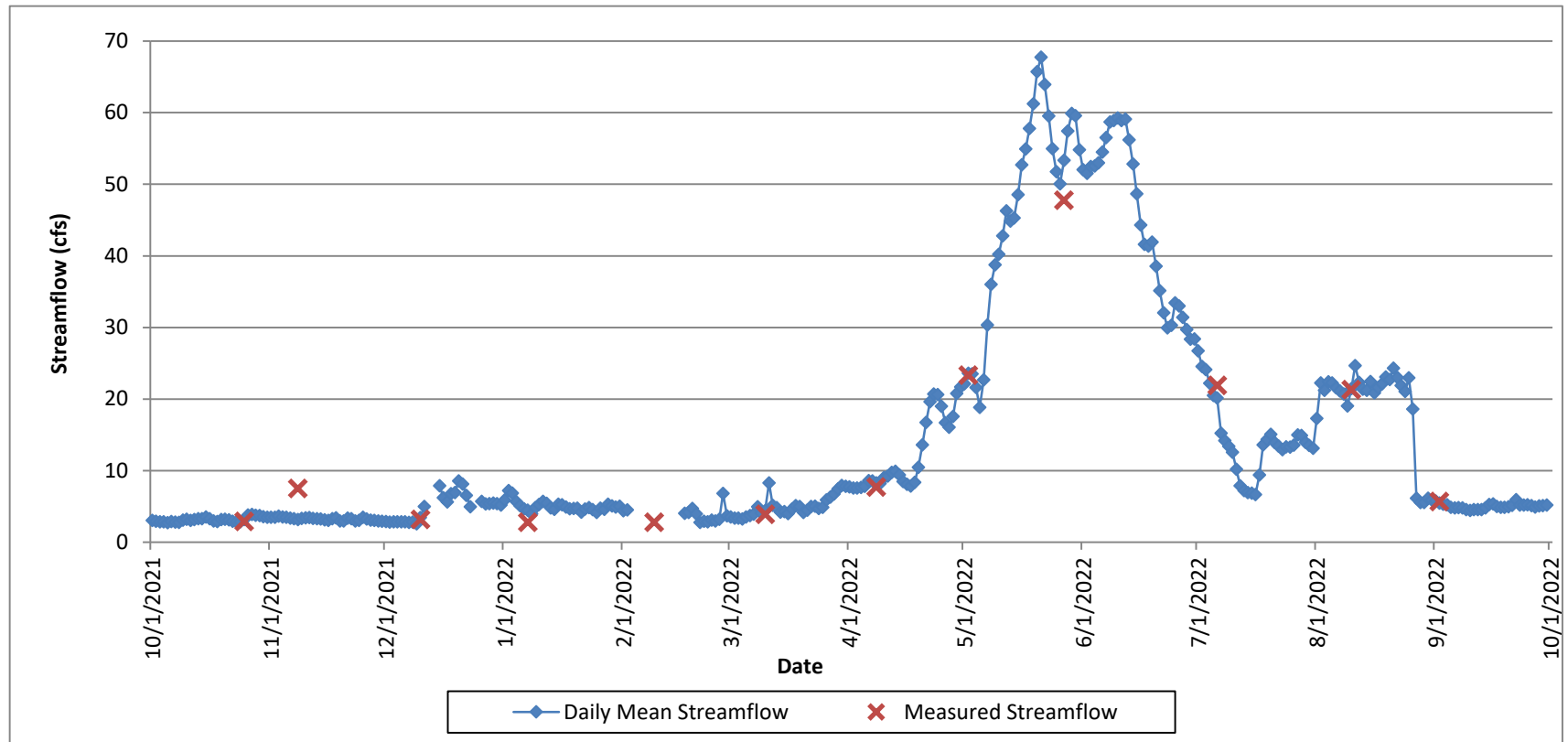
Upper North Fork (USGS) Hydrograph WY 2022



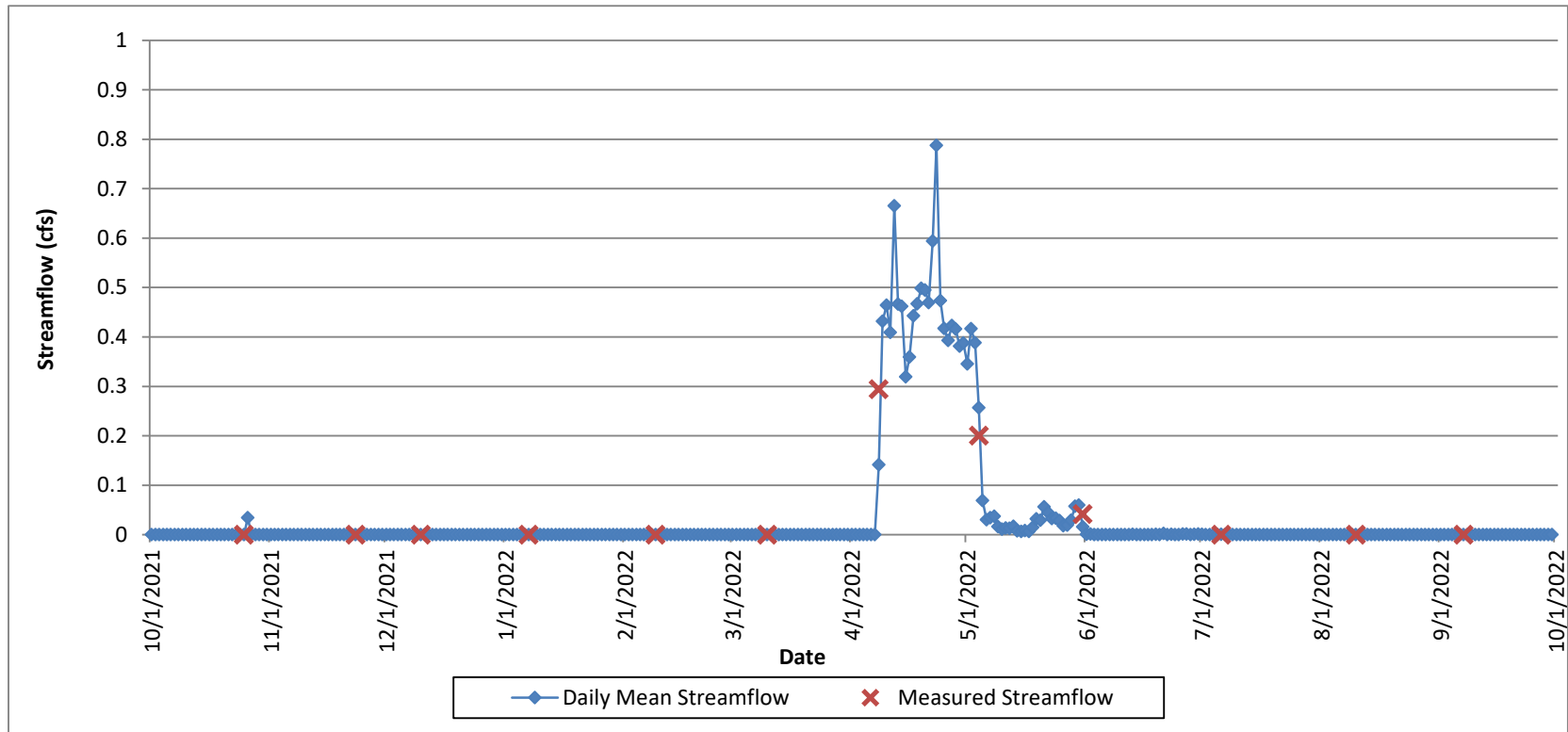
Lower Minnesota Creek Hydrograph WY 2022



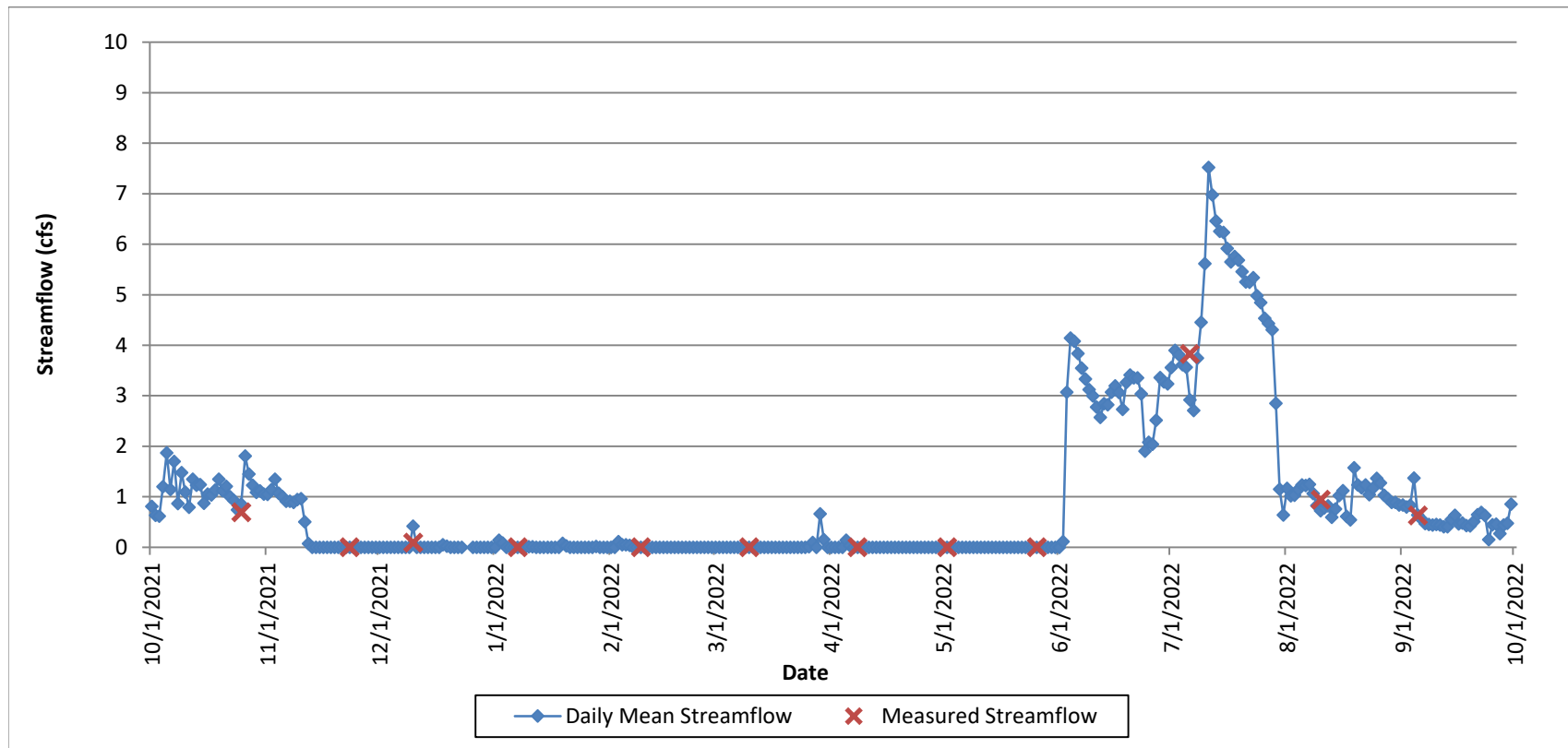
Upper Minnesota Creek Hydrograph WY 2022



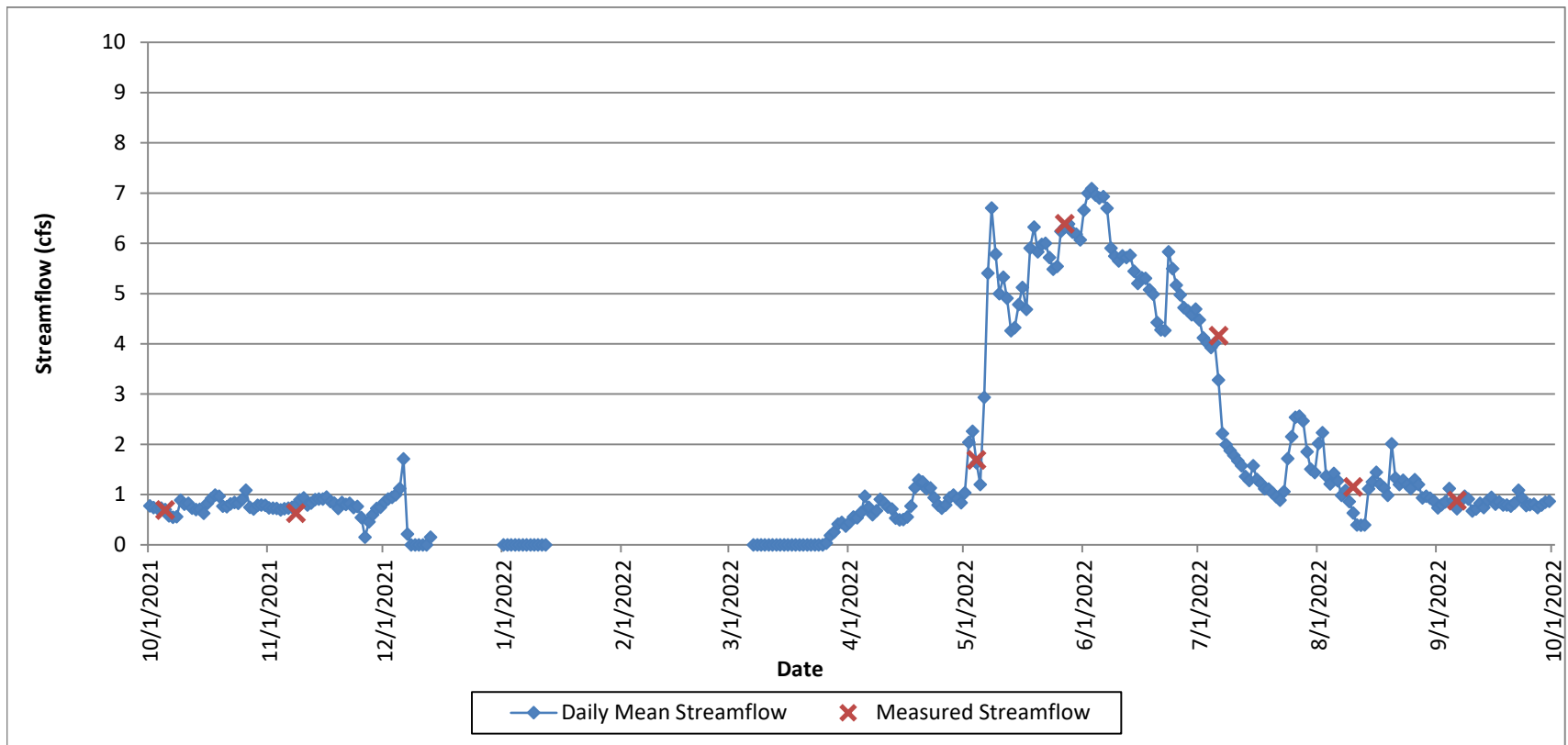
Middle Sylvester Gulch Hydrograph WY 2022



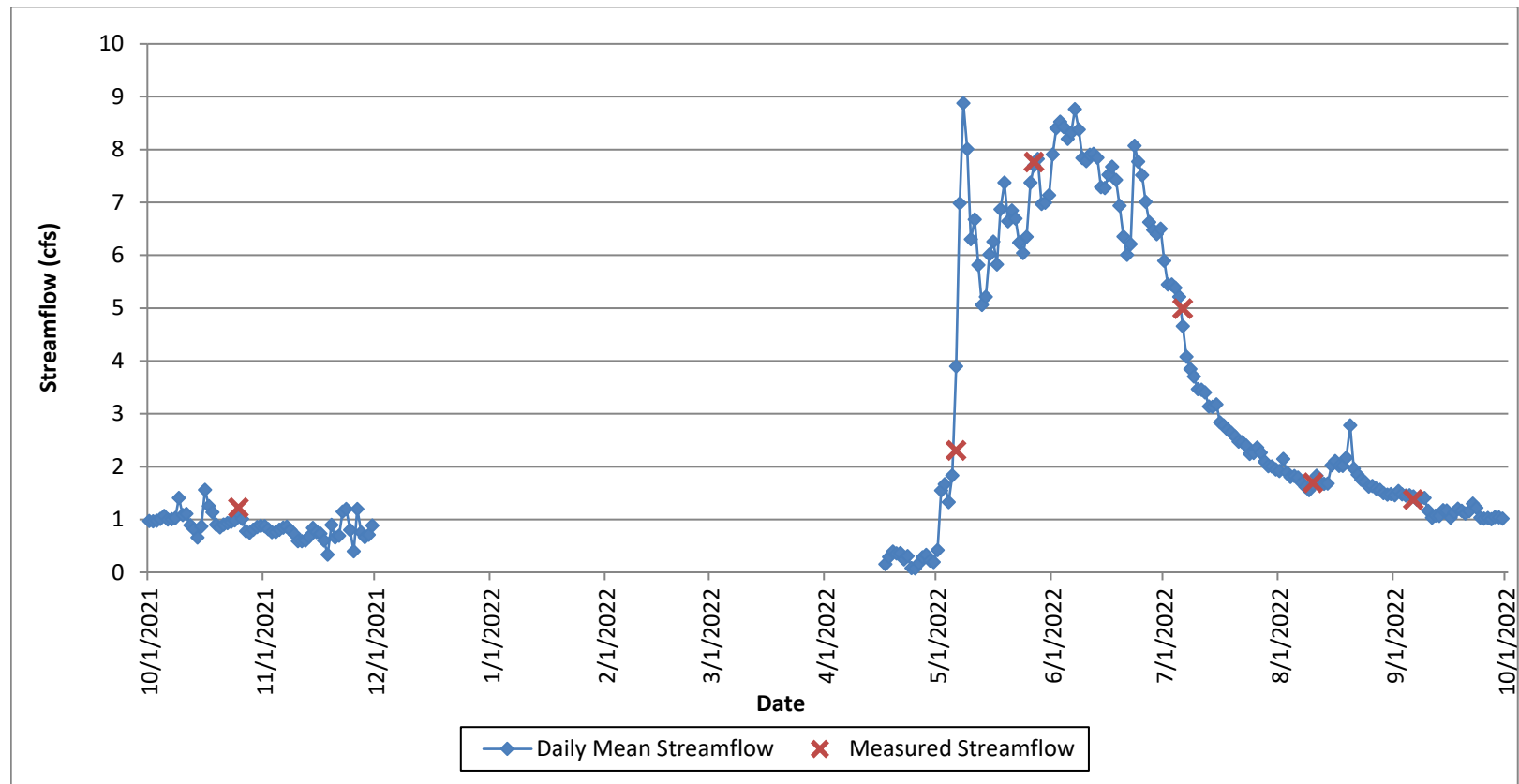
Lower Dry Fork Hydrograph WY 2022



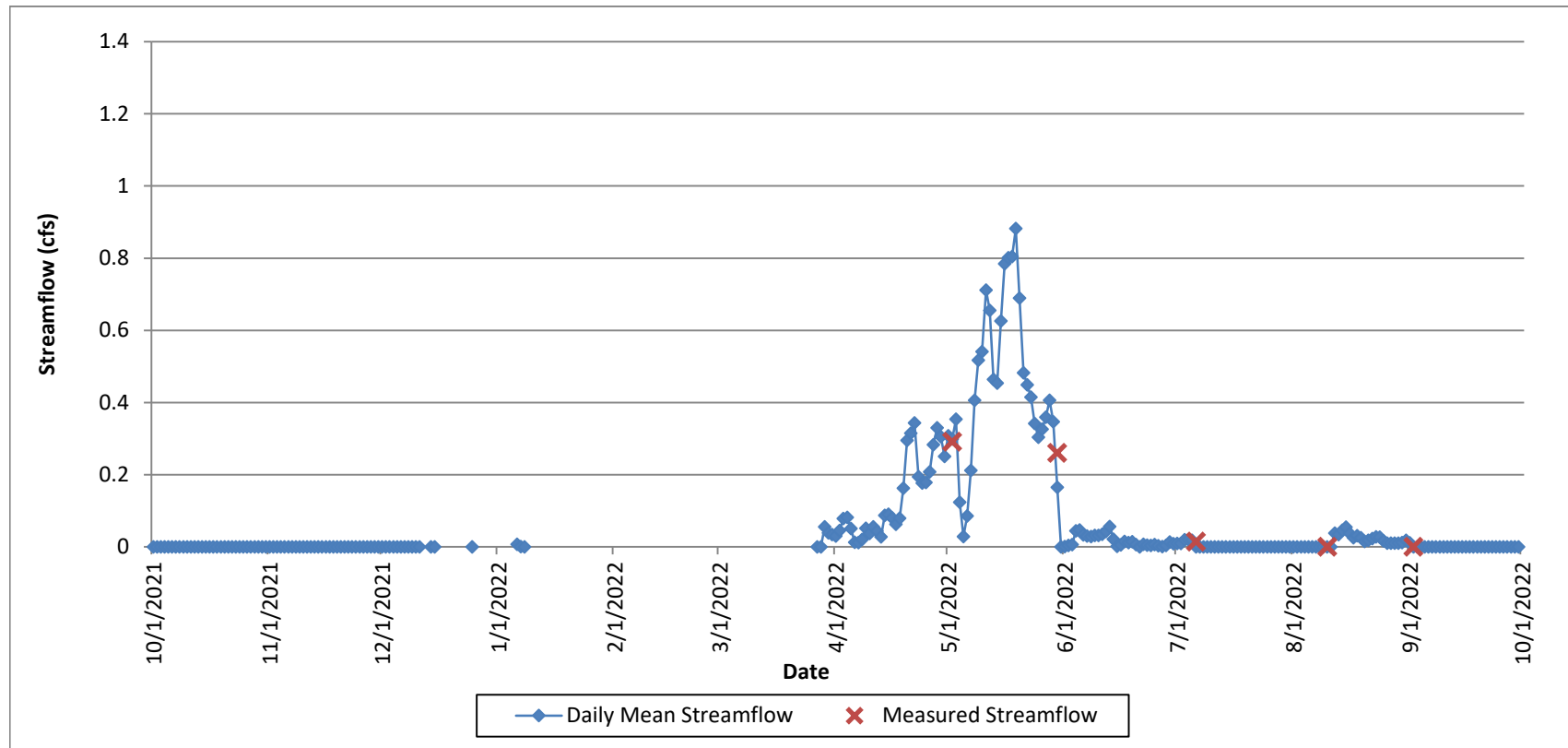
Middle Dry Fork Hydrograph WY 2022



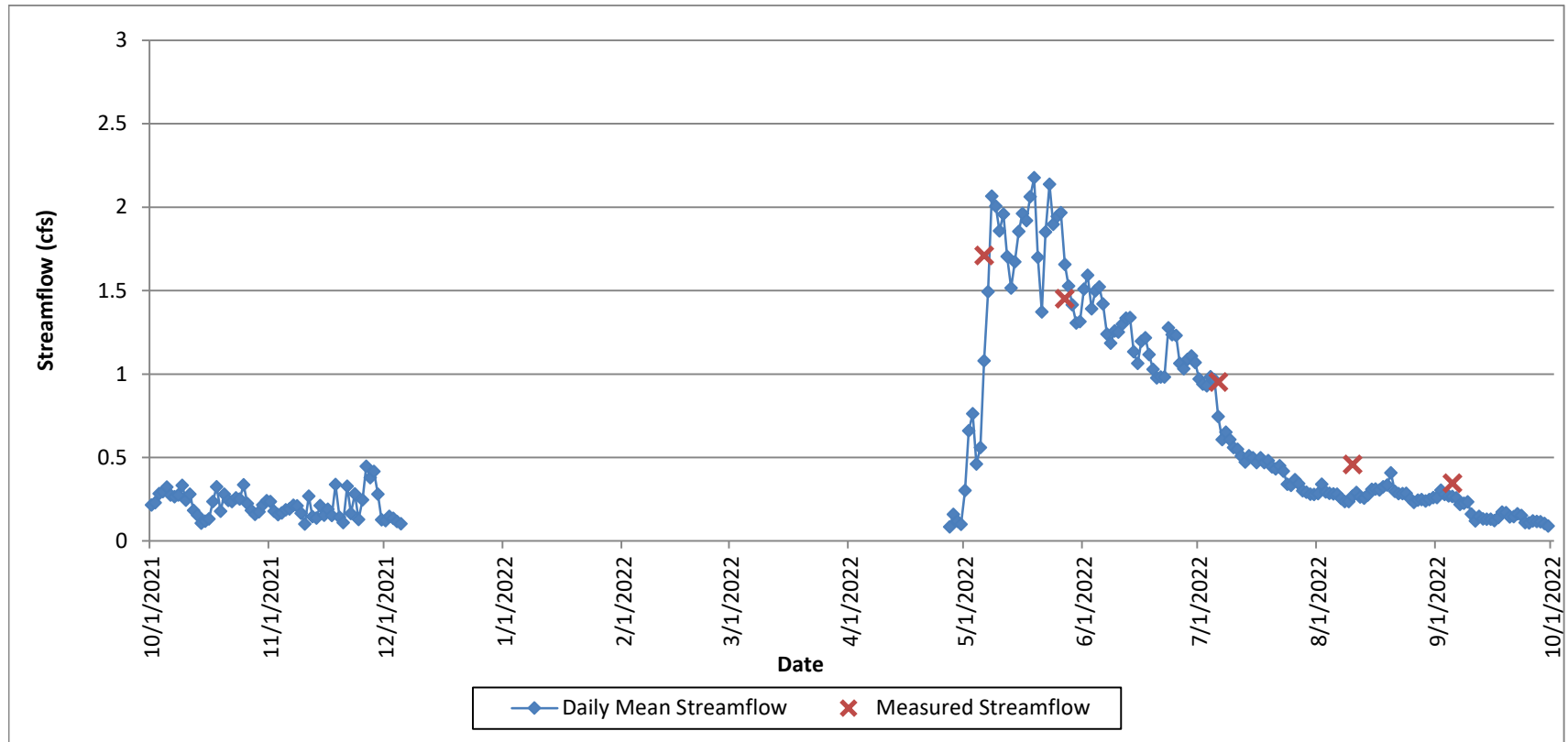
Upper Dry Fork Hydrograph WY 2022



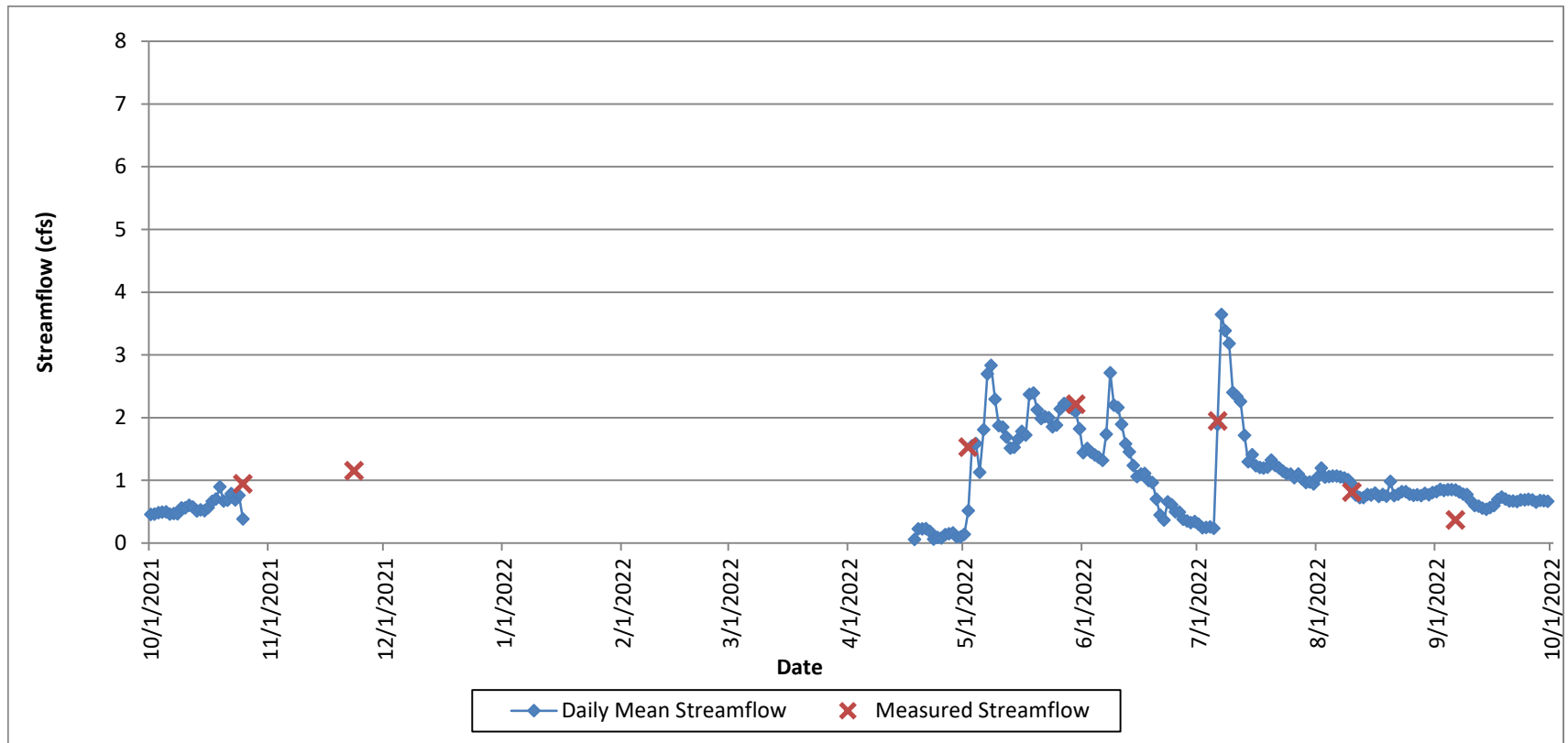
Lick Creek Hydrograph WY 2022



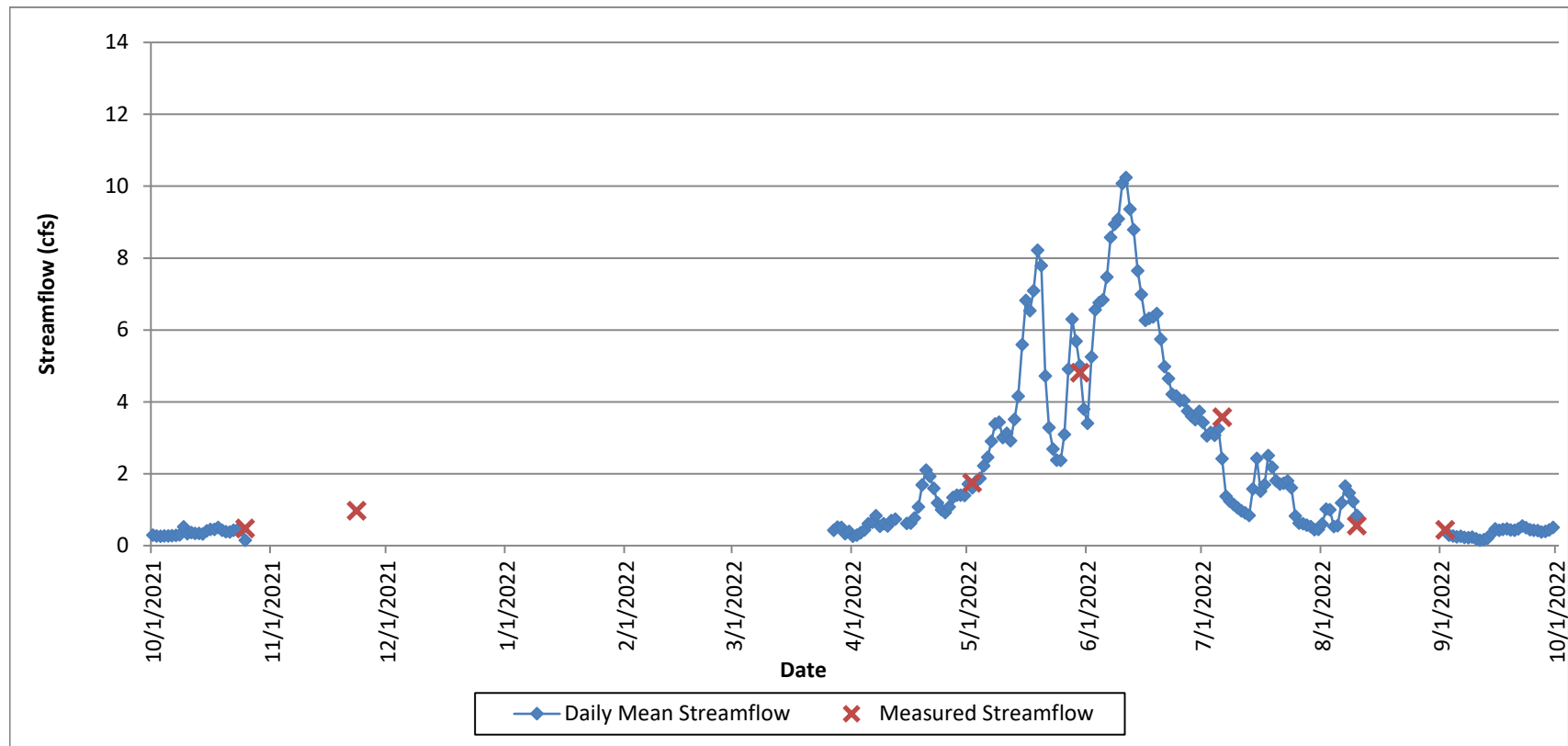
Deep Creek Ditch Hydrograph WY 2022



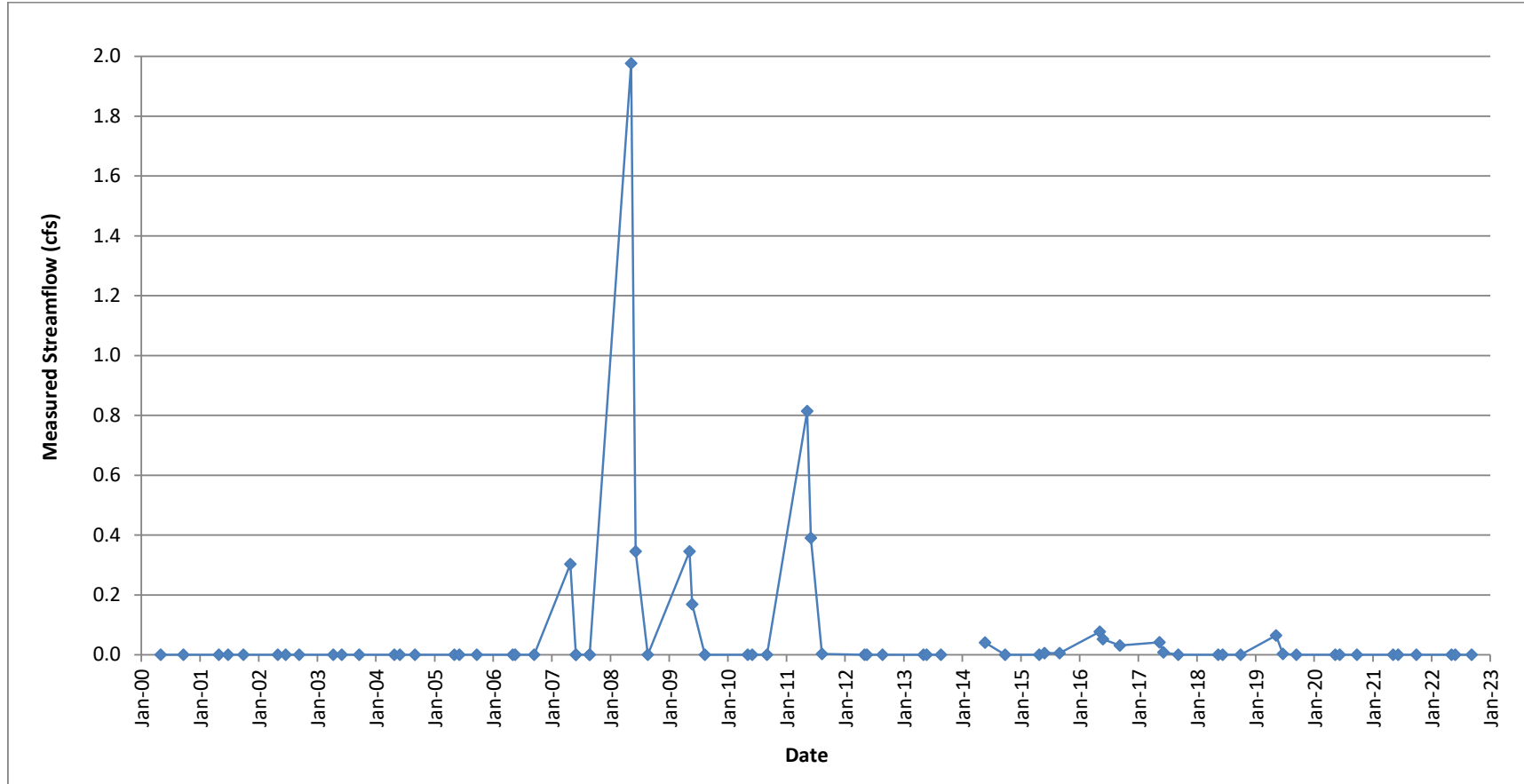
Minnesota Reservoir Flume Hydrograph WY 2022



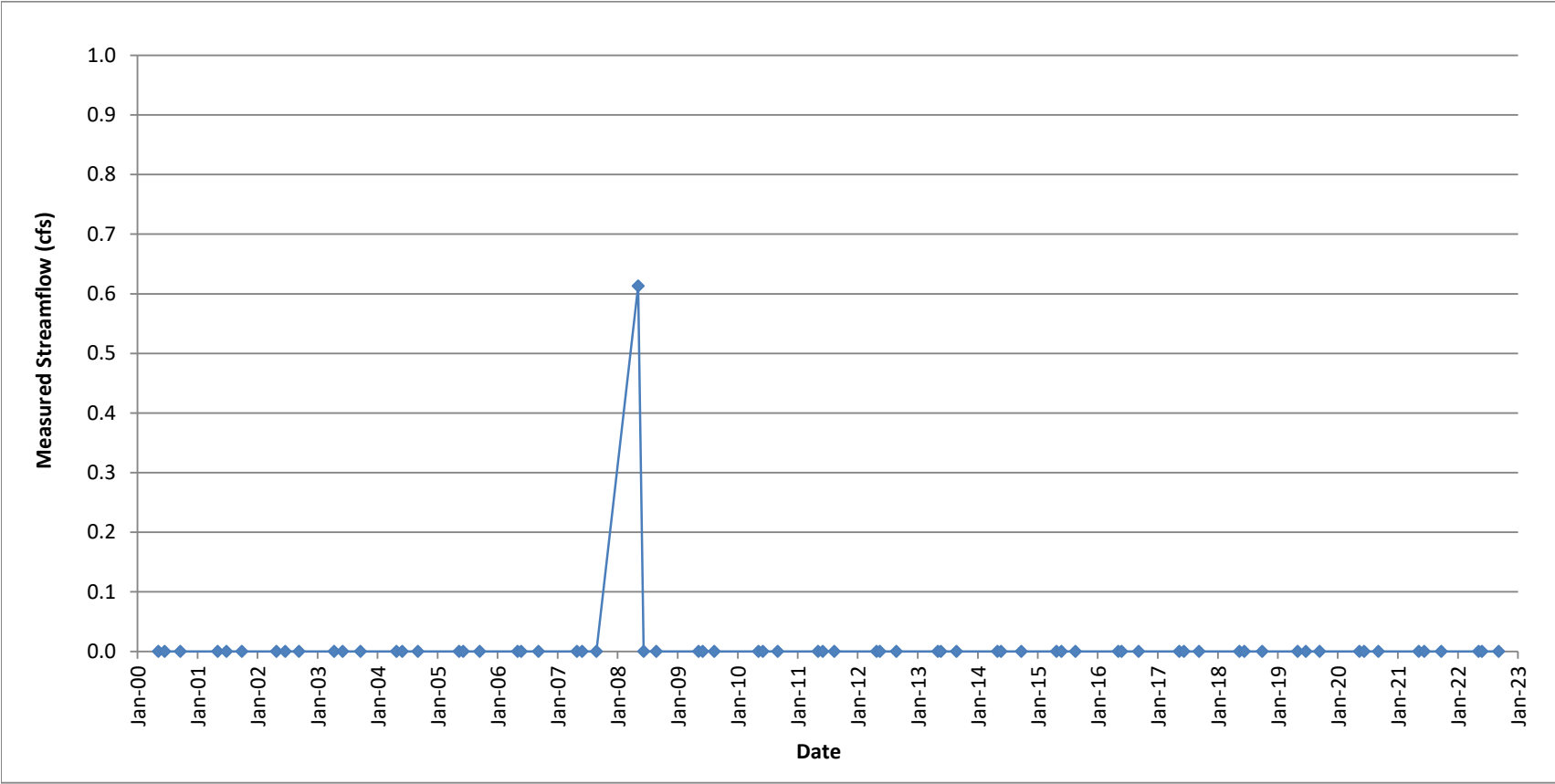
South Prong Creek Hydrograph WY 2022



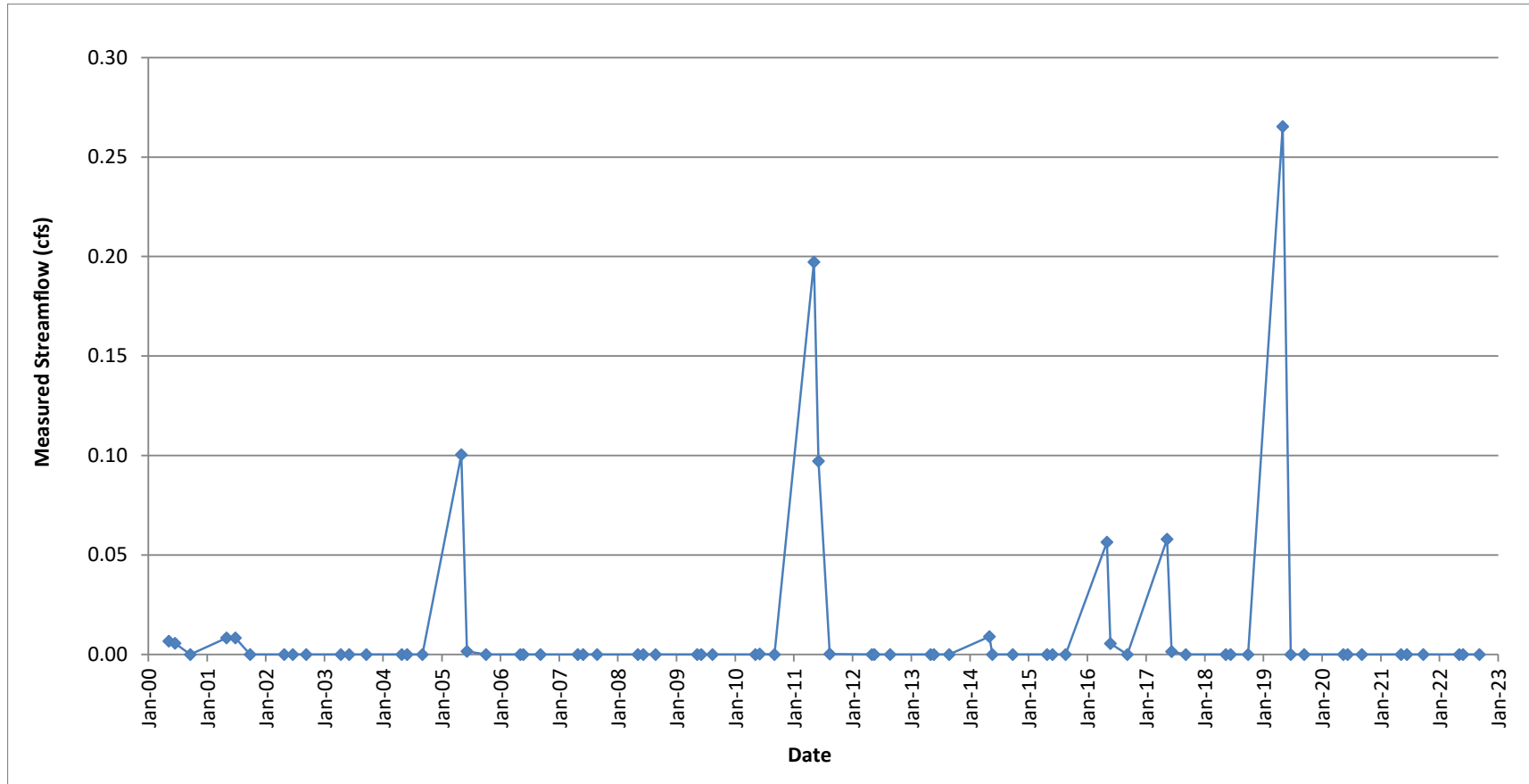
Upper Sylvester Gulch Flume Hydrograph



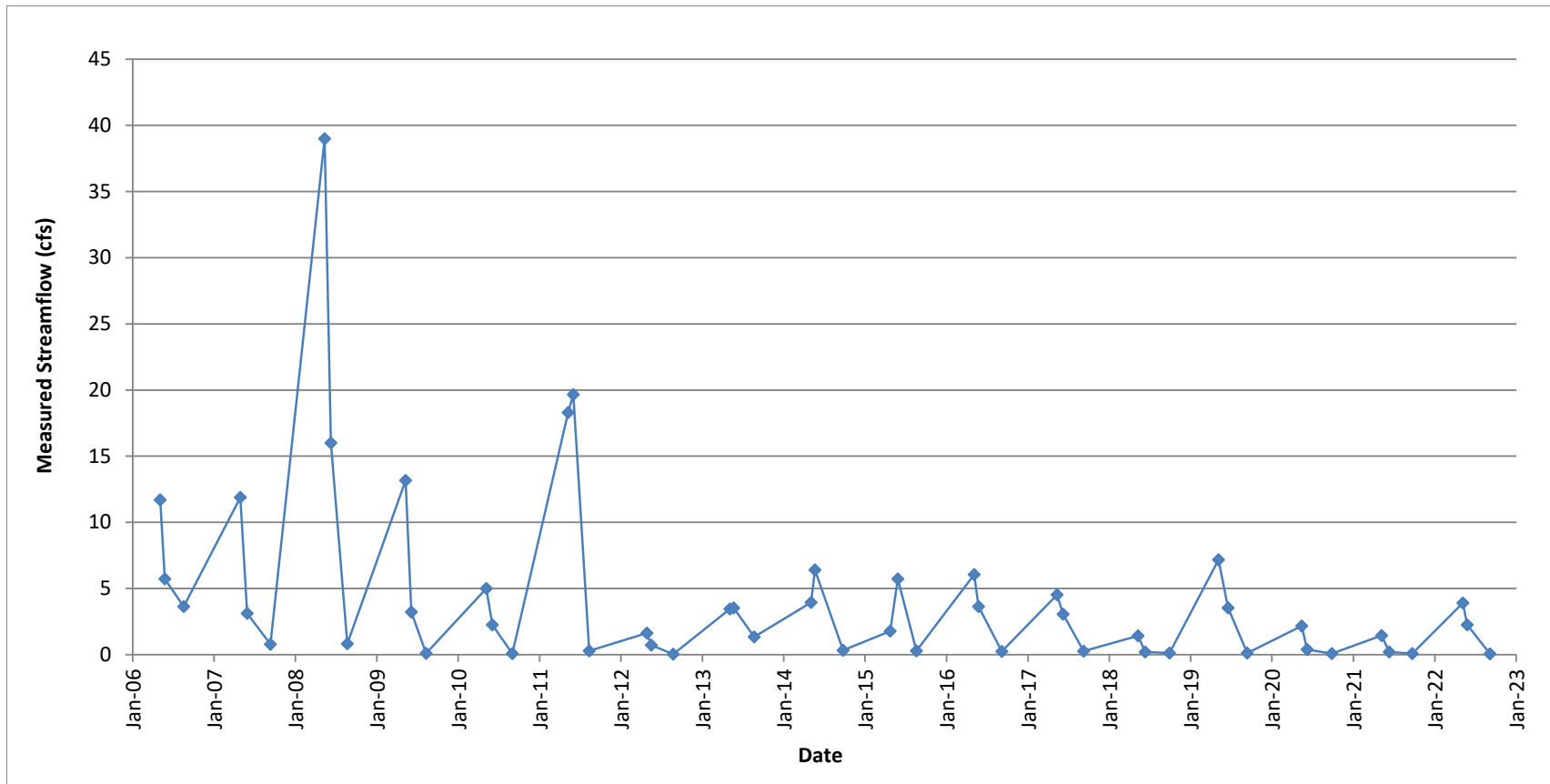
Horse Gulch
Hydrograph



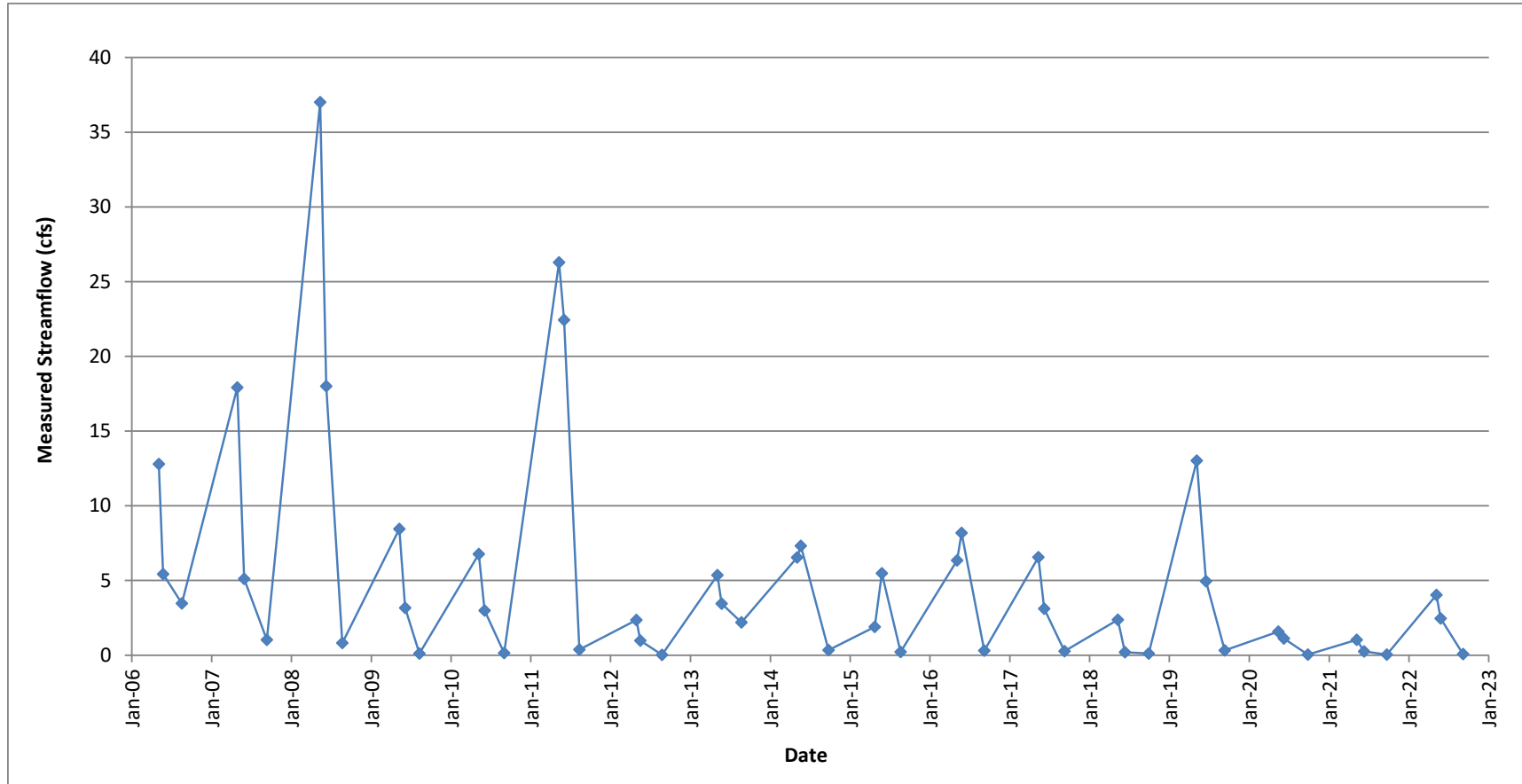
East Gulch east of Horse Gulch Hydrograph



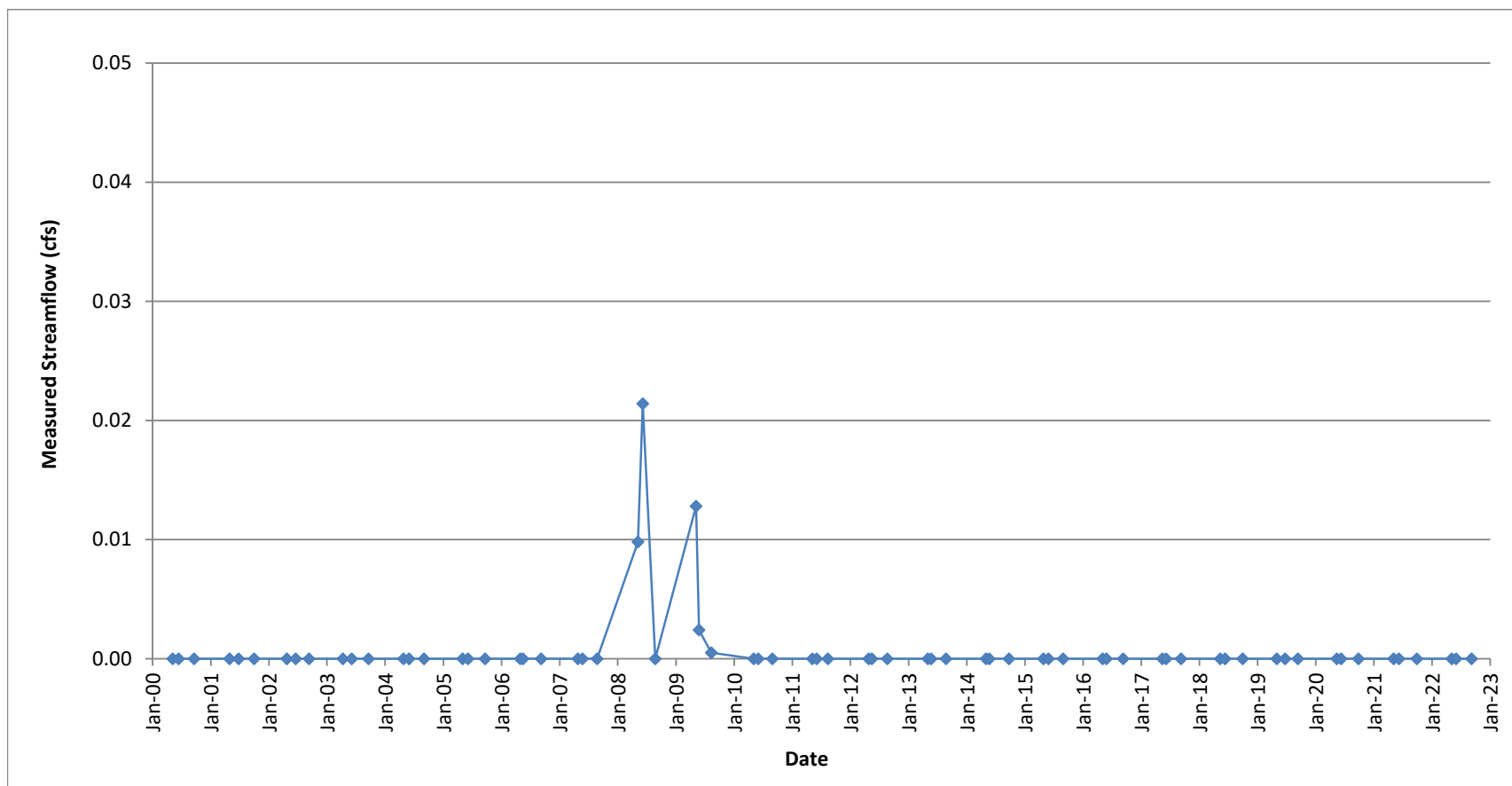
Upper Deep Creek Hydrograph



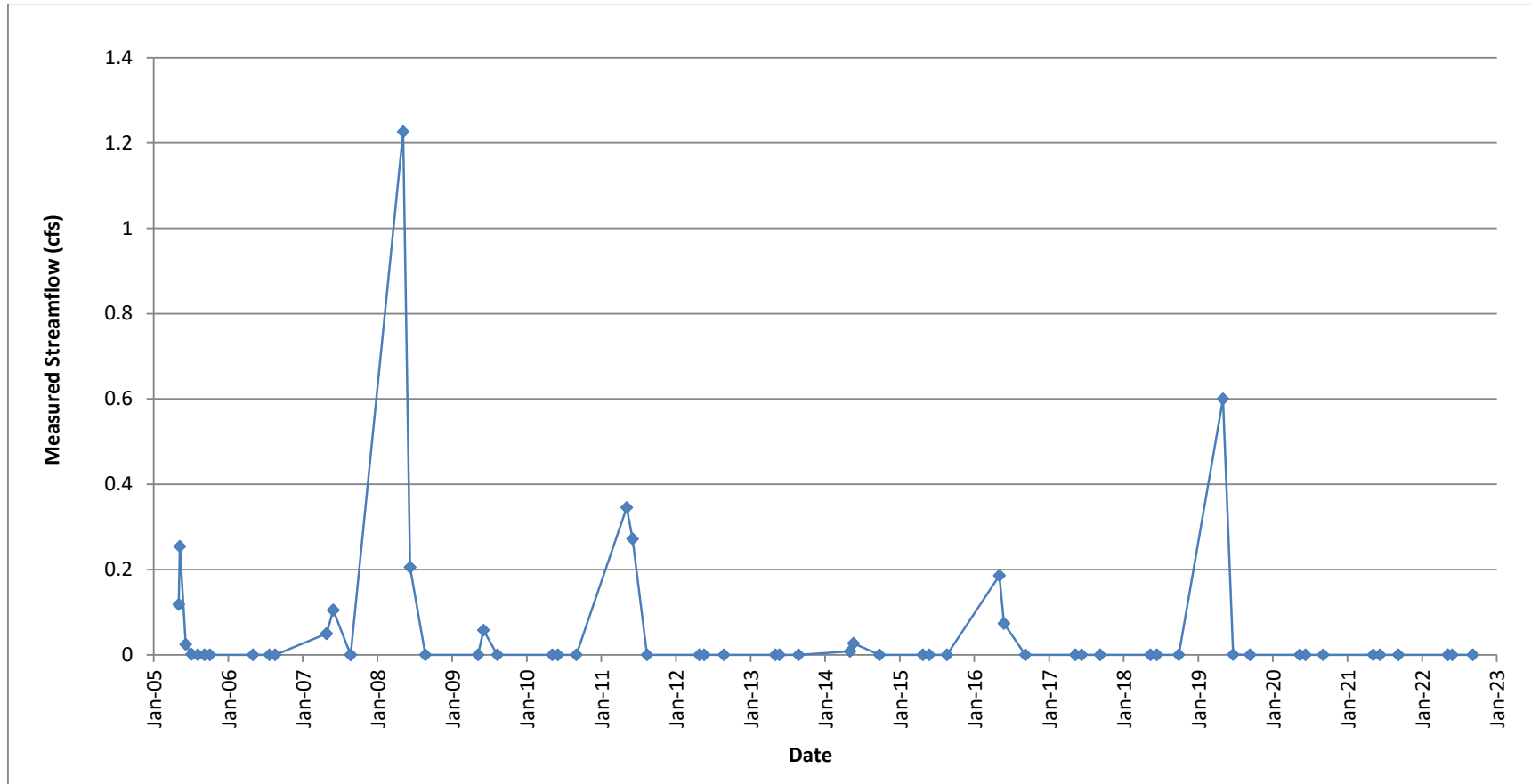
Lower Deep Creek Hydrograph



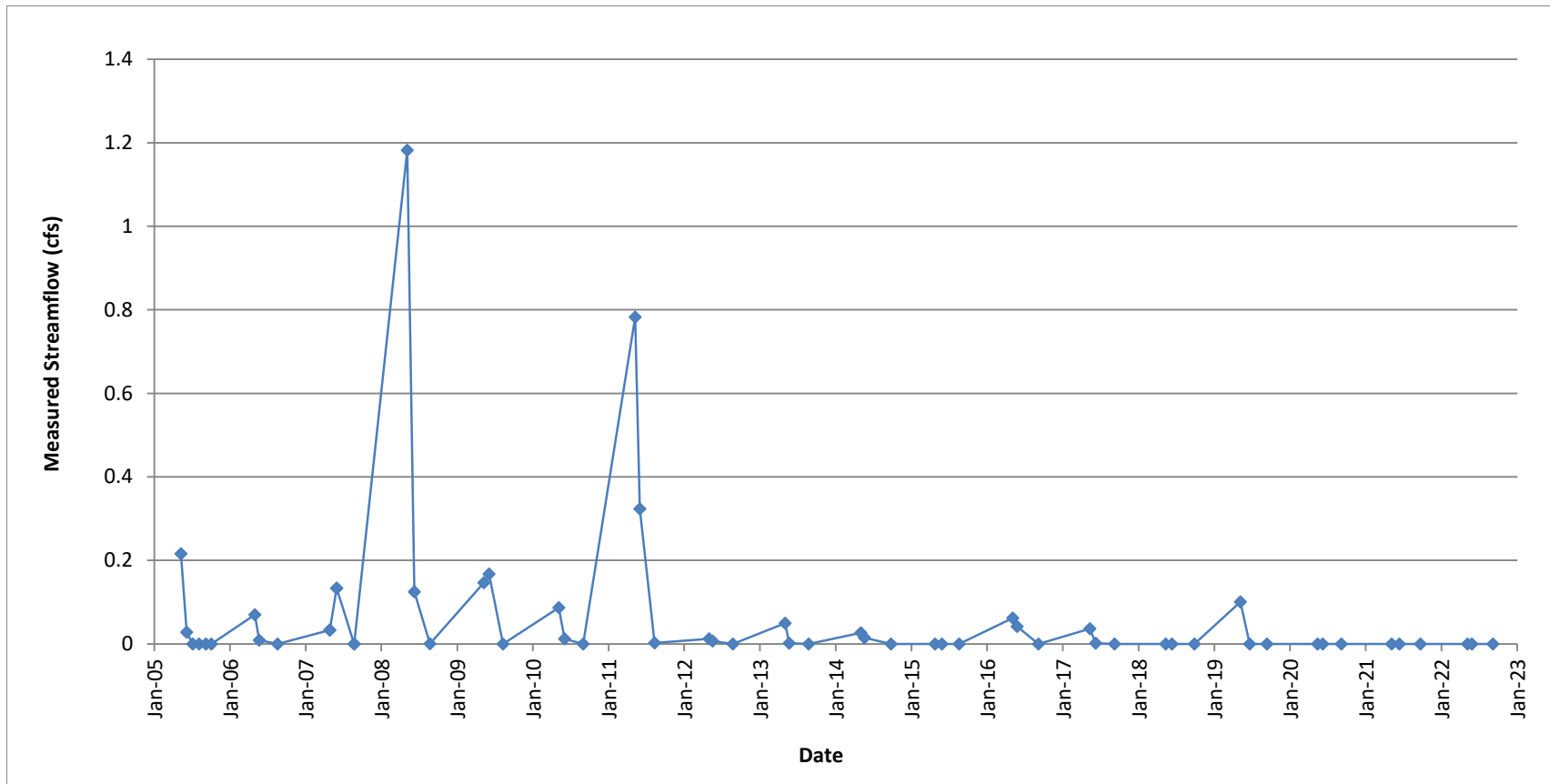
Box Canyon Hydrograph



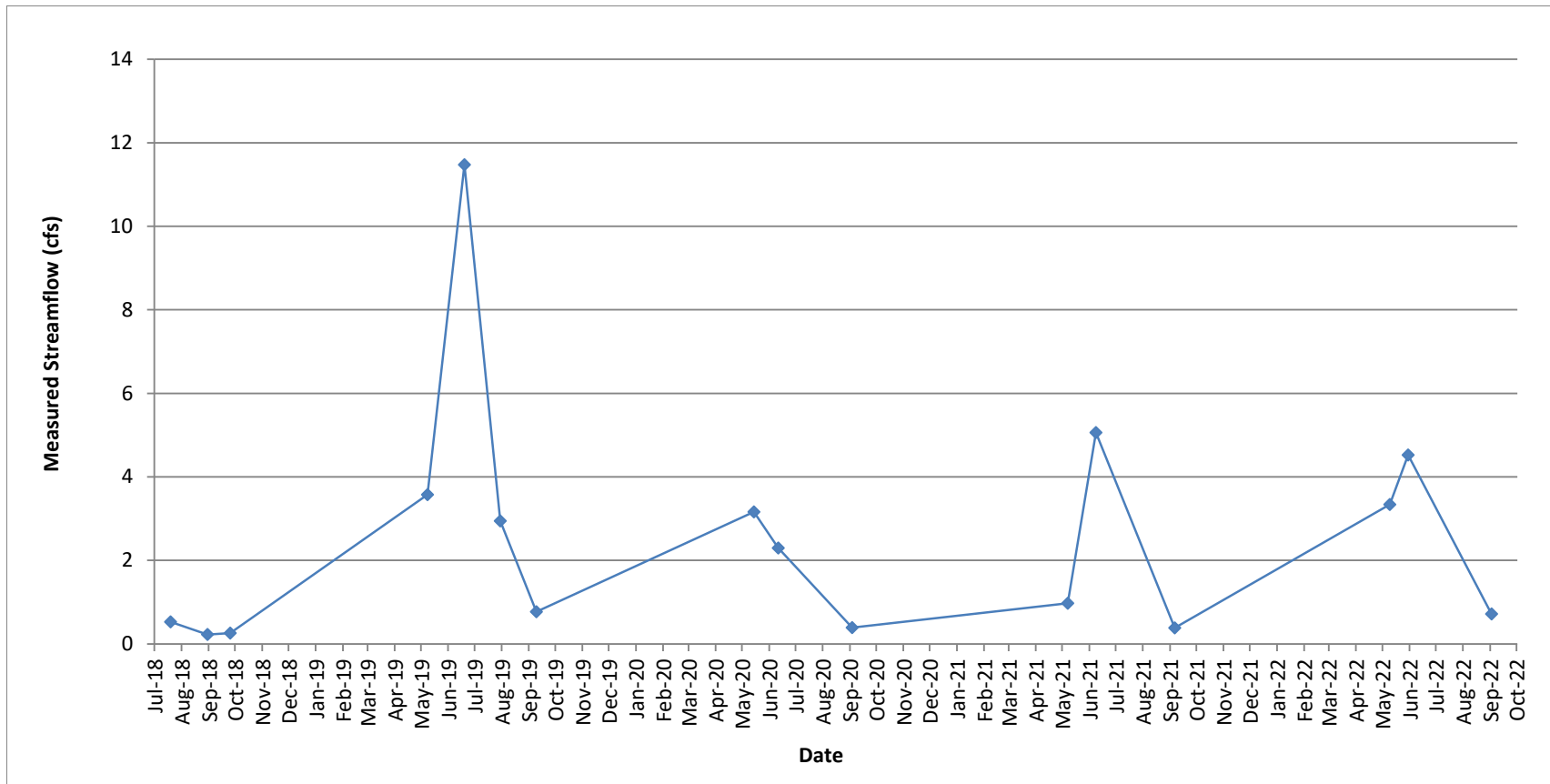
Deer Creek Hydrograph



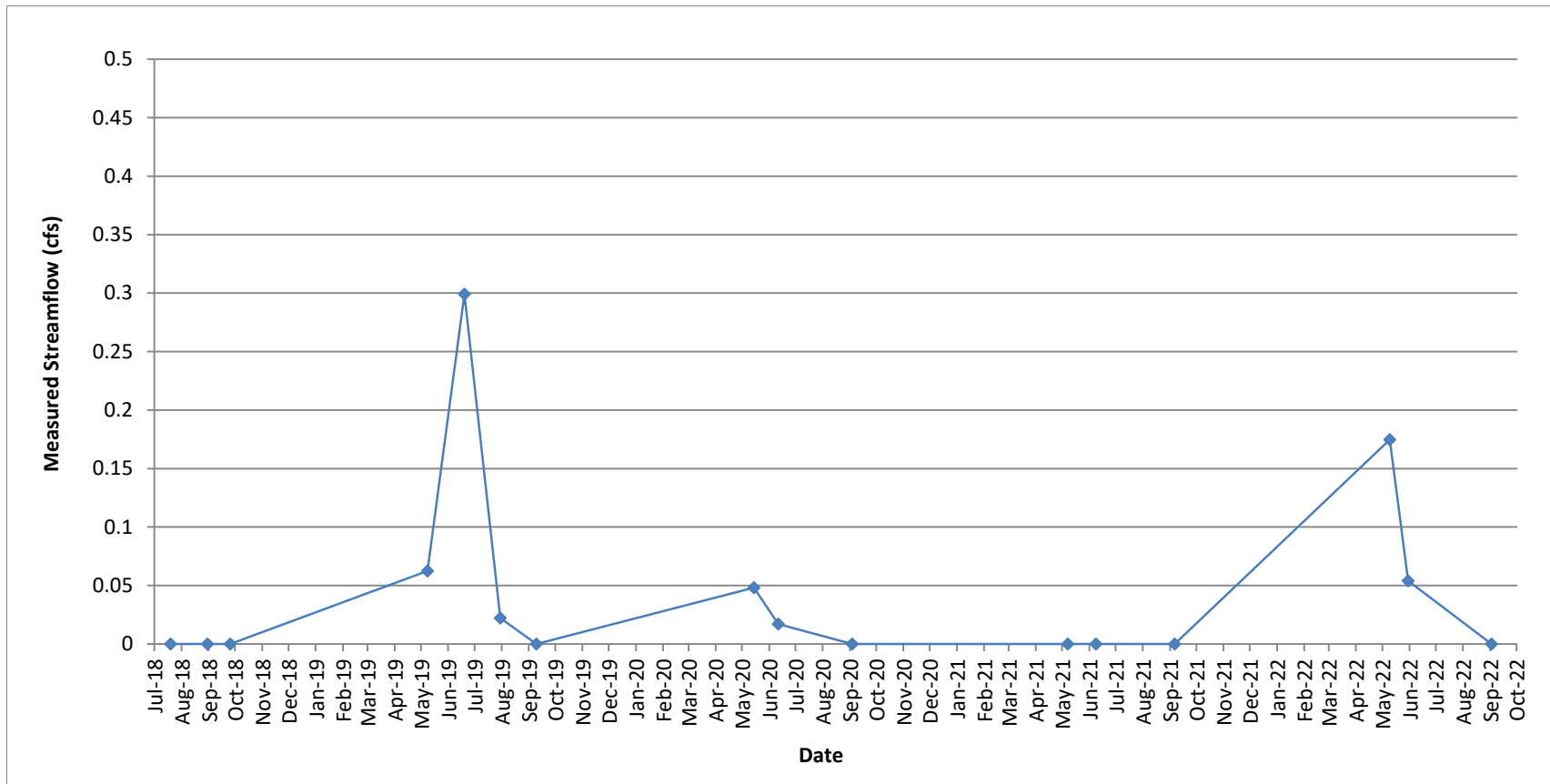
Poison Gulch Hydrograph



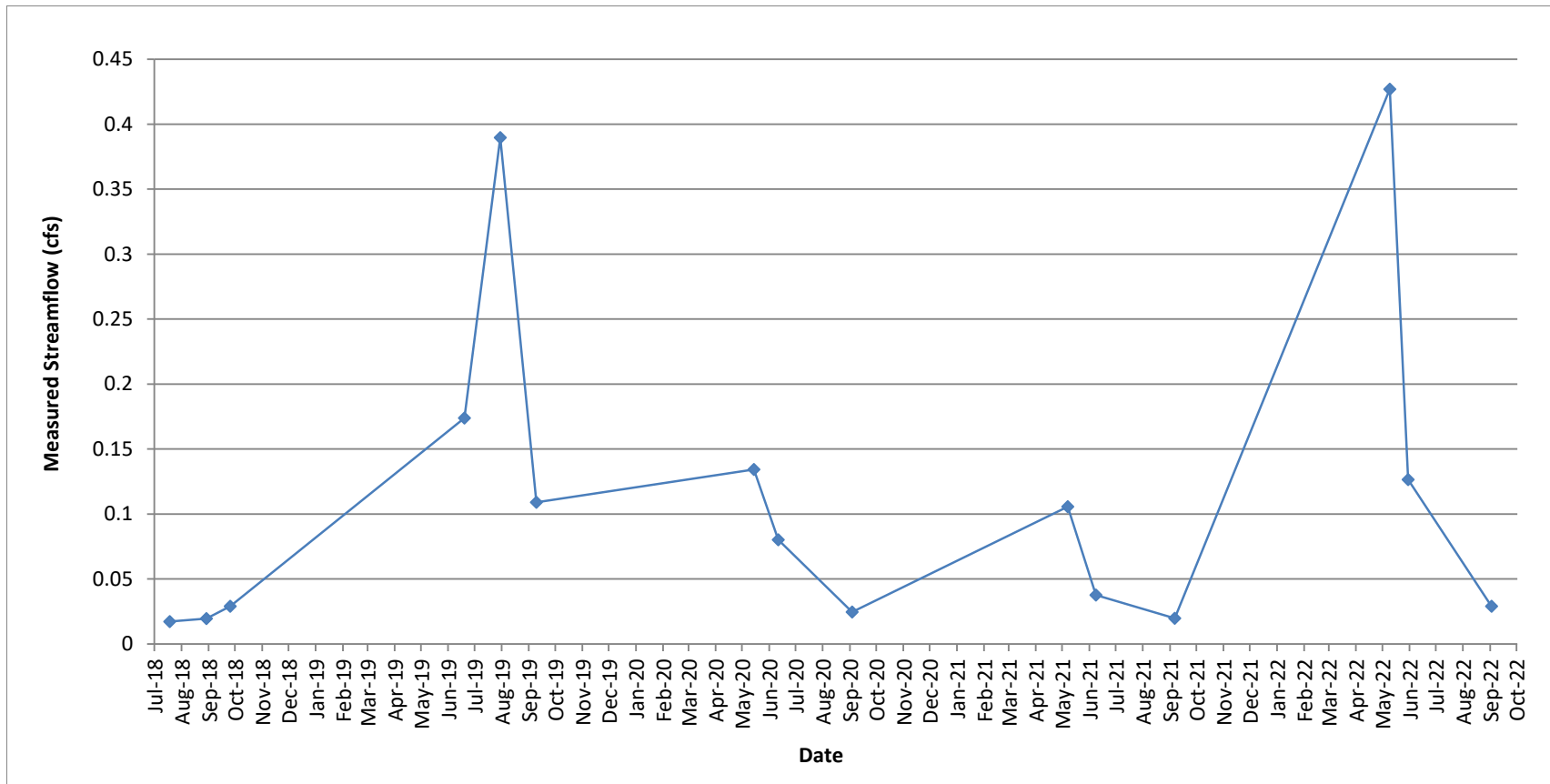
South Fork of South Prong Creek Hydrograph



North Fork of South Prong Creek Hydrograph



Stream ST-SW-1 Hydrograph



APPENDIX C

SURFACE WATER - LABORATORY AND FIELD WATER QUALITY DATA

Upper North Fork (USGS) Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022											
Monitoring Location: Upper North Fork (USGS)		Baseline ¹			Water Year 2022						
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	Q ⁴	5/31/2022 (Duplicate)	Q ⁴	9/7/2022	Q ⁴
Field Parameters											
Flow	staff gage				NA	NA		NA		NA	
pH (Field)	SU				8.09	8.05		--		8.31	
Conductivity (Field)	µmhos/cm				124.1	93.6		--		156.3	
Temperature (Field)	°C				7.7	7.3		--		14.0	
Comment											
Laboratory Parameters ²											
Name of Certified Lab ³						ACZ		ACZ		ACZ	
Lab Reference #						L73579-01		L73579-03		L75716-03	
Sample Date						5/31/2022		5/31/2022		9/7/2022	
Lab Test Date						6/2-6/17		6/2-6/17		9/9-9/29	
Sampled By						PH		PH		PH	
Alkalinity (Total CaCO ₃)	mg/L					43.8		45.9		78.8	
Aluminum, dissolved	mg/L					-0.05	U	-0.05	U	-0.05	U
Arsenic, dissolved	meq/L					-0.0002	U	-0.0002	U	0.00061	B
Arsenic, total recoverable	mg/L	0.001	0.001	0.001		0.00037	B	0.00040	B	0.00092	B
Bicarbonate as CaCO ₃	mg/L	40.9	167	81.3		42.6		45.9		78.8	
Boron, dissolved	mg/L					-0.03	U	-0.03	U	-0.03	U
Boron, total	mg/L					-0.03	U	-0.03	U	-0.06	U
Cadmium, dissolved	mg/L					-0.008	U	-0.008	U	-0.008	U
Cadmium, potentially dissolved	mg/L					-0.008	U	-0.008	U	-0.008	U
Calcium, dissolved	mg/L					12.5		12.4		22.1	
Carbonate as CaCO ₃	mg/L					-2	U	-2	U	-2	U
Cation - Anion Balance	mg/L					-3.9		-9.0		-2.9	
Chloride	%		10	3		1.50	B	1.59	B	2.2	
Chromium, total	meq/L					-0.02	U	-0.02	U	-0.04	U
Conductivity @25C	mg/L	76	241	169		96		94		167	
Copper, dissolved	mg/L	0.01	0.01	0.01		-0.01	U	-0.01	U	-0.01	U
Cyanide, total	µmhos/cm					0.0112		-0.003	U	-0.003	U
Hardness as CaCO ₃	mg/L	40	107	70		38		38		69	
Hydroxide as CaCO ₃	mg/L					-2	U	-2	U	-2	U
Iron, dissolved	mg/L		0.38	0.09		-0.06	U	-0.06	U	-0.06	U
Iron, total	mg/L		26.3	1.6		0.626		0.630		1.67	
Iron, total recoverable	mg/L					0.675		0.626		1.56	
Lead, dissolved	mg/L		0.02	0.01		-0.03	U	-0.03	U	-0.03	U
Magnesium, dissolved	mg/L	2	3.4	2.9		1.74		1.70		3.5	
Manganese, dissolved	mg/L		0.009	0.006		-0.01	U	-0.01	U	-0.01	U
Manganese, total	mg/L		0.19	0.04		-0.01	U	-0.01	U	0.029	B
Mercury, total	mg/L					-0.0002	U	-0.0002	U	-0.0002	U
Molybdenum, dissolved	mg/L					-0.02	U	-0.02	U	-0.02	U
Nickel, dissolved or potentially dissolved	mg/L					-0.008	U	-0.008	U	-0.008	U
Nickel, total	mg/L					-0.008	U	-0.008	U	-0.016	U
Nitrate/Nitrite (as N)	mg/L		0.19	0.06		-0.02	U	0.020	B	-0.02	U
Nitrogen, ammonia	mg/L					-0.05	U	-0.05	U	-0.05	U
pH	mg/L	6.7	9.0	7.8		8.3	H	8.2	H	8.2	H
Phosphate	mg/L					-0.03	U	.0899	B	-0.03	U
Phosphorus, ortho dissolved	SU		1.61	0.12		-0.01	U	0.029	B	-0.01	U
Potassium, dissolved	mg/L					0.57	B	0.60	B	0.77	B
Residue, Filterable (TDS) @180C	mg/L	30	650	109		72		74		106	
Residue, Non-Filterable (TSS) @105C	mg/L		636	55		12.0	B	13.0	B	23	
Silver, total	mg/L					-0.0001	U	-0.0001	U	-0.0001	U
Sodium Adsorption Ratio (SAR)	mg/L	0.2	1.62	0.5		0.23		0.23		0.33	
Sodium, dissolved	calc.	3.4	5.7	4.6		3.25		3.28		6.22	
Sulfate	mg/L		70	10		5.9		6.1		8.8	
Sum of Anions	mg/L					1.0		1.1		1.8	
Sum of Cations	mg/L					0.925		0.919		1.7	
TDS (calculated)	calc.					51.4		53.7		91.6	
TDS (ratio - measured/calculated)	mg/L					1.40		1.38		1.16	
Zinc, dissolved	mg/L					-0.02	U	-0.02	U	-0.02	U

¹ Baseline and WY 2000 data adapted from WWE (2001).
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Lower North Fork **Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022										
Monitoring Location: Lower North Fork		Baseline ¹			Water Year 2022					
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	Q ⁴	9/7/2022	Q ⁴	9/7/2022 (duplicate)
Field Parameters										
Flow	staff gage				not measured	not measured		not measured		not measured
pH (Field)	SU				7.99	7.82		8.10		--
Conductivity (Field)	µmhos/cm				124.4	93.6		160.4		--
Temperature (Field)	°C				7.8	6.5		13.3		--
Comment										
Laboratory Parameters 2										
Name of Certified Lab 3						ACZ		ACZ		ACZ
Lab Reference #						L73579-04		L75716-02		L75716-04
Sample Date						5/31/2022		9/27/2021		9/27/2021
Lab Test Date						6/2-6/17		9/9-9/29		9/9-9/29
Sampled By						PH		PH		PH
Alkalinity (Total CaCO3)	mg/L					42.1		79		81.1
Aluminum, dissolved	mg/L					-0.05	U	-0.05	U	-0.05
Arsenic, dissolved	mg/L					-0.0002	U	0.00067	B	0.00061
Arsenic, total recoverable	mg/L					0.00045	B	0.00094	B	0.0009
Bicarbonate as CaCO3	mg/L	41	138	78		42.1		79		81.1
Boron, dissolved	mg/L					-0.03	U	-0.03	U	-0.03
Boron, total	mg/L					-0.03	U	-0.03	U	-0.03
Cadmium, dissolved	mg/L					-0.008	U	-0.008	U	-0.008
Cadmium, potentially dissolved	mg/L					-0.008	U	-0.008	U	-0.008
Calcium, dissolved	mg/L					12.4		22.3		22.4
Carbonate as CaCO3	mg/L					-2	U	-2	U	-2
Cation - Anion Balance	%					-4.5		-2.9		-5.6
Chloride	mg/L	1.6	8	3.8		1.42	B	1.92	B	1.71
Chromium, total	mg/L					-0.02	U	-0.02	U	-0.02
Conductivity @25C	µmhos/cm					93		173		170
Copper, dissolved	mg/L					-0.01	U	-0.01	U	-0.01
Cyanide, total	mg/L					-0.003	U	-0.003	U	-0.003
Hardness as CaCO3	mg/L	39.3	109	68.7		38.0		70		71
Hydroxide as CaCO3	mg/L					-2	U	-2	U	-2
Iron, dissolved	mg/L		0.126	0.065		-0.06	U	-0.06	U	-0.06
Iron, total	mg/L	0.09	3.8	0.92		0.717		1.58		1.56
Iron, total recoverable	mg/L					0.680		1.61		1.6
Lead, dissolved	mg/L					-0.03	U	-0.03	U	-0.03
Magnesium, dissolved	mg/L					1.70		3.51		3.6
Manganese, dissolved	mg/L	0.0002	0.05	0.01		-0.01	U	-0.01	U	-0.01
Manganese, total	mg/L					0.010	B	0.031	B	0.032
Mercury, total	mg/L					-0.0002	U	-0.0002	U	-0.0002
Molybdenum, dissolved	mg/L					-0.02	U	-0.02	U	-0.02
Nickel, dissolved or potentially dissolved	mg/L					-0.008	U	-0.008	U	-0.008
Nickel, total	mg/L					-0.008	U	-0.008	U	-0.008
Nitrate/Nitrite (as N)	mg/L					0.033	B	-0.02	U	0.058
Nitrogen, ammonia	mg/L					-0.05	U	-0.05	U	-0.05
pH	SU	7	8.8	8.1		8.1	H	8.3	H	8.2
Phosphate	mg/L					-0.03	U	0.0868	B	0.0868
Phosphorus, ortho dissolved	mg/L		2.74	0.25		-0.01	U	0.028	B	0.028
Potassium, dissolved	mg/L					0.58	B	0.73	B	0.78
Residue, Filterable (TDS) @180C	mg/L	36	180	101		78		184		108
Residue, Non-Filterable (TSS) @105C	mg/L	6.4	107	36		14.0	B	28.0		25.0
Selenium, total recoverable	mg/L					0.00017	B	0.00011	B	0.00014
Silver, total	mg/L					-0.0001	U	-0.0001	U	-0.0001
Sodium Adsorption Ratio (SAR)	calc.					0.23		0.35		0.34
Sodium, dissolved	mg/L					3.17		6.57		6.55
Sulfate	mg/L	4	25	12		5.9		8.6		9.1
Sum of Anions	meq/L					1.0		1.8		1.9
Sum of Cations	meq/L					0.914		1.7		1.7
TDS (calculated)	calc.					50.9		91.8		93.6
TDS (ratio - measured/calculated)	mg/L					1.53		2		1.15
Zinc, dissolved	mg/L					-0.02	U	-0.02	U	-0.02

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



**Upper Sylvester Gulch
Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Upper Sylvester Gulch		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	staff gage	0.26'	0.64'	0.45'	dry	dry		dry
pH (Field)	SU	8.1	8.3	8.2				
Conductivity (Field)	µmhos/cm	300	380	340				
Temperature (Field)	°C	8.4	9.5	9.0				
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	212	212	212				
Aluminum, dissolved	mg/L	0.03	0.03	0.03				
Bicarbonate as CaCO ₃	mg/L	204	204	204				
Cadmium, dissolved	mg/L	0.003	0.003	0.003				
Calcium, dissolved	mg/L	35.1	35.1	35.1				
Carbonate as CaCO ₃	mg/L	8	8	8				
Cation - Anion Balance	%	-4.1	-4.1	-4.1				
Chloride	mg/L	2	2	2				
Conductivity @25C	µmhos/cm	462	462	462				
Copper, dissolved	mg/L	0.01	0.01	0.01				
Hardness as CaCO ₃	mg/L	124	124	124				
Hydroxide as CaCO ₃	mg/L	2	2	2				
Iron, dissolved	mg/L	0.01	0.01	0.01				
Iron, total	mg/L	0.07	0.07	0.07				
Lead, dissolved	mg/L	0.04	0.04	0.04				
Magnesium, dissolved	mg/L	8.8	8.8	8.8				
Manganese, dissolved	mg/L	0.005	0.005	0.005				
Manganese, total	mg/L	0.005	0.005	0.005				
Mercury, total	mg/L	0.0002	0.0002	0.0002				
Molybdenum, dissolved	mg/L	0.01	0.01	0.01				
pH	SU							
Phosphate	mg/L	0.03	0.03	0.03				
Phosphorus, ortho dissolved	mg/L	0.005	0.005	0.005				
Potassium, dissolved	mg/L	1.4	1.4	1.4				
Residue, Filterable (TDS) @180C	mg/L	250	260	255				
Residue, Non-Filterable (TSS) @105C	mg/L	8	20	14				
Selenium, total recoverable	mg/L	0.04	0.04	0.04				
Sodium Adsorption Ratio (SAR)	calc.	2.03	2.03	2.03				
Sodium, dissolved	mg/L	51.4	51.4	51.4				
Sulfate	mg/L	40	40	40				
Sum of Anions	meq/L	5.1	5.1	5.1				
Sum of Cations	meq/L	4.7	4.7	4.7				
Zinc, dissolved	mg/L	0.01	0.01	0.01				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

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H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Middle Sylvester Gulch **Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Middle Sylvester Gulch		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	Q ⁴	9/7/2022
Field Parameters								
Flow	staff gage				0.14'	0.05'		dry
pH (Field)	SU				8.43	8.31		
Conductivity (Field)	µmhos/cm				1,188	1,385		
Temperature (Field)	°C				9.6	7.4		
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-02		
Sample Date						5/31/2022		
Lab Test Date						6/2-6/17		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L					481		
Aluminum, dissolved	mg/L					-0.05	U	
Arsenic, dissolved	mg/L					0.00034	B	
Arsenic, total recoverable	mg/L					0.00073	B	
Bicarbonate as CaCO ₃	mg/L		448	310		433		
Boron, dissolved	mg/L					0.232		
Boron, total	mg/L					0.229		
Cadmium, dissolved	mg/L					-0.008	U	
Cadmium, potentially dissolved	mg/L					-0.008	U	
Calcium, dissolved	mg/L					51.0		
Carbonate as CaCO ₃	mg/L					48.3		
Cation - Anion Balance	%					0.0		
Chloride	mg/L	3	10	5		73.5		
Chromium, total	mg/L					-0.02	U	
Conductivity @25C	µmhos/cm	480	800	606		1,270		
Copper, dissolved	mg/L					-0.01	U	
Cyanide, total	mg/L					0	U	
Hardness as CaCO ₃	mg/L	159	234	194		247		
Hydroxide as CaCO ₃	mg/L					-2	U	
Iron, dissolved	mg/L		0.4	0.1		-0.06	U	
Iron, total	mg/L	0.05	10.5	2.0		2.37		
Iron, total recoverable	mg/L					2.31		
Lead, dissolved	mg/L					-0.03	U	
Magnesium, dissolved	mg/L					29.1		
Manganese, dissolved	mg/L					0.015	B	
Manganese, total	mg/L		0.56	0.05		0.102		
Mercury, total	mg/L					-0.0002	U	
Molybdenum, dissolved	mg/L					-0.02	U	
Nickel, dissolved or potentially dissolved	mg/L					-0.008	U	
Nickel, total	mg/L					-0.008	U	
Nitrate/Nitrite (as N)	mg/L		0.08	0.02		-0.02	U	
Nitrogen, ammonia	mg/L					-0.05	U	
pH	SU	7.35	8.70	8.08		8.6	H	
Phosphate	mg/L					.0589	B	
Phosphorus, ortho dissolved	mg/L		0.875	0.110		0.019	B	
Potassium, dissolved	mg/L					3.56		
Residue, Filterable (TDS) @180C	mg/L	3.68	584	381		800		
Residue, Non-Filterable (TSS) @105C	mg/L	4.2	5,740	419		60.0		
Selenium, total recoverable	mg/L					0.00014	B	
Silver, total	mg/L					-0.0001	U	
Sodium Adsorption Ratio (SAR)	calc.	2.29	3.02	2.70		5.5		
Sodium, dissolved	mg/L					197		
Sulfate	mg/L	28.2	80	46.1		108		
Sum of Anions	meq/L					14.0		
Sum of Cations	meq/L					14		
TDS (calculated)	calc.					755		
TDS (ratio - measured/calculated)	mg/L					1.06		
Zinc, dissolved	mg/L					-0.02	U	

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Lower Sylvester Gulch
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Lower Sylvester Gulch		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	Q ⁴	9/7/2022
Field Parameters								
Flow	staff gage	0.07	0.07	0.07	not measured	not measured		dry
pH (Field)	SU	8.50	9.70	8.90	8.45	8.33		
Conductivity (Field)	µmhos/cm	620	700	653	1,187	1,371		
Temperature (Field)	°C	7.9	10.2	9	8.5	6.7		
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-02		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	323	323	323				
Aluminum, dissolved	mg/L	0.03	0.03	0.03				
Arsenic, total recoverable	mg/L	0.001	0.001	0.001				
Bicarbonate as CaCO ₃	mg/L	315	315	315				
Cadmium, dissolved	mg/L	0.003	0.003	0.003				
Calcium, dissolved	mg/L	41	41	41				
Carbonate as CaCO ₃	mg/L	8	8	8				
Cation - Anion Balance	%	-3.2	-3.2	-3.2				
Chloride	mg/L	4	4	4				
Conductivity @25C	µmhos/cm	597	597	597		1,280		
Copper, dissolved	mg/L	0.01	0.01	0.01				
Hardness as CaCO ₃	mg/L	179	179	179				
Hydroxide as CaCO ₃	mg/L	2	2	2				
Iron, dissolved	mg/L	0.05	0.05	0.05		-0.06	U	
Iron, total	mg/L	0.17	0.17	0.17		3.03		
Lead, dissolved	mg/L	0.04	0.04	0.04				
Magnesium, dissolved	mg/L	18.7	18.7	18.7				
Manganese, dissolved	mg/L	0.007	0.007	0.007				
Manganese, total	mg/L	0.005	0.005	0.005				
Mercury, total	mg/L	0.0002	0.0002	0.0002				
Molybdenum, dissolved	mg/L	0.01	0.01	0.01				
Nitrate/Nitrite (as N)	mg/L	0.05	0.05	0.05				
pH	SU	8.3	8.3	8.3		8.6	H	
Phosphate	mg/L	0.09	0.09	0.09				
Phosphorus, ortho dissolved	mg/L	0.031	0.031	0.031				
Potassium, dissolved	mg/L	2.2	2.2	2.2				
Residue, Filterable (TDS) @180C	mg/L	400	430	410		796		
Residue, Non-Filterable (TSS) @105C	mg/L	5	120	74		70.0		
Selenium, total recoverable	mg/L	0.04	0.04	0.04				
Sodium Adsorption Ratio (SAR)	calc.	2.89	2.89	2.89				
Sodium, dissolved	mg/L	87.8	87.8	87.8				
Sulfate	mg/L	70	70	70				
Sum of Cations	meq/L	7.5	7.5	7.5				
Zinc, dissolved	mg/L	0.01	0.01	0.01				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



**Lower Minnesota Creek
Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Lower Minnesota Creek		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/2/2022	5/27/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	staff gage				0.80'	1.27'		0.51'
pH (Field)	SU				7.96	7.87		7.81
Conductivity (Field)	µmhos/cm				327	173.7		227
Temperature (Field)	°C				6.4	9.4		14.9
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-01		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/16		
Sampled By						PH		
Bicarbonate as CaCO ₃	mg/L	46	75	60				
Calcium, dissolved	mg/L	19.6	19.6	19.6				
Chloride	mg/L		2	1				
Conductivity @25C	µmhos/cm	152	803	350		185		
Hardness as CaCO ₃	mg/L	65	106	82				
Iron, dissolved	mg/L	0.23	0.58	0.41		0.180		
Iron, total	mg/L	0.45	82	8.9		3.10		
Magnesium, dissolved	mg/L	6.1	8.7	7.4				
Manganese, dissolved	mg/L	0.013	0.015	0.014				
Manganese, total	mg/L	0.018	1.83	0.188				
pH	SU					8.4	H	
Residue, Filterable (TDS) @180C	mg/L	100	584	231		128		
Residue, Non-Filterable (TSS) @105C	mg/L	16	1,300	292		106		
Sodium Adsorption Ratio (SAR)	calc.	0.3	0.5	0.4				
Sodium, dissolved	mg/L	7.7	7.7	7.7				
Sulfate	mg/L	20	50	40				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



**Upper Minnesota Creek Flume (USFS)
Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: U. Minnesota Ck Flume (USFS)		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/2/2022	5/27/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	staff gage				1.27'	flooded		0.52'
pH (Field)	SU				7.98	7.79		7.94
Conductivity (Field)	µmhos/cm				323	175.9		168.9
Temperature (Field)	°C				6.5	9.3		15.1
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-02		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/16		
Sampled By						PH		
Conductivity @25C	µmhos/cm					181		
Iron, dissolved	mg/L					-0.06	U	
Iron, total	mg/L					3.04		
pH	SU					8.3	H	
Residue, Filterable (TDS) @180C	mg/L					128		
Residue, Non-Filterable (TSS) @105C	mg/L					69.0		
¹ No baseline data. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Lower Dry Fork Flume
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Lower Dry Fork Flume		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/2/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	staff gage				dry	dry		0.17'
pH (Field)	SU							8.12
Conductivity (Field)	µmhos/cm							388
Temperature (Field)	°C							16.5
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Bicarbonate as CaCO ₃	mg/L	118	324	220				
Calcium, dissolved	mg/L	87.9	87.9	87.9				
Chloride	mg/L		8.4	4.2				
Conductivity @25C	µmhos/cm	207	1,920	755				
Hardness as CaCO ₃	mg/L	125	726	360				
Iron, dissolved	mg/L		0.178	0.049				
Iron, total	mg/L	0.02	84	5.6				
Magnesium, dissolved	mg/L	9.8	49	29				
Manganese, dissolved	mg/L	0.008	0.013	0.011				
Manganese, total	mg/L		46.4	1.4				
Nitrate/Nitrite (as N)	mg/L	0.1	0.3	0.2				
pH	SU	6.9	9	8.2				
Phosphorus, ortho dissolved	mg/L		0.763	0.048				
Sodium Adsorption Ratio (SAR)	calc.	0.71	1.48	1.11				
Sodium, dissolved	mg/L	69	69	69				
Sulfate	mg/L	35	613	249				
Residue, Filterable (TDS) @180C	mg/L	158	1,388	581				
Residue, Non-Filterable (TSS) @105C	mg/L	1.2	1,098	144				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Middle Dry Fork Flume
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022									
Monitoring Location: Middle Dry Fork Flume		Baseline ¹			Water Year 2022				
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	Q ⁴	5/27/2022 (Duplicate)	Q ⁴ 9/6/2022
Field Parameters									
Flow	staff gage				0.32'	0.75'		--	0.21'
pH (Field)	SU	7.80	8.50	8.20	8.03	8.06		--	7.92
Conductivity (Field)	µmhos/cm	30	480	213	234	80.9		--	135
Temperature (Field)	°C	3.6	19.8	12	6.8	12.4		--	16.7
Comment									
Laboratory Parameters ²									
Name of Certified Lab ³						ACZ		ACZ	
Lab Reference #						L73629-11		L73629-08	
Sample Date						5/27/2022		5/27/2022	
Lab Test Date						6/2-6/16		6/2-6/16	
Sampled By						PH		PH	
Alkalinity (Total CaCO ₃)	mg/L	34	270	142					
Aluminum, dissolved	mg/L	0.07	0.07	0.07					
Arsenic, total recoverable	mg/L	0.002	0.002	0.002					
Bicarbonate as CaCO ₃	mg/L	34	270	142					
Calcium, dissolved	mg/L	6.6	56.6	31.96					
Cation - Anion Balance	%	-22.2	-22.2	-22.2					
Chloride	mg/L		4	1					
Conductivity @25C	µmhos/cm	76	76	76		84		82	
Hardness as CaCO ₃	mg/L	23	208	115					
Iron, dissolved	mg/L	0.11	0.11	0.11		-0.06	U	0.227	
Iron, total	mg/L	0.16	14.2	3.14		4.32		4.39	
Magnesium, dissolved	mg/L	1.5	17.6	8.7					
Manganese, dissolved	mg/L	0.029	0.029	0.029					
Manganese, total	mg/L	0.01	0.432	0.11					
Nitrate (as N), dissolved	mg/L		0.57	0.10					
Nitrate/Nitrite (as N)	mg/L		0.57	0.12					
Nitrite (as N), dissolved	mg/L		0.1	0.02					
pH	SU	6.7	6.7	6.7		8.3	H	8.1	H
Phosphate	mg/L	0.33	0.33	0.33					
Phosphorus, ortho dissolved	mg/L		0.166	0.041					
Potassium, dissolved	mg/L	0.5	0.5	0.5					
Residue, Filterable (TDS) @180C	mg/L	50	300	172		64		64	
Residue, Non-Filterable (TSS) @105C	mg/L		278	72		88.0		92.0	
Sodium Adsorption Ratio (SAR)	calc.	0.47	1.19	0.78					
Sodium, dissolved	mg/L	5.9	38.8	19.9					
Sulfate	mg/L		50	25					
Sum of Anions	meq/L	1.1	1.1	1.1					
Sum of Cations	meq/L	0.7	0.7	0.7					

¹ Baseline and WY 2000 data adapted from WWE (2001).
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Upper Dry Fork Flume
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Upper Dry Fork Flume		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	staff gage	0.08'	0.58'	0.28'	0.39'	0.85'		0.28'
pH (Field)	SU	7.01	8.42	7.76	7.78	7.89		8.04
Conductivity (Field)	µmhos/cm	114	699	310	92.6	53.9		58.5
Temperature (Field)	°C	11.9	16.0	13.5	5.8	12.4		16.0
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-07		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Alkalinity (Total CaCO3)	mg/L	24	100	57				
Aluminum, dissolved	mg/L	0.04	0.34	0.13				
Arsenic, total recoverable	mg/L	0.0005	0.0012	0.0008				
Bicarbonate as CaCO3	mg/L	24	100	57				
Boron, dissolved	mg/L	-0.01	-0.01	-0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	4.6	20.1	11.5				
Carbonate as CaCO3	mg/L	-2	-2	-2				
Cation - Anion Balance	%	-11.1	4.3	-5.2				
Chloride	mg/L	1	8	3				
Conductivity @25C	µmhos/cm	47	246	135		55		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO3	mg/L	16	67	39				
Hydroxide as CaCO3	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.06	0.32	0.20		-0.06	U	
Iron, total	mg/L	1.70	3.64	2.75		4.07		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	1.1	4.0	2.4				
Manganese, dissolved	mg/L	0.007	0.035	0.017				
Manganese, total	mg/L	0.047	0.103	0.078				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.15	0.04				
pH	SU	7.8	8.2	8.0		8.0	H	
Phosphate	mg/L	0.06	0.12	0.08				
Phosphorus, ortho dissolved	mg/L	0.02	0.04	0.03				
Potassium, dissolved	mg/L	-0.3	1.1	0.6				
Residue, Filterable (TDS) @180C	mg/L	40	160	105		46		
Residue, Non-Filterable (TSS) @105C	mg/L	24	88	42		106		
Selenium, total recoverable	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	0.20	1.36	0.80				
Sodium, dissolved	mg/L	1.9	25.2	12.5				
Sulfate	mg/L	-10	20	3				
Sum of Anions	meq/L	0.5	2.2	1.4				
Sum of Cations	meq/L	0.4	2.4	1.3				
TDS (calculated)	calc.	23	123	73				
TDS (ratio - measured/calculated)	mg/L	1.22	1.74	1.52				
Zinc, dissolved	mg/L	0.01	0.02	0.02				

¹ Baseline 2006.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Lick Creek Flume
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Lick Creek Flume		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/2/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	staff gage				0.14'	0.13'		dry
pH (Field)	SU				8.13	8.08		
Conductivity (Field)	µmhos/cm				409	289		
Temperature (Field)	°C				8.2	9.8		
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-09		
Sample Date						5/30/2022		
Lab Test Date						6/4-6/17		
Sampled By						PH		
Aluminum, dissolved	mg/L	0.12	0.12	0.12				
Arsenic, dissolved	mg/L	0.001	0.001	0.001				
Bicarbonate as CaCO ₃	mg/L	56	229	111				
Calcium, dissolved	mg/L	25.5	25.5	25.5				
Chloride	mg/L		8	4				
Conductivity @25C	µmhos/cm	118	481	238		275		
Hardness as CaCO ₃	mg/L	45	169	87				
Iron, dissolved	mg/L		0.56	0.13		0.091	B	
Iron, total	mg/L	0.49	11.3	4.06		0.848		
Magnesium, dissolved	mg/L	5.3	6.9	6.1				
Manganese, dissolved	mg/L	0.007	0.015	0.012				
Manganese, total	mg/L	0.003	0.39	0.11				
Molybdenum, dissolved	mg/L		0.01	0.005				
Nitrate/Nitrite (as N)	mg/L		0.13	0.04				
pH	SU	7.1	8.75	7.85		8.5	H	
Phosphorus, ortho dissolved	mg/L		1.67	0.19				
Residue, Filterable (TDS) @180C	mg/L	90	552	169		176		
Residue, Non-Filterable (TSS) @105C	mg/L	4	614	157		18.0	B	
Sodium Adsorption Ratio (SAR)	calc.	0.59	1.08	0.86				
Sodium, dissolved	mg/L	23.6	23.6	23.6				
Sulfate	mg/L	8.5	47.2	21.03				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Horse Gulch
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Horse Gulch		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/6/2022	5/26/2022	9/6/2022
Field Parameters							
Flow	gpm				dry	dry	dry
pH (Field)	SU	8.2	8.5	8.3			
Conductivity (Field)	µmhos/cm	240	740	542			
Temperature (Field)	°C	5.1	14.7	10.0			
Comment							
Laboratory Parameters ²							
Name of Certified Lab ³							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L	128	332	270			
Aluminum, dissolved	mg/L	0.04	0.04	0.04			
Arsenic, total recoverable	mg/L	0.001	0.001	0.001			
Bicarbonate as CaCO ₃	mg/L	128	331	268			
Calcium, dissolved	mg/L		0.004	0.000			
Carbonate as CaCO ₃	mg/L		9	2			
Cation - Anion Balance	%	-4.8	-4.8	-4.8			
Chloride	mg/L	1	5	3			
Conductivity @25C	µmhos/cm	780	780	780			
Hardness as CaCO ₃	mg/L	89	324	255			
Iron, dissolved	mg/L	0.05	0.05	0.05			
Iron, total	mg/L	0.1	3.09	0.83			
Magnesium, dissolved	mg/L	7	29.4	22.7			
Manganese, dissolved	mg/L	0.007	0.007	0.007			
Manganese, total	mg/L		0.34	0.04			
Nitrate/Nitrite (as N)	mg/L		0.36	0.12			
pH	SU	8.3	8.3	8.30			
Phosphate	mg/L	0.11	0.11	0.11			
Phosphorus, ortho dissolved	mg/L		0.037	0.011			
Potassium, dissolved	mg/L	3.6	3.6	3.6			
Residue, Filterable (TDS) @180C	mg/L	170	440	354			
Residue, Non-Filterable (TSS) @105C	mg/L						
Sodium Adsorption Ratio (SAR)	calc.	0.72	1.35	1.2			
Sodium, dissolved	mg/L	15.5	54	41.1			
Sulfate	mg/L	10	90	66			
Sum of Anions	meq/L	6.5	6.5	6.5			
Sum of Cations	meq/L	5.9	5.9	5.9			

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.



East Gulch, East of Horse Gulch
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: E. Gulch, E. of Horse Gulch		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	9/6/2022
Field Parameters							
Flow	gpm				dry	dry	dry
pH (Field)	SU	7.7	8.4	8.0			
Conductivity (Field)	µmhos/cm	260	480	402			
Temperature (Field)	°C	4.8	14.8	10.0			
Comment							
Laboratory Parameters ²							
Name of Certified Lab ³							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L	135	245	202			
Aluminum, dissolved	mg/L	0.03	0.03	0.03			
Bicarbonate as CaCO ₃	mg/L	135	245	202			
Calcium, dissolved	mg/L	26.8	53.6	42.6			
Carbonate as CaCO ₃	mg/L		6	0.5			
Chloride	mg/L	1	4	2			
Conductivity @25C	µmhos/cm	453	453	453			
Hardness as CaCO ₃	mg/L	95	190	156			
Iron, dissolved	mg/L	0.05	0.05	0.05			
Iron, total	mg/L	0.41	3.59	1.07			
Magnesium, dissolved	mg/L	6.9	13.7	11.6			
Manganese, dissolved	mg/L	0.012	0.012	0.012			
Manganese, total	mg/L	0.01	0.094	0.068			
Nitrate/Nitrite (as N)	mg/L	0.04	0.23	0.13			
pH	SU	8	8	8			
Phosphate	mg/L	0.2	0.2	0.2			
Phosphorus, ortho dissolved	mg/L		0.066	0.018			
Potassium, dissolved	mg/L	1.8	1.8	1.8			
Residue, Filterable (TDS) @180C	mg/L	170	290	252			
Residue, Non-Filterable (TSS) @105C	mg/L		50	17			
Sodium Adsorption Ratio (SAR)	calc.	0.94	1.65	1.5			
Sodium, dissolved	mg/L	20.9	47.8	40.2			
Sum of Anions	meq/L	4.9	4.9	4.9			
Sum of Cations	meq/L	4.9	4.9	4.9			
¹ Baseline and WY 2000 data adapted from WWE (2001). ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.							



**Upper Deep Creek
Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022										
Monitoring Location: Upper Deep Creek		Baseline ¹			Water Year 2022					
Description	Units	Minimum	Maximum	Mean	5/6/2022	5/26/2022	Q ⁴	5/26/2022 (Duplicate)	Q ⁴	9/5/2022
Field Parameters										
Flow	gpm				1,748	1,012		--		23.85
pH (Field)	SU	8.10	8.80	8.50	7.89	7.91		--		8.16
Conductivity (Field)	µmhos/cm	80	310	192	241	146.9		--		572
Temperature (Field)	°C	0.2	18.6	10.0	10.9	9.5		--		15.4
Comment										
Laboratory Parameters ²										
Name of Certified Lab ³						ACZ		ACZ		
Lab Reference #						L73579-06		L73579-07		
Sample Date						5/26/2022		5/26/2022		
Lab Test Date						6/2-6/14		6/2-6/14		
Sampled By						PH		PH		
Alkalinity (Total CaCO3)	mg/L		160	103.4						
Bicarbonate as CaCO3	mg/L	53	153	106.3						
Calcium, dissolved	mg/L	14	44.4	28.7						
Carbonate as CaCO3	mg/L		9	1.3						
Cation - Anion Balance	%	-3.4	-2	-2.7						
Chloride	mg/L		2	0.2						
Conductivity @25C	µmhos/cm	139	242	191		151		150		
Hardness as CaCO3	mg/L	47	138	91						
Iron, dissolved	mg/L	0.02	0.04	0		-0.06	U	-0.06	U	
Iron, total	mg/L	0.14	9.43	2.63		5.95		5.65		
Magnesium, dissolved	mg/L	2.6	6.6	4.6						
Manganese, dissolved	mg/L		0.007	0.004						
Manganese, total	mg/L	0.005	0.282	0						
Nitrate/Nitrite (as N)	mg/L		0.05	0.01						
pH	SU	6.9	8	7.5		8.3	H	8.2	H	
Phosphate	mg/L	0.12	0.2	0.16						
Phosphorus, ortho dissolved	mg/L		0.065	0.013						
Potassium, dissolved	mg/L	0.7	1.2	1.0						
Residue, Filterable (TDS) @180C	mg/L	60	210	133		148		148		
Residue, Non-Filterable (TSS) @105C	mg/L					219		211		
Sodium Adsorption Ratio (SAR)	calc.	0.32	0.77	0.6						
Sodium, dissolved	mg/L	7.9	20	13.8						
Sulfate	mg/L		30	10.8						
Sum of Anions	meq/L	1.5	2.6	2.1						
Sum of Cations	meq/L	1.4	2.5	2.0						

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



**Lower Deep Creek
Surface Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Lower Deep Creek		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm				1,812	1,101		38.91
pH (Field)	SU	8.10	8.80	8.50	7.65	7.91		8.24
Conductivity (Field)	µmhos/cm	120	380	246	278	261		562
Temperature (Field)	°C	0.1	16.4	10.0	10.1	13.9		15.5
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-08		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	61	183	126				
Aluminum, dissolved	mg/L		0.03	0.02				
Bicarbonate as CaCO ₃	mg/L	65	173	132				
Calcium, dissolved	mg/L	18.6	46.8	31.9				
Carbonate as CaCO ₃	mg/L		12	2				
Cation - Anion Balance	%	-6.7	-2.9	-4.8				
Chloride	mg/L		2	1				
Conductivity @25C	µmhos/cm	162	270	216		249		
Iron, dissolved	mg/L	0.03	0.43	0.23		-0.06	U	
Iron, total	mg/L	0.11	5.83	1.68		2.12		
Magnesium, dissolved	mg/L	3.1	7.5	5.4				
Manganese, dissolved	mg/L		0.009	0.005				
Manganese, total	mg/L		0.16	0.04				
Nitrate/Nitrite (as N)	mg/L		0.10	0.03				
pH	SU	6.5	8.20	7.4		8.4	H	
Phosphate	mg/L	0.08	0.09	0.09				
Phosphorus, ortho dissolved	mg/L		0.32	0.007				
Potassium, dissolved	mg/L	0.8	1.1	1.0				
Residue, Filterable (TDS) @180C	mg/L	90	250	165		174		
Residue, Non-Filterable (TSS) @105C	mg/L		448	93		68.0		
Sodium Adsorption Ratio (SAR)	calc.	0.59	1.32	0.94				
Sodium, dissolved	mg/L	12.3	31.4	21.6				
Sulfate	mg/L		30	19				
Sum of Anions	meq/L	1.8	3.2	2.5				
Sum of Cations	meq/L	1.7	2.8	2.25				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Box Canyon
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Box Canyon		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	9/6/2022
Field Parameters							
Flow	gpm				dry	dry	dry
pH (Field)	SU	7.9	8.9	8.3			
Conductivity (Field)	µmhos/cm	840	1020	916			
Temperature (Field)	°C	2.0	15.9	10.0			
Comment							
Laboratory Parameters ²							
Name of Certified Lab ³							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L	401	447	427			
Aluminum, dissolved	mg/L	0 ⁽⁴⁾	0.07 ⁽⁴⁾	0.03 ⁽⁴⁾			
Arsenic, dissolved	mg/L	0	0	0			
Arsenic, total recoverable	mg/L	0	0.006	0.001			
Bicarbonate as CaCO ₃	mg/L	398	447	425			
Cadmium, dissolved	mg/L	0	0.003	0.0008			
Calcium, dissolved	mg/L	40.2	67.9	58.0			
Carbonate as CaCO ₃	mg/L	0	12	2			
Cation - Anion Balance	%	-4	3.6	0.02			
Chloride	mg/L	2	6	5			
Conductivity @25C	µmhos/cm	868	968	921			
Hardness as CaCO ₃	mg/L	195	283	255			
Hydroxide as CaCO ₃	mg/L	0	0	0			
Iron, dissolved	mg/L	0	0.02	0.01			
Iron, total	mg/L	0.02	0.44	0.16			
Magnesium, dissolved	mg/L	23	28	27			
Manganese, total	mg/L	0	0.009	0.002			
Nitrate (as N), dissolved	mg/L	0.13	0.48	0.30			
Nitrate/Nitrite (as N)	mg/L	0.13	0.48	0.30			
pH	SU	8	8.2	8.1			
Phosphate	mg/L	0	0.03	0.01			
Phosphorus, ortho dissolved	mg/L	0	0.007	0.002			
Potassium, dissolved	mg/L	2.6	3.3	3.0			
Residue, Filterable (TDS) @180C	mg/L	540	620	586			
Residue, Non-Filterable (TSS) @105C	mg/L	0	38	19			
Selenium, dissolved	mg/L	0.001	0.002	0.002			
Selenium, total recoverable	mg/L	0	0.003	0.001			
Sodium Adsorption Ratio (SAR)	calc.	3.43	4.26	3.91			
Sodium, dissolved	mg/L	127	154	141			
Sulfate	mg/L	100	140	118			
Sum of Anions	meq/L	10.3	12.1	11.1			
Sum of Cations	meq/L	9.5	12.23	11.1			
Zinc, dissolved	mg/L	0	0.01	0.002			

¹ Baseline and WY 2000 data adapted from WWE (2001). Shaded cells indicate value different from AHR 2000 baseline value due to rounding.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ Baseline value is for total Aluminum.



Deer Creek
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Deer Creek		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm	0.72	114	44.7	dry	dry		dry
pH (Field)	SU	8.3	8.4	8.4				
Conductivity (Field)	µmhos/cm	537	796	659				
Temperature (Field)	°C	11.2	16.9	13.1				
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	247	274	263				
Aluminum, dissolved	mg/L	-0.03	-0.03	-0.03				
Arsenic, dissolved	mg/L	-0.0005	-0.0005	-0.0005				
Arsenic, total recoverable	mg/L	-0.0005	0.0009	0.0006				
Bicarbonate as CaCO ₃	mg/L	218	249	235				
Boron, dissolved	mg/L	0.03	0.03	0.03				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	47.0	64.5	56.5				
Carbonate as CaCO ₃	mg/L	25	30	28				
Cation - Anion Balance	%	-5.7	4.6	3.7				
Chloride	mg/L	3	3	3				
Conductivity @25C	µmhos/cm	487	547	517				
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	176	245	211				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.09	0.11	0.10				
Iron, total	mg/L	0.36	2.92	1.64				
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	14.3	20.4	18.3				
Manganese, dissolved	mg/L	-0.005	0.009	0.005				
Manganese, total	mg/L	-0.005	0.049	0.026				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	0.88	2.07	1.50				
pH	SU	8.5	8.6	8.6				
Phosphate	mg/L	0.03	0.12	0.08				
Phosphorus, ortho dissolved	mg/L	0.01	0.04	0.03				
Potassium, dissolved	mg/L	3.2	3.6	3.4				
Residue, Filterable (TDS) @180C	mg/L	280	330	310				
Residue, Non-Filterable (TSS) @105C	mg/L	16	68	42				
Selenium, total recoverable	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	1.09	1.21	1.15				
Sodium, dissolved	mg/L	32.8	43.9	39.9				
Sulfate	mg/L	30	50	40				
Sum of Anions	meq/L	5.6	6.2	5.9				
Sum of Cations	meq/L	5.0	6.8	5.9				
TDS (calculated)	calc.	292	346	319				
TDS (ratio - measured/calculated)	mg/L	0.92	0.96	0.94				
Zinc, dissolved	mg/L	-0.01	0.02	0.01				

¹ Baseline 2005.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Poison Gulch
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Poison Gulch		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	9/6/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				dry	dry		dry
pH (Field)	SU	6.56	7.08	6.74				
Conductivity (Field)	µmhos/cm	271	479	383				
Temperature (Field)	°C	10.9	12.9	12.2				
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	119	152	136				
Aluminum, dissolved	mg/L	-0.03	-0.03	-0.03				
Arsenic, total recoverable	mg/L	-0.0005	0.0007	0.0005				
Bicarbonate as CaCO ₃	mg/L	119	152	136				
Boron, dissolved	mg/L	0.02	0.03	0.03				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	22.0	35.5	28.8				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	%	-2.1	7.7	4.4				
Chloride	mg/L	1	1	1				
Conductivity @25C	µmhos/cm	240	295	268				
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	78	124	101				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.07	0.11	0.09				
Iron, total	mg/L	0.41	0.43	0.42				
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	5.6	8.6	7.1				
Manganese, dissolved	mg/L	-0.005	-0.005	-0.005				
Manganese, total	mg/L	-0.005	0.010	0.006				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
pH	SU	7.8	8.1	8.0				
Phosphate	mg/L	0.21	0.21	0.21				
Phosphorus, ortho dissolved	mg/L	0.07	0.07	0.07				
Potassium, dissolved	mg/L	2.9	2.9	2.9				
Residue, Filterable (TDS) @180C	mg/L	130	170	150				
Residue, Non-Filterable (TSS) @105C	mg/L	-5	28	15				
Selenium, total recoverable	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	0.82	0.92	0.87				
Sodium, dissolved	mg/L	16.6	23.3	20.0				
Sulfate	mg/L	-10	-10	-10				
Sum of Anions	meq/L	2.4	3.0	2.7				
Sum of Cations	meq/L	2.3	3.5	2.9				
TDS (calculated)	calc.	120	163	142				
TDS (ratio - measured/calculated)	mg/L	1.04	1.08	1.06				
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01				
¹ Baseline 2005. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. ⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Deep Creek Ditch
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Deep Creek Ditch		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/27/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm / staff	70	1527	563	0.55'	0.50'		0.21
pH (Field)	SU	6.32	8.20	7.27	8.13	7.57		8.25
Conductivity (Field)	µmhos/cm	75.9	131	107	60.5	50.7		47.7
Temperature (Field)	°C	5.0	11.9	9.6	6.9	12.3		14.6
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-09		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	25	60	45				
Aluminum, dissolved	mg/L	0.05	0.15	0.10				
Arsenic, total recoverable	mg/L	-0.0005	0.0006	0.0003				
Bicarbonate as CaCO ₃	mg/L	25	60	45				
Boron, dissolved	mg/L	-0.01	-0.01	-0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	4.6	13.7	10.1				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	%	-11.1	6.7	-3.0				
Chloride	mg/L	1	9	3				
Conductivity @25C	µmhos/cm	50	113	88		51		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	16	47	35				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.04	0.14	0.09		-0.06	U	
Iron, total	mg/L	1.19	2.59	1.83		1.90		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	1.1	3.1	2.3				
Manganese, dissolved	mg/L	-0.005	0.013	0.005				
Manganese, total	mg/L	0.032	0.090	0.064				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	3.39	0.90				
pH	SU	7.8	8.1	8.0		8.0	H	
Phosphate	mg/L	0.06	0.09	0.08				
Phosphorus, ortho dissolved	mg/L	0.02	0.03	0.03				
Potassium, dissolved	mg/L	-0.3	0.7	0.5				
Residue, Filterable (TDS) @180C	mg/L	40	100	75		46		
Residue, Non-Filterable (TSS) @105C	mg/L	8	76	32		41.0		
Selenium, total recoverable	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	0.19	0.33	0.28				
Sodium, dissolved	mg/L	1.8	5.2	3.9				
Sulfate	mg/L	-10	-10	-10				
Sum of Anions	meq/L	0.5	1.4	0.9				
Sum of Cations	meq/L	0.4	1.2	0.9				
TDS (calculated)	calc.	24	68	47				
TDS (ratio - measured/calculated)	mg/L	1.38	2.05	1.64				
Zinc, dissolved	mg/L	-0.01	0.03	0.02				
¹ Baseline 2006. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. ⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Minnesota Reservoir Flume
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Minnesota Reservoir Flume		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/2/2022	5/30/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm / staff	83	3,591	1,364	0.30'	0.38'		0.12'
pH (Field)	SU	7.97	8.75	8.29	7.81	8.02		not measured
Conductivity (Field)	µmhos/cm	114	682	360	456	90.4		not measured
Temperature (Field)	°C	14.8	24.1	18.5	12.4	11.4		not measured
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-10		
Sample Date						5/30/2022		
Lab Test Date						6/4-6/17		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	46	230	140				
Aluminum, dissolved	mg/L	-0.03	0.08	0.05				
Arsenic, dissolved	mg/L	-0.001	0.001	0.001				
Bicarbonate as CaCO ₃	mg/L	46	213	134				
Boron, dissolved	mg/L	-0.01	0.02	0.01				
Cadmium, dissolved	mg/L	-0.01	-0.01	-0.01				
Calcium, dissolved	mg/L	8.9	53.7	31.2				
Carbonate as CaCO ₃	mg/L	-2	18	8				
Cation - Anion Balance	%	-5.9	2.1	-1.1				
Chloride	mg/L	1.00	3.00	1.86				
Conductivity @25C	µmhos/cm	95	456	295		93		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	31	192	111				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.03	0.26	0.10		0.072	B	
Iron, total	mg/L	0.36	3.62	1.58		4.48		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	2.1	14.1	8.1				
Manganese, dissolved	mg/L	-0.01	0.09	0.03				
Manganese, total	mg/L	0.031	0.397	0.136				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate (as N), dissolved	mg/L	-0.02	0.64	0.22				
pH	SU	8.0	8.5	8.3		8.3	H	
Phosphate	mg/L	-0.03	0.40	0.12				
Phosphorus, ortho dissolved	mg/L	-0.01	0.13	0.04				
Potassium, dissolved	mg/L	0.6	2.0	1.3				
Residue, Filterable (TDS) @180C	mg/L	70	250	176		78		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	60	26		46.0		
Selenium, dissolved	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	0.38	1.16	0.72				
Sodium, dissolved	mg/L	4.8	32.4	17.3				
Sulfate	mg/L	-10	30	6				
Sum of Anions	meq/L	0.90	4.80	3.06				
Sum of Cations	meq/L	0.8	4.7	3.0				
TDS (calculated)	calc.	46	244	158				
TDS (ratio - measured/calculated)	mg/L	0.99	1.74	1.24				
Zinc, dissolved	mg/L	-0.01	0.02	0.01				

¹ Baseline 2006.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



South Prong Creek Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: South Prong Creek		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/2/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	staff	--	--	--	0.44'	0.85'		0.18'
pH (Field)	SU	7.5	9	8.5	7.85	8.11		7.97
Conductivity (Field)	µmhos/cm	64.9	178.0	109.2	148.6	74.9		99.3
Temperature (Field)	°C	4.9	16.1	10.6	7.1	5.8		13.9
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #								
Sample Date						5/30/2022		
Lab Test Date								
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	31.9	64.6	50.4		34.5		
Aluminum, dissolved	mg/L	-0.05	0.04	0.03		-0.05	U	
Arsenic, total recoverable	mg/L	0.0003	0.0011	0.0005		0.00022	B	
Bicarbonate as CaCO ₃	mg/L	31.9	63.6	50.3		34.5		
Boron, dissolved	mg/L	-0.02	0.01	0.01		-0.03	U	
Cadmium, dissolved	mg/L	-0.008	-0.005	-0.005		-0.008	U	
Calcium, dissolved	mg/L	7.7	14.4	11.5		8.27		
Carbonate as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Cation-Anion Balance	calc.	-4.8	0.0	-2.7		-0.9		
Chloride	mg/L	-0.5	1.0	0.4		1.04	B	
Conductivity @25C	umhos/cm	66	146	103		71		
Copper, dissolved	mg/L	-0.01	0.03	0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	25	50	39		28		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2.0		-2	U	
Iron, dissolved	mg/L	-0.03	0.05	0.03		-0.06	U	
Iron, total	mg/L	0.60	4.01	1.64		0.647		
Lead, dissolved	mg/L	-0.03	0.04	0.02		-0.03	U	
Magnesium, dissolved	mg/L	1.5	3.5	2.6		1.82		
Manganese, dissolved	mg/L	-0.01	0.01	0.00		-0.01	U	
Manganese, total	mg/L	0.02	0.08	0.04		0.015	B	
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	0.15	0.04		0.106		
pH	units	7.8	8.3	8.1		8.0	H	
Phosphate	mg/L	-0.06	0.12	0.08		-0.0300	U	
Phosphorus, ortho dissolved	mg/L	-0.02	0.04	0.03		-0.02	UH	
Potassium, dissolved	mg/L	0.2	0.9	0.5		0.37	B	
Residue, Filterable (TDS) @180C	mg/L	52	128	82		56		
Residue, Non-Filterable (TSS) @105C	mg/L	18.0	140.0	57.5		16.0	B	
Selenium, total recoverable	mg/L	-0.0001	0.0003	0.0001		0.00015	B	
Sodium Adsorption Ratio in Water	calc.	0.26	0.58	0.32		0.30		
Sodium, dissolved	mg/L	3.3	9.4	4.6		3.66		
Sulfate	mg/L	-1	7.7	2.0		1.3	B	
Sum of Anions	meq/L	0.7	1.5	1.059		0.746		
Sum of Cations	meq/L	0.658	1.4	1.006		0.733		
TDS (calculated)	mg/L	34.0	75.4	52.0		37.5		
TDS (ratio - measured/calculated)	calc.	1.36	1.78	1.57		1.49		
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01		-0.02	U	

¹ Baseline period is July 2018 through July 2019.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



South Fork of South Prong Creek Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022									
Monitoring Location: South Fork of South Prong Creek		Baseline ¹			Water Year 2022				
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	5/30/2022 (duplicate)	Q ⁴ 9/2/2022
Field Parameters									
Flow	gpm	--	--	--	1,497	2,030		--	322
pH (Field)	SU	7.5	8.4	8.0	7.2	7.55		--	7.9
Conductivity (Field)	umhos/cm	55.9	144.0	96.7	97.9	64.6		--	93.1
Temperature (Field)	°C	4.5	13.0	9.8	7.9	7.0		--	14.2
Comment									
Laboratory Parameters ²									
Name of Certified Lab ³						ACZ		ACZ	
Lab Reference #						L73578-03		L73578-06	
Sample Date						5/30/2022		5/30/2022	
Lab Test Date						6/1-6/21		6/1-6/21	
Sampled By						PH		PH	
Alkalinity (Total CaCO3)	mg/L	28.9	56.1	45.5		32.0		38.9	
Aluminum, dissolved	mg/L	-0.05	-0.03	-0.03		-0.05	U	-0.05	U
Arsenic, total recoverable	mg/L	0.0002	0.0003	0.0002		-0.0002	U	-0.0002	U
Bicarbonate as CaCO3	mg/L	28.9	56.1	45.5		32.0		38.9	
Boron, dissolved	mg/L	-0.02	0.01	0.01		-0.03	U	-0.03	U
Cadmium, dissolved	mg/L	-0.008	-0.005	-0.005		-0.008	U	-0.008	U
Calcium, dissolved	mg/L	6.6	14.1	10.6		7.51		8.23	
Carbonate as CaCO3	mg/L	-10	-2	-2		-2	U	-2	U
Cation-Anion Balance	calc.	-10.8	9.1	-2.1		-1.1		-5.8	
Chloride	mg/L	-0.5	0.6	0.4		1.09	B	1.14	B
Conductivity @25C	umhos/cm	58	120	90		63		64	
Copper, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U	-0.01	U
Hardness as CaCO3 (dissolved)	mg/L	22	47	37		26		28	
Hydroxide as CaCO3	mg/L	-10	-2	-2		-2	U	-2	U
Iron, dissolved	mg/L	-0.03	0.04	0.03		-0.06	U	-0.06	U
Iron, total	mg/L	0.33	0.62	0.49		0.360		0.349	
Lead, dissolved	mg/L	-0.03	0.03	0.02		-0.03	U	-0.03	U
Magnesium, dissolved	mg/L	1.3	3.0	2.4		1.66		1.74	
Manganese, dissolved	mg/L	-0.01	0.01	0.004		-0.01	U	-0.01	U
Manganese, total	mg/L	0.01	0.02	0.02		-0.01	U	-0.01	U
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	-0.0002	U
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	-0.02	U
Nitrate/Nitrite as N	mg/L	-0.02	0.14	0.05		0.093	B	0.094	B
pH	units	7.6	8.2	8.0		8.0	H	8.0	H
Phosphate	mg/L	-0.06	0.06	0.05		-0.03	U	-0.03	U
Phosphorus, ortho dissolved	mg/L	-0.02	0.02	0.02		-0.02	UH	-0.02	UH
Potassium, dissolved	mg/L	-0.2	0.7	0.4		0.32	B	0.34	B
Residue, Filterable (TDS) @180C	mg/L	46	104	69		48		48	
Residue, Non-Filterable (TSS) @105C	mg/L	8.0	17.0	14.2		12.0	B	10.0	B
Selenium, total recoverable	mg/L	-0.0001	0.0002	0.0001		0.00014	B	0.00013	B
Sodium Adsorption Ratio in Water	calc.	0.24	0.45	0.30		0.27		0.28	
Sodium, dissolved	mg/L	2.6	6.7	4.1		3.11		3.30	
Sulfate	mg/L	-1.0	5.2	2.0		-1.0	U	-1.0	U
Sum of Anions	meq/L	0.685	1.2	0.946		0.671		0.8	
Sum of Cations	meq/L	0.551	1.2	0.926		0.657		0.712	
TDS (calculated)	mg/L	33.0	62.0	47.1		33.2		38.6	
TDS (ratio - measured/calculated)	calc.	1.23	1.68	1.44		1.45		1.24	
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01		-0.02	U	0.109	

¹ Baseline period is July 2018 through July 2019.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



North Fork of South Prong Creek Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: North Fork of South Prong Creek		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴ 9/2/2022
Field Parameters							
Flow	gpm	--	--	--	78.33	24.26	dry
pH (Field)	SU	7.50	8.88	8.20	7.83	7.97	
Conductivity (Field)	µmhos/cm	301	460	356	409	449	
Temperature (Field)	°C	5.7	15.5	11.5	10.3	10.5	
Comment							
Laboratory Parameters ²							
Name of Certified Lab ³						ACZ	
Lab Reference #						L73578-07	
Sample Date						5/30/2022	
Lab Test Date						6/1-6/21	
Sampled By						PH	
Alkalinity (Total CaCO ₃)	mg/L	120	199	152		198	
Aluminum, dissolved	mg/L	-0.05	-0.05	-0.05		-0.05	U
Arsenic, total recoverable	mg/L	0.0003	0.0004	0.0004		0.00036	B
Bicarbonate as CaCO ₃	mg/L	115	187	144		181	
Boron, dissolved	mg/L	-0.02	0.04	0.02		-0.03	U
Cadmium, dissolved	mg/L	-0.008	-0.008	-0.008		-0.008	U
Calcium, dissolved	mg/L	23.1	40.5	29.5		37.8	
Carbonate as CaCO ₃	mg/L	-10	11.7	7.2		16.7	B
Cation-Anion Balance	calc.	0.0	1.6	0.9		0.0	
Chloride	mg/L	1.7	2.3	2.1		2.23	
Conductivity @25C	umhos/cm	282	405	328		424	
Copper, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U
Hardness as CaCO ₃ (dissolved)	mg/L	82	145	105		135	
Hydroxide as CaCO ₃	mg/L	-10	-2	4		-2	U
Iron, dissolved	mg/L	-0.03	-0.03	-0.03		-0.06	U
Iron, total	mg/L	0.33	0.65	0.47		0.524	
Lead, dissolved	mg/L	-0.03	-0.03	-0.03		0.033	B
Magnesium, dissolved	mg/L	6.0	10.6	7.6		9.89	
Manganese, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U
Manganese, total	mg/L	-0.01	-0.01	-0.01		-0.01	U
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U
Molybdenum, dissolved	mg/L	-0.02	-0.02	0.01		-0.02	U
Nitrate/Nitrite as N	mg/L	-0.02	0.18	0.07		-0.02	U
pH	units	8.4	8.4	8.4		8.5	H
Phosphate	mg/L	0.12	0.12	0.12		0.12	B
Phosphorus, ortho dissolved	mg/L	0.04	0.04	0.04		0.037	BH
Potassium, dissolved	mg/L	1.2	1.8	1.4		1.60	
Residue, Filterable (TDS) @180C	mg/L	174	254	207		262	
Residue, Non-Filterable (TSS) @105C	mg/L	10.0	23.0	15.0		15.0	B
Selenium, total recoverable	mg/L	0.0002	0.0005	0.0003		0.00023	B
Sodium Adsorption Ratio in Water	calc.	1.3	1.5	1.4		1.6	
Sodium, dissolved	mg/L	27.2	41.1	32.6		42.4	
Sulfate	mg/L	19.6	30.9	24.8		26.7	
Sum of Anions	meq/L	2.9	4.7	3.5		4.6	
Sum of Cations	meq/L	2.9	4.8	3.6		4.6	
TDS (calculated)	mg/L	154	248	188		241	
TDS (ratio - measured/calculated)	calc.	1.02	1.26	1.12		1.09	
Zinc, dissolved	mg/L	-0.01	0.01	0.01		-0.02	U

¹ Baseline period is July 2018 through July 2019.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Stream ST-SW-1
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Stream ST-SW-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	gpm	--	--	--	191.5	56.71		12.97
pH (Field)	SU	7.99	8.75	8.42	7.01	7.88		7.87
Conductivity (Field)	µmhos/cm	97.6	118.1	108.4	87.5	103.3		119.3
Temperature (Field)	°C	7.3	14.1	10.8	7.4	8.9		12.2
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-09		
Sample Date						5/30/2022		
Lab Test Date						6/1-6/21		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	45.8	53.4	49.2		49.4		
Aluminum, dissolved	mg/L	-0.05	-0.03	-0.04		-0.05	U	
Arsenic, total recoverable	mg/L	0.0002	0.0005	0.0003		0.00028	B	
Bicarbonate as CaCO ₃	mg/L	45.8	53.4	49.2		49.4		
Boron, dissolved	mg/L	-0.02	0.02	0.01		-0.03	U	
Cadmium, dissolved	mg/L	-0.008	-0.005	-0.006		-0.008	U	
Calcium, dissolved	mg/L	10.9	12.6	11.6		11.9		
Carbonate as CaCO ₃	mg/L	-10.0	-2.0	-3.6		-2.0	U	
Cation-Anion Balance	calc.	-12.0	24.6	0.2		0.0		
Chloride	mg/L	-0.5	0.9	0.5		1.44	B	
Conductivity @25C	umhos/cm	98	111	104		104		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	38	61	44		40		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Iron, dissolved	mg/L	-0.03	0.07	0.04		-0.06	U	
Iron, total	mg/L	0.64	2.71	1.29		0.839		
Lead, dissolved	mg/L	-0.03	0.03	0.01		-0.03	U	
Magnesium, dissolved	mg/L	2.4	8.1	3.6		2.52		
Manganese, dissolved	mg/L	-0.010	-0.005	-0.005		-0.01	U	
Manganese, total	mg/L	0.02	0.08	0.04		0.022	B	
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	0.11	0.05		-0.0200	U	
pH	units	7.9	8.1	8.0		8.2	H	
Phosphate	mg/L	0.06	0.16	0.09		0.0744	B	
Phosphorus, ortho dissolved	mg/L	0.02	0.05	0.03		0.024	BH	
Potassium, dissolved	mg/L	0.4	1.0	0.6		0.56	B	
Residue, Filterable (TDS) @180C	mg/L	70	86	79		84		
Residue, Non-Filterable (TSS) @105C	mg/L	13.0	72.0	31.8		14.0	B	
Selenium, total recoverable	mg/L	-0.0001	0.0001	0.0001		-0.0001	U	
Sodium Adsorption Ratio in Water	calc.	0.32	0.41	0.36		0.40		
Sodium, dissolved	mg/L	4.5	7.3	5.5		5.71		
Sulfate	mg/L	-1.0	15.7	5.8		5.4		
Sum of Anions	meq/L	1.0	1.4	1.1		1.1		
Sum of Cations	meq/L	0.964	1.6	1.1		1.1		
TDS (calculated)	mg/L	51.1	70.5	57.9		57.7		
TDS (ratio - measured/calculated)	calc.	1.22	1.57	1.37		1.46		
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01		-0.02	U	

¹ Baseline period is July 2018 through August 2019.
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Pond ST-P-1
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Pond ST-P-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	9/6/2022
Field Parameters								
Water Depth	feet	--	--	--	--	1.5		dry
pH (Field)	SU	7.88	8.99	8.27	--	7.65		
Conductivity (Field)	µmhos/cm	164.3	314	222	--	227		
Temperature (Field)	°C	9.8	22.3	18.0	--	14.5		
Comment					no site access			
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-08		
Sample Date						5/30/2022		
Lab Test Date						6/1-6/21		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	47.9	103	81		91.6		
Aluminum, dissolved	mg/L	-0.05	0.12	0.05		-0.05	U	
Arsenic, total recoverable	mg/L	0.0003	0.0080	0.0037		0.00114		
Bicarbonate as CaCO ₃	mg/L	47.9	103	81		91.6		
Boron, dissolved	mg/L	-0.02	0.06	0.03		-0.03	U	
Cadmium, dissolved	mg/L	-0.008	-0.005	-0.005		-0.008	U	
Calcium, dissolved	mg/L	9.8	22.3	16.0		23.6		
Carbonate as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Cation-Anion Balance	calc.	-2.2	12.0	3.4		2.2		
Chloride	mg/L	1.7	17.4	6.9		3.43		
Conductivity @25C	umhos/cm	148	217	187		219		
Copper, dissolved	mg/L	-0.01	0.02	0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	38	74	53		77		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Iron, dissolved	mg/L	0.04	1.52	0.65		0.063	B	
Iron, total	mg/L	0.18	13.6	4.5		0.483		
Lead, dissolved	mg/L	-0.03	-0.03	-0.03		-0.03	U	
Magnesium, dissolved	mg/L	2.4	4.4	3.2		4.29		
Manganese, dissolved	mg/L	-0.01	0.32	0.16		0.029	B	
Manganese, total	mg/L	-0.01	0.65	0.30		0.047	B	
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	3.85	0.78		-0.02	U	
pH	units	7.8	8.1	7.9		8.3	H	
Phosphate	mg/L	-0.06	0.22	0.13		-0.03	U	
Phosphorus, ortho dissolved	mg/L	-0.02	0.07	0.04		-0.02	UH	
Potassium, dissolved	mg/L	3.6	7.1	5.5		7.65		
Residue, Filterable (TDS) @180C	mg/L	122	420	200		152		
Residue, Non-Filterable (TSS) @105C	mg/L	5.0	300.0	78.8		15.0	B	
Selenium, total recoverable	mg/L	0.0002	0.0007	0.0004		0.00035		
Sodium Adsorption Ratio in Water	calc.	0.49	1.90	1.03		0.58		
Sodium, dissolved	mg/L	7.5	26.7	16.0		11.6		
Sulfate	mg/L	-1	6.1	3.1		12.9		
Sum of Anions	meq/L	1.1	2.3	1.9		2.2		
Sum of Cations	meq/L	1.4	2.3	2.0		2.3		
TDS (calculated)	mg/L	66	121	101		119		
TDS (ratio - measured/calculated)	calc.	1.15	3.96	1.98		1.28		
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01		-0.02	U	

¹ Baseline period is August 2018 through August 2019.
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Pond ST-P-2
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Pond ST-P-2		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Water Depth	feet	--	--	--	1.2	full		dry
pH (Field)	SU	6.55	8.27	7.45	7.19	7.04		
Conductivity (Field)	µmhos/cm	111.0	190.8	138.1	126.6	111.8		
Temperature (Field)	°C	7.5	22.7	15.6	12.1	13.3		
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-02		
Sample Date						5/30/2022		
Lab Test Date						6/1-6/21		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	42.6	91.8	64.6		49.7		
Aluminum, dissolved	mg/L	-0.05	0.19	0.08		-0.05	U	
Arsenic, total recoverable	mg/L	0.000	0.001	0.000		0.00024	B	
Bicarbonate as CaCO ₃	mg/L	42.6	91.8	64.6		49.7		
Boron, dissolved	mg/L	-0.02	-0.02	-0.02		-0.03	U	
Cadmium, dissolved	mg/L	-0.008	-0.008	-0.008		-0.008	U	
Calcium, dissolved	mg/L	10.2	25.8	17.1		13.8		
Carbonate as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Cation-Anion Balance	calc.	2.1	4.8	3.6		0.0		
Chloride	mg/L	1.0	4.9	2.4		1.95	B	
Conductivity @25C	umhos/cm	90	201	136		113		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	36	89	59		49		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Iron, dissolved	mg/L	0.05	0.85	0.35		-0.06	U	
Iron, total	mg/L	0.13	1.68	0.72		0.249		
Lead, dissolved	mg/L	-0.03	-0.03	-0.03		0.042	B	
Magnesium, dissolved	mg/L	2.6	5.9	4.0		3.45		
Manganese, dissolved	mg/L	-0.01	0.04	0.02		-0.01	U	
Manganese, total	mg/L	-0.01	0.11	0.04		-0.01	U	
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	-0.02	-0.02		-0.02	U	
pH measured at	C	7.7	7.9	7.8		7.9	H	
Phosphate	mg/L	0.06	2.23	0.83		0.12	B	
Phosphorus, ortho dissolved	mg/L	0.02	0.72	0.27		0.039	BH	
Potassium, dissolved	mg/L	0.6	7.0	2.9		1.46		
Residue, Filterable (TDS) @180C	mg/L	88	172	121		100		
Residue, Non-Filterable (TSS) @105C	mg/L	-20	7.0	5.7		7.0	B	
Selenium, total recoverable	mg/L	-0.0001	0.0006	0.0003		0.00026		
Sodium Adsorption Ratio in Water	calc.	0.22	0.24	0.23		0.23		
Sodium, dissolved	mg/L	3.3	4.7	4.0		3.59		
Sulfate	mg/L	-1	-1	-1		6.5		
Sum of Anions	meq/L	0.9	2.0	1.4		1.2		
Sum of Cations	meq/L	0.9	2.2	1.5		1.2		
TDS (calculated)	mg/L	45	105	70		61.1		
TDS (ratio - measured/calculated)	calc.	1.64	1.96	1.77		1.64		
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01		-0.02	U	

¹ Baseline period is August 2018 through August 2019.
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Pond ST-P-3
Surface Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Pond ST-P-3		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Water Depth	feet	--	--	--	2.5	full		dry
pH (Field)	SU	7.19	7.29	7.24	7.09	7.11		
Conductivity (Field)	µmhos/cm	95.0	124.0	111.8	101.3	125.6		
Temperature (Field)	°C	7.3	20.4	15.6	12.0	14.0		
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-05		
Sample Date						5/30/2022		
Lab Test Date						6/1-6/21		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	38.9	64.1	54.4		64.1		
Aluminum, dissolved	mg/L	-0.05	0.19	0.07		-0.05	U	
Arsenic, total recoverable	mg/L	-0.0002	0.0004	0.0003		0.00027	B	
Bicarbonate as CaCO ₃	mg/L	38.9	64.1	54.4		64.1		
Boron, dissolved	mg/L	-0.02	-0.02	-0.02		-0.03	U	
Cadmium, dissolved	mg/L	-0.008	-0.008	-0.008		-0.008	U	
Calcium, dissolved	mg/L	8.9	15.1	12.7		16.0		
Carbonate as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Cation-Anion Balance	calc.	0.8	4.0	2.8		3.7		
Chloride	mg/L	1.0	1.0	1.0		1.86	B	
Conductivity @25C	umhos/cm	80	133	112		129		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	32	56	47		57		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Iron, dissolved	mg/L	0.13	0.84	0.37		-0.06	U	
Iron, total	mg/L	0.43	1.33	0.73		0.143	B	
Lead, dissolved	mg/L	-0.03	-0.03	-0.03		0.038	B	
Magnesium, dissolved	mg/L	2.4	5.0	3.7		4.19		
Manganese, dissolved	mg/L	-0.01	0.04	0.02		-0.01	U	
Manganese, total	mg/L	-0.01	0.07	0.04		-0.01	U	
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	-0.02	-0.02		-0.02	U	
pH	units	7.4	7.9	7.7		8.1	H	
Phosphate	mg/L	0.12	0.40	0.28		0.21		
Phosphorus, ortho dissolved	mg/L	0.04	0.13	0.09		0.067	H	
Potassium, dissolved	mg/L	0.8	1.4	1.1		1.86		
Residue, Filterable (TDS) @180C	mg/L	94	110	102		108		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	15.0	6		-5.0	U	
Selenium, total recoverable	mg/L	0.0001	0.0003	0.0002		0.00023	B	
Sodium Adsorption Ratio in Water	calc.	0.23	0.27	0.25		0.25		
Sodium, dissolved	mg/L	2.9	4.5	3.8		4.37		
Sulfate	mg/L	-1	-1	-1		-1	U	
Sum of Anions	meq/L	0.8	1.3	1.1		1.3		
Sum of Cations	meq/L	0.8	1.4	1.2		1.4		
TDS (calculated)	mg/L	40	66	56		67.4		
TDS (ratio - measured/calculated)	calc.	1.65	2.34	1.89		1.60		
Zinc, dissolved	mg/L	-0.01	0.01	0.01		-0.02	U	

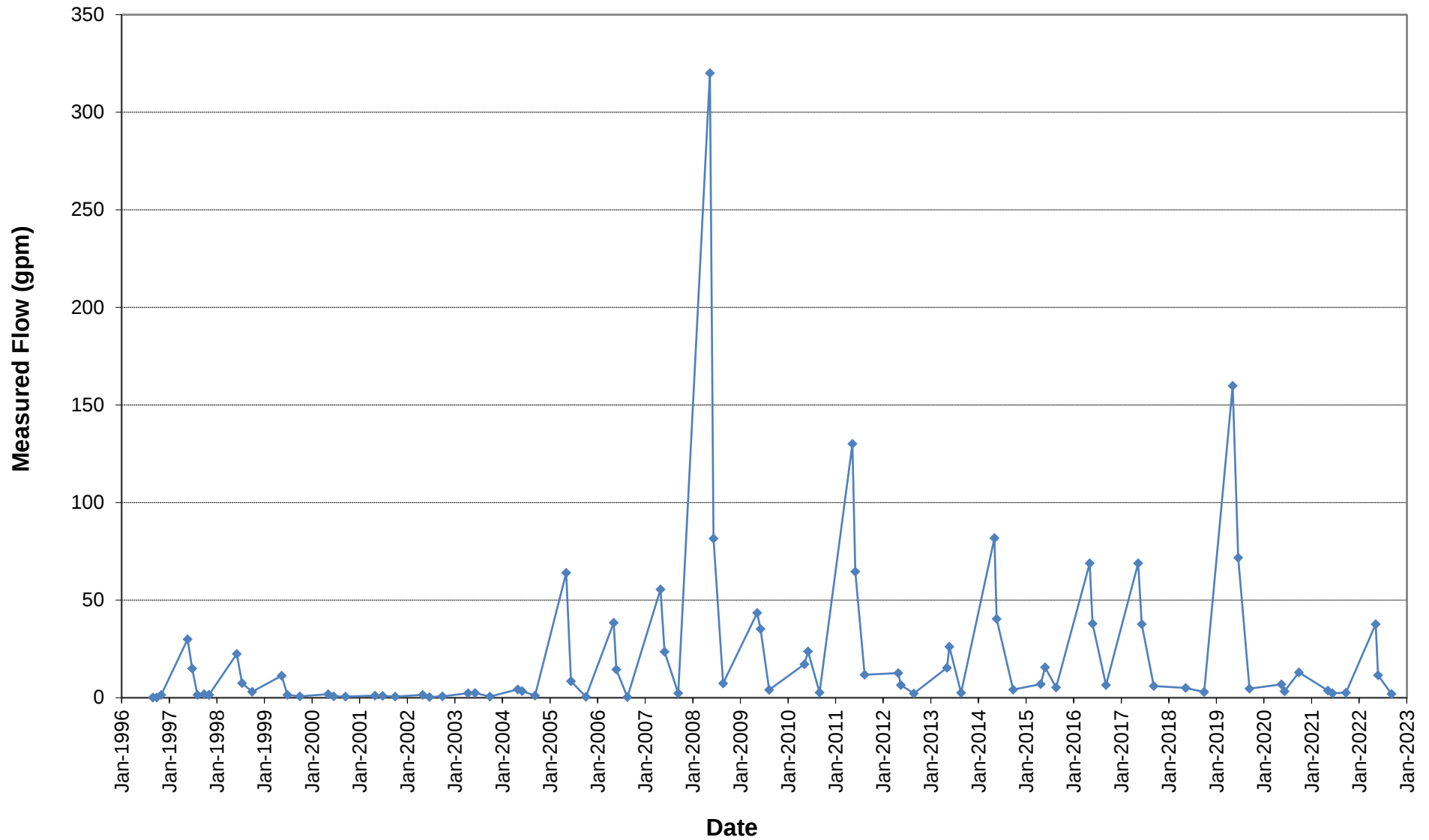
¹ Baseline period is August 2018 through August 2019.
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



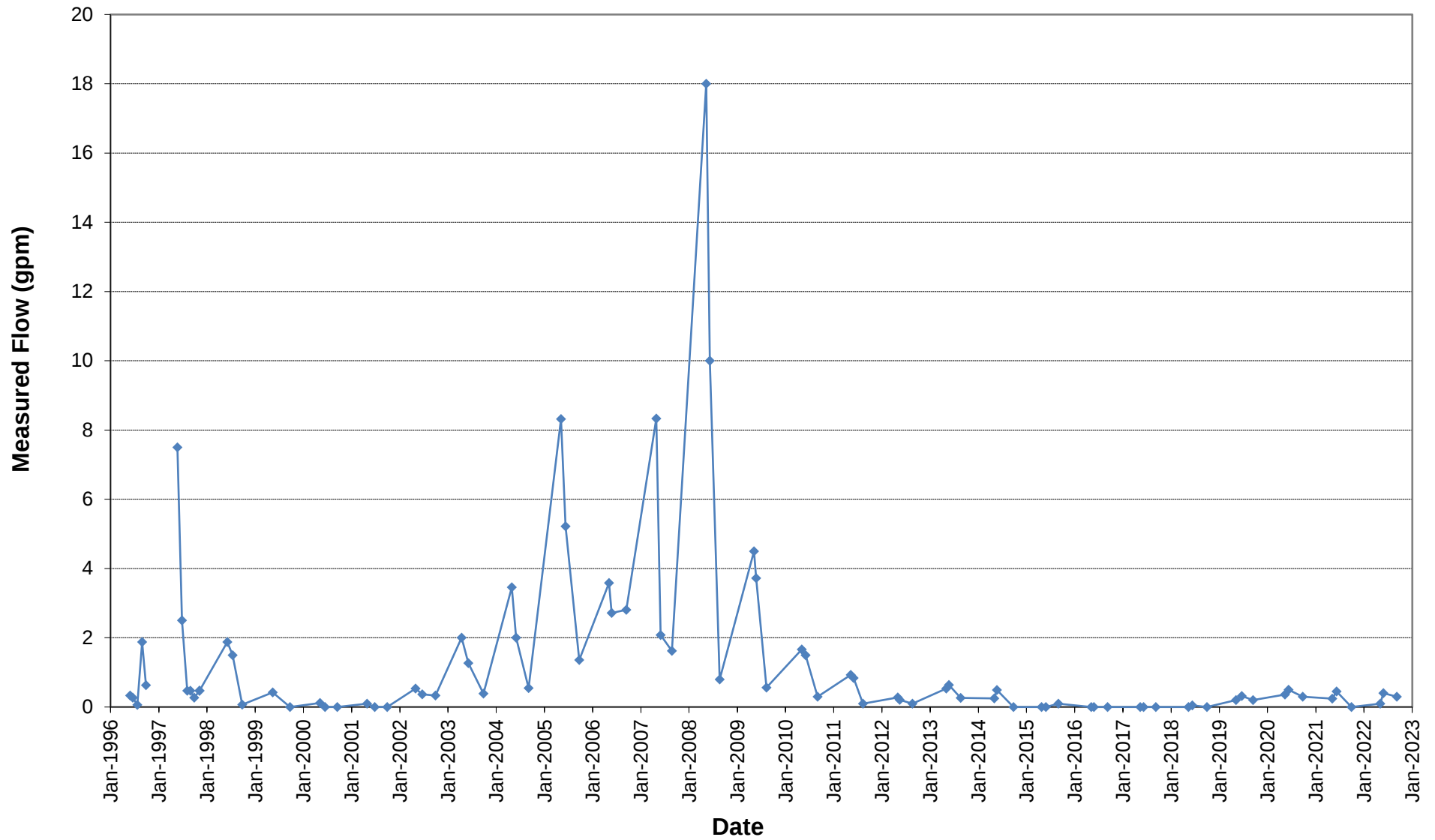
APPENDIX D

SPRINGS - HYDROGRAPHS

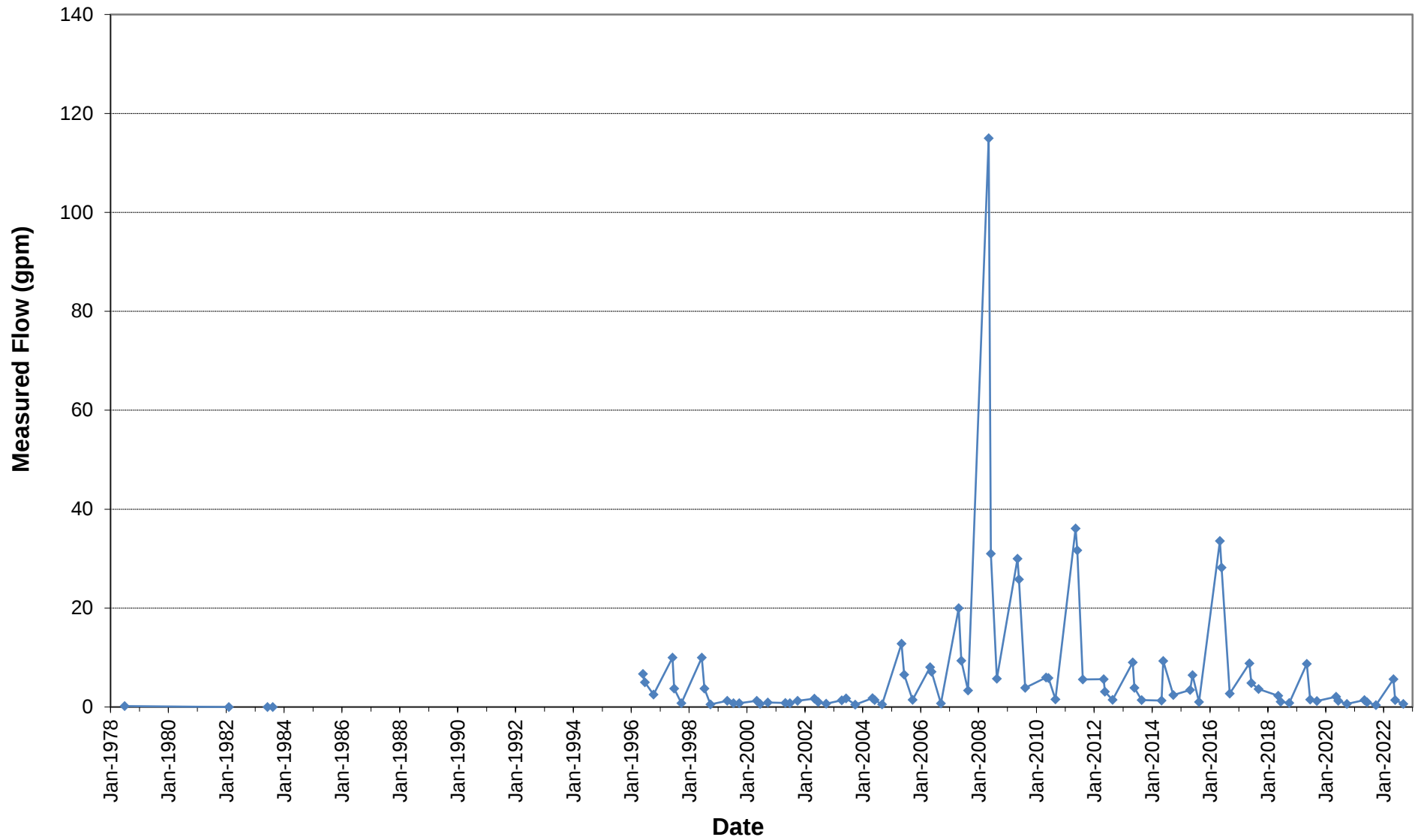
Spring 26-1
Source: Above F-Seam



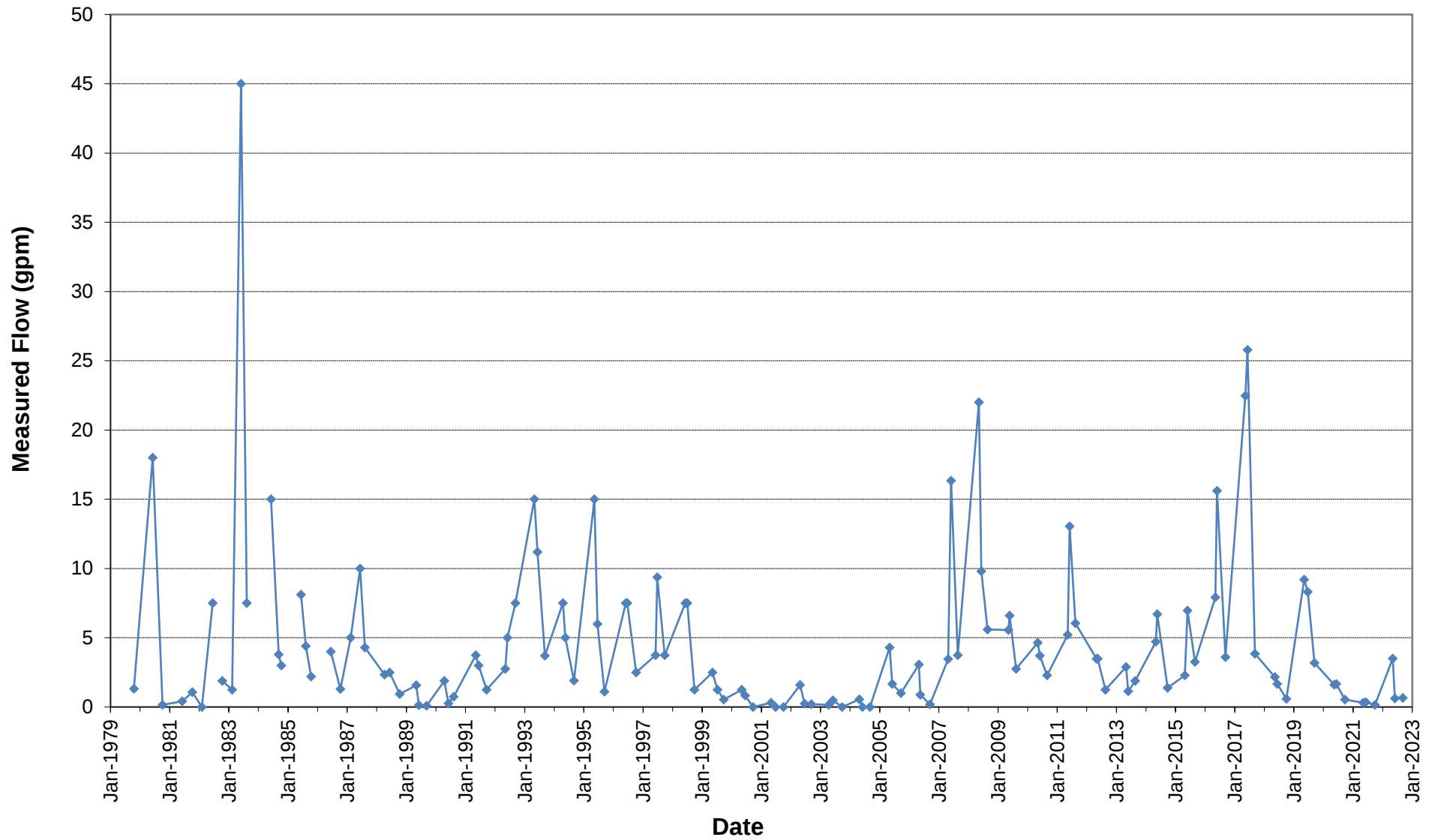
Spring 27-1
Source: Above F-Seam



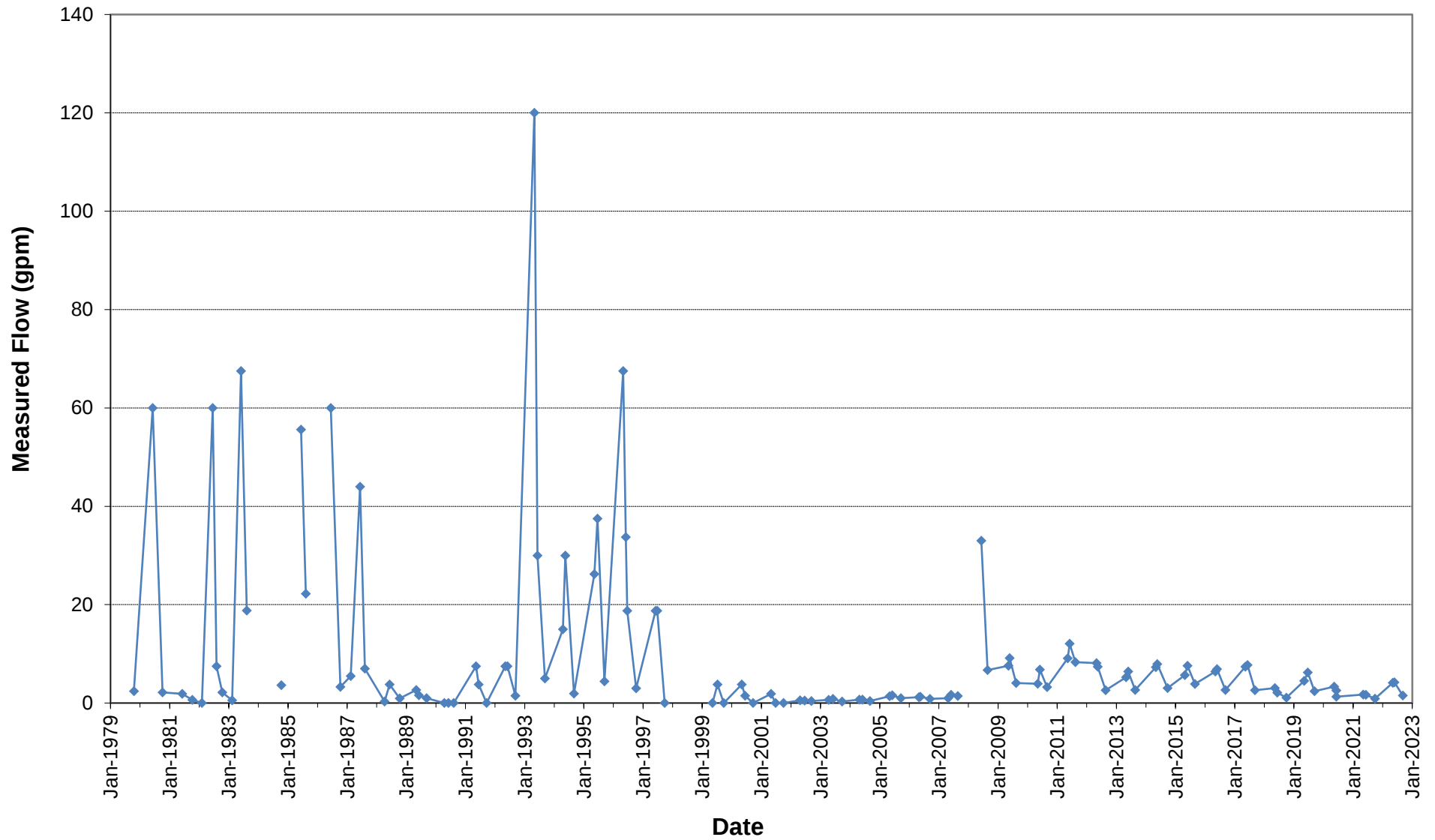
Spring G-7
Source: Above F-Seam



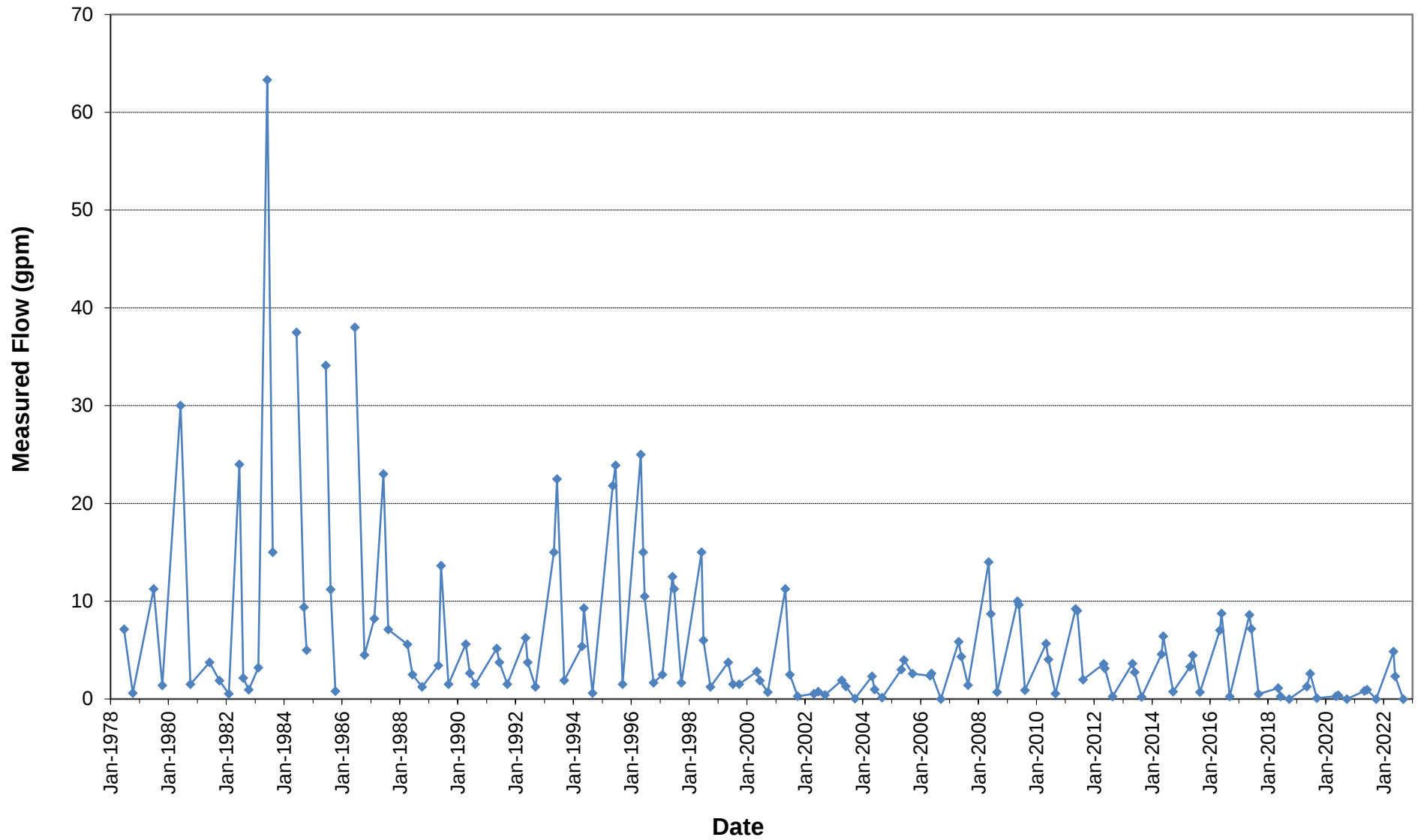
Spring G-16
Source: Above F-Seam



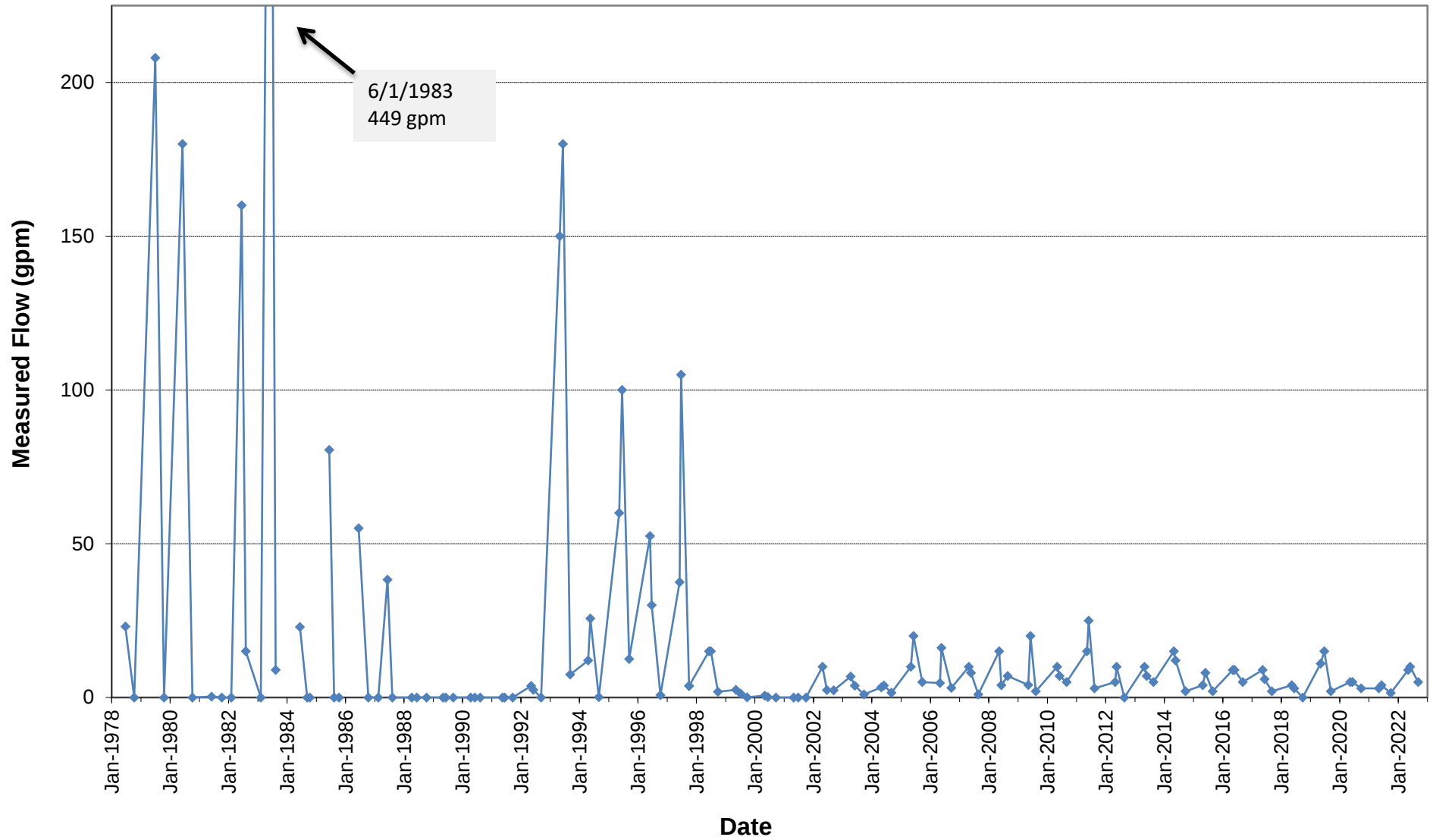
Spring G-24
Source: Above F-Seam



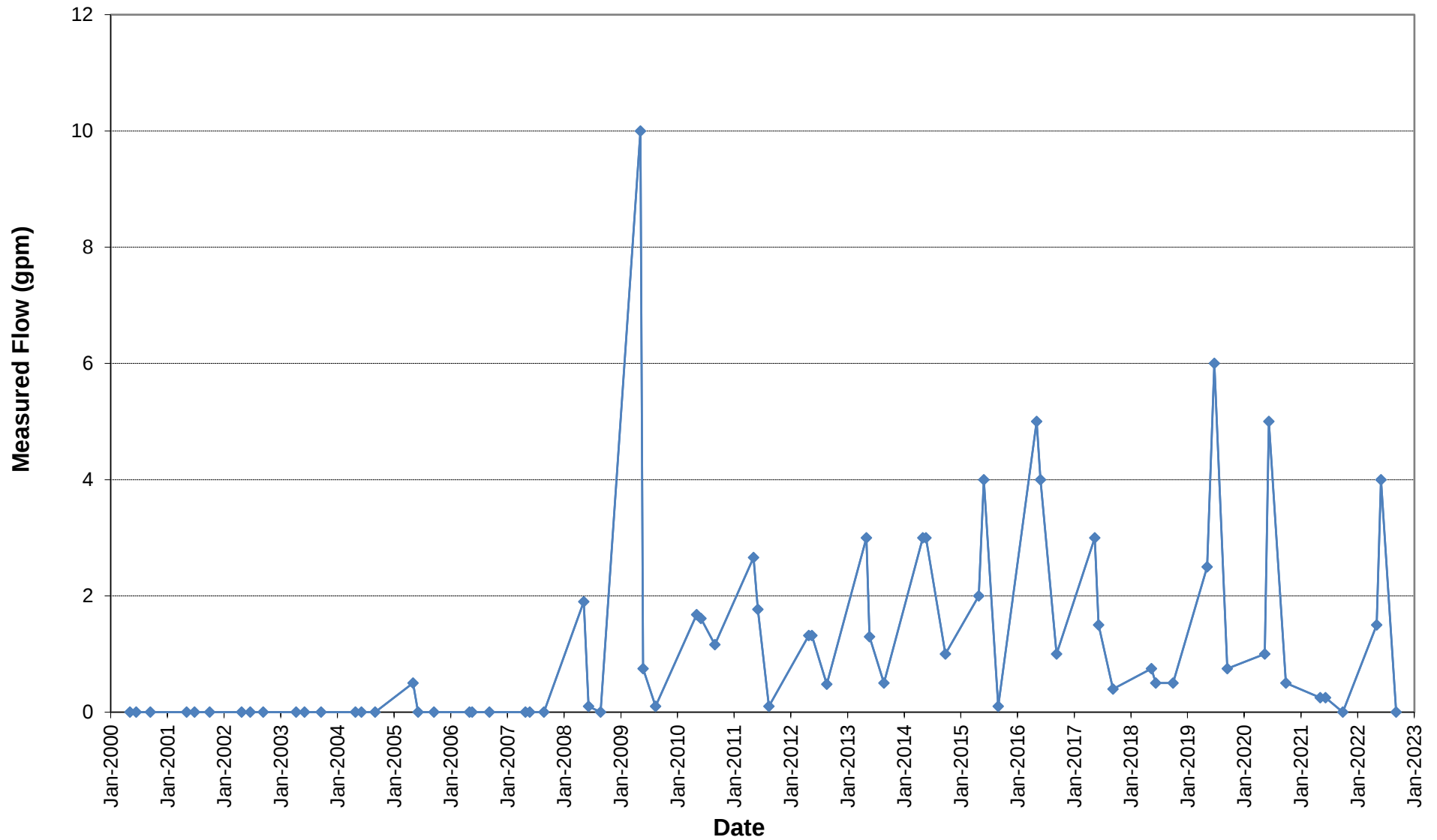
Spring G-14
Source: Above F-Seam



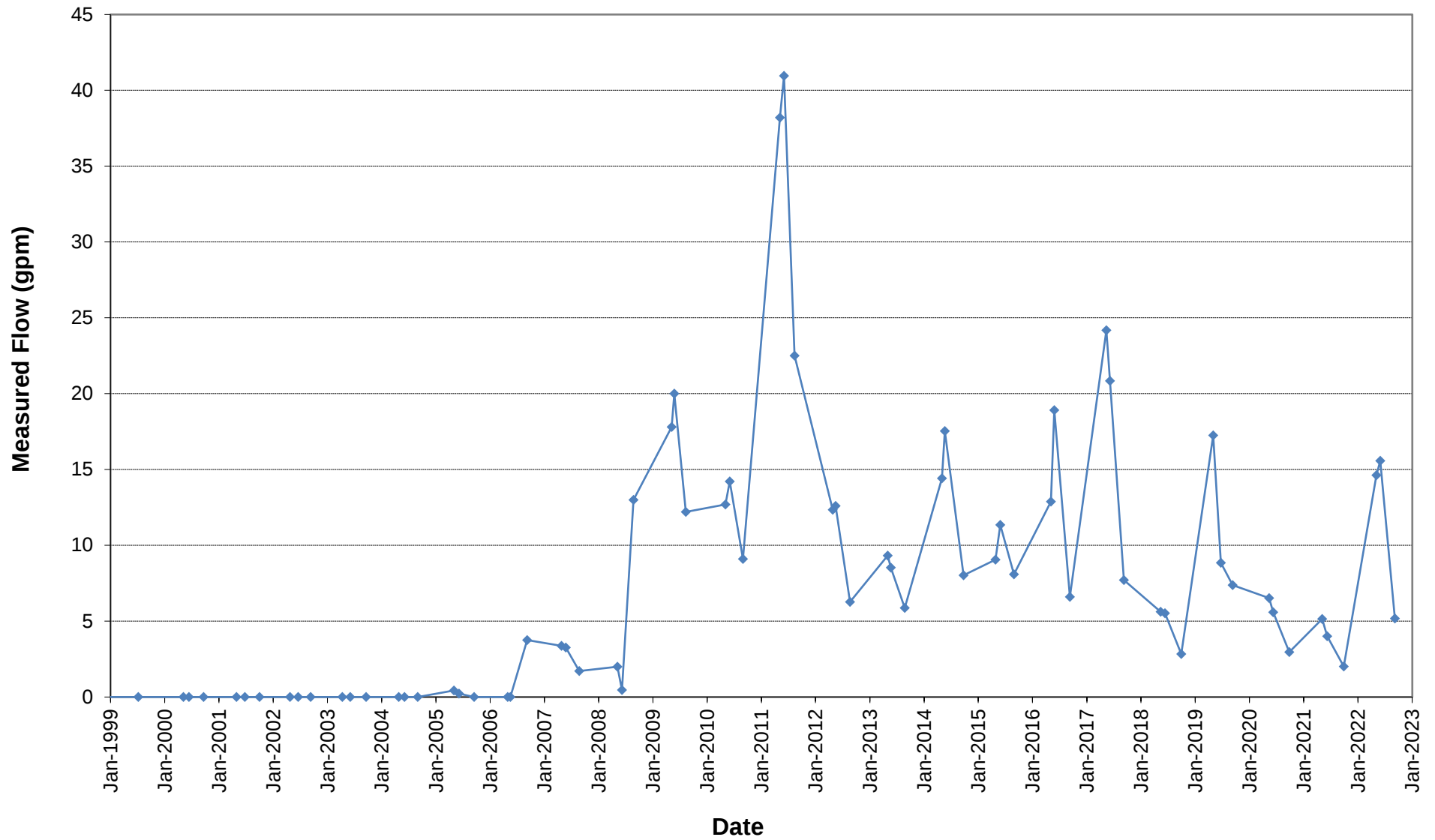
Spring G-22
Source: Above F-Seam



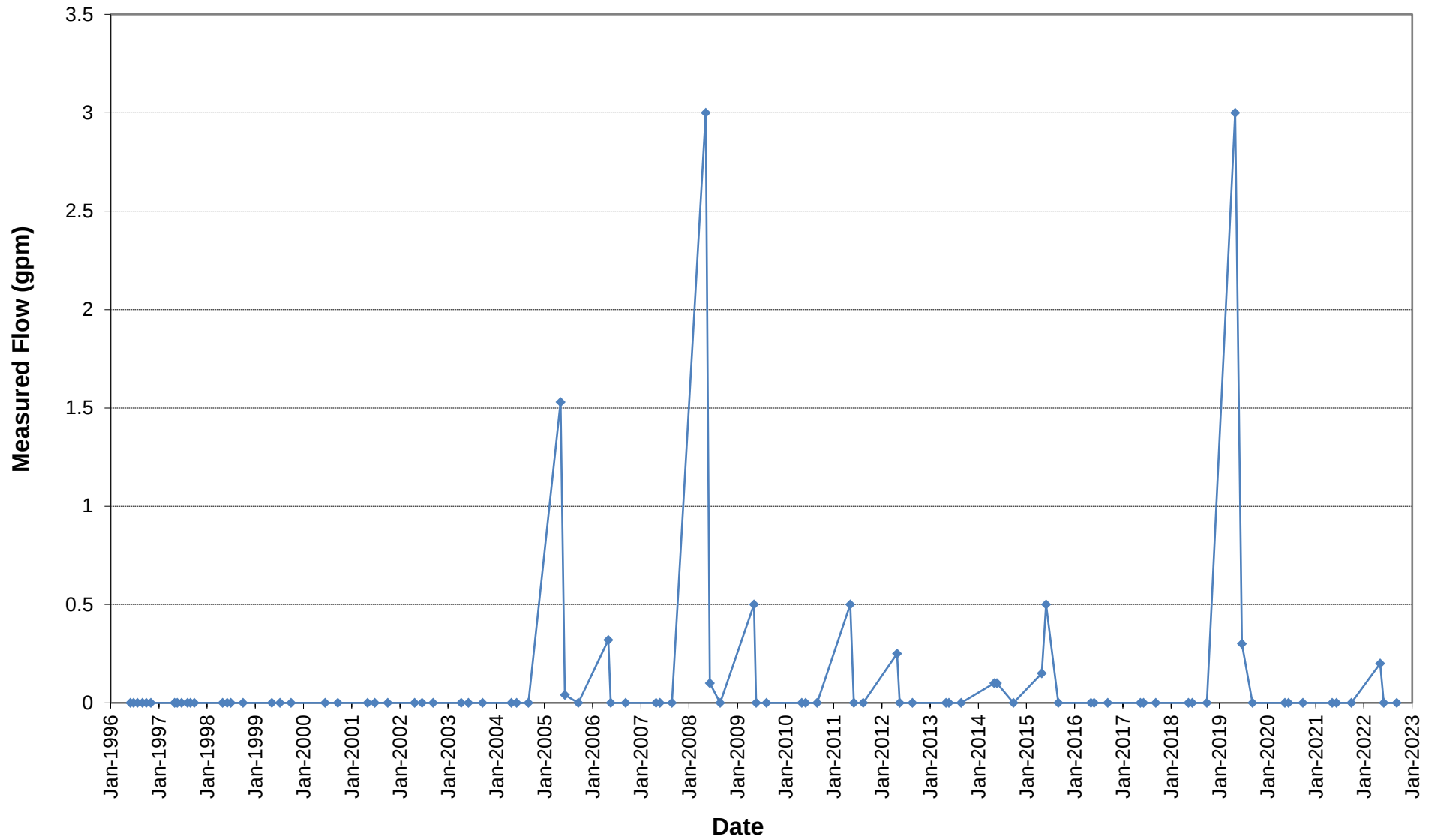
Spring 11-2
Source: Below F-Seam



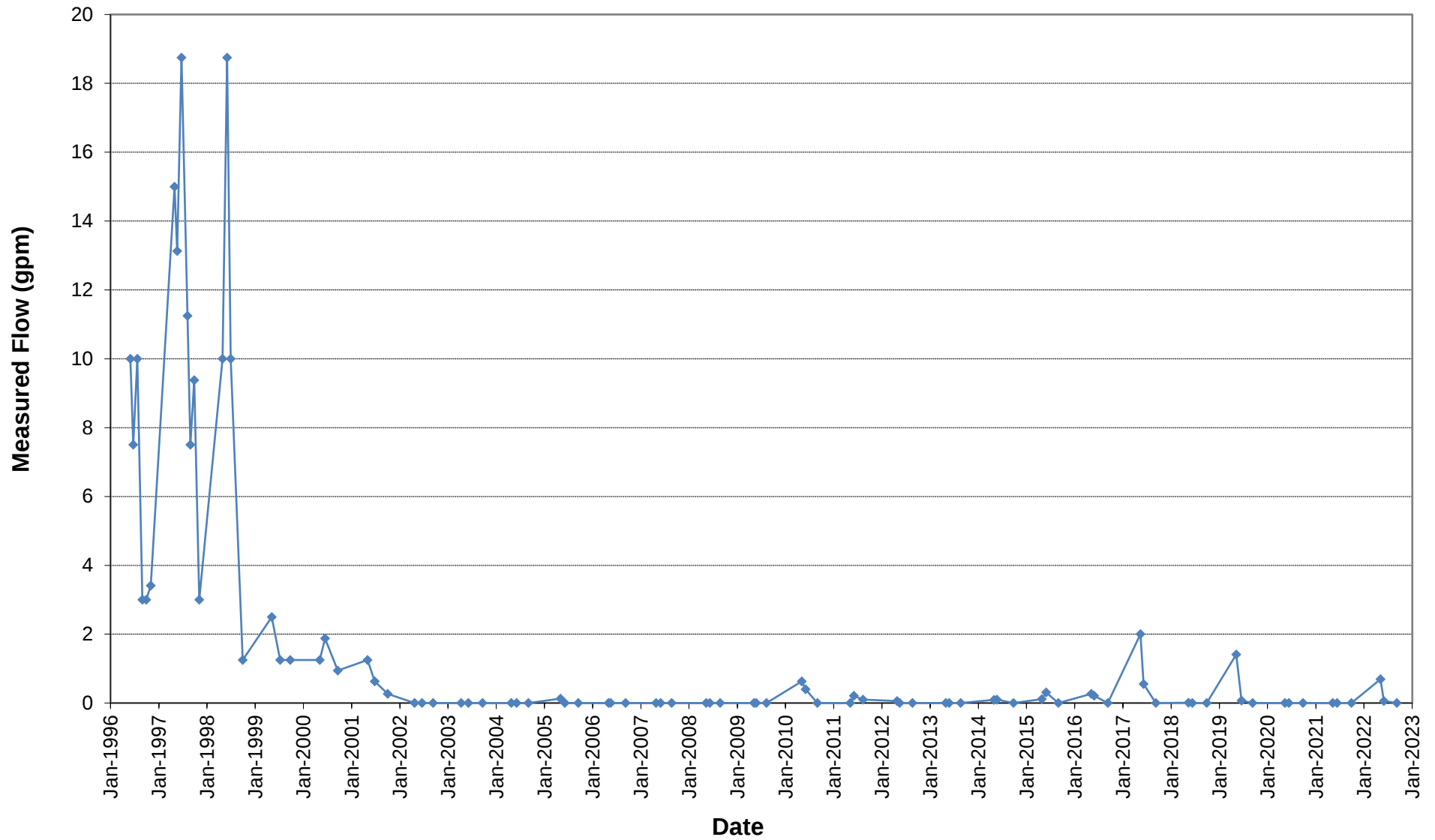
Spring 10-1
Source: Below F-Seam



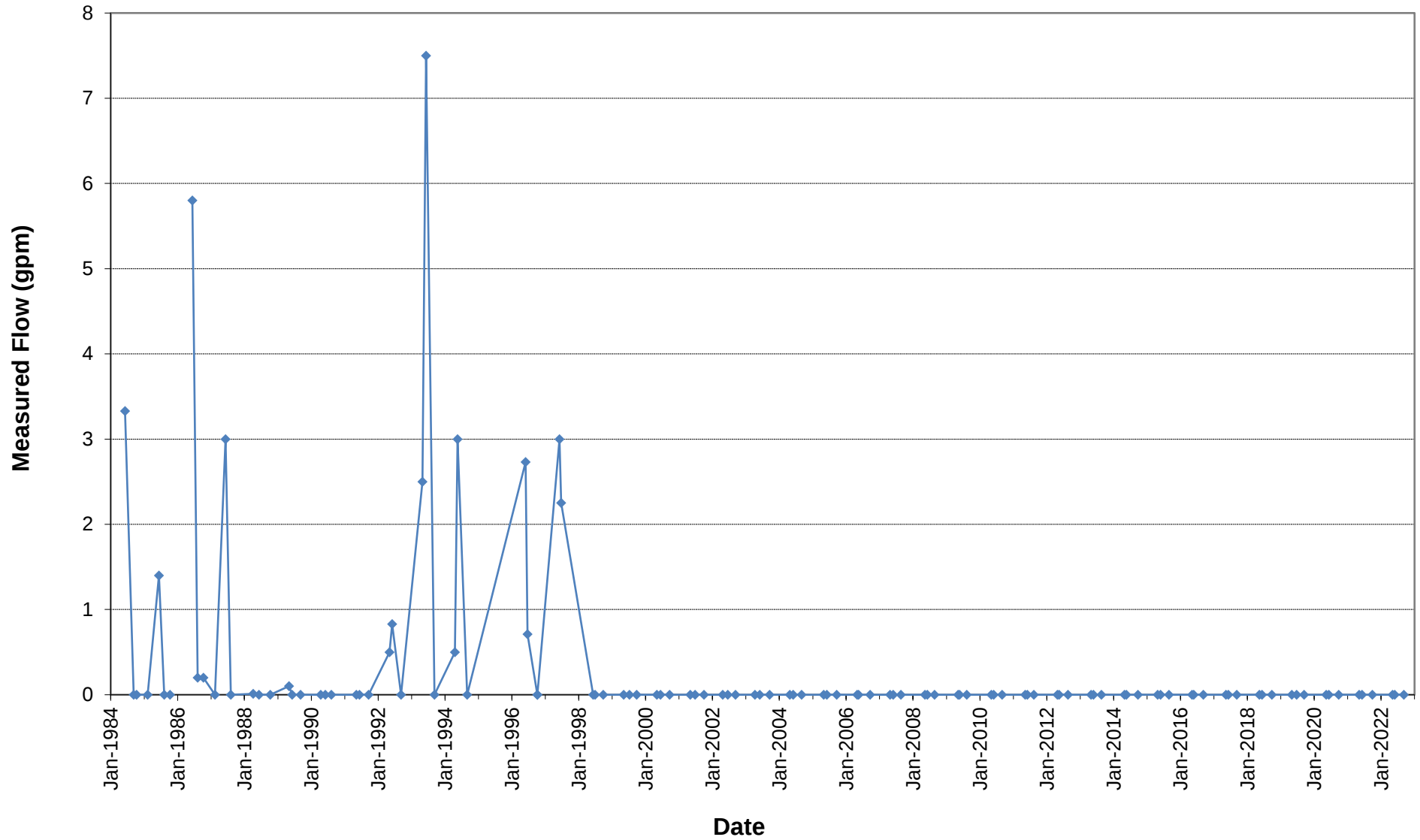
Spring E10-2
Source: Below F-Seam



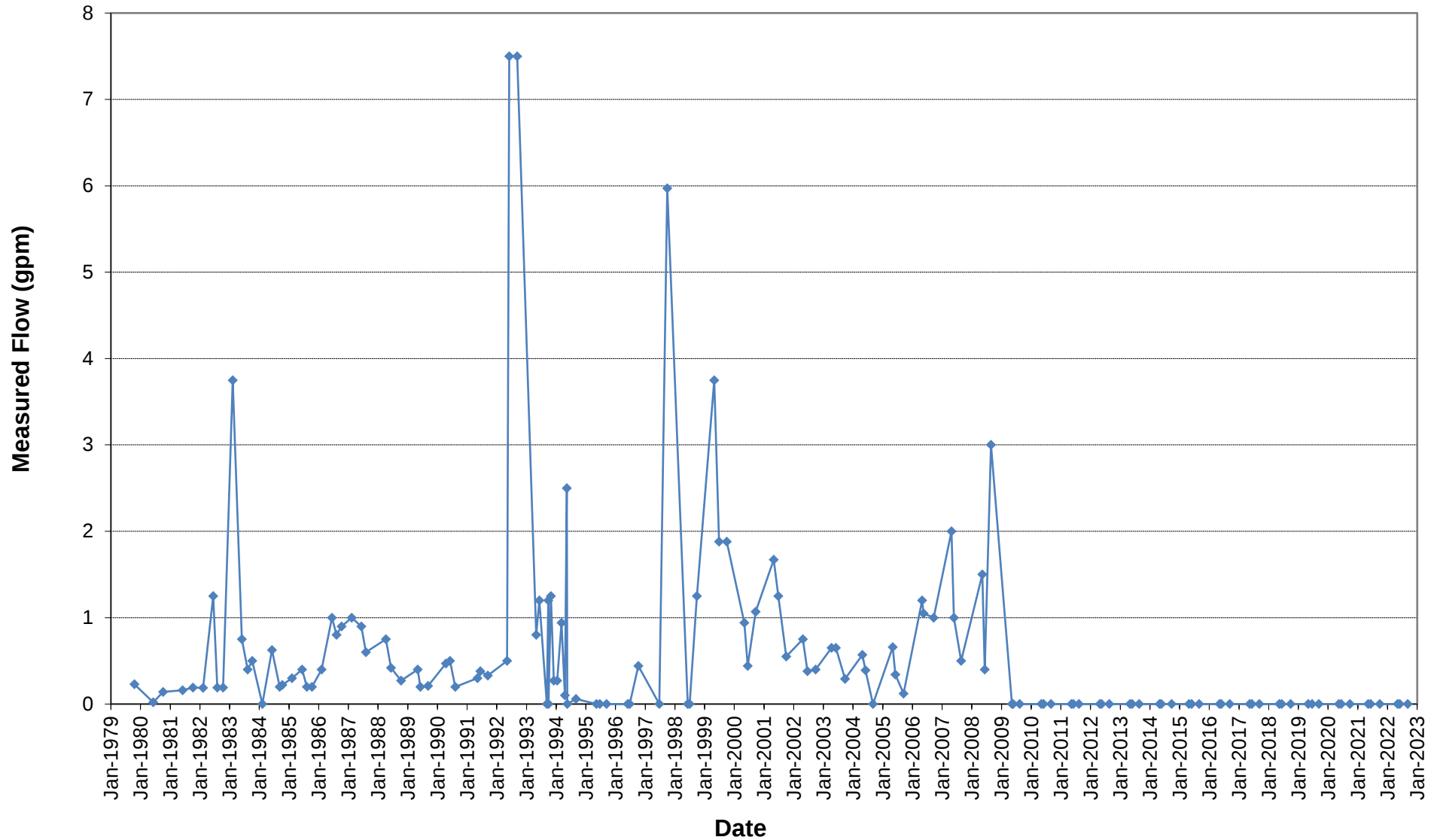
**Spring 15-1
Source: Below F-Seam**



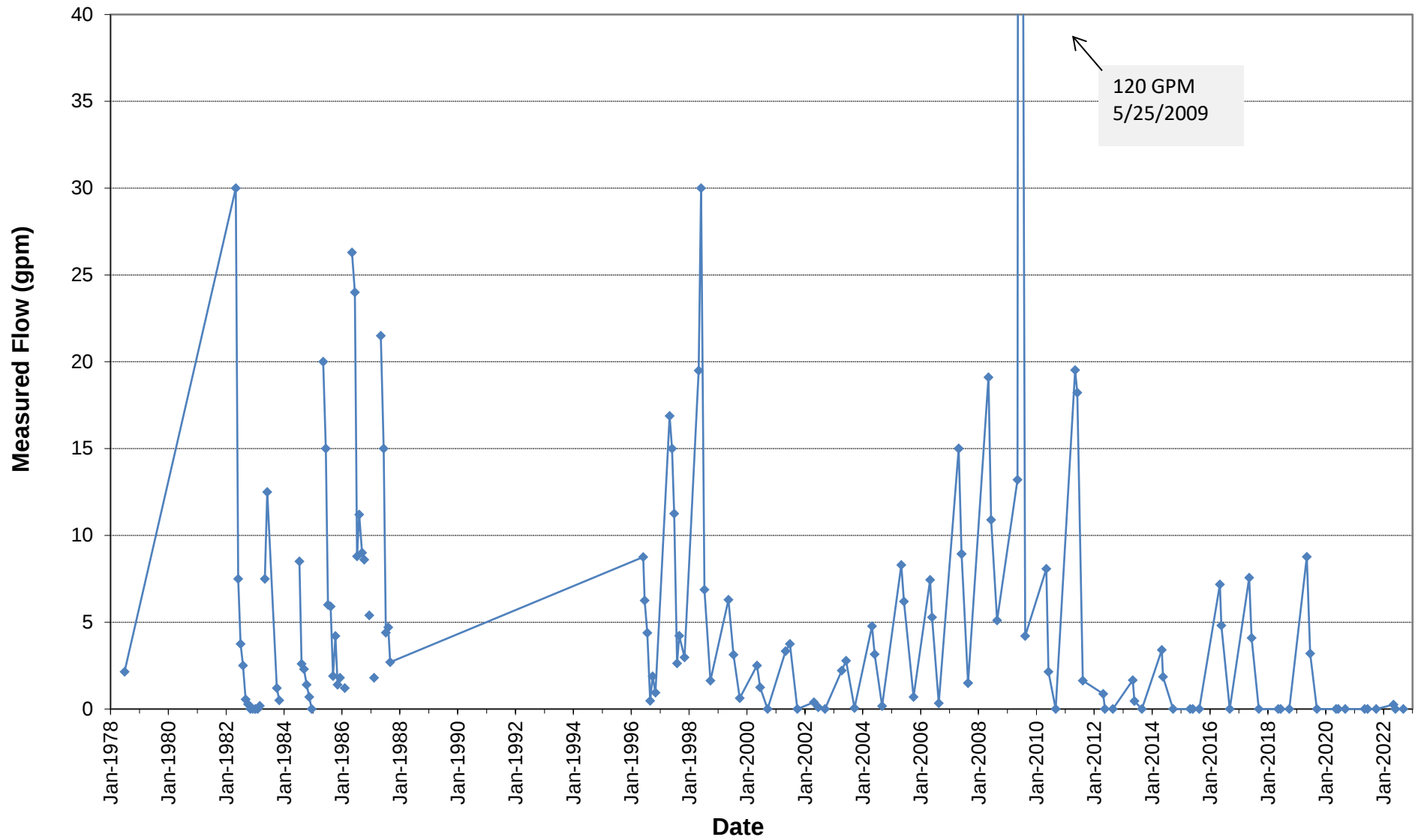
Spring G-1a
Source: Below F-Seam



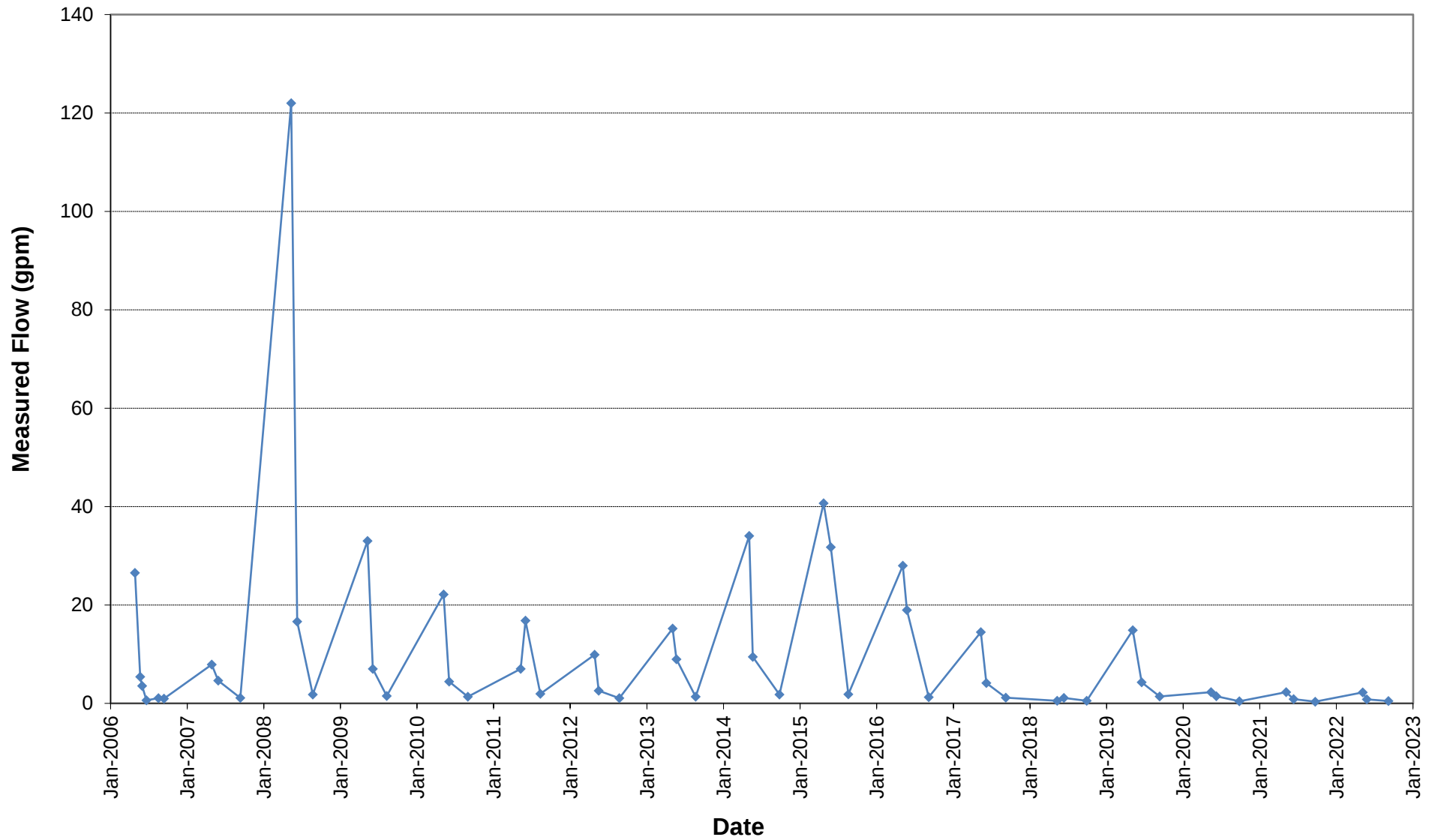
Spring G-20
Source: Below F-Seam



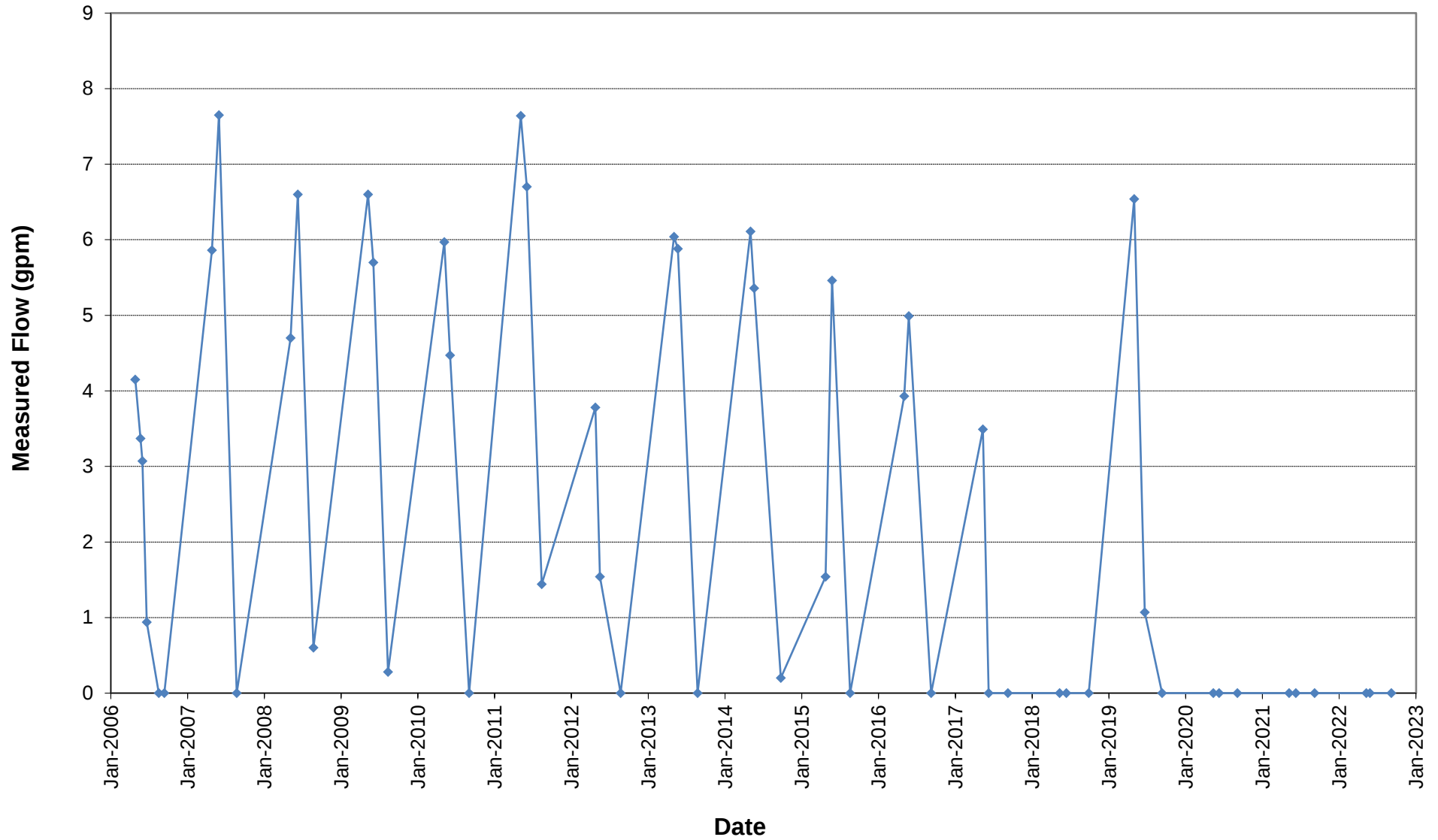
Spring J-4 Source: Above E-Seam



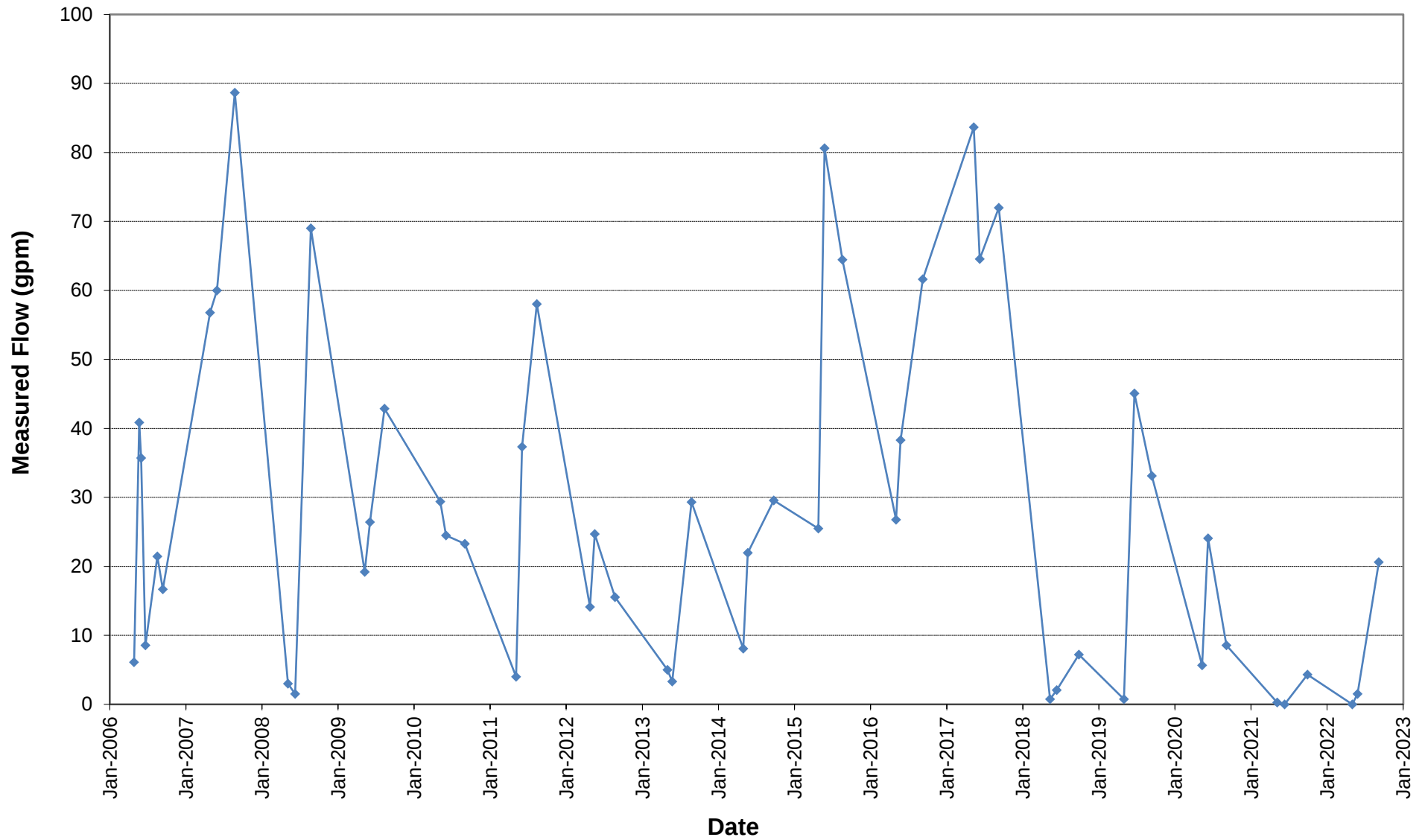
Spring 35-3
Source: Above F-Seam



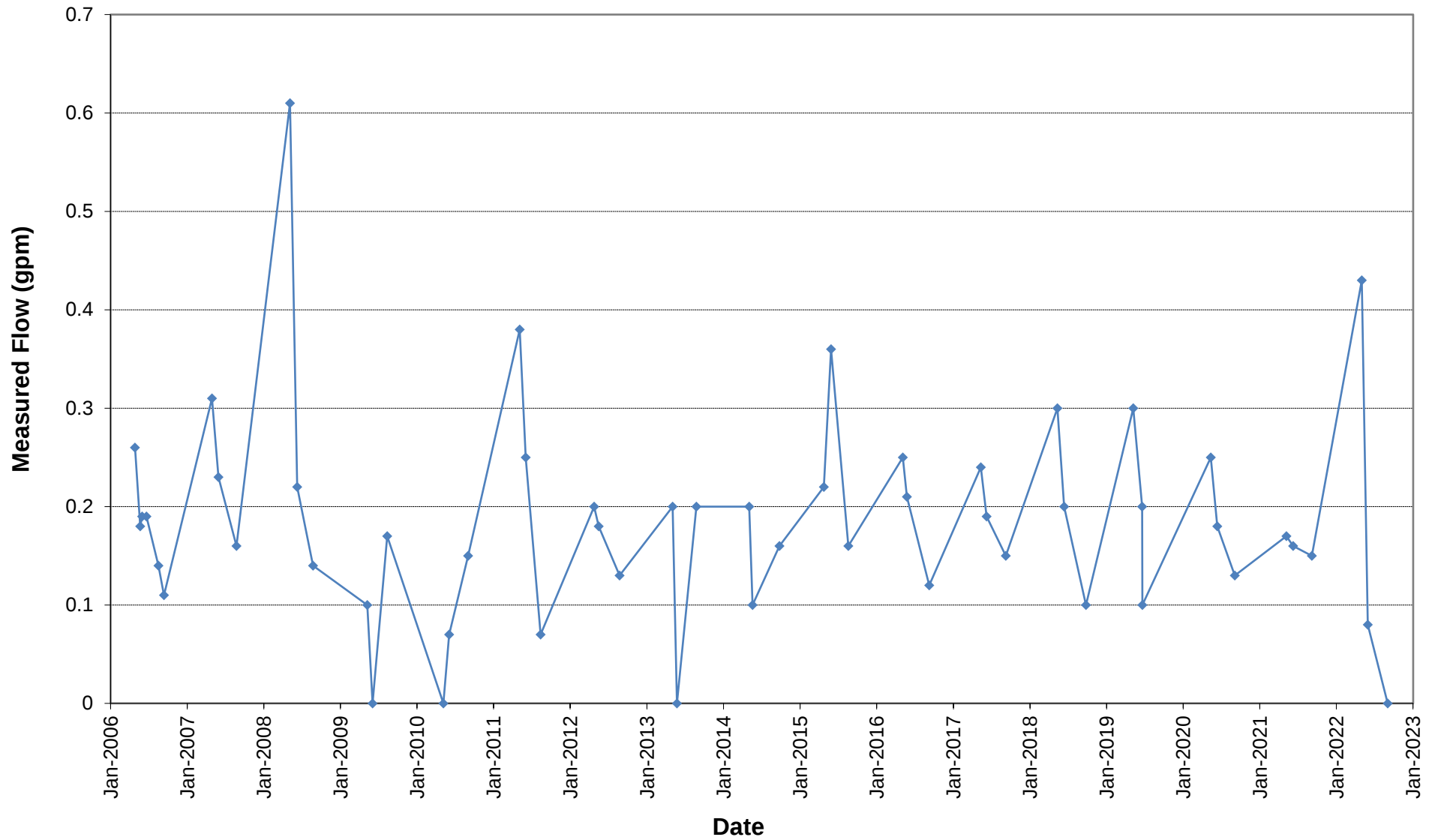
**Deer Creek Spring
Source: Above E-Seam**



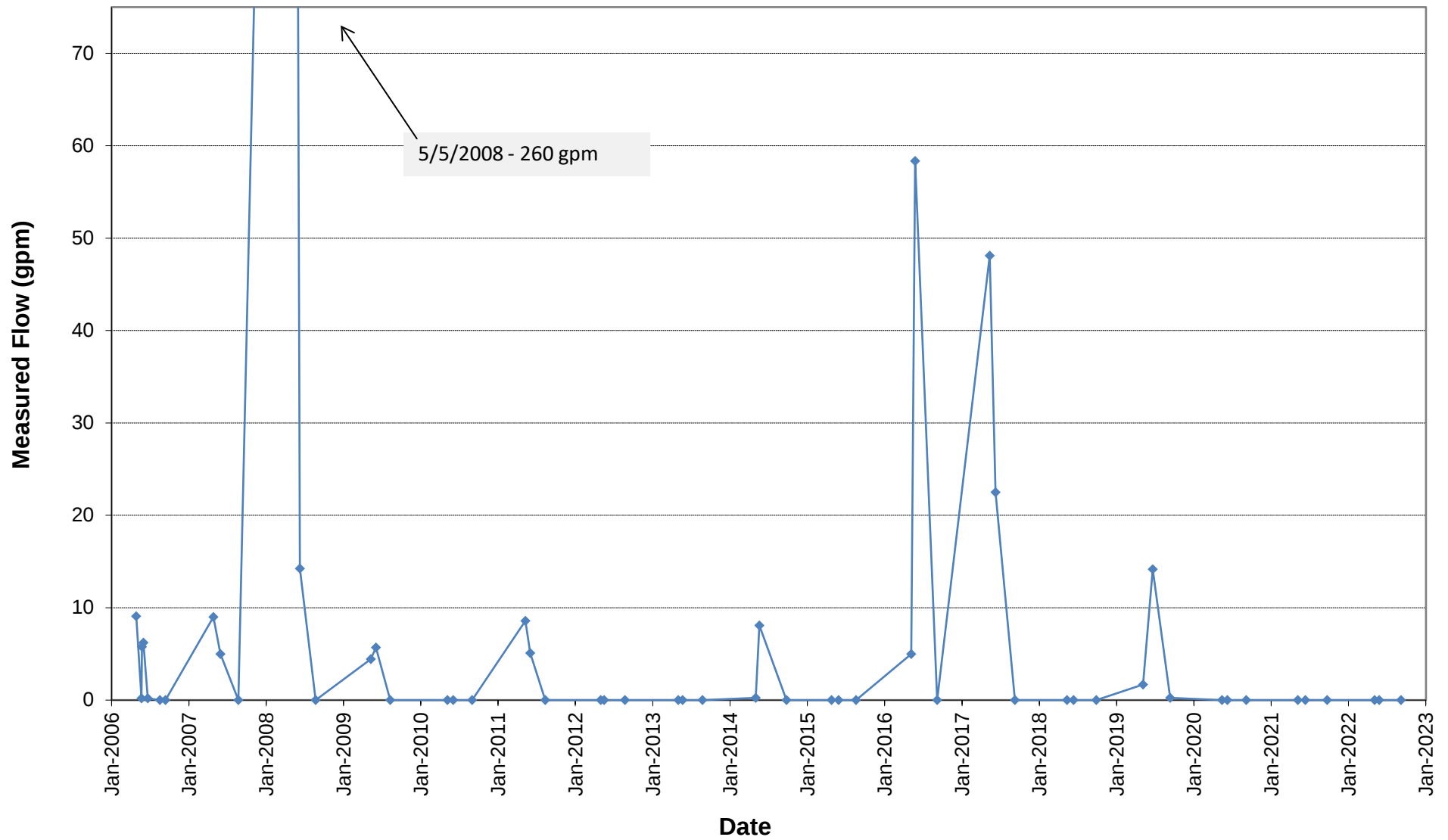
Spring WCC-24
Source: Above E-Seam



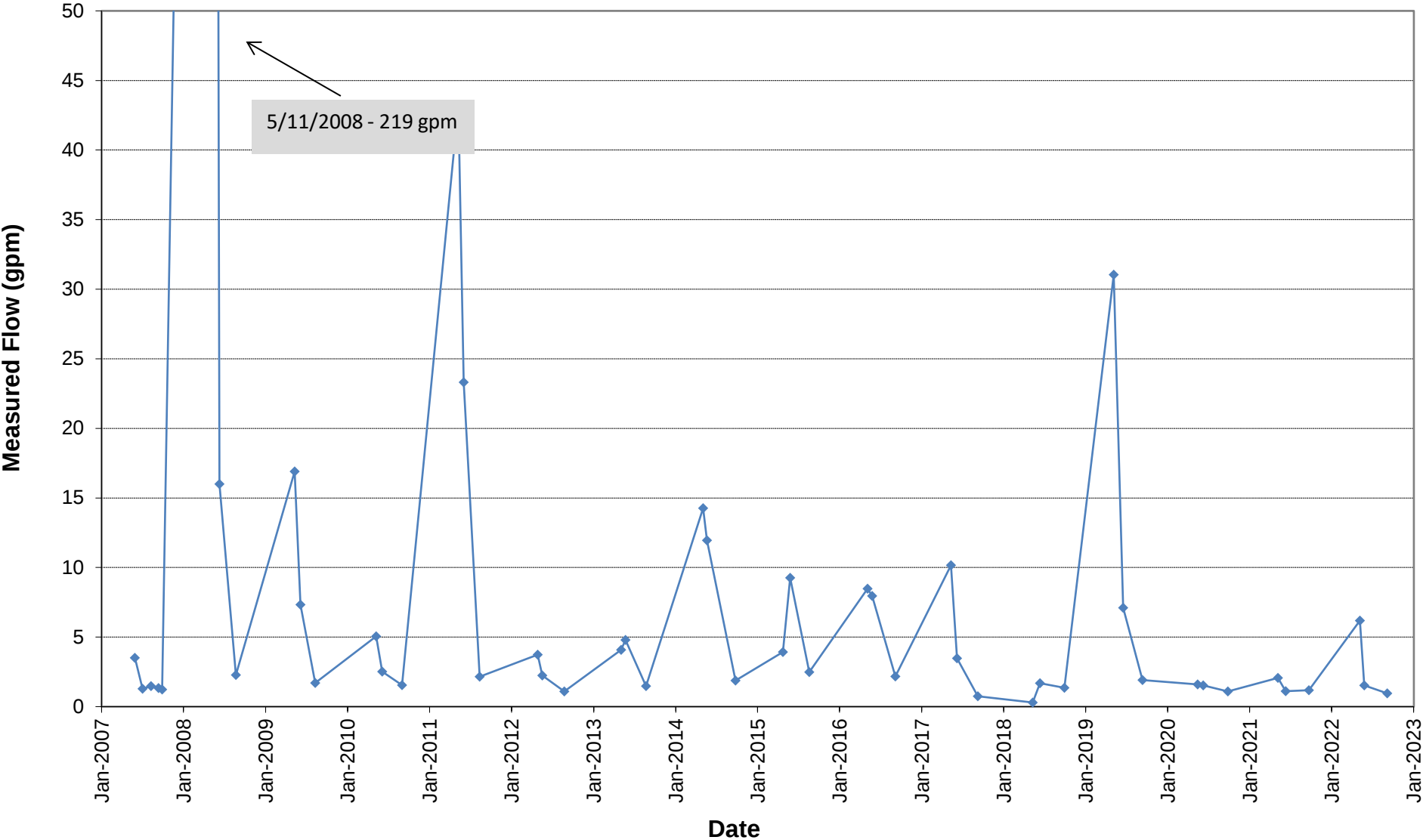
Spring J-2
Source: Above E-Seam



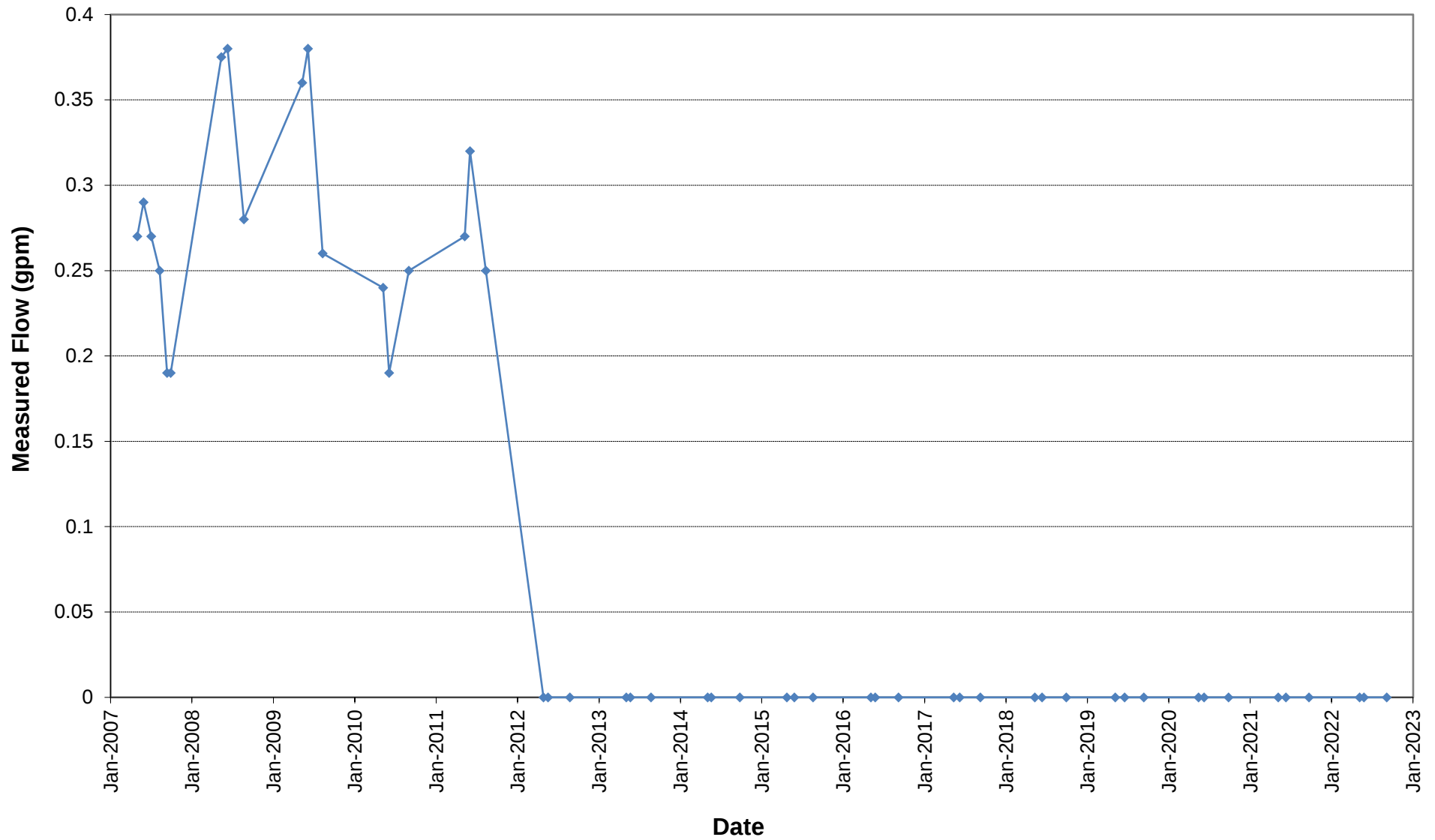
Spring J-7
Source: Above E-Seam



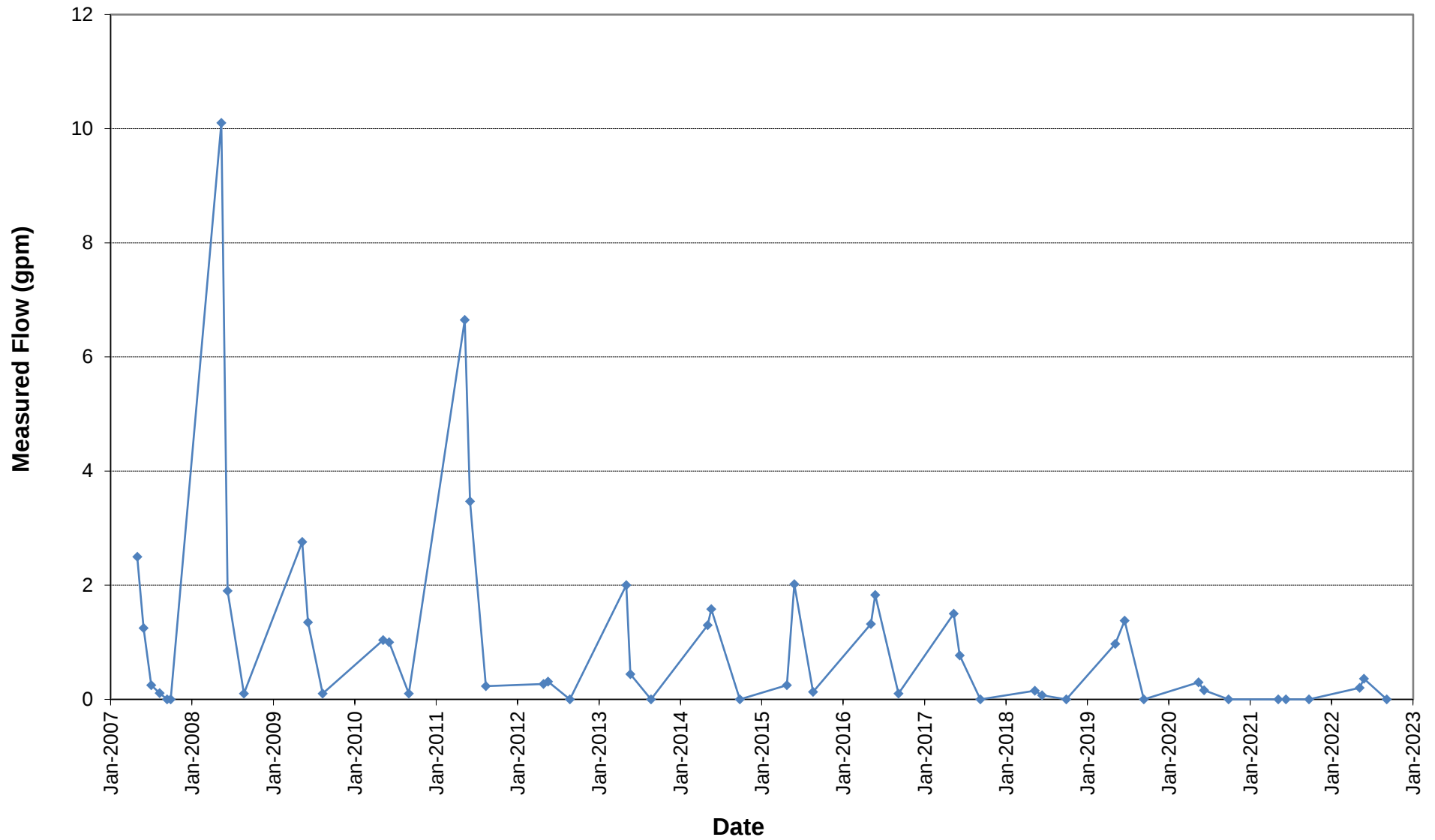
Deep Creek Trail Spring
Source: Above F-Seam



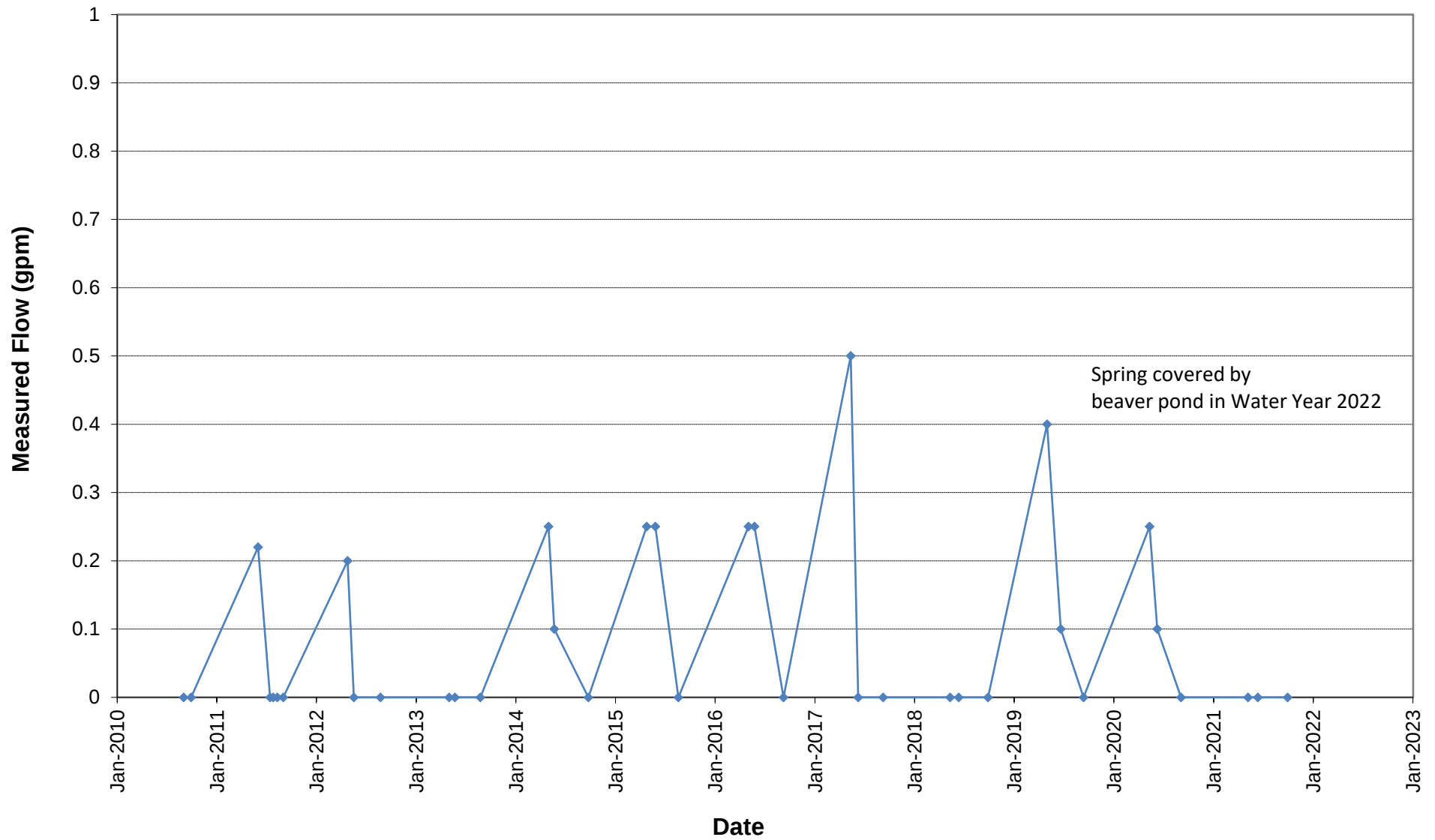
Deep Creek Spring #2
Source: Above F-Seam



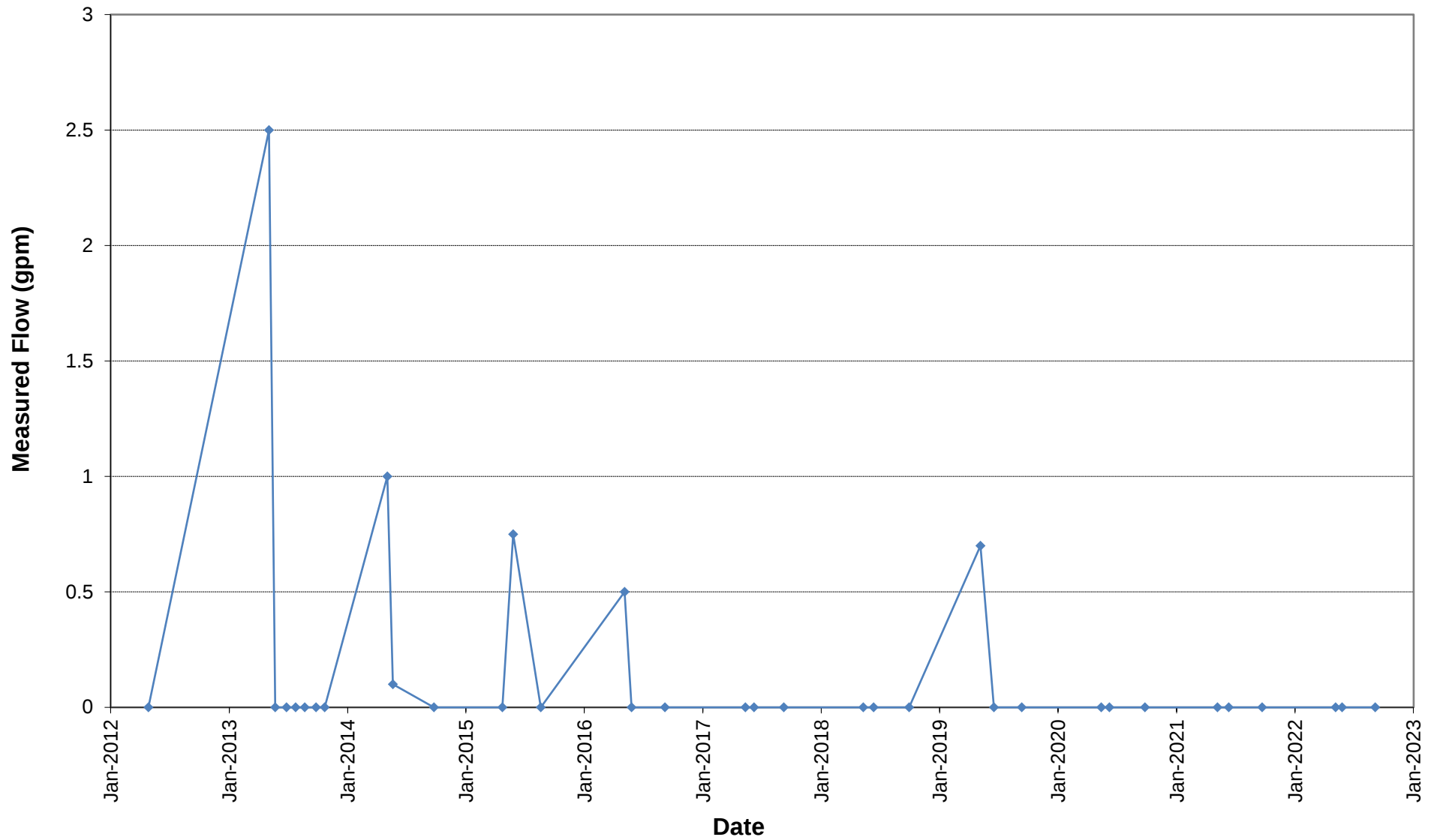
**96-2-2 Area Spring
Source: Above F-Seam**



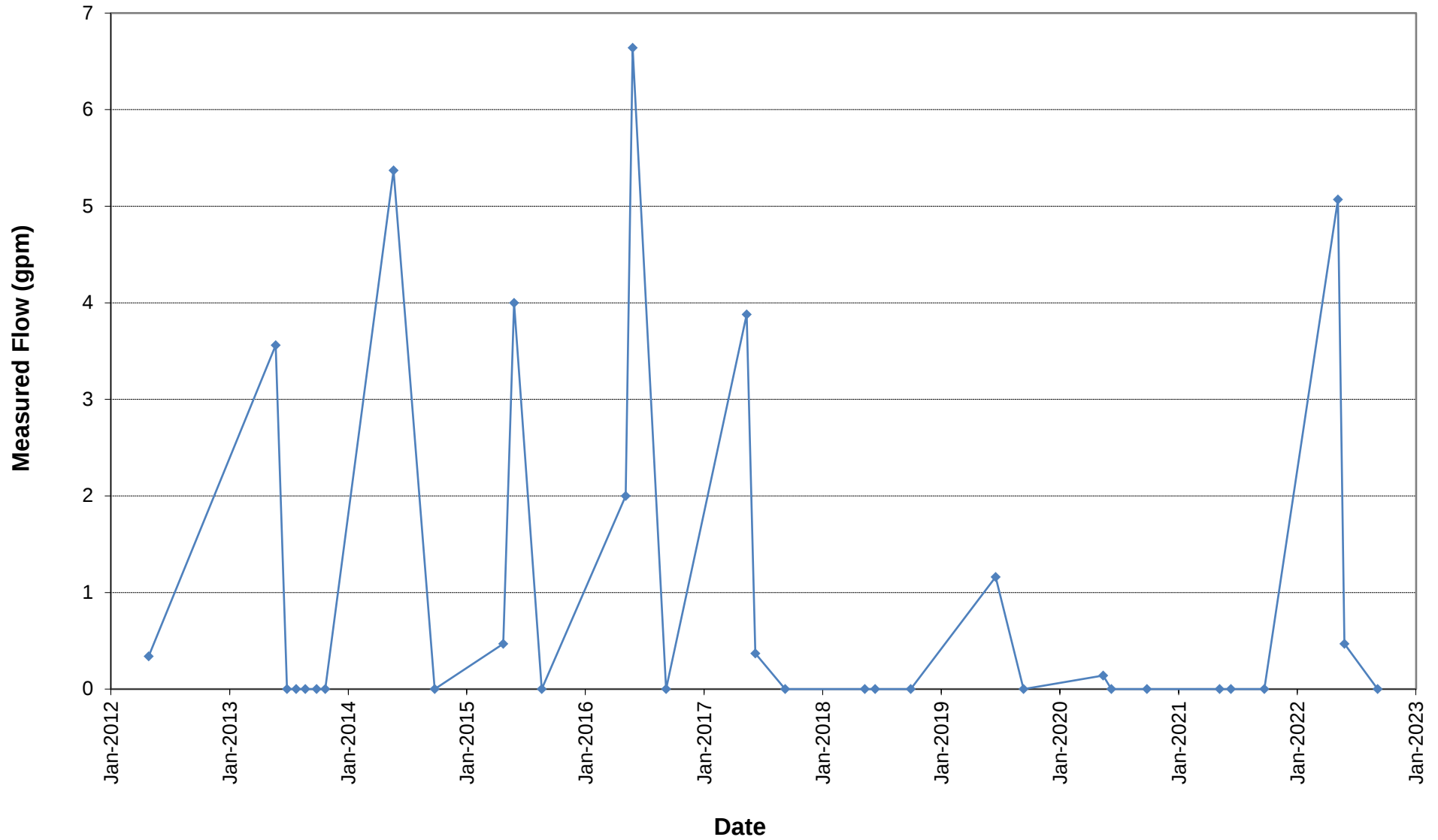
Spring J-10
Source: Above E-Seam



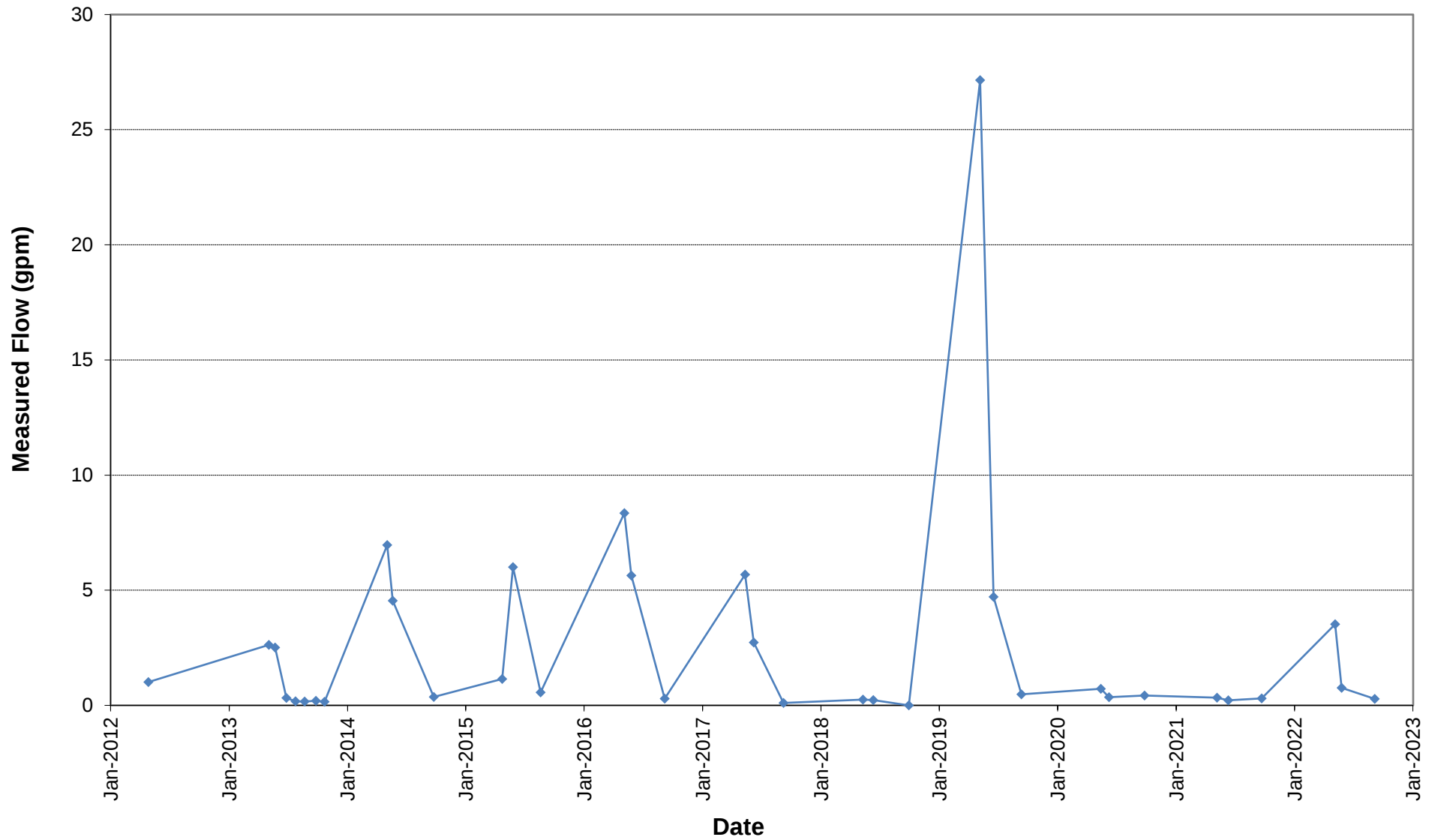
Spring 2012-1
Source: Above F-Seam



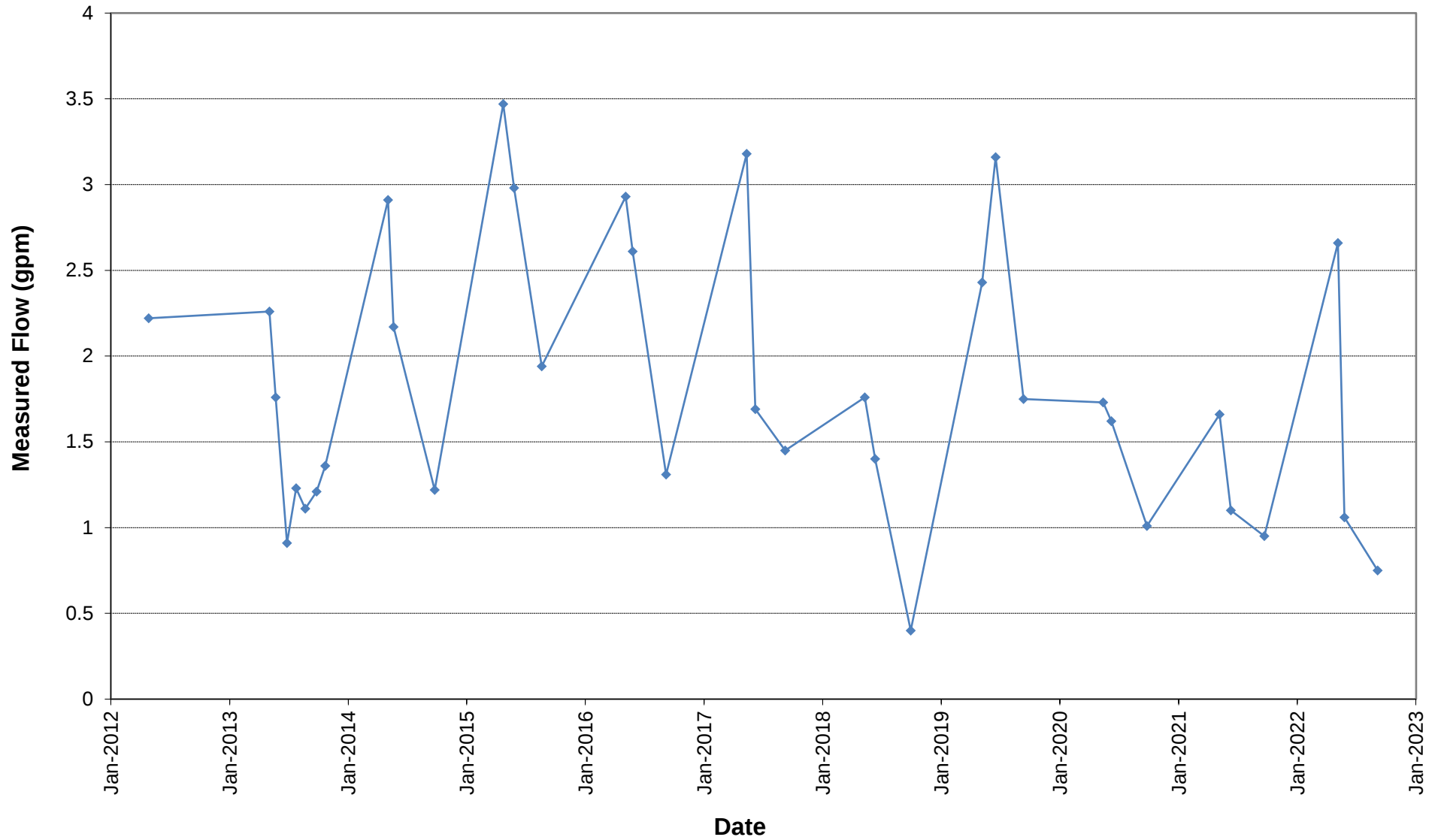
Spring 2012-2
Source: Above F-Seam



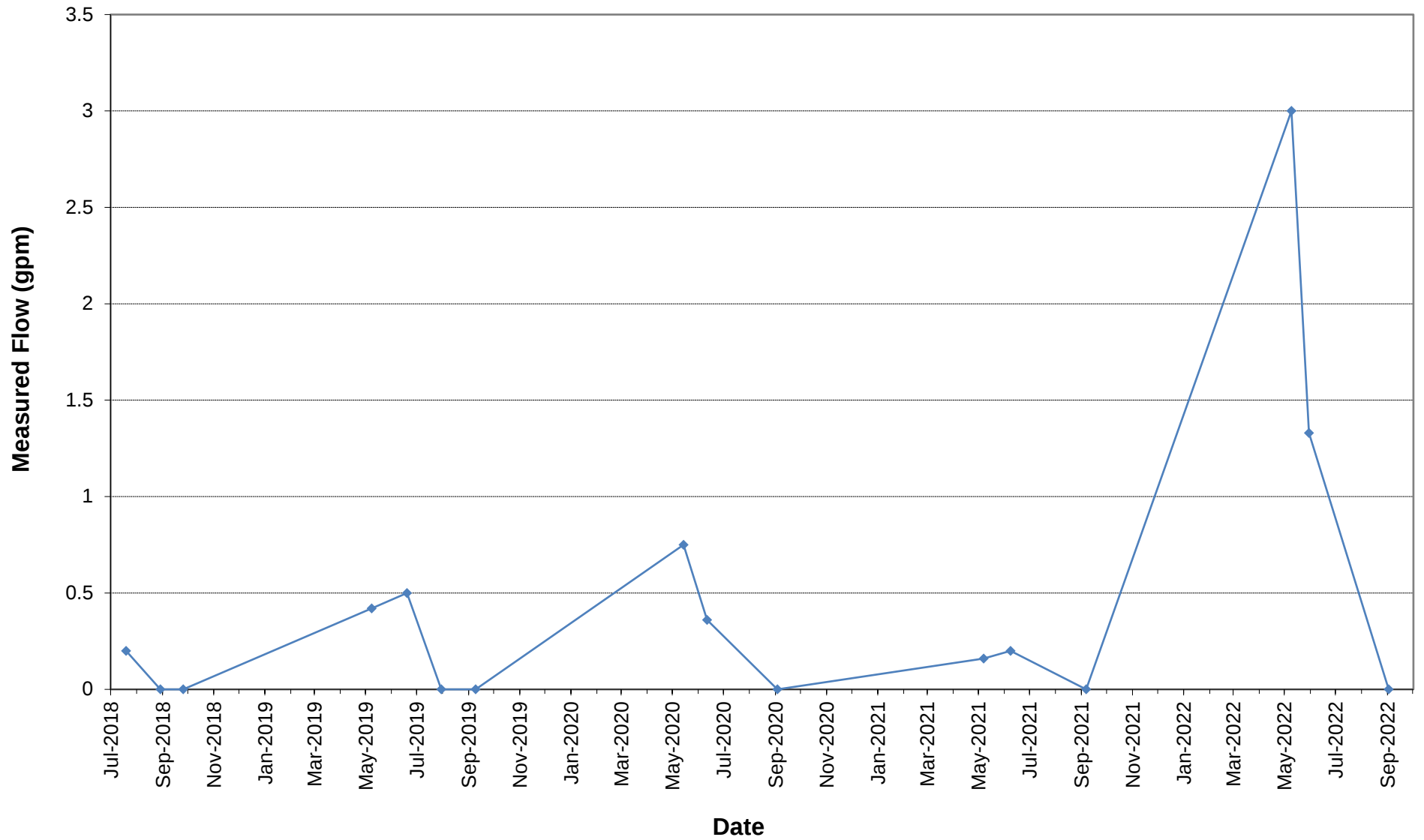
**Spring 2012-3
Source: Above F-Seam**



Spring 2012-4
Source: Above F-Seam



Spring ST-S-1
Source: Above E-Seam



APPENDIX E

SPRINGS - LABORATORY AND FIELD WATER QUALITY DATA

Spring 26-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 26-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm				37.74	11.58		2.00
pH (Field)	SU	7.3	8.1	7.7	8.02	8.12		7.95
Conductivity (Field)	µmhos/cm	240	640	482	630	681		877
Temperature (Field)	°C				8.2	9.4		10.4
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-11		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	151	284	222				
Bicarbonate as CaCO ₃	mg/L	151	284	222				
Calcium, dissolved	mg/L	24	37.2	31.5				
Cation - Anion Balance	mg/L	1	3.3	2.15				
Chloride	mg/L	2	6	4.4				
Conductivity @25C	µmhos/cm	480	548	514		654		
Hardness as CaCO ₃	mg/L	81	126	105				
Iron, dissolved	mg/L					-0.06	U	
Iron, total	mg/L		1.45	0.24		0.747		
Magnesium, dissolved	mg/L	5.1	8	6.7				
Manganese, total	mg/L		0.028	0.004				
Nitrate/Nitrite (as N)	mg/L	0.14	0.31	0.19				
pH	SU	7.1	7.7	7.4		8.6	H	
Phosphorus, ortho dissolved	mg/L		0.007	0.001				
Potassium, dissolved	mg/L	1.2	1.4	1.3				
Residue, Filterable (TDS) @180C	mg/L	220	410	327		412		
Residue, Non-Filterable (TSS) @105C	mg/L		16	4		30.0		
Selenium, total	mg/L		0.001	0.001				
Sodium Adsorption Ratio (SAR)	calc.	2.8	4.96	3.96				
Sodium, dissolved	mg/L	57.2	125	94.5				
Sulfate	mg/L	40	80	63.1				
Sum of Anions	meq/L	5.1	5.9	5.5				
Sum of Cations	meq/L	5.2	6.3	5.75				
Zinc, dissolved	mg/L		0.02	0.01				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring 27-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 27-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				0.1	0.4		0.3
pH (Field)	SU	7.9	8.6	8.2	7.13	7.35		7.33
Conductivity (Field)	µmhos/cm	290	460	364	695	718		893
Temperature (Field)	°C				7.7	8.7		12.4
Comment					flow estimated			
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-04		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Alkalinity (Total CaCO3)	mg/L	136	290	169				
Bicarbonate as CaCO3	mg/L	136	290	168				
Calcium, dissolved	mg/L	19.9	29.4	24.4				
Carbonate as CaCO3	mg/L		7	0.9				
Cation - Anion Balance	mg/L	1.3	4.3	2.8				
Chloride	mg/L	2	6	3				
Conductivity @25C	µmhos/cm	368	437	403		676		
Hardness as CaCO3	mg/L	64	122	85				
Iron, dissolved	mg/L		0.02	0.01		-0.06	U	
Iron, total	mg/L	0.16	9.15	1.68		0.307		
Magnesium, dissolved	mg/L	4.5	7.8	5.77				
Manganese, total	mg/L		0.192	0.037				
Nitrate (as N), dissolved	mg/L		0.4	0.08				
Nitrate/Nitrite (as N)	mg/L		0.4	0.08				
pH	SU	7.6	8.2	7.9		8.5	H	
Phosphorus, ortho dissolved	mg/L		0.022	0.003				
Potassium, dissolved	mg/L	1	1.2	1.1				
Residue, Filterable (TDS) @180C	mg/L	210	300	252		406		
Residue, Non-Filterable (TSS) @105C	mg/L		96	42		17.0	B	
Sodium Adsorption Ratio (SAR)	calc.	2.91	4.98	3.4				
Sodium, dissolved	mg/L	57.2	74.5	66.1				
Sulfate	mg/L	30	80	57				
Sum of Anions	meq/L	3.9	4.5	4.2				
Sum of Cations	meq/L	4	4.9	4.45				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring G-7
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring G-7		Baseline¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				5.61	1.40		0.63
pH (Field)	SU				7.87	7.81		7.62
Conductivity (Field)	µmhos/cm				537	644		749
Temperature (Field)	°C				6.6	8.9		9.4
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-03		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/16		
Sampled By						PH		
Aluminum, dissolved	mg/L	0.05	0.05	0.05				
Bicarbonate as CaCO ₃	mg/L	177	184	180.5				
Calcium, dissolved	mg/L	41.8	41.8	41.8				
Chloride	mg/L		1	0.5				
Conductivity @25C	µmhos/cm	387	414	400.5		599		
Hardness as CaCO ₃	mg/L	134	142	138				
Iron, dissolved	mg/L	0.04	0.07	0		-0.06	U	
Iron, total	mg/L	0.35	0.4	0.375		0.254		
Lead, dissolved	mg/L		0.02	0.01				
Magnesium, dissolved	mg/L	6.8	7.2	7				
Manganese, total	mg/L	0.005	0.006	0				
Nitrate/Nitrite (as N)	mg/L	0.08	0.1	0.09				
pH	SU	7.8	8.1	7.95		8.6	H	
Phosphorus, ortho dissolved	mg/L		0.014	0.007				
Residue, Filterable (TDS) @180C	mg/L	230	230	230		366		
Residue, Non-Filterable (TSS) @105C	mg/L	10	30	20		7.0	B	
Sodium Adsorption Ratio (SAR)	calc.	1.54	1.63	1.6				
Sodium, dissolved	mg/L	42.8	42.8	42.8				
Sulfate	mg/L	40	50	45				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring G-16
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring G-16		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				3.50	0.62		0.65
pH (Field)	SU				7.90	8.09		8.07
Conductivity (Field)	µmhos/cm				597	671		709
Temperature (Field)	°C				9.5	9.8		11.6
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-03		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Bicarbonate as CaCO ₃	mg/L	241	441	307				
Calcium, dissolved	mg/L	55.2	55.9	55.6				
Chloride	mg/L	2	12	5				
Conductivity @25C	µmhos/cm	529	1,120	691		640		
Hardness as CaCO ₃	mg/L	160	453	220				
Iron, dissolved	mg/L		0.08	0.01		-0.06	U	
Iron, total	mg/L		4.63	0.56		1.36		
Magnesium, dissolved	mg/L	15.1	15.8	15.3				
Manganese, total	mg/L		0.07	0.01				
Nitrate/Nitrite (as N)	mg/L	0.07	0.16	0.1				
pH	SU	7.1	8.2	7.7		8.7	H	
Phosphorus, ortho dissolved	mg/L		0.19	0.04				
Residue, Filterable (TDS) @180C	mg/L	274	700	349		384		
Residue, Non-Filterable (TSS) @105C	mg/L		194	21		15.0	B	
Sodium Adsorption Ratio (SAR)	calc.	1.4	2	1.8				
Sodium, dissolved	mg/L	58.1	64.5	61.3				
Sulfate	mg/L	18.2	200	51.6				
¹ Baseline pre -2000 data, adapted from WWE (2001). ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Spring G-24
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring G-24		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				4.09	4.23		1.55
pH (Field)	SU				7.12	7.11		7.4
Conductivity (Field)	µmhos/cm				983	912		933
Temperature (Field)	°C				9.2	9.1		10.4
Comment		Decreed Spring #8						
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-06		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Aluminum, dissolved	mg/L		0.08	0.04				
Arsenic, total	mg/L	0.001	0.001	0.001				
Bicarbonate as CaCO3	mg/L	267	376	307				
Calcium, dissolved	mg/L	56.4	56.4	56.4				
Chloride	mg/L	1.2	10	4.4				
Conductivity @25C	µmhos/cm	550	564	557		867		
Hardness as CaCO3	mg/L	176	233	203				
Iron, dissolved	mg/L		0.1	0.03		-0.06	U	
Iron, total	mg/L		2.28	0.45		1.88		
Magnesium, dissolved	mg/L	15.9	16.5	16.2				
Manganese, dissolved	mg/L		0.006	0.002				
Manganese, total	mg/L		0.048	0.005				
Nitrate/Nitrite (as N)	mg/L	0.05	0.1	0.08				
pH	SU	7.2	8.3	7.9		8.3	H	
Phosphorus, ortho dissolved	mg/L		0.105	0.027				
Residue, Filterable (TDS) @180C	mg/L	214	520	362		498		
Residue, Non-Filterable (TSS) @105C	mg/L		102	21		-5	U	
Sodium Adsorption Ratio (SAR)	calc.	1.8	1.8	1.8				
Sodium, dissolved	mg/L	58.9	58.9	58.9				
Sulfate	mg/L	21.2	70	30.5				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring G-14
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring G-14			Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				4.86	2.32		seep
pH (Field)	SU				7.67	7.94		7.69
Conductivity (Field)	µmhos/cm				1,128	1,092		1,103
Temperature (Field)	°C				7.3	9.7		25.0
Comment		Decreed Spring #7						
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-05		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Arsenic, total	mg/L	0.001	0.001	0.001				
Bicarbonate as CaCO3	mg/L	325	484	406				
Calcium, dissolved	mg/L	54.9	61.4	58.2				
Chloride	mg/L	2	14	6				
Conductivity @25C	µmhos/cm	553	682	637		1,040		
Hardness as CaCO3	mg/L	215	307	257				
Iron, dissolved	mg/L		0.11	0.02		-0.06	U	
Iron, total	mg/L		3	0.1		0.293		
Magnesium, dissolved	mg/L	21.5	29.8	24.6				
Manganese, total	mg/L		0.03	0.003				
Nitrate/Nitrite (as N)	mg/L	0.12	0.21	0.16				
pH	SU	7.1	8.2	7.7		8.6	H	
Phosphorus, ortho dissolved	mg/L		2.08	0.15				
Residue, Filterable (TDS) @180C	mg/L	324	708	499		656		
Residue, Non-Filterable (TSS) @105C	mg/L		107	5		15.0	B	
Selenium, total	mg/L	0.001	0.001	0.001				
Sodium Adsorption Ratio (SAR)	calc.	2.22	3.11	2.53				
Sodium, dissolved	mg/L	81.3	114	97.7				
Sulfate	mg/L	40	150	88				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring G-22
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring G-22		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	Q ⁴	9/6/2022
Field Parameters								
Flow ⁵	gpm				9	10		5
pH (Field)	SU				6.91	7.16		7.16
Conductivity (Field)	µmhos/cm				1,247	1,242		1,244
Temperature (Field)	°C				8.1	8.4		10.5
Comment		Decreed Spring #3			flow dispersed, estimated			
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-05		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Bicarbonate as CaCO3	mg/L	287	359	332				
Calcium, dissolved	mg/L	64.9	64.9	64.9				
Chloride	mg/L	3	18	7				
Conductivity @25C	µmhos/cm	633	640	637		1,210		
Hardness as CaCO3	mg/L	180	270	234				
Iron, dissolved	mg/L		0.05	0.01		-0.06	U	
Iron, total	mg/L		0.2	0.08		-0.06	U	
Lead, dissolved	mg/L	0.02	0.02	0.02				
Magnesium, dissolved	mg/L	19	19.9	19.5				
Manganese, total	mg/L		0.85	0.11				
Nitrate/Nitrite (as N)	mg/L	0.08	0.08	0.08				
pH	SU	7	7.9	7.6		8.4	H	
Phosphorus, ortho dissolved	mg/L		0.044	0.019				
Residue, Filterable (TDS) @180C	mg/L	300	516	388		738		
Residue, Non-Filterable (TSS) @105C	mg/L		24	5		-5.0	U	
Sodium Adsorption Ratio (SAR)	calc.	1.78	1.92	1.85				
Sodium, dissolved	mg/L	66.1	66.1	66.1				
Sulfate	mg/L	24	80	41				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Visual flow estimate.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring 11-2
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 11-2		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	Q ⁴	9/6/2022
Field Parameters								
Flow ⁵	gpm				1.5	4		seep
pH (Field)	SU				8.09	8.00		8.68
Conductivity (Field)	µmhos/cm				2,240	2,350		2,600
Temperature (Field)	°C				8.7	12.3		11.6
Comment					flow dispersed, estimated			
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-01		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Conductivity @25C	µmhos/cm					2,140		
Iron, dissolved	mg/L					-0.06	U	
Iron, total	mg/L					0.393		
pH	SU					8.7	H	
Residue, Filterable (TDS) @180C	mg/L					1,440		
Residue, Non-Filterable (TSS) @105C	mg/L					5.0	B	

¹ Insufficient flows for baseline measurements and sampling.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Visual flow estimate.



Spring 10-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 10-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				14.63	15.58		5.18
pH (Field)	SU				7.96	7.95		8.02
Conductivity (Field)	µmhos/cm				1,801	1,780		1,792
Temperature (Field)	°C				9.5	10.7		10.7
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-04		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Conductivity @25C	µmhos/cm					1,790		
Iron, dissolved	mg/L					-0.06	U	
Iron, total	mg/L					0.061	B	
pH	SU					8.8	H	
Residue, Filterable (TDS) @180C	mg/L					1,140		
Residue, Non-Filterable (TSS) @105C	mg/L					-5.0	U	

¹ Insufficient flows for baseline measurements and sampling.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.



Spring E10-2
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring E10-2		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/31/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				0.2	seep		dry
pH (Field)	SU				7.58	8.05		
Conductivity (Field)	µmhos/cm				1,692	1,945		
Temperature (Field)	°C				16.7	7.4		
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-06		
Sample Date						5/31/2022		
Lab Test Date						6/3-6/17		
Sampled By						PH		
Conductivity @25C	µmhos/cm					1,920		
Iron, dissolved	mg/L					0.083	B	
Iron, total	mg/L					0.923		
pH	SU					8.6	H	
Residue, Filterable (TDS) @180C	mg/L					1,260		
Residue, Non-Filterable (TSS) @105C	mg/L					42.0		
¹ Insufficient flows for baseline measurements and sampling. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.								



Spring 15-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 15-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	Q ⁴	9/7/2022
Field Parameters								
Flow	gpm				0.69	0.06		dry
pH (Field)	SU	7.4	8.6	8.2	7.73	7.89		
Conductivity (Field)	µmhos/cm	1,060	1,240	1,137	2,540	2,480		
Temperature (Field)	°C	1.1	12.8	8	20.0	15		
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-07		
Sample Date						5/31/2022		
Lab Test Date						6/6-6/17		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	375	520	480				
Arsenic, total	mg/L		0.001	0.001				
Bicarbonate as CaCO ₃	mg/L	364	520	477				
Cadmium, dissolved	mg/L		0.004	0.0005				
Calcium, dissolved	mg/L	44.9	67.8	58.3				
Carbonate as CaCO ₃	mg/L		12	2.2				
Cation - Anion Balance	mg/L	-5.8	3.8	-1				
Chloride	mg/L	4	9	6.3				
Conductivity @25C	µmhos/cm	1,080	1,120	1,100		2,270		
Copper, dissolved	mg/L		0.01	0.01				
Hardness as CaCO ₃	mg/L	222	307	271				
Iron, dissolved	mg/L		0.01	0.01		-0.06	U	
Iron, total	mg/L	0.01	0.73	0.12		-0.06	U	
Magnesium, dissolved	mg/L	25.8	33.4	30				
Manganese, total	mg/L		0.022	0.001				
Nitrate/Nitrite (as N)	mg/L	0.08	0.18	0.11				
pH	SU	7.9	8.2	8.1		8.6	H	
Phosphorus, ortho dissolved	mg/L		0.009	0.001				
Potassium, dissolved	mg/L	2.8	3.2	3				
Residue, Filterable (TDS) @180C	mg/L	660	730	701		1,590		
Residue, Non-Filterable (TSS) @105C	mg/L		26	9		-5	U	
Selenium, total	mg/L		0.002	0.001				
Sodium Adsorption Ratio (SAR)	calc.	4.61	5.39	4.99				
Sodium, dissolved	mg/L	163	200	185				
Sulfate	mg/L	140	180	151				
Sum of Anions	meq/L		0.5	0.09				
Sum of Cations	meq/L	12.1	14.4	13.3				
Zinc, dissolved	mg/L		0.01	0.01				
Zinc, total	mg/L		0.05	0.02				

¹ Baseline pre -2000 data, adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring G-1A
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Spring G-1A		Baseline¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/6/2022
Field Parameters							
Flow	gpm				dry	dry	dry
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field)	°C						
Comment							
Laboratory Parameters²							
Name of Certified Lab ³							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Bicarbonate as CaCO ₃	mg/L	288	501	342			
Calcium, dissolved	mg/L	69.4	69.4	69.4			
Chloride	mg/L	4	17	8			
Conductivity @25C	µmhos/cm	570	672	621			
Hardness as CaCO ₃	mg/L	266	271	269			
Iron, dissolved	mg/L						
Iron, total	mg/L		1.18	0.2			
Magnesium, dissolved	mg/L	23.7	25.9	24.8			
Manganese, dissolved	mg/L	0.005	0.005	0.005			
Manganese, total	mg/L		0.03	0.004			
Nitrate/Nitrite (as N)	mg/L		0.23	0.08			
pH	SU	7.9	8.5	8.17			
Phosphorus, ortho dissolved	mg/L		0.04	0.01			
Residue, Filterable (TDS) @180C	mg/L	312	550	396			
Residue, Non-Filterable (TSS) @105C	mg/L		66	10			
Sodium Adsorption Ratio (SAR)	calc.	1.22	1.61	1.37			
Sodium, dissolved	mg/L	50.4	50.4	50.4			
Sulfate	mg/L	40	207	83			
¹ Baseline pre -2000 data, adapted from WWE (2001). ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO.							



Spring G-20
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Spring G-20		Baseline¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Flow	gpm				dry	dry	dry
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field)	°C						
Comment							
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Bicarbonate as CaCO ₃	mg/L	452	657	539			
Calcium, dissolved	mg/L	81	81	81			
Chloride	mg/L	1.2	10	5.3			
Conductivity @25C	µmhos/cm	970	1,090	1,023			
Hardness as CaCO ₃	mg/L	193	416	318			
Iron, dissolved	mg/L		0.05	0.01			
Iron, total	mg/L		0.32	0.05			
Magnesium, dissolved	mg/L	33.3	33.3	33.3			
Manganese, dissolved	mg/L	0.002	0.002	0.002			
Manganese, total	mg/L		0.06	0.005			
Nitrate/Nitrite (as N)	mg/L	0.01	0.05	0.03			
pH	SU	7	8.1	7.7			
Phosphorus, ortho dissolved	mg/L		0.15	0.02			
Residue, Filterable (TDS) @180C	mg/L	502	686	598			
Residue, Non-Filterable (TSS) @105C	mg/L		19.6	3.5			
Sodium Adsorption Ratio (SAR)	calc.	2.31	2.73	2.52			
Sodium, dissolved	mg/L	102	102	102			
Sulfate	mg/L	16	117	81			

¹ Baseline pre -2000 data, adapted from WWE (2001).



Spring J-4
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring J-4		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/30/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm				0.25	dry		dry
pH (Field)	SU	7.5	8.2	7.8	7.49			
Conductivity (Field)	µmhos/cm	340	480	392	625			
Temperature (Field)	°C				14.6			
Comment								
Laboratory Parameters²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	109	262	195				
Aluminum, dissolved	mg/L		0.05	0.02				
Arsenic, dissolved	mg/L		0.001	0				
Bicarbonate as CaCO ₃	mg/L	169	262	195				
Calcium, dissolved	mg/L	34.2	54.4	43				
Cation - Anion Balance	mg/L	1.1	3.2	2.3				
Chloride	mg/L		3	1.9				
Conductivity @25C	µmhos/cm	412	429	423				
Copper, dissolved	mg/L		0.01	0				
Hardness as CaCO ₃	mg/L	125	191	156				
Iron, dissolved	mg/L		0.06	0.02				
Iron, total	mg/L	0.03	6.75	0.82				
Magnesium, dissolved	mg/L	9.6	13.4	11.4				
Manganese, total	mg/L		0.066	0.009				
Nitrate (as N), dissolved	mg/L	0.02	0.37	0.14				
Nitrate/Nitrite (as N)	mg/L	0.05	0.37	0.13				
Nitrite (as N), dissolved	mg/L		0.03	0.003				
pH	SU	7.1	8.1	7.5				
Phosphorus, ortho dissolved	mg/L		0.025	0.005				
Potassium, dissolved	mg/L	1.3	1.3	1.3				
Residue, Filterable (TDS) @180C	mg/L	230	300	254				
Residue, Non-Filterable (TSS) @105C	mg/L		26	6				
Selenium, total	mg/L		0.002	0				
Sodium Adsorption Ratio (SAR)	calc.	1.08	1.8	1.3				
Sodium, dissolved	mg/L	29.6	51.5	36.7				
Sulfate	mg/L	30	60	45				
Sum of Anions	meq/L	4.5	4.7	4.6				
Sum of Cations	meq/L	4.6	4.91	4.8				
Zinc, dissolved	mg/L		0.01	0				

¹ Baseline pre -2000 data, adapted from WVE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring 35-3
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 35-3		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	0.63	26.5	6.3	2.23	0.80		0.48
pH (Field)	SU	6.53	8.74	7.48	7.42	7.79		7.42
Conductivity (Field)	µmhos/cm	223	560	428	466	535		517
Temperature (Field)	°C	5.9	12.1	8.9	5.7	7.2		8.5
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-11		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	102	217	170				
Aluminum, dissolved	mg/L	-0.03	0.09	0.04				
Arsenic, total	mg/L	0.0009	0.0130	0.0039				
Bicarbonate as CaCO ₃	mg/L	102	212	169				
Boron, dissolved	mg/L	-0.01	-0.01	-0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	18.2	47.2	34.3				
Carbonate as CaCO ₃	mg/L	-2	4	2				
Cation - Anion Balance	mg/L	-8.6	-2.1	-4.4				
Chloride	mg/L	1	11	3				
Conductivity @25C	µmhos/cm	216	451	351		489		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	59	142	105				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	0.12	0.06		-0.06	U	
Iron, total	mg/L	0.19	42.50	9.14		0.103	B	
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	3.3	5.8	4.8				
Manganese, dissolved	mg/L	-0.005	0.272	0.055				
Manganese, total	mg/L	0.021	1.280	0.325				
Mercury, total	mg/L	-0.0002	0.0003	0.0001				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.17	0.08				
pH	SU	7.8	8.3	8.2		8.4	H	
Phosphate	mg/L	-0.03	0.15	0.07				
Phosphorus, ortho dissolved	mg/L	-0.01	0.05	0.02				
Potassium, dissolved	mg/L	0.7	1.4	0.9				
Residue, Filterable (TDS) @180C	mg/L	160	250	210		310		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	510	133		9.0	B	
Selenium, total	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	1.27	1.60	1.45				
Sodium, dissolved	mg/L	25.7	42.5	33.4				
Sulfate	mg/L	10	30	20				
Sum of Anions	meq/L	2.5	4.8	3.9				
Sum of Cations	meq/L	2.3	4.6	3.6				
TDS (calculated)	mg/L	131	248	199				
TDS (ratio - measured/calculated)	calc.	0.09	1.22	0.93				
Zinc, dissolved	mg/L	-0.01	0.02	0.01				
¹ Baseline 2006. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. ⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Deer Creek Spring
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Deer Creek Spring		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm	0.94	4.15	2.88	dry	dry		dry
pH (Field)	SU	6.72	7.77	7.10				
Conductivity (Field)	µmhos/cm	574	889	735				
Temperature (Field)	°C	7.1	17.4	10.9				
Comment								
Laboratory Parameters²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	294	302	298				
Aluminum, dissolved	mg/L	-0.03	-0.03	-0.03				
Arsenic, total	mg/L	-0.005	-0.005	-0.005				
Bicarbonate as CaCO ₃	mg/L	294	302	298				
Boron, dissolved	mg/L	-0.01	-0.01	-0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	64.8	68.6	66.8				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	mg/L	-5.3	0.0	-2.1				
Chloride	mg/L	3	4	3				
Conductivity @25C	µmhos/cm	587	660	611				
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	241	255	249				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	-0.02	-0.02				
Iron, total	mg/L	-0.02	0.20	0.10				
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	19.1	20.4	20.0				
Manganese, dissolved	mg/L	-0.005	-0.005	-0.005				
Manganese, total	mg/L	-0.005	0.005	0.003				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	1.92	2.33	2.16				
pH	SU	7.9	8.2	8.1				
Phosphate	mg/L	-0.03	0.03	0.02				
Phosphorus, ortho dissolved	mg/L	-0.01	0.01	0.02				
Potassium, dissolved	mg/L	1.9	2.1	2.0				
Residue, Filterable (TDS) @180C	mg/L	320	360	343				
Residue, Non-Filterable (TSS) @105C	mg/L	-5	14	5				
Selenium, total	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	0.87	0.95	0.92				
Sodium, dissolved	mg/L	31.1	34.7	33.0				
Sulfate	mg/L	30	40	33				
Sum of Anions	meq/L	6.6	6.9	6.7				
Sum of Cations	meq/L	6.2	6.6	6.425				
TDS (calculated)	mg/L	329	341	336				
TDS (ratio - measured/calculated)	calc.	0.95	1.06	1.02				
Zinc, dissolved	mg/L	0.02	0.02	0.02				

¹ Baseline 2006.

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³ ACZ Laboratory, Steamboat Springs, CO.

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H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring WCC-24
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring WCC-24		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/2/2022	5/27/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm	6.12	40.85	23.36	seep	1.5		20.6
pH (Field)	SU	7.30	8.64	8.05	7.84	7.88		8.05
Conductivity (Field)	µmhos/cm	1,778	3,240	2,319	1,448	1,542		1,750
Temperature (Field)	°C	11.4	19.0	13.1	9.5	13.4		12.9
Comment						flow estimated		
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73629-10		
Sample Date						5/27/2022		
Lab Test Date						6/2-6/15		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	323	406	368				
Aluminum, dissolved	mg/L	-0.03	0.04	0.02				
Arsenic, total	mg/L	0.00079	0.0086	0.0070				
Bicarbonate as CaCO ₃	mg/L	321	406	364				
Boron, dissolved	mg/L	0.74	0.86	0.79				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	165	197	180				
Carbonate as CaCO ₃	mg/L	-2	16	4				
Cation - Anion Balance	mg/L	-2	2	-0.2				
Chloride	mg/L	2	4	3				
Conductivity @25C	µmhos/cm	1,710	2,070	1,925		1,550		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	856	969	905				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	0.07	0.03		-0.06	U	
Iron, total	mg/L	-0.02	0.53	0.20		0.146	B	
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	106	116	111				
Manganese, dissolved	mg/L	-0.005	0.009	0.003				
Manganese, total	mg/L	-0.005	0.053	0.012				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	0.02	0.01				
Nitrate/Nitrite (as N)	mg/L	2.39	2.97	2.62				
pH	SU	8.1	8.4	8.2		8.5	H	
Phosphate	mg/L	0.12	0.34	0.24				
Phosphorus, ortho dissolved	mg/L	0.04	0.11	0.08				
Potassium, dissolved	mg/L	22.9	26.9	25.0				
Residue, Filterable (TDS) @180C	mg/L	1,460	1,630	1,561		1,170		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	48	12		-5	U	
Selenium, total	mg/L	0.014	0.019	0.016				
Sodium Adsorption Ratio (SAR)	calc.	1.71	1.85	1.81				
Sodium, dissolved	mg/L	116	131	123				
Sulfate	mg/L	760	820	800				
Sum of Anions	meq/L	22.5	25.3	24.2				
Sum of Cations	meq/L	23.2	25.8	24.2				
TDS (calculated)	mg/L	1,380	1,530	1,465				
TDS (ratio - measured/calculated)	calc.	1.04	1.11	1.07				
Zinc, dissolved	mg/L	-0.01	0.03	0.02				

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B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

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Spring J-2
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring J-2		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/2/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	gpm	0.11	0.26	0.18	0.43	0.08		seep
pH (Field)	SU	8.26	9.10	8.59	8.37	8.45		8.37
Conductivity (Field)	µmhos/cm	975	1,690	1,281	1,338	1,583		1,315
Temperature (Field)	°C	9.6	19.6	14.4	11.7	10.9		14.1
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73630-08		
Sample Date						5/30/2022		
Lab Test Date						6/4-6/17		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	605	650	637				
Aluminum, dissolved	mg/L	-0.03	0.20	0.12				
Arsenic, total	mg/L	-0.005	0.010	0.003				
Bicarbonate as CaCO ₃	mg/L	557	614	584				
Boron, dissolved	mg/L	0.45	0.59	0.54				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	4.2	10.9	5.8				
Carbonate as CaCO ₃	mg/L	36	72	53				
Cation - Anion Balance	mg/L	-8.6	0.7	-4.6				
Chloride	mg/L	4	12	6				
Conductivity @25C	µmhos/cm	1,090	1,190	1,145		1,590		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	21	47	28				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.05	1.80	0.44		0.280		
Iron, total	mg/L	1.36	37.70	8.42		5.91		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	2.4	4.7	3.2				
Manganese, dissolved	mg/L	0.012	0.18	0.05				
Manganese, total	mg/L	0.046	0.872	0.204				
Mercury, total	mg/L	-0.0002	0.0003	0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	1.14	0.24				
pH	SU	8.4	8.8	8.6		9.0	H	
Phosphate	mg/L	0.46	1.36	0.72				
Phosphorus, ortho dissolved	mg/L	0.15	0.44	0.23				
Potassium, dissolved	mg/L	1.4	5.0	2.1				
Residue, Filterable (TDS) @180C	mg/L	650	910	742		1,100		
Residue, Non-Filterable (TSS) @105C	mg/L	20	754	192		59.0	H	
Selenium, total	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	16.30	27.60	23.03				
Sodium, dissolved	mg/L	248	295	266				
Sulfate	mg/L	-10	60	27				
Sum of Anions	meq/L	12.7	14.6	13.5				
Sum of Cations	meq/L	11.4	13.5	12.3				
TDS (calculated)	mg/L	664	752	715				
TDS (ratio - measured/calculated)	calc.	0.96	1.21	1.04				
Zinc, dissolved	mg/L	-0.01	0.19	0.04				

¹ Baseline 2006.

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Spring J-7
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring J-7		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/4/2022	5/26/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm	0.19	9.09	4.29	dry	dry		dry
pH (Field)	SU	6.55	8.25	7.60				
Conductivity (Field)	µmhos/cm	242	496	376				
Temperature (Field)	°C	9.7	21.0	15.4				
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO ₃)	mg/L	121	188	142				
Aluminum, dissolved	mg/L	-0.03	0.05	0.03				
Sum of Anions	meq/L	2.7	4.4	3.8				
Arsenic, total	mg/L	-0.005	0.0008	0.002				
Bicarbonate as CaCO ₃	mg/L	116	188	140				
Boron, dissolved	mg/L	-0.01	0.02					
Cadmium, dissolved	mg/L	-0.005	-0.005					
Calcium, dissolved	mg/L	21.1	33.9	30.3				
Carbonate as CaCO ₃	mg/L	-2	7	1				
Cation - Anion Balance	mg/L	-7.3	0	-2.60				
Sum of Cations	meq/L	2.6	4.3	3.6				
Chloride	mg/L	2	4	3				
Conductivity @25C	µmhos/cm	250	426	354				
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	79	125	107				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.02	0.11	0.05				
Iron, total	mg/L	0.53	1.96	1.02				
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	6.3	9.9	7.5				
Manganese, dissolved	mg/L	-0.005	-0.005	-0.005				
Manganese, total	mg/L	-0.005	0.037	0.019				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.33	0.16				
pH	SU	7.6	8.4	8.2				
Phosphate	mg/L	-0.03	0.24	0.09				
Phosphorus, ortho dissolved	mg/L	-0.01	0.08	0.03				
Potassium, dissolved	mg/L	1.2	2.2	1.62				
Selenium, total	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	1.19	1.61	1.41				
Sodium, dissolved	mg/L	23.9	41	33.2				
Sulfate	mg/L	10	60	44				
TDS (ratio - measured/calculated)	calc.	0.99	1.38	1.14				
TDS (calculated)	mg/L	138	234	205				
Residue, Filterable (TDS) @180C	mg/L	190	270	230				
Residue, Non-Filterable (TSS) @105C	mg/L	-5	24	10				
Zinc, dissolved	mg/L	-0.01	0.03	0				

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B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

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Deep Creek Trail Spring **Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Deep Creek Trail Spring		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	1.24	3.51	1.77	6.18	1.53		0.95
pH (Field)	SU	7.72	8.07	7.90	7.56	7.65		7.71
Conductivity (Field)	µmhos/cm	400	479	455	487	509		512
Temperature (Field)	°C	5.8	11.8	8.74	7.6	7.6		8.5
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-10		
Sample Date						5/26/2022		
Lab Test Date						6/1-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	161	236	211				
Aluminum, dissolved	mg/L	-0.03	0.11	0.04				
Arsenic, total	mg/L	-0.0005	-0.0005	-0.0005				
Bicarbonate as CaCO ₃	mg/L	156	232	208				
Boron, dissolved	mg/L	0.02	0.02	0.02				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	29.4	40.3	37.4				
Carbonate as CaCO ₃	mg/L	-2	7	4				
Cation - Anion Balance	mg/L	-1.1	9.5	1.9				
Chloride	mg/L	1	2	2				
Conductivity @25C	µmhos/cm	357	463	440		476		
Copper, dissolved	mg/L	-0.01	0.02	0.01				
Hardness as CaCO ₃	mg/L	96	123	116				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	0.14	0.05		-0.06	U	
Iron, total	mg/L	0.14	1.63	0.79		0.094	B	
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	5.2	6.0	5.6				
Manganese, dissolved	mg/L	-0.005	-0.005	-0.005				
Manganese, total	mg/L	-0.005	0.024	0.012				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	1.51	0.66				
pH	SU	8.3	8.4	8.4		8.5	H	
Phosphate	mg/L	-0.03	0.15	0.05				
Phosphorus, ortho dissolved	mg/L	-0.01	0.05	0.02				
Potassium, dissolved	mg/L	1.0	1.1	1.0				
Residue, Filterable (TDS) @180C	mg/L	230	270	253		292		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	60	20		-5.0	U	
Selenium, total	mg/L	-0.001	-0.001	-0.001				
Sodium Adsorption Ratio (SAR)	calc.	1.85	2.47	2.22				
Sodium, dissolved	mg/L	41.2	62.0	54.6				
Sulfate	mg/L	10	20	14				
Sum of Anions	meq/L	3.7	4.9	5				
Sum of Cations	meq/L	3.7	5.2	4.7				
TDS (calculated)	mg/L	198	262	243				
TDS (ratio - measured/calculated)	calc.	0.98	1.16	1.05				
Zinc, dissolved	mg/L	-0.01	0.02	0				

¹ Baseline 2007.

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Deep Creek Spring # 2
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Deep Creek Spring #2		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean ²	5/6/2022	5/26/2022	9/5/2022
Field Parameters							
Flow	gpm	0.19	0.29	0.24	dry	dry	dry
pH (Field)	SU	7.97	8.19	8.09			
Conductivity (Field)	µmhos/cm	396	453	433			
Temperature (Field)	°C	7.1	13.4	10.4			
Comment							
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L	167	219	195			
Aluminum, dissolved	mg/L	-0.03	0.09	0.06			
Arsenic, total	mg/L	-0.0005	0.0012	0.0006			
Bicarbonate as CaCO ₃	mg/L	159	211	185			
Boron, dissolved	mg/L	0.01	0.02	0.01			
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005			
Calcium, dissolved	mg/L	41.6	47.8	44.2			
Carbonate as CaCO ₃	mg/L	6	14	9			
Cation - Anion Balance	mg/L	0	4.9	1.8			
Chloride	mg/L	2	3	2			
Conductivity @25C	µmhos/cm	393	440	422			
Copper, dissolved	mg/L	-0.01	0.03	0.01			
Hardness as CaCO ₃	mg/L	127	147	136			
Hydroxide as CaCO ₃	mg/L	-2	-2	-2			
Iron, dissolved	mg/L	0.02	0.08	0.05			
Iron, total	mg/L	1.07	9.71	3.70			
Lead, dissolved	mg/L	-0.04	-0.04	-0.04			
Magnesium, dissolved	mg/L	5.7	6.7	6.3			
Manganese, dissolved	mg/L	-0.005	0.008	0.003			
Manganese, total	mg/L	0.018	0.146	0.057			
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002			
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01			
Nitrate/Nitrite (as N)	mg/L	-0.02	0.25	0.08			
pH	SU	8.4	8.5	8.4			
Phosphate	mg/L	-0.03	0.18	0.05			
Phosphorus, ortho dissolved	mg/L	-0.01	0.06	0.02			
Potassium, dissolved	mg/L	0.9	1.4	1.2			
Residue, Filterable (TDS) @180C	mg/L	230	260	247			
Residue, Non-Filterable (TSS) @105C	mg/L	6	302	136			
Selenium, total	mg/L	-0.001	-0.001	-0.001			
Sodium Adsorption Ratio (SAR)	calc.	1.37	1.63	1.49			
Sodium, dissolved	mg/L	35.1	44.8	39.5			
Sulfate	mg/L	20	20	20			
Sum of Anions	meq/L	3.8	4.8	4.3			
Sum of Cations	meq/L	4.1	4.9	4.5			
TDS (calculated)	mg/L	209	257	234			
TDS (ratio - measured/calculated)	calc.	1.01	1.16	1.06			
Zinc, dissolved	mg/L	-0.01	0.03	0.01			

¹ Baseline 2007.

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96-2-2 Area Spring
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: 96-2-2 Area Spring		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	0.11	2.5	0.75	0.2	0.36		dry
pH (Field)	SU	7.78	8.18	7.88	7.49	7.89		
Conductivity (Field)	µmhos/cm	348	430	399	509	524		
Temperature (Field)	°C	6.9	12.3	10.6	6.6	8.7		
Comment					estimated flow			
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-05		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	129	172	156				
Aluminum, dissolved	mg/L	-0.03	0.21	0.09				
Arsenic, total	mg/L	-0.0005	0.0012	0.0007				
Bicarbonate as CaCO ₃	mg/L	129	171	154				
Boron, dissolved	mg/L	0.01	0.02	0.02				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	11.8	18.3	16.2				
Carbonate as CaCO ₃	mg/L	-2	10	4				
Cation - Anion Balance	mg/L	0.0	5.6	2.2				
Chloride	mg/L	2	3	2				
Conductivity @25C	µmhos/cm	332	421	387		461		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	38	59	52				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.05	0.30	0.13		-0.06	U	
Iron, total	mg/L	0.84	9.08	4.55		0.421		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	2.1	3.3	2.9				
Manganese, dissolved	mg/L	-0.005	0.177	0.045				
Manganese, total	mg/L	0.013	0.153	0.075				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	0.01	0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.04	0.03				
pH	SU	8.2	8.5	8.4		8.5	H	
Phosphate	mg/L	0.03	0.18	0.08				
Phosphorus, ortho dissolved	mg/L	0.01	0.06	0.03				
Potassium, dissolved	mg/L	0.7	1.4	1.2				
Residue, Filterable (TDS) @180C	mg/L	190	240	220		284		
Residue, Non-Filterable (TSS) @105C	mg/L	22	510	175		18.0	B	
Selenium, total	mg/L	-0.001	0.002	0.0008				
Sodium Adsorption Ratio (SAR)	calc.	3.93	4.17	4.09				
Sodium, dissolved	mg/L	58.5	70.8	67.0				
Sulfate	mg/L	30	30	30				
Sum of Anions	meq/L	3.2	4	3.8				
Sum of Cations	meq/L	3.3	4.3	4.0				
TDS (calculated)	mg/L	183	231	216				
TDS (ratio - measured/calculated)	calc.	0.97	1.04	1.02				
Zinc, dissolved	mg/L	-0.01	0.11	0.03				
¹ Baseline 2007. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. ⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Spring J-10
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring J-10		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/2/2022	5/30/2022	Q ⁴	9/6/2022
Field Parameters								
Flow	gpm	dry	0.22	seep				
pH (Field)	SU	7.14	7.92	7.42				
Conductivity (Field)	µmhos/cm	770	982	879				
Temperature (Field)	°C	5.9	19.5	12.8				
Comment					site covered by beaver pond			
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Alkalinity (Total CaCO3)	mg/L	299	463	377				
Aluminum, dissolved	mg/L	-0.03	-0.03	-0.03				
Arsenic, total recoverable	mg/L	-0.0005	0.0055	0.0018				
Bicarbonate as CaCO3	mg/L	294	463	375				
Boron, dissolved	mg/L	0.02	0.06	0.05				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	70	118	92.8				
Carbonate as CaCO3	mg/L	-2	15	3				
Cation - Anion Balance	mg/L	-7.4	4.7	-1.3				
Chloride	mg/L	10	19	14				
Conductivity @25C	µmhos/cm	721	927	822				
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO3	mg/L	273	447	360				
Hydroxide as CaCO3	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	0.68	0.18				
Iron, total	mg/L	0.44	10.9	3.45				
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	23.5	36.9	31.0				
Manganese, dissolved	mg/L	0.011	1.06	0.287				
Manganese, total	mg/L	0.043	1.85	0.587				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.01	-0.01	-0.01				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.04	0.02				
pH	SU	8.2	8.3	8.2				
Phosphate	mg/L	-0.03	0.06	-0.03				
Phosphorus, ortho dissolved	mg/L	-0.01	0.02	-0.01				
Potassium, dissolved	mg/L	1.7	2.5	2.0				
Residue, Filterable (TDS) @180C	mg/L	450	600	512				
Residue, Non-Filterable (TSS) @105C	mg/L	15	157	53				
Selenium, total recoverable	mg/L	0.0002	0.0011	0.0005				
Sodium Adsorption Ratio (SAR)	calc.	0.84	1.05	0.92				
Sodium, dissolved	mg/L	31.9	47.6	39.8				
Sulfate	mg/L	30	71	57				
Sum of Anions	meq/L	8.0	10.4	9.2				
Sum of Cations	meq/L	6.9	11.1	9.0				
TDS (calculated)	mg/L	397	522	466				
TDS (ratio - measured/calculated)	calc.	1.02	1.15	1.10				
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01				

¹ Baseline Monitoring WY 2011.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring 2012-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Spring 2012-1		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	9/5/2022
Field Parameters							
Flow	gpm	dry	2.5	NA	seep	dry	dry
pH (Field)	SU	7.79	7.79	7.79	6.97		
Conductivity (Field)	µmhos/cm	123	123	123	94.5		
Temperature (Field)	°C	7.3	7.3	7.3	14.2		
Comment							
Laboratory Parameters²							
Name of Certified Lab ³							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L						
Aluminum, dissolved	mg/L						
Arsenic, total recoverable	mg/L						
Bicarbonate as CaCO ₃	mg/L						
Boron, dissolved	mg/L						
Cadmium, dissolved	mg/L						
Calcium, dissolved	mg/L						
Carbonate as CaCO ₃	mg/L						
Cation - Anion Balance	mg/L						
Chloride	mg/L						
Conductivity @25C	µmhos/cm						
Copper, dissolved	mg/L						
Hardness as CaCO ₃	mg/L						
Hydroxide as CaCO ₃	mg/L						
Iron, dissolved	mg/L						
Iron, total	mg/L						
Lead, dissolved	mg/L						
Magnesium, dissolved	mg/L						
Manganese, dissolved	mg/L						
Manganese, total	mg/L						
Mercury, total	mg/L						
Molybdenum, dissolved	mg/L						
Nitrate/Nitrite (as N)	mg/L						
pH	SU						
Phosphate	mg/L						
Phosphorus, ortho dissolved	mg/L						
Potassium, dissolved	mg/L						
Residue, Filterable (TDS) @180C	mg/L						
Residue, Non-Filterable (TSS) @105C	mg/L						
Selenium, total recoverable	mg/L						
Sodium Adsorption Ratio (SAR)	calc.						
Sodium, dissolved	mg/L						
Sulfate	mg/L						
Sum of Anions	meq/L						
Sum of Cations	meq/L						
TDS (calculated)	mg/L						
TDS (ratio - measured/calculated)	calc.						
Zinc, dissolved	mg/L						

¹ Baseline Monitoring May Through October 2013. Insufficient flow for lab samples. Field measurements only.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.



Spring 2012-2
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 2012-2		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	dry	3.56	0.59	5.07	0.47		dry
pH (Field)	SU	8.00	8.32	8.16	7.17	7.43		
Conductivity (Field)	µmhos/cm	91	114	103	79.9	96.3		
Temperature (Field)	°C	4.8	6.6	5.7	8.4	15.4		
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-12		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	38.0	38.0	38.0				
Aluminum, dissolved	mg/L	0.05	0.05	0.05				
Arsenic, total recoverable	mg/L	-0.0002	-0.0002	-0.0002				
Bicarbonate as CaCO ₃	mg/L	38.0	38.0	38.0				
Boron, dissolved	mg/L	-0.01	-0.01	-0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	7.5	7.5	7.5				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	mg/L	6.3	6.3	6.3				
Chloride	mg/L	2	2	2				
Conductivity @25C	µmhos/cm	99	99	99		96		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	25	25	25				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.11	0.11	0.11		0.067	B	
Iron, total	mg/L	1.04	1.04	1.04		1.63		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	1.6	1.6	1.6				
Manganese, dissolved	mg/L	-0.005	-0.005	-0.005				
Manganese, total	mg/L	0.009	0.009	0.009				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02				
Nitrate/Nitrite (as N)	mg/L	0.41	0.41	0.41				
pH	SU	7.9	7.9	7.9		8.1	H	
Phosphate	mg/L	-0.03	-0.03	-0.03				
Phosphorus, ortho dissolved	mg/L	-0.01	-0.01	-0.01				
Potassium, dissolved	mg/L	0.7	0.7	0.7				
Residue, Filterable (TDS) @180C	mg/L	80	80	80		106		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	-5	-5		5.0	B	
Selenium, total recoverable	mg/L	0.0002	0.0002	0.0002				
Sodium Adsorption Ratio (SAR)	calc.	0.82	0.82	0.82				
Sodium, dissolved	mg/L	9.4	9.4	9.4				
Sulfate	mg/L	1	1	1				
Sum of Anions	meq/L	0.837	0.837	0.837				
Sum of Cations	meq/L	0.949	0.949	0.949				
TDS (calculated)	mg/L	45	45	45				
TDS (ratio - measured/calculated)	calc.	1.78	1.78	1.78				
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01				

¹ Baseline Monitoring May Through October 2013. Only one laboratory sample was collected during the baseline period in May 2013. The spring was dry from June through October 2013.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring 2012-3
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 2012-3		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	0.16	2.63	0.88	3.52	0.76		0.28
pH (Field)	SU	7.51	8.63	8.13	7.32	7.75		7.58
Conductivity (Field)	µmhos/cm	396	525	471	424	486		597
Temperature (Field)	°C	2.0	9.1	6.2	7.4	7.3		13.3
Comment								
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-10		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	169	201	183				
Aluminum, dissolved	mg/L	-0.03	0.05	0.02				
Arsenic, total recoverable	mg/L	-0.0002	0.0013	0.0005				
Bicarbonate as CaCO ₃	mg/L	163	191	173				
Boron, dissolved	mg/L	-0.01	0.02	0.01				
Cadmium, dissolved	mg/L	-0.005	-0.005	0.003				
Calcium, dissolved	mg/L	29.3	39.7	37.2				
Carbonate as CaCO ₃	mg/L	6	17	11				
Cation - Anion Balance	mg/L	-4.2	2.3	1.5				
Chloride	mg/L	1	2	2				
Conductivity @25C	µmhos/cm	373	475	436		447		
Copper, dissolved	mg/L	-0.01	-0.01	0.01				
Hardness as CaCO ₃	mg/L	97	130	122				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.02	0.27	0.07		-0.06	U	
Iron, total	mg/L	0.49	5.24	1.77		0.338		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	5.7	7.5	7.1				
Manganese, dissolved	mg/L	-0.005	0.032	0.010				
Manganese, total	mg/L	0.017	0.124	0.052				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02				
Nitrate/Nitrite (as N)	mg/L	0.04	0.16	0.09				
pH	SU	8.3	8.5	8.4		8.5	H	
Phosphate	mg/L	-0.03	0.16	0.07				
Phosphorus, ortho dissolved	mg/L	-0.01	0.05	0.02				
Potassium, dissolved	mg/L	1.2	1.8	1.5				
Residue, Filterable (TDS) @180C	mg/L	210	280	260		274		
Residue, Non-Filterable (TSS) @105C	mg/L	13	245	72		28.0		
Selenium, total recoverable	mg/L	0.0003	0.0005	0.0004				
Sodium Adsorption Ratio (SAR)	calc.	1.82	1.86	1.84				
Sodium, dissolved	mg/L	41.5	48.2	46.2				
Sulfate	mg/L	33	51.5	42				
Sum of Anions	meq/L	4.1	5.0	4.6				
Sum of Cations	meq/L	3.8	4.8	4.5				
TDS (calculated)	mg/L	214	265	246				
TDS (ratio - measured/calculated)	calc.	0.98	1.11	1.05				
Zinc, dissolved	mg/L	-0.01	-0.01	-0.01				
¹ Baseline Monitoring May Through October 2013. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. ⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit. Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.								



Spring 2012-4
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring 2012-4		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/26/2022	Q ⁴	9/5/2022
Field Parameters								
Flow	gpm	0.91	2.26	1.41	2.66	1.06		0.75
pH (Field)	SU	7.02	8.24	7.93	7.62	7.66		7.89
Conductivity (Field)	µmhos/cm	444	538	507	528	549		559
Temperature (Field)	°C	4.7	6.2	5.4	5.9	6.8		9.3
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73579-09		
Sample Date						5/26/2022		
Lab Test Date						6/2-6/14		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	173	209	196				
Aluminum, dissolved	mg/L	-0.03	0.07	0.03				
Arsenic, total recoverable	mg/L	-0.0002	0.0008	0.0003				
Bicarbonate as CaCO ₃	mg/L	169	204	189				
Boron, dissolved	mg/L	0.01	0.02	0.02				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	34.8	41.1	39.5				
Carbonate as CaCO ₃	mg/L	-2	13	7				
Cation - Anion Balance	mg/L	-1.1	2.1	1.0				
Chloride	mg/L	1	2	2				
Conductivity @25C	µmhos/cm	422	496	469		501		
Copper, dissolved	mg/L	-0.01	-0.01	-0.01				
Hardness as CaCO ₃	mg/L	113	134	128				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.02	0.45	0.11		-0.06	U	
Iron, total	mg/L	0.09	2.99	0.92		0.166		
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	6.4	7.5	7.2				
Manganese, dissolved	mg/L	-0.005	0.013	0.004				
Manganese, total	mg/L	-0.005	0.05	0.02				
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002				
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.03	0.02				
pH	SU	8.2	8.5	8.4		8.5	H	
Phosphate	mg/L	-0.03	0.09	0.05				
Phosphorus, ortho dissolved	mg/L	-0.01	0.03	0.02				
Potassium, dissolved	mg/L	0.9	1.6	1.2				
Residue, Filterable (TDS) @180C	mg/L	240	298	274		310		
Residue, Non-Filterable (TSS) @105C	mg/L	-5	112	34		13.0	B	
Selenium, total recoverable	mg/L	0.0003	0.0004	0.0003				
Sodium Adsorption Ratio (SAR)	calc.	1.93	2.03	2.01				
Sodium, dissolved	mg/L	46.6	53.1	51.6				
Sulfate	mg/L	37	45	40				
Sum of Anions	meq/L	4.4	5.0	4.8				
Sum of Cations	meq/L	4.3	5.06	4.9				
TDS (calculated)	mg/L	234	268	259				
TDS (ratio - measured/calculated)	calc.	1.03	1.12	1.06				
Zinc, dissolved	mg/L	-0.01	0.16	0.02				

¹ Baseline Monitoring May Through October 2013.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Spring ST-S-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Spring ST-S-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/9/2022	5/30/2022	Q ⁴	9/2/2022
Field Parameters								
Flow	gpm	--	--	--	3	1.33		seep
pH (Field)	SU	6.85	8.73	8.01	7.27	8.25		8.13
Conductivity (Field)	µmhos/cm	357	596	468	449	397		488
Temperature (Field)	°C	8.5	19.6	14.5	8.5	11.4		18.5
Comment					estimated flow			
Laboratory Parameters²								
Name of Certified Lab ³						ACZ		
Lab Reference #						L73578-04		
Sample Date						5/30/2022		
Lab Test Date						6/1-6/21		
Sampled By						PH		
Alkalinity (Total CaCO ₃)	mg/L	163	266	206		218		
Aluminum, dissolved	mg/L	-0.05	0.21	0.09		0.092	B	
Arsenic, total recoverable	mg/L	0.0004	0.0045	0.0022		0.00194		
Bicarbonate as CaCO ₃	mg/L	161	266	203		203		
Boron, dissolved	mg/L	-0.02	0.04	0.03		0.031	B	
Cadmium, dissolved	mg/L	-0.008	-0.005	-0.005		-0.008	U	
Calcium, dissolved	mg/L	2.6	21.9	12.7		2.15		
Carbonate as CaCO ₃	mg/L	-10	7	4		14.9	B	
Cation-Anion Balance	%	-5.8	3.7	-1.3		-4.7		
Chloride	mg/L	1.6	7.2	3.3		1.65	B	
Conductivity @25C	umhos/cm	374	526	430		377		
Copper, dissolved	mg/L	-0.01	0.01	0.01		-0.01	U	
Hardness as CaCO ₃ (dissolved)	mg/L	9	82	47		7.6		
Hydroxide as CaCO ₃	mg/L	-10	-2	-2		-2	U	
Iron, dissolved	mg/L	-0.03	0.52	0.18		0.153		
Iron, total	mg/L	0.63	18.10	8.82		12.3		
Lead, dissolved	mg/L	-0.03	-0.03	-0.03		-0.03	U	
Magnesium, dissolved	mg/L	0.7	6.5	3.8		0.55	B	
Manganese, dissolved	mg/L	-0.01	0.08	0.03		-0.01	U	
Manganese, total	mg/L	-0.01	0.35	0.15		0.178		
Mercury, total	mg/L	-0.0002	-0.0002	-0.0002		-0.0002	U	
Molybdenum, dissolved	mg/L	-0.02	-0.02	-0.02		-0.02	U	
Nitrate/Nitrite as N	mg/L	-0.02	0.77	0.17		-0.02	U	
pH	units	7.3	8.4	8.1		8.6	H	
Phosphate	mg/L	0.06	0.19	0.11		0.33		
Phosphorus, ortho dissolved	mg/L	0.02	0.06	0.04		0.106	H	
Potassium, dissolved	mg/L	0.6	1.7	1.0		0.58	B	
Residue, Filterable (TDS) @180C	mg/L	260	760	381		298		
Residue, Non-Filterable (TSS) @105C	mg/L	14.0	312.0	154.6		338		
Selenium, total recoverable	mg/L	-0.0001	0.003	0.001		-0.0001	U	
Sodium Adsorption Ratio in Water	calc.	3.5	13.0	7.0		14		
Sodium, dissolved	mg/L	64.5	102.0	79.0		89.4		
Sulfate	mg/L	-1	38.9	21.1		2.5	B	
Sum of Anions	meq/L	3.9	5.5	4.6		4.5		
Sum of Cations	meq/L	4.1	5.0	4.5		4.1		
TDS (calculated)	mg/L	213	280	246		230		
TDS (ratio - measured/calculated)	calc.	1.12	2.71	1.50		1.30		
Zinc, dissolved	mg/L	-0.01	0.01	0.01		-0.02	U	

¹ Baseline period is July 2018 through July 2019.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte concentration detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

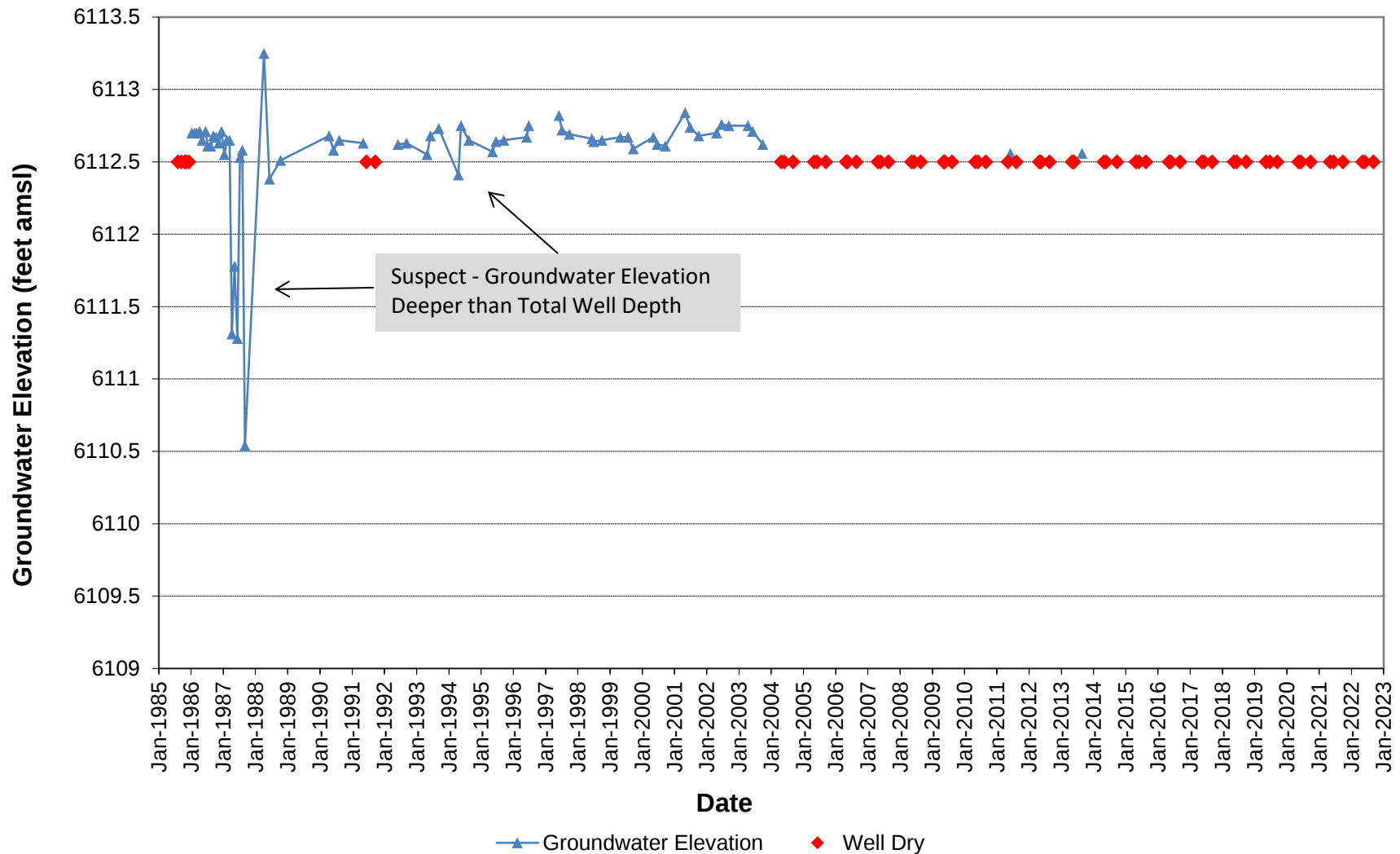
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



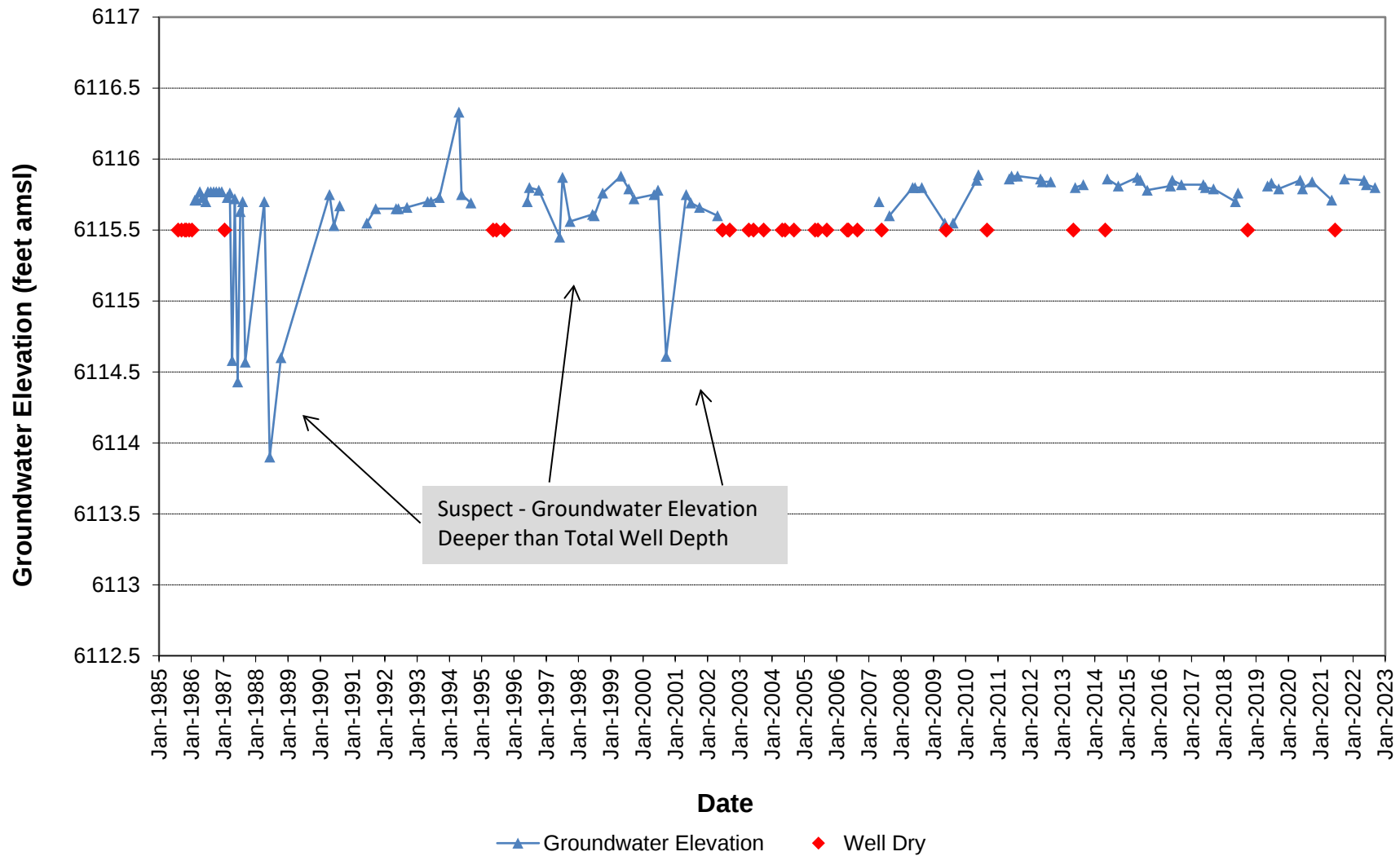
APPENDIX F

WELLS - WATER LEVEL ELEVATION GRAPHS

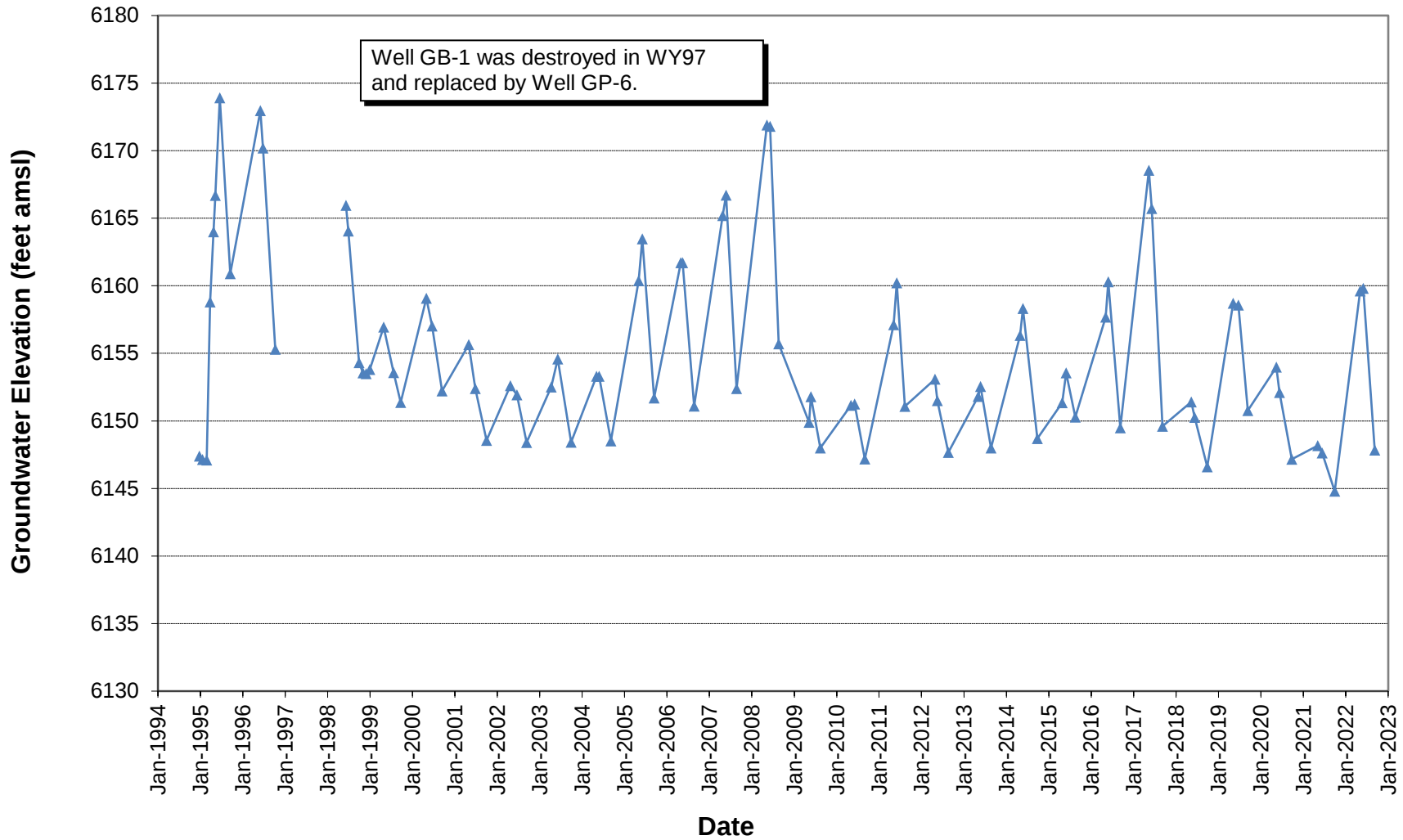
Well GP-3 - Groundwater Elevations
Formation: Colluvium (Total Depth = 33 ft)



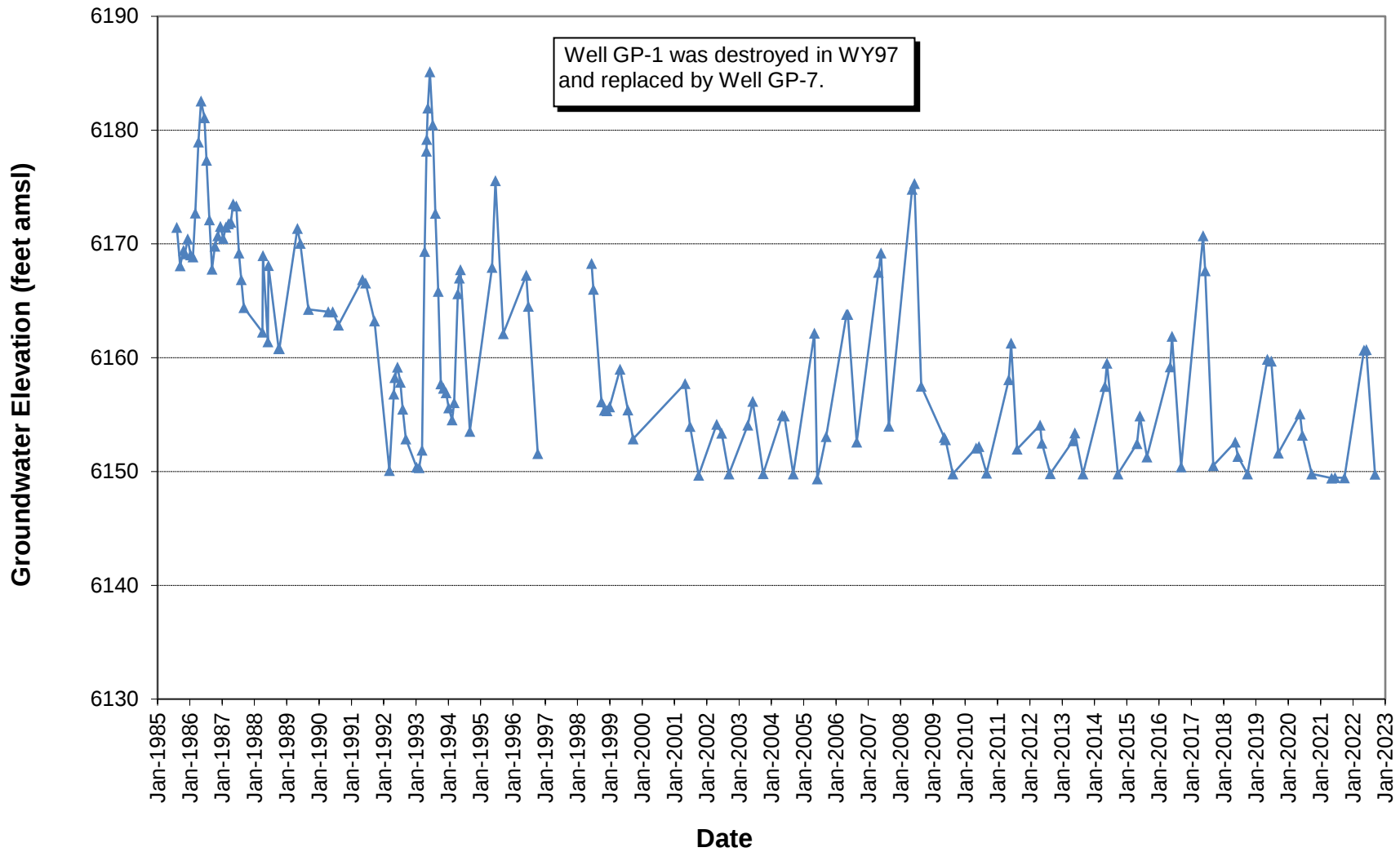
GP-4 - Groundwater Elevations Formation: Colluvium (Total Depth = 32 ft)



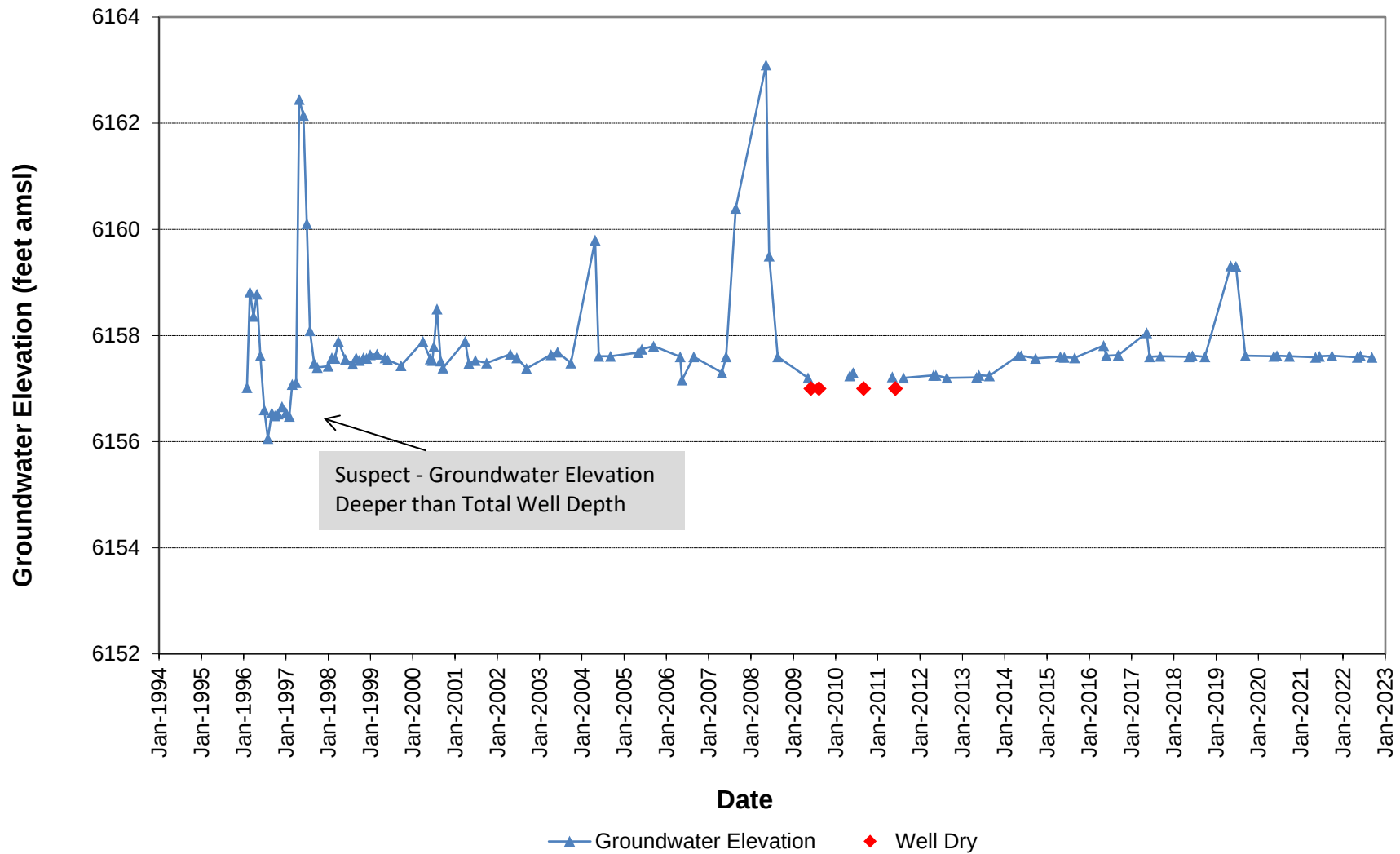
Well GP-6 - Groundwater Elevations **Formation: Sylvester Gulch Alluvium (Total Depth = 83 ft)**



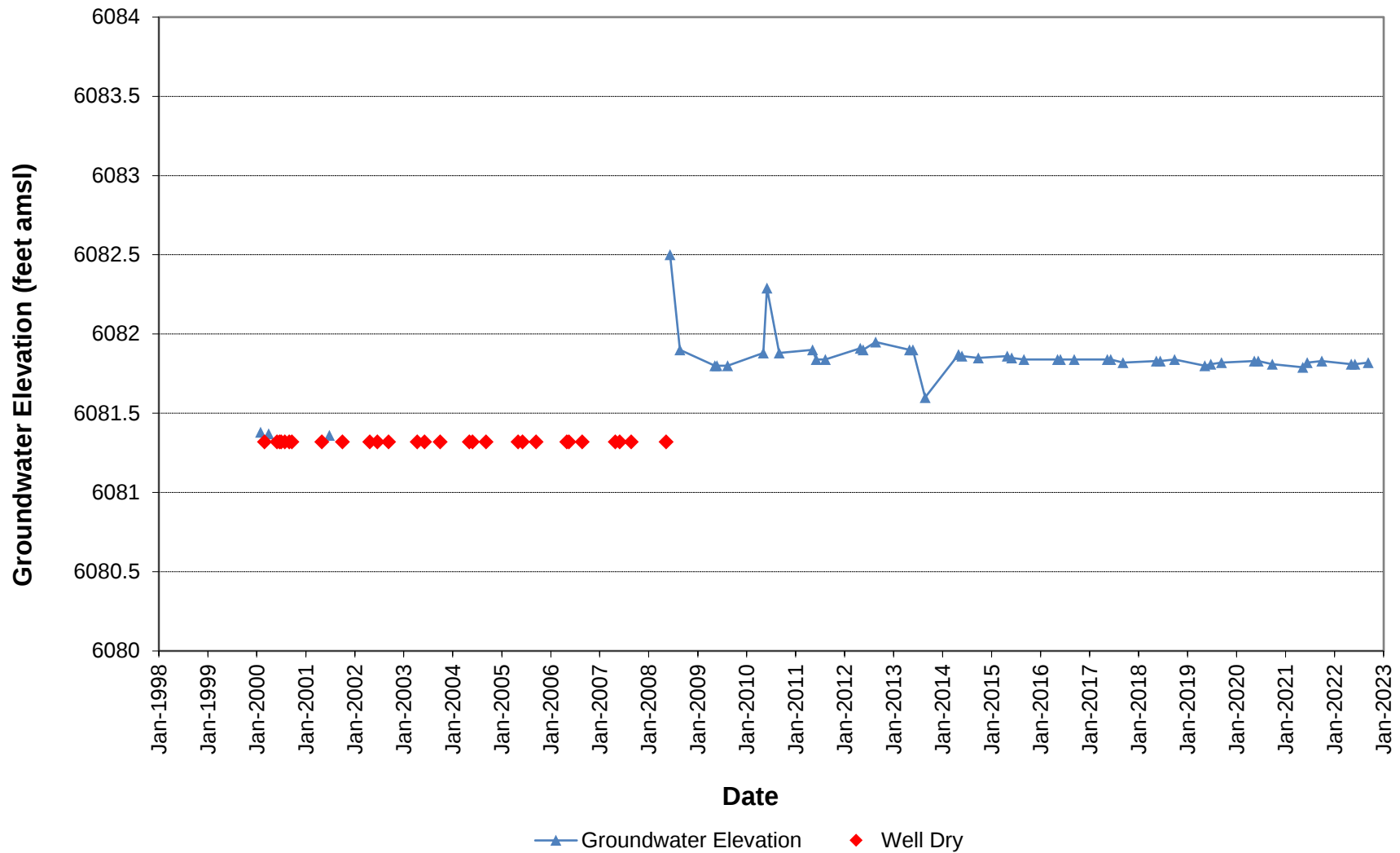
Well GP-7 - Groundwater Elevations
Formation: Sylvester Gulch Alluvium (Total Depth = 55 ft)



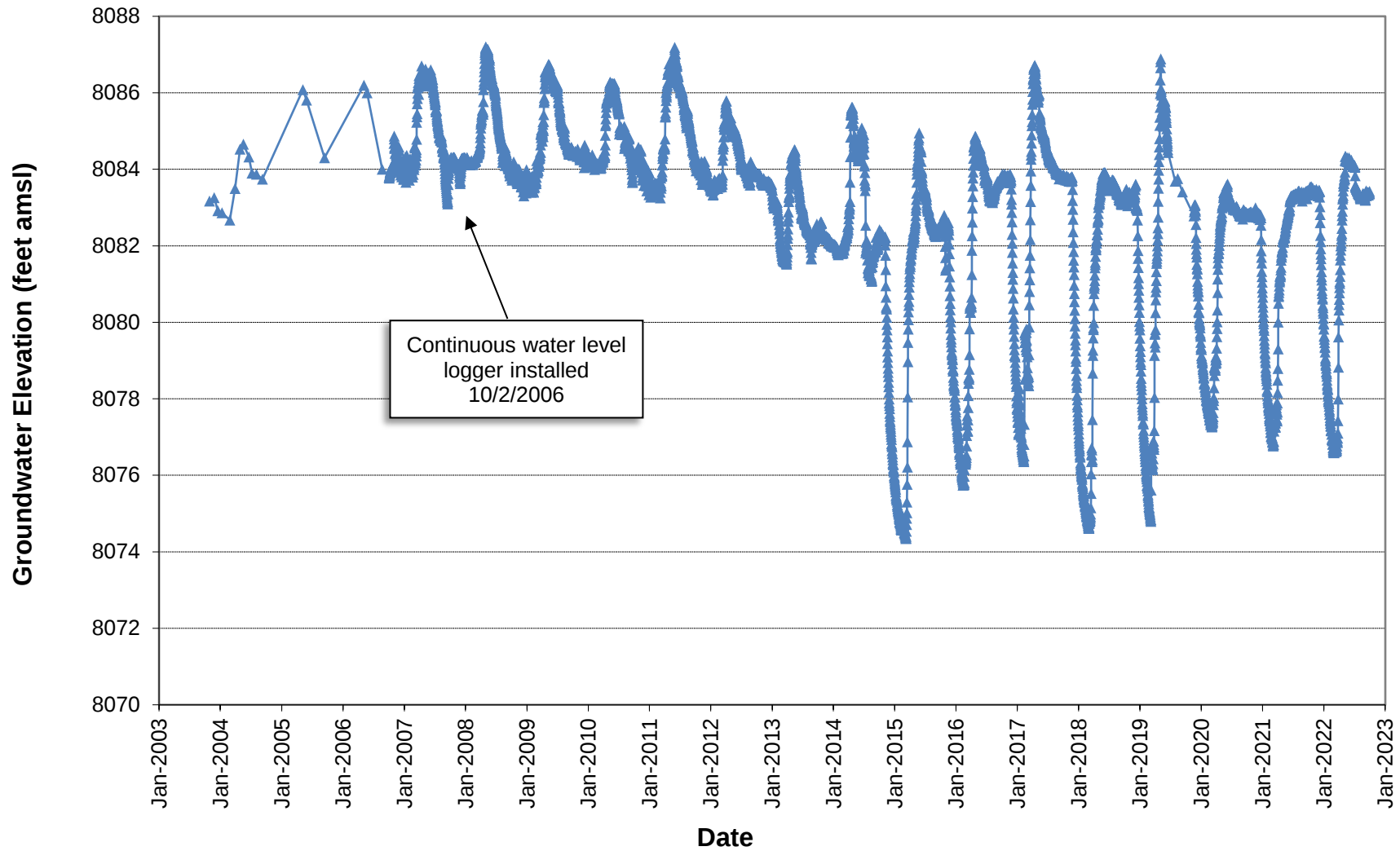
Well RPE-1 - Groundwater Elevations
Formation: Colluvium (Total Depth = 30 ft)



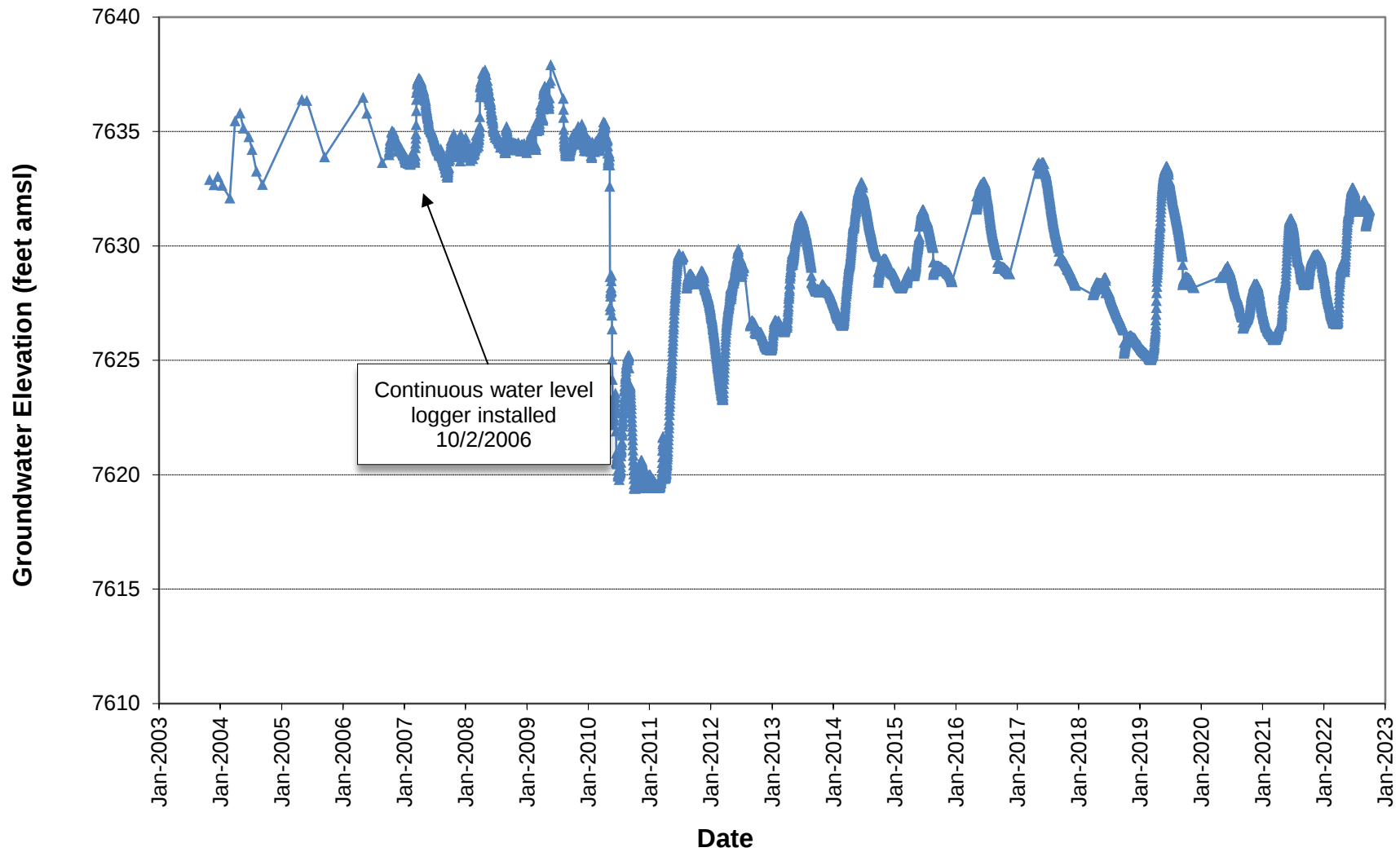
Well RPE-7 - Groundwater Elevations
Formation: Colluvium (Total Depth = 32 ft)



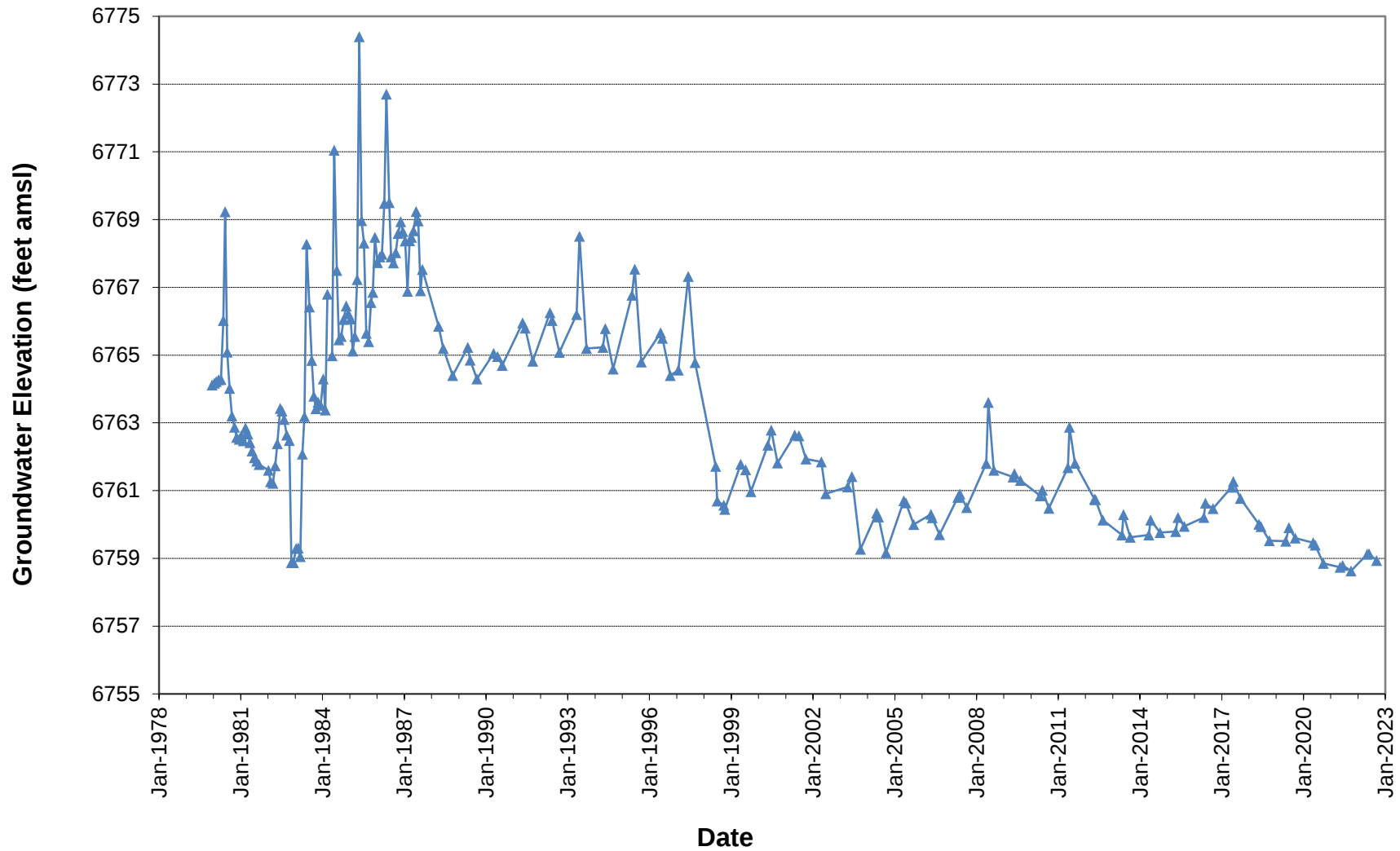
Upper Dry Fork Alluvial Well - Groundwater Elevations Formation: Alluvium (Total Depth = 29 ft)



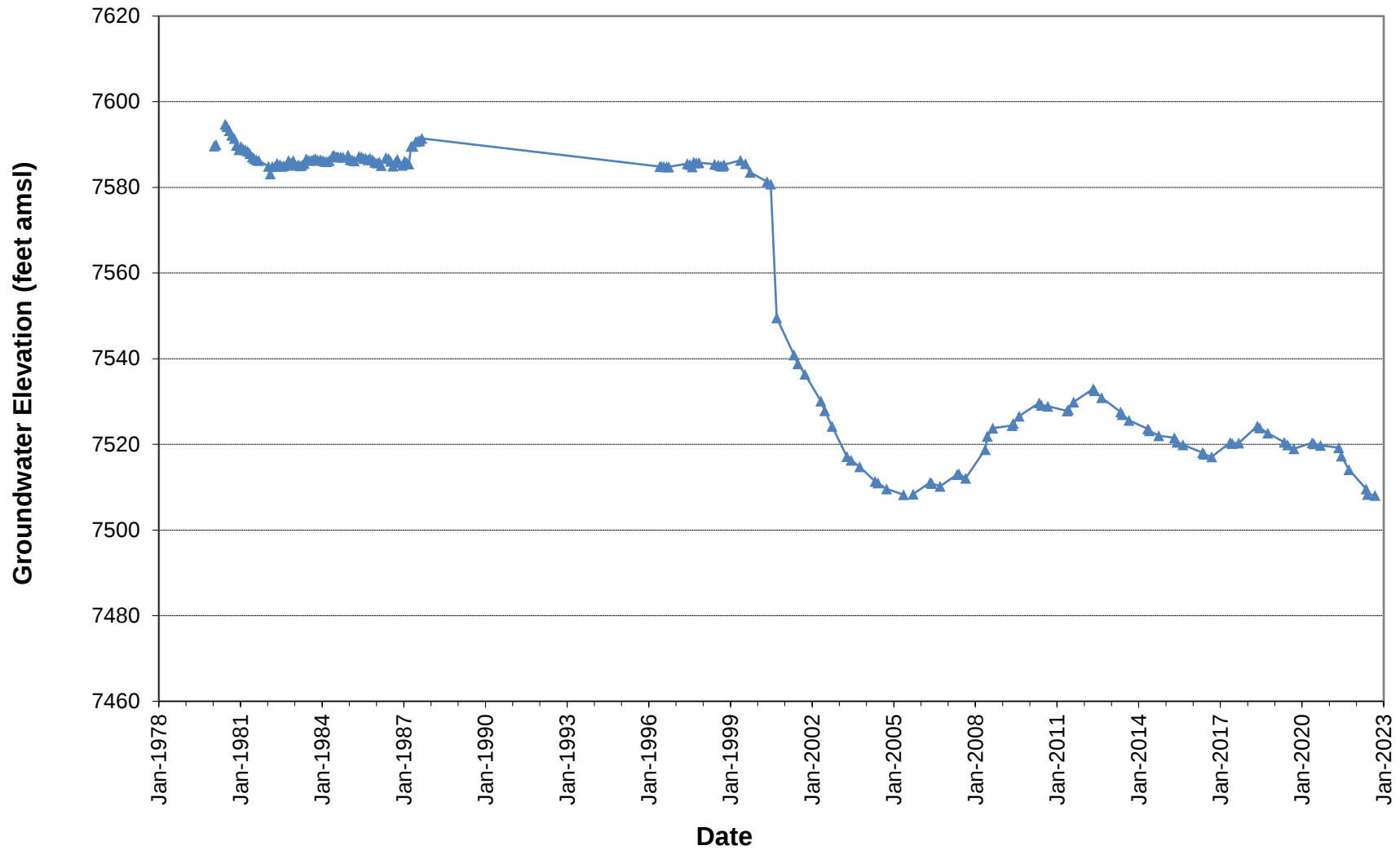
Lower Dry Fork Alluvial Well - Groundwater Elevations
Formation: Alluvium (Total Depth = 22.5 ft)



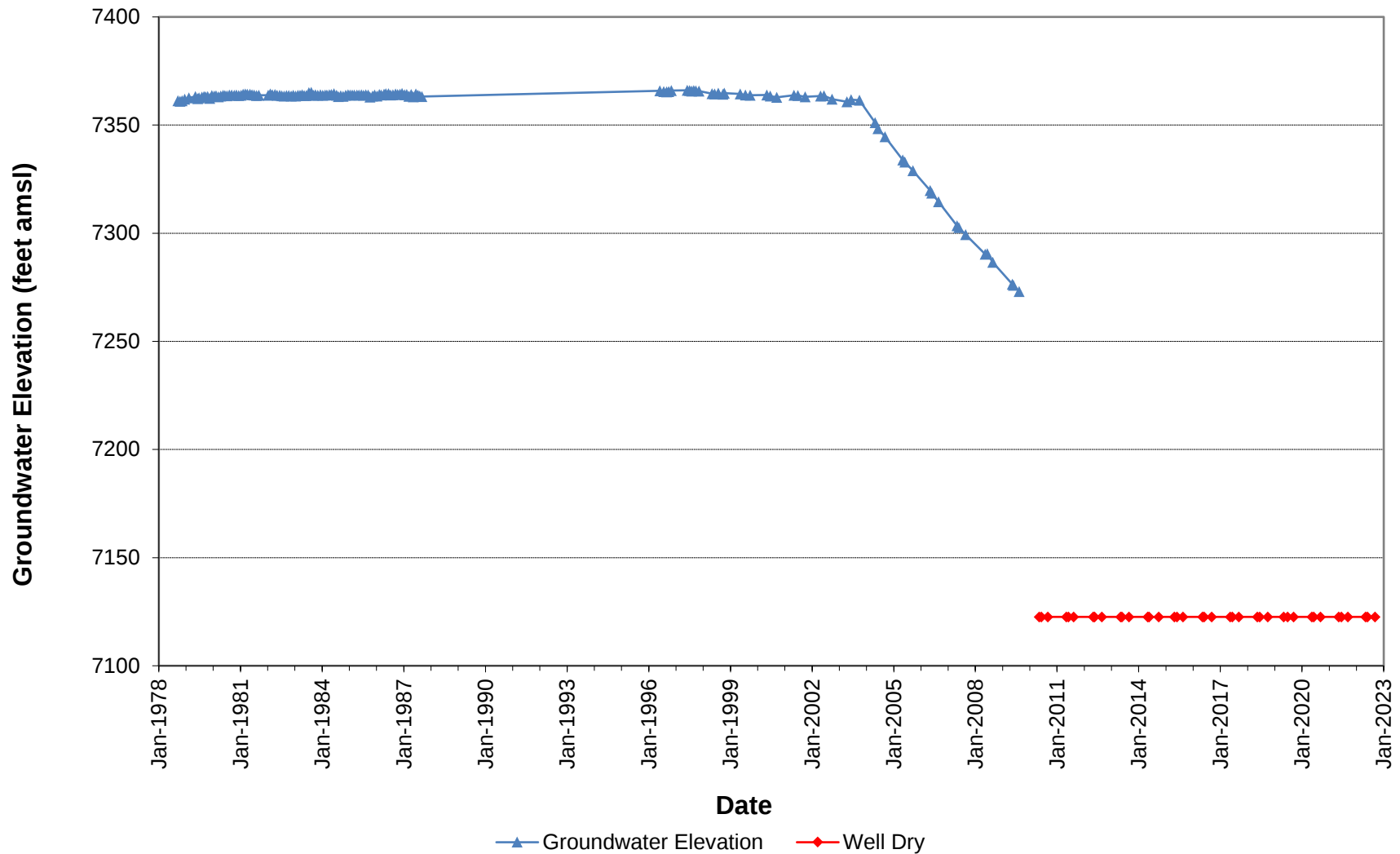
Well SOM-80 - Groundwater Elevations
Formation: Barren Member (Total Depth = 142.5 ft)



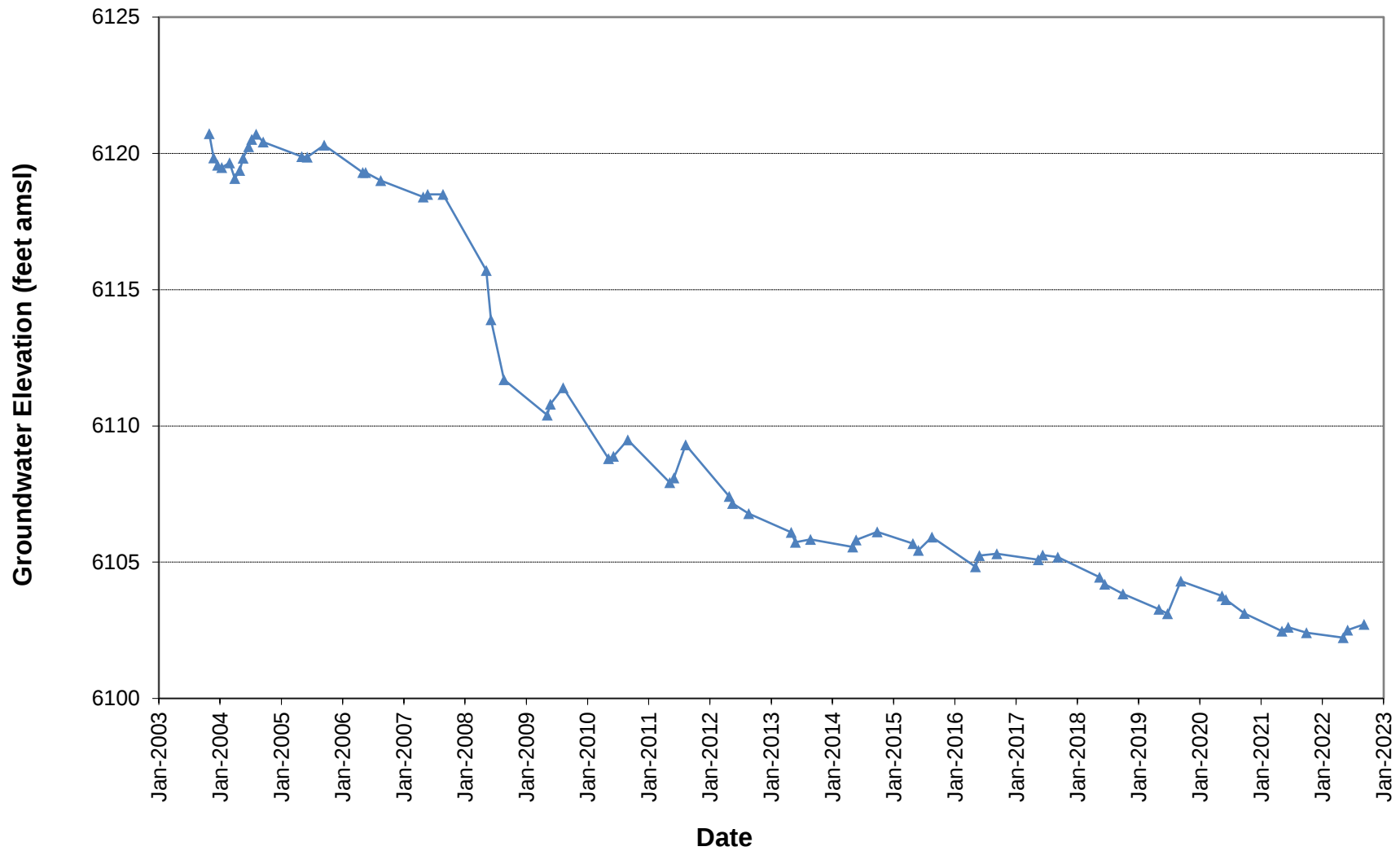
Well SOM-45-H-1 - Groundwater Elevations
Formation: Barren Member (Total Depth = 260 ft)



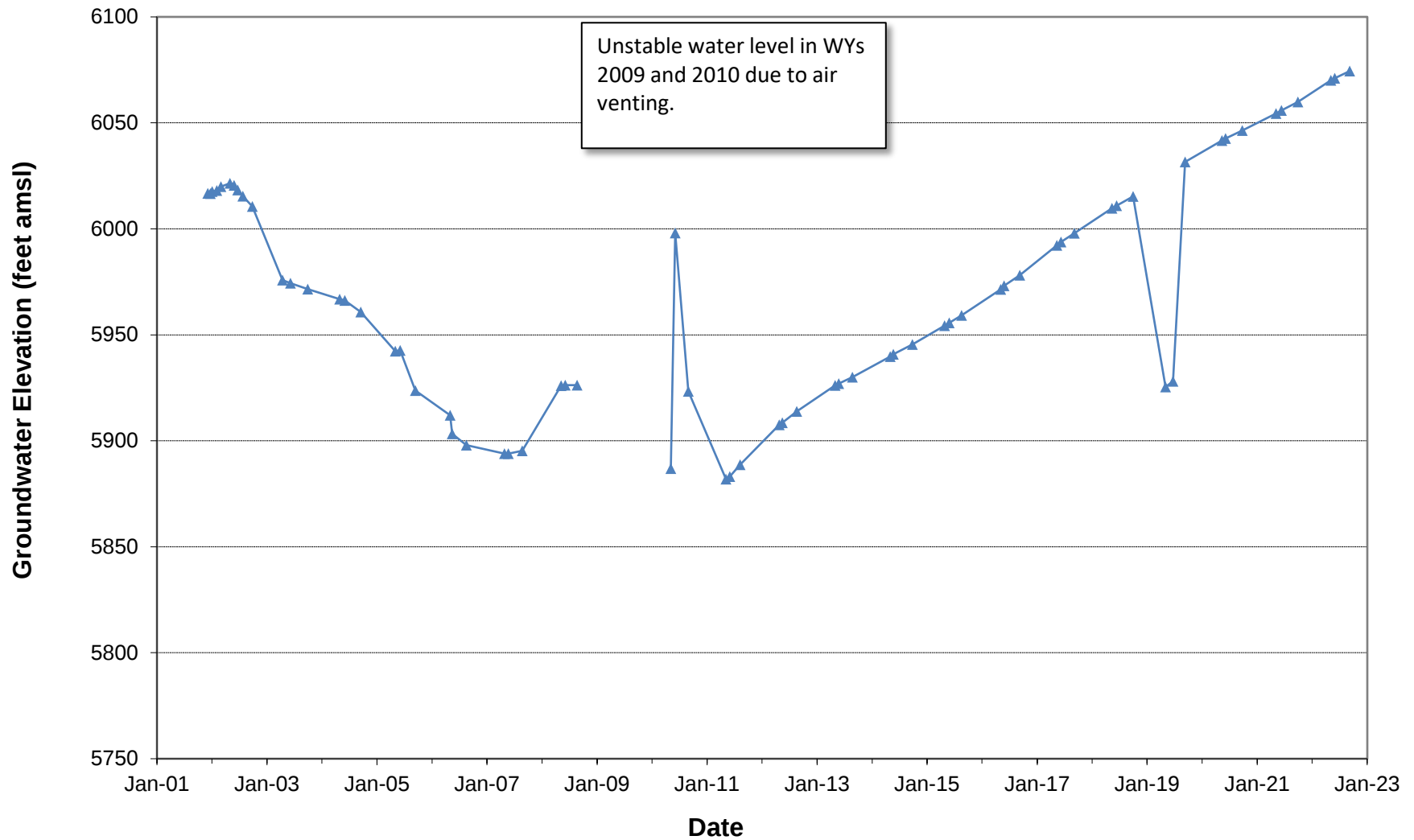
Well SOM-C-76 - Groundwater Elevations
Formation: F-Seam (Total Depth = 457 ft)



Well 03-11-1- Groundwater Elevations
Formation: E-Seam (Total Depth = 250 ft)



Well 01-11-1 - Groundwater Elevations
Formation: B-Seam (Total Depth = 638 ft)



APPENDIX G

WELLS - LABORATORY AND FIELD WATER QUALITY DATA

Well GP-3
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Well GP-3		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Water Level Depth	feet				dry	dry	dry
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field- F)	°F						
Temperature (Field)	°C						
Comment							
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Conductivity @25C	µmhos/cm						
Iron, dissolved	mg/L						
Iron, total	mg/L						
pH	SU						
Residue, Filterable (TDS) @180C	mg/L						
Residue, Non-Filterable (TSS) @105C	mg/L						
¹ No baseline data.							



Well GP-4
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Well GP-4		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Water Level Depth	feet				31.65	31.68	31.7
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field- F)	°F						
Temperature (Field)	°C						
Comment					not enough water for sample	not enough water for sample	not enough water for sample
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Conductivity @25C	µmhos/cm						
Iron, dissolved	mg/L						
Iron, total	mg/L						
pH	SU						
Residue, Filterable (TDS) @180C	mg/L						
Residue, Non-Filterable (TSS) @105C	mg/L						

¹ No baseline data.



Well GP-6
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location Well GP-6		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				45.19	44.98	56.96	
pH (Field)	SU				7.35	7.21	7.28	
Conductivity (Field)	µmhos/cm				1,201	1,205	1,214	
Temperature (Field)	°C				12.2	12.9	12.9	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-11	
Sample Date							9/7/2022	
Lab Test Date							9/13-9/20	
Sampled By							PH	
Conductivity @25C	µmhos/cm						1,210	
Iron, dissolved	mg/L						0.222	
Iron, total	mg/L						0.633	
pH	SU						8.1	H
Residue, Filterable (TDS) @180C	mg/L						712	
Residue, Non-Filterable (TSS) @105C	mg/L						6.0	B
¹ No baseline data. ² Negative values denote readings below lab detection levels. ³ ACZ Laboratory, Steamboat Springs, CO. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.								



Well GP-7
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Well GP-7		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				45.03	44.98	55.93	
pH (Field)	SU				6.97	6.9		
Conductivity (Field)	µmhos/cm				1,720	1,722		
Temperature (Field)	°C				11.7	12.0		
Comment							not enough water for sample	
Laboratory Parameters ²								
Name of Certified Lab ³								
Lab Reference #								
Sample Date								
Lab Test Date								
Sampled By								
Conductivity @25C	µmhos/cm							
Iron, dissolved	mg/L							
Iron, total	mg/L							
pH	SU							
Residue, Filterable (TDS) @180C	mg/L							
Residue, Non-Filterable (TSS) @105C	mg/L							
¹ No baseline data. ² ACZ Laboratory, Steamboat Springs, CO. ³ Negative values denote readings below lab detection levels. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.								



Well RPE-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Well RPE-1		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Water Level Depth	feet				29.41	29.38	29.41
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field)	°C						
Comment					not enough water for sample	not enough water for sample	not enough water for sample
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Conductivity @25C	µmhos/cm						
Iron, dissolved	mg/L						
Iron, total	mg/L						
pH	SU						
Residue, Filterable (TDS) @180C	mg/L						
Residue, Non-Filterable (TSS) @105C	mg/L						
¹ No baseline data.							



Well RPE-7
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Well RPE-7		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Water Level Depth	feet				34.49	34.49	34.48
pH (Field)	SU						
Conductivity (Field)	µmhos/cm						
Temperature (Field)	°C						
Comment					not enough water for sample	not enough water for sample	not enough water for sample
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Conductivity @25C	µmhos/cm						
Iron, dissolved	mg/L						
Iron, total	mg/L						
pH	SU						
Residue, Filterable (TDS) @180C	mg/L						
Residue, Non-Filterable (TSS) @105C	mg/L						
¹ No baseline data.							



**Upper Dry Fork Alluvial Well
Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Upper Dry Fk Alluvial Well		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/6/2022	5/27/2022	9/5/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				16.18	15.98	16.64	
pH (Field)	SU				7.53	7.48	7.73	
Conductivity (Field)	µmhos/cm				868	871	858	
Temperature (Field)	°C				9.7	10.7	10.2	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-05	
Sample Date							9/5/2022	
Lab Test Date							9/9-9/20	
Sampled By							PH	
Alkalinity (Total CaCO ₃)	mg/L	227	266	248				
Arsenic, dissolved	mg/L	-0.0005	0.0006	0.0002				
Bicarbonate as CaCO ₃	mg/L	227	266	248				
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005				
Calcium, dissolved	mg/L	3.2	5.1	3.7				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	%	0.9	3.9	1.9				
Chloride	mg/L	-1	6	4				
Conductivity @25C	µmhos/cm	493	509	503			847	
Hardness as CaCO ₃	mg/L	10	16	12				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.03	0.49	0.19			-0.06	U
Iron, total	mg/L	1.3	25.9	13.6			0.63	
Lead, dissolved	mg/L	-0.04	-0.04	-0.04				
Magnesium, dissolved	mg/L	-0.2	0.7	0.4				
Manganese, dissolved	mg/L	0.067	0.101	0.081				
Manganese, total	mg/L	0.109	0.349	0.229				
Mercury, dissolved	mg/L	-0.0002	0.0015	0.0002				
Nitrate/Nitrite (as N)	mg/L	0.04	0.87	0.16				
Nitrogen, ammonia	mg/L	-0.05	0.20	0.10				
pH	SU	8.0	8.1	8.0			8.1	H
Phosphate	mg/L	0.1	0.4	0.2				
Phosphorus, ortho dissolved	mg/L	0.03	0.13	0.06				
Potassium, dissolved	mg/L	0.9	2.7	1.8				
Residue, Filterable (TDS) @180C	mg/L	290	390	326			526	
Residue, Non-Filterable (TSS) @105C	mg/L						26	
Selenium, dissolved	mg/L	-0.0010	0.0003	0.0003				
Sodium Absorption Ratio (SAR)	calc.	16	17	17				
Sodium, dissolved	mg/L	113	144	126				
Sulfate	mg/L	30	50	35				
Sum of Anions	meq/L	5.6	6.2	5.8				
Sum of Cations	meq/L	5.7	6.7	6.0				
TDS (calculated)	calc.	313	313	313				
TDS (ratio - measured/calculated)	mg/L	1	1	1				
Zinc, dissolved	mg/L	-0.01	0.04	0.02				

¹ Baseline 2004.
² Negative values denote readings below lab detection levels.
³ ACZ Laboratory, Steamboat Springs, CO.
⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.
⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.
Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



**Lower Dry Fork Alluvial Well
Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022										
Monitoring Location: Lower Dry Fk Alluvial Well		Baseline ¹			Water Year 2022					
Description	Units	Minimum	Maximum	Mean ⁵	5/4/2022	5/27/2022	9/6/2022	Q ⁴	9/6/2022 (Duplicate)	Q ⁴
Field Parameters										
Water Level Depth	feet	4.19	7.90	6.27	10.59	8.48	8.19		--	
pH (Field)	SU	6.60	7.10	6.87	7.49	7.62	7.67		--	
Conductivity (Field)	µmhos/cm	575	693	626	564	561	548		--	
Temperature (Field)	°C	6.4	16.4	10.3	7.9	10.2	12.5		--	
Comment										
Laboratory Parameters ²										
Name of Certified Lab ³							ACZ		ACZ	
Lab Reference #							L75716-08		L75716-12	
Sample Date							9/6/2022		9/6/2022	
Lab Test Date							9/13-9/20		9/13-9/20	
Sampled By							PH		PH	
Alkalinity (Total CaCO ₃)	mg/L	260	300	272						
Arsenic, dissolved	mg/L	-0.0005	0.0004	0.0003						
Bicarbonate as CaCO ₃	mg/L	260	300	272						
Cadmium, dissolved	mg/L	-0.005	-0.005	-0.005						
Calcium, dissolved	mg/L	38.5	62.6	53.4						
Carbonate as CaCO ₃	mg/L	-2	-2	-2						
Cation - Anion Balance	%	0.9	3.3	1.7						
Chloride	mg/L	-1	3	2						
Conductivity @25C	µmhos/cm	459	497	482			527		522	
Hardness as CaCO ₃	mg/L	186	208	200						
Hydroxide as CaCO ₃	mg/L	-2	-2	-2						
Iron, dissolved	mg/L	-0.01	0.83	0.15			-0.06	U	-0.06	U
Iron, total	mg/L	0.08	0.51	0.26			-0.06	U	-0.06	U
Lead, dissolved	mg/L	-0.04	-0.04	-0.04						
Magnesium, dissolved	mg/L	10.2	16.0	13.8						
Manganese, dissolved	mg/L	-0.01	1.96	0.37						
Manganese, total	mg/L	1.13	2.48	1.72						
Mercury, dissolved	mg/L	-0.0002	0.0014	0.0002						
Nitrate/Nitrite (as N)	mg/L	-0.02	0.71	0.13						
Nitrogen, ammonia	mg/L	-0.05	0.09	0.044						
pH	SU	7.8	8.0	7.9			8.2	H	8.2	H
Phosphate	mg/L	-0.030	0.030	0.02						
Phosphorus, ortho dissolved	mg/L	-0.05	0.01	0.01						
Potassium, dissolved	mg/L	2.0	3.1	2.5						
Residue, Filterable (TDS) @180C	mg/L	250	310	297			288		282	
Residue, Non-Filterable (TSS) @105C	mg/L						6.0	B	5.0	B
Selenium, dissolved	mg/L	-0.0010	0.0001	0.0003						
Sodium Absorption Ratio (SAR)	calc.	1.18	1.45	1.32						
Sodium, dissolved	mg/L	35	46	41						
Sulfate	mg/L	20	20	20						
Sum of Anions	meq/L	5.8	5.8	5.8						
Sum of Cations	meq/L	5.9	6.2	6.0						
Zinc, dissolved	mg/L	-0.01	0.03	0.02						

¹ Baseline 2004.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Well SOM-80
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Well SOM-80		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/4/2022	5/27/2022	9/6/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				95.28	95.26	95.46	
pH (Field)	SU				7.41	7.29	7.40	
Conductivity (Field)	µmhos/cm				1,103	1,139	1,192	
Temperature (Field)	°C				11.4	12.1	13.9	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-10	
Sample Date							9/6/2022	
Lab Test Date							9/13-9/20	
Sampled By							PH	
Ammonia	mg/L	0	1.73	0.51				
Arsenic, dissolved	mg/L	0	0	0				
Bicarbonate as CaCO ₃	mg/L	213	641	443				
Cadmium, dissolved	mg/L	0	0	0				
Calcium, dissolved	mg/L	60.2	60.2	60.2				
Chloride	mg/L	3	17	7				
Conductivity @25C	µmhos/cm	886	897	892			1,190	
Hardness as CaCO ₃	mg/L	45	754	389				
Iron, dissolved	mg/L	0	0.82	0.15			-0.06	U
Iron, total	mg/L	0	6.8	0.71			0.233	
Lead, dissolved	mg/L	0	0	0				
Magnesium, dissolved	mg/L	17.6	17.6	17.6				
Manganese, dissolved	mg/L	0.005	0.01	0.008				
Manganese, total	mg/L	0	0.557	0.066				
Mercury, dissolved	mg/L	0	0	0				
Nitrate/Nitrite (as N)	mg/L	0.24	0.49	0.33				
pH	SU	6.7	8.1	7.4			8.2	H
Phosphorus, ortho dissolved	mg/L	0	0.3	0.049				
Residue, Filterable (TDS) @180C	mg/L	26.8	1,888	868			710	
Residue, Non-Filterable (TSS) @105C	mg/L						14.0	B
Selenium, dissolved	mg/L	0	0	0				
Sodium Absorption Ratio (SAR)	calc.	1.94	5.22	2.91				
Sodium, dissolved	mg/L	129	129	129				
Sulfate	mg/L	70	984	515				
Zinc, dissolved	mg/L	0.02	0.02	0.02				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Well SOM-45-H-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Well SOM-45-H-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/9/2022	5/27/2022	9/6/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				194.23	195.48	195.73	
pH (Field)	SU	6.4	8.6	7.7	7.61	7.64	7.68	
Conductivity (Field)	µmhos/cm	1,073	1,626	1,285	2,170	2,240	1,938	
Temperature (Field)	°C				10.6	10.5	13.4	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-06	
Sample Date							9/6/2022	
Lab Test Date							9/13-9/20	
Sampled By							PH	
Alkalinity (Total CaCO ₃)	mg/L	286	955	635				
Ammonia	mg/L	0.03	2.35	0.69				
Arsenic, dissolved	mg/L	0	0.002	0.001				
Bicarbonate as CaCO ₃	mg/L	0	1156	455				
Cadmium, dissolved	mg/L	0	0	0				
Calcium, dissolved	mg/L	4	6.9	5.6				
Carbonate as CaCO ₃	mg/L	0	218	17				
Cation - Anion Balance	%	-5.4	3.8	-0.2				
Chloride	mg/L	2	10	8				
Conductivity @25C	µmhos/cm	1,310	1,390	1,350			1,980	
Hardness as CaCO ₃	mg/L	15	882	215				
Hydroxide as CaCO ₃	mg/L	0	0	0				
Iron, dissolved	mg/L	0	0.86	0.25			0.13	B
Iron, total	mg/L	0.35	6.15	1.96			0.895	
Lead, dissolved	mg/L	0	0	0				
Magnesium, dissolved	mg/L	1.3	5	2.1				
Manganese, dissolved	mg/L	0.034	0.064	0.048				
Manganese, total	mg/L	0.014	0.39	0.131				
Mercury, dissolved	mg/L	0	0	0				
Nitrate/Nitrite (as N)	mg/L	0	0.04	0.01				
Nitrogen, ammonia	mg/L	0.1	1.04	0.61				
pH	SU	7	8.2	7.6			8.3	H
Phosphate	mg/L	0.39	0.42	0.41				
Phosphorus, ortho dissolved	mg/L	0	0.535	0.074				
Potassium, dissolved	mg/L	2	2.5	2.3				
Residue, Filterable (TDS) @180C	mg/L						1,210	
Residue, Non-Filterable (TSS) @105C	mg/L						24.0	
Selenium, dissolved	mg/L	0	0	0				
Sodium Absorption Ratio (SAR)	calc.	14.9	37.9	32				
Sodium, dissolved	mg/L	308	385	352				
Sulfate	mg/L	20	526	161				
Sum of Anions	meq/L	15	15.5	15.3				
Sum of Cations	meq/L	13.9	16.4	15.3				
Zinc, dissolved	mg/L	0	0.02	0.01				

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Well SOM-C-76
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: Well SOM-C-76		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean ²	5/4/2022	5/27/2022	9/5/2022
Field Parameters							
Water Level Depth	feet				dry	dry	dry
pH (Field)	SU	5.2	8.2	9.3			
Conductivity (Field)	µmhos/cm	1,910	2,500	2,970			
Temperature (Field)	°C						
Comment							
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/L	1,294	1,503	1,860			
Ammonia	mg/L	0.00	0.64	1.36			
Arsenic, dissolved	mg/L	0.000	0.000	0.001			
Bicarbonate as CaCO ₃	mg/L	41	1,181	1,894			
Cadmium, dissolved	mg/L	0.000	0.000	0.000			
Calcium, dissolved	mg/L	1.6	2.0	2.3			
Carbonate as CaCO ₃	mg/L	0	30	186			
Cation - Anion Balance	%	-3.3	-0.45	3.0			
Chloride	mg/L	0	4	17			
Conductivity @25C	µmhos/cm	2,300	2,487	2,650			
Hardness as CaCO ₃	mg/L	6	15	43			
Hydroxide as CaCO ₃	mg/L	0	0	0			
Iron, dissolved	mg/L	0.00	0.13	1.00			
Iron, total	mg/L	0.00	5.01	18.00			
Lead, dissolved	mg/L	0.00	0.00	0.00			
Magnesium, dissolved	mg/L	0.6	0.8	1.5			
Manganese, dissolved	mg/L	0.000	0.005	0.016			
Manganese, total	mg/L	0.000	0.017	0.145			
Mercury, dissolved	mg/L	0.0000	0.0000	0.0000			
Nitrate/Nitrite (as N)	mg/L	0.00	0.16	2.16			
Nitrogen, ammonia	mg/L	0.57	0.65	0.73			
pH	SU	7.9	8.4	9.3			
Phosphate	mg/L	0.06	0.06	0.06			
Phosphorus, ortho dissolved	mg/L	0.000	0.068	1.26			
Potassium, dissolved	mg/L	3.6	3.9	4.2			
Residue, Filterable (TDS) @180C	mg/L	1,530	1,642	2,590			
Residue, Non-Filterable (TSS) @105C	mg/L	7	37	226			
Selenium, dissolved	mg/L	0.000	0.000	0.000			
Sodium Absorption Ratio (SAR)	calc.	46.1	102.7	128.6			
Sodium, dissolved	mg/L	658	700	756			
Sulfate	mg/L	0	9	180			
Sum of Anions	meq/L	29.6	30.88	32.71			
Sum of Cations	meq/L	29.30	30.53	31.50			
Zinc, dissolved	mg/L	0.00	0.00	0.01			

¹ Baseline and WY 2000 data adapted from WWE (2001).

² Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.



Well 03-11-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Well 03-11-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/5/2022	5/31/2022	9/6/2022	Q ⁴
Field Parameters								
Water Level Depth	feet				178.77	178.49	178.28	
pH (Field)	SU				7.30	7.29	7.39	
Conductivity (Field)	µmhos/cm				3,350	3,440	3,390	
Temperature (Field)	°C				14.5	14.6	14.6	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-09	
Sample Date							9/6/2022	
Lab Test Date							9/13-9/20	
Sampled By							PH	
Alkalinity (Total CaCO ₃)	mg/L	1,620	1,950	1,802				
Arsenic, dissolved	mg/L	-0.0030	0.0010	-0.0007				
Bicarbonate as CaCO ₃	mg/L	1,620	1,950	1,802				
Cadmium, dissolved	mg/L	-0.010	-0.005	-0.008				
Calcium, dissolved	mg/L	5.3	12.5	8.1				
Carbonate as CaCO ₃	mg/L	-2	-2	-2				
Cation - Anion Balance	%	-3.8	-2.5	-3.2				
Chloride	mg/L	66	177	89				
Conductivity @25C	µmhos/cm	2,660	2,730	2,695			3,170	
Hardness as CaCO ₃	mg/L	35	38	37				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	0.02	0.82	0.31			0.094	B
Iron, total	mg/L	0.30	0.49	0.40			0.23	
Magnesium, dissolved	mg/L	1.2	3.0	1.8				
Manganese, dissolved	mg/L	0.03	0.14	0.07				
Manganese, total	mg/L	0.14	0.15	0.15				
Mercury, dissolved	mg/L	-0.0002	0.0006	0.0002				
Nitrate (as N), dissolved	mg/L	0.03	0.21	0.10				
Nitrate/Nitrite (as N)	mg/L	-0.02	0.21	0.07				
Nitrite (as N), dissolved	mg/L	0.06	0.06	0.06				
Nitrogen, ammonia	mg/L	0.73	0.92	0.82				
pH	SU	8.1	8.3	8.2			8.3	H
Phosphate	mg/L	-0.03	0.09	0.01				
Phosphorus, ortho dissolved	mg/L	-0.01	0.03	-0.01				
Potassium, dissolved	mg/L	4.0	4.1	4.1				
Residue, Filterable (TDS) @180C	mg/L	1,850	2,130	2,044			1,970	
Residue, Non-Filterable (TSS) @105C	mg/L						5.0	B
Selenium, dissolved	mg/L	-0.0050	0.0030	-0.0010				
Sodium Absorption Ratio (SAR)	calc.	52.6	54.5	53.6				
Sodium, dissolved	mg/L	723	1,780	878				
Sulfate	mg/L	-10	40	1				
Sum of Anions	meq/L	35	36	35				
Sum of Cations	meq/L	33.0	33.4	33.2				
Zinc, dissolved	mg/L	-0.02	0.21	0.05				

¹ Baseline 2004.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.

H - Holding time exceeded; pH is a field test with an immediate hold time.

B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.

Shaded cells indicate parameters elevated greater than ten percent above the maximum baseline value.



Well 01-11-1
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: Well 01-11-1		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean ⁵	5/5/2022	5/31/2022	9/6/2022	Q ⁴
Field Parameters								
Water Level Depth	feet	259.85	295.39	268.40	211.17	210.19	206.89	
pH (Field)	SU	9.10	9.71	9.37	7.48	7.5	7.61	
Conductivity (Field)	µmhos/cm	5,010	6,820	5,880	4,350	4,340	4,350	
Temperature (Field)	°C	9.8	20.2	15.6	15.6	14.9	14.6	
Comment								
Laboratory Parameters ²								
Name of Certified Lab ³							ACZ	
Lab Reference #							L75716-07	
Sample Date							9/6/2022	
Lab Test Date							9/13-9/20	
Sampled By							PH	
Alkalinity (Total CaCO ₃)	mg/L	629	1,880	1,602				
Ammonia	mg/L	0.79	1.56	1.08				
Arsenic, dissolved	mg/L	-0.005	0.003	-0.001				
Bicarbonate as CaCO ₃	mg/L	522	1300	768				
Boron, dissolved	mg/L	1.11	1.25	1.18				
Cadmium, dissolved	mg/L	-0.0100	-0.0002	-0.0055				
Calcium, dissolved	mg/L	1.3	6.3	3.3				
Carbonate as CaCO ₃	mg/L	389	1360	1075				
Cation - Anion Balance	%	-10.4	1.7	-4.6				
Chloride	mg/L	527	640	603				
Conductivity @25C	µmhos/cm	4,060	5,740	5,115			4,170	
Hardness as CaCO ₃	mg/L	3	32	12				
Hydroxide as CaCO ₃	mg/L	-2	-2	-2				
Iron, dissolved	mg/L	-0.05	0.23	0.09			-0.12	U
Iron, total	mg/L	0.16	0.99	0.57			0.178	B
Lead, dissolved	mg/L	-0.080	0.081	-0.040				
Magnesium, dissolved	mg/L	-0.4	4.1	0.8				
Manganese, dissolved	mg/L	-0.01	0.05	0.01				
Manganese, total	mg/L	-0.010	0.030	0.003				
Mercury, total	mg/L	-0.00020	0.00040	-0.00003				
Nitrate/Nitrite (as N)	mg/L	-0.02	2.78	0.53				
Nitrogen, ammonia	mg/L	2.21	4.09	3.17				
pH	SU	9.4	10.1	9.8			8.3	H
Phosphate	mg/L	-0.03	0.16	0.09				
Phosphorus, ortho dissolved	mg/L	0.009	0.052	0.034				
Potassium, dissolved	mg/L	159	291	217				
Residue, Filterable (TDS) @180C	mg/L	2,910	3,300	3,180			2,610	
Residue, Non-Filterable (TSS) @105C	mg/L						10.0	B
Selenium, dissolved	mg/L	-0.001	0.002	-0.001				
Sodium Absorption Ratio (SAR)	calc.	72.6	212.0	150.5				
Sodium, dissolved	mg/L	816	1,080	942				
Sulfate	mg/L	40	50	48				
Sum of Anions	meq/L	51.1	56.6	53.7				
Sum of Cations	meq/L	43.4	54.0	47.7				
TDS (calculated)	calc.	2,900	3,430	3,165				
TDS (ratio - measured/calculated)	mg/L	0.91	1.00	0.96				
Zinc, dissolved	mg/L	0.18	8.89	1.78				

¹ Baseline WY 2004.

² Negative values denote readings below lab detection levels.

³ ACZ Laboratory, Steamboat Springs, CO.

⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL.
H - Holding time exceeded; pH is a field test with an immediate hold time.
B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity.

⁵ Average (mean) value calc using 1/2 of detection limit for readings below lab detection limits unless all readings are below lab detection limit.



APPENDIX H

MINE WATER – LABORATORY AND FIELD WATER QUALITY DATA

**LRP Underdrain
Water Quality and Field Parameters**

Mountain Coal West Elk Mine - Water Year 2022							
Monitoring Location: LRP Underdrain		Baseline ¹			Water Year 2022		
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022
Field Parameters							
Flow	gpm				dry	dry	dry
Electrical Conductivity	mhos/cm						
pH	SU						
Temperature (°C)	°C						
Comment							
Laboratory Parameters							
Name of Certified Lab							
Lab Reference #							
Sample Date							
Lab Test Date							
Sampled By							
Alkalinity (Total CaCO ₃)	mg/l						
Aluminum, dissolved	mg/l						
Arsenic, total	mg/l						
Bicarbonate as CaCO ₃	mg/l						
Boron, dissolved	mg/l						
Calcium, dissolved	mg/l						
Carbonate as CaCO ₃	mg/l						
Cation - Anion Balance	%						
Chloride	mg/l						
Conductivity @25C	umhos/cm						
Copper, dissolved	mg/l						
Hardness as CaCO ₃	mg/l						
Hydroxide as CaCO ₃	mg/l						
Iron, dissolved	mg/l						
Iron, total	mg/l						
Lead, dissolved	mg/l						
Magnesium, dissolved	mg/l						
Manganese, dissolved	mg/l						
Manganese, total	mg/l						
Mercury, total	mg/l						
Molybdenum, dissolved	mg/l						
Nitrate/Nitrite (as N)	mg/l						
pH	SU						
Phosphate	mg/l						
Phosphorus, ortho dissolved	mg/l						
Potassium, dissolved	mg/l						
Residue, Filterable (TDS) @180C	mg/l						
Selenium, total	mg/l						
Sodium Absorption Ratio (SAR)	calc.						
Sodium, dissolved	mg/l						
Sulfate	mg/l						
Sum of Anions	meq/l						
Sum of Cations	meq/l						
TDS (calculated)	calc.						
TDS (ratio - measured/calculated)	mg/l						
Zinc, dissolved	mg/l						
¹ No baseline data.							



RPE Grate
Water Quality and Field Parameters

Mountain Coal West Elk Mine - Water Year 2022								
Monitoring Location: RPE Underdrain		Baseline ¹			Water Year 2022			
Description	Units	Minimum	Maximum	Mean	5/5/2022	5/31/2022	9/7/2022	Q ⁴
Field Parameters								
Flow ⁵	gpm				0.5	0.5	0.25	
pH (Field)	SU				7.88	7.90	7.83	
Conductivity (Field)	µmhos/cm				5,650	5,700	5,920	
Temperature (Field)	°C				12.9	12.5	17.8	
Comment								
Laboratory Parameters ³								
Name of Certified Lab ²							ACZ	
Lab Reference #							L75716-01	
Sample Date							9/7/2022	
Lab Test Date							9/9-9/29	
Sampled By							PH	
Alkalinity (Total CaCO ₃)	mg/L						438	
Aluminum, dissolved	mg/L						-0.1	U
Arsenic, total	mg/L						0.00112	
Bicarbonate as CaCO ₃	mg/L						437	
Boron, dissolved	mg/L						0.899	
Cadmium, dissolved	mg/L						-0.016	U
Calcium, dissolved	mg/L						133	
Carbonate as CaCO ₃	mg/L						-2	U
Cation-Anion Balance	%						-4.3	
Chloride	mg/L						1,090	
Conductivity @25C	umhos/cm						5,470	
Copper, dissolved	mg/L						-0.02	U
Hardness as CaCO ₃ (dissolved)	mg/L						474	
Hydroxide as CaCO ₃	mg/L						-2	U
Iron, dissolved	mg/L						-0.12	U
Iron, total	mg/L						-0.12	U
Lead, dissolved	mg/L						-0.06	U
Magnesium, dissolved	mg/L						34.4	
Manganese, dissolved	mg/L						-0.02	U
Manganese, total	mg/L						-0.02	U
Mercury, total	mg/L						-0.0002	U
Molybdenum, dissolved	mg/L						0.051	B
Nitrate/Nitrite as N	mg/L						2.09	
pH	units						8.2	H
Phosphate	mg/L						0.0682	B
Phosphorus, ortho dissolved	mg/L						0.022	B
Potassium, dissolved	mg/L						16.6	
Residue, Filterable (TDS) @180C	mg/L						3,480	
Selenium, total	mg/L						0.00394	
Sodium Adsorption Ratio in Water	calc.						21	
Sodium, dissolved	mg/L						1,030	
Sulfate	mg/L						963	
Sum of Anions	meq/L						60	
Sum of Cations	meq/L						55	
TDS (calculated)	mg/L						3,530	
TDS (ratio - measured/calculated)	calc.						0.99	
Zinc, dissolved	mg/L						0.081	B
¹ No baseline data. ² ACZ Laboratory, Steamboat Springs, CO. ³ Negative values denote readings below lab detection levels. ⁴ ACZ Lab Qualifiers: U - Analyte was analyzed for but not detected at the indicated MDL. H - Holding time exceeded; pH is a field test with an immediate hold time. B - Analyte conc detected at a value between method detection limit (MDL) and practical quantitation limit (PQL). The associated value is an estimated quantity. ⁵ Estimated flow.								



APPENDIX I

SURFACE WATER - TEMPERATURE DATA

NFG-1
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	11.87	6.38	0.02	0.17	0.02	0.02	5.50	5.67	ND	ND	14.94	17.85
2	12.61	6.09	0.02	0.00	0.02	0.02	4.97	6.19	ND	ND	15.19	17.65
3	11.44	6.36	0.02	0.00	0.02	0.02	4.69	5.87	ND	ND	14.83	17.78
4	11.09	4.80	0.01	0.00	0.02	0.02	5.38	5.53	ND	ND	15.08	18.17
5	11.18	4.16	0.00	0.01	0.02	0.02	5.10	0.00	ND	ND	15.06	17.11
6	11.91	3.69	-0.07	0.87	0.02	0.02	3.78	0.00	ND	15.60	15.46	17.28
7	11.02	3.78	0.03	0.56	0.02	0.02	3.70	0.00	ND	15.01	15.42	16.91
8	10.47	4.06	0.03	0.54	0.02	0.01	4.50	ND	ND	15.39	15.67	16.35
9	11.36	3.82	0.02	0.00	0.02	0.02	4.63	ND	ND	14.77	15.86	16.67
10	9.83	4.59	0.02	0.00	0.02	0.02	4.96	ND	ND	14.62	16.62	16.02
11	8.44	4.01	0.01	0.00	0.02	0.02	4.56	ND	ND	15.14	16.69	14.29
12	7.17	4.43	0.01	0.00	0.02	0.02	3.63	ND	ND	14.32	17.45	13.89
13	6.31	4.21	0.02	0.00	0.02	0.02	2.75	ND	ND	14.22	18.11	13.15
14	4.74	3.29	0.02	0.01	0.02	0.04	3.48	ND	ND	14.97	18.50	14.83
15	4.87	3.49	0.02	0.00	0.02	0.07	5.51	ND	ND	15.10	18.49	14.91
16	4.63	3.70	0.01	0.01	0.02	0.24	5.17	ND	ND	15.13	18.15	13.86
17	5.71	2.94	0.00	0.01	0.02	1.64	5.68	ND	ND	14.88	18.65	14.53
18	6.82	0.91	0.01	0.01	0.02	1.84	5.80	ND	ND	14.90	19.03	13.84
19	6.96	2.00	0.01	0.02	0.02	2.20	5.83	ND	ND	15.03	18.76	13.75
20	5.26	2.79	0.01	0.02	0.02	2.33	6.07	ND	ND	14.18	18.34	12.88
21	4.77	1.48	0.02	0.02	0.02	3.16	5.73	ND	ND	14.26	19.25	13.76
22	4.64	0.14	0.02	0.02	0.02	2.08	4.97	ND	ND	14.34	18.99	14.27
23	4.70	0.09	0.02	0.02	0.02	2.79	4.21	ND	ND	14.36	18.73	13.86
24	7.20	0.59	0.02	0.02	0.02	3.24	5.17	ND	ND	13.43	18.84	12.63
25	7.10	0.07	0.02	0.02	0.02	4.00	5.79	ND	ND	13.91	18.74	12.25
26	6.13	0.02	0.02	0.02	0.02	3.87	5.77	ND	ND	13.92	18.22	12.24
27	5.26	0.03	0.02	0.02	0.02	3.83	5.86	ND	ND	13.83	17.61	12.73
28	5.69	0.00	0.01	0.02	0.02	3.94	5.96	ND	ND	13.16	17.47	13.50
29	4.93	0.03	0.02	0.02	--	3.30	5.84	ND	ND	14.09	18.23	14.04
30	4.73	0.03	0.05	0.02	--	4.28	6.03	ND	ND	13.70	17.99	13.10
31	5.03	--	0.02	0.02	--	3.89	--	ND	--	14.11	18.01	--
Mean	7.54	2.73	0.02	0.08	0.02	1.52	5.03	3.32	ND	14.48	17.37	14.80
Min	4.63	0.00	-0.07	0.00	0.02	0.01	2.75	0.00	ND	13.16	14.83	12.24
Max	12.61	6.38	0.05	0.87	0.02	4.28	6.07	6.19	ND	15.60	19.25	18.17

ND No Data. Data Logger Washed Away.



NFG-2
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	11.89	6.45	0.14	0.41	0.03	0.12	5.52	5.72	9.87	15.09	14.85	17.83
2	12.70	6.11	0.20	0.03	0.02	0.13	5.00	6.26	9.95	15.78	15.14	17.63
3	11.55	6.46	0.13	0.03	0.02	0.11	4.72	5.94	9.45	15.82	14.74	17.75
4	11.21	4.93	0.13	0.05	0.02	0.09	5.41	5.84	9.72	16.71	14.96	18.12
5	11.29	4.29	0.08	0.11	0.02	0.10	5.13	6.88	10.15	15.50	14.93	17.07
6	11.97	3.83	0.06	1.20	0.02	0.07	3.81	7.43	10.64	14.39	15.30	17.16
7	11.12	3.92	0.06	0.66	0.02	0.09	3.73	6.89	10.66	14.85	15.27	16.91
8	10.48	4.09	0.04	0.58	0.03	0.08	4.59	7.09	10.68	15.21	15.49	16.33
9	11.43	3.86	0.04	0.04	0.03	0.07	4.72	6.89	11.33	14.60	15.70	16.66
10	9.91	4.63	0.04	0.04	0.03	0.06	4.98	7.15	11.67	14.51	16.47	16.02
11	8.54	4.13	0.09	0.04	0.03	0.06	4.68	7.26	11.99	14.96	16.61	14.31
12	7.20	4.55	0.04	0.03	0.04	0.10	3.56	6.76	11.85	14.19	17.34	13.90
13	6.32	4.34	0.03	0.03	0.04	0.16	2.81	6.71	11.40	14.07	18.03	13.11
14	4.75	3.41	0.03	0.03	0.04	0.29	3.60	7.37	11.68	14.82	18.44	14.80
15	4.98	3.63	0.03	0.03	0.04	0.31	5.61	7.83	11.05	14.93	18.45	14.89
16	4.76	3.73	0.03	0.03	0.05	0.74	5.23	7.42	11.79	14.96	18.12	13.86
17	5.84	3.08	0.03	0.04	0.06	1.98	5.72	7.87	12.13	14.74	18.60	14.54
18	6.94	1.05	0.02	0.03	0.06	2.01	5.90	8.16	12.76	14.76	19.00	13.85
19	7.04	2.03	0.02	0.03	0.07	2.39	5.92	8.05	12.13	14.87	18.72	13.77
20	5.39	2.85	0.04	0.04	0.08	2.45	6.11	6.68	12.74	14.06	18.30	12.85
21	4.88	1.65	0.07	0.03	0.04	3.36	5.81	7.25	12.34	14.12	19.20	13.71
22	4.74	0.32	0.08	0.06	0.04	2.16	5.01	8.04	12.53	14.17	18.95	14.23
23	4.73	0.06	0.08	0.03	0.04	2.94	4.29	8.53	12.85	14.23	18.69	13.88
24	7.32	0.67	0.08	0.03	0.04	3.42	5.28	7.93	12.93	13.33	18.80	12.66
25	7.23	0.18	0.08	0.05	0.07	4.14	5.87	8.43	14.03	13.79	18.70	12.28
26	6.17	0.13	0.07	0.04	0.08	3.98	5.87	9.41	13.76	13.79	18.18	12.28
27	5.34	0.09	0.05	0.02	0.04	3.90	5.90	9.49	13.97	13.74	17.58	12.75
28	5.74	0.09	0.04	0.03	0.09	4.00	6.05	8.64	14.57	13.09	17.44	13.53
29	5.05	0.15	0.07	0.03	--	3.34	5.89	8.40	15.47	13.94	18.19	14.08
30	4.85	0.15	0.19	0.03	--	4.31	6.14	8.11	15.29	13.61	17.95	13.07
31	5.08	--	0.08	0.03	--	3.93	--	8.51	--	13.99	17.98	--
Mean	7.63	2.83	0.07	0.12	0.04	1.64	5.09	7.51	12.05	14.54	17.29	14.79
Min	4.73	0.06	0.02	0.02	0.02	0.06	2.81	5.72	9.45	13.09	14.74	12.28
Max	12.70	6.46	0.20	1.20	0.09	4.31	6.14	9.49	15.47	16.71	19.20	18.12



NFG-3
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	11.96	6.49	0.14	0.00	-0.03	0.19	5.60	5.73	9.93	15.21	15.09	17.79
2	12.80	6.17	0.20	-0.02	-0.03	0.23	5.06	6.29	10.02	15.92	15.38	17.58
3	11.67	6.50	0.13	-0.01	-0.03	0.16	4.79	5.93	9.50	16.00	14.97	17.73
4	11.33	4.99	0.12	-0.01	-0.03	0.10	5.47	5.87	9.77	16.86	15.20	18.17
5	11.43	4.34	0.06	-0.01	-0.02	0.14	5.27	6.93	10.20	15.71	15.20	17.13
6	12.16	3.87	0.00	0.00	-0.02	0.06	3.86	7.49	10.68	14.57	15.55	17.31
7	11.25	3.96	0.06	0.10	-0.02	0.13	3.78	6.93	10.72	14.99	15.50	17.07
8	10.51	4.07	-0.01	0.37	-0.02	0.14	4.65	7.12	10.72	15.39	15.71	16.44
9	11.53	3.82	0.00	-0.01	-0.01	0.08	4.75	6.91	11.36	14.79	15.88	16.77
10	9.98	4.66	0.00	-0.01	0.00	0.05	5.02	7.17	11.72	14.70	16.67	16.17
11	8.59	4.06	-0.01	-0.01	0.01	0.12	4.69	7.28	12.04	15.15	16.77	14.39
12	7.23	4.60	-0.01	-0.01	0.01	0.17	3.56	6.79	11.91	14.37	17.47	13.96
13	6.30	4.39	-0.01	-0.02	0.02	0.27	2.75	6.71	11.45	14.24	18.19	13.11
14	4.74	3.43	0.00	-0.01	0.02	0.48	3.59	7.40	11.74	15.07	18.53	14.89
15	4.92	3.68	-0.01	-0.02	0.01	0.46	5.67	7.87	11.11	15.17	18.50	14.98
16	4.79	3.74	-0.02	-0.01	0.03	0.75	5.26	7.44	11.86	15.22	18.09	13.96
17	5.89	3.09	-0.01	-0.02	0.05	1.95	5.82	7.89	12.22	15.00	18.62	14.68
18	7.02	0.96	-0.01	-0.02	0.06	2.05	5.96	8.20	12.85	15.00	19.01	14.00
19	7.13	1.99	0.00	-0.02	0.06	2.45	5.98	8.07	12.19	15.14	18.69	13.85
20	5.42	2.85	0.00	-0.02	0.08	2.47	6.17	6.70	12.83	14.30	18.28	12.94
21	4.91	1.72	0.00	-0.02	-0.01	3.51	5.85	7.24	12.41	14.33	19.23	13.76
22	4.77	0.25	0.01	0.00	0.00	2.16	5.01	8.04	12.62	14.40	18.93	14.31
23	4.69	0.00	-0.01	-0.02	-0.01	3.04	4.27	8.56	12.97	14.49	18.65	14.01
24	7.35	0.58	0.00	-0.01	0.01	3.55	5.28	7.97	13.05	13.53	18.75	12.77
25	7.33	0.06	0.00	-0.01	0.05	4.32	5.91	8.48	14.16	13.95	18.68	12.39
26	6.20	0.03	0.00	-0.02	0.07	4.14	5.89	9.46	13.91	14.03	18.18	12.39
27	5.37	0.05	-0.01	-0.02	0.04	4.02	5.93	9.55	14.05	13.97	17.56	12.87
28	5.81	0.06	-0.01	-0.02	0.10	4.07	6.07	8.66	14.68	13.24	17.37	13.63
29	5.09	0.12	0.00	-0.02	--	3.39	5.90	8.39	15.63	14.25	18.19	14.23
30	4.91	0.15	-0.02	-0.02	--	4.31	6.15	8.15	15.43	13.84	17.95	13.09
31	5.11	--	-0.01	-0.02	--	3.94	--	8.53	--	14.22	17.96	--
Mean	7.68	2.82	0.02	0.00	0.01	1.71	5.13	7.54	12.12	14.74	17.38	14.88
Min	4.69	0.00	-0.02	-0.02	-0.03	0.05	2.75	5.73	9.50	13.24	14.97	12.39
Max	12.80	6.50	0.20	0.37	0.10	4.32	6.17	9.55	15.63	16.86	19.23	18.17



MCSG-1
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	9.59	4.17	-2.01	-0.03	-0.91	-0.58	0.06	9.12	11.40	15.84	18.67	15.77
2	9.22	4.88	-1.83	-0.02	-0.73	-0.25	0.07	8.08	12.40	16.14	19.69	15.42
3	8.17	4.14	-2.12	-0.03	-1.41	-0.15	0.08	7.09	13.01	17.06	19.52	16.52
4	7.90	2.90	-2.24	-0.05	-1.84	-0.09	0.09	5.41	13.80	17.50	19.52	16.66
5	8.32	2.29	-2.46	-0.06	-1.84	-0.06	0.21	8.63	14.14	17.20	19.87	16.59
6	9.58	1.87	-2.36	-0.03	-1.66	-0.03	0.17	11.53	14.81	16.73	20.19	17.15
7	8.55	1.88	-0.35	-0.02	-1.67	-0.03	0.05	12.86	15.37	15.55	19.84	17.08
8	8.91	2.70	-1.16	-0.03	-1.60	-0.04	0.66	14.24	15.34	16.50	19.82	16.56
9	9.18	2.65	-0.25	-0.09	-1.36	-0.10	2.00	14.10	16.18	17.02	19.65	16.67
10	7.58	3.23	0.05	-0.25	-1.02	-0.13	3.50	14.39	16.78	18.33	21.06	15.18
11	6.13	1.92	0.02	-0.33	-0.85	-0.18	3.87	14.42	17.55	18.28	19.19	12.98
12	5.78	1.95	-0.17	-0.37	-0.87	-0.19	2.14	12.98	18.01	18.32	17.52	12.98
13	4.97	2.03	-0.44	-0.34	-1.38	-0.15	-0.18	11.38	17.59	17.91	19.32	12.81
14	4.05	1.50	-0.42	-0.22	-1.39	-0.09	0.83	12.60	17.05	19.45	19.87	12.91
15	2.85	1.58	-0.26	-0.30	-1.08	-0.06	4.75	14.37	14.43	20.05	19.12	12.60
16	2.41	2.30	-0.23	-0.44	-0.70	-0.04	5.07	14.42	15.08	19.84	18.02	11.43
17	2.65	1.67	-0.29	-0.45	-0.70	-0.03	7.00	14.50	16.61	19.81	17.27	12.10
18	3.72	0.29	-0.39	-0.43	-1.12	-0.03	7.26	15.12	17.21	20.84	17.12	11.21
19	4.56	0.30	-0.59	-0.39	-1.23	-0.03	8.61	14.39	15.41	18.97	16.79	11.83
20	3.07	1.22	-0.64	-0.42	-1.03	0.00	10.59	10.08	14.84	19.10	15.40	11.97
21	2.74	0.74	-0.61	-0.33	-0.59	0.00	10.05	7.76	13.89	18.69	15.93	13.01
22	2.81	-0.10	-0.63	-0.25	-0.55	0.00	8.22	9.68	15.04	19.45	15.93	12.62
23	3.34	-0.29	-0.33	-0.41	-0.50	0.00	3.79	10.83	15.32	20.53	16.07	10.99
24	4.57	-0.30	0.00	-0.49	-0.47	0.00	4.86	9.85	14.55	17.55	16.85	9.52
25	4.71	-2.77	0.02	-0.36	-0.63	0.00	5.49	10.02	15.54	18.13	16.43	9.29
26	4.55	-2.68	0.02	-0.49	-0.83	0.00	7.35	12.34	16.07	18.58	15.14	9.48
27	3.58	-2.22	0.01	-0.55	-1.34	0.02	8.62	13.99	14.18	18.72	13.84	10.69
28	3.94	-2.05	0.00	-0.76	-1.05	0.02	9.08	13.64	15.00	17.70	13.79	11.86
29	2.97	-1.79	0.00	-0.93	--	0.03	8.87	11.79	16.35	17.98	14.29	12.79
30	2.64	-1.96	-0.02	-0.98	--	0.05	8.18	9.05	16.66	17.87	15.39	11.30
31	3.22	--	-0.03	-1.01	--	0.05	--	9.25	--	16.74	16.25	--

Mean	5.36	1.07	-0.63	-0.35	-1.09	-0.07	4.38	11.54	15.32	18.14	17.66	13.27
Min	2.41	-2.77	-2.46	-1.01	-1.84	-0.58	-0.18	5.41	11.40	15.55	13.79	9.29
Max	9.59	4.88	0.05	-0.02	-0.47	0.05	10.59	15.12	18.01	20.84	21.06	17.15

Red - Air/Soil Temp. (Stream Likely Dry)



MCSG-2
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	10.84	5.30	1.09	2.38	1.79	1.35	3.51	6.87	10.16	14.58	17.57	13.93
2	10.83	5.74	1.07	2.20	1.90	1.32	3.59	7.21	10.50	14.97	17.90	13.60
3	9.84	5.58	1.00	2.26	1.53	1.36	3.82	7.04	10.70	15.31	17.45	13.64
4	9.23	4.77	0.92	2.36	1.41	1.40	3.83	6.74	10.94	15.87	17.19	13.66
5	9.19	4.25	0.85	2.49	1.45	1.41	4.15	7.23	11.47	15.49	17.51	13.64
6	10.13	3.86	0.82	2.59	1.51	1.47	3.94	7.91	11.78	15.30	17.68	13.66
7	9.46	3.74	1.01	2.37	1.52	1.48	3.66	8.32	12.09	15.51	17.46	13.73
8	9.37	4.22	0.77	2.32	1.53	1.34	3.94	8.64	12.16	16.03	17.28	13.26
9	10.06	4.27	1.03	2.16	1.61	1.52	4.02	8.73	12.50	16.32	16.90	13.35
10	9.24	4.75	0.92	2.07	1.68	1.58	4.30	8.89	12.84	16.22	17.22	12.68
11	7.83	4.10	0.89	2.08	1.57	1.36	4.37	9.04	13.26	16.76	16.90	11.44
12	7.32	4.02	0.91	2.13	1.46	1.36	4.10	8.97	13.59	16.29	16.47	11.17
13	6.75	3.98	0.96	2.23	1.38	1.37	3.40	8.55	13.41	16.36	17.35	11.69
14	5.92	3.55	1.21	2.36	1.36	1.50	3.31	8.78	13.63	17.36	17.42	12.75
15	4.76	3.51	1.27	2.19	1.48	1.54	4.29	9.41	12.90	18.20	17.49	13.47
16	4.31	3.90	1.36	2.07	1.64	1.63	4.70	9.74	12.93	18.21	17.10	11.61
17	4.45	3.57	1.53	2.06	1.57	1.76	5.28	9.78	13.28	18.18	16.52	11.65
18	5.10	2.56	1.26	2.10	1.43	1.78	5.51	10.23	13.82	18.59	15.77	10.95
19	5.79	2.66	1.16	2.14	1.35	1.92	5.86	10.25	13.81	18.66	15.66	10.88
20	4.80	3.20	1.13	2.11	1.35	2.01	6.48	9.59	13.79	18.03	15.75	11.12
21	4.26	2.80	1.21	2.27	1.51	2.23	6.58	8.71	13.24	17.53	16.51	12.27
22	4.04	2.05	1.17	2.25	1.66	2.02	6.52	9.12	13.42	17.70	15.78	12.59
23	4.23	1.94	1.41	2.06	1.73	2.11	5.73	9.40	13.62	18.25	15.25	11.60
24	5.20	2.30	1.17	2.00	1.73	2.47	5.70	9.28	13.71	17.34	15.02	10.13
25	5.42	1.52	1.43	2.15	1.70	2.82	5.75	9.15	14.08	17.49	15.12	9.34
26	5.51	1.30	1.71	1.96	1.60	2.96	5.94	9.72	14.04	17.45	15.50	9.08
27	5.27	1.22	2.00	1.96	1.43	2.89	6.55	10.35	13.94	17.23	14.08	9.76
28	5.43	1.16	2.17	1.73	1.39	2.82	6.64	10.40	14.20	16.91	14.13	10.41
29	4.81	1.17	2.39	1.64	--	3.07	6.79	10.30	14.77	16.94	13.97	11.01
30	4.45	1.13	2.40	1.63	--	3.13	6.53	9.88	14.80	16.87	14.15	11.20
31	4.71	--	2.38	1.66	--	3.04	--	9.71	--	16.92	14.37	--

Mean	6.73	3.27	1.31	2.13	1.55	1.94	4.96	8.97	12.98	16.87	16.27	11.98
Min	4.04	1.13	0.77	1.63	1.35	1.32	3.31	6.74	10.16	14.58	13.97	9.08
Max	10.84	5.74	2.40	2.59	1.90	3.13	6.79	10.40	14.80	18.66	17.90	13.93

Red - Air/Soil Temp. (Stream Likely Dry)



MCSG-3
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	10.02	5.52	0.72	1.48	0.47	0.75	3.72	7.08	10.95	14.13	15.85	12.68
2	9.71	6.05	0.81	0.52	0.68	0.90	3.94	7.91	11.22	14.55	16.07	12.37
3	8.68	5.13	0.66	0.67	0.25	1.02	4.17	6.94	11.23	14.99	15.65	12.62
4	8.35	4.05	0.56	1.31	0.19	1.09	4.56	6.76	11.89	15.49	15.42	12.58
5	8.78	3.64	0.43	1.72	0.27	0.95	4.80	8.54	12.58	14.93	15.59	12.58
6	9.74	3.36	0.35	2.14	0.32	1.21	3.56	9.48	12.97	14.58	15.63	12.71
7	8.86	3.43	1.39	1.72	0.28	1.26	3.56	9.52	13.05	14.30	15.06	12.58
8	9.07	4.41	0.39	1.95	0.33	0.69	4.43	9.80	12.85	14.50	14.81	12.36
9	9.85	3.91	1.17	0.76	0.52	1.24	4.89	9.94	13.41	14.53	14.43	12.51
10	8.11	4.56	0.46	0.54	0.76	1.19	5.20	10.20	13.75	14.99	15.47	11.63
11	6.88	3.37	-0.59	0.54	0.69	0.42	4.87	10.22	14.32	15.25	15.35	10.24
12	6.44	4.04	-0.60	0.62	0.64	0.71	3.13	9.59	14.14	14.76	15.07	10.17
13	5.91	3.76	-0.31	0.91	0.42	0.86	2.26	8.99	13.69	14.83	15.47	10.78
14	4.62	3.21	0.37	1.49	0.53	1.25	3.34	9.81	13.76	16.11	15.53	12.18
15	2.82	3.50	0.75	0.84	0.92	1.05	5.67	10.89	11.90	16.57	15.67	12.38
16	3.33	4.05	0.85	0.56	1.31	1.20	5.15	10.77	12.52	16.38	15.38	11.25
17	4.45	2.74	1.25	0.60	1.12	1.17	6.49	10.89	13.19	16.20	15.07	11.46
18	5.71	0.96	0.34	0.77	0.70	1.10	6.43	11.59	14.20	16.89	14.27	10.35
19	5.67	2.42	0.18	0.90	0.64	1.08	7.01	11.13	13.87	16.63	14.27	10.46
20	4.04	3.59	0.22	0.85	0.70	1.40	7.94	8.52	13.36	16.05	14.46	10.77
21	3.84	1.70	0.51	1.43	1.24	1.27	7.72	8.98	12.24	15.66	15.03	12.01
22	3.82	0.69	0.46	1.36	1.32	1.16	6.11	9.70	13.03	15.69	14.51	12.31
23	4.50	1.06	0.99	0.68	1.38	1.11	4.87	10.20	13.25	16.59	13.66	11.09
24	5.90	2.26	0.28	0.63	1.28	1.11	5.70	9.36	13.34	15.68	13.46	9.76
25	5.84	0.31	1.06	1.23	1.14	1.22	5.70	9.66	13.74	15.91	13.72	9.37
26	5.39	0.31	1.26	0.56	0.89	1.12	6.58	10.94	13.55	15.66	14.03	9.38
27	4.87	0.44	1.45	0.60	0.43	1.47	7.10	11.69	13.42	15.45	13.00	10.25
28	5.20	0.55	1.44	0.31	0.72	2.02	7.29	10.94	13.71	15.37	12.78	10.94
29	4.12	0.78	1.87	0.25	--	1.80	6.99	10.14	14.54	15.25	12.99	11.48
30	4.01	0.76	1.63	0.29	--	2.66	6.99	10.19	14.59	15.07	12.98	11.29
31	4.66	--	1.70	0.33	--	2.90	--	9.78	--	15.03	13.19	--
Mean	6.23	2.82	0.71	0.92	0.72	1.24	5.34	9.68	13.14	15.42	14.64	11.42
Min	2.82	0.31	-0.60	0.25	0.19	0.42	2.26	6.76	10.95	14.13	12.78	9.37
Max	10.02	6.05	1.87	2.14	1.38	2.90	7.94	11.69	14.59	16.89	16.07	12.71



MCSG-4
Daily Mean Temperature Values
(Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	10.65	5.31	0.27	1.20	0.10	0.44	3.72	7.06	11.09	14.59	17.29	13.96
2	10.58	5.74	0.30	-0.70	0.43	0.60	3.90	7.91	11.41	15.11	17.47	13.27
3	9.37	4.94	0.20	-0.47	-0.03	0.76	4.03	6.96	11.42	15.51	16.55	14.08
4	8.99	3.63	0.15	0.71	-0.06	0.84	4.43	6.82	12.04	16.10	16.95	14.11
5	9.21	3.15	0.10	1.44	-0.41	0.78	4.68	8.47	12.78	15.39	17.18	13.73
6	10.40	2.80	0.15	1.88	-1.01	1.04	3.50	9.44	13.17	15.06	17.68	14.17
7	9.23	2.85	0.88	1.35	-1.37	1.10	3.51	9.49	13.33	15.07	17.12	14.07
8	9.20	4.01	0.14	1.58	-1.30	0.49	4.34	9.76	13.18	15.40	16.95	13.74
9	10.31	3.49	0.69	0.45	-0.66	1.08	4.80	9.92	13.69	15.51	16.58	13.86
10	8.46	4.42	0.27	0.24	0.55	0.97	5.14	10.17	14.07	15.70	17.08	12.72
11	6.82	3.02	-0.02	0.27	0.42	0.21	4.79	10.20	14.67	16.27	16.44	11.13
12	6.22	3.61	-0.07	0.37	0.26	0.51	3.26	9.59	14.59	15.39	16.81	11.18
13	5.80	3.24	-0.19	0.70	0.12	0.63	2.32	8.99	14.08	15.56	17.50	11.07
14	4.18	2.66	-0.10	1.22	0.22	1.08	3.20	9.81	14.34	17.08	17.49	13.04
15	2.78	2.95	0.55	0.46	0.67	0.94	5.38	10.88	12.48	17.80	16.75	13.30
16	2.92	3.61	0.73	0.22	1.09	1.23	5.03	10.74	13.02	17.40	16.08	11.82
17	4.11	2.22	0.99	0.32	0.72	1.34	6.32	10.92	13.52	17.36	15.71	12.36
18	5.45	0.53	0.39	0.53	0.32	1.21	6.31	11.64	14.52	18.13	15.62	11.24
19	5.62	1.83	0.24	0.60	0.26	1.40	6.86	11.13	14.18	17.79	14.90	11.47
20	3.71	3.08	0.24	0.55	0.34	1.59	7.82	8.67	13.97	16.83	15.54	11.08
21	3.39	1.13	0.42	1.23	0.96	1.83	7.65	9.01	12.79	16.91	16.03	12.28
22	3.37	0.31	0.36	1.02	1.06	1.21	6.27	9.68	13.36	16.99	15.58	12.52
23	3.99	0.70	0.67	0.36	1.02	1.46	5.01	10.25	13.69	17.79	14.74	11.69
24	5.76	1.75	0.10	0.39	0.97	1.71	5.67	9.45	13.75	16.29	14.95	10.21
25	5.54	0.05	0.90	0.99	0.91	1.88	5.68	9.76	14.27	16.90	14.60	9.78
26	5.14	0.04	1.04	0.23	0.62	1.61	6.40	11.01	13.94	16.70	14.62	9.83
27	4.79	0.15	1.18	0.32	0.21	1.75	7.02	11.80	13.94	16.41	13.45	10.79
28	5.05	0.19	1.16	-0.05	0.38	2.18	7.20	11.00	14.22	15.93	13.49	11.55
29	3.77	0.33	1.64	-0.02	--	2.12	7.06	10.29	15.09	16.42	14.21	12.15
30	3.60	0.31	1.36	-0.03	--	2.72	6.96	10.39	15.01	15.95	14.24	11.47
31	4.32	--	1.32	-0.10	--	2.92	--	10.01	--	16.24	14.38	--
Mean	6.22	2.40	0.52	0.56	0.24	1.28	5.27	9.72	13.52	16.31	15.94	12.26
Min	2.78	0.04	-0.19	-0.70	-1.37	0.21	2.32	6.82	11.09	14.59	13.45	9.78
Max	10.65	5.74	1.64	1.88	1.09	2.92	7.82	11.80	15.09	18.13	17.68	14.17



MCSG-5

Daily Mean Temperature Values (Degrees Celsius)

Day	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1	10.75	5.84	1.80	0.16	-1.85	-0.21	2.79	6.57	10.91	18.07	20.53	16.02
2	10.30	6.02	2.15	0.17	-1.33	-0.13	2.99	7.83	11.72	18.40	21.15	16.28
3	9.48	5.60	1.94	-0.01	-2.82	-0.10	3.51	6.53	11.79	18.86	21.02	17.13
4	9.17	4.48	1.85	-0.01	-3.49	-0.08	3.63	5.91	12.54	19.55	21.31	17.44
5	9.69	4.20	1.50	0.06	-3.24	-0.06	4.25	7.82	12.80	18.53	21.83	17.84
6	10.66	4.04	1.08	0.20	-2.83	-0.04	2.13	9.37	13.46	18.62	22.22	18.44
7	9.63	4.12	2.39	0.30	-2.76	-0.03	1.90	9.89	13.74	16.58	21.95	18.86
8	9.84	4.65	1.17	0.35	-1.90	-0.03	3.14	10.53	13.56	16.76	22.03	18.29
9	10.25	4.37	2.00	0.29	-0.46	-0.03	3.84	10.28	14.17	17.22	21.85	18.32
10	8.63	4.52	1.15	0.04	-0.38	-0.02	4.23	10.16	15.16	18.48	23.28	16.43
11	7.09	3.17	-0.87	-0.16	-0.45	0.00	3.88	10.15	15.99	18.82	21.10	14.79
12	6.83	3.75	-1.51	-0.27	-0.90	0.00	2.42	9.47	16.58	19.22	17.86	14.98
13	5.91	3.92	-1.44	-0.21	-2.14	0.00	0.57	8.23	16.01	19.39	18.80	14.77
14	4.57	3.32	-0.48	-0.04	-1.93	0.00	1.48	9.32	16.00	20.91	18.70	15.00
15	2.44	3.77	-0.15	-0.18	-0.96	0.00	4.52	11.05	14.47	21.13	18.58	13.60
16	2.76	4.07	-0.38	-0.44	-0.33	0.01	4.19	11.08	15.60	21.12	17.23	12.78
17	4.40	2.58	-0.36	-0.49	-0.46	0.02	5.43	11.35	17.27	21.49	17.21	12.71
18	5.63	0.90	-1.06	-0.48	-1.57	0.04	5.30	12.34	17.35	22.12	17.55	11.49
19	5.71	1.93	-1.57	-0.42	-1.72	0.08	5.88	11.34	15.95	21.44	17.29	11.80
20	4.08	3.42	-1.76	-0.51	-1.50	0.36	7.17	8.81	15.93	21.26	15.96	12.31
21	3.84	1.95	-1.58	-0.29	-0.58	0.33	6.70	7.68	15.37	20.81	17.20	13.45
22	4.01	0.95	-1.72	-0.24	-0.45	0.19	5.60	8.98	16.21	21.58	16.96	13.20
23	4.41	1.17	-0.59	-0.56	-0.38	0.21	4.09	9.77	16.46	22.40	16.78	12.06
24	6.03	2.41	0.02	-0.71	-0.47	0.26	4.65	8.79	15.13	19.40	17.16	10.46
25	6.18	0.28	0.02	-0.40	-0.72	0.57	5.00	8.93	16.95	19.76	17.54	10.04
26	5.35	0.09	0.02	-0.83	-0.99	0.82	5.54	10.97	17.57	20.63	16.08	10.27
27	4.36	0.59	0.02	-1.06	-1.29	1.03	6.62	12.21	16.67	20.86	16.16	11.27
28	4.83	1.01	0.00	-1.67	-0.55	1.27	6.64	11.59	17.39	18.91	15.31	12.15
29	4.26	1.61	0.00	-1.96	--	1.30	6.73	10.81	18.25	20.32	15.63	12.68
30	4.32	1.75	0.01	-1.94	--	2.14	6.57	9.35	18.16	20.18	15.83	11.86
31	4.96	--	0.05	-1.97	--	2.01	--	9.31	--	18.95	16.21	--

Mean	6.46	3.02	0.12	-0.43	-1.37	0.32	4.38	9.56	15.31	19.73	18.65	14.22
Min	2.44	0.09	-1.76	-1.97	-3.49	-0.21	0.57	5.91	10.91	16.58	15.31	10.04
Max	10.75	6.02	2.39	0.35	-0.33	2.14	7.17	12.34	18.25	22.40	23.28	18.86

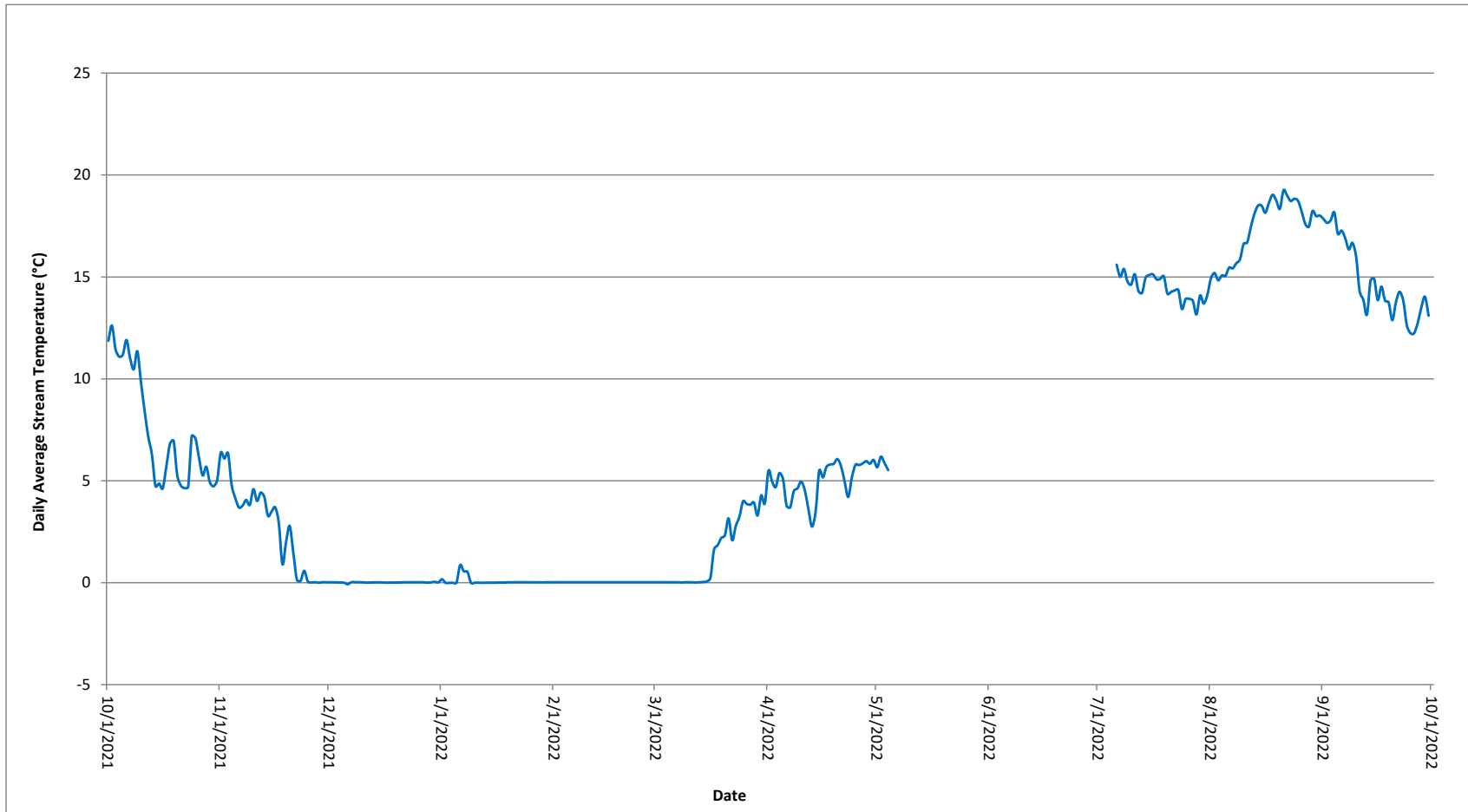
Red - Air/Soil Temp. (Stream Likely Dry)



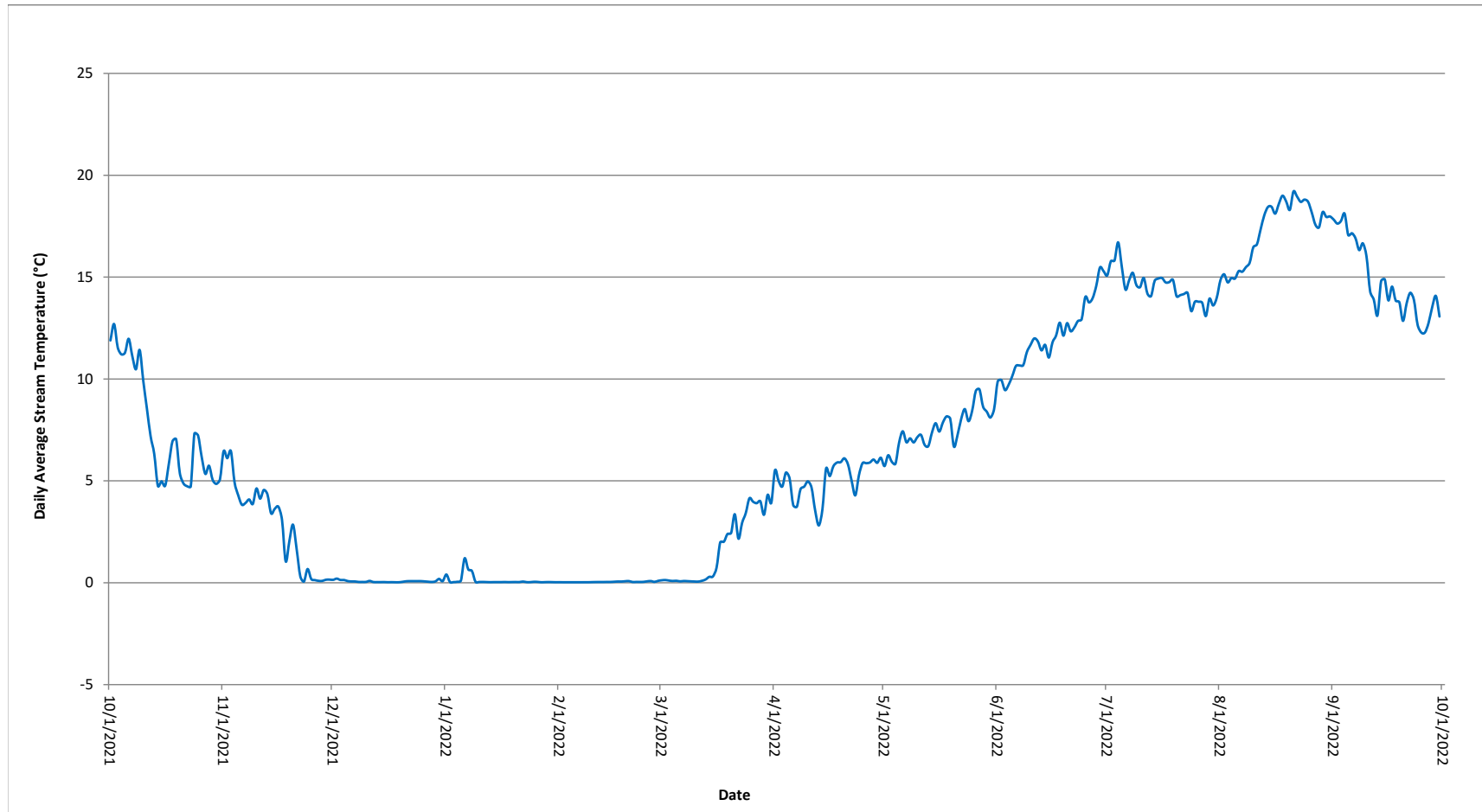
APPENDIX J

SURFACE WATER - TEMPERATURE GRAPHS

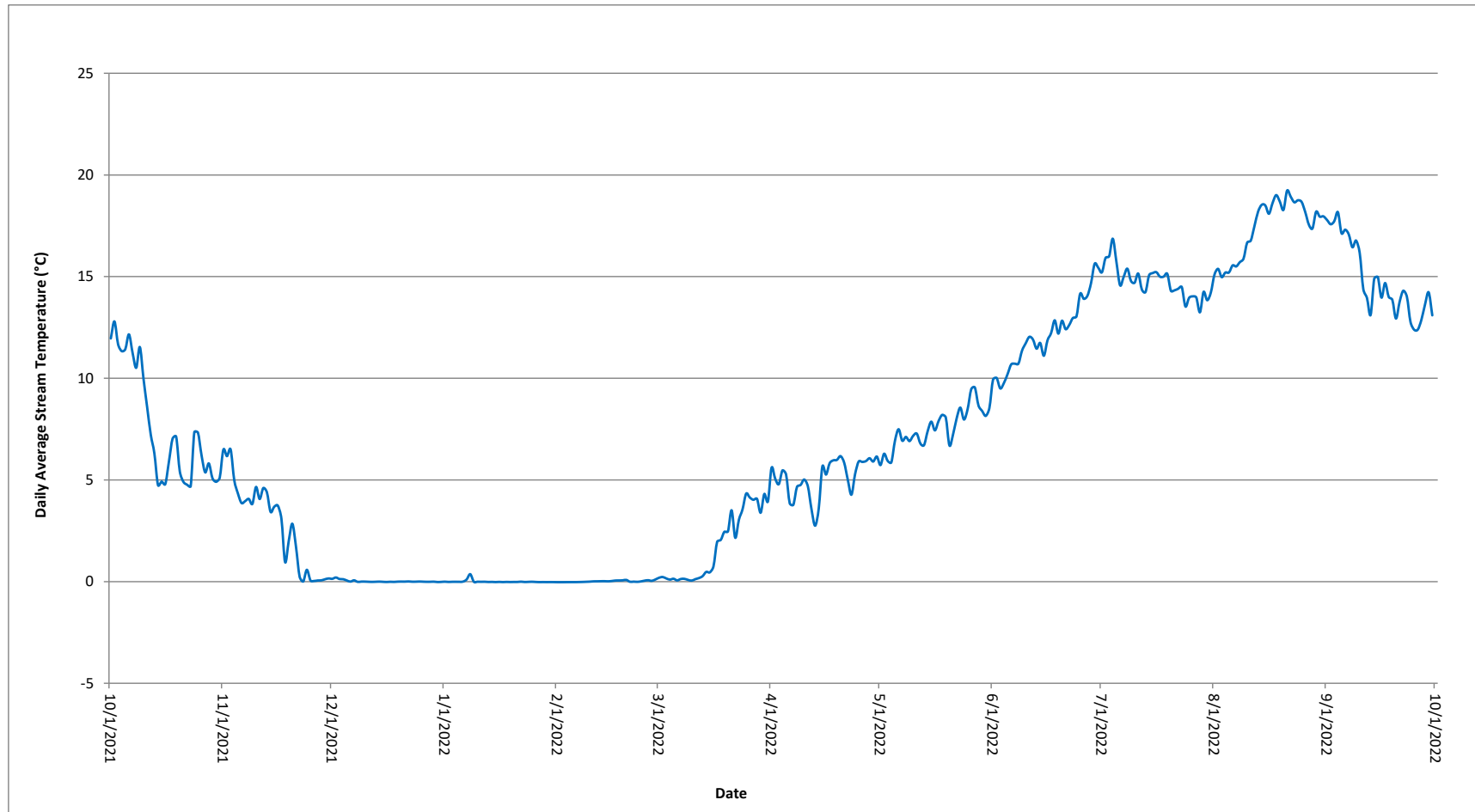
NFG-1 Daily Mean Temperature Graph



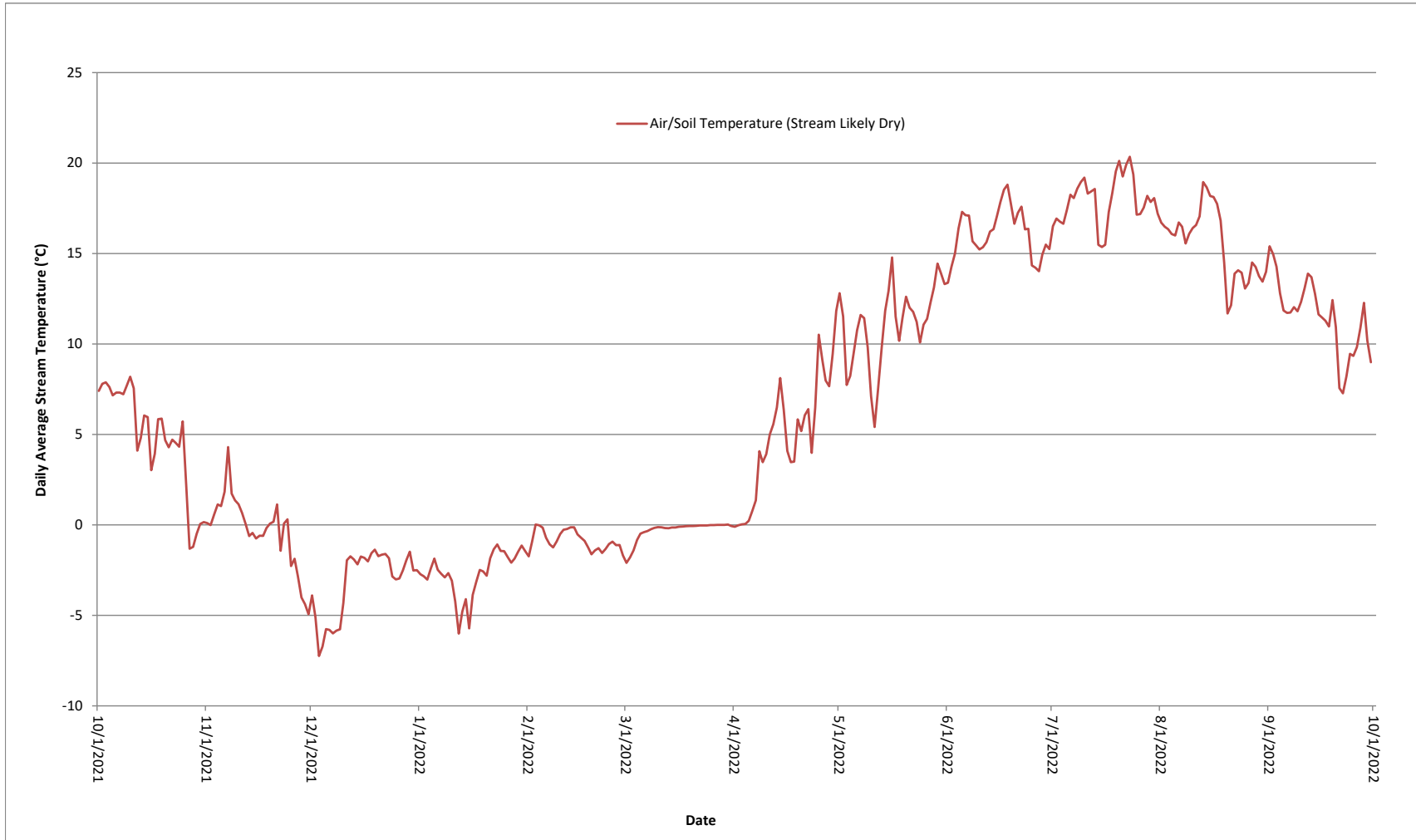
NFG-2 Daily Mean Temperature Graph



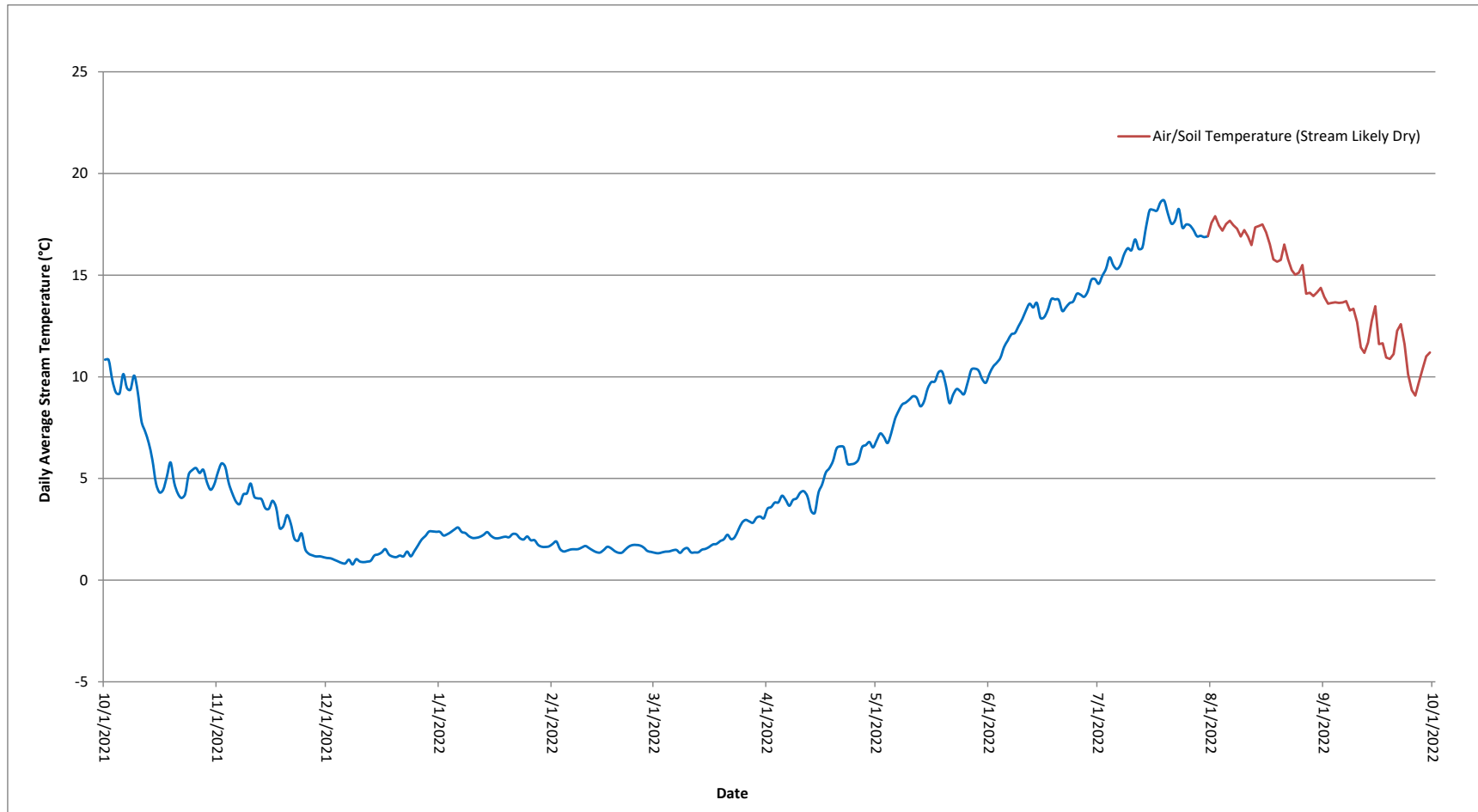
NFG-3 Daily Mean Temperature Graph



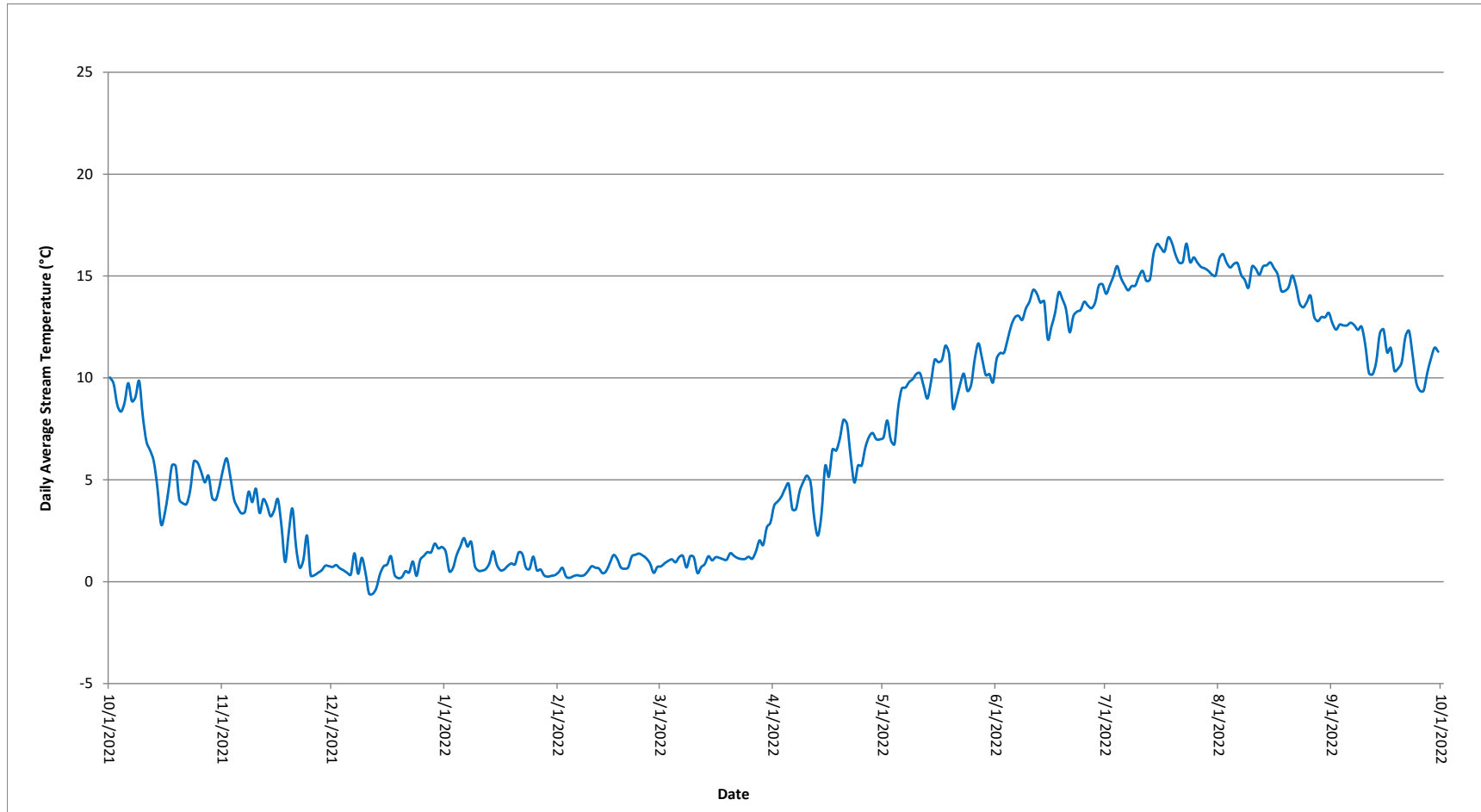
MCSG-1 Daily Mean Temperature Graph



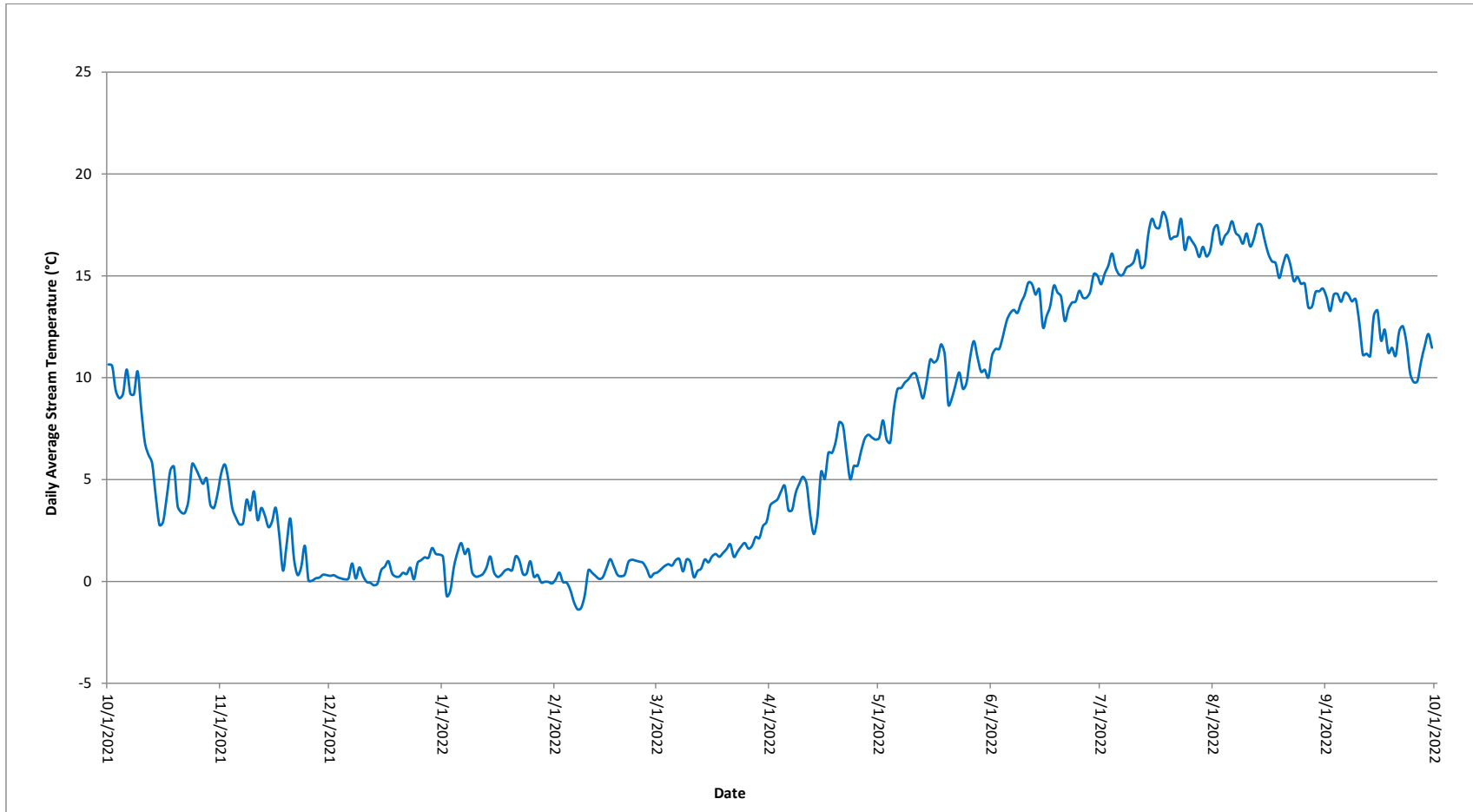
MCSG-2 Daily Mean Temperature Graph



MCSG-3 Daily Mean Temperature Graph



MCSG-4 Daily Mean Temperature Graph



MCSG-5 Daily Mean Temperature Graph

