Mountain Studies Institute

SAN JUAN MOUNTAINS COLORADO

Bonita Peak Mining District
2016 Low Flow Seeps and Springs Characterization Report

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List of Abbreviations and Acronyms

EPA	Environmental Protection Agency
GPS	Global Positioning System
ESAT	Environmental Services Assistance Team
RI	Remedial Investigation
BPMD	Bonita Peak Mining District
SOP	Standard Operating Procedure
MSI	Mountain Studies Institute
s&s	Seeps and Springs
TAL	Target Analyte List
DRMS	Division of Reclamation and Mining Safety
QA/QC	Quality Assurance, Quality Control
USGS	United States Geologic Survey
GMWL	Global Meteoric Water Line
LMWL	Local Meteoric Water Line
FSP	Field Sampling Plan

Metals and Minerals:

Al	aluminum
Sb	antimony
As	arsenic
Be	beryllium
Cd	cadmium
Ca	calcium
Cl-	chloride
Cr	chromium
Cu	copper
Fe	iron
F-	fluoride
Pb	lead
Mg	magnesium
Mn	manganese
Ni	nickel
Se	selenium
SiO_2	silica
SO_4	sulfate
Ag	silver
Sr	strontium
Th	thorium
Zn	zinc

1.0 Executive Summary

The Bonita Peak Mining District (BPMD) was designated by the Environmental Protection Agency (EPA) as a Superfund site on the National Priorities List in 2016. BPMD is located in a highly mineralized zone of the San Juan Mountains where high metal concentrations from natural and mine-related sources have contributed to a long history of degraded water quality. One of the current data gaps is understanding the water quality and quantity emerging from seeps and springs in the mining district. Understanding the quality of water at these locations will help decipher the potential hydrologic connectivity between emerging seeps and springs and mine waters as well as identify non-anthropogenic groundwater quality in areas of the mining district void of mining disturbance.

This report summarizes the results of the 2016 low flow sampling event to measure water quality and quantity emanating from seeps, springs, and draining mine adits in the BPMD. The sampling was conducted by Mountain Studies Institute (MSI) with laboratory analysis provide by the EPA Region 8 lab and by the Arikaree Environmental Laboratory at the University of Colorado.

MSI successfully collected 98 s&s samples along with 17 draining mines (not all of which are listed sites under BPMD), and an additional 17 dry mine portals were surveyed for presence of seeps or discharge (see Appendices 1,2). Samples were analyzed for total discharge, total and dissolved metals, anions, alkalinity, pH, temperature, conductivity, dissolved oxygen, and stable water isotopes (□^{18}O and □^{2}H). The sampling area was 14 discrete sub-basins that represent the major basins and headwater tributary flows that originate around Bonita Peak and contribute to Cement Creek and the South Fork of the Animas River. Sampling was also conducted in Prospect Gulch. Large variability in water chemistry was observed across the study area. Stable water isotope results demonstrated the ability to use that parameter as a conservative tracer in this setting.

This report only summarizes the first round of sampling for the investigation. A more detailed report will be written after the completion of high and low flow sampling of all sites in 2017.

In addition to the high flow synoptic sampling occurring in June and July of 2017, the primary draining mines near Bonita Peak are being monitored monthly for field parameters and stable water isotopes which enable a more comprehensive temporal understanding of the complete mountain hydrologic system currently influenced by draining mines.

2.0 Introduction

CDM Federal Programs Corporation (CDM Smith) is under contract to the U.S. Environmental Protection Agency (EPA) to prepare a remedial investigation (RI) at the Bonita Peak Mining District (BPMD) Superfund Site in San Juan County, Colorado. This characterization report is for sampling and technical services to be provided by the Mountain Studies Institute (MSI) for investigation of seeps and springs (s&s) within the project area, with a specific focus on the vicinity of Bonita Peak and the Sunnyside Mine Pool. The following report summarizes the data collected and findings associated with the 2016 low flow seeps and springs survey. The survey results will be presented to help characterize loading sources to surface water emanating from s&s. Information presented in this report shall summarize:

- The location and resampling of previously identified prominent seeps and springs and all other springs found within the vicinity of Bonita Peak
- Global positioning system locations, site photography, and general descriptions of individual seeps, springs, and relevant geologic features
- Water quantity from each identified seep, spring, or draining mine adit
- Water quality from each identified seep, spring, or draining mine adit

The results of the sampling event will provide initial information to help address the main study question:

What is the spatial distribution, flow rates, and magnitude of mining related contaminants from discharges of known seeps or springs?

3.0 Methods

3.1 Field Activity methods and procedures

The field sampling methods used, as well as applicable SOPs, for the collection of seep and spring water, field measurements, GPS coordinates, and photographs are found in the 2016 FSP (MSI, 2016). All water samples were collected and analyzed in a manner that enables direct comparison to all other water samples, including surface water and ground water, collected for the BPMD project. All applicable quality assurance (QA)/quality control (QC) requirements followed the BPMD Quality Assurance Project Plan (CDM Smith, 2016). Maps with previously sampled s&s from other studies and federal agency efforts were used to locate many of the s&s while others, such as the first emergence of first order streams, were located by hiking up each drainage investigated until reaching the start of a given stream channel.

3.2 Metals, Anions, and Isotopic Analysis

All collected water samples were analyzed by the EPA Region 8 Laboratory, ESAT Analytical Chemistry department for TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) (total/dissolved) and wet chemistry (alkalinity, anions, hardness). A subset of samples was also sent to the University of Colorado, INSTAAR Arikaree Environmental Laboratory for analysis of stable water isotopes. The stable isotope analysis included deuterium (D, ^{2}H) and ^{18}O using an L1102-i Isotopic Liquid Water Analyzer, developed by Picarro Incorporated. The analyzer is based on Picarro's unique Wavelength- Scanned Cavity Ring Down Spectroscopy, which is a time-based measurement using near-infrared laser to quantify spectral features of molecules in a gas contained in an optical measurement cavity. Oxygen has three stable isotopes: ^{16}O (99.63%), ^{17}O (0.0375%) and ^{18}O (0.1995). Ratios of ^{18}O to ^{16}O in waters are reported in ‰ (per mil) relative to Vienna Standard Mean Ocean Water (VSMOW) as shown for ^{18}O:

$$\delta^{18}O = \frac{(^{18}O/^{16}O)sample - (^{18}O/^{16}O)VSMOW}{(^{18}O/^{16}O)VSMOW} \times 1000$$

The precision for δ^{18}O was ±0.05‰ and for D was ±0.1‰.

3.3 Sampling locations

The initial spatial extent of sampling began in the area of the Red and Bonita and Gold King mine sites and extend east and north over Bonita Peak towards the Mogul mine (North) and the Lake Emma basin at the head waters of Eureka Gulch to the east and north. Sampling then expanded to include the accessible sub-basins on all sides of Bonita peak. The sub basins all drained to either the South Fork of the Animas or to Cement Creek above Gladstone. Additional sampling was completed in Prospect Gulch (Figure 1). To aid in understanding the spatial variability of s&s, the study area was delineated into 14 discrete sub-basins that represent the major basins and headwater tributary flows that originate around Bonita Peak and contribute to Cement Creek and the South Fork of the Animas River. The sub-basin approach enables a finer scaled approach at considering relationships with surface geology (Figure 2) and will enable better analysis of water quality for individual stream segments that contribute to the headwaters of Cement Creek and Animas River watersheds.

4.0 Results

The data quality objective of the study was to provide data collected in a consistent and defined manner at seep and spring locations previously identified and/or sampled by earlier investigators and located within the Bonita Peak Mining District. Samples were collected from discharging seeps at locations known to have active discharge at least part of the year.

4.*1 Relocating previously sampled seeps and springs*

MSI successfully collected 98 s&s samples along with 14 draining mines (not all of which are listed sites under BPMD), and an additional 17 dry mine portals were surveyed for presence of seeps or discharge. All draining and dry mines sampled during this event are identified in Appendix 1 for quick reference while the full list of all samples can be found in Appendix 2. The goal of 100 samples stated in Table 2 of the FSP was successfully reached during the sampling event. The quality control requirements were also met with 10/98 (10.2%) duplicate samples and 7/98 (7.1%) field blank samples collected.

The first emergence of each headwater stream was sampled when accessible to provide comparison to the surface water data collected at other locations along the stream reaches. MSI identified and sampled many existing locations for s&s by referencing previous data sets collected by Sunnyside Gold Corporation in the 1990’s and early 2000’s (Sunnyside Gold Corporation, 2001). Additional previously located/sampled s&s locations were referenced through the BPMD web map viewer (https://epa.maps.arcgis.com) including; a geospatial data layer called USGS named springs, springs from USGS open file report 00-53 (Mast *et al.*, 2000), non-published data given directly to MSI (Wright, 2017), and from geospatial data collected as part of USGS professional paper 1651 (USGS, 2007). Most of the previously sampled s&s were located and identified, with the GPS locations updated using high precision GPS equipment. The accuracy of many previously identified s&s locations was often off by > 10-20m due to GPS/satellite limitations in complex terrain with limited sky view. All locations sampled in this study received updated GPS coordinates (Appendix 2) with sub-meter accuracy, which will greatly improve ability to monitor and resample these locations in the future. Occasional accuracy issues were still encountered for s&s located in steep drainages where limited sky view impacted the ability for the Global Navigation Satellite Systems (GNSS) to locate sufficient satellites.

4.2 Site Photography and vegetation documentation

Photos were taken in all four cardinal directions at each location to document the current conditions at each site and have been uploaded to the EPA SharePoint online database for further viewing. Additionally, the presence/absence of wetland plant species was recorded for each s&s (Appendix 2) to provide an initial indication on perennial and inter-annual longevity of each location. Most (89/98) of the sampled springs had the presence of wetland plants indicating that they are perennial in nature and that consistent discharge of water has occurred at these locations not withstanding any of the hydrologic alterations to mine flows (i.e. bulk heading) which has occurred in the study area in recent decades. Results also provide preliminary qualitative data for locations that may contain obligate wetland species and will need to be evaluated and monitored further to determine if EPA Superfund remedial or removal actions impact these potentially ecologically sensitive locations within BPMD. Repeat photography at each location during future sampling efforts will document any changes to wetland vegetation which will provide qualitative evidence of changes to the timing and magnitude of discharge at each location.

4.3 Discharge

Water quantity (discharge) was measured at each s&s location using a variety of methods as described in the FSP. The discharge from s&s varied from no measureable overland flow to a high of 60 gallons per minute (gpm) with an average discharge of 5 gpm across the sampled sites (Appendix 2). Upon completion of future repeat sampling during different times of the year at individual locations a qualitative analysis of flow consistency will be performed to describe perenniality of flow. Locations where discharge does not increase significantly during high flow sampling will be identified as perennially consistent groundwater discharge points and may provide useful information on the surface and groundwater interactions in that area.

The summation of flows at the sub-basin scale will also assist in calculating metals loading to surface waters and should be compared to flow and loading from draining mine adits within those sub-basins. A complete data set of draining mine water quantity and quality was not available for comparative analysis at the time of this report. Additionally, the s&s discharge data may be used at a later date to investigate sub-basin and basin scale water balance in relation to other point sources (draining mines) and diffuse sources (gaining stream reaches) across the study area. The discharge data also serves as a baseline for each s&s that can be used to monitor any future changes potentially associated with any changes to mine discharge (i.e. bulk head closures) within BPMD.

4.4 Water quality; Metals

The total and dissolved metals concentrations were measured for each of the 98 seep or spring locations in the study and can be obtained online via Scribe. Metals samples for draining mines were not collected in this study because they were collected concurrently by either the State of Colorado Division of Reclamation and Mining Safety (CDPHE, 2017) or by the EPA surface water sampling ESAT contractors. To best represent the potential impacts of individual s&s on nearby surface water quality the metals concentrations were multiplied by the discharge to express metals concentrations as loads to the watershed in kilograms per day (Appendix 2).

Several metals found to be in elevated concentrations, including Al, Cu, Fe, Pb, and Zn will be presented in graphical format while the other metals analyzed (including As, Be, Cd, Cr, Mg, Mn, Ni, Ag, Sb, Sr, and Tl) are presented in Appendix 2 but were found at low levels or below detection and not a focus of this report. The metal loads for Al, Cu, Fe, Pb, and Zn were calculated as a mean and total amount by sub basin (Table 1). The sub basin with the highest mean and total s&s load for each of these metals is highlighted in red while the lowest values are highlighted in green. Other sub-basins with elevated load for each metal are also highlighted in orange to help easily identify where the lower water quality s&s are located. The results in Table 1 suggest metal loading from s&s occur across a few sub-basins including Alaska Basin, South Fork of the Animas, and Cement Creak at Gladstone and up gradient along Cement Creek towards the Mogul mine area. The s&s along the east side of Cement Creek from Gladstone north to the Mogul mine were generally of degraded water quality (acidic pH, elevated metals concentrations).

The loading in Alaska Basin comes primarily from SS 27 and 29 which are the sites below Queen Anne Mine and are much poorer water quality than the s&s that emerge in the basin headwaters above the Queen Anne Mine complex. These two springs reside immediately north of the Eureka Graben structure and immediately down gradient of the Lower Queen Anne mine where sericite-pyrite is present at the surface. Therefore, further investigation is needed to understand the source of water for these two springs. SS 29 had the largest discharge of all springs samples (60 GPM), which indicates a significant groundwater flow path at this location and deserves more analysis to understand the sources of these flows.

Loading calculations from South Fork Animas are specifically from the east-facing slope of the lower part of the drainage (SS 71-75) and does not represent emergent water quality in the headwaters of this drainage which was not sampled for this study. Of particular note for these 5 springs is that we included 2 draining mines (SS 71 and 75) as s&s because these mines are not listed as draining mines by DRMS. All the sampled s&s for S Fork of the Animas occur within a narrow elevation band at ~11,100 feet and appear to be in line with some number of radial fractures that come off the Achilles heel area of the Eureka Graben. Analysis of the surface water in South Fork Animas upstream of SS 71 is recommended to determine if the lower quality water emerging at this location is isolated or part of a larger groundwater network. Initial surface water quality results for S Fork of the Animas suggest that there is a considerable degradation of water quality near these s&s, which further emphasizes the need to understand their contribution of metals to the watershed.

The dissolved and total loads of the two most commonly encountered metals, Zn and Cu, were plotted for all sampled s&s in Figures 3-6. For visual clarity, the individual s&s were grouped into ranges of loading and plotted using proportional symbology. The largest loaders are labeled with ID and load as kg/day. From Figures 3-6 it is clear to see that McCarty basin, which resides above 12,000 ft. elevation, has non-detect levels of Cu and Zn. In general, the highest quality (lowest metals concentrations) was sampled in McCarty Basin and Minnehaha Basin, while Ross Basin and Velocity Basin also have relatively low Zn and Cu loads coming from s&s (Table 1). The s&s emerging from the headwaters of M Fork Cement Creek also have low metals concentrations. In upper Eureka Gulch the s&s that flow into the S Fork of Eureka have non-detection for Cu and Zn while those that are closer to the N Fork of Eureka (historically starting from Lake Emma), and in the proximity of the Sunnyside mine workings, have higher levels of metals. The s&s at the headwaters of N Fork Eureka do reside in an area of vein-related quartz-sericite-pyrite hydrothermally altered surface rock and are along the Eureka Graben (Figure 2), which are likely influencing the degraded water quality. The s&s in the N Fork Eureka may be an important identifier of potential water quality associated with surface interactions and infiltration that may occur near the former Lake Emma and impact recharge of the Sunnyside mine workings residing below.

4.5 Water quality; pH, conductivity, and major ions

All collected pH and conductivity data can be found in Appendix 2. Major ion chemistry can be obtained online via Scribe. The pH was measured at each location and ranged from 2.8 to 8.91 with an average of 6.24 across the study area. PH was lowest (<3) in s&s along N Fork of Cement Creek below the Gold King mine and was consistently below 5 along the entire main stem of Cement Creek (Figure 7). In general, the pH was higher in the highest elevation basins with the exception of Prospect Gulch, which had both high and low pH values across the entire upper basin. The low pH s&s sites in Prospect did not appear to be related to proximity to mine features or adits. Completion of high flow sampling in 2017 will help determine the seasonality of pH which can provide initial insight on the sources and residence times of water emerging at each location.

Conductivity was measured with pH at all locations and ranged from a low of 21 μs/cm to a high of 2050 μs/cm with an average of 426 μs/cm. The highest conductivity was found in the s&s located in the Cement Creek at Gladstone sub basin followed by high values for most all of the springs along the N Fork of Cement Creek and several in Cement Creek above N Fork. High conductivity (> 1000 µs/cm) was also found at SS 01 in upper Eureka Gulch, SS 11 in Alaska Basin, SS 74 in S. Fork Animas, and SS 94 in Prospect Gulch.

The major ions (Cl^-, F^-, SO_4^{2-}, and NO^{3-}/NO^{2-} as N) were measured for each location in the study area. Sulfate (SO_4^{2-}) varied widely across the sampled s&s from 5 to 1500 mg/l with a mean value of 205 mg/l. In general SO_4^{2-} was highest where pH was lowest (N Fork and main stem of Cement Creek) but was also elevated in the S Fork of the Animas and in a few locations in Eureka Gulch (Figure 8). Elevated sulfate was also found in several locations in Prospect Gulch. Future analysis of the stable isotope ($\delta^{34}S$) of sulfate could be helpful in identifying where the sulfate has been derived in s&s waters relative to the waters draining from mines especially in the Eureka Graben area. Unique $\delta^{34}S$ signals could help to differentiate sulfate coming from vein and disseminated sulfides to sulfate from gypsum and anhydrite phases common to the Eureka Graben (Bove *et al.*, 2007).

Fluoride (F^-) from s&s ranged from 0 to 4.8 mg/l with an average of 0.68 mg/l across all s&s (Figure 9). Fluoride is known to be a potential conservative tracer in mine waters (Cowie *et al.*, 2014) and has previously been measured in elevated concentrations (> 2 mg/L) at multiple locations within the Eureka Graben/Bonita Peak study area (Bove *et al.*, 2007). Specifically, several locations including discharge from the American Tunnel, the Gold King via N Fork Cement Creek, and a location in Upper Eureka Gulch, are correlated with nearby vein systems containing late-stage fluorite and heubnerite (Bove *et al.*, 2007). Interestingly, Walton-Day *et al.* (2007) also measured extremely elevated fluoride (21.8 mg/L) in the Mogul mine discharge in 1999. This is significant because the Nearby Queen Anne mine, which exploited similarly mineralized and parallel vein structures, had low fluoride concentrations. Also, fluorite has not been reported as a vein constituent at the Mogul mine nor is it found in the associated waste dumps (Bove *et al.*, 2007; Burbank and Luedke, 1969). There were large increases in fluoride in upper Cement Creek between 1996 and 1999 and it was suggested by Bove *et al.* (2007) that the increase was due to increases in fluoride from the Mogul mine as a result of plugging the American Tunnel which was hypothesized to cause the rise of the mine pool waters into the mogul workings (Walton-Day *et al.*, 2007). The previous studies clearly indicate that fluoride may be a useful tracer to understand sub surface hydrologic connections between mine waters and s&s, especially when combined with other measured parameters.

The F^- concentrations in s&s showed no relationship with elevation (Figure 10) but when plotted with $\delta^{18}O$ (Figure 11) there is an apparent connection with higher F^- values occurring in samples that were more depleted in $\delta^{18}O$. Further analysis of the F^- to $\delta^{18}O$ relationship at these locations during high flow conditions and in relation to draining mines may provide useful information related to source water. Additionally, it is recommended that further comparison of geochemical signatures in mine waters and s&s waters relative to the nearby areas of mineralization will enable better characterization of fluoride sources and its ability to act as a conservative tracer for subsurface waters.

4.6 Stable Water Isotopes

Precipitation is the ultimate source of ground water in virtually all systems. Hence, knowledge of the factors that control the isotopic compositions of precipitation before and after recharge allows the use of oxygen and hydrogen isotopes as tracers of water sources and processes. Craig (1961) observed that the $\delta^{18}O$ and $\delta^{2}H$ (δD) values of precipitation that has not been evaporated are linearly related by:

$$\delta D = 8\delta^{18}O + 10$$

This equation, known as the "Global Meteoric Water Line" (GMWL), is based on precipitation data from locations around the globe, and has an $r^2 > 0.95$. This high correlation coefficient reflects the fact that the oxygen and hydrogen stable isotopes in water molecules are intimately associated; consequently, the isotopic ratios and fractionations of the two elements are usually discussed together. The slope and intercept of any "Local Meteoric Water Line" (LMWL), which is the line derived from precipitation collected from a single site or set of "local" sites, can be significantly different from the GMWL. The water inputs (rain and snow) for local and regional precipitation near BPMD were sampled to establish a LMWL (Figure 12). Due to the limited time (and seasonality) of this study, previously measured stable isotope concentrations from both rain and snow previously collected within the central San Juan Mountains were combined with samples collected during the study to represent local inputs (data from Cowie *et al*. 2014). The data set includes five snow samples collected in December 2016 and January 2017 at the Bonita

Peak weather station. The local meteoric water line developed for this study (Y = 7.79x + 7.88, R^2 = .996) was very similar to the GMWL indicating that inputs to the local hydrologic system are typical of global precipitation. Incoming snow precipitation had a $\delta^{18}O$ of about -20 to -22 ‰ while rain had a $\delta^{18}O$ of about -5 to -10 ‰ (Figure 12).

The concentration of water isotopes found in individual water molecules of individual water samples (from s&s and draining mines) were plotted with the LMWL to provide insight on the contribution of water sources (rain, snow, glacial ice) comprising each sample collected.
All of the s&s and draining mine waters sampled were a mixture of both rain and snow with most samples falling on the LMWL. There were a few samples that fell to the right of the LMWL, indicative of fractionation associated with evaporation since arriving as meteoric waters. The three springs falling below the LMWL (SS 33,34,80) were enriched in $\delta^{18}O$ and had lower D excess values, which is consistent with preferential loss of the lighter isotopes through evaporation. These three s&s locations had standing surface water at the point of emergence in the form of kettle ponds or small surface water ponds where evaporation is probable. The evaporation signal suggests that these springs have a low discharge rate and the water resides for some time at the surface expression, therefore these springs do not present an ideal representation of groundwater discharge and may have chemistry that is altered by the longer residence time of the water at the surface.

A detailed view of Figure 12 is provided in Figure 13 to more closely examine the relationships between s&s flows and those from draining mines. The first observation is that most of the draining mines are closely clustered, and fall towards the more depleted end of the LMWL. This indicates that the water from the draining mines during low flow conditions were from a similar ratio of rain and snow with the more isotopically depleted snow being a greater contributor of recharge.

The mean $\delta\,^{18}O$ of all seeps and springs was -14.894 +/- 1.6 ‰ and the mean $\delta\,^{18}O$ of all sampled draining mines was -16.079 +/- 0.46 ‰ indicating that both sources are derived from snow dominated meteoric recharge. Therefore, the largest input of meteoric waters within the study site is from snowmelt, which has a more depleted signal ($\delta\,^{18}O$ ~-20 ‰) than that of summer monsoon rains (δ ^{18}O ~-5 ‰). Assuming a snow dominated precipitation/recharge regime typical for high elevation alpine and sub-alpine mountain catchments (see Cowie *et al*., 2017) a snow dominated water isotopic signature would be expected for groundwater emerging from s&s and draining mines. There was no significant relationship (R^2 .09) between δ^{18}O and elevation of s&s (Figure 14). This result demonstrates that the ratio of rain/snow contribution to recharge does not appear to change significantly for groundwater discharging across the elevation range of the BPMD study area.

The s&s sites that have more enriched (i.e. δ^{18}O > -14 ‰) indicate a greater source contribution from rain. These locations may be expressing shallower flow path groundwater that was more heavily influenced by the recent summer monsoon rains occurring prior to the fall low flow sampling event. When recent precipitation is observed in groundwater discharge a shorter sub-surface residence time can be interpreted for the emerging waters. A shallow flow path is also less likely to interact with many of the deeper mine workings that may be flooded and sourcing lower quality groundwater. The fall 2016 sampling event occurred during low flow or baseflow conditions to best represent the background groundwater system without interference or mixing from “new” inputs of snowmelt or summer monsoon rain. Comparison of the measured water isotope values with future high and low flow sampling events will provide further understanding of the flow paths and residence times of emerging groundwater.

Despite the overall general similarity in isotope values across the sample sites there was some clear variability in δ^{18}O between groups of springs in different sub-basins. Specifically, there were a number of s&s clusters that were more depleted than -16 ‰ in δ^{18}O, which would be more similar to the draining mines than too many of the other springs. For example, all four s&s in the sub basin Cement Creek at Gladstone and all five s&s that were sampled in S. Fork Animas are more depleted than –16 ‰ in δ^{18}O. Additionally, there were several s&s in Cement Creek above N. Fork and one at Terry Tunnel (SS 42) and one in N. Fork Cement (SS 85) that were also more depleted than –16 ‰ in δ^{18}O (see Appendix 2 for values). Interestingly, these sites are all below 12,000 ft. elevation while many of the other s&s locations with more enriched δ^{18}O are located in the higher elevation sub-basins or in locations further away from the main mine workings beneath Bonita Peak. The results therefore provide preliminary information that these s&s locations cannot be ruled out as non-influenced by mine waters and require further investigation.

When the above-mentioned s&s are looked at from a water quality (metals concentrations) perspective, we see that these locations are also some of the largest s&s loaders within the sampling area. The s&s in Cement Creek at Gladstone and those sampled in S Fork Animas are some of the largest loaders from all locations sampled. Therefore, the isotopic composition may be correlated to metals concentrations and should be analyzed in more detail following completion of the 2017 and 2018 sampling events.

Terry Tunnel seeps (SS 41, 42) emerge from the toe of the reclaimed area down gradient of the closed tunnel and may represent either local discharge from the flat reclaimed area or also inclusive of emergent groundwater associated with unique fracture flow or a unique flow path connected to the Terry Tunnel and other up gradient mine workings in the headwaters of Eureka Gulch. Based on the first round of isotopic sampling SS 41 has a δ^{18}O of -14.67 ‰ while SS 42 has a more depleted signal of -16.06 ‰ suggesting potentially unique and different flow paths for these 2 seeps. The more depleted signal from SS 42 suggests a more snow dominated recharge and may represent a longer or deeper flow path that is more similar to the s&s sampled in S Fork Animas, and near Cement Creek at Gladstone.

4.7 Stable water isotopes: Time Series for draining mines

In addition to providing insight on spatial variability of source waters, stable water isotopes can also indicate temporal variability in source waters when measured at unique locations over time. Ongoing monthly sampling of stable water isotopes in several of the draining mines within the Bonita Peak complex began in September 2016 and will continue through 2017. Results for samples collected through January 2017 were available for this report and are summarized in Figure 15. During the period of measurement there is a similar signature from the AT, R&B, and GK discharges. The signals from the Grand Mogul, Natalie Occidental, and Mogul mines are all enriched relative to the other mines indicating a different mixture of source waters emerging from those locations. An enriched signal may suggest a greater input from monsoon rains via a shallower or shorter flow at those mines. A longer time series of the isotopic signal that spans several years of precipitation input variability will enable further analysis on the water sources at different mines and will indicate if variability tracks across the different mines. Temporal stability in the isotopic signal at any one location indicates the source waters are well mixed and likely have a longer sub-surface residence time and/or come from a large reservoir. Temporal instability in isotopic composition from a location will indicate changing source waters and shorter residence times suggesting shallower flow path recharge directly to the mine workings.

4.8 Stable water isotopes: Rock Glacier signal

There were four sample locations (SS 25,32,35, and 49) that were in the proximity of remaining rock glaciers on the north facing sides of peaks in the BPMD. Interestingly, each of these four locations had a unique and similar isotopic signal (δ^{18}O of -13.46 +/- 0.16) indicating that a unique glacier ice isotopic signal occurs at these locations during the fall low flow periods. This result is comparable to previous studies of rock glacier outflow isotopic signals that are often enriched relative to other local groundwater and surface water signatures at that time (see Williams *et al*., 2006; Cowie *et al*., 2016). To summarize, the rock glacier ice has been formed over long periods of time and is a combination of rain and snow that has melted and refrozen under the rock (talus) covered slopes. This ice and resulting melt water has significant interaction with lots of surface area of the local talus and bedrock which leads to greater weathering and higher solute concentrations in the resulting outflows. The increase in air temperatures and longer snow-free summer seasons in recent decades have led to more heating of the subsurface and melting of the rock glacier ice may be increasing in late summer leading to increases in surface water contribution from these sources during low flow conditions (see Caine, 2010). Elevated sulfate from draining rock glaciers is common due to greater exposed rock surfaces and longer residence times enabling more rock water interactions and greater weathering. Higher metals concentrations may also be discharged at these locations due to increased weathering and prolonged rock/water/air interactions with the host parent material at these locations. Ongoing monitoring at these locations is highly recommended because continued loss of the rock glacier ice reservoir driven by a warming climate may lead to increased contaminant loading from these locations. Increased discharge from rock glacier locations is most common in the late summer after prolonged heating of the subsurface, which also coincides with lower baseflow conditions in the local surface waters. The result is a potential for increased natural loading during low flow conditions under reasonably expected future climatic conditions.

5.0 Conclusions

The first round of seeps and springs sampling was completed during low flow conditions in the fall of 2016. A total of 98 s&s were sampled along with 17 draining mines and an additional 17 dry mine portals were surveyed for presence of seeps or discharge. The quality control requirements of 10% duplicate samples and 5% rinsate blank samples were met. The initial findings are intended to provide a preliminary baseline, a more detailed characterization report of s&s will be completed after sampling in 2017.

6.0 Recommendations

- Repeat sampling of all s&s and draining mines during spring runoff high flow conditions is necessary to understand the temporal variability of both water quality and water quantity emerging from s&s and draining mines. 2017 and 2018 sampling events will fill this data gap.
- Continued temporal sampling for stable water isotopes will enable further understanding of the spatial and temporal variability of emergent groundwater from both s&s and draining mines within the Bonita Peak mountain complex. The stable isotope ratios in samples plot similar to the GMWL and appear to be an easily measured conservative tracer in this investigation. Further analysis of stable water isotopes with other natural and applied conservative tracers will enhance the conceptual understanding of surface water and groundwater interactions in the BPMD.
- Sampling for stable isotope ($\delta^{34}S$) of sulfate to differentiate source water flow paths where accumulated sulfate comes from vein and disseminated sulfides to sulfate from gypsum and anhydrite phases common to the Eureka Graben.
- Additional analysis and/or sample collection recommend in the following identified data gap areas.
    1. Upper Cement Creek above Grand Mogul and below Alaska basin. Inclusive of SS27,29 and Queen Anne Mine area.

2. South Fork Animas basin upstream of SS71. Surface water sampling in this area would address loading along this stretch.
3. Left bank s&s inflows and loading to Cement Creek from Gladstone to Grand Mogul (Bonita Peak GW boundary). Suggest re-visiting previous USGS work on this section
4. California Gulch and Placer Gulch draining mines (e.g. Mountain Queen, Gold Prince, Silver Queen, Sound Democrat) and surrounding s&s. This represents potential connection to Bonita Peak groundwater system to the North.

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7.0 Tables

Sub Basin	# S&S	Al_d	Cu_d	Fe_d	Pb_d	Zn_d	Al_t	Cu_t	Fe_t	Pb_t	Zn_t
Alaska Basin (total)	9	0.642	0.037	0	0	0.711	0.649	0.038	0.022	0	0.697
Alaska Basin (mean)	9	0.071	0.004	0	0	0.079	0.072	0.004	0.002	0	0.077
McCarty Basin (total)	6	0	0	0	0	0	0	0	0	0	0
McCarty Basin (mean)	6	0	0	0	0	0	0	0	0	0	0
Ross Basin (total)	6	0.008	0	0	0	0.01	0.007	0.002	0.009	0	0.087
Ross Basin (mean)	6	0.001	0	0	0	0.002	0.001	0	0.001	0	0.015
Minnehaha Basin (total)	2	0	0	0	0	0	0	0	0.001	0	0
Minnehaha Basin (mean)	2	0	0	0	0	0	0	0	0	0	0
Upper Eureka Gulch (total)	6	0.002	0.001	0	0	0.041	0.014	0.001	0.046	0.001	0.042
Upper Eureka Gulch (mean)	6	0	0	0	0	0.007	0.002	0	0.008	0	0.007
South Fork Eureka Gulch (total)	9	0.026	0.001	0	0	0.003	0.032	0.001	0.006	0	0.003
South Fork Eureka Gulch (mean)	9	0.003	0	0	0	0	0.004	0	0.001	0	0
Eureka Gulch (total)	8	0.042	0.009	0	0.001	0.245	0.056	0.009	0.04	0.007	0.241
Eureka Gulch (mean)	8	0.005	0.001	0	0	0.031	0.007	0.001	0.005	0.001	0.03
South Fork Animas River (total)	5	0.083	0.002	4	0.001	0.251	0.1	0.002	4.484	0.001	0.248
South Fork Animas River (mean)	5	0.017	0	0.8	0	0.05	0.02	0	0.897	0	0.05
Velocity Basin (total)	3	0.009	0	0	0	0.002	0.043	0.001	0.044	0	0.002
Velocity Basin (mean)	3	0.003	0	0	0	0.001	0.014	0	0.015	0	0.001
South Fork Cement Creek (total)	6	0.268	0.002	0	0	0.088	0.27	0.002	0.009	0	0.087
South Fork Cement Creek (mean)	6	0.045	0	0	0	0.015	0.045	0	0.001	0	0.015
Middle Fork Cement Creek (total)	6	0.015	0.001	0	0	0.007	0.024	0.002	0.005	0	0.007
Middle Fork Cement Creek (mean)	6	0.003	0	0	0	0.001	0.005	0	0.001	0	0.001
North Fork Cement Creek (total)	6	0.084	0.007	0	0	0.031	0.092	0.008	0.179	0	0.03
North Fork Cement Creek (mean)	6	0.014	0.001	0	0	0.005	0.015	0.001	0.03	0	0.005
Cement Creek at Gladstone (total)	4	0.314	0.001	3	0	0.32	0.312	0.001	2.08	0	0.322
Cement Creek at Gladstone (mean)	4	0.079	0	0.75	0	0.08	0.078	0	0.52	0	0.081
Cement Creek abv North Fork (total)	17	0.222	0.004	0	0.001	0.212	0.233	0.004	0.243	0.001	0.208
Cement Creek abv North Fork (mean)	17	0.013	0	0	0	0.012	0.014	0	0.014	0	0.012
Prospect Gulch (total)	14	0.452	0.003	0	0.004	0.016	0.455	0.003	0.406	0.004	0.016
Prospect Gulch (mean)	14	0.032	0	0	0	0.001	0.033	0	0.029	0	0.001

Table 1. Metals loading by sub-basing calculated in kg/day. Red boxes are the highest total or mean loader of sub-basins studied. Green is the lowest loaders by sub-basin. Orange represents elevated loading.

8.0 Figures

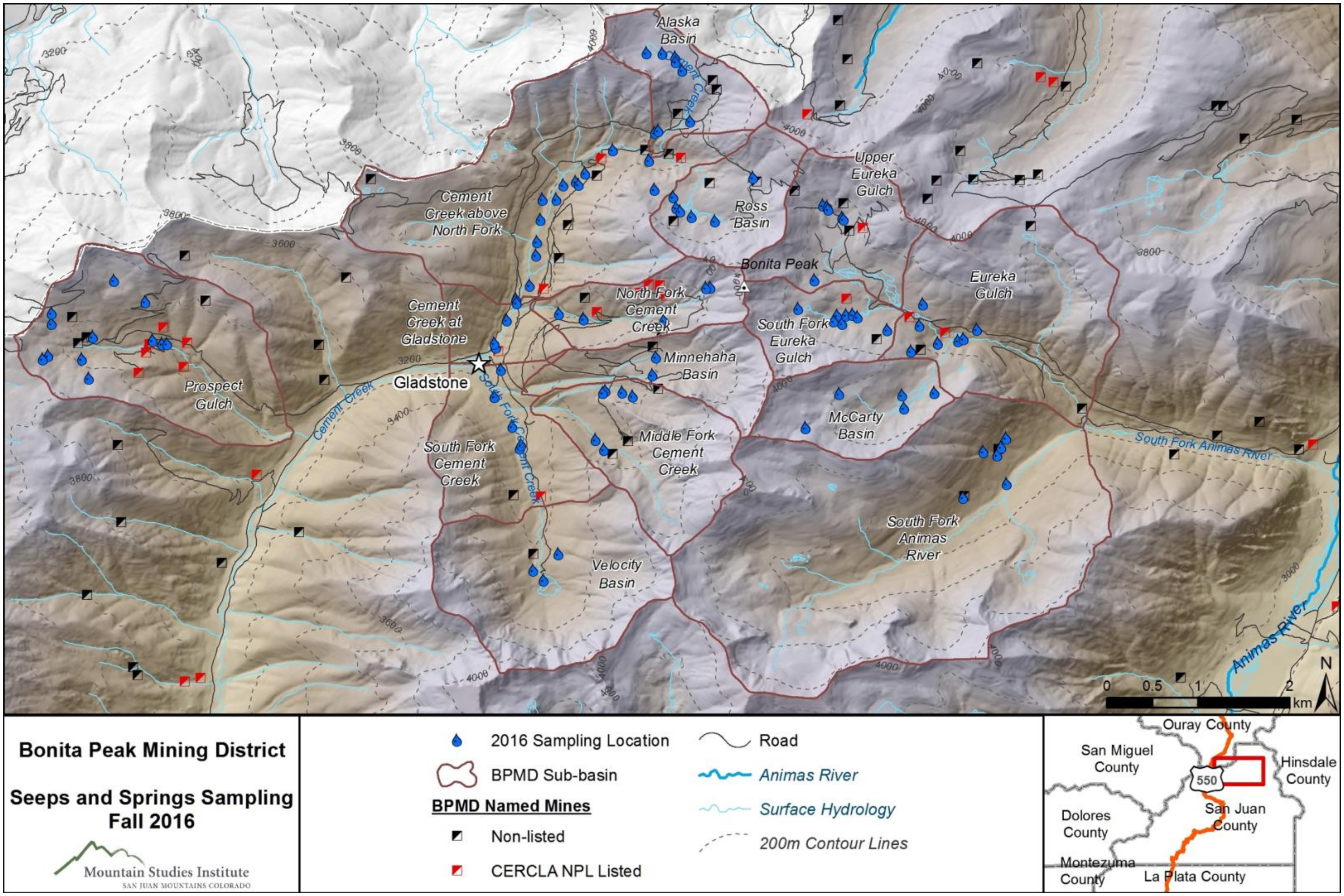

Figure 1: Sampling sites with sub-basin delineations

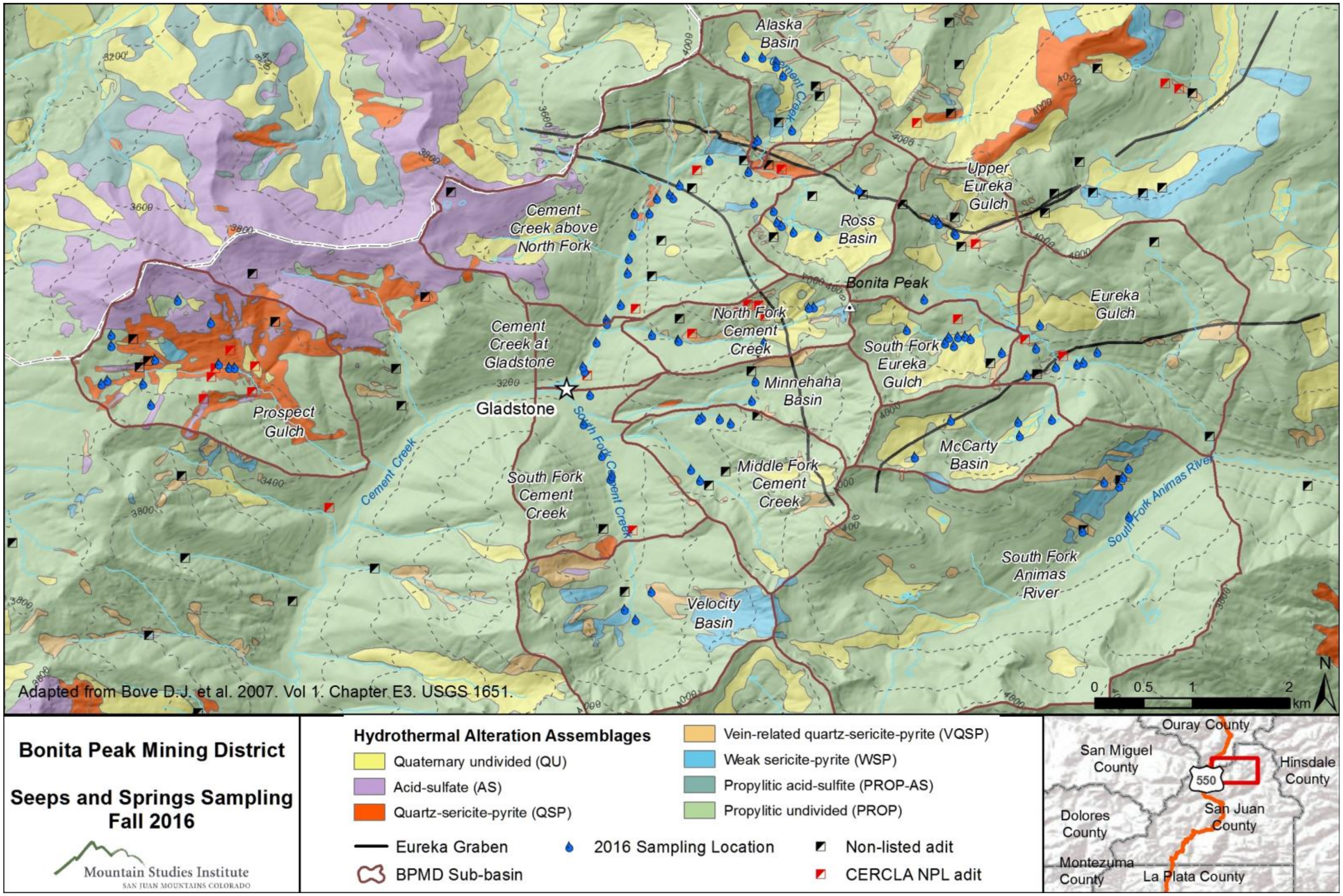

Figure 2: Sampling sites with hydrothermal alteration assemblages

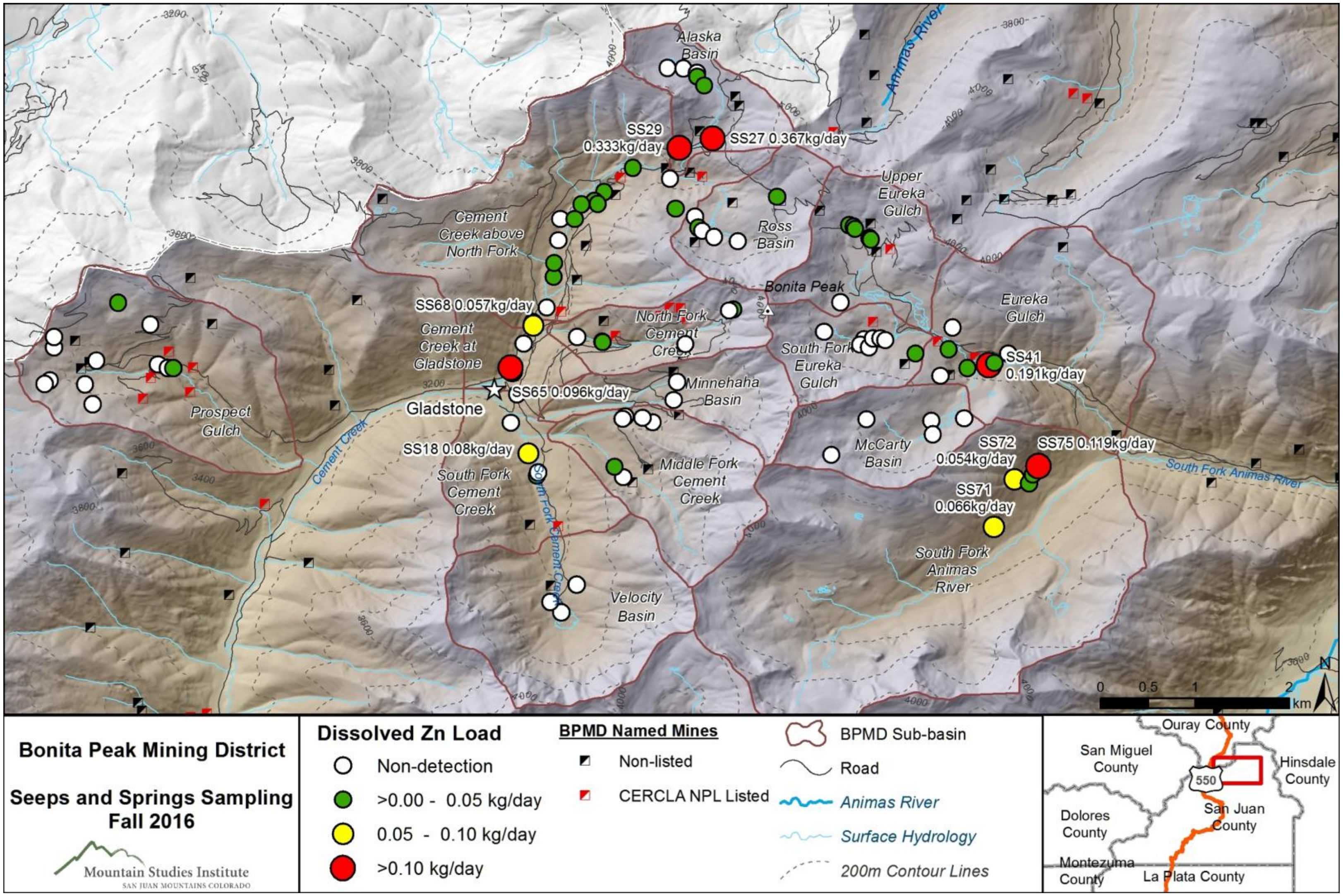

Figure 3: Dissolved zinc (Zn) loading

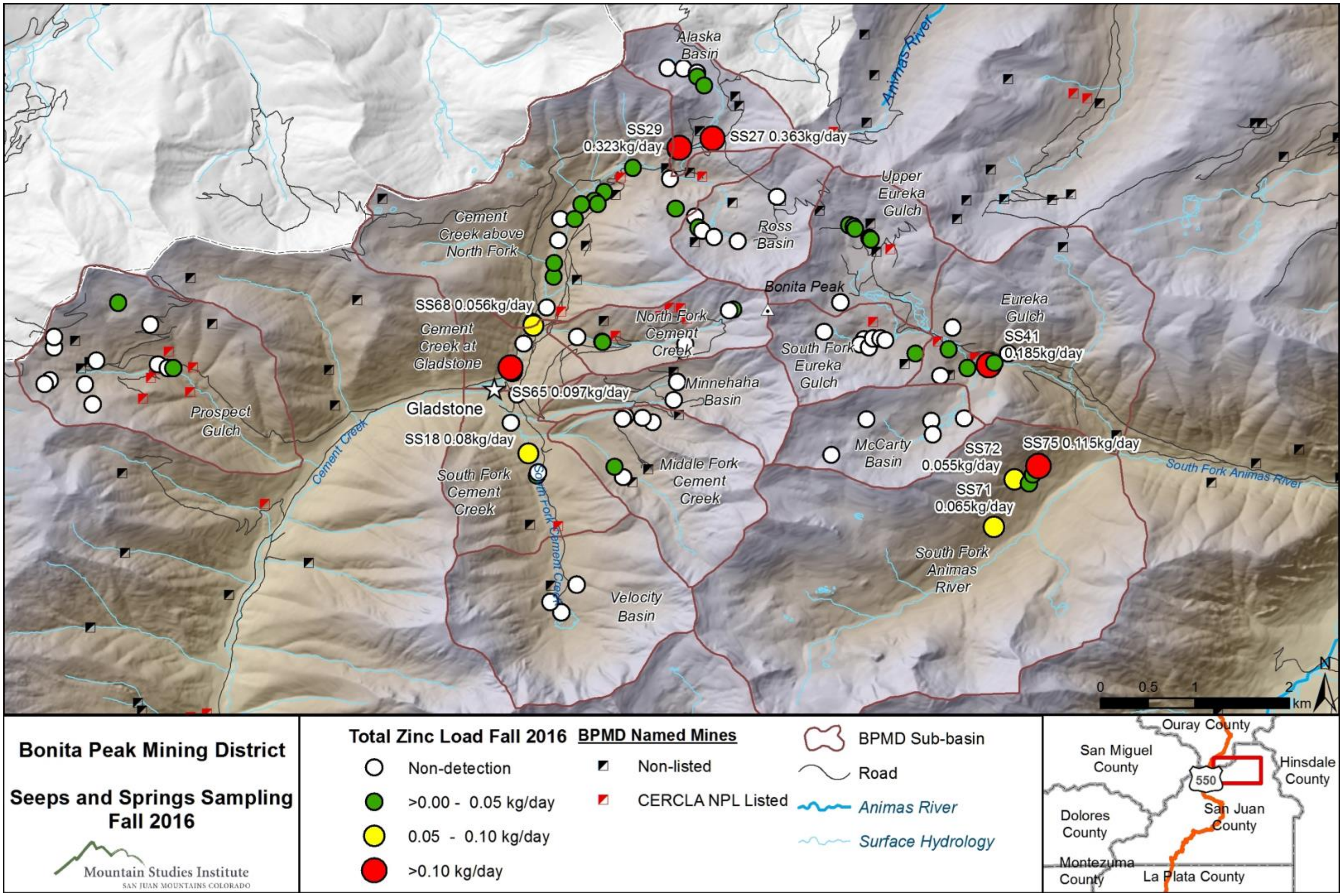

Figure 4: Total zinc (Zn) loading

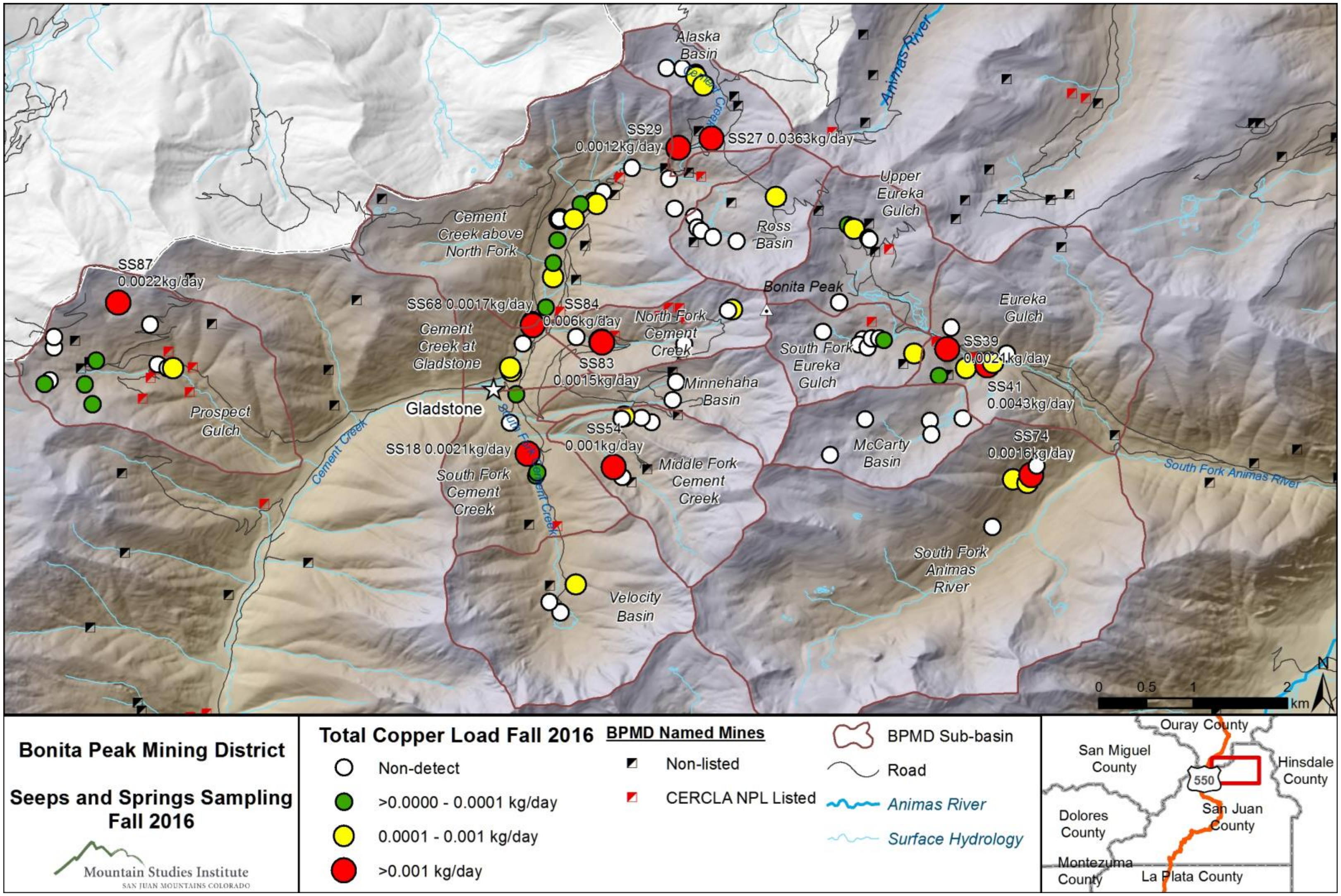

Figure 5: Dissolved copper (Cu) loading

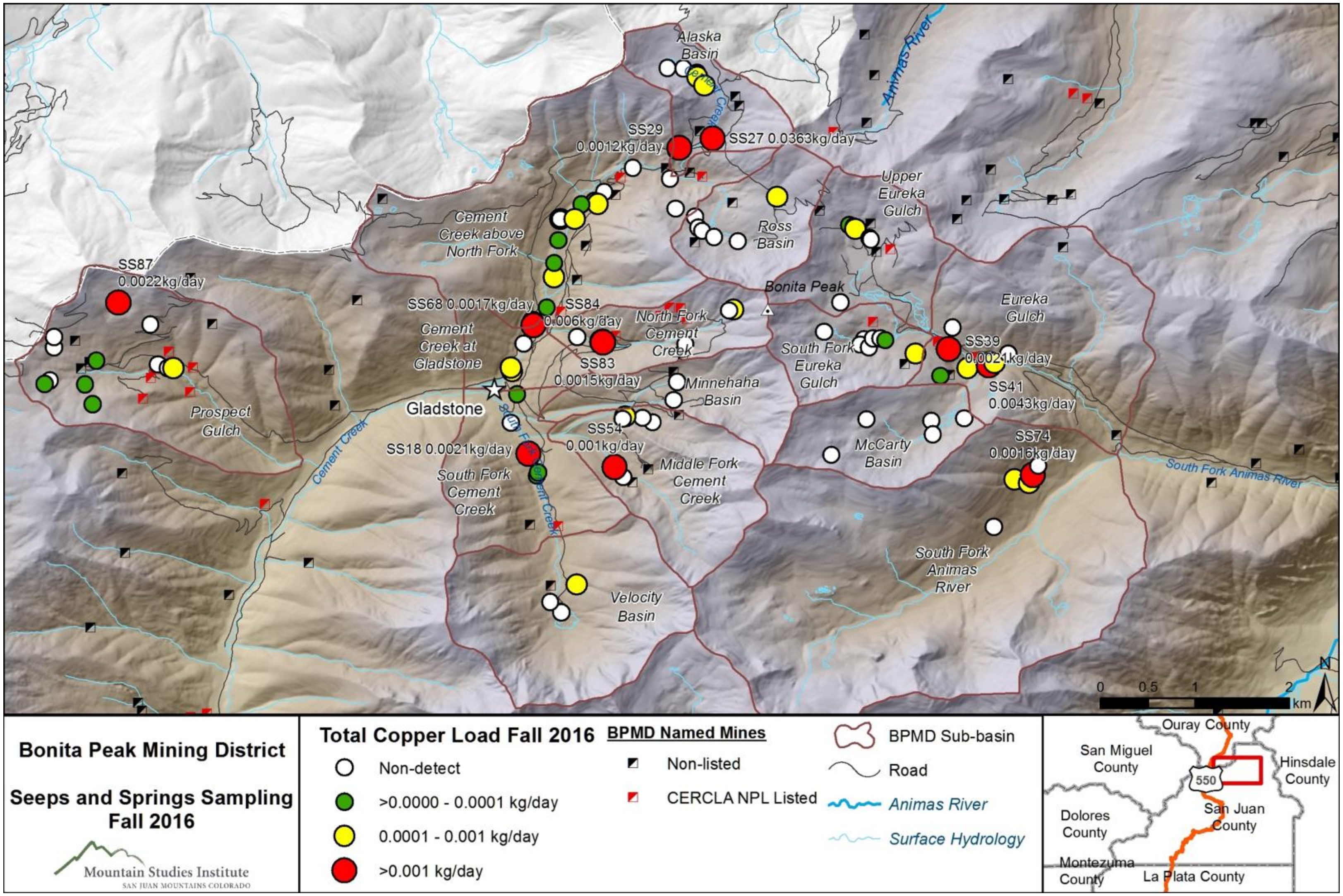

Figure 6: Total copper (Cu) loading

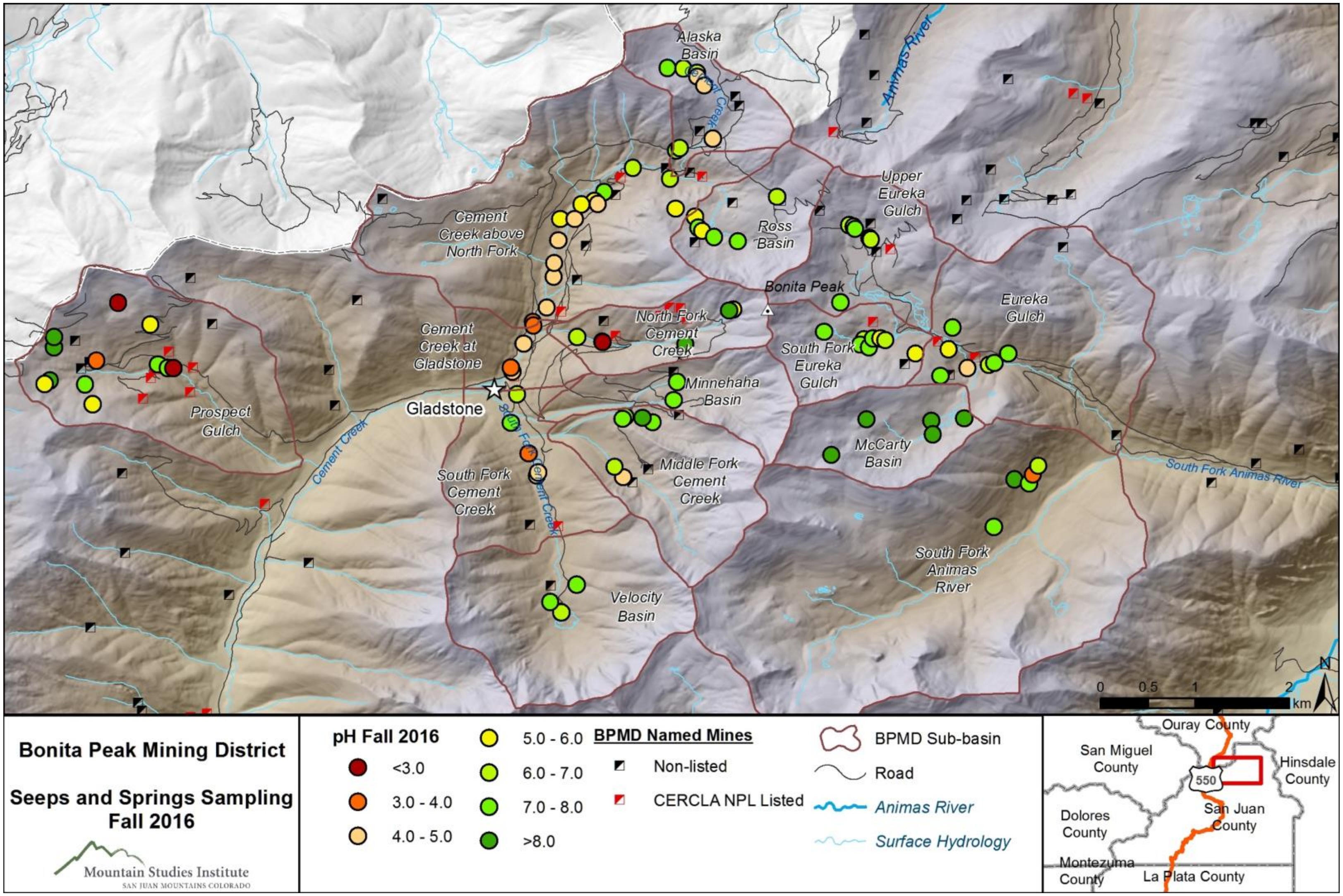

Figure 7: Field measured pH values

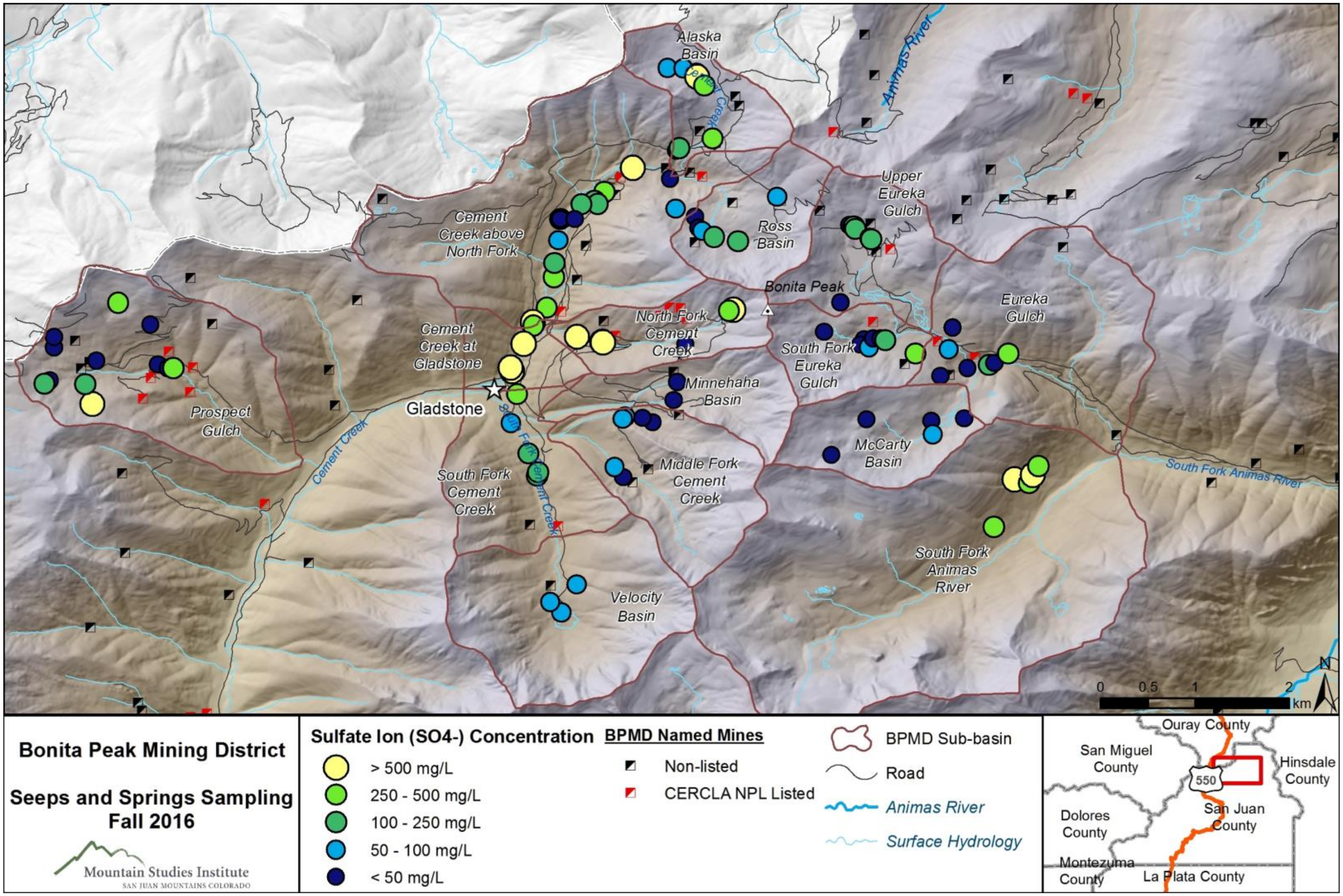

Figure 8: Sulfate ion (SO_4^-) concentration

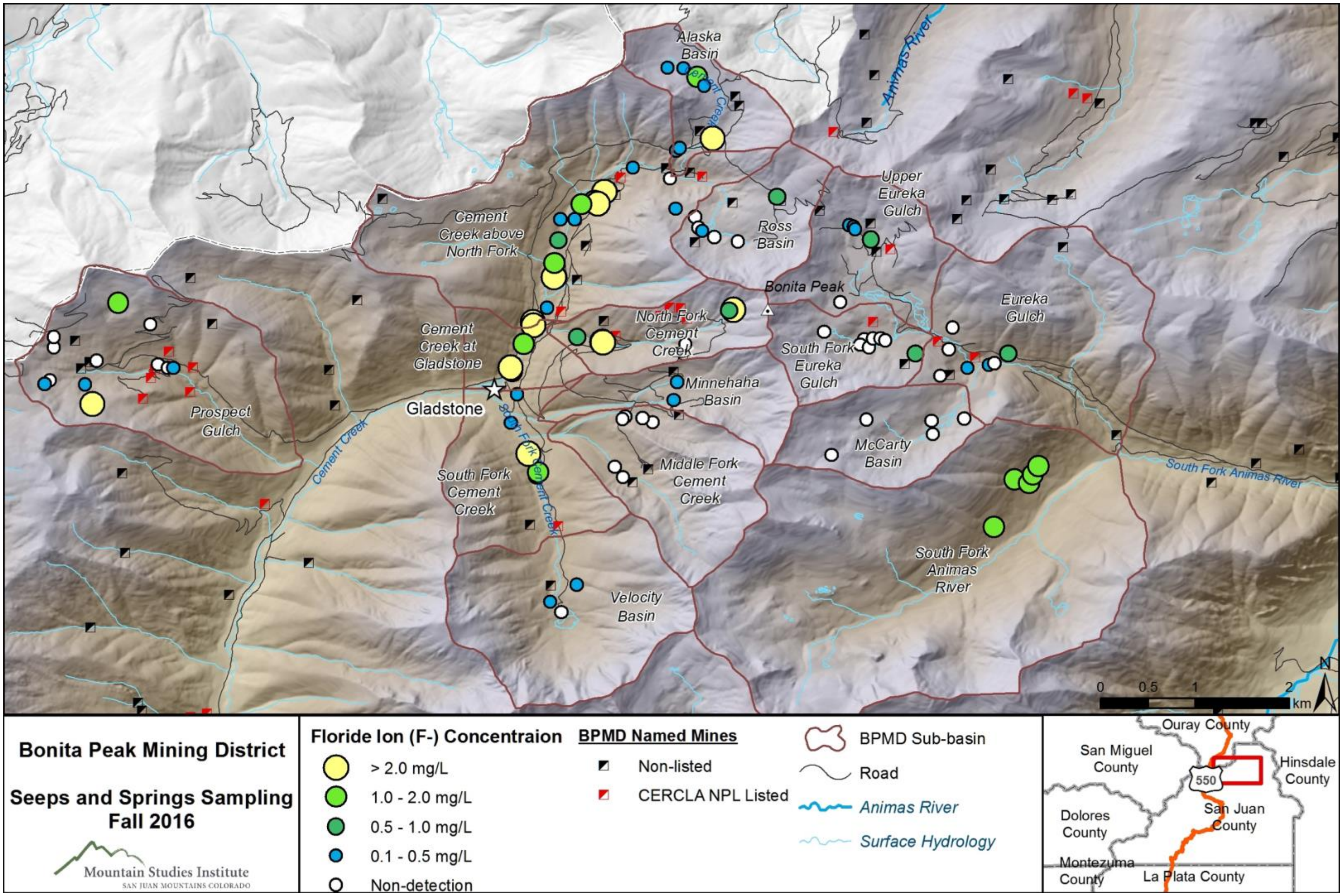

Figure 9: Fluoride ion (F$^-$) concentrations

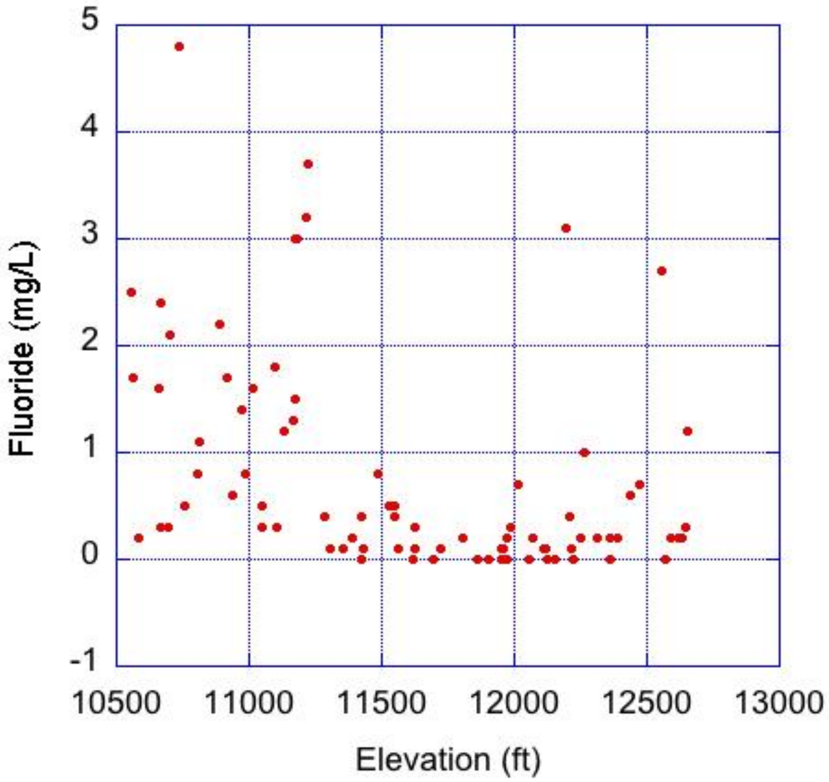

Figure 10: Fluoride ion (F^-) concentration vs. Elevation

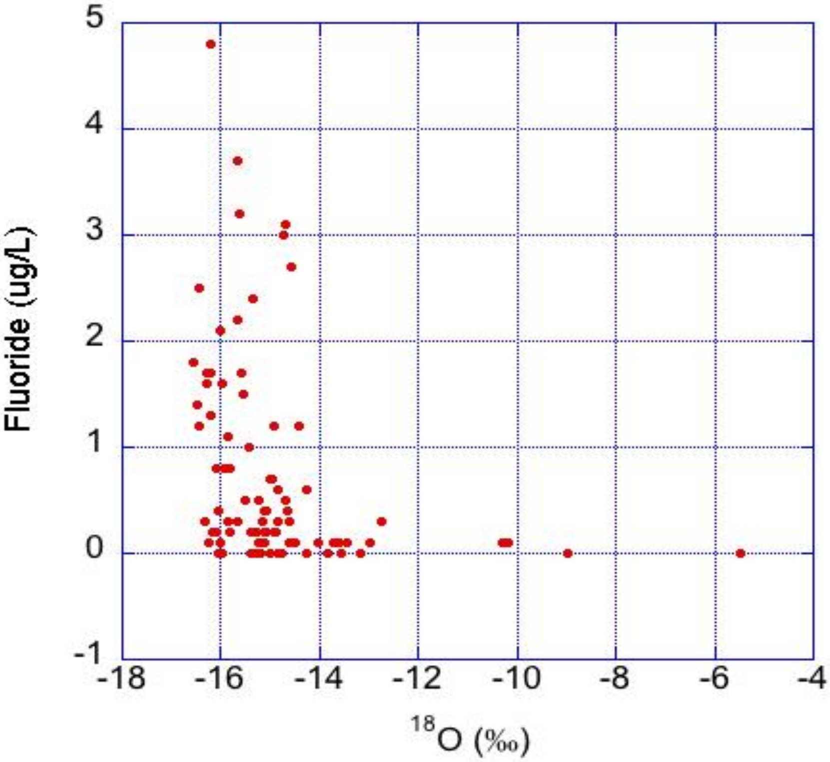

Figure 11: Fluoride ion (F^-) concentration vs. $\delta^{18}O$

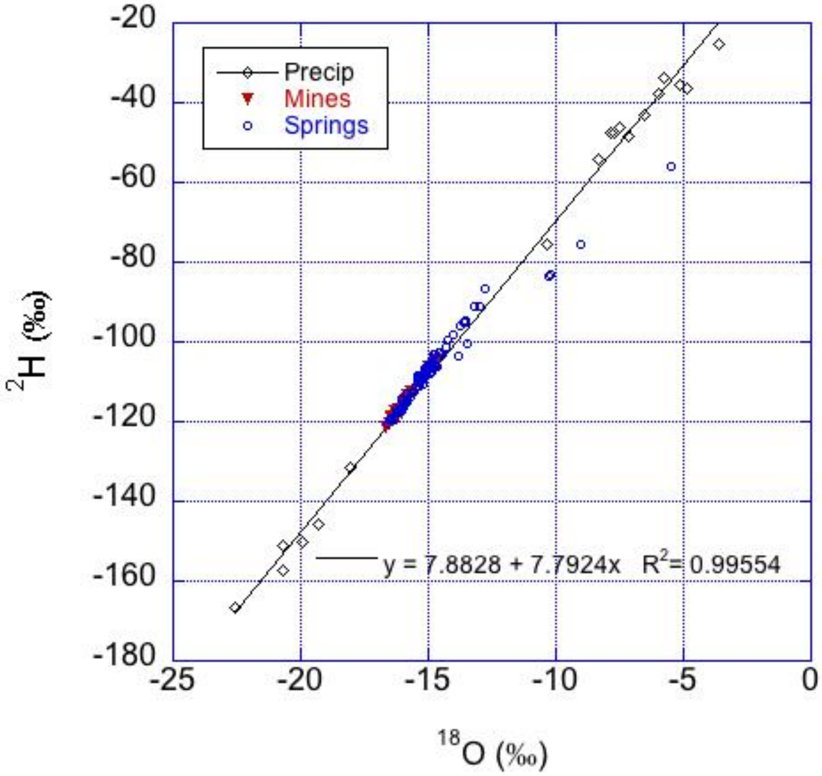

Figure 12: Stable isotopes, δ^2H vs δ^{18}O for seeps, springs, draining mines, and precipitation. The linear local meteoric water line (LMWL) is shown in black.

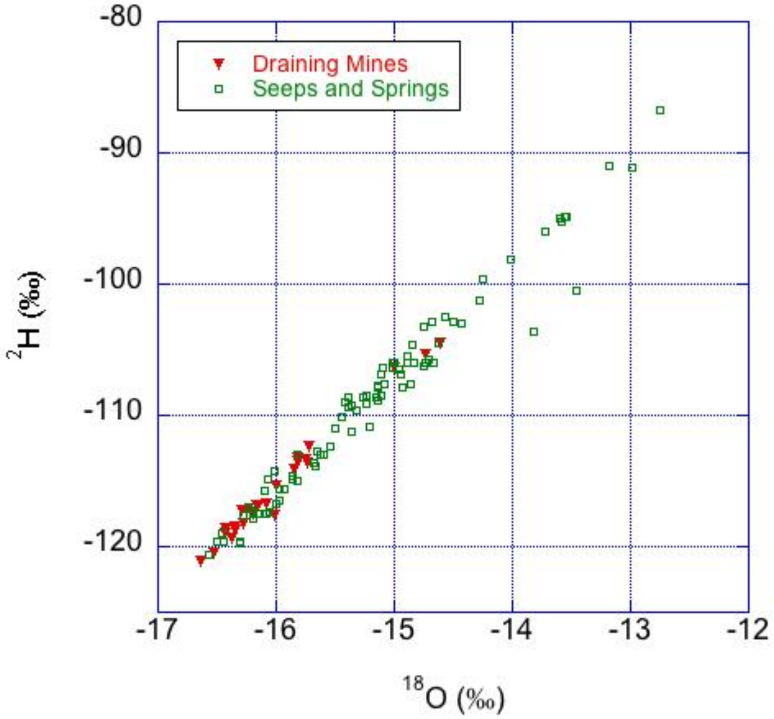

Figure 13: Detailed view of sable isotopes, δ^2H vs δ^{18}O, for seeps, springs, and draining mines.

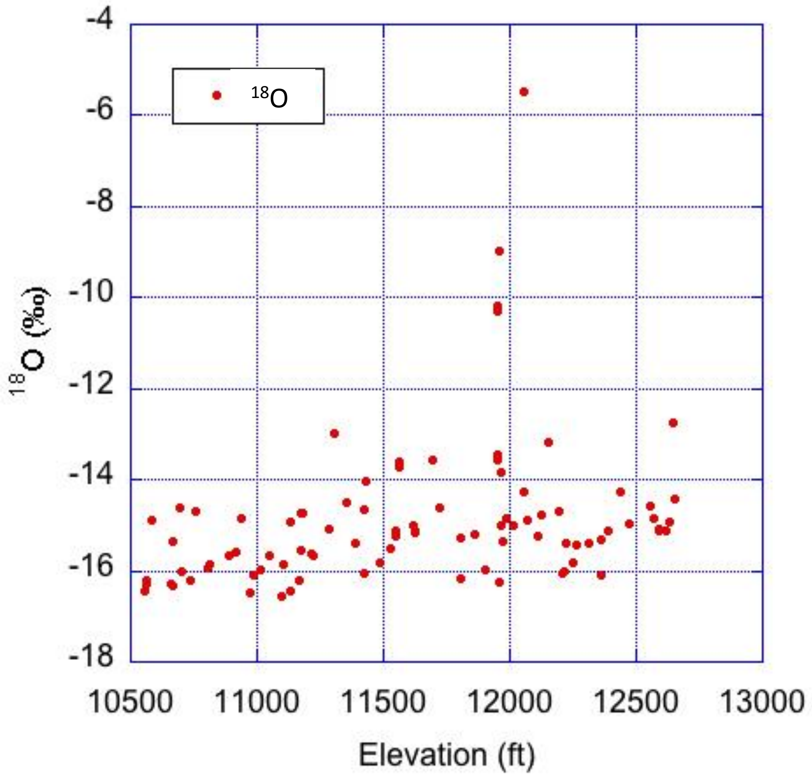

Figure 14: Stable isotope ($\delta^{18}O$) of seeps and springs vs. elevation

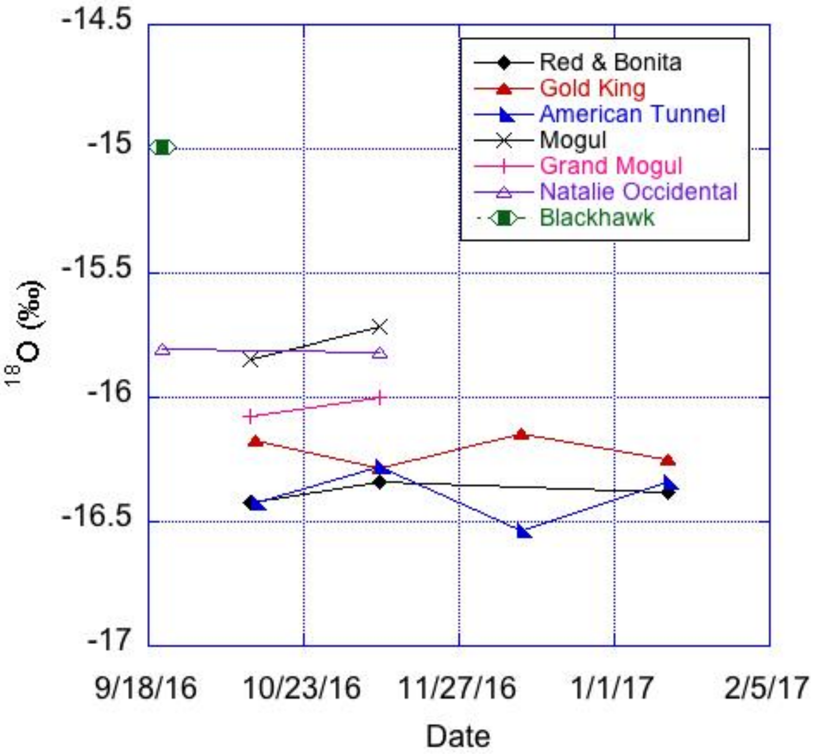

Figure 15: 2016 Time series of the stable isotope of water ($\delta^{18}O$) for several draining mines potentially connected to the Bonita Peak groundwater system.

Appendix 1 – Sampled mine sites (quick reference)

ID	Type	Mine Name	Alias/Alternate ID	2016 CDPHE	BPMD QAPP ID	AREA	LAT	LONG	ELEV (m)	ANALYSIS
SS071	Draining	S F Animas #16	S Fork Mine # 16	NA	NA	S Fork Animas	37.876719	-107.602423	3381.63	TRM,DM,alk, ^{18}O/^{2}H
SS075	Draining	S F Animas # 17	S F Animas # 17	NA	NA	S Fork Animas	37.88253	-107.598205	3394.00	TRM,DM,alk, ^{18}O/^{2}H
SS095	Draining	NA	NA	NA	NA	Prospect Gulch	37.89032	-107.689131	3542.16	TRM,DM,alk, ^{18}O/^{2}H
SS100	Draining	Natalie Occidental	Silver Ledge (wrong)	NA	CC14	S Fork CC	37.87676369	-107.6439899	3356.00	^{18}O/^{2}H,*
SS101	Draining	Red and Bonita	CC03D	NA	CC03C	CC above N Fork	37.89723101	-107.6437025	3339.00	^{18}O/^{2}H,*
SS102	Draining	Gold King Level 7	NA	NA	CCO6	N Fork CC	37.891604	-107.648921	3226.00	^{18}O/^{2}H,*
SS103	Draining	Queen Anne	CC01A	DRMS-121	QA Adit	Alaska Basin	37.914474	-107.630476	3732.80	^{18}O/^{2}H,*
SS104	Draining	American Tunnel	SS109	NA	CC19	CC at Gladstone	37.890981	-107.64844	3238.70	^{18}O/^{2}H,*
SS105	Draining	Mogul South	South of Mogul	**DRMS 120	NA	CC above N Fork	37.90833	-107.638424	3493.30	^{18}O/^{2}H,*
SS106	Draining	Grand Mogul	CC01C	DRMS 98	CCO1C1	CC above N Fork	37.909831	-107.630887	3584.40	^{18}O/^{2}H,*
SS107	Draining	Mogul	CC01B	NA	CC02D, CC01B	CC above N Fork	37.90999	-107.638324	3487.20	^{18}O/^{2}H,*
SS108	Draining	Mogul South	South of Mogul	**DRMS 120	NA	CC above N Fork	37.90833	-107.638424	3493.30	^{18}O/^{2}H,*
SS110	Draining	Ben Franklin Mine	DM32	NA	NA	Eureka Gulch	37.894485	-107.60795	3625.10	^{18}O/^{2}H,*
SS111	Draining	Big Colorado Mine	NA	DRMS 88	CC16C	S Fork CC	37.876802	-107.646642	3372.20	^{18}O/^{2}H,*
SS112	Draining	Terry Tunnel	A38	NA	A38	Eureka Gulch	37.892864	-107.604247	3523.60	^{18}O/^{2}H,*
SS113	Draining	BlackHawk	CC50	DRMS 89	NA	M Fork CC	37.882231	-107.635607	3535.70	^{18}O/^{2}H,*
SS115	Draining	Senator	DM24	DRMS 123	DM24	Upper Animas	37.88189	-107.567987	3071.10	^{18}O/^{2}H,*
SS120	Dry	Hercules	NA	NA	NA	Prospect Gulch	37.8924374	-107.6886326	3542.37	NA
SS121	Dry	Galena Queen	NA	NA	CC23J	Prospect Gulch	37.89187819	-107.6895044	3545.07	NA
SS122	Dry	NA	NA	NA	NA	Prospect Gulch	37.88915913	-107.6917829	3643.69	NA
SS123	Dry	Henrietta #7	99H7A, SO4H	NA	CC24G	Prospect Gulch	37.89096205	-107.6828174	3441.04	NA
SS124	Dry	Henrietta #8	NA	NA	CC22B	Prospect Gulch	37.89173755	-107.6824783	3415.30	NA
SS125	Dry	Lark Mine	99L3A, SO2H	DRMS 109	CC24D	Prospect Gulch	37.89341098	-107.6811311	3471.00	NA
SS126	Dry	Joe and John	99JJA, SO6H	DRMS 106	CC25C	Prospect Gulch	37.891504	-107.679079	3421.00	NA
SS127	Dry	Adams Mine	NA	NA	NA	CC above N Fork	37.90021839	-107.642346	3388.06	NA
SS128	Dry	Pride of Bonita	NA	NA	NA	CC above N Fork	37.90363586	-107.6411956	3449.45	NA
SS129	Dry	South of Pride (73 m)	NA	NA	NA	CC above N Fork	37.903049	-107.641927	3438.00	NA
SS130	Dry	Solomon Group	NA	NA	NA	N Fork CC	37.89635248	-107.6396136	3515.94	NA
SS131	Dry	Abover Solomon Group	NA	NA	NA	N Fork CC	37.89687397	-107.6370694	3630.53	NA
SS132	Dry	Adit abv Gold king # 7	NA	NA	NA	N Fork CC	37.89608	-107.636648	3617.00	NA
SS133	Dry	Benitoite Mine	NA	NA	NA	N Fork CC	37.8936541	-107.6343117	3698.87	NA
SS134	Dry	GK Upper Sampson	NA	NA	NA	N Fork CC	37.89757546	-107.6334355	3743.92	NA
SS135	Dry	Upper GK Paul Level	NA	NA	NA	N Fork CC	37.89742113	-107.6323968	3727.97	NA
SS136	Dry	Upper GK Level 1	NA	NA	NA	N Fork CC	37.89660712	-107.6320212	3687.95	NA

* Chemistry sampled by DRMS (2016 CDPHE report) or by ESAT (2016 LF SW)

** To be changed to Mogul South

Appendix 2 – Field data, stable isotope, metals loading

SITE ID	SITE ID - long	TYPE	BASIN	ALIAS	DATE	TIME	LAT	LONG	ELEVATION (m)	PREVIOUS SAMPLE
SS01-00	20160922BP-SS01-SS-00-EPA	SS	Upper Eureka Gulch	Sunnyside Saddle 1, abv Lake EMMA	09/22/2016	13:00	37.905506	-107.616232	3767.32	NO
SS02-00	20160922BP-SS02-SS-00-EPA	SS	Upper Eureka Gulch	Sunnyside Saddle 2, abv Lake Emma	09/22/2016	13:40	37.905365	-107.61578	3751.94	NO
SS03-00	20160922BP-SS03-SS-00-EPA	SS	Upper Eureka Gulch	Sunnyside Saddle 3, abv Lake Emma	09/22/2016	14:00	37.905117	-107.615672	3776.7	NO
SS04-00	20160922BP-SS04-SS-00-EPA	SS	Upper Eureka Gulch	Sunnyside Saddle 4, north of Lake road natural	09/22/2016	15:50	37.904255	-107.614295	3734.01	NO
SS05-00	20160922BP-SS05-SS-00-EPA	SS	Upper Eureka Gulch	Sunnysdie Saddle 5, north of lake road natural	09/22/2016	16:15	37.904122	-107.614155	3737.48	NO
SS06-00	20160923BP-SS06-SS-00-EPA	SS	Upper Eureka Gulch	Eureka Gulch S Fork headwater, natural	09/23/2016	10:00	37.898148	-107.617055	3725.48	NO
SS07-00	20160923BP-SS07-SS-00-EPA	SS	South Fork Eureka Gulch	Eureka Gulch M Fork headwater	09/23/2016	11:00	37.895306	-107.618645	3722.29	NO
SS08-00	20160926BP-SS08-SS-00-EPA	SS	Alaska Basin	Alaska Basin Lake Talus	09/26/2016	13:50	37.92052	-107.633544	3849.92	NO
SS09-00	20160926BP-SS09-SS-00-EPA	SS	Alaska Basin	Alaska Basin Lake 2	09/26/2016	15:00	37.920468	-107.632023	3845.19	NO
SS10-00	20160926BP-SS10-SS-00-EPA	SS	Alaska Basin	Alaska Basin Lake 3	09/26/2016	15:15	37.920056	-107.630744	3837.08	NO
SS10-30	20160926BP-SS10-SS-00-EPA	SS	Alaska Basin	Alaska Basin Lake 3 Dup	09/26/2016	15:15	37.920056	-107.630744	3837.08	NO
SS11-00	20160926BP-SS11-SS-00-EPA	SS	Alaska Basin	Alaska Basin Lake 4	09/26/2016	16:00	37.91965	-107.6307	3855.9	NO
SS12-00	20160926BP-SS12-SS-00-EPA	SS	Alaska Basin	Alaska Basin Draining Adit	09/26/2016	16:25	37.918808	-107.630075	3855.4	NO
SS13-00	20161003BP-SS13-SS-00-EPA	SS	Velocity Basin	Velocity Basin 1	10/03/2016	11:45	37.86854	-107.643707	3446	NO
SS14-00	20161003BP-SS14-SS-00-EPA	SS	Velocity Basin	Velocity Basin 2	10/03/2016	12:30	37.86952	-107.644713	3439.5	NO
SS15-00	20161003BP-SS15-SS-00-EPA	SS	Velocity Basin	Velocity Basin 3	10/03/2016	13:20	37.871164	-107.642219	3470.4	NO
SS16-00	20161003BP-SS16-SS-00-EPA	SS	South Fork Cement Creek	Velocity Basin 4	10/03/2016	14:15	37.881573	-107.646016	3292.9	YES
SS17-00	20161003BP-SS17-SS-00-EPA	SS	South Fork Cement Creek	Velocity Basin 5; S. Fork Cement, Sunnyside #15	10/03/2016	14:45	37.8819	-107.645897	3295.4	NO
SS18-00	20161003BP-SS18-SS-00-EPA	SS	South Fork Cement Creek	Velocity Basin 6;	10/03/2016	15:15	37.883718	-107.646793	3250.5	YES
SS19-00	20161003BP-SS19-SS-00-EPA	SS	South Fork Cement Creek	Velocity Basin 7; Sunnyside S-1?	10/03/2016	16:00	37.886621	-107.64851	3226	YES
SS19-30	20161003BP-SS19-SS-30-EPA	SS	South Fork Cement Creek	Velocity Basin 7; Sunnyside S-1? DUP	10/03/2016	16:00	37.886621	-107.64851	3226	YES
SS20-00	20161004BP-SS20-SS-00-EPA	SS	Cement Creek above North Fork	Ross Basin 1	10/04/2016	11:45	37.90706	-107.632797	3678.51	NO
SS21-00	20161004BP-SS21-SS-00-EPA	SS	Ross Basin	Ross Basin 2	10/04/2016	12:20	37.906326	-107.630939	3691.38	NO
SS22-00	20161004BP-SS22-SS-00-EPA	SS	Ross Basin	Ross Basin 3	10/04/2016	12:50	37.905258	-107.630635	3693.58	NO
SS23-00	20161004BP-SS23-SS-00-EPA	SS	Ross Basin	Ross Basin 4	10/04/2016	13:20	37.90493	-107.630232	3720.7	NO
SS24-00	20161004BP-SS24-SS-00-EPA	SS	Ross Basin	Ross Basin 5	10/04/2016	13:40	37.904364	-107.629131	3696.73	YES
SS25-00	20161004BP-SS25-SS-00-EPA	SS	Ross Basin	Ross Basin 6	10/04/2016	14:20	37.903941	-107.626835	3703.92	YES
SS26-00	20161004BP-SS26-SS-00-EPA	SS	Ross Basin	Ross Basin 7	10/04/2016	15:20	37.90822	-107.623109	3790.99	NO
SS27-00	20161004BP-SS27-SS-00-EPA	SS	Alaska Basin	at Ross Basin rd junction	10/04/2016	16:05	37.913774	-107.629268	3716.93	YES
SS28-00	20161004BP-SS28-SS-00-EPA	SS	Alaska Basin	Roadside blw Queene Anne	10/04/2016	16:50	37.91265	-107.632752	3648.76	NO
SS29-00	20161004BP-SS29-SS-00-EPA	SS	Alaska Basin	Roadside blw Queene Anne 2	10/04/2016	17:15	37.912872	-107.632396	3653.14	NO
SS30-00	20161005BP-SS30-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka Upwelling, No confined discharge	10/05/2016	10:45	37.894614	-107.614796	3645.95	NO
SS31-00	20161005BP-SS31-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka	10/05/2016	11:15	37.894083	-107.615165	3647.1	NO
SS32-00	20161005BP-SS32-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka, Rock Glaicer outflow	10/05/2016	11:40	37.893836	-107.614318	3643.78	NO
SS33-00	20161005BP-SS33-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka, kettle spring, no discharge measured	10/05/2016	12:20	37.894679	-107.613936	3645.48	NO
SS34-00	20161005BP-SS34-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka, Kettle spring 2, no measurable Q	10/05/2016	12:45	37.894703	-107.613267	3643.92	NO
SS34-30	20161005BP-SS34-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka, Kettle spring 2, no measurable Q	10/05/2016	12:45	37.894703	-107.613267	3643.92	NO
SS35-00	20161005BP-SS35-SS-00-EPA	SS	South Fork Eureka Gulch	S. Fork Eureka	10/05/2016	13:50	37.894494	-107.612788	3642.93	NO
SS36-00	20161005BP-SS36-SS-00-EPA	SS	Eureka Gulch	McCarthy Basin 1, Pack Trail Spring abv Bavarian Mine	10/05/2016	15:50	37.891128	-107.607551	3675.09	NO
SS37-00	20161005BP-SS37-SS-00-EPA	SS	South Fork Eureka Gulch	Above Ben Franklin (possible four bank spring)	10/05/2016	16:20	37.893231	-107.609872	3662.93	NO
SS38-00	20161006BP-SS38-SS-00-EPA	SS	Eureka Gulch	North of Ben Franklin, south facing hillslope	10/06/2016	94:40	37.895748	-107.606359	3627.42	NO
SS39-00	20161006BP-SS39-SS-00-EPA	SS	Eureka Gulch	Below Ben Franklin, Sunnyside #18	10/06/2016	10:30	37.893643	-107.606734	3573.13	YES
SS40-00	20161006BP-SS40-SS-00-EPA	SS	Eureka Gulch	Below Bavarian Mine, Sunnyside S17	10/06/2016	11:00	37.891882	-107.60492	3519.23	YES
SS40-30	20161006BP-SS40-SS-00-EPA	SS	Eureka Gulch	Below Bavarian Mine, Sunnyside S17 (dup)	10/06/2016	11:00	37.891882	-107.60492	3519.23	YES
SS41-00	20161006BP-SS41-SS-00-EPA	SS	Eureka Gulch	Terry Tunnel Tailings seep, Sunnyside TT-1	10/06/2016	11:30	37.892134	-107.602922	3482.33	YES
SS42-00	20161006BP-SS42-SS-00-EPA	SS	Eureka Gulch	Terry Tunnel Tailings seep, Sunnyside TT-2	10/06/2016	11:50	37.892317	-107.60237	3480.96	YES
SS43-00	20161006BP-SS43-SS-00-EPA	SS	Eureka Gulch	North side road abv Terry Tunnel Turn off	10/06/2016	12:45	37.893254	-107.601083	3500.38	NO
SS44-00	20161006BP-SS44-SS-00-EPA	SS	Cement Creek above North Fork	Below mogul, resents Sunnyside MS-1	10/06/2016	15:00	37.908677	-107.639612	3421.57	NO
SS45-00	20161006BP-SS45-SS-00-EPA	SS	Cement Creek above North Fork	South of Mogul South, Sunnyside S-9	10/06/2016	15:30	37.907822	-107.640522	3405.67	YES
SS46-00	20161006BP-SS46-SS-00-EPA	SS	Cement Creek above North Fork	Draining Adit, uphill of Sunnyside S-9	10/06/2016	16:00	37.907521	-107.640225	3418.75	NO
SS47-00	20161010BP-SS47-SS-00-EPA	SS	Minnehaha Basin	LC01	10/10/2016	11:45	37.888791	-107.632963	3597.7	YES
SS48-00	20161010BP-SS48-SS-00-EPA	SS	Minnehaha Basin	LC02	10/10/2016	12:15	37.890559	-107.632656	3598.8	YES
SS49-00	20161010BP-SS49-SS-00-EPA	SS	Middle Fork Cement Creek	LC-01 (Sunnyside)	10/10/2016	13:00	37.886676	-107.634941	3565.3	YES
SS49-30	20161010BP-SS49-SS-30-EPA	SS	Middle Fork Cement Creek	LC-01 (Sunnyside)	10/10/2016	13:00	37.886676	-107.634941	3565.3	YES

SITE ID	SAMPLER	PREVIOUS ID	TEMP_AIR (deg C)	TEMP_WATER (deg C)	PH	COND (us/cm)	DO	FLOW_LPM (liters/minute)	FLOW_GPM (gallons/minute)	WETLAND SPECIES	d 18O (per mil)	d D (per mil)	D-EXCESS (per mil)	AL_D (kg/day)	SB_D (kg/day)	AS_D (kg/day)	BE_D (kg/day)
SS01-00	NA	NA	5	9.4	6.59	1020	5.29	6	1.59	PRESENT	-16.091	-115.758	12.970	0.001763	0	0	0
SS02-00	NA	NA	4	6.2	7.28	345	6.42	19.28	5.1	PRESENT	-15.391	-109.392	13.732	0	0	0	0
SS03-00	NA	NA	4	0	7.27	<null>	5.7	10	2.65	PRESENT	-15.110	-106.822	14.060	0.000409	0	0	0
SS04-00	NA	NA	4	5.6	7.32	236	5.12	9	2.38	PRESENT	-15.813	-112.945	13.558	0	0	0	0
SS05-00	NA	NA	4	7.6	6.69	355	5.56	0.63	0.17	PRESENT	-15.445	-110.161	13.398	0.000305	0	0	0
SS06-00	NA	NA	-1	0.4	7.75	214	1.05	27.56	7.29	PRESENT	-15.412	-109.030	14.262	0	0	0	0
SS07-00	NA	NA	-1	3.2	7.01	216	4.77	6	1.59	PRESENT	-16.019	-114.291	13.862	0	0	0	0
SS08-00	NA	NA	10	3	7.8	252	8.53	57.46	15.2	PRESENT	-14.938	-106.809	12.695	0	0	0	0
SS09-00	NA	NA	10	11.3	6.63	225	3.9	7.18	1.9	PRESENT	-15.133	-107.912	13.151	0.000359	0	0	0
SS10-00	NA	NA	8	6.6	6.05	195	5.1	1.81	0.48	PRESENT	-15.133	-107.795	13.265	0.000192	0	0	0
SS10-30	NA	NA	8	6.6	6.05	195	5.1	1.81	0.48	PRESENT	-15.087	-107.672	13.020	0.000171	0	0	0
SS11-00	NA	NA	8	4.5	4.29	1385	5.55	3.78	1	PRESENT	-14.433	-103.033	12.434	0.051275	0	0	0
SS12-00	NA	NA	5	1.4	4.3	674	7.93	3.6	0.95	PRESENT	-12.743	-86.770	15.171	0.006428	0	0	0
SS13-00	NA	NA	3	3.1	6.8	313	6.86	71.06	18.8	PRESENT	-12.986	-91.143	12.743	0.003561	0	0	0
SS14-00	NA	NA	2	2.6	7.24	139	7.5	130.79	34.6	PRESENT	-15.101	-106.411	14.399	0	0	0	0
SS15-00	NA	NA	3	1.8	7.32	227	10.51	181.44	48	PRESENT	-15.392	-108.583	14.556	0.005565	0	0	0
SS16-00	USGS	CC52	3	3.6	4.5	319	6	7.03	1.86	PRESENT	-15.929	-115.594	11.834	0.013465	0	0	0
SS17-00	NA	NA	3	3	4.6	335	6.15	1.59	0.42	PRESENT	-15.856	-114.825	12.025	0.004252	0	0	0
SS18-00	SGC	S-14	3	4.2	3.86	635	4.33	34.1	9.02	PRESENT	-15.354	-111.258	11.574	0.248434	0	0	0
SS19-00	SGC	S-1	3	3.6	7.25	162	6.48	14.97	3.96	PRESENT	-14.886	-105.476	13.614	0	0	0	0
SS19-30	SGC	S-1	3	3.6	7.25	162	6.48	14.97	3.96	PRESENT	<null>	<null>	<null>	0	0	0	0
SS20-00	NA	NA	3	7.2	5.67	383	4.33	45.36	12	PRESENT	-14.887	-105.967	13.128	0.040693	0	0	0
SS21-00	NA	NA	4	6.2	5.53	51	4.77	1.43	0.38	PRESENT	-15.232	-108.547	13.311	0.000374	0	0	0
SS22-00	NA	NA	3	4	7.08	140	6.21	12.1	3.2	PRESENT	<null>	<null>	<null>	0.001693	0	0	0
SS23-00	NA	NA	3	3.3	5.89	149	5.2	0.5	0.13	PRESENT	-16.063	-114.824	13.679	0.000259	0	0	0
SS24-00	USGS	CC51	3	1.6	7.06	494	7.15	51.41	13.6	PRESENT	-14.754	-103.305	14.731	0.001562	0	0	0
SS25-00	USGS	CC50	3	2.8	7.23	352	8.2	1.7	0.45	PRESENT	-13.173	-90.957	14.426	0	0	0	0
SS26-00	NA	NA	1	3.4	6.6	242	7.05	4.5	1.19	PRESENT	-14.249	-99.650	14.338	0.004458	0	0	0
SS27-00	USGS	CC56	2	3.5	4.7	606	7.3	52.92	14	PRESENT	-14.686	-102.903	14.586	0.498379	0	0	0
SS28-00	NA	NA	4	6.7	7.36	71	5.77	1.44	0.38	PRESENT	<null>	<null>	<null>	0.000046	0	0	0
SS29-00	NA	NA	4	3.6	6.54	351	6.7	226.8	60	PRESENT	-14.839	-105.967	12.742	0.085241	0	0	0
SS30-00	NA	NA	2	5.7	6.6	331	3.6	0	0	PRESENT	-16.237	-116.963	12.935	0	0	0	0
SS31-00	NA	NA	2	3.7	7.09	235	6.7	6.05	1.6	PRESENT	-15.016	-105.954	14.172	0	0	0	0
SS32-00	NA	NA	2	1.5	7.08	567	6.4	5.67	1.5	PRESENT	-13.558	-94.833	13.631	0	0	0	0
SS33-00	NA	NA	2	5.5	7.03	51	6.88	0	0	PRESENT	-8.992	-75.367	-3.430	0	0	0	0
SS34-00	NA	NA	2	5.5	5.3	145	6.5	0	0	PRESENT	-10.292	-83.524	-1.191	0	0	0	0
SS34-30	NA	NA	2	5.5	5.3	145	6.5	0	0	PRESENT	-10.199	-83.104	-1.513	0	0	0	0
SS35-00	NA	NA	4	6.8	6.8	417	5.4	3	0.79	PRESENT	-13.455	-100.482	7.162	0.000146	0	0	0
SS36-00	NA	NA	2	4.4	7.24	127	6.9	1	0.26	PRESENT	-14.272	-101.299	12.880	0.00006	0	0	0
SS37-00	NA	NA	2	3.5	5.03	697	6.32	3	0.79	PRESENT	-15.011	-106.360	13.732	0.025747	0	0	0
SS38-00	NA	NA	1	3	7.69	934	7.6	12	3.17	PRESENT	-15.977	-115.610	12.204	0	0	0	0
SS39-00	SGC	S-18	2	5.5	5.49	153	7.6	12	3.17	PRESENT	-14.631	-104.531	12.518	0.016675	0	0	0
SS40-00	SGC	S-17	3	3.1	4.61	138	6.5	3	0.79	PRESENT	-15.138	-108.838	12.267	0.004752	0	0	0
SS40-30	SGC	S-17	3	3.1	4.61	138	6.5	3	0.79	PRESENT	-15.233	-109.180	12.680	0.004795	0	0	0
SS41-00	SGC	TT-2	4	6.9	6.95	222	6.5	37.8	10	PRESENT	-14.671	-106.006	11.364	0.014697	0	0	0
SS42-00	SGC	TT-2	3	6.4	7.33	117	5.3	5	1.32	PRESENT	-16.059	-117.415	11.058	0	0	0	0
SS43-00	NA	NA	3	8.4	7.35	757	0.88	12	3.17	PRESENT	-15.818	-114.971	11.575	0.00098	0	0	0
SS44-00	NA	NA	3	3	7.57	793	7.5	30	7.94	PRESENT	-15.650	-112.787	12.410	0.004	0	0	0
SS45-00	SGC	S-9	3	4.5	5.17	259	7.8	12	3.17	PRESENT	-15.538	-112.321	11.983	0.020218	0	0	0
SS46-00	NA	NA	3	2.8	4.71	330	5.7	9	2.38	PRESENT	-15.629	-113.002	12.028	0.027216	0	0	0
SS47-00	USGS	CC41	2	2.2	7.52	197	9.4	111	29.37	PRESENT	-15.268	-108.616	13.524	0	0	0	0
SS48-00	SGC	LC	2	5.8	7.15	82	5.6	3.6	0.95	PRESENT	-16.155	-117.475	11.764	0	0	0	0
SS49-00	SGC	LC-1	2	4.2	7.29	68	6.9	1	0.26	PRESENT	-13.582	-95.242	13.410	0	0	0	0
SS49-30	SGC	LC-1	2	4.2	7.29	68	6.9	1	0.26	PRESENT	-13.582	-95.242	13.410	0	0	0	0

SITE ID	CD_D (kg/day)	CA_D (kg/day)	CR_D (kg/day)	CU_D (kg/day)	FE_D (kg/day)	PB_D (kg/day)	MA_D (kg/day)	MN_D (kg/day)	NI_D (kg/day)	SE_D (kg/day)	SIO2 (kg/day)	AG_D (kg/day)	SR_D (kg/day)	TH_D (kg/day)	ZN_D (kg/day)	AL_T (kg/day)	SB_T (kg/day)	AS_T (kg/day)	BE_T (kg/day)	CD_T (kg/day)	CA_T (kg/day)
SS01-00	0.000006	0.110592	0	0.000042	0	0.000158	0.013651	0.000314	0.000023	0	0.051149	0	0.00045	0	0.002566	0.002549	0	0	0	0.000006	0.111456
SS02-00	0.000007	1.549026	0	0.000031	0	0	0.15407	0.00016	0	0	0.102436	0	0.010077	0	0.002634	0.000594	0	0	0	0	1.60177
SS03-00	0.000054	0.85536	0	0.000485	0	0.000045	0.082224	0.006091	0	0	0.0648	0	0.005486	0	0.021312	0.000562	0	0	0	0.000051	0.85536
SS04-00	0.000003	0.458784	0	0.000008	0	0.000002	0.031882	0	0	0	0.063245	0	0.002462	0	0.001685	0.001413	0	0	0	0	0.46656
SS05-00	0.000007	0.0378	0	0.000008	0	0	0.003843	0.000007	0.000005	0	0.01341	0	0.000127	0	0.01278	0.000339	0	0	0	0.000008	0.04347
SS06-00	0	0.587278	0	0	0	0	0.034007	0.000512	0	0	0.084917	0	0.004047	0	0	0.008333	0	0	0	0	0.60315
SS07-00	0	0.196128	0	0	0	0	0.009418	0	0.000012	0	0.051581	0	0.001719	0	0	0	0	0	0	0	0.193536
SS08-00	0.000008	2.945424	0	0.000067	0	0	0.363214	0.010094	0	0	0.100111	0	0.030199	0	0.001299	0.011335	0	0	0	0	2.771677
SS09-00	0.000003	0.33922	0	0	0	0	0.038783	0	0	0	0.042816	0	0.002606	0	0.000419	0.000683	0	0	0	0	0.338186
SS10-00	0.000001	0.072634	0	0.000002	0	0.000001	0.007133	0.000013	0	0	0.01646	0	0.000494	0	0.000203	0.000209	0	0	0	0	0.070805
SS10-30	0.000001	0.072373	0	0.000002	0	0	0.007133	0.000012	0	0	0.016774	0	0.000499	0	0.000208	0.000189	0	0	0	0	0.070805
SS11-00	0.000024	0.81648	0	0.000219	0	0.000089	0.113763	0.027869	0.000117	0	0.053017	0	0.007512	0	0.004072	0.053452	0	0	0	0.000026	0.821923
SS12-00	0.000021	0.549504	0	0.000119	0	0.000028	0.065318	0.007102	0.000024	0	0.040902	0	0.003157	0	0.004712	0.006739	0	0	0	0.00002	0.54432
SS13-00	0	3.868156	0	0.000109	0	0	0.197501	0.001248	0	0	0.324393	0	0.027118	0	0.001873	0.00483	0	0	0	0	3.78629
SS14-00	0	6.987218	0	0	0	0	0.329586	0	0	0	1.241126	0	0.058007	0	0	0.003767	0	0	0	0	6.987218
SS15-00	0	8.883302	0	0.000252	0	0	0.731566	0.003266	0	0	2.019645	0	0.061922	0	0	0.034227	0	0	0	0	8.778793
SS16-00	0.000004	0.384725	0	0.000048	0	0	0.040396	0.007533	0.00002	0	0.341191	0	0.003614	0	0.002248	0.013364	0	0	0	0	0.383713
SS17-00	0.000005	0.095104	0	0.000019	0	0	0.012208	0.002675	0.000006	0	0.08573	0	0.000928	0	0.00093	0.004321	0	0	0	0.000005	0.097161
SS18-00	0.000464	2.538349	0	0.001856	0	0.000012	0.441879	0.128636	0.000482	0	1.747877	0	0.022929	0	0.080029	0.247943	0	0	0	0.000467	2.562898
SS19-00	0.000004	0.517322	0	0.00002	0	0	0.03923	0	0	0	0.140324	0	0.004742	0	0.001826	0	0	0	0	0	0.515166
SS19-30	0.000004	0.513011	0	0.00002	0	0	0.038368	0	0	0	0.13903	0	0.004699	0	0.001824	0	0	0	0	0	0.510855
SS20-00	0.000029	0.506218	0	0.000065	0	0.000048	0.152845	0.012606	0.000231	0	0.347494	0	0.002547	0	0.004514	0.041543	0	0	0	0.000033	0.504911
SS21-00	0.000001	0.009115	0	0.000005	0	0.000002	0.001177	0.000046	0.000001	0	0.011604	0	0.000052	0	0.000237	0.00037	0	0	0	0.000001	0.008683
SS22-00	0.000017	0.29611	0	0.000028	0	0	0.03083	0.000042	0.000011	0	0.062531	0	0.00138	0	0.00425	0.001864	0	0	0	0.000016	0.294368
SS23-00	0	0.01404	0	0.000001	0	0	0.00185	0.000007	0.000001	0	0.004946	0	0.000068	0	0.000153	0.000287	0	0	0	0	0.01404
SS24-00	0	6.122076	0	0.000051	0	0	0.441944	0	0	0	0.225784	0	0.062627	0	0.000948	0.002058	0	0	0	0	6.018437
SS25-00	0	0.1224	0	0.000001	0	0	0.007589	0	0	0	0.005851	0	0.000974	0	0.000027	0.00071	0	0	0	0	0.123624
SS26-00	0.000018	0.215784	0	0.000384	0	0.000054	0.02268	0.003279	0.000008	0	0.04374	0	0.000752	0	0.004452	0.0021	0	0	0	0.000007	0.0972
SS27-00	0.002721	6.004938	0	0.035359	0	0.000176	1.089729	0.745283	0.001509	0	0.815391	0	0.01486	0	0.367307	0.491521	0	0	0	0.002591	6.020179
SS28-00	0	0.016051	0	0.000001	0	0.000001	0.001202	0.00002	0	0	0.011107	0	0.000078	0	0.000039	0.000096	0	0	0	0	0.015865
SS29-00	0.00111	13.684205	0	0.001006	0	0	1.352091	0.033312	0.000692	0	2.282878	0	0.071197	0	0.333124	0.084914	0	0	0	0.00095	13.45559
SS30-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS31-00	0	0.217728	0	0	0	0	0.009841	0	0	0	0.034227	0	0.001768	0	0	0	0	0	0	0	0.217728
SS32-00	0	0.538877	0	0	0	0	0.040089	0	0	0	0.02082	0	0.005438	0	0	0.001568	0	0	0	0	0.542959
SS33-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS34-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS34-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS35-00	0	0.242352	0	0.000003	0	0	0.022248	0	0	0	0.016114	0	0.002294	0	0.000073	0.00445	0	0	0	0	0.24624
SS36-00	0.000004	0.025488	0	0.000051	0	0.000069	0.001656	0.00001	0.000001	0	0.006034	0	0.000134	0	0.001348	0.000116	0	0	0	0.000004	0.025632
SS37-00	0.00002	0.432	0	0.000804	0	0.00002	0.101088	0.013608	0.000095	0	0.050544	0	0.002713	0	0.003188	0.025877	0	0	0	0.000019	0.44064
SS38-00	0	0.698112	0	0	0	0	0.047347	0	0	0	0.059443	0	0.014118	0	0	0.000731	0	0	0	0	0.71712
SS39-00	0.000088	0.312768	0	0.002212	0	0.000059	0.032832	0.007966	0.000041	0	0.124243	0	0.001398	0	0.025747	0.016813	0	0	0	0.000085	0.321408
SS40-00	0.000029	0.035165	0	0.000955	0	0.000002	0.006696	0.026741	0.00001	0	0.044064	0	0.000142	0	0.010411	0.004838	0	0	0	0.000027	0.036936
SS40-30	0.00003	0.035294	0	0.000963	0	0.000002	0.006782	0.026698	0.000009	0	0.044064	0	0.000142	0	0.010541	0.004882	0	0	0	0.000027	0.036072
SS41-00	0.000637	2.117405	0	0.004316	0	0.000332	0.189423	0.208475	0.000133	0	0.279236	0	0.025365	0	0.191056	0.020902	0	0	0	0.000621	2.052086
SS42-00	0.000011	0.12096	0	0.00002	0	0.00002	0.007344	0.000871	0	0	0.027864	0	0.00149	0	0.005278	0.006869	0	0	0	0.000033	0.13248
SS43-00	0	2.71296	0	0.000014	0	0.000071	0.140486	0.050285	0	0	0.210816	0	0.068947	0	0.000791	0.001215	0	0	0	0	2.7648
SS44-00	0.000013	6.8256	0	0.000047	0	0	0.316656	0.054	0	0	0.94176	0	0.079488	0	0.025056	0.007344	0	0	0	0	6.9552
SS45-00	0.000163	0.651456	0	0.000035	0	0	0.044755	0.001441	0.000022	0	0.373248	0	0.008001	0	0.014014	0.020218	0	0	0	0.00015	0.667008
SS46-00	0.000273	0.504144	0	0.000197	0	0.000422	0.040954	0.023717	0.00005	0	0.393984	0	0.0067	0	0.030586	0.027605	0	0	0	0.000264	0.517104
SS47-00	0	5.226768	0	0	0	0.000017	0.266933	0	0	0	0.764035	0	0.051948	0	0	0	0	0	0	0	5.27472
SS48-00	0	0.063763	0	0	0	0	0.006273	0	0	0	0.07465	0	0.000506	0	0	0.000446	0	0	0	0	0.065837
SS49-00	0	0.012413	0	0	0	0	0.001164	0	0	0	0.006322	0	0.000083	0	0	0	0	0	0	0	0.012413
SS49-30	0	0.012413	0	0	0	0	0.001164	0	0	0	0.006322	0	0.000083	0	0	0	0	0	0	0	0.012413

SITE ID	CR_T (kg/day)	CU_T (kg/day)	FE_T (kg/day)	PB_T (kg/day)	MA_T (kg/day)	MN_T (kg/day)	NI_T (kg/day)	SE_T (kg/day)	SIO2 (kg/day)	AG_T (kg/day)	SR_T (kg/day)	TH_T (kg/day)	ZN_T (kg/day)
SS01-00	0	0.000061	0.001572	0.000238	0.013478	0.000379	0.000024	0	0.053222	0	0.000452	0	0.002532
SS02-00	0	0	0	0	0.157401	0.000208	0	0	0.102713	0	0.01041	0	0.002629
SS03-00	0	0.000505	0	0.000106	0.08136	0.006394	0	0	0.063792	0	0.00553	0	0.020736
SS04-00	0	0.000082	0.002696	0.000101	0.031882	0.000389	0	0	0.065966	0	0.002449	0	0.00175
SS05-00	0	0.00001	0	0.000002	0.004329	0.000011	0.000006	0	0.01332	0	0.000149	0	0.0144
SS06-00	0	0	0.041665	0.000076	0.037538	0.00104	0	0	0.1119	0	0.004166	0	0
SS07-00	0	0	0	0	0.009418	0	0	0	0.050285	0	0.001702	0	0
SS08-00	0	0	0	0.000051	0.340048	0.010838	0	0	0.108385	0	0.028213	0	0.001754
SS09-00	0	0	0	0	0.03899	0.000022	0	0	0.044161	0	0.002648	0	0.000413
SS10-00	0	0.000011	0	0.000002	0.006976	0.000018	0	0	0.016382	0	0.000486	0	0.000188
SS10-30	0	0	0	0	0.007002	0.000015	0	0	0.01646	0	0.000489	0	0.000191
SS11-00	0	0.000227	0	0.000102	0.11594	0.029012	0.000127	0	0.054976	0	0.007566	0	0.004066
SS12-00	0	0.000125	0.021825	0.000037	0.065318	0.007154	0.000028	0	0.04085	0	0.003126	0	0.004609
SS13-00	0	0	0	0	0.192384	0.001351	0	0	0.324393	0	0.026606	0	0.001729
SS14-00	0	0	0	0	0.325819	0	0	0	1.233592	0	0.057442	0	0
SS15-00	0	0.000794	0.044417	0	0.71589	0.003919	0	0	2.045772	0	0.060354	0	0
SS16-00	0	0.000056	0	0	0.03989	0.007593	0	0	0.340178	0	0.003574	0	0.002217
SS17-00	0	0.000023	0	0	0.012299	0.002721	0.000009	0	0.08573	0	0.000937	0	0.00091
SS18-00	0	0.002057	0.005352	0	0.440406	0.1306	0.000555	0	1.752787	0	0.022781	0	0.079538
SS19-00	0	0	0	0	0.038152	0	0	0	0.139246	0	0.004656	0	0.001729
SS19-30	0	0	0	0	0.038152	0	0	0	0.137737	0	0.004656	0	0.001709
SS20-00	0	0	0	0.000049	0.151539	0.012737	0.00023	0	0.343575	0	0.002528	0	0.004278
SS21-00	0	0	0	0.000002	0.001125	0.000045	0	0	0.011255	0	0.00005	0	0.000216
SS22-00	0	0	0	0	0.03083	0.000043	0	0	0.134643	0	0.001364	0	0.004041
SS23-00	0	0	0	0	0.001858	0.000007	0	0	0.005011	0	0.000068	0	0.00015
SS24-00	0	0	0	0	0.427879	0	0	0	0.225044	0	0.061295	0	0.000844
SS25-00	0	0	0.000825	0.00001	0.007834	0.000036	0	0	0.008054	0	0.000984	0	0.000044
SS26-00	0	0.000188	0	0.000025	0.010368	0.001516	0	0	0.018986	0	0.000342	0	0.001963
SS27-00	0	0.03635	0	0.000201	1.082108	0.752141	0.001486	0	0.807771	0	0.014784	0	0.363497
SS28-00	0	0	0	0.000001	0.0012	0.000022	0	0	0.01239	0	0.000078	0	0.000035
SS29-00	0	0.001231	0	0	1.325964	0.033312	0	0	2.240421	0	0.068911	0	0.322673
SS30-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS31-00	0	0	0	0	0.009754	0	0	0	0.03414	0	0.001733	0	0
SS32-00	0	0	0.000865	0	0.040252	0.000034	0	0	0.025556	0	0.005372	0	0
SS33-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS34-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS34-30	0	0	0	0	0	0	0	0	0	0	0	0	0
SS35-00	0	0.000014	0.004709	0.000006	0.023501	0.000064	0	0	0.028296	0	0.00229	0	0.000105
SS36-00	0	0.000054	0	0.000082	0.00167	0.000019	0	0	0.006019	0	0.000131	0	0.001293
SS37-00	0	0.000795	0	0.000021	0.101952	0.013781	0.000103	0	0.050544	0	0.00267	0	0.00321
SS38-00	0	0	0	0	0.048557	0	0	0	0.060653	0	0.014187	0	0
SS39-00	0	0.002143	0	0.000057	0.033523	0.007949	0.000068	0	0.123206	0	0.001403	0	0.024883
SS40-00	0	0.00092	0	0.000003	0.006869	0.026827	0.000016	0	0.043632	0	0.000143	0	0.010152
SS40-30	0	0.000907	0	0	0.006826	0.02687	0.000016	0	0.044064	0	0.000142	0	0.010109
SS41-00	0	0.004251	0.013173	0.000582	0.188335	0.210108	0.000191	0	0.276515	0	0.025256	0	0.185069
SS42-00	0	0.000504	0.023256	0.005832	0.009	0.005328	0	0	0.04392	0	0.001548	0	0.00828
SS43-00	0	0	0.003681	0.000173	0.145325	0.062035	0	0	0.212544	0	0.069811	0	0.000902
SS44-00	0	0	0.089856	0.000035	0.323136	0.054864	0	0	0.9504	0	0.079488	0	0.02592
SS45-00	0	0.000044	0	0	0.045101	0.001455	0.000049	0	0.364608	0	0.008018	0	0.013219
SS46-00	0	0.000211	0.084629	0.000403	0.041861	0.024235	0.000061	0	0.400464	0	0.00683	0	0.030067
SS47-00	0	0	0	0	0.265334	0	0	0	0.740059	0	0.052907	0	0
SS48-00	0	0	0.000772	0.000005	0.006324	0.000125	0	0	0.075168	0	0.000529	0	0
SS49-00	0	0	0	0	0.001151	0	0	0	0.00612	0	0.000085	0	0
SS49-30	0	0	0	0	0.001151	0	0	0	0.00612	0	0.000085	0	0

SITE ID	SITE ID - long	TYPE	BASIN	ALIAS	DATE	TIME	LAT	LONG	ELEVATION (m)	PREVIOUS SAMPLE
SS50-00	20161010BP-SS50-SS-00-EPA	SS	Middle Fork Cement Creek	MH02 (BLM MH4)	10/10/2016	13:40	37.887072	-107.635941	3542.2	YES
SS51-00	20161010BP-SS51-SS-00-EPA	SS	Middle Fork Cement Creek	MH03	10/10/2016	14:00	37.887235	-107.637596	3524.7	NO
SS52-00	20161010BP-SS52-SS-00-EPA	SS	Middle Fork Cement Creek	Mini 4	10/10/2016	14:20	37.887021	-107.637859	3523.6	NO
SS53-00	20161010BP-SS53-SS-00-EPA	SS	Middle Fork Cement Creek	MFC 1 first emergence	10/10/2016	15:30	37.881428	-107.637774	3483.5	YES
SS54-00	20161010BP-SS54-SS-00-EPA	SS	Middle Fork Cement Creek	MFC 2 natural sp below BH	10/10/2016	16:00	37.882417	-107.638575	3460.3	NO
SS55-00	20161010BP-SS55-SS-00-EPA	SS	South Fork Cement Creek	MFC 3 road abv Gladstone natural	10/10/2016	17:45	37.889338	-107.6479	3251.5	NO
SS56-00	20161011BP-SS56-SS-00-EPA	SS	Cement Creek above North Fork	CC (vicinity of Sunnside S-5)	10/11/2016	10:30	37.90606	-107.643794	3368.09	NO
SS56-30	20161011BP-SS56-SS-00-EPA	SS	Cement Creek above North Fork	CC (vicinity of Sunnside S-5)	10/11/2016	10:30	37.90606	-107.643794	3368.09	YES
SS57-00	20161011BP-SS57-SS-00-EPA	SS	Cement Creek above North Fork	CC (roadside btw mogul and Grand Mogul)	10/11/2016	12:40	37.910964	-107.636868	3513.35	NO
SS58-00	20161011BP-SS58-SS-00-EPA	SS	Cement Creek above North Fork	CC spring pool below Gr Mogul, natural	10/11/2016	13:10	37.90994	-107.633296	3543.38	NO
SS58-00	20161011BP-SS58-SS-00-EPA	SS	Cement Creek above North Fork	CC spring pool below Gr Mogul, natural	10/11/2016	13:10	37.90994	-107.633296	3543.38	NO
SS59-00	20161011BP-SS59-SS-00-EPA	SS	Cement Creek above North Fork	Mogul Spring 02	10/11/2016	14:30	37.907486	-107.641738	3393.26	YES
SS60-00	20161011BP-SS60-SS-00-EPA	SS	Cement Creek above North Fork	Mogul Spring 0?	10/11/2016	15:50	37.906085	-107.642411	3384.78	YES
SS61-00	20161011BP-SS61-SS-00-EPA	SS	Cement Creek above North Fork	CC (same fault as Pride of Bonita?)	10/11/2016	15:30	37.904061	-107.644002	3334.87	NO
SS62-00	20161011BP-SS62-SS-00-EPA	SS	Cement Creek above North Fork	CC (in fen complex North of R&B)	10/11/2016	16:30	37.897621	-107.645047	3278.57	NO
SS63-00	20161012BP-SS63-SS-00-EPA	SS	North Fork Cement Creek	MFC01	10/12/2016	13:45	37.897425	-107.627271	3826.72	NO
SS64-00	20161012BP-SS64-SS-00-EPA	SS	North Fork Cement Creek	MFC02	10/12/2016	14:30	37.897346	-107.627702	3802.23	NO
SS65-00	20161012BP-SS65-SS-00-EPA	SS	Cement Creek at Gladstone	AT01	10/12/2016	16:00	37.891519	-107.648381	3219.77	NO
SS65-30	20161012BP-SS65-SS-30-EPA	SS	Cement Creek at Gladstone	AT01	10/12/2016	16:00	37.891519	-107.648381	3219.77	NO
SS66-00	20161012BP-SS66-SS-00-EPA	SS	Cement Creek at Gladstone	AT02	10/12/2016	16:30	37.891911	-107.648525	3217.71	NO
SS67-00	20161013BP-SS67-SS-00-EPA	SS	Cement Creek above North Fork	MFC03	10/13/2016	11:45	37.896249	-107.646373	3273.4	YES
SS68-00	20161013BP-SS68-SS-00-EPA	SS	Cement Creek above North Fork	MFC04	10/13/2016	12:15	37.89591	-107.646335	3261.94	YES
SS69-00	20161013BP-SS69-SS-00-EPA	SS	Cement Creek above North Fork	CC	10/13/2016	14:00	37.900564	-107.644423	3318.72	NO
SS70-00	20161013BP-SS70-SS-00-EPA	SS	Cement Creek above North Fork	CC	10/13/2016	14:45	37.901871	-107.644353	3327.12	NO
SS71-00	20161017BP-SS71-DM-00-EPA	DM	South Fork Animas River	SFA01	10/17/2016	12:00	37.876719	-107.602423	3381.63	NO
SS72-00	20161017BP-SS72-SS-00-EPA	SS	South Fork Animas River	SFA02	10/17/2016	13:00	37.881232	-107.600445	3403.76	NO
SS73-00	20161017BP-SS73-SS-00-EPA	SS	South Fork Animas River	SFA03	10/17/2016	13:30	37.880884	-107.599078	3344.67	NO
SS74-00	20161017BP-SS74-SS-00-EPA	SS	South Fork Animas River	SFA04	10/17/2016	14:00	37.881676	-107.598683	3357.79	NO
SS75-00	20161017BP-SS75-DM-00-EPA	DM	South Fork Animas River	SFA05	10/17/2016	15:00	37.88253	-107.598205	3394	NO
SS76-00	20161018BP-SS76-SS-00-EPA	SS	McCarty Basin	MB01	10/18/2016	10:30	37.886801	-107.608403	3646.22	NO
SS77-00	20161018BP-SS77-SS-00-EPA	SS	McCarty Basin	MB02	10/18/2016	11:15	37.886933	-107.614588	3768.48	NO
SS78-00	20161018BP-SS78-SS-00-EPA	SS	McCarty Basin	MB03	10/18/2016	11:45	37.883568	-107.617914	3832.04	NO
SS78-30	20161018BP-SS78-SS-30-EPA	SS	McCarty Basin	MB03	10/18/2016	11:45	37.883568	-107.617914	3832.04	NO
SS79-00	20161018BP-SS79-SS-00-EPA	SS	McCarty Basin	MB04	10/18/2016	12:30	37.885515	-107.608237	3648.47	NO
SS80-00	20161018BP-SS80-SS-00-EPA	SS	McCarty Basin	MB05	10/18/2016	13:00	37.887026	-107.605265	3674.96	NO
SW81-00	20161018BP-SW81-SW-00-EPA	SW	South Fork Animas River	SFA_SW_01	10/18/2016	15:30	37.878037	-107.598146	3259.49	NO
SS82-00	20161020BP-SS82-SS-00-EPA	SS	North Fork Cement Creek	MFC05	10/20/2016	12:30	37.888341	-107.632763	3615.842284	NO
SS83-00	20161020BP-SS83-SS-00-EPA	SS	North Fork Cement Creek	MFC06	10/20/2016	14:00	37.894344	-107.639765	3405.3	NO
SS84-00	20161020BP-SS84-SS-00-EPA	SS	North Fork Cement Creek	MFC07	10/20/2016	14:30	37.894308	-107.639741	3408.4	NO
SS85-00	20161020BP-SS85-SS-00-EPA	SS	North Fork Cement Creek	MFC08	10/20/2016	15:45	37.894842	-107.642207	3348.52	NO
SS86-00	20161020BP-SS86-SS-00-EPA	SS	Cement Creek at Gladstone	CC	10/20/2016	16:45	37.894184	-107.647306	3248.3	NO
SS87-00	20161025BP-SS87-SS-00-EPA	SS	Prospect Gulch	PG01	10/25/2016	10:00	37.898073	-107.685949	3680.96	YES
SS88-00	20161025BP-SS88-SS-00-EPA	SS	Prospect Gulch	PG02	10/25/2016	11:30	37.895996	-107.68289	3604.18	YES
SS89-00	20161025BP-SS89-SS-00-EPA	SS	Prospect Gulch	PG03	10/25/2016	12:45	37.893865	-107.692072	3630.96	NO
SS90-00	20161025BP-SS90-SS-00-EPA	SS	Prospect Gulch	PG04	10/25/2016	13:15	37.894855	-107.692081	3656.82	NO
SS91-00	20161025BP-SS91-SS-00-EPA	SS	Prospect Gulch	PG05	10/25/2016	14:00	37.892556	-107.688036	3527.51	NO
SS91-30	20161025BP-SS91-SS-30-EPA	SS	Prospect Gulch	PG05	10/25/2016	14:00	37.892556	-107.688036	3527.51	NO
SS92-00	20161108BP-SS92-SS-00-EPA	SS	Prospect Gulch	PG06	11/08/2016	10:15	37.89066	-107.692453	3642.66	NO
SS93-00	20161108BP-SS93-SS-00-EPA	SS	Prospect Gulch	PG07	11/08/2016	10:45	37.890349	-107.692983	3651.54	YES
SS94-00	20161108BP-SS94-SS-00-EPA	SS	Prospect Gulch	PG08	11/08/2016	11:30	37.888435	-107.688413	3655.466283	NO
SS95-00	20161108BP-SS95-DM-00-EPA	DM	Prospect Gulch	PG09	11/08/2016	12:00	37.89032	-107.689131	3542.16	YES
SS96-00	20161108BP-SS96-SS-00-EPA	SS	Prospect Gulch	PG10	11/08/2016	13:20	37.892169	-107.68216	3425.99	YES
SS97-00	20161108BP-SS97-SS-00-EPA	SS	Prospect Gulch	PG11	11/08/2016	13:50	37.891842	-107.681224	3413.18	YES
SS97-30	20161108BP-SS97-SS-30-EPA	SS	Prospect Gulch	PG11	11/08/2016	13:50	37.891842	-107.681224	3413.18	YES
SS98-00	20161108BP-SS98-SS-00-EPA	SS	Prospect Gulch	PG12	11/08/2016	15:30	37.891849	-107.680724	3406.84	NO

SITE ID	SAMPLER	PREVIOUS ID	TEMP_AIR (deg C)	TEMP_WATER (deg C)	PH	COND (us/cm)	DO	FLOW_LPM (liters/minute)	FLOW_GPM (gallons/minute)	WETLAND SPECIES	d 18O (per mil)	d D (per mil)	D-EXCESS (per mil)	AL_D (kg/day)	SB_D (kg/day)	AS_D (kg/day)	BE_D (kg/day)
SS50-00	SGC	MH2-3	4	0.5	8.03	216	11.5	12	3.17	PRESENT	-15.005	-105.955	14.084	0	0	0	0
SS51-00	NA	NA	4	2.5	7.79	162	9.6	15	3.97	PRESENT	-13.600	-94.998	13.804	0.000397	0	0	0
SS52-00	NA	NA	4	2.9	7.02	151	8.5	1.5	0.4	PRESENT	-13.721	-96.036	13.731	0	0	0	0
SS53-00	USGS	CC40	3	3.1	4.5	145	9.5	12	3.17	PRESENT	-14.020	-98.134	14.024	0.000074	0	0	0
SS54-00	NA	NA	4	5	6.99	653	7	20	5.29	PRESENT	-14.502	-102.818	13.194	0.014964	0	0	0
SS55-00	NA	NA	5	4.4	6.07	242	5.2	9	2.38	PRESENT	-16.311	-119.755	10.737	0.001979	0	0	0
SS56-00	NA	NA	4	3.7	5.14	117	2.4	1	0.26	PRESENT	-15.671	-113.846	11.520	0.005145	0	0	0
SS56-30	SGC	S-5	4	3.7	5.14	117	2.4	1	0.26	PRESENT	<null>	<null>	<null>	0.001395	0	0	0
SS57-00	NA	NA	3	3.2	6.08	1053	1.6	0.5	0.13	PRESENT	-15.498	-110.983	13.003	0.000328	0	0	0
SS58-00	NA	NA	3	4.9	6.34	21	5.4	0	0	PRESENT	-15.152	-108.565	12.651	0	0	0	0
SS58-00	NA	NA	3	4.9	6.34	21	5.4	0	0	PRESENT	-15.112	-108.432	12.468	0	0	0	0
SS59-00	SGC	MS-2	3	5.5	5.3	189	7.5	8	2.12	PRESENT	-14.933	-107.818	11.648	0.012211	0	0	0
SS60-00	SGC	MS-3	2	5	4.9	60	4.1	15	3.97	PRESENT	-15.860	-114.599	12.284	0.013608	0	0	0
SS61-00	NA	NA	3	5.1	4.98	405	7.3	0.5	0.13	PRESENT	-14.859	-107.577	11.293	0.000763	0	0	0
SS62-00	NA	NA	3	7	4.58	498	2.8	0.5	0.13	PRESENT	-14.705	-105.716	11.923	0.00069	0	0	0
SS63-00	NA	NA	5	3.5	5.72	1126	5.8	3	0.79	PRESENT	-14.564	-102.497	14.012	0.014645	0	0	0
SS64-00	NA	NA	4	4.5	8.24	676	8.6	20	5.29	ABSENT	-14.961	-106.530	13.154	0.002275	0	0	0
SS65-00	NA	NA	6	6.5	4.52	1744	2	5	1.32	ABSENT	-16.271	-117.668	12.497	0.08784	0	0	0
SS65-30	NA	NA	6	6.5	4.52	1744	2	5	1.32	ABSENT	-16.198	-117.446	12.136	0.08856	0	0	0
SS66-00	NA	NA	6	5.3	3.17	2050	1.9	6	1.59	PRESENT	-16.459	-118.970	12.705	0.133056	0	0	0
SS67-00	SGC	S-7	7	4	3.5	1199	1.6	1.5	0.4	PRESENT	-16.195	-117.926	11.630	0.038664	0	0	0
SS68-00	SGC	S-8	7	5.4	3.98	710	3	6	1.59	PRESENT	-16.006	-116.745	11.306	0.036979	0	0	0
SS69-00	NA	NA	8	4.3	4.2	474	7.4	1.5	0.4	PRESENT	-15.681	-113.654	11.792	0.010174	0	0	0
SS70-00	NA	NA	8	5.6	4.44	261	4.32	3	0.79	PRESENT	-15.594	-112.960	11.791	0.009461	0	0	0
SS71-00	NA	NA	10	6.3	7.58	554	0.6	151.2	40	PRESENT	-16.562	-120.599	11.899	0.009907	0	0	0
SS72-00	NA	NA	10	8.8	8.01	915	4.7	72	19.05	ABSENT	-16.198	-117.256	12.331	0.010886	0	0	0
SS73-00	NA	NA	10	7.6	7.41	826	2.7	12	3.17	ABSENT	-16.495	-119.558	12.406	0.007327	0	0	0
SS74-00	NA	NA	10	8.2	3.06	1175	7.2	3	0.79	ABSENT	-15.966	-116.547	11.181	0.03361	0	0	0
SS75-00	NA	NA	10	5.7	6.89	804	1.5	180	47.62	PRESENT	-16.450	-119.622	11.976	0.021125	0	0	0
SS76-00	NA	NA	4	5.2	8.34	47	10.3	0	0	PRESENT	-13.820	-103.618	6.938	0	0	0	0
SS77-00	NA	NA	4	5.5	8.75	80	8.8	9	2.38	PRESENT	-15.321	-109.562	13.007	0	0	0	0
SS78-00	NA	NA	5	1.7	8.9	116	6.3	66	17.46	PRESENT	-14.846	-104.636	14.136	0	0	0	0
SS78-30	NA	NA	5	1.7	8.9	116	6.3	66	17.46	PRESENT	<null>	<null>	<null>	0	0	0	0
SS79-00	NA	NA	5	3.4	8.83	181	7	1	0.26	PRESENT	-15.364	-109.289	13.622	0	0	0	0
SS80-00	NA	NA	6	6.7	8.91	89	9.6	0	0	PRESENT	-5.470	-55.969	-12.211	0	0	0	0
SW81-00	NA	NA	6	6.8	7.3	247	10.2	6395.76	1692	PRESENT	-14.634	-104.836	12.237	0.230256	0	0	0
SS82-00	NA	NA	10	3.8	8.8	25	9.4	6	1.59	PRESENT	-15.211	-110.835	10.856	0	0	0	0
SS83-00	NA	NA	9	5.5	2.96	1246	6.5	0.5	0.13	ABSENT	-14.738	-106.022	11.878	0.01368	0	0	0
SS84-00	NA	NA	9	4.6	2.9	1223	8.5	2	0.53	ABSENT	-14.747	-106.248	11.725	0.052992	0	0	0
SS85-00	NA	NA	5	0.6	6.8	1236	6.2	0	0	ABSENT	-16.086	-117.514	11.172	0	0	0	0
SS86-00	NA	NA	5	7	4.28	784	1.6	0.4	0.11	PRESENT	-16.305	-119.576	10.864	0.004545	0	0	0
SS87-00	USGS	CC36	1	1.6	2.94	936	9	18	4.76	PRESENT	-13.739	-96.347	13.567	0.40176	0	0	0
SS88-00	USGS	CC47	1	4.9	5.3	114	1.39	3	0.79	PRESENT	-15.758	-113.892	12.175	0.002514	0	0	0
SS89-00	NA	NA	3	6	8.7	107	8.5	1.2	0.32	PRESENT				0	0	0	0
SS90-00	NA	NA	3	4.2	8.5	78	6.8	1	0.26	PRESENT				0.000091	0	0	0
SS91-00	NA	NA	3	6.6	3.95	151	8.6	5	1.32	PRESENT				0.00311	0	0	0
SS91-30	NA	NA	3	6.6	3.95	151	8.6	5	1.32	PRESENT				0.003154	0	0	0
SS92-00	NA	NA	5	7.1	8.61	80	6.9	1.5	0.4	PRESENT	-13.563	-96.066	12.437	0.000052	0	0	0
SS93-00	USGS	CC49	5	4.2	5.28	212	6.9	1	0.26	PRESENT	-14.107	-101.407	11.445	0.008525	0	0	0
SS94-00	NA	NA	2	0.6	5.04	1068	9.5	1	0.26	ABSENT	-13.857	-98.068	12.786	0.020592	0	0	0
SS95-00	USGS	CC44	5	7.8	7.8	435	4.8	5	1.32	PRESENT	-15.571	-113.228	11.342	0.000476	0	0	0
SS96-00	USGS	SP114	4	4.2	7.51	76	7.2	0.5	0.13	PRESENT	-15.418	-112.179	11.166	0.000144	0	0	0
SS97-00	USGS	SP193	4	8.2	7.26	98	5.8	0.25	0.07	PRESENT	-14.122	-102.225	10.748	0.0004	0	0	0
SS97-30	USGS	SP193	4	8.2	7.26	98	5.8	0.25	0.07	PRESENT	-13.895	-100.941	10.217	0.000396	0	0	0
SS98-00	NA	NA	2	3.7	2.8	940	8.5	0.25	0.07	PRESENT	-14.876	-107.464	11.541	0.010512	0	0	0

SITE ID	CD_D (kg/day)	CA_D (kg/day)	CR_D (kg/day)	CU_D (kg/day)	FE_D (kg/day)	PB_D (kg/day)	MA_D (kg/day)	MN_D (kg/day)	NI_D (kg/day)	SE_D (kg/day)	SIO2 (kg/day)	AG_D (kg/day)	SR_D (kg/day)	TH_D (kg/day)	ZN_D (kg/day)	AL_T (kg/day)	SB_T (kg/day)	AS_T (kg/day)	BE_T (kg/day)	CD_T (kg/day)	CA_T (kg/day)
SS50-00	0	0.012672	0	0.000001	0	0	0.001169	0	0	0	0.006134	0	0.000085	0	0	0	0	0	0	0	0.012946
SS51-00	0	0.782784	0	0	0	0	0.0648	0	0	0	0.067738	0	0.007845	0	0	0.008692	0	0	0	0.000009	0.787968
SS52-00	0	0.53784	0	0.000033	0	0	0.05292	0	0	0	0.096552	0	0.006631	0	0.000287	0.000451	0	0	0	0	0.5508
SS53-00	0.000001	0.030024	0	0.000004	0	0	0.005054	0	0	0	0.016783	0	0.00033	0	0.000142	0.000098	0	0	0	0	0.030024
SS54-00	0.000036	0.309312	0	0.000997	0	0.000011	0.044237	0.003214	0.000021	0	0.114566	0	0.001866	0	0.006636	0.015258	0	0	0	0.000036	0.3024
SS55-00	0.000008	4.032	0	0.000045	0	0	0.163008	0	0	0	0.208224	0	0.06192	0	0.001048	0.004176	0	0	0	0	4.032
SS56-00	0.000016	0.329184	0	0.000057	0	0.000002	0.101866	0.004575	0.000028	0	0.355104	0	0.002087	0	0.004056	0.010485	0	0	0	0.000016	0.326592
SS56-30	0	0.011578	0	0.000004	0	0	0.002362	0.001241	0.000002	0	0.023472	0	0.000105	0	0.00057	0.001355	0	0	0	0	0.011376
SS57-00	0.000001	0.1404	0	0.000002	0	0	0.004968	0.009144	0.000014	0	0.012744	0	0.002016	0	0.003211	0.000487	0	0	0	0.000001	0.14544
SS58-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS58-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS59-00	0.000015	0.399744	0	0.000041	0	0	0.034445	0.000232	0.000014	0	0.183168	0	0.004332	0	0.007891	0.011981	0	0	0	0.000016	0.381312
SS60-00	0.000032	0.098496	0	0.000611	0	0.000012	0.017712	0.00257	0.000038	0	0.29808	0	0.000974	0	0.008273	0.014666	0	0	0	0.000032	0.095688
SS61-00	0.000001	0.013032	0	0.000007	0	0.000001	0.001836	0.000287	0.000001	0	0.013464	0	0.00012	0	0.000329	0.000929	0	0	0	0.000001	0.012456
SS62-00	0	0.064152	0	0.000015	0	0.000003	0.006026	0.00553	0	0	0.018144	0	0.000459	0	0.000211	0.000972	0	0	0	0.000001	0.062064
SS63-00	0.000031	0.97632	0	0.000167	0	0	0.165888	0.029808	0.000618	0	0.069552	0	0.007387	0	0.006048	0.020218	0	0	0	0.000031	0.96768
SS64-00	0	3.8592	0	0	0	0	0.3744	0.000608	0.000126	0	0.221472	0	0.03744	0	0.00131	0.004579	0	0	0	0	3.8592
SS65-00	0.000028	2.4552	0	0.000415	1	0	0.19584	0.22392	0.000306	0	0.27216	0	0.027216	0	0.0972	0.08712	0	0	0	0.000026	2.4264
SS65-30	0.000028	2.448	0	0.000411	1	0	0.19656	0.22392	0.000292	0	0.27072	0	0.027216	0	0.09648	0.08712	0	0	0	0.000025	2.4408
SS66-00	0.00004	3.29184	0	0.000272	1	0.000055	0.257472	0.3024	0.000391	0	0.356832	0	0.036029	0	0.12528	0.133056	0	0	0	0.00004	3.27456
SS67-00	0.000087	0.43416	0	0.000557	0	0.000011	0.03996	0.035856	0.000051	0	0.115992	0	0.003607	0	0.026352	0.038664	0	0	0	0.000086	0.432
SS68-00	0.000073	1.00224	0	0.001633	0	0.000118	0.098496	0.068774	0.00013	0	0.352512	0	0.008571	0	0.056765	0.037066	0	0	0	0.000076	0.9936
SS69-00	0.000045	0.153144	0	0.00032	0	0.000002	0.01579	0.013046	0.000018	0	0.076248	0	0.001363	0	0.015919	0.010541	0	0	0	0.000045	0.152496
SS70-00	0.000042	0.161568	0	0.000057	0	0.000007	0.017885	0.006782	0.000038	0	0.138672	0	0.002277	0	0.014386	0.009634	0	0	0	0.000039	0.162
SS71-00	0	27.216	0	0	1	0	1.275886	0.465938	0	0	3.244147	0	0.246033	0	0.066407	0.011344	0	0	0	0	26.998272
SS72-00	0	20.83968	0	0.000298	1	0	1.689984	0.409536	0.000908	0	1.223424	0	0.061793	0	0.053603	0.019699	0	0	0	0	20.94336
SS73-00	0	2.98944	0	0.000116	0	0	0.247104	0.059616	0.000084	0	0.269568	0	0.014239	0	0.007983	0.011007	0	0	0	0	2.9376
SS74-00	0.000028	0.73008	0	0.001611	0	0.000004	0.080352	0.016675	0.000074	0	0.06912	0	0.002121	0	0.00445	0.035035	0	0	0	0.000027	0.72144
SS75-00	0	47.1744	0	0	2	0.000664	2.92896	0.559872	0	0	2.146176	0	0.195955	0	0.118714	0.022499	0	0	0	0	46.656
SS76-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS77-00	0	0.21384	0	0	0	0	0.009539	0	0	0	0.048859	0	0.002216	0	0	0	0	0	0	0	0.212544
SS78-00	0	2.223936	0	0	0	0	0.081734	0	0	0	0.301277	0	0.021764	0	0	0	0	0	0	0	2.109888
SS78-30	0	2.23344	0	0	0	0	0.081259	0	0	0	0.300326	0	0.021669	0	0	0	0	0	0	0	2.062368
SS79-00	0	0.038736	0	0.000001	0	0	0.002074	0	0	0	0.004795	0	0.000192	0	0	0.000048	0	0	0	0	0.036576
SS80-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW81-00	0	454.985856	0	0.008225	0	0	24.867648	0.019802	0	0	47.98535	0	4.724853	0	0.339858	0.257887	0	0	0	0	462.354048
SS82-00	0	0.018749	0	0.000006	0	0	0.004061	0.000019	0	0	0.241056	0	0.000098	0	0	0.001356	0	0	0	0	0.018317
SS83-00	0.000016	0.050112	0	0.001368	0	0.000001	0.014256	0.005551	0.000017	0	0.02808	0	0.000528	0	0.004673	0.013248	0	0	0	0.000019	0.049608
SS84-00	0.000063	0.199872	0	0.005472	0	0.000002	0.055584	0.022147	0.000066	0	0.112608	0	0.002068	0	0.018691	0.052416	0	0	0	0.000073	0.197568
SS85-00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SS86-00	0.000003	0.093312	0	0.000006	0	0	0.008352	0.003992	0.000005	0	0.02615	0	0.000685	0	0.000962	0.004493	0	0	0	0.000002	0.093888
SS87-00	0.000032	1.368576	0	0.002094	0	0.003473	0.334368	0.05832	0.000581	0	0.533952	0	0.013556	0	0.008424	0.40176	0	0	0	0.000026	1.378944
SS88-00	0	0.005227	0	0.000003	0	0.000003	0.001344	0.000083	0.000002	0	0.085104	0	0.000059	0	0	0.002717	0	0	0	0	0.006869
SS89-00	0	0.019526	0	0.000001	0	0	0.002523	0.000008	0	0	0.00629	0	0.0007	0	0	0.000213	0	0	0	0	0.022464
SS90-00	0	0.01103	0	0	0	0	0.002347	0.000057	0.000001	0	0.006451	0	0.000275	0	0	0.000151	0	0	0	0	0.011534
SS91-00	0	0.013608	0	0.00003	0	0.000004	0.003758	0.000334	0.000008	0	0.03888	0	0.000073	0	0.000086	0.003298	0	0	0	0	0.018
SS91-30	0	0.013752	0	0.00003	0	0.000004	0.003773	0.000335	0.000008	0	0.039168	0	0.000073	0	0.000073	0.003406	0	0	0	0	0.014328
SS92-00	0	0.023544	0	0.000002	0	0	0.003866	0.00002	0.000002	0	0.009223	0	0.000471	0	0	0.000246	0	0	0	0	0.024192
SS93-00	0	0.036288	0	0.00003	0	0	0.005342	0.000929	0.000016	0	0.01944	0	0.00067	0	0.000085	0.00877	0	0	0	0	0.036144
SS94-00	0.000005	0.26928	0	0.000027	0	0.000065	0.095184	0.006034	0.000132	0	0.013478	0	0.005933	0	0.000487	0.021024	0	0	0	0.000006	0.27216
SS95-00	0	0.7272	0	0.000005	0	0	0.031392	0.002635	0	0	0.044496	0	0.03132	0	0	0.001073	0	0	0	0	0.7344
SS96-00	0	0.00113	0	0.000006	0	0.000002	0	0.000059	0	0	0.00828	0	0.000011	0	0	0.000189	0	0	0	0	0.001145
SS97-00	0.000001	0.004356	0	0.000003	0	0.000002	0.000727	0.000082	0.000002	0	0.006408	0	0.00002	0	0.00032	0.001152	0	0	0	0.000001	0.0045
SS97-30	0.000001	0.00432	0	0.000003	0	0.000002	0.000716	0.000082	0.000002	0	0.006408	0	0.00002	0	0.000321	0.000529	0	0	0	0.000001	0.004428
SS98-00	0.00002	0.011376	0	0.000652	0	0.000018	0.004248	0.001501	0.000013	0	0.02556	0	0.000068	0	0.005832	0.01062	0	0	0	0.00002	0.011664

SITE ID	CR_T (kg/day)	CU_T (kg/day)	FE_T (kg/day)	PB_T (kg/day)	MA_T (kg/day)	MN_T (kg/day)	NI_T (kg/day)	SE_T (kg/day)	SIO2 (kg/day)	AG_T (kg/day)	SR_T (kg/day)	TH_T (kg/day)	ZN_T (kg/day)
SS50-00	0	0	0	0	0.001164	0	0	0	0.006178	0	0.000086	0	0
SS51-00	0	0.000804	0.004838	0.000019	0.063936	0.007603	0	0	0.074995	0	0.007897	0	0.001569
SS52-00	0	0	0	0	0.053352	0	0	0	0.09396	0	0.006804	0	0
SS53-00	0	0	0	0	0.005076	0	0	0	0.01661	0	0.000337	0	0.000129
SS54-00	0	0.001045	0	0.000017	0.043546	0.003093	0	0	0.110419	0	0.001884	0	0.005789
SS55-00	0	0.000079	0.0036	0.000086	0.1656	0.00028	0	0	0.205344	0	0.064224	0	0.000939
SS56-00	0	0.000132	0.012727	0.000203	0.104587	0.008022	0	0	0.3564	0	0.002125	0	0.003823
SS56-30	0	0.000004	0.005875	0	0.002261	0.001211	0	0	0.022464	0	0.000103	0	0.000497
SS57-00	0	0.000004	0.010008	0.000001	0.005054	0.00864	0.000016	0	0.01332	0	0.002102	0	0.003262
SS58-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS58-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS59-00	0	0.000044	0	0	0.032832	0.00023	0	0	0.180864	0	0.004262	0	0.007096
SS60-00	0	0.000654	0.00216	0.000019	0.017798	0.002419	0	0	0.28512	0	0.000987	0	0.007106
SS61-00	0	0.00001	0.000342	0.000004	0.00185	0.000282	0	0	0.013896	0	0.000122	0	0.000294
SS62-00	0	0.000026	0.009	0.000013	0.005933	0.005386	0	0	0.018792	0	0.000456	0	0.000294
SS63-00	0	0.000172	0.002056	0	0.161568	0.029938	0.000188	0	0.070848	0	0.00743	0	0.005875
SS64-00	0	0	0.005616	0.000016	0.37152	0.000746	0	0	0.219168	0	0.038304	0	0.001374
SS65-00	0	0.000401	0.648	0	0.19368	0.22536	0.000274	0	0.26856	0	0.027576	0	0.0972
SS65-30	0	0.000419	0.64944	0	0.19224	0.22536	0.000289	0	0.26712	0	0.027648	0	0.0972
SS66-00	0	0.00028	0.765504	0.000057	0.255744	0.307584	0.000381	0	0.359424	0	0.036979	0	0.127008
SS67-00	0	0.000559	0.022032	0.000012	0.039744	0.035856	0.000052	0	0.11556	0	0.003715	0	0.02592
SS68-00	0	0.00165	0.003525	0.000119	0.098496	0.06912	0.000131	0	0.34992	0	0.008813	0	0.05616
SS69-00	0	0.000367	0.000775	0.000002	0.015984	0.01309	0.000021	0	0.075816	0	0.001408	0	0.015725
SS70-00	0	0.000064	0.001974	0.000011	0.017971	0.006912	0.000043	0	0.141696	0	0.002376	0	0.014429
SS71-00	0	0	1.045094	0	1.249759	0.465938	0	0	3.222374	0	0.24821	0	0.065101
SS72-00	0	0.000487	1.275264	0.000181	1.71072	0.416794	0.000879	0	1.275264	0	0.063245	0	0.055469
SS73-00	0	0.00019	0.409536	0.000034	0.247104	0.059789	0.000098	0	0.278208	0	0.014429	0	0.007897
SS74-00	0	0.001585	0.108432	0.000103	0.080352	0.016934	0.000074	0	0.071712	0	0.002156	0	0.004406
SS75-00	0	0	1.64592	0.000905	2.90304	0.559872	0	0	2.133216	0	0.199843	0	0.114826
SS76-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS77-00	0	0	0	0	0.009603	0	0	0	0.049248	0	0.002268	0	0
SS78-00	0	0	0	0	0.081734	0	0	0	0.304128	0	0.02281	0	0
SS78-30	0	0	0	0	0.080214	0	0	0	0.301277	0	0.022715	0	0
SS79-00	0	0	0	0	0.002074	0	0	0	0.004781	0	0.000199	0	0
SS80-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SW81-00	0	0	0	0	25.236058	0.029933	0	0	45.406483	0	4.706433	0	0.334332
SS82-00	0	0	0.001331	0.000006	0.004216	0.000036	0	0	0.243648	0	0.000101	0	0
SS83-00	0	0.001498	0.034416	0.000007	0.013968	0.00558	0.000019	0	0.028008	0	0.000517	0	0.004565
SS84-00	0	0.006048	0.13536	0.000002	0.055296	0.022291	0.000076	0	0.112032	0	0.002056	0	0.018
SS85-00	0	0	0	0	0	0	0	0	0	0	0	0	0
SS86-00	0	0.000007	0.016589	0	0.008294	0.004003	0.000006	0	0.026208	0	0.000685	0	0.000945
SS87-00	0	0.002224	0.365472	0.003473	0.331776	0.059098	0.000625	0	0.539136	0	0.014049	0	0.008476
SS88-00	0	0	0.001953	0.000006	0.001382	0.000084	0	0	0.0864	0	0.000064	0	0
SS89-00	0	0	0.000525	0.000001	0.002644	0.000029	0	0	0.007344	0	0.000745	0	0
SS90-00	0	0	0.001555	0.000001	0.00239	0.000059	0	0	0.006638	0	0.000291	0	0
SS91-00	0	0.00003	0.002066	0.000006	0.003881	0.000341	0	0	0.040536	0	0.000081	0	0.000076
SS91-30	0	0.00003	0.002174	0.000005	0.003874	0.000338	0	0	0.040896	0	0.000078	0	0
SS92-00	0	0	0.000808	0	0.003866	0.000029	0	0	0.010001	0	0.00049	0	0
SS93-00	0	0.000026	0	0	0.005314	0.000932	0.000013	0	0.020016	0	0.000685	0	0.000082
SS94-00	0	0.00003	0.00016	0.000107	0.097776	0.006149	0.000139	0	0.014054	0	0.00625	0	0.000491
SS95-00	0	0.000035	0.010008	0	0.031608	0.002959	0	0	0.044928	0	0.032832	0	0
SS96-00	0	0.000008	0.016488	0.000003	0.000279	0.000065	0	0	0.008712	0	0.000011	0	0.000022
SS97-00	0	0.000006	0.000774	0.000014	0.00077	0.000087	0.000002	0	0.007056	0	0.000022	0	0.000329
SS97-30	0	0.000004	0.00012	0.000004	0.000749	0.000083	0.000002	0	0.006444	0	0.000021	0	0.000316
SS98-00	0	0.000662	0.003672	0.000026	0.004284	0.001516	0.000014	0	0.025632	0	0.000071	0	0.005796

SITE ID	SITE ID - long	TYPE	BASIN	ALIAS	DATE	TIME	LAT	LONG	ELEVATION (m)	PREVIOUS SAMPLE
SS100-00	20161109BP-SS100-DM-00-EPA	DM	South Fork Cement Creek	Natalie Occidental	11/09/2016	13:00	37.87676369	-107.6439899	3356	YES
SS101-00	20161109-SS101-DM-00-EPA	DM	Cement Creek above North Fork	Red and Bonita	11/09/2016	15:00	37.89723101	-107.6437025	3339	YES
SS102-00	20161109-SS102-DM-00-EPA	DM	North Fork Cement Creek	Gold King #7 @ Gladstone	11/09/2016	14:45	37.891604	-107.648921	3226	YES
SS103-00	20161109-SS103-DM-00-EPA	DM	Alaska Basin	Queen Anne	11/09/2016	15:00	37.914474	-107.630476	3732.8	YES
SS104-00	20161109-SS104-DM-00-EPA	DM	Cement Creek at Gladstone	American Tunnel	11/09/2016	13:30	37.890981	-107.64844	3238.7	YES
SS105-00	20161109-SS105-DM-00-EPA	DM	Cement Creek above North Fork	Mogul South	11/09/2016	14:30	37.90833	-107.638424	3493.3	YES
SS106-00	20161109-SS106-DM-00-EPA	DM	Cement Creek above North Fork	Grand Mogul	11/09/2016	14:00	37.909831	-107.630887	3584.4	YES
SS107-00	20161109-SS107-DM-00-EPA	DM	Cement Creek above North Fork	Mogul	11/09/2016	14:00	37.90999	-107.638324	3487.2	YES
SS108-00	20161011-SS108-DM-00-EPA	DM	Cement Creek above North Fork	Mogul South Adit	10/11/2016	16:00	37.90833	-107.638424	3493.3	YES
SS109-00	20161012-SS109-DM-00-EPA	DM	Cement Creek at Gladstone	American Tunnel	10/12/2016	10:00	37.890981	-107.64844	3238.7	YES
SS110-00	20161006-SS110-DM-00-EPA	DM	Eureka Gulch	Ben Franklin	10/06/2016	15:00	37.894485	-107.60795	3625.1	YES
SS111-00	20160921-SS111-DM-00-EPA	DM	South Fork Cement Creek	Big Colorado	09/21/2016	11:00	37.876802	-107.646642	3372.2	YES
SS112-00	20161006-SS112-DM-00-EPA	DM	Eureka Gulch	Terry Tunnel	10/06/2016	15:00	37.892864	-107.604247	3523.6	YES
SS113-00	20160921-SS113-DM-00-EPA	DM	Middle Fork Cement Creek	Black Hawk	09/21/2016	16:00	37.882231	-107.635607	3535.7	YES
SS114-00	20161011-SS114-DM-00-EPA	DM	Cement Creek above North Fork	Red and Bonita	10/11/2016	14:00	37.87676369	-107.6439899	3339	YES
SS115-00	20161006-SS115-DM-00-EPA	DM	Upper Animas	Senator	10/06/2016	15:45	37.88189	-107.567987	3071.1	YES
SS116-00	20160921-SS116-DM-00-EPA	DM	South Fork Cement Creek	Natalie Occidental	09/21/2016	11:00	37.87676369	-107.6439899	3356	YES
SS117-00	20161011-SS117-DM-00-EPA	DM	Cement Creek above North Fork	Grand Mogul	10/11/2016	10:00	37.909831	-107.630887		YES
SS118-00	20161011-SS118-DM-00-EPA	DM	Cement Creek above North Fork	Mogul	10/11/2016	16:00	37.90999	-107.638324	3487.2	YES
SS119-00	20161012-SS119-DM-00-EPA	DM	North Fork Cement Creek	Gold King #7 @ Gladstone	10/12/2016	9:30	37.891604	-107.648921	3226	YES
SS120-00	20161108-SS120-DRY-00-EPA	DRY	Prospect Gulch	Hercules	11/08/2016	9:20	37.8924374	-107.6886326	3542.37	YES
SS121-00	20161109-SS121-DRY-00-EPA	DRY	Prospect Gulch	Galena Queen	11/09/2016	11:15	37.89187819	-107.6895044	3545.07	YES
SS122-00	20161109-SS122-DRY-00-EPA	DRY	Prospect Gulch	Prospect Adit 01	11/09/2016	13:00	37.88915913	-107.6917829	3643.69	YES
SS123-00	20161109-SS123-DRY-00-EPA	DRY	Prospect Gulch	Henrietta #7	11/09/2016	13:15	37.89096205	-107.6828174	3441.04	YES
SS124-00	20161109-SS124-DRY-00-EPA	DRY	Prospect Gulch	Henrietta #8	11/09/2016	14:30	37.89173755	-107.6824783	3415.3	YES
SS125-00	20161109-SS125-DRY-00-EPA	DRY	Prospect Gulch	Lark	11/09/2016	16:00	37.89341098	-107.6811311	3471	YES
SS126-00	20161109-SS126-DM-00-EPA	DM	Prospect Gulch	Joe and Johns	11/09/2016	14:00	37.891504	-107.679079	3421	YES
SS127-00	20161013-SS127-DRY-00-EPA	DRY	Cement Creek above North Fork	Adams	10/13/2016	13:00	37.90021839	-107.642346	3388.06	<null>
SS128-00	20161013-SS128-DRY-00-EPA	DRY	Cement Creek above North Fork	Pride of Bonita	10/13/2016	13:15	37.90363586	-107.6411956	3449.45	<null>
SS129-00	20161013-SS129-DRY-00-EPA	DRY	Cement Creek above North Fork	Pride of Bonita Adit 01	10/13/2016	10:20	37.903049	-107.641927	3438	<null>
SS130-00	20161013-SS130-DRY-00-EPA	DRY	North Fork Cement Creek	Solomon Group	10/13/2016	13:00	37.89635248	-107.6396136	3515.94	<null>
SS131-00	20161012-SS131-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King Unnamed Adit 01	10/12/2016	13:15	37.89687397	-107.6370694	3630.53	<null>
SS132-00	20161012-SS132-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King Unnamed Adit 02	10/12/2016	11:50	37.89608	-107.636648	3617	<null>
SS133-00	20161012-SS133-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King Sampson Level	10/12/2016	12:00	37.8936541	-107.6343117	3698.87	<null>
SS134-00	20161012-SS134-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King Upper Sampson	10/12/2016	12:20	37.89757546	-107.6334355	3743.92	<null>
SS135-00	20161012-SS135-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King Paul Level	10/12/2016	12:30	37.89742113	-107.6323968	3727.97	<null>
SS136-00	20161012-SS136-DRY-00-EPA	DRY	North Fork Cement Creek	Gold King #1	10/12/2016	12:00	37.89660712	-107.6320212	3687.95	<null>

SITE ID	SAMPLER	PREVIOUS ID	TEMP_AIR (deg C)	TEMP_WATER (deg C)	PH	COND (us/cm)	DO	FLOW_LPM (liters/minute)	FLOW_GPM (gallons/minute)	WETLAND SPECIES	d 18O (per mil)	d D (per mil)	D-EXCESS (per mil)	AL_D (kg/day)	SB_D (kg/day)	AS_D (kg/day)	BE_D (kg/day)
SS100-00	DRMS	Natalie Occidental	2	5.8	7.7	831.9	<null>	<null>	<null>	<null>	-15.816	-113.219	13.312	<null>	<null>	<null>	<null>
SS101-00	DRMS	Red and Bonita	2	6.5	6.54	1528	<null>	<null>	<null>	<null>	-16.341	-118.765	11.963	<null>	<null>	<null>	<null>
SS102-00	DRMS	Gold King #7 @ Gladstone	2	<null>	<null>	<null>	<null>	<null>	750	<null>	-16.286	-117.236	13.053	<null>	<null>	<null>	<null>
SS103-00	DRMS	Queen Anne	2	2.1	8.2	396.5	<null>	<null>	15	<null>	-14.61	-104.444	12.434	<null>	<null>	<null>	<null>
SS104-00	DRMS	All American Tunnel	2	7.8	5.92	1634	<null>	<null>	<null>	<null>	-16.278	-118.184	12.038	<null>	<null>	<null>	<null>
SS105-00	DRMS	Mogul South	2	4.2	7.8	678.5	<null>	<null>	<null>	<null>	-15.754	-113.327	12.701	<null>	<null>	<null>	<null>
SS106-00	DRMS	Grand Mogul	2	4.8	3.63	415.2	<null>	<1	<null>	<null>	-15.998	-115.382	12.605	<null>	<null>	<null>	<null>
SS107-00	DRMS	Mogul	2	5.5	3.78	1053	<null>	<null>	<null>	<null>	-15.718	-112.309	13.434	<null>	<null>	<null>	<null>
SS108-00	DRMS	Mogul South Adit	3	4.8	6.77	1151	<null>	<null>	34.2	<null>	-15.813	-113.45	13.053	<null>	<null>	<null>	<null>
SS109-00	DRMS	American Tunnel	4	7.8		1634	<null>	<null>	<null>	<null>	-16.423	-118.571	12.814	<null>	<null>	<null>	<null>
SS110-00	DRMS	Ben Franklin	4	<null>	<null>	<null>	<null>	<null>	<null>	<null>	-14.738	-105.346	12.557	<null>	<null>	<null>	<null>
SS111-00	DRMS	Big Colorado	7	6.4	4.37	944	<null>	35.23	9.32	<null>	-16.199	-117.499	12.092	<null>	<null>	<null>	<null>
SS112-00	DRMS	Terry Tunnel	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	-15.738	-113.653	12.248	<null>	<null>	<null>	<null>
SS113-00	DRMS	Black Hawk	5	7.9	7.08	1555	<null>	1778.49	470.5	<null>	-14.993	-106.382	13.559	<null>	<null>	<null>	<null>
SS114-00	DRMS	Red and Bonita	6	6.5		1528	<null>	<null>	<null>	<null>	-16.423	-119	12.383	<null>	<null>	<null>	<null>
SS115-00	DRMS	Senator	16	13.1	7.01	731.1	<null>	122.85	32.5	<null>	-16.02	-117.593	10.568	<null>	<null>	<null>	<null>
SS116-00	DRMS	Natalie Occidental	10	6.4	6.78	1123	<null>	1539.59	407.3	<null>	-15.808	-113.411	13.056	<null>	<null>	<null>	<null>
SS117-00	DRMS	Grand Mogul	10	5.9	3.1	1721	<null>	10.51	2.78	<null>	-16.079	-116.7	11.929	<null>	<null>	<null>	<null>
SS118-00	DRMS	Mogul	3	<null>	<null>	<null>	<null>	<null>	<null>	<null>	-15.85	-114.131	12.668	<null>	<null>	<null>	<null>
SS119-00	DRMS	Gold King #7 @ Gladstone	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	-16.172	-116.906	12.466	<null>	<null>	<null>	<null>
SS120-00	DRMS	Hercules		<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS121-00	DRMS	Galena Queen	2	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS122-00	DRMS	Prospect Adit 01	2	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS123-00	DRMS	Henrietta #7	2	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS124-00	DRMS	Henrietta #8	2	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS125-00	DRMS	Lark	2	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS126-00	DRMS	Joe and Johns	2	4.1	2.7	820	9.5	<null>	3	<null>	-16.637	-121.161	11.934	<null>	<null>	<null>	<null>
SS127-00	<null>	Adams	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS128-00	<null>	Pride of Bonita	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS129-00	<null>	Pride of Bonita Adit 01	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS130-00	<null>	Solomon Group	5	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
SS131-00	<null>	Gold King Unnamed Adit 01	4	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>	<null>
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