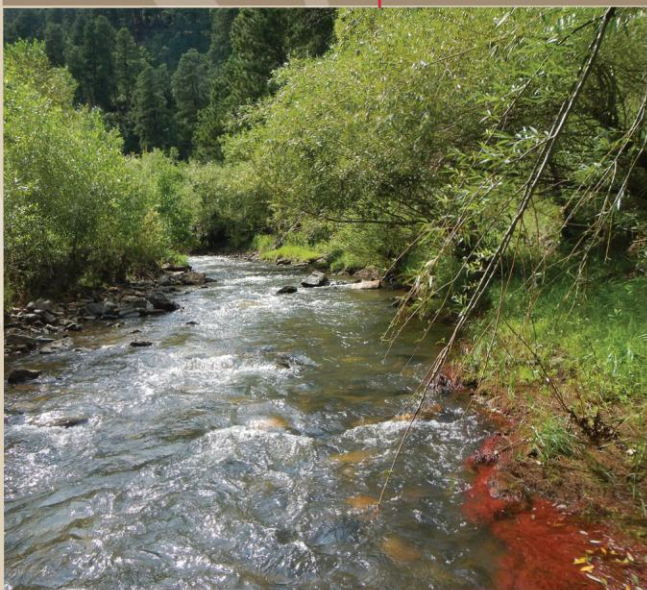


2025 Aquatic Biological Monitoring Report for Gold Run Creek, South Dakota

March 2026



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Submitted to:
South Dakota Science and Technology Authority
Sanford Underground Research Facility
630 E. Summit Street
Lead, SD 57754

Submitted by:
GEI Consultants, Inc.
4601 DTC Boulevard, Suite 325
Denver, CO 80237

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A handwritten signature in blue ink, appearing to read "Ashley Ficke".

Ashley Ficke, Reviewer

A handwritten signature in blue ink, appearing to read "Jenniffer Lynch".

Jenniffer Lynch, Project Manager

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1. Introduction

Aquatic biological monitoring of Gold Run Creek and Whitewood Creek in the northern Black Hills, South Dakota began in 2009 for the Sanford Underground Research Facility (SURF), operated by the South Dakota Science and Technology Authority (SDSTA). This site was formerly the Homestake underground mine and has been converted into an underground research laboratory. SDSTA is dewatering the underground facility with National Pollutant Discharge Elimination System (NPDES) permit SD0000043 through Outfall 001 to Gold Run Creek.

Five sites were established in Gold Run and Whitewood creeks in 2009 by personnel from SDSTA and GEI Consultants, Inc. (GEI) to monitor the biological communities (Figure 1-1). Site locations are in accordance with the study plan developed for SDSTA (GEI 2009) and approved by the South Dakota Department of Agriculture and Natural Resources (SDDANR) and South Dakota Department of Game, Fish and Parks (SDDGFP). In 2009, data were collected at two control sites (sites WWC-A and GR-A) and the site furthest downstream from Outfall 001 (Site WWC-C) prior to initiation of discharge. These sites were selected to establish baseline data as they were the least likely to be affected by the discharge (Stan Michals, SDDGFP, personal communication). All five sites were sampled from 2010 through 2016.

In March 2017, SDDANR, along with SDDGFP, revised the biological monitoring sampling plan that had been used from 2009 through 2016. The revised changes were enacted for the 2017 sampling as a condition of the current NPDES permit. The revisions to the sampling plan required alterations to how certain data were analyzed; the habitat assessment method used; and the sites that require continued monitoring. The revised sampling plan only requires monitoring at the two sites on Gold Run Creek. Until 2023, sampling continued at Site WWC-B on Whitewood Creek downstream of the confluence with Gold Run Creek at the discretion of SDSTA. From 2019 through 2023, control Site WWC-A on Whitewood Creek, upstream of the confluence with Gold Run Creek, was also sampled at the request of SDSTA. In 2024, SDSTA decided to discontinue discretionary sampling on Whitewood Creek; Gold Run Creek was the only water body sampled in 2024 and 2025.

This report presents the seventeenth year of monitoring for Site GR-A, and the sixteenth year for Site GR-B. Habitat characterization and sampling of the fish, benthic invertebrate, and periphyton populations were conducted by GEI on August 18, 2025, at these two sites. The purpose of the continued monitoring on Gold Run Creek is to identify any potential effects on biological communities in Gold Run Creek resulting from discharge approved through the SURF NPDES permit. Specifically, biological data were collected and analyzed in the study areas to determine if any potential short-term and/or long-term aquatic impairment was apparent. In this report, data collected in 2025 are presented and compared to data collected

since 2009 (GEI 2010, 2011, 2012, 2013a, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025).

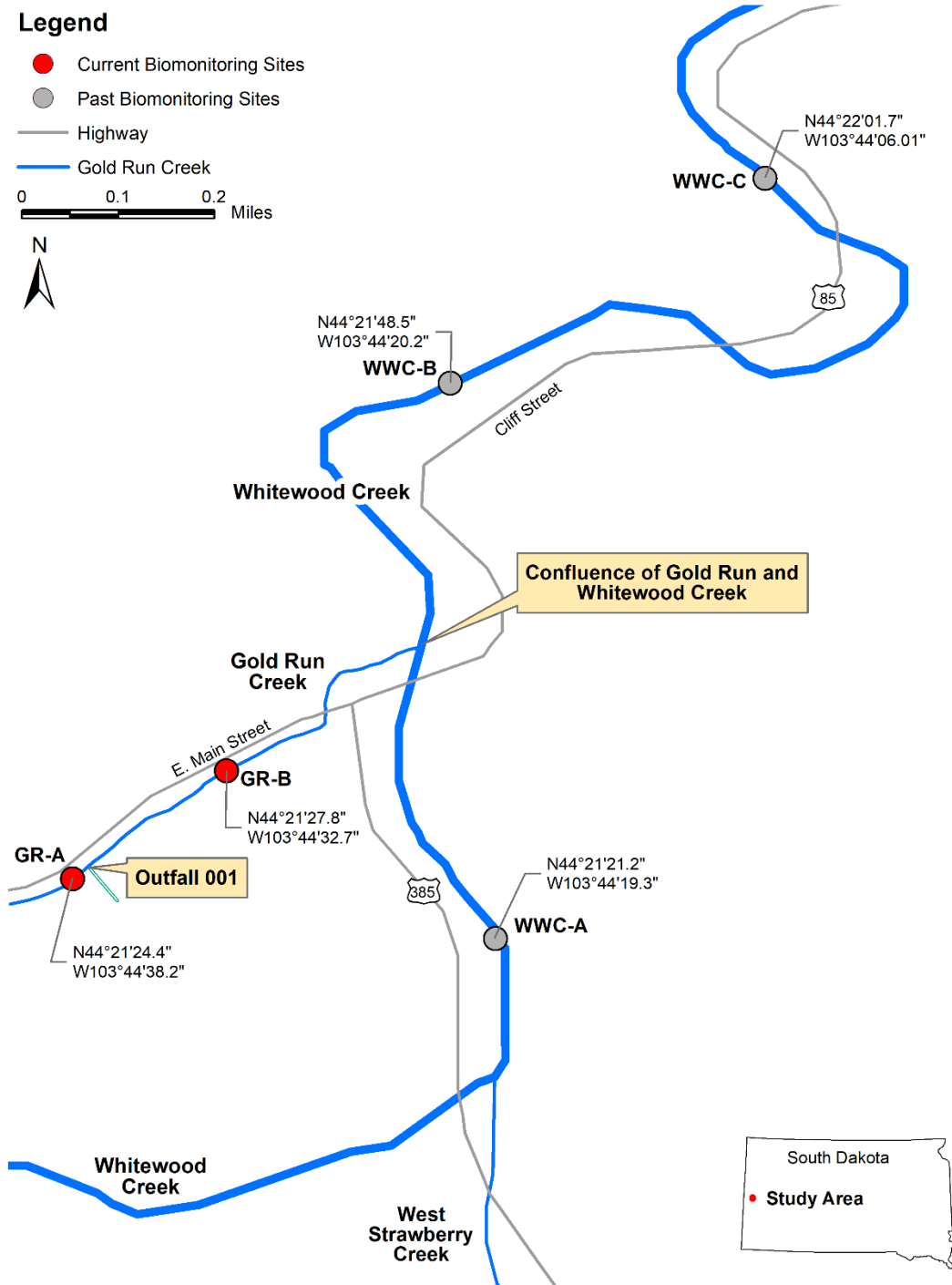


Figure 1-1: Current and past aquatic biological monitoring sites on Gold Run Creek and Whitewood Creek, respectively, near Lead and Deadwood, South Dakota. GPS coordinates were collected at downstream site boundaries.

2. Study Area

The study area is located in the northern Black Hills in the Middle Rockies Ecoregion (Omernik 1987; Omernik and Gallant 1987) near Lead and Deadwood, South Dakota. Five study sites were established in total on Gold Run and Whitewood creeks in 2009 as part of the aquatic biological monitoring program. (Figure 1-1). Two sites, located upstream and downstream of the SURF NPDES permitted Outfall 001, were established on Gold Run Creek. Three sites were established on Whitewood Creek: one upstream and two downstream of the confluence with Gold Run Creek. Specific sites on each stream were chosen in the field with consultation from SDSTA (John Scheetz, personal communication) and approved by SDDGFP. Individual sites were representative of the sampling reach with respect to habitat features and stream morphology.

In 2017, the study plan used from 2009 through 2016 was revised by the SDDANR and SDDGFP. The revised study plan directs sites GR-A and GR-B on Gold Run Creek to be monitored for potential effects from the Outfall 001 discharge. No biological monitoring is required on Whitewood Creek. However, SDSTA elected to perform biological monitoring at Site WWC-B on Whitewood Creek in 2017 and 2018 in addition to the two Gold Run sites. From 2019 through 2023, both Site WWC-A and Site WWC-B were monitored along with the two Gold Run sites to provide a more robust data set describing the aquatic biological community in Whitewood Creek.

2.1 Current Sites

2.1.1 Gold Run Creek

Gold Run Creek is a relatively steep, first order stream for most of its length. It flows northeast from the city of Lead to its confluence with Whitewood Creek at an elevation of approximately 1,430 meters (m). The city of Lead and the former Homestake Mine mill area are located in the headwaters of Gold Run Creek, and SURF's Outfall 001 discharges into Gold Run Creek below the former mill area. Locations of the study sites (Figure 1-1) are described below.

GR-A This site is located on Gold Run Creek at an elevation of 1,461 m, approximately 0.6 kilometer (km) upstream of the confluence with Whitewood Creek. This site acts as a control site for the downstream site. The bottom of this site is located approximately 10 m upstream of Outfall 001. GPS coordinates for the bottom and top of this site are N44° 21' 24.4", W103° 44' 38.2" and N44° 21' 21.8", W103° 44' 40.9", respectively.

GR-B This site is located on Gold Run Creek at an elevation of 1,453 m, approximately 0.4 km upstream of the confluence with Whitewood Creek and downstream of

Outfall 001. The downstream end of this site is located adjacent to the Deadwood/Custer road sign. Approximate GPS coordinates for the bottom and top of this site are N44° 21' 27.8" and W103° 44' 32.7", respectively.

2.2 Past Sampling Sites

2.2.1 *Whitewood Creek*

Site WWC-C on Whitewood Creek (Figure 1-1) was discontinued from the biological monitoring plan in 2017, and sampling at sites WWC-A and WWC-B were discontinued in 2024. The past Whitewood Creek sites are described here for historical reference.

Whitewood Creek originates in the northern Black Hills of South Dakota and flows northeast into the Belle Fourche River. The confluence of Whitewood Creek with the Belle Fourche River is approximately 24 km northeast of Spearfish, South Dakota. Mean monthly discharge of Whitewood Creek (US Geological Survey [USGS] Gage 06436180) near the study sites is highest from April through June when average flows ranged from 52 to 91 cubic feet per second (cfs) from 2010 through 2024, and in the remaining months, average flow ranges between 8 and 26 cfs (USGS 2024). Within the study area, Whitewood Creek is a third order stream. The location of the three past study sites on this stream (Figure 1-1) are described below.

- WWC-A This site is located on Whitewood Creek at an elevation of 1,446 m, approximately 0.6 km upstream of Gold Run Creek. The bottom of this site is located just upstream of the foot bridge for the Mickelson Trail, and the top of the site is located adjacent to an old USGS staff gage. GPS coordinates for the bottom and top of this site are N44° 21' 21.2", W103° 44' 19.3" and N44° 21' 18.2", W103° 44' 17.7", respectively.
- WWC-B This site is located on Whitewood Creek at an elevation of 1,425 m, approximately 0.6 km downstream of the confluence with Gold Run Creek and just below NPDES Monitoring Site MTL-2. This site is located across from the Thunder Cove Inn. Approximate GPS coordinates for the bottom and top of this site are N44° 21' 48.2', W103° 44' 20.2' and N44° 21' 48.2', W103° 44' 25.4', respectively.
- WWC-C This site is located on Whitewood Creek at an elevation of 1,408 m, approximately 1.8 km downstream of the confluence with Gold Run Creek. The bottom of this site is located adjacent to Claim Jumper's storage units, and the top of the site is located adjacent to the corner of the Super 8 building. GPS coordinates for the bottom and top of this site are N44° 22' 01.7", W103° 44' 06.1" and N44° 21' 59.3", W103° 44' 03.1, respectively.

3. Methods

3.1 Habitat Assessment

Physical habitat data were collected at the study sites on August 18, 2025. Sites were surveyed with a standardized habitat measurement protocol that has been used during monitoring since 2009 and includes parameters measured by the U.S. Forest Service (Platts et al. 1983; Overton et al. 1997). Pursuant to the monitoring plan approved in 2017, the U.S. Environmental Protection Agency (EPA) Environmental Monitoring and Assessment Program (EMAP) habitat survey method (SDDANR 2005) was used until 2018. This method was discontinued in 2019 and is not scheduled to be performed in the future.

Since 2019, the following methods have been used to survey habitat in Gold Run Creek. Each habitat characteristic listed below was measured throughout the entire unit or at a representative transect within the habitat unit. Flow measurements were taken at each site by GEI. The following parameters were measured in each habitat unit over the entire length of the monitoring site.

1. **Habitat type** – each habitat unit is classified as a riffle, run, or pool.
2. **Channel width** – water width plus width of left and right banks at each transect.
3. **Water width** – width of the water surface measured at each transect.
4. **Average water depth** – measured at 25, 50, and 75 percent of the water width at each transect.
5. **Maximum water depth** – deepest point within each habitat unit.
6. **Water velocity** – measurements collected at 25, 50, and 75 percent of the water width along each transect.
7. **Eroding streambank** – percent of eroding streambank along each bank for entire length of each habitat unit.
8. **Streambank vegetation** – describes dominant streambank vegetation at the transect.
9. **Streambank cover** – visual estimate of percentage of streambank covered by different vegetation types, along entire length of each habitat unit.
10. **Streambank angle** – rating of whether streambank is sloping, vertical, or undercut at the transect.
11. **Streambank undercut** – depth of undercut bank (if present) for each bank at the transect.
12. **Vegetation overhang** – width of overhanging vegetation (which provides cover for fish), as measured along each transect.
13. **Percent surface fines** – substrate measurement based on a grid sampling device, as described in Overton et al. (1997). Measurements are collected at three or more individual locations in each habitat unit.

14. **Substrate composition** – visual estimate of the percent of the stream bottom covered by bedrock, boulder, cobble, gravel, and coarse or fine sediment in each habitat unit.

The percent surface fines metric provides an accurate estimate of the amount of fine substrate in pool tails and riffles. Measurements are usually collected closer to the middle of the channel and away from the slower areas near the bank where deposition would be typical. The focus on these fast water areas provides an estimate of how much fine sediment is present in areas where fish might spawn and areas that provide the most suitable habitat for macroinvertebrates. The substrate composition metric focuses on substrate throughout the entire habitat unit, including slow-flow areas near the bank.

3.2 Fish Populations

Fish populations were sampled at both sites on August 18, 2025. At the two sites on Gold Run Creek, where fish have not historically been found, only a single electrofishing pass was conducted to confirm that fish were still absent from these sites. Population estimates based on electrofishing depletion rates assume no immigration into or emigration out of the site during sampling. Therefore, the upper and lower boundaries at each sampling site were placed at natural barriers such as small waterfalls or steep riffles, or a block net was used at the upstream and/or downstream ends of the reach to prevent potential for fish movement into the reach during the sampling effort. No fish have been present on Gold Run Creek during biological monitoring since sampling began in 2009. Fish were present in Whitewood Creek in the earlier sampling events. This report does not include fish population and fish tissue data and analyses from Whitewood Creek, but these data are available from previous GEI reports (GEI 2009, 2010, 2011, 2012, 2013a, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024).

3.3 Benthic Macroinvertebrate Populations

Benthic invertebrate samples were collected at both sites on Gold Run Creek on August 18, 2025, using SDDANR (2017) sampling protocols (Peck et al 2006). Using this protocol, an area of 1 square foot (ft²; 0.09 m²) was sampled with a kick net (500 micrometer [µm] mesh size) at 11 transects. Macroinvertebrate samples were collected before other sampling or survey activities were conducted to eliminate bias created by physical disturbance. At each transect, one sample was collected at 25, 50, or 75 percent of the wetted width from the bank on a rotating basis. In erosional habitat, loose rocks and large (large cobble) and finer substrates (small cobble, gravel, and smaller) were kicked vigorously for 30 seconds to dislodge organisms into the net. In depositional habitats, the same techniques were used, except that the net was dragged through the standing water within the 0.09 m² area to capture suspended benthic organisms. Samples from the eleven transects were combined into a single, composite sample of 11 ft² (approximately 1.0 m²) for each site.

Collected samples were transferred to individual sample containers and preserved in the field using 95 percent ethanol. Each labeled sample container was submitted to the GEI laboratory, where organisms were sorted from debris, identified, and counted. For quality assurance, all samples were checked by a quality assurance officer or macroinvertebrate lab manager to ensure completeness.

The sorted specimens were identified to the lowest practical taxonomic level (usually species), depending on the age and condition of each specimen (Lenat and Resh 2001), and counted. Quality assurance for identifications and counts (Whittaker 1975; Stribling et al. 2003) was conducted randomly on one of the four samples. The quality assessment target is 95 percent similarity, and taxonomic and count accuracy in 2025 was 99 percent.

Oligochaetes (aquatic segmented worms) were mounted on glass slides prior to identification, and chironomids were identified under a dissecting microscope. Chironomid (midge) larvae and oligochaetes were identified and counted by GEI personnel. All organisms were identified in samples with small numbers of chironomids or oligochaetes (i.e., <30 individuals/sample). Samples with greater than 30 organisms/sample were randomly subsampled prior to identification (minimum of 30 individuals each). Quality assurance checks for identification were not made on Chironomidae or Oligochaeta but were conducted by taxonomists certified in identifications of these groups by the Society of Freshwater Science.

These analyses provided species lists, estimates of relative abundance (number of organisms/sample), and percent abundance of each taxon (as percent of total abundance). The data was used to calculate the invertebrate metrics described below.

3.3.1 Metric Calculations

Many metrics are available for evaluating benthic macroinvertebrate populations with most belonging to one of five categories: richness, composition, tolerance, trophic habits, and life history. In 2017, the SDDANR provided a revised list of requested metrics for reporting under the current NPDES permit (Table 3-1). In addition to the SDDANR requested metrics, the macroinvertebrate density and number of taxa are also provided for each site.

3.3.1.1 Richness Metrics

Four metrics were calculated for richness: density, total number of taxa, number of EPT taxa, and number of Plecoptera Taxa (Table 3-1). The total number of taxa is commonly used to represent invertebrate species richness at a site and higher richness usually indicates better water quality. In mountain streams, such as those in the northern Black Hills, the presence of mayfly (Ephemeroptera), stonefly (Plecoptera), and caddisfly (Trichoptera) taxa (collectively referred to as the EPT taxa) is generally an indicator of good water quality because these insect taxa are considered to be sensitive to a wide range of pollutants (Hynes 1970; Wiederholm 1984; Klemm et al. 1990; Barbour et al. 1999; Merritt et al. 2008).

Table 3-1: Summary of benthic macroinvertebrate metrics calculated for data from Gold Run Creek, South Dakota.

Metric	Type of Metric	Definition	Change Expected Following Environmental Disturbance
Density	Richness	Total abundance of invertebrates (/sample)	Decrease
Number of Taxa	Richness	Number of distinct taxa	Usually Decrease
Number of EPT Taxa	Richness	Number of taxa in the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT)	Decrease
Number of Plecoptera Taxa	Richness	Number of the taxa in the order Plecoptera	Decrease
Percent Sensitive EPT Taxa	Composition	Percent taxa comprised of EPTs with tolerance values between 0 and 4	Decrease
Percent Dominant Taxon	Composition	Relative abundance of the most abundant taxon	Increase
Percent of non- <i>Baetis</i> Ephemeroptera	Composition	Proportion of Ephemeroptera density not in the genus <i>Baetis</i>	Decrease
Percent of Oligochaeta and Hirudinea	Composition	Relative abundance of Oligochaeta and Hirudinea	Increase
Hilsenhoff Biotic Index (HBI)	Tolerance	Abundance-weighted average of the tolerance values.	Increase
Percent Intolerant Taxa	Tolerance	Percent taxa comprised of taxa with tolerance values ranging from 0 to 4	Decrease
Number of Intolerant Taxa	Tolerance	Number of taxa with tolerance values ranging from 0 to 4	Decrease
Number of Shredder Taxa	Trophic Habit	Number of taxa belonging to this functional feeding group	Decrease
Percent Collector-Gatherers	Trophic Habit	Relative abundance belonging to this functional feeding group	Variable
Number of Semivoltine Taxa	Life History	Number of taxa classified as having a semivoltine (longer than 1 year) life history	Decrease
Percent of Semivoltine Taxa	Life History	Percent of taxa classified as having a semivoltine (longer than 1 year) life history	Decrease
Number of Univoltine Taxa	Life History	Number of taxa classified as having a univoltine (shorter than 1 year) life history	Increase

The number of taxa and the number of EPT taxa would be expected to be higher in unimpacted sites than in impacted sites. However, in some cases, the number of taxa can increase due to increases in the number of non-insect taxa or to tolerant insect taxa which indicate poor water quality. Therefore, changes in the number of taxa were also evaluated with respect to species composition. Plecoptera tolerate a narrow range of fluctuation in environmental conditions, and apparently minor changes may affect Plecopteran species

composition, abundance, and distribution (EPA 1978). The number of Plecoptera taxa is expected to be higher in unimpacted sites than in impacted sites.

3.3.1.2 Composition Metrics

Four composition metrics were evaluated in this study: the percent of sensitive EPT taxa, the percent individuals in the sample belonging to the dominant taxon, the percent of non-*Baetis* Ephemeroptera, and the percent of Oligochaeta and Hirudinea (Table 3-1). The percent of sensitive EPT taxa was calculated as the number of sensitive EPT taxa divided by the total number of taxa and multiplied by 100. Sensitive EPT taxa were defined as those with tolerance values of 0, 1, 2, 3, or 4. The derivation of tolerance values is discussed in the following section on Tolerance Metrics. The percent of sensitive EPT taxa is expected to be higher in unimpacted sites because these more sensitive organisms cannot survive in disturbed environments (Wiederholm 1984; Klemm et al. 1990; Barbour et al. 1999).

The percent of the dominant taxon metric is an indicator of the diversity of the macroinvertebrate community. A diverse community contains a well-distributed relative abundance of many taxa, where a single taxon does not comprise the majority of the abundance. Stable and healthy macroinvertebrate communities contain a diverse number of taxa (including intolerant taxa). A high percentage of the dominant taxon reflects an unbalanced community and values for this metric are likely to increase with an increase in environmental disturbance.

The percent of non-*Baetis* Ephemeroptera metric is calculated by dividing the density of all mayflies except for those in the genus *Baetis* by the total density of Ephemeroptera. The mayfly family Baetidae includes species with a wide range of tolerance values, but *Baetis* species in general are more tolerant than the non-*Baetis* Ephemeroptera species. The non-*Baetis* Ephemeroptera metric provides similar ecological assessment to the number of EPT taxa richness metric. The percent of non-*Baetis* Ephemeroptera is expected to decrease in disturbed environments.

The percent of Oligochaeta and Hirudinea (leeches) metric is an indicator of habitat and water quality. There is an increasing percentage of Oligochaeta and Hirudinea as habitat quality decreases (Wilkins et al. 2016). A high relative abundance of Oligochaeta and Hirudinea may be an indicator of the presence of organic pollution, sedimentation, and/or disturbed habitat.

3.3.1.3 Tolerance Metrics

Three metrics were calculated for tolerance: The Hilsenhoff Biotic Index (HBI, Hilsenhoff 1987), percent intolerant (or sensitive) taxa, and number of intolerant taxa (Table 3-1). All three of these metrics were calculated based on the Idaho Department of Environmental Quality (IDEQ) values described below. The IDEQ compiled a set of updated values in the Northwest Regional Tolerance Value database (Appendix B of Barbour et al. 1999). These

updated values measure sensitivities of individual taxa to general environmental stress (Grafe 2002). Although multiple tolerance databases are available (Barbour et al. 1999), benthic invertebrate communities in the northern Black Hills have the most taxa in common with the communities used to develop the Northwest Regional Tolerance Value database. The updated tolerance values range from 0 (sensitive, intolerant organisms) to 10 (highly tolerant organisms) and were assigned to each identified taxon by GEI. If an identified taxon was not listed in Appendix B of Barbour et al. (1999) or a tolerance value was not given for that taxon, best available literature and professional judgement were used by GEI to determine a tolerance value.

The HBI was originally designed to gauge the effects of nutrient pollution but has been updated to incorporate species tolerances to general disturbance. The final HBI value is an abundance-weighted average of the tolerance values. The HBI is expected to be higher at impacted sites since the community would be comprised of more tolerant (higher scoring) organisms. Hilsenhoff Biotic Index scores were also rated. Invertebrate communities with scores of 0.00 - 3.50 are considered “Excellent,” 3.51 - 4.50 are considered “Very Good,” 4.51 - 5.50 are considered “Good,” 5.51 - 6.50 are considered “Fair,” 6.51 - 7.50 are considered “Fairly Poor,” 7.51 - 8.50 are considered “Poor,” and 8.51 - 10.00 are considered “Very Poor” (Hilsenhoff 1987). The HBI values and ratings were compared between sites to determine whether non-control sites showed indications of environmental stress absent at the control sites.

The proportion of intolerant individuals and number of intolerant taxa in the community were also used to evaluate community sensitivity to environmental stress. Tolerant taxa are defined as those which have been assigned tolerance values of 7, 8, 9, or 10. Intolerant taxa are those that have been assigned values of 0, 1, 2, 3, or 4. Stressed sites tend to support communities dominated by tolerant taxa (Barbour et al. 1999; Grafe 2002), so the percentage and number of intolerant taxa tend to decrease with increasing environmental stress. The percentage and number of intolerant taxa were evaluated at each site to determine whether individual sites showed signs of environmental stress.

3.3.1.4 Trophic Habit Metrics

Trophic habits and functional feeding groups (e.g., predators, collector-gatherers, shredders, etc.) were determined for each taxon based on Merritt et al. (2008). Number of shredder taxa is a measure of the trophic stability of a stream (Shearer 2006). Impacts to a stream’s riparian area that directly alter allochthonous inputs (e.g., leaves, twigs, grasses) would have a direct impact on the trophic structure of the associated macroinvertebrate community (Shearer 2006). A disturbed riparian habitat and an increase in environmental stress in the vicinity of and upstream of a site may decrease allochthonous input and result in a community with a diminished number of shredder taxa.

Fine particulate organic matter is the primary food source of collector-gatherers, and their relative abundance can indicate disturbances associated with sedimentation and/or nutrient

enrichment (Hargett 2011). These species tolerate a wider range of conditions. They are generalist feeders and can adjust to a broader range of food materials than specialist feeders. Disturbances that increase organic matter in the stream, such as nutrient enrichment, may result in a community shift favoring high relative abundance of collector-gatherers (Hargett 2011). However, physical disturbances, such as increased sedimentation, can reduce these species.

3.3.1.5 Life History Metrics

The number of taxa and percent of taxa characterized as having a semivoltine life history, and number of taxa characterized as having a univoltine life history were calculated. Semivoltine taxa require more than one year to complete a generation, and short-term disruptions in suitable aquatic conditions, either chemical or physical, can reduce the number of taxa with this life history trait. For this metric, the number of merovoltine taxa which require three or more years to complete their life cycle were also included in the semivoltine calculation.

The number of univoltine taxa, taxa that complete one life history cycle in one year, can be expected to supplant semivoltine taxa as environmental disturbance increases. As anthropogenic stressors increase, a community shift towards taxa with short life histories that develop multiple generations in a year are favored. The presence of longer-lived macroinvertebrates indicates a permanence of suitable habitat (Shearer 2006).

3.4 Periphyton Populations

Periphyton samples were collected at both monitoring sites on August 18, 2025, using SDDANR (2005) protocols, following EMAP procedures described in Peck et al. (2006). Using this protocol, an area of 12 square centimeters (cm) was sampled at each of the 11 transects delineated during the habitat assessment. As with the macroinvertebrate samples, one sample was collected from each transect from a point 25, 50, or 75 percent of the wetted width from the bank, on a rotating basis determined by random assignment at the first transect, similar to that for macroinvertebrates. In erosional habitats, a piece of substrate was selected and scrubbed with a stiff-bristled toothbrush for 30 seconds, and the dislodged periphyton was washed into a 500 milliliter (mL) plastic collection bottle. In depositional habitats, the top 1 cm of sediment was collected with a 60-mL syringe and added to the 500-mL plastic collection bottle.

The 11 periphyton samples were combined to create a single “reach-wide” composite sample for the site, and this composite sample was brought up to a total of 500 ml. After thorough mixing, a 50-mL aliquot was removed for taxonomic identification and enumeration and preserved with Lugol’s solution. A second aliquot of 25 mL was filtered onto a Whatman GF/F filter for chlorophyll *a* determination and stored wrapped in foil in the dark on dry ice to prevent exposure to light. A third aliquot of 25 mL for biomass determination was filtered onto a pre-combusted Whatman GF/F filter for ash-free dry mass (AFDM) determination.

All samples were labeled with the site name, sample type, and date, and samples were submitted to the GEI laboratory. Samples for identification and enumeration were sent to Aquatic Analysts (White Salmon, WA) or similar laboratory for processing. Samples for chlorophyll-*a* and AFDW were processed by GEI. Filamentous algae are not targeted in sample analysis, but visual observations are recorded for comparison over time.

3.5 Metric Calculations

Similar to the benthic macroinvertebrate data, metrics that described species richness, community composition, and tolerance of individual taxa were calculated from the periphyton data (Table 3-2).

Table 3-2: Summary of periphyton metrics calculated for data from Gold Run Creek, South Dakota.

Metric	Type of Metric	Definition	Change Expected Following Environmental Disturbance
Relative Density	Richness	Percent density of individual periphyton divisions (/mm ²)	Decrease
Total Density	Richness	Total density of all periphyton divisions (/mm ²)	Decrease
Number of Taxa	Richness	Total number of taxa	Decrease
Number of Diatom Taxa	Richness	Number of diatom taxa	Decrease
Number of Genera	Richness	Total number of genera	Decrease
Number of Divisions	Richness	Total number of divisions	Decrease
Shannon–Weaver Diversity Index for Diatoms	Composition	The extent that density is spread among a wide number of species.	Decrease
Autotrophic Index (AI)	Composition	Ash free dry weight / chlorophyll <i>a</i>	Increase
Autecological Classes of Diatoms <ul style="list-style-type: none"> • Eutrophic • Acidophilic • Alkaliphilic • Nitrogen Heterotrophs • High Oxygen • Motile • Saprobic 	Composition	Percent density of the autecological classes of diatoms	Variable
Diatom Tolerance Values	Tolerance	Percent density of diatoms belonging to the three Classes: (1) tolerant, (2) less tolerant, and (3) sensitive	Increase in Class 1, decrease in Class 3
Lange-Bertalot Pollution Tolerance Index	Tolerance	Weighted average of the relative abundance of each taxon multiplied by its pollution tolerance value	Decrease

3.5.1.1 Richness Metrics

The richness metrics calculated were the relative density and total density of periphyton, total number of taxa and of diatom taxa, and the number of genera and divisions (Table 3-2). The relative and total density represents the overall abundance of the different periphyton divisions. The total number of taxa represents the biological diversity at a given site. This measure includes taxa from all algal divisions that are large enough to see or identify during routine identifications. Diatoms (Bacillariophyceae) are generally larger, have a more resilient physical structure, and have a more stable taxonomy (Patrick and Reimer 1966, 1975; Wehr and Sheath 2003). Therefore, the total number of taxa and the total number of diatom taxa were calculated separately. The number of genera and number of divisions was also calculated to further define the biological diversity at a given site. All richness metrics would be expected to decrease with increasing disturbance or stresses to the periphyton community.

3.5.1.2 Composition Metrics

The following three composition metrics were calculated: the Shannon-Weaver Diversity Index (H'), the Autotrophic Index (AI), and the Autecological Classes of Diatoms (Table 3-2). The Shannon-Weaver Diversity Index was calculated for diatom data using the same formula as for benthic invertebrates. This index is considered to be sensitive to changes in water quality (Barbour et al. 1999), but its utility is lessened if total number of diatom taxa is less than ten (Barbour et al. 1999). The Shannon-Weaver Diversity Index for diatoms was calculated for each site.

The Autotrophic Index (AI) is calculated by dividing the AFDW value by the Chlorophyll *a* value and is used to indicate proportions of the community composed of either heterotrophic (outside sources of organic matter, such as leaf litter) or autotrophic (in-stream sources such as periphyton) material. Communities less disturbed by organic pollution and dominated by algae usually contain AI values ranging from 50-100. Values greater than 400 indicate communities affected by organic pollution.

The autecology classes of diatoms are a classification system that groups diatom taxa into the classes as outlined by Fore and Grafe (2002). The percent of diatom density for each class at each site were classified into the following attribute categories: eutrophic, acidophilic, alkaliphilic, nitrogen heterotrophic, high oxygen, motile, and saprobic. The density of eutrophic, saprobic, and nitrogen heterotrophic diatoms is expected to increase with an increase in inorganic and organic nutrients (Fore and Grafe 2002). Acidophilic diatom density is expected to increase with an increase in acidity and are indicators of acid-mine waste. Alkaliphilic diatoms density is expected to increase with an increase in agricultural disturbances since agricultural practices tend to produce alkaline salts and residues (Fore and Grafe 2002). The density of the high oxygen autecology class is indicative of organic matter and decreases in dissolved oxygen concentrations in the stream (Fore and Grafe 2002).

Motile diatom density is expected to increase with an increase in anthropogenic disturbance that increases the siltation of a stream. Diatoms in the genera *Navicula*, *Nitzschia*, and *Surirella* can move upwards through sediment if they are covered by silt (Wehr and Sheath 2003). Because of this ability, the combined relative abundance of these three motile diatom taxa is generally expected to reflect the amount and frequency of siltation at a site (Barbour et al. 1999). Therefore, the percent of motile diatoms is a surrogate siltation index and was calculated from the data for each site as the sum of the relative abundances of the three motile genera. The percent motile diatoms metric is expected to be higher at sites with more silt.

3.5.1.3 Tolerance Metrics

Tolerance values are based on values in Bahls (1993), which incorporated previously published tolerance values (Lange-Bertalot 1979) with changes and additions based on ecological preferences in Lowe (1974). The scale ranges from 1 to 3, where a value of 1 is assigned to the most pollution-tolerant taxa, 2 to less tolerant taxa, and 3 to sensitive taxa. The diatom tolerance values metric calculated the relative abundance of periphyton in each of the three tolerance groups for each site and is especially important in smaller-order streams where primary productivity and periphyton density may be naturally low (Barbour et al. 1999). The Lange-Bertalot Pollution Tolerance Index is the weighted average of the relative abundance of the taxa in each tolerance group. This metric is expected to be lower in degraded streams with fewer sensitive taxa (tolerance value of 3) and more tolerant taxa (tolerance value of 1). The index scores are rated according to Bahls (1993) as No Organic Enrichment (>2.50), Minor Organic Enrichment (2.01 to 2.50), Moderate Organic Enrichment (1.50 to 2.00), and Severe Organic Enrichment (<1.50).

3.6 Water Quality Monitoring

Water quality samples were collected at both biological monitoring sites by Sanford personnel on August 18th and 19th, 2025. Results are included in Appendix C. for reference.

3.7 Data Analyses

Habitat data were summarized, analyzed, and interpreted with regards to possible impacts from Outfall 001. When appropriate, fish, benthic macroinvertebrate, and periphyton community data were referenced with stream habitat and flow data to explain variations in the biotic community. Results from 2025 were compared to those from 2009 through 2024.

A single benthic macroinvertebrate sample was collected from each site in 2025. As statistical analysis cannot be conducted with a single value per site, metric values between the two sites in 2025 were compared qualitatively between the upstream control site, Site GR-A, and the site downstream of Outfall 001, Site GR-B.

Differences between sites over the study period in long-term mean values for macroinvertebrate abundance, total number of taxa, number of EPT taxa, percent sensitive EPT taxa, HBI, and percent intolerant taxa were compared and identified statistically using Analysis of Variance (ANOVA) comparisons. Within each site, these macroinvertebrate metrics were compared from 2009 (or 2010) through 2025 to identify any temporal patterns in the macroinvertebrate community. Linear regression analyses were utilized for this purpose to determine if metric values were increasing, decreasing, or remaining stable over time. If macroinvertebrate data did not meet the assumptions of parametric tests (i.e., normal distribution and equal variance), nonparametric statistical methods were used to analyze the data. The parametric and nonparametric tests produced p-values which were considered significant when compared to an $\alpha = 0.05$ level.

Similarly, periphyton samples consisted of one composite sample at each site, so statistical tests comparing 2025 data among sites are not feasible. Therefore, periphyton metrics calculated in 2025 were compared qualitatively among sites. Within each site, periphyton density and number of taxa metrics were compared from 2009 (or 2010) through 2025 to identify any temporal trends in the periphyton community. Long-term differences in means for periphyton density, number of taxa, and Shannon-Weaver Diversity values were identified statistically between sites using ANOVA comparisons. Linear regression analyses were also conducted for these metrics. The remaining metrics were not analyzed statistically as many were added recently using the revised study plan and long-term datasets are lacking.

4. Results and Discussion

4.1 Habitat Assessment

Low-gradient riffles and step runs were the most common habitat types at both Gold Run Creek sites in 2025 (Table 4-1). Both sites contained scour pool, plunge pool, and/or step pool complex habitat units. In addition, GR-A included a cascade and step run unit, while site GR-B included a run during 2025 surveys.

Table 4-1: Habitat characteristics for sites on Gold Run Creek, August 2025. CAS = cascade; LGR = low gradient riffle; RUN = run; SMB = scour mid channel boulder formed; SPR = plunge pool formed by bedrock; SRN = step run; STP = step pool complex.

Site/Habitat Type	Number of Units	Total Length (m)	Average Water Width (m)	Average Depth (cm)
Site GR-A				
CAS	1	10.9	2.5	19
LGR	3	31.7	3.5	8
SMB	1	3.5	2.7	20
SPR	1	8.1	2.4	62
SRN	3	32.7	1.6	9
STP	1	16.6	2.1	27
Site GR-B				
LGR	2	29.2	3.7	14
RUN	1	15.1	2.6	18
SMB	1	3.3	3.7	17
SRN	2	44.5	3.7	13
STP	1	15.1	2.8	17

Pools found at the study sites in 2025 were formed by bedrock and boulders. Diversity of habitat can increase the suitability of sites for both macroinvertebrates and fish, and pools function as valuable habitat during low flow periods when temperature extremes can occur, such as late summer and winter. Pools also provide shelter from terrestrial predators.

Habitat characteristics varied among the study sites (Table 4-1). The Gold Run Creek sites generally had narrow wetted widths, although widths at the downstream site were greater than at the upstream site. Gold Run Creek is a small first-order stream with a small volume of flow upstream of Outfall 001. Depths were also generally very shallow at both sites on Gold Run Creek, aside from the two relatively deep pools at Site GR-A.

The control site on Gold Run Creek, Site GR-A, flows adjacent to Highway 85. The streambank here is comprised primarily of rock gabions to prevent erosion of the base of the

roadway. The opposite streambank is a steep wall of exposed bedrock. Almost no riparian vegetation exists at Site GR-A. The water at Site GR-A is turbid and rust-colored, and an orange (iron) precipitate is often found on the surface of the substrate throughout the reach (Figure 4-1). This precipitate was again present in 2025, as in almost all other years since 2009. Overhanging vegetation and undercut banks, which can serve as protective fish habitat, are not present at Site GR-A.



Figure 4-1: The top portion of Site GR-A , August 2025.

Site GR-B has more riparian vegetation, particularly in the lower reaches of the site, but exposed rock is abundant. Gabions also border the stream adjacent to the roadway for the upstream half of this site, similar to Site GR-A. Vegetation was primarily grasses, sedges, forbs, and trees at Site GR-B. In contrast to Site GR-A, the water at Site GR-B is less turbid and has no visible precipitate accumulation, and streamflow at this site is much higher than at Site GR-A due to effluent from Outfall 001. The higher flow at Site GR-B results in the wider wetted widths than at the upstream control site.

Coarse sediment, gravel, and boulder/bedrock were the most common substrate type at Site GR-A, while coarse sediment and gravel were abundant at Site GR-B (Table 4-2). The percentages of fine sediment were similar between Site GR-A and Site GR-B. High amounts of surface fines and fine sediments can reduce habitat suitability for spawning trout and fill in interstitial spaces that are utilized by many types of benthic macroinvertebrates, particularly mayfly, stonefly, and caddisfly taxa (Waters 1995). Therefore, a high proportion of surface fines within a given site is typically undesirable. Substrate compositions among both sites showed a diversity of particle sizes.

Table 4-2: Substrate characteristics for sites on Gold Run creek, August 2025. Values are combined results from all habitat types.

Site/Habitat Type	Average Percent Surface Fines	Average Percent Substrate Composition				
		Fine Sediment	Coarse Sediment	Gravel	Rubble	Boulder and Bedrock
Site GR-A	6	7	30	23	17	25
Site GR-B	7	5	37	28	19	12

Year-to-year variation in fine substrate metrics (percent surface fines and fine sediment) in Gold Run Creek is related to variations in the flows of these streams. High spring runoff in 2013 (Figure 4-2) removed small substrates, reducing the amount of surface fines observed during sampling. Moderate spring flows as indicated at the Whitewood Creek flow gage in 2014 and 2015 allowed suspended sediment to settle in the sampling reaches. Spring runoff flows from 2016 through 2018 were substantially less than those observed in 2013 through 2015, reflected in slightly higher values for both surface fines and percentages of fine substrate. Despite higher peak flows in 2022, percentages of surface fines and fine sediments were higher than during the previous two years at both sites. In 2023, multiple rain events led to numerous spikes in stream flow during the summer months and percentages of surface fines and fine sediments were lower at both sites than during the previous year. In 2025, consistent baseflows appear to have maintained a low percentage of surface fines at both Gold Run Creek sites. Percentages in 2025 were comparable to percentages observed in 2024, 2023, and 2021.

Stream flow in 2025 was generally low, though several flow spikes occurred during the summer rains. Small increases in flow (approximately 17.7 cfs to 21.2 cfs) were observed just prior to the August 18, 2025, sampling event. Notably, stream flow remained relatively stable both in the month leading up to and following the sampling, with no substantial changes during this period. Physical indicators of a recent high flow event were evident in the channel at both sites, particularly at Site GR-B (Figure 4-3). This high flow event, in addition to the flow contributed by Outfall 001, was a likely cause of the low percentages of surface fines and fine sediment at Site GR-B in 2025. The high flow event also appears to have reduced the percentage of fine sediments at Site GR-A, upstream of the outfall.

Year to year variations in fine sediment percentages may be influenced by inputs from the roadway adjacent to Gold Run Creek as well as the flow regime during a given year. Site GR-A has much lower discharge than Site GR-B. Due to the much lower discharge at Site GR-A for much of the year, a higher proportion of surface fines and fine sediments are often found at Site GR-A.

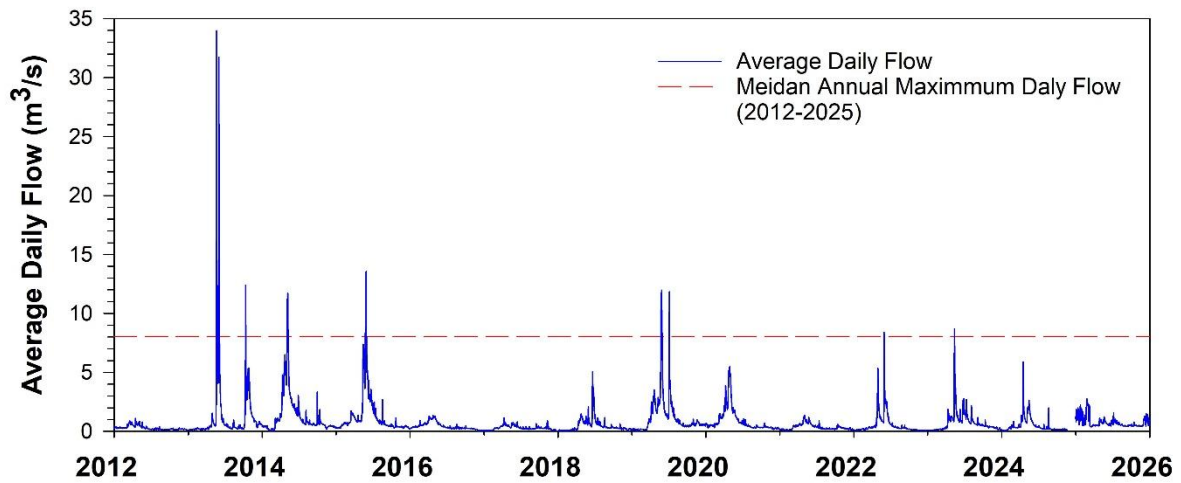


Figure 4-2: Average daily flow (in m³/s) on Whitewood Creek from January 2012 through December 2025 (USGS 2025). Data are from USGS Gage 06436180 upstream of Whitewood, South Dakota. Median annual maximum flow from 2012 through 2025 is also presented for comparison.



Figure 4-3: Evidence of a recent high flow event on Gold Run Creek as shown at the downstream portion of Site GR-B on August 19, 2025. Vegetation along the banks was submerged above the bankfull width just prior to sampling.

Overall, the habitat at sites on Gold Run Creek is not very suitable for abundant and varied macroinvertebrate populations and fish habitat. The low flows and abundance of bedrock, are particularly limiting to aquatic communities at Site GR-A. Site GR-B has higher flows and

more substrate diversity than Site GR-A. Despite improved habitat at Site GR-B, this site remains inaccessible to fish from downstream due to the low flow barrier where the stream passes under the roadway. The general habitat features at each site on Gold Run Creek have been mostly consistent over time since monitoring began and do not indicate negative impacts due to Outfall 001.

4.2 Benthic Macroinvertebrate Populations

4.2.1 Community Composition and Abundance

4.2.1.1 2025 Data

In 2025, both sites supported macroinvertebrate communities that included springtails (Collembola), mayflies, beetles (Coleoptera), caddisflies, true flies (Diptera), segmented worms, and snails (Gastropoda; Table 4-3 and Appendix A). Site GR-A also contained water mites (Hydracarina), and Site GR-B also contained damselflies (Odonata) and moths (Lepidoptera).

Table 4-3: Benthic macroinvertebrate abundances on Gold Run Creek from August 2025.

TAXA	Site GR-A	Site GR-B
INSECTA		
Collembola (Springtails)	1	1
Ephemeroptera (Mayflies)	324	86
Odonata (Dragonflies & Damselflies)	--	3
Coleoptera (Beetles)	8	2
Lepidoptera (Moths)	--	3
Trichoptera (Caddisflies)	3	29
Diptera (True flies)	57	68
HYDRACARINA (Water mites)	1	--
ANNELIDA		
Oligochaeta (Segmented worms)	23	19
MOLLUSCA		
Gastropoda (Snails)	1	2

Site GR-A in 2025 was dominated by mayflies, which represented 78 percent of the total density at this site, resulting in an unbalanced macroinvertebrate community (Table 4-3 and Appendix A). The moderately tolerant and cosmopolitan mayfly species, *Baetis tricaudatus* cx., was the most abundant species, comprising 70 percent of the total abundance (Appendix A). The other two mayfly species present were also baetid mayflies. Despite lower abundances, the remaining species at Site GR-A showed even distribution across multiple taxa.

Site GR-B exhibited low overall macroinvertebrate abundance across all taxonomic groups. Mayflies were the dominant taxon, with true flies representing the second most abundant

group. The proportion of species in each taxonomic group was slightly higher at Site GR-B than at Site GR-A; however, the pattern of *B. tricaudatus* dominance was similar at both sites (Appendix A). However, some groups present at both sites, such as springtails and beetles, were represented by only a few individuals (Table 4-3).

Richness Metrics

4.2.1.2 2025 Data

Richness metrics indicated limited taxa richness at both sites, with some differences between sites GR-A and GR-B. Density was higher at Site GR-A, but the number of taxa and number of EPT taxa, were at least slightly greater at Site GR-B (Table 4-4). A key difference in species richness at the two sites was in the Trichoptera assemblage: Site GR-B supported five caddisfly taxa, while Site GR-A had only three Trichoptera taxa at very low abundances. No plecopteran taxa were collected at either site in 2025 (Table 4-4).

Table 4-4: Benthic macroinvertebrate summary metrics on Gold Run Creek from August 2025.

METRIC	Site GR-A	Site GR-B
RICHNESS METRICS		
Density (per sample)	418	213
Number of Taxa	25	29
Number of EPT Taxa	6	7
Number of Plecoptera Taxa	0	0
COMPOSITION METRICS		
Percent Sensitive EPT Taxa	12.0	10.3
Percent Dominant Taxon	69.6	39.4
Percent of non-Baetis Ephemeroptera	0	0
Percent of Oligochaeta and Hirudinea	5.50	8.92
TOLERANCE METRICS		
Hilsenhoff Biotic Index	5.39	5.85
Percent Intolerant Taxa	16.0	20.7
Number of Intolerant Taxa	4	6
TROPHIC HABIT METRICS		
Number of Shredder Taxa	5	5
Percent Collector-Gatherers	87.3	65.3
VOLTINISM METRICS		
Number of Semivoltine Taxa	1	2
Percent Semivoltine Taxa	4.0	6.9
Number of Univoltine Taxa	6	11

Long-Term Data

Both sites on Gold Run Creek showed improved benthic macroinvertebrate communities based on some richness metrics in 2025 compared to the previous year, although this was

more apparent at the downstream site. The high flow scouring event discussed in Section 4.1 appeared to have positively influenced substrate conditions at both sites in 2025, creating more favorable habitat for macroinvertebrate colonization. Density at Site GR-A in 2025 was above the long-term average for the site, as were the numbers of total taxa and EPT taxa. At Site GR-B in 2025, density remained well below the long-term average, though it represented a substantial recovery from the exceptionally low 2024 value of 89 organisms/sample. The number of total taxa and EPT taxa in 2025 at least slightly exceeded the long-term average. Despite the improvement from 2024, density at Site GR-B in 2025 remained among the lower values observed over the study period (Figure 4-4; Appendix D).

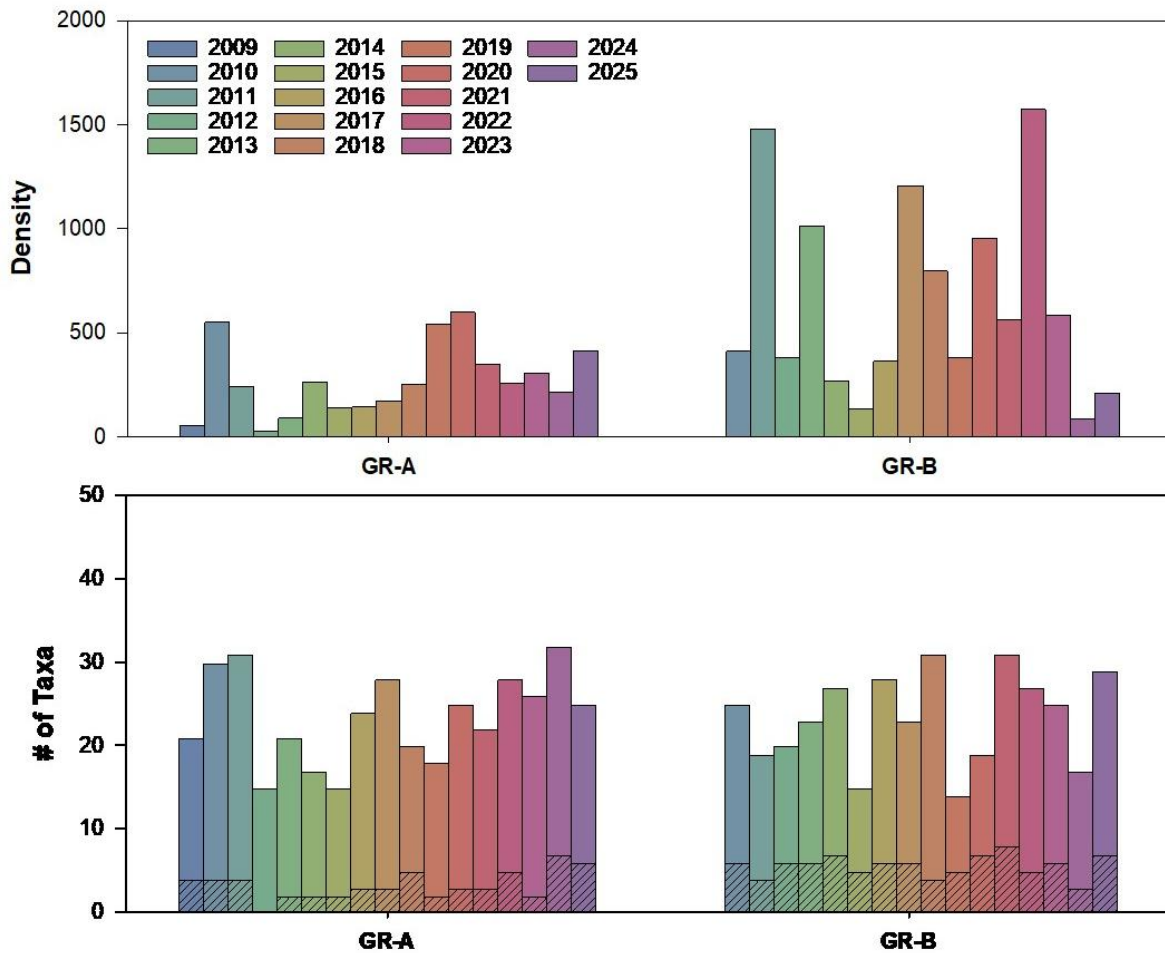


Figure 4-4: Total macroinvertebrate density and number of taxa and EPT taxa from Gold Run Creek, 2009 through 2025. Site GR-B was not sampled in 2009.

ANOVA analyses indicate that density and number of EPT taxa have been significantly greater at Site GR-B than Site GR-A over the study period ($p < 0.05$ for both). No significant differences in mean number of taxa over time was observed. Linear regression analyses indicated that density and total taxa have been stable over time at both sites, with no significant

increase or decrease in trends ($p > 0.05$). EPT taxa showed a slight increasing trend at Site GR-A ($p < 0.05$) but remained stable at Site GR-B ($p > 0.05$).

Stoneflies have been rare or absent at both Gold Run Creek sites during many years of sampling, including in 2025 when no stonefly taxa were collected at either site. Stonefly taxa have been absent from Site GR-A in 13 of the 17 years sampled and absent from Site GR-B in 11 of the 16 years sampled. Inadequate flow appears to be the most important limiting factor in Gold Run Creek for this group (and for other groups reflected in other metrics). Other limiting factors to stoneflies in some years may also include occasional high temperatures, nutrient enrichment, or some other regional water quality constituent.

Over time, the effluent from Outfall 001 appears to be improving the conditions in Gold Run Creek below the outfall, likely due to the increased flows. While density remained lower at Site GR-B compared to Site GR-A in 2025, both total taxa and EPT taxa richness was higher at Site GR-B than at Site GR-A. The data on density, number of taxa, and number of EPT taxa indicate overall conditions since 2009 have been stable at both sites on Gold Run Creek.

4.2.2 Composition Metrics

4.2.2.1 2025 Data

Percent sensitive EPT taxa values were similar at both Gold Run Creek sites in 2025 (Table 4-4 and Figure 4-5), but Site GR-A had a marginally higher value than Site GR-B. Sensitive EPT species were present at both sites, with higher numerical abundance at Site GR-A despite lower taxonomic diversity (Appendix A).

The percentage of individuals belonging to the dominant taxon (*Baetis tricaudatus* at both sites) was markedly higher at Site GR-A (69.6%) than at Site GR-B (39.4%), resulting in a less bl. This indicates a higher level of environmental disturbance or a less favorable environment for other taxa at Site GR-A. However, neither site supported mayfly taxa that were not in the *Baetis* genus. EPT taxa comprised similar proportions of the total taxa present at Site GR-B and Site GR-A, but the relative abundance of EPT organisms was greater at Site GR-A.

The percent of Oligochaeta and Hirudinea (leeches) metric was relatively low and similar at both Gold Run Creek sites in 2025. Site GR-A had three oligochaete taxa that comprised 5.5 percent of the total density at the site, while Site GR-B had four oligochaete taxa that comprised 8.9 percent of the total density. No leeches were collected at the Gold Run Creek sites in 2025.

4.2.2.2 Long-Term Data

Values for the percent sensitive EPT taxa metric have been variable at both sites on Gold Run Creek, ranging from 0 to 15 percent at Site GR-A and from 7 to 26 percent at Site GR-B (Figure 4-5; Appendix D). The percent sensitive EPT taxa metric value at Site GR-A has been lower in most years when compared to Site GR-B, and values for this metric have been

5 percent or less in seven of the 17 years sampled (Appendix D). Fluctuation in the percent sensitive EPT taxa metric at the study sites appears to be related to natural variations in flows, water quality conditions, and sediment input. The additional flow present at Site GR-B likely mutes some of this natural variation at the downstream site.

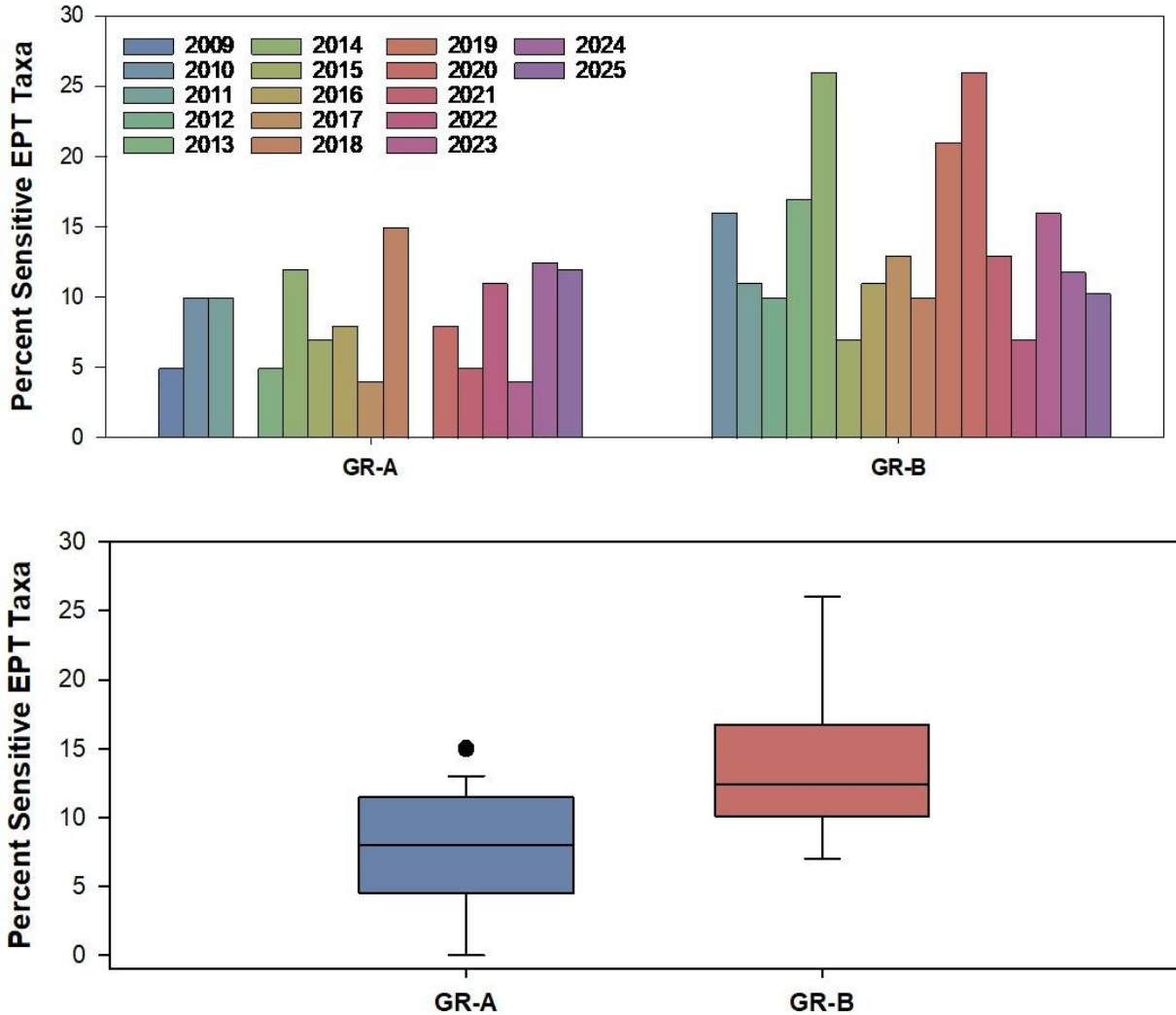


Figure 4-5: Percent sensitive EPT taxa from Gold Run Creek, 2009 through 2025. Site GR-B was not sampled in 2009.

The percentage of sensitive EPT taxa has been significantly greater at Site GR-B than Site GR-A over the study period ($p < 0.05$), indicating that conditions at Site GR-B have been more favorable than those at Site GR-A since 2010. There were no significant increasing or decreasing trends for percent sensitive EPT taxa over the study period within both Gold Run Creek sites ($p > 0.05$), indicating percentages have been stable at both sites since the beginning of the study. As stated earlier, there is a statistically significant increasing trend in number of EPT taxa at Site GR-A over time ($p < 0.05$), although these metrics show high year-to-year variation.

4.2.3 Tolerance Metrics

4.2.3.1 2025 Data

The HBI scores in 2025 on both Gold Run Creek sites were similar, with Site GR-A categorized as "Good" and Site GR-B categorized as "Fair" (Table 4-4). The slightly higher (i.e., less favorable) HBI score at Site GR-B illustrates that the benthic macroinvertebrate community was comprised of slightly more tolerant benthic macroinvertebrates than Site GR-A in 2025. High relative abundance of moderately tolerant mayfly species and true fly species, in addition to moderately high relative abundances of segmented worms, at both sites increased both HBI scores in 2025. Site GR-A had a lower number and percentage of intolerant taxa compared to Site GR-B. The tolerance metrics indicated that some sensitive taxa were present at both sites in 2025. While HBI scores were slightly more favorable at Site GR-A, taxonomic richness of sensitive taxa was greater at Site GR-B.

4.2.3.2 Long-Term Data

HBI ratings have been variable at both sites on Gold Run Creek over the study period, ranging from 5.08 to 8.03 at Site GR-A and from 4.87 to 6.35 at Site GR-B (Appendix D). Both sites were rated as "Good" in 2013, 2016, and 2019, as was Site GR-B from 2021 through 2023 and Site GR-A in 2015, 2020, and 2025. Site GR-B was mostly rated as "Fair" in the remaining years, including 2025. Values at Site GR-A have been more variable in the other years, having ratings of "Poor," "Fairly Poor," and "Fair." HBI scores were less favorable in some years at Site GR-A due to a relatively high proportion of tolerant or moderately tolerant species, such as *B. tricaudatus* cx. ANOVA analysis of HBI scores indicated no significant differences were apparent between the Gold Run Creek sites over time ($p > 0.05$), and regression analyses indicate no significant trends for HBI scores at either site over the study period ($p > 0.05$). These data suggest conditions for less tolerant taxa have been comparable and stable at both sites and have not significantly changed with time at either site.

The percent intolerant taxa metric has also varied over the study period, although more variability has been observed at the upstream control site. Values for this metric at Site GR-A ranged from 0 to 36 percent in 2012 and 2022, respectively, while values at Site GR-B ranged from 20 to 37 percent in 2015 and 2020, respectively. Mean percent intolerant taxa values were significantly higher at Site GR-B compared to Site GR-A over the study period ($p < 0.05$). While values for both sites for this metric have generally increased over time, this increase was not statistically significant.

4.2.4 Trophic Habit Metrics

4.2.4.1 2025 Data

The number of shredder taxa at Site GR-A was the same as Site GR-B in 2025 (Table 4-4). Factors such as riparian trees and shrubs can influence the availability of leaf and woody

material utilized by shredders. Vegetated riparian areas along Gold Run Creek are limited, particularly at Site GR-A, which has a steep bedrock hillside on one bank and rock gabions along the other bank. More vegetation is found in the vicinity of Site GR-B than at Site GR-A; however, this was not reflected in the number of shredder taxa present.

Larger values for the percent collector-gatherer metric can indicate disturbance, and both sites contained relatively high percentages of collector-gatherers, with values of 87.3 percent and 65.3 percent at sites GR-A and GR-B, respectively (Table 4-4). Both values increased from 2024 values at Site GR-B, and the number of shredder taxa also increased between these years at Site GR-A, while the percentage of collector-gatherers was similar at this site in both years.

4.2.5 Voltinism Metrics

4.2.5.1 2025 Data

Semivoltine taxa require more than one year to complete a generation, and short-term disruptions in aquatic conditions, either chemical or physical, can reduce the number of taxa with this life history trait. Therefore, as anthropogenic stressors increase, taxa with shorter life histories, capable of producing one generation (univoltine) or multiple generations in a year (multivoltine) are favored.

Site GR-A and GR-B in 2025 contained one and two semivoltine taxa, respectively, representing about 4 and 7 percent of total abundance at each site (Table 4-4). Univoltine taxa were substantially more common at both sites than semivoltine indicating conditions in Gold Run Creek favored invertebrates with shorter life cycles in 2025. Although no substantial flow events occurred in 2025, higher flows did occur prior to sampling in August 2025 and may have influenced the assemblages at both sites. The number of semi-voltine taxa in 2025 decreased from the number present in 2024 at Site GR-A but was the same in the two years at Site GR-B (Appendix D). Values for the percent semi-voltine taxa decreased at both sites between the two years.

Even with the scouring event in 2025, some of the data from Gold Run Creek in 2024 and data over the entire study period suggest that the added water from Outfall 001 benefits the benthic macroinvertebrate community at Site GR-B, likely by improving water quality and increasing water volume. Inflows from Outfall 001 provide more physical habitat for benthic macroinvertebrate colonization, sustain streamflow during dry periods, and increase dissolved oxygen, all of which would favorably impact the benthic macroinvertebrate community. In contrast, Site GR-A often has very little flowing water, and substrate is covered with an orange (iron) precipitate (Figure 4-6). Long-term benthic macroinvertebrate metrics at both Gold Run Creek sites continue to show that a more limited community is present upstream of Outfall 001 on Gold Run Creek, while healthier communities are found at Site GR-B.



Figure 4-6: Photos of conditions during sampling at sites GR-A (left) and GR-B (right) on Gold Run Creek, August 2025.

4.3 Periphyton Populations

4.3.1 Community Composition and Density

4.3.1.1 2025 Data

Pennate diatoms were the only taxonomic group found at both Gold Run Creek sites in 2025 (Table 4-5). The species *Achnanthes minutissima* was the most abundant species at Site GR-A and Site GR-B (Appendix B). Relative abundance of *A. minutissima* greater than 25 percent can suggest recent disturbances in the form of scouring events or exposure to toxic pollution, with severity of disturbance proportional to higher abundances, and as well as the time elapsed since these events (Barbour et al. 1999). This species comprised 83.6 percent of the density at Site GR-A and 69.9 percent of the density at Site GR-B in 2025 (Appendix B). As discussed in Section 4.1 there was evidence of a high flow event at both sites on Gold Run Creek just prior to sampling on August 18, 2025, most notable at Site GR-B, which likely caused scouring in the channel at this site. This species is often the first to become established at a scoured site, sometimes to the exclusion of all other algae as seen in 2024, which helps explain its high percentage and abundance. (Barbour et al. 1999).

4.3.2 Richness Metrics

4.3.2.1 2025 Data

The density of algal cells in 2025 was greater at Site GR-B than at Site GR-A (6,889 versus 2,383 cells/mm², respectively, Table 4-5, Figure 4-7). However, Site GR-A and Site GR-B had the same number of taxa, number of diatom taxa, and number of divisions in 2025. The number of genera present was also similar at the two sites, with seven genera present at Site

GR-A and six at Site GR-B. This relatively low richness across sites indicates limiting conditions for algae establishment on both sides of the outfall.

4.3.2.2 Long-Term Data

Periphyton density at Site GR-A exhibited considerable variability throughout the sampling period (2009–2025), with values ranging from 0 cells/cm² in 2019 to a maximum of 1,807,889 cells/cm² in 2017. During the early sampling years (2009–2014), total diatom densities remained relatively low, except for a notable spike in 2010 (164,400 cells/cm²), before subsiding to baseline levels. Low densities in some other years appeared to be related to the thick mats of filamentous algae that are periodically observed that may have limited the ability of diatoms to establish. The density at Site GR-A in 2025 was substantially lower than the long-term average (2009 to 2025) but was within the range of values observed in previous years and has increased since 2024 (Figure 4-7).

The density at Site GR-B in 2025 was considerably lower than the long-term average but has generally recovered from the lowest recorded density of 46 in 2024. The taxa and diatom taxa have increased substantially at Site GR-B in 2025 since 2024, and its values are now more similar to, but still below, the long-term average of 13 taxa. The taxa and diatom taxa decreased at Site GR-A in 2025 since 2024; however, both metrics remain greater than the long-term average over the monitoring period (Appendix E). Site GR-A has contained the same or fewer taxa and diatom taxa than Site GR-B in all years except 2021 and 2024. Site GR-A typically has fewer algal taxa than Site GR-B because it generally has lower flows, higher percentages of fine sediment, and an orange-colored precipitate that covers the substrate and settles into interstitial spaces. This poor habitat impacts both the periphyton and benthic macroinvertebrate communities (See 4.1 Habitat Assessment).

Numbers of taxa supported at both sites have generally shown less annual variability than densities within each site over the monitoring period. The mean number of taxa was significantly greater at Site GR-B compared to Site GR-A ($p < 0.05$). No long-term increasing or decreasing trends for mean number of taxa was observed over time ($p > 0.05$ for both sites).

Table 4-5: Periphyton density and community metrics for both sites on Gold Run Creek, August 2025.

Taxa	Site GR-A	Site GR-B
BACILLARIOPHYTA		
Pennales (Pennate diatoms; cells/cm ²)	2,383	6,889
Summary		
RICHNESS METRICS		
Total Density (cells/cm ²)	2,383	6,889
Number of Taxa	9	9
Number of Diatom Taxa	9	9
Number of Divisions	1	1
Number of Genera	7	6
COMPOSITION METRICS		
Shannon-Weaver Diatom Diversity (H')	1.10	1.62
Autotrophic Index	7,117	689
Autecological Classes of Diatoms*(percent of diatom density)		
Eutrophic	2.5	24.7
Acidophilic	0	0
Alkaliphilic	2.5	24.7
Nitrogen Heterotrophs	0	3.2
High Oxygen	83.6	71
Motile	8.9	6.4
Saprobic	0	3.2
TOLERANCE METRICS		
Diatom Tolerance Values (percent of diatom density)		
(1) Tolerant	0	3.2
(2) Less Tolerant	3.8	4.3
(3) Sensitive	96.2	92.5
Lange-Bertalot Pollution Tolerance Index	2.96	2.89
Ash-Free Dry Weight (mg/m ²)	2,135	1,102
Chlorophyll a (mg/m ²)	0.3	1.6

* = Some taxa are categorized into multiple autecological classes; displayed as percent of total density.

The periphyton communities collected by KNK in 1998 through 2000 were comparable to the periphyton communities observed in 2010 through 2025 by GEI (Knudson 2001, GEI 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025). Species varied between KNK and GEI samples, but the genera collected from 1998 through 2000 were similar to the genera observed from 2010 through 2025.

4.3.3 Composition Metrics

4.3.3.1 2025 Data

At Site GR-A in 2025, the Shannon-Weaver Diversity was 1.10. The relatively low diversity was likely due to the numerical dominance of *Achnanthes minutissima* despite the fact that the remaining individuals were evenly distributed across taxa. At Site GR-B, Shannon-Weaver Diversity was higher than at GR-A, with a value of 1.62.

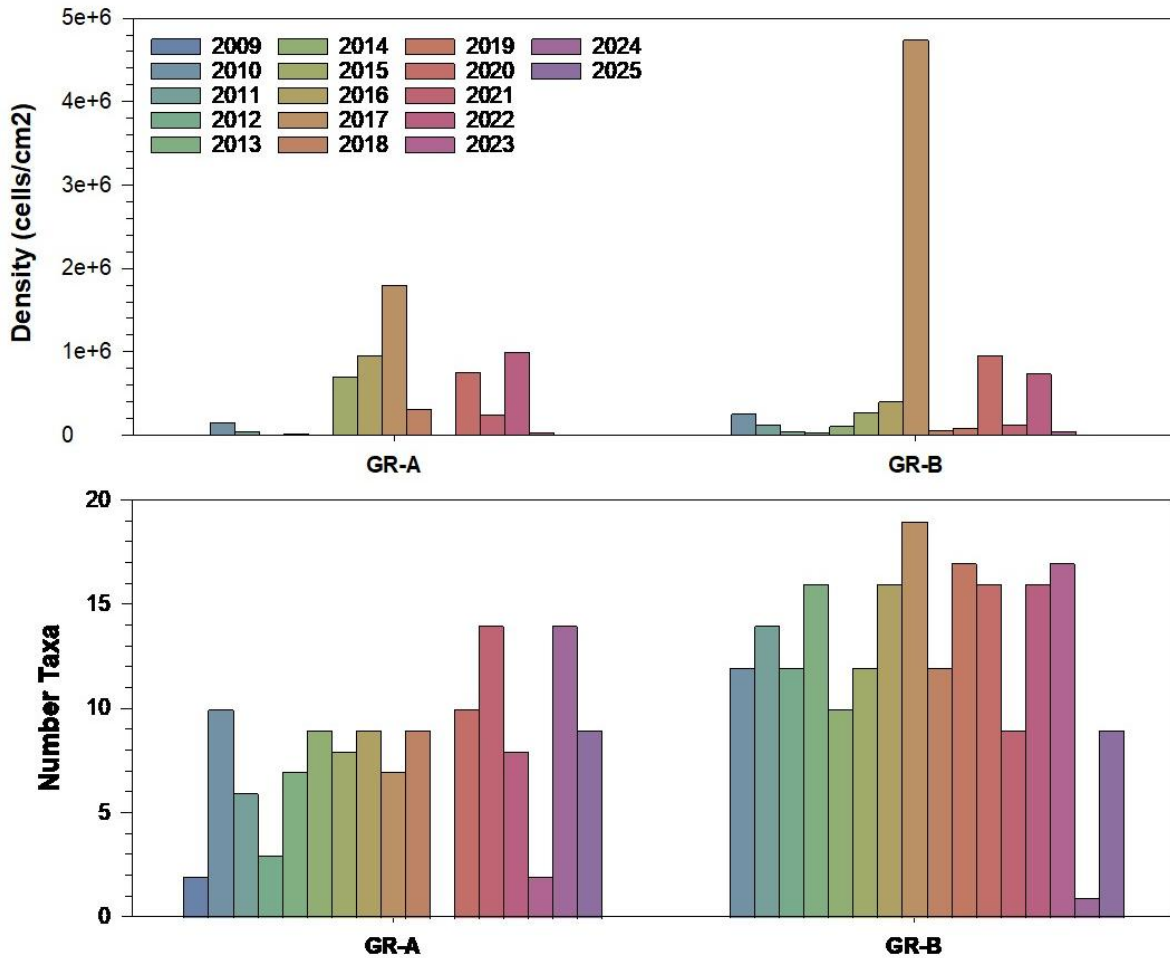


Figure 4-7: Total periphyton density (cells/cm²) and number of taxa from all sites on Gold Run Creek, 2009 through 2025. N=not sampled. += Periphyton present at low density. *= No periphyton cells found in sample.

Autotrophic Index (AI) values were 7,117 at Site GR-A and 689 at Site GR-B in 2025 (Table 4-5). Communities less disturbed by organic pollution usually contain AI values ranging from 50 to 100, and values greater than 400 indicate communities affected by organic pollution. In 2025, the high AI value at Site GR-A may have been more related to the very low amount of chlorophyll- α at both sites rather than organic enrichment. It is likely the metric was affected by the low periphyton abundance and relatively high AFDW at Site GR-

A, while Site GR-B's lower score reflected a higher AFDW value and a higher concentration of chlorophyll- α . Considering that both scores are above 400, both communities appear to be affected by organic pollution in 2025. Notably, energy budgets in small stream vary considerably throughout a year, and thus Autotrophic Index values may not be the best metric for characterizing stream health in Gold Run Creek.

The most abundant autecological group collected from Site GR-A in 2025 was high oxygen diatoms, followed by motile diatoms (table 4-5). Of note, some taxa are categorized in multiple autoecological classes. Despite motile diatoms comprising the second highest percentage of abundance, there was a large disparity between the two groups — 9 percent versus 83 percent. A small percentage of eutrophic and alkaliphilic diatoms were also present while heterotrophic, saprobic, and acidiphilic diatoms were absent from the site (Table 4-5).

Trophic habitat density metrics at Site GR-B were more evenly distributed; although like Site GR-A, the most abundant autecological group collected was high oxygen diatoms, followed by alkaliphilic and eutrophic diatoms. Notably, acidiphilic diatoms were the only group absent from the Site GR-B (Table 4-5). These abundances at both sites indicate high concentrations of dissolved oxygen in Gold Run Creek. The presence of a relatively abundant eutrophic and alkaliphilic diatoms combined with less abundant nitrogen heterotrophs indicate that organic or inorganic nutrient inputs and/or the presence of alkaline salts from agricultural disturbance were present at Site GR-A and Site GR-B in 2025.

Motile diatoms were present at Site GR-A and GR-B. The presence of motile diatoms at both sites could indicate periodic sedimentation occurs on Gold Run Creek, although their presence is also influenced by other factors. Acidiphilic diatoms were absent at both Gold Run Creek sites in 2025 (Table 4-5), suggesting a lack of impacts from acid mine drainage.

4.3.3.2 Long-Term Data

Shannon-Weaver Diversity Index values have generally been low and frequently very low at Site GR-A (Appendix E), with values less than 1.00 in 11 of the 17 years of sampling. From 2009 to 2025, the maximum diversity value observed was 3.08 in 2024. The value in 2025 was 1.10; this value is lower than the 2024 value, but still higher than all other years. The low Shannon-Weaver Diversity scores observed at Site GR-A over time occur because the algal community is typically dominated by one or two taxa.

Diversity values at Site GR-B have typically varied less, ranging from 0.92 in 2014 to 3.40 in 2019 during the 2009 through 2023 sampling period. However, in 2024, the algal community was dominated by a single species, and the Shannon-Weaver Diversity score was zero. In almost all other years, values at Site GR-B were consistently greater than 1.00 and often greater than 2.00. Over time, the mean diversity value at Site GR-B was significantly greater than at Site GR-A ($p < 0.05$). No significant long-term increasing or decreasing trends were observed.

Interpretation of algal autecology over time is difficult for Gold Run Creek because densities are often low. Regardless, over the period of study, there have been indications of organic pollution at both sites on Gold Run Creek. Runoff from lawns in residential developments or along roadways may be affecting these sites in some years.

4.3.4 Tolerance Metrics

4.3.4.1 2025 Data

There were no tolerant diatoms at Site GR-A, while tolerant diatoms comprised 3.2 percent of the assemblage at Site GR-B in 2025 (Table 4-5). Sensitive diatoms comprised 96 and 93 percent of the density at sites GR-A and GR-B, respectively, in 2025, with less tolerant diatoms comprising the remainder of the population. The Lange-Bertalot pollution tolerance index values were greater than 2.50 at both sites, indicating an absence of organic enrichment. These values contradict the AI values discussed above, further suggesting that the AI values were unduly influenced by the low densities and low chlorophyll- α values in 2025.

4.3.4.2 Long-Term Data

Over the study period, algal community sensitivity metrics have been affected by high percentages of *A. minutissima* in Gold Run Creek. In 2025, this species accounted for 83.6 percent and 69.9 percent of the density at sites GR-A and GR-B, respectively (Appendix E). This dominance of the community by a small number of diatom taxa results in lower richness, diversity, and percent tolerant and motile diatom values in 2025 and other years. However, since *A. minutissima* is classified as a sensitive species, this skews some of the autecological and tolerance metrics to indicate a healthy community when diversity values often suggest otherwise. Additionally, as with the composition metrics, periodic high flows prior to sampling (including in 2025) reduced algal densities at both sites, thereby limiting the extent to which tolerance metrics can be interpreted.

5. Conclusions

Two sites on Gold Run Creek were sampled in August 2025 to continue monitoring activities upstream and downstream of SURF's permitted Outfall 001. Habitat surveys were conducted and fish, benthic macroinvertebrate, and periphyton population sampling was performed at both Gold Run Creek sites. The 2025 sampling event was the seventeenth consecutive year of sampling conducted since 2009 at Site GR-A, and the sixteenth consecutive year of sampling at Site GR-B since 2010.

5.1 Habitat

Gold Run Creek at Site GR-A contains very low base flows when there is no recent precipitation or surface water runoff, and the water in this site is turbid and rusty colored. Overhanging vegetation, which can function as fish habitat, is not found at Site GR-A, and depths are generally shallow. The riparian area at this site is mostly comprised of bedrock and rock gabions, and habitat is significantly influenced by the roadway adjacent to the stream. An orange precipitate is often found on the surface of rocks at Site GR-A and was present in 2025. In 2025, most of the habitat at Site GR-A consisted primarily of step runs and low gradient riffles, with smaller amounts of cascade and pool habitat. Coarse sediment was the dominant substrate type observed, and percent surface fines were low, averaging 6 percent site-wide.

Site GR-B contains much greater flows than the upstream site due to inflows from Outfall 001. Riparian vegetation is also more abundant, particularly in the lower sections of the site, although exposed rock is also common. A small amount of overhanging vegetation is present along the site. In contrast to Site GR-A, the water at Site GR-B is much less turbid and has no orange coloration. Step runs and low gradient riffles formed a large proportion of the habitat at Site GR-B in 2025, with a single run and multiple pools also observed. Course sediment was also the most abundant substrate size present in the reach surveyed for Site GR-B, and average percent fine sediment was low at 7 percent. In 2021, scour and bank erosion from an August high flow event that year was evident; some areas of exposed banks due to this storm event remained evident in the years following. Similarly, there was a high flow event in 2025 that caused scouring and exposed banks on Gold Run Creek and was most notable at Site GR-B.

The suitability of Gold Run Creek to support aquatic communities is limited due to its low widths and depths, as well as the culvert that is located upstream of its confluence with Whitewood Creek. This culvert is likely too shallow to be passable to fish, and Gold Run Creek remains inaccessible to the fish populations in Whitewood Creek.

5.2 Fish Populations

No fish have been collected in Gold Run Creek over the study period, including in 2025. Upstream of Outfall 001 the stream has very low flows and poor water quality and cannot support fish. Downstream of Outfall 001, the stream is larger with higher flow, but fish are not present. The section of stream below Outfall 001 at Site GR-B is likely too short to support a self-sustaining fish population, and a culvert that runs under the road near the mouth of Gold Run Creek acts as a barrier to migration and prevents colonization of fish into this reach from Whitewood Creek.

5.3 Benthic Macroinvertebrate Populations

In 2025, both sites on Gold Run Creek supported diverse but relatively low-abundance benthic macroinvertebrate communities. Consistent with 2024 trends, macroinvertebrate abundance was greater at Site GR-A than Site GR-B; however, some metrics suggested a more diverse and sensitive macroinvertebrate community at the downstream site. Although density at Site GR-B was below average, the site had a slightly higher number of taxa and EPT taxa collected compared to Site GR-B. Composition metrics, along with most tolerance and voltinism metrics, scored similarly between the two sites or more favorably at Site GR-B.

Site GR-A has limited flows and less favorable aquatic habitat compared to Site GR-B. Consistently higher community metrics during most years at Site GR-B downstream of Outfall 001 indicate that Outfall 001 benefits the benthic macroinvertebrate community downstream by increasing flows, expanding aquatic habitat, and improving water quality. Mean density, number of EPT taxa, percentage of sensitive EPT taxa, and percent intolerant taxa values over the study period were significantly higher at Site GR-B compared to GR-A. The larger volume of water at Site GR-B from Outfall 001 is likely the main reason for better community metrics at Site GR-B compared to Site GR-A. Dilution from Outfall 001 also improves water quality in Gold Run Creek through reduction of turbidity and the concentration of metals, particularly iron. With higher density observed at Site GR-A in 2025 compared to 2024, the macroinvertebrate population at this site appears to have recovered following the large scouring event in 2024. At Site GR-B, density has increased but remains below long-term averages, suggesting the population is still in a recovery period. Nevertheless, the number of EPT taxa at this site rebounded from 2024 to 2025 to a value slightly above the long-term mean value, indicating that the community remains resilient. Overall, most macroinvertebrate metrics at both Gold Run Creek Sites in 2025 remained consistent with long-term averages, and the only increasing or decreasing trends observed over the period of study was in increasing trend over time at Site GR-B in the number of EPT taxa.

5.4 Periphyton Populations

Both sites on Gold Run Creek supported limited periphyton communities in 2025, although there was a considerable increase in density since 2024. Additionally, each site contained nine unique taxa, although the taxa could at Site GR-B, while increased from 2024, remained below the long-term average. Values for the Lange-Bertalot Pollution Tolerance Index were favorable at both sites in 2025.

High percentages of *A. minutissima* continued to dominate the periphyton assemblages at both sites in 2025, comprising 83.6 percent of density at Site GR-A and 69.9 percent at Site GR-B. This is consistent with patterns observed in many prior years of study, where metrics are heavily influenced by the presence of this single species. While *A. minutissima* is classified as a sensitive species, indicating suitable habitat conditions including adequate dissolved oxygen, its strong dominance at both sites results in unbalanced communities. The 2025 assemblage at Site GR-A was more strongly dominated by *A. minutissima* than in 2024, when the species comprised 28 percent of the density. At Site GR-B, dominance was somewhat lower than at Site GR-A, though still substantial.

Frequent dominance of algal communities by *A. minutissima* at both sites likely occurs because this species is one of the first to colonize new substrates and can quickly recover from disturbances. Its dominance can also be attributed to seasonality, with peak abundance occurring at specific times of the year, which may further influence community composition at the time of sampling.

Low flow, turbid water, and poor water quality are especially limiting to the periphyton community at Site GR-A. Past data indicate Outfall 001 has a positive effect on the periphyton communities downstream. The long-term data indicate that Site GR-B has maintained a more robust periphyton community over time than at Site GR-A. Despite low densities observed at each Gold Creek Site, the algal community appears to have recovered somewhat since scouring flows in 2024.

5.5 Overall

Fish were absent from both sites on Gold Run Creek in 2025, as has been observed throughout the study period. The benthic macroinvertebrate community has since recovered from a high flow event in 2024, which caused disturbances to the aquatic communities at both sites on Gold Run Creek. However, low algal densities at both sites suggest that the periphyton community may still be in a period of recovery. While the communities at Site GR-B were more affected than at Site GR-A, communities are expected to rebound over time, and many of the macroinvertebrate metric values remained favorable at the downstream site compared to the upstream site.

Site GR-B is directly downstream of Outfall 001 and has historically supported more robust macroinvertebrate and periphyton communities relative to Site GR-A. Long-term data

analysis does not indicate any unfavorable temporal trends in the benthic macroinvertebrate or periphyton population metrics at either site. Low-flow, poor water quality, and less suitable habitat conditions limit aquatic life at Site GR-A, upstream of Outfall 001. Data collected over the study period indicate that the continuous discharge of water from Outfall 001 benefits macroinvertebrate and periphyton communities at Site GR-B when compared to communities at Site GR-A.

6. References

- Bahls, L. L. 1993. Periphyton Bioassessment Methods for Montana Streams. Water Quality Bureau, Montana Department of Health and Environmental Sciences, Helena, MT.
- Barbour, M. T., J. Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Invertebrates and Fish, 2nd Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency, Washington, DC.
- Fore, L. and C. Grafe. 2002. Using diatoms to assess the biological condition of large rivers in Idaho (U.S.A.). *Freshwater Biology* 47:2015-2037.
- GEI Consultants, Inc. (GEI). 2009. Study Plan for Aquatic Biological Monitoring of Gold Run and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2010. Aquatic Biological Monitoring of Gold Run and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2011. Aquatic Biological Monitoring of Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2012. Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2013a. Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2013b. Aquatic Biological Monitoring Report for Whitewood Creek, South Dakota, 2012. Report prepared for Homestake Mining Company, Lead, SD.
- GEI Consultants, Inc. (GEI). 2014. Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.
- GEI Consultants, Inc. (GEI). 2015. Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2016. Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2017. 2016 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2018. 2017 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2019. 2018 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2020. 2019 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2021. 2020 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2022. 2021 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2023. 2022 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2024. 2023 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

GEI Consultants, Inc. (GEI). 2025. 2024 Aquatic Biological Monitoring Report for Gold Run Creek and Whitewood Creek, South Dakota. Report prepared for South Dakota Science and Technology Authority, Lead, SD.

Grafe, C.S. (ed.). 2002. Idaho Small Stream Ecological Assessment Framework: An Integrated Approach. Idaho Department of Environmental Quality, Boise, ID.

Hargett, E. G. 2011. The Wyoming Stream Integrity Index (WSII)- Multimetric Indices for Assessment of Wadeable Streams and Large Rivers in Wyoming. Document #11-0787, Water Quality Division, Cheyenne, Wyoming.

- Hilsenhoff, W. L. 1987. An improved biotic index of organic stream pollution. *Great Lakes Entomologist* 20(1): 31-40.
- Hynes, H. B. N. 1970. *The Ecology of Running Waters*. University of Toronto Press, Toronto, Canada.
- Klemm, D. J., P. A. Lewis, F. Fulk, and J. M. Lazorchak. 1990. *Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters*. EPA/600/4-90/030. U.S. Environmental Protection Agency.
- Knudson, K. 2001. *An Evaluation of the Biological Communities of Whitewood Creek near Deadwood, South Dakota*. Report prepared for Homestake Mining Company, Lead, SD.
- Lange-Bertalot, H. 1979. Pollution tolerance of diatoms as a criterion for water quality estimation. *Nova Hedwigia* 64:285-304.
- Lenat, D. R., and V. H. Resh. 2001. Taxonomy and stream ecology: the benefits of genus- and species-level identifications. *Journal of the North American Benthological Society* 20:287-298.
- Lowe, R. L. 1974. *Environmental Requirements and Pollution Tolerance of Freshwater Diatoms*. EPA 670/4-74-005. U.S. Environmental Protection Agency, Cincinnati, OH.
- Merritt, R. W., Cummins, K. W., and M. B. Berg. 2008. *An Introduction to the Aquatic Invertebrates of North America*, 4th ed. Kendall-Hunt Publishing Company, Dubuque, IA.
- NCSS 12 Statistical Software. 2021. Version 12.0.18.
- Omernik, J. M. 1987. Ecoregions of the conterminous United States. *Annals of the Association of American Geographers* 77:118-125.
- Omernik, J. M., and A. L. Gallant. 1987. *Ecoregions of the West Central United States*. EPA/600/D-87/317. U.S. Environmental Protection Agency.
- Overton, C. K., S. P. Wollrab, B. C. Roberts, and M. A. Radko. 1997. R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. General Technical Report INT-GTR-346. U.S. Forest Service Intermountain Research Station.
- Patrick, R., and C. W. Reimer. 1966. *The Diatoms of the United States, Exclusive of Alaska and Hawaii*. Monograph 13. Academy of Natural Sciences, Philadelphia, PA.
- Patrick, R., and C. W. Reimer. 1975. *The Diatoms of the United States, Volume 2, Part 1*, Monograph 13. Academy of Natural Sciences, Philadelphia, PA.
- Peck, D.V., A.T. Herlihy, B.H. Hill, R. M. Hughes, P.R. Kaufmann, D.J. Klemm, J.M. Lazorchak, F.H. McCormick, S.A. Peterson, P.L. Ringold, T. Magee, and M.R.

- Cappaert. 2006. *Environmental Monitoring and Assessment Program-Surface Waters Western Pilot Study: Field Operations Manual for Wadeable Streams*. U.S. EPA Report EPA/620/R-06/003. U.S. Environmental Protection Agency, Washington, D.C.
- Platts, W. S., W. F. Megahan, and G. W. Minshall. 1983. *Methods for Evaluating Stream, Riparian, and Biotic Conditions*. General Technical Report INT-138. U.S. Forest Service.
- Shearer, J. 2006. *Macroinvertebrate Bioassessment of Black Hills Streams, South Dakota*. SD GFP Report 2006-09. June 2006. South Dakota Game, Fish and Parks, Rapid City, South Dakota.
- South Dakota Department of Agriculture and Natural Resources (SDDANR). 2005. *Standard Operating Procedures for Field Samplers, Volume II: Biological and Habitat Sampling*. Version 1.2, Water Resources Monitoring Team, February 2005.
- Stribling, J. B., S. R. Moulton, II, and G. T. Lester. 2003. Determining the quality of taxonomic data. *Journal of the North American Benthological Society* 22:621-631.
- U.S. Environmental Protection Agency (EPA). 1978. *Environmental Requirements and Pollution Tolerance of Plecoptera*. EPA-600/4-78-062. October 1978. Environmental Monitoring and Support Laboratory, Cincinnati, OH.
- U.S. Geological Survey (USGS). 2024. USGS 06436180 Whitewood Creek Above Whitewood, SD. Available online: http://waterdata.usgs.gov/sd/nwis/uv?site_no=06436180, accessed 1/2025.
- Waters, T. F. 1995. *Sediment in streams: sources, biological effects, and control*. American Fisheries Society Monograph 7.
- Wehr, J. D., and R. G. Sheath (eds.). 2003. *Freshwater Algae of North America*. Academic Press, San Diego, CA.
- Whittaker, R. H. 1975. *Communities and Ecosystems*, 2nd edition. Macmillan Publishing Company, New York, NY.
- Wiederholm, T. 1984. Responses of aquatic insects to environmental pollution. Pp. 508-557 in Resh, V.H., and D.M. Rosenberg (eds.). *The Ecology of Aquatic Insects*. Praeger Scientific, New York, NY.
- Wilkins, J., Rosse, A., and Dozark, K. 2016. *A Macroinvertebrate Index of Biotic Integrity for Monitoring Mining Impacts in Black Hills Streams*. March 2016. South Dakota Department of Environment and Natural Resources, Pierre, South Dakota.

Appendix A 2025 Benthic Invertebrate Data

DATA: MACROINVERTEBRATE DENSITY
Client: SDSTA
Sampled: 8/18/2025
Site: **GOLD RUN, GR-A**

TAXA

	REACH WIDE COMPOSITE (#/SAMPLE)	% OF TOTAL
INSECTA		
COLLEMBOLA	1	
Unid. Collembola	1	0.2
EPHEMEROPTERA	324	
Baetis flavistriga cx.	6	1.4
Baetis rhodani gr.	27	6.5
Baetis tricaudatus cx.	291	69.6
COLEOPTERA	8	
Agabus cx.	3	0.7
Hydroporinae	3	0.7
Optioservus sp.	2	0.5
TRICHOPTERA	3	
Cheumatopsyche sp.	1	0.2
Limnephilidae	1	0.2
Micrasema bactro	1	0.2
DIPTERA	57	
Brillia sp.	24	5.7
Cricotopus sp.	7	1.7
Eukiefferiella sp.	7	1.7
Muscidae	1	0.2
Orthocladius/Cricotopus gr.	4	1.0
Parametricnemus sp.	4	1.0
Psychodini sp.	4	1.0
Rheocricotopus sp.	1	0.2
Simulium sp.	4	1.0
Thienemanniella sp.	1	0.2
HYDRACARINA	1	
Torrenticola sp.	1	0.2
ANNELIDA		
OLIGOCHAETA	23	
Eiseniella tetraedra	2	0.5
Enchytraeidae	2	0.5
Nais sp.	19	4.5
MOLLUSCA		

DATA: MACROINVERTEBRATE DENSITY
 Client: SDSTA
 Sampled: 8/18/2025
 Site: **GOLD RUN, GR-A**

GASTROPODA	1	
Physa sp.	1	0.2
TOTAL (#/sample)	418	
NUMBER OF TAXA	25	
SHANNON-WEAVER (H')	2.00	
TOTAL EPT TAXA	6	
EPT INDEX (% of Total Taxa)	24	
EPHEMEROPTERA ABUNDANCE (% of Total Number)	78	

DATA: MACROINVERTEBRATE DENSITY
Client: SDSTA
Sampled: 8/18/2025
Site: **GOLD RUN, GR-B**

TAXA

	REACH WIDE COMPOSITE (#/SAMPLE)	% OF TOTAL
INSECTA		
COLLEMBOLA	1	
Unid. Collembola	1	0.5
EPHEMEROPTERA	86	
Baetis flavistriga cx.	2	0.9
Baetis tricaudatus cx.	84	39.4
ODONATA	3	
Argia sp.	3	1.4
COLEOPTERA	2	
Microcyloopus pusillus	1	0.5
Optioservus castanipennis	1	0.5
LEPIDOPTERA	3	
Petrophila sp.	3	1.4
TRICHOPTERA	29	
Cheumatopsyche sp.	1	0.5
Hesperophylax sp.	6	2.8
Hydropsyche sp.	20	9.4
Hydroptilidae	1	0.5
Polycentropodidae	1	0.5
DIPTERA	68	
Brillia sp.	11	5.2
Caloparyphus/Euparyphus sp.	1	0.5
Conchapelopia/Thienemannimyia gr.	1	0.5
Cricotopus sp.	17	8.0
Dicranomyia sp.	5	2.3
Eukiefferiella sp.	14	6.6
Parametriocnemus sp.	10	4.7
Psychodini sp.	6	2.8
Rheocricotopus sp.	1	0.5
Sciomyzidae	1	0.5
Tipulidae	1	0.5

DATA: MACROINVERTEBRATE DENSITY
Client: SDSTA
Sampled: 8/18/2025
Site: **GOLD RUN, GR-B**

ANNELIDA

OLIGOCHAETA	19	
Eiseniella tetraedra	2	0.9
Enchytraeidae	7	3.3
Nais sp.	9	4.2
Tubificinae	1	0.5

MOLLUSCA

GASTROPODA	2	
Gyraulus sp.	1	0.5
Physa sp.	1	0.5

TOTAL (#/sample)	213
NUMBER OF TAXA	29
SHANNON-WEAVER (H')	3.41
TOTAL EPT TAXA	7
EPT INDEX (% of Total Taxa)	24
EPHEMEROPTERA ABUNDANCE (% of Total Number)	40

Appendix B 2025 Periphyton Data

DATA: PERIPHYTON ANALYSES
Client: SDSTA
Sampled: 8/18/2025
Site: **GOLD RUN, GR-A**

TOTAL CELLS/cm ²	2,383
NUMBER OF TAXA	9
SHANNON-WEAVER DIVERSITY (H')	1.10
TROPHIC STATE INDEX	38.9

<u>Organisms</u>	<u>Cells/cm²</u>	<u>Rel % Conc.</u>
BACILLARIOPHYTA		
Order Pennales		
Achnanthes hauckiana	30	1.3
Achnanthes linearis	60	2.5
Achnanthes minutissima	1,992	83.6
Caloneis ventricosa minuta	30	1.3
Cymbella minuta	30	1.3
Denticula elegans	60	2.5
Diatoma tenue	30	1.3
Navicula cryptocephala	121	5.1
Rhoicosphenia curvata	30	1.3

DATA: PERIPHYTON ANALYSES
Client: SDSTA
Sampled: 8/18/2025
Site: **GOLD RUN, GR-B**

TOTAL CELLS/cm ²	6,889
NUMBER OF TAXA	9
SHANNON-WEAVER DIVERSITY (H')	1.62
TROPHIC STATE INDEX	47.7

<u>Organisms</u>	<u>Cells/cm²</u>	<u>Rel % Conc.</u>
BACILLARIOPHYTA		
Order Pennales		
Achnanthes lanceolata	148	2.1
Achnanthes linearis	74	1.1
Achnanthes minutissima	4,815	69.9
Cocconeis placentula	741	10.8
Gomphonema angustatum	74	1.1
Navicula cryptocephala	148	2.1
Nitzschia communis	222	3.2
Nitzschia innominata	74	1.1
Rhoicosphenia curvata	593	8.6

Appendix C 2025 Water Quality Data



2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: **GR - A**
Sampled: 08/18/25 at 12:00 PM
by Bonita Goode
Sample Matrix: Water

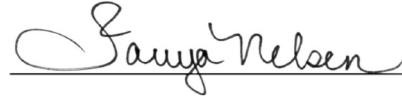
Lab ID#: 20250822216
Received: 08/19/25 at 12:11 PM
by Bobbie Laurenz
Account: W1433 - South Dakota Science
& Technology Authority

JULIE EWING
SOUTH DAKOTA SCIENCE & TECHNOLOGY
AUTHORITY
630 EAST SUMMIT STREET
LEAD, SD 57754

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1100	µmhos/cm	1	0.168	5.00	SM 2510B	JAM	09/02/25
Hardness	478	mg/L	1			SM 2340 B	TMN	09/05/25
pH	8.12	S.U.	1			SM 4500-H+ B	JAM	08/28/25
Total Dissolved Solids	736	mg/L	100ml	12.7	50.0	SM 2540 C	IBS	08/25/25
Total Suspended Solids	6.00	mg/L	500ml	0.565	2.00	SM 2540 D	IBS	08/25/25
Non-Metallics								
Cyanide, WAD	< 0.010	mg/L	1	0.00067	0.010	Kelada 01	TMN	08/26/25
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.006	0.050	Timberline-001	IBS	08/25/25
Nitrogen, Nitrate (NO3)	1.77	mg/L	2	0.018	0.100	SM 4500-NO3 F	BLL	08/22/25
Phosphorus (P) Dissolved	0.049	mg/L	1	0.005	0.010	SM 4500-P E	GRR	08/27/25
Metals - Dissolved								
Calcium (Ca)	129	mg/L	4	0.195	4.00	SM 3111 B	GRT	08/27/25
Magnesium (Mg)	37.8	mg/L	1	0.069	0.500	SM 3111 B	GRT	08/27/25
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000045	0.0002	EPA 245.1	GRT	08/27/25
Metals - Total Recoverable								
Arsenic (As)	0.015	mg/L	10	0.0004	0.005	EPA 200.8	TNA	08/25/25
Cadmium (Cd)	< 0.001	mg/L	10	0.00041	0.001	EPA 200.8	TNA	08/25/25
Chromium (Cr)	< 0.0010	mg/L	10	0.000109	0.0010	EPA 200.8 DRC	TNA	08/25/25
Copper (Cu)	0.011	mg/L	10	0.00047	0.005	EPA 200.8	TNA	08/25/25
Iron (Fe)	3.56	mg/L	10	0.015	0.050	EPA 200.8	TNA	08/25/25
Lead (Pb)	< 0.0010	mg/L	10	0.00015	0.0010	EPA 200.8	TNA	08/25/25
Nickel (Ni)	0.031	mg/L	10	0.00045	0.005	EPA 200.8	TNA	08/25/25
Selenium (Se)	< 0.005	mg/L	10	0.00048	0.005	EPA 200.8	TNA	08/25/25
Silver (Ag)	< 0.0010	mg/L	10	0.000074	0.0010	EPA 200.8	TNA	08/25/25
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	TNA	08/25/25

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Speciation							
Selenium (IV) Speciation	< 0.002	mg/L	1			Selenium (IV) Speciation	TNA 09/13/25
Selenium (VI) Speciation	0.002	mg/L	1			Selenium (VI) Speciation	TNA 09/13/25

Report Approved By:



Report Approved On: 9/16/2025 11:42:12 AM



2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: **GR - B**
Sampled: 08/18/25 at 12:30 PM
by Bonita Goode
Sample Matrix: Water

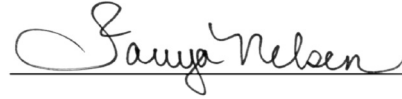
Lab ID#: 20250822217
Received: 08/19/25 at 12:11 PM
by Bobbie Laurenz
Account: W1433 - South Dakota Science
& Technology Authority

JULIE EWING
SOUTH DAKOTA SCIENCE & TECHNOLOGY
AUTHORITY
630 EAST SUMMIT STREET
LEAD, SD 57754

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2550	µmhos/cm	1	0.168	5.00	SM 2510B	JAM	09/02/25
Hardness	1290	mg/L	1			SM 2340 B	TMN	09/05/25
pH	8.24	S.U.	1			SM 4500-H+ B	JAM	08/28/25
Total Dissolved Solids	2060	mg/L	100ml	12.7	50.0	SM 2540 C	IBS	08/25/25
Total Suspended Solids	4.40	mg/L	500ml	0.565	2.00	SM 2540 D	IBS	08/25/25
Non-Metallics								
Cyanide, WAD	< 0.010	mg/L	1	0.00067	0.010	Kelada 01	TMN	08/26/25
Nitrogen, Ammonia (NH3)	0.060	mg/L	1	0.006	0.050	Timberline-001	IBS	08/25/25
Nitrogen, Nitrate (NO3)	2.37	mg/L	2	0.018	0.100	SM 4500-NO3 F	BLL	08/22/25
Phosphorus (P) Dissolved	< 0.010	mg/L	1	0.005	0.010	SM 4500-P E	GRR	08/27/25
Metals - Dissolved								
Calcium (Ca)	198	mg/L	5	0.244	5.00	SM 3111 B	GRT	08/27/25
Magnesium (Mg)	194	mg/L	5	0.346	2.50	SM 3111 B	GRT	08/27/25
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000045	0.0002	EPA 245.1	GRT	08/27/25
Metals - Total Recoverable								
Arsenic (As)	0.019	mg/L	10	0.0004	0.005	EPA 200.8	TNA	08/25/25
Cadmium (Cd)	< 0.001	mg/L	10	0.00041	0.001	EPA 200.8	TNA	08/25/25
Chromium (Cr)	< 0.0010	mg/L	10	0.000109	0.0010	EPA 200.8 DRC	TNA	08/25/25
Copper (Cu)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA	08/25/25
Iron (Fe)	0.492	mg/L	10	0.015	0.050	EPA 200.8	TNA	08/25/25
Lead (Pb)	0.0013	mg/L	10	0.00015	0.0010	EPA 200.8	TNA	08/25/25
Nickel (Ni)	0.007	mg/L	10	0.00045	0.005	EPA 200.8	TNA	08/25/25
Selenium (Se)	< 0.005	mg/L	10	0.00048	0.005	EPA 200.8	TNA	08/25/25
Silver (Ag)	< 0.0010	mg/L	10	0.000074	0.0010	EPA 200.8	TNA	08/25/25
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	TNA	08/25/25

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Speciation							
Selenium (IV) Speciation	< 0.002	mg/L	1			Selenium (IV) Speciation	TNA 09/13/25
Selenium (VI) Speciation	< 0.002	mg/L	1			Selenium (VI) Speciation	TNA 09/13/25

Report Approved By:



Report Approved On: 9/16/2025 11:42:12 AM



2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: 001
Sampled: 08/19/25 at 07:59 AM
by Cody Jones
Sample Matrix: Water

Lab ID#: 20250822218
Received: 08/19/25 at 12:11 PM
by Steve Ristau
Account: W1433 - South Dakota Science
& Technology Authority

JULIE EWING
SOUTH DAKOTA SCIENCE & TECHNOLOGY
AUTHORITY
630 EAST SUMMIT STREET
LEAD, SD 57754

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Hardness	1350	mg/L	1			SM 2340 B	TMN 09/05/25
Total Dissolved Solids	2180	mg/L	50ml	25.5	100	SM 2540 C	IBS 08/25/25
Total Suspended Solids	< 2.00	mg/L	500ml	0.565	2.00	SM 2540 D	IBS 08/25/25
Non-Metallics							
Cyanide, WAD	< 0.010	mg/L	1	0.00067	0.010	Kelada 01	TMN 08/26/25
Nitrogen, Ammonia (NH3)	0.240	mg/L	1	0.006	0.050	Timberline-001	IBS 08/25/25
Nitrogen, Nitrate (NO3)	2.36	mg/L	2	0.018	0.100	SM 4500-NO3 F	BLL 08/22/25
Metals - Dissolved							
Calcium (Ca)	204	mg/L	5	0.244	5.00	SM 3111 B	GRT 08/27/25
Magnesium (Mg)	203	mg/L	5	0.346	2.50	SM 3111 B	GRT 08/27/25
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000045	0.0002	EPA 245.1	GRT 08/27/25
Metals - Total Recoverable							
Arsenic (As)	0.013	mg/L	10	0.0004	0.005	EPA 200.8	TNA 08/26/25
Copper (Cu)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 08/26/25
Lead (Pb)	< 0.0010	mg/L	10	0.00015	0.0010	EPA 200.8	TNA 08/26/25
Selenium (Se)	< 0.005	mg/L	10	0.00048	0.005	EPA 200.8	TNA 08/26/25
Silver (Ag)	< 0.0010	mg/L	10	0.000074	0.0010	EPA 200.8	TNA 08/26/25

Report Approved By:

Report Approved On: 9/15/2025 9:57:51 AM



2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Lab Numbers: 20250822216 - 20250822220

QC Sample Report

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Spike								
TDS	0822111	1640	638	1000	100ml	100.5 %	(95.30) - (111.0)	SM 2540 C
TDS	0822202	1150	84.0	1000	100ml	106.7 %	(95.30) - (111.0)	SM 2540 C
TSS	0822202	49.0	< 10.0	50.0	100ml	98.0 %	(93.81) - (108.6)	SM 2540 D
TSS	0822301	103	55.0	50.0	100ml	96.0 %	(93.81) - (108.6)	SM 2540 D
CN, WAD	0825312	4.74	3.61	0.020	50	113.0 %	(57.26) - (129.5)	Kelada 01
CN, WAD	0822205	0.020	0.001	0.020	1	95.0 %	(57.26) - (129.5)	Kelada 01
N, Ammonia	0822303	2.02	< 0.050	2.00	1	101.0 %	(86.30) - (119.0)	Timberline-001
N, Ammonia	0822110	2.05	0.060	2.00	1	99.5 %	(86.30) - (119.0)	Timberline-001
N, Ammonia	0822901	2.21	0.120	2.00	1	104.5 %	(86.30) - (119.0)	Timberline-001
N, Ammonia	0825211	2.15	0.070	2.00	1	104.0 %	(86.30) - (119.0)	Timberline-001
N, Ammonia	0825104	1.95	< 0.050	2.00	1	97.5 %	(86.30) - (119.0)	Timberline-001
N, Nitrate	0822313	0.360	< 0.050	0.400	1	90.0 %	(87.45) - (102.4)	SM 4500-NO3 F
N, Nitrate	0822103	119	79.3	0.400	100	99.4 %	(87.45) - (102.4)	SM 4500-NO3 F
N, Nitrate	0822202	0.402	0.025	0.400	1	94.3 %	(87.45) - (102.4)	SM 4500-NO3 F
Phosphorus - D	0822217	0.096	0.00	0.100	1	96.0 %	(82.51) - (114.6)	SM 4500-P E
Phosphorus - D	0825302	0.118	0.009	0.100	1	109.0 %	(82.51) - (114.6)	SM 4500-P E
Arsenic - D	0821105	0.104	< 0.002	0.025	4	104.2 %	(86.14) - (113.0)	EPA 200.8
Arsenic - D	0822110	0.251	< 0.005	0.025	10	100.5 %	(86.14) - (113.0)	EPA 200.8
Arsenic - D	0825215	0.238	< 0.005	0.025	10	95.1 %	(86.14) - (113.0)	EPA 200.8
Arsenic - D	0825305	0.369	0.122	0.025	10	98.7 %	(86.14) - (113.0)	EPA 200.8
Barium - D	0825305	0.343	0.107	0.025	10	94.2 %	(83.29) - (105.9)	EPA 200.8
Barium - D	0825215	0.242	< 0.005	0.025	10	96.9 %	(83.29) - (105.9)	EPA 200.8
Barium - D	0821105	0.195	0.096	0.025	4	98.8 %	(83.29) - (105.9)	EPA 200.8
Barium - D	0822110	0.317	0.078	0.025	10	96.0 %	(83.29) - (105.9)	EPA 200.8
Cadmium - D	0825215	0.267	0.016	0.025	10	100.4 %	(85.33) - (112.4)	EPA 200.8
Cadmium - D	0825305	0.247	0.001	0.025	10	98.5 %	(85.33) - (112.4)	EPA 200.8
Cadmium - D	0821105	0.102	< 0.000	0.025	4	102.4 %	(85.33) - (112.4)	EPA 200.8
Cadmium - D	0822110	0.250	< 0.001	0.025	10	100.2 %	(85.33) - (112.4)	EPA 200.8
Calcium - D	0822207	178	77.0	10.0	10	101.4 %	(91.47) - (111.8)	SM 3111 B
Calcium - D	0822215	181	79.8	10.0	10	101.4 %	(91.47) - (111.8)	SM 3111 B
Calcium - D	0825102	180	77.3	10.0	10	102.4 %	(91.47) - (111.8)	SM 3111 B
Calcium - D	0825101	180	77.5	10.0	10	102.4 %	(91.47) - (111.8)	SM 3111 B
Chromium - D	0825305	0.266	< 0.001	0.025	10	106.5 %	(85.73) - (111.1)	EPA 200.8 DRC
Chromium - D	0822110	0.237	< 0.001	0.025	10	95.0 %	(85.73) - (111.1)	EPA 200.8 DRC
Chromium - D	0821105	0.103	< 0.000	0.025	4	102.8 %	(85.73) - (111.1)	EPA 200.8 DRC
Chromium - D	0825215	0.270	0.006	0.025	10	105.7 %	(85.73) - (111.1)	EPA 200.8 DRC
Chromium - D	0822108	0.094	< 0.000	0.025	4	94.2 %	(85.27) - (111.9)	EPA 200.8 DRC
Chromium - D	0822105	1.15	< 0.005	0.025	50	91.6 %	(85.27) - (111.9)	EPA 200.8 DRC

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Spike								
Copper - D	0825215	0.609	0.373	0.025	10	94.4 %	(78.58) - (108.7)	EPA 200.8
Copper - D	0825305	0.269	0.030	0.025	10	95.4 %	(78.58) - (108.7)	EPA 200.8
Copper - D	0822110	0.247	< 0.005	0.025	10	98.9 %	(78.58) - (108.7)	EPA 200.8
Copper - D	0821105	0.135	0.037	0.025	4	98.3 %	(78.58) - (108.7)	EPA 200.8
Iron - D	0825215	1.54	0.269	0.125	10	101.5 %	(79.76) - (111.4)	EPA 200.8
Iron - D	0822110	1.19	< 0.050	0.125	10	95.1 %	(79.76) - (111.4)	EPA 200.8
Iron - D	0821105	0.517	< 0.020	0.125	4	103.3 %	(79.76) - (111.4)	EPA 200.8
Iron - D	0825305	3.17	1.88	0.125	10	102.9 %	(79.76) - (111.4)	EPA 200.8
Iron - D	0822108	0.484	0.021	0.125	4	92.6 %	(82.78) - (109.6)	EPA 200.8
Iron - D	0822105	5.76	< 0.250	0.125	50	92.1 %	(82.78) - (109.6)	EPA 200.8
Lead - D	0821105	0.1052	0.0042	0.025	4	101.0 %	(87.78) - (110.2)	EPA 200.8
Lead - D	0822110	0.2530	< 0.0010	0.025	10	101.2 %	(87.78) - (110.2)	EPA 200.8
Lead - D	0825305	0.2525	< 0.0010	0.025	10	101.0 %	(87.78) - (110.2)	EPA 200.8
Lead - D	0825215	0.2556	0.0013	0.025	10	101.7 %	(87.78) - (110.2)	EPA 200.8
Lead - D	0822108	0.0989	< 0.0004	0.025	4	98.9 %	(88.22) - (109.3)	EPA 200.8
Lead - D	0822105	1.268	< 0.0050	0.025	50	101.5 %	(88.22) - (109.3)	EPA 200.8
Magnesium - D	0822215	282	187	10.0	10	94.8 %	(83.06) - (104.7)	SM 3111 B
Magnesium - D	0822207	32.7	22.6	10.0	1	101.9 %	(83.06) - (104.7)	SM 3111 B
Magnesium - D	0825102	33.7	23.3	10.0	1	104.1 %	(83.06) - (104.7)	SM 3111 B
Magnesium - D	0825101	33.6	23.1	10.0	1	104.3 %	(83.06) - (104.7)	SM 3111 B
Nickel - D	0821105	0.112	0.013	0.025	4	98.9 %	(81.77) - (110.1)	EPA 200.8
Nickel - D	0825305	0.269	0.029	0.025	10	95.7 %	(81.77) - (110.1)	EPA 200.8
Nickel - D	0822110	0.252	< 0.005	0.025	10	100.9 %	(81.77) - (110.1)	EPA 200.8
Nickel - D	0825215	0.538	0.299	0.025	10	95.9 %	(81.77) - (110.1)	EPA 200.8
Selenium - D	0825305	1.27	0.020	0.125	10	99.64%	(89.72) - (109.1)	EPA 200.8
Selenium - D	0825215	1.21	< 0.002	0.125	10	96.8 %	(89.72) - (109.1)	EPA 200.8
Selenium - D	0821105	0.526	< 0.002	0.125	4	105.1 %	(89.72) - (109.1)	EPA 200.8
Selenium - D	0822110	1.30	0.038	0.125	10	101.0 %	(89.72) - (109.1)	EPA 200.8
Selenium - D	0822108	0.508	< 0.002	0.125	4	101.7 %	(90.77) - (107.9)	EPA 200.8
Selenium - D	0822105	6.90	0.366	0.125	50	104.6 %	(90.77) - (107.9)	EPA 200.8
Silver - D	0822110	0.2401	0.0026	0.025	10	95.0 %	(66.04) - (113.5)	EPA 200.8
Silver - D	0825305	0.2320	0.0017	0.025	10	92.1 %	(66.04) - (113.5)	EPA 200.8
Silver - D	0821105	0.0952	< 0.0004	0.025	4	95.2 %	(66.04) - (113.5)	EPA 200.8
Silver - D	0825215	0.2320	< 0.0010	0.025	10	92.8 %	(66.04) - (113.5)	EPA 200.8
Zinc - D	0822110	1.06	0.801	0.025	10	102.9 %	(73.04) - (134.4)	EPA 200.8
Zinc - D	0825305	0.316	0.066	0.025	10	99.68%	(73.04) - (134.4)	EPA 200.8
Zinc - D	0825215	0.450	0.197	0.025	10	101.2 %	(73.04) - (134.4)	EPA 200.8
Zinc - D	0821105	0.694	0.585	0.025	4	109.1 %	(73.04) - (134.4)	EPA 200.8
Arsenic - T	0825103	0.092	< 0.002	0.025	4	91.7 %	(81.51) - (117.9)	EPA 200.8
Barium - T	0825103	0.163	0.066	0.025	4	96.8 %	(79.93) - (121.7)	EPA 200.8
Cadmium - T	0825103	0.095	< 0.000	0.025	4	95.4 %	(83.39) - (111.8)	EPA 200.8
Chromium - T	0825103	0.109	< 0.000	0.025	4	109.0 %	(88.38) - (120.8)	EPA 200.8 DRC
Chromium - T	0820103	0.257	0.003	0.025	10	101.6 %	(88.39) - (121.3)	EPA 200.8 DRC
Chromium - T	0821102	0.265	< 0.001	0.025	10	105.9 %	(88.39) - (121.3)	EPA 200.8 DRC
Chromium - T	0821310	1.22	< 0.005	0.025	50	97.6 %	(88.39) - (121.3)	EPA 200.8 DRC
Copper - T	0825103	0.095	< 0.002	0.025	4	94.7 %	(82.53) - (113.2)	EPA 200.8

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Spike								
Iron - T	0825103	0.658	0.131	0.125	4	105.3 %	(71.75) - (134.0)	EPA 200.8
Iron - T	0821310	6.11	< 0.250	0.125	50	97.8 %	(71.75) - (133.9)	EPA 200.8
Iron - T	0821102	1.31	< 0.050	0.125	10	104.7 %	(71.75) - (133.9)	EPA 200.8
Iron - T	0820103	2.74	1.40	0.125	10	107.8 %	(71.75) - (133.9)	EPA 200.8
Lead - T	0825103	0.1008	< 0.0004	0.025	4	100.8 %	(88.04) - (117.7)	EPA 200.8
Lead - T	0821310	1.275	< 0.0050	0.025	50	102.0 %	(88.02) - (117.7)	EPA 200.8
Lead - T	0820103	0.2769	0.0023	0.025	10	109.9 %	(88.02) - (117.7)	EPA 200.8
Lead - T	0821102	0.3015	0.0240	0.025	10	111.0 %	(88.02) - (117.7)	EPA 200.8
Mercury - T	0825103	0.0020	< 0.0002	0.002	1	98.5 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0822304	0.0021	< 0.0002	0.002	1	107.0 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0822301	0.0020	< 0.0002	0.002	1	100.0 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0822218	0.0020	< 0.0002	0.002	1	99.5 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0825313	0.0020	< 0.0002	0.002	1	99.5 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0825301	0.0020	< 0.0002	0.002	1	98.5 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0825201	0.0019	< 0.0002	0.002	1	95.5 %	(86.95) - (116.1)	EPA 245.1
Mercury - T	0825204	0.0019	< 0.0002	0.002	1	94.0 %	(86.95) - (116.1)	EPA 245.1
Nickel - T	0825103	0.112	0.017	0.025	4	94.9 %	(91.59) - (111.4)	EPA 200.8
Selenium - T	0825103	0.458	< 0.002	0.125	4	91.6 %	(83.72) - (114.9)	EPA 200.8
Selenium - T	0820103	1.40	< 0.005	0.125	10	112.0 %	(82.95) - (115.4)	EPA 200.8
Selenium - T	0821310	6.91	0.291	0.125	50	105.9 %	(82.95) - (115.4)	EPA 200.8
Selenium - T	0821102	1.38	< 0.005	0.125	10	110.6 %	(82.95) - (115.4)	EPA 200.8
Silver - T	0825103	0.0925	0.0005	0.025	4	92.0 %	(77.40) - (113.3)	EPA 200.8
Zinc - T	0825103	0.134	0.041	0.025	4	93.6 %	(80.99) - (121.3)	EPA 200.8
Arsenic - TR	0825111	0.099	0.003	0.025	4	96.1 %	(89.43) - (110.1)	EPA 200.8
Barium - TR	0825111	0.233	0.139	0.025	4	94.3 %	(86.92) - (102.4)	EPA 200.8
Cadmium - TR	0825111	0.099	< 0.000	0.025	4	99.4 %	(89.14) - (108.6)	EPA 200.8
Chromium - TR	0825111	0.1108	< 0.0004	0.025	4	110.8 %	(78.44) - (116.3)	EPA 200.8 DRC
Chromium - TR	0821203	0.4788	0.0034	0.025	20	95.1 %	(77.14) - (119.0)	EPA 200.8 DRC
Chromium - TR	0822215	0.2366	< 0.0010	0.025	10	94.7 %	(77.14) - (119.0)	EPA 200.8 DRC
Chromium - TR	0822116	0.2370	< 0.0010	0.025	10	94.8 %	(77.14) - (119.0)	EPA 200.8 DRC
Chromium - TR	0821209	0.4867	< 0.0020	0.025	20	97.3 %	(77.14) - (119.0)	EPA 200.8 DRC
Copper - TR	0825111	0.093	< 0.002	0.025	4	93.2 %	(82.89) - (111.1)	EPA 200.8
Iron - TR	0825111	0.531	< 0.020	0.125	4	106.2 %	(73.06) - (116.6)	EPA 200.8
Iron - TR	0821209	2.83	0.414	0.125	20	96.5 %	(73.10) - (118.3)	EPA 200.8
Iron - TR	0822116	1.33	0.169	0.125	10	93.1 %	(73.10) - (118.3)	EPA 200.8
Iron - TR	0822215	1.17	< 0.050	0.125	10	93.8 %	(73.10) - (118.3)	EPA 200.8
Iron - TR	0821203	2.37	< 0.100	0.125	20	94.8 %	(73.10) - (118.3)	EPA 200.8
Lead - TR	0825111	0.0987	< 0.0004	0.025	4	98.7 %	(85.69) - (109.8)	EPA 200.8
Lead - TR	0822215	0.2443	< 0.0004	0.025	10	97.7 %	(85.81) - (109.4)	EPA 200.8
Lead - TR	0821209	0.5047	< 0.0020	0.025	20	100.9 %	(85.81) - (109.4)	EPA 200.8
Lead - TR	0822116	0.2455	0.0013	0.025	10	97.7 %	(85.81) - (109.4)	EPA 200.8
Lead - TR	0821203	0.4980	< 0.0020	0.025	20	99.59%	(85.81) - (109.4)	EPA 200.8
Nickel - TR	0825111	0.096	0.004	0.025	4	92.9 %	(80.51) - (113.2)	EPA 200.8
Selenium - TR	0825111	0.493	< 0.002	0.125	4	98.6 %	(88.36) - (106.7)	EPA 200.8
Selenium - TR	0822116	1.26	0.010	0.125	10	100.1 %	(88.73) - (106.0)	EPA 200.8
Selenium - TR	0821209	2.58	< 0.010	0.125	20	103.0 %	(88.73) - (106.0)	EPA 200.8

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method	
Spike									
Selenium - TR	0821203	2.57	0.055	0.125	20	100.7 %	(88.73) - (106.0)	EPA 200.8	
Selenium - TR	0822215	1.24	< 0.005	0.125	10	98.9 %	(88.73) - (106.0)	EPA 200.8	
Silver - TR	0825111	0.0923	< 0.0004	0.025	4	92.3 %	(83.08) - (108.6)	EPA 200.8	
Zinc - TR	0825111	0.105	< 0.020	0.025	4	104.5 %	(89.94) - (116.3)	EPA 200.8	
Selenium (IV)	0825309	0.010	< 0.002	0.010	1	99.0 %	(75.42) - (107.8)	Selenium (IV) Speciation	
Selenium (IV)	0826203	0.008	< 0.002	0.010	1	84.0 %	(75.42) - (107.8)	Selenium (IV) Speciation	
Selenium (IV)	0822216	0.010	< 0.002	0.010	1	102.0 %	(75.42) - (107.8)	Selenium (IV) Speciation	
Selenium (IV)	0825112	0.009	< 0.002	0.010	1	93.0 %	(75.42) - (107.8)	Selenium (IV) Speciation	
Selenium (VI)	0825309	0.019	0.010	0.010	1	88.0 %	(76.66) - (113.0)	Selenium (VI) Speciation	
Selenium (VI)	0826203	0.009	< 0.002	0.010	1	91.0 %	(76.66) - (113.0)	Selenium (VI) Speciation	
Selenium (VI)	0822217	0.011	< 0.002	0.010	1	111.0 %	(76.66) - (113.0)	Selenium (VI) Speciation	
Selenium (VI)	0825112	0.009	< 0.002	0.010	1	87.0 %	(76.66) - (113.0)	Selenium (VI) Speciation	
Matrix Spike Duplicate									
CN, WAD	0825312	4.82	4.74		50	1.67%	(-13.41) - (9.581)	Kelada 01	
CN, WAD	0822205	0.020	0.020		1	0.00%	(-13.41) - (9.581)	Kelada 01	
N, Ammonia	0825104	1.99	1.95		1	2.03%	(-5.533) - (6.359)	Timberline-001	
N, Ammonia	0825211	2.25	2.15		1	4.55%	(-5.533) - (6.359)	Timberline-001	
N, Ammonia	0822303	2.02	2.02		1	0.00%	(-5.533) - (6.359)	Timberline-001	
N, Ammonia	0822110	2.04	2.05		1	-0.489%	(-5.533) - (6.359)	Timberline-001	
N, Ammonia	0822901	2.24	2.21		1	1.35%	(-5.533) - (6.359)	Timberline-001	
N, Nitrate	0822202	0.417	0.402		1	3.66%	(-3.532) - (2.507)	SM 4500-NO3 F	
- Recovery was within 10% of expected value									
N, Nitrate	0822103	118	119		100	-0.539%	(-3.532) - (2.507)	SM 4500-NO3 F	
N, Nitrate	0822313	0.355	0.360		1	-1.40%	(-3.532) - (2.507)	SM 4500-NO3 F	
Phosphorus - D	0822217	0.103	0.096		1	7.04%	(-8.947) - (7.644)	SM 4500-P E	
Phosphorus - D	0822217	0.103	0.096		1	7.04%	(-8.947) - (7.644)	SM 4500-P E	
Arsenic - D	0822110	0.257	0.251		10	2.09%	(-5.433) - (6.322)	EPA 200.8	
Arsenic - D	0825215	0.241	0.238		10	1.24%	(-5.433) - (6.322)	EPA 200.8	
Arsenic - D	0825305	0.363	0.369		10	-1.59%	(-5.433) - (6.322)	EPA 200.8	
Arsenic - D	0821105	0.103	0.104		4	-1.40%	(-5.433) - (6.322)	EPA 200.8	
Barium - D	0821105	0.193	0.195		4	-0.927%	(-3.743) - (4.106)	EPA 200.8	
Barium - D	0825305	0.350	0.343		10	2.08%	(-3.743) - (4.106)	EPA 200.8	
Barium - D	0822110	0.319	0.317		10	0.534%	(-3.743) - (4.106)	EPA 200.8	
Barium - D	0825215	0.243	0.242		10	0.148%	(-3.743) - (4.106)	EPA 200.8	
Cadmium - D	0821105	0.103	0.102		4	0.691%	(-4.788) - (4.947)	EPA 200.8	
Cadmium - D	0822110	0.254	0.250		10	1.53%	(-4.788) - (4.947)	EPA 200.8	
Cadmium - D	0825215	0.264	0.267		10	-0.878%	(-4.788) - (4.947)	EPA 200.8	
Cadmium - D	0825305	0.250	0.247		10	0.990%	(-4.788) - (4.947)	EPA 200.8	
Calcium - D	0822207	179	178		10	0.347%	(-10.48) - (9.591)	SM 3111 B	
Calcium - D	0825102	192	180		10	6.73%	(-10.48) - (9.591)	SM 3111 B	
Calcium - D	0825101	177	180		10	-1.43%	(-10.48) - (9.591)	SM 3111 B	
Calcium - D	0822215	190	181		10	4.88%	(-10.48) - (9.591)	SM 3111 B	
Chromium - D	0822110	0.239	0.237		10	0.877%	(-6.211) - (6.562)	EPA 200.8 DRC	
Chromium - D	0825305	0.266	0.266		10	-0.169%	(-6.211) - (6.562)	EPA 200.8 DRC	
Chromium - D	0821105	0.105	0.103		4	1.87%	(-6.211) - (6.562)	EPA 200.8 DRC	

X

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Matrix Spike Duplicate								
Chromium - D	0825215	0.271	0.270		10	0.343%	(-6.211) - (6.562)	EPA 200.8 DRC
Chromium - D	0822108	0.096	0.094		4	1.30%	(-5.690) - (5.570)	EPA 200.8 DRC
Chromium - D	0822105	1.15	1.15		50	0.145%	(-5.690) - (5.570)	EPA 200.8 DRC
Copper - D	0825305	0.267	0.269		10	-0.658%	(-3.174) - (4.687)	EPA 200.8
Copper - D	0825215	0.617	0.609		10	1.35%	(-3.174) - (4.687)	EPA 200.8
Copper - D	0821105	0.134	0.135		4	-0.446%	(-3.174) - (4.687)	EPA 200.8
Copper - D	0822110	0.250	0.247		10	0.990%	(-3.174) - (4.687)	EPA 200.8
Iron - D	0825215	1.55	1.54		10	0.972%	(-3.402) - (3.991)	EPA 200.8
Iron - D	0825305	3.19	3.17		10	0.606%	(-3.402) - (3.991)	EPA 200.8
Iron - D	0821105	0.520	0.517		4	0.721%	(-3.402) - (3.991)	EPA 200.8
Iron - D	0822110	1.19	1.19		10	0.494%	(-3.402) - (3.991)	EPA 200.8
Iron - D	0822105	5.78	5.76		50	0.415%	(-3.110) - (3.494)	EPA 200.8
Iron - D	0822108	0.488	0.484		4	0.822%	(-3.110) - (3.494)	EPA 200.8
Lead - D	0825215	0.2558	0.2556		10	0.090%	(-3.499) - (3.815)	EPA 200.8
Lead - D	0825305	0.2551	0.2525		10	1.02%	(-3.499) - (3.815)	EPA 200.8
Lead - D	0821105	0.1057	0.1052		4	0.531%	(-3.499) - (3.815)	EPA 200.8
Lead - D	0822110	0.2544	0.2530		10	0.552%	(-3.499) - (3.815)	EPA 200.8
Lead - D	0822108	0.0991	0.0989		4	0.232%	(-2.361) - (2.518)	EPA 200.8
Lead - D	0822105	1.274	1.268		50	0.475%	(-2.361) - (2.518)	EPA 200.8
Magnesium - D	0822207	32.7	32.7		1	-0.122%	(-4.066) - (2.897)	SM 3111 B
Magnesium - D	0822215	273	282		10	-3.01%	(-4.066) - (2.897)	SM 3111 B
Magnesium - D	0825101	33.4	33.6		1	-0.628%	(-4.066) - (2.897)	SM 3111 B
Magnesium - D	0825102	33.6	33.7		1	-0.357%	(-4.066) - (2.897)	SM 3111 B
Nickel - D	0822110	0.255	0.252		10	1.12%	(-3.051) - (4.194)	EPA 200.8
Nickel - D	0821105	0.111	0.112		4	-0.760%	(-3.051) - (4.194)	EPA 200.8
Nickel - D	0825215	0.549	0.538		10	1.91%	(-3.051) - (4.194)	EPA 200.8
Nickel - D	0825305	0.267	0.269		10	-0.643%	(-3.051) - (4.194)	EPA 200.8
Selenium - D	0825305	1.25	1.27		10	-1.24%	(-3.754) - (4.766)	EPA 200.8
Selenium - D	0825215	1.22	1.21		10	1.13%	(-3.754) - (4.766)	EPA 200.8
Selenium - D	0822110	1.32	1.30		10	1.78%	(-3.754) - (4.766)	EPA 200.8
Selenium - D	0821105	0.521	0.526		4	-0.973%	(-3.754) - (4.766)	EPA 200.8
Selenium - D	0822105	6.96	6.90		50	0.855%	(-3.990) - (4.846)	EPA 200.8
Selenium - D	0822108	0.504	0.508		4	-0.800%	(-3.990) - (4.846)	EPA 200.8
Silver - D	0822110	0.2439	0.2401		10	1.57%	(-4.834) - (6.540)	EPA 200.8
Silver - D	0825305	0.2362	0.2320		10	1.80%	(-4.834) - (6.540)	EPA 200.8
Silver - D	0825215	0.2331	0.2320		10	0.495%	(-4.834) - (6.540)	EPA 200.8
Silver - D	0821105	0.0951	0.0952		4	-0.105%	(-4.834) - (6.540)	EPA 200.8
Zinc - D	0822110	1.07	1.06		10	0.864%	(-3.760) - (4.507)	EPA 200.8
Zinc - D	0825215	0.455	0.450		10	1.18%	(-3.760) - (4.507)	EPA 200.8
Zinc - D	0821105	0.688	0.694		4	-0.836%	(-3.760) - (4.507)	EPA 200.8
Zinc - D	0825305	0.315	0.316		10	-0.098%	(-3.760) - (4.507)	EPA 200.8
Arsenic - T	0825103	0.097	0.092		4	5.10%	(-12.11) - (12.70)	EPA 200.8
Barium - T	0825103	0.171	0.163		4	4.90%	(-15.96) - (12.25)	EPA 200.8
Cadmium - T	0825103	0.098	0.095		4	2.86%	(-10.58) - (11.42)	EPA 200.8
Chromium - T	0825103	0.119	0.109		4	8.55%	(-10.75) - (10.80)	EPA 200.8 DRC
Chromium - T	0820103	0.262	0.257		10	2.06%	(-11.80) - (12.59)	EPA 200.8 DRC

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Matrix Spike Duplicate								
Chromium - T	0821310	1.26	1.22		50	3.37%	(-11.80) - (12.59)	EPA 200.8 DRC
Chromium - T	0821102	0.273	0.265		10	2.87%	(-11.80) - (12.59)	EPA 200.8 DRC
Copper - T	0825103	0.100	0.095		4	5.99%	(-10.61) - (9.990)	EPA 200.8
Iron - T	0825103	0.720	0.658		4	8.99%	(-12.19) - (11.41)	EPA 200.8
Iron - T	0821102	1.33	1.31		10	1.46%	(-12.65) - (13.24)	EPA 200.8
Iron - T	0820103	2.79	2.74		10	1.67%	(-12.65) - (13.24)	EPA 200.8
Iron - T	0821310	6.30	6.11		50	2.97%	(-12.65) - (13.24)	EPA 200.8
Lead - T	0825103	0.1065	0.1008		4	5.59%	(-10.88) - (10.86)	EPA 200.8
Lead - T	0821310	1.388	1.275		50	8.53%	(-10.98) - (11.75)	EPA 200.8
Lead - T	0821102	0.3087	0.3015		10	2.36%	(-10.98) - (11.75)	EPA 200.8
Lead - T	0820103	0.2707	0.2769		10	-2.28%	(-10.98) - (11.75)	EPA 200.8
Mercury - T	0822301	0.0020	0.0020		1	0.995%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0825313	0.0020	0.0020		1	-0.504%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0822218	0.0019	0.0020		1	-3.58%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0825301	0.0020	0.0020		1	1.51%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0825201	0.0019	0.0019		1	-1.05%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0825103	0.0019	0.0020		1	-2.05%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0822304	0.0020	0.0021		1	-6.76%	(-12.16) - (9.995)	EPA 245.1
Mercury - T	0825204	0.0018	0.0019		1	-2.70%	(-12.16) - (9.995)	EPA 245.1
Nickel - T	0825103	0.119	0.112		4	5.85%	(-13.73) - (13.33)	EPA 200.8
Selenium - T	0825103	0.481	0.458		4	4.90%	(-11.07) - (12.18)	EPA 200.8
Selenium - T	0821102	1.42	1.38		10	2.68%	(-11.25) - (12.71)	EPA 200.8
Selenium - T	0820103	1.35	1.40		10	-3.86%	(-11.25) - (12.71)	EPA 200.8
Selenium - T	0821310	7.37	6.91		50	6.50%	(-11.25) - (12.71)	EPA 200.8
Silver - T	0825103	0.0957	0.0925		4	3.35%	(-9.908) - (11.48)	EPA 200.8
Zinc - T	0825103	0.140	0.134		4	4.31%	(-11.58) - (10.85)	EPA 200.8
Arsenic - TR	0825111	0.103	0.099		4	3.68%	(-4.425) - (4.903)	EPA 200.8
Barium - TR	0825111	0.238	0.233		4	2.21%	(-5.619) - (5.048)	EPA 200.8
Cadmium - TR	0825111	0.100	0.099		4	0.842%	(-3.503) - (4.302)	EPA 200.8
Chromium - TR	0825111	0.1118	0.1108		4	0.863%	(-7.879) - (7.386)	EPA 200.8 DRC
Chromium - TR	0822215	0.2416	0.2366		10	2.06%	(-7.866) - (7.471)	EPA 200.8 DRC
Chromium - TR	0821209	0.4906	0.4867		20	0.810%	(-7.866) - (7.471)	EPA 200.8 DRC
Chromium - TR	0822116	0.2385	0.2370		10	0.639%	(-7.866) - (7.471)	EPA 200.8 DRC
Chromium - TR	0821203	0.4852	0.4788		20	1.31%	(-7.866) - (7.471)	EPA 200.8 DRC
Copper - TR	0825111	0.095	0.093		4	2.23%	(-4.067) - (4.677)	EPA 200.8
Iron - TR	0825111	0.544	0.531		4	2.32%	(-4.797) - (6.222)	EPA 200.8
Iron - TR	0821203	2.40	2.37		20	1.28%	(-4.786) - (6.419)	EPA 200.8
Iron - TR	0822215	1.21	1.17		10	3.08%	(-4.786) - (6.419)	EPA 200.8
Iron - TR	0822116	1.33	1.33		10	-0.164%	(-4.786) - (6.419)	EPA 200.8
Iron - TR	0821209	2.80	2.83		20	-1.02%	(-4.786) - (6.419)	EPA 200.8
Lead - TR	0825111	0.1001	0.0987		4	1.33%	(-4.150) - (4.209)	EPA 200.8
Lead - TR	0822116	0.2476	0.2455		10	0.852%	(-3.771) - (4.176)	EPA 200.8
Lead - TR	0821203	0.5012	0.4980		20	0.643%	(-3.771) - (4.176)	EPA 200.8
Lead - TR	0821209	0.5045	0.5047		20	-0.040%	(-3.771) - (4.176)	EPA 200.8
Lead - TR	0822215	0.2479	0.2443		10	1.50%	(-3.771) - (4.176)	EPA 200.8
Nickel - TR	0825111	0.098	0.096		4	1.57%	(-6.449) - (7.661)	EPA 200.8

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method	
Matrix Spike Duplicate									
Selenium - TR	0825111	0.504	0.493		4	2.19%	(-3.301) - (3.614)	EPA 200.8	
Selenium - TR	0822215	1.25	1.24		10	1.47%	(-3.431) - (3.823)	EPA 200.8	
Selenium - TR	0821203	2.55	2.57		20	-0.795%	(-3.431) - (3.823)	EPA 200.8	
Selenium - TR	0822116	1.27	1.26		10	0.680%	(-3.431) - (3.823)	EPA 200.8	
Selenium - TR	0821209	2.58	2.58		20	0.367%	(-3.431) - (3.823)	EPA 200.8	
Silver - TR	0825111	0.0948	0.0923		4	2.68%	(-3.578) - (5.149)	EPA 200.8	
Zinc - TR	0825111	0.106	0.105		4	1.03%	(-4.230) - (5.025)	EPA 200.8	
Duplicate									
Conductivity	0822216	1100	1100		1	0.00%	(-0.4604) - (0.5358)	SM 2510B	
Conductivity	0822217	2490	2550		1	-2.38%	(-0.4604) - (0.5358)	SM 2510B	
- Recovery was within 10% of expected value									
pH	0822217	8.24	8.24		1	0.00%	(-1.849) - (2.271)	SM 4500-H+ B	
TDS	0822306	1200	1190	100ml		1.17%	(-4.553) - (8.874)	SM 2540 C	
TDS	0822301	579	593	100ml		-2.39%	(-4.553) - (8.874)	SM 2540 C	
TDS	0822216	739	736	100ml		0.407%	(-4.553) - (8.874)	SM 2540 C	
TSS	0822204	< 10.0	< 10.0	100ml		0.00%	(-9.518) - (9.754)	SM 2540 D	
TSS	0822306	124	123	100ml		0.810%	(-9.518) - (9.754)	SM 2540 D	
N, Ammonia	0825103	< 0.050	< 0.050		1	0.00%	(-8.714) - (9.383)	Timberline-001	
N, Ammonia	0822302	< 0.050	< 0.050		1	0.00%	(-8.714) - (9.383)	Timberline-001	
N, Ammonia	0822109	69.7	70.0		20	-0.429%	(-8.714) - (9.383)	Timberline-001	
N, Ammonia	0825209	< 0.050	< 0.050		1	0.00%	(-8.714) - (9.383)	Timberline-001	
N, Ammonia	0822401	2.10	2.11		1	-0.475%	(-8.714) - (9.383)	Timberline-001	
N, Nitrate	0822308	3.51	3.48		4	0.974%	(-2.798) - (3.193)	SM 4500-NO3 F	
Initial Calibration Verification									
Conductivity		1420	1410		1	0.283%	(-3.530) - (2.242)	SM 2510B	
pH		7.01	7.00		1	0.143%	(-0.9838) - (1.084)	SM 4500-H+ B	
TDS		1010	1000	100ml		0.800%	(-1.806) - (3.146)	SM 2540 C	
TSS		50.0	50.0	100ml		0.00%	(-3.567) - (7.767)	SM 2540 D	
CN, WAD		0.107	0.100		1	7.00%	(-9.360) - (12.36)	Kelada 01	
N, Ammonia		2.24	2.50		1	-10.4 %	(-13.35) - (15.64)	Timberline-001	
N, Ammonia		9.45	10.0		1	-5.50%	(-13.35) - (15.64)	Timberline-001	
N, Nitrate		0.990	1.00		1	-1.00%	(-7.423) - (6.533)	SM 4500-NO3 F	
Phosphorus - D		0.099	0.100		1	-1.00%	(-7.350) - (8.150)	SM 4500-P E	
Arsenic - D		0.050	0.050		1	0.280%	(-4.866) - (3.038)	EPA 200.8	
Barium - D		0.050	0.050		1	-0.200%	(-5.827) - (3.549)	EPA 200.8	
Cadmium - D		0.050	0.050		1	0.600%	(-3.881) - (4.101)	EPA 200.8	
Chromium - D		0.050	0.050		1	0.440%	(-5.499) - (8.939)	EPA 200.8 DRC	
Copper - D		0.051	0.050		1	2.06%	(-2.745) - (3.907)	EPA 200.8	
Iron - D		0.246	0.250		1	-1.61%	(-7.227) - (8.491)	EPA 200.8	
Lead - D		0.0512	0.0500		1	2.34%	(-1.442) - (5.312)	EPA 200.8	
Nickel - D		0.052	0.050		1	3.68%	(-3.122) - (5.128)	EPA 200.8	
Selenium - D		0.253	0.250		1	1.02%	(-4.728) - (4.386)	EPA 200.8	
Silver - D		0.0501	0.0500		1	0.140%	(-2.483) - (5.763)	EPA 200.8	
Zinc - D		0.051	0.050		1	0.940%	(-3.127) - (2.381)	EPA 200.8	

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Initial Calibration Verification								
Mercury - T		0.0029	0.0030		1	-4.67%	(-9.601) - (13.23)	EPA 245.1
Selenium (IV)		0.010	0.010		1	-2.00%	(-25.87) - (27.17)	Selenium (IV) Speciation
Selenium (VI)		0.010	0.010		1	0.00%	(-31.06) - (19.66)	Selenium (VI) Speciation
Continuing Calibration Verification								
Conductivity		1400	1410		1	-0.778%	(-3.618) - (2.323)	SM 2510B
pH		7.02	7.00		1	0.286%	(-3.098) - (3.931)	SM 4500-H+ B
pH		4.08	4.00		1	2.00%	(-3.098) - (3.931)	SM 4500-H+ B
pH		10.0	10.0		1	0.200%	(-3.098) - (3.931)	SM 4500-H+ B
pH		7.05	7.00		1	0.714%	(-3.098) - (3.931)	SM 4500-H+ B
CN, WAD		0.099	0.100		1	-1.00%	(-13.96) - (11.16)	Kelada 01
CN, WAD		0.105	0.100		1	5.00%	(-13.96) - (11.16)	Kelada 01
N, Ammonia		2.37	2.50		1	-5.20%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		2.25	2.50		1	-10.0%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		0.055	0.050		1	9.60%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		2.26	2.50		1	-9.60%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		2.40	2.50		1	-4.00%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		4.71	5.00		1	-5.80%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		0.455	0.500		1	-9.00%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		0.963	1.00		1	-3.70%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		2.40	2.50		1	-4.00%	(-17.93) - (13.77)	Timberline-001
N, Ammonia		0.097	0.100		1	-3.00%	(-17.93) - (13.77)	Timberline-001
N, Nitrate		1.02	1.00		1	1.60%	(-2.914) - (8.184)	SM 4500-NO3 F
N, Nitrate		1.02	1.00		1	1.80%	(-2.914) - (8.184)	SM 4500-NO3 F
N, Nitrate		1.02	1.00		1	2.20%	(-2.914) - (8.184)	SM 4500-NO3 F
Phosphorus - D		0.098	0.100		1	-2.00%	(-11.61) - (11.01)	SM 4500-P E
Arsenic - D		0.047	0.050		1	-6.50%	(-5.772) - (4.520)	EPA 200.8
- Recovery was within 10% of expected value								
Arsenic - D		0.049	0.050		1	-1.36%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.049	0.050		1	-2.24%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.049	0.050		1	-2.30%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.051	0.050		1	1.86%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.048	0.050		1	-3.28%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.048	0.050		1	-4.28%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.050	0.050		1	-0.880%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.049	0.050		1	-2.44%	(-5.772) - (4.520)	EPA 200.8
Arsenic - D		0.048	0.050		1	-4.56%	(-5.772) - (4.520)	EPA 200.8
Barium - D		0.049	0.050		1	-2.82%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.048	0.050		1	-4.86%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.049	0.050		1	-1.42%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.049	0.050		1	-1.82%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.048	0.050		1	-4.08%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.049	0.050		1	-2.12%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.050	0.050		1	0.400%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.049	0.050		1	-2.38%	(-10.04) - (9.766)	EPA 200.8
Barium - D		0.049	0.050		1	-2.48%	(-10.04) - (9.766)	EPA 200.8

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Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Verification								
Barium - D		0.048	0.050		1	-3.84%	(-10.04) - (9.766)	EPA 200.8
Cadmium - D		0.049	0.050		1	-2.94%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.050	0.050		1	-0.680%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.049	0.050		1	-2.76%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.050	0.050		1	-0.940%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.050	0.050		1	-0.960%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.050	0.050		1	-0.320%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.049	0.050		1	-1.98%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.049	0.050		1	-2.64%	(-3.322) - (5.098)	EPA 200.8
Cadmium - D		0.048	0.050		1	-3.80%	(-3.322) - (5.098)	EPA 200.8
- Recovery was within 10% of expected value								
Cadmium - D		0.050	0.050		1	0.460%	(-3.322) - (5.098)	EPA 200.8
Calcium - D		24.5	25.0		1	-2.04%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.9	25.0		1	-0.240%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		23.8	25.0		1	-4.64%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.0	25.0		1	-4.12%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.3	25.0		1	-2.84%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		23.6	25.0		1	-5.68%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.1	25.0		1	-3.56%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.2	25.0		1	-3.12%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		24.0	25.0		1	-4.16%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		23.8	25.0		1	-4.64%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		23.7	25.0		1	-5.04%	(-13.41) - (4.279)	SM 3111 B
Calcium - D		23.5	25.0		1	-5.92%	(-13.41) - (4.279)	SM 3111 B
Chromium - D		0.049	0.050		1	-3.08%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.050	0.050		1	-0.300%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.053	0.050		1	5.96%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.050	0.050		1	0.380%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.054	0.050		1	7.74%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-2.46%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-1.74%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-1.48%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.053	0.050		1	6.60%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-2.84%	(-12.72) - (12.78)	EPA 200.8 DRC
Chromium - D		0.050	0.050		1	-1.08%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-1.88%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.048	0.050		1	-3.50%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-1.78%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-2.08%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-2.10%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.051	0.050		1	1.84%	(-10.12) - (12.96)	EPA 200.8 DRC
Chromium - D		0.049	0.050		1	-2.68%	(-10.12) - (12.96)	EPA 200.8 DRC
Copper - D		0.049	0.050		1	-1.52%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.049	0.050		1	-2.04%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.050	0.050		1	0.120%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.051	0.050		1	2.04%	(-11.93) - (13.23)	EPA 200.8

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Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Verification								
Copper - D		0.049	0.050		1	-1.66%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.051	0.050		1	1.70%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.051	0.050		1	1.72%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.049	0.050		1	-2.16%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.048	0.050		1	-3.18%	(-11.93) - (13.23)	EPA 200.8
Copper - D		0.049	0.050		1	-1.32%	(-11.93) - (13.23)	EPA 200.8
Iron - D		0.243	0.250		1	-2.74%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.248	0.250		1	-0.948%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.246	0.250		1	-1.79%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.240	0.250		1	-3.84%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.252	0.250		1	0.656%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.258	0.250		1	3.12%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.248	0.250		1	-0.900%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.267	0.250		1	6.80%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.245	0.250		1	-1.90%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.261	0.250		1	4.20%	(-12.97) - (11.92)	EPA 200.8
Iron - D		0.241	0.250		1	-3.61%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.243	0.250		1	-2.80%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.240	0.250		1	-3.93%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.242	0.250		1	-3.07%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.239	0.250		1	-4.48%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.248	0.250		1	-0.912%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.242	0.250		1	-3.12%	(-9.601) - (11.31)	EPA 200.8
Iron - D		0.243	0.250		1	-2.74%	(-9.601) - (11.31)	EPA 200.8
Lead - D		0.0492	0.0500		1	-1.54%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0482	0.0500		1	-3.70%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0506	0.0500		1	1.20%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0488	0.0500		1	-2.40%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0480	0.0500		1	-3.96%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0503	0.0500		1	0.620%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0506	0.0500		1	1.12%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0503	0.0500		1	0.680%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0498	0.0500		1	-0.480%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0501	0.0500		1	0.120%	(-15.12) - (12.63)	EPA 200.8
Lead - D		0.0494	0.0500		1	-1.30%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0496	0.0500		1	-0.860%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0500	0.0500		1	-0.060%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0493	0.0500		1	-1.34%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0494	0.0500		1	-1.18%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0496	0.0500		1	-0.800%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0495	0.0500		1	-1.00%	(-10.87) - (10.41)	EPA 200.8
Lead - D		0.0497	0.0500		1	-0.700%	(-10.87) - (10.41)	EPA 200.8
Magnesium - D		24.9	25.0		1	-0.440%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.5	25.0		1	-2.12%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.9	25.0		1	-0.520%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		25.1	25.0		1	0.520%	(-6.274) - (4.330)	SM 3111 B

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Verification								
Magnesium - D		24.8	25.0		1	-0.960%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.5	25.0		1	-2.16%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.8	25.0		1	-0.840%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		25.3	25.0		1	1.08%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.4	25.0		1	-2.28%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		25.0	25.0		1	0.00%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.9	25.0		1	-0.280%	(-6.274) - (4.330)	SM 3111 B
Magnesium - D		24.2	25.0		1	-3.32%	(-6.274) - (4.330)	SM 3111 B
Nickel - D		0.049	0.050		1	-2.76%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.049	0.050		1	-2.52%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.051	0.050		1	1.92%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.051	0.050		1	1.22%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.050	0.050		1	0.220%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.048	0.050		1	-4.04%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.049	0.050		1	-2.72%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.051	0.050		1	1.22%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.049	0.050		1	-1.48%	(-14.60) - (15.40)	EPA 200.8
Nickel - D		0.049	0.050		1	-2.02%	(-14.60) - (15.40)	EPA 200.8
Selenium - D		0.243	0.250		1	-2.62%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.239	0.250		1	-4.59%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.241	0.250		1	-3.80%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.252	0.250		1	0.640%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.243	0.250		1	-2.84%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.240	0.250		1	-3.86%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.238	0.250		1	-4.75%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.237	0.250		1	-5.31%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.248	0.250		1	-0.648%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.244	0.250		1	-2.51%	(-11.49) - (6.786)	EPA 200.8
Selenium - D		0.244	0.250		1	-2.41%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.246	0.250		1	-1.67%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.236	0.250		1	-5.60%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.234	0.250		1	-6.46%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.246	0.250		1	-1.66%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.246	0.250		1	-1.48%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.245	0.250		1	-1.82%	(-7.813) - (4.297)	EPA 200.8
Selenium - D		0.247	0.250		1	-1.03%	(-7.813) - (4.297)	EPA 200.8
Silver - D		0.0495	0.0500		1	-1.10%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0488	0.0500		1	-2.46%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0470	0.0500		1	-6.00%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0453	0.0500		1	-9.38%	(-7.213) - (3.953)	EPA 200.8
- Recovery was within 10% of expected value								
Silver - D		0.0487	0.0500		1	-2.62%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0495	0.0500		1	-1.06%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0498	0.0500		1	-0.380%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0478	0.0500		1	-4.40%	(-7.213) - (3.953)	EPA 200.8
Silver - D		0.0516	0.0500		1	3.22%	(-7.213) - (3.953)	EPA 200.8

X

Parameter	QC Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Verification								
Silver - D		0.0464	0.0500		1	-7.16%	(-7.213) - (3.953)	EPA 200.8
Zinc - D		0.049	0.050		1	-1.32%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.050	0.050		1	0.060%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.051	0.050		1	1.22%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.050	0.050		1	-0.640%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.049	0.050		1	-2.52%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.049	0.050		1	-2.34%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.050	0.050		1	0.360%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.051	0.050		1	1.86%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.049	0.050		1	-1.94%	(-8.160) - (9.946)	EPA 200.8
Zinc - D		0.050	0.050		1	-0.840%	(-8.160) - (9.946)	EPA 200.8
Mercury - T		0.0019	0.0020		1	-6.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-7.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-6.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-3.50%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0009	0.0010		1	-7.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-5.50%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0051	0.0050		1	2.80%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0018	0.0020		1	-9.50%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0018	0.0020		1	-8.50%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-5.50%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-6.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-4.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0019	0.0020		1	-4.00%	(-13.86) - (13.10)	EPA 245.1
Mercury - T		0.0020	0.0020		1	-2.00%	(-13.86) - (13.10)	EPA 245.1
Selenium (IV)		0.010	0.010		1	-4.00%		Selenium (IV) Speciation
Selenium (IV)		0.010	0.010		1	1.00%		Selenium (IV) Speciation
Selenium (IV)		0.009	0.010		1	-6.00%		Selenium (IV) Speciation
Selenium (VI)		0.010	0.010		1	-2.00%		Selenium (VI) Speciation
Selenium (VI)		0.010	0.010		1	-3.00%		Selenium (VI) Speciation
Selenium (VI)		0.010	0.010		1	-2.00%		Selenium (VI) Speciation

Initial Calibration Blank

Conductivity		0.300	0.00		1	0.3	(-0.0876) - (0.8276)	SM 2510B
TDS		-2.00	0.00		100ml	2	(-2.372) - (4.372)	SM 2540 C
TSS		2.00	0.00		100ml	2	(-1.110) - (1.710)	SM 2540 D
- Blank value is less than half of the reporting limit								
CN, WAD		0.001	0.00		1	0.00057	(-0.0013) - (0.0037)	Kelada 01
N, Ammonia		0.001	0.00		1	0.001	(-0.0039) - (0.0171)	Timberline-001
N, Nitrate		-0.009	0.00		1	0.009	(-0.0128) - (0.0200)	SM 4500-NO3 F
Phosphorus - D		0.00	0.00		1	0	(-0.0048) - (0.0059)	SM 4500-P E
Mercury - T		0.0001	0.000		1	0.00008	(-0.0001) - (0.0001)	EPA 245.1

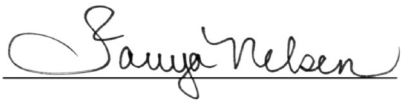
Continuing Calibration Blank

Conductivity		0.400	0.00		1	0.4	(0.0142) - (0.9658)	SM 2510B
CN, WAD		0.002	0.00		1	0.0023	(-0.0045) - (0.0063)	Kelada 01

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Blank								
CN, WAD		0.001	0.00		1	0.00057	(-0.0045) - (0.0063)	Kelada 01
N, Ammonia		0.003	0.00		1	0.003	(-0.0047) - (0.0216)	Timberline-001
N, Ammonia		0.001	0.00		1	0.0012	(-0.0047) - (0.0216)	Timberline-001
N, Ammonia		0.001	0.00		1	0.001	(-0.0047) - (0.0216)	Timberline-001
N, Ammonia		0.001	0.00		1	0.0013	(-0.0047) - (0.0216)	Timberline-001
N, Ammonia		0.001	0.00		1	0.0012	(-0.0047) - (0.0216)	Timberline-001
N, Nitrate		-0.008	0.00		1	0.008	(-0.0037) - (0.0106)	SM 4500-NO3 F
N, Nitrate		0.001	0.00		1	0.001	(-0.0037) - (0.0106)	SM 4500-NO3 F
N, Nitrate		-0.008	0.00		1	0.008	(-0.0037) - (0.0106)	SM 4500-NO3 F
Phosphorus - D		-0.001	0.00		1	-0.001	(-0.0058) - (0.0082)	SM 4500-P E
Arsenic - D		0.000	0.00		1	0.00002	(0.0000) - (0.0001)	EPA 200.8
Barium - D		0.000	0.00		1	0.00001	(0.0000) - (0.0000)	EPA 200.8
Cadmium - D		0.000	0.00		1	-0.00001	(0.0000) - (0.0000)	EPA 200.8
Calcium - D		0.020	0.00		1	0.02	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		-0.160	0.00		1	-0.16	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.010	0.00		1	0.01	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		-0.110	0.00		1	-0.11	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		-0.130	0.00		1	-0.13	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.00	0.00		1	0	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.030	0.00		1	0.03	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		-0.170	0.00		1	-0.17	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.020	0.00		1	0.02	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		-0.070	0.00		1	-0.07	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.010	0.00		1	0.01	(-0.3062) - (0.4562)	SM 3111 B
Calcium - D		0.040	0.00		1	0.04	(-0.3062) - (0.4562)	SM 3111 B
Chromium - D		0.000	0.00		1	0.00001	(0.0000) - (0.0001)	EPA 200.8 DRC
Copper - D		0.00	0.00		1	0	(0.0000) - (0.0001)	EPA 200.8
Iron - D		0.00	0.00		1	0	(-0.0006) - (0.0009)	EPA 200.8
Lead - D		0.000	0.000		1	0	(0.0000) - (0.0000)	EPA 200.8
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.020	0.00		1	0.02	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.030	0.00		1	0.03	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.050	0.00		1	0.05	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.020	0.00		1	0.02	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		-0.010	0.00		1	-0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.040	0.00		1	0.04	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Magnesium - D		0.010	0.00		1	0.01	(-0.1459) - (0.0789)	SM 3111 B
Nickel - D		0.00	0.00		1	0	(0.0000) - (0.0000)	EPA 200.8
Selenium - D		0.000	0.00		1	0.0001	(-0.0002) - (0.0004)	EPA 200.8
Silver - D		-0.0001	0.000		1	-0.00007	(0.0000) - (0.0001)	EPA 200.8
- Blank value is less than half of the reporting limit								
Zinc - D		0.000	0.00		1	-0.00001	(-0.0002) - (0.0002)	EPA 200.8

X

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Blank								
Mercury - T		0.0000	0.000		1	0.00004	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0000	0.000		1	0.00003	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00005	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00008	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0000	0.000		1	0.00004	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00005	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00008	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00009	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00005	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0001	0.000		1	0.00009	(-0.0001) - (0.0001)	EPA 245.1
Mercury - T		0.0000	0.000		1	0.00004	(-0.0001) - (0.0001)	EPA 245.1

Approved By: 

Approved On: 09/16/2025 11:42 AM

EXAMPLE



MIDCONTINENT TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709 (605) 348-0111 www.thechemistrylab.com

Sample Site: GR - A
Sampled: 08/26/24 at 11:19 AM by Zachary Adam
Sample Matrix: Water
Lab ID#: 20240828202
Received: 08/27/24 at 11:50 AM by Bobbie Laurenz W1433 - South Dakota
Account: Science & Technology Authority

JULIE EWING
SOUTH DAKOTA SCIENCE & TECHNOLOGY AUTHORITY
630 EAST SUMMIT STREET
LEAD, SD 57754

Table with columns: Parameter, Result, Units, DF, MDL, PQL, Method, Analyst/Date. Rows include Physical Properties (Electrical Conductivity, Hardness, pH, etc.), Non-Metallics (Cyanide, Nitrogen, Phosphorus), Metals - Dissolved (Calcium, Magnesium), Metals - Total (Mercury), Metals - Total Recoverable (Arsenic, Cadmium, Chromium, etc.), and Metals - Speciation (Selenium).

Report Approved By:

[Signature]

SAMPLE RECEIPT CHECKLIST

Company Name SOSTA

Date/Time Received 8-19-25 1211
Date / Time

Project _____

Received by [Signature] / Steve Kistan

Lab Number(s) 216-220 822-25

Carrier Name RD

Yes	No	<u>UNPACKING</u>	Initials
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. Shipping container in good condition?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Custody seals present on shipping container? Condition: Intact <input checked="" type="checkbox"/> Broken <input type="checkbox"/>	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. <u>ice</u> / Blue Ice (circle one) present in shipping container? Container(s) Temp. 1. <u>6.6</u> 2. _____ 3. _____ 4. _____	_____
<input type="checkbox"/>	<input checked="" type="checkbox"/>	4. Bottles broken and/or leaking? (Photograph broken bottles.)	_____
<input type="checkbox"/>	<input checked="" type="checkbox"/>	5. Custody seals on sample bottles? Condition: Intact <input type="checkbox"/> Broken <input type="checkbox"/>	_____

Yes	No	<u>LABELING</u>	Initials
<input type="checkbox"/>	<input type="checkbox"/>	6. Chain of custody Present?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. Chain of custody includes signatures, dates, and times when relinquished and received?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Chain of custody agrees with bottle count?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. Chain of custody agrees with labels?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. Samples received within holding times?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. Samples in proper container?	_____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. Sufficient sample volume for indicated tests?	_____

		<u>PRESERVATIVE</u>					
Yes	No	Initials	Yes	No	Initials		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. Metals bottle(s) pH < 2? _____	<input type="checkbox"/>	<input type="checkbox"/>	17. TOC bottle(s) pH < 2? _____		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. Nutrient bottle(s) pH < 2? _____	<input type="checkbox"/>	<input type="checkbox"/>	18. Oil & Grease bottle(s) pH < 2? _____		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. Cyanide bottle(s) pH > 12? _____	<input type="checkbox"/>	<input type="checkbox"/>	19. Volatiles pH < 2? _____		
<input type="checkbox"/>	<input type="checkbox"/>	16. Sulfide bottle(s) pH > 9? _____					

COMMENTS: _____



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CHAIN OF CUSTODY RECORD

FOR LAB USE ONLY
 Seal Intact (Y/N) Number 2
 Sample Condition good
 Temperature of Container min 6:00

REQUESTED TURN AROUND
 STANDARD _____ RUSH _____

PRESERVED WITH									
FILTERED (Y/N)									
REFRIGERATED (Y/N)									
ANALYSES REQUESTED									

Company SD STA
 Project Name / Mgr. Weekly OPDES / Sampling
 Project Number _____
 Sampled by Cody Jones
 Signature _____
 Printed Cody Jones

SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1 001 weekly	8-19-25	0759	L	4	metals (tr) <u>Roche</u> As, Cu, Pb, Hg, Se, Ag	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
<u>[Signature]</u>	SD STA	8-19-25	0810	<u>[Signature]</u>	Rapid Del	8/19/25	10:35
<u>[Signature]</u>	Rapid Del	8-19-25	12:08	<u>[Signature]</u>	MCT	8/19/25	12:11



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CHAIN OF CUSTODY RECORD

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	metals (tr) - 2 lines

FOR LAB USE ONLY

Seal Intact (Y/N)/Number _____

Sample Condition _____

Temperature of Container _____

REQUESTED TURN AROUND

STANDARD _____ RUSH _____

Company: **SOSTA**

Project Name / Mgr. _____

Project Number _____

Sampled by: *Doug Cooley*
Signature

Sampled by: *Doug Cooley*
Print

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	MJD EW030	8-18-25	1340	L	1	Metals (tr) include As, Ba, Cd, Cr, Pb, Hg, Se, Ag	
2							
3	219						
4							
5	MJD EW031	8-18-25	1343	L	1	Metals (tr) include As, Ba, Cd, Cr, Pb, Hg, Se, Ag	
6							
7	220						
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
<i>Doug Cooley</i>	SOSTA	8-19-25	0800	<i>Shirley Larson</i>	Rapid Del	8/19/25	10:25
<i>Shirley Larson</i>	Rapid Del	8-19-25	12:11	<i>S. Larson</i>	MCT	8/19/25	12:11

Appendix D Long-Term Benthic Macroinvertebrate Data

Table D-1: Long-term benthic macroinvertebrate data on Gold Run Creek from 2002 – 2025.

Year	Abundance (/sample)	Number of Total Taxa	Number of EPT Taxa	Number of Plecoptera Taxa	Shannon-Weaver Diversity	Percentage of Sensitive EPT Taxa	Hilsenhoff Biotic Index
Site GR-A							
2009	59	21	4	0	3.93	5.0	6.75
2010	555	30	4	1	3.46	10.0	8.03
2011	244	31	4	0	4.32	10.0	6.25
2012	29	15	0	0	3.41	0.0	6.59
2013	95	21	2	0	2.94	5.0	5.08
2014	269	17	2	0	3.09	12.0	7.28
2015	143	15	2	1	2.11	7.0	5.29
2016	147	24	3	0	3.11	8.0	5.39
2017	177	28	3	0	3.96	4.0	6.39
2018	255	20	5	0	1.99	15.0	5.53
2019	548	18	2	0	1.41	0.0	5.36
2020	602	25	3	0	2.49	8.0	5.20
2021	353	22	3	0	2.88	5.0	6.24
2022	263	28	5	1	3.09	11.0	7.79
2023	310	26	2	0	3.51	4.0	5.80
2024	221	32	7	2	3.38	12.5	6.39
2025	418	25	6	0	2.00	12	5.39
2009 – 2024 Averages	267	23	3	0.31	3.07	7.3	6.21
Site GR-B							
2010	415	25	6	1	3.56	16.0	5.71
2011	1480	19	4	0	2.41	11.0	6.03
2012	385	20	6	0	2.56	10.0	6.35
2013	1018	23	6	0	2.71	17.0	5.33
2014	273	27	7	1	3.57	26.0	6.18
2015	141	15	5	0	2.96	7.0	5.70

Year	Abundance (/sample)	Number of Total Taxa	Number of EPT Taxa	Number of Plecoptera Taxa	Shannon-Weaver Diversity	Percentage of Sensitive EPT Taxa	Hilsenhoff Biotic Index
2016	368	28	6	0	3.49	11.0	5.43
2017	1210	23	6	0	3.14	13.0	6.15
2018	800	31	4	0	2.73	10.0	5.58
2019	386	14	5	1	1.26	21.0	5.16
2020	958	19	7	0	3.00	26.0	6.04
2021	565	31	8	1	2.50	13.0	5.07
2022	1576	27	5	0	2.46	7.0	4.87
2023	588	25	6	2	3.24	16.0	5.50
2024	89	17	3	0	3.51	11.8	6.13
2025	213	29	7	0	3.41	10.3	5.85
2010 – 2024 Averages	683	23	6	0.40	2.87	14	5.68

Appendix E Long-Term Periphyton Data

Table D-1: Long-term periphyton data on Gold Run Creek from 2002 – 2025

Year	Density (cells/cm ²)	Total Number of Taxa	Total Number of Diatom Taxa	Shannon-Weaver Diversity	Percentage of Tolerant Diatoms	Percentage of Motile Diatoms
Site GR-A						
2009	1,200	2	2	0.81	0	0
2010	164,400	10	10	1.06	0.9	10.9
2011	61,300	6	6	0.26	1.5	1.95
2012	1,400	3	3	1.09	0	28.6
2013	30,700	7	7	0.38	0	0.7
2014	14,059	9	9	0.82	1.8	9.7
2015	712,471	8	8	0.26	0.6	1.4
2016	969,632	9	9	0.29	2	1
2017	1,807,889	7	7	0.20	1.1	0.5
2018	321,295	9	9	0.40	0.8	0.8
2019	0	0	0	--	--	--
2020	769,050	10	10	0.44	0	1
2021	248,173	14	14	1.04	0.7	8.9
2022	999,705	8	8	0.48	0	2
2023	46,315	2	2	0.02	0.2	0
2024	1,560	14	14	3.08	0	20
2025	2,383	24	9	1.1	0	8.9
2009 – 2024 Averages	384,322	7	7	0.71	0.6	6
Site GR-B						
2010	265,700	12	12	1.03	5.3	97.9
2011	136,800	14	14	1.66	77.9	88
2012	54,400	12	12	1.31	81.3	89
2013	38,700	16	16	3.04	34.6	91.7
2014	115,692	10	10	0.92	87.3	95.3
2015	286,189	12	12	1.78	10.5	85.3

Year	Density (cells/cm ²)	Total Number of Taxa	Total Number of Diatom Taxa	Shannon-Weaver Diversity	Percentage of Tolerant Diatoms	Percentage of Motile Diatoms
2016	413,801	16	16	2.77	48	45
2017	4,743,276	19	19	3.40	57.4	53.3
2018	72,557	12	12	2.76	15.1	20.8
2019	89,726	17	17	2.96	3.4	20.5
2020	968,487	16	16	1.23	0.2	4
2021	128,914	9	9	1.85	1.5	4.4
2022	743,441	16	16	2.43	1.6	9
2023	52,931	17	17	2.78	8.7	24.6
2024	46	1	1	0	0	0
2025	6,889	9	9	1.62	3.2	6.4
2010 – 2024 Averages	540,711	13	13	1.99	28.9	48.59