



COMMUNITY-BASED WATER MONITORING

2022 CABIN REPORT

2022

PREPARED BY:

ELK RIVER ALLIANCE, FERNIE, BC

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THE PROVINCE OF BRITISH COLUMBIA'S BC COMMUNITY GAMING GRANT & HEALTHY WATERSHED INITIATIVE

THE REAL ESTATE FOUNDATION OF BRITISH COLUMBIA

THE ERA COMMUNITY



Land Acknowledgment

ERA operates within the ?amaḱ?is Ktunaxa, the Traditional Territory of the Ktunaxa Nation.

For more than 10,000 years, the Ktunaxa people have occupied their traditional territory, the ?amaḱ?is Ktunaxa, which spans from southwestern Canada into parts of the United States. (Ktunaxa Nation Council 2022). The Elk River flows through part of this traditional territory, the Qukin ?amaḱ?is, or the land of the raven. Prior to European settlement, the Ktunaxa people moved throughout this land, following vegetation and hunting cycles. The introduction of European settlers in the late 1800s and the creation of Indian reservations marked the beginning of large land-use changes and a long history of resource development.



Executive Summary

The Elk River Alliance's (ERA) Community-based Monitoring program (CBWM) was established in 2012 as a response to rising community concern over the health of the Elk River Watershed. The primary purpose of the program is to fill in gaps in currently available watershed data and to make these data accessible to the wider community. In 2020, ERA's CBWM program transitioned into a fully CABIN (Canadian Aquatic Biomonitoring Network) based program, adopting these nationally recognized protocols to assess 10 sites across 5 tributaries of the Elk River, all affected by different types of land-use and development.

The Elk Valley has a long history of resource development following European arrival more than 100 years ago. Currently, the valley is home to 4 active steelmaking coal mines, with two additional mines and a mine extension either currently submitted or pending submission for regulatory review. Following a long period of moderate timber extraction over the past century, the valley is experiencing a rapid increase in the rate and volume of clearcut timber harvesting by a private logging operation. Growing urban centers and linear development such as road, rail, power, and natural gas also have their impacts on the Elk River and its tributaries. Since there are extensive government and industry water monitoring programs examining the effects of mining operations, the Elk River Alliance's CBWM program focuses on streams impacted by other land uses, which are not directly affected by current mining operations.

Analysis of 2022 sampling data indicated that sites on Alexander Creek (ALX001, ALX003) and Boivin Creek (BOI001, BOI002) are in similar condition to their associated reference sites, based on their benthic macroinvertebrate communities, meaning that these streams likely contain healthy aquatic habitats. Conversely, sites on lower Coal Creek (COL001), lower Morrissey Creek (MOR001), and both Lizard Creek locations (LIZ001, LIZ003) deviated significantly from "reference condition" indicating potentially degraded aquatic systems. 2022 sampling also indicated that the upper Coal Creek (COL003) and upper Morrissey Creek (MOR002) sites may be moving away from "reference condition" with COL003 assessed at "divergent" and MOR002 becoming "mildly divergent". Initial investigations have not identified a clear cause. Further in-depth research is needed to determine the accuracy of these results and potential stressors affecting these tributaries.



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- Ashlee Jollymore, ERA Board of Directors (Program Advisor)
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The **Healthy Watersheds Initiative** is a \$27-million program, supported by the Province of BC, to stimulate British Columbia's economic recovery through investments in community-driven watershed conservation and restoration projects. Through this program, the Real Estate Foundation of BC, in partnership with Watersheds BC, is administering grants for more than 60 watershed security projects in communities across the province.

https://refbc.com/healthy-watersheds-initiative

The **Real Estate Foundation of BC** is a philanthropic organization that works to advance sustainable land use and real estate practices in British Columbia. Since 1988, the REFBC has granted more than \$90 million for research, education, and policy projects that strengthen BC communities and protect our land and water.

https://refbc.com

Watersheds BC was launched in 2020 to support water leaders to improve decision-making for their home waters by equipping them with the knowledge, skills, and connections they need to engage effectively in their watershed. WBC supports water leaders across many organizations including First Nation communities and governments, local government staff, watershed boards and roundtables, provincial government staff, and other community champions.

https://www.watershedsbc.ca

The **Province of BC** has invested \$37 million (including \$27 million through the Healthy Watersheds Initiative) for projects that support healthy watersheds, species, and ecosystems, and create new jobs in areas that are critical to help communities adapt to the effects of climate change. This funding is part of the Province's \$10-billion COVID-19 response to help people in hard-hit industries.

https://strongerbc.gov.bc.ca



Introduction

The Elk River Alliance

Operating since 2010, the Elk River Alliance (ERA) is a community-based water charity that connects people to the Elk River using science, education and community collaboration to ensure sustainable stewardship of the Elk River watershed. ERA aims to improve and preserve watershed health through projects that raise watershed literacy, inform sustainable water decision-making, collect scientific data to prioritize restoration opportunities, and promote safe and sustainable river recreation. ERA is a registered charity that is governed by a volunteer board consisting of board members from various backgrounds.

ERA has four guiding principles: (1) Stimulate conversation, share information, and facilitate community input to encourage sustainable water decision-making in the Elk Valley; (2) Promote a new era in watershed thinking by coordinating a community voice to contribute to watershed planning and management activities, regulatory processes, and other regional water initiatives; (3) Bring together diverse points of view and offer a safe place to dialogue about the Elk River, and; (4) Unite, not divide.

Advisor Credentials

Stella Swanson, Ph.D. Limnology (ERA Director)

Stella is an aquatic biologist whose 42 year-career has included management of the Aquatic Biology Group at the Saskatchewan Research Council and consulting with SENTAR Consultants and Golder Associates, Ltd. She has owned and operated Swanson Environmental Strategies since 2007, where she focuses on environmental risk management, Indigenous and community engagement, and sustainability. Stella has contributed to dozens of environmental impact assessments, ecological risk assessments and human health risk assessments. She provides strategic advice regarding the regulatory requirements for resource development projects and facilitates multidisciplinary teams working on a wide range of environmental issues. She led the development of a new generation of monitoring design approaches for Terrestrial Biological Monitoring, focused on monitoring for cumulative effects within the Oil Sands Monitoring Program and in 2020 was appointed to the Nuclear Waste Management Advisory Council to provide advice on siting a high-level nuclear waste facility in Canada. More locally, she led the original development of the Elk Valley Cumulative Effects Management Framework and was the chair of the Strategic Advisory Panel for Selenium Management.

Ashlee Jollymore, Ph.D. Resource Management Studies (ERA Director)

Ashlee is a senior hydrologist for MacDonald Hydrology Consultants Ltd., was previously a hydrologist for the provincial government in the River Forecast Centre, and has experience in forestry, land management and sustainable development.

Staff and Volunteer Credentials

Chad Hughes, Executive Director, B.Sc. Environmental Science

Kaileigh McCallum, Ecologist, M.Sc. Biodiversity & Conservation

Anne-Caroline Kroeger, Program Manager, M.Sc. Bioresource Engineering



Chris Bush, ERA Volunteer

Alana Block, ERA Volunteer

Chandra Buchanan, ERA Volunteer

Meagan Malone, ERA Volunteer

Staff and Volunteers were trained and received CABIN Field technician (Chris Bush, Alana Block, Chandra Buchanan, Meagan Malone, and Anne-Caroline Kroeger) and Project Manager level certification (Chad Hughes and Kaileigh McCallum), through the Canadian Rivers Institute and Living Lakes Canada (LLC). LLC also provided training on the new STREAM e-DNA program.

Community-based Water Monitoring (CBWM)

The Elk River Alliance's Community Based Water Monitoring (CBWM) program collects baseline data on aquatic habitat health and increases community water literacy in the Elk River Watershed, located in the East Kootenay Region of the Province. The program was created to fill gaps in watershed data, with findings creating an opportunity for community and industry discussion on watershed health and providing contextual information to decision makers. Trained staff and volunteers conduct monitoring and research on targeted Elk River tributaries and sharing relevant findings with the community.

The Elk Valley's long-standing relationship with coal mining has resulted in the formation of extensive government and industry water monitoring programs covering a large extent of mine-affected areas. However, aquatic health of non-mine-affected tributaries is not monitored despite impacts from other forms of land use. The Elk River Alliance's Community Based Water Monitoring program began monitoring the effects of land use on non-mine-affected Elk River tributaries to allow for a more well-rounded assessment of the state of the watershed. This program has expanded to now include five Elk River tributaries.

Study Area

ERA's CBWM program is located in the Elk River watershed, within the East Kootenay region of British Columbia (Figure 1). This watershed begins at the Elk Lakes near the Continental Divide and extends to Lake Koocanusa, which continues across the Canada-US border. The communities of Elkford, Sparwood, Hosmer, Fernie and Elko are located along the river as well as rural properties in the Regional District of East Kootenay.

In 2022, the CBWM program assessed ten sites across five major tributaries – Lizard Creek, Alexander Creek, Coal Creek, Boivin Creek and Morrissey Creek (Figure 1). These sites were chosen as they are areas of community interest and/or contain good aquatic habitat that ERA identified as important to monitor, preserve, or restore.



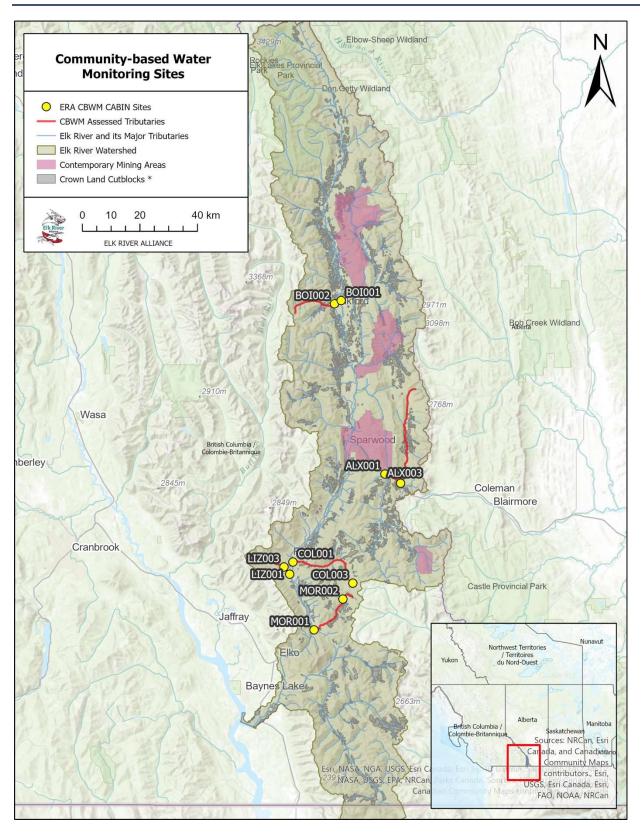


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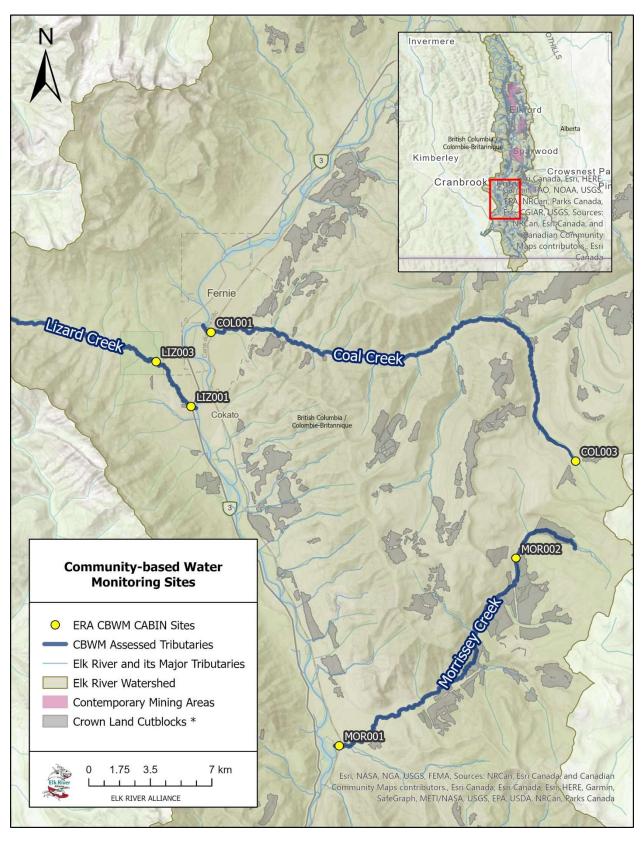


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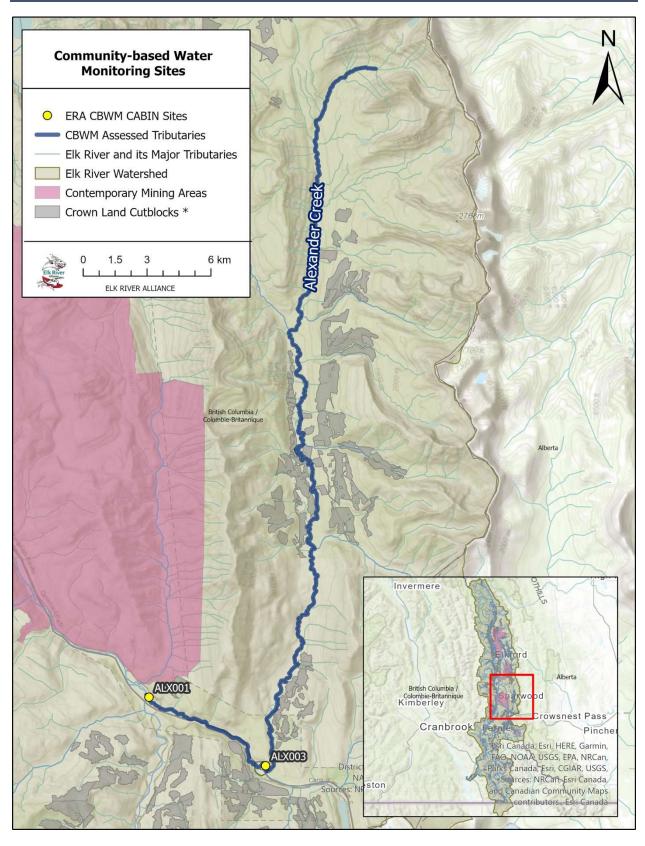


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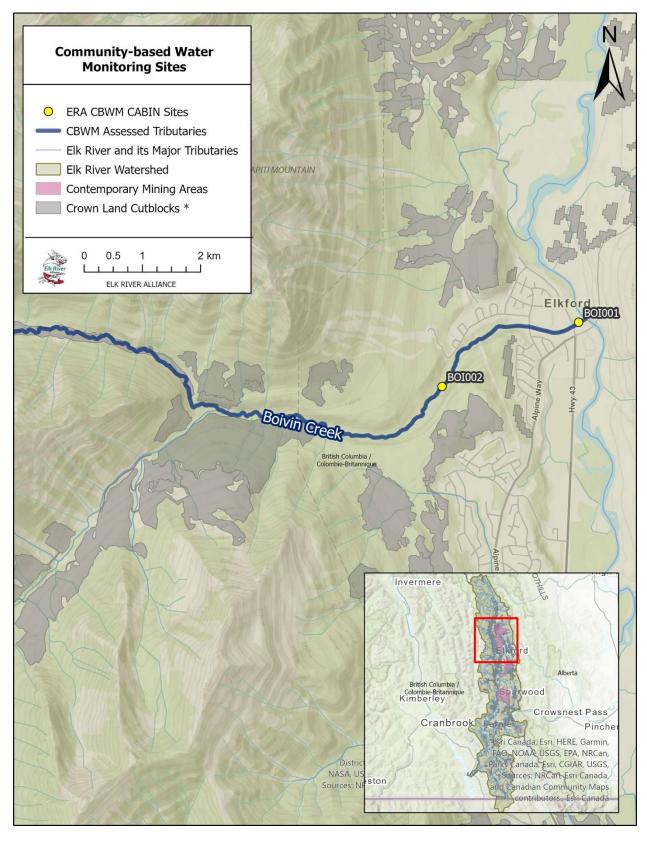


Figure 4. CBWM sites (BOI001, BOI002) on Boivin Creek in Elkford.



Lizard Creek

Lizard Creek, located approximately 5km south of Fernie, was the first Elk River tributary for ERA's CBWM program. It was initially assessed as a 'reference site' in 2011 since at the time, the creek and its catchment had relatively little residential development and no active industrial activity (although logging had occurred historically). A large amount of the lower portion of this creek falls within Mount Fernie Provincial Park and is protected. Upstream of the Provincial Park is Island Lake, a hotel and cat skiing area with access roads. Residential development near the creek began in 2018. Lizard Creek has continued to be monitored as it contains important spawning grounds for Westslope Cutthroat Trout (Elk River Alliance 2020).

Since 2018, the Lizard Creek catchment downstream of the provincial park has seen increasing urban, road and trail development. ERA will continue to pay special attention to these sites as the surrounding land-use changes.

LIZ001



Figure 5. Images of LIZ001: upstream across the stream and downstream. Note the clay visible on the side of the bank. The major flooding event in November 2021 left sections of Lizard Creek scoured down to the clay bed.

LIZ003



Figure 6. Images of LIZ003: upstream, across the stream and downstream.



Alexander Creek

In 2012, sites were established along Alexander Creek. This creek was identified as important due to its role as a significant tributary into Michel Creek, as well as the absence of effects from mining and urban development. The placement of sites along Alexander Creek allowed ERA to expand monitoring efforts into the Sparwood area. Sites along the creek were established to monitor effects related to stream proximity to the Crowsnest Highway, local logging and cattle grazing leases in the area.

The proposed Crown Mountain coal mine in the upper reaches of Alexander Creek poses an additional source of stressors, and continued monitoring here will provide baseline data for pre-mining conditions (NWP Coal Canada Ltd. 2014).

ALX001



Figure 7. Images of ALX001: upstream, across the stream and downstream.

ALX003



Figure 8. Images of ALX003: upstream, across the stream and downstream.



Boivin Creek

In 2018, Boivin Creek was selected to include Elkford in CBWM activities, and to contribute to a greater understanding of tributaries further upstream in the watershed. Boivin Creek was chosen for its undeveloped upstream catchment and to understand the effects of urban development and extensive riprap in its lower reaches.

BOI001



Figure 9. BOI001: upstream, across the stream and downstream.

BO1002



Figure 10. BOI002: upstream, across the stream and downstream.



Coal Creek

Coal Creek was added to the CBWM program in 2019. According to community discussions, this creek purportedly contained good quality habitat for Westslope Cutthroat Trout; however, few spawning sites were identified by ERA in a 2019 redd survey (Elk River Alliance 2020). Historical mining, logging, forestry, access roads, recreational trails/activities, and the old Fernie landfill are all likely stressors on this catchment. In recent years, increased clearcut logging activity and associated road development along Coal Creek continues to alter the waterways in this catchment area.

COL001



Figure 11. COL001: upstream, across the stream and downstream.

COL003



Figure 12. COL003: upstream, across the stream and downstream.



Morrissey Creek

The Morrissey Creek sites are the newest additions to ERA's CBWM monitoring locations, added in 2020 due to the presence of good quality trout spawning habitat coupled with logging, resource road use and cattle grazing activities in the catchment. Monitoring this creek is essential in understanding and potentially mitigating the effects of logging, linear development (forestry roads, gas lines), recreational use (vehicle and ATV access), agriculture, and natural erosion that may degrade Morrissey Creek.

These Morrissey Creek locations may also allow ERA to monitor the effects of short-term developments. In 2022, TC Energy began pipeline work in the Morrissey area - this included the expansion and increased use of roadways that run alongside Morrissey Creek. It is estimated that pipeline development in this area will be completed by 2024.

MOR001



Figure 13. MOR001: upstream, across the stream and downstream.

MOR002



Figure 14. MOR002: upstream, across the stream and downstream.



Background Information

CABIN

2020 marked the completion of ERA's CBWM program transition from Streamkeepers-based protocols to CABIN (Canadian Aquatic Biomonitoring Network) protocols for the assessment of aquatic health. CABIN is a nationally recognized program that uses a "reference system approach" to assess aquatic ecosystem condition and was designed with community-based water monitoring in mind. ERA staff and volunteers have been trained by certified CABIN trainers.

The reference system approach to assessment means study sites or "test sites" are compared to sites in pristine condition, without the presence of human impact, called "reference sites". CABIN uses a combination of physical, chemical and biological parameters, to statistically categorize a test site and analyze it based on benthic macroinvertebrate (aquatic insects, worms, etc. – see "Benthic Invertebrates" section below for more details) assemblages, in comparison to reference sites with similar hydrologic (amounts and quality of water), geomorphic (stream bed, channel features and bank forms) and geographic (topography, geology, climate, vegetation, and human setting) characteristics. The assumption is that a test site in good condition will have similarly assessed values to the associated reference sites, and the more polluted or poor quality the site is, the farther it will diverge from reference site conditions.

The use of CABIN protocols has greatly improved ERA's ability to produce data comparable to monitoring data collected by other organizations, government, and industry, increasing the validity of ERA's work, and facilitating better data sharing.

In 2020, a new statistical CABIN model for the Columbia Basin was released. Beginning in 2021, ERA's CBWM program upgraded from using the older Okanagan-Columbia 2010 model to the Columbia Basin 2020 model, which is tailored to a smaller, more specific region in BC, and includes the use of different criteria for site organization and assessment.

Habitat Variables

Geology, topography, stream morphology, climate and vegetation cover all play a critical role in stream health. The CABIN approach uses these characteristics to categorize and then assess test sites for similarities with reference sites. The physical characteristics of a test site are used to assign the site to a reference group for comparison.

These characteristics are important because the natural "pristine" state of a site is dependant upon these traits. If the CABIN test site was not compared to a suitable group of reference sites with similar physical variables, results would not accurately assess the health of an area. For example, a creek with limestone as the primary underlying rock will naturally have a higher pH than a stream dominated by sandstone, resulting in assemblages of benthic macroinvertebrates reflective of these respective natural conditions. If a limestone-based creek was compared to a sandstone-based "reference site", the different benthic macroinvertebrate community may be misinterpreted as a sign of an unhealthy aquatic system due to a pollutant causing a higher pH, rather than a natural occurrence.





Physical Properties of Water

The physical properties of water – colour, temperature, turbidity, taste and odour - are useful indicators of what is occurring within a stream. The CBWM program assesses both temperature and turbidity to better understand the condition of studied sites.

The *temperature* of a stream needs to remain within certain limits for healthy aquatic life, and many species take their life stage cues from temperature changes in the water. For example, Westslope Cutthroat Trout (WCT) begin migration to spawning grounds when the temperature is between 7-10 degrees Celsius (Bear, McMahon, and Zale 2007). Figure 15 includes a visual representation of temperature limits for the survival of adult WCT. In green is the optimal temperature range for this species, with the orange-red showing the sub-optimal, or increased stress range. The bright red colour signifies the range at which the temperature increase becomes lethal for WCT. Outside of these temperatures, WCT do not survive.

Temperature is closely correlated with dissolved oxygen levels. Colder water contains higher oxygen levels, which are critical for most of the stream life in the Rockies. Elevated water temperatures during WCT life stages such as embryo development (when oxygen requirements are particularly high) may result in embryo death or high mortality of alevins (a very young life stage, just after emergence from the egg). For example, if an early spring heat wave occurs and water temperature rises above 12°C, oxygen levels will fall below the guideline for protection of embryos and alevins (British Columbia Ministry of Environment and Climate Change Strategy 2021).

Temperature

Temperature affects many physiological aspects of an animal's life, especially their metabolism. Elk River Alliance monitors the water temperature in the Elk River watershed to measure annual and seasonal temperature variation.

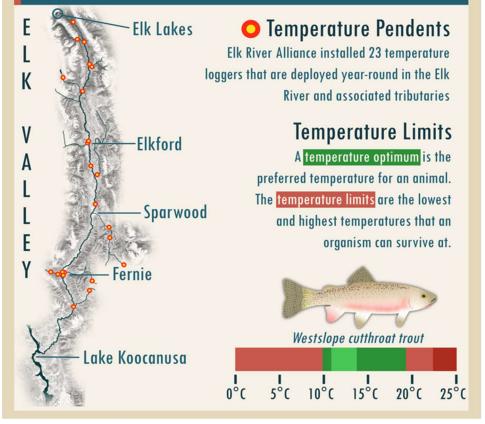


Figure 15. ERA Infographic outlining the importance of temperature to aquatic systems.





Turbidity is a measure of the ability of light to pass through water and is usually a reflection of the amount of sediment (B.C. Ministry of Environment and Climate Change Strategy 2021b). Excess sediment can negatively affect aquatic life - reduces the amount of sunlight reaching aquatic plants and organisms, settles on the bottom of the stream reducing habitat for benthic invertebrates and smothering fish eggs (Figure 16)

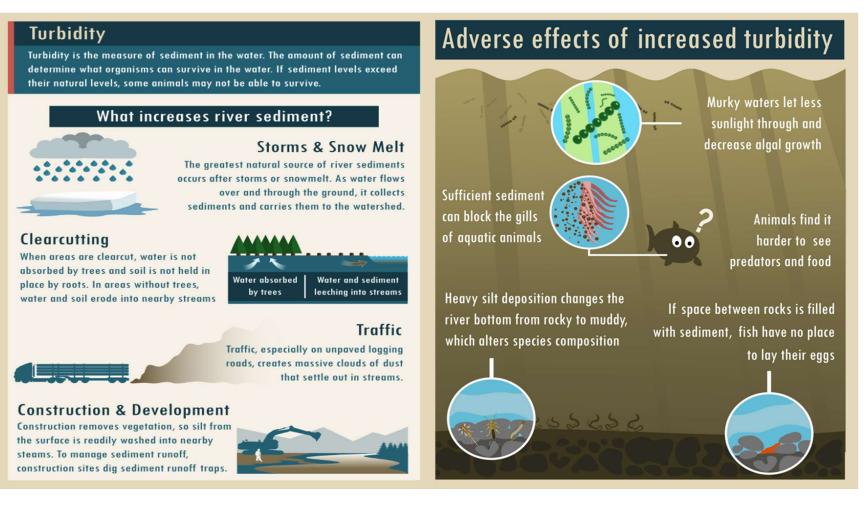


Figure 16. ERA CBWM infographic explaining turbidity and its importance.



Water Chemistry

Water chemistry parameters are important indicators of water quality. These parameters provide insight into the processes happening within a stream and the health of aquatic systems. Changes in water chemistry variables can signify landscape level changes or the introduction of new pollutants.

Dissolved oxygen, pH and conductivity are fundamental parameters measured as part of CABIN protocols. Aquatic life can only survive in water that falls within a specific range of water quality parameters. Unusually high or low measurements for any of these variables may suggest a problem in the stream.

Aquatic animals require enough dissolved oxygen for them to breathe easily. Oxygen levels depend on whether water is flowing or still, whether there are rocks or other obstacles for water to flow over, how many plants are growing in the water, and water temperature. Common causes of low dissolved increases oxygen are in temperature, decaying organic matter and weather (i.e. cloudy days reduce oxygen production from aquatic plants and algae). Excess nutrients added to the water via sewage or stormwater discharges, agricultural runoff or mine water discharges can cause excessive algae growth which then decompose, using up oxygen. The amount of dissolved oxygen in water affects the types

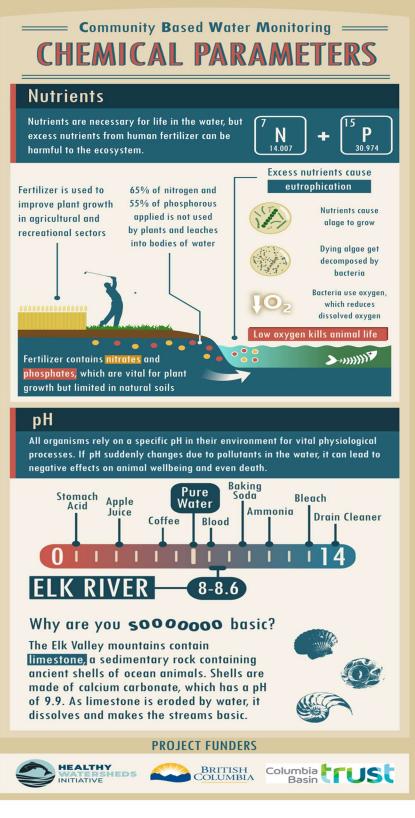


Figure 17. ERA infographic on chemical parameters associated with the CBWM program.



and health of aquatic life present. The lower the oxygen content, the less life that can persist in the water.

The pH range for freshwater aquatic life set by BC water quality guidelines is 6.5-9.0. Pure distilled water has a neutral pH of 7. The local geology of an area can result in water that is alkaline or acidic. In the Elk River watershed, streams are more alkaline due to a limestone-based geology, and aquatic organisms have adapted to these conditions. When pH levels deviate from natural ambient conditions, there may be direct or indirect effects on the health of aquatic organisms and partial or complete changes in species composition. The pH of water affects the solubility (amount that can be dissolved in water) and bioavailability (amount that can be used by aquatic life) of chemicals in water such as metals or nutrients (Government of British Columbia 2023). Low pH increases the solubility of metals, meaning that a decrease in the pH of a stream causes an increase in the amount of dissolved metals in that water. These high amounts of dissolved metal can attach to the surface of fish gills, damaging the gills and reducing oxygen uptake. Increases in pH can also increase the concentration of the more toxic forms of chemicals, like ammonia, in the water, killing fish quickly (B.C. Ministry of Environment and Climate Change Strategy 2021a). Significant changes in pH can be caused by historic mine wastes, landfill leachate, runoff from cattle feedlots, recent draining of wetlands, asphalt production or disposal, and limestone gravel roads (US EPA 2003).

Conductivity is another measure that can indicate changes in aquatic health. It is a measure of the ability of water to pass an electrical current. Conductivity increases when there are more dissolved mineral salts such as sodium, potassium, magnesium, chloride and sulphate (Chapman 1996). Significant changes in conductivity can be indicative of increased or decreased mineral salts dissolved in the water. In the Elk Valley, high conductivity in stream water is often associated with groundwater influence (because groundwater naturally has higher concentrations of salts); however, an increase in conductivity may point to increased human disturbance. Mining commonly causes increased sulphate concentrations in surface waters. Sodium, calcium, or potassium chloride runoff due to road salting is another common source of increased conductivity.

In addition to measurement of dissolved oxygen, pH and conductivity, the CBWM program includes water samples collected for laboratory analysis of nutrients, total and dissolved metals, and major ions (salts).

Changes in physical and chemical parameters which fall outside of the range of natural variability can cause a cascade of effects on the diversity and productivity of aquatic life. If such changes are observed, further monitoring should be initiated to explore different local stressors as potential causes. From here, additional required mitigation and management measures can be identified. For example, if elevated water temperatures in areas known to be important for WCT spawning are shown to be connected to less vegetation along the streambanks providing shade, mitigation may include planting of fast-growing riparian species such as willow.

If CABIN analyses show a test site in poor condition, water chemistry results can provide vital insight into what is occurring in the system. Often, consistent, long-term monitoring is needed to detect unusual changes to a specific water chemistry parameter and identify the underlying reasons for the change.



Benthic Invertebrates

A "biological indicator" is an organism that can be used to monitor the health of an CABIN uses benthic ecosystem. macroinvertebrates (small aquatic insects and other species such as aquatic worms) as biological indicators of stream health. While water chemistry variables can provide a "snapshot" of what is happening at a distinct moment in time within an benthic aquatic system, organisms experience the cumulative effects of all the physical and chemical stressors interacting within this system over time. Benthic organisms tend to remain in one general location and can be an indicator of the effects of activities associated with land uses in that area. Changes in the health of an aquatic systems are reflected in the structure of the communities of these organisms within it.

In general, aquatic communities consist of groups (taxa) that are tolerant to pollution and those that are sensitive to it. By comparing the amount of tolerant versus intolerant groups in a community, assumptions can be made about the overall health of a system. For example, mayflies (Ephemeroptera), stoneflies (*Plectoptera*) and caddisflies (*Trichoptera*) are all, generally, considered to be sensitive to pollution, while groups like (Chironomidae), leeches midges (Hirudinea) and worms (Naididae) are more tolerant to pollutants. A high number of midges, leeches and worms and little of anything else is a likely indication of a stream in poor condition (Figure 18).

CABIN assessments use the composition of the benthic macroinvertebrate community (at the taxonomic level of family) within the stream, and their sensitivities, to make assumptions about the health of the system.

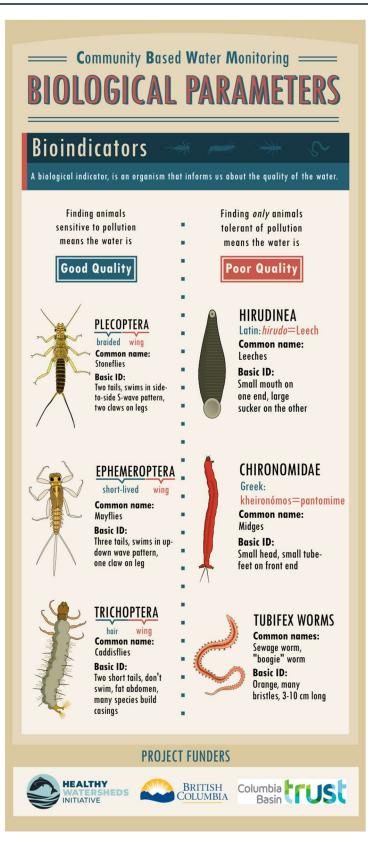


Figure 18. ERA infographic outlining the biological parameters associated with the CBWM program.



STREAM e-DNA

In 2020, the CBWM program was further expanded to include participating in STREAM e-DNA sampling; a trial for a future phase of CABIN monitoring, where additional benthic invertebrate samples are collected and analyzed to a finer taxonomic resolution using DNA analysis (Wright, Robinson, and Hajibabaei 2020). This means benthic organisms can be identified to the species level. STREAM e-DNA is not currently part of the CABIN analysis process, and the aim of these trials is to potentially incorporate this feature in future monitoring efforts.

Although DNA analysis only produces data on presence versus absence of benthic species, it allows for the examination of benthic communities at a finer taxonomic resolution and may prove helpful for the early identification of pathogenic species. For example, the *Tubifex tubifex* species of worm can host whirling disease (*Myxobolus cerebralis*), and the presence of *T. tubifex* may indicate a reach is vulnerable to whirling disease infection.



Methods

Site Selection

The Elk River Alliance's CBWM sites are chosen based on community input and/or the presence of important habitat that warrants monitoring. Areas of interest are identified using a combination of GIS (Geographic Information System) and in-person assessments. Representative sites along a creek are chosen to capture the effects of different types of land-use or disturbance. Typically, sites are placed upstream and downstream of suspected impacts or stressor source point. Sites may also be placed just above the confluence of tributaries to gain an overall idea of water quality and stream habitat health within a catchment.

Aquatic Habitat Assessment

Test sites were assessed using the techniques outlined in the Canadian Aquatic Biomonitoring Network (CABIN) Field Manual for Wadeable Streams (Carter 2012).

At each site, a detailed site description, including GPS location, surrounding land-use, site drawing, photographs, and reach¹ characteristics are recorded. This includes information on habitat types, canopy coverage, streamside vegetation and the amount of macrophyte (aquatic plants) and periphyton (organisms growing on submerged surfaces – i.e. algae, cyanobacteria, etc.) coverage.

Water chemistry measurements and water samples are taken at the lower end of the reach to avoid disturbing benthic macroinvertebrate communities. This includes the collection of on-site water quality parameters (temperature, dissolved oxygen, pH, conductivity, ORP, turbidity), and any samples that need to be taken for laboratory analysis of metals, nutrients, and major ions.

Next, the benthic macroinvertebrates are collected using the "kick-net" method, which includes 3 minutes of travelling backwards upstream, with a large net placed on the bottom of the stream, and aggressively kicking rocks to send any insects hanging on into the kick-net. Organisms and material collected in the net during these 3 minutes are moved into a sample jar and preserved with the appropriate chemicals.

When STREAM protocols are included, 3 additional "kick-net" samples are collected, prior to the standard CABIN "kick-net" sampling, using the same protocol but with full decontaminations of the equipment and sampler before each round (Wright, Robinson, and Hajibabaei 2020). Since STREAM focuses on taxonomic identification through DNA, proper decontamination is necessary to avoid tainting the samples. Benthic invertebrate sampling is always performed beginning downstream and moving upstream. STREAM samples are collected in sampling jars and preserved according to STREAM protocols. Only the lower site on each creek (near the mouth) were included in the STREAM program (i.e., COL001, MOR001 etc.).

CABIN requires the sampler to collect information on substrate characteristics. This includes following the kick-net path while counting and measuring 100 pebbles from the bottom of the stream and assessing every 10th pebble for embeddedness. The surrounding substrate, or streambed, material is also assessed based on size and consistency.

Finally, the study site channel characteristics are measured. The width of the stream during high flow (estimated based on bank structure and changes in vegetation) and current flow are measured, as well as

¹ Reach is the length of the stream included in the test site – usually 6 times the stream width.



the slope, depth, velocity, and overall discharge of the stream.

For more details on CABIN and STREAM protocols, please see the *Canadian Aquatic Biomonitoring Network (CABIN) Field Manual for Wadeable Streams*, and *STREAM: Procedure for collecting benthic macroinvertebrate DNA samples in wadeable streams* (Carter 2012; Wright, Robinson, and Hajibabaei 2020)

Laboratory Analysis

Basic water quality parameters – temperature, pH, conductivity, dissolved oxygen, and turbidity – were tested on site by trained ERA staff and volunteers. Samples acquired during site assessments were preserved appropriately and shipped to independent laboratories for further analysis.

Water Chemistry

CARO Analytical Services in Kelowna, BC was responsible for water chemistry analyses. Typically, ERA CABIN sites are assessed for total and dissolved metals, nutrients, cations and anions (e.g. chloride, sulphate, carbonate) (Appendix C: CARO Reports).

Benthic Invertebrate Taxonomy

ERA contracted Surrey-based, CABIN-approved, aquatic invertebrate taxonomist, Pina Viola (B.Sc. Biology, SFS, SAFIT) to assess benthic macroinvertebrate samples for the CBWM program. She sorted, identified, and performed data entry for benthic invertebrate samples, following CABIN laboratory protocols (Environment and Climate Change Canada 2020).

Data Analysis

As per CABIN Wadable Streams Protocols, all data collected was entered into the Environment and Climate Change Canada (ECCC) national CABIN database, under "CBWQ – Elk study".

In 2021, ERA shifted from using the older Okanagan-Columbia 2010 preliminary model to the new Columbia Basin 2020 model, to perform CABIN assessments. The new model includes 156 reference sites across the Columbia Basin, with 11 of these falling within the Elk River Watershed, an additional 4 in the neighbouring Flathead area, and 1 within the Bull River basin (Stephanie Strachan 2020).

To prepare site data for CABIN analysis, characteristics based on GIS data were assembled. Catchments for each site were delineated using GIS software and analysed for model requirements: drainage area (km2); % grassland; % low shrubland; % water; mean precipitation for October; minimum temperature for December; % sedimentary rock; and maximum slope.

From here the CABIN database sorts sites into smaller groups based on similarities in characteristics to designated groups of reference sites, then performs a BEAST (Benthic Assessment of Sediment) analysis to assess the health of a site, in comparison to similar reference sites, based on the benthic community structure, the functional responses of these invertebrates, and selected habitat variables. These analyses produce "community ellipses" for each site, which is an ordination plot that visually represents how similar reference sites are to each other and where a test site fits into the comparison among sites. The center ellipse represents reference condition. The further out from the center ellipse a test site appears,



the more it has diverged from the reference condition and the more likely it is to be in poor condition.

Where sites appeared to be diverging from reference condition, data were further explored to investigate patterns associated with these sites. Water chemistry parameters were assessed for any notable results. RIVPACS, Bray-Curtis dissimilarities, and metrics related to the presence and abundance of specific invertebrates (i.e. EPT, *Diptera* and non-insects) were used to explore potential issues with benthic community structure.

RIVPACS (River Invertebrate Prediction and Classification System) is an aquatic biomonitoring system used to assess water quality. It measures taxa richness (presence/absence but not abundance), based on expected taxa according to reference sites versus what is observed at a test site. A value of 1, indicates the test site is similar to the reference sites, while values above 1 indicate increasing differences from the reference sites (and more taxa), and values below 1 indicate increasing differences but less taxa, and likely poorer conditions.

Bray-Curtis dissimilarity is a statistical assessment to measure the dissimilarity between sites based on numbers within groups at each site. In CABIN, the Bray-Curtis dissimilarity is used to measure both richness and abundance of test sites compared to the mean values of the reference sites. A value of 0 means that the sites are in good condition, similar to the mean values of the reference sites, while a value of 1 indicates complete dissimilarity.



Results & Discussion

In 2022, 10 sites were assessed across 5 tributaries – Lizard Creek, Alexander Creek, Boivin Creek, Coal Creek and Morrissey Creek. CABIN analyses tools yielded similar results to the previous year (see ERA's 2021 Report for details), with sites along Alexander Creek (ALX001, ALX003) and Boivin Creek (BOI001, BOI002) having similar benthic community structures to their associated reference sites, while lower Coal Creek (COL001), lower Morrissey Creek (MOR001), and both Lizard Creek sites (LIZ001, LIZ003) diverge significantly from the designated 'reference condition'. However, this year, both the upper Morrissey (MOR002) and upper Coal (COL003) sites appear to have continued to diverge farther from "reference condition", with MOR002 assessed as mildly divergent and COL003 moving to divergent.

ERA is concerned about these results and what they could mean for the health of these streams. However, the reason for these results is still uncertain. In 2020, CABIN introduced a new statistical model for aquatic habitat assessments in the Columbia Basin – Columbia 2020 model. The use of this model saw unexpected shifts in assessment results for ERA's test sites. This new model is generally considered more accurate and more sensitive to potential stressors – it is tailored more specifically to the region, focusing on the Columbia Basin rather than the previous model's focus on both the Columbia and Okanagan Basins, and features double the amount of reference sites than the previous model (Gaber 2012; Stephanie Strachan 2020). Due to these unexpected shifts in assessment results, ERA is recommending further investigations on "divergent" streams to examine potential unknown stressors on these systems and eliminate the possibility of inaccurate or exaggerated results related to the model's ability to represent ERA's test sites.

The composition of the benthic macroinvertebrate communities at many of these sites appears to align with these new assessment results, but water chemistry sampling results at all sites consistently remain below BC Water Quality Guideline limits for aquatic life and there are no obvious trends to lend support to any specific cause. ERA will continue the long-term monitoring of these sites into 2023, and is recommending further investigation, outside of CABIN assessments, to explore potential reasons for these results.



Lizard Creek

In 2022, Lizard Creek sites – LIZ001, LIZ003 – were assessed as "highly divergent" from reference condition based on the Columbia 2020 CABIN model (Figure 19). Year to year changes using the new model indicate a steady shift at LIZ001 from reference condition to highly divergent from 2014 to 2017, then remaining highly divergent from 2017-2022.

Although this appears to suggest a potential trend of site degradation over time, it is worth noting that this CABIN model sorted the LIZ001 site for comparison with a different set reference groups for 2012, 2014 and 2015, compared to the rest of the assessment years. Generally, sites are expected to be compared with the same reference group from year to year (based on the assumption that the fundamental geological, topographic, climate, stream morphological and vegetation cover characteristics remain the same). Capturing the full range of ecological variation of reference sites using an adequate number of sites sampled with sufficient frequency is critical for confident interpretation of CABIN data (Strachan and Reynolds 2014). The changing assignment of the reference group for the LIZ001 site may indicate a technician error or model issue rather than a truly changing site condition. Looking at the variables used to sort test sites into model reference site, only four changed between years - latitude, altitude, channel slope and % canopy cover. Of these predictor variables, only % canopy coverage had an obvious pattern between years sorted into the model's Reference Group 3 (2012, 2014 and 2015) which were all assessed as having 26-50% canopy coverage and Reference Group 2 (2013, 2016-2022), which were assessed as having 1-25% canopy coverage. Changing the canopy coverage in the data for the years sorted into Group 3 results in new assessments for these monitoring events, with 2012 changing to "Mildly Divergent", while 2014 and 2015 both become "Divergent". Essentially, by changing a single variable, and having all the LIZ001 site visits compared to the same set of reference sites, the pattern of increasing divergence that can be seen from 2014 to 2017 changes significantly. This may point to an issue with this CABIN model's ability to sort LIZ001 into a group with appropriate reference sites.



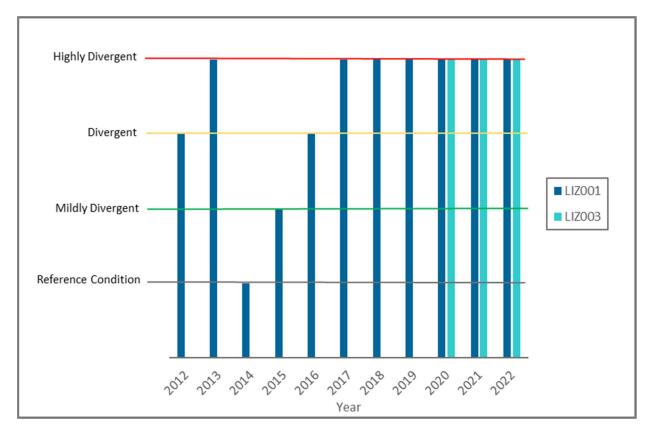


Figure 19.CABIN analysis results for Lizard Creek sites from 2012 – 2022 using the Columbia 2020 CABIN model.

Further examination into 2022 data, suggests that both Lizard Creek sites differ from reference sites according to the Bray-Curtis dissimilarity, which uses taxa richness and abundance for comparison (LIZ001: 0.97, LIZ003: 0.91); however, RIVPACS analysis, which take an exclusive presence/absence approach to assessment (LIZ001: 0.97, LIZ003: 0.97) suggests that these sites still have relatively good taxa richness. This difference may be in part due to the larger number of taxa present at Lizard Creek sites, compared to reference sites (Table 1).

Taking a closer look at the benthic macroinvertebrate community composition, the percentage of EPT individuals (*Ephemeroptera, Plecoptera, Trichoptera -* typically pollutant-sensitive taxa) for LIZ001 and LIZ003 (40.02% and 76.27%, respectively) is lower than what would be expected based on the reference site means (88.13% ±9.27; 91.94% ±7.30), but LIZ003's value is similar to the values seen at Alexander Creek and Boivin Creek, which are both in near "reference condition". Total abundance of benthic macroinvertebrates was significantly higher than expected according to mean reference site values which may contribute to the unexpected significant divergence from reference condition (i.e. LIZ003, the upper Lizard Creek site's abundance for 2022 was almost 24,000 higher than that of associated reference sites' mean)(Table 1). Although ERA is currently unsure of the cause, total abundance of benthic macroinvertebrates at Lizard Creek has been increasing over time - the data available for LIZ001 show a distinct pattern of increasing abundance since 2012 (LIZ003 has not been monitored long enough to begin confidently assessing any trends within this data)(Figure 20). Unfortunately, decreasing EPT appears to be accompanying this increase in abundance (Figure 20). There has also been a noticeable increase in the amount of *Tubifida*, a pollution-tolerant taxonomic order of worms, at LIZ001, which further suggests the introduction of a pollutant or disturbance affecting this site.



The high abundance with lower diversity (and low EPT) within the populations at LIZ001 likely suggests the introduction of a pollutant to the system and may signify the declining health of this site; however, further investigation of this area is needed to confirm and explore potential causation.

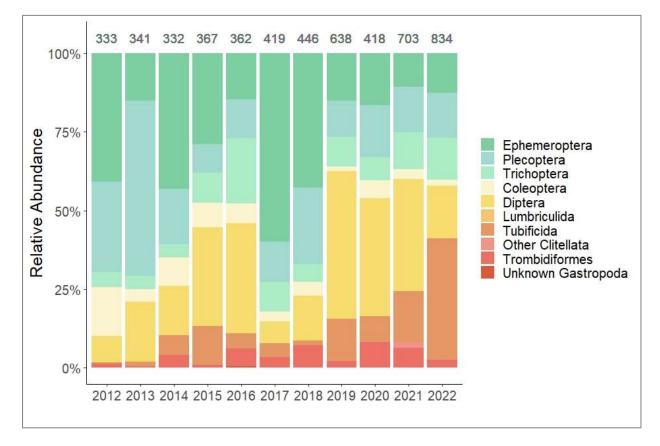


Figure 20. Plot of benthic macroinvertebrate community composition based on taxonomic order of samples collected at LIZ001 during CABIN sampling over time. The cool colours (blues, greens) represent orders that are generally sensitive to pollution (Ephemeroptera, Plecoptera, Tricoptera), while the orders in warm colours (yellow, orange, red) are more tolerant to pollutants. The numbers along the top of the graph are the raw individual counts of all benthic macroinvertebrates found at this site in each year.

Based on ERA's understanding of Lizard Creek, poor aquatic health at LIZ003 is unexpected. The LIZ003 site is within Mount Fernie provincial park and Island Lake Lodge is located near the headwaters of the creek (cat skiing, hotel, and restaurant operations). There is a resource road that runs alongside Lizard Creek for approximately 9.5 kilometers from Highway 3 to Island Lake Lodge and comes within 300 meters of the creek at different points along the way (See

Figure 21 for more details on land use within the Lizard Creek catchment). There are also several tributaries that cross over this road and eventually feed into Lizard Creek. Recreational use is moderate-to-high depending on the time of year, with many formal and informal trails used for skiing, biking, hiking, and horseback riding. Anecdotal observations indicate the presence of fish in good condition in Lizard Creek as well as spawning redd and fry and fingerling rearing area. However, regular visitors to the creek have noted increasing algae growth (particularly filamentous algae). Increased algae growth may indicate increased nutrient inputs to the creek.



LIZ001 is closer to the Lizard Creek confluence into the Elk River (**Error! Reference source not found.**). This site is downstream from the provincial park and has greater potential to be affected by human disturbance from residential development adjacent to the stream as well as recreational uses in the provincial park and adjacent private lands. Proposed future residential development adjacent to Lizard Creek, with associated access roads, water withdrawals from aquifers (which contribute to baseflow in the creek), and increased access for recreational uses may contribute additional impacts to those which may already be occurring. ERA is committed to continued monitoring of Lizard Creek as human activities in the catchment increase.

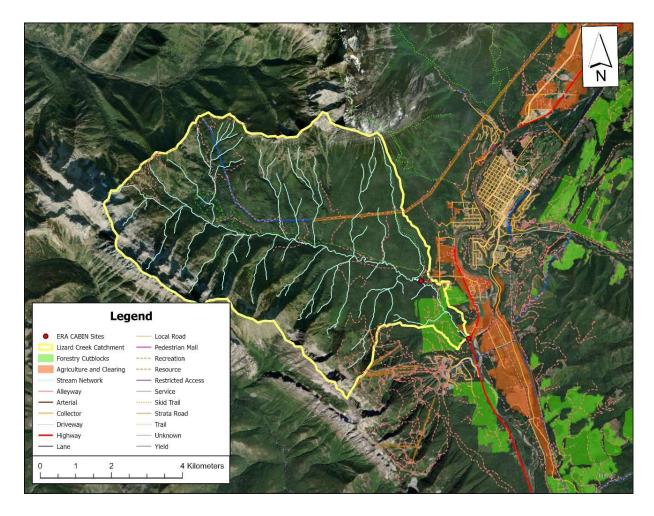


Figure 21. Land use in the Lizard Creek Catchment

Preliminary investigations into water quality parameters have not identified a clear cause - all measured water quality variables met BC guidelines for the protection of aquatic life and there have been no notable trends in water quality parameters (See Water Quality Trends section). However, trends cannot reliably be determined by "snapshot" sampling.

Initial examinations of water quality parameters in 2021 allowed ERA to begin flagging specific water quality parameters for continued monitoring. Although there were no exceedances of BC Water Quality Guidelines, LIZ001 and LIZ001 have consistently higher amounts of total phosphorus, sulfate, hardness



(as CaCO3), conductivity, total calcium, and total magnesium than other CABIN monitored creeks (Figure 22; Figure 24; Figure 39).

Although high amounts of some of these parameters, namely, hardness, calcium, magnesium and conductivity, can, in the right conditions, result in the precipitation of calcite on rocks within a stream, naturally elevated levels are not a concern. In this case, these elevated levels can likely be attributed to the limestone-based geology of the area and increased groundwater influence (more interaction with the limestone) at Lizard Creek – as water erodes the limestone, minerals like calcium and magnesium are deposited into the stream, thereby also increasing the conductivity and hardness, but further investigation is needed to confirm this. If these levels are natural, further assessment of the ability of this CABIN model to accurately assess these sites is recommended, with associated reference samples containing significantly lower levels of many of these parameters – hardness (\cong 100 ± 77.36 mg/L), magnesium (\cong 9 ± 7.544 mg/L), and conductivity (\cong 120 ± 104.00 uS/cm).

Anecdotal observations of algal growth, led to an exploration of nutrient levels within Lizard Creek – both phosphorus and sulfate levels were flagged in 2021, and noted to be regularly higher than the other CABIN monitored creeks. Although there is currently no Water Quality Guideline for phosphorus in streams in BC, the long-term chronic limit within lakes is 0.015mg/L, which Lizard Creek sites regularly meet and/or exceed. Initial data investigations in 2021, also flagged sulfate as another parameter to watch. Although sulfate measurements at Lizard Creek sites are higher than ERA's other CABIN sites, they are all well below limits outlined in the BC Water Quality Guidelines (429 mg/L). Unfortunately, in 2022 the lab analyzing samples was unable to perform the test necessary to quantify total phosphorus (as P) or sulfate, so ERA is unable to complete a 2022 assessment. It may be worth noting that ERA's Coal Creek sites (COL001, COL003), which have also been diverging significantly from reference condition, are the only other ERA test sites that reach similar phosphorus levels. ERA will continue to monitor these parameters and recommend that it be considered for future examinations.

During these initial investigations, a potential pattern of increasing alkalinity was noted at Lizard Creek sites. Upon further investigation, this pattern seems to be shared amongst all of ERA's CABIN test sites. Similar to hardness, calcium and magnesium, elevated alkalinity is usually a result of the limestone-based geology of the local area. ERA will continue to monitor this parameter over time to continue to assess emerging trends (Figure 23).

In-depth investigations outside of CABIN assessments are needed to better understand what is occurring at Lizard Creek.





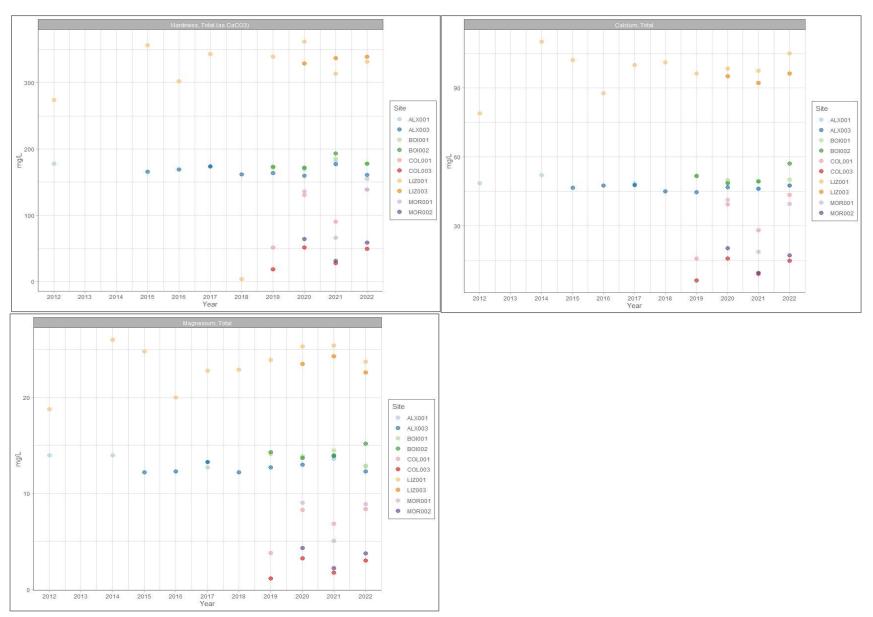


Figure 22. Total hardness (as CaCO3), total calcium, and total magnesium in samples at ERA CABIN sites between 2012 and 2022. Note that Lizard Creek sites have levels higher than the other monitored sites. All these parameters are likely a reflection of the limestone-based geology in the region and an increased groundwater influence at Lizard Creek.



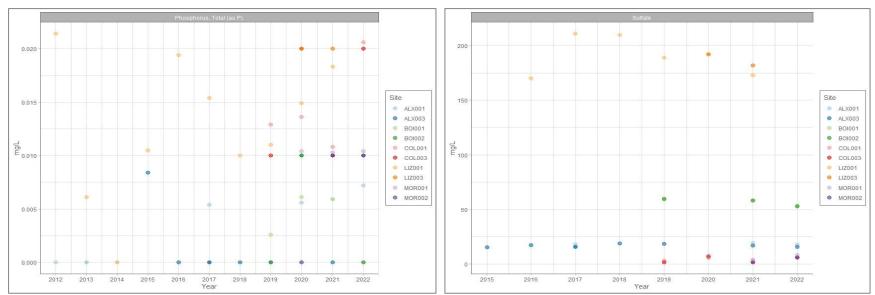


Figure 24. Total phosphorus and total sulfate at ERA CABIN sites between 2012 and 2022. Lizard Creek consistently has higher values within these parameters across years.

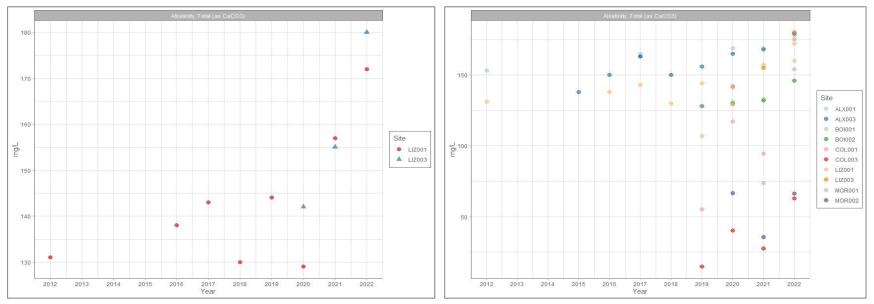


Figure 23. Total alkalinity (as CaCO3) over time. The plot on the left focuses on the Lizard Creek sites, while the graph on the right allows for comparison across sites. Although alkalinity is usually a result of the local geology, this analyte appears to be increasing over time.



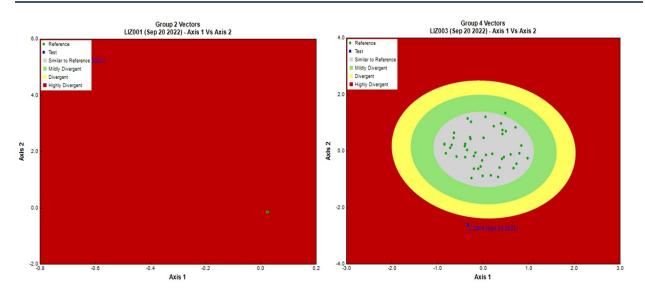


Figure 25. CABIN community ellipses for LIZ001 and LIZ003, respectively, in 2022. Note that in the LIZ001 diagram, the ellipses is the green dot in the bottom right of the diagram, while the point representing LIZ001 is to the top left, partially covered by the diagram's legend.

Alexander Creek

In 2022, both the upstream (ALX003) and downstream (ALX001) sites were in good condition, according to CABIN analysis (Figure 26). Water chemistry variables were also consistent with good health, with all measurements for both sites meeting the BC guidelines for the protection of aquatic life. There have been no consistent trends in dissolved oxygen, pH, conductivity, turbidity, or temperature (see the Water Quality Trends section below). However, trends cannot reliably be determined by "snapshot" sampling. ERA is currently implementing a network of real-time discharge and temperature monitoring in CBWM streams, which will allow for better monitoring.

CABIN results from Alexander Creek sites have been relatively consistent over time, generally remaining in reference condition, however ALX001 was found to be highly divergent in 2012 and divergent in 2017. Further statistical testing (Bray-Curtis, RIVPACS) indicates that sites on Alexander Creek were similar to reference sites in taxa diversity and %EPT.

Alexander Creek runs alongside the Crowsnest highway for about 4 kilometers, is crossed by the CP Rail mainline, and passes a gun range and local logging roads. Fluctuations in CABIN assessment may result from intermittent disturbances caused by the use of these areas, combined with events such as runoff from heavy or prolonged rain causing erosion of disturbed areas. Proposed mining development in the upper catchment may increase stressors on Alexander Creek. If mining development goes forward, ongoing monitoring of Alexander Creek will become increasingly important to track changes in stream health.



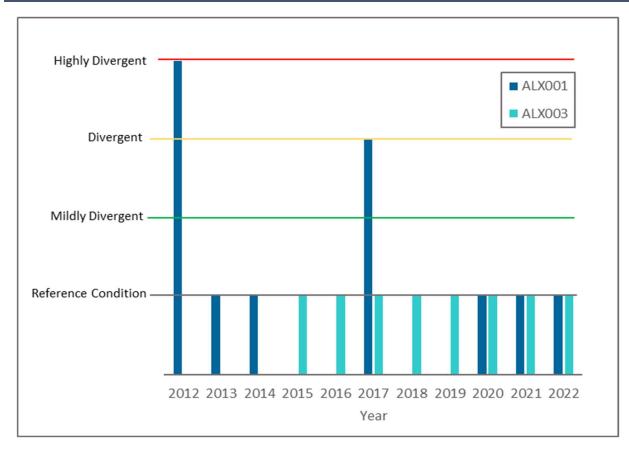


Figure 26. CABIN analysis results for Alexander Creek sites from 2012 - 2022.

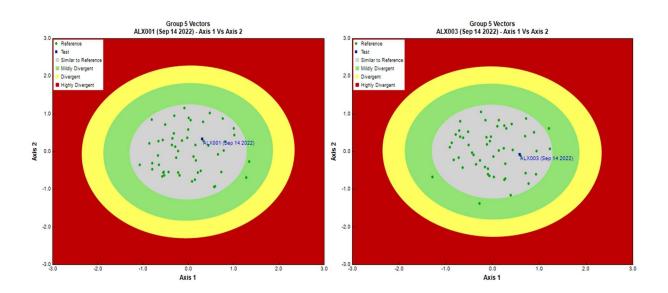


Figure 27. CABIN community ellipses for Alexander Creek sites (ALX001 & ALX003) in 2022.



Boivin Creek

In the four years (2019 to 2022) of monitoring on Boivin Creek, sites have remained in relatively good, stable condition (Figure 28). 2022 CABIN analysis showed that both Boivin Creek sites were in similar condition to their associated reference sites. The shift to a "mildly divergent" condition seen in 2021 at the lower Boivin Creek site (BOI001) was likely a result of the natural variability of benthic invertebrate communities, or a smaller disturbance. Further analysis of metrics associated with benthic invertebrate community structure suggested that in 2021, BOI001 may have been experiencing a slightly lower species richness (RIVPACS) which could have contributed to this assessment. Based on 2022 monitoring results, species richness (RIVPACS) at BOI001 has increased again, but %EPT has decreased which, if it continues, may affect future results (Table 1).

ERA began monitoring this site to assess the impacts of artificial riprap that stretches along large sections of the creek as it passes through Elkford. However, CABIN results to date show that the creek is similar to comparable reference sites. Continued monitoring efforts, including implementation of real-time monitoring of discharge and temperature will allow for more long-term assessments of the creek and potential impacts of local urban developments. All measured water quality variables met BC guidelines for the protection of aquatic life.

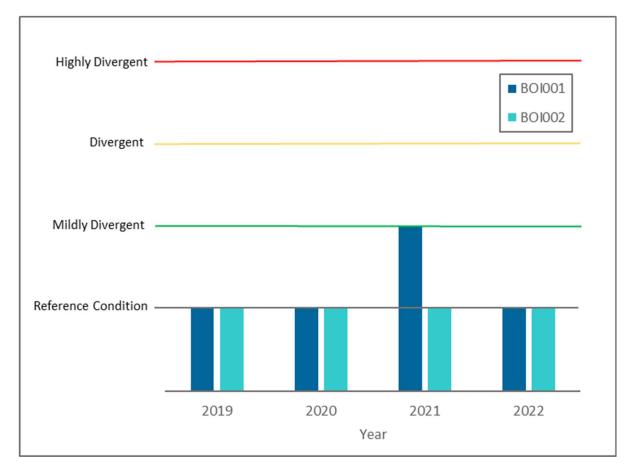


Figure 28. CABIN results for Boivin Creek sites in 2019 - 2022. The upstream (BOI002) site has remained in a similar state to reference condition, while the downstream site (BOI001) has experienced some fluctuation in state. Continued monitoring will allow for ERA to assess any developing patterns.



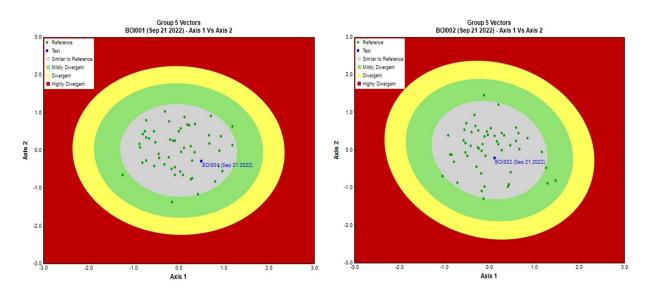


Figure 29. CABIN community ellipses for Boivin Creek sites (BOI001, BOI002) in 2022, showing both sites to be "similar to reference".

Coal Creek

Coal Creek was added to the CBWM CABIN assessments in 2019. Results indicate the creek is divergent from reference condition, with more dramatic results seen at the site near the mouth (COL001)(Figure 30). According to additional analyses, both sites along Coal Creek exhibited species diversity (Bray-Curtis), diverging from reference sites but both had high taxa richness when compared with reference sites (RIVPACS)(Table 1). Total abundance of individuals was much higher than expected for the lower site (more than 10,000 above what would be expected based on CABIN reference sites) which may push results to a more divergent classification.

Further analyses revealed low numbers of EPT individuals (generally sensitive to pollutants and their abundance is considered an indicator of good health) compared with Diptera and non-insects (generally pollutant-tolerant) - 37% of the benthic invertebrates sampled at COL001 were EPT individuals while 62% belonged to Diptera or non-insect groups, and COL003 having 66% EPT and 39% Diptera and non-insects.

All measured water quality variables met BC guidelines for the protection of aquatic life. The Coal Creek sites were established too recently to enable comparison of water quality results over time. Furthermore, as noted for the other creeks in the CBWM program, one-time sampling for water quality is not sufficient for indicating true trends.

The COL001 site is downstream of historic mining sites, a decommissioned landfill, cattle grazing, recreational ATV trails, and current clear-cut logging practices. The final kilometer stretch flows through a portion of Fernie before arriving at the sampling site. This urban portion of Coal Creek is confined by riprap and concrete armoring along the sides of the channel. Recreational use of the lower portion of the creek sometimes includes the construction of weirs in the streambed with large rocks and cobble to create swimming or wading areas.

The highly divergent results for the COL001 site are not unexpected, given the multiple historic and current stressors in the catchment. Benthic invertebrates integrate the effects of these multiple



stressors, particularly flow, turbidity, and temperature, but may also be responding to short and longterm changes in water quality parameters such as nutrients. The consistent categorization of COL001 as "highly divergent" from reference condition over the four years it has been monitored, along with the list of known stressors effecting this stream, give ERA confidence in these results.

ERA will continue to monitor COL001 and COL003 to confirm CABIN results and acquire sufficient data to begin to evaluate trends. If the COL003 site continues to diverge from reference sites, ERA will seek to investigate further, as this site is within the headwaters, and poor conditions are not expected at this location.



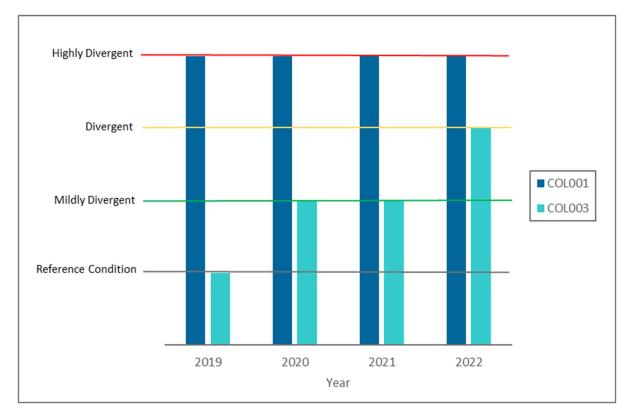


Figure 30. CABIN results for Coal Creek sites in 2019 – 2022.

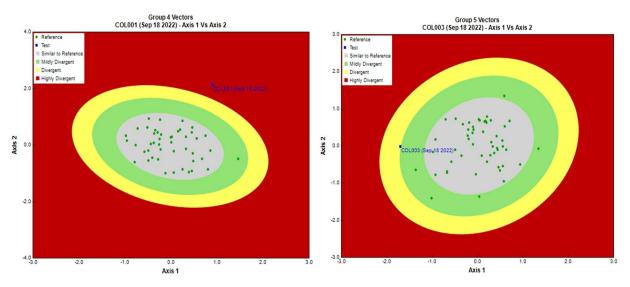


Figure 31. 2022 CABIN analysis community ellipses for Coal Creek sites, showing COL001 significantly divergent from reference condition (left) and COL003.



Morrissey Creek

2022 was the third year of CBWM assessments for Morrissey Creek. The upstream site, MOR002, shifted from a state like that of the associated reference sites to "mildly divergent", while the downstream site, MOR001, remained highly divergent (Figure 32). Although the RIVPACS ratio suggests that MOR001 had a higher-than-expected taxa richness, the Bray-Curtis score (0.87) indicates the taxa diversity at the site was low. EPT values were significantly lower this year than in 2021 (42% compared to 86%) (Table 1). Like COL001, MOR001 also has very high total individual abundance numbers (10,780, compared to a mean reference site abundance of 1449.58 ± 859.69).

There were no exceedances of BC Water Quality Guidelines. The Morrissey Creek sites were established too recently to enable any valuable comparison of water quality results over time. Furthermore, as noted for the other creeks in the CBWM program, one-time sampling for water quality is not sufficient for indicating trends. Morrissey Creek is part of ERA's continuous temperature and discharge monitoring network, which is currently being implemented.

Morrissey Creek originates from a geographically similar location to Coal Creek, with similar historical logging in the upstream reaches. MOR001 is downstream of active logging roads, ATV trails, cattle grazing, and an active farming area. Previously, MOR002 was above most potential disturbance, but is now being exposed to significant disturbance through the construction of the TC Energy pipeline – significant traffic and construction on roadways and bridges directly upstream of its location. 2022 results do not show significant changes to the benthic invertebrate community at MOR002 (other than a decrease in *Trichoptera*, leaving *Ephemeroptera* and *Plecoptera* to dominate the EPT portion of individuals in the stream), but the total abundance of individuals sampled doubled between years (although still within the range of associated reference locations).

The downstream sites in both Coal and Morrissey Creeks have multiple land use-related stressors in their catchments. Therefore, divergence from reference condition is not unexpected in either. Continued monitoring over time should begin to reveal patterns in site characteristics that may help identify the cause of these results. Further investigation, outside of CABIN monitoring, will be needed in future to fully understand the dynamics of this stream and the stressors effecting it.

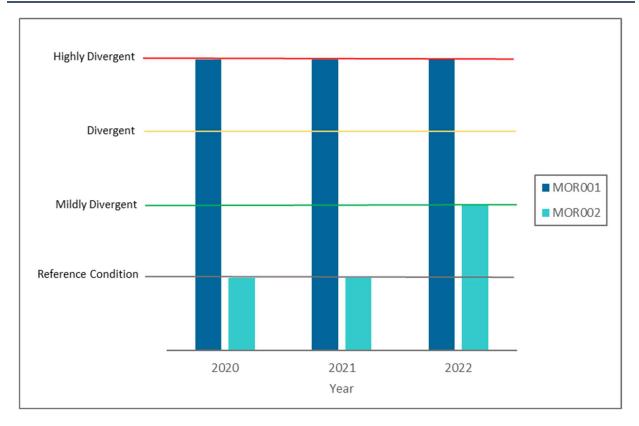


Figure 32. Results of CABIN assessment for Morrissey Creek sites in 2020-2022. This year, MOR001 was again classified as "highly divergent" while MOR002 appears to be experiencing a shift away from "reference condition" to "mildly divergent".

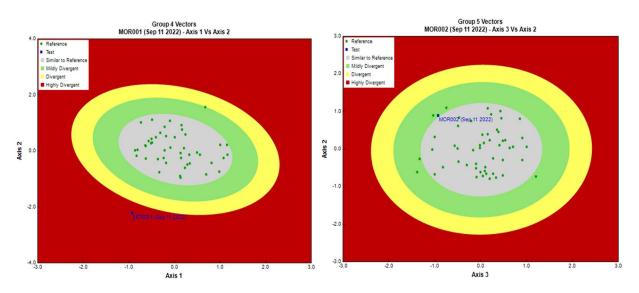


Figure 33. CABIN analysis community ellipses for the Morrissey Creek sites, showing MOR001 significantly diverging from reference condition and MOR002 beginning to diverge from reference condition.



Benthic Macroinvertebrate Communities

CABIN assessments assign test sites a condition based on the structure of the benthic macroinvertebrate community. Figure 34 shows the general diversity in each CBWM test stream, based on the proportion of individuals belonging to each taxonomic order. Sites with a higher proportion of EPT (pollution sensitive taxa) coincide with those deemed less divergent from reference condition through CABIN assessments, and sites with the lowest proportion of EPT are those that have been assessed as the most divergent. The sites assessed as most divergent, LIZ001, COL001, and MOR001, all have significantly smaller proportions of pollution-sensitive individuals, as well as higher numbers Tubifida (an order of pollution-tolerant worms).

The exception to this is the upper Lizard Creek site (LIZ003), which was assessed as "Highly Divergent", yet a majority of the taxa present are part of the pollution sensitive group (EPT). Different levels of species-specific sensitivity are seen within these EPT groups, with some exhibiting higher tolerances and even thriving in certain disturbed environments (Houghtona 2004). Further exploration of the conditions at Lizard Creek is needed to fully understand these results.

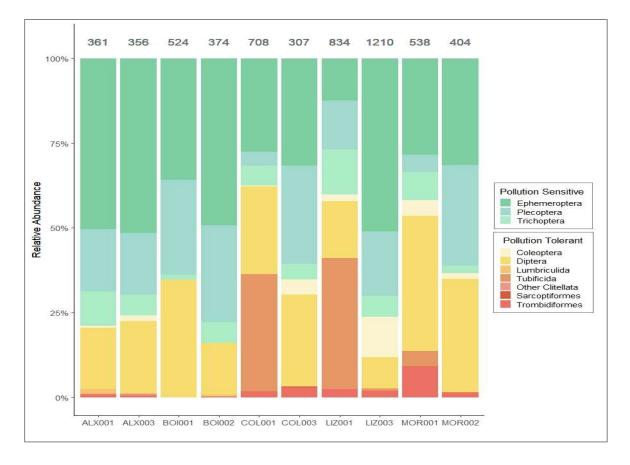


Figure 34. Graph representing the proportions of different taxonomic orders of benthic macroinvertebrates at each CBWM site. Raw counts of all benthic macroinvertebrate individuals found at each site are displayed along the top.



Table 1 takes a closer look at these results within benthic communities at each CBWM site using RIVPACS, Bray-Curtis Dissimilarity, %EPT and total abundance. The highlighted cells indicate values that differ significantly (i.e. 2 x standard deviation from the mean) from what is expected from a site in "reference condition".

Table 1. A comparison of CBWM sites, their classification according to 2022 CABIN assessments, and additional statistical measures that address the classification – RIVPACS, Bray-Curtis dissimilarity, and the percent EPT (Ephemeroptera, Plecoptera, Trichoptera). Highlighted cells indicate values that differ from what is expected for a reference site in good condition.

Stream Name	Site ID	CABIN Analysis	RIVPACS O:E (P>0.5)	Bray-Curtis Dissimilarity*	% EPT	Total Abundance
Alexander	ALX001	Reference	1.13	0.38ª	78.95ª	7,220.00ª
Creek	ALX003	Reference	1.12	0.38ª	75.92ª	7,140.00 ^a
Boivin	BOI001	Reference	0.98	0.45ª	65.27ª	8,733.00ª
Creek	BO1002	Reference	1.10	0.24ª	83.96ª	4,675.00ª
Coal Creek	COL001	Highly Divergent	0.93	0.90 ^b	37.43 ^b	11,800.00 ^b
Cleek	COL003	Divergent	0.79	0.69ª	66.00ª	1,565.00ª
Lizard	LIZ001	Highly Divergent	0.97	0.97 ^c	40.02°	16,720.00°
Creek	LIZ003	Highly Divergent	0.97	0.91 ^b	76.27 ^b	24,200.00 ^b
Morrissey	MOR001	Highly Divergent	1.13	0.87 ^b	42.21 ^b	10,780.00 ^b
Creek	MOR002	Mildly Divergent	0.80	0.59ª	63.28ª	6,766.67ª
	Reference Mean			(a) 0.40 ±0.14 (b) 0.34 ±0.10 (c) 0.34 ±0.10	(a) 89.20 ±10.03 (b) 91.94 ±7.30 (c) 88.13 ±9.27	 (a) 4,661.00 ±3,118.98 (b) 1449.58 ±859.69 (c) 1083.09 ±932.35

* The average dissimilarity value between individual reference sites and the "Reference Mean" that all test sites were measured against.

STREAM e-DNA

STREAM e-DNA analysis presents a list of species present at each sampled site, including general information on the species' ability to tolerate stressors and information regarding species richness at each site.



ERA's inclusion of STREAM e-DNA monitoring allowed for the identification of *Tubifex tubifex*, one of the two host species necessary for the presence of whirling disease, caused by the *Myxobolus cerebralis* parasite at ERA CABIN monitoring sites, leading to the creation of ERA's Whirling Disease Education and Monitoring program. *Tubifex tubifex* was not identified in any CABIN monitoring streams in 2022, but was identified in previous years at Morrissey, Lizard and Boivin Creeks. As of the end of 2022, there are no known cases of whirling disease in British Columbia to date, but it is widespread in the neighbouring parts of Alberta, including the Oldman watershed bordering the Elk River watershed (Veillard and James 2020). If whirling disease were to enter BC, these creeks could be a high-risk area for an outbreak. The initial discovery of this species at Boivin Creek led the creation of a new ERA program, the 'Elk Valley Whirling Disease Project', an outreach and monitoring initiative within the Elk Valley to identify other potentially high-risk locations and educate to prevent the introduction of this disease.

The detailed STREAM report is available in (Appendix E: Stream Report).



Water Quality Trends

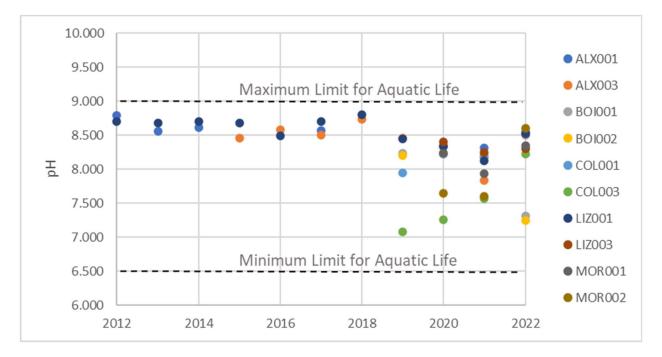
ERA's CBWM program monitors water quality parameters over time to assess long-term trends. Data on pH, temperature, turbidity, dissolved oxygen concentration, conductivity and discharge are available as far back as 2012.

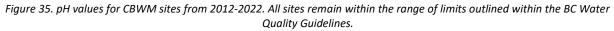
рΗ

PH levels at all sites have been relatively consistent over time (Figure 35). All areas assessed remained within the 6.5 to 9 pH BC Water Quality Guideline limits for freshwater aquatic life (British Columbia Ministry of Environment and Climate Change Strategy 2021). Stream pH is primarily a function of surrounding geology, so the Elk Valley's predominantly limestone formations result in high pH values. Aquatic life in these areas has adapted to high pH conditions. If values deviate outside of these limits, damage to current aquatic communities and changes to the species composition of the stream can occur (B.C. Ministry of Environment and Climate Change Strategy 2021a).

In 2022, Boivin Creek (BOI001, BOI002) sites had a noticeably lower pH value than the other CABIN monitoring locations. This drop in pH at these sites is exclusive to 2022 results, and further years of monitoring are necessary begin to decipher between natural variation and patterns indicative of disturbance or permanent changes to aquatic habitats. Similarly, although **Error! Reference source not found.** appears to suggest a pattern of increasing pH over time at the upper Coal Creek site (COL003), there is not yet enough year-to-year data to draw any concrete conclusions.

ERA will continue to monitor for any potential patterns through yearly CABIN sampling.







Temperature

In light of the potential effects of climate change on the Elk River system, understanding long-term temperature trends is a priority for ERA. Typically, aquatic life can only survive within specific ranges of temperatures. For example, WCT can only survive in waters between $0 - 25^{\circ}$ C (Bear, McMahon, and Zale 2007).

Temperatures measured during CABIN monitoring varied considerably between sampling years at all sites (Figure 36). However, this can be attributed to natural climatic variability and different sampling dates. Although all sites in CABIN are monitored during low flow conditions between the end of August and the beginning of November, relatively large fluctuations are expected during this period, and a single annual measurement is insufficient to understand long term trends. Temperatures remained within the critical limit for important local species like the WCT and bull trout (DFO 2017).

In depth analysis of temperature is only possible with ongoing, frequent monitoring using instream logging equipment. To this end, as part of its broader monitoring program, ERA has developed a separate hydrometric monitoring program to examine stream temperature throughout the Elk Valley in more detail.

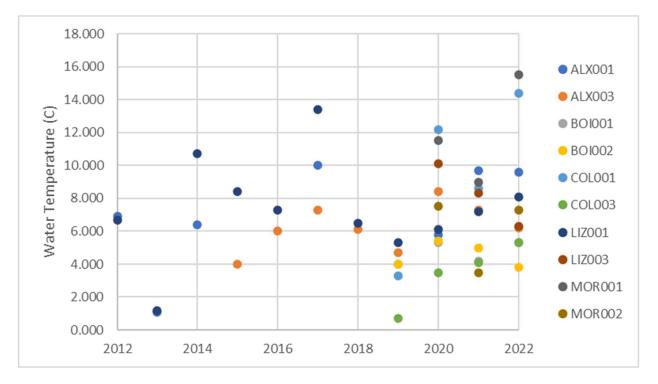


Figure 36. Temperature values for CBWM sites from 2012-2022.



Dissolved Oxygen

The concentration of dissolved oxygen (DO) at all CBWM sites has remained stable over time and is consistently above the BC Water Quality Guideline long-term minimum level of 8mg/L (Figure 37)(British Columbia Ministry of Environment and Climate Change Strategy 2021). Dissolved oxygen measurements are more consistent across sites since 2021, this is likely due to the use of new, more accurate equipment (YSI ProDSS). This consistency amongst these measurements is expected to be observed in future.

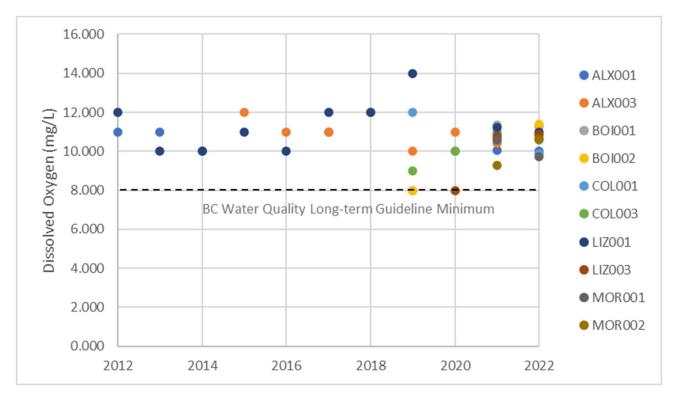


Figure 37. The amount of dissolved oxygen at CBWM sites in mg/L from 2012-2022. Site values do not fall below the BC water Quality Long-term Guideline minimum for Freshwater Aquatic Life (8mg/L).



Turbidity

Canadian Water Quality guidelines suggest that environmental samples vary within the normal range of 1 to 1000 NTU but that turbidity as low as 25 NTU can begin to have a negative effect on fish growth (Canadian Council of Ministers of the Environment 1999). Since 2012, CBWM site turbidity readings have remained below 4 NTU, with most readings below 2 NTU.

ERA staff and community observations indicate all tributaries in the Elk River watershed experience significant turbidity spikes during rainfall events and spring freshet. However, all monitored creeks tend to have low turbidity readings during low-flow conditions, with turbidity spikes generally being indicative of upstream disturbance coupled with high rainfall/snowmelt events, particularly during the May-July freshet.

According to the BC Water Quality Guidelines, turbidity is only a concern when the value changes by 8 or more NTU for 24 hours from the ambient turbidity level, or 2 NTU for 30 days (British Columbia Ministry of Environment and Climate Change Strategy 2021). Annual single occurrence sampling is not sufficient to detect these changes. In 2023, ERA will begin phase 2 of it's Sedimentation program, working with Ed Clayton, a PhD candidate from the University of Auckland, to a explore the use of a low-cost sensor that hopes to enable continuous turbidity measurements throughout the year.

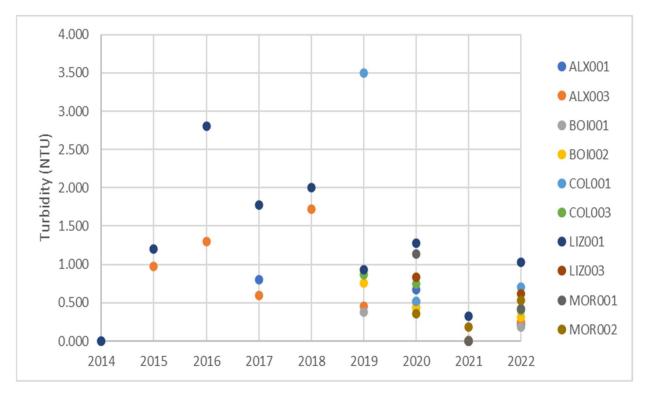


Figure 38. The turbidity (NTU) measured at CBWM sites from 2014-2022.





Conductivity

In general, conductivity levels for a freshwater river system range between 0 and 1000 uS/cm – conductivity levels above this are usually indicative of a saltwater system. Although all monitored sites fall within this range, the Lizard Creek sites have significantly higher conductivity levels than the other sites, likely due to high groundwater influence at this stream. This plot also shows a steep decrease in conductivity levels at LIZ001 between 2012 and 2013, followed by levels more than doubling in 2015. Although conductivity levels can fluctuate, the large change may have been a result of some added stressor.

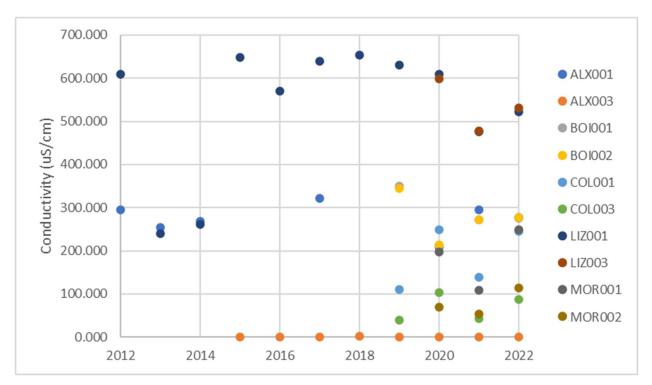


Figure 39. Conductivity levels measured at CBWM sites from 2012-2022.



Discharge

Discharge, referring to the volume of water flowing through a section of stream at a given time, was assessed during low flow conditions for each site (Figure 40). Discharge measurements at all sites remained relatively stable, fluctuating within site-specific ranges between years.

Like other measured parameters, discharge can fluctuate from day to day (and within the day). A single annual measurement is not sufficient to detect long term trends. In depth analysis of discharge is only possible with ongoing, frequent monitoring (e.g. hourly logging). To address this, ERA has begun implementing a hydrometric monitoring program to examine discharge in more detail.

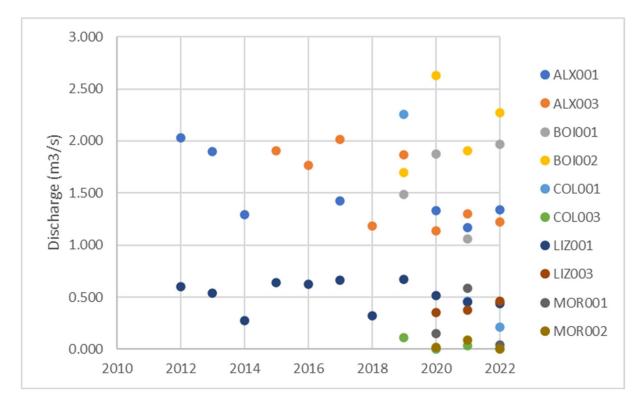


Figure 40. Discharge measurements calculated for CBWM sites from 2012- 2022.

Metals & Nutrients

Water chemistry data collected during the 2022 sampling period indicates there were no exceedances in metals or nutrients based on BC Water Quality Guidelines and no notable overall trends were observed.

Selenium and Calcite

The Elk Valley has a long history of mining, and its residents are very aware of the associated environmental issues with this industry. Selenium and calcite are two constituents of serious concern in this region.



Selenium (Se) is a naturally occurring element and low levels are essential for the health of both humans and animals (Janz et al. 2010). Unfortunately, selenium actively bioaccumulates in tissues, and in higher concentrations, begins to become toxic, eventually causing reproductive issues and deformities (Teck Resources Ltd. 2015). Waste rock, resulting from coal mining operations, contains selenium. During the mining process, this rock is broken into smaller pieces, creating more opportunity for air and water to interact with the rock. This results in the conversion of selenium into its soluble form, which is then released in water seeping through these waste rock piles into local waterways (Teck Resources Ltd. 2015). The BC water quality guideline for the protection of aquatic life is $2 \mu g/L$ (micrograms/litre). The BC human drinking water consumption guideline is $10 \mu g/L$ (British Columbia Ministry of Environment and Climate Change Strategy 2021).

Calcite (CaCO3) is also naturally occurring and is formed when calcium (Ca) and carbonate (CO3) ions react under saturated conditions (Janz et al. 2010). Calcite concretion in streambeds, specifically downstream of local coal mining operations, has become an increasing concern in the Elk Valley. Although calcite precipitates occur naturally, the waste rock produced from mining has high concentrations of both calcium and carbonate which can solidify on large stretches of stream. Supersaturated conditions cause concretion of the streambed which can negatively affect aquatic life by actively eliminating benthic invertebrate habitat (Barrett, Weech, and Orr 2016). High amounts of calcite precipitate correlate with decreased %EPT and *%Ephemeroptera* (Golder Associates Ltd. 2014). There are no water quality guidelines associated with calcite in rivers, and as the Elk River watershed is primarily calcite-rich limestone, local rivers are naturally high in this substance (Golder Associates Ltd. 2014). Assessments of calcite usually measure the amount of solidified deposits within a stream through pebble counts (Barrett, Weech, and Orr 2016). CBWM monitoring includes a pebble count which should allow ERA to see any major deposits, if present. To date, no major calcite deposits have been seen during monitoring. ERA may begin to explore options for more robust calcite monitoring, at the request of advisors on the Elk River Watershed Monitoring Collaborative.

Tributary catchments assessed with ERA's CBWM program are not affected by contemporary mining activities and are not expected to experience related contaminant issues. Selenium concentrations at the CBWM sites do not exceed reference levels and remain below the water quality guideline for freshwater aquatic life (Figure 41) (British Columbia Ministry of Environment and Climate Change Strategy 2021). For comparison, Figure 42 displays selenium concentrations in the Elk River mainstem near the outflow to Lake Koocanusa, (the Elk receives selenium loadings from upstream mines), and compares the levels found in ERA's CBWM assessed tributaries in 2020. The concentrations at these tributaries are well below what is now observed in the Elk River mainstem and are similar to those in the Elk River in the 1990s.



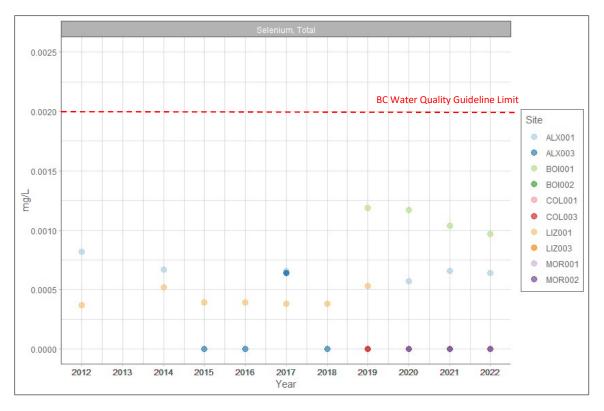


Figure 41. Total selenium concentrations at CBWM sites from 2012 to 2022. All concentrations are well below the BC water quality guideline of 0.002 mg/L (2μ g/L).

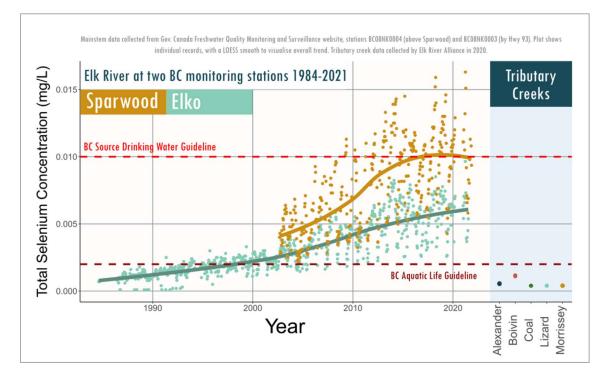


Figure 42. Total selenium in the Elk River mainstem at the outflow to Lake Koocanusa. Approximate concentrations at CBWM tributaries are included to the right and coincides with Elk River concentrations in the 1990s.



Study Limitations

A breakdown of some of the potential limitations for the 2022 CBWM sampling season.

Aspect	Constraint	Comments on Limitations
Team competency/ experience	No	Teams performing site assessments are trained in CABIN protocols through the Canadian Rivers Institute, ECCC and/or Living Lakes Canada. Individuals in these teams have varying levels of experience practicing CABIN protocols but are always led by a more experienced ERA staff member.
Timing / weather / seasonality	No	All monitoring is completed during low flow conditions, typically between August and November. Site visits are rescheduled if weather is not conducive to CABIN sampling (i.e. heavy rains that may change benthic invertebrate communities).
CABIN Model	Maybe	In 2020 a new CABIN model was produced for the Columbia Basin which when applied to ERA sites, yielded substantially different results than with the previous model. ERA is currently investigating these issues to explore whether they are a result of unknown stressors on the aquatic systems, issues with the new model's ability to sort and assess ERA's sites, GIS, or field technician error.
Scope	No	The scope was clearly defined and realistically achievable within the designated timeframe.
Proportion of task achieved, and further work which might be needed	Maybe	All sites were successfully sampled and assessed, but there is room for improvement and expansion. The CBWM program aims to create a better understanding of watershed health. Increasing the number of sites across different watershed areas and incorporating a greater variety of habitats may be necessary to better understand overall ecosystem health.
Resources	No	Through the ERA board of directors and local partnerships, ERA staff have access to a diverse group of experts in various scientific fields. With the development of the Elk River Watershed Monitoring Collaborative, ERA's CBWM program focus will aim to align with the initiatives of this group and will gain further expertise in several different fields through its involvement in this program.
		In the past, ERA has had limited access to industry-standard equipment. In 2021, ERA was able to begin upgrading equipment. Physical water quality parameters are being assessed using the YSI ProDSS which increases the accuracy of measurements.
Access	No	All sites were accessible. Initial CBWM site selection includes evaluating the accessibility of a site prior to inclusion in the program.

Table 2. Outline of the potential limitations of ERA's Community-based Water Monitoring program



Conclusion & Recommended Actions

ERA's CBWM program is an ongoing program used to assess streams of concern identified through research and community input. 2022 methodology continued to center around CABIN-based assessments and included STREAM e-DNA sampling.

While study sites on Alexander Creek and Boivin Creek appear to be in healthy condition, the lower Coal Creek site (COL001), the lower Morrisey Creek site (MOR001), and both Lizard Creek sites (LIZ001 and LIZ003), are being assessed as "highly divergent" from reference condition, which suggests that these sites may not be in good health. According to CABIN assessments, the upper test sites at both Coal and Morrissey are also experiencing a potential decline in health, with COL003 assessed as "divergent" and MOR002 as "mildly divergent".

Both Coal Creek and Morrissey Creek have large amounts of current and historical upstream development, which is why the poor assessment results at the lower sites (COL001, MOR001) were not entirely unexpected. Analysis of water quality parameters associated with these sites does not indicate any obvious red flags due to exceedances of water quality guidelines that would point to causes for divergence, but the diversity of the benthic communities at these locations appears abnormal compared to reference condition sites. Continuing to monitor these sites and watching for patterns in water quality parameters over time, is a priority going forward.

The unexpected results for the Lizard Creek sites are a concern given the creek's importance in Westslope Cutthroat Trout population recruitment (Elk River Alliance 2020). Although there are no specific exceedances of any water quality parameters based on BC guidelines, the benthic communities differ from what is expected from a typical healthy aquatic habitat, with numbers of pollutant-tolerant families becoming more prominent.

For each of these sites that have been assessed as "highly divergent", the total abundance of benthic invertebrates has been significantly higher than at associated reference sites. Furthermore, based on several measured water quality parameters, Lizard Creek may have unique conditions that are not captured by assigned reference sites (elevated alkalinity, hardness, calcium, magnesium, etc.). Due to the nature of CABIN models, which match a test site with a collection of specific reference sites and then compare the benthic communities, its possible that these high abundances have exaggerated how different the sites are, and produced these more extreme results, or that the differences in the natural state of this creek and reference creeks is too great to compare, yielding inaccurate results.

Understanding why these shifts in state have occurred, whether it is a data error, CABIN model issue, or a sign of a quickly degrading important aquatic habitat, is a high priority. ERA is recommending further investigations into potential stressors affecting these "highly divergent" CABIN monitoring sites. Lizard Creek has been flagged as a high priority creek for more in-depth monitoring in future.

ERA has established and continues to engage with the Elk River Watershed Collaborative Monitoring Program (ERWCMP). With the growth of new partnerships, the development of new research questions and access to previously inaccessible data, ERA hopes to continue to expand the CBWM program in the coming years and integrate ERA CABIN sites with ERWCMP's recommendations to improve our understanding of watershed health. The primary focus will continue to be filling in current data gaps and finding answers to the local community's environmental concerns. ERA will seek to engage the ERWCMP on the potential issues with Lizard Creek and hopes to enlist this group to take a leading role in new monitoring efforts on this Creek.



Literature Cited

Barrett, Tim, Shari Weech, and Patti Orr. 2016. "Evaluation of Calcite Effects on Aquatic Biota in the Elk Valley (2014 & 2015)." Minnow Environmental Inc. https://www.teck.com/media/Calcite-Effects-on-Aquatic-Biota-2014-2015-Report.pdf.

B.C. Ministry of Environment and Climate Change Strategy. 2021a. "pH Water Quality Guidelines (Reformatted from: British Columbia Ministry of Environment, 1991. Ambient Water Quality Criteria for pH)." Water Quality Guideline Series. Victoria, B.C. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/bc_env_ph_waterqualityguidelines_technical.pdf.

———. 2021b. "Turbidity, Suspending and Benthic Sediments Water Quality Guidelines (Reformatted from: Ambient Water Quality Guidelines for Turbidity, Suspended and Benthic Sediments - Technical Appendix Prepared for the Ministry of Environment, Lands and Parks by Cadmus Group Inc. and MacDonald Environmental Sciences Ltd. 1997)." Water Quality Guideline Series, WQG-18. Victoria, B.C. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-qualityguidelines/approved-wqgs/bc_env_turbidity_waterqualityguideline_technical.pdf.

Bear, Elizabeth A., Thomas E. McMahon, and Alexander V. Zale. 2007. "Comparative Thermal Requirements of Westslope Cutthroat Trout and Rainbow Trout: Implications for Species Interactions and Development of Thermal Protection Standards." *Transactions of the American Fisheries Society* 136 (4): 1113–21. https://doi.org/10.1577/T06-072.1.

British Columbia Ministry of Environment and Climate Change Strategy. 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary. Victoria, B.C. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf.

Canadian Council of Ministers of the Environment, ed. 1999. *Canadian Environmental Quality Guidelines*. Publication / Canadian Council of Ministers of the Environment, no. 1299. Hull, QC: CCME. https://ccme.ca/en/res/total-particulate-matter-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf.

Carter, Lesley. 2012. *Canadian Aquatic Biomonitoring Network, Field Manual - Wadeable Streams.* Dartmouth, N.S.: Environment Canada. https://central.bac-lac.gc.ca/.item?id=En84-87-2012eng&op=pdf&app=Library.

Chapman, Deborah, ed. 1996. *Water Quality Assessments: A Guide to the Use of Biota, Sediments and Water Environmental Monitoring*. 2. ed. London: E & FN Spon. https://apps.who.int/iris/bitstream/handle/10665/41850/0419216006_eng.pdf;jsessionid=35E83B3687EF1 9CB2D37AF3274089861?sequence=1.

DFO. 2017. "Recovery Potential Assessment of Bull Trout, Salvelinus Confluentus (Saskatchewan–Nelson Rivers Populations)." DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/050. https://waves-vagues.dfo-mpo.gc.ca/Library/40595900.pdf.

Elk River Alliance. 2020. "Elk River Westslope Cutthroat Trout (WCT) Research Initiative: 2019 Report."



Environment and Climate Change Canada. 2020. *CABIN Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples.* http://publications.gc.ca/collections/collection_2021/eccc/En84-86-2021-eng.pdf.

Gaber, Leon. 2012. "A Predictive Model for Bioassessment of Streams in the Columbia-Okanagan Area of British Columbia Using the Reference Condition Approach: 2010." Report prepared by Water Protection and Sustainability Branch, B.C. Ministry of Environment.

Golder Associates Ltd. 2014. "Calcite Treatment Technologies." https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/area-based-man-plan/annexes/j2_calcite_treatment_technologies.pdf.

Government of British Columbia. 2023. "Canada-BC Water Quality Monitoring Program. pH." https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-monitoring/canada-bc-water-quality-monitoring-program/water-quality-parameters.

Houghtona, David C. 2004. "Utility of Caddisflies (Insecta: Trichoptera) as Indicators of Habitat Disturbance in Minnesota." *Journal of Freshwater Ecology* 19 (1): 97–108. https://doi.org/10.1080/02705060.2004.9664517.

Janz, David M, David K DeForest, Marjorie L Brooks, Peter M Chapman, Guy Gilron, Dale Hoff, William A Hopkins, Dennis O McIntyre, Christopher A Mebane, and Vincent P Palace. 2010. "Selenium Toxicity to Aquatic Organisms." *Ecological Assessment of Selenium in the Aquatic Environment*, 141–231.

Ktunaxa Nation Council. 2022. "Ktunaxa Nation. Celebrating Who We Are." https://docs.google.com/viewerng/viewer?url=http://www.ktunaxa.org/wp-content/uploads/KNC-Brochure2019.pdf&hl=en_US.

NWP Coal Canada Ltd. 2014. "Crown Mountain Coking Coal Project: Project Description Executive Summary." https://iaac-aeic.gc.ca/050/documents/p80087/100512E.pdf.

Strachan, S, and T Reynolds. 2014. "Performance of the Standard CABIN Method: Comparison of BEAST Models and Error Rates to Detect Simulated Degradation from Multiple Data Sets." *Freshwater Science*, no. 33: 4.

Strachan, Stephanie. 2020. "Reference Model Supporting Documentation for CABIN Analytical Tools: Columbia Basin 2020." Environment and Climate Change Canada. https://cabinrcba.ec.gc.ca/Cabin/ModelDocs/Columbia2020_EN.pdf.

Teck Resources Ltd. 2015. "Elk Valley Water Quality Plan." https://www.teck.com/media/2015-Water-elk_valley_water_quality_plan_T3.2.3.2.pdf.

US EPA. 2003. "CADDIS Volume 2. About Stressors. pH." https://www.epa.gov/caddis-vol2/ph.

Veillard, Marie, and Clayton James. 2020. *Status of Whirling Disease in the Crowsnest River 2019: Technical Report*. https://doi.org/10.13140/RG.2.2.15044.04486.

Wright, Michael, Chloe Robinson, and Mehrdad Hajibabaei. 2020. "STREAM: Procedure for Collecting Benthic Macroinvertebrate DNA Samples in Wadeable Streams." https://stream-dna.com/wp-content/uploads/2021/03/Sampling-procedure-for-DNA_STREAM-v1.1.pdf.



Appendix A: CABIN Reports

ELK River Alliance		1	C14-	ALX001	ALX003	BOI001	B01002	1001001	601002	117004	LIZ003	MOR001	MOR002
2022 CABIN Benthos			Site		Alexander Creek			COL001	COL003	LIZ001			
			Stream	CBWQ-Elk	CBWQ-Elk	CBWQ-Elk	Boivin Creek	Coal Creek	Coal Creek	Lizard Creek	Lizard Creek	Morrissey Creek	Morrissey Creek
Taxonomist: Pina Viola			CABIN study				CBWQ-Elk 09/21/2022	CBWQ-Elk 09/18/2022	CBWQ-Elk	CBWQ-Elk 09/20/2022	CBWQ-Elk 09/20/2022	CBWQ-Elk	CBWQ-Elk
Date: September 25, 2023			Sampling date Device	09/14/2022 kicknet	09/14/2022 kicknet	09/21/2022 kicknet	kicknet	kicknet	09/18/2022 kicknet	kicknet	kicknet	09/11/2022 kicknet	09/11/2022 kicknet
lł			Habitat	riffle	riffle	riffle	riffle	riffle	riffle	riffle	riffle	riffle	riffle
ił			% sorted	5/100	5/100	6/100	8/100	6/100	20/100	5/100	5/100	5/100	6/100
Order I	Family	Genus	Species	5/100	5/100	0/100	8/100	0/100	20/100	5/100	5/100	5/100	0/100
Anellida-Oligochaeta	Failing	Genus	species	0	1	0			0	0			
	Enchytraeidae			0					0	0	0	0	
	Lumbriculidae			5	0		°		0	0	0	ů	,
	Naididae (Tubificidae)			1	-			°	0	321		24	
Acari-Sarcoptiformes (Oribatea				0	4		-		1	321		24	
Acari-Trombidiformes	a)			0	0	0	-		1	0	1		
	Aturidae	Aturus		0	-		-	1	4	0	1	3	
	Hydryphantidae	Aturus		0	°	, , , , , , , , , , , , , , , , , , ,	° °	1	0	1	0	3	
lł'	nyuryphantiuae	Protzia		0	-				0	0	0	0	1
l	Hygrobatidae	Hygrobates		0	0	,	, ,	, .	0	0	, v	, v	
				0		-	-		0	12		0	
	Lebertiidae Sperchontidae	Lebertia Sperchon		2	1			3	0	12		2	4
	Sperchontidae Torrenticolidae	Testudacarus	L	0	0	0		3	4	0	13	-	
├ ────────────────────────────────────	Tonenticoliuae		ļ	0	-		° *	0 5	1	4	13	37	
Colooptora	Elmidae	Torrenticola		1	°		,	, ,	4	4	°		
Coleoptera	cimuae	Heterlimnius		0					4				4
ił				2		, , , , , , , , , , , , , , , , , , ,	, 			14			
(ł		Narpus Zaitzevia		0				, 	0	0		10	,
Distant		Zaltzevia		0				-	0	0	, v	10	
Diptera	a				0			0	0		1	0	
	Ceratopogonidae			6	2	0		0 0	1	0	0	2	(
	Chironomidae			39									135
	Empididae			1	0	0			0	0	0	1	(
lł		Chelifera		Ů	3	, v	,	,	°	ů	, v	1	(
í∔		Oreogeton		0				. 0		0	0	0	(
l		Wiedemannia		0	-			0 0	0	9	0	0	(
	Pelecorhynchidae	Glutops		0		•	0	0	°	0	2	0	(
	Psychodidae	Pericoma/Telmatoscopus		17			. 3	0	0	18			(
	Simuliidae			0	°	-	°	,		5	1	0	<u> </u>
lł		Simulium		2				0 0		10	2	0	(
l	Tipulidae			0	°	, , , , , , , , , , , , , , , , , , ,	,	8	0	1	0	6	(
lł		Antocha		0				0	0	0	9	1	(
lł		Hexatoma		0	÷	-		0 0	0	0	0	3	(
lł		Tipula (Arctotipula)		0				1	0	0	0	0	(
Ephemeroptera				0	0	0		0 0	0	0	1	0	(
	Ameletidae	Ameletus		1	1	-		1	64		0	4	27
├─────┤ ′	Baetidae	A + 11-		0				1		0	2	5	1
↓ ↓		Acentrella	L	0	0	ÿ	,	1	0	Ŭ	0	4	(
-		Baetis		55						54		5	15
↓ ↓		Diphetor		0	0			-	0	1	4	4	23
⊢−−−−− [↓]	Ephemerellidae			25				10			268	18	7
├ ───── ↓		Caudatella	Devenuelle enderenderen:	2	18			0	0	0	0	0	
├ ──────────────────────────────		Drunella	Drunella coloradensis	1	2		-	. 0	°	0	-	Ĵ	<u> </u>
├────			Drunella doddsi	16					0	17	62		
├────			Drunella grandis	0	0	-	-	-	0	5	2	0	
-			Drunella spinifera	0	-	0	-	0	-	1	0	, v	
↓ ↓ ′	Heptageniidae			22				3	0	3	28		
_		Cinygmula		23						2	35	58	42
 		Epeorus	ļ	25					0	0	2	2	(
_		Rhithrogena		12					0	0	-	3	4
ļĮ'				0	-	÷) 1	0	0	0	7	5
	Leptophlebiidae					0	0	1 1	0	0	I 0	1 5	
	Leptophlebiidae	Neoleptophlebia		0	-	-	-	· · ·		-	, , , , , , , , , , , , , , , , , , ,		<u> </u>
Plecoptera		Neoleptophlebia		0	-		-	0	2	2	2	0	1
	Capniidae	Neoleptophlebia		-	2	0	0 0	22	2	2	2 29	0	1
				-	-	-	0 0	-	2 24 12	2 7 0	2 29 7	0 17 0	16
(Capniidae	Neoleptophlebia Sweltza		-	2 5 1 5	0 1 1 2	0 2 9 0	22	2	2 7 0	2 29 7 7	0 17 0 17	

·					-	-		-		-	-	-	
l	Nemouridae			0	2	0	1	0		0	3	0	(
l		Visoka		0	0	5	2	0	3	0	0	1	1
l		Zapada		12	8	1	0	1	6	11	26	0	, i
			Zapada cinctipes	17	14	0	0	3	-	64	78	6	1
L			Zapada columbiana	0	2	18			-	7	4	0	1
L			Zapada oregonensis/haisi	6	2	1	. 0	0	0	9	7	0	1
L	Peltoperlidae			0	0	0	0	0	1	0	0	0	
L		Yoraperla		0	0	0	0	0	0	0	0	0	2
L	Perlidae			0	0	0	0	0	6	4	9	0	2
		Doroneuria		0	0	0	0	0	5	8	5	0	
	Perlodidae			1	6	0	1	0	7	0	0	0	1
		Megarcys		0	0	1	. 11	0	0	0	5	0	
		Skwala		0	0	0	0	2	0	0	0	2	(
	Taeniopterygidae			25	18	112	67	0	0	7	48	0	(
Trichoptera				0	1	0	0	0	6	2	0	1	1
	Apatanidae	Apatania		0	0	0	0	0	0	1	1	0	(
	Brachycentridae	Brachycentrus		1	0	0	0	0	0	2	0	0	(
		Micrasema		1	3	0	0	0	8	6	5	7	2
[Glossosomatidae	Glossosoma		21	4	3	8	0	0	2	3	0	(
[Hydropsychidae			1	5	0	1	1	0	35	4	4	(
		Artopsyche		0	0	0	0	0	0	3	0	0	(
		Hydropsyche		0	0	0	0	1	0	49	1	10	(
[Parapsyche		1	1	0	0	0	0	0	1	0	(
[Hydroptilidae	Hydroptila		0	0	0	0	1	0	2	0	0	(
[Lepidostomatidae	Lepidostoma		0	0	0	0	38	0	0	0	23	(
	Rhyacophilidae	Rhyacophila		8	1	2	12	0	2	3	19	1	6
[Rhyacophila betteni gr.A	0	0	0	0	0	1	0	2	0	(
[Rhyacophila hyalinata gr.	1	0	0	0	0	0	0	0	0	(
[Rhyacophila narvae	0	1	0	0	0	0	0	0	0	(
			Rhyacophila sibirica gr., atr	0	2	0	0	0	0	0	0	0	(
(Rhyacophila vemna/brunn	3	3	3	1	0	2	2	3	0	(
(Uenoidae			0	0	0	0	0	0	0	0	0	
[Neothremma		0	0	0	1	0	1	0	0	0	(
		Oligophlebodes		0	2	0	0	0	0	6	35	0	(
	1												
[ł												
TOTAL				361	357	524	374	708	313	836	1210	539	406



Appendix B: Raw CABIN Datasheets

Field Crew: K. McCallum A	Kroeger, A.Blocksite Code: ALXOOL
Sampling Date: (DD/MM/YYYY) 14	109/2022
provide and the state of a strain of the	Object and Interd
Occupational Health & Safety:	Site Inspection Sheet completed
PRIMARY SITE DATA	IL Grand Marrie Clife Piule 16
CABIN Study Name: CBMM - EI	Local Basin Name: Clarkiver Creck Stream Order: (map scale 1:50,000)
 The second se Second second sec	
Select one: 🗖 Test Site 🛛 Potential Refe	erence Site
Geographical Description/Notes: Take left turnoff from Follow dirt road shrace	highway before Michel Creek bridgel of piert-stay right Park @river, (x confluence dite is ~70m y/s of co Information Source: Agriculture Residential/Urban
walk up Michel to Al	ex confluence. dite is 270 m u/s of contents
Forest L Field/Pasture	Agriculture Image: Commercial/Industrial Image: Commercial/Industrial Image: Commercial/Industrial
Logging A Mining	
Dominant Surrounding Land Use: (cneck of	
Forest Field/Pasture	Agriculture Residential/Urban Commercial/Industrial Other
Forest Field/Pasture	Agriculture
Forest Field/Pasture	Agriculture Residential/Orban Commercial/Industrial Other
Logging Dining D	Agriculture Residential/Orban Commercial/Industrial Other
Forest Field/Pasture Logging Mining Location Data Latitude: 49.674.237N Latitude: 1219.0 (fasl or masl) GF	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Levation: 13.19.0 (tasl or masl) GF Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Levation: 13.19.0 (tasl or masl) GF Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Longitude: 119.0 (tasl or masl) Green Bite Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Longitude: 119.0 (tasl or masl) Green Bite Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Levation: 13.19.0 (tasl or masl) GF Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Levation: 13.19.0 (tasl or masl) GF Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Constant Stress	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Forest Field/Pasture Logging Mining Location Data Latitude: 49.67437N Levation: 13.19.0 (tasl or masl) GF Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
Constant Stress	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)
KForest Field/Pasture Logging Mining Location Data Latitude: <u>49.674287N</u> Longitude: - []] Elevation: <u>1219.0 (fast or mast)</u> GF Site Location Map Drawing Site Location Map Drawing	Agriculture Residential/Orban Commercial/Industrial Other 4.780191_w (DMS or DD)

<

Field Crew: KM A	B.AK	Site Code: <u>ALXOO</u>
Sampling Date: (DD/MM/YY	m 14/09/2	2072
Photos	ream Downstru D Substrate (aquati	
REACH DATA (represents	6 times bankfull width)	
1. Habitat Types: <i>(check those</i> Riffle Ra		n Dool/Back Eddy
2. Canopy Coverage: (stand in	middle of stream and lo	ok up, check one) 51-75 % 76-100 %
3. Macrophyte Coverage: (not a		ne)
4. Streamside Vegetation: (<i>che</i>		eciduous trees
5. Dominant Streamside Vegeta		eciduous trees 🔲 coniferous trees
6. Periphyton Coverage on Sub	strate: <i>(benthic algae, i</i>	not moss, check one)
1 - Rocks are not s	lippery, no obvious colo	our (thin layer < 0.5 mm thick)
		n to light green colour (0.5-1 mm thick)
algae (1-5 mm t		footing is slippery), with patches of thicker green to brown
		emoved with thumbnail), numerous large clumps of green
	gae (5 mm -20 mm thic ly obscured by algal ma	at, extensive green, brown to black algal mass may have
long strands (> :	The second se	and the second se
Note: 1 through 5 represent cate	gories entered into the C	ABIN database.
BENTHIC MACROINVERT	EBRATE DATA	
abitat sampled: (<i>check one</i>)		
abitat sampled: (check one)	2 riffle L rapids L	and the second
00 μm mesh Kick Net		Preservative used: <u>99% 150</u>
erson sampling	K.MCCallin	Sampled sieved on site using "Bucket Swirling Method
ampling time (i.e. 3 min.)	3 mins	
o. of sample jars		If YES, debris collected for QAQC
	A CONTRACTOR OF	



Field Crew: 1/10, Sampling Date: (DD/M	ALC, AB, M/MM 14/09/	Site C	Code: ALXCOL
Air Temp:	e was measured: (check o	$ \begin{array}{c} \underline{g, 6} (^{\circ}C) pH: _\\ \underline{10, 0} (mg/L) Turbing analyses: \\ d/or Ammonia) \\ d/or Sulphate) & & Other analyses, but not required for (0) \\ analyses, but not required for (0) \\ ne) \\ commended if field measurement in (m), (m) \\ commended if field measurement in (m) \\ commended if field measurement in$	bidity: <u>0.22</u> (NTU) her <u>Aug</u> water anoty field shee CABIN assessments.
Measurements ^a Top <u>Hairline (</u> T)	Upstream (U/S)	Downstream(D/S)	Calculation
^a Mid Hairline (ht) OR ^b Height of rod	0.403	1.610	
^a Bottom Hairline (B) ^b Distance (dis) OR ^a T-B x 100 Change in height (Δht)	30 m ^a US _{dis} =T-B	30 m ^a DS _{dis} =T-B	$\frac{US_{dis}+DS_{dis}=}{60 \text{ M}}$ $DS_{ht}-US_{ht}=$
Slope (Δht/total dis)	A REAL PROPERTY AND A REAL PROPERTY A REAL PROPERTY AND A REAL PRO		
	s	DS _{dis}	

CABIN Field Sheet June 2012

9"

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Field Crew: KM, ALL, A	R	Jack Inderson	approach which is a francher way to be	Site Code:	ALAC	201	
Sampling Date: (DD/MM/YYYY)		1/20	Market Charles		NB =	0.7	1947 Fr
	17/0,	17 00	PSD	-	WB=	= 10.	5
Widths and Depth		THE T				to the	1
ocation at site:	kick ne	+ and	licate where	in sample r	each, ex. (d/s of kick	area)
A - Bankfull Width: 14.3 (m)				am Width: _		(m)	17.6
C - Bankfull–Wetted Depth (height from	m water surf				april 1	(cm)	
	n des ma ant has bei his the sin his just des a	-	ent life life life life and life bet and life	A			
1c			* *	-B-/			0 1
V1 P1	V2 D2		T 1 V4 V5 D4 D5	/	Mar 1		No.
1	T	T	1 -		heger .		and there
Note:		+	-				duraster 1
Netted widths > 5 m, measure a minimum Netted widths < 5 m, measure 3-4 equidist	of 5-6 equidi	istant locatio	ons;				1211
The second second second second	2.10	X_{i} is the first state					
Shore and depth are required regardles Velocity Head Rod (or ruler): Velo	ss of metho ocity Equati	ion (m/s) =	√ [2(∆D/10)0) * 9.81]		QZL	335m 1
			AL ALAK	in ne -	on chart for		335m 1
Velocity Head Rod (or ruler): Velo Rotary meters: Gurley/Price/Mini-			AL ALAK	in ne -	on chart for	Qzl. calculation	335m 1 30 34 SO AVG
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			40
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			49 AVG 0.209
Direct velocity measurements:] Marsh-Mc	Birney	Sontek or E	Other			49 AVG 0.209
Distance from Shore (m) Depth (D) (cm) Elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Dtary meter Revolutions] Marsh-Mc	Birney	Sontek or E	Other			49 AVG 0.209
Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth ($\Delta D=D_2-D_1$) (cm) Dtary meter Revolutions Time (minimum 40 seconds)] Marsh-Mc	Birney	Sontek or E	Other			49 AVG 0.209

CABIN

Field Crew: VM AK	100/2022
Field Crew: VAD, AK, Sampling Date: (DD/MM/YYYY)	14/09/2020
Sampling Date. (De	and a second a secon

SUBSTRATE DATA

6

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Cito Class	Category
Substrate Size Class	0
Organic Cover	1
< 0.1 cm (fine sand, silt or clay)	()
0.1-0.2 cm (coarse sand)	4
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
6.4-12.8 cm (smail councy)	7
12.8-25.6 cm (cobble)	8
> 25.6 cm (boulder)	9
Bedrock	9

Site Code: A

正

100 Pebble Count & Substrate Embeddedness

• Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.

- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- mbededness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

• EI	Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	Е
1	5		26	9,0		51	25.0		76	3.0	12
2	2.5		27	5.5	and the second	52	10.0		77	11.0	
3	25		28	5.0		53	4.0		78	27.0	
4	1	1 1 1 10	29	GAR 20 16		54	10.0		79	16.0	
5	1.8		(30)	2.2	0	55	7.0	in Winds	80	9.5	0
6	6.0		31	16.0		56	4.0		81	. 4.7	
7	3.6		32	3.0		57	5.5	() Spin	82	23	The second second
8	8.2		33	8.5		58	7.5	eserges das	83	5.8	142 11
9	7,2		34	4.5		59	10.0	122 Autor	84	paire 11 stores	1 Augent
10	3.5	14	35	17.0	-	60	5.5	0	85	5.8	a la billion
11	0.00		36	5.5	A State	61	4.5		86	7.5	
12	11.6		37	31		62	5.5		87	14.0	
13	10.0		38	24.0		63	7.5		88	2.6	
14	3.0		39	38.0		64	8.0		89	2.0	1000
15	8.0		40	ŦO	14	65	5,0		(90)	5.9	114
16	18.0		41	5.5	7.1	66	4.0	(The second	91	8,9	
17	16.0	•	42	45.0		67	3.5		92	10.5	
18	50.0		43	15.0		68	8.0		93	8.5	1.14.15
19	6.4		44	25.0	and the second	69	2.5	- Andrews	94	11.5	Binn
20	14.8	0	45	18.0		(70)	15.6	114	95	7.4	-
21	7.0		46	17.0		71	6.5		96	12.0	
22	4.2		47	24.5		72	14.5	N. S. D.	97	2.0	
23	. 2.4		48	17.0	in a star	73	6.5		98	5.4	
24	4,4		49	21.0		74	10.0		99	124	
25	10.5		50	21.0	314	75	3.0		100	5.5	314

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



CABIN Field Sheet June 2012

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Field Crew: LM, AK, AB	Site Code: <u>ALXOO</u>
Sampling Date: (DD/MM/YYYY) 14/09/2022	
SITE INSPECTIO	DN
Site Inspected by: KMCCallum	
Communication Information	
Hitinerary left with contact person (include contact numbers)	
Contact Person: $\underline{C.Hughes}$ Tir Form of communication: \Box radio β cell β satellite \Box hotel/pay p Phone number: (β^{O}) $\underline{423-0344}$	me checked-in: <u>12:0</u> 0 ohone 🗆 SPOT
Phone number: (D°) 423-0344	

Vehicle Safety

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)

Equipment and chemicals safely secured for transport

Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary

Notes:

Shore & Wading Safety

Wading Task Hazard Analysis read by all field staff

Wading Safe Work Procedures read by all field staff

Anstream hazards identified (i.e. log jams, deep pools, slippery rocks)

□ PFD worn

Appropriate footwear, waders, wading belt

Belay used

Notes: 18W flow

CABIN Field Sheet June 2012

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g philqmsa cloyd Clern: Q=1.338 r Alliance velocimeter Measurement Field Sheet CHE: EWE Staff Gauge: site: Wetted Width: C Date: Bankful Width: 14 Time: Instrument ID: FlowHocker 2 Staff: Grolin Photos: 7 1. Completed Field Sheet 3. Downstream 4. Across (from left bank ite Code: _ 2. Upstream Lor if possible) ALa Distance (m) Depth (m) Velocity (m/s) Notes 1 eted 24 2 G 3 0 4 IK RI 5 :50,000) . 0 6 7 N 6 4 8 tur fores side 6 9 10 11 4 12 13 0 14 2 S. 15

19e

Surre Indi Fo, Logs

nant, urre est

ing Dat 7.6

ap

16	nued from ot	0.28	0.225		12
17	6.0	0.26	0.108		0
18	64	0.18	0.477	14 33	
19	10.8	0.26	0.776	2000	-
20	7.2	86.0	0.684	T-Line	_
21	7.6	0.19	0.SQ3	1 1 2	-
22	9	0.18	0.233	1 Crean	
23	8.5	0.18	0.478	302	
24	01	0.15	0.437		
25	9.5	0.09	0.146	12001	
26	10.5	0	0	01	
27		101 20	N 1 P	01	
28	1.1.23		N. L. C		
29		8.8			
30				1 0	
81					
2	101	and the			
3	2 1 1			C	
4				01	-
5		A A			-

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Anne-Groline Kroeger
ALX 003
Field Crew: <u>Karleigh McLallum</u> Site Code. <u>Hen</u> Sampling Date: (DD/MM/YYYY) <u>14/09/2022</u> Alana Block
Sampling Date: (DD/MM/YYYY)
h the second s
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CBWM-ELK Local Basin Name: Elk River Watershed
River/Stream Name: <u>Alex ander Creek</u> Stream Order: (map scale 1:50,000) <u>4</u>
Select one: X Test Site D Potential Reference Site
Select one: Af rest site in Potential Rectange of the AB, take left turn-off unto formation for the AB, take left turn-off unto formation formation for the AB, take left turn-off unto formation for the AB, take B, take B, take B, take B, take B, take B, t
Location Data Latitude: 49.0556% N Longitude: Latitude: 49.0556% N Longitude: Elevation: 311,0 (fasl or masl) GPS Datum: GRS80 (NAD83/WGS84) Other:
Site Location Map Drawing Wa Parwood Kick Sparwood Sp
Note: Indicate north



Field Crew: K-M A.B A.C.K	Site Code:ALX003
Sampling Date: (DD/MM/YYYY) 14092022	Man Date (DD), and way of Land
Photos Image: Substrate (exposed) Image: Substrate (aquatic)	Across Site Aerial View
REACH DATA (represents 6 times bankfull width)	
1. Habitat Types: <i>(check those present)</i>	Pool/Back Eddy
2. Canopy Coverage: (stand in middle of stream and look up, che	ock one) 75 %
3. Macrophyte Coverage: (not algae or moss, check one) □ 0 % ♀ 1-25 % □ 26-50 % □ 51-	75 % 🛛 76-100 %
4. Streamside Vegetation: (<i>check those present</i>) ⊠ ferns/grasses ⊠ shrubs ⊠ deciduous tr	ees 🕅 coniferous trees
5. Dominant Streamside Vegetation: <i>(check one)</i> ferns/grasses	ees 🔲 coniferous trees
6. Periphyton Coverage on Substrate: (benthic algae, not moss, o	check one)
1 - Rocks are not slippery, no obvious colour (thin la	yer < 0.5 mm thick)
2 - Rocks are slightly slippery, yellow-brown to light g	
3 - Rocks have a noticeable slippery feel (footing is salgae (1-5 mm thick)	slippery), with patches of thicker green to brown
4 - Rocks are very slippery (algae can be removed w to dark brown algae (5 mm -20 mm thick)	vith thumbnail), numerous large clumps of green
5 - Rocks are mostly obscured by algal mat, extensi long strands (> 20 mm thick)	ve green, brown to black algal mass may have
Note: 1 through 5 represent categories entered into the CABIN datab	base.
BENTHIC MACROINVERTEBRATE DATA	
Habitat sampled: (<i>check one</i>) 📈 riffle 🛛 rapids 🗍 straight r	un

400 μm mesh Kick Net	V	Preservative used: 150 pro parol 99 16
Person sampling	ACK	Sampled sieved on site using "Bucket Swirling Method":
Sampling time (i.e. 3 min.)	3 min	XYES NO
No. of sample jars	2	If YES, debris collected for QAQC
Typical depth in kick area (cm)	20	

Note: Indicate if a sampling method other than the recommended 400 μm mesh kick net is used.



Page 2 of 6

	K-M A.C.K.	5	Site Code:	ALX003	Field
Field Crew: A. 6	K-11 110020	17		conceptibility and ball	
Sampling Date: (DD/MM	MMM 140920	<u> </u>	and a state of the		
WATER CHEMISTRY	DATA Time: 9:24 (°C) Water Temp: 4 76.9 (µs/cm) DO:	(24 hr clock)	Time zone:		
Check if water samples we TSS (Total Suspended Nitrogen (i.e. Total, Nitrogen (i.e. Total, Nitrogen (i.e. Total, Ortogen) Major lons (i.e. Alkalinit	re collected for the following Solids) rate, Nitrite, Dissolved, and/	g analyses: or Ammonia) /or Sulphate)	Other	Sampling fields of	
CHANNEL DATA	and philade				
	e was measured: (check or	ne)			
contour interval (vertica distance between conto slope = vertical distanc OR Measured in field Circle device used and	our intervals (horizontal dist	(m), ance)	_ (m)		
Measurements	Upstream (U/S)	Downstream	(D/S)	Calculation	
^a Top Hairline (T)			_		
^a Mid Hairline (ht) OR			Carl Andrea		
^b Height of rod	1,205	1.921			
^a Bottom Hairline (B)					
^b Distance (dis) OR	30 m	A AND	EBRATE	BE	
^a T-B x 100	^a US _{dis} =T-B	30.00		US _{dis} +DS _{dis} = 60.0m	
Change in height (Δht)	COdis-1-D	^a DS _{dis} =T-B		DO. HIS	
Slope (Δht/total dis)				$\frac{DS_{ht}-US_{ht}}{1.921-1.205=0.716}$	
CABIN Field Sheet June 20	Page 3 of 6	DS _{die}		$0.711_{30} = 0.02386666(2.39%)DS_{ht}$, ,
	, ago o or o			CABIN	

Samo.

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Field Crew: A.B. A.C.K.	KIVI			Site Code	e: AUX		and is
Sampling Date: (DD/MM/YYYY) _	14092	222		- The	LWB : 0	.13m	
		an all the	and and the state of the		RWB 10	.Im	
Widths and Depth	An an an						and an and the
Location at site: U/S kicken	et	And the second			e reach, ex.		area)
A - Bankfull Width: 10.90 (m)				a contract of the second s	-9,97	(m)	
C - Bankfull-Wetted Depth (height fro	om water surfac	ce to Bank	kfull):	1.1 CM	Ύ	(cm)	
1c	ner lent den son aus aus aus aus den mit hen aus aus den		4 166 189 189 189 189 187 187 187 188 189		1		
		1 1 V3 V	4 V5 04 D5	-87			ninders po
	1 V2 51 D2	V3 V D3 D	4 V5 04 D5	/			
	+	+ .					
Note: Wetted widths > 5 m, measure a minimu Wetted widths < 5 m, measure 3-4 equid	m of 5-6 equidist listant locations.	ant location	ns;				
Velocity and Depth	and the second second						
 Velocity Head Rod (or ruler): Velocity Head Rod (or ruler): Velocity Rotary meters: Gurley/Price/Min 	ni-Price/Propelle	er (Refer t	o specific m	eter conve	ersion chart fo	or calculatio	n) See
	ni-Price/Propelle	er (Refer t	o specific m	eter conve	ersion chart fo	or calculatio	n) 2 (500)
Rotary meters: Gurley/Price/Min	ni-Price/Propelle	er (Refer t	o specific m	eter conve	ersion chart fo	or calculatio	n) See of
Rotary meters: Gurley/Price/Min Direct velocity measurements:	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Set
Rotary meters: Gurley/Price/Min Direct velocity measurements:	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Set
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) 2 F
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) 2 F
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) /elocity Head Rod (ruler)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) 2 F
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Yelocity Head Rod (ruler) Flowing water Depth (D ₁) (cm)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) 2 F
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) 2 F
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) /elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Z T AVG
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Z T AVG
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) /elocity Head Rod (ruler) Flowing water Depth (D1) (cm) Depth of Stagnation (D2) (cm) Change in depth (ΔD=D2-D1) (cm) Revolutions Time (minimum 40 seconds)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Z T AVG
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D1) (cm) Depth of Stagnation (D2) (cm) Change in depth (ΔD=D2-D1) (cm) Revolutions Time (minimum 40 seconds)	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	Flowtra	dun	n) Z T AVG
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Revolutions Time (minimum 40 seconds) Direct Measurement or calculation	ni-Price/Propelle	er (Refer t	o specific m Sontek or D	eter conve	5		n) 2 4 0.263 0.263
Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Revolutions Time (minimum 40 seconds) Direct Measurement or calculation	ni-Price/Propelle		o specific m Sontek or D	eter conve	Flowtra		n) 2 4 0.263 0.263

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Field Crew: K.M. ACK AB	Site Code:	XUUS
Field Crew:	2 Substrate Size Class	Category
A second		0
SUBSTRATE DATA	Organic Cover < 0.1 cm (fine sand, silt or clay)	1
	0.1-0.2 cm (coarse sand)	(2)
Surrounding/Interstitial Material	0.2-1.6 cm (gravel)	3
Circle the substrate size category for the surrounding	1.6-3.2 cm (small pebble)	4
naterial.	3.2-6.4 cm (large pebble)	5
	6.4-12.8 cm (small cobble)	6
	12.8-25.6 cm (cobble)	7
	> 25.6 cm (boulder)	8
	Bedrock	9

100 Pebble Count & Substrate Embeddedness

2

Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.

Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.

• Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E	A CONTRACTOR OF THE OWNER	Diameter (cm)	Е		Diameter (cm)	E		Diameter (cm)	E
1	5		26	105		51	3.0		76	6.1	-
2	1 g		27	50		52	12.0		77	3.1	
3	25		28	130		53	10.5		78	6.5	113
4	1 II	1	29	12	404	54	3	1. s.nn.	79	11-1	10.192
5	17		- 30	9	1/4	55	8		- 80	6.2	1/4
6	7		31	12		56	16	they?	81	4.1	1 min
7	1 cy	138	32	13		57	11		82	7	
8			33	12.2		58	8.6	Tradition of	83	4.5	1. Terre
9	13	0	34	4.2	to state	59	0.7	1.7924	84	7	1200
10	12	1	35	11.1		- 60	85	114	85	6	
11	11	Ra	36	10.9	1. 1. 1. 1	61	20		86	12.4	
12	iD		37	14.5		62	9		87	11.5	
3	9		38	7.2		63	13.5	- for - mail	88	4.5	
4	21		39	11.9		64	11.5		89	19	1
5	11	-	- 40	.4.5	1/2	65	7.3		- 90	13	0
6	1	and for	41	10.0	- S. P.	66	4.2		91	9.5	
7	Y		42	10.1	1 martin	67	8.3		92	19	
3	20		43	15.5		68	2.1		93	17	-
,	10 .	-	44	14.0		69	10.7		94	9.5	
	12	1/2	45	2.8		. 70	3.9	0	95	21	-
	11	101	46	7.5	-	71	10.2		95		
	4		47	7.8		72	13		-	0.0	
1	0		48	4.5					97	3.5	
-	12		49			73	3	A PARTIE	98	11	
	12			8.5	11	74	14.4		99	21.5	100
	10 1	+	50	47	112	75	10.1		100	9.4	1)

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



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CABIN Field Sheet June 2012

Page 5 of 6

Field Crew: <u>KM AB ACK</u> Sampling Date: (DD/MM/YYYY) <u>14/09/2022</u>	Site Code: _	ALXDI	2
SITE INSPECTION			
Site Inspected by: <u>Anne-Caroline Kroeger</u>			
Communication Information			
Itinerary left with contact person (include contact numbers)			YP
	checked-in: _	8:00	A
Form of communication: Tadio X cell satellite hotel/pay phor			1
Phone number: (250) 423-0344			

Vehicle Safety

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)

K Equipment and chemicals safely secured for transport

Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary

Notes:

Shore & Wading Safety

S Wading Task Hazard Analysis read by all field staff

Wading Safe Work Procedures read by all field staff

Instream hazards identified (i.e. log jams, deep pools, slippery rocks)

DED WOM NIA LOW Flow (trickle)

Appropriate footwear, waders, wading belt

D Belay used NIA

Notes:

=0.468 iver Alliance elocimeter Measurement Field Sheet LWE: RWE: ALX00 Staff Gauge: site: 14 G 177 Wetted Width: Date: Time: Bankful Width: 10.90 te: (DD/N Instrument ID: FLOWHIGCHEV Staff: VN Photos: 1. Completed Field Sheet 3. Downstream ional H alt' 4. Across (from left bank 2. Upstream if possible) ITE DA Distance (m) Depth (m) Velocity (m/s) Notes lame: <u>C</u> ett Barn ame: L 0.03 2 2 est Site 3 0.0259 0:2718 I Descr 4 1 Fire rocks large US .1153 5 on 500 85 .2 0,5359 6)m 6.0746 25 Use: (cł 7 Field/F ... 65 0.0158 8 Mining 05 0.6308 9 0.20 0.5 0.2 45 10 ling Lan 0.2178 0.5 Field/Pa 85 .32 0.5428 11 Mining 4.25 0.44 0.637 12 ,65 国 0.48 13 0.6465 05 5 0.44 14 0.7231 32 N 15 15 43 4947 (fasl or

p Dra

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16	16.85	her side	0.9291	Same and
17	6.25	0.44	0.5786	
18	6.65	0-28	0.5893	
19	7.05	0.34	0.6288	all aller
20	7.45	0.31	0.4822	1 to series
21	7.85	0.18	0.4856	TAL Mad
22	8.25	0.22	0.3887	19 rock
23	8,65	0.11	0.4041	T.
24	9.05	0,08	0.2834	
25	9.45	0,15	.1283	
26	10.10	0	0	Rightann
27	120	1.511.51		
28	107	and the second		- 10.
29			1 2343	
30	19 23.01	Ser in	S. 1.	A.F.
31	A.	in the second		P. 1.
32		C. A. L. M. KON	1 1 2 1	24
33		at we be	1991 20	E.
34		in the	1	21
35	The aspects			
Comme	ents:	CR.	£	R. I.
	AND F.	are literates	1 1 3/2	12 1 1
	and the second			UN TO

E Price

Field Crew: K.McCallum, C. Hughes Site Code: BOLOOL
Sampling Date: (DD/MM/YYYY) D1/09/2022
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CBNQ - EIL Local Basin Name: EIL RIVER
River/Stream Name: <u>BOWIN CICCLE</u> Stream Order: (map scale 1:50,000)
Select one: A Test Site D Potential Reference Site
Geographical Description/Notes: Boivin Creek above confluence into Elk River, below in-town bridge.
Surrounding Land Use: (check those present) Information Source: <u>Visual</u> 10 cal know
Logging Mining Mining Commercial/Industrial Other
Dominant Surrounding Land Use: (check one) Information Source: Vis, locol Forest Field/Pasture Agriculture Logging Mining Mining
Location Data
Latitude: $50, 0100$ N Longitude: - $-114, 93(996)$ (DMS of DD) Elevation: $348, 5$ (fasl or masl) GPS Datum: GRS80 (NAD83/WGS84) Other: DS=30
45.33
Site Location Map Drawing
Lat Flow USE 0.53
TTITT & UN BORD
Parkingler Trailing The State
Sof 1 Barbon ()
Note: Indicate north

CABIN Field Sheet June 2012

Page 1 of 6



Field Crew: Lam, CH, al 109/2022
Sampling Date: (DD/MM/YYYY) 21/04/4444 Photos Photos Field Sheet Upstream Substrate (exposed) Substrate (aquatic)
REACH DATA (represents 6 times bankfull width)
1. Habitat Types: (check those present)
2. Canopy Coverage: (stand in middle of stream and look up, check one) 0 % 1-25 % 26-50 % 51-75 % 76-100 %
3. Macrophyte Coverage: (not algae or moss, check one) ↓ 0 % □ 1-25 % □ 26-50 % □ 51-75 % □ 76-100 %
4. Streamside Vegetation: (check those present)
5. Dominant Streamside Vegetation: (check one)
6. Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
 1 - Rocks are not slippery, no obvious colour (thin layer < 0.5 mm thick) 2 - Rocks are slightly slippery, yellow-brown to light green colour (0.5-1 mm thick) 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick)
4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to dark brown algae (5 mm -20 mm thick)
 5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have
Note: 1 through 5 represent categories entered into the CABIN database.
ENTHIC MACROINVERTEBRATE DATA

	rime L rapids L	straight run
400 µm mesh Kick Net		Preservet
Person sampling	CH	Preservative used: 150 PROP 99%
Sampling time (i.e. 3 min.)	3 mins	Sampled sieved on site using "Bucket Swirling Method":
No. of sample jars	1	If YES, debris collected for QAQC
Typical depth in kick area (cm)	35 UM	A A A A A A A A A A A A A A A A A A A

CABIN

Note: Indicate if a sampling method other than the recommended 400 μm mesh kick net is used.

CABIN Field Sheet June 2012

Page 2 of 6

Field Crew: KM, CH	Site Code: <u>B61001</u>
Sampling Date: (DD/MM/YYYY)	more labor and a dame
WATER CHEMISTRY DATA Time: 3:36 (24 hr clock)	Time zone: <u>MT</u>
Air Temp: 17.5 (°C) Water Temp: 5.3 (°C)	pH: 7.3(
Specific Conductance: 2763(µs/cm) DO: 11.28 (mg/L 89.10/14) Turbidity: <u>0.18 (</u> NTU)
Check if water samples were collected for the following analyses:	an pil top any the sate and a pilotent -
TSS (Total Suspended Solids)	and the second
Phosphorus (Total, Ortho, and/or Dissolved)	Dother See WG field sheet
Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate)	D Other <u>All NO field</u> theet
Note: Determining alkalinity is recommended, as are other analyses, but not re	quired for CABIN assessments.
CHANNEL DATA	
Slope - Indicate how slope was measured: (check one)	

Calculated from map

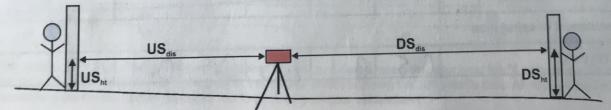
Scale:	(Note: small scale map recommende	ed if field measurement is not possible - i.e. 1:20,000).
contour interval (vertical distance between conto slope = vertical distance	distance) (m), ur intervals (horizontal distance) _	(m)

OR

Measured in field

Circle device used and fill out table according to device: a. Survey Equipment b. Hand Level & Measuring Tape

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
^a Top Hairline (T)			
^a Mid Hairline (ht) OR	0.533m	2000	the albert a co
^b Height of rod	0.000m	2.333m	<
^a Bottom Hairline (B)			
^b Distance (dis) OR	30m	SQW	US _{dis} +DS _{dis} =
^a T-B x 100	^a US _{dis} =T-B	^a DS _{dis} =T-B	DSht-USbt=
Change in height (Δht)	1		
Slope (∆ht/total dis)			0.03



CABIN Field Sheet June 2012

Page 3 of 6



	Site Coue.
Field Crew: KM, (CH Site Code: BOLOOT
Sampling Date: (DD/MM/	CH mm_21/09/20220
	A RECEIPTION AND THE ADDRESS
Widths and Depth	kick area
A - Bankfulling 2.0.5	kicknet (Indicate where in sample reden, or 35 (m)
A - Bankfull Width: 8.95	(m) B - Wetted Stream Width
	eight from water surface to Bankfull):(cm)
0 10.00	1c
	V1 V2 V3 V4 V5 D1 D2 D3 D4 D5
	D1 D2 D3 D4 D5
Note: Wetted widths > 5 m, measure a mi Wetted widths < 5 m, measure 3-4 e	ANNELDATA
	equidistant locations;
Rotary meters: Gurlev/Price/I	: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$
Shore and depth are required reg Velocity Head Rod (or ruler) Rotary meters: Gurley/Price/I	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: □ Marsh-McBirney □ Sontek or 7 Other <u>$(\Delta bal Flow prok)$</u> $2 \cdot 84 4 \cdot 0.3 5 \cdot 22 6 \cdot 41 7 \cdot (a0 - 2 - 76)$
Shore and depth are required reg Velocity Head Rod (or ruler) Rotary meters: Gurley/Price/I	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or $\overrightarrow{\Box}$ Other $\underline{(\Box bal Flow)}$ prove 2.844.4.035.226.4417.608.79 1 2 3 4 5 6 AVC
Velocity Head Rod (or ruler) Rotary meters: Gurley/Price/I Direct velocity measurement	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
bistance from Shore (m)	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Distance from Shore (m)	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \overrightarrow{D} Other $\underline{(Dbal Flow)}$ prove 2.84 + 0.3 + 0.2 + 0.4 + 0.5 + 0.4 + 0.5 + 0.5 + 0.4 + 0.5 + 0.5 + 0.4 + 0.5
Direct velocity measurement Direct velocity measurement Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler)	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Image: Shore and depth are required reg Image: Shore and Control of Shore (m) Image: Shore and Shore (m) Image: Depth (Image: Shore and Shore (m) Image: Shore and Shore and Shore (m) Image: Shore and Shore and Shore (m) Image: Shore and Shore a	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Direct velocity measurement Direct velocity measurement Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D1) (cm) Depth of Stagnation (D2) (cm)	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Image: Shore and depth are required reg Image: Shore and Control Image: Image: Shore are required reg Image: Image: Shore are required reg Image: Image: Image: Shore are required reg Image: Image: Image: Shore are required reg Image: Image: Image: Image: Shore are required reg Image: Ima	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Image: Shore and depth are required reg Image: Shore and Content and Shore (m) Image: Shore are shore	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 100 +
Image: Shore and depth are required reg Image: Shore and Content and Shore (m) Image: Shore and Shore (m) Image:	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 12 + 2.84 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 6 + 6 + 6 + 6 + 6 + 6 + 6 +
Image: Shore and depth are required reg Image: Shore and Control and Shore (m) Image: Shore are and control and shore (m) Image: Depth (D) (cm) Image: Velocity Head Rod (ruler) Image: Flowing water Depth (D1) (cm) Image: Image: Depth (D2) (cm) Change in depth (D2) (cm) Change in depth (D2) (cm) Revolutions Time (minimum 40 seconds) Image: Imag	P: Velocity Equation (m/s) = $\sqrt{[2(\Delta D/100) * 9.81]}$ Mini-Price/Propeller (Refer to specific meter conversion chart for calculation) ts: \Box Marsh-McBirney \Box Sontek or \Box Other $(\Box D)$ bal Flow proventiation 2.84 + 0.03 + 5.22 + 0.41 + 7.60 + 8.79 + 12 + 2.84 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 4.76 + 5 + 6 + 6 + 6 + 6 + 6 + 6 + 6 + 6 +

CABIN Field Sheet June 2012



Field Crew: 14

Site Code: BOICO

Sampling Date: (DD/MM/YYYY) 109/2022 21

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	(2)
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	• 5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- Embededness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	bededness catego		a market have been	Diameter (cm)	E	[Diameter (cm)	E	Di	ameter (cm)	E
-	Diameter (cm)	E				51	01		76	35.4	
1	5.5		26	10.1		52	10.7		77	18.2	
2	5.4		27	6.2		53	4.9		78	17.0	
3	3.5		28	19		54	a d		79	15.4	Meltio
4	2.8		29	6.7		55	910		80	7.2	
5	18.5		30	3.4	14	56	2810		81	3.7	1/4
6	189		31	10.5		57	87	a carter of	82	15.0	
7	10.5		32	12.0		58	N.T.		83	10.0	
8	19.2		33	12:0		59	10.2	- Contraction	84	2.0	
9	10-2		34	4:4	7	60	174	1/4	85	5.2	
10	11.0	0	35	2.0		61	8.2	14	86	3.5	
11	1,6		36	6.2		62	110		87	4.6	
12	210		37	233		63	0.5		88	3.9	
13	0:3		38	4.7		64	Til		89	0.8	
14	5.7		39	5.5	11		10-		90	29	1/2
15	14.3		40	5.5	1/2		20.5		91	2.1	10
16	14.2		41	19.3		66	17.0		92		
17	4.1		42	10-8	- Carl	67	8.2			3.5	
18	41		43	20	- Company	68	15.0	1	93		-
19	3.0		44	10.0		69	18.0	14	94	0.4	-
20	28.0		45	10.1		70	8.5	1.0	95	7.5	
21	11.2	\hat{O}	46	4,9		71	45.0		96	6.2	
22	INS		47	121		72	17.0		97	1.2	
23	27		48	10.2		73	10.5		98	21.0	
24	720		49	aa		74	15.0		99	11.6	
25	08.0		50	a'2	0	75	11.0		100	Fourteencn	1 1/4

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



Site Code: BO'1001
Sampling Date: (DD/MM/YYYY) <u>21/09/2022</u>
ATLC STATISTICS
SITE INSPECTION
Site Inspected by: K.M.C.allin
Communication Information
Itinerary left with contact person (include contact numbers)
Contact Person: ACK Time checked-in: 12:0
Form of communication: Tradio Cell Satellite hotel/pay phone SPOT
Phone number: $(514) 664 - 6815$
Vehicle Safety
Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)
Equipment and chemicals safely secured for transport
Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary
Notes:
Shore & Wading Safety
Wading Task Hazard Analysis read by all field staff
Wading Safe Work Procedures read by all field staff
Instream hazards identified (i.e. log jams, deep pools, slippery rocks)
□ PFD worn
Appropriate footwear, waders, wading belt
□ Belay used
Notes:

19.972



Field Crew: K. McCallum, C. Hughes Site Code: BOIDO2
Sampling Date: (DD/MM/YYYY) 21/09/2020
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CBWQ-CIL Local Basin Name: FIL River
River/Stream Name: Boivin Cu. Stream Order: (map scale 1:50,000)
Select one: A Test Site D Potential Reference Site
Geographical Description/Notes: Park @ X-country ski trails (on Natal Rd), follow path to tridge, Atay on LWB, tread u/s until "n ight may before x-mas" the the
Surrounding Land Use: (check those present) Information Source: <u>MSUal</u> , <u>Maps</u> , Jocal Forest Field/Pasture Agriculture Residential/Urban Logging Mining Commercial/Industrial Other <u>fl Creational</u> trails
Dominant Surrounding Land Use: (check one) Information Source: Forest Field/Pasture Agriculture Residential/Urban Logging Mining Commercial/Industrial Other
Location Data Latitude: <u>50-0/6927</u> N Longitude: - <u>(14936979</u> W (DMS or DD)
Latitude: <u>O:O[6927_N Longitude:</u> <u>O:O[6927_N Longitude:</u> Elevation: (fasl or masl) GPS Datum: GRS80 (NAD83/WGS84) Other:
F por and
Site Location Map Drawing
- And in
wicknet find
Flow - Benet
Note: Indicate north



10- 11	Site Code: BOIOO2
Field Crew: <u>KM, CH</u> Sampling Date: (DD/MM/YYYY) <u>11/09/202</u>	22
Photos Downstream Field Sheet Upstream Substrate (exposed) Substrate (aquatic)	Across Site Aerial View
REACH DATA (represents 6 times bankfull width)	
1. Habitat Types: (check those present)	Pool/Back Eddy
2. Canopy Coverage: (stand in middle of stream and look up,	check one) 51-75 %
3. Macrophyte Coverage: (not algae or moss, check one)	51-75 % 🛛 76-100 %
4. Streamside Vegetation: (<i>check those present</i>)	s trees Coniferous trees
5. Dominant Streamside Vegetation: <i>(check one)</i>	s trees Coniferous trees
6. Periphyton Coverage on Substrate: (benthic algae, not mos	s, check one)
 1 - Rocks are not slippery, no obvious colour (thin 2 - Rocks are slightly slippery, yellow-brown to lightly slippery 	h layer < 0.5 mm thick)
3 - Rocks have a noticeable slippery feel (footing i algae (1-5 mm thick)	is slippery), with patches of thicker green to brown
4 - Rocks are very slippery (algae can be removed to dark brown algae (5 mm -20 mm thick)	d with thumbnail), numerous large clumps of green
5 - Rocks are mostly obscured by algal mat, exter long strands (> 20 mm thick)	nsive green, brown to black algal mass may have
Note: 1 through 5 represent categories entered into the CABIN da	tabase

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one) 📈 riffle	rapids 🛛 straight run
400 μm mesh Kick Net	Preservative used: Sopropy 99%
Person sampling C. H	Sampled sieved on site using "Bucket Swirling Method":
Sampling time (i.e. 3 min.)	VA YES LINO
No. of sample jars	If YES, debris collected for QAQC
Typical depth in kick area (cm) 351	cm

Note: Indicate if a sampling method other than the recommended 400 μm mesh kick net is used.



Sampling Date: (DD/MM/YYYY) 21/09/2022	1100
WATER CHEMISTRY DATA Time: 1:30 (24 hr clock)	Time zone:
Air Temp: 3, 0 °C (°C) Water Temp: 3.8 (°C)	pH: 7.24
Specific Conductance: <u>J77.6(µs/cm</u>) DO: <u>11, 40</u> (mg/L	
Check if water samples were collected for the following analyses:	and the second second second second
 TSS (Total Suspended Solids) Nitrogen (i.e. Total, Nitrate, Nitrite, Dissolved, and/or Ammonia) 	ale V
Phosphorus (Total, Ortho, and/or Dissolved)	water doll
Anajor lons (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate)	Dother See chun she
Note: Determining alkalinity is recommended, as are other analyses, but not re	

□ Calculated from map

Scale: (Note:	small scale map recommended if field r	measurement is not possible - i	.e. 1:20,000
contour interval (vertical distance)	(m),		
distance between contour intervals		(m)	
slope = vertical distance/horizontal	distance =		

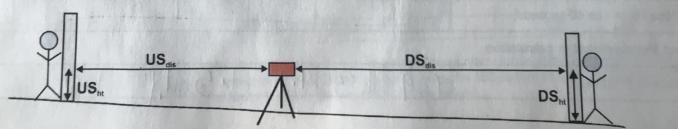
OR

t

Measured in field

Gircle device used and fill out table according to device: a. Survey Equipment b. Hand Level & Measuring Tape

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
^a Top Hairline (T)	entre internet		
^a Mid Hairline (ht) OR	0 1110	0 0 0 0 0 0 0	
^b Height of rod	0.449m	2.344 M	
^a Bottom Hairline (B)			
^b Distance (dis) OR	30 m	30m	US _{dis} +DS _{dis} =
³ T-B x 100	^a US _{dis} =T-B	30₩ ªDS _{dis} =T-B	60
Change in height (∆ht)			DSht-USht=
Slope (Δht/total dis)			0.031583





0).

CABIN Field Sheet June 2012

Field Crew: Km, CH,	1000	- 1-		Site Code	:	UUA	
Sampling Date: (DD/MM/YYYY)	21/6	19/0	2020	2			
Sampling - the t			2. A.	-	- Vare		
Widths and Depth	and the set			N 103	and or	the of kick an	ea)
Rocation at site:S kick	netar	<u>la</u> (Ind	icate where	e in sample eam Width:	reach, ex.	d/s of kick an (m)	
A- Bankfull Width:(m)					<u> </u>	(cm)	1115
C - Bankfull-Wetted Depth (height fro	om water sur	face to Ban	kfull):	29.0			and B
tc				P			are B
	1 1 V2 01 D2	↓ V3 D3	1 1 14 V5 04 D5	/			
	D1 D2	D3		/			
		+	· · ·				1AHS
Note: Wetted widths > 5 m, measure a minimum	m of 5-6 equic	listant locatio	ons;			- mentari -	00013
Wetted widths < 5 m, measure 3-4 equid	listant location	s.					
Velocity and Depth	device one	SIL out the	oppropriate	section in	chart below	v. Distance fi	rom
Check appropriate velocity measuring	g device and less of metho	fill out the od:	appropriate	e section in	chart below	v. Distance fi	rom
Check appropriate velocity measuring shore and depth are required regard	less of metho	50:			chart belov	v. Distance fi	rom
Check appropriate velocity measuring shore and depth are required regard	elocity Equat	tion (m/s) =	√ [2(∆D/10	00) * 9.81]			rom
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity Head Rod (or r	less of metho elocity Equat ni-Price/Prop	od: tion (m/s) = eller (Refer	√ [2(Δ D/10	00) * 9.81] eter convers	sion chart for		rom S
Check appropriate velocity measuring shore and depth are required regard	less of metho elocity Equat ni-Price/Prop	ca: tion (m/s) = eller (Refer cBirney 🖸 \$	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] leter convers Other 6	sion chart for $(b_{1}b_{1})^{2}$	calculation)	AVG
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity Head Rod (or r	less of metho elocity Equat ni-Price/Prop	od: tion (m/s) = eller (Refer	√ [2(Δ D/10	00) * 9.81] eter convers	sion chart for		2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Ve Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Vo Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for $(b_{1}b_{1})^{2}$	calculation)	2
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Ve Rotary meters: Gurley/Price/Min Direct velocity measurements:	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Vo Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Velocity Head Rod (or ruler): Velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Velocity Head Rod (or ruler): Velocity measurements: Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regards Velocity Head Rod (or ruler): Vo Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regard □ Velocity Head Rod (or ruler): Vo □ Rotary meters: Gurley/Price/Min □ Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity Head Rod (or ruler): Velocity measurements: Direct velocity measurements: Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions	less of metho elocity Equat ni-Price/Prop	ba: tion (m/s) = eller (Refer cBirney □ \$ 5 · Q ↓ 2	$\sqrt{2} \left[2(\Delta D) \right]$ to specific m Sontek or $\sqrt{2}$	00) * 9.81] eter convers Other 6 7.5 4 3.12	sion chart for 16528 5 3.90	calculation)	2



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2-24 R-9 Field Crew: KM, C

Site Code: BO1002

Sampling Date: (DD/MM/YYYY) 21/09/2022

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organić Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	2
0.2-1.6 cm (gravel)	(3)
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	E	C	Diameter (cm)	E
1	15,3		26	242		51	7.5	1.54	76	0.4	
2	5.3		27	11.0		52	22.0		77	0.2	
3	10.4		28	9.5		53	.30.0		78	3.6	
4	4.0		29	-6.6		54	25.0		79	21.8	Stand
5	4.5		30	4.3	0	55	40.0		80	16.5	0
6	4.1		31	'S	o Cassia	56	40.0		81	8.5	
7	2.9		32	5.2		57	10.6	1.0 TENE	82	15.0	100
8	3.1		33	12.0		58	20.0		83	3.5	
9	T.S		34	6.0	1. 1. 1. M.	59	14.0	1.0	84	2.0	
10	5.6	125	35	4.8		60	30	.25	85	16.0	
11	5.1		36	8.6		61	9.5		86	4.8	
12	1.2		37	5.0		62	1.2	1	87	7.5	
13	8.0		38	7.0		63	11.5		88	4.0	
14	6.0		39	9.7		64	5.2		89	1.5	130
15	14.0		40	7.5		65	5.1		90	3.0	:25
16	0.7.0		41	15.0		66	9.5		91	1.5	
17	25.0		42	26.0	.75	67	0.9	1 6 2 "	92	1.0	
18	6.0		43	28.0		68	0.5		93	9418 S	3
19	31.6		44	3-8		69	9.2		94	4.5	
20	80.0	:75	45	5.0		70	1.1	0	95	5.5	1
21	il		46	7.2		71	22.4		96	472	
22	42		47	8.6		72	8.2	19 28 1	97	8.5	
23	Ś		48	4.2		73	7.5		98	15.0	
24	5.5		49	5.0		74	1.2		99	14.5	
25	10.5		50	12.9	.25	75	81		100	85	.52

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



Field Crew: KM. C	H	Site Code: _1	301001
Sampling Date: (DD/MM/YY	m_21/091	2022	
			ATAG STRATERUS
	SITE INSI	PECTION	
Site Inspected by:KM			
			No. 1
Communication Information			
Itinerary left with contact per			. 11
Contact Person: <u>ACK</u>		Time checked-in:	-00
Form of communication: I rad		hotel/pay phone SPOT	
Phone number: (5[4]) (0(0	4-6815		
Vehicle Safety			
Safety equipment (first aid, fi			
Equipment and chemicals sa	Contraction of the second s		
Vehicle parked in safe location	on; pylons, hazard light, re	eflective vests if necessary	1.1.2.2
Notes:			
Shore & Wading Safety		and a first	and the second of the second o
Contraction of the second	read by all field staff		
Wading Task Hazard Analysis	and the first of the second	- 1071	
Wading Safe Work Procedure	s read by all field staff	and the second second	
Instream hazards identified (i.e	e. log jams, deep pools, s	slippery rocks)	
PFD worn		1. 1. 0 1 1. 1 M	
Appropriate footwear, waders,	wading belt	and the second sec	
] Belay used	18-11-5 C 11-31		
		e i p	
ntes.			

Page 6 of 6



Field Crew: K.MCCallum, C.Buchanan, M.Malone Site Code: COLOOI
Sampling Date: (DD/MM/YYYY) 18/09/2022
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CBWQ-EIk Local Basin Name: EIk
River/Stream Name: COAL Creek_Stream Order: (map scale 1:50,000)
Select one: D Test Site D Potential Reference Site
Geographical Description/Notes: Site between Park Ave + train bridge, dls of Sombrowskis giant house.
Surrounding Land Use: (check those present) Information Source: Image: Surrounding Land Use: (check those present) Information Source: Image: Surrounding Land Use: (check those present) Information Source: Image: Surrounding Land Use: (check those present) Information Source: Image: Surrounding Land Use: (check those present) Information Source: Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surrounding Use: (check those present) Image: Surrounding Land Use: (check those present) Image: Surroundin
Dominant Surrounding Land Use: (check one) Information Source: Forest Field/Pasture Agriculture Residential/Urban Logging Mining Commercial/Industrial Other
Location Data Latitude: <u>49.495744</u> N Longitude: - <u>L(S. 066434</u> W (DMS or DD) Elevation: <u>999</u> (fasl o masl) GPS Datum: GRS80 (NAD83/WGS84) Other:
Site Location Map Drawing



CABIN Field Sheet June 2012

Page 1 of 6

Field Sheet Upst	ream Downstre		Aerial View
REACH DATA (represent	s 6 times bankfull width)		
1. Habitat Types: (check those	present)	Pool/Back Ed	dy
2. Canopy Coverage: (stand in	middle of stream and loc 25 %	ok up, check one)	9 %
3. Macrophyte Coverage: (not	algae or moss, check on 25 % 🔲 26-50 %	e)	0% 20r 3 horse tait
4. Streamside Vegetation: (che		ciduous trees 🗹 conife	ous trees
5. Dominant Streamside Vegeta		ciduous trees 🛛 conife	rous trees
6. Periphyton Coverage on Sub	strate: <i>(benthic algae, n</i>	ot moss, check one)	
 2 - Rocks are slight 3 - Rocks have a no algae (1-5 mm t 4 - Rocks are very s to dark brown algae 	ly slippery, yellow-brown oticeable slippery feel (fo hick) slippery (algae can be re gae (5 mm -20 mm thick	emoved with thumbnail), nur	
long strands (>			staat algar made may have
Note: 1 through 5 represent cate	gories entered into the CA	BIN database.	
ENTHIC MACROINVERT	EBRATE DATA		
abitat sampled: (check one)	Triffle Trapids T	straight run	
00 μm mesh Kick Net		Preservative used:	PROPYI
erson sampling	CB		
ampling time (i.e. 3 min.)		YES NO	sing "Bucket Swirling Method"
o. of sample jars	3min	If YES, debris collected for	
1 Jane	•		

101

Field Crew: K.M.C.B		Site Code:	1001
Sampling Date: (DD/MM/Y	m) 18/09/202	Y2	
WATER CHEMISTRY D	ATA Time: 15:45	(24 hr clock) Time zone: _M	15T
Air Temp: 21.0	(°C) Water Temp: 14	4 (°C) pH: 8.51	
Specific Conductance: 24	5_(µs/cm) DO: 9.	89 (mg/L) Turbidity:	- 70(NTU)
Check if water samples were Check if water samples were Comparison of the samples were Comp	collected for the following a olids) e, Nitrite, Dissolved, and/or , and/or Dissolved) Hardness, Chloride, and/or	nalyses:	e wa sheet
CHANNEL DATA		A CONTRACTOR	
Slope - Indicate how slope	and the second second		
OR Measured in field Circle device used and fill a. Survey Equipment b. Measurements Top Hairline (T)	THE REAL PROPERTY OF THE PROPERTY OF THE REAL PROPE	ice: Tape Downstream(D/S)	Calculation
Mid Hairline (ht) OR	1.366m	1:775m	
Bottom Hairline (B)			1
Distance (dis) OR	30m	30 m	US _{dis} +DS _{dis} =
-B x 100	^a US _{dis} =T-B	^a DS _{dis} =T-B	(LOM
hange in height (Zhit)	The second second		0.409m
ope (Δht/total dis)			0.0068166
US _{at}	T	DSai	DS.
IN Field Sheet June 2012	Page 3 of 6		CABIN

C/

	.McCallu	111, 				
Field Crew: KM, CB, M Sampling Date: (DD/MM/YYYY)		9/202	2	Site Cod	e. <u>COL</u>	001
	1070	11000				
Widths and Depth Location at site: Wost ream of A - Bankfull Width: 9.8 (m C - Bankfull-Wetted Depth (height f)	В-	Wetted Str	eam Width	10-	. d/s of kick area <u>5 (m)</u> <i>L</i> •3.7 (cm)
1c	↑ V1 V2 D1 D2	4 V3 03	↑ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓			
Note: Wehed widths > 5 m, measure a minimu Wetted widths < 5 m, measure 3-4 equi	um of 5-6 equ	idistant locati	ons			
Check appropriate velocity measurin shore and depth are required regard Velocity Head Rod (or ruler): \	lless of met /elocity Equ	hod: ation (m/s) =	-√[2(∆D/1)	00) * 9.81]		
Velocity and Depth Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary meters: Gurley/Price/Min Direct velocity measurements: Verial depth Rod (when, o., or)	dless of met /elocity Equ ni-Price/Pro : □ Marsh-N	hod: ation (m/s) = peller (Refer AcBirney [] = 2	to specific m Sontek or $\frac{2}{3}$	00) * 9.81] leter conver ØOther 4	sion chart fo Silobal	er calculation) <u>FIGW pro</u> 6 A
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Min Direct velocity measurements: Operative addited (weet) and conjugation	dless of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary meters: Gurley/Price/Min Direct velocity measurements: //initial/earthcod (wherbaco, com) Distance from Shore (m)	dless of met /elocity Equ ni-Price/Pro : □ Marsh-N	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary meters: Gurley/Price/Min Direct velocity measurements: Vertification (nuter), or (cm) Distance from Shore (m) epth (D) (cm)	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary meters: Gurley/Price/Min View Direct velocity measurements: View Velocity	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Min Direct velocity measurements: Distance from Shore (m) Pepth (D) (cm) elocity Head Rod (ruler)	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary meters: Gurley/Price/Min Direct velocity measurements: Velocity Head Rod (ruler), o, (on) Distance from Shore (m) epth (D) (cm) elocity Head Rod (ruler)	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): \ Rotary maters: Gurley/Price/Min Direct velocity measurements: United for the statement of the statement Distance from Shore (m) epth (D) (cm) elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Min Direct velocity measurements: Vertical entities (utler), end) Distance from Shore (m) epth (D) (cm) elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm)	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Control Head Rod (or ruler): Rotary meters: Gurley/Price/Min Control Head Rod (or ruler): Direct velocity measurements: Direct velocity me	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity Head Rod (or ruler): Velocity measurements: Direct velocity measurements: Velocity Head Rod (ruler) Distance from Shore (m) epth (D) (cm) elocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (AD=D ₂ -D ₁) (cm) Distary meter	dess of met /elocity Equ ni-Price/Pro : □ Marsh-N 1 4, 5 9,8	hod: ation (m/s) = peller (Refer AcBirney II = 2 6.0	to specific m Sontek or $\frac{2}{3}$ 7.5	00) * 9.81] heter conver &Other_(4 9.0	sion chart fo Silobal 5 10.5	er calculation) <u>Flow</u> pro 6 A 12

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ield Crew: KM, CB, MM

Site Code: COLOO/

Site Co

and (DD/MM/mm 10/00 10 -

sampling Date: (DD/MM/YYYY) 18/09/2022

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	D .
0.1-0.2 cm (coarse sand)	2 *
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

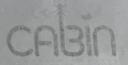
bank secured + underned

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	a-E	Diameter (cm)	E	Diameter (cm)	14 5-1748 12 D	meter (cm)	BE
1	3.2	26	1,9	51	0.2	76	24.5	
2	9.6	27	15,4	52	13.5	77	4.1	
3	8.0	28	9.7	53	8.1	78	5	
4	8.5	29	5.2	54	4.8	79	4.8	74
5	12.7	30	37,0	1/2 55	7.6	08	41	3/4
6	0.11	31	2.0	56	7.2	81	7:5	
7	1.0	32	10.3	57	9.7	82	1.2	1
8	19.2	33	8.5	58	9.2	83	35-4	
9	4.0	34	8.2	59	11.5	84 - 1	27'	
10	75.4	14 35	5.8	60	Ce. Le	O 85 1	3.1	
11	13.1	36	6.6	61	11.2	86	8.0	
12	9.0	37	39.0	62	OS	87	S.	
13	16.3	38	12.7	63	5	88	llect	
14	10.9	39	7.4	164	7.5	89	701	
15	3.1	40	20.9	1/2 65	4.7	90	6.9	0
16	H.01	- 41	2.4	66	3.2	91	128	
17	23,5	42	11.4	67	as		0.75	
18	20,6	43	4.2	68	6.2	93	a.1	
19	2,5	44	50	69	L.O		7.10	
20	6.5	45	27.6	70	4.7	1/4/95	2.5	
21	4	0 46	111	. 71	23	96	5.4	
22	AC	47	28.4		46		4.1	
23	7.9	48	nci	73	Q.I	98	US	
	Sil	4.9	A.2	1 74	Teta	99	un	
24	2.4		8.5		405	100	28	0
25	() - ()	50	8.2	0 75	2.5	100	Dia	0

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



Field Crew: KM, CB, MM

3

Site Code: COLOG /

Bio

Sampling Date: (DD/MM/YYYY) 18/09/2022

SITE INSPECTION	
Site Inspected by: KrM .	
Communication Information	
(X linerary left with contact person (include contact numbers)	
Contact Person: Time checked-in: Form of communication: A radio A cell A satellite D hotel/pay phone D SPOT	
Phone number: (709) 743 - 91678	
Vehicle Safety Asafety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)	
Equipment and chemicals safely secured for transport	
Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary Notes:	
Shore & Wading Safety	
Weding Task Hazard Analysis read by all field staff	
A Wading Safe Work Procedures read by all field staff	
Sonstream hazards identified (i.e. log jam's, deep pools, slippery rocks)	
PFD worn	
Appropriate footwear, waders, wading belt	
D Belay used	

Page 6 of 6

Field Crew: K.MCCallu	M, Site Code: <u>COLO</u>	03_
Sampling Date: (DD/MM/Y	mm 18/09/2022	
Occupational Healt	h & Safety: Site Inspection Sheet completed	
PRIMARY SITE DATA		
CABIN Study Name: CBV	NQ-EIL Local Basin Name: EIL Riv	er
River/Stream Name: 100	I Creek _Stream Order: (map scale 1:50,000)	(1
Select one: Test Site	Potential Reference Site	
Surrounding Land Use: (check Forest Logging Mining Dominant Surrounding Land	tion/Notes:	n ng
00 0		
ocation Data	ongitude: - 114 87999 W (DMS or DD)	and the second second
_ocation Data .atitude: <u>49.45.2853</u> N L	ongitude: - 114 87999 W (DMS or DD)	
Location Data atitude: <u>49.452853</u> N L Elevation: <u>1737.0</u> (fasl of (ongitude: - 114 g 7999_W (DMS or DD) masi) GPS Datum: DKGRS80 (NAD83/WGS84) □ Other:_	K N
Location Data Latitude: <u>49.457853</u> N L Elevation: <u>1737.0</u> (fasl of (Longitude: - 114 & 7999_W (DMS or DD) masi) GPS Datum: DXGRS80 (NAD83/WGS84) □ Other:_ wing Very low flow	
Location Data	ers Alow	
Location Data atitude: <u>49,45,2853</u> N La Elevation: <u>1737.0</u> (fast of f Site Location Map Drav Alde	ers Alow	KI

HILK

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SUM

Coll



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Page 1 of 6

Cald Cana Land DO		
Field Crew: K.M.C.B. N Sampling Date: (DD/MM/YYY	Site Code	COLOO3_
	1)_10/0/100000	
Photos Field Sheet Upstrea Substrate (exposed)	am 🖾 Downstream 🗹 Across Site 🗹 Substrate (aquatic) 🗖 Other	Aerial View
REACH DATA (represents 6	times bankfull width)	approved and a los
1. Habitat Types: (check those p	resent)	ldy
2. Canopy Coverage: (stand in m	niddle of stream and look up, check one) 5 % ☑ 26-50 % □ 51-75 % □ 76-100) %
3. Macrophyte Coverage: (not alg	gae or moss, check one) 5 %	0 %
4. Streamside Vegetation: (<i>check</i>		rous trees
5. Dominant Streamside Vegetati		rous trees
6. Periphyton Coverage on Subst	rate: (benthic algae, not moss, check one)	
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm this algae (1-5 mm this to dark brown algae) 	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5- ceable slippery feel (footing is slippery), with patc ck) ppery (algae can be removed with thumbnail), nu ie (5 mm -20 mm thick) obscured by algal mat, extensive green, brown to	I mm thick) hes of thicker green to bro merous large clumps of gr
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a notialgae (1-5 mm thicks) 4 - Rocks are very slipto dark brown alga 5 - Rocks are mostly long strands (> 20) 	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5- ceable slippery feel (footing is slippery), with patc ck) ppery (algae can be removed with thumbnail), nu ie (5 mm -20 mm thick) obscured by algal mat, extensive green, brown to	I mm thick) hes of thicker green to bro merous large clumps of gr
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm this algae (1-5 mm this to dark brown algae) 4 - Rocks are very slip to dark brown algae 5 - Rocks are mostly long strands (> 20) Note: 1 through 5 represent categories 	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5- ceable slippery feel (footing is slippery), with patc ck) ppery (algae can be removed with thumbnail), nu le (5 mm -20 mm thick) obscured by algal mat, extensive green, brown to 0 mm thick) pries entered into the CABIN database.	I mm thick) hes of thicker green to bro merous large clumps of gr
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm thich algae (1-5 mm thich	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5- ceable slippery feel (footing is slippery), with pate ck) opery (algae can be removed with thumbnail), nu le (5 mm -20 mm thick) obscured by algal mat, extensive green, brown to 0 mm thick) ories entered into the CABIN database.	I mm thick) hes of thicker green to bro merous large clumps of gr
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm thich algae (1-5 mm thich	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5- ceable slippery feel (footing is slippery), with pate ck) ppery (algae can be removed with thumbnail), nu te (5 mm -20 mm thick) obscured by algal mat, extensive green, brown to 0 mm thick) ories entered into the CABIN database.	I mm thick) hes of thicker green to bro merous large clumps of gr o black algal mass may ha
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm thich algae (1-5 mm thich	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5-4 ceable slippery feel (footing is slippery), with pate ck)	I mm thick) hes of thicker green to bro merous large clumps of gr b black algal mass may ha
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm thich algae (1-5 mm thich	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5-4 ceable slippery feel (footing is slippery), with pate ck)	I mm thick) hes of thicker green to bro merous large clumps of gr b black algal mass may ha
 1 - Rocks are not slip 2 - Rocks are slightly 3 - Rocks have a noti algae (1-5 mm thick algae (1-5 mm thick	opery, no obvious colour (thin layer < 0.5 mm thick slippery, yellow-brown to light green colour (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slippery feel (footing is slippery), with pate color (0.5-4 ceable slipper), with pate colo	I mm thick) hes of thicker green to bro merous large clumps of gr b black algal mass may ha black algal mass may ha

Note: Indicate if a sampling method other than the recommended 400 µm mesh kick net is used.



Field Crew: <u>KM, CB, MM</u> Sampling Date: (DD/MM/YYYY) <u>18/09/3030</u>	Site Code: <u>COLOO 3</u>
WATER CHEMISTRY DATA Time: Hi20 (24 hr clock)	Time zone: MDT
Air Temp:(0,(°C) Water Temp:(°C)	
Specific Conductance: 36.9 (µs/cm) DO: 10.58 (mg/L) Check if water samples were collected for the following analyses:	Turbidity: 0-40 (NTU)
TSS (Total Suspended Solids)	
Nitrogen (i.e. Total, Nitrate, Nitrite, Dissolved, and/or Ammonia)	
Phosphorus (Total, Ortho, and/or Dissolved)	Station in the second second
Major lons (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate)	Dother See MG analytis
Note: Determining alkalinity is recommended, as are other analyses, but not requ	uired for CABIN assessments.

CHANNEL DATA

Slope - Indicate how slope was measured: (check one)

□ Calculated from map

Scale: (Note:	small scale map recommended if field	d measurement is not possible - i.e. 1:2	0 000
contour interval (vertical distance)	(m).	a modearoment is not possible - i.e. 1.2	0,000).
distance between contour intervals	s (horizontal distance)	(m)	
slope = vertical distance/horizonta	I distance =		

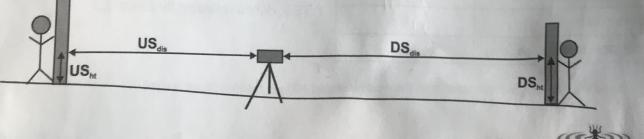
OR

ny

Measured in field

Circle device used and fill out table according to device: a. Survey Equipment b. Hand Level & Measuring Tape

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
^a Top Hairline (T)			
^a Mid Hairline (ht) OR		Charles and	
^b Height of rod	1.231	1,725	
^a Bottom Hairline (B)		defense man	
^b Distance (dis) OR	13,7m	13 600	US _{dis} +DS _{dis} =
^a T-B x 100	^a US _{dis} =T-B	B.G.M. ^a DS _{dis} =T-B	27.3
Change in height (Δht)			DSht-USht=0.494
Slope (Δht/total dis)			0.018095238





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CABIN Field Sheet June 2012

Page 3 of 6

B - Inface to Ban V3 D3 distant locati ns. d fill out the hod: ation (m/s) = beller (Refer	dicate where Wetted Streen hkfull): \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow	e in sample re am Width: . () () () () 	2.) Ford 3. Chart below	_(m) _(cm) 7 I.U 7 I.U 7. Distance	o from
B - arface to Ban V3 D3 distant locations d fill out the hod: ation (m/s) = beller (Refer AcBirney []	Wetted Strends hkfull): 4 V_4 V_5 V_5 V_4 V_5 D_4 D_5	e section in c 00) * 9.81] heter conversi Other G	2.) PW 3: chart below	_(m) _(cm) (cm) T [.U A. Distance	o from
B - arface to Ban V3 D3 distant locations d fill out the hod: ation (m/s) = beller (Refer AcBirney []	Wetted Strends hkfull): 4 V_4 V_5 V_5 V_4 V_5 D_4 D_5	e section in c 00) * 9.81] heter conversi Other G	2.) PW 3: chart below	_(m) _(cm) (cm) T [.U A. Distance	o from
B - arface to Ban V3 D3 distant locations d fill out the hod: ation (m/s) = beller (Refer AcBirney []	Wetted Strends hkfull): 4 V_4 V_5 V_5 V_4 V_5 D_4 D_5	e section in c 00) * 9.81] heter conversi Other G	2.) PW 3: chart below	_(m) _(cm) (cm) T [.U A. Distance	o from
idistant locati ns. d fill out the nod: ation (m/s) = beller (Refer fcBirney []	hkfull): 4 V_4 V_5 V_5 V_4 V_5 D_5 $D_$	e section in c 00) * 9.81] heter conversi Other G	chart below	Distance	he.
distant locati ns. d fill out the nod: ation (m/s) = beller (Refer AcBirney []	appropriate $\sqrt{2}$ $\sqrt{5}$ \sqrt	e section in c 00) * 9.81] heter conversi 2 Other <u>G</u>	chart below	calculation	he.
idistant locati ns. d fill out the nod: ation (m/s) = beller (Refer IcBirney [] 2	ons; appropriate $= \sqrt{[2(\Delta D/1)]}$ to specific m Sontek or $\sqrt{3}$	00) * 9.81] neter conversi Ø Other 4	ion chart for Obe Flo	calculation	he.
idistant locati ns. d fill out the nod: ation (m/s) = beller (Refer IcBirney [] 2	ons; appropriate $= \sqrt{[2(\Delta D/1)]}$ to specific m Sontek or $\sqrt{3}$	00) * 9.81] neter conversi Ø Other 4	ion chart for Obe Flo	calculation	he.
ns. d fill out the nod: ation (m/s) = celler (Refer AcBirney [] 2	appropriate $= \sqrt{[2(\Delta D/1)]}$ to specific m Sontek or $\sqrt{3}$	00) * 9.81] neter conversi Ø Other 4	ion chart for Obe Flo	calculation	he.
ns. d fill out the nod: ation (m/s) = celler (Refer AcBirney [] 2	appropriate $= \sqrt{[2(\Delta D/1)]}$ to specific m Sontek or $\sqrt{3}$	00) * 9.81] neter conversi Z Other <u>G</u>	ion chart for Obe Flo	calculation	he.
d fill out the nod: ation (m/s) = peller (Refer 1cBirney [] 2	= √ [2(∆D/1 to specific m Sontek or \ 3	00) * 9.81] neter conversi Z Other <u>G</u>	ion chart for Obe Flo	calculation	he.
nod: ation (m/s) = peller (Refer AcBirney [] 2	= √ [2(∆D/1 to specific m Sontek or \ 3	00) * 9.81] neter conversi Z Other <u>G</u>	ion chart for Obe Flo	calculation	he.
nod: ation (m/s) = peller (Refer AcBirney [] 2	= √ [2(∆D/1 to specific m Sontek or \ 3	00) * 9.81] neter conversi Z Other <u>G</u>	ion chart for Obe Flo	calculation	he.
beller (Refer IcBirney □ 2	to specific m Sontek or Ç	eter conversi	obe Flo	ombion	sl.
beller (Refer IcBirney □ 2	to specific m Sontek or Ç	eter conversi	obe Flo	ombion	sl.
1cBirney 🗆 2	Sontek or 🕻	2 Other <u>(9</u>) 4	obe Flo	ombion	sl.
2	3	4			C. S. C.
			5	6	AVG
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				0000000	0000000

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Field Crew: KM

Site Code: _COLOO -

Camplines

Sampling Date: (DD/MM/YYYY) 18/09/2020

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	(2)
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
 Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E	_). 0011	Diameter (cm)	E		Diameter (cm)	E	Di	ameter (cm)	E
1	32		26	a a		51	1.2		76	3.1	
2	8.4	-	27	104		52	10.0		77	8.4	
3	ail		28	SM		53	3-1		78	26.0	
4	14.7	a star	29	13.8		54	7.3	- ART	79	11.2	111
5	15.4		30	4.9	0	55	3.2		80	3.8	-74
6	49		31	14.0		56	1-1-6		81	2.7	
7	5.7	•	32	2.6		57	3.9	-	82	8.5	100
8	1.a	1	33	5.6		58	1.5		83	5.4	
9	12.8	118	34	17.5		59	3.0		84	4.9	A
10	91	0	35	2.2		60	22.9	63/4	85	6.8	
11	40		36	4,4		61	23		86	0,2	
12	119		37	4.5		62	17.1		87	8.8	
13	11 G		38	20.8		63	3.2		88	3.3	
14	T K		39	13.9		64	0.11		89	1.0	
15	10 0		40	5.1	1/4	65	8.1		90	1.4	0
16	55		41	51		66	9.9		91	2.le	
17	64	(Br	42	7.7		67	4.0		92	11.4	
18	7.02		43	0.8		68	6,1		93	5.2	
19	1. 11	-	44	2.0		69	6.0		94	2.5	
	1.4		45	20		70	31	0	95	2,5	
20	4.4	AIT	46	2.7-7		71	1108	1	96	18.6	
21	U.T	144		1.2 2		72	7 LI		97	4.4	
22	2.0		47	12.2		73	4,2		98	310	
23	4.0		48	1.0		74	100			11-1	
24	6.2		49	11.0			10,0		99	110	P
25	1.7		50	0.4	C) 75	4.(2	10	6.1	10

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



Sampling Date: (DD/MM/YYYY) 18/09/2022	
SITE INSPECTIO	ИС
Site Inspected by: K.M.	

Contact Person: E. Matvell	Time checked-in;
Form of communication: I radio Cell Asatellite I r	notel/pay phone
Phone number: (709) 763 - 9678	

Vehicle Safety

69/9 analjuit

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)

Equipment and chemicals safely secured for transport

Notes:

Shore & Wading Safety

Wading Task Hazard Analysis read by all field staff
Wading Safe Work Procedures read by all field staff
Instream hazards identified (i.e. log jams, deep pools, slippery rocks)
PFD worn
Appropriate footwear, waders, wading belt
Belay used

Notes:



Anne- Groline Kroeger
Field Crew: <u>Kaileigh Adaltum</u> , Chad Hughesite code: <u>Lizoo</u> Sampling Date: (DD/MM/YYYY) <u>2010912022</u>
Sampling Date: (DD/MM/YYYY) 2010912022
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CBNG-EIK Local Basin Name: EIK Piver
River/Stream Name: <u>Lizava CIL</u> Stream Order: (map scale 1:50,000)
Select one: Test Site D Potential Reference Site
Geographical Description/Notes: = 100m w/s from hwy 3 Liz. Ck. bridge, about the Scoured portion of river.
Surrounding Land Use: (check those present) Information Source: Visual 10col Forest Ariculture Logging Mining Commercial/Industrial Other viculture
Dominant Surrounding Land Use: (check one) Information Source: Profest Field/Pasture Agriculture Residential/Urban Logging Mining Commercial/Industrial Other
Location Data Latitude: 4944444 M Latitude: 4944444 M Location: 994464 M Location: 994464 M Location: 994464 M Latitude: 994464 M
Site Location Map Drawing
Fight and the second se



CABIN Field Sheet June 2012

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Page 1 of 6

Field Crew: KM CH, ACK Site Code: 11200
Sampling Date: (DD/MM/YYYY) _ 20/09/2022
Photos
Field Sheet Upstream Downstream Across Site Aerial View Substrate (exposed) Substrate (aquatic) Other
REACH DATA (represents 6 times bankfull width)
1. Habitat Types: (check those present)
2. Canopy Coverage: (stand in middle of stream and look up, check one)
3. Macrophyte Coverage: (not algae or moss, check one)
4. Streamside Vegetation: (check those present)
5. Dominant Streamside Vegetation: (check one)
6. Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
1 - Rocks are not slippery, no obvious colour (thin layer ≤ 0.5 mm thick)
2 - Nocks are slightly slippery, vellow-brown to light green colour (0.5.4
 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick)
 4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to dark brown algae (5 mm -20 mm thick)
5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have long strands (> 20 mm thick)
Note: 1 through 5 represent categories entered into the CABIN database.

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one)			
400 μm mesh Kick Net		Preservative used: 99% 150	
Person sampling	KMCCallur	Sampled sieved on site using "Bucket Swirling Method":	
Sampling time (i.e. 3 min.)	3 min		
No. of sample jars	1		
Typical depth in kick area (cm)	adam		

Note: Indicate if a sampling method other than the recommended 400 μ m mesh kick net is used.



CABIN Field Sheet June 2012

Page 2 of 6

Field Crew: Im. G. M.M. Sampling Date: (DD/MM/YYY) I/A9/2022. Image:			Site Co	de: 1002
Sampling Date: (DD/MMYYYY)	Field Crew: UD C	B, MM	and the second state of the second se	Lander and the second sec
WATER CHEMISTRY DATA Time: [0:27] (24 hr clock) Time zone: [MIS1] Air Temp:	Sampling Date: (DD/MN	mm)_11/09/20	500	4
Specific Conductance: []	WATER CHEMISTRY	(°C) Water Temp:	(24 hr clock) Time zo	8.60
Note: Determining alkalinity is recommended, as are other analyses, but not required for CABIN assessments. CHANNEL DATA Slope - Indicate how slope was measured: (check one) Calculated from map Scale:	Specific Conductance:	<u>3.8 (µs/cm)</u> ere collected for the followin Solids) trate, Nitrite, Dissolved, and, tho, and/or Dissolved)	g analyses: /or Ammonia)	
CHANNEL DATA Slope - Indicate how slope was measured: (check one) Calculated from map Scale:				ABIN assessments.
Amid Hairline (ht) OR 1.288 1.590 Height of rod 1.288 1.590 Bottom Hairline (B)	Slope - Indicate how slop Calculated from map Scale: contour interval (vertica distance between contr	(Note: small scale map re al distance) our intervals (horizontal dis	commended if field measurement i (m), tance) (m)	is not possible - i.e. 1:20,000).
Bottom Hairline (B) 1.5 MO Distance (dis) OR 10 1° B x 100 a° US _{dis} =T-B a° US _{dis} =T-B a° DS _{dis} =T-B bange in height (Δ ht) DS _{ht} -US _{ht} =	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring	commended if field measurement i (m), ance) (m) wice: g Tape	s not possible - i.e. 1:20,000).
Bottom Hairline (B) Image: Constraints Image:	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring	commended if field measurement i (m), ance) (m) wice: g Tape	s not possible - i.e. 1:20,000).
$\frac{10}{a^{a}US_{dis}=T-B} = \frac{10}{a^{b}DS_{dis}=T-B} = \frac{10}{DS_{dis}=T-B}$	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).
DSht-USht=	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).
lope (Δht/total dis)	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist se/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.288 1.288	commended if field measurement is (m), tance)(m) evice: g Tape Downstream(D/S) 	s not possible - i.e. 1:20,000).
Slope (Aht/total dia)	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).



eld Sheet June 2012

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WATER CHEMISTRY	DATA Time: 12:28		
Air Temp:12.0	(°C) Water Temp: <u></u>		
Specific Conductance: 57	<u>13 (µs/cm)</u> DO: <u>10</u>	<u>97 (mg/L)</u> Turbidity: <u>1</u>	<u>03 (NTU)</u>
TSS (Total Suspended S Nitrogen (i.e. Total, Nitra Phosphorus (Total, Orth	ate, Nitrite, Dissolved, and/or	Ammonia)	see water sampling
Note: Determining alkalinity is r	ecommended, as are other anal	lyses, but not required for CABIN	assessments.
CHANNEL DATA			
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance	distance) (m ur intervals (horizontal distan	nmended if field measurement is not p	possible - i.e. 1:20,000).
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. OR Measured in field Circle device used and fi	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance =	nmended if field measurement is not p i), ice) (m) 	
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. OR Measured in field Circle device used and fi	(Note: small scale map recon distance) (m ur intervals (horizontal distan /horizontal distance = Il out table according to devi	nmended if field measurement is not p i), ice) (m) 	
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. CR Measured in field Circle device used and fi a. Survey Equipment Measurements	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance = ll out table according to deviso. Hand Level & Measuring T	nmended if field measurement is not p n), ice) (m) ce: Fape	D manager au ma ny D many sadar G sing M mod words want
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. CR Measured in field Circle device used and fi a. Survey Equipment Measurements Top Hairline (T) Mid Hairline (ht) OR	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance = ll out table according to deviso. Hand Level & Measuring T	nmended if field measurement is not p n), ice) (m) ce: Fape	D manager au ma ny D many sadar G sing M mod words want
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance CR Measured in field Circle device used and fi a. Survey Equipment Measurements Top Hairline (T) Mid Hairline (ht) OR Height of rod	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance = Il out table according to devic b. Hand Level & Measuring T Upstream (U/S)	nmended if field measurement is not p n), nce) (m) ce: Fape Downstream(D/S)	D manager au Ras (1) D manager au Ras (1) D manager and a sing D manager and a single D manager a single D manag
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. CR Measured in field Circle device used and fi a. Survey Equipment Measurements Top Hairline (T) Mid Hairline (ht) OR Height of rod Bottom Hairline (B)	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance = Il out table according to devic b. Hand Level & Measuring T Upstream (U/S)	nmended if field measurement is not p n), nce) (m) ce: Fape Downstream(D/S)	Calculation US _{dis} +DS _{dis} =
Calculated from map Scale:	(Note: small scale map recom distance) (m ur intervals (horizontal distan /horizontal distance = Il out table according to devic b. Hand Level & Measuring T Upstream (U/S)	nmended if field measurement is not p n), nce) (m) ce: Fape Downstream(D/S)	Calculation US _{dis} +DS _{dis} = 48.95
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance. CR Measured in field Circle device used and fi a. Survey Equipment Measurements Top Hairline (T) Mid Hairline (ht) OR Height of rod Bottom Hairline (B) Distance (dis) OR -B x 100	(Note: small scale map recomdistance)(mur intervals (horizontal distance)/horizontal distance = Il out table according to devide. Hand Level & Measuring To Upstream (U/S)	timended if field measurement is not p (n), (ce) (m) (ce) Ce: Tape Downstream(D/S) 2, 245 m 24.1m	Calculation US _{dis} +DS _{dis} =
Calculated from map Scale: contour interval (vertical distance between contou slope = vertical distance OR Measured in field Circle device used and fi a. Survey Equipment	(Note: small scale map recomdistance)(mur intervals (horizontal distance)/horizontal distance = Il out table according to devide. Hand Level & Measuring To Upstream (U/S)	timended if field measurement is not p (n), (ce) (m) (ce) Ce: Tape Downstream(D/S) 2, 245 m 24.1m	Calculation US _{dis} +DS _{dis} = 48.95

CABIN Field Sheet June 2012

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CABIN

Field Crew: KM, CH, S	00/1	19/21	72-0			
Sampling Date: (DD/MM/YYYY)	20/0	1100				- Territy
Widths and Depth Location at site: US of V	kickne				e reach, ex.	d/s of kick (m)
A - Bankfull Width: 8.51 (m)	В -	Wetted St	ream Width	ו:	(cm)
C - Bankfull–Wetted Depth (height f	from water su	rface to Ba	nkfull):	7.0	A	(ciii)
ţc	↑ ↑ V1 V2 D1 D2 ↓ ↓	↓ V3 D3 ↓	↑ ↑ V4 V5 D4 D5	в		
Note: Wetted widths > 5 m, measure a minimu Wetted widths < 5 m, measure 3-4 equi			ons;		A.	PALS 423
Velocity and Depth Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mit	dless of metho /elocity Equa ni-Price/Prop	od: tion (m/s) = eller (Refer	= √ [2(∆D/1 to specific n	00) * 9.81] neter conve	rsion chart fo	
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler) : V	dless of metho /elocity Equa ni-Price/Prop	od: tion (m/s) = eller (Refer cBirney □	= √ [2(∆D/1 to specific n Sontek or)	00) * 9.81] neter conve	rsion chart fo	r calculation
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler) : V	dless of metho /elocity Equa ni-Price/Prop	od: tion (m/s) = eller (Refer	= √ [2(∆D/1 to specific n	00) * 9.81] neter conve X Other	rsion chart fo	
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mit Direct velocity measurements	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mit Direct velocity measurements Distance from Shore (m)	dless of metho /elocity Equa ni-Price/Prop : □ Marsh-Mo 1	od: tion (m/s) = eller (Refer cBirney ⊡ 2	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve COther4 4 4,44	rsion chart fo	r calculation Flow 6 5.78
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mit Direct velocity measurements Distance from Shore (m) Depth (D) (cm)	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity measurements Direct velocity measurements Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler)	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mit Direct velocity measurements Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm)	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78
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Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity measurements Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78
Check appropriate velocity measuring shore and depth are required regard Velocity Head Rod (or ruler): Velocity measurements Direct velocity measurements Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions	dless of metho /elocity Equa ni-Price/Prop : D Marsh-Mo 1 2.43	od: tion (m/s) = eller (Refer cBirney 2 2 3,1 \$,1	= $\sqrt{2} (\Delta D/1)$ to specific n Sontek or 2 3 3,77	00) * 9.81] neter conve X Other 4 4,44	rsion chart fo Global 5 5.11 2.15	r calculation Flow 6 5.78

CABIN Field Sheet June 2012

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Field Crew:

Sampling Date: (DD/MM/YYYY) 20/09/2022

Site Code: LIZOC

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	
0.1-0.2 cm (coarse sand)	2
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.

• Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	E	D	iameter (cm)	E
1	3.2		26	8.2		51	19.4		76	7.9	
2	10.5		27	0.7		52	16.0		77	10.1	
3	0.5		28	11.9		53	24,4		78	6.9	
4	4.6		29	17.4		54	5.5		79	6.2	110
5	25.2		30	18.4	1/2	55	4.5		80 23	0.275	112
6	8.1		31	6.9		56	13.0		81	1.9	
7	19.2		32	22.2		57	11.2	12	82	1.5	
8	10.5		33	12.4		58	16.0		83	73.3	
9	5.9		34	4.2	Neiter /	59	13.7	1100	84	4.t	
10	5.8	0	35	9.1		60	7.3	0	85	13.3	
11	6.3		36	12.2		61	12.1		86	10,5	
12	12.7		37	3.6		62	6.1		87	9.5	
13	49.8		38	S		63	8.9		88	18.5	
14	10.3		39	18.9		64	5.4		89	15.2	-
15	0.3		40	18.9	12	65	10.3		90	13.8	0
16	18.8		41	1.5		66	0.9		91	11.3	-
17	24.6		42	6.6		67	15.4	an again	92	12.4	1.81
18	14.3		43	9.8		68	17.5		93	20.2	
19	18.4		44	4,7		69	S		94	7.6	
20	12.3	2/4	45	3.6	- Miles	70	15.8	14	95	9.8	
21	7.4		46	37.6		71	6.0		96	23.1	
22	70		47	5.7		72	43-1	10/11/20	97	5.4	
23	1511		48	24.5	116	73	8.4		98	6.3	
24	18.4		49	2.3	Ander	74	12.3		99	13.3	
25	19.3		50	25.5	1	75	8.8		100	9.6	C

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



Field Crew: KM, CH, ACK Site Code: 112001
Sampling Date: (DD/MM/YYYY) 20/09/2022
SITE INSPECTION
Site Inspected by: K.M.C.allen
Communication Information
Tinerary left with contact person (include contact numbers)
Contact Person: <u>E. Matveev</u> Time checked-in: <u>12.00</u>
Form of communication: Tradio Creell asatellite hotel/pay phone SPOT
Phone number: (70) 763 - 91078
Vehicle Safety
A Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)
Equipment and chemicals safely secured for transport

Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary

Notes:

Shore & Wading Safety

Wading Task Hazard Analysis read by all field staff

Wading Safe Work Procedures read by all field staff

Instream hazards identified (i.e. log jams, deep pools, slippery rocks)

□ PFD worn

Appropriate footwear, waders, wading belt

□ Belay used

Notes:

CABIN Field Sheet June 2012

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	C. Hughes, A.C. Kroeger Site Code: <u>112003</u> 20/09/2022
Occupational Health & Saf	ety: Site Inspection Sheet completed
PRIMARY SITE DATA	Demonstration and the second of the second of the second
CABIN Study Name: CBWQ -	Elk Local Basin Name: Elk River
River/Stream Name: Lizard	Ck. Stream Order: (map scale 1:50,000) 3
Select one: Test Site D Potential	Reference Site
Geographical Description/Not Park @ far end 0 Aite on left of Site), site is d/s Surrounding Land Use: (check those p Forest	es: Mt. Fernie f Visiter Parking, take trail upstream Arail Utrail hits river just ups of of Bank restoration Information Source: <u>IOCal, Visual</u> Agriculture Residential/Urban
	Commercial/Industrial
Location Data	Agriculture Residential/Urban Commercial/Industrial Other
Logging Mining	Agriculture Residential/Urban Commercial/Industrial Other
Forest Field/Pasture Logging Mining Location Data Latitude: <u>49</u> 4560 N Longitude: Elevation: <u>10</u> 22 0 (fast or mast)	Agriculture Residential/Urban Commercial/Industrial Other - <u>INS 09432</u> W (DMS of DD) GPS Datum: GRS80 (NAD83/WGS84) Other: VISITOR PARKLING
Location Data	Agriculture Residential/Urban Commercial/Industrial Other GPS Datum: GRS80 (NAD83/WGS84) Other:
Contraction Carlounding Land Ose. (Che Contraction Data Location Data Latitude: <u>49</u> <u>485600</u> N Longitude: Elevation: <u>10</u> <u>10</u> (fast or mast)	Agriculture Residential/Urban Commercial/Industrial Other - <u>INS_09432</u> W (DMS of DD) GPS Datum: GRS80 (NAD83/WGS84) Other: VISITOR PARKLING
Contraction Carlounding Land Ose. (Che Contraction Data Location Data Latitude: <u>49</u> <u>485600</u> N Longitude: Elevation: <u>10</u> <u>10</u> (fast or mast)	Agriculture Residential/Urban Commercial/Industrial Other - <u>INS_09432</u> W (DMS of DD) GPS Datum: GRS80 (NAD83/WGS84) Other: VISITOR PARKLING
Cobole ban	Agriculture Residential/Urban Commercial/Industrial Other - <u>INS 09432</u> W (DMS of DD) GPS Datum: GRS80 (NAD83/WGS84) Other: VISITOR PARKLING

CABIN Field Sheet June 2012

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Field Crew: KM	, CH, ACK,	Site Code:
Sampling Date: (DD	(MM/YYYY) 20/09/22	the state of the second states
Photos Field Sheet Substrate (exposed	Dupstream Downstream	Across Site Aerial View
REACH DATA (re)	presents 6 times bankfull width)	MAN BUNG
1. Habitat Types: (check	·	Pool/Back Eddy
2. Canopy Coverage: (:	stand in middle of stream and look up,	
3. Macrophyte Coverag	e: (not algae or moss, check one)	51-75 % 🔲 76-100 %
4. Streamside Vegetatio	en: (<i>check those present</i>) es Ashrubs Adeciduous	s trees
5. Dominant Streamside	Vegetation: (check one)	Chases Danie Cont
Periphyton Coverage	on Substrate: (benthic algae, not mos	
 1 - Rocks an 2 - Rocks an 3 - Rocks had algae (1-4) 4 - Rocks and to dark br 5 - Rocks and to dark br 	re not slippery, no obvious colour (thin e slightly slippery, yellow-brown to ligh we a noticeable slippery feel (footing is 5 mm thick) e very slippery (algae can be removed own algae (5 mm -20 mm thick)	$a_{\rm Ver} < 0.5 \rm mm$ thick)
	ent categories entered into the CABIN data	ahase

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one) 🕅 riffle 🗆 rapids 🗆 straight run

400 μm mesh Kick Net		Preservative used: 1500000. 99%
Person sampling	C. Hugher	Sampled sjeved on site using "Bucket Swirling Method":
Sampling time (i.e. 3 min.)	3 min	
No. of sample jars	2	If YES, debris collected for QAQC
Typical depth in kick area (cm)	iscm	

Note: Indicate if a sampling method other than the recommended 400 μm mesh kick net is used.

CABIN Field Sheet June 2012

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Field Crew: KM, CH, ACK	Site Code: <u>LIZOO3</u>
Sampling Date: (DD/MM/YYYY)20/09/2022	
WATER CHEMISTRY DATA Time: 09:30 (24 hr cl	lock) Time zone: <u>MT</u>
Air Temp: 01.8 (°C) Water Temp: 6.3	
Specific Conductance: <u>531</u> (µs/cm) DO: 10.88	(mg/L) Turbidity:
Check if water samples were collected for the following analyses:	
TSS (Total Suspended Solids) Nitrogen (i.e. Total, Nitrate, Nitrite, Dissolved, and/or Ammonia	a)
	~,
Phosphorus (Total, Ortho, and/or Dissolved)	e) Dother See WC. Shee
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate	
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but	
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate lote: Determining alkalinity is recommended, as are other analyses, but	SC NA A SA A
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but	
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but CHANNEL DATA Nope - Indicate how slope was measured: (check one)	
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but CHANNEL DATA Nope - Indicate how slope was measured: (check one) Calculated from map	not required for CABIN assessments.
 Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but CHANNEL DATA Chaculated how slope was measured: (check one) Calculated from map Scale: (Note: small scale map recommended if contour interval (vertical distance) (m), 	not required for CABIN assessments.
Phosphorus (Total, Ortho, and/or Dissolved) Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate Note: Determining alkalinity is recommended, as are other analyses, but CHANNEL DATA Slope - Indicate how slope was measured: (check one) Calculated from map Scale:	not required for CABIN assessments.

Measured in field

N

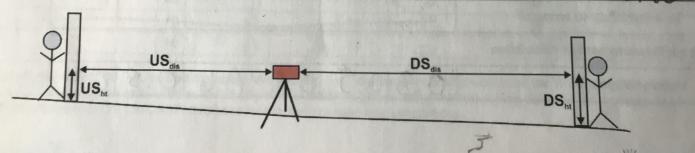
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Circle device used and fill out table according to device: a. Survey Equipment b. Hand Level & Measuring Tape

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
^a Top Hairline (T)		-	-
^a Mid Hairline (ht) OR ^b Height of rod	1.468m.	1.185m	
^a Bottom Hairline (B)			
^b Distance (dis) OR	22m	2200	US _{dis} +DS _{dis} =
^a T-B x 100	^a US _{dis} =T-B	aDS _{dis} =T-B	44m
Change in height (Δht)			DSm-USm= 0.283M
Slope (Δht/total dis)		•	0.00643182



	Field Crew: KM	MI AI	1 10		0"		2007	
		0,	<u>Jk</u>			e Code: 4	2005	-
5	Sampling Date: (DD/M	M/YYYY) 20	209,	1202	2			
	and the second second	22						
1	Widths and Depth	L. And heart		1 KARA		N. S. M. C. S.	an all an fer	14 125
1	Location at site:/S	ofhich	xnet	(Indica	e where in	sample reach.	ex. d/s of kick a	area)
0	A - Bankfull Width:	<u>69 (m)</u>				Width: 4.C		
39	C - Bankfull–Wetted Dep	th (height from	water surfa	ce to Bankfu	ll):	30,0	(cm)	
8						Α		
		IC	Alter and all		B			
			CONTRACTOR AND A DECIMAL AND A					
		V1	V2 D2	V3 V4	V5	/		
		-11-		V3 V4 D3 D4	V5 D5			
	lote:	4			V5 D5			
N	lote: Vetted widths > 5 m, meas Vetted widths < 5 m, meas	ure a minimum of	5-6 equidist		V5 D+			
N	Vetted widths > 5 m, meas Vetted widths < 5 m, meas	ure a minimum of	5-6 equidist		V55		ATAC 13	
N N N C	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth theck appropriate veloci	ure a minimum of ure 3-4 equidistar ty measuring de	f 5-6 equidist int locations.	ant locations;	/	ction in chart b	pelow. Distanc	e from
V C st	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth theck appropriate veloci- hore and depth are requ	ure a minimum of ure 3-4 equidistar ty measuring de ired regardless	5-6 equidist to locations. evice and fi of method:	ant locations;	propriate se		pelow. Distance	e from
	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth theck appropriate veloci hore and depth are required Velocity Head Rod (ure a minimum of ure 3-4 equidistar ty measuring de ired regardless or ruler): Veloc	5-6 equidist to the locations. evice and find of method: sity Equation	ant locations; Il out the app n (m/s) = $$ [propriate se 2(\D/100)	* 9.81]		
	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth heck appropriate veloci hore and depth are requ Velocity Head Rod (Rotary meters: Gurle	ure a minimum of ure 3-4 equidistar ty measuring de ired regardless or ruler): Veloc	5-6 equidist to to cations. evice and fi of method: ity Equation ice/Propello	ant locations; Il out the app n (m/s) = $\sqrt{[}$ er (Refer to s	propriate se 2(ΔD/100) pecific meter	* 9.81] · conversion cha		
	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth theck appropriate veloci hore and depth are required Velocity Head Rod (ure a minimum of ure 3-4 equidistar ty measuring de ired regardless or ruler): Veloc ey/Price/Mini-Pr	5-6 equidist to to cations. evice and fi of method: ity Equation ice/Propello	ant locations; Il out the app n (m/s) = $\sqrt{[}$ er (Refer to s	propriate se 2(ΔD/100) pecific meter	* 9.81] · conversion cha		
	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth heck appropriate veloci hore and depth are requ Velocity Head Rod (Rotary meters: Gurle	ure a minimum of ure 3-4 equidistar ty measuring de ired regardless or ruler): Veloc ey/Price/Mini-Pr	5-6 equidist to to cations. evice and fi of method: ity Equation ice/Propello	ant locations; Il out the app n (m/s) = $\sqrt{[}$ er (Refer to s	propriate se 2(ΔD/100) pecific meter	* 9.81] · conversion cha	art for calculation $x = 1$	n)) W F
	Vetted widths > 5 m, meas Vetted widths < 5 m, meas Velocity and Depth heck appropriate veloci hore and depth are requ Velocity Head Rod (Rotary meters: Gurle	ure a minimum of ure 3-4 equidistar ty measuring de ired regardless or ruler): Veloc ey/Price/Mini-Pr	5-6 equidist int locations. evice and fi of method: ity Equation ice/Propello Marsh-McB	ant locations; If out the app in (m/s) = $\sqrt{[}$ er (Refer to s irney \Box Son	propriate se $2(\Delta D/100)$ pecific meter tek or \square Of	* 9.81] conversion cha ther <u>GLb c</u>	art for calculation $x = 1$	

							Statement of the second statement of the second statement of the second statement of the second statement of the
Velocity Head Rod (ruler)		HARMAN	withings.	5.15.1	4		
Flowing water Depth (D ₁) (cm)		a de a provinsi agres de ser		alerer .			
Depth of Stagnation (D ₂) (cm)	The			100			
Change in depth ($\Delta D=D_2-D_1$) (cm)							
Rotary meter				- Arenar -		in proper	1 https://
Revolutions							
Time (minimum 40 seconds)		-			1000		
Direct Measurement or calculation	ald.				Ser.		1
Velocity (V) (m/s)	0.3	0.5	0.8	0.6	0.5	10.4	0.5/6-

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Field Crew: UM, CM, ACK

Site Code: 12003

Sampling Date: (DD/MM/YYYY) 20/09/2022

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	C.
0.1-0.2 cm (coarse sand)	(2)
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.

Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.

• Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E		Diameter (cm)	E	1	Diameter (cm)	E		Diameter (cm)	Е
1	7.1		26	4.8		51	3.0		76	5-5	
2	7.2		27	10.0		52	4.5		77	3.6	
3	5.5		28	10.0		53	1.6		78	3.5	
4	3.5		29	5.0		54	7.1		79	20	0
5	L.7		30	4.0		55	4.5	-	80	1.0	
6	6.6		31	6.0		56	9.0		81 82	0.6	
7	9.4	1	32	11.0	74	57	10.0	10000	83	20	
8	9.0		33	3.5		58	4.2		84	2.0	- ANA
9	8.0		34	4.5		59	82		85	AE	
10	8.2	O	35	9.0	(60	9.0	1/1		110	- Contraction
11	10.0		36	1.5		61	1.1	1	87	70	
12	3.0		37	2.5		62	2.4		88	12.2	
13	7.5		38	6.8		63	5.0		89	0.7	B month
14	4.0		39	6.0		64	2.0		90	08	0
15	2.6	(40	7.0	O	65	3.0		91	10.0	
16	30		41	7.6		66	1.2		92	19-2-	-
17	6.1		42	7.0		67	1.2		93		
18	3.0		43	2.0		68	1.+		94		
19	12.0		44	4.0		69	5.0	3			1
20	10.0	1/2	45	4.5		70	\$.5		4 98		-
21	12.5		46	5.3		71	4.0				1.9
22	u c		47	3.0		72	8.0		9	1 x - 1	2
23	12		48	20		73	5.0		9		
	2.0		49	14		74	7.6			19/115	0
24	71		50)	90	1/1	75	7.2		[1	100 1.6	10
25	6.0		00	110						ut a 0/ acompositi	on of the

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.

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1.408 5 . N. C. 1 Field Crew: KM, CH, ACK

Sampling Date: (DD/MM/YYYY) 20/09/202

SITE INSPECTION

Site Inspected by: K.MCCallum

Communication Information

Stinerary left with contact person (include contact numbers)

Time checked-in: 8:00 Contact Person: E. Matulev Form of communication: Tradio Herell satellite hotel/pay phone SPOT Phone number: (709) 763 - 9678

Vehicle Safety

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)

Equipment and chemicals safely secured for transport

Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary Notes:

Shore & Wading Safety

Wading Task Hazard Analysis read by all field staff

Wading Safe Work Procedures read by all field staff

Instream hazards identified (i.e. log jams, deep pools, slippery rocks)

□ PFD worn

Appropriate footwear, waders, wading belt

Belay used

Notes:

CABIN Field Sheet June 2012

Page 6 of 6



Field Crew: K.M. Malone Site Code: MOROOI
Sampling Date: (DD/MM/YYYY) 11/09/202/
the designed of the second designed and the
Occupational Health & Safety: Site Inspection Sheet completed
PRIMARY SITE DATA
CABIN Study Name: CRWM-FIK Local Basin Name: FILL RIVER
River/Stream Name: MOTTISSEY Stream Order: (map scale 1:50,000)
Select one: Test Site D Potential Reference Site
Geographical Description/Notes:
Morrissey FSR to Lodgepole. Turn right near Snowmobile Association sign lon left). Drive to railway Park + walk
d/s 50m to site
Surrounding Land Use: (check those present) Information Source: Visual, maps
Forest Field/Pasture Agriculture Residential/Urban
Description Description Commercial/Industrial Description
Dominant Surrounding Land Use: (check one) Information Source: VISUAL
Forest Field/Pasture Agriculture Residential/Urban Logging Mining Commercial/Industrial Other
Location Data
Latitude: <u>49.35837</u> N Longitude: - <u>115.000669</u> W (DMS or DD)
Elevation: GPS Datum: CRS80 (NAD83/WGS84) Other:
Site Location Man Drawing
FLOW B
RAILWAY BRIDGE
The second
R
the second s
Wat
J====
Note: Indicate north

Field Crew: 100, CB, MM Site Code: MOR.002
Sampling Date: (DD/MM/YYYY) 11/09/2022
Photos Pfield Sheet Upstream Downstream Across Site Aerial View Substrate (exposed) Substrate (aquatic) Other
REACH DATA (represents 6 times bankfull width)
1. Habitat Types: <i>(check those present)</i>
2. Canopy Coverage: (stand in middle of stream and look up, check one)
3. Macrophyte Coverage: (not algae or moss, check one) 0 % 1-25 % 26-50 % 51-75 % 76-100 %
4. Streamside Vegetation: (<i>check those present</i>)
5. Dominant Streamside Vegetation: <i>(check one)</i> ferns/grasses shrubs deciduous trees coniferous trees
6. Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
 1 - Rocks are not slippery, no obvious colour (thin layer < 0.5 mm thick) 2 - Rocks are slightly slippery, yellow-brown to light green colour (0.5-1 mm thick) 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick) 4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to doub have a large (5 mm thick)
 to dark brown algae (5 mm -20 mm thick) 5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have long strands (> 20 mm thick)
Note: 1 through 5 represent categories entered into the CABIN database.

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one) I riffle I rapids I straight run

400 μm mesh Kick Net	
Person sampling	C. Bush
Sampling time (i.e. 3 min.)	3 min
No. of sample jars	2
Typical depth in kick area (cm)	1.2 cm

Preservative used: <u><u><u>29</u> / <u>Sopropul</u></u> Sampled sieved on site using "Bucket Swirling Method": <u>UYES</u> NO</u>

If YES, debris collected for QAQC

Note: Indicate if a sampling method other than the recommended 400 μm mesh kick net is used.



		Site Cod	e: MOROGI
Field Crew: KM, C	B, MM	2	
Field Crem	Wmm/1/09/2022		
Sampling Date. (DDAte.	Y DATA Time: 15:31	0 (24 hr clock) Time zor	
WATER CHEMISTRY	YDATA Time Tomp	5.5_(°C) pH:	.35
Air Temp:	(°C) Water Temp:	Ha (mg/L) Turbidi	ty: <u>0, 42 (</u> NTU)
Check if water samples w	vere collected for the followin	g analyses:	and acout an and a start was
			La realization de la factoria
Tabaanharus (Total Or		A CARLES MANAGEMENT AND	
Major Ions (i.e. Alkalin	hity, Hardness, Chloride, and	l/or Sulphate)	
Note: Determining alkalinity i	is recommended, as are other a	analyses, but not required for CA	BIN assessments.
CHANNEL DATA			
Slope - Indicate how slo	pe was measured: (check o	ne)	
Calculated from map		(cherrana)	
contour interval (vertic	al distance)	commended if field measurement is r (m),	
distance between cont	tour intervals (horizontal dist ce/horizontal distance =	tance) (m)	
OR Measured in field	aver a 0.5 min trick) aver a 0.5 min trick)	יייין אס פטאפאפ כפוכען זראה א אסרי אסן פעמאר איסופע פעוניין	
OR Measured in field Circle device used and	fill out table according to de	avice.	
OR Measured in field Circle device used and	fill out table according to de b. Hand Level & Measuring	evice: g Tape	2 1-Rocks are not the
Measured in field Circle device used and a Survey Equipment Measurements	fill out table according to de	avice.	
OR Measured in field Circle device used and a Survey Equipment Measurements Top Hairline (T)	fill out table according to de b. Hand Level & Measuring	evice: g Tape	2 1-Rocks are not the
OR Measured in field Circle device used and a Survey Equipment Measurements Top Hairline (T) Iid Hairline (ht) OR	fill out table according to de b. Hand Level & Measuring	evice: g Tape	2 1-Rocks are not the
OR Measured in field Circle device used and a. Survey Equipment Measurements Top Hairline (T) Iid Hairline (ht) OR eight of rod	fill out table according to de b. Hand Level & Measuring	evice: g Tape	2 1-Rocks are not the
OR Measured in field Circle device used and a. Survey Equipment Measurements op Hairline (T) lid Hairline (ht) OR eight of rod ottom Hairline (B) stance (dis) OR	fill out table according to de b. Hand Level & Measuring Upstream (U/S)	evice: g Tape Downstream(D/S)	2 1-Rocks are not the
A Measured in field Circle device used and a Survey Equipment Measurements Op Hairline (T) Iid Hairline (ht) OR eight of rod Dettom Hairline (B) stance (dis) OR B x 100	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355	evice: g Tape Downstream(D/S)	2 1-Rocks are not the
Measured in field Circle device used and Survey Equipment Measurements Op Hairline (T) Iid Hairline (ht) OR eight of rod ottom Hairline (B) stance (dis) OR 3 x 100 nge in height (Δht)	fill out table according to de b. Hand Level & Measuring Upstream (U/S)	evice: g Tape Downstream(D/S)	Calculation US _{dis} +DS _{dis} = 2 X Y Y
Measured in field Circle device used and Survey Equipment Measurements Op Hairline (T) Iid Hairline (ht) OR eight of rod ottom Hairline (B) stance (dis) OR 3 x 100 nge in height (Δht)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355	evice: g Tape Downstream(D/S)	Calculation
Measured in field Circle device used and Survey Equipment Measurements Op Hairline (T) Iid Hairline (ht) OR eight of rod ottom Hairline (B) stance (dis) OR 3 x 100 nge in height (Δht)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355	evice: g Tape Downstream(D/S)	Calculation US _{dis} +DS _{dis} = 2 X Y Y
Measured in field Circle device used and Survey Equipment Measurements Op Hairline (T) Iid Hairline (ht) OR eight of rod Dttom Hairline (B) stance (dis) OR B x 100 nge in height (Δht)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355	evice: g Tape Downstream(D/S)	Calculation US _{dis} +DS _{dis} = 2 X Y Y
OR Measured in field Circle device used and Survey Equipment Measurements Top Hairline (T) Nid Hairline (ht) OR eight of rod Dattom Hairline (B) stance (dis) OR B x 100 Inge in height (Δht) e (Δht/total dis)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355 1.355 14.22 aUS _{dis} =T-B	evice: g Tape Downstream(D/S) I.SS7 I.SS7 I.4.22 aDS _{dis} =T-B	Calculation US _{dis} +DS _{dis} = 2 X Y Y
Measured in field Circle device used and Survey Equipment Measurements Top Hairline (T) Nid Hairline (ht) OR eight of rod Dttom Hairline (B) stance (dis) OR 3 x 100 Inge in height (Δht) Image in height (Δht)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355 1.355 14.22 aUS _{dis} =T-B	evice: g Tape Downstream(D/S)	Calculation US _{dis} +DS _{dis} = 2 X Y Y
OR Measured in field Circle device used and Survey Equipment Measurements Top Hairline (T) Nid Hairline (ht) OR eight of rod Dattom Hairline (B) stance (dis) OR B x 100 Inge in height (Δht) e (Δht/total dis)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355 1.355 14.22 aUS _{dis} =T-B	evice: g Tape Downstream(D/S) I.SS7 I.SS7 I.4.22 aDS _{dis} =T-B	Calculation USdis+DSdis= A & 4u Dshr-Usht= O.QOTI
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OR Measured in field Circle device used and Survey Equipment Measurements Top Hairline (T) Nid Hairline (ht) OR eight of rod Dattom Hairline (B) stance (dis) OR B x 100 Inge in height (Δht) e (Δht/total dis)	fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.355 1.355 14.22 aUS _{dis} =T-B	evice: g Tape Downstream(D/S) I.SS7 I.SS7 I.4.22 aDS _{dis} =T-B	Calculation USdis+DSdis= A & 4U Dshr-USht= O.QOTI

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Field Crew: KM, CB, MM		- Sector of the sector of the		Site Code:	MOR	002		
Sampling Date: (DD/MM/YYYY)	09/11.	12022	7	07764	TANA	1.2.3	st-lägni v	
Widths and Depth Location at site:							ick area)	
A - Bankfull Width: 20-50 (m)		B - '	Wetted Str	eam Width: _	P.C)(m)		
C - Bankfull-Wetted Depth (height fi	rom water su	rface to Ban	kfull):	145		(cm)	
Note: Wetted widths > 5 m, measure a minimu Wetted widths < 5 m, measure 3-4 equid			ons;	->^00	huc	tral	filld &	hee
Check appropriate velocity measurin shore and depth are required regard Velocity Head Rod (or ruler): V	lless of meth /elocity Equa	od: tion (m/s) =	√ [2(∆D/1	e section in c	hart belo	ow. Dista $Q =$	ance from : 0.04	
Velocity and Depth Check appropriate velocity measurin shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Min Direct velocity measurements:	lless of meth ′elocity Equa ni-Price/Prop	od: ition (m/s) = peller (Refer t	√ [2(Δ D/1 to specific m	e section in c 00) * 9.81] eter conversio	hart belo	ow. Dista $Q =$	ance from : 0.04	
Check appropriate velocity measurin shore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir	lless of meth ′elocity Equa ni-Price/Prop	od: ition (m/s) = peller (Refer t	√ [2(Δ D/1 to specific m	e section in c 00) * 9.81] eter conversio	hart belo	ow. Dista $Q =$	ance from : 0.04	
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Check appropriate velocity measurin hore and depth are required regard Velocity Head Rod (or ruler) : V Rotary meters : Gurley/Price/Mir Direct velocity measurements : stance from Shore (m)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from .04 .04	6
Check appropriate velocity measurin hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: stance from Shore (m) opth (D) (cm)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: stance from Shore (m) epth (D) (cm)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: stance from Shore (m) epth (D) (cm) Hocity Head Rod (ruler)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
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Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: stance from Shore (m) apth (D) (cm) Hocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Min Direct velocity measurements: Stance from Shore (m) epth (D) (cm) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Eary meter	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: stance from Shore (m) epth (D) (cm) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth ($\Delta D=D_2-D_1$) (cm) tary meter Revolutions	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6
Check appropriate velocity measuring hore and depth are required regard Velocity Head Rod (or ruler): V Rotary meters: Gurley/Price/Mir Direct velocity measurements: istance from Shore (m) epth (D) (cm) Flocity Head Rod (ruler) Flowing water Depth (D ₁) (cm)	lless of meth ′elocity Equa ni-Price/Prop □ Marsh-M	od: htion (m/s) = beller (Refer t cBirney D	√[2(∆D/1 to specific m Sontek or E	e section in c 00) * 9.81] eter conversionation 1 Other	chart belo	ow. Dista	ance from 0.04 ation) AVG	6



Site Code: MOROC

Field Crew: 10M, CB, MA Sampling Date: (DD/MM/YYYY) _11/09/2022

SUBSTRATE DATA

235/110

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Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
	0
Organic Cover	1
< 0.1 cm (fine sand, silt or clay)	(2)
0.1-0.2 cm (coarse sand)	
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
	8
> 25.6 cm (boulder)	9
Bedrock	9

100 Pebble Count & Substrate Embeddedness

Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.

Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.

• Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)		E	Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	E
1			26			51	19.0		76	601	1
2			27			52	17.5		77	8.9	
3	15.6		28			53	3.0		78	6.4	Nise
4	24.9		29		- Incone	54	16.6	1.0.11	79	28.2	120.25
5	4.3		30	3.9	0	55	14.9		80	13.1	1/4
6	8.9		31	11.4		56	6.6	- lety	81	5.2	(anie)
7	10.1		32	10.5		57	2.5		82	4.4	
8	12.2		33	11.2	0.000 8	58	2.4	1.ST MAY	83	22.1	120.20
9	2.6	1	34	7.1	10 alexity	59	3.9		84	9.3	a sala
10	5.4	0	35	18.5	- Andrews	60	8.5	1/4	85	18.2	
11	32		36	13.5		61	13.2		86	32.1	and the second
12	8.5		37	1.5		62	5.8		87	15.4	
13	16.1		38	15.6		63	8.7	1	88	18.5	-
14	14.3	1	39	9.1		64	5.8		89	18.1	
15	3.7		40	1.4		65	.3.8		90	16.6	75%
16	28		41	1.9		66	24.0	- figure	91	2.9	1010
17	2.1		42	14.0	50%	67	12.0	1	92	17.5	
18	3.9		43	7.5		68	3.0	1	93	21.7	
19	6.4		44	6.9	A Jaimana	69	6.4	- Andrews	94	6.2	1 0 /010
20	11.2	0	45	12.1		70	5.6		95	13.4	
21	10.1		46	5.2		71	9.0		96	1.9	
22	122		47	4.3		72	3.6				
23	S		48	20.0		73			97	3.8	
24	9.7	- T	49	3.4			8.8		98	3.9	
25	4.2	Land and a	50		11	74	5.8	0	99	37.5	and the second
	4.6	-	00	17.6	1/4	75	23.0	- linger	100	9.2	0

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



CABIN Field Sheet June 2012

Field Crew: VM, CB, MM

Site Code: MOROOT

Sampling Date: (DD/MM/YYYY) 11/09/2022

SITE INSPECTION

Site Inspected by: <u>Meagan malone</u>

Communication Information

Itinerary left with contact person (include contact numbers)

Time checked-in: 16:1/ Contact Person: chad hughes Form of communication:
radio
cell
satellite
hotel/pay phone
SPOT Phone number: (250) 423-0344

Vehicle Safety

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)

Equipment and chemicals safely secured for transport

Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary

Notes:

Shore & Wading Safety

A Wading Task Hazard Analysis read by all field staff

Wading Safe Work Procedures read by all field staff

Instream hazards identified (i.e. log jams, deep pools, slippery rocks)

D PFD worn

Appropriate footwear, waders, wading belt

□ Belay used

Notes:



Elk River Alliance

Velocimeter Measurement Field Sheet

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Site:	MOROOI
Date:	22/09/M
Time:	16:52
Staff:	IKM CB
Photos:	1. Completed Field Sheet
	2. Upstream

LWE:	RWE:
Staff Gauge:	1 <u>11</u>
Wetted Width:	5.8
Bankful Width:	20.5
Instrument ID:	Flowtracker2
3. Down	nstream
4. Across (fr if possi	om left bank ible)

Q=0.046m36

	Distance (m)	Depth (m)	Velocity (m/s)	Notes
1	1.55	0	0	
2	1.75	0.09	-0001	
3	1.95	0.15	0.616	
4	2.15	0.2	0.007	State 1
5	235	0.12	0.051	
6	2.55	0.145	0.049	1. 3
7	2.75	0.22	0.035	
8	2.95	0.21	0.059	
9	3.15	6.227	0.023	
10	3.35	6.23	0.014	
11	3.55	0.217	0.036	annemine.
12	3.75	0.275	0.052	
13	395	0.225	0.076	· · · ·
14	4.15	0.23	0.082	
15	4.35	6.22	0.065	+

Continued from other side

Cont	inued from of	nerside	I	
16	4.55	O. Has	0.662	
17	4.75	0.28	0.048	
18	4.8	0.28.	0.065	14
19	4.95	0.265	0.087	1000
20	5,15	0-23	0.039	AL MAIL
21	5.35	0.221	0.048	1968
22	5.35	0.27.	-0.003	Charles and
23	5.75	0.25	0.025	14
24	8.95	0.26	0.024	
25	6.75	0.23	0.028	
26	6.35	0.23	0.019	
27	6.555	0.22 .	0.007	
28	6.75	0.12	0.07-	2
29	7.35	0	0	3
30				TTP- 13
31	- AND	G/241	No 1 20	
32	1.28	101.00	7 1 2.4	
33		1 miles 1 G ::	5 1 24	
34	1.231	an Form	1.1.3	283
35	141	32,10	015	1810
Commen	its:	AL FILL	715	5 21

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Field Crew: K.MC	Callum, C. Bush, M. Malone Site Code: MOROOZ
	MM/YYYY)1/69/2022
and an inter and	
Occupational H	lealth & Safety: Site Inspection Sheet completed
PRIMARY SITE DA	
	BWM-Elk Local Basin Name: Elk River 2
River/Stream Name: 1	Lorrissey Stream Order: (map scale 1:50,000)
Select one: Test Sit	e D Potential Reference Site
Geographical Des Drive Morrisst Arte	cription/Notes: cy FSR until 3rd bridge. Walk d/s ~50 m to
Forest Fie	(check those present) Information Source: Visual maps d/Pasture Agriculture ing Commercial/Industrial
	Land Use: (check one) Information Source:
Location Data Latitude: <u>49.420558</u> Elevation: <u>1544.0</u> (fa	N Longitude: - <u>114,91068</u> W (DMS or DD) sl of masi) GPS Datum: GRS80 (NAD83/WGS84) Other:
Site Location Map	Drawing
Bridge	tions outermant
ote: Indicate north	
TOT IT MICH I MIL	

CABIN Field Sheet June 2012

1



Field Crew: K.M. CB.MM Site Code: MOROOZ
Sampling Date: (DD/MM/YYYY) 109/2022
Photos Image: Constraint of the constr
REACH DATA (represents 6 times bankfull width)
1. Habitat Types: <i>(check those present)</i> Riffle I Rapids I Straight run Pool/Back Eddy
2. Canopy Coverage: (<i>stand in middle of stream and look up, check one</i>)
3. Macrophyte Coverage: <i>(not algae or moss, check one)</i> □ 0 % ☑ 1-25 % □ 26-50 % □ 51-75 % □ 76-100 %
4. Streamside Vegetation: (<i>check those present</i>) ↓ ferns/grasses ↓ shrubs □ deciduous trees ↓ coniferous trees
5. Dominant Streamside Vegetation: <i>(check one)</i> ferns/grasses shrubs deciduous trees coniferous trees
6. Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
 1 - Rocks are not slippery, no obvious colour (thin layer < 0.5 mm thick) 2 - Rocks are slightly slippery, yellow-brown to light green colour (0.5-1 mm thick) 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick) 4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to dark brown algae (5 mm 20 mm thick)
to dark brown algae (5 mm -20 mm thick) 5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have long strands (> 20 mm thick)
Note: 1 through 5 represent categories entered into the CABIN database.

BENTHIC MACROINVERTEBRATE DATA

400 µm mesh Kick Net		Preservative u
Person sampling	M. Malone	Sampled sieve
Sampling time (i.e. 3 min.)	3 mins	
No. of sample jars	1	If YES, debris
Typical depth in kick area (cm)	Rem	

Habitat sampled: (check one) riffle rapids straight run

Preservative used: <u>99% Sopropy</u>

Sampled sieved on site using "Bucket Swirling Method":

Note: Indicate if a sampling method other than the recommended 400 μ m mesh kick net is used.



Page 2 of 6

Field Crew: Im. G. M.M. Sampling Date: (DD/MM/YYY) I/A9/2022. Image:			Site Co	de: 1002
Sampling Date: (DD/MMYYYY)	Field Crew: UD C	B, MM	and the second state of the second se	Lander and the second sec
WATER CHEMISTRY DATA Time: [0:27] (24 hr clock) Time zone: [MIS1] Air Temp:	Sampling Date: (DD/MN	mm)_11/09/20	500	4
Specific Conductance: []	WATER CHEMISTRY	(°C) Water Temp:	(24 hr clock) Time zo	8.60
Note: Determining alkalinity is recommended, as are other analyses, but not required for CABIN assessments. CHANNEL DATA Slope - Indicate how slope was measured: (check one) Calculated from map Scale:	Specific Conductance:	<u>3.8 (µs/cm)</u> ere collected for the followin Solids) trate, Nitrite, Dissolved, and, tho, and/or Dissolved)	g analyses: /or Ammonia)	
CHANNEL DATA Slope - Indicate how slope was measured: (check one) Calculated from map Scale:				ABIN assessments.
Amid Hairline (ht) OR 1.288 1.590 Height of rod 1.288 1.590 Bottom Hairline (B)	Slope - Indicate how slop Calculated from map Scale: contour interval (vertica distance between contr	(Note: small scale map re al distance) our intervals (horizontal dis	commended if field measurement i (m), tance) (m)	is not possible - i.e. 1:20,000).
Bottom Hairline (B) 1.5 MO Distance (dis) OR 10 1° B x 100 a° US _{dis} =T-B a° US _{dis} =T-B a° DS _{dis} =T-B bange in height (Δ ht) DS _{ht} -US _{ht} =	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring	commended if field measurement i (m), ance) (m) wice: g Tape	s not possible - i.e. 1:20,000).
Bottom Hairline (B) Image: Constraints Image:	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring	commended if field measurement i (m), ance) (m) wice: g Tape	s not possible - i.e. 1:20,000).
$\frac{10}{a^{a}US_{dis}=T-B} = \frac{10}{a^{b}DS_{dis}=T-B} = \frac{10}{DS_{dis}=T-B}$	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).
DSht-USht=	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).
lope (Δht/total dis)	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist se/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S) 1.288 1.288	commended if field measurement is (m), tance)(m) evice: g Tape Downstream(D/S) 	s not possible - i.e. 1:20,000).
Slope (Aht/total dia)	Slope - Indicate how slop Calculated from map Scale:	(Note: small scale map re al distance) our intervals (horizontal dist e/horizontal distance = fill out table according to de b. Hand Level & Measuring Upstream (U/S)	commended if field measurement i (m), tance) (m) evice: g Tape Downstream(D/S)	s not possible - i.e. 1:20,000).



eld Sheet June 2012

1'

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1171012

	MINI	Margary -	Starry Strange	Site Code	: MOR	002	-
ampling Date: (DD/MM/YYYY)	-11/09/2	2022	1221	10/14	errerio	1	Contine of
Vidths and Depth	1.1.1.1.1.1					1802	
ocation at site: up stream	n 20m ofk	ick (India	ate where	e in sample	reach, ex.	d/s of kick	area)
A - Bankfull Width: 12.76 (m					1.4m		
C - Bankfull-Wetted Depth (height				78.9		(cm)	
	ne and have been seen and also have have have have any have any and			A			
10		* *	+	-B-/			
0000	V1 V2 D1 D2	V3 V4 D3 D4	V5 D5	/			and second second
		+ +	/				
Note: Wetted widths > 5 m, measure a minin Wetted widths < 5 m, measure 3-4 equ		ant location	5;				1.
Velocity and Depth Check appropriate velocity measu shore and depth are required rega	ring device and fil	l out the a	opropriate	e section ir	chart belo	w. Distanc	e from hydro
Velocity Head Rod (or ruler):			[2(AD/10	00) * 9.811	4	netric	datas
Rotary meters: Gurley/Price/N			specific m	eter conver	sion chart fo	or calculatio	n)
C Rolary meters. Curley/ nec/n	with the off topolic			1000 Ale an			E E and
Direct velocity measurement	ts: □ Marsh-McBi	rnev 🖸 So	ntek or E	toncher	4	T	
Direct velocity measurement	ts: □ Marsh-McBi	APER	ontek or D] Other	-	6	AVG
	ts: □ Marsh-McBi 1	rney 🗗 So 2	ontek or E	toncher	5	6	3.1
Distance from Shore (m)	ts: □ Marsh-McBi	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm)	ts: Marsh-McBi	APER	ontek or D] Other	-	6	3.1
	ts: Marsh-McBi	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler)	ts: D Marsh-McBi	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm)	1	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm)	1	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm)	1	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter	1	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions	1	APER	ontek or D] Other	-	6	AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions Time (minimum 40 seconds)	1	APER	ontek or D	4	5		AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions Time (minimum 40 seconds) Direct Measurement or calculation	1	APER	ontek or D	4	5		AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions Time (minimum 40 seconds) Direct Measurement or calculation	1	APER	3	4	5		AVG
Distance from Shore (m) Depth (D) (cm) Velocity Head Rod (ruler) Flowing water Depth (D ₁) (cm) Depth of Stagnation (D ₂) (cm) Change in depth (ΔD=D ₂ -D ₁) (cm) Rotary meter Revolutions Time (minimum 40 seconds) Direct Measurement or calculation	1	2	ontek or D	4	5		AVG

Note: Indicate mere

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Site Code: MORDO 7

Field

Field Crew: KIM CB,

Sampling Date: (DD/MM/YYYY) 11/09/2022

SUBSTRATE DATA

Surrounding/Interstitial Material

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	2
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

• Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.

• Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.

• Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E	-	Diameter (cm)	E		Diameter (cm)	E		Diameter (cm)	E
1	8.1		26	5.7		51	4.3		76	4.4	
2	11.2		27	2.7		52	6.4		77	5	
3	4.9		28	1.4	1	53	7.5		78	33.4	(abina)
4	0.8		29	5.6	e loma	54	3.7		79	5.7	E. C. O.
5	7.4		30	9	50%	55	8.7		80	3.1	0
6	35.6		31	5.5		56	In Loundary	ional -	81	13.3	- Sale
7	7.6		32	10		57	14.2		82	5.2	
8	1.7		33	17.5		58	6.3	111111	83	6.7	R. Carlos
9	11.3		34	4.3	in steels	59	2.8	1.1 4494	84	1.8	(about
10	2.8	0%	35	6.1	and the second second	60	4.8	25%	85	6	
11	1.6		36	3.2	N. P.S.	61	4.8		86	7.1	
12	3.2		37	4.8		62	8.3		87	3.3	
13	2.9	122	38	4.5		63	12.5	A Commence	88	10.6	
14	10		39	14.3		64	1.2		89	4.8	3.397
15	19.8		40	6.9	0%	65	3.4		90	0 0	
16	4.3		41	1.8		66	11.5		91	10.4	0
17	6		42	7.8		67	0.9		92	00	
18	1.4		43	8.4		68	5		93	0.9	-
19	7.9		44	10.6		69	15		93	1.4	-
20	7.5	50%	45	1.7		70	6	0		0.6	
21	14.3		46	7.2		71	6	0	95	4.6	
22	6.9		47	3.2		72	101		96	3.1	
23	19		48	1.7		Children and	11.2		97	21	
24	2		49	25.8		73	1.4		98	5.4	
25	7.6		50	8.9	0 00/	74	5.5		99	8.9	
				0.1	25%	75	1.8	- Second	100	6	0

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.



CABIN Field Sheet June 2012

Field Crew: K. McCallum, C. Bush, M. Malone	Site Code: MOROD2	
Sampling Date: (DD/MM/YYYY) 11/09/2022		

SITE INSPECTION

Site Inspected by: K. Mc Callum

Communication Information

Itinerary left with contact person (include contact number		Itinerary left with (contact person	(include	contact	number
--	--	-----------------------	----------------	----------	---------	--------

Contact Person: E. Matveev	Time checked-in: 9:0
Form of communication: radio Ccell Satellite	hotel/pay phone SPOT
Phone number: (709) 703-9678	

Vehicle Safety

Safety equipment (first aid, fire extinguisher, blanket, emergency kit in vehicle)
 Equipment and chemicals safely secured for transport
 Vehicle parked in safe location; pylons, hazard light, reflective vests if necessary
 Notes:

Shore & Wading Safety

Wading Task Hazard Analysis read by all field staff
Wading Safe Work Procedures read by all field staff
Instream hazards identified (i.e. log jams, deep pools, slippery rocks)
PFD worn
Appropriate footwear, waders, wading belt
Belay used

Page 6 of 6

Notes:



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= 0.007 m3/5 K River Alliance Velocimeter Measurement Field Sheet RWE: LWE: Staff Gauge: MORO Site: Wetted Width: Date: aphical Je Bankful Width: Time: 00 Instrument ID: Flowtracker2 Staff: 3. Downstream 1. Completed Field Sheet Photos: ing Land 4. Across (from left bank JSE 101 2. Upstream Fi if possible) ng Velocity (m/s) Notes Depth (m) Surrour Distance (m) 1 g 9 2 .009 Data 3 50,0 2 4 1248.5 Ta. 5 6 ation M 7 8 Ru 9 10 11 Con la 12 13 0 14 9/07 15

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Comments:





Elk River Alliance | CBWM: 2022 Report

Appendix C: CARO Reports



CERTIFICATE OF ANALYSIS

REPORTED TO	Elk River Alliance PO Box 2095, 1111 2nd Ave Fernie, BC V0B1M0		
ATTENTION	Kaileigh McCallum	WORK ORDER	2212256
PO NUMBER PROJECT PROJECT INFO	CBWM-2022 [info]	RECEIVED / TEMP REPORTED COC NUMBER	2022-09-16 14:00 / 9.9°C 2022-09-23 12:52 No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

We've Got Chemistry

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too. It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

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Ahead of the Curve

research, Through regulation and instrumentation, knowledge, we are your analytical centre the for knowledge technical you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at TeamCaro@caro.ca

Authorized By:

Team CARO Client Service Representative

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4



	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212256 2022-09-2	3 12:52
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
ALX001_20220914_	_1520 (22l2256-01) M	atrix: Water Sam	pled: 2022-09-14 1	5:20			
Anions							
Bromide		< 0.10	N/A	0.10	mg/L	2022-09-21	
Chloride		0.97	AO ≤ 250		mg/L	2022-09-21	
Fluoride		0.17	MAC = 1.5		mg/L	2022-09-21	
Nitrate (as N)		< 0.010	MAC = 10	0.010	-	2022-09-21	HT1
Nitrite (as N)		< 0.010	MAC = 1	0.010	-	2022-09-21	HT1
Phosphate (as P)		< 0.0050	N/A	0.0050	-	2022-09-21	HT1
Sulfate		17.7	AO ≤ 500		mg/L	2022-09-21	
BCMOE Aggregate H	vdrocarbons						
EPHw10-19	yarocarbono	< 250	N/A	250	µg/L	2022-09-22	
EPHw19-32		< 250	N/A	250		2022-09-22	
Surrogate: 2-Methyli	nonane (FPH/F2-4)	90	10,7 (60-140	%	2022-09-22	
Calculated Paramete							
Hardness, Total (as		155	None Required	0.500	ma/L	N/A	
Nitrate+Nitrite (as N)		< 0.0100	N/A	0.0100	-	N/A	
Nitrogen, Total	/	< 0.0500	N/A	0.0500	-	N/A	
Dissolved Metals					0		
Aluminum, dissolved	ł	< 0.0050	N/A	0.0050	mg/L	2022-09-22	
Antimony, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-22	
Arsenic, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-22	
Barium, dissolved		0.0681	N/A	0.0050	mg/L	2022-09-22	
Beryllium, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-22	
Bismuth, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-22	
Boron, dissolved		< 0.0500	N/A	0.0500	mg/L	2022-09-22	
Cadmium, dissolved		< 0.000010	N/A	0.000010	mg/L	2022-09-22	
Calcium, dissolved		41.6	N/A	0.20	mg/L	2022-09-22	
Chromium, dissolved	d	< 0.00050	N/A	0.00050	mg/L	2022-09-22	
Cobalt, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-22	
Copper, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-22	
Iron, dissolved		< 0.010	N/A	0.010	mg/L	2022-09-22	
Lead, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-22	
Lithium, dissolved		0.00341	N/A	0.00010	mg/L	2022-09-22	
Magnesium, dissolve	ed	12.4	N/A	0.010	mg/L	2022-09-22	
Manganese, dissolv	ed	0.00057	N/A	0.00020	mg/L	2022-09-22	
Mercury, dissolved		< 0.000010	N/A	0.000010	mg/L	2022-09-22	
Molybdenum, dissol	ved	0.00072	N/A	0.00010	mg/L	2022-09-22	
Nickel, dissolved		< 0.00040	N/A	0.00040		2022-09-22	
Phosphorus, dissolv	ed	< 0.050	N/A	0.050	-	2022-09-22	
Potassium, dissolve	d	0.40	N/A		mg/L	2022-09-22	
Selenium, dissolved		0.00063	N/A	0.00050	-	2022-09-22	
Silicon, dissolved		2.1	N/A		mg/L	2022-09-22	
Silver, dissolved		< 0.000050	N/A	0.000050	-	2022-09-22	



REPORTED TO Elk River Alliance PROJECT CBWM-2022				WORK ORDER REPORTED	2212256 2022-09-	23 12:52
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
ALX001_20220914_1520 (22l2256-01) l	Matrix: Water Sam	pled: 2022-09-14 1	5:20, Contin	ued		
Dissolved Metals, Continued						
Sodium, dissolved	1.77	N/A	0.10	mg/L	2022-09-22	
Strontium, dissolved	0.114	N/A	0.0010	•	2022-09-22	
Sulfur, dissolved	5.4	N/A		mg/L	2022-09-22	
Tellurium, dissolved	< 0.00050	N/A	0.00050	-	2022-09-22	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2022-09-22	
Thorium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-22	
Tin, dissolved	< 0.00020	N/A	0.00020	•	2022-09-22	
Titanium, dissolved	< 0.0050	N/A	0.0050	-	2022-09-22	
Tungsten, dissolved	< 0.0010	N/A	0.0010	-	2022-09-22	
Uranium, dissolved	0.000576	N/A	0.000020	mg/L	2022-09-22	
Vanadium, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-22	
Zinc, dissolved	< 0.0040	N/A	0.0040	-	2022-09-22	
Zirconium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-22	
General Parameters				-		
Alkalinity, Total (as CaCO3)	178	N/A	1.0	mg/L	2022-09-22	
Alkalinity, Phenolphthalein (as CaCO3)	1.9	N/A		mg/L	2022-09-22	
Alkalinity, Bicarbonate (as CaCO3)	174	N/A		mg/L	2022-09-22	
Alkalinity, Carbonate (as CaCO3)	3.8	N/A		mg/L	2022-09-22	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A		mg/L	2022-09-22	
Ammonia, Total (as N)	< 0.050	None Required	0.050	-	2022-09-20	
BOD, 5-day	< 6.2	N/A		mg/L	2022-09-22	
Carbon, Total Organic	0.87	N/A		mg/L	2022-09-21	
Carbon, Dissolved Organic	0.66	N/A		mg/L	2022-09-21	
Chemical Oxygen Demand	< 20	N/A		mg/L	2022-09-18	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	-	2022-09-23	
Phosphorus, Total (as P)	0.0072	N/A	0.0050	-	2022-09-21	
Solids, Total Suspended	< 2.0	N/A		mg/L	2022-09-23	HT1
Total Metals						
Aluminum, total	0.0061	OG < 0.1	0.0050	mg/L	2022-09-20	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-20	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050		2022-09-20	
Barium, total	0.0674	MAC = 2	0.0050	0	2022-09-20	
Beryllium, total	< 0.00010	N/A	0.00010	-	2022-09-20	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Boron, total	< 0.0500	MAC = 5	0.0500	-	2022-09-20	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	-	2022-09-20	
Calcium, total	47.5	None Required		mg/L	2022-09-20	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	-	2022-09-20	
Cobalt, total	< 0.00010	N/A	0.00010	-	2022-09-20	
Copper, total	< 0.00040	MAC = 2	0.00040	-	2022-09-20	
Iron, total	< 0.010	AO ≤ 0.3	0.010	-	2022-09-20	
Lead, total	< 0.00020	MAC = 0.005	0.00020	-	2022-09-20	
,						Page 3 of



	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212256 2022-09-2	3 12:52
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
ALX001_20220914_	1520 (22l2256-01) Ma	atrix: Water San	pled: 2022-09-14 1	5:20, Contin	ued		
Total Metals, Continue	ed						
Lithium, total		0.00389	N/A	0.00010	mg/L	2022-09-20	
Magnesium, total		12.8	None Required	0.010	mg/L	2022-09-20	
Manganese, total		0.00092	MAC = 0.12	0.00020	mg/L	2022-09-20	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-22	
Molybdenum, total		0.00073	N/A	0.00010	mg/L	2022-09-20	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-20	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-20	
Potassium, total		0.38	N/A	0.10	mg/L	2022-09-20	
Selenium, total		0.00064	MAC = 0.05	0.00050	mg/L	2022-09-20	
Silicon, total		2.0	N/A	1.0	mg/L	2022-09-20	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-09-20	
Sodium, total		1.80	AO ≤ 200	0.10	mg/L	2022-09-20	
Strontium, total		0.114	MAC = 7	0.0010	mg/L	2022-09-20	
Sulfur, total		5.4	N/A	3.0	mg/L	2022-09-20	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-20	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-20	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-20	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-20	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-20	
Uranium, total		0.000576	MAC = 0.02	0.000020	mg/L	2022-09-20	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-20	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-20	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-20	

ALX003_20220914_0924 (22I2256-02) | Matrix: Water | Sampled: 2022-09-14 09:24

Hardness, Total (as CaCO3)	161	None Required	0.500	mg/L	N/A	
Calculated Parameters						
Surrogate: 2-Methylnonane (EPH/F2-4)	93		60-140	%	2022-09-22	
EPHw19-32	< 250	N/A	250	µg/L	2022-09-22	
EPHw10-19	< 250	N/A	250	µg/L	2022-09-22	
3CMOE Aggregate Hydrocarbons						
Sulfate	15.7	AO ≤ 500	1.0	mg/L	2022-09-21	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2022-09-21	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-21	HT1
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2022-09-21	HT1
Fluoride	0.15	MAC = 1.5	0.10	mg/L	2022-09-21	
Chloride	0.80	AO ≤ 250	0.10	mg/L	2022-09-21	
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-21	

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Caring About Results, Obviously.
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	tiver Alliance M-2022			WORK ORDER REPORTED	2212256 2022-09-2	3 12:52
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
ALX003_20220914_0924	l (22l2256-02) Matrix: Water Sam	pled: 2022-09-14	09:24, Contini	ued		
Calculated Parameters, Co	ontinued					
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	0.0780	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	ma/L	2022-09-22	
Antimony, dissolved	< 0.00020	N/A	0.00020	0	2022-09-22	
Arsenic, dissolved	< 0.00050	N/A	0.00050		2022-09-22	
Barium, dissolved	0.0679	N/A	0.0050	•	2022-09-22	
Beryllium, dissolved	< 0.00010	N/A	0.00010	•	2022-09-22	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-22	
Boron, dissolved	< 0.0500	N/A	0.0500	0	2022-09-22	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2022-09-22	
Calcium, dissolved	44.3	N/A		mg/L	2022-09-22	
Chromium, dissolved	< 0.00050	N/A	0.00050		2022-09-22	
Cobalt, dissolved	< 0.00010	N/A	0.00010		2022-09-22	
Copper, dissolved	< 0.00040	N/A	0.00040		2022-09-22	
Iron, dissolved	< 0.010	N/A	0.010		2022-09-22	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-22	
Lithium, dissolved	0.00338	N/A	0.00010	mg/L	2022-09-22	
Magnesium, dissolved	12.2	N/A	0.010	-	2022-09-22	
Manganese, dissolved	0.00100	N/A	0.00020	-	2022-09-22	
Mercury, dissolved	< 0.000010	N/A	0.000010		2022-09-22	
Molybdenum, dissolved	0.00063	N/A	0.00010	mg/L	2022-09-22	
Nickel, dissolved	< 0.00040	N/A	0.00040	-	2022-09-22	
Phosphorus, dissolved	< 0.050	N/A	0.050		2022-09-22	
Potassium, dissolved	0.37	N/A	0.10	mg/L	2022-09-22	
Selenium, dissolved	0.00052	N/A	0.00050	mg/L	2022-09-22	
Silicon, dissolved	2.1	N/A	1.0	mg/L	2022-09-22	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2022-09-22	
Sodium, dissolved	1.57	N/A	0.10	mg/L	2022-09-22	
Strontium, dissolved	0.110	N/A	0.0010	mg/L	2022-09-22	
Sulfur, dissolved	5.0	N/A	3.0	mg/L	2022-09-22	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-22	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2022-09-22	
Thorium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-22	
Tin, dissolved	< 0.00020	N/A	0.00020	-	2022-09-22	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-22	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2022-09-22	
Uranium, dissolved	0.000531	N/A	0.000020	-	2022-09-22	
Vanadium, dissolved	< 0.0050	N/A	0.0050	-	2022-09-22	
Zinc, dissolved	< 0.0040	N/A	0.0040	-	2022-09-22	
Zirconium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-22	

General Parameters

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REPORTED TOElk River AlliancePROJECTCBWM-2022				WORK ORDER REPORTED	2212256 2022-09-2	3 12:52
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
ALX003_20220914_0924 (22l2256-02) Ma	atrix: Water San	npled: 2022-09-14 0	9:24, Contin	ued		
General Parameters, Continued						
Alkalinity, Total (as CaCO3)	179	N/A	1.0	mg/L	2022-09-22	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-22	
Alkalinity, Bicarbonate (as CaCO3)	179	N/A	1.0	mg/L	2022-09-22	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-22	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-22	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2022-09-20	
BOD, 5-day	< 6.2	N/A	2.0	mg/L	2022-09-22	
Carbon, Total Organic	0.59	N/A	0.50	mg/L	2022-09-21	
Carbon, Dissolved Organic	0.56	N/A	0.50	mg/L	2022-09-21	
Chemical Oxygen Demand	< 20	N/A	20	mg/L	2022-09-18	
Nitrogen, Total Kjeldahl	0.078	N/A	0.050	mg/L	2022-09-23	
Phosphorus, Total (as P)	0.0081	N/A	0.0050	mg/L	2022-09-21	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2022-09-23	HT1
Total Metals						
Aluminum, total	0.0087	OG < 0.1	0.0050	mg/L	2022-09-20	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-20	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2022-09-20	
Barium, total	0.0650	MAC = 2	0.0050	mg/L	2022-09-20	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2022-09-20	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2022-09-20	
Calcium, total	47.5	None Required	0.20	mg/L	2022-09-20	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-20	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Copper, total	< 0.00040	MAC = 2	0.00040	mg/L	2022-09-20	
Iron, total	0.014	AO ≤ 0.3	0.010	mg/L	2022-09-20	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2022-09-20	
Lithium, total	0.00361	N/A	0.00010	mg/L	2022-09-20	
Magnesium, total	12.3	None Required	0.010	mg/L	2022-09-20	
Manganese, total	0.00155	MAC = 0.12	0.00020	mg/L	2022-09-20	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-22	
Molybdenum, total	0.00065	N/A	0.00010	mg/L	2022-09-20	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2022-09-20	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2022-09-20	
Potassium, total	0.35	N/A	0.10	mg/L	2022-09-20	
Selenium, total	0.00052	MAC = 0.05	0.00050	mg/L	2022-09-20	
Silicon, total	2.0	N/A	1.0	mg/L	2022-09-20	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2022-09-20	
Sodium, total	1.57	AO ≤ 200	0.10	mg/L	2022-09-20	
Strontium, total	0.109	MAC = 7	0.0010	mg/L	2022-09-20	
Sulfur, total	5.0	N/A	3.0	mg/L	2022-09-20	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212256 2022-09-2	3 12:52
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
ALX003_2022091	4_0924 (22l2256-02) N	atrix: Water Sam	oled: 2022-09-14 0	9:24, Contini	beu		
Total Metals, Conti	nued						
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-20	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-20	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-20	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-20	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-20	
Uranium, total		0.000522	MAC = 0.02	0.000020	mg/L	2022-09-20	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-20	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-20	
,		< 0.00010	N/A	0.00010		2022-09-20	

Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO Elk River All PROJECT CBWM-2022		WORK ORDE REPORTED	R 22I2256 2022-09-2	3 12:52
Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	\checkmark	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	\checkmark	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	\checkmark	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	\checkmark	Kelowna
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	✓	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	\checkmark	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond
EPH in Water	EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	\checkmark	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	\checkmark	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2017)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

Caring About Results, Obviously.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Elk River Alliance
PROJECT	CBWM-2022

WORK ORDER REPORTED

2212256 2022-09-23 12:52

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do <u>not</u> take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:TeamCaro@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



REPORTED TO	Elk River Alliance	WORK ORDER	2212256
PROJECT	CBWM-2022	REPORTED	2022-09-23 12:52

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- Duplicate (Dup): An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike	Source	% REC	REC	% RPD	RPD	Qualifier
, maly to	Rooun		Level	Result	/01120	Limit	70 TU B	Limit	quamo

Anions, Batch B2I1978

Blank (B2I1978-BLK1)			Prepared: 20)22-09-21, Analyze	ed: 2022-09-21	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.05	0.05 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 0.5	0.5 mg/L				
Blank (B2I1978-BLK2)			Prepared: 20)22-09-21, Analyze	ed: 2022-09-21	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.05	0.05 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 0.5	0.5 mg/L				
Blank (B2I1978-BLK3)			Prepared: 20)22-09-22, Analyze	ed: 2022-09-22	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.05	0.05 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 0.5	0.5 mg/L				
LCS (B2I1978-BS1)			Prepared: 20)22-09-21, Analyze	ed: 2022-09-21	
Bromide	3.85	0.10 mg/L	4.00	96	85-115	
Chloride	16.3	0.05 mg/L	16.0	102	90-110	
Fluoride	4.07	0.10 mg/L	4.00	102	88-108	
Nitrate (as N)	4.17	0.010 mg/L	4.00	104	90-110	
Nitrite (as N)	1.96	0.010 mg/L	2.00	98	85-115	
Phosphate (as P)	1.07	0.0050 mg/L	1.00	107	80-120	
Sulfate	16.3	0.5 mg/L	16.0	102	90-110	
LCS (B2I1978-BS2)			Prepared: 20)22-09-21, Analyze	ed: 2022-09-21	
Bromide	3.92	0.10 mg/L	4.00	98	85-115	_
	(Caring About Res	sults, Obviously			Page 10 of 17



REPORTED TOElk River AlliancePROJECTCBWM-2022						WORK REPOR	ORDER RTED		256 2-09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
Anions, Batch B2I	1978, Continued									
Anions, Batch B2l LCS (B2l1978-BS2	,			Prepared	: 2022-09-2	21, Analyze	ed: 2022-0)9-21		
,	,	15.6	0.05 mg/L	Prepared 16.0	: 2022-09-2	21, Analyze 97	ed: 2022-0 90-110)9-21		
LCS (B2I1978-BS2	,	15.6 4.02	0.05 mg/L 0.10 mg/L		: 2022-09-2	· •)9-21		
LCS (B2I1978-BS2 Chloride	,		0	16.0	: 2022-09-2	97	90-110)9-21		
LCS (B2I1978-BS2 Chloride Fluoride	,	4.02	0.10 mg/L	16.0 4.00	: 2022-09-2	97 101	90-110 88-108	09-21		
LCS (B2I1978-BS2 Chloride Fluoride Nitrate (as N)	,	4.02 4.03	0.10 mg/L 0.010 mg/L	16.0 4.00 4.00	: 2022-09-2	97 101 101	90-110 88-108 90-110	09-21		

LCS (B2I1978-BS3)	Prepared: 2022-09-22, Analyzed: 2022-09-22						
Bromide	3.65	0.10 mg/L	4.00	91	85-115		
Chloride	15.6	0.05 mg/L	16.0	97	90-110		
Fluoride	4.08	0.10 mg/L	4.00	102	88-108		
Nitrate (as N)	4.01	0.010 mg/L	4.00	100	90-110		
Nitrite (as N)	1.98	0.010 mg/L	2.00	99	85-115		
Phosphate (as P)	1.06	0.0050 mg/L	1.00	106	80-120		
Sulfate	15.4	0.5 mg/L	16.0	96	90-110		

BCMOE Aggregate Hydrocarbons, Batch B2l2496

Blank (B2I2496-BLK1)			Prepared: 2022	2-09-22, Analyze	ed: 2022-09	-22		
EPHw10-19	< 250	250 µg/L						
EPHw19-32	< 250	250 µg/L						
Surrogate: 2-Methylnonane (EPH/F2-4)	4360	µg/L	4400	99	60-140			
LCS (B2I2496-BS2)		Prepared: 2022-09-22, Analyzed: 2022-09-22						
EPHw10-19	17900	250 µg/L	15400	116	70-130			
EPHw19-32	25900	250 µg/L	22100	117	70-130			
Surrogate: 2-Methylnonane (EPH/F2-4)	4440	µg/L	4400	101	60-140			
LCS Dup (B2I2496-BSD2)			Prepared: 2022	2-09-22, Analyze	ed: 2022-09	-22		
EPHw10-19	16000	250 µg/L	15400	104	70-130	11	20	
EPHw19-32	23000	250 µg/L	22100	104	70-130	12	20	
Surrogate: 2-Methylnonane (EPH/F2-4)	4330	µg/L	4400	98	60-140			

Dissolved Metals, Batch B2I2476

Blank (B2)2476 BLK4)

Blank (B2I2476-BLK1)			Prepared: 2022-09-22, Analyzed: 2022-09-22
Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Antimony, dissolved	< 0.00020	0.00020 mg/L	
Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Barium, dissolved	< 0.0050	0.0050 mg/L	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Boron, dissolved	< 0.0500	0.0500 mg/L	
Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Chromium, dissolved	< 0.00050	0.00050 mg/L	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Copper, dissolved	< 0.00040	0.00040 mg/L	
Iron, dissolved	< 0.010	0.010 mg/L	
Lead, dissolved	< 0.00020	0.00020 mg/L	
Lithium, dissolved	< 0.00010	0.00010 mg/L	
Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Manganese, dissolved	< 0.00020	0.00020 mg/L	
Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Nickel, dissolved	< 0.00040	0.00040 mg/L	
Phosphorus, dissolved	< 0.050	0.050 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			256 -09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Dissolved Metals, Batch B2I2476, Continued

Blank (B2I2476-BLK1), Continued			Prepared: 202	2-09-22, Analyze	d: 2022-09-22	
Potassium, dissolved	< 0.10	0.10 mg/L				
Selenium, dissolved	< 0.00050	0.00050 mg/L				
Silicon, dissolved	< 1.0	1.0 mg/L				
Silver, dissolved	< 0.000050	0.000050 mg/L				
Sodium, dissolved	< 0.10	0.10 mg/L				
Strontium, dissolved	< 0.0010	0.0010 mg/L				
Sulfur, dissolved	< 3.0	3.0 mg/L				
Tellurium, dissolved	< 0.00050	0.00050 mg/L				
Thallium, dissolved	< 0.000020	0.000020 mg/L				-
Thorium, dissolved	< 0.00010	0.00010 mg/L				
Tin, dissolved	< 0.00020	0.00020 mg/L				
Titanium, dissolved	< 0.0050	0.0050 mg/L				
Tungsten, dissolved	< 0.0010	0.0010 mg/L				
Uranium, dissolved	< 0.000020	0.000020 mg/L				
Vanadium, dissolved	< 0.0050	0.0050 mg/L				
Zinc, dissolved	< 0.0040	0.0040 mg/L				
Zirconium, dissolved	< 0.00010	0.00010 mg/L				
LCS (B2I2476-BS1)			Prepared: 202	2-09-22, Analyze	d [.] 2022-09-22	
,	3.97	0.0050 mg/l	4.00	99	80-120	
Aluminum, dissolved Antimony, dissolved		0.0050 mg/L				
	0.0392	0.00020 mg/L	0.0400	98	80-120 80-120	
Arsenic, dissolved	0.0408	0.00050 mg/L 0.0050 mg/L	0.0400	102 98	80-120	
Barium, dissolved		U		90	80-120	
Beryllium, dissolved	0.0396	0.00010 mg/L	0.0400		80-120	
Bismuth, dissolved	0.0406	0.00010 mg/L	0.0400	101		
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0400	99	80-120	
Cadmium, dissolved	0.0395	0.000010 mg/L	0.0400	99	80-120	
Calcium, dissolved, dissolved	3.87	0.20 mg/L	4.00	97	80-120	
Chromium, dissolved	0.0398	0.00050 mg/L	0.0400	100	80-120	
Cobalt, dissolved	0.0396	0.00010 mg/L	0.0400	99	80-120	
Copper, dissolved	0.0398	0.00040 mg/L	0.0400	100	80-120	
Iron, dissolved	3.92	0.010 mg/L	4.00	98	80-120	
Lead, dissolved	0.0408	0.00020 mg/L	0.0400	102	80-120	
Lithium, dissolved	0.0393	0.00010 mg/L	0.0400	98	80-120	
Magnesium, dissolved, dissolved	3.96	0.010 mg/L	4.00	99	80-120	
Manganese, dissolved	0.0399	0.00020 mg/L	0.0400	100	80-120	
Molybdenum, dissolved	0.0387	0.00010 mg/L	0.0400	97	80-120	
Nickel, dissolved	0.0395	0.00040 mg/L	0.0400	99	80-120	
Phosphorus, dissolved	4.02	0.050 mg/L	4.00	101	80-120	
Potassium, dissolved	4.05	0.10 mg/L	4.00	101	80-120	
Selenium, dissolved	0.0416	0.00050 mg/L	0.0400	104	80-120	
Silicon, dissolved	4.1	1.0 mg/L	4.00	102	80-120	
Silver, dissolved	0.0395	0.000050 mg/L	0.0400	99	80-120	
Sodium, dissolved	4.12	0.10 mg/L	4.00	103	80-120	
Strontium, dissolved	0.0405	0.0010 mg/L	0.0400	101	80-120	
Sulfur, dissolved	41.2	3.0 mg/L	40.0	103	80-120	
Tellurium, dissolved	0.0392	0.00050 mg/L	0.0400	98	80-120	
Thallium, dissolved	0.0414	0.000020 mg/L	0.0400	103	80-120	
Thorium, dissolved	0.0406	0.00010 mg/L	0.0400	102	80-120	
Tin, dissolved	0.0394	0.00020 mg/L	0.0400	99	80-120	
Titanium, dissolved	0.0392	0.0050 mg/L	0.0400	98	80-120	
Tungsten, dissolved	0.0406	0.0010 mg/L	0.0400	102	80-120	
Uranium, dissolved	0.0427	0.000020 mg/L	0.0400	107	80-120	
Vanadium, dissolved	0.0399	0.0050 mg/L	0.0400	100	80-120	
Zinc, dissolved	0.0402	0.0040 mg/L	0.0400	100	80-120	
Zirconium, dissolved	0.0394	0.00010 mg/L	0.0400	98	80-120	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER RTED	2212: 2022	256 -09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
Dissolved Metals, I	Batch B2l2586									
Blank (B2I2586-BL	K1)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
Blank (B2I2586-BL	K2)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Mercury, dissolved	,	< 0.000010	0.000010 mg/L							
LCS (B2I2586-BS1)				Prepared	: 2022-09-2	2 Analyze	ed: 2022-0	9-22		
Mercury, dissolved		0.000522	0.000010 mg/L	0.000500	. 2022 00 2	104	80-120	0 22		
		0.000022	0.000010					0.00		
LCS (B2I2586-BS2)		0.000504	0.000040	-	: 2022-09-2			9-22		
Mercury, dissolved		0.000524	0.000010 mg/L	0.000500		105	80-120			
General Parameters	s, Batch B2l1971									
Blank (B2I1971-BL	K1)			Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		< 0.50	0.50 mg/L							
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
Blank (B2I1971-BL	K2)			Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		< 0.50	0.50 mg/L							
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
Blank (B2I1971-BL	K3)			Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic	;	< 0.50	0.50 mg/L							
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
Blank (B2I1971-BL	K4)			Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		< 0.50	0.50 mg/L							
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
LCS (B2I1971-BS1))			Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		10.4	0.50 mg/L	10.0		104	78-116			
Carbon, Dissolved Or	ganic	10.6	0.50 mg/L	10.0		106	78-116			
LCS (B2I1971-BS2)				Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		10.6	0.50 mg/L	10.0		106	78-116			
Carbon, Dissolved Or	ganic	10.6	0.50 mg/L	10.0		106	78-116			
LCS (B2I1971-BS3)				Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		10.6	0.50 mg/L	10.0		106	78-116			
Carbon, Dissolved Or		10.6	0.50 mg/L	10.0		106	78-116			
LCS (B2I1971-BS4)				Prepared	: 2022-09-2	1. Analvze	ed: 2022-0	9-21		
Carbon, Total Organic		10.5	0.50 mg/L	10.0		105	78-116			
Carbon, Dissolved Or		10.5	0.50 mg/L	10.0		105	78-116			
LCS (B2I1971-BS5)				Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		10.4	0.50 mg/L	10.0		104	78-116			
Carbon, Dissolved Or	ganic	10.5	0.50 mg/L	10.0		105	78-116			
Duplicate (B2I1971	•		ource: 22l2256-02	Prepared	: 2022-09-2	1, Analyze	ed: 2022-0	9-21		
Carbon, Total Organic		0.62	0.50 mg/L		0.59				16	
Carbon, Dissolved Or		0.61	0.50 mg/L		0.56				15	
Matrix Spike (B2I19	•		ource: 2212256-02	-	: 2022-09-2			9-21		
Carbon, Total Organic		10.9	0.50 mg/L	10.0	0.59	103	70-130			



	Elk River Alliance CBWM-2022					WORK (REPOR			256 2-09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters,	Batch B2l1974									
Blank (B2I1974-BLK1)			Prepared	: 2022-09-17	, Analyzed	d: 2022-0	9-22		
BOD, 5-day		< 2.0	2.0 mg/L							
LCS (B2I1974-BS1)				Prepared	: 2022-09-17	, Analyzed	l: 2022-0	9-22		
BOD, 5-day		183	51.6 mg/L	198		92	85-115			
General Parameters,	Batch B2l1997									
Blank (B2I1997-BLK1)			Prepared	: 2022-09-18	3, Analyzed	l: 2022-0	9-18		
Chemical Oxygen Dema	ind	< 20	20 mg/L							
LCS (B2I1997-BS1)				Prepared	: 2022-09-18	3, Analyzeo	1: 2022-0	9-18		
Chemical Oxygen Dema	nd	548	20 mg/L	500		110	89-115			
General Parameters,	Batch B2/2208									
Blank (B2I2208-BLK1)			Prepared	: 2022-09-20), Analyzeo	d: 2022-0	9-20		
Ammonia, Total (as N)		< 0.050	0.050 mg/L							
Blank (B2I2208-BLK2	2)			Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		< 0.050	0.050 mg/L							
Blank (B2I2208-BLK3	3)			Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		< 0.050	0.050 mg/L							
Blank (B2I2208-BLK4	L)			Prepared	: 2022-09-20), Analyzeo	d: 2022-0	9-20		
Ammonia, Total (as N)		< 0.050	0.050 mg/L							
Blank (B2I2208-BLK5	5)			Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		< 0.050	0.050 mg/L							
LCS (B2I2208-BS1)				Prepared	: 2022-09-20), Analyzeo	l: 2022-(9-20		
Ammonia, Total (as N)		0.956	0.050 mg/L	1.00		96	90-115			
LCS (B2I2208-BS2)				Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		0.943	0.050 mg/L	1.00		94	90-115			
LCS (B2I2208-BS3)				Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		0.944	0.050 mg/L	1.00		94	90-115			
LCS (B2I2208-BS4)				Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-20		
Ammonia, Total (as N)		0.913	0.050 mg/L	1.00		91	90-115			
LCS (B2I2208-BS5)				Prepared	: 2022-09-20), Analyzeo	l: 2022-(9-20		
Ammonia, Total (as N)		0.919	0.050 mg/L	1.00		92	90-115			
General Parameters,	Batch B2/2304									
Blank (B2I2304-BLK1	•			Prepared	: 2022-09-20), Analyzeo	1: 2022-0	9-21		
Phosphorus, Total (as P))	< 0.0050	0.0050 mg/L							
Blank (B2I2304-BLK2	2)			Prepared	: 2022-09-20), Analyzeo	d: 2022-0	9-21		
Phosphorus, Total (as P))	< 0.0050	0.0050 mg/L							
LCS (B2I2304-BS1)				Prepared	: 2022-09-20), Analyzeo	l: 2022-0	9-21		
Phosphorus, Total (as P))	0.102	0.0050 mg/L	0.100		102	85-115			

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER	22122 2022	256 -09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifi
General Parameter	s, Batch B2l2304, Cont	inued								
LCS (B2I2304-BS2	2)			Prepared	: 2022-09-2	0, Analyze	d: 2022-0	9-21		
Phosphorus, Total (as	•	0.102	0.0050 mg/L	0.100		102	85-115	-		
General Parameter	s. Batch B2l2448									
Blank (B2I2448-BL				Prepared	: 2022-09-2	1. Analvze	d: 2022-0	9-23		
Nitrogen, Total Kjelda	•	< 0.050	0.050 mg/L							
Blank (B2l2448-BL				Proparad	: 2022-09-2		4. 2022 0	0.23		
· ·	·	< 0.050	0.050 mg/L	Fiepaleu	. 2022-09-2	I, Analyze	u. 2022-0	9-23		
Nitrogen, Total Kjelda		< 0.000	0.000 mg/L	_						
LCS (B2I2448-BS1)			•	: 2022-09-2			9-23		
Nitrogen, Total Kjelda	ihl	1.05	0.050 mg/L	1.00		105	85-115			
LCS (B2I2448-BS2	2)			Prepared	: 2022-09-2	1, Analyze	d: 2022-0	9-23		
Nitrogon, Total Kielde	ahl	1.05	0.050 mg/L	1.00		105	85-115			
Nitrogen, Total Kjelda General Parameter Blank (B2l2545-BL	s, Batch B2l2545			Prepared	: 2022-09-2	3, Analyze	d: 2022-0	9-23		
General Parameter Blank (B2l2545-BL Solids, Total Suspend	rs, Batch B2/2545 .K1) Jed	< 2.0	2.0 mg/L	· ·	: 2022-09-2					
General Parameter Blank (B2l2545-BL Solids, Total Suspend LCS (B2l2545-BS1	rs, Batch B2l2545 .K1) Jed	< 2.0	2.0 mg/L 10.0 mg/L	· ·	: 2022-09-2 : 2022-09-2					
General Parameter Blank (B2l2545-BL Solids, Total Suspend LCS (B2l2545-BS1 Solids, Total Suspend	rs, Batch B2/2545 .K1) ded) ded			Prepared		3, Analyze	d: 2022-0			
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter	rs, Batch B2/2545 .K1) ded) ded s, Batch B2/2627			Prepared 100		3, Analyze 87	d: 2022-0 85-115	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL	s, Batch B2/2545 .K1) Jed) Jed s, Batch B2/2627 .K1)			Prepared 100	: 2022-09-2	3, Analyze 87	d: 2022-0 85-115	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) nalein (as CaCO3)	87.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100	: 2022-09-2	3, Analyze 87	d: 2022-0 85-115	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate	s, Batch B2/2545 .K1)	87.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100	: 2022-09-2	3, Analyze 87	d: 2022-0 85-115	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate Alkalinity, Carbonate	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) malein (as CaCO3) e (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100	: 2022-09-2	3, Analyze 87	d: 2022-0 85-115	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate Alkalinity, Hydroxide (s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) nalein (as CaCO3) e (as CaCO3) (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Denolphth Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, Hydroxide (Blank (B2I2627-BL	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) alelin (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) .K2)	87.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) alein (as CaCO3) e (as CaCO3) (as CaCO3) (as CaCO3) .K2) aCO3)	87.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
Seneral Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend Seneral Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Total (as Ca	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) alein (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) .K2) aCO3) alein (as CaCO3)	87.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
Seneral Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend Seneral Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Total (as Ca	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) nalein (as CaCO3) e (as CaCO3) (as CaCO3) .K2) aCO3) nalein (as CaCO3) .K2 aCO3) aclosi) (as CaCO3)	87.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate Alkalinity, Bicarbonate	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) nalein (as CaCO3) e (as CaCO3) (as CaCO3) .K2) aCO3) nalein (as CaCO3) e (as CaCO3) .K2) aCO3) (as CaCO3) (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L 1.0 mg/L	Prepared 100 Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze	d: 2022-0 85-115 d: 2022-0	9-23 9-22		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Phenolphth Alkalinity, Phenolphth Alkalinity, Total (as Ca Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Hydroxide (s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) malein (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) .K2) aCO3) malein (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L	Prepared 100 Prepared Prepared	: 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze 2, Analyze	d: 2022-0 85-115 d: 2022-0 d: 2022-0	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Hydroxide (Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Dicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Bicarbonate Alkalinity, Hydroxide (LCS (B2I2627-BS1	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) nalein (as CaCO3) (as CaCO3) (as CaCO3) .K2) aCO3) nalein (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L	Prepared 100 Prepared Prepared	: 2022-09-2 : 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze 2, Analyze	d: 2022-0 85-115 d: 2022-0 d: 2022-0	9-23		
General Parameter Blank (B2I2545-BL Solids, Total Suspend LCS (B2I2545-BS1 Solids, Total Suspend General Parameter Blank (B2I2627-BL Alkalinity, Total (as Ca Alkalinity, Phenolphth Alkalinity, Phenolphth Alkalinity, Hydroxide (Blank (B2I2627-BL	s, Batch B2/2545 .K1) ded) ded s, Batch B2/2627 .K1) aCO3) alelein (as CaCO3) (as CaCO3)	87.0 < 1.0 < 1.0	10.0 mg/L 1.0 mg/L	Prepared 100 Prepared Prepared Prepared 100	: 2022-09-2 : 2022-09-2 : 2022-09-2	3, Analyze 87 2, Analyze 2, Analyze 2, Analyze 114	d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 80-120	9-23 9-22 9-22 9-22		

Total Metals, Batch B2l2226

Blank (B2l2226-BLK1) Prepared: 2022-09-20, Analyzed: 2022-09-20 Aluminum, total < 0.0050 0.0050 mg/L Antimony, total < 0.00020 0.00020 mg/L 0.00050 mg/L Arsenic, total < 0.00050 Barium, total < 0.0050 0.0050 mg/L Beryllium, total < 0.00010 0.00010 mg/L < 0.00010 0.00010 mg/L Bismuth, total



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			256 2-09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Total Metals, Batch B2l2226, Continued

Blank (B2I2226-BLK1), Continued			Prepared: 2022-09-20, Analyzed: 2022-09-20
Boron, total	< 0.0500	0.0500 mg/L	
Cadmium, total	< 0.000010	0.000010 mg/L	
Calcium, total	< 0.20	0.20 mg/L	
Chromium, total	< 0.00050	0.00050 mg/L	
Cobalt, total	< 0.00010	0.00010 mg/L	
Copper, total	< 0.00040	0.00040 mg/L	
Iron, total	< 0.010	0.010 mg/L	
Lead, total	< 0.00020	0.00020 mg/L	
Lithium, total	< 0.00010	0.00010 mg/L	
Magnesium, total	< 0.010	0.010 mg/L	
Manganese, total	< 0.00020	0.00020 mg/L	
Molybdenum, total	< 0.00010	0.00010 mg/L	
Nickel, total	< 0.00040	0.00040 mg/L	
Phosphorus, total	< 0.050	0.050 mg/L	
Potassium, total	< 0.10	0.10 mg/L	
Selenium, total	< 0.00050	0.00050 mg/L	
Silicon, total	< 1.0	1.0 mg/L	
Silver, total	< 0.000050	0.000050 mg/L	
Sodium, total	< 0.10	0.10 mg/L	
Strontium, total	< 0.0010	0.0010 mg/L	
Sulfur, total	< 3.0	3.0 mg/L	
Tellurium, total	< 0.00050	0.00050 mg/L	
Thallium, total	< 0.000020	0.000020 mg/L	
Thorium, total	< 0.00010	0.00010 mg/L	
Tin, total	< 0.00020	0.00020 mg/L	
Titanium, total	< 0.0050	0.0050 mg/L	
Tungsten, total	< 0.0002	0.0002 mg/L	
Jranium, total	< 0.000020	0.000020 mg/L	
/anadium, total	< 0.0050	0.0050 mg/L	
Zinc, total	< 0.0040	0.0040 mg/L	
Zirconium, total	< 0.00010	0.00010 mg/L	
LCS (B2I2226-BS1)			Prepared: 2022-09-20, Analyzed: 2022-09-20

LCS (B2I2226-BS1)			Prepared: 20	22-09-20, Analyze	d: 2022-09-20	D
Aluminum, total	4.00	0.0050 mg/L	4.00	100	80-120	
Antimony, total	0.0398	0.00020 mg/L	0.0400	100	80-120	
Arsenic, total	0.0407	0.00050 mg/L	0.0400	102	80-120	
Barium, total	0.0390	0.0050 mg/L	0.0400	98	80-120	
Beryllium, total	0.0395	0.00010 mg/L	0.0400	99	80-120	
Bismuth, total	0.0409	0.00010 mg/L	0.0400	102	80-120	
Boron, total	< 0.0500	0.0500 mg/L	0.0400	105	80-120	
Cadmium, total	0.0398	0.000010 mg/L	0.0400	99	80-120	
Calcium, total	4.07	0.20 mg/L	4.00	102	80-120	
Chromium, total	0.0403	0.00050 mg/L	0.0400	101	80-120	
Cobalt, total	0.0401	0.00010 mg/L	0.0400	100	80-120	
Copper, total	0.0399	0.00040 mg/L	0.0400	100	80-120	
Iron, total	4.11	0.010 mg/L	4.00	103	80-120	
Lead, total	0.0411	0.00020 mg/L	0.0400	103	80-120	
Lithium, total	0.0402	0.00010 mg/L	0.0400	100	80-120	
Magnesium, total	4.08	0.010 mg/L	4.00	102	80-120	
Manganese, total	0.0405	0.00020 mg/L	0.0400	101	80-120	
Molybdenum, total	0.0396	0.00010 mg/L	0.0400	99	80-120	
Nickel, total	0.0404	0.00040 mg/L	0.0400	101	80-120	
Phosphorus, total	4.09	0.050 mg/L	4.00	102	80-120	
Potassium, total	4.05	0.10 mg/L	4.00	101	80-120	
Selenium, total	0.0394	0.00050 mg/L	0.0400	98	80-120	
Silicon, total	4.0	1.0 mg/L	4.00	100	80-120	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			256 -09-23	12:52
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie

Total Metals, Batch B2l2226, Continued

LCS (B2I2226-BS1), Continued	Prepared: 2022-09-20, Analyzed: 2022-09-20						
Silver, total	0.0403	0.000050 mg/L	0.0400	101	80-120		
Sodium, total	3.94	0.10 mg/L	4.00	99	80-120		
Strontium, total	0.0403	0.0010 mg/L	0.0400	101	80-120		
Sulfur, total	39.6	3.0 mg/L	40.0	99	80-120		
Tellurium, total	0.0380	0.00050 mg/L	0.0400	95	80-120		
Thallium, total	0.0395	0.000020 mg/L	0.0400	99	80-120		
Thorium, total	0.0398	0.00010 mg/L	0.0400	100	80-120		
Tin, total	0.0400	0.00020 mg/L	0.0400	100	80-120		
Titanium, total	0.0396	0.0050 mg/L	0.0400	99	80-120		
Tungsten, total	0.0413	0.0002 mg/L	0.0400	103	80-120		
Uranium, total	0.0414	0.000020 mg/L	0.0400	103	80-120		
Vanadium, total	0.0404	0.0050 mg/L	0.0400	101	80-120		
Zinc, total	0.0397	0.0040 mg/L	0.0400	99	80-120		
Zirconium, total	0.0402	0.00010 mg/L	0.0400	100	80-120		

Total Metals, Batch B2l2587

Blank (B2I2587-BLK1)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	< 0.000010	0.000010 mg/L			
Blank (B2I2587-BLK2)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	< 0.000010	0.000010 mg/L			
Blank (B2I2587-BLK3)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	< 0.000010	0.000010 mg/L			
LCS (B2I2587-BS1)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	0.000482	0.000010 mg/L	0.000500	96 80-120	
LCS (B2I2587-BS2)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	0.000474	0.000010 mg/L	0.000500	95 80-120	
LCS (B2I2587-BS3)			Prepared: 2022-	9-22, Analyzed: 2022-09-22	
Mercury, total	0.000506	0.000010 mg/L	0.000500	101 80-120	



CERTIFICATE OF ANALYSIS

REPORTED TO	Elk River Alliance PO Box 2095, 1111 2nd Ave Fernie, BC V0B1M0		
ATTENTION	Kaileigh McCallum	WORK ORDER	22 3237
PO NUMBER PROJECT PROJECT INFO	CBWM-2022 [info]	RECEIVED / TEMP REPORTED COC NUMBER	2022-09-23 16:30 / NA 2022-10-03 13:39 B90467

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

It's simple. We figure the more you

with

likely you are to give us continued

members;

our

fun

the more

and

Ahead of the Curve

up to date and in the know.

research,

knowledge

BEFORE you need it, so you can stay

and instrumentation,

analytical centre

regulation

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need,

Through

knowledge,

are your

technical

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

Work Order Comments:

Custody Seals Intact: N/A

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opportunities to support you.

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Authorized By:

Team CARO Client Service Representative

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I3237 2022-10-0	3 13:39
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
BO1001_2022092	21_1336 (22I3237-01) M	atrix: Water San	npled: 2022-09-21 1	3:36			
Anions							
Bromide		< 0.10	N/A	0.10	mg/L	2022-09-30	
Chloride		< 0.10	AO ≤ 250		mg/L	2022-09-30	
Fluoride		0.23	MAC = 1.5		mg/L	2022-09-30	
Nitrate (as N)		0.039	MAC = 10	0.010	-	2022-09-30	HT1
Nitrite (as N)		< 0.010	MAC = 1	0.010	-	2022-09-30	HT1
Phosphate (as P)		< 0.0050	N/A	0.0050	-	2022-09-30	HT1
Sulfate		52.8	AO ≤ 500		mg/L	2022-09-30	
BCMOE Aggregate	Hvdrocarbons	0210					
EPHw10-19	,	< 250	N/A	250	µg/L	2022-09-29	
EPHw19-32		< 250	N/A N/A	250		2022-09-29	
	ylnonane (EPH/F2-4)	82	IN/A	60-140	%	2022-09-29	
Calculated Parame	,	02		00-140	70	2022-09-29	
Hardness, Total (a		178	None Required	0.500	ma/l	N/A	
Nitrate+Nitrite (as		0.0389	N/A	0.0100		N/A	
Nitrogen, Total	11)	< 0.0500	N/A	0.0100	-	N/A	
Dissolved Metals Aluminum, dissolv		< 0.0050	N/A	0.0050		2022-09-29	
Antimony, dissolve		< 0.00020	N/A	0.00020		2022-09-29	
Arsenic, dissolved		< 0.00050	N/A	0.00050	0	2022-09-29	
Barium, dissolved		0.0268	N/A	0.0050	-	2022-09-29	
Beryllium, dissolve		< 0.00010	N/A	0.00010		2022-09-29	
Bismuth, dissolved	d	< 0.00010	N/A	0.00010	-	2022-09-29	
Boron, dissolved		< 0.0500	N/A	0.0500	-	2022-09-29	
Cadmium, dissolv		0.000020	N/A	0.000010	-	2022-09-29	
Calcium, dissolved		50.2	N/A		mg/L	2022-09-29	
Chromium, dissolv	ved	< 0.00050	N/A	0.00050	0	2022-09-29	
Cobalt, dissolved		< 0.00010	N/A	0.00010	-	2022-09-29	
Copper, dissolved		< 0.00040	N/A	0.00040		2022-09-29	
Iron, dissolved		< 0.010	N/A	0.010		2022-09-29	
Lead, dissolved		< 0.00020	N/A	0.00020	-	2022-09-29	
Lithium, dissolved		0.00133	N/A	0.00010	-	2022-09-29	
Magnesium, disso		12.8	N/A	0.010		2022-09-29	
Manganese, disso		< 0.00020	N/A	0.00020		2022-09-29	
Mercury, dissolved		< 0.000010	N/A	0.000010	0	2022-09-29	
Molybdenum, diss	solved	0.00135	N/A	0.00010		2022-09-29	
Nickel, dissolved		< 0.00040	N/A	0.00040		2022-09-29	
Phosphorus, disso		< 0.050	N/A	0.050	-	2022-09-29	
Potassium, dissolv		0.27	N/A		mg/L	2022-09-29	
Selenium, dissolve	ed	0.00097	N/A	0.00050	-	2022-09-29	
Silicon, dissolved		2.0	N/A		mg/L	2022-09-29	
Silver, dissolved		< 0.000050	N/A	0.000050	mg/L	2022-09-29	



Iron, total

Lead, total

REPORTED TO Elk River Alliance PROJECT CBWM-2022				WORK ORDER REPORTED	2213237 2022-10-0	3 13:39
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
BO1001_20220921_1336 (22l3237-01) N	latrix: Water San	npled: 2022-09-21 1	3:36, Contin	ued		
Dissolved Metals, Continued						
Sodium, dissolved	0.62	N/A	0.10	mg/L	2022-09-29	
Strontium, dissolved	0.492	N/A	0.0010	mg/L	2022-09-29	
Sulfur, dissolved	15.7	N/A	3.0	mg/L	2022-09-29	
Tellurium, dissolved	< 0.00050	N/A	0.00050		2022-09-29	
Thallium, dissolved	< 0.000020	N/A	0.000020	-	2022-09-29	
Thorium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-29	
Tin, dissolved	< 0.00020	N/A	0.00020	0	2022-09-29	
Titanium, dissolved	< 0.0050	N/A	0.0050	•	2022-09-29	
Tungsten, dissolved	< 0.0010	N/A	0.0010	-	2022-09-29	
Uranium, dissolved	0.000914	N/A	0.000020	-	2022-09-29	
Vanadium, dissolved	< 0.0050	N/A	0.0050		2022-09-29	
Zinc, dissolved	< 0.0040	N/A	0.0040	0	2022-09-29	
Zirconium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-29	
General Parameters						
Alkalinity, Total (as CaCO3)	160	N/A	1.0	mg/L	2022-09-28	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-28	
Alkalinity, Bicarbonate (as CaCO3)	160	N/A		mg/L	2022-09-28	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A		mg/L	2022-09-28	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A		mg/L	2022-09-28	
Ammonia, Total (as N)	< 0.050	None Required	0.050	-	2022-09-27	
BOD, 5-day	< 6.7	N/A		mg/L	2022-09-29	
Carbon, Total Organic	< 0.50	N/A		mg/L	2022-09-28	
Carbon, Dissolved Organic	< 0.50	N/A		mg/L	2022-09-28	
Chemical Oxygen Demand	< 20	N/A		mg/L	2022-09-26	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	-	2022-10-02	
Phosphorus, Total (as P)	< 0.0050	N/A	0.0050	-	2022-09-29	
Solids, Total Suspended	< 2.0	N/A		mg/L	2022-09-28	
Total Metals	2.0		2.0		2022 00 20	
Aluminum, total	< 0.0050	OG < 0.1	0.0050	ma/l	2022-10-02	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	•	2022-10-02	
Arsenic, total	0.00053	MAC = 0.000	0.00020		2022-10-01	
Barium, total	0.0274	MAC = 2	0.0050	-	2022-10-01	
Beryllium, total	< 0.00010	N/A	0.00010	-	2022-10-01	
Bismuth, total	< 0.00010	N/A N/A	0.00010	-	2022-10-01	
Boron, total	< 0.0500	MAC = 5	0.0500	-	2022-10-01	
Cadmium, total	0.000026	MAC = 0.005	0.000010	-	2022-10-01	
				-		
Calcium, total	50.0	None Required		mg/L	2022-10-01	
Chromium, total	0.00052	MAC = 0.05	0.00050	-	2022-10-01	
Cobalt, total	< 0.00010	N/A	0.00010	-	2022-10-01	
Copper, total	< 0.00040	MAC = 2	0.00040	•	2022-10-01	

AO ≤ 0.3

MAC = 0.005

0.010 mg/L

0.00020 mg/L

< 0.010

< 0.00020

2022-10-01 Page 3 of 19

2022-10-01



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I3237 2022-10-0	3 13:39
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
BO1001_20220921	1_1336 (22I3237-01) M	latrix: Water San	npled: 2022-09-21 1	3:36, Contin	ued		
Total Metals, Contin	nued						
Lithium, total		0.00131	N/A	0.00010	mg/L	2022-10-01	
Magnesium, total		12.9	None Required	0.010	mg/L	2022-10-01	
Manganese, total		< 0.00020	MAC = 0.12	0.00020	mg/L	2022-10-01	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-30	
Molybdenum, total		0.00140	N/A	0.00010	mg/L	2022-10-01	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-10-01	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-10-01	
Potassium, total		0.28	N/A	0.10	mg/L	2022-10-01	
Selenium, total		0.00097	MAC = 0.05	0.00050	mg/L	2022-10-01	
Silicon, total		2.1	N/A	1.0	mg/L	2022-10-01	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-10-01	
Sodium, total		0.57	AO ≤ 200	0.10	mg/L	2022-10-01	
Strontium, total		0.490	MAC = 7	0.0010	mg/L	2022-10-01	
Sulfur, total		16.9	N/A	3.0	mg/L	2022-10-01	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-10-01	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-10-01	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-10-01	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-10-01	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-10-01	
Tungsten, total		0.0002	N/A	0.0002	mg/L	2022-10-01	
Uranium, total		0.000916	MAC = 0.02	0.000020	mg/L	2022-10-01	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-10-01	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-10-01	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-10-01	

BO1002_20220921_1130 (22I3237-02) | Matrix: Water | Sampled: 2022-09-21 11:30

Hardness, Total (as CaCO3)	178	None Required	0.500	mg/L	N/A	
Calculated Parameters						
Surrogate: 2-Methylnonane (EPH/F2-4)	87		60-140	%	2022-09-29	
EPHw19-32	< 250	N/A	250	µg/L	2022-09-29	
EPHw10-19	< 250	N/A	250	µg/L	2022-09-29	
3CMOE Aggregate Hydrocarbons						
Sulfate	53.0	AO ≤ 500	1.0	mg/L	2022-09-30	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2022-09-30	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-30	HT1
Nitrate (as N)	0.066	MAC = 10	0.010	mg/L	2022-09-30	HT1
Fluoride	0.24	MAC = 1.5	0.10	mg/L	2022-09-30	
Chloride	< 0.10	AO ≤ 250	0.10	mg/L	2022-09-30	
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-30	

Caring About Results, Obviously.

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I3237 2022-10-0)3 13:39
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
BO1002_2022092	21_1130 (22I3237-02) N	/latrix: Water Sam	oled: 2022-09-21 ⁻	11:30, Contin	ued		
Calculated Parame	eters, Continued						
Nitrate+Nitrite (as	N)	0.0657	N/A	0.0100	mg/L	N/A	
Nitrogen, Total		0.0657	N/A	0.0500	mg/L	N/A	
Dissolved Metals							
Aluminum, dissolv	ved	< 0.0050	N/A	0.0050	mg/L	2022-09-29	
Antimony, dissolv	ed	< 0.00020	N/A	0.00020	•	2022-09-29	
Arsenic, dissolved		< 0.00050	N/A	0.00050		2022-09-29	
Barium, dissolved		0.0260	N/A	0.0050	-	2022-09-29	
Beryllium, dissolv		< 0.00010	N/A	0.00010	0	2022-09-29	
Bismuth, dissolve		< 0.00010	N/A	0.00010	•	2022-09-29	
Boron, dissolved		< 0.0500	N/A	0.0500	0	2022-09-29	
Cadmium, dissolv	red	0.000027	N/A	0.000010	•	2022-09-29	
Calcium, dissolve		50.1	N/A		mg/L	2022-09-29	
Chromium, dissol		< 0.00050	N/A	0.00050	-	2022-09-29	
Cobalt, dissolved		< 0.00010	N/A	0.00010	-	2022-09-29	
Copper, dissolved	1	< 0.00040	N/A	0.00040	-	2022-09-29	
Iron, dissolved		< 0.010	N/A		mg/L	2022-09-29	
Lead, dissolved		< 0.00020	N/A	0.00020	•	2022-09-29	
Lithium, dissolved	1	0.00132	N/A	0.00010	-	2022-09-29	
Magnesium, disso		12.8	N/A		mg/L	2022-09-29	
Manganese, disso		< 0.00020	N/A	0.00020		2022-09-29	
Mercury, dissolve		< 0.000010	N/A	0.000010		2022-09-29	
Molybdenum, dise		0.00136	N/A	0.00010	-	2022-09-29	
Nickel, dissolved		< 0.00040	N/A	0.00040	<u> </u>	2022-09-29	
Phosphorus, diss	olved	< 0.050	N/A	0.050	-	2022-09-29	
Potassium, dissol		0.28	N/A		mg/L	2022-09-29	
Selenium, dissolv		0.00100	N/A	0.00050	<u> </u>	2022-09-29	
Silicon, dissolved		2.0	N/A		mg/L	2022-09-29	
Silver, dissolved		< 0.000050	N/A	0.000050		2022-09-29	
Sodium, dissolved	d	0.63	N/A		mg/L	2022-09-29	
Strontium, dissolv		0.490	N/A	0.0010		2022-09-29	
Sulfur, dissolved		15.7	N/A		mg/L	2022-09-29	
Tellurium. dissolve	ed	< 0.00050	N/A	0.00050		2022-09-29	
Thallium, dissolve		< 0.000020	N/A	0.000020	-	2022-09-29	
Thorium, dissolve		< 0.00010	N/A	0.00010	-	2022-09-29	
Tin, dissolved		< 0.00020	N/A	0.00020	-	2022-09-29	
Titanium, dissolve	ed	< 0.0050	N/A	0.0050		2022-09-29	
Tungsten, dissolv		< 0.0010	N/A	0.0010		2022-09-29	
Uranium, dissolve		0.000916	N/A	0.000020		2022-09-29	
Vanadium, dissolv		< 0.0050	N/A	0.0050	-	2022-09-29	
Zinc, dissolved		< 0.0040	N/A	0.0040	-	2022-09-29	
Zirconium, dissolv	ved	< 0.00010	N/A	0.00010		2022-09-29	
		- 0.00010	11/7	0.00010		2022 00-20	

General Parameters

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Analyte Result Guideline RL Units Analyzed Qt B01002_20220921_1130 (2213237-02) Matrix: Water Sampled: 2022-09-21 11:30, Continued General Parameters, Continued Alkalinity, That (as CaCO3) 146 N/A 1.0 mg/L 2022-09-28 Alkalinity, Phenophthaleni (as CaCO3) 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Carbonate (as CaCO3) <1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Carbonate (as CaCO3) <1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Hydroxide (as CaCO3) <1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Hydroxide (as CaCO3) <1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Hydroxide (as CaCO3) <1.0 N/A 0.50 mg/L 2022-09-28 Carbon. Total Organic <0.50 N/A 0.50 mg/L 2022-09-28 Carbon. Total Organic <0.50 N/A 0.50 mg/L 2022-09-28 Carbon. Total (Spina) <0.050 N/A 0.0050 mg/L 2022-09-29 Solids, Total (Spina) 2002-09-29 Sol	REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2213237 2022-10-0	3 13:39																																																																																																																																																																																																						
Akaininiy, Total (as CaCO3) 145 N/A 1.0 mg/L 2022-09-28 Alkalinity, Phenolphthalein (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Elarbonate (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Elarbonate (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Edytoxide (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Hydroxide (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Carbon, Dissolved Organic < 0.50 N/A 2.0 mg/L 2022-09-27 BOD, 5-day < 6.7 N/A 2.0 mg/L 2022-09-28 Carbon, Dissolved Organic < 0.50 N/A 0.050 mg/L 2022-09-28 Chemical Oxygen Demand < 2.0 N/A 0.050 mg/L 2022-09-28 Stotal Kistal < 0.0050 N/A 0.0050 mg/L 2022-10-02 Antimory, total < 0.0050	Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier																																																																																																																																																																																																						
Alkalinity, Total (as CaCO3) 146 N/A 1.0 mg/L 2022-09-28 Alkalinity, Benolphthalein (as CaCO3) 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Extoronate (as CaCO3) 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Carbonate (as CaCO3) <1.0	BO1002_2022092	21_1130 (22I3237-02) M	atrix: Water Sam	pled: 2022-09-21 1 [.]	1:30, Contin	ued																																																																																																																																																																																																								
Alkalinity, Phenolphthalein (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Alkalinity, Exarbonate (as CaCO3) <1.0	General Parameter	rs, Continued																																																																																																																																																																																																												
Alkalinity, Bicarbonate (as CaCO3) 146 N/A 1.0 mg/L 2022-09-28 Alkalinity, Microxide (as CaCO3) < 1.0	Alkalinity, Total (as	s CaCO3)	146	N/A	1.0	mg/L	2022-09-28																																																																																																																																																																																																							
Alkalinity, Carbonate (as CaC03) <1.0	Alkalinity, Phenolp	ohthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-28																																																																																																																																																																																																							
Alkalinity, Hydroxide (as CaCO3) < 1.0 N/A 1.0 mg/L 2022-09-28 Ammonia, Total (as N) < 0.050	Alkalinity, Bicarbo	nate (as CaCO3)	146	N/A	1.0	mg/L	2022-09-28																																																																																																																																																																																																							
Ammonia, Total (as N) < 0.050 None Required 0.050 mg/L 2022-09-27 BOD, 5-day < 6.7	Alkalinity, Carbona	ate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-28																																																																																																																																																																																																							
Anmonia, Total (as N) < 0.050 None Required 0.050 mg/L 2022-09-27 BOD, 5-day < 6.7			< 1.0	N/A		-	2022-09-28																																																																																																																																																																																																							
BOD, 5-day < 6.7 N/A 2.0 mg/L 2022-09-29 Carbon, Total Organic < 0.50			< 0.050	None Required		-	2022-09-27																																																																																																																																																																																																							
Carbon, Total Organic < 0.50	,	,	< 6.7			-	2022-09-29																																																																																																																																																																																																							
Carbon, Dissolved Organic < 0.50		anic	< 0.50	N/A		-	2022-09-28																																																																																																																																																																																																							
Chemical Oxygen Demand < 20 N/A 20 mg/L 2022-09-26 Nitrogen, Total Kjeldahl < 0.050			< 0.50	N/A		-	2022-09-28																																																																																																																																																																																																							
Nitrogen, Total Kjeldahl < 0.050 N/A 0.050 mg/L 2022-10-02 Phosphorus, Total (as P) < 0.050		•	< 20	N/A		-	2022-09-26																																																																																																																																																																																																							
Phosphorus, Total (as P) < 0.0050 N/A 0.0050 mg/L 2022-09-29 Solids, Total Suspended < 2.0																																																																																																																																																																																																														
Solids, Total Suspended < 2.0 N/A 2.0 mg/L 2022-09-28 Total Metals 2012 Muminum, total < 0.0050 OG < 0.1 0.0050 mg/L 2022-10-02 Antimory, total < 0.00020 MAC = 0.006 0.00020 mg/L 2022-10-01 Arsenic, total 0.00058 MAC = 2 0.0050 mg/L 2022-10-01 Barium, total 0.0307 MAC = 2 0.0050 mg/L 2022-10-01 Beryllium, total 0.00010 N/A 0.00010 mg/L 2022-10-01 Boron, total mg/L 2022-10-01 2022-10-01 Cadium, total 0.00028 MAC = 0.050 0.00010 mg/L 2022-10-01 Calium, total 0.00028 MAC = 0.05 0.000010 mg/L 2022-10-01 Chromium, total 0.0010 MA 0.0010 mg/L 2022-10-01	,			-		-																																																																																																																																																																																																								
Total Metals Aluminum, total < 0.0050 OG < 0.1 0.0050 mg/L 2022-10-02 Antimony, total < 0.00020 MAC = 0.006 0.00020 mg/L 2022-10-01 Arsenic, total 0.00058 MAC = 0.01 0.00050 mg/L 2022-10-01 Barium, total 0.0307 MAC = 2 0.0050 mg/L 2022-10-01 Beryllium, total < 0.00010 N/A 0.00010 mg/L 2022-10-01 Boron, total < 0.00010 N/A 0.00010 mg/L 2022-10-01 Cadmium, total 0.000028 MAC = 5 0.0500 mg/L 2022-10-01 Cadmium, total 0.000028 MAC = 0.005 0.00010 mg/L 2022-10-01 Cadmium, total 0.000052 MAC = 0.050 mg/L 2022-10-01 Cadmium, total 0.00062 MAC = 2 0.00040 mg/L 2022-10-01 Cadmium, total 0.00020 MAC = 0.055 0.00020 mg/L 2022-10-01						0																																																																																																																																																																																																								
Antimony, total < 0.00020 MAC = 0.006 0.00020 mg/L 2022-10-01 Arsenic, total 0.00058 MAC = 2 0.0050 mg/L 2022-10-01 Barium, total 0.0307 MAC = 2 0.0050 mg/L 2022-10-01 Beryllium, total < 0.00010	· ·					0																																																																																																																																																																																																								
Arsenic, total 0.00058 MAC = 0.01 0.00050 mg/L 2022-10-01 Barium, total 0.0307 MAC = 2 0.0050 mg/L 2022-10-01 Beryllium, total < 0.00010	Aluminum, total		< 0.0050	OG < 0.1	0.0050	mg/L	2022-10-02																																																																																																																																																																																																							
Barium, total 0.0307 MAC = 2 0.0050 mg/L 2022-10-01 Beryllium, total < 0.00010	Antimony, total		< 0.00020	MAC = 0.006	0.00020	mg/L	2022-10-01																																																																																																																																																																																																							
Beryllium, total< 0.00010N/A0.00010mg/L2022-10-01Bismuth, total< 0.00010	Arsenic, total		0.00058	MAC = 0.01	0.00050	mg/L	2022-10-01																																																																																																																																																																																																							
Bismuth, total < 0.00010 N/A 0.00010 mg/L 2022-10-01 Boron, total < 0.0500	Barium, total		0.0307	MAC = 2	0.0050	mg/L	2022-10-01																																																																																																																																																																																																							
Boron, total< 0.0500MAC = 50.0500mg/L2022-10-01Cadmium, total0.000028MAC = 0.0050.00010mg/L2022-10-01Calcium, total57.0None Required0.20mg/L2022-10-01Chromium, total0.00062MAC = 0.050.00050mg/L2022-10-01Cobalt, total< 0.0010	Beryllium, total		< 0.00010	N/A	0.00010	mg/L	2022-10-01																																																																																																																																																																																																							
Cadmium, total0.000028MAC = 0.0050.000010mg/L2022-10-01Calcium, total57.0None Required0.20mg/L2022-10-01Chromium, total0.00062MAC = 0.050.00050mg/L2022-10-01Cobalt, total< 0.00010	Bismuth, total		< 0.00010	N/A	0.00010	mg/L	2022-10-01		Calcium, total57.0None Required 0.20 mg/L $2022-10-01$ Chromium, total 0.00062 MAC = 0.05 0.00050 mg/L $2022-10-01$ Cobalt, total < 0.0010 N/A 0.00010 mg/L $2022-10-01$ Copper, total < 0.0040 MAC = 2 0.0040 mg/L $2022-10-01$ Iron, total < 0.0010 AO ≤ 0.3 0.010 mg/L $2022-10-01$ Lead, total < 0.00020 MAC = 0.005 0.00020 mg/L $2022-10-01$ Lithium, total 0.00152 N/A 0.00010 mg/L $2022-10-01$ Magnesium, total15.2None Required 0.010 mg/L $2022-10-01$ Marganese, total < 0.00020 MAC = 0.12 0.00020 mg/L $2022-10-01$ Mercury, total < 0.00010 MAC = 0.001 0.00010 mg/L $2022-10-01$ Nickel, total < 0.00040 N/A 0.00010 mg/L $2022-10-01$ Nickel, total < 0.00040 N/A 0.00010 mg/L $2022-10-01$ Phosphorus, total < 0.00040 N/A 0.00040 mg/L $2022-10-01$ Selenium, total 0.00110 MAC = 0.055 0.00050 mg/L $2022-10-01$ Silicon, total 2.4 N/A 1.0 mg/L $2022-10-01$ Silver, total < 0.000050 None Required 0.00050 mg/L $2022-10-01$ Sodium, total 0.66 AO ≤ 200 0.10 mg/L $2022-10-01$	Boron, total		< 0.0500	MAC = 5	0.0500	mg/L	2022-10-01		Chromium, total 0.00062 MAC = 0.05 0.00050 mg/L $2022-10-01$ Cobalt, total< 0.0010	Cadmium, total		0.000028	MAC = 0.005	0.000010	mg/L	2022-10-01		Cobalt, total< 0.00010N/A0.00010mg/L2022-10-01Copper, total< 0.00040	Calcium, total		57.0	None Required	0.20	mg/L	2022-10-01		Copper, total< 0.00040MAC = 20.00040mg/L2022-10-01Iron, total< 0.010	Chromium, total		0.00062	MAC = 0.05		-	2022-10-01		Copper, total< 0.00040MAC = 20.00040mg/L2022-10-01Iron, total< 0.010	Cobalt, total		< 0.00010	N/A		-	2022-10-01		Iron, total < 0.010 AO ≤ 0.3 0.010mg/L2022-10-01Lead, total < 0.00020 MAC = 0.0050.00020mg/L2022-10-01Lithium, total0.00152N/A0.00010mg/L2022-10-01Magnesium, total15.2None Required0.010mg/L2022-10-01Manganese, total < 0.00020 MAC = 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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2213237 2022-10-0	3 13:39
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
3O1002_2022092	1_1130 (22I3237-02) M	atrix: Water Sam	pled: 2022-09-21 1	1:30, Continu	led		
Total Metals, Conti	nued						
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-10-01	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-10-01	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-10-01	
Tin, total		0.00045	N/A	0.00020	mg/L	2022-10-01	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-10-01	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-10-01	
Uranium, total		0.00107	MAC = 0.02	0.000020	mg/L	2022-10-01	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-10-01	
		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-10-01	
Zinc, total							

Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO Elk River Al PROJECT CBWM-202		WORK ORDE REPORTED	R 22I3237 2022-10-0	3 13:39
Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	\checkmark	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	\checkmark	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	\checkmark	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	\checkmark	Kelowna
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	✓	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	\checkmark	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond
EPH in Water	EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	\checkmark	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	\checkmark	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	\checkmark	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2017)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

Caring About Results, Obviously.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Elk River Alliance
PROJECT	CBWM-2022

WORK ORDER REPORTED 22I3237 2022-10-03 13:39

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do <u>not</u> take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:TeamCaro@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



REPORTED TO	Elk River Alliance	WORK ORDER	2213237
PROJECT	CBWM-2022	REPORTED	2022-10-03 13:39

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike	Source	% REC	REC	% RPD RPD	Qualifier
, mary to	Rooun		Level	Result	/01120	Limit	Limit	quanter

Anions, Batch B2l2828

Blank (B2I2828-BLK1)			Prepared: 202	2-09-30, Analyze	ed: 2022-09-30	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 1.0	1.0 mg/L				
Blank (B2l2828-BLK2)			Prepared: 202	2-10-01, Analyze	ed: 2022-10-01	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 1.0	1.0 mg/L				
LCS (B2I2828-BS1)		Prepared: 2022-09-30, Analyzed: 2022-09-30				
Bromide	3.72	0.10 mg/L	4.00	93	85-115	
Chloride	15.7	0.10 mg/L	16.0	98	90-110	
Fluoride	4.08	0.10 mg/L	4.00	102	88-108	
Niturate (an NI)						
Nitrate (as N)	4.09	0.010 mg/L	4.00	102	90-110	
Nitrite (as N)	2.04	0.010 mg/L	4.00 2.00	102 102	90-110 85-115	
Nitrite (as N) Phosphate (as P)		•	2.00 1.00			
Nitrite (as N)	2.04	0.010 mg/L	2.00	102	85-115	
Nitrite (as N) Phosphate (as P)	2.04 0.911	0.010 mg/L 0.0050 mg/L	2.00 1.00 16.0	102 91	85-115 80-120 90-110	
Nitrite (as N) Phosphate (as P) Sulfate	2.04 0.911	0.010 mg/L 0.0050 mg/L	2.00 1.00 16.0	102 91 98	85-115 80-120 90-110	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2I2828-BS2)	2.04 0.911 15.7	0.010 mg/L 0.0050 mg/L 1.0 mg/L	2.00 1.00 16.0 Prepared: 202	102 91 98 2-10-01, Analyze	85-115 80-120 90-110 ed: 2022-10-01	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2!2828-BS2) Bromide	2.04 0.911 15.7 3.70	0.010 mg/L 0.0050 mg/L 1.0 mg/L 0.10 mg/L	2.00 1.00 16.0 Prepared: 202 4.00	102 91 98 2-10-01, Analyze 93	85-115 80-120 90-110 ed: 2022-10-01 85-115	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2I2828-BS2) Bromide Chloride	2.04 0.911 15.7 3.70 16.1	0.010 mg/L 0.0050 mg/L 1.0 mg/L 0.10 mg/L 0.10 mg/L	2.00 1.00 16.0 Prepared: 202 4.00 16.0	102 91 98 2-10-01, Analyze 93 101	85-115 80-120 90-110 ed: 2022-10-01 85-115 90-110	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2I2828-BS2) Bromide Chloride Fluoride	2.04 0.911 15.7 3.70 16.1 4.13	0.010 mg/L 0.0050 mg/L 1.0 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L	2.00 1.00 16.0 Prepared: 202 4.00 16.0 4.00	102 91 98 2-10-01, Analyze 93 101 103	85-115 80-120 90-110 ed: 2022-10-01 85-115 90-110 88-108	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2I2828-BS2) Bromide Chloride Fluoride Nitrate (as N)	2.04 0.911 15.7 3.70 16.1 4.13 4.05	0.010 mg/L 0.0050 mg/L 1.0 mg/L 0.10 mg/L 0.10 mg/L 0.010 mg/L 0.010 mg/L	2.00 1.00 16.0 Prepared: 202 4.00 16.0 4.00 4.00	102 91 98 2-10-01, Analyze 93 101 103 101	85-115 80-120 90-110 ed: 2022-10-01 85-115 90-110 88-108 90-110	
Nitrite (as N) Phosphate (as P) Sulfate LCS (B2I2828-BS2) Bromide Chloride Fluoride Nitrate (as N) Nitrite (as N)	2.04 0.911 15.7 3.70 16.1 4.13 4.05 2.00	0.010 mg/L 0.0050 mg/L 1.0 mg/L 0.10 mg/L 0.10 mg/L 0.010 mg/L 0.010 mg/L 0.010 mg/L	2.00 1.00 16.0 Prepared: 202 4.00 16.0 4.00 4.00 2.00	102 91 98 2-10-01, Analyze 93 101 103 101 100	85-115 80-120 90-110 ed: 2022-10-01 85-115 90-110 88-108 90-110 85-115	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-		237 2-10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie

Blank (B2I3443-BLK1)	Prepared: 2022-09-29, Analyzed: 2022-09-29							
EPHw10-19	< 250	250 µg/L						
EPHw19-32	< 250	250 µg/L						
Surrogate: 2-Methylnonane (EPH/F2-4)	2950	μg/L	4400	67	60-140			
LCS (B2I3443-BS2)			Prepared: 2022	2-09-29, Analyze	ed: 2022-09	-29		
EPHw10-19	17100	250 µg/L	15400	111	70-130			
EPHw19-32	25100	250 µg/L	22100	113	70-130			
Surrogate: 2-Methylnonane (EPH/F2-4)	3120	μg/L	4400	71	60-140			
LCS Dup (B2I3443-BSD2)			Prepared: 2022	2-09-29, Analyze	ed: 2022-09	-29		
EPHw10-19	17800	250 µg/L	15400	115	70-130	4	20	
EPHw19-32	26200	250 µg/L	22100	118	70-130	5	20	
Surrogate: 2-Methylnonane (EPH/F2-4)	3350	μg/L	4400	76	60-140			

Dissolved Metals, Batch B2/3391

Blank (B2I3391-BLK1)

Blank (B2I3391-BLK1)			Prepared: 2022-09-29, Analyzed: 2022-09-29
Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Antimony, dissolved	< 0.00020	0.00020 mg/L	
Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Barium, dissolved	< 0.0050	0.0050 mg/L	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Boron, dissolved	< 0.0500	0.0500 mg/L	
Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Chromium, dissolved	< 0.00050	0.00050 mg/L	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Copper, dissolved	< 0.00040	0.00040 mg/L	
Iron, dissolved	< 0.010	0.010 mg/L	
Lead, dissolved	< 0.00020	0.00020 mg/L	
Lithium, dissolved	< 0.00010	0.00010 mg/L	
Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Manganese, dissolved	< 0.00020	0.00020 mg/L	
Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Nickel, dissolved	< 0.00040	0.00040 mg/L	
Phosphorus, dissolved	< 0.050	0.050 mg/L	
Potassium, dissolved	< 0.10	0.10 mg/L	
Selenium, dissolved	< 0.00050	0.00050 mg/L	
Silicon, dissolved	< 1.0	1.0 mg/L	
Silver, dissolved	< 0.000050	0.000050 mg/L	
Sodium, dissolved	< 0.10	0.10 mg/L	
Strontium, dissolved	< 0.0010	0.0010 mg/L	
Sulfur, dissolved	< 3.0	3.0 mg/L	
Tellurium, dissolved	< 0.00050	0.00050 mg/L	
Thallium, dissolved	< 0.000020	0.000020 mg/L	
Thorium, dissolved	< 0.00010	0.00010 mg/L	
Tin, dissolved	< 0.00020	0.00020 mg/L	
Titanium, dissolved	< 0.0050	0.0050 mg/L	
Tungsten, dissolved	< 0.0010	0.0010 mg/L	
Uranium, dissolved	< 0.000020	0.000020 mg/L	
Vanadium, dissolved	< 0.0050	0.0050 mg/L	
Zinc, dissolved	< 0.0040	0.0040 mg/L	
Zirconium, dissolved	< 0.00010	0.00010 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					ORK ORDER PORTED	2213 2022	237 2-10-03	13:39
Analyte		Result	RL Units	Spike Level	Source % F Result	REC REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, I	Batch B2l3391, Continu	ued							
LCS (B2I3391-BS1))			Prepared	l: 2022-09-29, An	alyzed: 2022-0	9-29		
Aluminum, dissolved		3.99	0.0050 mg/L	4.00	1(0 80-120			
Antimony, dissolved		0.0397	0.00020 mg/L	0.0400	9	9 80-120			
Arsenic, dissolved		0.0411	0.00050 mg/L	0.0400	1(03 80-120			
Barium, dissolved		0.0389	0.0050 mg/L	0.0400	9	7 80-120			
Beryllium, dissolved		0.0406	0.00010 mg/L	0.0400		02 80-120			
Bismuth, dissolved		0.0406	0.00010 mg/L	0.0400	10				
Boron, dissolved		< 0.0500	0.0500 mg/L	0.0400		02 80-120			
Cadmium, dissolved		0.0399	0.000010 mg/L	0.0400	10				
Calcium, dissolved, di	ssolved	4.05	0.20 mg/L	4.00	1(
Chromium, dissolved		0.0402	0.00050 mg/L	0.0400	10				
Cobalt, dissolved Copper, dissolved		0.0396	0.00010 mg/L 0.00040 mg/L	0.0400	9				
Iron, dissolved		3.98	0.010 mg/L	4.00	10				
Lead, dissolved		0.0403	0.00020 mg/L	0.0400	10				
Lithium, dissolved		0.0403	0.00010 mg/L	0.0400		02 80-120			
Magnesium, dissolved	dissolved	4.09	0.010 mg/L	4.00	10				
Manganese, dissolved		0.0403	0.00020 mg/L	0.0400	10				
Molybdenum, dissolve		0.0396	0.00010 mg/L	0.0400	9				
Nickel, dissolved		0.0398	0.00040 mg/L	0.0400	9				
Phosphorus, dissolved	d	3.98	0.050 mg/L	4.00	9	9 80-120			
Potassium, dissolved		3.98	0.10 mg/L	4.00	1(00 80-120			
Selenium, dissolved		0.0400	0.00050 mg/L	0.0400	1(00 80-120			
Silicon, dissolved		4.2	1.0 mg/L	4.00	1(04 80-120			
Silver, dissolved		0.0403	0.000050 mg/L	0.0400	10	01 80-120			
Sodium, dissolved		3.99	0.10 mg/L	4.00	10				
Strontium, dissolved		0.0404	0.0010 mg/L	0.0400	10				
Sulfur, dissolved		39.5	3.0 mg/L	40.0	9				
Tellurium, dissolved		0.0409	0.00050 mg/L	0.0400	10				
Thallium, dissolved		0.0400	0.000020 mg/L	0.0400	1(
Thorium, dissolved		0.0396	0.00010 mg/L	0.0400	9				
Tin, dissolved		0.0410	0.00020 mg/L	0.0400	1(
Titanium, dissolved		0.0405	0.0050 mg/L	0.0400	10				
Tungsten, dissolved Uranium, dissolved		0.0402	0.0010 mg/L 0.000020 mg/L	0.0400	10				
Vanadium, dissolved		0.0400	0.0050 mg/L	0.0400	1(
Zinc, dissolved		0.0385	0.0040 mg/L	0.0400		6 80-120			
Zirconium, dissolved		0.0410	0.00010 mg/L	0.0400	10				
Duplicate (B2I3391	-DUP1)		ource: 22 3237-01		l: 2022-09-29, An		9-29		
Aluminum, dissolved	· ·	< 0.0050	0.0050 mg/L	•	< 0.0050	-		20	
Antimony, dissolved		< 0.00020	0.00020 mg/L		< 0.00020			20	
Arsenic, dissolved		< 0.00050	0.00050 mg/L		< 0.00050			20	
Barium, dissolved		0.0261	0.0050 mg/L		0.0268		3	20	
Beryllium, dissolved		< 0.00010	0.00010 mg/L		< 0.00010			20	
Bismuth, dissolved		< 0.00010	0.00010 mg/L		< 0.00010			20	
Boron, dissolved		< 0.0500	0.0500 mg/L		< 0.0500			20	
Cadmium, dissolved		0.000024	0.000010 mg/L		0.000020			20	
Calcium, dissolved, di	ssolved	49.3	0.20 mg/L		50.2		2	20	
Chromium, dissolved		< 0.00050	0.00050 mg/L		< 0.00050			20	
Cobalt, dissolved		< 0.00010	0.00010 mg/L		< 0.00010			20	
Copper, dissolved		< 0.00040	0.00040 mg/L		< 0.00040			20	
Iron, dissolved		< 0.010	0.010 mg/L		< 0.010			20	
Lead, dissolved		< 0.00020	0.00020 mg/L		< 0.00020			20	
Lithium, dissolved	diagolyad	0.00131	0.00010 mg/L		0.00133		1	20	
Magnesium, dissolved		12.7	0.010 mg/L		12.8		< 1	20	
Manganese, dissolved	1	< 0.00020	0.00020 mg/L		< 0.00020			20	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-		237 -10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals,	Batch B2l3391, Continue	d								

Duplicate (B2I3391-DUP1), Continued	Sc	ource: 22 3237-01	Prepared	d: 2022-09-29	, Analyz	ed: 2022-09-29		
Molybdenum, dissolved	0.00135	0.00010 mg/L		0.00135		<	1 20)
Nickel, dissolved	< 0.00040	0.00040 mg/L		< 0.00040			20)
Phosphorus, dissolved	< 0.050	0.050 mg/L		< 0.050			20)
Potassium, dissolved	0.28	0.10 mg/L		0.27			20)
Selenium, dissolved	0.00099	0.00050 mg/L		0.00097			20)
Silicon, dissolved	2.0	1.0 mg/L		2.0			20)
Silver, dissolved	< 0.000050	0.000050 mg/L		< 0.000050			20)
Sodium, dissolved	0.63	0.10 mg/L		0.62		<	1 20)
Strontium, dissolved	0.491	0.0010 mg/L		0.492		<	1 20)
Sulfur, dissolved	15.8	3.0 mg/L		15.7		<	1 20)
Tellurium, dissolved	< 0.00050	0.00050 mg/L		< 0.00050			20)
Thallium, dissolved	< 0.000020	0.000020 mg/L		< 0.000020			20)
Thorium, dissolved	< 0.00010	0.00010 mg/L		< 0.00010			20)
Tin, dissolved	< 0.00020	0.00020 mg/L		< 0.00020			20)
Titanium, dissolved	< 0.0050	0.0050 mg/L		< 0.0050			20	
Tungsten, dissolved	< 0.0010	0.0010 mg/L		< 0.0010			20	
Uranium, dissolved	0.000927	0.000020 mg/L		0.000914		1		
Vanadium, dissolved	< 0.0050	0.0050 mg/L		< 0.0050			20	
Zinc, dissolved	< 0.0040	0.0040 mg/L		< 0.0040			20	
Zirconium, dissolved	< 0.00010	0.00010 mg/L		< 0.00010			20	
Matrix Spike (B2I3391-MS1)		ource: 22 3237-02	Prepared		Analvz	ed: 2022-09-29		
Aluminum, dissolved	3.95	0.0050 mg/L	4.00	< 0.0050	99	70-130		
Antimony, dissolved	0.0379	0.00020 mg/L	0.0400	< 0.00020	95	70-130		
Arsenic, dissolved	0.0420	0.00050 mg/L	0.0400	< 0.00050	104	70-130		
Barium, dissolved	0.0645	0.0050 mg/L	0.0400	0.0260	96	70-130		
Beryllium, dissolved	0.0408	0.00010 mg/L	0.0400	< 0.00010	102	70-130		
Bismuth, dissolved	0.0348	0.00010 mg/L	0.0400	< 0.00010	87	70-130		
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0400	< 0.0500	94	70-130		
Cadmium, dissolved	0.0403	0.000010 mg/L	0.0400	0.000027	101	70-130		
Calcium, dissolved, dissolved	52.3	0.20 mg/L	4.00	50.1	55	70-130		MS2
Chromium, dissolved	0.0398	0.00050 mg/L	0.0400	< 0.00050	98	70-130		
Cobalt, dissolved	0.0386	0.00010 mg/L	0.0400	< 0.00010	97	70-130		
Copper, dissolved	0.0387	0.00040 mg/L	0.0400	< 0.00040	97	70-130		
Iron, dissolved	3.89	0.010 mg/L	4.00	< 0.010	97	70-130		
Lead, dissolved	0.0397	0.00020 mg/L	0.0400	< 0.00020	99	70-130		
Lithium, dissolved	0.0414	0.00010 mg/L	0.0400	0.00132	100	70-130		
Magnesium, dissolved, dissolved	17.9	0.010 mg/L	4.00	12.8	127	70-130		
Magnese, dissolved	0.0398	0.00020 mg/L	0.0400	< 0.00020	99	70-130		
Molybdenum, dissolved	0.0414	0.00010 mg/L	0.0400	0.00136	100	70-130		
Nickel, dissolved	0.0388	0.00040 mg/L	0.0400	< 0.00040	97	70-130		
Phosphorus, dissolved	4.06	0.050 mg/L	4.00	< 0.00040	101	70-130		
Potassium, dissolved	4.00	0.10 mg/L	4.00	0.28	96	70-130		
Selenium, dissolved	0.0415	0.00050 mg/L	0.0400	0.20	101	70-130		
	6.0		4.00	2.0	101	70-130		
Silicon, dissolved Silver, dissolved	0.0374	1.0 mg/L 0.000050 mg/L				70-130		
	4.53	0.000050 mg/L 0.10 mg/L	0.0400	< 0.000050 0.63	93	70-130		
Sodium, dissolved	0.528	0.0010 mg/L			98	70-130		
Strontium, dissolved		3.0 mg/L	0.0400	0.490	95			
Sulfur, dissolved	54.7		40.0	15.7	97	70-130		
Tellurium, dissolved	0.0422	0.00050 mg/L	0.0400	< 0.00050	106	70-130		
Thallium, dissolved	0.0393	0.000020 mg/L	0.0400	< 0.000020	98	70-130		
Thorium, dissolved	0.0394	0.00010 mg/L	0.0400	< 0.00010	99	70-130		
Tin, dissolved	0.0407	0.00020 mg/L	0.0400	< 0.00020	102	70-130		
Titanium, dissolved	0.0404	0.0050 mg/L	0.0400	< 0.0050	101	70-130		
Tungsten, dissolved	0.0400	0.0010 mg/L	0.0400	< 0.0010	100	70-130		
Uranium, dissolved	0.0410	0.000020 mg/L	0.0400	0.000916	100	70-130		



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK (REPOR	-	22132 2022	237 -10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals,	Batch B2l3391, Contin	ued								
Matrix Spike (B2I3	391-MS1), Continued	So	ource: 22l3237-02	Prepared	: 2022-09-29	, Analyzeo	d: 2022-0	9-29		
Vanadium, dissolved		0.0408	0.0050 mg/L	0.0400	< 0.0050	101	70-130			
Zinc, dissolved		0.0410	0.0040 mg/L	0.0400	< 0.0040	99	70-130			
Zirconium, dissolved		0.0409	0.00010 mg/L	0.0400	< 0.00010	102	70-130			
Dissolved Metals,	Batch B2/3408									
Blank (B2I3408-BL	.K1)			Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-29		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
Blank (B2I3408-BL	.K2)			Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-29		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
Blank (B2I3408-BL	.K3)			Prepared	: 2022-09-28	, Analyzed	d: 2022-0	9-29		
Mercury, dissolved		< 0.000010	0.000010 mg/L	-		-				
LCS (B2I3408-BS1)			Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-29		
Mercury, dissolved	,	0.000535	0.000010 mg/L	0.000500		107	80-120			
LCS (B2I3408-BS2)			Prepared	: 2022-09-28	, Analyzed	d: 2022-0	9-29		
Mercury, dissolved	,	0.000518	0.000010 mg/L	0.000500		104	80-120			
LCS (B2I3408-BS3)			Prepared	: 2022-09-28	Analyzed	1· 2022-0	9-29		
Mercury, dissolved	/	0.000534	0.000010 mg/L	0.000500		107	80-120	0 20		
Duplicate (B2I3408	3-DUP2)	So	ource: 22 3237-01	Prepared	: 2022-09-28	. Analvzed	d: 2022-0	9-29		
Mercury, dissolved	,	< 0.000010	0.000010 mg/L		< 0.000010	, ,			20	
Matrix Spike (B2I3	408-MS2)	So	ource: 22 3237-02	Prepared	: 2022-09-28	. Analvzed	d: 2022-0	9-29		
Mercury, dissolved	,	0.000243	0.000010 mg/L		< 0.000010	97	70-130			
General Parameter	s, Batch B2l2761									
Blank (B2l2761-BL	.K1)			Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-28		
Carbon, Total Organio		< 0.50	0.50 mg/L							
Carbon, Dissolved Or		< 0.50	0.50 mg/L							
Blank (B2l2761-BL	•		0.50 "	Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-28		
Carbon, Total Organio Carbon, Dissolved Or		< 0.50	0.50 mg/L 0.50 mg/L							
· · · · ·	~	0.00	0.00 mg/L	Bronorod	: 2022-09-28	Apolyzor	4. 2022 0	0.20		
Blank (B2I2761-BL Carbon, Total Organic		< 0.50	0.50 mg/L	Prepared	. 2022-09-20	, Analyzed	1. 2022-0	9-20		
Carbon, Dissolved Or		< 0.50	0.50 mg/L							
Blank (B2I2761-BL				Prepared	: 2022-09-28	, Analyzeo	d: 2022-0	9-28		
Carbon, Total Organio Carbon, Dissolved Or		< 0.50 < 0.50	0.50 mg/L 0.50 mg/L							
· · · · · · · · · · · · · · · · · · ·	<u> </u>	< 0.00	0.30 mg/L	Dec		A		0.00		
LCS (B2I2761-BS1	•	10.4	0.50 mm//		: 2022-09-28	, ,		9-28		
Carbon, Total Organio Carbon, Dissolved Or		10.4	0.50 mg/L 0.50 mg/L	10.0		104	78-116 78-116			
LCS (B2I2761-BS2	-		0.00 mg/L		: 2022-09-28			9-28		
Carbon, Total Organi	•	10.5	0.50 mg/L	10.0		105	78-116			
Carbon, Dissolved Or	rganic	11.0	0.50 mg/L	10.0		110	78-116			

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER RTED	2213: 2022	237 2-10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameter	s, Batch B2l2761, Conti	inued								
LCS (B2I2761-BS3	3)			Prepared	: 2022-09-2	8, Analyze	ed: 2022-0	9-28		
Carbon, Total Organi		9.53	0.50 mg/L	10.0		95	78-116			
Carbon, Dissolved O	rganic	9.37	0.50 mg/L	10.0		94	78-116			
LCS (B2I2761-BS4				Prepared	: 2022-09-2	8, Analyze	ed: 2022-0	9-28		
Carbon, Total Organi		9.32	0.50 mg/L	10.0		93	78-116			
Carbon, Dissolved O	rganic	10.4	0.50 mg/L	10.0		104	78-116			
General Parameter	s, Batch B2l2823									
Blank (B2l2823-BL	_K1)		0.0	Prepared	: 2022-09-2	4, Analyze	ed: 2022-0	9-29		
BOD, 5-day		< 2.0	2.0 mg/L							
LCS (B2I2823-BS1)			-	: 2022-09-2			9-29		
BOD, 5-day		203	55.5 mg/L	198		103	85-115			
Duplicate (B2I2823	3-DUP1)		rce: 22l3237-02	Prepared	: 2022-09-2	4, Analyze	ed: 2022-0	9-29		
BOD, 5-day		< 6.7	2.0 mg/L		< 6.7				22	
General Parameter Blank (B2l2911-BL Chemical Oxygen De	-K1)	< 20	20 mg/L	Prepared	: 2022-09-2	6, Analyze	ed: 2022-0	9-26		
		< 20	20 mg/L	Durana		0 A		0.00		
LCS (B2I2911-BS1 Chemical Oxygen De		534	20 mg/L	500	1: 2022-09-2	6, Analyze	89-115	9-20		
General Parameter			20 mg/L			107	03-113			
Blank (B2I3086-BL	_K1)			Prepared	: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	1)	< 0.020	0.020 mg/L							
Blank (B2I3086-BL	_K2)			Prepared	: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	1)	< 0.020	0.020 mg/L							
Blank (B2I3086-BL	_K3)			Prepared	: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	1)	< 0.020	0.020 mg/L							
Blank (B2I3086-BL	_K4)			Prepared	: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	1)	< 0.020	0.020 mg/L			-				
Blank (B2I3086-BL	_K5)			Prepared	: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	,	< 0.020	0.020 mg/L							
LCS (B2I3086-BS1				Prepared	: 2022-09-2	7 Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N	•	0.944	0.020 mg/L	1.00		94	90-115			
LCS (B2I3086-BS2					: 2022-09-2	-		9-27		
Ammonia, Total (as N	,	0.907	0.020 mg/L	1.00	0 00-2	91	90-115	~ _ 1		
	,				: 2022-09-2	-		0.27		
LCS (B2I3086-BS3 Ammonia, Total (as N	•	0.916	0.020 mg/L	1.00	1. 2022-09-2	7, Analyze 92	90-115	5-21		
		0.010	0.020 mg/L		. 2022 00 2			0.27		
LCS (B2I3086-BS4	•	0.928	0.020 mg/L	Prepared 1.00	1: 2022-09-2	7, Analyze	90-115	9-21		
Ammonia, Total (as N	N)	0.920	0.020 Mg/L	1.00		90	30-113			



REPORTED TO Elk River Alliance PROJECT CBWM-2022					WORK REPOR	ORDER RTED	2213 2022	237 2-10-03	13:39
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
General Parameters, Batch B2l3086, Con	tinued								
LCS (B2I3086-BS5)			Prepared	l: 2022-09-2	7, Analyze	ed: 2022-0	9-27		
Ammonia, Total (as N)	0.980	0.020 mg/L	1.00		98	90-115			
General Parameters, Batch B2l3242									
Blank (B2I3242-BLK1)			Prepared	l: 2022-09-2	8, Analyze	ed: 2022-0	9-28		
Solids, Total Suspended	< 2.0	2.0 mg/L	•						
LCS (B2I3242-BS1)			Prepared	l: 2022-09-2	8 Analyze	ed: 2022-0	9-28		
Solids, Total Suspended	88.5	5.0 mg/L	100		88	85-115	0 20		
General Parameters, Batch B2l3359									
Blank (B2l3359-BLK1)			Prepared	I: 2022-09-2	8, Analyze	ed: 2022-0	9-28		
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3) Alkalinity, Carbonate (as CaCO3)	< 1.0 < 1.0	1.0 mg/L 1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
			Proparad	I: 2022-09-2	98 Analyza	4. 2022 0	0.28		
Blank (B2I3359-BLK2) Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L	Fiepaleu	1. 2022-09-2	.o, Analyze	u. 2022-0	9-20		
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Blank (B2I3359-BLK3)			Prepared	l: 2022-09-2	8, Analyze	ed: 2022-0	9-28		
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3) Alkalinity, Carbonate (as CaCO3)	< 1.0 < 1.0	1.0 mg/L 1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
			Droporod	H 2022 00 2		4. 2022 0	0.20		
LCS (B2I3359-BS1) Alkalinity, Total (as CaCO3)	111	1.0 mg/L	100	l: 2022-09-2	111	80-120	9-20		
		1.0 mg/L					0.00		
LCS (B2I3359-BS2) Alkalinity, Total (as CaCO3)	120	1.0 mg/L	Prepared 100	l: 2022-09-2	28, Analyze 120	80-120	9-28		
LCS (B2I3359-BS3)	120	1.0 mg/L		I: 2022-09-2			9-28		
Alkalinity, Total (as CaCO3)	114	1.0 mg/L	100	. 2022 00 2	114	80-120	0 20		
General Parameters, Batch B2l3367									
Blank (B2I3367-BLK1)			Prenared	l: 2022-09-2	8 Analyza	ed: 2022-0	9-29		
Phosphorus, Total (as P)	< 0.0050	0.0050 mg/L	, icpaieu	2022-03-2	, , , , , , , , , , , , , , , , , ,	.a. 2022-0	5 20		
Blank (B2I3367-BLK3)			Prepared	l: 2022-09-2	28, Analyze	ed: 2022-0	9-29		
Phosphorus, Total (as P)	< 0.0050	0.0050 mg/L	·						
LCS (B2I3367-BS1)			Prepared	l: 2022-09-2	28, Analvze	ed: 2022-0	9-29		
Phosphorus, Total (as P)	0.106	0.0050 mg/L	0.100		106	85-115			
LCS (B2I3367-BS3)			Prepared	l: 2022-09-2	28, Analvze	ed: 2022-0	9-29		
Phosphorus Total (as P)	0.105	0.0050 mg/l	0 100		105	85 115			

0.100

105

85-115

0.0050 mg/L

0.105

Phosphorus, Total (as P)

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER TED	22132 2022	237 -10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameter	rs, Batch B2l3639									
Blank (B2I3639-BL	_K1)			Prepared	: 2022-09-30	, Analyze	d: 2022-1	0-02		
Nitrogen, Total Kjelda	ahl	< 0.050	0.050 mg/L							
Blank (B2I3639-BL	_K2)			Prepared	: 2022-09-30	, Analyze	d: 2022-1	0-02		
Nitrogen, Total Kjelda	ahl	< 0.050	0.050 mg/L							
LCS (B2I3639-BS1)			Prepared	: 2022-09-30	, Analyze	d: 2022-1	0-02		
Nitrogen, Total Kjelda	ahl	0.931	0.050 mg/L	1.00		93	85-115			
LCS (B2I3639-BS2	2)			Prepared	: 2022-09-30	, Analyze	d: 2022-1	0-02		
Nitrogen, Total Kjelda	ahl	0.921	0.050 mg/L	1.00		92	85-115			
Total Metals, Batc. Blank (B2l3409-BL				Prepared	: 2022-09-28	, Analyze	d: 2022-0	0-30		
Mercury, total	,							J-00		
Mercury, Iotai		< 0.000010	0.000010 mg/L	•				5-50		
Blank (B2I3409-BL	_K2)	< 0.000010	0.000010 mg/L	•	: 2022-09-28	, Analyze				
	.K2)	< 0.000010	0.000010 mg/L 0.000010 mg/L	•	: 2022-09-28	, Analyze				
Blank (B2I3409-BL				Prepared	: 2022-09-28 : 2022-09-28	· · · · ·	d: 2022-0	9-30		
Blank (B2I3409-BL Mercury, total				Prepared		· · · · ·	d: 2022-0	9-30		
Blank (B2I3409-BL Mercury, total Blank (B2I3409-BL	_K3)	< 0.000010	0.000010 mg/L	Prepared Prepared		, Analyze	d: 2022-0 d: 2022-0	9-30 9-29		
Blank (B2I3409-BL Mercury, total Blank (B2I3409-BL Mercury, total	_K3)	< 0.000010	0.000010 mg/L	Prepared Prepared	: 2022-09-28	, Analyze	d: 2022-0 d: 2022-0	9-30 9-29		
Blank (B2I3409-BL Mercury, total Blank (B2I3409-BL Mercury, total LCS (B2I3409-BS1	_K3)	< 0.000010 < 0.000010	0.000010 mg/L 0.000010 mg/L	Prepared Prepared Prepared 0.000500	: 2022-09-28	, Analyze , Analyze 110	d: 2022-0 d: 2022-0 d: 2022-0 80-120	9-30 9-29 9-30		
Blank (B2I3409-BI Mercury, total Blank (B2I3409-BI Mercury, total LCS (B2I3409-BS1 Mercury, total	_K3)	< 0.000010 < 0.000010	0.000010 mg/L 0.000010 mg/L	Prepared Prepared Prepared 0.000500	: 2022-09-28 : 2022-09-28	, Analyze , Analyze 110	d: 2022-0 d: 2022-0 d: 2022-0 80-120	9-30 9-29 9-30		
Blank (B2I3409-BL Mercury, total Blank (B2I3409-BL Mercury, total LCS (B2I3409-BS1 Mercury, total LCS (B2I3409-BS2	-K3)	< 0.000010 < 0.000010 0.000548	0.000010 mg/L 0.000010 mg/L 0.000010 mg/L	Prepared Prepared 0.000500 Prepared 0.000500	: 2022-09-28 : 2022-09-28	, Analyze , Analyze 110 , Analyze 113	d: 2022-0 d: 2022-0 d: 2022-0 80-120 d: 2022-0 80-120	9-30 9-29 9-30 9-30		
Blank (B2I3409-BI Mercury, total Blank (B2I3409-BI Mercury, total LCS (B2I3409-BS1 Mercury, total LCS (B2I3409-BS2 Mercury, total	-K3)	< 0.000010 < 0.000010 0.000548	0.000010 mg/L 0.000010 mg/L 0.000010 mg/L	Prepared Prepared 0.000500 Prepared 0.000500	: 2022-09-28 : 2022-09-28 : 2022-09-28	, Analyze , Analyze 110 , Analyze 113	d: 2022-0 d: 2022-0 d: 2022-0 80-120 d: 2022-0 80-120	9-30 9-29 9-30 9-30		
Blank (B2I3409-BI Mercury, total Blank (B2I3409-BI Mercury, total LCS (B2I3409-BS1 Mercury, total LCS (B2I3409-BS2 Mercury, total LCS (B2I3409-BS3	_K3)))	< 0.000010 < 0.000010 0.000548 0.000563 0.000539	0.000010 mg/L 0.000010 mg/L 0.000010 mg/L 0.000010 mg/L	Prepared Prepared 0.000500 Prepared 0.000500 Prepared 0.000500	: 2022-09-28 : 2022-09-28 : 2022-09-28	, Analyze 110 , Analyze 113 , Analyze 108	d: 2022-0 d: 2022-0 80-120 d: 2022-0 80-120 d: 2022-0 80-120 d: 2022-0 80-120	9-30 9-29 9-30 9-30 9-29		

Total Metals, Batch B2I3636

Blank (B2I3636-BLK1)

Blank (B2I3636-BLK1)			Prepared: 2022-09-30, Analyzed: 2022-10-02
Aluminum, total	< 0.0050	0.0050 mg/L	
Antimony, total	< 0.00020	0.00020 mg/L	
Arsenic, total	< 0.00050	0.00050 mg/L	
Barium, total	< 0.0050	0.0050 mg/L	
Beryllium, total	< 0.00010	0.00010 mg/L	
Bismuth, total	< 0.00010	0.00010 mg/L	
Boron, total	< 0.0500	0.0500 mg/L	
Cadmium, total	< 0.000010	0.000010 mg/L	
Calcium, total	< 0.20	0.20 mg/L	
Chromium, total	< 0.00050	0.00050 mg/L	
Cobalt, total	< 0.00010	0.00010 mg/L	
Copper, total	< 0.00040	0.00040 mg/L	
Iron, total	< 0.010	0.010 mg/L	
Lead, total	< 0.00020	0.00020 mg/L	
Lithium, total	< 0.00010	0.00010 mg/L	
Magnesium, total	< 0.010	0.010 mg/L	
Manganese, total	< 0.00020	0.00020 mg/L	
Molybdenum, total	< 0.00010	0.00010 mg/L	
Nickel, total	< 0.00040	0.00040 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR		-	237 2-10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Total Metals, Batch B2I3636, Continued

Blank (B2I3636-BLK1), Continued			Prepared: 202	2-09-30, Analyze	d: 2022-09-30	
Phosphorus, total	< 0.050	0.050 mg/L				
Potassium, total	< 0.10	0.10 mg/L				
Selenium, total	< 0.00050	0.00050 mg/L				
Silicon, total	< 1.0	1.0 mg/L				
Silver, total	< 0.000050	0.000050 mg/L				
Sodium, total	< 0.10	0.10 mg/L				
Strontium, total	< 0.0010	0.0010 mg/L				
Sulfur, total	< 3.0	3.0 mg/L				
Tellurium, total	< 0.00050	0.00050 mg/L				
Thallium, total	< 0.000020	0.000020 mg/L				
Thorium, total	< 0.00010	0.00010 mg/L				
Tin, total	< 0.00020	0.00020 mg/L				
Titanium, total	< 0.0050	0.0050 mg/L				
Tungsten, total	< 0.0002	0.0002 mg/L				
Uranium, total	< 0.000020	0.000020 mg/L				
Vanadium, total	< 0.0050	0.0050 mg/L				
Zinc, total	< 0.0040	0.0040 mg/L				
Zirconium, total	< 0.00010	0.00040 mg/L				
Enconium, total	- 0.00010	0.00010 mg/L				
LCS (B2I3636-BS1)			-	2-09-30, Analyze		
Aluminum, total	3.87	0.0050 mg/L	4.00	97	80-120	
Antimony, total	0.0450	0.00020 mg/L	0.0400	113	80-120	
Arsenic, total	0.0447	0.00050 mg/L	0.0400	112	80-120	
Barium, total	0.0451	0.0050 mg/L	0.0400	113	80-120	
Beryllium, total	0.0456	0.00010 mg/L	0.0400	114	80-120	
Bismuth, total	0.0440	0.00010 mg/L	0.0400	110	80-120	
Boron, total	< 0.0500	0.0500 mg/L	0.0400	120	80-120	
Cadmium, total	0.0445	0.000010 mg/L	0.0400	111	80-120	
Calcium, total	4.75	0.20 mg/L	4.00	119	80-120	
Chromium, total	0.0448	0.00050 mg/L	0.0400	112	80-120	
Cobalt, total	0.0444	0.00010 mg/L	0.0400	111	80-120	
Copper, total	0.0436	0.00040 mg/L	0.0400	109	80-120	
Iron, total	4.35	0.010 mg/L	4.00	109	80-120	
Lead, total	0.0450	0.00020 mg/L	0.0400	112	80-120	
Lithium, total	0.0452	0.00010 mg/L	0.0400	113	80-120	
Magnesium, total	4.55	0.010 mg/L	4.00	114	80-120	
Manganese, total	0.0453	0.00020 mg/L	0.0400	113	80-120	
Molybdenum, total	0.0447	0.00010 mg/L	0.0400	112	80-120	
Nickel, total	0.0446	0.00040 mg/L	0.0400	111	80-120	
Phosphorus, total	4.42	0.050 mg/L	4.00	110	80-120	
Potassium, total	4.45	0.10 mg/L	4.00	111	80-120	
Selenium, total	0.0440	0.00050 mg/L	0.0400	110	80-120	
Silicon, total	4.6	1.0 mg/L	4.00	116	80-120	
Silver, total	0.0437	0.000050 mg/L	0.0400	109	80-120	
Sodium, total	4.53	0.10 mg/L	4.00	113	80-120	
Strontium, total	0.0449	0.0010 mg/L	0.0400	112	80-120	
Sulfur, total	44.1	3.0 mg/L	40.0	110	80-120	
Tellurium, total	0.0418	0.00050 mg/L	0.0400	105	80-120	
Thallium, total	0.0431	0.000020 mg/L	0.0400	108	80-120	
Thorium, total	0.0451	0.00010 mg/L	0.0400	113	80-120	
Tin, total	0.0458	0.00020 mg/L	0.0400	115	80-120	
Titanium, total	0.0497	0.0050 mg/L	0.0400	124	80-120	MES
Tungsten, total	0.0458	0.0002 mg/L	0.0400	115	80-120	
Uranium, total	0.0456	0.000020 mg/L	0.0400	114	80-120	
Vanadium, total	0.0451	0.0050 mg/L	0.0400	113	80-120	
Zinc, total	0.0446	0.0040 mg/L	0.0400	112	80-120	
	0.0++0	0.0010 mg/L	0.0100	112	00 120	Deve 10 of



REPORTED PROJECT	TO Elk River Alliance CBWM-2022					WORK REPOF	ORDER RTED	2213 2022	237 2-10-03	13:39
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
	Batch B2/3636, Continued 6-BS1), Continued			Prepared	: 2022-09-3	80, Analyze	ed: 2022-1	0-01		
Zirconium, tota	al	0.0448	0.00010 mg/L	0.0400		112	80-120			
t MS2	ers: A number up to 10% (rou o 10% (absolute). The native sample concen apply.	,								



CERTIFICATE OF ANALYSIS

REPORTED TO	Elk River Alliance PO Box 2095, 1111 2nd Ave Fernie, BC V0B1M0		
ATTENTION	Kaileigh McCallum	WORK ORDER	2212558
PO NUMBER PROJECT PROJECT INFO	CBWM-2022 [info]	RECEIVED / TEMP REPORTED COC NUMBER	2022-09-20 14:00 / 11.2°C 2022-09-27 15:24 No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

It's simple. We figure the more you

with

likely you are to give us continued

members;

our

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

Work Order Comments:

Custody Seals Intact: N/A

We've Got Chemistry

working

opportunities to support you.

engaged team

and

the more

fun

Ahead of the Curve

Through research, regulation and instrumentation, knowledge, we are your analytical centre the for knowledge technical you need, BEFORE you need it, so you can stay up to date and in the know.

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If you have any questions or concerns, please contact me at TeamCaro@caro.ca

Authorized By:

Team CARO **Client Service Representative**

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	River Alliance VM-2022				WORK ORDER REPORTED	2212558 2022-09-2	7 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
COL001_20220918_154	15 (22I2558-01) Matri x	x: Water San	npled: 2022-09-18 1	5:45			
Anions							
Bromide		< 0.10	N/A	0.10	mg/L	2022-09-23	
Chloride		0.61	AO ≤ 250		mg/L	2022-09-23	
Fluoride		< 0.10	MAC = 1.5	0.10	mg/L	2022-09-23	
Nitrate (as N)		< 0.010	MAC = 10	0.010	mg/L	2022-09-23	HT1
Nitrite (as N)		< 0.010	MAC = 1	0.010	mg/L	2022-09-23	HT1
Phosphate (as P)		< 0.0050	N/A	0.0050	mg/L	2022-09-23	HT1
Sulfate		6.4	AO ≤ 500	1.0	mg/L	2022-09-23	
BCMOE Aggregate Hydro	ocarbons						
EPHw10-19		< 250	N/A	250	µg/L	2022-09-23	
EPHw19-32		< 250	N/A		µg/L	2022-09-23	
Surrogate: 2-Methylnona	ane (EPH/F2-4)	77		60-140	%	2022-09-23	
Calculated Parameters							
Hardness, Total (as CaC	O3)	139	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)		< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total		0.0530	N/A	0.0500	mg/L	N/A	
Dissolved Metals							
Aluminum, dissolved		< 0.0050	N/A	0.0050	mg/L	2022-09-23	
Antimony, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Arsenic, dissolved		< 0.00050	N/A	0.00050		2022-09-23	
Barium, dissolved		0.287	N/A	0.0050	mg/L	2022-09-23	
Beryllium, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Bismuth, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Boron, dissolved		< 0.0500	N/A	0.0500	mg/L	2022-09-23	
Cadmium, dissolved		0.000031	N/A	0.000010	mg/L	2022-09-23	
Calcium, dissolved		42.5	N/A	0.20	mg/L	2022-09-23	
Chromium, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Cobalt, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Copper, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-23	
Iron, dissolved		0.010	N/A	0.010	mg/L	2022-09-23	
Lead, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Lithium, dissolved		0.00710	N/A	0.00010	mg/L	2022-09-23	
Magnesium, dissolved		8.03	N/A	0.010	mg/L	2022-09-23	
Manganese, dissolved		0.00305	N/A	0.00020	mg/L	2022-09-27	
Mercury, dissolved		< 0.000010	N/A	0.000010	-	2022-09-26	
Molybdenum, dissolved		0.00085	N/A	0.00010	-	2022-09-23	
Nickel, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-23	
Phosphorus, dissolved		< 0.050	N/A	0.050	mg/L	2022-09-23	
Potassium, dissolved		0.81	N/A		mg/L	2022-09-23	
Selenium, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Silicon, dissolved		1.8	N/A		mg/L	2022-09-23	
Silver, dissolved		< 0.000050	N/A	0.000050	mg/L	2022-09-23	



REPORTED TOElk River AlliancePROJECTCBWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	27 15:24
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
COL001_20220918_1545 (22I2558-01)	Matrix: Water San	npled: 2022-09-18 1	5:45, Contin	ued		
Dissolved Metals, Continued						
Sodium, dissolved	2.73	N/A	0.10	mg/L	2022-09-23	
Strontium, dissolved	0.143	N/A	0.0010	mg/L	2022-09-23	
Sulfur, dissolved	< 3.0	N/A	3.0	mg/L	2022-09-23	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2022-09-23	
Thorium, dissolved	< 0.00010	N/A	0.00010		2022-09-23	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Titanium, dissolved	< 0.0050	N/A	0.0050	-	2022-09-23	
Tungsten, dissolved	< 0.0010	N/A	0.0010		2022-09-23	
Uranium, dissolved	0.000543	N/A	0.000020		2022-09-23	
Vanadium, dissolved	< 0.0050	N/A	0.0050	0	2022-09-23	
Zinc, dissolved	< 0.0040	N/A	0.0040	-	2022-09-23	
Zirconium, dissolved	< 0.00010	N/A	0.00010	-	2022-09-23	
General Parameters						
Alkalinity, Total (as CaCO3)	175	N/A	1.0	mg/L	2022-09-24	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Bicarbonate (as CaCO3)	175	N/A		mg/L	2022-09-24	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A		mg/L	2022-09-24	
Ammonia, Total (as N)	< 0.050	None Required	0.050	-	2022-09-24	
BOD, 5-day	< 7.3	N/A		mg/L	2022-09-22	
-		N/A N/A			2022-09-20	
Carbon, Total Organic	2.31	N/A N/A		mg/L	2022-09-20	
Carbon, Dissolved Organic	1.85			mg/L		
Chemical Oxygen Demand		N/A		mg/L	2022-09-22	
Nitrogen, Total Kjeldahl	0.053	N/A	0.050	-	2022-09-27	
Phosphorus, Total (as P)	0.0206	N/A	0.0050		2022-09-23	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2022-09-23	
<i>Total Metals</i> Aluminum, total	0.0078	OG < 0.1	0.0050	ma/l	2022-09-23	
Antimony, total	< 0.00020	MAC = 0.006	0.00020		2022-09-23	
Arsenic, total	< 0.00020	MAC = 0.000	0.00020		2022-09-23	
· · · · · · · · · · · · · · · · · · ·		MAC = 0.01 MAC = 2		-		
Barium, total	0.279 < 0.00010		0.0050		2022-09-23	
Beryllium, total		N/A N/A	0.00010		2022-09-23	
Bismuth, total	< 0.00010		0.00010	•	2022-09-23	
Boron, total	< 0.0500	MAC = 5	0.0500		2022-09-23	
Cadmium, total	0.000037	MAC = 0.005	0.000010	mg/L	2022-09-23	
Calcium, total	43.5	None Required	0.20	mg/L	2022-09-23	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	-	2022-09-23	
Cobalt, total	< 0.00010	N/A	0.00010	-	2022-09-23	
Copper, total	0.00050	MAC = 2	0.00040	-	2022-09-23	
Iron, total	0.017	AO ≤ 0.3	0.010		2022-09-23	
Lead, total	< 0.00020	MAC = 0.005	0.00020	ma/l	2022-09-23	



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	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212558 2022-09-27 15:24	
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
COL001_20220918	_1545 (22l2558-01) N	latrix: Water San	npled: 2022-09-18 1	5:45, Contin	ued		
Total Metals, Continu	led						
Lithium, total		0.00736	N/A	0.00010	mg/L	2022-09-23	
Magnesium, total		8.38	None Required	0.010	mg/L	2022-09-23	
Manganese, total		0.00411	MAC = 0.12	0.00020	mg/L	2022-09-23	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-26	
Molybdenum, total		0.00085	N/A	0.00010	mg/L	2022-09-23	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-23	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-23	
Potassium, total		0.85	N/A	0.10	mg/L	2022-09-23	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-23	
Silicon, total		2.0	N/A	1.0	mg/L	2022-09-23	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-09-23	
Sodium, total		2.77	AO ≤ 200	0.10	mg/L	2022-09-23	
Strontium, total		0.146	MAC = 7	0.0010	mg/L	2022-09-23	
Sulfur, total		< 3.0	N/A	3.0	mg/L	2022-09-23	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-23	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-23	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-23	
Uranium, total		0.000528	MAC = 0.02	0.000020	mg/L	2022-09-23	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-23	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-23	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-23	

COL003_20220918_1120 (22l2558-02) | Matrix: Water | Sampled: 2022-09-18 11:20

Hardness, Total (as CaCO3)	49.1	None Required	0.500	mg/L	N/A	
Calculated Parameters						
Surrogate: 2-Methylnonane (EPH/F2-4)	97		60-140	%	2022-09-23	
EPHw19-32	< 250	N/A	250	µg/L	2022-09-23	
EPHw10-19	< 250	N/A	250	µg/L	2022-09-23	
BCMOE Aggregate Hydrocarbons						
Sulfate	6.3	AO ≤ 500	1.0	mg/L	2022-09-22	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2022-09-22	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-22	HT1
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2022-09-22	HT1
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2022-09-22	
Chloride	< 0.10	AO ≤ 250	0.10	mg/L	2022-09-22	
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-22	

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Caring About Results, Obviously.
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	lk River Alliance BWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	7 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
COL003_20220918_1	120 (22l2558-02) Ma	atrix: Water Sam	pled: 2022-09-18	11:20, Contin	ued		
Calculated Parameters	, Continued						
Nitrate+Nitrite (as N)		< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total		< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals							
Aluminum, dissolved		0.0158	N/A	0.0050	mg/L	2022-09-23	
Antimony, dissolved		< 0.00020	N/A	0.00020		2022-09-23	
Arsenic, dissolved		< 0.00050	N/A	0.00050	0	2022-09-23	
Barium, dissolved		0.0817	N/A	0.0050	mg/L	2022-09-23	
Beryllium, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Bismuth, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Boron, dissolved		< 0.0500	N/A	0.0500	mg/L	2022-09-23	
Cadmium, dissolved		0.000059	N/A	0.000010	mg/L	2022-09-23	
Calcium, dissolved		14.9	N/A	0.20	mg/L	2022-09-23	
Chromium, dissolved		< 0.00050	N/A	0.00050		2022-09-23	
Cobalt, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Copper, dissolved		< 0.00040	N/A	0.00040		2022-09-23	
Iron, dissolved		< 0.010	N/A	0.010	mg/L	2022-09-23	
Lead, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Lithium, dissolved		0.00012	N/A	0.00010	mg/L	2022-09-23	
Magnesium, dissolved	l	2.90	N/A	0.010	mg/L	2022-09-23	
Manganese, dissolved	1	< 0.00020	N/A	0.00020	mg/L	2022-09-27	
Mercury, dissolved		< 0.000010	N/A	0.000010	mg/L	2022-09-26	
Molybdenum, dissolve	ed	0.00043	N/A	0.00010	mg/L	2022-09-23	
Nickel, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-23	
Phosphorus, dissolved	b	< 0.050	N/A	0.050	mg/L	2022-09-23	
Potassium, dissolved		0.24	N/A	0.10	mg/L	2022-09-23	
Selenium, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Silicon, dissolved		1.1	N/A	1.0	mg/L	2022-09-23	
Silver, dissolved		< 0.000050	N/A	0.000050	mg/L	2022-09-23	
Sodium, dissolved		0.17	N/A	0.10	mg/L	2022-09-23	
Strontium, dissolved		0.0191	N/A	0.0010	mg/L	2022-09-23	
Sulfur, dissolved		< 3.0	N/A	3.0	mg/L	2022-09-23	
Tellurium, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Thallium, dissolved		< 0.000020	N/A	0.000020	mg/L	2022-09-23	
Thorium, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Tin, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Titanium, dissolved		< 0.0050	N/A	0.0050	mg/L	2022-09-23	
Tungsten, dissolved		< 0.0010	N/A	0.0010	mg/L	2022-09-23	
Uranium, dissolved		0.000093	N/A	0.000020	mg/L	2022-09-23	
Vanadium, dissolved		< 0.0050	N/A	0.0050	-	2022-09-23	
Zinc, dissolved		< 0.0040	N/A	0.0040	-	2022-09-23	
Zirconium, dissolved		< 0.00010	N/A	0.00010	-	2022-09-23	

General Parameters

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	27 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
COL003_20220918	_1120 (22l2558-02) M	atrix: Water San	npled: 2022-09-18 1	1:20, Contin	ued		
General Parameters,	Continued						
Alkalinity, Total (as (CaCO3)	62.8	N/A	1.0	mg/L	2022-09-24	
Alkalinity, Phenolph	thalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Bicarbona		62.8	N/A		mg/L	2022-09-24	
Alkalinity, Carbonate		< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Hydroxide		< 1.0	N/A		mg/L	2022-09-24	
Ammonia, Total (as		< 0.050	None Required	0.050		2022-09-22	
BOD, 5-day	7	< 7.3	N/A		mg/L	2022-09-26	
Carbon, Total Organ	nic	2.08	N/A		mg/L	2022-09-26	
Carbon, Dissolved (1.96	N/A		mg/L	2022-09-26	
Chemical Oxygen D		< 20	N/A		mg/L	2022-09-22	
Nitrogen, Total Kjelo		< 0.050	N/A	0.050	•	2022-09-27	
Phosphorus, Total (0.0168	N/A	0.0050		2022-09-23	
Solids, Total Susper		< 2.0	N/A		mg/L	2022-09-23	
Total Metals		2.0		2.0		2022 00 20	
Aluminum, total		0.0253	OG < 0.1	0.0050	ma/L	2022-09-23	
Antimony, total		< 0.00020	MAC = 0.006	0.00020		2022-09-23	
Arsenic, total		< 0.00050	MAC = 0.01	0.00050	•	2022-09-23	
Barium, total		0.0768	MAC = 2	0.0050		2022-09-23	
Beryllium, total		< 0.00010	N/A	0.00010		2022-09-23	
Bismuth, total		< 0.00010	N/A	0.00010	-	2022-09-23	
Boron, total		< 0.0500	MAC = 5	0.0500	•	2022-09-23	
Cadmium, total		0.000060	MAC = 0.005	0.000010	-	2022-09-23	
Calcium, total		14.8	None Required		mg/L	2022-09-23	
Chromium, total		< 0.00050	MAC = 0.05	0.00050	-	2022-09-23	
Cobalt, total		< 0.00010	N/A	0.00030		2022-09-23	
Copper, total		< 0.00040	MAC = 2	0.00040	-	2022-09-23	
Iron, total		< 0.010	AO ≤ 0.3	0.00040	•	2022-09-23	
Lead, total		< 0.00020	MAC = 0.005	0.00020	-	2022-09-23	
Lithium, total		0.00015	N/A	0.00020	-	2022-09-23	
Magnesium, total		3.03	None Required		mg/L	2022-09-23	
Manganese, total		0.00062	MAC = 0.12	0.00020	-	2022-09-23	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	-	2022-09-26	
Molybdenum, total		0.00042	N/A	0.00010	-	2022-09-23	
Nickel, total		< 0.00040	N/A	0.00040	-	2022-09-23	
Phosphorus, total		< 0.050	N/A	0.050		2022-09-23	
Potassium, total		0.25	N/A		mg/L	2022-09-23	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	-	2022-09-23	
Silicon, total		1.1	N/A		mg/L	2022-09-23	
Silver, total		< 0.000050	None Required	0.000050	-	2022-09-23	
Sodium, total		0.17	AO ≤ 200		mg/L	2022-09-23	
Strontium, total		0.0197	MAC = 7	0.0010	-	2022-09-23	
Sulfur, total		< 3.0	N/A	3.0	mg/L	2022-09-23	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	7 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
COL003_2022091	8_1120 (22l2558-02) M	atrix: Water Sam	pled: 2022-09-18 1	1:20, Continu	beu		
Total Metals, Conti	inued						
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-23	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-23	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
,							
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
		< 0.00020 < 0.0050	N/A N/A	0.00020	0	2022-09-23 2022-09-23	
Tin, total					mg/L		
Tin, total Titanium, total		< 0.0050	N/A	0.0050	mg/L mg/L	2022-09-23	
Tin, total Titanium, total Tungsten, total		< 0.0050 < 0.0002	N/A N/A	0.0050 0.0002	mg/L mg/L mg/L	2022-09-23 2022-09-23	
Tin, total Titanium, total Tungsten, total Uranium, total		< 0.0050 < 0.0002 0.000091	N/A N/A MAC = 0.02	0.0050 0.0002 0.00020	mg/L mg/L mg/L mg/L	2022-09-23 2022-09-23 2022-09-23	

DUP001_20220918_1120 (22I2558-03) | Matrix: Water | Sampled: 2022-09-18 11:20

Anions					
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-22
Chloride	< 0.10	AO ≤ 250	0.10	mg/L	2022-09-22
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2022-09-22
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2022-09-22 HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-22 HT1
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2022-09-22 HT1
Sulfate	6.3	AO ≤ 500	1.0	mg/L	2022-09-22
BCMOE Aggregate Hydrocarbons					
EPHw10-19	< 250	N/A	250	µg/L	2022-09-23
EPHw19-32	< 250	N/A	250	µg/L	2022-09-23
Surrogate: 2-Methylnonane (EPH/F2-4)	97		60-140	%	2022-09-23
Calculated Parameters					
Hardness, Total (as CaCO3)	48.5	None Required	0.500	mg/L	N/A
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A
Dissolved Metals					
Aluminum, dissolved	0.0172	N/A	0.0050	mg/L	2022-09-23
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-23
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-23
Barium, dissolved	0.0816	N/A	0.0050	mg/L	2022-09-23
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-23
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-23
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2022-09-23
Cadmium, dissolved	0.000054	N/A	0.000010	mg/L	2022-09-23
Calcium, dissolved	14.7	N/A	0.20	mg/L	2022-09-23
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-23
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-23
	Caring Al	bout Results, Obvid	ously.		Page 7 c



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	7 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
DUP001_2022091	8_1120 (22I2558-03) N	latrix: Water Sam	pled: 2022-09-18 1	1:20, Contin	ued		
Dissolved Metals, (Continued						
Copper, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-23	
Iron, dissolved		< 0.010	N/A	0.010	mg/L	2022-09-23	
Lead, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-23	
Lithium, dissolved		0.00013	N/A	0.00010		2022-09-23	
Magnesium, disso		2.83	N/A	0.010	0	2022-09-23	
Manganese, disso		< 0.00020	N/A	0.00020	-	2022-09-23	
Mercury, dissolved		< 0.000010	N/A	0.000010	-	2022-09-26	
Molybdenum, diss		0.00043	N/A	0.00010	-	2022-09-23	
Nickel, dissolved		< 0.00040	N/A	0.00040	•	2022-09-23	
Phosphorus, disso	blved	< 0.050	N/A	0.050	-	2022-09-23	
Potassium, dissolv		0.24	N/A		mg/L	2022-09-23	
Selenium, dissolve		< 0.00050	N/A	0.00050	-	2022-09-23	
Silicon, dissolved	54	1.1	N/A		mg/L	2022-09-23	
Silver, dissolved		< 0.000050	N/A	0.000050	-	2022-09-23	
Sodium, dissolved		0.16	N/A		mg/L	2022-09-23	
-		0.0192	N/A		-		
Strontium, dissolve	eu		N/A N/A	0.0010	-	2022-09-23	
Sulfur, dissolved		< 3.0			mg/L	2022-09-23	
Tellurium, dissolve		< 0.00050	N/A	0.00050	0	2022-09-23	
Thallium, dissolved		< 0.000020	N/A	0.000020	-	2022-09-23	
Thorium, dissolved		< 0.00010	N/A	0.00010	-	2022-09-23	
Tin, dissolved		< 0.00020	N/A	0.00020	-	2022-09-23	
Titanium, dissolve		< 0.0050	N/A	0.0050	0	2022-09-23	
Tungsten, dissolve		< 0.0010	N/A	0.0010	0	2022-09-23	
Uranium, dissolve		0.000092	N/A	0.000020	-	2022-09-23	
Vanadium, dissolv	ed	< 0.0050	N/A	0.0050	0	2022-09-23	
Zinc, dissolved		< 0.0040	N/A	0.0040	-	2022-09-23	
Zirconium, dissolv	ed	< 0.00010	N/A	0.00010	mg/L	2022-09-23	
General Parameters							
Alkalinity, Total (as	,	61.4	N/A		mg/L	2022-09-24	
	hthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Bicarbor	nate (as CaCO3)	61.4	N/A		mg/L	2022-09-24	
Alkalinity, Carbona		< 1.0	N/A		mg/L	2022-09-24	
Alkalinity, Hydroxid	de (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-24	
Ammonia, Total (a	s N)	< 0.050	None Required	0.050	-	2022-09-22	
BOD, 5-day		< 7.3	N/A	2.0	mg/L	2022-09-26	
Carbon, Total Orga	anic	2.11	N/A	0.50	mg/L	2022-09-26	
Carbon, Dissolved	l Organic	1.80	N/A	0.50	mg/L	2022-09-26	
Chemical Oxygen	Demand	< 20	N/A	20	mg/L	2022-09-22	
Nitrogen, Total Kje	eldahl	< 0.050	N/A	0.050	mg/L	2022-09-27	
Phosphorus, Total	(as P)	0.0153	N/A	0.0050	mg/L	2022-09-23	
Calida Tatal Curr	ll	100	N1/A	0.0		0000 00 00	

Total Metals

Solids, Total Suspended

N/A

2.0 mg/L

< 2.0

2022-09-23



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	2212558 2022-09-2	7 15:24
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
DUP001_2022091	8_1120 (22l2558-03) M	atrix: Water San	npled: 2022-09-18 1	1:20, Continu	ber		
Total Metals, Contir	nued						
Aluminum, total		0.0188	OG < 0.1	0.0050	mg/L	2022-09-23	
Antimony, total		< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-23	
Arsenic, total		< 0.00050	MAC = 0.01	0.00050	mg/L	2022-09-23	
Barium, total		0.0772	MAC = 2	0.0050	mg/L	2022-09-23	
Beryllium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Bismuth, total		< 0.00010	N/A	0.00010	mg/L	2022-09-23	
Boron, total		< 0.0500	MAC = 5	0.0500		2022-09-23	
Cadmium, total		0.000051	MAC = 0.005	0.000010		2022-09-23	
Calcium, total		14.9	None Required		mg/L	2022-09-23	
Chromium, total		< 0.00050	MAC = 0.05	0.00050	-	2022-09-23	
Cobalt, total		< 0.00010	N/A	0.00010		2022-09-23	
Copper, total		< 0.00040	MAC = 2	0.00040		2022-09-23	
Iron, total		< 0.010	AO ≤ 0.3	0.010	0	2022-09-23	
Lead, total		< 0.00020	MAC = 0.005	0.00020		2022-09-23	
Lithium, total		0.00014	N/A	0.00010	0	2022-09-23	
Magnesium, total		3.06	None Required	0.010		2022-09-23	
Manganese, total		0.00023	MAC = 0.12	0.00020		2022-09-23	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	-	2022-09-26	
Molybdenum, total		0.00042	N/A	0.00010	•	2022-09-23	
Nickel, total		< 0.00040	N/A	0.00040	-	2022-09-23	
Phosphorus, total		< 0.050	N/A	0.050		2022-09-23	
Potassium, total		0.25	N/A		mg/L	2022-09-23	
Selenium, total		< 0.00050	MAC = 0.05 N/A	0.00050		2022-09-23 2022-09-23	
Silicon, total		1.1 < 0.000050	None Required	0.000050	mg/L		
Silver, total Sodium, total			AO ≤ 200		mg/L	2022-09-23 2022-09-23	
,		0.16	MAC = 7	0.10	0	2022-09-23	
Strontium, total Sulfur, total		0.0195 < 3.0	N/A			2022-09-23	
,				0.00050	mg/L		
Tellurium, total		< 0.00050	N/A	0.000020		2022-09-23	
Thallium, total		< 0.000020	N/A		0	2022-09-23	
Thorium, total Tin, total		< 0.00010	N/A N/A	0.00010	•	2022-09-23 2022-09-23	
Titanium, total		< 0.00020	N/A N/A	0.00020	-	2022-09-23	
		< 0.0050	N/A N/A	0.0050	-	2022-09-23	
Tungsten, total				0.0002	-		
Uranium, total Vanadium, total		0.000088 < 0.0050	MAC = 0.02 N/A	0.00020	-	2022-09-23 2022-09-23	
		< 0.0050		0.0050	-		
Zinc, total Zirconium, total		< 0.0040	AO ≤ 5 N/A	0.0040	-	2022-09-23 2022-09-23	

Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO Elk River All PROJECT CBWM-2022		WORK ORDE REPORTED	R 2212558 2022-09-2	7 15:24
Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	\checkmark	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	\checkmark	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	\checkmark	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	\checkmark	Kelowna
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	✓	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	\checkmark	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond
EPH in Water	EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	\checkmark	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	\checkmark	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	\checkmark	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2017)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

Caring About Results, Obviously.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Elk River Alliance
PROJECT	CBWM-2022

WORK ORDER 2 REPORTED 2

22I2558 2022-09-27 15:24

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do <u>not</u> take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:TeamCaro@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



REPORTED TO	Elk River Alliance	WORK ORDER	2212558
PROJECT	CBWM-2022	REPORTED	2022-09-27 15:24

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- Duplicate (Dup): An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- Reference Material (SRM): A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike	Source	% REC	REC	% RPD	RPD	Qualifier
, maly to	Rooun		Level	Result	/01120	Limit	70 TU B	Limit	quamor

Anions, Batch B2I2233

Blank (B2I2233-BLK1)			Prepared:	2022-09-23, Analyze	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 0.5	0.5 mg/L				
Blank (B2I2233-BLK2)			Prepared:	2022-09-23, Analyze	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 0.5	0.5 mg/L				
LCS (B2I2233-BS1)			Prepared:	2022-09-23, Analyzo	ed: 2022-09-23	
Bromide	3.86	0.10 mg/L	4.00	97	85-115	
Chloride	15.6	0.10 mg/L	16.0	97	90-110	
Fluoride	4.07	0.10 mg/L	4.00	102	88-108	
Nitrate (as N)	4.08	0.010 mg/L	4.00	102	90-110	
Nitrite (as N)	1.96	0.010 mg/L	2.00	98	85-115	
Phosphate (as P)	1.10	0.0050 mg/L	1.00	110	80-120	
Sulfate	15.8	0.5 mg/L	16.0	98	90-110	
LCS (B2I2233-BS2)			Prepared:	2022-09-23, Analyzo	ed: 2022-09-23	
Bromide	3.70	0.10 mg/L	4.00	92	85-115	
Chloride	15.6	0.10 mg/L	16.0	98	90-110	
Fluoride	4.12	0.10 mg/L	4.00	103	88-108	
Nitrate (as N)	4.09	0.010 mg/L	4.00	102	90-110	
Nitrite (as N)	2.03	0.010 mg/L	2.00	101	85-115	
Phosphate (as P)	1.04	0.0050 mg/L	1.00	104	80-120	
Sulfate	15.6	0.5 mg/L	16.0	98	90-110	
Duplicate (B2I2233-DUP2)	s	ource: 22I2558-01	Prepared:	2022-09-23, Analyzo	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L		< 0.10		10
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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER RTED	2212 2022	558 -09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B2I				_						
Duplicate (B2I223	3-DUP2), Continued	Sou	Irce: 2212558-01	Prepared	I: 2022-09-2	23, Analyze	ed: 2022-0	9-23		
Chloride		0.61	0.10 mg/L		0.61			< 1	10	
Fluoride		< 0.10	0.10 mg/L		< 0.10				10	
Nitrate (as N)		< 0.010	0.010 mg/L		< 0.010				10	
Nitrite (as N)		< 0.010	0.010 mg/L		< 0.010				15	
Phosphate (as P)		< 0.0050	0.0050 mg/L		< 0.0050				20	
Sulfate		6.4	1.0 mg/L		6.4			< 1	10	
Matrix Spike (B2l2	233-MS2)	Sou	ırce: 22l2558-01	Prepared	I: 2022-09-2	3, Analyze	ed: 2022-0	9-23		
Bromide		3.62	0.10 mg/L	4.00	< 0.10	91	80-120			
Chloride		16.8	0.10 mg/L	16.0	0.61	101	75-125			
Fluoride		3.90	0.10 mg/L	4.00	< 0.10	96	75-125			
Nitrate (as N)		3.80	0.010 mg/L	4.00	< 0.010	95	75-125			
Nitrite (as N)		2.04	0.010 mg/L	2.00	< 0.010	102	80-120			
Phosphate (as P)		0.798	0.0050 mg/L	1.00	< 0.0050	80	70-130			
			0.5 mg/L	16.0		100				

BCMOE Aggregate Hydrocarbons, Batch B2l2678

Blank (B2I2678-BLK1)			Prepared: 202	2-09-23, Analyze	ed: 2022-09	-23		
EPHw10-19	< 250	250 µg/L						
EPHw19-32	< 250	250 µg/L						
Surrogate: 2-Methylnonane (EPH/F2-4)	4200	µg/L	4400	95	60-140			
LCS (B2I2678-BS2)	Prepared: 2022-09-23, Analyzed: 2022-09-23							
EPHw10-19	15500	250 µg/L	15400	100	70-130			
EPHw19-32	22800	250 µg/L	22100	103	70-130			
Surrogate: 2-Methylnonane (EPH/F2-4)	3370	µg/L	4400	77	60-140			
LCS Dup (B2I2678-BSD2)			Prepared: 202	2-09-23, Analyze	ed: 2022-09	-23		
EPHw10-19	15700	250 µg/L	15400	102	70-130	1	20	
EPHw19-32	23000	250 µg/L	22100	104	70-130	1	20	
Surrogate: 2-Methylnonane (EPH/F2-4)	3540	µg/L	4400	80	60-140			

Dissolved Metals, Batch B2I2636

Blank (B2I2636-BLK1)

Blank (B2I2636-BLK1)			Prepared: 2022-09-23, Analyzed: 2022-09-23
Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Antimony, dissolved	< 0.00020	0.00020 mg/L	
Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Barium, dissolved	< 0.0050	0.0050 mg/L	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Boron, dissolved	< 0.0500	0.0500 mg/L	
Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Chromium, dissolved	< 0.00050	0.00050 mg/L	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Copper, dissolved	< 0.00040	0.00040 mg/L	
Iron, dissolved	< 0.010	0.010 mg/L	
Lead, dissolved	< 0.00020	0.00020 mg/L	
Lithium, dissolved	< 0.00010	0.00010 mg/L	
Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Manganese, dissolved	< 0.00020	0.00020 mg/L	
Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Nickel, dissolved	< 0.00040	0.00040 mg/L	
Phosphorus, dissolved	< 0.050	0.050 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			558 -09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Dissolved Metals, Batch B2I2636, Continued

Blank (B2I2636-BLK1), Continued			Prepared: 202	2-09-23, Analyze	d: 2022-09-23	
Potassium, dissolved	< 0.10	0.10 mg/L				
Selenium, dissolved	< 0.00050	0.00050 mg/L				
Silicon, dissolved	< 1.0	1.0 mg/L				
Silver, dissolved	< 0.000050	0.000050 mg/L				
Sodium, dissolved	< 0.10	0.10 mg/L				
Strontium, dissolved	< 0.0010	0.0010 mg/L				
Sulfur, dissolved	< 3.0	3.0 mg/L				
Tellurium, dissolved	< 0.00050	0.00050 mg/L				
Thallium, dissolved	< 0.000020	0.000020 mg/L				
Thorium, dissolved	< 0.00010	0.00010 mg/L				
Tin, dissolved	< 0.00020	0.00020 mg/L				
Titanium, dissolved	< 0.0050	0.0050 mg/L				
Tungsten, dissolved	< 0.0010	0.0010 mg/L				
Uranium, dissolved	< 0.000020	0.000020 mg/L				
Vanadium, dissolved	< 0.0050	0.0050 mg/L				
Zinc, dissolved	< 0.0040	0.0040 mg/L				
Zirconium, dissolved	< 0.00010	0.00010 mg/L				
LCS (B2I2636-BS1)			Prepared: 202	2-09-23, Analyze	d: 2022-09-23	
Aluminum, dissolved	4.06	0.0050 mg/L	4.00	102	80-120	
Antimony, dissolved	0.0410	0.00020 mg/L	0.0400	102	80-120	
Arsenic, dissolved	0.0416	0.00050 mg/L	0.0400	104	80-120	
Barium, dissolved	0.0410	0.0050 mg/L	0.0400	103	80-120	
Beryllium, dissolved	0.0396	0.00010 mg/L	0.0400	99	80-120	
Bismuth, dissolved	0.0416	0.00010 mg/L	0.0400	104	80-120	
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0400	101	80-120	
Cadmium, dissolved	0.0411	0.000010 mg/L	0.0400	103	80-120	
Calcium, dissolved, dissolved	3.88	0.20 mg/L	4.00	97	80-120	
Chromium, dissolved	0.0403	0.00050 mg/L	0.0400	101	80-120	
Cobalt, dissolved	0.0400	0.00010 mg/L	0.0400	100	80-120	
Copper, dissolved	0.0399	0.00040 mg/L	0.0400	100	80-120	
Iron, dissolved	4.03	0.010 mg/L	4.00	101	80-120	
Lead, dissolved	0.0416	0.00020 mg/L	0.0400	104	80-120	
Lithium, dissolved	0.0391	0.00010 mg/L	0.0400	98	80-120	
Magnesium, dissolved, dissolved	4.06	0.010 mg/L	4.00	102	80-120	
Manganese, dissolved	0.0405	0.00020 mg/L	0.0400	101	80-120	
Molybdenum, dissolved	0.0400	0.00010 mg/L	0.0400	100	80-120	
Nickel, dissolved	0.0401	0.00040 mg/L	0.0400	100	80-120	
Phosphorus, dissolved	4.11	0.050 mg/L	4.00	103	80-120	
Potassium, dissolved	3.96	0.10 mg/L	4.00	99	80-120	
Selenium, dissolved	0.0412	0.00050 mg/L	0.0400	103	80-120	
Silicon, dissolved	4.0	1.0 mg/L	4.00	101	80-120	
Silver, dissolved	0.0410	0.000050 mg/L	0.0400	102	80-120	
Sodium, dissolved	4.12	0.10 mg/L	4.00	103	80-120	
Strontium, dissolved	0.0409	0.0010 mg/L	0.0400	102	80-120	
Sulfur, dissolved	42.1	3.0 mg/L	40.0	105	80-120	
Tellurium, dissolved	0.0412	0.00050 mg/L	0.0400	103	80-120	
Thallium, dissolved	0.0421	0.000020 mg/L	0.0400	105	80-120	
Thorium, dissolved	0.0420	0.00010 mg/L	0.0400	105	80-120	
Tin, dissolved	0.0413	0.00020 mg/L	0.0400	103	80-120	
Titanium, dissolved	0.0402	0.0050 mg/L	0.0400	100	80-120	
Tungsten, dissolved	0.0418	0.0010 mg/L	0.0400	105	80-120	
Uranium, dissolved	0.0424	0.000020 mg/L	0.0400	106	80-120	
Vanadium, dissolved	0.0405	0.0050 mg/L	0.0400	101	80-120	
Zinc, dissolved	0.0415	0.0040 mg/L	0.0400	104	80-120	
Zirconium, dissolved	0.0414	0.00010 mg/L	0.0400	103	80-120	



								0010		
REPORTED TO PROJECT	Elk River Alliance CBWM-2022					REPOR	ORDER TED	2212 2022	-09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, E	Batch B2l2908									
Blank (B2I2908-BLI	K1)			Prepared	2022-09-20	6, Analyze	d: 2022-0	9-26		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
Blank (B2I2908-BL	K2)			Prepared	2022-09-20	6, Analyze	d: 2022-0	9-26		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
LCS (B2I2908-BS1)	1			Prepared	2022-09-20	6, Analyze	d: 2022-0	9-27		
Mercury, dissolved		0.000553	0.000010 mg/L	0.000500		111	80-120			
LCS (B2I2908-BS2)	1			Prepared	2022-09-20	6, Analyze	d: 2022-0	9-27		
Mercury, dissolved		0.000523	0.000010 mg/L	0.000500		105	80-120			
General Parameters	, Batch B2l2377									
Blank (B2I2377-BL	K1)			Prepared	2022-09-2	1, Analyze	d: 2022-0	9-26		
BOD, 5-day		< 2.0	2.0 mg/L							
LCS (B2I2377-BS1)	1			Prepared	2022-09-2	1, Analyze	d: 2022-0	9-26		
BOD, 5-day		204	60.9 mg/L	198		103	85-115			
Duplicate (B2I2377	-DUP1)	Sc	ource: 22l2558-03	Prepared	2022-09-2	1, Analyze	d: 2022-0	9-26		
BOD, 5-day		< 7.3	2.0 mg/L		< 7.3				22	
General Parameters	, Batch B2l2456									
				Durana		0 A		0.00		
Blank (B2I2456-BL	K1)	4.00	20	Prepared	2022-09-22	2, Analyze	d: 2022-0	9-22		
Blank (B2I2456-BLI Chemical Oxygen Der	K1) nand	< 20	20 mg/L							
Blank (B2l2456-BL Chemical Oxygen Der LCS (B2l2456-BS1)	mand			Prepared	: 2022-09-2 : 2022-09-2	2, Analyze	d: 2022-0			
Blank (B2l2456-BLI Chemical Oxygen Der	mand	< 20 515	20 mg/L 20 mg/L							
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der	K1) nand nand			Prepared		2, Analyze	d: 2022-0			
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der	K1) nand mand s, Batch B2/2506			Prepared 500		2, Analyze 103	d: 2022-0 89-115	9-22		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic	K1) nand nand <i>5, Batch B2l2506</i> K1)	515 < 0.50	20 mg/L 0.50 mg/L	Prepared 500	: 2022-09-2	2, Analyze 103	d: 2022-0 89-115	9-22		
Blank (B2l2456-BL Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BL	K1) nand nand <i>5, Batch B2l2506</i> K1)	515	20 mg/L	Prepared 500 Prepared	: 2022-09-2; : 2022-09-2	2, Analyze 103 6, Analyze	d: 2022-0 89-115 d: 2022-0	9-22 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Dissolved Org Blank (B2l2506-BLI	K1) mand mand s, Batch B2/2506 K1) ganic K2)	515 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared	: 2022-09-2	2, Analyze 103 6, Analyze	d: 2022-0 89-115 d: 2022-0	9-22 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic	K1) mand mand s, Batch B2/2506 K1) ganic K2)	515 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared	: 2022-09-2; : 2022-09-2	2, Analyze 103 6, Analyze	d: 2022-0 89-115 d: 2022-0	9-22 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Dissolved Org	K1) mand mand <i>b, Batch B2l2506</i> K1) ganic K2) ganic	515 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared	: 2022-09-2 : 2022-09-2 : 2022-09-2	2, Analyze 103 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0	9-22 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic	K1) mand mand 5, Batch B2/2506 K1) ganic K2) ganic K3)	515 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared	: 2022-09-2; : 2022-09-2	2, Analyze 103 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0	9-22 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Dissolved Org Blank (B2l2506-BLI	K1) mand mand <i>5, Batch B2l2506</i> K1) ganic K2) ganic K3)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared	: 2022-09-2 : 2022-09-2 : 2022-09-2	2, Analyze 103 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0	9-22 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Dissolved Org	K1) mand mand s, Batch B2/2506 K1) ganic K2) ganic K3)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared	: 2022-09-2 : 2022-09-2 : 2022-09-2	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic	K1) mand mand s, Batch B2/2506 K1) ganic K2) ganic K3) ganic K4)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared	: 2022-09-2: : 2022-09-2: : 2022-09-2: : 2022-09-2:	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI	K1) mand mand s, Batch B2/2506 K1) ganic K2) ganic K3) ganic K4)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared Prepared	: 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI	K1) mand mand s, Batch B2/2506 K1) ganic K2) ganic K3) ganic K4) ganic K5)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared Prepared	: 2022-09-2: : 2022-09-2: : 2022-09-2: : 2022-09-2:	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic	K1) mand mand <i>c, Batch B2/2506</i> K1) ganic K2) ganic K3) ganic K4) ganic K5)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared Prepared	: 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org	K1) nand mand mand s, Batch B2l2506 K1) ganic K2) ganic K3) ganic K4) ganic K5)	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared Prepared Prepared	: 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26 9-26		
Blank (B2l2456-BLI Chemical Oxygen Der LCS (B2l2456-BS1) Chemical Oxygen Der General Parameters Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Total Organic Carbon, Dissolved Org Blank (B2l2506-BLI Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic Carbon, Total Organic	K1) mand mand mand s, Batch B2/2506 K1) ganic K2) ganic K3) ganic K4) ganic K5) ganic	515 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50 < 0.50	20 mg/L 0.50 mg/L	Prepared 500 Prepared Prepared Prepared Prepared Prepared	: 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21 : 2022-09-21	2, Analyze 103 6, Analyze 6, Analyze 6, Analyze 6, Analyze 6, Analyze	d: 2022-0 89-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-22 9-26 9-26 9-26 9-26		



	Elk River Alliance CBWM-2022				_	WORK REPOR	ORDER RTED	2212 2022	558 2-09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters,	Batch B2l2506, Conti	nued								
LCS (B2I2506-BS2)				Prepared	: 2022-09-2	6, Analyze	ed: 2022-0	9-26		
Carbon, Total Organic		10.1	0.50 mg/L	10.0		101	78-116			
Carbon, Dissolved Organ	nic	9.97	0.50 mg/L	10.0		100	78-116			
LCS (B2I2506-BS3)				-	: 2022-09-2			9-26		
Carbon, Total Organic Carbon, Dissolved Organ		<u> </u>	0.50 mg/L 0.50 mg/L	10.0		101 100	78-116 78-116			
		9.90	0.50 mg/L							
LCS (B2I2506-BS4)				-	: 2022-09-2			9-26		
Carbon, Total Organic Carbon, Dissolved Organ	nic	9.85	0.50 mg/L 0.50 mg/L	10.0		98 98	78-116			
		0.00	0.00 mg/2					0.26		
LCS (B2I2506-BS5) Carbon, Total Organic		10.5	0.50 mg/L	10.0	1: 2022-09-2	105	78-116	9-20		
Carbon, Dissolved Organ	nic	10.5	0.50 mg/L	10.0		105	78-116			
Duplicate (B2I2506-D		Sou	rce: 22l2558-01	Prenared	1: 2022-09-2	6 Analyze	d. 2022-0	9-26		
Carbon, Total Organic	01 2)	2.31	0.50 mg/L	Перагеа	2.31	.0, Analyze	u. 2022-0	5-20	16	
Carbon, Dissolved Organ	nic	1.91	0.50 mg/L		1.85				15	
Matrix Spike (B2I2506	6-MS2)	Sou	rce: 22l2558-01	Prepared	1: 2022-09-2	6, Analyze	ed: 2022-0	9-26		
Carbon, Total Organic Carbon, Dissolved Organ		12.1 12.0	0.50 mg/L 0.50 mg/L	10.0 10.0	2.31 1.85	98 102	70-130 70-130			
General Parameters, Blank (B2I2543-BLK1 Ammonia, Total (as N)		< 0.050	0.050 mg/L	Prepared	: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Blank (B2I2543-BLK2	:)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Ammonia, Total (as N)	,	< 0.050	0.050 mg/L	· ·						
Blank (B2I2543-BLK3	5)			Prepared	1: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Ammonia, Total (as N)		< 0.050	0.050 mg/L	· · ·						
Blank (B2I2543-BLK4	.)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-0	9-22		
Ammonia, Total (as N)	•	< 0.050	0.050 mg/L	•						
Blank (B2I2543-BLK5	5)			Prepared	: 2022-09-2	2. Analvze	ed: 2022-0	9-22		
Ammonia, Total (as N)	,	< 0.050	0.050 mg/L			, ,		-		
LCS (B2I2543-BS1)				Prepared	1: 2022-09-2	2 Analyze	ed: 2022-0	9-22		
Ammonia, Total (as N)		1.02	0.050 mg/L	1.00		102	90-115	0 22		
			,,,		1: 2022-09-2			0.00		
LCS (B2I2543-BS2) Ammonia, Total (as N)		1.02	0.050 mg/L	1.00	1. 2022-09-2	102	90-115	9-22		
		1.02	0.030 mg/L		1: 2022-09-2			0_22		
LCS (B2I2543-BS3) Ammonia, Total (as N)		0.973	0.050 mg/L	1.00	. 2022-03-2	97	90-115	0-22		
		0.010	0.000 mg/L					0.00		
LCS (B2I2543-BS4)		0.005	0.050 ~="		1: 2022-09-2			9-22		
Ammonia, Total (as N)		0.995	0.050 mg/L	1.00		100	90-115			
LCS (B2I2543-BS5)					: 2022-09-2			9-22		
Ammonia, Total (as N)		1.01	0.050 mg/L	1.00		101	90-115			

General Parameters, Batch B2I2645



Barium, total

Boron, total

Beryllium, total Bismuth, total

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER TED	2212 2022	558 2-09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
General Parameter	rs, Batch B2l2645, Con	ntinued								
Blank (B2I2645-BL	_K1)			Prepared	I: 2022-09-2	2, Analyze	d: 2022-0	9-23		
Phosphorus, Total (as	s P)	< 0.0020	0.0020 mg/L							BLK
Blank (B2I2645-BL	_K2)			Prepared	I: 2022-09-2	2. Analvze	d: 2022-0	9-23		
Phosphorus, Total (as	,	0.0026	0.0020 mg/L			, ,				BLK
LCS (B2I2645-BS1)			Prenarec	I: 2022-09-2	2 Analyze	d. 2022-0	19-23		
Phosphorus, Total (as	,	0.112	0.0020 mg/L	0.100	. 2022 00 2	112	85-115	.0 20		
					. 2022 00 2			0.22		
LCS (B2I2645-BS2 Phosphorus, Total (as		0.113	0.0020 mg/L	0.100	l: 2022-09-2	113	85-115	19-23		
Filosphorus, Total (as	57)	0.113	0.0020 mg/L	0.100		115	00-110			
General Parameter	rs, Batch B2l2722									
Blank (B2l2722-BL	-K 1)			Prepared	l: 2022-09-2	3, Analyze	d: 2022-0	9-23		
Solids, Total Suspend	-	< 2.0	2.0 mg/L							
LCS (B2I2722-BS1)		<u> </u>	Prepared	I: 2022-09-2	3. Analvze	d: 2022-0	9-23		
Solids, Total Suspend		95.0	10.0 mg/L	100		95	85-115			
Blank (B2l2817-BL				Preparec	l: 2022-09-2	4, Analyze	d: 2022-0	9-24		
Alkalinity, Total (as Ca Alkalinity, Phenolphth	,	< 1.0	1.0 mg/L							
Alkalinity, Phenoiphtr Alkalinity, Bicarbonat	· · ·	< 1.0	1.0 mg/L 1.0 mg/L							
Alkalinity, Carbonate		< 1.0	1.0 mg/L							
Alkalinity, Hydroxide	(as CaCO3)	< 1.0	1.0 mg/L							
LCS (B2I2817-BS1	l)			Prepared	I: 2022-09-2	4, Analyze	d: 2022-0	9-24		
Alkalinity, Total (as C	aCO3)	114	1.0 mg/L	100		114	80-120			
General Parameter				_						
Blank (B2I2871-BL	1	< 0.050	0.050 mg/l	Preparec	l: 2022-09-2	5, Analyze	a: 2022-0	9-27		
Nitrogen, Total Kjelda		< 0.050	0.050 mg/L							
Blank (B2I2871-BL				Prepared	I: 2022-09-2	5, Analyze	d: 2022-0	9-27		
Nitrogen, Total Kjelda	ahl	< 0.050	0.050 mg/L							
LCS (B2I2871-BS1)			Prepared	I: 2022-09-2	5, Analyze	d: 2022-0	9-27		
Nitrogen, Total Kjelda	ahl	0.931	0.050 mg/L	1.00		93	85-115			
LCS (B2I2871-BS2	2)			Prepared	I: 2022-09-2	5, Analyze	d: 2022-0	9-27		
Nitrogen, Total Kjelda	ahl	0.939	0.050 mg/L	1.00		94	85-115			
otal Metals, Batc	h B2l2681									
Blank (B2I2681-BL	_K1)			Prepared	l: 2022-09-2	3, Analyze	d: 2022-0	9-23		
Aluminum, total		< 0.0050	0.0050 mg/L							
Antimony, total		< 0.00020	0.00020 mg/L							
Arsenic, total		< 0.00050	0.00050 mg/L							

0.0050 mg/L

0.00010 mg/L

0.00010 mg/L

0.0500 mg/L

< 0.0050

< 0.00010

< 0.00010

< 0.0500

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			558 2-09-27	15:24
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Total Metals, Batch B2l2681, Continued

Blank (B2I2681-BLK1), Continued			Prepared: 2022-09-23, Analyzed: 2022-09-23
Cadmium, total	< 0.000010	0.000010 mg/L	
Calcium, total	< 0.20	0.20 mg/L	
Chromium, total	< 0.00050	0.00050 mg/L	
Cobalt, total	< 0.00010	0.00010 mg/L	
Copper, total	< 0.00040	0.00040 mg/L	
ron, total	< 0.010	0.010 mg/L	
Lead, total	< 0.00020	0.00020 mg/L	
Lithium, total	< 0.00010	0.00010 mg/L	
Magnesium, total	< 0.010	0.010 mg/L	
Manganese, total	< 0.00020	0.00020 mg/L	
Molybdenum, total	< 0.00010	0.00010 mg/L	
Nickel, total	< 0.00040	0.00040 mg/L	
Phosphorus, total	< 0.050	0.050 mg/L	
Potassium, total	< 0.10	0.10 mg/L	
Selenium, total	< 0.00050	0.00050 mg/L	
Silicon, total	< 1.0	1.0 mg/L	
Silver, total	< 0.000050	0.000050 mg/L	
Sodium, total	< 0.10	0.10 mg/L	
Strontium, total	< 0.0010	0.0010 mg/L	
Sulfur, total	< 3.0	3.0 mg/L	
Tellurium, total	< 0.00050	0.00050 mg/L	
Fhallium, total	< 0.000020	0.000020 mg/L	
Fhorium, total	< 0.00010	0.00010 mg/L	
Γin, total	< 0.00020	0.00020 mg/L	
Fitanium, total	< 0.0050	0.0050 mg/L	
Fungsten, total	< 0.0002	0.0002 mg/L	
Jranium, total	< 0.000020	0.000020 mg/L	
Vanadium, total	< 0.0050	0.0050 mg/L	
Zinc, total	< 0.0040	0.0040 mg/L	
Zirconium, total	< 0.00010	0.00010 mg/L	
LCS (B2I2681-BS1)			Prepared: 2022-09-23, Analyzed: 2022-09-23
Aluminum, total	4.13	0.0050 ma/L	4.00 103 80-120

Aluminum, total	4.13	0.0050 mg/L	4.00	103 8	80-120
Antimony, total	0.0394	0.00020 mg/L	0.0400	99 8	30-120
Arsenic, total	0.0428	0.00050 mg/L	0.0400	107 8	80-120
Barium, total	0.0387	0.0050 mg/L	0.0400	97 8	80-120
Beryllium, total	0.0388	0.00010 mg/L	0.0400	97 8	80-120
Bismuth, total	0.0401	0.00010 mg/L	0.0400	100 8	80-120
Boron, total	< 0.0500	0.0500 mg/L	0.0400	100 8	80-120
Cadmium, total	0.0399	0.000010 mg/L	0.0400	100 8	80-120
Calcium, total	3.94	0.20 mg/L	4.00	98 8	80-120
Chromium, total	0.0411	0.00050 mg/L	0.0400	103 8	80-120
Cobalt, total	0.0412	0.00010 mg/L	0.0400	103 8	30-120
Copper, total	0.0411	0.00040 mg/L	0.0400	103 8	80-120
Iron, total	4.07	0.010 mg/L	4.00	102 8	80-120
Lead, total	0.0397	0.00020 mg/L	0.0400	99 8	80-120
Lithium, total	0.0390	0.00010 mg/L	0.0400	98 8	80-120
Magnesium, total	4.28	0.010 mg/L	4.00	107 8	80-120
Manganese, total	0.0412	0.00020 mg/L	0.0400	103 8	80-120
Molybdenum, total	0.0392	0.00010 mg/L	0.0400	98 8	80-120
Nickel, total	0.0409	0.00040 mg/L	0.0400	102 8	80-120
Phosphorus, total	4.08	0.050 mg/L	4.00	102 8	80-120
Potassium, total	4.21	0.10 mg/L	4.00	105 8	30-120
Selenium, total	0.0402	0.00050 mg/L	0.0400	101 8	80-120
Silicon, total	4.1	1.0 mg/L	4.00	104 8	80-120
Silver, total	0.0401	0.000050 mg/L	0.0400	100 8	80-120

Γ



	River Alliance /M-2022				WORK REPOR	-		558 -09-27	15:24
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie

Total Metals, Batch B2l2681, Continued

LCS (B2I2681-BS1), Continued			Prepared: 202	22-09-23, Analyze	d: 2022-09-23	
Sodium, total	4.07	0.10 mg/L	4.00	102	80-120	
Strontium, total	0.0419	0.0010 mg/L	0.0400	105	80-120	
Sulfur, total	40.7	3.0 mg/L	40.0	102	80-120	
Tellurium, total	0.0384	0.00050 mg/L	0.0400	96	80-120	
Thallium, total	0.0391	0.000020 mg/L	0.0400	98	80-120	
Thorium, total	0.0404	0.00010 mg/L	0.0400	101	80-120	
Tin, total	0.0398	0.00020 mg/L	0.0400	99	80-120	
Titanium, total	0.0415	0.0050 mg/L	0.0400	104	80-120	
Tungsten, total	0.0396	0.0002 mg/L	0.0400	99	80-120	
Uranium, total	0.0398	0.000020 mg/L	0.0400	100	80-120	
Vanadium, total	0.0405	0.0050 mg/L	0.0400	101	80-120	
Zinc, total	0.0404	0.0040 mg/L	0.0400	101	80-120	
Zirconium, total	0.0396	0.00010 mg/L	0.0400	99	80-120	

Total Metals, Batch B2l2909

		Prepared: 2022	-09-26, Analyze	ed: 2022-09-26	
< 0.000010	0.000010 mg/L				
		Prepared: 2022	-09-26, Analyze	ed: 2022-09-26	
< 0.000010	0.000010 mg/L				
		Prepared: 2022	-09-26, Analyze	ed: 2022-09-27	
0.000530	0.000010 mg/L	0.000500	106	80-120	
		Prepared: 2022	-09-26, Analyze	ed: 2022-09-26	
0.000428	0.000010 mg/L	0.000500	86	80-120	
	< 0.000010 0.000530	< 0.000010 0.000010 mg/L 0.000530 0.000010 mg/L	 < 0.000010 0.000010 mg/L Prepared: 2022 < 0.000010 0.000010 mg/L Prepared: 2022 0.000530 0.000010 mg/L 0.000500 Prepared: 2022 	 < 0.000010 0.000010 mg/L Prepared: 2022-09-26, Analyze < 0.000010 0.000010 mg/L Prepared: 2022-09-26, Analyze 0.000530 0.000010 mg/L 0.000500 106 Prepared: 2022-09-26, Analyze 	Prepared: 2022-09-26, Analyzed: 2022-09-26 < 0.000010

QC Qualifiers:

BLK Analyte concentration in the Method Blank is above the Reporting Limit (RL).



CERTIFICATE OF ANALYSIS

REPORTED TO	Elk River Alliance PO Box 2095, 1111 2nd Ave Fernie, BC V0B1M0		
ATTENTION	Kaileigh McCallum	WORK ORDER	2212857
PO NUMBER PROJECT PROJECT INFO	CBWM-2022 [info]	RECEIVED / TEMP REPORTED COC NUMBER	2022-09-21 14:30 / 12.8°C 2022-10-31 14:20 No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

We've Got Chemistry

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too. It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

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Ahead of the Curve

research, Through regulation and instrumentation, knowledge, we are your analytical centre the for knowledge technical you need, BEFORE you need it, so you can stay up to date and in the know.

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If you have any questions or concerns, please contact me at TeamCaro@caro.ca

Authorized By:

Team CARO Client Service Representative

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REPORTED TO Elk River Alliance PROJECT CBWM-2022				WORK ORDER REPORTED	22I2857 2022-10-3	31 14:20
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
LIZ001_20220920_1228 (2212857-01) Ma	ıtrix: Water Samı	oled: 2022-09-20 12	2:28			
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-23	
Chloride	0.23	AO ≤ 250		mg/L	2022-09-23	
Fluoride	0.11	MAC = 1.5	0.10	mg/L	2022-09-23	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2022-09-23	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-23	
BCMOE Aggregate Hydrocarbons						
EPHw10-19	< 250	N/A	250	µg/L	2022-09-25	
EPHw19-32	< 250	N/A	250	μg/L	2022-09-25	
Surrogate: 2-Methylnonane (EPH/F2-4)	95		60-140		2022-09-25	
Calculated Parameters						
Hardness, Total (as CaCO3)	332	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	0.0630	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-25	
Antimony, dissolved	< 0.00020	N/A	0.00020	<u> </u>	2022-09-25	
Arsenic, dissolved	< 0.00050	N/A	0.00050		2022-09-25	
Barium, dissolved	0.0706	N/A	0.0050	mg/L	2022-09-25	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Boron, dissolved	< 0.0500	N/A	0.0500		2022-09-25	
Cadmium, dissolved	0.000012	N/A	0.000010	mg/L	2022-09-25	
Calcium, dissolved	94.9	N/A	0.20	mg/L	2022-09-25	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-25	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2022-09-25	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2022-09-25	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-25	
Lithium, dissolved	0.00381	N/A	0.00010	mg/L	2022-09-25	
Magnesium, dissolved	23.0	N/A	0.010	mg/L	2022-09-25	
Manganese, dissolved	0.00144	N/A	0.00020	-	2022-09-25	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2022-09-27	
Molybdenum, dissolved	0.00183	N/A	0.00010	mg/L	2022-09-25	
Nickel, dissolved	< 0.00040	N/A	0.00040		2022-09-25	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2022-09-25	
Potassium, dissolved	0.43	N/A		mg/L	2022-09-25	
Selenium, dissolved	< 0.00050	N/A	0.00050	-	2022-09-25	
Silicon, dissolved	2.2	N/A		mg/L	2022-09-25	
Silver, dissolved	< 0.000050	N/A	0.000050		2022-09-25	
Sodium, dissolved	1.67	N/A		mg/L	2022-09-25	
Strontium, dissolved	1.57	N/A	0.0010	mg/L	2022-09-25	



Analyte					REPORTED	2022-10-0	31 14:20
	Res	sult	Guideline	RL	Units	Analyzed	Qualifie
IZ001_20220920_1228 (22	2l2857-01) Matrix: Water	Samp	iled: 2022-09-20 12	2:28, Continu	ed		
issolved Metals, Continued							
Sulfur, dissolved		66.4	N/A	3.0	mg/L	2022-09-25	
Tellurium, dissolved	< 0.00	050	N/A	0.00050	mg/L	2022-09-25	
Thallium, dissolved	< 0.000	020	N/A	0.000020	mg/L	2022-09-25	
Thorium, dissolved	< 0.00	010	N/A	0.00010	mg/L	2022-09-25	
Tin, dissolved	< 0.00	020	N/A	0.00020	mg/L	2022-09-25	
Titanium, dissolved	< 0.0	050	N/A	0.0050	mg/L	2022-09-25	
Tungsten, dissolved	< 0.0	010	N/A	0.0010	mg/L	2022-09-25	
Uranium, dissolved	0.000)357	N/A	0.000020	•	2022-09-25	
Vanadium, dissolved	< 0.0	050	N/A	0.0050	ma/L	2022-09-25	
Zinc, dissolved	< 0.0		N/A	0.0040	0	2022-09-25	
Zirconium, dissolved	< 0.00	010	N/A	0.00010	0	2022-09-25	
eneral Parameters					<u> </u>		
Alkalinity, Total (as CaCO3)		172	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Phenolphthalein (a	is CaCO3)	1.4	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Bicarbonate (as Ca	,	169	N/A	1.0	•	2022-09-25	
Alkalinity, Carbonate (as Ca	,	2.8	N/A		mg/L	2022-09-25	
Alkalinity, Hydroxide (as CaC	/	: 1.0	N/A		mg/L	2022-09-25	
Ammonia, Total (as N)	,	.050	None Required	0.050		2022-09-23	
BOD, 5-day		6.8	N/A		mg/L	2022-09-27	
Carbon, Total Organic		1.00	N/A		mg/L	2022-09-26	
Carbon, Dissolved Organic		0.93	N/A		mg/L	2022-09-26	
Chemical Oxygen Demand		< 20	N/A		mg/L	2022-09-25	
Nitrogen, Total Kjeldahl		.063	N/A	0.050		2022-09-28	
Solids, Total Suspended		: 2.0	N/A		mg/L	2022-09-26	
otal Metals							
Aluminum, total	0.0	238	OG < 0.1	0.0050	ma/l	2022-09-24	
Antimony, total	< 0.00		MAC = 0.006	0.00020	-	2022-09-24	
Arsenic, total	< 0.00		MAC = 0.01	0.00050	-	2022-09-24	
Barium, total)751	MAC = 2	0.0050	-	2022-09-24	
Beryllium, total	< 0.00		N/A	0.00010		2022-09-24	
Bismuth, total	< 0.00		N/A	0.00010	-	2022-09-24	
Boron, total	< 0.0		MAC = 5	0.0500	-	2022-09-24	
Cadmium, total	0.000		MAC = 0.005	0.000010		2022-09-24	
Calcium, total		105	None Required		mg/L	2022-09-24	
Chromium, total	< 0.00		MAC = 0.05	0.00050	-	2022-09-24	
Cobalt, total	< 0.00		N/A	0.00030	-	2022-09-24	
Copper, total	< 0.00		MAC = 2	0.00040		2022-09-24	
Iron, total		.023	AO ≤ 0.3	0.00040	-	2022-09-24	
Lead, total	< 0.00		MAC = 0.005	0.00020	-	2022-09-24	
Lithium, total			N/A	0.00020	-	2022-09-24	
Magnesium, total		0403 23.7	None Required	0.00010		2022-09-24	
Magnesium, total		23.7	MAC = 0.12	0.010	-	2022-09-24 2022-09- <u>24</u>	

Caring About Results, Obviously.

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I2857 2022-10-3	1 14:20
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
LIZ001_20220920	0_1228 (22I2857-01) Ma	atrix: Water Samp	oled: 2022-09-20 12	:28, Continu	ed		
Total Metals, Conti	inued						
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-28	
Molybdenum, tota	I	0.00199	N/A	0.00010	mg/L	2022-09-24	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-24	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-24	
Potassium, total		0.43	N/A	0.10	mg/L	2022-09-24	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-24	
Silicon, total		2.6	N/A	1.0	mg/L	2022-09-24	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-09-24	
Sodium, total		1.73	AO ≤ 200	0.10	mg/L	2022-09-24	
Strontium, total		1.73	MAC = 7	0.0010	mg/L	2022-09-24	
Sulfur, total		73.0	N/A	3.0	mg/L	2022-09-24	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-24	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-24	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-24	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-24	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-24	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-24	
Uranium, total		0.000397	MAC = 0.02	0.000020	mg/L	2022-09-24	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-24	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-24	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-24	

LIZ003_20220920_0930 (22I2857-02) | Matrix: Water | Sampled: 2022-09-20 09:30

Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-25 Page 4 of
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-25
Dissolved Metals					
Nitrogen, Total	0.136	N/A	0.0500	mg/L	N/A
Nitrate+Nitrite (as N)	0.0464	N/A	0.0100	mg/L	N/A
Hardness, Total (as CaCO3)	339	None Required	0.500	mg/L	N/A
Calculated Parameters					
Surrogate: 2-Methylnonane (EPH/F2-4)	94		60-140	%	2022-09-25
EPHw19-32	< 250	N/A	250	µg/L	2022-09-25
EPHw10-19	< 250	N/A	250	µg/L	2022-09-25
BCMOE Aggregate Hydrocarbons					
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-23
Nitrate (as N)	0.046	MAC = 10	0.010	mg/L	2022-09-23
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2022-09-23
Chloride	0.23	AO ≤ 250	0.10	mg/L	2022-09-23
Bromide	< 0.10	N/A	0.10	mg/L	2022-09-23
Anions					



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22l2857 2022-10-3	1 14:20
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
LIZ003_20220920	_0930 (22l2857-02) Ma	atrix: Water Samp	led: 2022-09-20 0	9:30, Continu	ed		
Dissolved Metals, C	Continued						
Arsenic, dissolved		< 0.00050	N/A	0.00050	mg/L	2022-09-25	
Barium, dissolved		0.0653	N/A	0.0050	mg/L	2022-09-25	
Beryllium, dissolve	d	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Bismuth, dissolved	1	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Boron, dissolved		< 0.0500	N/A	0.0500	mg/L	2022-09-25	
Cadmium, dissolve	ed	0.000012	N/A	0.000010	mg/L	2022-09-25	
Calcium, dissolved	1	97.3	N/A	0.20	mg/L	2022-09-25	
Chromium, dissolv	red	< 0.00050	N/A	0.00050	mg/L	2022-09-25	
Cobalt, dissolved		< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Copper, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-25	
Iron, dissolved		< 0.010	N/A	0.010	mg/L	2022-09-25	
Lead, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-25	
Lithium, dissolved		0.00396	N/A	0.00010	mg/L	2022-09-25	
Magnesium, disso	lved	23.2	N/A	0.010	mg/L	2022-09-25	
Manganese, disso	lved	0.00251	N/A	0.00020	mg/L	2022-09-25	
Mercury, dissolved	l	< 0.000010	N/A	0.000010	mg/L	2022-09-27	
Molybdenum, diss	olved	0.00185	N/A	0.00010	mg/L	2022-09-25	
Nickel, dissolved		< 0.00040	N/A	0.00040	mg/L	2022-09-25	
Phosphorus, disso	lved	< 0.050	N/A	0.050	mg/L	2022-09-25	
Potassium, dissolv	ved	0.43	N/A	0.10	mg/L	2022-09-25	
Selenium, dissolve	ed	< 0.00050	N/A	0.00050	mg/L	2022-09-25	
Silicon, dissolved		2.4	N/A	1.0	mg/L	2022-09-25	
Silver, dissolved		< 0.000050	N/A	0.000050	mg/L	2022-09-25	
Sodium, dissolved		1.67	N/A	0.10	mg/L	2022-09-25	
Strontium, dissolve	ed	1.64	N/A	0.0010	mg/L	2022-09-25	
Sulfur, dissolved		67.9	N/A	3.0	mg/L	2022-09-25	
Tellurium, dissolve	d	< 0.00050	N/A	0.00050	mg/L	2022-09-25	
Thallium, dissolved	b	< 0.000020	N/A	0.000020	mg/L	2022-09-25	
Thorium, dissolved	ł	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
Tin, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-25	
Titanium, dissolved	d	< 0.0050	N/A	0.0050	mg/L	2022-09-25	
Tungsten, dissolve	d	< 0.0010	N/A	0.0010	mg/L	2022-09-25	
Uranium, dissolved	b	0.000354	N/A	0.000020	mg/L	2022-09-25	
Vanadium, dissolv	ed	< 0.0050	N/A	0.0050	mg/L	2022-09-25	
Zinc, dissolved		< 0.0040	N/A	0.0040	mg/L	2022-09-25	
Zirconium, dissolve	ed	< 0.00010	N/A	0.00010	mg/L	2022-09-25	
General Parameters	S						
Alkalinity, Total (as	CaCO3)	180	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Phenolp	hthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Bicarbor	nate (as CaCO3)	180	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Carbona	ite (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-25	
Alkalinity, Hydroxic	le (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-25	

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I2857 2022-10-3	1 14:20
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
_IZ003_20220920_	0930 (22I2857-02) Ma	trix: Water Samp	oled: 2022-09-20 09	:30, Continu	ed		
General Parameters,	Continued						
Ammonia, Total (as	N)	< 0.050	None Required	0.050	mg/L	2022-09-23	
BOD, 5-day		< 6.8	N/A		mg/L	2022-09-27	
Carbon, Total Orgar	nic	1.07	N/A		mg/L	2022-09-26	
Carbon, Dissolved (Organic	0.80	N/A	0.50	mg/L	2022-09-26	
Chemical Oxygen D	-	< 20	N/A		mg/L	2022-09-25	
Nitrogen, Total Kjelo		0.090	N/A	0.050	mg/L	2022-09-28	
Solids, Total Susper		< 2.0	N/A		mg/L	2022-09-26	
Total Metals							
Aluminum, total		0.0151	OG < 0.1	0.0050	mg/L	2022-09-24	
Antimony, total		< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-24	
Arsenic, total		< 0.00050	MAC = 0.01	0.00050	mg/L	2022-09-24	
Barium, total		0.0653	MAC = 2	0.0050	mg/L	2022-09-24	
Beryllium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-24	
Bismuth, total		< 0.00010	N/A	0.00010	mg/L	2022-09-24	
Boron, total		< 0.0500	MAC = 5	0.0500	mg/L	2022-09-24	
Cadmium, total		0.000014	MAC = 0.005	0.000010		2022-09-24	
Calcium, total		96.2	None Required	0.20	-	2022-09-24	
Chromium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-24	
Cobalt, total		< 0.00010	N/A	0.00010	•	2022-09-24	
Copper, total		< 0.00040	MAC = 2	0.00040	-	2022-09-24	
Iron, total		0.016	AO ≤ 0.3	0.010	-	2022-09-24	
Lead, total		< 0.00020	MAC = 0.005	0.00020	•	2022-09-24	
Lithium, total		0.00378	N/A	0.00010	-	2022-09-24	
Magnesium, total		22.6	None Required	0.010	-	2022-09-24	
Manganese, total		0.00337	MAC = 0.12	0.00020	-	2022-09-24	
Mercury, total		< 0.000010	MAC = 0.001	0.000010		2022-09-28	
Molybdenum, total		0.00188	N/A	0.00010	-	2022-09-24	
Nickel, total		< 0.00040	N/A	0.00040	-	2022-09-24	
Phosphorus, total		< 0.050	N/A	0.050	-	2022-09-24	
Potassium, total		0.41	N/A		mg/L	2022-09-24	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	-	2022-09-24	
Silicon, total		2.6	N/A		mg/L	2022-09-24	
Silver, total		< 0.000050	None Required	0.000050	-	2022-09-24	
Sodium, total		1.66	AO ≤ 200		mg/L	2022-09-24	
Strontium, total		1.70	MAC = 7	0.0010	-	2022-09-24	
Sulfur, total		67.8	N/A		mg/L	2022-09-24	
Tellurium, total		< 0.00050	N/A	0.00050	-	2022-09-24	
Thallium, total		< 0.000020	N/A N/A	0.000020	-	2022-09-24	
Thorium, total		< 0.00010	N/A N/A	0.000020	-	2022-09-24	
		< 0.00010	N/A N/A	0.00010	-	2022-09-24	
Tin total		\u00020	IN/A	0.00020	IIIY/L	2022-03-24	
Tin, total Titanium, total		< 0.0050	N/A	0.0050	-	2022-09-24	

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22l2857 2022-10-3	1 14:20
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
LIZ003_20220920 Total Metals, Conti)_0930 (22l2857-02) Mat inued	rix: Water Samp	led: 2022-09-20 09):30, Continu	ed		
Uranium, total		0.000366	MAC = 0.02	0.000020	mg/L	2022-09-24	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-24	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-24	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-24	



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TOElk River AlPROJECTCBWM-202		WORK ORDE REPORTED	ER 2212857 2022-10-3	1 14:20
Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	\checkmark	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	\checkmark	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	\checkmark	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	\checkmark	Kelowna
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	✓	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	\checkmark	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond
EPH in Water	EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	\checkmark	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	\checkmark	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2017)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCI Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Elk River Alliance
PROJECT	CBWM-2022

WORK ORDER REPORTED

22I2857 2022-10-31 14:20

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do <u>not</u> take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:TeamCaro@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



REPORTED TO	Elk River Alliance	WORK ORDER	2212857
PROJECT	CBWM-2022	REPORTED	2022-10-31 14:20

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- Duplicate (Dup): An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- Reference Material (SRM): A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike	Source	% REC	REC	% RPD	RPD	Qualifier
,			Level	Result		Limit		Limit	
								-	

Anions, Batch B2I2664

Blank (B2I2664-BLK1)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Blank (B2I2664-BLK2)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Blank (B2I2664-BLK3)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	< 0.10	0.10 mg/L				
Chloride	< 0.10	0.10 mg/L				
Fluoride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
LCS (B2I2664-BS1)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	3.93	0.10 mg/L	4.00	98	85-115	
Chloride	16.0	0.10 mg/L	16.0	100	90-110	
Fluoride	4.08	0.10 mg/L	4.00	102	88-108	
Nitrate (as N)	4.09	0.010 mg/L	4.00	102	90-110	
Nitrite (as N)	1.96	0.010 mg/L	2.00	98	85-115	
LCS (B2I2664-BS2)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	3.86	0.10 mg/L	4.00	96	85-115	
Chloride	16.0	0.10 mg/L	16.0	100	90-110	
Fluoride	3.97	0.10 mg/L	4.00	99	88-108	
Nitrate (as N)	3.93	0.010 mg/L	4.00	98	90-110	
Nitrite (as N)	1.95	0.010 mg/L	2.00	97	85-115	
LCS (B2I2664-BS3)			Prepare	d: 2022-09-23, Analyz	ed: 2022-09-23	
Bromide	3.93	0.10 mg/L	4.00	98	85-115	
Chloride	16.2	0.10 mg/L	16.0	101	90-110	
				_		Page 10 of 17



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-	2212 2022	857 2-10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B2l	2664, Continued									
LCS (B2I2664-BS3	3). Continued			Prepared	I: 2022-09-2	23, Analyze	d: 2022-0)9-23		

LCS (B2I2664-BS3), Continued			Prepared. 20	22-09-23, Analyzeu. 2022-09-23	
Fluoride	4.16	0.10 mg/L	4.00	104 88-108	
Nitrate (as N)	4.13	0.010 mg/L	4.00	103 90-110	
Nitrite (as N)	2.00	0.010 mg/L	2.00	100 85-115	

BCMOE Aggregate Hydrocarbons, Batch B2l2865

Blank (B2I2865-BLK1)			Prepared: 2022	2-09-25, Analyze	ed: 2022-09	-25		
EPHw10-19	< 250	250 µg/L						
EPHw19-32	< 250	250 µg/L						
Surrogate: 2-Methylnonane (EPH/F2-4)	4230	µg/L	4400	96	60-140			
LCS (B2I2865-BS2)			Prepared: 2022	2-09-25, Analyze	ed: 2022-09	-25		
EPHw10-19	16900	250 µg/L	15400	110	70-130			
EPHw19-32	24500	250 µg/L	22100	111	70-130			
Surrogate: 2-Methylnonane (EPH/F2-4)	4150	µg/L	4400	94	60-140			
LCS Dup (B2I2865-BSD2)			Prepared: 2022	2-09-25, Analyze	ed: 2022-09	-25		
EPHw10-19	17400	250 µg/L	15400	113	70-130	3	20	
EPHw19-32	25300	250 µg/L	22100	114	70-130	3	20	
Surrogate: 2-Methylnonane (EPH/F2-4)	4310	µg/L	4400	98	60-140			

Dissolved Metals, Batch B2l2801

Blank (B2I2801-BLK1)			Prepared: 2022-09-25, Analyzed: 2022-09-25
Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Antimony, dissolved	< 0.00020	0.00020 mg/L	
Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Barium, dissolved	< 0.0050	0.0050 mg/L	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Boron, dissolved	< 0.0500	0.0500 mg/L	
Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Chromium, dissolved	< 0.00050	0.00050 mg/L	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Copper, dissolved	< 0.00040	0.00040 mg/L	
Iron, dissolved	< 0.010	0.010 mg/L	
Lead, dissolved	< 0.00020	0.00020 mg/L	
Lithium, dissolved	< 0.00010	0.00010 mg/L	
Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Manganese, dissolved	< 0.00020	0.00020 mg/L	
Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Nickel, dissolved	< 0.00040	0.00040 mg/L	
Phosphorus, dissolved	< 0.050	0.050 mg/L	
Potassium, dissolved	< 0.10	0.10 mg/L	
Selenium, dissolved	< 0.00050	0.00050 mg/L	
Silicon, dissolved	< 1.0	1.0 mg/L	
Silver, dissolved	< 0.000050	0.000050 mg/L	
Sodium, dissolved	< 0.10	0.10 mg/L	
Strontium, dissolved	< 0.0010	0.0010 mg/L	
Sulfur, dissolved	< 3.0	3.0 mg/L	
Tellurium, dissolved	< 0.00050	0.00050 mg/L	
Thallium, dissolved	< 0.000020	0.000020 mg/L	
Thorium, dissolved	< 0.00010	0.00010 mg/L	
Tin, dissolved	< 0.00020	0.00020 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-	22128 2022	357 -10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
Dissolved Metals, B	atch B2l2801, Contin	ued								
Blank (B2I2801-BLK	(1), Continued			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Titanium, dissolved		< 0.0050	0.0050 mg/L							
Tungsten, dissolved		< 0.0010	0.0010 mg/L							
Uranium, dissolved		< 0.000020	0.000020 mg/L							
Vanadium, dissolved		< 0.0050	0.0050 mg/L							
Zinc, dissolved		< 0.0040	0.0040 mg/L							
Zirconium, dissolved		< 0.00010	0.00010 mg/L							
LCS (B2I2801-BS1)				Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Aluminum, dissolved		4.03	0.0050 mg/L	4.00		101	80-120			
Antimony, dissolved		0.0408	0.00020 mg/L	0.0400		102	80-120			
Arsenic, dissolved		0.0422	0.00050 mg/L	0.0400		105	80-120			
Barium, dissolved		0.0398	0.0050 mg/L	0.0400		100	80-120			
Beryllium, dissolved		0.0399	0.00010 mg/L	0.0400		100	80-120			
Bismuth, dissolved		0.0397	0.00010 mg/L	0.0400		99	80-120			
Boron, dissolved		< 0.0500	0.0500 mg/L	0.0400		102	80-120			
Cadmium, dissolved		0.0405	0.000010 mg/L	0.0400		102	80-120			
Calcium, dissolved, dis	solved	4.02	0.20 mg/L	4.00		101	80-120			
Chromium, dissolved, dis	Solveu	0.0412	0.00050 mg/L	0.0400		101	80-120			
			0.00010 mg/L			103				
Cobalt, dissolved		0.0407	0.00040 mg/L	0.0400		102	80-120 80-120			
Copper, dissolved										
Iron, dissolved		4.08	0.010 mg/L	4.00		102	80-120			
Lead, dissolved		0.0403	0.00020 mg/L	0.0400		101	80-120			
Lithium, dissolved		0.0400	0.00010 mg/L	0.0400		100	80-120			
Magnesium, dissolved,	dissolved	4.17	0.010 mg/L	4.00		104	80-120			
Manganese, dissolved		0.0407	0.00020 mg/L	0.0400		102	80-120			
Molybdenum, dissolved	1	0.0395	0.00010 mg/L	0.0400		99	80-120			
Nickel, dissolved		0.0407	0.00040 mg/L	0.0400		102	80-120			
Phosphorus, dissolved		4.05	0.050 mg/L	4.00		101	80-120			
Potassium, dissolved		4.08	0.10 mg/L	4.00		102	80-120			
Selenium, dissolved		0.0409	0.00050 mg/L	0.0400		102	80-120			
Silicon, dissolved		4.2	1.0 mg/L	4.00		104	80-120			
Silver, dissolved		0.0409	0.000050 mg/L	0.0400		102	80-120			
Sodium, dissolved		4.00	0.10 mg/L	4.00		100	80-120			
Strontium, dissolved		0.0417	0.0010 mg/L	0.0400		104	80-120			
Sulfur, dissolved		41.0	3.0 mg/L	40.0		103	80-120			
Tellurium, dissolved		0.0398	0.00050 mg/L	0.0400		99	80-120			
Thallium, dissolved		0.0398	0.000020 mg/L	0.0400		99	80-120			
Thorium, dissolved		0.0408	0.00010 mg/L	0.0400		102	80-120			
Tin, dissolved		0.0410	0.00020 mg/L	0.0400		103	80-120			
Titanium, dissolved		0.0392	0.0050 mg/L	0.0400		98	80-120			
Tungsten, dissolved		0.0399	0.0010 mg/L	0.0400		100	80-120			
Uranium, dissolved		0.0401	0.000020 mg/L	0.0400		100	80-120			
Vanadium, dissolved		0.0410	0.0050 mg/L	0.0400		102	80-120			
,										
Zinc, dissolved		0.0396	0.0040 mg/L	0.0400		99	80-120			

Dissolved Metals, Batch B2l2968

Blank (B2I2968-BLK1)			Prepared: 2022-09-26, Analyzed: 2022-09-27
Mercury, dissolved	< 0.000010	0.000010 mg/L	
Blank (B2l2968-BLK2)			Prepared: 2022-09-26, Analyzed: 2022-09-27
Mercury, dissolved	< 0.000010	0.000010 mg/L	
Blank (B2l2968-BLK3)			Prepared: 2022-09-26, Analyzed: 2022-09-27
Mercury, dissolved	< 0.000010	0.000010 mg/L	

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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK (REPOR		2212 2022	857 2-10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
Dissolved Metals, I	Batch B2l2968, Contin	ued								
Blank (B2I2968-BL	K4)			Prepared:	2022-09-26	, Analyzeo	d: 2022-0	9-27		
Mercury, dissolved		< 0.000010	0.000010 mg/L							
LCS (B2I2968-BS1))			Prepared:	2022-09-26	, Analyzed	d: 2022-0	9-27		
Mercury, dissolved		0.000487	0.000010 mg/L	0.000500		97	80-120			
LCS (B2I2968-BS2)				Prepared:	2022-09-26	, Analyzed	d: 2022-0	9-27		
Mercury, dissolved		0.000492	0.000010 mg/L	0.000500		98	80-120			
LCS (B2I2968-BS3)				Prepared:	2022-09-26	. Analvzed	d: 2022-0	9-27		
Mercury, dissolved	·	0.000490	0.000010 mg/L	0.000500		98	80-120			
LCS (B2I2968-BS4)				Prenared	2022-09-26	Analyzed	1. 2022-0	9-27		
Mercury, dissolved		0.000490	0.000010 mg/L	0.000500	2022 00 20	98	80-120	0 21		
Duplicate (B2I2968					2022-09-26			0.27		
Mercury, dissolved	-DUF3)	< 0.000010	0.000010 mg/L	Flepaleu.	< 0.000010	, Analyzed	1. 2022-0	9-21	20	
				Deserved		A		0.07	20	
Matrix Spike (B2l2	968-MS3)		ource: 22l2857-01	•	2022-09-26			9-27		
Mercury, dissolved		0.000238	0.000010 mg/L	0.000250	< 0.000010	95	70-130			
Blank (B2I2506-BL Carbon, Total Organic		< 0.50	0.50 mg/L	Prepared:	2022-09-26	, Analyzeo	1: 2022-0	9-26		
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
Blank (B2I2506-BL				Prepared:	2022-09-26	, Analyzeo	d: 2022-0	9-26		
Carbon, Total Organic Carbon, Dissolved Org		< 0.50 < 0.50	0.50 mg/L 0.50 mg/L							
	-	< 0.50	0.00 mg/L	Duenened	0000 00 00	Analyza	4. 2022 0	0.00		
Blank (B2I2506-BL Carbon, Total Organic	,	< 0.50	0.50 mg/L	Prepared:	2022-09-26	, Analyzed	1: 2022-0	9-20		
Carbon, Total Organic Carbon, Dissolved Org		< 0.50	0.50 mg/L							
Blank (B2I2506-BL	-			Prepared:	2022-09-26	, Analyzed	1: 2022-0	9-26		
Carbon, Total Organic	•	< 0.50	0.50 mg/L	•						
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
Blank (B2I2506-BL	K5)			Prepared:	2022-09-26	, Analyzeo	d: 2022-0	9-26		
Carbon, Total Organic		< 0.50	0.50 mg/L							
Carbon, Dissolved Or	ganic	< 0.50	0.50 mg/L							
LCS (B2I2506-BS1)				Prepared:	2022-09-26	, Analyzeo	d: 2022-0	9-26		
Carbon, Total Organic		10.4	0.50 mg/L	10.0		104	78-116			
Carbon, Dissolved Or	ganic	10.4	0.50 mg/L	10.0		104	78-116			
LCS (B2I2506-BS2)				-	2022-09-26			9-26		
Carbon, Total Organic Carbon, Dissolved Org		10.1 9.97	0.50 mg/L 0.50 mg/L	10.0		101 100	78-116 78-116			
Carbon, Dissolved Ol	yanic	9.91	0.50 mg/L	10.0				0.00		
I CS (BOIDENE DOD				Dronarad	2022.00.26	Analyza	1. 2022 0			
LCS (B2I2506-BS3)		10.1	0.50 mg/l		2022-09-26			9-26		
LCS (B2I2506-BS3) Carbon, Total Organic Carbon, Dissolved Org	;	10.1 9.98	0.50 mg/L 0.50 mg/L	Prepared: 10.0 10.0	2022-09-26	, Analyzeo 101 100	1: 2022-0 78-116 78-116	9-26		
Carbon, Total Organic Carbon, Dissolved Org	ganic		•	10.0 10.0		101 100	78-116 78-116			
Carbon, Total Organic	: ganic)		•	10.0 10.0	2022-09-26 2022-09-26	101 100	78-116 78-116			



REPORTED TO Elk River Alliance PROJECT CBWM-2022					WORK REPOF	ORDER RTED	2212 2022	857 2-10-31	14:20
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B2l2506, Cont	inued								
LCS (B2I2506-BS5)			Prepared	: 2022-09-2	6, Analyze	ed: 2022-09	-26		
Carbon, Total Organic	10.5	0.50 mg/L	10.0		105	78-116			
Carbon, Dissolved Organic	10.5	0.50 mg/L	10.0		105	78-116			
General Parameters, Batch B2l2570									
Blank (B2I2570-BLK1)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-09	-27		
BOD, 5-day	< 2.0	2.0 mg/L							
LCS (B2I2570-BS1)			Prepared	: 2022-09-2	2, Analyze	ed: 2022-09	-27		
BOD, 5-day	185	56.4 mg/L	198		93	85-115			
General Parameters, Batch B2l2705									
Blank (B2l2705-BLK1)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	< 0.050	0.050 mg/L							
Blank (B2I2705-BLK2)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	< 0.050	0.050 mg/L							
Blank (B2I2705-BLK3)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	< 0.050	0.050 mg/L							
Blank (B2I2705-BLK4)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	< 0.050	0.050 mg/L							
LCS (B2I2705-BS1)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	0.984	0.050 mg/L	1.00		98	90-115			
LCS (B2I2705-BS2)			Prepared	: 2022-09-2	3, Analyze	ed: 2022-09	-23		
Ammonia, Total (as N)	0.996	0.050 mg/L	1.00		100	90-115			
LCS (B2I2705-BS3)			Prepared	: 2022-09-2	3. Analvze	ed: 2022-09	-23		
Ammonia, Total (as N)	0.985	0.050 mg/L	1.00		98	90-115			
LCS (B2I2705-BS4)			Prepared	1: 2022-09-2	3. Analvze	ed: 2022-09	-23		
Ammonia, Total (as N)	0.978	0.050 mg/L	1.00		98	90-115			
General Parameters, Batch B2l2861									
Blank (B2I2861-BLK1)			Prepared	1: 2022-09-2	5, Analyze	ed: 2022-09	-25		
Chemical Oxygen Demand	< 20	20 mg/L							
LCS (B2I2861-BS1)			Prepared	: 2022-09-2	5, Analyze	ed: 2022-09	-25		
Chemical Oxygen Demand	517	20 mg/L	500		103	89-115			
General Parameters, Batch B2l2873									
Blank (B2l2873-BLK1)			Prepared	: 2022-09-2	5, Analyze	ed: 2022-09	-25		
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3) Alkalinity, Bicarbonate (as CaCO3)	< 1.0 < 1.0	1.0 mg/L 1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Blank (B2I2873-BLK2)			Prepared	: 2022-09-2	5, Analyze	ed: 2022-09	-25		
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L						De	ge 14 of
	Са	ring About Re <mark>su</mark>	ılts, Obviou	ısly.				Pa	ige 14



REPORTED TO	Elk River Alliance					WORK	ORDER	2212	857	
ROJECT	CBWM-2022					REPOR	TED	2022	2-10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
eneral Parameter	s, Batch B2l2873, Conti	inued								
Blank (B2I2873-BL	.K2), Continued			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Alkalinity, Phenolphth	alein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonat	e (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate	(as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide	(as CaCO3)	< 1.0	1.0 mg/L							
Blank (B2l2873-BL	.K3)			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Alkalinity, Total (as C	aCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphth	alein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonat	e (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate	(as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide	(as CaCO3)	< 1.0	1.0 mg/L							
LCS (B2I2873-BS1)			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Alkalinity, Total (as Ca	•	114	1.0 mg/L	100		114	80-120			
LCS (B2I2873-BS2)			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Alkalinity, Total (as C	aCO3)	116	1.0 mg/L	100		116	80-120			
LCS (B2I2873-BS3)			Prepared	: 2022-09-2	5, Analyze	d: 2022-0	9-25		
Alkalinity, Total (as C	aCO3)	117	1.0 mg/L	100		117	80-120			
General Parameter	s, Batch B2l2923									
Blank (B2l2923-BL	.K1)			Prepared	: 2022-09-2	6. Analvze	d: 2022-0	9-26		
Solids, Total Suspend	•	< 2.0	2.0 mg/L	·		-, ,				
LCS (B2I2923-BS1				Prepared	: 2022-09-2	6 Analyze	d [.] 2022-0	9-26		
Solids, Total Suspend		100	10.0 mg/L	100		100	85-115			
Seneral Devenuetor	a Batah Balanna									
General Parameter										
Blank (B2I2999-BL	•			Prepared	: 2022-09-2	6, Analyze	d: 2022-0	9-28		
Nitrogen, Total Kjelda	hl	< 0.050	0.050 mg/L							
Blank (B2I2999-BL	,			Prepared	: 2022-09-2	6, Analyze	d: 2022-0	9-28		
Nitrogen, Total Kjelda	hl	< 0.050	0.050 mg/L							
LCS (B2I2999-BS1)			Prepared	: 2022-09-2	6, Analyze	d: 2022-0	9-28		
Nitrogen, Total Kjelda	hl	0.978	0.050 mg/L	1.00		98	85-115			
LCS (B2I2999-BS2)			Prepared	: 2022-09-2	6, Analyze	d: 2022-0	9-28		
Nitrogen, Total Kjelda	bl	0.969	0.050 mg/L	1.00		97	85-115			

Blank (B2I2797-BLK1)			Prepared: 2022-09-23, Analyzed: 2022-09-24
Aluminum, total	< 0.0050	0.0050 mg/L	
Antimony, total	< 0.00020	0.00020 mg/L	
Arsenic, total	< 0.00050	0.00050 mg/L	
Barium, total	< 0.0050	0.0050 mg/L	
Beryllium, total	< 0.00010	0.00010 mg/L	
Bismuth, total	< 0.00010	0.00010 mg/L	
Boron, total	< 0.0500	0.0500 mg/L	
Cadmium, total	< 0.000010	0.000010 mg/L	
Calcium, total	< 0.20	0.20 mg/L	
Chromium, total	< 0.00050	0.00050 mg/L	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR		2212 2022	857 2-10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Total Metals, Batch B2l2797, Continued

Blank (B2I2797-BLK1), Continued			Prepared: 2022	-09-23, Analyze	d: 2022-09-24	
Cobalt, total	< 0.00010	0.00010 mg/L				
Copper, total	< 0.00040	0.00040 mg/L				
Iron, total	< 0.010	0.010 mg/L				
Lead, total	< 0.00020	0.00020 mg/L				
Lithium, total	< 0.00010	0.00010 mg/L				
Magnesium, total	< 0.010	0.010 mg/L				
Manganese, total	< 0.00020	0.00020 mg/L				
Molybdenum, total	< 0.00010	0.00010 mg/L				
Nickel, total	< 0.00040	0.00040 mg/L				
Phosphorus, total	< 0.050	0.050 mg/L				
Potassium, total	< 0.10	0.10 mg/L				
Selenium, total	< 0.00050	0.00050 mg/L				
Silicon, total	< 1.0	1.0 mg/L				
Silver, total	< 0.000050	0.000050 mg/L				
Sodium, total	< 0.10	0.10 mg/L				
Strontium, total	< 0.0010	0.0010 mg/L				
Sulfur, total	< 3.0	3.0 mg/L				
Tellurium, total	< 0.00050	0.00050 mg/L				
Thallium, total	< 0.000020	0.000020 mg/L				
Thorium, total	< 0.00010	0.00010 mg/L				
Tin, total	< 0.00020	0.00020 mg/L				
Titanium, total	< 0.0050	0.0050 mg/L				
Tungsten, total	< 0.0002	0.0002 mg/L				
Uranium, total	< 0.000020	0.000020 mg/L				
Vanadium, total	< 0.0050	0.0050 mg/L				
Zinc, total	< 0.0040	0.0040 mg/L				
Zirconium, total	< 0.00010	0.00010 mg/L				
LCS (B2I2797-BS1)			Prepared: 2022	-09-23, Analyze	d: 2022-09-24	
LCS (B2l2797-BS1) Aluminum, total	4.02	0.0050 mg/L	Prepared: 2022 4.00	-09-23, Analyze 101	d: 2022-09-24 80-120	
· · · · · ·	4.02 0.0403	0.0050 mg/L 0.00020 mg/L				
Aluminum, total		v	4.00	101	80-120	
Aluminum, total Antimony, total	0.0403	0.00020 mg/L	4.00 0.0400	101 101	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total	0.0403 0.0420	0.00020 mg/L 0.00050 mg/L	4.00 0.0400 0.0400	101 101 105	80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total	0.0403 0.0420 0.0388	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400	101 101 105 97	80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total	0.0403 0.0420 0.0388 0.0388	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97	80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total	0.0403 0.0420 0.0388 0.0388 0.0388	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97 97 98	80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total	0.0403 0.0420 0.0388 0.0388 0.0390 < 0.0500 0.0403 3.97	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.20 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00	101 101 105 97 97 98 99 101 99	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.20 mg/L 0.00050 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400	101 101 105 97 97 98 99 101 99 102	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total	0.0403 0.0420 0.0388 0.0388 0.0390 < 0.0500 0.0403 3.97	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.20 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00	101 101 105 97 97 98 99 101 99	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.20 mg/L 0.00050 mg/L 0.00010 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97 98 99 101 99 102	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Chromium, total Cobalt, total Copper, total Iron, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.0500 mg/L 0.000010 mg/L 0.20 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 0.0400 4.00	101 101 105 97 97 98 99 101 99 102 101 100 101	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.0500 mg/L 0.00010 mg/L 0.20 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.010 mg/L 0.00020 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 4.00 0.0400	101 101 105 97 97 98 99 101 99 102 101 100	80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Iron, total Lead, total Lithium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00020 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97 98 99 99 101 101 102 101 100 101 99 99 96	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Iron, total Lead, total Lithium, total Magnesium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.000010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00020 mg/L 0.00010 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 97 98 99 101 99 102 101 100 101 99 99 96 103	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Iron, total Lead, total Lithium, total Magnesium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0394 0.0382 4.12 0.0405	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00040 mg/L 0.010 mg/L 0.00020 mg/L 0.010 mg/L 0.010 mg/L 0.010 mg/L 0.010 mg/L 0.00020 mg/L	4.00 0.0400 4.00 0.0400	101 101 105 97 97 98 99 99 101 101 102 101 100 101 100 101 99 96 103 101	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Manganese, total Molybdenum, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0405 0.0397	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00020 mg/L 0.00010 mg/L 0.00020 mg/L 0.00020 mg/L 0.00020 mg/L 0.00020 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97 98 99 99 101 99 102 101 100 101 100 101 99 96 103 101 99	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Malgesium, total Molybdenum, total Nickel, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0405 0.0397 0.0398	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00020 mg/L 0.00010 mg/L 0.00020 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400	101 101 105 97 97 98 99 101 101 99 102 101 100 101 100 101 99 96 103 101 99 99 99	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Marganese, total Molybdenum, total Nickel, total Phosphorus, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0382 4.12 0.0405 0.0397 0.0398	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 97 98 99 101 99 102 101 101 100 101 100 101 101 99 96 103 101 99 99 90 100	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Marganese, total Nickel, total Phosphorus, total Potassium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0382 4.12 0.0405 0.0397 0.0398 4.00	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00010 mg/L 0.00040 mg/L 0.00010 mg/L 0.00010 mg/L 0.00020 mg/L 0.00020 mg/L 0.00020 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 97 98 99 101 99 102 101 101 100 101 100 101 99 96 103 101 99 99 90 100	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Manganese, total Nolybdenum, total Phosphorus, total Potassium, total Selenium, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 4.05 0.0394 4.12 0.0405 0.0397 0.0398 4.00	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00010 mg/L 0.00020 mg/L 0.00010 mg/L 0.00010 mg/L 0.00020 mg/L 0.00020 mg/L 0.00020 mg/L 0.00010 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 98 99 101 99 101 99 102 101 100 101 99 102 101 99 96 103 101 99 96 103 101 99 90 101 102 100 102	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Molybdenum, total Nickel, total Phosphorus, total Potassium, total Selenium, total Silicon, total	0.0403 0.0420 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0405 0.0394 0.0382 4.12	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00050 mg/L 0.10 mg/L 0.00050 mg/L 0.00050 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 4.00 4.00 4.00 4.00	101 101 105 97 97 98 99 101 99 102 101 100 101 99 102 101 99 96 103 101 99 96 103 101 99 99 100 102 100 102 100 102	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Molybdenum, total Nickel, total Phosphorus, total Selenium, total Silicon, total Siliver, total	0.0403 0.0420 0.0388 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.15 0.0394 0.0382 4.12 0.0397 0.0398 4.00 4.07 0.0398 4.1 0.0398 4.1	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00020 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 1.0 mg/L 0.00050 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 98 99 101 99 101 99 102 101 100 101 99 102 101 99 96 103 101 99 96 103 101 99 99 100 102 100 102 100 102 101	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Magnese, total Molybdenum, total Nickel, total Phosphorus, total Selenium, total Silicon, total Siliver, total Sodium, total	0.0403 0.0420 0.0388 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.12 0.0405 0.0397 0.0398 4.00 4.07 0.0398 4.01 0.0398 4.11 0.0406 4.02	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00050 mg/L 1.0 mg/L 0.000050 mg/L 0.00050 mg/L 0.00050 mg/L 0.00050 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00	101 101 105 97 98 99 101 99 101 99 102 101 100 101 99 96 103 101 99 96 103 101 99 99 100 102 100 102 101 102 101 102 101 102	80-120 80-120	
Aluminum, total Antimony, total Arsenic, total Barium, total Beryllium, total Bismuth, total Boron, total Cadmium, total Cadmium, total Calcium, total Chromium, total Cobalt, total Copper, total Iron, total Lead, total Lithium, total Magnesium, total Molybdenum, total Nickel, total Phosphorus, total Selenium, total Silicon, total Siliver, total	0.0403 0.0420 0.0388 0.0388 0.0390 < 0.0500 0.0403 3.97 0.0409 0.0405 0.0399 4.05 0.0394 0.0382 4.15 0.0394 0.0382 4.12 0.0397 0.0398 4.00 4.07 0.0398 4.1 0.0398 4.1	0.00020 mg/L 0.00050 mg/L 0.0050 mg/L 0.00010 mg/L 0.00010 mg/L 0.0500 mg/L 0.00010 mg/L 0.00050 mg/L 0.00050 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00020 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00010 mg/L 0.00050 mg/L 1.0 mg/L 0.00050 mg/L	4.00 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400 4.00 0.0400	101 101 105 97 98 99 101 99 101 99 102 101 100 101 99 102 101 99 96 103 101 99 96 103 101 99 99 100 102 100 102 100 102 101	80-120 80-120	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-		857 2-10-31	14:20
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
	h P212707 Continued			2010.	Rooun					

Total Metals, Batch B2l2797, Continued

LCS (B2I2797-BS1), Continued	Prepared: 2022-09-23, Analyzed: 2022-09-24							
Tellurium, total	0.0384	0.00050 mg/L	0.0400	96	80-120			
Thallium, total	0.0393	0.000020 mg/L	0.0400	98	80-120			
Thorium, total	0.0392	0.00010 mg/L	0.0400	98	80-120			
Tin, total	0.0403	0.00020 mg/L	0.0400	101	80-120			
Titanium, total	0.0402	0.0050 mg/L	0.0400	100	80-120			
Tungsten, total	0.0402	0.0002 mg/L	0.0400	100	80-120			
Uranium, total	0.0404	0.000020 mg/L	0.0400	101	80-120			
Vanadium, total	0.0397	0.0050 mg/L	0.0400	99	80-120			
Zinc, total	0.0401	0.0040 mg/L	0.0400	100	80-120			
Zirconium, total	0.0405	0.00010 mg/L	0.0400	101	80-120			

Total Metals, Batch B2l2969

Blank (B2I2969-BLK1)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	< 0.000010	0.000010 mg/L		
Blank (B2l2969-BLK2)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	< 0.000010	0.000010 mg/L		
Blank (B2l2969-BLK3)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	< 0.000010	0.000010 mg/L		
Blank (B2l2969-BLK4)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	< 0.000010	0.000010 mg/L		
LCS (B2I2969-BS1)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	0.000481	0.000010 mg/L	0.000500 96 80-120	
LCS (B2I2969-BS2)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	0.000473	0.000010 mg/L	0.000500 95 80-120	
LCS (B2I2969-BS3)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	0.000464	0.000010 mg/L	0.000500 93 80-120	
LCS (B2I2969-BS4)			Prepared: 2022-09-26, Analyzed: 2022-09-27	
Mercury, total	0.000463	0.000010 mg/L	0.000500 93 80-120	



CERTIFICATE OF ANALYSIS

REPORTED TO	Elk River Alliance PO Box 2095, 1111 2nd Ave Fernie, BC V0B1M0		
ATTENTION	Kaileigh McCallum	WORK ORDER	2211636
PO NUMBER PROJECT PROJECT INFO	CBWM-2022 [info]	RECEIVED / TEMP REPORTED COC NUMBER	2022-09-13 14:00 / 6.4°C 2022-09-20 12:57 B122576

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

We've Got Chemistry

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too. It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

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Ahead of the Curve

research, Through regulation and instrumentation, knowledge, we are your analytical centre the for knowledge technical you need, BEFORE you need it, so you can stay up to date and in the know.

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If you have any questions or concerns, please contact me at TeamCaro@caro.ca

Authorized By:

Team CARO Client Service Representative

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4



REPORTED TOElk River AlliancePROJECTCBWM-2022				WORK ORDER REPORTED	2211636 2022-09-2	0 12:57
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
MOR001-20220911-1536 (22I1636-01) M	atrix: Water Sam	pled: 2022-09-11 1	5:36			
Anions						
Chloride	3.39	AO ≤ 250	0.10	mg/L	2022-09-17	
Nitrate (as N)	< 0.010	MAC = 10	0.010	-	2022-09-17	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010		2022-09-17	HT1
Phosphate (as P)	0.0097	N/A	0.0050	mg/L	2022-09-17	HT1
Sulfate	8.2	AO ≤ 500		mg/L	2022-09-17	
BCMOE Aggregate Hydrocarbons						
EPHw10-19	< 250	N/A	250	µg/L	2022-09-16	
EPHw19-32	< 250	N/A	250	µg/L	2022-09-16	
Surrogate: 2-Methylnonane (EPH/F2-4)	91		60-140		2022-09-16	
Calculated Parameters						
Hardness, Total (as CaCO3)	139	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	0.0670	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-17	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-17	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-17	
Barium, dissolved	0.170	N/A	0.0050	mg/L	2022-09-17	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-17	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-17	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2022-09-17	
Cadmium, dissolved	0.000022	N/A	0.000010	mg/L	2022-09-17	
Calcium, dissolved	40.3	N/A	0.20	mg/L	2022-09-17	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-17	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-17	
Copper, dissolved	0.00042	N/A	0.00040	mg/L	2022-09-17	
Iron, dissolved	< 0.010	N/A	0.010		2022-09-17	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-17	
Lithium, dissolved	0.00381	N/A	0.00010	mg/L	2022-09-17	
Magnesium, dissolved	9.27	N/A	0.010	mg/L	2022-09-17	
Manganese, dissolved	0.00591	N/A	0.00020	-	2022-09-17	
Mercury, dissolved	< 0.000010	N/A	0.000010	-	2022-09-16	
Molybdenum, dissolved	0.00079	N/A	0.00010		2022-09-17	
Nickel, dissolved	< 0.00040	N/A	0.00040		2022-09-17	
Phosphorus, dissolved	< 0.050	N/A	0.050	-	2022-09-17	
Potassium, dissolved	0.68	N/A		mg/L	2022-09-17	
Selenium, dissolved	< 0.00050	N/A	0.00050	-	2022-09-17	
Silicon, dissolved	2.0	N/A		mg/L	2022-09-17	
Silver, dissolved	< 0.000050	N/A	0.000050	-	2022-09-17	
Sodium, dissolved	2.06	N/A		mg/L	2022-09-17	
Strontium, dissolved	0.157	N/A	0.0010	mg/L	2022-09-17	



EPORTED TOElk River AllianceROJECTCBWM-2022				WORK ORDER REPORTED	22I1636 2022-09-2	20 12:57
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
IOR001-20220911-1536 (22I1636-01) N	latrix: Water Sam	pled: 2022-09-11 1	5:36, Continu	ied		
issolved Metals, Continued						
Sulfur, dissolved	< 3.0	N/A	3.0	mg/L	2022-09-17	
Tellurium, dissolved	< 0.00050	N/A	0.00050		2022-09-17	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2022-09-17	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-17	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-17	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-17	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2022-09-17	
Uranium, dissolved	0.000424	N/A	0.000020	mg/L	2022-09-17	
Vanadium, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-17	
Zinc, dissolved	< 0.0040	N/A	0.0040		2022-09-17	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-17	
eneral Parameters						
Alkalinity, Total (as CaCO3)	154	N/A	1.0	mg/L	2022-09-18	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-18	
Alkalinity, Bicarbonate (as CaCO3)	154	N/A	1.0	•	2022-09-18	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0		2022-09-18	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A		mg/L	2022-09-18	
BOD, 5-day	< 5.6	N/A		mg/L	2022-09-10	
Carbon, Total Organic	1.68	N/A		mg/L	2022-09-19	
Carbon, Dissolved Organic	1.59	N/A		mg/L	2022-09-16	
Chemical Oxygen Demand	< 20	N/A		mg/L	2022-09-14	
Nitrogen, Total Kjeldahl	0.067	N/A	0.050	0	2022-09-16	
Phosphorus, Total (as P)	0.0104	N/A	0.0050	mg/L	2022-09-16	
Solids, Total Suspended	< 2.0	N/A		mg/L	2022-09-14	
otal Metals	2.0		2.0			
Aluminum, total	0.0175	OG < 0.1	0.0050	ma/L	2022-09-18	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	-	2022-09-18	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	0	2022-09-18	
Barium, total	0.166	MAC = 2	0.0050	-	2022-09-18	
Beryllium, total	< 0.00010	N/A	0.00010	-	2022-09-18	
Bismuth, total	< 0.00010	N/A	0.00010	-	2022-09-18	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2022-09-18	
Cadmium, total	0.000022	MAC = 0.005	0.000010	-	2022-09-18	
Calcium, total	39.5	None Required	0.20	-	2022-09-18	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	0	2022-09-18	
Cobalt, total	< 0.00010	N/A	0.00010	-	2022-09-18	
Copper, total	0.00046	MAC = 2	0.00040	-	2022-09-18	
Iron, total	0.018	AO ≤ 0.3	0.010	0	2022-09-18	
Lead, total	< 0.00020	MAC = 0.005	0.00020	0	2022-09-18	
Lithium, total	0.00348	N/A	0.00010	-	2022-09-18	
Magnesium, total	8.90	None Required	0.010	-	2022-09-18	



				1. S.			
REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I1636 2022-09-2	0 12:57
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
MOR001-2022091	11-1536 (22l1636-01) Ma	atrix: Water Sam	pled: 2022-09-11 15	i:36, Continu	ied		
Total Metals, Conti	nued						
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-17	
Molybdenum, tota	l	0.00077	N/A	0.00010	mg/L	2022-09-18	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-18	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-18	
Potassium, total		0.66	N/A	0.10	mg/L	2022-09-18	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-18	
Silicon, total		1.9	N/A	1.0	mg/L	2022-09-18	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-09-18	
Sodium, total		2.00	AO ≤ 200	0.10	mg/L	2022-09-18	
Strontium, total		0.152	MAC = 7	0.0010	mg/L	2022-09-18	
Sulfur, total		< 3.0	N/A	3.0	mg/L	2022-09-18	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-18	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-18	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-18	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-18	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-18	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-18	
Uranium, total		0.000414	MAC = 0.02	0.000020	mg/L	2022-09-18	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-18	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-18	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-18	

MOR002-20220911-1027 (22I1636-02) | Matrix: Water | Sampled: 2022-09-11 10:27

	Caring Al	bout Results, Obvio	ously.		F	Page 4 o
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Barium, dissolved	0.164	N/A	0.0050	mg/L	2022-09-16	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-16	
Aluminum, dissolved	0.0112	N/A	0.0050	mg/L	2022-09-16	
Dissolved Metals						
Hardness, Total (as CaCO3)	58.5	None Required	0.500	mg/L	N/A	
Calculated Parameters						
Surrogate: 2-Methylnonane (EPH/F2-4)	91		60-140	%	2022-09-16	
EPHw19-32	< 250	N/A	250	µg/L	2022-09-16	
EPHw10-19	< 250	N/A	250	µg/L	2022-09-16	
3CMOE Aggregate Hydrocarbons						
Sulfate	5.8	AO ≤ 500	1.0	mg/L	2022-09-17	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2022-09-17	HT1
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2022-09-17	HT1
Chloride	2.65	AO ≤ 250	0.10	mg/L	2022-09-17	
Anions						



Carbon, Total Organic

Carbon, Dissolved Organic

REPORTED TO Elk River Alliance PROJECT CBWM-2022				WORK ORDER REPORTED	22I1636 2022-09-2	0 12:57
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifie
MOR002-20220911-1027 (22I1636-02) M	atrix: Water Samp	oled: 2022-09-11 1	0:27, Continu	ied		
Dissolved Metals, Continued						
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2022-09-16	
Cadmium, dissolved	0.000027	N/A	0.000010	mg/L	2022-09-16	
Calcium, dissolved	16.8	N/A	0.20	mg/L	2022-09-16	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2022-09-16	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2022-09-16	
Lead, dissolved	< 0.00020	N/A	0.00020		2022-09-16	
Lithium, dissolved	0.00103	N/A	0.00010		2022-09-16	
Magnesium, dissolved	3.99	N/A	0.010	mg/L	2022-09-16	
Manganese, dissolved	0.00129	N/A	0.00020	mg/L	2022-09-16	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2022-09-16	
Molybdenum, dissolved	0.00060	N/A	0.00010	mg/L	2022-09-16	
Nickel, dissolved	< 0.00040	N/A	0.00040		2022-09-16	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2022-09-16	
Potassium, dissolved	0.46	N/A		mg/L	2022-09-16	
Selenium, dissolved	< 0.00050	N/A	0.00050		2022-09-16	
Silicon, dissolved	< 1.0	N/A		mg/L	2022-09-16	
Silver, dissolved	< 0.000050	N/A	0.000050		2022-09-16	
Sodium, dissolved	1.62	N/A		mg/L	2022-09-16	
Strontium, dissolved	0.112	N/A	0.0010		2022-09-16	
Sulfur, dissolved	< 3.0	N/A		mg/L	2022-09-16	
Tellurium, dissolved	< 0.00050	N/A	0.00050	-	2022-09-16	
Thallium, dissolved	< 0.000020	N/A	0.000020	-	2022-09-16	
Thorium, dissolved	< 0.00010	N/A	0.00010	•	2022-09-16	
Tin, dissolved	< 0.00020	N/A	0.00020	-	2022-09-16	
Titanium, dissolved	< 0.0050	N/A	0.0050	-	2022-09-16	
Tungsten, dissolved	< 0.0010	N/A	0.0010	-	2022-09-16	
Uranium, dissolved	0.000182	N/A	0.000020	0	2022-09-16	
Vanadium, dissolved	< 0.0050	N/A	0.0050		2022-09-16	
Zinc, dissolved	< 0.0040	N/A	0.0040		2022-09-16	
Zirconium, dissolved	< 0.00010	N/A	0.00010	0	2022-09-16	
General Parameters				<u> </u>		
Alkalinity, Total (as CaCO3)	66.3	N/A	10	mg/L	2022-09-18	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A		mg/L	2022-09-18	
Alkalinity, Preholphinalein (as CaCO3) Alkalinity, Bicarbonate (as CaCO3)		N/A N/A		mg/L	2022-09-18	
Alkalinity, Carbonate (as CaCO3)	66.3 < 1.0	N/A N/A				
				mg/L	2022-09-18	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A		mg/L	2022-09-18	
BOD, 5-day	< 5.6	N/A		mg/L	2022-09-19	

1.75

1.70

N/A

N/A

0.50 mg/L

0.50 mg/L

2022-09-16

2022-09-16



REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I1636 2022-09-2	20 12:57
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
MOR002-2022091	1-1027 (22l1636-02) Ma	atrix: Water Sam	pled: 2022-09-11 10	:27, Continu	ied		
General Parameters	s, Continued						
Chemical Oxygen	Demand	< 20	N/A	20	mg/L	2022-09-14	
Nitrogen, Total Kje		0.132	N/A	0.050	-	2022-09-16	
Phosphorus, Total		0.0102	N/A	0.0050	mg/L	2022-09-16	
Solids, Total Suspe	. ,	5.4	N/A		mg/L	2022-09-14	
Total Metals							
Aluminum, total		0.0401	OG < 0.1	0.0050	mg/L	2022-09-18	
Antimony, total		< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-18	
Arsenic, total		< 0.00050	MAC = 0.01	0.00050	mg/L	2022-09-18	
Barium, total		0.160	MAC = 2	0.0050	mg/L	2022-09-18	
Beryllium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-18	
Bismuth, total		< 0.00010	N/A	0.00010	mg/L	2022-09-18	
Boron, total		< 0.0500	MAC = 5	0.0500	mg/L	2022-09-18	
Cadmium, total		0.000024	MAC = 0.005	0.000010	mg/L	2022-09-18	
Calcium, total		17.2	None Required	0.20	mg/L	2022-09-18	
Chromium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-18	
Cobalt, total		< 0.00010	N/A	0.00010	mg/L	2022-09-18	
Copper, total		< 0.00040	MAC = 2	0.00040	mg/L	2022-09-18	
Iron, total		0.020	AO ≤ 0.3	0.010	mg/L	2022-09-18	
Lead, total		< 0.00020	MAC = 0.005	0.00020	mg/L	2022-09-18	
Lithium, total		0.00108	N/A	0.00010	-	2022-09-18	
Magnesium, total		3.75	None Required	0.010	mg/L	2022-09-18	
Manganese, total		0.00164	MAC = 0.12	0.00020	-	2022-09-18	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	-	2022-09-17	
Molybdenum, total		0.00058	N/A	0.00010	-	2022-09-18	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-18	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-18	
Potassium, total		0.45	N/A		mg/L	2022-09-18	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	-	2022-09-18	
Silicon, total		< 1.0	N/A		mg/L	2022-09-18	
Silver, total		< 0.000050	None Required	0.000050	-	2022-09-18	
Sodium, total		1.56	AO ≤ 200		mg/L	2022-09-18	
Strontium, total		0.108	MAC = 7	0.0010	•	2022-09-18	
Sulfur, total		< 3.0	N/A		mg/L	2022-09-18	
Tellurium, total		< 0.00050	N/A	0.00050	-	2022-09-18	
Thallium, total		< 0.000020	N/A	0.000020	-	2022-09-18	
Thorium, total		< 0.00010	N/A	0.00010	-	2022-09-18	
Tin, total		< 0.00020	N/A	0.00020	-	2022-09-18	
Titanium, total		< 0.0050	N/A	0.0050	-	2022-09-18	
Tungsten, total		< 0.0002	N/A	0.0002	-	2022-09-18	
Uranium, total		0.000183	MAC = 0.02	0.000020	-	2022-09-10	
Vanadium, total		< 0.0050	N/A	0.00020	-	2022-09-10	
vanadium, iotai		- 0.0000	11/7	0.0000	mg/L	2022-03-10	



REPORTED TOElk River AlliandPROJECTCBWM-2022	e			WORK ORDER REPORTED	2211636 2022-09-2	20 12:57
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MOR002-20220911-1027 (22I1636-	02) Matrix: Water Sam	pled: 2022-09-11 10	0:27, Continu	ed		
Total Metals, Continued						
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2022-09-18	
FLD001-20220911-1536 (22l1636-0	3) Matrix: Water Samp	oled: 2022-09-11 15	:36			
Anions						
Chloride	0.93	AO ≤ 250	0.10	mg/L	2022-09-16	
Nitrate (as N)	0.012	MAC = 10	0.010	-	2022-09-16	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010		2022-09-16	HT1
Phosphate (as P)	< 0.0050	N/A	0.0050	-	2022-09-16	HT1
Sulfate	13.8	AO ≤ 500		mg/L	2022-09-16	
BCMOE Aggregate Hydrocarbons						
EPHw10-19	< 250	N/A	250	µg/L	2022-09-16	
EPHw19-32	< 250	N/A		µg/L	2022-09-16	
Surrogate: 2-Methylnonane (EPH/F2-		14/7 (60-140	%	2022-09-16	
Calculated Parameters Hardness, Total (as CaCO3)	< 0.500	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.0117	N/A	0.0100		N/A	
Nitrogen, Total	0.0917	N/A	0.0500		N/A	
Dissolved Metals				-		
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-16	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2022-09-16	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Barium, dissolved	< 0.0050	N/A	0.0050	mg/L	2022-09-16	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2022-09-16	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2022-09-16	
Calcium, dissolved	< 0.20	N/A	0.20	mg/L	2022-09-16	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Cobalt, dissolved	< 0.00010	N/A	0.00010		2022-09-16	
Copper, dissolved	< 0.00040	N/A	0.00040		2022-09-16	
Iron, dissolved	< 0.010	N/A	0.010	-	2022-09-16	
Lead, dissolved	< 0.00020	N/A	0.00020		2022-09-16	
Lithium, dissolved	< 0.00010	N/A	0.00010		2022-09-16	
Magnesium, dissolved	< 0.010	N/A	0.010		2022-09-16	
Manganese, dissolved	< 0.00020	N/A	0.00020		2022-09-16	
Mercury, dissolved	< 0.000010	N/A	0.000010	-	2022-09-16	
Molybdenum, dissolved	< 0.00010	N/A	0.00010		2022-09-16	
Nickel, dissolved	< 0.00040	N/A	0.00040	•	2022-09-16	
Phosphorus, dissolved	< 0.050	N/A	0.050		2022-09-16	
Potassium, dissolved	< 0.10	N/A	0.10	mg/L	2022-09-16	Page 7 of



Chromium, total

Cobalt, total

Copper, total

REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22I1636 2022-09-2	0 12:57
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifie
FLD001-20220911	1-1536 (22l1636-03) Ma	ntrix: Water Samp	oled: 2022-09-11 15	:36, Continu	ed		
Dissolved Metals, (Continued						
Selenium, dissolve	ed	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Silicon, dissolved		< 1.0	N/A	1.0	mg/L	2022-09-16	
Silver, dissolved		< 0.000050	N/A	0.000050	mg/L	2022-09-16	
Sodium, dissolved	1	< 0.10	N/A	0.10	mg/L	2022-09-16	
Strontium, dissolve	ed	< 0.0010	N/A	0.0010	mg/L	2022-09-16	
Sulfur, dissolved		< 3.0	N/A	3.0	mg/L	2022-09-16	
Tellurium, dissolve	ed	< 0.00050	N/A	0.00050	mg/L	2022-09-16	
Thallium, dissolve	d	< 0.000020	N/A	0.000020	mg/L	2022-09-16	
Thorium, dissolved	d	< 0.00010	N/A	0.00010	mg/L	2022-09-16	
Tin, dissolved		< 0.00020	N/A	0.00020	mg/L	2022-09-16	
Titanium, dissolve	d	< 0.0050	N/A	0.0050	mg/L	2022-09-16	
Tungsten, dissolve	ed	< 0.0010	N/A	0.0010	-	2022-09-16	
Uranium, dissolve		< 0.000020	N/A	0.000020	mg/L	2022-09-16	
Vanadium, dissolv	red	< 0.0050	N/A	0.0050		2022-09-16	
Zinc, dissolved		< 0.0040	N/A	0.0040	0	2022-09-16	
Zirconium, dissolv	ed	< 0.00010	N/A	0.00010	0	2022-09-16	
General Parameter							
Alkalinity, Total (as	s CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-18	
Alkalinity, Phenolp	hthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-18	
Alkalinity, Bicarbor	nate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-18	
Alkalinity, Carbona		< 1.0	N/A		mg/L	2022-09-18	
Alkalinity, Hydroxid		< 1.0	N/A		mg/L	2022-09-18	
BOD, 5-day	. ,	< 5.6	N/A		mg/L	2022-09-19	
Carbon, Total Orga	anic	0.81	N/A		mg/L	2022-09-16	
Carbon, Dissolved		< 0.50	N/A		mg/L	2022-09-16	
Chemical Oxygen	-	< 20	N/A		mg/L	2022-09-14	
Nitrogen, Total Kje		0.080	N/A	0.050		2022-09-16	
Phosphorus, Total		0.0067	N/A	0.0050	-	2022-09-16	
Solids, Total Susp	· · /	< 2.0	N/A		mg/L	2022-09-16	
Total Metals							
Aluminum, total		0.0080	OG < 0.1	0.0050	mg/L	2022-09-15	
Antimony, total		< 0.00020	MAC = 0.006	0.00020	-	2022-09-15	
Arsenic, total		< 0.00050	MAC = 0.01	0.00050	-	2022-09-15	
Barium, total		< 0.0050	MAC = 2	0.0050	-	2022-09-15	
Beryllium, total		< 0.00010	N/A	0.00010		2022-09-15	
Bismuth, total		< 0.00010	N/A	0.00010	-	2022-09-15	
Boron, total		< 0.0500	MAC = 5	0.0500	-	2022-09-15	
Cadmium, total		< 0.000010	MAC = 0.005	0.000010	-	2022-09-15	
Calcium, total		< 0.20	None Required		mg/L	2022-09-15	
		< 0.20		0.20		2022-09-15	

MAC = 0.05

N/A

MAC = 2

0.00050 mg/L

0.00010 mg/L

0.00040 mg/L

< 0.00050

< 0.00010

< 0.00040

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TEST RESULTS

REPORTED TO PROJECT	Elk River Alliance CBWM-2022				WORK ORDER REPORTED	22l1636 2022-09-2	0 12:57
Analyte		Result	Guideline	RL	Units	Analyzed	Qualifier
FLD001-2022091	1-1536 (22l1636-03) Ma	atrix: Water Samp	oled: 2022-09-11 15	:36, Continu	ed		
Total Metals, Conti	inued						
Iron, total		< 0.010	AO ≤ 0.3	0.010	mg/L	2022-09-15	
Lead, total		< 0.00020	MAC = 0.005	0.00020	mg/L	2022-09-15	
Lithium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-15	
Magnesium, total		< 0.010	None Required	0.010	mg/L	2022-09-15	
Manganese, total		< 0.00020	MAC = 0.12	0.00020	mg/L	2022-09-15	
Mercury, total		< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-17	
Molybdenum, tota	al	< 0.00010	N/A	0.00010	mg/L	2022-09-15	
Nickel, total		< 0.00040	N/A	0.00040	mg/L	2022-09-15	
Phosphorus, total		< 0.050	N/A	0.050	mg/L	2022-09-15	
Potassium, total		< 0.10	N/A	0.10	mg/L	2022-09-15	
Selenium, total		< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-15	
Silicon, total		< 1.0	N/A	1.0	mg/L	2022-09-15	
Silver, total		< 0.000050	None Required	0.000050	mg/L	2022-09-15	
Sodium, total		< 0.10	AO ≤ 200	0.10	mg/L	2022-09-15	
Strontium, total		< 0.0010	MAC = 7	0.0010	mg/L	2022-09-15	
Sulfur, total		< 3.0	N/A	3.0	mg/L	2022-09-15	
Tellurium, total		< 0.00050	N/A	0.00050	mg/L	2022-09-15	
Thallium, total		< 0.000020	N/A	0.000020	mg/L	2022-09-15	
Thorium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-15	
Tin, total		< 0.00020	N/A	0.00020	mg/L	2022-09-15	
Titanium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-15	
Tungsten, total		< 0.0002	N/A	0.0002	mg/L	2022-09-15	
Uranium, total		< 0.000020	MAC = 0.02	0.000020	mg/L	2022-09-15	
Vanadium, total		< 0.0050	N/A	0.0050	mg/L	2022-09-15	
Zinc, total		< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-15	
Zirconium, total		< 0.00010	N/A	0.00010	mg/L	2022-09-15	

Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.



APPENDIX 1: SUPPORTING INFORMATION

	k River Allia BWM-2022		WORK ORD REPORTED		20 12:57
Analysis Description	on	Method Ref.	Technique	Accredited	Location
Alkalinity in Water		SM 2320 B* (2017)	Titration with H2SO4	\checkmark	Kelowna
Anions in Water		SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Biochemical Oxygen D Water	Demand in	SM 5210 B (2017)	Dissolved Oxygen Meter	\checkmark	Kelowna
Carbon, Dissolved Org Water	ganic in	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	\checkmark	Kelowna
Carbon, Total Organic	in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	✓	Kelowna
Chemical Oxygen Der Water	nand in	SM 5220 D* (2017)	Closed Reflux, Colorimetry	\checkmark	Kelowna
Dissolved Metals in W	ater	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond
EPH in Water		EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	\checkmark	Richmond
Hardness in Water		SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in N	Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Mercury, total in Water	-	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	\checkmark	Richmond
Nitrogen, Total Kjeldah	nl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	\checkmark	Kelowna
Phosphorus, Total in V	Vater	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	\checkmark	Kelowna
Solids, Total Suspende Water	ed in	Solids in Water, Filtered / SM 2540 D* (2017)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water		EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	\checkmark	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Elk River Alliance
PROJECT	CBWM-2022

WORK ORDER REPORTED

22I1636 2022-09-20 12:57

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do <u>not</u> take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:TeamCaro@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



REPORTED TO	Elk River Alliance	WORK ORDER	2211636
PROJECT	CBWM-2022	REPORTED	2022-09-20 12:57

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- Duplicate (Dup): An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike	Source	% REC	REC	% RPD RPD	Qualifier
, many to	Hoodit		Level	Result	/0 IXE0	Limit	Limit	quanto

Anions, Batch B2I1570

Blank (B2I1570-BLK1)			Prepared: 202	2-09-17, Analyze	ed: 2022-09-17	
Chloride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 1.0	1.0 mg/L				
Blank (B2I1570-BLK2)			Prepared: 202	2-09-17, Analyze	ed: 2022-09-17	
Chloride	< 0.10	0.10 mg/L				
Nitrate (as N)	< 0.010	0.010 mg/L				
Nitrite (as N)	< 0.010	0.010 mg/L				
Phosphate (as P)	< 0.0050	0.0050 mg/L				
Sulfate	< 1.0	1.0 mg/L				
LCS (B2I1570-BS1)			Prepared: 202	2-09-17, Analyze	ed: 2022-09-17	
Chloride	15.8	0.10 mg/L	16.0	99	90-110	
Nitrate (as N)	4.04	0.010 mg/L	4.00	101	90-110	
Nitrite (as N)	1.94	0.010 mg/L	2.00	97	85-115	
Phosphate (as P)	1.05	0.0050 mg/L	1.00	105	80-120	
Sulfate	15.6	1.0 mg/L	16.0	97	90-110	
LCS (B2I1570-BS2)			Prepared: 202	2-09-17, Analyze	ed: 2022-09-17	
Chloride	15.8	0.10 mg/L	16.0	99	90-110	
Nitrate (as N)	4.05	0.010 mg/L	4.00	101	90-110	
	1.94	0.010 mg/L	2.00	97	85-115	
Nitrite (as N)						
Nitrite (as N) Phosphate (as P)	1.05	0.0050 mg/L	1.00	105	80-120	

BCMOE Aggregate Hydrocarbons, Batch B2I1802

Blank (B2I1802-BLK1)			Prepared: 2022	2-09-15, Analyze	ed: 2022-09-16	
EPHw10-19	< 250	250 µg/L				
EPHw19-32	< 250	250 µg/L				
Surrogate: 2-Methylnonane (EPH/F2-4)	4360	µg/L	4400	99	60-140	
LCS (B2I1802-BS2)			Prepared: 2022	2-09-15, Analyze	ed: 2022-09-16	
EPHw10-19	17600	250 µg/L	15400	114	70-130	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-		636 2-09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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BCMOE Aggregate Hydrocarbons, Batch B2I1802, Continued

LCS (B2I1802-BS2), Continued	Prepared: 2022-09-15, Analyzed: 2022-09-16							
EPHw19-32	25100	250 µg/L	22100	113	70-130			-
Surrogate: 2-Methylnonane (EPH/F2-4)	4350	μg/L	4400	99	60-140			
LCS Dup (B2I1802-BSD2)			Prepared: 2022	2-09-15, Analyze	ed: 2022-09	-16		
EPHw10-19	17300	250 µg/L	15400	112	70-130	1	20	-
EPHw19-32	24800	250 µg/L	22100	112	70-130	1	20	
Surrogate: 2-Methylnonane (EPH/F2-4)	4380	μg/L	4400	99	60-140			

Dissolved Metals, Batch B2I1705

Auminy, disolved < 0.0050 0.0080 mgL Arsenic, dissolved < 0.0050 0.0080 mgL Barium, dissolved < 0.0050 0.0080 mgL Barium, dissolved < 0.0001 0.00810 mgL Barium, dissolved < 0.0001 0.00810 mgL Barnut, dissolved < 0.0001 0.00010 mgL Cadmium, dissolved < 0.0001 0.00010 mgL Cadmium, dissolved < 0.0001 0.00010 mgL Cadmium, dissolved, dissolved < 0.0001 0.00010 mgL Coper, dissolved < 0.0001 0.00010 mgL Coper, dissolved < 0.0001 0.00010 mgL Lead, dissolved < 0.0001 0.00010 mgL Lead, dissolved < 0.0001 0.00010 mgL Mappanee, dissolved < 0.0001 0.0001 Mappanee, dissolved < 0.0001 0.0001 Mappanee, dissolved < 0.0000 0.0001 Koldenum, dissolved < 0.0000 0.0001 Mappanee, dissolved < 0.0000 0.0001 Solue, dissolved < 0.0000 0.00000 <th>Blank (B2I1705-BLK1)</th> <th></th> <th></th> <th>Prepared: 2022-09-16, Analyzed: 2022-09-16</th>	Blank (B2I1705-BLK1)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Antimory, dissolved < 0.00020	Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Barlum, dissolved < 0.0050	Antimony, dissolved	< 0.00020		
Beryllin, dissolved < 0.00010	Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Bisnuh, dissolved < 0.00010	Barium, dissolved	< 0.0050	0.0050 mg/L	
Boron, dissolved < 0.0500	Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Cadium, dissolved < 0.00010	Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Calcum, dissolved < 0.20	Boron, dissolved	< 0.0500	0.0500 mg/L	
Chromum, dissolved < 0.00050	Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Chromum, dissolved < 0.00050	Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Copper, dissolved < 0.00040 mg/L	Chromium, dissolved	< 0.00050		
Iron, dissolved < 0.010 mg/L	Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Lead, dissolved < 0.00020		< 0.00040	0.00040 mg/L	
Lithum, dissolved < 0.0010	Iron, dissolved	< 0.010	0.010 mg/L	
Magnesium, dissolved, dissolved < 0.010 mg/L Manganese, dissolved < 0.00010	Lead, dissolved	< 0.00020	0.00020 mg/L	
Marganese, dissolved < 0.00020 mg/L Molyberum, dissolved < 0.00010	Lithium, dissolved	< 0.00010	0.00010 mg/L	
Molybdenum, dissolved < 0.00010 mg/L Nickel, dissolved < 0.00040	Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Molybdenum, dissolved < 0.00010 mg/L Nickel, dissolved < 0.00040	Manganese, dissolved	< 0.00020	0.00020 mg/L	
Phosphorus, dissolved < 0.050 mg/L Potassium, dissolved < 0.00	Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Potassium, dissolved < 0.10 mg/L Selenium, dissolved < 0.00050	Nickel, dissolved	< 0.00040	0.00040 mg/L	
Selenium, dissolved < 0.00050 mg/L Silicon, dissolved < 1.0	Phosphorus, dissolved	< 0.050	0.050 mg/L	
Silicon, dissolved < 1.0 mg/L Silver, dissolved < 0.00050	Potassium, dissolved	< 0.10	0.10 mg/L	
Silver, dissolved < 0.00050 0.000050 mg/L Sodium, dissolved < 0.010	Selenium, dissolved	< 0.00050	0.00050 mg/L	
Sodium, dissolved < 0.10 mg/L Strontum, dissolved < 0.0010	Silicon, dissolved	< 1.0	1.0 mg/L	
Strontium, dissolved < 0.0010 0.0010 mg/L Sulfur, dissolved < 3.0	Silver, dissolved	< 0.000050	0.000050 mg/L	
Sulfur, dissolved < 3.0 3.0 mg/L Tellurium, dissolved < 0.00050	Sodium, dissolved	< 0.10	0.10 mg/L	
Tellurium, dissolved < 0.00050 mg/L Thallium, dissolved < 0.00000	Strontium, dissolved	< 0.0010	0.0010 mg/L	
Thallium, dissolved < 0.00020	Sulfur, dissolved	< 3.0	3.0 mg/L	
Thorium, dissolved < 0.00010 0.00010 mg/L Tin, dissolved < 0.00020	Tellurium, dissolved	< 0.00050	0.00050 mg/L	
Tin, dissolved < 0.00020 mg/L Titanium, dissolved < 0.0050	Thallium, dissolved	< 0.000020	0.000020 mg/L	
Titanium, dissolved < 0.0050	Thorium, dissolved	< 0.00010	0.00010 mg/L	
Tungsten, dissolved < 0.0010	Tin, dissolved	< 0.00020	0.00020 mg/L	
Uranium, dissolved < 0.00020 0.00020 mg/L Vanadium, dissolved < 0.0050	Titanium, dissolved	< 0.0050	0.0050 mg/L	
Vanadium, dissolved < 0.0050 0.0050 mg/L Zinc, dissolved < 0.0040	Tungsten, dissolved	< 0.0010	0.0010 mg/L	
Zinc, dissolved < 0.0040 mg/L Zirconium, dissolved < 0.00010	Uranium, dissolved	< 0.000020	0.000020 mg/L	
Zirconium, dissolved < 0.00010 mg/L LCS (B2I1705-BS1) Prepared: 2022-09-16, Analyzed: 2022-09-16 Aluminum, dissolved 4.14 0.0050 mg/L 4.00 104 80-120 Antimony, dissolved 0.0408 0.00020 mg/L 0.0400 102 80-120 Arsenic, dissolved 0.0428 0.00050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 101 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Vanadium, dissolved	< 0.0050	0.0050 mg/L	
LCS (B2I1705-BS1) Prepared: 2022-09-16, Analyzed: 2022-09-16 Aluminum, dissolved 4.14 0.0050 mg/L 4.00 104 80-120 Antimony, dissolved 0.0408 0.00020 mg/L 0.0400 102 80-120 Arsenic, dissolved 0.0428 0.00050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 107 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Zinc, dissolved	< 0.0040	0.0040 mg/L	
Aluminum, dissolved 4.14 0.0050 mg/L 4.00 104 80-120 Antimony, dissolved 0.0408 0.00020 mg/L 0.0400 102 80-120 Arsenic, dissolved 0.0428 0.00050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 101 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Zirconium, dissolved	< 0.00010	0.00010 mg/L	
Antimony, dissolved 0.0408 0.00020 mg/L 0.0400 102 80-120 Arsenic, dissolved 0.0428 0.00050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 101 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 101 80-120	LCS (B2I1705-BS1)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Arsenic, dissolved 0.0428 0.00050 mg/L 0.0400 107 80-120 Barium, dissolved 0.0405 0.0050 mg/L 0.0400 101 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Aluminum, dissolved	4.14	0.0050 mg/L	4.00 104 80-120
Barium, dissolved 0.0405 0.0050 mg/L 0.0400 101 80-120 Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Antimony, dissolved	0.0408	0.00020 mg/L	0.0400 102 80-120
Beryllium, dissolved 0.0414 0.00010 mg/L 0.0400 104 80-120	Arsenic, dissolved	0.0428	0.00050 mg/L	0.0400 107 80-120
	Barium, dissolved	0.0405	0.0050 mg/L	0.0400 101 80-120
Bismuth, dissolved 0.0402 0.00010 mg/L 0.0400 100 80-120	Beryllium, dissolved	0.0414	0.00010 mg/L	0.0400 104 80-120
	Bismuth, dissolved	0.0402	0.00010 mg/L	0.0400 100 80-120



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REPORTED TO Elk River Alli PROJECT CBWM-2022					RK ORDER ORTED		636 2-09-20	12:57
Analyte	Result	RL Units	Spike Level	Source % RE Result	EC REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B2l1705,	Continued							
LCS (B2I1705-BS1), Continued			Prepared	: 2022-09-16, Ana	yzed: 2022-0)9-16		
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0400	103	80-120			
Cadmium, dissolved	0.0406	0.000010 mg/L	0.0400	101	80-120			
Calcium, dissolved, dissolved	3.99	0.20 mg/L	4.00	100	80-120			
Chromium, dissolved	0.0420	0.00050 mg/L	0.0400	105	80-120			
Cobalt, dissolved	0.0409	0.00010 mg/L	0.0400	102	80-120			
Copper, dissolved	0.0410	0.00040 mg/L	0.0400	102	80-120			
Iron, dissolved	4.04	0.010 mg/L	4.00	101	80-120			
Lead, dissolved	0.0401	0.00020 mg/L	0.0400	100	80-120			
Lithium, dissolved	0.0413	0.00010 mg/L	0.0400	103	80-120			
Magnesium, dissolved, dissolved	4.14	0.010 mg/L	4.00	103	80-120			
Manganese, dissolved	0.0409	0.00020 mg/L	0.0400	102	80-120			
Molybdenum, dissolved	0.0397	0.00010 mg/L	0.0400	99	80-120			
Nickel, dissolved	0.0402	0.00040 mg/L	0.0400	101	80-120			
Phosphorus, dissolved	4.23	0.050 mg/L	4.00	106	80-120			
Potassium, dissolved	4.07	0.10 mg/L	4.00	102	80-120			
Selenium, dissolved	0.0405	0.00050 mg/L	0.0400	101	80-120			
Silicon, dissolved	4.1	1.0 mg/L	4.00	103	80-120			
Silver, dissolved	0.0404	0.000050 mg/L	0.0400	101	80-120			
Sodium, dissolved	4.08	0.10 mg/L	4.00	102	80-120			
Strontium, dissolved	0.0422	0.0010 mg/L	0.0400	105	80-120			
Sulfur, dissolved	40.4	3.0 mg/L	40.0	101	80-120			
Tellurium, dissolved	0.0417	0.00050 mg/L	0.0400	104	80-120			
Thallium, dissolved	0.0402	0.000020 mg/L	0.0400	100	80-120			
Thorium, dissolved	0.0405	0.00010 mg/L	0.0400	101	80-120			
Tin, dissolved	0.0410	0.00020 mg/L	0.0400	102	80-120			
Titanium, dissolved	0.0417	0.0050 mg/L	0.0400	104	80-120			
Tungsten, dissolved	0.0413	0.0010 mg/L	0.0400	103	80-120			
Uranium, dissolved	0.0406	0.000020 mg/L	0.0400	102	80-120			
Vanadium, dissolved	0.0407	0.0050 mg/L	0.0400	102	80-120			
Zinc, dissolved	0.0408	0.0040 mg/L	0.0400	102	80-120			
Zirconium, dissolved	0.0404	0.00010 mg/L	0.0400	101	80-120			

Dissolved Metals, Batch B2I1798

Blank (B2I1798-BLK1)

Blank (B2I1798-BLK1)			Prepared: 2022-09-17, Analyzed: 2022-09-17
Aluminum, dissolved	< 0.0050	0.0050 mg/L	
Antimony, dissolved	< 0.00020	0.00020 mg/L	
Arsenic, dissolved	< 0.00050	0.00050 mg/L	
Barium, dissolved	< 0.0050	0.0050 mg/L	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	
Boron, dissolved	< 0.0500	0.0500 mg/L	
Cadmium, dissolved	< 0.000010	0.000010 mg/L	
Calcium, dissolved, dissolved	< 0.20	0.20 mg/L	
Chromium, dissolved	< 0.00050	0.00050 mg/L	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	
Copper, dissolved	< 0.00040	0.00040 mg/L	
Iron, dissolved	< 0.010	0.010 mg/L	
Lead, dissolved	< 0.00020	0.00020 mg/L	
Lithium, dissolved	< 0.00010	0.00010 mg/L	
Magnesium, dissolved, dissolved	< 0.010	0.010 mg/L	
Manganese, dissolved	< 0.00020	0.00020 mg/L	
Molybdenum, dissolved	< 0.00010	0.00010 mg/L	
Nickel, dissolved	< 0.00040	0.00040 mg/L	
Phosphorus, dissolved	< 0.050	0.050 mg/L	
Potassium, dissolved	< 0.10	0.10 mg/L	



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Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Dissolved Metals, Batch B2I1798, Continued

Blank (B2I1798-BLK1), Continued			Prepared: 202	2-09-17, Analyze	d: 2022-09-17
Selenium, dissolved	< 0.00050	0.00050 mg/L			
Silicon, dissolved	< 1.0	1.0 mg/L			
Silver, dissolved	< 0.000050	0.000050 mg/L			
Sodium, dissolved	< 0.10	0.10 mg/L			
Strontium, dissolved	< 0.0010	0.0010 mg/L			
Sulfur, dissolved	< 3.0	3.0 mg/L			
Tellurium, dissolved	< 0.00050	0.00050 mg/L			
Thallium, dissolved	< 0.000020	0.000020 mg/L			
Thorium, dissolved	< 0.00010	0.00010 mg/L			
Tin, dissolved	< 0.00020	0.00020 mg/L			
Titanium, dissolved	< 0.0050	0.0050 mg/L			
Tungsten, dissolved	< 0.0010	0.0010 mg/L			
Uranium, dissolved	< 0.000020	0.000020 mg/L			
Vanadium, dissolved	< 0.0050	0.0050 mg/L			
Zinc, dissolved	< 0.0040	0.0040 mg/L			
Zirconium, dissolved	< 0.00010	0.00010 mg/L			
	\$ 0.00010	0.00010 mg/L			
LCS (B2I1798-BS1)			Prepared: 202	2-09-17, Analyze	ed: 2022-09-17
Aluminum, dissolved	3.93	0.0050 mg/L	4.00	98	80-120
Antimony, dissolved	0.0400	0.00020 mg/L	0.0400	100	80-120
Arsenic, dissolved	0.0418	0.00050 mg/L	0.0400	104	80-120
Barium, dissolved	0.0395	0.0050 mg/L	0.0400	99	80-120
Beryllium, dissolved	0.0407	0.00010 mg/L	0.0400	102	80-120
Bismuth, dissolved	0.0401	0.00010 mg/L	0.0400	100	80-120
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0400	100	80-120
Cadmium, dissolved	0.0398	0.000010 mg/L	0.0400	100	80-120
Calcium, dissolved, dissolved	3.98	0.20 mg/L	4.00	100	80-120
Chromium, dissolved	0.0405	0.00050 mg/L	0.0400	101	80-120
Cobalt, dissolved	0.0407	0.00010 mg/L	0.0400	102	80-120
Copper, dissolved	0.0411	0.00040 mg/L	0.0400	102	80-120
Iron, dissolved	4.10	0.010 mg/L	4.00	103	80-120
Lead, dissolved	0.0401	0.00020 mg/L	0.0400	100	80-120
Lithium, dissolved	0.0373	0.00010 mg/L	0.0400	93	80-120
Magnesium, dissolved, dissolved	3.88	0.010 mg/L	4.00	97	80-120
	0.0403	0.00020 mg/L	0.0400	101	80-120
Manganese, dissolved		U		98	80-120
Molybdenum, dissolved	0.0393	0.00010 mg/L	0.0400		
Nickel, dissolved	0.0406	0.00040 mg/L	0.0400	102	80-120
Phosphorus, dissolved	3.99	0.050 mg/L	4.00	100	80-120
Potassium, dissolved	4.03	0.10 mg/L	4.00	101	80-120
Selenium, dissolved	0.0416	0.00050 mg/L	0.0400	104	80-120
Silicon, dissolved	4.1	1.0 mg/L	4.00	102	80-120
Silver, dissolved	0.0401	0.000050 mg/L	0.0400	100	80-120
Sodium, dissolved	3.94	0.10 mg/L	4.00	98	80-120
Strontium, dissolved	0.0411	0.0010 mg/L	0.0400	103	80-120
Sulfur, dissolved	40.9	3.0 mg/L	40.0	102	80-120
Tellurium, dissolved	0.0401	0.00050 mg/L	0.0400	100	80-120
Thallium, dissolved	0.0400	0.000020 mg/L	0.0400	100	80-120
Thorium, dissolved	0.0405	0.00010 mg/L	0.0400	101	80-120
Tin, dissolved	0.0395	0.00020 mg/L	0.0400	99	80-120
Titanium, dissolved	0.0396	0.0050 mg/L	0.0400	99	80-120
Tungsten, dissolved	0.0409	0.0010 mg/L	0.0400	102	80-120
Uranium, dissolved	0.0403	0.000020 mg/L	0.0400	101	80-120
Vanadium, dissolved	0.0407	0.0050 mg/L	0.0400	102	80-120
Zinc, dissolved	0.0405	0.0040 mg/L	0.0400	101	80-120
Zirconium, dissolved	0.0397	0.00010 mg/L	0.0400	99	80-120



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER TED	22110 2022	636 -09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals,	Batch B2l1798, Continue	ed								
Matrix Spike (B2I1	798-MS1)	Sc	ource: 22I1636-01	Prepared	l: 2022-09-1	7, Analyze	d: 2022-0	9-17		
Aluminum, dissolved		3.97	0.0050 mg/L	4.00	< 0.0050	99	70-130			
Antimony, dissolved		0.0392	0.00020 mg/L	0.0400	< 0.00020	98	70-130			
Arsenic, dissolved		0.0430	0.00050 mg/L	0.0400	< 0.00050	107	70-130			
Barium, dissolved		0.211	0.0050 mg/L	0.0400	0.170	102	70-130			
Beryllium, dissolved		0.0416	0.00010 mg/L	0.0400	< 0.00010	104	70-130			
Bismuth, dissolved		0.0325	0.00010 mg/L	0.0400	< 0.00010	81	70-130			
Boron, dissolved		0.0519	0.0500 mg/L	0.0400	< 0.0500	106	70-130			
Cadmium, dissolved		0.0414	0.000010 mg/L	0.0400	0.000022	103	70-130			
Calcium, dissolved, o		42.7	0.20 mg/L	4.00	40.3	59	70-130			MS2
Chromium, dissolved		0.0401	0.00050 mg/L	0.0400	< 0.00050	100	70-130			
Cobalt, dissolved		0.0397	0.00010 mg/L	0.0400	< 0.00010	99	70-130			
Copper, dissolved		0.0399	0.00040 mg/L	0.0400	0.00042	99	70-130			
Iron, dissolved		4.10	0.010 mg/L	4.00	< 0.010	102	70-130			
Lead, dissolved		0.0393	0.00020 mg/L	0.0400	< 0.00020	98	70-130			
Lithium, dissolved	I. P I.	0.0469	0.00010 mg/L	0.0400	0.00381	108	70-130			
Magnesium, dissolve		13.1	0.010 mg/L	4.00	9.27	96	70-130			
Manganese, dissolve		0.0457	0.00020 mg/L	0.0400	0.00591	99	70-130			
Molybdenum, dissolv	red	0.0413	0.00010 mg/L	0.0400	0.00079	101	70-130			
Nickel, dissolved	- d	0.0396	0.00040 mg/L	0.0400	< 0.00040	98 104	70-130 70-130			
Phosphorus, dissolve Potassium, dissolved		4.10	0.050 mg/L 0.10 mg/L	4.00	0.68	99	70-130			
Selenium, dissolved		0.0425	0.00050 mg/L	0.0400	< 0.00050	106	70-130			
Silicon, dissolved		5.9	1.0 mg/L	4.00	2.0	97	70-130			
Silver, dissolved		0.0403	0.000050 mg/L	0.0400	< 0.000050	101	70-130			
Sodium, dissolved		6.22	0.10 mg/L	4.00	2.06	101	70-130			
Strontium, dissolved		0.193	0.0010 mg/L	0.0400	0.157	92	70-130			
Sulfur, dissolved		42.1	3.0 mg/L	40.0	< 3.0	100	70-130			
Tellurium, dissolved		0.0430	0.00050 mg/L	0.0400	< 0.00050	100	70-130			
Thallium, dissolved		0.0400	0.000020 mg/L	0.0400	< 0.000020	100	70-130			
Thorium, dissolved		0.0400	0.00010 mg/L	0.0400	< 0.000020	100	70-130			
Tin, dissolved		0.0412	0.00020 mg/L	0.0400	< 0.00020	102	70-130			
Titanium, dissolved		0.0372	0.0050 mg/L	0.0400	< 0.0050	93	70-130			
Tungsten, dissolved		0.0412	0.0010 mg/L	0.0400	< 0.0010	103	70-130			
Uranium, dissolved		0.0404	0.000020 mg/L	0.0400	0.000424	100	70-130			
Vanadium, dissolved		0.0415	0.0050 mg/L	0.0400	< 0.0050	103	70-130			
Zinc, dissolved		0.0413	0.0040 mg/L	0.0400	< 0.0040	102	70-130			
Zirconium, dissolved		0.0415	0.00010 mg/L	0.0400	< 0.00010	104	70-130			

Dissolved Metals, Batch B2I1892

Blank (B2I1892-BLK1)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Mercury, dissolved	< 0.000010	0.000010 mg/L	
Blank (B2I1892-BLK2)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Mercury, dissolved	< 0.000010	0.000010 mg/L	
Blank (B2I1892-BLK3)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Mercury, dissolved	< 0.000010	0.000010 mg/L	
Blank (B2I1892-BLK4)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Mercury, dissolved	< 0.000010	0.000010 mg/L	
LCS (B2I1892-BS1)			Prepared: 2022-09-16, Analyzed: 2022-09-16
Mercury, dissolved	0.000472	0.000010 mg/L	0.000500 94 80-120



REPORTED TO Elk River Alliance PROJECT CBWM-2022					WORK REPOR	ORDER RTED	2211 2022	636 2-09-20	12:57
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B2l1892, Contin	nued								
LCS (B2I1892-BS2)			Prepared	: 2022-09-1	6, Analyze	d: 2022-0	9-16		
Mercury, dissolved	0.000475	0.000010 mg/L	0.000500		95	80-120			
LCS (B2I1892-BS3)			Prepared	: 2022-09-1	6, Analyze	ed: 2022-0	9-16		
Mercury, dissolved	0.000477	0.000010 mg/L	0.000500		95	80-120			
LCS (B2I1892-BS4)			Prepared	: 2022-09-1	6, Analyze	d: 2022-0	9-16		
Mercury, dissolved	0.000482	0.000010 mg/L	0.000500		96	80-120			
General Parameters, Batch B2I1477									
Blank (B2I1477-BLK1)			Prepared	: 2022-09-1	6, Analyze	ed: 2022-0	9-16		
Carbon, Total Organic	< 0.50	0.50 mg/L							
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B2I1477-BLK2)			Prepared	: 2022-09-1	6, Analyze	ed: 2022-0	9-16		
Carbon, Total Organic	< 0.50 < 0.50	0.50 mg/L							
Carbon, Dissolved Organic Blank (B2I1477-BLK3)	< 0.50	0.50 mg/L	Prepared	: 2022-09-1	6 Analyze	d. 2022-0	9-16		
Carbon, Total Organic	< 0.50	0.50 mg/L	riopulou	. 2022 00 1	0,7 andr <u>y</u> 20		0 10		
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B2I1477-BLK4)			Prepared	: 2022-09-1	9, Analyze	d: 2022-0	9-19		
Carbon, Total Organic	< 0.50	0.50 mg/L							
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B2I1477-BLK5)			Prepared	: 2022-09-1	9, Analyze	ed: 2022-0	9-19		
Carbon, Total Organic	< 0.50	0.50 mg/L							
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B2I1477-BLK6)			Prepared	: 2022-09-1	9, Analyze	d: 2022-0	9-19		
Carbon, Total Organic Carbon, Dissolved Organic	< 0.50 < 0.50	0.50 mg/L 0.50 mg/L							
LCS (B2I1477-BS1)		0.00 mg/L	Prepared	: 2022-09-1	6 Analyze	d. 2022-0	9-16		
Carbon, Total Organic	10.1	0.50 mg/L	10.0		101	78-116	0.0		
Carbon, Dissolved Organic	9.87	0.50 mg/L	10.0		99	78-116			
LCS (B2I1477-BS2)			Prepared	: 2022-09-1	6, Analyze	d: 2022-0	9-16		
Carbon, Total Organic	9.75	0.50 mg/L	10.0		98	78-116			
Carbon, Dissolved Organic	9.79	0.50 mg/L	10.0		98	78-116			
LCS (B2I1477-BS3)			Prepared	: 2022-09-1	6, Analyze	d: 2022-0	9-16		
Carbon, Total Organic	10.2	0.50 mg/L	10.0		102	78-116			
Carbon, Dissolved Organic	10.1	0.50 mg/L	10.0		101	78-116			
LCS (B2I1477-BS4)				: 2022-09-1		d: 2022-0	9-19		
Carbon, Total Organic	10.0	0.50 mg/L	10.0		100	78-116			
Carbon, Dissolved Organic	10.2	0.50 mg/L	10.0	0000 00 1		78-116	0.40		
LCS (B2I1477-BS5)		0.50 "		: 2022-09-1			9-19		
Carbon, Total Organic Carbon, Dissolved Organic	10.3	0.50 mg/L 0.50 mg/L	10.0		103 104	78-116 78-116			
	10.1	5.55 mg/E		· 2022 00 1			0_10		
LCS (B2I1477-BS6) Carbon, Total Organic	9.93	0.50 mg/L	10.0	: 2022-09-1	9, Analyze 99	78-116	5-19		
Carbon, Dissolved Organic	10.1	0.50 mg/L	10.0		101	78-116			



	lk River Alliance BWM-2022					WORK REPOR	ORDER	22I1 2022	636 2-09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifie
General Parameters, B	Batch B2I1477, Conti	inued								
Duplicate (B2I1477-DU	JP2)	Sou	ırce: 22l1636-03	Prepared:	2022-09-1	9, Analyze	d: 2022-0	9-19		
Carbon, Total Organic		0.84	0.50 mg/L		0.81				16	
Carbon, Dissolved Organi	c	< 0.50	0.50 mg/L		< 0.50				15	
Matrix Spike (B2I1477-	-MS2)	Sou	ırce: 22l1636-03	Prepared:	2022-09-1	6, Analyze	d: 2022-0	9-16		
Carbon, Total Organic		10.2	0.50 mg/L	10.0	0.81	94	70-130			
Carbon, Dissolved Organi	ic	10.0	0.50 mg/L	10.0	< 0.50	95	70-130			
General Parameters,B	Batch B2I1515									
Blank (B2I1515-BLK1)				Prepared:	2022-09-1	4, Analyze	d: 2022-0	9-14		
Chemical Oxygen Deman	d	< 20	20 mg/L							
LCS (B2I1515-BS1)				Prepared:	2022-09-1	4, Analvze	d: 2022-0	9-14		
Chemical Oxygen Deman	d	506	20 mg/L	500		101	89-115			
General Parameters, B	Batch B2l1543									
Blank (B2I1543-BLK1)				Prepared:	2022-09-1	4, Analyze	d: 2022-0	9-19		
		< 2.0	2.0 mg/L							
BOD, 5-day		~ 2.0								
		< 2.0		Prenared:	2022-00-1	1 Analyza	4· 2022-0	0_10		
BOD, 5-day LCS (B2I1543-BS1) BOD, 5-day General Parameters, B	Batch B2l1562	214	46.7 mg/L	Prepared: 198	2022-09-1	4, Analyze 108	d: 2022-0 85-115	9-19		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1)		214	46.7 mg/L	198	2022-09-1	108	85-115			
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended				198 Prepared:	2022-09-1	108 4, Analyze	85-115 d: 2022-0	9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1)		214	46.7 mg/L 2.0 mg/L	198 Prepared: Prepared:		108 4, Analyze 4, Analyze	85-115 d: 2022-0 d: 2022-0	9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended		214	46.7 mg/L	198 Prepared:	2022-09-1	108 4, Analyze	85-115 d: 2022-0	9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B	Batch B2l1675	214	46.7 mg/L 2.0 mg/L	198 Prepared: Prepared: 100	2022-09-1- 2022-09-1-	108 4, Analyze 4, Analyze 90	85-115 d: 2022-0 d: 2022-0 85-115	9-14 9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1)	Batch B2l1675	214 < 2.0 90.0	46.7 mg/L 2.0 mg/L 10.0 mg/L	198 Prepared: Prepared: 100	2022-09-1	108 4, Analyze 4, Analyze 90	85-115 d: 2022-0 d: 2022-0 85-115	9-14 9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended	Batch B2l1675	214	46.7 mg/L 2.0 mg/L	198 Prepared: Prepared: 100	2022-09-1- 2022-09-1-	108 4, Analyze 4, Analyze 90	85-115 d: 2022-0 d: 2022-0 85-115	9-14 9-14		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1)	Batch B2l1675	214 < 2.0 90.0 < 2.0	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L	198 Prepared: Prepared: 100 Prepared:	2022-09-1- 2022-09-1-	108 4, Analyze 90 5, Analyze 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0	9-14 9-14 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended	Batch B2l1675	214 < 2.0 90.0	46.7 mg/L 2.0 mg/L 10.0 mg/L	198 Prepared: Prepared: 100 Prepared:	2022-09-1- 2022-09-1- 2022-09-1:	108 4, Analyze 90 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0	9-14 9-14 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1)	Batch B2l1675	214 < 2.0 90.0 < 2.0	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L	198 Prepared: Prepared: 100 Prepared: Prepared: Prepared:	2022-09-1- 2022-09-1- 2022-09-1:	108 4, Analyze 90 5, Analyze 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0	9-14 9-14 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L	198 Prepared: Prepared: 100 Prepared: Prepared: 100 Prepared: 100	2022-09-1- 2022-09-1- 2022-09-1:	108 4, Analyze 90 5, Analyze 5, Analyze 96	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 85-115	9-14 9-14 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L	198 Prepared: Prepared: 100 Prepared: Prepared: 100 Prepared: 100	2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 5, Analyze 96	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 85-115	9-14 9-14 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L	198 Prepared: 100 Prepared: Prepared: 100 Prepared:	2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 96 5, Analyze 96 5, Analyze	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 85-115 d: 2022-0	9-14 9-14 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L	198 Prepared: 100 Prepared: Prepared: 100 Prepared:	2022-09-1- 2022-09-1- 2022-09-1: 2022-09-1: 2022-09-1:	108 4, Analyze 90 5, Analyze 96 5, Analyze 96 5, Analyze	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 85-115 d: 2022-0	9-14 9-14 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK2) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L 0.0050 mg/L	198 Prepared: Prepared: 100 Pr	2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK2) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 96.5 < 0.0050 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L 0.0050 mg/L	198 Prepared: Prepared: 100 Pr	2022-09-1- 2022-09-1- 2022-09-1: 2022-09-1: 2022-09-1:	108 4, Analyze 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BLK1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK2) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L 0.0050 mg/L	198 Prepared: Prepared: 100 Prepared: 100 Prepared: 100 Prepared: 100 Prepared: 100 Prepared: Pr	2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze 5, Analyze	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK2) Phosphorus, Total (as P) Blank (B2I1765-BLK3) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 96.5 < 0.0050 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 0.0050 mg/L 0.0050 mg/L 0.0050 mg/L	198 Prepared: 100 Prepared: 100 Prepared: 100 Prepared: Prepared: Prepared: Prepared: Prepared:	2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze 5, Analyze 5, Analyze	85-115 d: 2022-0 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK3) Phosphorus, Total (as P) Blank (B2I1765-BLK3) Phosphorus, Total (as P) LCS (B2I1765-BS1) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 96.5 < 0.0050 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 5.0 mg/L 0.0050 mg/L	198 Prepared: 100 Prepared: 100 Prepared: 100 Prepared: Prepared: Prepared: Prepared: 0.100	2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze 5, Analyze 5, Analyze 107	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16 9-16 9-16		
LCS (B2I1543-BS1) BOD, 5-day General Parameters, B Blank (B2I1562-BLK1) Solids, Total Suspended LCS (B2I1562-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1675-BLK1) Solids, Total Suspended LCS (B2I1675-BS1) Solids, Total Suspended General Parameters, B Blank (B2I1765-BLK1) Phosphorus, Total (as P) Blank (B2I1765-BLK2) Phosphorus, Total (as P) Blank (B2I1765-BLK3) Phosphorus, Total (as P)	Batch B2l1675 Batch B2l1765	214 < 2.0 90.0 < 2.0 96.5 96.5 < 0.0050 < 0.0050	46.7 mg/L 2.0 mg/L 10.0 mg/L 2.0 mg/L 0.0050 mg/L 0.0050 mg/L 0.0050 mg/L	198 Prepared: 100 Prepared: 100 Prepared: 100 Prepared: Prepared: Prepared: Prepared: 0.100	2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1 2022-09-1	108 4, Analyze 90 5, Analyze 96 5, Analyze 5, Analyze 5, Analyze 5, Analyze 5, Analyze 107	85-115 d: 2022-0 85-115 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0 d: 2022-0	9-14 9-14 9-16 9-16 9-16 9-16 9-16 9-16		



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER TED	22110 2022	636 -09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameter	s, Batch B2l1765, Cont	inued								
LCS (B2I1765-BS3	3)			Prepared	l: 2022-09-1	15, Analyze	d: 2022-0	9-16		
Phosphorus, Total (as	s P)	0.108	0.0050 mg/L	0.100		108	85-115			
General Parameter	s, Batch B2l1877									
Blank (B2I1877-BL	_K1)			Prepared	I: 2022-09-1	l6, Analyze	d: 2022-0	9-16		
Nitrogen, Total Kjelda	ahl	< 0.050	0.050 mg/L							
LCS (B2I1877-BS1)			Prepared	I: 2022-09-1	16. Analvze	d: 2022-0	9-16		
Nitrogen, Total Kjelda	,	0.976	0.050 mg/L	1.00		98	85-115			
General Parameter	s, Batch B2l2027									
Blank (B2l2027-BL	_K1)			Prepared	I: 2022-09-1	18, Analyze	d: 2022-0	9-18		
Alkalinity, Total (as C	,	< 1.0	1.0 mg/L							
Alkalinity, Phenolphth	· /	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonat	· /	< 1.0	1.0 mg/L							
Alkalinity, Carbonate	· /	< 1.0 < 1.0	1.0 mg/L 1.0 mg/L							
Alkalinity, Hydroxide		< 1.0	1.0 mg/L	D		10 A	-1. 0000 0	0.40		
Blank (B2I2027-BL	•			Prepared	I: 2022-09-1	18, Analyze	a: 2022-0	9-18		
Alkalinity, Total (as C	,	< 1.0	1.0 mg/L							
Alkalinity, Phenolphth	· /	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonat	· /	< 1.0	1.0 mg/L							
Alkalinity, Carbonate	. ,	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide		< 1.0	1.0 mg/L	5				0.40		
Blank (B2I2027-BL	•			Prepared	l: 2022-09-1	18, Analyze	d: 2022-0	9-18		
Alkalinity, Total (as C	/	< 1.0	1.0 mg/L							
Alkalinity, Phenolphth		< 1.0	1.0 mg/L							
Alkalinity, Bicarbonat	· /	< 1.0	1.0 mg/L							
Alkalinity, Carbonate		< 1.0	1.0 mg/L							
Alkalinity, Hydroxide	· · · · ·	< 1.0	1.0 mg/L	5				0.40		
LCS (B2I2027-BS1	,				I: 2022-09-1	· •		9-18		
Alkalinity, Total (as C	aCO3)	110	1.0 mg/L	100		110	80-120			
LCS (B2I2027-BS2	,				l: 2022-09-1			9-18		
Alkalinity, Total (as C	aCO3)	110	1.0 mg/L	100		110	80-120			
LCS (B2I2027-BS3	3)			Prepared	l: 2022-09-1	18, Analyze	d: 2022-0	9-18		
Alkalinity, Total (as C		110	1.0 mg/L	100		110	80-120			

Total Metals, Batch B2I1701

Blank (B2I1701-BLK1)			Prepared: 2022-09-15, Analyzed: 2022-09-15
Aluminum, total	< 0.0050	0.0050 mg/L	
Antimony, total	< 0.00020	0.00020 mg/L	
Arsenic, total	< 0.00050	0.00050 mg/L	
Barium, total	< 0.0050	0.0050 mg/L	
Beryllium, total	< 0.00010	0.00010 mg/L	
Bismuth, total	< 0.00010	0.00010 mg/L	
Boron, total	< 0.0500	0.0500 mg/L	
Cadmium, total	< 0.000010	0.000010 mg/L	
Calcium, total	< 0.20	0.20 mg/L	
Chromium, total	< 0.00050	0.00050 mg/L	
Cobalt, total	< 0.00010	0.00010 mg/L	Dama 10 af 0



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR			636 2-09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

Total Metals, Batch B2I1701, Continued

Blank (B2I1701-BLK1), Continued			Prepared: 2022-09-15, Analyzed: 2022-09-15
Copper, total	< 0.00040	0.00040 mg/L	
Iron, total	< 0.010	0.010 mg/L	
Lead, total	< 0.00020	0.00020 mg/L	
Lithium, total	< 0.00010	0.00010 mg/L	
Magnesium, total	< 0.010	0.010 mg/L	
Manganese, total	< 0.00020	0.00020 mg/L	
Molybdenum, total	< 0.00010	0.00010 mg/L	
Nickel, total	< 0.00040	0.00040 mg/L	
Phosphorus, total	< 0.050	0.050 mg/L	
Potassium, total	< 0.10	0.10 mg/L	
Selenium, total	< 0.00050	0.00050 mg/L	
Silicon, total	< 1.0	1.0 mg/L	
Silver, total	< 0.000050	0.000050 mg/L	
Sodium, total	< 0.10	0.10 mg/L	
Strontium, total	< 0.0010	0.0010 mg/L	
Sulfur, total	< 3.0	3.0 mg/L	
Tellurium, total	< 0.00050	0.00050 mg/L	
Thallium, total	< 0.000020	0.000020 mg/L	
Thorium, total	< 0.00010	0.00010 mg/L	
Tin, total	< 0.00020	0.00020 mg/L	
Titanium, total	< 0.0050	0.0050 mg/L	
Tungsten, total	< 0.0002	0.0002 mg/L	
Uranium, total	< 0.000020	0.000020 mg/L	
Vanadium, total	< 0.0050	0.0050 mg/L	
Zinc, total	< 0.0040	0.0040 mg/L	
Zirconium, total	< 0.00010	0.00010 mg/L	

LCS (B2I1701-BS1)			Prepared: 2	022-09-15, Analyzed	d: 2022-09-15	
Aluminum, total	4.14	0.0050 mg/L	4.00	103	80-120	
Antimony, total	0.0393	0.00020 mg/L	0.0400	98	80-120	
Arsenic, total	0.0402	0.00050 mg/L	0.0400	101	80-120	
Barium, total	0.0390	0.0050 mg/L	0.0400	98	80-120	
Beryllium, total	0.0388	0.00010 mg/L	0.0400	97	80-120	
Bismuth, total	0.0393	0.00010 mg/L	0.0400	98	80-120	
Boron, total	< 0.0500	0.0500 mg/L	0.0400	104	80-120	
Cadmium, total	0.0387	0.000010 mg/L	0.0400	97	80-120	
Calcium, total	4.12	0.20 mg/L	4.00	103	80-120	
Chromium, total	0.0399	0.00050 mg/L	0.0400	100	80-120	
Cobalt, total	0.0403	0.00010 mg/L	0.0400	101	80-120	
Copper, total	0.0395	0.00040 mg/L	0.0400	99	80-120	
Iron, total	4.09	0.010 mg/L	4.00	102	80-120	
Lead, total	0.0397	0.00020 mg/L	0.0400	99	80-120	
Lithium, total	0.0406	0.00010 mg/L	0.0400	101	80-120	
Magnesium, total	4.05	0.010 mg/L	4.00	101	80-120	
Manganese, total	0.0404	0.00020 mg/L	0.0400	101	80-120	
Molybdenum, total	0.0393	0.00010 mg/L	0.0400	98	80-120	
Nickel, total	0.0400	0.00040 mg/L	0.0400	100	80-120	
Phosphorus, total	4.06	0.050 mg/L	4.00	102	80-120	
Potassium, total	4.03	0.10 mg/L	4.00	101	80-120	
Selenium, total	0.0394	0.00050 mg/L	0.0400	98	80-120	
Silicon, total	4.3	1.0 mg/L	4.00	107	80-120	
Silver, total	0.0390	0.000050 mg/L	0.0400	98	80-120	
Sodium, total	4.03	0.10 mg/L	4.00	101	80-120	
Strontium, total	0.0394	0.0010 mg/L	0.0400	98	80-120	
Sulfur, total	41.0	3.0 mg/L	40.0	103	80-120	
Tellurium, total	0.0389	0.00050 mg/L	0.0400	97	80-120	



REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	-		636 2-09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch	h B2l1701, Continued									

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LCS (B2I1701-BS1), Continued		Prepared: 2022-09-15, Analyzed: 2022-09-15				
Thallium, total	0.0394	0.000020 mg/L	0.0400	99	80-120	
Thorium, total	0.0398	0.00010 mg/L	0.0400	99	80-120	
Tin, total	0.0396	0.00020 mg/L	0.0400	99	80-120	
Titanium, total	0.0409	0.0050 mg/L	0.0400	102	80-120	
Tungsten, total	0.0408	0.0002 mg/L	0.0400	102	80-120	
Uranium, total	0.0398	0.000020 mg/L	0.0400	99	80-120	
Vanadium, total	0.0403	0.0050 mg/L	0.0400	101	80-120	
Zinc, total	0.0396	0.0040 mg/L	0.0400	99	80-120	
Zirconium, total	0.0392	0.00010 mg/L	0.0400	98	80-120	

Prepared: 2022-09-15, Analyzed: 2022-09-18

Total Metals, Batch B2I1800

Blank (B2I1800-BLK1)

BIAIIK (BZI 1800-BEK I)			T Tepared. 202	.2-09-15, Allaly20	54. 2022-05-10	
Aluminum, total	< 0.0050	0.0050 mg/L				
Antimony, total	< 0.00020	0.00020 mg/L				
Arsenic, total	< 0.00050	0.00050 mg/L				
Barium, total	< 0.0050	0.0050 mg/L				
Beryllium, total	< 0.00010	0.00010 mg/L				
Bismuth, total	< 0.00010	0.00010 mg/L				
Boron, total	< 0.0500	0.0500 mg/L				
Cadmium, total	< 0.000010	0.000010 mg/L				
Calcium, total	< 0.20	0.20 mg/L				
Chromium, total	< 0.00050	0.00050 mg/L				
Cobalt, total	< 0.00010	0.00010 mg/L				
Copper, total	< 0.00040	0.00040 mg/L				
Iron, total	< 0.010	0.010 mg/L				
Lead, total	< 0.00020	0.00020 mg/L				
Lithium, total	< 0.00010	0.00010 mg/L				
Magnesium, total	< 0.010	0.010 mg/L				
Manganese, total	< 0.00020	0.00020 mg/L				
Molybdenum, total	< 0.00010	0.00010 mg/L				
Nickel, total	< 0.00040	0.00040 mg/L				
Phosphorus, total	< 0.050	0.050 mg/L				
Potassium, total	< 0.10	0.10 mg/L				
Selenium, total	< 0.00050	0.00050 mg/L				
Silicon, total	< 1.0	1.0 mg/L				
Silver, total	< 0.000050	0.000050 mg/L				
Sodium, total	< 0.10	0.10 mg/L				
Strontium, total	< 0.0010	0.0010 mg/L				
Sulfur, total	< 3.0	3.0 mg/L				
Tellurium, total	< 0.00050	0.00050 mg/L				
Thallium, total	< 0.000020	0.000020 mg/L				
Thorium, total	< 0.00010	0.00010 mg/L				
Tin, total	< 0.00020	0.00020 mg/L				
Titanium, total	< 0.0050	0.0050 mg/L				
Tungsten, total	< 0.0002	0.0002 mg/L				
Uranium, total	< 0.000020	0.000020 mg/L				
Vanadium, total	< 0.0050	0.0050 mg/L				
Zinc, total	< 0.0040	0.0040 mg/L				
Zirconium, total	< 0.00010	0.00010 mg/L				
LCS (B2I1800-BS1)			Prepared: 202	2-09-15, Analyzo	ed: 2022-09-18	
Aluminum, total	4.10	0.0050 mg/L	4.00	103	80-120	
Antimony, total	0.0397	0.00020 mg/L	0.0400	99	80-120	
Arsenic, total	0.0416	0.00050 mg/L	0.0400	104	80-120	
Barium, total	0.0414	0.0050 mg/L	0.0400	104	80-120	
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REPORTED TO PROJECT	Elk River Alliance CBWM-2022					WORK REPOR	ORDER TED	22110 2022	636 -09-20	12:57
Analyte		Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch	h B2l1800, Continued									
LCS (B2I1800-BS1), Continued			Prepared	l: 2022-09-1	5, Analyze	d: 2022-0	9-18		
Beryllium, total	,,	0.0393	0.00010 mg/L	0.0400		98	80-120			
Bismuth, total		0.0393	0.00010 mg/L	0.0400		98	80-120			
Boron, total		< 0.0500	0.0500 mg/L	0.0400		94	80-120			
Cadmium, total		0.0398	0.000010 mg/L	0.0400		99	80-120			
Calcium, total		4.05	0.20 mg/L	4.00		101	80-120			
Chromium, total		0.0402	0.00050 mg/L	0.0400		100	80-120			
Cobalt, total		0.0411	0.00010 mg/L	0.0400		103	80-120			
Copper, total		0.0405	0.00040 mg/L	0.0400		101	80-120			
Iron, total		4.11	0.010 mg/L	4.00		103	80-120			
Lead, total		0.0401	0.00020 mg/L	0.0400		100	80-120			
Lithium, total		0.0358	0.00010 mg/L	0.0400		90	80-120			
Magnesium, total		3.95	0.010 mg/L	4.00		99	80-120			
Manganese, total		0.0406	0.00020 mg/L	0.0400		102	80-120			
Molybdenum, total		0.0394	0.00010 mg/L	0.0400		98	80-120			
Nickel, total		0.0407	0.00040 mg/L	0.0400		102	80-120			
Phosphorus, total		4.10	0.050 mg/L	4.00		102	80-120			
Potassium, total		4.08	0.10 mg/L	4.00		102	80-120			
Selenium, total		0.0410	0.00050 mg/L	0.0400		102	80-120			
Silicon, total		4.2	1.0 mg/L	4.00		105	80-120			
Silver, total		0.0403	0.000050 mg/L	0.0400		101	80-120			
Sodium, total		4.00	0.10 mg/L	4.00		100	80-120			
Strontium, total		0.0411	0.0010 mg/L	0.0400		103	80-120			
Sulfur, total		40.9	3.0 mg/L	40.0		102	80-120			
Tellurium, total		0.0388	0.00050 mg/L	0.0400		97	80-120			
Thallium, total		0.0398	0.000020 mg/L	0.0400		99	80-120			
Thorium, total		0.0405	0.00010 mg/L	0.0400		101	80-120			
Tin, total		0.0399	0.00020 mg/L	0.0400		100	80-120			
Titanium, total		0.0406	0.0050 mg/L	0.0400		102	80-120			
Tungsten, total		0.0402	0.0002 mg/L	0.0400		101	80-120			
Uranium, total		0.0407	0.000020 mg/L	0.0400		102	80-120			
Vanadium, total		0.0406	0.0050 mg/L	0.0400		101	80-120			
Zinc, total		0.0410	0.0040 mg/L	0.0400		102	80-120			
Zirconium, total		0.0402	0.00010 mg/L	0.0400		101	80-120			

Total Metals, Batch B2I1893

10 10	0.000010 mg/L 0.000010 mg/L	Prepared: 2022-09-16, Analyzed: 2022-09-16
10	0.000010 mg/L	Prepared: 2022-09-16, Analyzed: 2022-09-16
10	0.000010 mg/L	
		Prepared: 2022-09-16, Analyzed: 2022-09-16
62	0.000010 mg/L	0.000500 112 80-120
		Prepared: 2022-09-16, Analyzed: 2022-09-16
21	0.000010 mg/L	0.000500 104 80-120
	62 621	<u> </u>

QC Qualifiers:

MS2 The native sample concentration is greater than the spike concentration hence the matrix spike limits do not apply.



Appendix D: Benthic Macroinvertebrate Taxonomy Report

Site Description

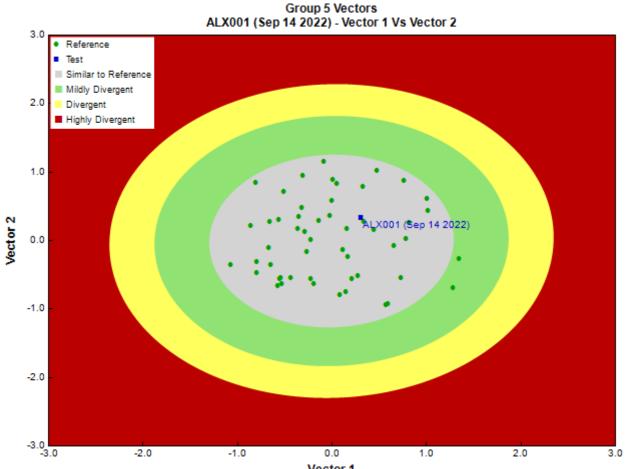
Study Name	CBWQ-Elk			
Site	ALX001			
Sampling Date	Sep 14 2022			
Know Your Watershed Basin Central Kootenay				
Province / Territory	British Columbia			
Terrestrial Ecological Classification	Montane Cordillera EcoZone			
	Northern Continental Divide EcoRegion			
Coordinates (decimal degrees)	49.67424 N, 114.78019 W			
Altitude	1219			
Local Basin Name	Alexander Creek			
	Elk River			
Stream Order	4			



Figure 1. Location Map

Cabin Assessment Results

R	eference Mo	del Summa	ary					
Model	Columbia Basin 2020							
Analysis Date	December 04, 2023							
Taxonomic Level	Family							
Predictive Model Variables	Altitude							
	Drainage-Area							
	Longitude							
	Natl-Grassland							
	Natl-ShrubLow							
	Natl-Water							
	Precip10_Oct							
	Reach-%CanopyCoverage							
	Sedimentary							
	Slope							
	SlopeMax							
	Temp12_DE	Cmin						
Reference Groups	1	2	3	4	5	6		
Number of Reference Sites	13	24	28	35	32	15		
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4%							
Overall Model Error Rate	39.4%							
Probability of Group Membership	1.3%	3.3%	3.9%	8.0%	82.0%	1.6%		
CABIN Assessment of ALX001 on Sep 14, 2022	Similar to Reference							



Vector 1

Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Pina Viola, Consultant
	Marchant Box
Sub-Sample Proportion	5/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	5	100.0
		Tubificida	Tubificida Naididae		20.0
Arthropoda	Arachnida	Trombidiformes	Lebertiidae	2	40.0
			Torrenticolidae	1	20.0
	Insecta	Coleoptera	Elmidae	2	40.0
		Diptera	Ceratopogonidae	6	120.0
			Chironomidae	39	780.0
			Empididae	1	20.0
			Psychodidae	17	340.0
			Simuliidae	2	40.0
		Ephemeroptera	Ameletidae	1	20.0
			Baetidae	55	1,100.0
			Ephemerellidae	44	880.0
			Heptageniidae	82	1,640.0
		Plecoptera	Capniidae	1	20.0
			Chloroperlidae	4	80.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Nemouridae		700.0
			Perlodidae		20.0
		Taeniopterygidae		25	500.0
		Trichoptera	Brachycentridae	2	40.0
			Glossosomatidae	21	420.0
			Hydropsychidae	2	40.0
			Rhyacophilidae	12	240.0
			Total	361	7,220.0

Metrics

Name	ALX001	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.38	0.4 ± 0.1
•	Indices	
Hilsenhoff Family index (Mid-Atlantic)	3.9	3.4 ± 0.4
Hilsenhoff Family index (North-West)	3.9	3.1 ± 0.5
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	1.0	1.7 ± 1.2
Tolerant individuals (%)		0.3 ± 0.0
Functiona	al Measures	
% Filterers		
% Gatherers	48.8	45.8 ± 14.9
% Predatores	17.2	14.8 ± 9.8
% Scrapers	52.4	59.4 ± 19.6
% Shredder	18.0	30.7 ± 17.4
No. Clinger Taxa	25.0	19.8 ± 4.0
Number O	f Individuals	
% Chironomidae	10.8	7.5 ± 8.6
% Coleoptera	0.6	0.1 ± 0.3
% Diptera + Non-insects	20.5	10.7 ± 9.9
% Ephemeroptera	50.4	47.2 ± 15.8
% Ephemeroptera that are Baetidae	30.2	25.4 ± 20.8
% EPT Individuals	78.9	89.2 ± 10.0
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	38.0	58.3 ± 10.6
% of 5 dominant taxa	70.6	83.6 ± 6.3
% of dominant taxa	22.7	37.8 ± 11.1
% Plecoptera	18.3	36.3 ± 16.7
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	5.4	25.4 ± 24.6
% Tricoptera	10.2	5.7 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.9 ± 0.1
Total Abundance	7220.0	4661.0 ± 3119.0
Ric	hness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1
Coleoptera taxa	1.0	0.1 ± 0.3
Diptera taxa	5.0	2.8 ± 1.0
Ephemeroptera taxa	4.0	3.7 ± 0.5
EPT Individuals (Sum)	5700.0	4035.4 ± 2618.4
EPT taxa (no)	13.0	12.3 ± 1.9
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.8	0.7 ± 0.1
Plecoptera taxa	5.0	5.5 ± 1.1
Shannon-Wiener Diversity	2.4	1.9 ± 0.3
Simpson's Diversity	0.9	0.8 ± 0.1
Simpson's Evenness	0.4	0.3 ± 0.1
Total No. of Taxa	23.0	17.0 ± 3.1
Trichoptera taxa	4.0	3.1 ± 1.2
•		

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Frequency of Occurrence in Reference Sites						Probability Of Occurrence at
	Group	Group	Group	Group	Group	Group	ALX001
	1	2	3	4	5	6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	12.44
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : 0:E (p > 0.5)	1.13
RIVPACS : Expected taxa P>0.70	9.53
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : 0:E (p > 0.7)	1.05

Habitat Description

Variable	ALX001		Predicted Group Reference Mean ±SD	
Bed	rock Geology			
Sedimentary (%)	100	.00000	98.46051 ± 8.10999	
	Channel			
Depth-Avg (cm)		20.9	20.0 ± 8.6	
Depth-BankfullMinusWetted (cm)		24.00	46.71 ± 35.00	
Depth-Max (cm)		38.0	28.8 ± 13.7	
Discharge (m^3/s)		1.338	0.682	
Macrophyte (PercentRange)		0	0 ± 0	
Reach-%CanopyCoverage (PercentRange)		1.00	1.04 ± 0.95	
Reach-DomStreamsideVeg (Category(1-4))		2	3 ± 1	
Reach-Pools (Binary)		0	1 ± 0	
Reach-Rapids (Binary)		0	0 ± 0	
Reach-Riffles (Binary)		1	1 ± 0	
Reach-StraightRun (Binary)		0	1 ± 0	
Slope (m/m)	0.0	151167	0.0270638 ± 0.0257534	
Veg-Coniferous (Binary)		1	1 ± 0	
Veg-Deciduous (Binary)		1	1 ± 0	
Veg-GrassesFerns (Binary)		1	1 ± 0	
Veg-Shrubs (Binary)		1	1 ± 0	
Velocity-Avg (m/s)		0.65	0.58 ± 0.20	
Velocity-Max (m/s)		1.38	0.85 ± 0.27	
Width-Bankfull (m)		14.3	16.1 ± 13.1	
Width-Wetted (m)		9.8	9.8 ± 7.7	
XSEC-VelInstrumentDirect (Category(1-3))		2	3 ± 0	
XSEC-VelMethod (Category(1-3))		3	2 ± 1	
	Climate			
Precip10_OCT (mm)		.44840	64.42223 ± 33.96544	
Temp12_DECmin (Degrees Celsius)		.37000	-12.74810 ± 1.73767	
	Hydrology			
Drainage-Area (km^2)		.83405	100.09787 ± 132.80561	
	andcover		100109707 101100001	
Natl-Grassland (%)		.13231	$7,47766 \pm 6,29880$	
Natl-ShrubLow (%)		.08024	1.80492 ± 1.50412	
Natl-Water (%)	C	.00000	0.32077 ± 0.59001	
Reg-Ice (%)		.00000	1.28005 ± 3.54484	
	bstrate Data			
%Bedrock (%)		0	0 ± 0	
%Boulder (%)		4	6 ± 6	
%Cobble (%)		55	57 ± 15	
%Gravel (%)		0	2 ± 3	
%Pebble (%)		41		
%Sand (%)		0	0 ± 0	
%Silt+Clay (%)		0	0 ± 1	
D50 (cm)		7.45	24.05 ± 35.66	
Dg (cm)		7.9	23.0 ± 33.8	
Dominant-1st (Category(0-9))		6		

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Habitat Description

Variable	ALX001	Predicted Group Reference Mean ±SD
Dominant-2nd (Category(0-9))	5	6 ± 1
Embeddedness (Category(1-5))	4	
PeriphytonCoverage (Category(1-5))	3	2 ± 1
SurroundingMaterial (Category(0-9))	2	2 = 1 3 ± 1
	graphy	5 - 1
Reg-SlopeLT30% (%)	39.74502	20.01334 ± 7.41149
SlopeMax (%)	353.26163	488.94077 ± 542.32910
	Chemistry	
Ag (mg/L)	0.0000250	0.0000018 ± 0.0000013
Al (mg/L)	0.0061000	0.0078031 ± 0.0090962
As (mg/L)	0.0002500	0.0002735 ± 0.0001787
B (mg/L)	0.0250000	0.0127286 ± 0.0135802
Ba (mg/L)	0.0674000	0.0677069 ± 0.0514113
Be (mg/L)	0.0000500	0.0000043 ± 0.0000039
Bi (mg/L)	0.0000500	0.0000018 ± 0.0000013
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L)	47.500000	28.2142857 ± 13.7707094
Cd (mg/L)	0.000050	0.0000100 ± 0.0000293
Chloride-Total (mg/L)	0.9700000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000075 ± 0.0000060
Cr (mg/L)	0.0002500	0.0001514 ± 0.0001361
Cu (mg/L)	0.0002000	0.0001604 ± 0.0001447
F (mg/L)	0.1700000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0050000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	178.000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	0.6600000	0.8383333 ± 0.4040008
General-CarbonTOC (mg/L)	0.8700000	0.5586957 ± 0.6229060
General-Conductivity (µS/cm)	195.3000000	$173.5150000 \pm 86.2502071$
General-DO (mg/L)	10.0100000	10.7243478 ± 0.8596502
General-Hardness (mg/L)	155.000000	$109.1853659 \pm 48.3470504$
General-pH (pH) General-SolidsTSS (mg/L)	8.6	8.0 ± 0.6 5.2717002 ± 27.1908288
General-SpCond (µS/cm)	276.8000000	$196.0710526 \pm 116.3908975$
General-TempAir (Degrees Celsius)	17.0	7.2 ± 5.7
General-TempWater (Degrees Celsius)	9.6000000	6.2042553 ± 2.0993816
General-Turbidity (NTU)	0.2200000	0.4347619 ± 0.5563328
Hg (ng/L)	0.0000200	$0.0000000 \pm 0.0000000000000000000000000$
K (mg/L)	0.3800000	0.3312424 ± 0.1572675
Li (mg/L)	0.0038900	0.0009183 ± 0.0003795
Mg (mg/L)	12.8000000	7.8748571 ± 3.9958945
Mn (mg/L)	0.0009200	0.0007721 ± 0.0008518
Mo (mg/L)	0.0007300	0.0012835 ± 0.0042333
Na (mg/L)	1.800000	0.7930303 ± 0.4756164
Ni (mg/L)	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2 (mg/L)	0.0050000	0.0049953 ± 0.0199967
Nitrogen-NO2+NO3 (mg/L)	0.0050000	0.0287300 ± 0.0357249
Nitrogen-NO3 (mg/L)	0.0050000	0.0336397 ± 0.0328125
Nitrogen-TKN (mg/L)	0.0250000	0.0352941 ± 0.0299453
Nitrogen-TN (mg/L)	0.0250000	0.0675581 ± 0.0509763
Pb (mg/L)	0.0001000	0.0000179 ± 0.0000156
Phosphorus-OrthoP (mg/L)	0.0025000	0.1105304 ± 0.5208890
Phosphorus-TP (mg/L)	0.0072000	0.0031912 ± 0.0087929
S (mg/L)	5.4000000	3.6625000 ± 1.5619928
Sb (mg/L)	0.0001000	0.0000337 ± 0.0000157
Se (mg/L)	0.0006400	0.0002782 ± 0.0002859
Si (mg/L)	2.000000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0001000	0.0000300 ± 0.0000407
SO4 (mg/L)	17.700000	$13.3070732 \pm 13.0883468$
Sr (mg/L)	0.1140000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	0.000000 ± 0.000000
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0003150 ± 0.0001205

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Habitat Description

Variable	ALX001	Predicted Group Reference Mean ±SD	
TI (mg/L)	0.0000100	0.0000040 ± 0.0000067	
U (mg/L)	0.0005760	0.0003872 ± 0.0002299	
V (mg/L)	0.0005000	0.0001617 ± 0.0001537	
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377	
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000	

Site Description

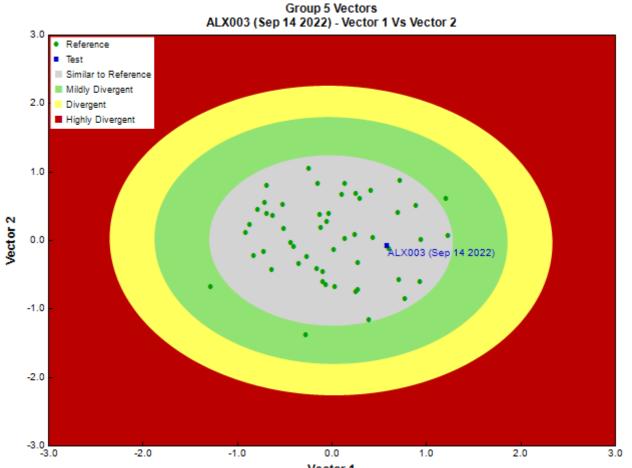
Study Name	CBWQ-Elk		
Site	ALX003		
Sampling Date	Sep 14 2022		
Know Your Watershed Basin	Central Kootenay		
Province / Territory	British Columbia		
Terrestrial Ecological Classification	Montane Cordillera EcoZone		
	Northern Continental Divide EcoRegion		
Coordinates (decimal degrees)	49.65563 N, 114.73078 W		
Altitude	1311		
Local Basin Name	Alexander Creek		
	Elk River Watershed		
Stream Order	4		



Figure 1. Location Map

Cabin Assessment Results

Reference Model Summary							
Model	Columbia Ba	Columbia Basin 2020					
Analysis Date	December 04	December 04, 2023					
Taxonomic Level	Family						
Predictive Model Variables	Altitude Drainage-Area Longitude Natl-Grassland Natl-ShrubLow Natl-Water Precip10_Oct Reach-%CanopyCoverage Sedimentary Slope Slope SlopeMax						
	Temp12_DE						
Reference Groups	1	2	3	4	5	6	
Number of Reference Sites	13	24	28	35	32	15	
Group Error Rate	53.8%	55.2%	34.1%	52.2%	23.1%	29.4%	
Overall Model Error Rate	39.4%						
Probability of Group Membership	1.5%	2.1%	3.6%	6.3%	85.6%	0.9%	
CABIN Assessment of ALX003 on Sep 14, 2022	Similar to Reference						



Vector 1

Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Pina Viola, Consultant
	Marchant Box
Sub-Sample Proportion	5/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata			1	20.0
		Tubificida	Naididae	1	20.0
Arthropoda	Arachnida	Trombidiformes	Lebertiidae	1	20.0
			Torrenticolidae	1	20.0
	Insecta	Coleoptera	Elmidae	6	120.0
		Diptera	Ceratopogonidae	2	40.0
			Chironomidae	22	440.0
			Empididae	3	60.0
			Psychodidae	47	940.0
			Simuliidae	2	40.0
		Ephemeroptera	Ameletidae	1	20.0
			Baetidae	22	440.0
			Ephemerellidae	71	1,420.0
			Heptageniidae	89	1,780.0
		Plecoptera		2	40.0
			Capniidae	5	100.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Chloroperlidae	6	120.0
			Nemouridae	28	560.0
			Perlodidae	6	120.0
			Taeniopterygidae	18	360.0
		Trichoptera		1	20.0
			Brachycentridae	3	60.0
			Glossosomatidae	4	80.0
			Hydropsychidae	6	120.0
			Rhyacophilidae	7	140.0
			Uenoidae	2	40.0
			Total	357	7,140.0

Metrics

Name	ALX003	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.38	0.4 ± 0.1
Biotic	Indices	
Hilsenhoff Family index (Mid-Atlantic)	3.8	3.4 ± 0.4
Hilsenhoff Family index (North-West)	3.8	3.1 ± 0.5
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	2.0	1.7 ± 1.2
Tolerant individuals (%)		0.3 ± 0.0
Functiona	l Measures	
% Filterers		
% Gatherers	58.3	45.8 ± 14.9
% Predatores	14.3	14.8 ± 9.8
% Scrapers	41.7	59.4 ± 19.6
% Shredder	16.8	30.7 ± 17.4
No. Clinger Taxa	30.0	19.8 ± 4.0
	Individuals	
% Chironomidae	6.2	7.5 ± 8.6
% Coleoptera	1.7	0.1 ± 0.3
% Diptera + Non-insects	22.4	10.7 ± 9.9
% Ephemeroptera	51.8	47.2 ± 15.8
% Ephemeroptera that are Baetidae	12.0	25.4 ± 20.8
% EPT Individuals	75.9	89.2 ± 10.0
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	45.3	58.3 ± 10.6
% of 5 dominant taxa	72.8	83.6 ± 6.3
% of dominant taxa	25.2	37.8 ± 11.1
% Plecoptera	17.8	36.3 ± 16.7
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	27.3	25.4 ± 24.6
% Tricoptera	6.2	5.7 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.9 ± 0.1
Total Abundance	7140.0	4661.0 ± 3119.0
	iness 1.0	10101
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1 0.1 ± 0.3
Coleoptera taxa Diptera taxa	5.0	0.1 ± 0.3 2.8 ± 1.0
Ephemeroptera taxa	4.0	2.6 ± 1.0 3.7 ± 0.5
EPT Individuals (Sum)	5360.0	3.7 ± 0.5 4035.4 ± 2618.4
EPT taxa (no)	14.0	4033.4 ± 2018.4 12.3 ± 1.9
Odonata taxa		12.5 ± 1.9 0.0 ± 0.0
Pielou's Evenness	0.7	0.0 ± 0.0 0.7 ± 0.1
Plecoptera taxa	5.0	5.5 ± 1.1
Shannon-Wiener Diversity	2.3	5.5 ± 1.1 1.9 ± 0.3
Simpson's Diversity	0.9	1.9 ± 0.3 0.8 ± 0.1
Simpson's Evenness	0.9	0.8 ± 0.1 0.3 ± 0.1
Total No. of Taxa	23.0	0.5 ± 0.1 17.0 ± 3.1
Trichoptera taxa	5.0	3.1 ± 1.2
	5.0	5.1 ± 1.2

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	quency o	f Occurre	Probability Of Occurrence at			
	Group	Group Group Group Group Group Group				ALX003	
	1	2	3	4	5	6	

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	12.47
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : 0:E (p > 0.5)	1.12
RIVPACS : Expected taxa P>0.70	9.54
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : 0:E (p > 0.7)	1.05

Habitat Description

Variable	ALX003	Predicted Group Reference Mean ±SD					
Bedrock Geology							
Sedimentary (%)	100.00000	98.46051 ± 8.10999					
Cha	nnel						
Depth-Avg (cm)	26.3	20.0 ± 8.6					
Depth-BankfullMinusWetted (cm)	19.10	46.71 ± 35.00					
Depth-Max (cm)	50.0	28.8 ± 13.7					
Discharge (m^3/s)	1.224	0.682					
Macrophyte (PercentRange)	1	0 ± 0					
Reach-%CanopyCoverage (PercentRange)	1.00	1.04 ± 0.95					
Reach-DomStreamsideVeg (Category(1-4))	2	3 ± 1					
Reach-Pools (Binary)	1	1 ± 0					
Reach-Rapids (Binary)	0	0 ± 0					
Reach-Riffles (Binary)	1	1 ± 0					
Reach-StraightRun (Binary)	1	1 ± 0					
Slope (m/m)	0.0238667	0.0270638 ± 0.0257534					
Veg-Coniferous (Binary)	1	1 ± 0					
Veg-Deciduous (Binary)	1	1 ± 0					
Veg-GrassesFerns (Binary)	1	1 ± 0					
Veg-Shrubs (Binary)	1	1 ± 0					
Velocity-Avg (m/s)	0.47	0.58 ± 0.20					
Velocity-Max (m/s)	0.73	0.85 ± 0.27					
Width-Bankfull (m)	10.9	16.1 ± 13.1					
Width-Wetted (m)	10.0	9.8 ± 7.7					
XSEC-VelInstrumentDirect (Category(1-3))	2	3 ± 0					
XSEC-VelMethod (Category(1-3))	3	2 ± 1					
	nate						
Precip10_OCT (mm)	43,56508	64.42223 ± 33.96544					
Temp12_DECmin (Degrees Celsius)	-14.37000	-12.74810 ± 1.73767					
	ology						
Drainage-Area (km^2)	145.66791	100.09787 ± 132.80561					
	lcover						
Natl-Grassland (%)	2.54675	7.47766 ± 6.29880					
Natl-ShrubLow (%)	0.09901	1.80492 ± 1.50412					
Natl-Water (%)	0.00000	0.32077 ± 0.59001					
Reg-Ice (%)	0.00000	1.28005 ± 3.54484					
	ate Data						
%Bedrock (%)	0	0 ± 0					
%Boulder (%)	1	6 ± 6					
%Cobble (%)	74	57 ± 15					
%Gravel (%)	3	2 ± 3					
%Pebble (%)	22	34 ± 16					
%Sand (%)	0	0 ± 0					
%Silt+Clay (%)	0	0 ± 1					
D50 (cm)	9.75	24.05 ± 35.66					
Dg (cm)	8.2	23.0 ± 33.8					
Dominant-1st (Category(0-9))	6	6 ± 1					
Dominant-2nd (Category(0-9))	7	6 ± 1					
	,	5-1					

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Habitat Description

Variable	ALX003	Predicted Group Reference Mean ±SD
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	3	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 1
То	pography	
Reg-SlopeLT30% (%)	37.52888	20.01334 ± 7.41149
SlopeMax (%)	353.26163	488.94077 ± 542.32910
Wate		
Ag (mg/L)	0.0000250	0.0000018 ± 0.0000013
AI (mg/L)	0.0087000	0.0078031 ± 0.0090962
As (mg/L)	0.0002500	0.0002735 ± 0.0001787
B (mg/L)	0.0250000	0.0127286 ± 0.0135802
Ba (mg/L)	0.0650000	0.0677069 ± 0.0514113
Be (mg/L)	0.0000500	0.0000043 ± 0.0000039
Bi (mg/L)	0.0000500	0.0000018 ± 0.0000013
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L) Cd (mg/L)	47.5000000	28.2142857 ± 13.7707094 0.0000100 ± 0.0000293
Cd (mg/L) Chloride-Total (mg/L)	0.8000000	$\frac{0.0000100 \pm 0.0000293}{0.00000000}$
Co (mg/L)	0.0000500	0.0000075 ± 0.0000060
Cr (mg/L)	0.0002500	0.0001514 ± 0.0001361
Cr (mg/L) Cu (mg/L)	0.0002300	$\frac{0.0001314 \pm 0.0001381}{0.0001604 \pm 0.0001447}$
F (mg/L)	0.1500000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0140000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	179.000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	0.5600000	$\frac{0.8383333 \pm 0.4040008}{0.8383333 \pm 0.4040008}$
General-CarbonTOC (mg/L)	0.5900000	0.5586957 ± 0.6229060
General-DO (mg/L)	10.7000000	10.7243478 ± 0.8596502
General-Hardness (mg/L)	161.0000000	$109.1853659 \pm 48.3470504$
General-pH (pH)	8.5	8.0 ± 0.6
General-SolidsTSS (mg/L)	1.0000000	5.2717002 ± 27.1908288
General-SpCond (µS/cm)	246.5000000	196.0710526 ± 116.3908975
General-TempAir (Degrees Celsius)	12.5	7.2 ± 5.7
General-TempWater (Degrees Celsius)	6.200000	6.2042553 ± 2.0993816
General-Turbidity (NTU)	0.2500000	0.4347619 ± 0.5563328
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.3500000	0.3312424 ± 0.1572675
Li (mg/L)	0.0036100	0.0009183 ± 0.0003795
Mg (mg/L)	12.300000	7.8748571 ± 3.9958945
Mn (mg/L)	0.0015500	0.0007721 ± 0.0008518
Mo (mg/L)	0.0006500	0.0012835 ± 0.0042333
Na (mg/L)	1.5700000	0.7930303 ± 0.4756164
	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2 (mg/L)	0.0050000	0.0049953 ± 0.0199967
Nitrogen-NO2+NO3 (mg/L) Nitrogen-NO3 (mg/L)	0.0050000	0.0287300 ± 0.0357249
Nitrogen-TKN (mg/L)	0.0050000	$\begin{array}{c} 0.0336397 \pm 0.0328125 \\ 0.0352941 \pm 0.0299453 \end{array}$
	0.0780000	$\frac{0.0332941 \pm 0.0299433}{0.0675581 \pm 0.0509763}$
Nitrogen-TN (mg/L) Pb (mg/L)	0.0080000	$\frac{0.0675381 \pm 0.0509763}{0.0000179 \pm 0.0000156}$
Pb (mg/L) Phosphorus-OrthoP (mg/L)	0.0025000	$\frac{0.0000179 \pm 0.0000138}{0.1105304 \pm 0.5208890}$
Phosphorus-TP (mg/L)	0.0023000	$\frac{0.1103304 \pm 0.3208890}{0.0031912 \pm 0.0087929}$
S (mg/L)	5.0000000	3.6625000 ± 1.5619928
Sb (mg/L)	0.0001000	0.0000337 ± 0.0000157
Se (mg/L)	0.0005200	0.0002782 ± 0.0002859
Si (mg/L)	2.0000000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0001000	$\frac{2.0400303 \pm 0.0510321}{0.0000300 \pm 0.0000407}$
SO4 (mg/L)	15.7000000	$13.3070732 \pm 13.0883468$
Sr (mg/L)	0.1090000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	$0.0000000 \pm 0.0000000000000000000000000$
Th (mg/L)	0.0000500	$0.0000000 \pm 0.0000000000000000000000000$
Ti (mg/L)	0.0025000	0.0003150 ± 0.0001205
TI (mg/L)	0.0000100	0.0000040 ± 0.0000067
U (mg/L)	0.0005220	0.0003872 ± 0.0002299
- \ _/ -/	0.0000220	

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Habitat Description

Variable	ALX003	Predicted Group Reference Mean ±SD
V (mg/L)	0.0005000	0.0001617 ± 0.0001537
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000

Site Description

Study Name	CBWQ-Elk
Site	BOI001
Sampling Date	Sep 21 2022
Know Your Watershed Basin	Central Kootenay
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera EcoZone
	Northern Continental Divide EcoRegion
Coordinates (decimal degrees)	50.02314 N, 114.91614 W
Altitude	1261
Local Basin Name	Elk River
	Boivin Creek
Stream Order	4



Figure 1. Location Map

Cabin Assessment Results

R	eference Mo	odel Summa	ary			
Model	Columbia Ba	Columbia Basin 2020				
Analysis Date	December 0	December 04, 2023				
Taxonomic Level	Family					
Predictive Model Variables	Altitude					
	Drainage-Ar	ea				
	Longitude					
	Natl-Grassla	nd				
	Natl-ShrubLo	ow				
	Natl-Water					
	Precip10 Oct					
	Reach-%CanopyCoverage					
	Sedimentary					
	Slope					
	SlopeMax					
	Temp12_DE	Cmin				
Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	24	28	35	32	15
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4					
Overall Model Error Rate	39.4%					
Probability of Group Membership	6.4%	9.5%	4.6%	17.3%	58.2%	4.0%
CABIN Assessment of BOI001 on Sep 21, 2022	Similar to Reference					

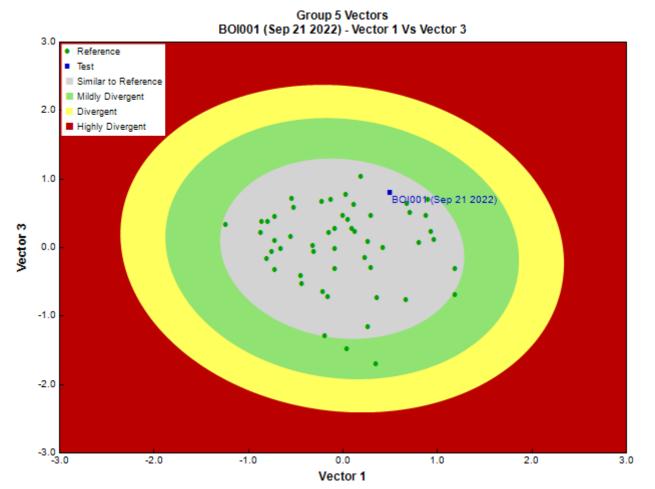


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Pina Viola, Consultant
	Marchant Box
Sub-Sample Proportion	6/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Arthropoda	Insecta	Diptera	Chironomidae	178	2,966.7
			Psychodidae	1	16.7
			Simuliidae	3	50.0
		Ephemeroptera	Ameletidae	1	16.7
			Baetidae	33	550.0
			Ephemerellidae	19	316.7
			Heptageniidae	135	2,250.0
		Plecoptera	Capniidae	1	16.7
			Chloroperlidae	3	50.0
			Leuctridae	4	66.7
			Nemouridae	25	416.7
			Perlodidae	1	16.7
			Taeniopterygidae	112	1,866.7
		Trichoptera	Glossosomatidae	3	50.0
			Rhyacophilidae	5	83.3
			Total	524	8,733.6

Metrics

Name	BOI001	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.45	0.4 ± 0.1
Biotic	Indices	
Hilsenhoff Family index (Mid-Atlantic)	3.2	3.4 ± 0.4
Hilsenhoff Family index (North-West)	3.2	3.1 ± 0.5
Intolerant taxa		1.0 ± 0.0
Long-lived taxa		1.7 ± 1.2
Tolerant individuals (%)		0.3 ± 0.0
Functiona	al Measures	
% Filterers		
% Gatherers	64.7	45.8 ± 14.9
% Predatores	35.7	14.8 ± 9.8
% Scrapers	54.6	59.4 ± 19.6
% Shredder	27.1	30.7 ± 17.4
No. Clinger Taxa	21.0	19.8 ± 4.0
	f Individuals	
% Chironomidae	34.0	7.5 ± 8.6
% Coleoptera	0.0	0.1 ± 0.3
% Diptera + Non-insects	34.7	10.7 ± 9.9
% Ephemeroptera	35.9	47.2 ± 15.8
% Ephemeroptera that are Baetidae	17.6	25.4 ± 20.8
% EPT Individuals	65.3	89.2 ± 10.0
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	59.7	58.3 ± 10.6
% of 5 dominant taxa	92.2	83.6 ± 6.3
% of dominant taxa	34.0	37.8 ± 11.1
% Plecoptera	27.9	36.3 ± 16.7
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	0.0	25.4 ± 24.6
% Tricoptera	1.5	5.7 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.7	0.9 ± 0.1
Total Abundance	8733.3	4661.0 ± 3119.0
	hness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1
Coleoptera taxa	0.0	0.1 ± 0.3
Diptera taxa	3.0	2.8 ± 1.0
Ephemeroptera taxa	4.0	3.7 ± 0.5
EPT Individuals (Sum)	5700.0	4035.4 ± 2618.4
EPT taxa (no)	12.0	12.3 ± 1.9
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.6	0.7 ± 0.1
Plecoptera taxa	6.0	5.5 ± 1.1
Shannon-Wiener Diversity	1.7	$\frac{5.5 \pm 1.1}{1.9 \pm 0.3}$
Simpson's Diversity	0.8	0.8 ± 0.1
Simpson's Evenness	0.3	0.3 ± 0.1
Total No. of Taxa	15.0	17.0 ± 3.1
Trichoptera taxa	2.0	3.1 ± 1.2
	2.0	5.1 - 1.2

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	Frequency of Occurrence in Reference Sites					Probability Of Occurrence at
	Group	Group Group Group Group Group				BOI001	
	1	2	3	4	5	6	

RIVPACS Ratios	
RIVPACS : Expected taxa P>0.50	11.28
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : O:E (p > 0.5)	0.98
RIVPACS : Expected taxa P>0.70	9.41
RIVPACS : Observed taxa P>0.70	9.00
RIVPACS : 0:E (p > 0.7)	0.96

Habitat Description

Variable	BOI001		Predicted Group Reference Mean ±SD	
	ock Geology			
Sedimentary (%)		00000	98.46051 ± 8.10999	
	Channel	20.4		
Depth-Avg (cm)		29.4	20.0 ± 8.6	
Depth-BankfullMinusWetted (cm)		20.00	46.71 ± 35.00	
Depth-Max (cm) Discharge (m^3/s)		44.0	28.8 ± 13.7	
Macrophyte (PercentRange)		1.965 0	0.682 0 ± 0	
Reach-%CanopyCoverage (PercentRange)		0.00	1.04 ± 0.95	
Reach-%Logging (PercentRange)		0.00	1.04 ± 0.55 0 ± 0	
Reach-DomStreamsideVeg (Category(1-4))		1	<u> </u>	
Reach-Pools (Binary)		0	1 ± 0	
Reach-Rapids (Binary)		0	0 ± 0	
Reach-Riffles (Binary)		1	1 ± 0	
Reach-StraightRun (Binary)		0	1 ± 0	
Slope (m/m)	0.03	00000	0.0270638 ± 0.0257534	
Veg-Coniferous (Binary)		1	1 ± 0	
Veg-Deciduous (Binary)		0	1 ± 0	
Veg-GrassesFerns (Binary)		1	1 ± 0	
Veg-Shrubs (Binary)		1	<u>1 ± 0</u>	
Velocity-Avg (m/s)		0.80	0.58 ± 0.20	
Velocity-Max (m/s)		1.50	0.85 ± 0.27	
Width-Bankfull (m) Width-Wetted (m)		9.0 8.4	<u>16.1 ± 13.1</u> 9.8 ± 7.7	
XSEC-VelInstrumentDirect (Category(1-3))		<u> </u>	$\frac{9.6 \pm 7.7}{3 \pm 0}$	
XSEC-VelMethod (Category(1-3))		3	2 ± 1	
	Climate		<u> </u>	
Precip10_OCT (mm)		44750	64.42223 ± 33.96544	
Temp12_DECmin (Degrees Celsius)		85000	-12.74810 ± 1.73767	
	ydrology			
Drainage-Area (km^2)	63.	55090	100.09787 ± 132.80561	
	andcover			
Natl-Grassland (%)		92278	7.47766 ± 6.29880	
Natl-ShrubLow (%)		38854	1.80492 ± 1.50412	
Natl-Water (%)		00000	0.32077 ± 0.59001	
Reg-Ice (%)	ostrate Data	00000	1.28005 ± 3.54484	
%Bedrock (%)	strate Data	0	0 ± 0	
%Boulder (%)		4	6 ± 6	
%Cobble (%)		60		
%Gravel (%)		5	2 ± 3	
%Pebble (%)		31	34 ± 16	
%Sand (%)		0	0 ± 0	
%Silt+Clay (%)		0	0 ± 1	
D50 (cm)		8.95	24.05 ± 35.66	
Dg (cm)		7.7	23.0 ± 33.8	
Dominant-1st (Category(0-9))		6	6 ± 1	
Dominant-2nd (Category(0-9))		7	6 ± 1	
Embeddedness (Category(1-5))		4	4 ± 1	
PeriphytonCoverage (Category(1-5))		3	2 ± 1	
SurroundingMaterial (Category(0-9))	pography	2	3 ± 1	
Reg-SlopeLT30% (%)		45671	20.01334 ± 7.41149	
SlopeMax (%)		63962	488.94077 ± 542.32910	
	er Chemistry	22302		
Ag (mg/L)		00250	0.0000018 ± 0.0000013	
Al (mg/L)		25000	0.0078031 ± 0.0090962	
As (mg/L)		05300	0.0002735 ± 0.0001787	
B (mg/L)		50000	0.0127286 ± 0.0135802	
Ba (mg/L)		74000	0.0677069 ± 0.0514113	
Be (mg/L)		00500	0.0000043 ± 0.0000039	
Bi (mg/L)		00500	0.0000018 ± 0.0000013	

Habitat Description

Habitat Description		
Variable	B0I001	Predicted Group Reference Mean ±SD
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L)	50.000000	28.2142857 ± 13.7707094
Cd (mg/L)	0.0000260	0.0000100 ± 0.0000293
Chloride-Total (mg/L)	0.050000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000075 ± 0.0000060
Cr (mg/L)	0.0005200	0.0001514 ± 0.0001361
Cu (mg/L)	0.0002000	0.0001604 ± 0.0001447
F (mg/L)	0.2300000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0050000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	160.000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	0.2500000	0.8383333 ± 0.4040008
General-CarbonTOC (mg/L)	0.2500000	0.5586957 ± 0.6229060
General-DO (mg/L)	11.2800000	10.7243478 ± 0.8596502
General-Hardness (mg/L)	178.000000	109.1853659 ± 48.3470504
General-pH (pH)	7.3	8.0 ± 0.6
General-SolidsTSS (mg/L)	1.000000	5.2717002 ± 27.1908288
General-SpCond (µS/cm)	276.300000	$196.0710526 \pm 116.3908975$
General-TempAir (Degrees Celsius)	17.5	7.2 ± 5.7
General-TempWater (Degrees Celsius)	5.300000	6.2042553 ± 2.0993816
General-Turbidity (NTU)	0.1800000	0.4347619 ± 0.5563328
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.2800000	0.3312424 ± 0.1572675
Li (mg/L)	0.0013100	0.0009183 ± 0.0003795
Mg (mg/L)	12.9000000	7.8748571 ± 3.9958945
Mn (mg/L)	0.0001000	0.0007721 ± 0.0008518
Mo (mg/L)	0.0014000	0.0012835 ± 0.0042333
Na (mg/L)	0.5700000	0.7930303 ± 0.4756164
Ni (mg/L)	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2 (mg/L)	0.0050000	0.0049953 ± 0.0199967
Nitrogen-NO2+NO3 (mg/L)	0.0389000	0.0287300 ± 0.0357249
Nitrogen-NO3 (mg/L)	0.0390000	0.0336397 ± 0.0328125
Nitrogen-TKN (mg/L)	0.0250000	0.0352941 ± 0.0299453
Nitrogen-TN (mg/L)	0.0250000	0.0675581 ± 0.0509763
Pb (mg/L)	0.0001000	0.0000179 ± 0.0000156
Phosphorus-OrthoP (mg/L)	0.0025000	0.1105304 ± 0.5208890
Phosphorus-TP (mg/L)	0.0025000	0.0031912 ± 0.0087929
S (mg/L)	16.900000	3.6625000 ± 1.5619928
Sb (mg/L)	0.0001000	0.0000337 ± 0.0000157
Se (mg/L)	0.0009700	0.0002782 ± 0.0002859
Si (mg/L)	2.100000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0001000	0.0000300 ± 0.0000407
SO4 (mg/L)	52.800000	13.3070732 ± 13.0883468
Sr (mg/L)	0.4900000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0003150 ± 0.0001205
TI (mg/L)	0.0000100	0.0000040 ± 0.0000067
U (mg/L)	0.0009160	0.0003872 ± 0.0002299
V (mg/L)	0.0005000	0.0001617 ± 0.0001537
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000
\ 2/ -/	010000000	

Site Description

Study Name	CBWQ-Elk			
Site	BOI002			
Sampling Date	Sep 21 2022			
Know Your Watershed Basin	Central Kootenay			
Province / Territory	British Columbia			
Terrestrial Ecological Classification	Montane Cordillera EcoZone			
	Northern Continental Divide EcoRegion			
Coordinates (decimal degrees)	50.01693 N, 114.93698 W			
Altitude	1316			
Local Basin Name	Elk River			
	Boivin Creek			
Stream Order	4			



Figure 1. Location Map

Cabin Assessment Results

R	eference Mo	del Summa	ary				
Model	Columbia Ba	Columbia Basin 2020					
Analysis Date	December 0	4, 2023					
Taxonomic Level	Family						
Predictive Model Variables	Altitude						
	Drainage-Area						
	Longitude						
	Natl-Grassla	nd					
	Natl-ShrubLo	ow					
	Natl-Water						
	Precip10 Oct						
	Reach-%CanopyCoverage						
	Sedimentary						
	Slope						
	SlopeMax						
	Temp12_DECmin						
Reference Groups	1 2 3 4 5 6						
Number of Reference Sites	13 24 28 35 32 15						
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4%						
Overall Model Error Rate	39.4%						
Probability of Group Membership	6.6%	7.2%	4.4%	14.8%	63.7%	3.2%	
CABIN Assessment of BOI002 on Sep 21, 2022	Similar to Reference						

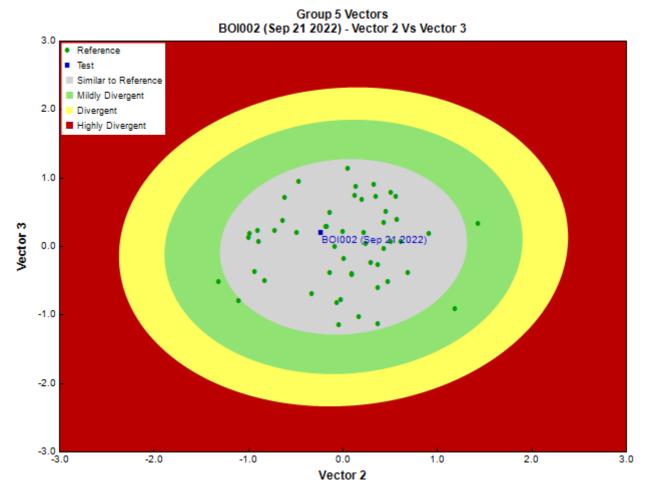


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net			
Mesh Size	400			
Sampling Time	3			
Taxonomist	Pina Viola, Consultant			
	Marchant Box			
Sub-Sample Proportion	8/100			

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	2	25.0
Arthropoda	Arachnida	Trombidiformes	Hydryphantidae	1	12.5
	Insecta	Diptera	Chironomidae	53	662.5
			Empididae	1	12.5
			Psychodidae	3	37.5
		Ephemeroptera	Ameletidae	5	62.5
			Baetidae	36	450.0
			Ephemerellidae	66	825.0
			Heptageniidae	77	962.5
		Plecoptera	Capniidae	2	25.0
			Chloroperlidae	9	112.5
			Nemouridae	17	212.5
			Perlodidae	12	150.0
			Taeniopterygidae	67	837.5
		Trichoptera	Glossosomatidae	8	100.0
			Hydropsychidae	1	12.5

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Rhyacophilidae	13	162.5
			Uenoidae	1	12.5
			Total	374	4,675.0

Metrics

Name	B01002	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.24	0.4 ± 0.1
-	otic Indices	
Hilsenhoff Family index (Mid-Atlantic)	3.3	3.4 ± 0.4
Hilsenhoff Family index (North-West)	3.3	3.1 ± 0.5
Intolerant taxa		1.0 ± 0.0
Long-lived taxa		1.7 ± 1.2
Tolerant individuals (%)		0.3 ± 0.0
Funct	ional Measures	
% Filterers		
% Gatherers	57.5	45.8 ± 14.9
% Predatores	21.7	14.8 ± 9.8
% Scrapers	50.8	59.4 ± 19.6
% Shredder	23.0	30.7 ± 17.4
No. Clinger Taxa	20.0	19.8 ± 4.0
Numbe	er Of Individuals	
% Chironomidae	14.2	7.5 ± 8.6
% Coleoptera	0.0	0.1 ± 0.3
% Diptera + Non-insects	16.0	10.7 ± 9.9
% Ephemeroptera	49.2	47.2 ± 15.8
% Ephemeroptera that are Baetidae	19.6	25.4 ± 20.8
% EPT Individuals	84.0	89.2 ± 10.0
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	38.5	58.3 ± 10.6
% of 5 dominant taxa	79.9	83.6 ± 6.3
% of dominant taxa	20.6	37.8 ± 11.1
% Plecoptera	28.6	36.3 ± 16.7
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	4.3	25.4 ± 24.6
% Tricoptera	6.1	5.7 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.9 ± 0.1
Total Abundance	4675.0	4661.0 ± 3119.0
	Richness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1
Coleoptera taxa	0.0	0.1 ± 0.3
Diptera taxa	3.0	2.8 ± 1.0
Ephemeroptera taxa	4.0	3.7 ± 0.5
EPT Individuals (Sum)	3925.0	4035.4 ± 2618.4
EPT taxa (no)	13.0	12.3 ± 1.9
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.8	0.7 ± 0.1
Plecoptera taxa	5.0	5.5 ± 1.1
Shannon-Wiener Diversity	2.2	1.9 ± 0.3
Simpson's Diversity	0.9	0.8 ± 0.1
Simpson's Evenness	0.4	0.3 ± 0.1
Total No. of Taxa	18.0	17.0 ± 3.1
Trichoptera taxa	4.0	3.1 ± 1.2

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	quency o	f Occurre	Probability Of Occurrence at			
	Group	Group Group Group Group Group				BOI002	
	1	2	3	4	5	6	

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	11.78
RIVPACS : Observed taxa P>0.50	13.00
RIVPACS : 0:E (p > 0.5)	1.10
RIVPACS : Expected taxa P>0.70	9.42
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : 0:E (p > 0.7)	1.06

Habitat Description

Variable	B01002	Predicted Group Reference Mean ±SD
	ck Geology	
Sedimentary (%)	100.00000	98.46051 ± 8.10999
	hannel	
Depth-Avg (cm)	35.3	20.0 ± 8.6
Depth-BankfullMinusWetted (cm)	29.00	46.71 ± 35.00
Depth-Max (cm)	41.0	28.8 ± 13.7
Macrophyte (PercentRange)	0	0 ± 0
Reach-%CanopyCoverage (PercentRange)	0.00	1.04 ± 0.95
Reach-DomStreamsideVeg (Category(1-4))	2	3 ± 1
Reach-Pools (Binary)	1	1 ± 0
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	0	1 ± 0
Slope (m/m)	0.0315830	0.0270638 ± 0.0257534
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	1	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	1.18	0.58 ± 0.20
Velocity-Max (m/s)	1.50	0.85 ± 0.27
Width-Bankfull (m)	9.2	16.1 ± 13.1
Width-Wetted (m)	5.4	9.8 ± 7.7
XSEC-VelInstrumentDirect (Category(1-3))	3	3 ± 0
XSEC-VelMethod (Category(1-3))	3	2 ± 1
	limate	
Precip10_OCT (mm)	45.58192	64.42223 ± 33.96544
Temp12_DECmin (Degrees Celsius)	-14.85000	-12.74810 ± 1.73767
	drology	
Drainage-Area (km^2)	59.44235	100.09787 ± 132.80561
	ndcover	
Natl-Grassland (%)	0.67640	7.47766 ± 6.29880
Natl-ShrubLow (%)	0.28480	1.80492 ± 1.50412
Natl-Water (%)	0.00000	0.32077 ± 0.59001
Reg-Ice (%)	0.00000	1.28005 ± 3.54484
	trate Data	
%Bedrock (%)	0	0 ± 0
%Boulder (%)	11	6 ± 6
%Cobble (%)	44	57 ± 15
%Gravel (%)	12	2 ± 3
%Pebble (%)	31	34 ± 16
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	2	0 ± 1
D50 (cm)	7.35	24.05 ± 35.66
Dg (cm)	6.5	23.0 ± 33.8
Dominant-1st (Category(0-9))	6	6 ± 1
Dominant-2nd (Category(0-9))	5	<u>6 ± 1</u>
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	2	2 ± 1
SurroundingMaterial (Category(0-9))	3	3 ± 1
	ography	
Reg-SlopeLT30% (%)	16.55265	20.01334 ± 7.41149
SlopeMax (%)	317.63962	488.94077 ± 542.32910

Habitat Description	Barras	
Variable	BOI002	Predicted Group Reference Mean ±SD
Ag (mg/L)	0.0000250	0.0000018 ± 0.0000013
Al (mg/L)	0.0025000	0.0078031 ± 0.0090962
As (mg/L)	0.0005800	0.0002735 ± 0.0001787
B (mg/L)	0.0250000	0.0127286 ± 0.0135802
Ba (mg/L)	0.0307000	0.0677069 ± 0.0514113
Be (mg/L)	0.0000500	0.0000043 ± 0.0000039
Bi (mg/L)	0.0000500	0.0000018 ± 0.0000013
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L)	57.000000	28.2142857 ± 13.7707094
Cd (mg/L)	0.0000280	0.0000100 ± 0.0000293
Chloride-Total (mg/L)	0.0500000	0.000000 ± 0.000000
Co (mg/L)	0.0000500	0.0000075 ± 0.0000060
Cr (mg/L)	0.0006200	0.0001514 ± 0.0001361
Cu (mg/L)	0.0002000	0.0001604 ± 0.0001447
F (mg/L)	0.2400000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0050000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	146.0000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	0.2500000	0.8383333 ± 0.4040008
General-CarbonTOC (mg/L)	0.2500000	0.5586957 ± 0.6229060
General-DO (mg/L)	11.400000	10.7243478 ± 0.8596502
General-Hardness (mg/L)	178.000000	$109.1853659 \pm 48.3470504$
General-pH (pH)	7.2	8.0 ± 0.6
General-SolidsTSS (mg/L)	1.000000	5.2717002 ± 27.1908288
General-SpCond (µS/cm)	277.6000000	$196.0710526 \pm 116.3908975$
General-TempAir (Degrees Celsius)	3.0	$\frac{196.0710326 \pm 116.3908973}{7.2 \pm 5.7}$
General-TempWater (Degrees Celsius)	3.800000	7.2 ± 5.7 6.2042553 ± 2.0993816
General-Turbidity (NTU)		$\frac{0.2042555 \pm 2.0993816}{0.4347619 \pm 0.5563328}$
	0.3100000	
Hg (ng/L)	0.0000200	$\begin{array}{c} 0.0000000 \pm 0.0000000 \\ 0.3312424 \pm 0.1572675 \end{array}$
K (mg/L)	0.3300000	$\frac{0.3312424 \pm 0.1372873}{0.0009183 \pm 0.0003795}$
Li (mg/L)	0.0015200	7.8748571 ± 3.9958945
Mg (mg/L)		
Mn (mg/L)	0.0001000	0.0007721 ± 0.0008518
Mo (mg/L)	0.0015600	$\begin{array}{r} 0.0012835 \pm 0.0042333 \\ 0.7930303 \pm 0.4756164 \end{array}$
Na (mg/L)		
Ni (mg/L)	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2 (mg/L)	0.0050000	0.0049953 ± 0.0199967
Nitrogen-NO2+NO3 (mg/L)	0.0657000	0.0287300 ± 0.0357249
Nitrogen-NO3 (mg/L)	0.0660000	0.0336397 ± 0.0328125
Nitrogen-TKN (mg/L)	0.0250000	0.0352941 ± 0.0299453
Nitrogen-TN (mg/L)	0.0657000	0.0675581 ± 0.0509763
Pb (mg/L)	0.0001000	0.0000179 ± 0.0000156
Phosphorus-OrthoP (mg/L)	0.0025000	0.1105304 ± 0.5208890
Phosphorus-TP (mg/L)	0.0025000	0.0031912 ± 0.0087929
S (mg/L)	19.2000000	3.6625000 ± 1.5619928
Sb (mg/L)	0.0001000	0.0000337 ± 0.0000157
Se (mg/L)	0.0011000	0.0002782 ± 0.0002859
Si (mg/L)	2.400000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0004500	0.0000300 ± 0.0000407
SO4 (mg/L)	53.000000	13.3070732 ± 13.0883468
Sr (mg/L)	0.5610000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	0.0000000 ± 0.000000
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0003150 ± 0.0001205
Tl (mg/L)	0.0000100	0.0000040 ± 0.0000067
U (mg/L)	0.0010700	0.0003872 ± 0.0002299
V (mg/L)	0.0005000	0.0001617 ± 0.0001537
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000

Site Description

Study Name	CBWQ-Elk	
Site	COL001	
Sampling Date	Sep 18 2022	
Know Your Watershed Basin	Central Kootenay	
Province / Territory	British Columbia	
Terrestrial Ecological Classification	Montane Cordillera EcoZone	
	Northern Continental Divide EcoRegion	
Coordinates (decimal degrees)	49.49574 N, 115.06643 W	
Altitude	999	
Local Basin Name	Elk River	
	Coal Creek	
Stream Order	3	



Figure 1. Location Map

Cabin Assessment Results

Reference Model Summary						
Model	Columbia Ba	Columbia Basin 2020				
Analysis Date	December 04	1, 2023				
Taxonomic Level	Family					
Predictive Model Variables	Altitude					
	Drainage-Are	ea				
	Longitude					
	Natl-Grasslar	nd				
	Natl-ShrubLo	w				
	Natl-Water					
	Precip10 Oct					
	Reach-%CanopyCoverage					
	Sedimentary					
	Slope					
	SlopeMax					
	Temp12_DECmin					
Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	24	28	35	32	15
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4%					29.4%
Overall Model Error Rate	39.4%					
Probability of Group Membership	2.7% 13.6% 11.8% 47.7% 21.9% 2.2%					2.2%
CABIN Assessment of COL001 on Sep 18, 2022	Highly Divergent					

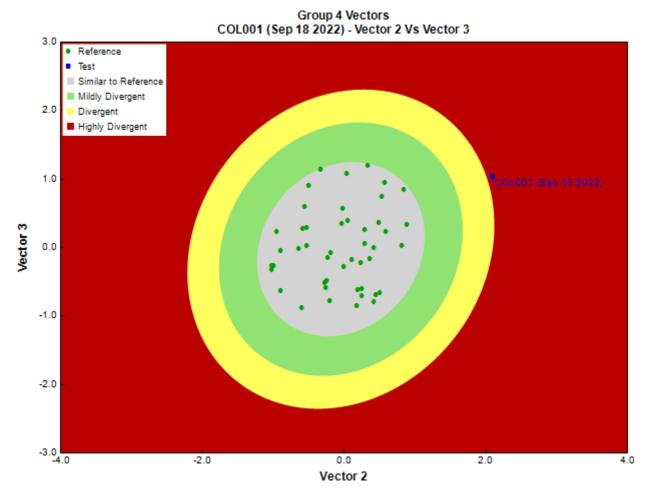


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net	
Mesh Size	400	
Sampling Time	3	
Taxonomist	Pina Viola, Consultant	
	Marchant Box	
Sub-Sample Proportion	6/100	

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Tubificida	Naididae	244	4,066.7
Arthropoda	Arachnida	Trombidiformes	Aturidae	1	16.7
			Hygrobatidae	1	16.7
			Lebertiidae	3	50.0
			Sperchontidae	3	50.0
			Torrenticolidae	5	83.3
	Insecta	Coleoptera	Elmidae	2	33.4
		Diptera	Chironomidae	174	2,900.0
			Empididae	1	16.7
			Tipulidae	9	150.0
		Ephemeroptera	Ameletidae	1	16.7
			Baetidae	23	383.4
			Ephemerellidae	150	2,500.1
			Heptageniidae	19	316.7
			Leptophlebiidae	2	33.3
		Plecoptera	Capniidae	22	366.7

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Leuctridae	1	16.7
			Nemouridae	4	66.7
		Perlodidae		2	33.3
		Trichoptera	Hydropsychidae	2	33.4
			Hydroptilidae	1	16.7
			Lepidostomatidae	38	633.3
			Total	708	11,800.5

Metrics

Name	COL001	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.9	0.3 ± 0.1
	Indices	
Hilsenhoff Family index (Mid-Atlantic)	8.6	3.2 ± 0.4
Hilsenhoff Family index (North-West)	8.6	2.9 ± 0.3
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	2.0	1.9 ± 1.0
Tolerant individuals (%)		0.5 ± 0.4
Function	al Measures	
% Filterers		0.3
% Gatherers	117.7	47.1 ± 15.4
% Predatores	27.1	12.9 ± 7.3
% Scrapers	6.6	68.3 ± 16.1
% Shredder	10.7	36.7 ± 14.6
No. Clinger Taxa	21.0	20.3 ± 4.6
Number O	f Individuals	
% Chironomidae	24.6	5.2 ± 5.7
% Coleoptera	0.3	0.6 ± 2.2
% Diptera + Non-insects	62.3	7.4 ± 7.0
% Ephemeroptera	27.5	45.8 ± 15.1
% Ephemeroptera that are Baetidae	11.8	28.9 ± 20.8
% EPT Individuals	37.4	91.9 ± 7.3
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	59.0	59.5 ± 11.3
% of 5 dominant taxa	88.8	85.1 ± 6.5
% of dominant taxa	34.5	37.7 ± 10.4
% Plecoptera	4.1	40.5 ± 13.3
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	4.9	23.9 ± 23.6
% Tricoptera	5.8	5.6 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.6	0.9 ± 0.1
Total Abundance	11800.0	1449.6 ± 859.7
Ric	hness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.2
Coleoptera taxa	1.0	0.2 ± 0.5
Diptera taxa	3.0	2.6 ± 1.1
Ephemeroptera taxa	5.0	3.7 ± 0.6
EPT Individuals (Sum)	4416.7	1353.0 ± 804.6
EPT taxa (no)	12.0	12.3 ± 2.2
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.6	0.7 ± 0.1
Plecoptera taxa	4.0	5.4 ± 1.2
Shannon-Wiener Diversity	1.8	1.9 ± 0.3
Simpson's Diversity	0.8	0.8 ± 0.1
Simpson's Evenness	0.2	0.3 ± 0.1
Total No. of Taxa	22.0	16.5 ± 3.6
Trichoptera taxa	3.0	3.2 ± 1.3

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Frequency of Occurrence in Reference Sites					Probability Of Occurrence at	
	Group	Group	Group	Group	Group	Group	COL001
	1	2	3	4	5	6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	11.85
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : 0:E (p > 0.5)	0.93
RIVPACS : Expected taxa P>0.70	10.13
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : 0:E (p > 0.7)	0.79

Habitat Description

Variable	COL001	Predicted Group Reference Mean ±SD
Bedro	ock Geology	
Sedimentary (%)	100.00000	90.78003 ± 16.48787
	Channel	
Depth-Avg (cm)	14.9) 27.7 ± 12.1
Depth-BankfullMinusWetted (cm)	15.00) 48.41 ± 32.00
Depth-Max (cm)	20.0) 41.6 ± 18.0
Macrophyte (PercentRange)	() 0 ± 0
Reach-%CanopyCoverage (PercentRange)	1.00) 1.20 ± 0.86
Reach-DomStreamsideVeg (Category(1-4))	3	3 ± 1
Reach-Pools (Binary)	1	1 ± 1
Reach-Rapids (Binary)	() 1 ± 1
Reach-Riffles (Binary)		1 ± 0
Reach-StraightRun (Binary)		1 ± 0
Slope (m/m)	0.0068167	
Veg-Coniferous (Binary)		
Veg-Deciduous (Binary)	1	
Veg-GrassesFerns (Binary)		-
Veg-Shrubs (Binary)		
Velocity-Avg (m/s)	0.1	
Velocity-Max (m/s)	0.20	
Width-Bankfull (m)	19.8	
Width-Wetted (m)	19.0	
XSEC-VelInstrumentDirect (Category(1-3))	11.0	
XSEC-VelMethod (Category(1-3))		$\frac{2 \pm 1}{2 \pm 1}$
	Climate	2 - 1
Precip10_OCT (mm)	52.8496 ²	101.93711 ± 37.08464
Temp12_DECmin (Degrees Celsius)	-13.2500	
	vdrology	-12.00205 ± 1.55007
Drainage-Area (km^2)	117.65190	153.19859 ± 249.47160
	andcover	
Natl-Grassland (%)	0.08905	
Natl-ShrubLow (%)	2.06878	
Natl-Water (%)	0.00000	
Reg-Ice (%)	0.00000	2.39543 ± 4.09623
	strate Data	
%Bedrock (%)	(
%Boulder (%)	L. L	
%Cobble (%)	49	
%Gravel (%)	3	
%Pebble (%)	36	
%Sand (%)	(
%Silt+Clay (%)		2 0 ± 0
D50 (cm)	7.00	
Dg (cm)	5.5	5 13.1 ± 19.3
Dominant-1st (Category(0-9))		
Dominant-2nd (Category(0-9))		5 6 ± 1

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Variable	COL001	Predicted Group Reference Mean ±SD
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	3	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 2
То	pography	
Reg-SlopeLT30% (%)	44.43454	17.11832 ± 8.21512
SlopeMax (%)	161.32619	386.22536 ± 140.72382
	er Chemistry	
Ag (mg/L)	0.0000250	0.0000028 ± 0.0000036
Al (mg/L)	0.0078000	0.0136410 ± 0.0145846
As (mg/L)	0.0002500	0.0001754 ± 0.0001818
B (mg/L)	0.0250000	0.0305833 ± 0.0370084
Ba (mg/L)	0.2790000	0.0435560 ± 0.0571949
Be (mg/L)	0.0000500	0.0000056 ± 0.0000072
Bi (mg/L)	0.0000500	0.0000028 ± 0.0000036
Br (mg/L)	0.0500000	0.0268750 ± 0.0585132
Ca (mg/L) Cd (mg/L)	43.5000000	20.8384848 ± 13.6841012 0.0000115 ± 0.0000149
Cd (mg/L) Chloride-Total (mg/L)	0.6100000	$\frac{0.0000113 \pm 0.0000149}{0.00000000}$
Co (mg/L)	0.0000500	$\frac{0.0000000 \pm 0.0000000}{0.0000298 \pm 0.0000226}$
Cr (mg/L)	0.0002500	$\frac{0.0000298 \pm 0.0000228}{0.0000889}$
Cr (mg/L) Cu (mg/L)	0.0002300	$\frac{0.0000900 \pm 0.0000889}{0.0003212 \pm 0.0001572}$
F (mg/L)	0.5500000	0.0484615 ± 0.0355181
Fe (mg/L)	0.0170000	0.0442667 ± 0.0348579
General-Alkalinity (mg/L)	175.0000000	59.4800000 ± 43.9851975
General-CarbonDOC (mg/L)	1.8500000	0.6500000 ± 0.3535534
General-CarbonTOC (mg/L)	2.3100000	0.394444 ± 0.3157179
General-DO (mg/L)	9.8900000	$12.6802381 \pm 11.2165934$
General-Hardness (mg/L)	139.0000000	76.7342857 ± 54.3511564
General-pH (pH)	8.5	7.9 ± 0.4
General-SolidsTSS (mg/L)	1.000000	1.9034611 ± 3.0161707
General-SpCond (µS/cm)	245.000000	153.2777778 ± 120.2707781
General-TempAir (Degrees Celsius)	21.0	10.6 ± 5.4
General-TempWater (Degrees Celsius)	14.4000000	6.4219048 ± 2.3475813
General-Turbidity (NTU)	0.700000	2.7965000 ± 4.1415171
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.8500000	0.4511613 ± 0.2901093
Li (mg/L)	0.0073600	0.0016910 ± 0.0023918
Mg (mg/L)	8.3800000	5.1886364 ± 5.0072212
Mn (mg/L)	0.0041100	0.0028572 ± 0.0019872
Mo (mg/L)	0.0008500	0.0006660 ± 0.0004339
Na (mg/L)	2.7700000	0.9945806 ± 0.9373003
NI (mg/L)	0.0002000	0.0002298 ± 0.0001811
Nitrogen-NO2 (mg/L) Nitrogen-NO2+NO3 (mg/L)	0.0050000	0.0042917 ± 0.0108893
Nitrogen-NO2 (mg/L)	0.0050000	$\begin{array}{c} 0.0732400 \pm 0.0567225 \\ 0.0865111 \pm 0.0538993 \end{array}$
Nitrogen-TKN (mg/L)	0.0530000	97.0987778 ± 290.9629753
Nitrogen-TN (mg/L)	0.0530000	24.3739167 ± 145.4787822
Pb (mg/L)	0.0001000	$\frac{24.3739107 \pm 143.4787822}{0.0000559 \pm 0.0000496}$
Phosphorus-OrthoP (mg/L)	0.0025000	0.0008667 ± 0.0013292
Phosphorus-TP (mg/L)	0.0206000	0.0031194 ± 0.0039854
S (mg/L)	1.500000	$362.2600000 \pm 803.7224104$
Sb (mg/L)	0.0001000	0.0000288 ± 0.0000136
Se (mg/L)	0.0002500	0.0002422 ± 0.0003912
Si (mg/L)	2.000000	1.9070000 ± 0.6500353
Sn (mg/L)	0.0001000	0.0000988 ± 0.0001602
SO4 (mg/L)	6.4000000	18.1942857 ± 18.0693910
Sr (mg/L)	0.1460000	0.1493500 ± 0.1276611
Te (mg/L)	0.0002500	$0.0000000 \pm 0.0000000000000000000000000$
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0008433 ± 0.0009290
TI (mg/L)	0.0000100	0.0000031 ± 0.0000048
U (mg/L)	0.0005280	0.0005805 ± 0.0003382
- \ _/ -/	0.0002000	

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Variable	COL001	Predicted Group Reference Mean ±SD
V (mg/L)	0.0005000	0.0001220 ± 0.0001369
Zn (mg/L)	0.0020000	0.0009430 ± 0.0009518
Zr (mg/L)	0.0000500	0.0000900 ± 0.0000894

Site Description

Study Name	CBWQ-Elk
Site	COL003
Sampling Date	Sep 18 2022
Know Your Watershed Basin	Central Kootenay
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera EcoZone
	Northern Continental Divide EcoRegion
Coordinates (decimal degrees)	49.45285 N, 114.87999 W
Altitude	1737
Local Basin Name	Elk River
	Coal Creek
Stream Order	1



Figure 1. Location Map

Cabin Assessment Results

Reference Model Summary						
Model	Columbia Ba	Columbia Basin 2020				
Analysis Date	December 0	4, 2023				
Taxonomic Level	Family					
Predictive Model Variables	Altitude					
	Drainage-Ar	ea				
	Longitude					
	Natl-Grassla	nd				
	Natl-ShrubLo	ow				
	Natl-Water					
	Precip10_Oc	t				
	Reach-%Car	nopyCoverag	e			
	Sedimentary	/				
	Slope					
	SlopeMax					
	Temp12_DE	Cmin				
Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	24	28	35	32	15
Group Error Rate	53.8%	55.2%	34.1%	52.2%	23.1%	29.4%
Overall Model Error Rate	39.4%					
Probability of Group Membership	0.3%	0.0%	1.7%	1.1%	96.8%	0.0%
CABIN Assessment of COL003 on Sep 18, 2022	Divergent					

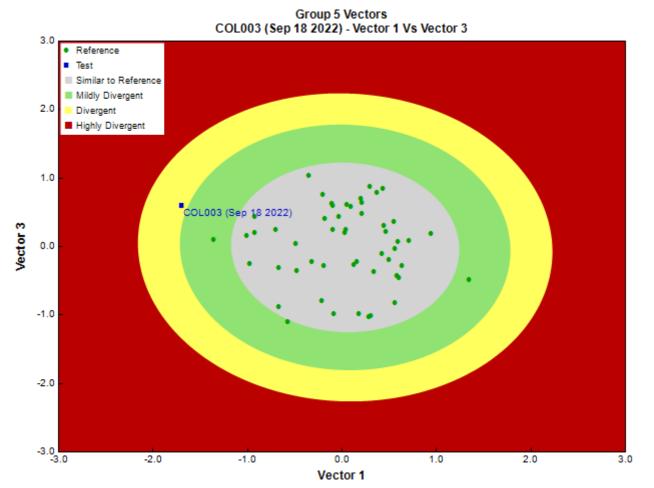


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net	
Mesh Size	400	
Sampling Time	3	
Taxonomist	Pina Viola, Consultant	
	Marchant Box	
Sub-Sample Proportion	20/100	

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Arthropoda	Arachnida	Sarcoptiformes		1	5.0
		Trombidiformes		4	20.0
			Sperchontidae	4	20.0
			Torrenticolidae	1	5.0
	Insecta	Coleoptera	Elmidae	14	70.0
		Diptera	Ceratopogonidae	1	5.0
			Chironomidae	82	410.0
		Ephemeroptera	Ameletidae	64	320.0
			Baetidae	7	35.0
			Ephemerellidae	22	110.0
			Heptageniidae	4	20.0
		Plecoptera		2	10.0
			Capniidae	24	120.0
			Chloroperlidae	29	145.0
			Nemouridae	15	75.0
			Peltoperlidae	1	5.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Perlidae	11	55.0
			Perlodidae	7	35.0
		Trichoptera		6	30.0
			Brachycentridae	8	40.0
			Rhyacophilidae	5	25.0
			Uenoidae	1	5.0
			Total	313	1,565.0

Metrics

Name	COL003	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.69	0.4 ± 0.1
Biotic	Indices	
Hilsenhoff Family index (Mid-Atlantic)	1.8	3.4 ± 0.4
Hilsenhoff Family index (North-West)	1.8	3.1 ± 0.5
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	4.0	1.7 ± 1.2
Tolerant individuals (%)		0.3 ± 0.0
Functiona	l Measures	
% Filterers		
% Gatherers	65.8	45.8 ± 14.9
% Predatores	37.7	14.8 ± 9.8
% Scrapers	8.3	59.4 ± 19.6
% Shredder	19.8	30.7 ± 17.4
No. Clinger Taxa	20.0	19.8 ± 4.0
Number Of	Individuals	
% Chironomidae	27.3	7.5 ± 8.6
% Coleoptera	4.7	0.1 ± 0.3
% Diptera + Non-insects	29.3	10.7 ± 9.9
% Ephemeroptera	32.3	47.2 ± 15.8
% Ephemeroptera that are Baetidae	7.2	25.4 ± 20.8
% EPT Individuals	66.0	89.2 ± 10.0
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	48.7	58.3 ± 10.6
% of 5 dominant taxa	73.7	83.6 ± 6.3
% of dominant taxa	27.3	37.8 ± 11.1
% Plecoptera	29.0	36.3 ± 16.7
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	0.0	25.4 ± 24.6
% Tricoptera	4.7	5.7 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.7	0.9 ± 0.1
Total Abundance	1565.0	4661.0 ± 3119.0
	iness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1
Coleoptera taxa	1.0	0.1 ± 0.3
Diptera taxa	2.0	2.8 ± 1.0
Ephemeroptera taxa	4.0	3.7 ± 0.5
EPT Individuals (Sum)	990.0	4035.4 ± 2618.4
EPT taxa (no)	13.0	12.3 ± 1.9
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.8	0.7 ± 0.1
Plecoptera taxa	6.0	5.5 ± 1.1
Shannon-Wiener Diversity	2.2	1.9 ± 0.3
Simpson's Diversity	0.9	0.8 ± 0.1
Simpson's Evenness	0.4	0.3 ± 0.1
Total No. of Taxa	18.0	17.0 ± 3.1
Trichoptera taxa	3.0	3.1 ± 1.2

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	Frequency of Occurrence in Reference Sites					Probability Of Occurrence at
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	COL003

RIVPACS Ratios	
RIVPACS : Expected taxa P>0.50	12.58
RIVPACS : Observed taxa P>0.50	10.00
RIVPACS : 0:E (p > 0.5)	0.79
RIVPACS : Expected taxa P>0.70	9.58
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : 0:E (p > 0.7)	0.83

Variable	COL003	Predicted Group Reference Mean ±SD
Bedr	ock Geology	
Sedimentary (%)	100.00000	98.46051 ± 8.10999
	Channel	
Depth-Avg (cm)	7.5	20.0 ± 8.6
Depth-BankfullMinusWetted (cm)	4.60	46.71 ± 35.00
Depth-Max (cm)	10.8	28.8 ± 13.7
Macrophyte (PercentRange)	0	0 ± 0
Reach-%CanopyCoverage (PercentRange)	2.00	1.04 ± 0.95
Reach-DomStreamsideVeg (Category(1-4))	2	3 ± 1
Reach-Pools (Binary)	1	1 ± 0
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	1	1 ± 0
Slope (m/m)	0.0180952	0.0270638 ± 0.0257534
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	0	1 ± 0
Veg-GrassesFerns (Binary)	1	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	0.03	0.58 ± 0.20
Velocity-Max (m/s)	0.10	0.85 ± 0.27
Width-Bankfull (m)	3.5	16.1 ± 13.1
Width-Wetted (m)	2.1	9.8 ± 7.7
XSEC-VelInstrumentDirect (Category(1-3))	3	3 ± 0
XSEC-VelMethod (Category(1-3))	3	2 ± 1
	Climate	
Precip10_OCT (mm)	52.73000	64.42223 ± 33.96544
Temp12_DECmin (Degrees Celsius)	-13.00000	-12.74810 ± 1.73767
	ydrology	100 00707 + 122 00501
Drainage-Area (km^2)	5.65737	100.09787 ± 132.80561
	andcover	7 47766 + 6 20990
Nati-Grassland (%)	0.00000	7.47766 ± 6.29880 1.80492 ± 1.50412
Natl-ShrubLow (%) Natl-Water (%)	0.14203	$\frac{1.80492 \pm 1.50412}{0.32077 \pm 0.59001}$
	0.00000	0.32077 ± 0.39001 1.28005 ± 3.54484
Reg-Ice (%)	strate Data	1.28005 ± 3.54484
%Bedrock (%)		0 ± 0
%Boulder (%)	1	6 ± 6
%Cobble (%)	38	
%Gravel (%)	9	2 ± 3
%Pebble (%)	52	34 ± 16
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	0	0 ± 0 0 ± 1
D50 (cm)	5.35	24.05 ± 35.66
Dg (cm)	5.2	23.0 ± 33.8
Dominant-1st (Category(0-9))	5	6 ± 1
Dominant-2nd (Category(0-9))	6	<u> </u>
Embeddedness (Category(1-5))	5	4 ± 1
PeriphytonCoverage (Category(1-5))	1	2 ± 1
SurroundingMaterial (Category(0-9))	2	

Variable	COL003	Predicted Group Reference Mean ±SD
	pography	
Reg-SlopeLT30% (%)	73.39946	20.01334 ± 7.41149
SlopeMax (%)	101.76495	488.94077 ± 542.32910
	er Chemistry	0.0000010 + 0.0000012
Ag (mg/L)	0.0000250	0.000018 ± 0.000013
Al (mg/L)	0.0253000	0.0078031 ± 0.0090962 0.0002735 ± 0.0001787
As (mg/L) B (mg/L)	0.0250000	$\frac{0.0002735 \pm 0.0001787}{0.0127286 \pm 0.0135802}$
Ba (mg/L)	0.0768000	0.0677069 ± 0.0514113
Be (mg/L)	0.0000500	0.0000043 ± 0.0000039
Bi (mg/L)	0.0000500	0.0000018 ± 0.0000013
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L)	14.8000000	28.2142857 ± 13.7707094
Cd (mg/L)	0.0000600	0.0000100 ± 0.0000293
Chloride-Total (mg/L)	0.0500000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000075 ± 0.0000060
Cr (mg/L)	0.0002500	0.0001514 ± 0.0001361
Cu (mg/L)	0.0002000	0.0001604 ± 0.0001447
F (mg/L)	0.5500000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0050000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	62.8000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	1.9600000	0.8383333 ± 0.4040008
General-CarbonTOC (mg/L)	2.0800000	0.5586957 ± 0.6229060
General-Conductivity (µS/cm)	54.300000	$173.5150000 \pm 86.2502071$
General-DO (mg/L) General-Hardness (mg/L)	10.5800000 49.1000000	$\frac{10.7243478 \pm 0.8596502}{109.1853659 \pm 48.3470504}$
General-pH (pH)	8.2	109.1855059 ± 48.5470504 8.0 ± 0.6
General-SolidsTSS (mg/L)	1.000000	5.2717002 ± 27.1908288
General-SpCond (µS/cm)	86.9000000	$196.0710526 \pm 116.3908975$
General-TempAir (Degrees Celsius)	10.0	7.2 ± 5.7
General-TempWater (Degrees Celsius)	5.300000	6.2042553 ± 2.0993816
General-Turbidity (NTU)	0.4000000	0.4347619 ± 0.5563328
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.2500000	0.3312424 ± 0.1572675
Li (mg/L)	0.0001500	0.0009183 ± 0.0003795
Mg (mg/L)	3.0300000	7.8748571 ± 3.9958945
Mn (mg/L)	0.0006200	0.0007721 ± 0.0008518
Mo (mg/L)	0.0004200	0.0012835 ± 0.0042333
Na (mg/L)	0.1700000	0.7930303 ± 0.4756164
Ni (mg/L)	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2 (mg/L)	0.0050000	0.0049953 ± 0.0199967 0.0287300 ± 0.0357249
Nitrogen-NO2+NO3 (mg/L) Nitrogen-NO3 (mg/L)	0.0050000	0.0336397 ± 0.0328125
Nitrogen-TKN (mg/L)	0.0250000	0.0352941 ± 0.0299453
Nitrogen-TN (mg/L)	0.0250000	0.0675581 ± 0.0509763
Pb (mg/L)	0.0001000	0.0000179 ± 0.0000156
Phosphorus-OrthoP (mg/L)	0.0025000	0.1105304 ± 0.5208890
Phosphorus-TP (mg/L)	0.0168000	0.0031912 ± 0.0087929
S (mg/L)	1.500000	3.6625000 ± 1.5619928
Sb (mg/L)	0.0001000	0.0000337 ± 0.0000157
Se (mg/L)	0.0002500	0.0002782 ± 0.0002859
Si (mg/L)	1.100000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0001000	0.0000300 ± 0.0000407
SO4 (mg/L)	6.3000000	$13.3070732 \pm 13.0883468$
Sr (mg/L)	0.0197000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000
Th (mg/L) Ti (mg/L)	0.0000500	$\begin{array}{c} 0.0000000 \pm 0.0000000 \\ 0.0003150 \pm 0.0001205 \end{array}$
TI (mg/L)	0.0025000	0.0003150 ± 0.0001203 0.00000040 ± 0.0000067
U (mg/L)	0.0000100	$\frac{0.000040 \pm 0.0000087}{0.0003872 \pm 0.0002299}$
V (mg/L)	0.0005000	$\frac{0.0003872 \pm 0.0002299}{0.0001617 \pm 0.0001537}$
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377
-·· \···'9/ =/	0.0020000	0.0003724 2 0.0003377

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Variable	COL003	Predicted Group Reference Mean ±SD
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000

Site Description

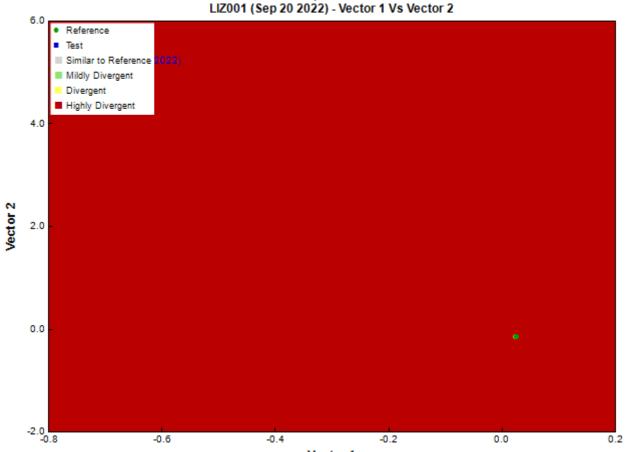
Site Description	
Study Name	CBWQ-Elk
Site	LIZ001
Sampling Date	Sep 20 2022
Know Your Watershed Basin	Central Kootenay
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera EcoZone
	Northern Continental Divide EcoRegion
Coordinates (decimal degrees)	49.47164 N, 115.07716 W
Altitude	994
Local Basin Name	Lizard Creek
	Elk River
Stream Order	3



Figure 1. Location Map

Cabin Assessment Results

R	Reference Mo	del Summa	ary			
Model	Columbia Ba	Columbia Basin 2020				
Analysis Date	December 04	December 04, 2023				
Taxonomic Level	Family					
Predictive Model Variables	Altitude Drainage-Ard Longitude Natl-Grassla Natl-ShrubLo Natl-Water Precip10_Oc Reach-%Car Sedimentary Slope SlopeMax Temp12_DE	nd ow t nopyCoverag v	e			
Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	2	3 28	35	32	15
Group Error Rate	53.8%	55.2%	34.1%	52.2%	23.1%	29.4%
Overall Model Error Rate	55.0%	55.2%	39.4		23.1%	29.4%
		26 10/		-	0.00	F (0)
Probability of Group Membership	5.6%	36.1%	17.1%	26.9%	8.6%	5.6%
CABIN Assessment of LIZ001 on Sep 20, 2022			Highly D	ivergent		



Vector 1

Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net	
Mesh Size	400	
Sampling Time	3	
Taxonomist	Pina Viola, Consultant	
	Marchant Box	
Sub-Sample Proportion	5/100	

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata		Enchytraeidae	1	20.0
		Tubificida	Naididae	321	6,420.0
Arthropoda	Arachnida	Trombidiformes	Aturidae	1	20.0
			Lebertiidae	12	240.0
			Torrenticolidae	8	160.0
	Insecta	Coleoptera	Elmidae	16	320.0
		Diptera	Chironomidae	97	1,940.0
			Empididae	9	180.0
			Psychodidae	18	360.0
			Simuliidae	15	300.0
			Tipulidae	1	20.0
		Ephemeroptera	Ameletidae	1	20.0
			Baetidae	55	1,100.0
			Ephemerellidae	43	860.0
			Heptageniidae	5	100.0
		Plecoptera		2	40.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Capniidae	7	140.0
			Leuctridae	1	20.0
			Nemouridae	91	1,820.0
			Perlidae	12	240.0
			Taeniopterygidae	7	140.0
		Trichoptera		2	40.0
			Apataniidae	1	20.0
			Brachycentridae	8	160.0
			Glossosomatidae	2	40.0
			Hydropsychidae	87	1,740.0
			Hydroptilidae	2	40.0
			Rhyacophilidae	5	100.0
			Uenoidae	6	120.0
			Total	836	16,720.0

Metrics

Netrics Name	LIZ001	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.97	0.3 ± 0.1
Biotic I	ndices	
Hilsenhoff Family index (Mid-Atlantic)	8.4	3.6 ± 0.4
Hilsenhoff Family index (North-West)	8.4	3.2 ± 0.3
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	4.0	2.7 ± 1.5
Tolerant individuals (%)		0.9 ± 0.2
Functional	Measures	
% Filterers		0.6 ± 0.3
% Gatherers	123.8	38.1 ± 14.1
% Predatores	30.4	15.8 ± 9.1
% Scrapers	23.4	60.8 ± 14.6
% Shredder	15.8	23.9 ± 11.1
No. Clinger Taxa	30.0	22.0 ± 5.6
Number Of 2	Individuals	
% Chironomidae	11.7	6.0 ± 5.6
% Coleoptera	1.9	1.7 ± 4.1
% Diptera + Non-insects	57.9	10.1 ± 7.7
% Ephemeroptera	12.5	53.4 ± 13.8
% Ephemeroptera that are Baetidae	52.9	29.5 ± 17.8
% EPT Individuals	40.0	88.1 ± 9.3
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	50.2	54.4 ± 11.4
% of 5 dominant taxa	78.2	81.6 ± 8.1
% of dominant taxa	38.6	35.2 ± 11.4
% Plecoptera	14.2	28.8 ± 11.6
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	78.4	28.7 ± 28.3
% Tricoptera	13.3	6.0 ± 5.0
No. EPT individuals/Chironomids+EPT Individuals	0.8	0.9 ± 0.1
Total Abundance	16720.0	1083.1 ± 932.3
Richt	ness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1
Coleoptera taxa	1.0	0.3 ± 0.5
Diptera taxa	5.0	3.1 ± 1.3
Ephemeroptera taxa	4.0	3.8 ± 0.6
EPT Individuals (Sum)	6660.0	941.8 ± 766.3
EPT taxa (no)	16.0	12.4 ± 2.4
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.7	0.7 ± 0.1
Plecoptera taxa	5.0	5.3 ± 1.3
Shannon-Wiener Diversity	2.2	2.0 ± 0.3
Simpson's Diversity	0.8	0.8 ± 0.1

CABIN/RCBA

Metrics

Name	LIZ001	Predicted Group Reference Mean ±SD	
Total No. of Taxa	27.0	18.2 ± 4.7	
Trichoptera taxa	7.0	3.3 ± 1.5	

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	Frequency of Occurrence in Reference Sites			Probability Of Occurrence at		
	Group	Group	Group	Group	Group	Group	LIZ001
	1	2	3	4	5	6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	12.35
RIVPACS : Observed taxa P>0.50	12.00
RIVPACS : 0:E (p > 0.5)	0.97
RIVPACS : Expected taxa P>0.70	10.06
RIVPACS : Observed taxa P>0.70	9.00
RIVPACS : 0:E (p > 0.7)	0.89

Habitat Description

Variable	LIZ001	Predicted Group Reference Mean ±SD
Bedroo	ck Geology	
Sedimentary (%)	100.00000	91.25558 ± 24.81348
Ch	annel	
Depth-Avg (cm)	24.2	31.4 ± 15.4
Depth-BankfullMinusWetted (cm)	17.00	54.15 ± 36.59
Depth-Max (cm)	39.8	46.8 ± 23.7
Macrophyte (PercentRange)	0	0 ± 0
Reach-%CanopyCoverage (PercentRange)	1.00	1.00 ± 0.96
Reach-DomStreamsideVeg (Category(1-4))	1	3 ± 1
Reach-Pools (Binary)	0	1 ± 1
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	1	1 ± 1
Slope (m/m)	0.0268600	0.0435622 ± 0.0544263
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	1	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	0.38	0.63 ± 0.23
Velocity-Max (m/s)	0.50	0.95 ± 0.33
Width-Bankfull (m)	8.5	23.6 ± 18.9
Width-Wetted (m)	4.7	14.0 ± 9.6
XSEC-VelInstrumentDirect (Category(1-3))	3	2 ± 0
XSEC-VelMethod (Category(1-3))	3	2 ± 1
	imate	
Precip10_OCT (mm)	48.29762	93.78954 ± 37.73803
Temp12_DECmin (Degrees Celsius)	-13.15000	-12.77499 ± 1.90440
	lrology	
Drainage-Area (km^2)	45.25148	267.49128 ± 347.95771
Lan	dcover	
Natl-Grassland (%)	3.20456	4.84000 ± 3.39798
Natl-ShrubLow (%)	6.94321	4.94988 ± 4.53147
Natl-Water (%)	0.16023	0.22026 ± 0.32058
Reg-Ice (%)	0.00000	4.18114 ± 6.57069
Subst	rate Data	
%Bedrock (%)	0	0 ± 1
%Boulder (%)	4	6 ± 7
%Cobble (%)	68	51 ± 23
%Gravel (%)	6	4 ± 6

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Variable	LIZ001	Predicted Group Reference Mean ±SD
%Pebble (%)	20	39 ± 23
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	2	0 ± 0
D50 (cm)	10.40	8.79 ± 6.32
Dg (cm)	8.5	7.7 ± 3.1
Dominant-1st (Category(0-9))	7	6 ± 1
Dominant-2nd (Category(0-9))	6	6 ± 1
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	4	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 1
Teg-SlopeLT30% (%)	opography 35.05430	22.23150 ± 8.61518
SlopeMax (%)	223.55025	475.68167 ± 413.51912
	er Chemistry	
Ag (mg/L)	0.0000250	0.0000038 ± 0.0000018
Al (mg/L)	0.0238000	0.0064450 ± 0.0021850
As (mg/L)	0.0002500	0.0002615 ± 0.0000120
B (mg/L)	0.0250000	0.0262500 ± 0.0335876
Ba (mg/L)	0.0751000	0.0683500 ± 0.0002121
Be (mg/L)	0.0000500	0.0000075 ± 0.0000035
Bi (mg/L)	0.0000500	0.0000038 ± 0.0000018
Br (mg/L)	0.0500000	0.0140909 ± 0.0253375
Ca (mg/L)	105.000000	24.6363636 ± 20.0629852
Cd (mg/L)	0.0000160	0.0000038 ± 0.0000018
Chloride-Total (mg/L)	0.2300000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000114 ± 0.0000019
Cr (mg/L)	0.0002500	0.0000750 ± 0.0000354
Cu (mg/L)	0.0002000	0.0001155 ± 0.0000219
F (mg/L)	0.1100000	0.0633810 ± 0.0630004
Fe (mg/L)	0.0230000	0.0105500 ± 0.0036062
General-Alkalinity (mg/L)	172.000000	74.2125000 ± 53.9915558
General-CarbonDOC (mg/L)	0.9300000	0.0000000 ± 0.0000000
General-CarbonTOC (mg/L)	1.000000	0.9750000 ± 0.4596194
General-DO (mg/L)	10.9700000	11.0129630 ± 0.8955266
General-Hardness (mg/L)	332.000000	95.8956522 ± 77.3576081
General-pH (pH)	8.5	7.7 ± 0.8
General-SolidsTSS (mg/L)	1.000000	5.9463636 ± 8.6422279
General-SpCond (µS/cm)	523.000000	$165.177778 \pm 128.4575336$
General-TempAir (Degrees Celsius)	12.0	11.5 ± 5.9
General-TempWater (Degrees Celsius)	8.1000000	6.4451852 ± 2.2997548
General-Turbidity (NTU)	1.0300000	5.7154545 ± 6.9690564
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.4300000	0.4604091 ± 0.2737828
Li (mg/L)	0.0040300	0.0011000 ± 0.0000000
Mg (mg/L)	23.700000	8.6045455 ± 7.5439965
Mn (mg/L)	0.0028600	0.0007470 ± 0.0001937
Mo (mg/L)	0.0019900	0.0006780 ± 0.0000170
Na (mg/L)	1.7300000	1.0881818 ± 0.7163042
Ni (mg/L)	0.0002000	0.0001625 ± 0.0001945
Nitrogen-NO2 (mg/L)	0.0050000	0.0034091 ± 0.0048394
Nitrogen-NO2+NO3 (mg/L)	0.0050000	0.0789333 ± 0.0140433
Nitrogen-NO3 (mg/L)	0.0050000	0.0719000 ± 0.0408583
Nitrogen-TKN (mg/L)	0.0630000	0.0200000
Nitrogen-TN (mg/L)	0.0630000	0.0929091 ± 0.0373336
Pb (mg/L)	0.0001000	0.0000337 ± 0.0000259
Phosphorus-TP (mg/L)	0.0250000	0.0049864 ± 0.0043795
S (mg/L)	73.000000	5.000000
Sb (mg/L)	0.0001000	0.0000635 ± 0.0000092
Se (mg/L)	0.0002500	0.0001105 ± 0.0000134
Si (mg/L)	2.600000	2.5681818 ± 1.4562562
Sn (mg/L)	0.0001000	0.0000075 ± 0.0000035
Sr (mg/L)	1.7300000	0.0445000 ± 0.0002828

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Variable	LIZ001	Predicted Group Reference
		Mean ±SD
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0005000
TI (mg/L)	0.0000100	0.0000015 ± 0.0000007
U (mg/L)	0.0003970	0.0012050 ± 0.0000495
V (mg/L)	0.0005000	0.0001500 ± 0.0000707
Zn (mg/L)	0.0020000	0.0006400 ± 0.0005091
Zr (mg/L)	0.0000500	0.0000000 ± 0.0000000

Site Description

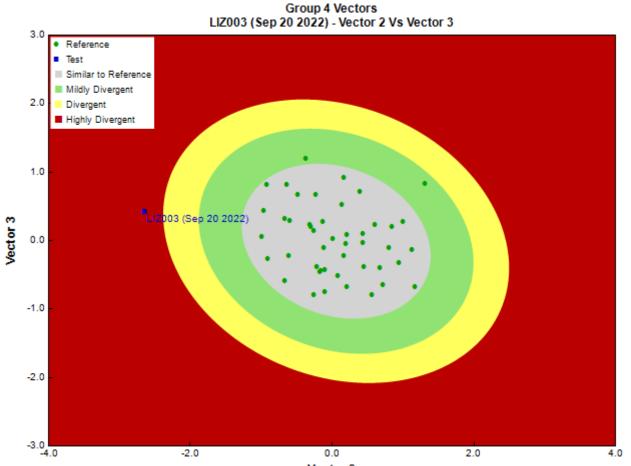
Sile Description	
Study Name	CBWQ-Elk
Site	LIZ003
Sampling Date	Sep 20 2022
Know Your Watershed Basin	Central Kootenay
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera EcoZone
	Northern Continental Divide EcoRegion
Coordinates (decimal degrees)	49.48569 N, 115.09432 W
Altitude	1022
Local Basin Name	Lizard Creek
	Central Kootenay
Stream Order	3



Figure 1. Location Map

Cabin Assessment Results

Reference Model Summary							
Model	Columbia Ba	Columbia Basin 2020					
Analysis Date	December 04	4, 2023					
Taxonomic Level	Family						
Predictive Model Variables	Altitude	Altitude					
	Drainage-Are	ea					
	Longitude						
	Natl-Grassla	nd					
	Natl-ShrubLo	w					
	Natl-Water						
	Precip10 Oct						
	Reach-%Can	opyCoverag	e				
	Sedimentary	,					
	Slope						
	SlopeMax						
	Temp12_DE0	Cmin					
Reference Groups	1	2	3	4	5	6	
Number of Reference Sites	13 24 28 35 32 1						
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4%						
Overall Model Error Rate	39.4%						
Probability of Group Membership	3.9% 27.7% 18.0% 33.4% 11.3% 5.7%						
CABIN Assessment of LIZ003 on Sep 20,	Highly Divergent						
2022							



Vector 2

Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Pina Viola, Consultant
	Marchant Box
Sub-Sample Proportion	5/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Tubificida	Naididae	9	180.0
Arthropoda	Arachnida	Trombidiformes		1	20.0
			Hygrobatidae	1	20.0
			Lebertiidae	9	180.0
			Torrenticolidae	13	260.0
	Insecta	Coleoptera	Elmidae	144	2,880.0
		Diptera		1	20.0
			Chironomidae	57	1,140.0
			Pelecorhynchidae	2	40.0
			Psychodidae	39	780.0
			Simuliidae	3	60.0
			Tipulidae	9	180.0
		Ephemeroptera		1	20.0
			Baetidae	215	4,300.0
			Ephemerellidae	332	6,640.0
			Heptageniidae	70	1,400.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
		Plecoptera		2	40.0
			Capniidae	29	580.0
			Chloroperlidae	14	280.0
			Nemouridae	118	2,360.0
			Perlidae	14	280.0
			Perlodidae	5	100.0
			Taeniopterygidae	48	960.0
		Trichoptera	Apataniidae	1	20.0
			Brachycentridae	5	100.0
			Glossosomatidae	3	60.0
			Hydropsychidae	6	120.0
			Rhyacophilidae	24	480.0
			Uenoidae	35	700.0
			Total	1,210	24,200.0

Metrics

Netrics Name	LIZ003	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.91	0.3 ± 0.1
Biotic 1	Indices	
Hilsenhoff Family index (Mid-Atlantic)	3.7	3.2 ± 0.4
Hilsenhoff Family index (North-West)	3.7	2.9 ± 0.3
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	5.0	1.9 ± 1.0
Tolerant individuals (%)		0.5 ± 0.4
Functional	Measures	
% Filterers		0.3
% Gatherers	67.3	47.1 ± 15.4
% Predatores	11.5	12.9 ± 7.3
% Scrapers	43.4	68.3 ± 16.1
% Shredder	29.3	36.7 ± 14.6
No. Clinger Taxa	34.0	20.3 ± 4.6
Number Of	Individuals	
% Chironomidae	4.7	5.2 ± 5.7
% Coleoptera	12.0	0.6 ± 2.2
% Diptera + Non-insects	11.8	7.4 ± 7.0
% Ephemeroptera	51.2	45.8 ± 15.1
% Ephemeroptera that are Baetidae	34.8	28.9 ± 20.8
% EPT Individuals	76.3	91.9 ± 7.3
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	45.4	59.5 ± 11.3
% of 5 dominant taxa	72.9	85.1 ± 6.5
% of dominant taxa	27.6	37.7 ± 10.4
% Plecoptera	18.9	40.5 ± 13.3
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	8.1	23.9 ± 23.6
% Tricoptera	6.1	5.6 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.9 ± 0.1
Total Abundance	24200.0	1449.6 ± 859.7
Rich		
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.2
Coleoptera taxa	1.0	0.2 ± 0.5
Diptera taxa	5.0	2.6 ± 1.1
Ephemeroptera taxa	3.0	3.7 ± 0.6
EPT Individuals (Sum)	18380.0	1353.0 ± 804.6
EPT taxa (no)	15.0	12.3 ± 2.2
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.7	0.7 ± 0.1
Plecoptera taxa	6.0	5.4 ± 1.2
Shannon-Wiener Diversity	2.3	1.9 ± 0.3
Simpson's Diversity	0.9	0.8 ± 0.1
Simpson's Evenness	0.3	0.3 ± 0.1

Metrics

Name	LIZ003	Predicted Group Reference Mean ±SD
Total No. of Taxa	25.0	16.5 ± 3.6
Trichoptera taxa	6.0	3.2 ± 1.3

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	quency o	f Occurre	Probability Of Occurrence at			
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	LIZ003

RIVPACS Ratios	
RIVPACS : Expected taxa P>0.50	12.34
RIVPACS : Observed taxa P>0.50	12.00
RIVPACS : O:E (p > 0.5)	0.97
RIVPACS : Expected taxa P>0.70	10.07
RIVPACS : Observed taxa P>0.70	11.00
RIVPACS : 0:E (p > 0.7)	1.09

Habitat Description

Variable	LIZ003	Predicted Group Reference Mean ±SD						
Bedrock Geology								
Sedimentary (%)	100.00000	90.78003 ± 16.48787						
Channel								
Depth-Avg (cm)	22.3	27.7 ± 12.1						
Depth-BankfullMinusWetted (cm)	30.00	48.41 ± 32.00						
Depth-Max (cm)	32.5	41.6 ± 18.0						
Macrophyte (PercentRange)	0	0 ± 0						
Reach-%CanopyCoverage (PercentRange)	1.00	1.20 ± 0.86						
Reach-DomStreamsideVeg (Category(1-4))	2	3 ± 1						
Reach-Pools (Binary)	0	1 ± 1						
Reach-Rapids (Binary)	0	1 ± 1						
Reach-Riffles (Binary)	1	1 ± 0						
Reach-StraightRun (Binary)	1	1 ± 0						
Slope (m/m)	0.0064318	0.0302442 ± 0.0225320						
Veg-Coniferous (Binary)	1	1 ± 0						
Veg-Deciduous (Binary)	1	1 ± 0						
Veg-GrassesFerns (Binary)	1	1 ± 0						
Veg-Shrubs (Binary)	1	1 ± 0						
Velocity-Avg (m/s)	0.52	0.65 ± 0.30						
Velocity-Max (m/s)	0.80	1.02 ± 0.40						
Width-Bankfull (m)	7.9	22.0 ± 20.4						
Width-Wetted (m)	4.0	14.4 ± 14.2						
XSEC-VelInstrumentDirect (Category(1-3))	3	2 ± 1						
XSEC-VelMethod (Category(1-3))	3	2 ± 1						
	limate							
Precip10_OCT (mm)	50.00611	101.93711 ± 37.08464						
Temp12_DECmin (Degrees Celsius)	-13.15000	-12.60285 ± 1.55807						
	drology							
Drainage-Area (km^2)	41.13000	153.19859 ± 249.47160						
	ndcover							
Natl-Grassland (%)	3.33072	4.14423 ± 3.51761						
Natl-ShrubLow (%)	6.54389	4.00461 ± 2.77104						
Natl-Water (%)	0.17633	0.26551 ± 0.58793						
Reg-Ice (%)	0.00000	2.39543 ± 4.09623						
	trate Data							
%Bedrock (%)	0	0 ± 0						
%Boulder (%)	0	8 ± 8						
%Cobble (%)	39	53 ± 15						
%Gravel (%)	9	4 ± 6						
%Pebble (%)	52	33 ± 14						
	52	55 - 14						

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	Habitat	Description
- 6		

Variable	LIZ003	Predicted Group Reference Mean ±SD
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	0	0 ± 0
D50 (cm)	5.20	14.48 ± 20.33
Dg (cm)	4.6	13.1 ± 19.3
Dominant-1st (Category(0-9))	6	6 ± 1
Dominant-2nd (Category(0-9))	5	6 ± 1
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	1	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 2
	graphy	
Reg-SlopeLT30% (%)	30.96964	17.11832 ± 8.21512
SlopeMax (%)	223.55025	386.22536 ± 140.72382
	Chemistry	0.0000028 ± 0.0000026
Ag (mg/L)	0.0000250	$\frac{0.0000028 \pm 0.0000036}{0.0136410 \pm 0.0145846}$
AI (mg/L)	0.0151000	$\frac{0.0136410 \pm 0.0143846}{0.0001754 \pm 0.0001818}$
As (mg/L)	0.0002300	$\frac{0.0001734 \pm 0.0001818}{0.0305833 \pm 0.0370084}$
B (mg/L) Ba (mg/L)	0.0250000	$\frac{0.0305833 \pm 0.0370084}{0.0435560 \pm 0.0571949}$
Be (mg/L)	0.000500	$\frac{0.0433360 \pm 0.0371949}{0.0000056 \pm 0.0000072}$
Bi (mg/L)	0.0000500	$\frac{0.0000036 \pm 0.0000072}{0.0000028 \pm 0.0000036}$
Br (mg/L)	0.0500000	0.0268750 ± 0.0585132
Ca (mg/L)	96.2000000	$\frac{0.0200750 \pm 0.0505152}{20.8384848 \pm 13.6841012}$
Cd (mg/L)	0.0000140	$\frac{20.0334343 \pm 13.0341012}{0.0000115 \pm 0.0000149}$
Chloride-Total (mg/L)	0.2300000	$0.0000000 \pm 0.0000000000000000000000000$
Co (mg/L)	0.0000500	0.0000298 ± 0.0000226
Cr (mg/L)	0.0002500	0.0000900 ± 0.0000889
Cu (mg/L)	0.0002000	0.0003212 ± 0.0001572
F (mg/L)	0.5500000	0.0484615 ± 0.0355181
Fe (mg/L)	0.0160000	0.0442667 ± 0.0348579
General-Alkalinity (mg/L)	180.000000	59.4800000 ± 43.9851975
General-CarbonDOC (mg/L)	0.800000	0.6500000 ± 0.3535534
General-CarbonTOC (mg/L)	1.0700000	0.3944444 ± 0.3157179
General-DO (mg/L)	10.8800000	$12.6802381 \pm 11.2165934$
General-Hardness (mg/L)	339.000000	76.7342857 ± 54.3511564
General-pH (pH)	8.3	7.9 ± 0.4
General-SolidsTSS (mg/L)	1.000000	1.9034611 ± 3.0161707
General-SpCond (µS/cm)	531.000000	153.2777778 ± 120.2707781
General-TempAir (Degrees Celsius)	9.8	10.6 ± 5.4
General-TempWater (Degrees Celsius)	6.300000	6.4219048 ± 2.3475813
General-Turbidity (NTU)	0.6200000	2.7965000 ± 4.1415171
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.4100000	0.4511613 ± 0.2901093
Li (mg/L)	0.0037800	$\frac{0.0016910 \pm 0.0023918}{5.1006264 \pm 5.0073212}$
Mg (mg/L)	22.600000	5.1886364 ± 5.0072212
Mn (mg/L)	0.0033700	$\frac{0.0028572 \pm 0.0019872}{0.0006660 \pm 0.0004339}$
Mo (mg/L) Na (mg/L)	1.6600000	0.0006660 ± 0.0004339 0.9945806 ± 0.9373003
Na (mg/L) Ni (mg/L)	0.0002000	$\frac{0.9945806 \pm 0.9373003}{0.0002298 \pm 0.0001811}$
Nitrogen-NO2 (mg/L)	0.0050000	$\frac{0.0002298 \pm 0.0001811}{0.0042917 \pm 0.0108893}$
Nitrogen-NO2+NO3 (mg/L)	0.0464000	0.0732400 ± 0.0567225
Nitrogen-NO3 (mg/L)	0.0460000	0.0865111 ± 0.0538993
Nitrogen-TKN (mg/L)	0.0900000	97.0987778 ± 290.9629753
Nitrogen-TN (mg/L)	0.1360000	24.3739167 ± 145.4787822
Pb (mg/L)	0.0001000	$\frac{143.4767622}{0.0000559 \pm 0.0000496}$
Phosphorus-TP (mg/L)	0.0250000	0.0031194 ± 0.0039854
S (mg/L)	67.8000000	362.2600000 ± 803.7224104
Sb (mg/L)	0.0001000	$\frac{0.0000288 \pm 0.0000136}{0.0000136}$
Se (mg/L)	0.0002500	0.0002422 ± 0.0003912
Si (mg/L)	2.6000000	1.9070000 ± 0.6500353
Sn (mg/L)	0.0001000	0.0000988 ± 0.0001602
Sr (mg/L)	1.7000000	0.1493500 ± 0.1276611
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000

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Variable	LIZ003	Predicted Group Reference	
		Mean ±SD	
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000	
Ti (mg/L)	0.0025000	0.0008433 ± 0.0009290	
TI (mg/L)	0.0000100	0.0000031 ± 0.0000048	
U (mg/L)	0.0003660	0.0005805 ± 0.0003382	
V (mg/L)	0.0005000	0.0001220 ± 0.0001369	
Zn (mg/L)	0.0020000	0.0009430 ± 0.0009518	
Zr (mg/L)	0.0000500	0.0000900 ± 0.0000894	

Site Description

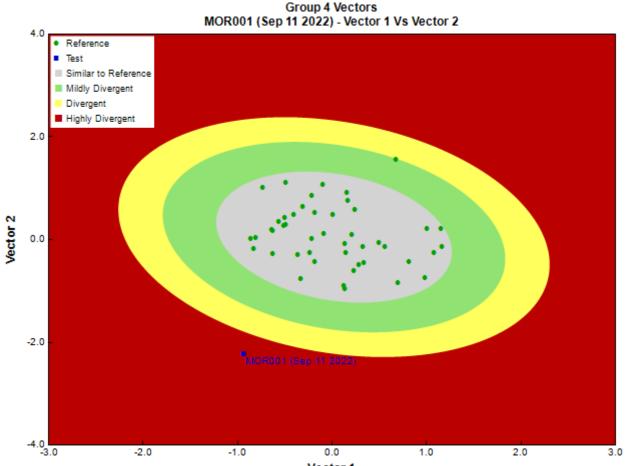
CBWQ-Elk
MOR001
Sep 11 2022
Central Kootenay
British Columbia
Montane Cordillera EcoZone
Northern Continental Divide EcoRegion
49.35833 N, 115.00067 W
948
Morrissey Creek
Central Kootenay
4



Figure 1. Location Map

Cabin Assessment Results

Reference Model Summary						
Model	Columbia Ba	Columbia Basin 2020				
Analysis Date	December 0	4, 2023				
Taxonomic Level	Family					
Predictive Model Variables	Altitude Drainage-Area Longitude Natl-Grassland Natl-ShrubLow Natl-Water Precip10_Oct Reach-%CanopyCoverage Sedimentary Slope Slope					
	Temp12_DE					
Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	24	28	35	32	15
Group Error Rate	53.8%	55.2%	34.1%	52.2%	23.1%	29.4%
Overall Model Error Rate			39.	4%		
Probability of Group Membership	2.9%	22.4%	14.6%	48.1%	9.6%	2.5%
CABIN Assessment of MOR001 on Sep 11, 2022	Highly Divergent					



Vector 1

Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Pina Viola, Consultant
	Marchant Box
Sub-Sample Proportion	5/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Tubificida	Naididae	24	480.0
Arthropoda	Arachnida	Trombidiformes		5	100.0
			Aturidae	3	60.0
			Lebertiidae	2	40.0
			Sperchontidae	2	40.0
			Torrenticolidae	38	760.0
	Insecta	Coleoptera	Elmidae	25	500.0
		Diptera	Ceratopogonidae	2	40.0
			Chironomidae	199	3,980.0
			Empididae	2	40.0
			Psychodidae	1	20.0
			Tipulidae	10	200.0
		Ephemeroptera	Ameletidae	4	80.0
			Baetidae	18	360.0
			Ephemerellidae	18	360.0
			Heptageniidae	101	2,020.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Leptophlebiidae	12	240.0
		Plecoptera	Capniidae	17	340.0
			Chloroperlidae	1	20.0
			Nemouridae	7	140.0
			Perlodidae	2	40.0
		Trichoptera		1	20.0
			Brachycentridae	7	140.0
			Hydropsychidae	14	280.0
			Lepidostomatidae	23	460.0
			Rhyacophilidae	1	20.0
			Total	539	10,780.0

Metrics

Name	MOR001	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.87	0.3 ± 0.1
Biotic	Indices	
Hilsenhoff Family index (Mid-Atlantic)	4.5	3.2 ± 0.4
Hilsenhoff Family index (North-West)	4.5	2.9 ± 0.3
Intolerant taxa		1.0 ± 0.0
Long-lived taxa	3.0	1.9 ± 1.0
Tolerant individuals (%)		0.5 ± 0.4
Functiona	l Measures	
% Filterers		0.3
% Gatherers	64.0	47.1 ± 15.4
% Predatores	50.1	12.9 ± 7.3
% Scrapers	29.3	68.3 ± 16.1
% Shredder	16.5	36.7 ± 14.6
No. Clinger Taxa	23.0	20.3 ± 4.6
Number Of	Individuals	
% Chironomidae	37.3	5.2 ± 5.7
% Coleoptera	4.7	0.6 ± 2.2
% Diptera + Non-insects	53.1	7.4 ± 7.0
% Ephemeroptera	28.7	45.8 ± 15.1
% Ephemeroptera that are Baetidae	11.8	28.9 ± 20.8
% EPT Individuals	42.2	91.9 ± 7.3
% Odonata		0.0 ± 0.0
% of 2 dominant taxa	56.3	59.5 ± 11.3
% of 5 dominant taxa	72.6	85.1 ± 6.5
% of dominant taxa	37.3	37.7 ± 10.4
% Plecoptera	5.1	40.5 ± 13.3
% Tribe Tanyatarisini		
% Trichoptera that are Hydropsychida	31.1	23.9 ± 23.6
% Tricoptera	8.4	5.6 ± 3.9
No. EPT individuals/Chironomids+EPT Individuals	0.5	0.9 ± 0.1
Total Abundance	10780.0	1449.6 ± 859.7
	iness	
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.2
Coleoptera taxa	1.0	0.2 ± 0.5
Diptera taxa	5.0	2.6 ± 1.1
Ephemeroptera taxa	5.0	3.7 ± 0.6
EPT Individuals (Sum)	4500.0	1353.0 ± 804.6
EPT taxa (no)	13.0	12.3 ± 2.2
Odonata taxa		0.0 ± 0.0
Pielou's Evenness	0.7	0.7 ± 0.1
Plecoptera taxa	4.0	5.4 ± 1.2
Shannon-Wiener Diversity	2.2	1.9 ± 0.3
Simpson's Diversity	0.8	0.8 ± 0.1
Simpson's Evenness	0.2	0.3 ± 0.1
Total No. of Taxa	24.0	16.5 ± 3.6
Trichoptera taxa	4.0	3.2 ± 1.3

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Fre	Frequency of Occurrence in Reference Sites				Probability Of Occurrence at	
	Group	Group	Group	Group	Group	Group	MOR001
	1	2	3	4	5	6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	12.37
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : 0:E (p > 0.5)	1.13
RIVPACS : Expected taxa P>0.70	10.12
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : 0:E (p > 0.7)	0.99

Habitat Description

Variable	M	OR001	Predicted Group Reference Mean ±SD	
	Bedrock Geology			
Sedimentary (%)		100.00000	90.78003 ± 16.48787	
	Channel			
Depth-Avg (cm)		19.7	27.7 ± 12.1	
Depth-BankfullMinusWetted (cm)		1.15	48.41 ± 32.00	
Depth-Max (cm)		28.0	41.6 ± 18.0	
Discharge (m^3/s)		0.046	4.100	
Macrophyte (PercentRange)		0	0 ± 0	
Reach-%CanopyCoverage (PercentRange)		1.00	1.20 ± 0.86	
Reach-DomStreamsideVeg (Category(1-4))		3	3 ± 1	
Reach-Pools (Binary)		0	1 ± 1	
Reach-Rapids (Binary)		0	1 ± 1	
Reach-Riffles (Binary)		1	1 ± 0	
Reach-StraightRun (Binary)		1	1 ± 0	
Slope (m/m)		0.0071000	0.0302442 ± 0.0225320	
Veg-Coniferous (Binary)		1	1 ± 0	
Veg-Deciduous (Binary)		1	1 ± 0	
Veg-GrassesFerns (Binary)		1	1 ± 0	
Veg-Shrubs (Binary)		1	1 ± 0	
Velocity-Avg (m/s)		0.04	0.65 ± 0.30	
Velocity-Max (m/s)		0.09	1.02 ± 0.40	
Width-Bankfull (m)		20.5	22.0 ± 20.4	
Width-Wetted (m)		5.8	14.4 ± 14.2	
	Climate			
Precip10_OCT (mm)		51.55424	101.93711 ± 37.08464	
Temp12_DECmin (Degrees Celsius)		-13.00000	-12.60285 ± 1.55807	
· - · · - /	Hydrology			
Drainage-Area (km^2)		81.94000	153.19859 ± 249.47160	
<u> </u>	Landcover			
Natl-Grassland (%)		0.00000	4.14423 ± 3.51761	
Natl-ShrubLow (%)		4.53336	4.00461 ± 2.77104	
Natl-Water (%)		0.00000	0.26551 ± 0.58793	
Reg-Ice (%)		0.00000	2.39543 ± 4.09623	
	Substrate Data			
%Bedrock (%)		0	0 ± 0	
%Boulder (%)		2	8 ± 8	
%Cobble (%)		59	53 ± 15	
%Gravel (%)		2	4 ± 6	
%Pebble (%)		36	33 ± 14	
%Sand (%)		0	0 ± 0	
%Silt+Clay (%)		1	0 ± 0	
D50 (cm)		8.85	14.48 ± 20.33	
Dg (cm)		7.5	13.1 ± 19.3	
Dominant-1st (Category(0-9))		6	6 ± 1	
Dominant-2nd (Category(0-9))		7	6 ± 1	
Embeddedness (Category(1-5))		4	0 ± 1 4 ± 1	

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Variable	MOR001	Predicted Group Reference Mean ±SD
PeriphytonCoverage (Category(1-5))	3	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 2
	ography	
Reg-SlopeLT30% (%)	50.32512	17.11832 ± 8.21512
SlopeMax (%)	209.87454	386.22536 ± 140.72382
	Chemistry	
Ag (mg/L)	0.0000250	0.0000028 ± 0.0000036
Al (mg/L)	0.0175000	0.0136410 ± 0.0145846
As (mg/L)	0.0002500	0.0001754 ± 0.0001818
B (mg/L)	0.0250000	0.0305833 ± 0.0370084
Ba (mg/L)	0.1660000	0.0435560 ± 0.0571949
Be (mg/L)	0.0000500	0.0000056 ± 0.000072
Bi (mg/L)	0.0000500	0.0000028 ± 0.0000036
Br (mg/L)	0.0500000	0.0268750 ± 0.0585132
Ca (mg/L)	39.500000	20.8384848 ± 13.6841012
Cd (mg/L)	0.0000220	0.0000115 ± 0.0000149
Chloride-Total (mg/L)	3.3900000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000298 ± 0.0000226
Cr (mg/L)	0.0002500	0.0000900 ± 0.0000889
Cu (mg/L)	0.0004600	0.0003212 ± 0.0001572
F (mg/L)	0.5500000	0.0484615 ± 0.0355181
Fe (mg/L)	0.0180000	0.0442667 ± 0.0348579
General-Alkalinity (mg/L)	154.000000	59.4800000 ± 43.9851975
General-CarbonDOC (mg/L)	1.5900000	0.6500000 ± 0.3535534
General-CarbonTOC (mg/L)	1.6800000	0.394444 ± 0.3157179
General-DO (mg/L)	9.7200000	12.6802381 ± 11.2165934
General-Hardness (mg/L)	139.000000	76.7342857 ± 54.3511564
General-pH (pH)	8.4	7.9 ± 0.4
General-SolidsTSS (mg/L)	1.000000	1.9034611 ± 3.0161707
General-SpCond (µS/cm)	248.800000	153.277778 ± 120.2707781
General-TempAir (Degrees Celsius)	17.9	10.6 ± 5.4
General-TempWater (Degrees Celsius)	15.500000	6.4219048 ± 2.3475813
General-Turbidity (NTU)	0.4200000	2.7965000 ± 4.1415171
Hg (ng/L)		$\begin{array}{c} 0.0000000 \pm 0.0000000 \\ 0.4511613 \pm 0.2901093 \end{array}$
K (mg/L) Li (mg/L)	0.6600000	0.4311013 ± 0.2901093 0.0016910 ± 0.0023918
Mg (mg/L)	8.900000	5.1886364 ± 5.0072212
Mn (mg/L)	0.0069400	$\frac{5.1886364 \pm 5.0072212}{0.0028572 \pm 0.0019872}$
Mo (mg/L)	0.0003400	0.0026572 ± 0.0019872 0.0006660 ± 0.0004339
Na (mg/L)	2.000000	0.9945806 ± 0.9373003
Ni (mg/L)	0.0002000	$\frac{0.9949000 \pm 0.9979003}{0.0002298 \pm 0.0001811}$
Nitrogen-NO2 (mg/L)	0.0050000	0.0042917 ± 0.0108893
Nitrogen-NO2+NO3 (mg/L)	0.0050000	0.0732400 ± 0.0567225
Nitrogen-NO3 (mg/L)	0.0050000	0.0865111 ± 0.0538993
Nitrogen-TKN (mg/L)	0.0670000	97.0987778 ± 290.9629753
Nitrogen-TN (mg/L)	0.0670000	24.3739167 ± 145.4787822
Pb (mg/L)	0.0001000	0.0000559 ± 0.0000496
Phosphorus-OrthoP (mg/L)	0.0097000	0.0008667 ± 0.0013292
Phosphorus-TP (mg/L)	0.0104000	0.0031194 ± 0.0039854
S (mg/L)	1.5000000	362.2600000 ± 803.7224104
Sb (mg/L)	0.0001000	0.0000288 ± 0.0000136
Se (mg/L)	0.0002500	0.0002422 ± 0.0003912
Si (mg/L)	1.9000000	1.9070000 ± 0.6500353
Sn (mg/L)	0.0001000	0.0000988 ± 0.0001602
S04 (mg/L)	8.2000000	18.1942857 ± 18.0693910
Sr (mg/L)	0.1520000	0.1493500 ± 0.1276611
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000
Th (mg/L)	0.0000500	0.0000000 ± 0.0000000
Ti (mg/L)	0.0025000	0.0008433 ± 0.0009290
TI (mg/L)	0.0000100	0.0000031 ± 0.0000048
U (mg/L)	0.0004140	0.0005805 ± 0.0003382
V (mg/L)	0.0005000	0.0001220 ± 0.0001369
· · · · · · · · · · · · · · · · · · ·	01000000	

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Variable	MOR001	Predicted Group Reference Mean ±SD
Zn (mg/L)	0.0020000	0.0009430 ± 0.0009518
Zr (mg/L)	0.0000500	0.0000900 ± 0.0000894

Site Description

CBWQ-Elk
MOR002
Sep 11 2022
Central Kootenay
British Columbia
Montane Cordillera EcoZone
Northern Continental Divide EcoRegion
49.42056 N, 114.91069 W
1544
Morrissey Creek
Central Kootenay
3



Figure 1. Location Map

Cabin Assessment Results

R	eference Mo	odel Summa	ary				
Model	Columbia Ba	Columbia Basin 2020					
Analysis Date	December 0	4, 2023					
Taxonomic Level	Family						
Predictive Model Variables	Altitude						
	Drainage-Ar	Drainage-Area					
	Longitude						
	Natl-Grassla	nd					
	Natl-ShrubLo	ow					
	Natl-Water						
	Precip10_Oct						
	Reach-%CanopyCoverage						
	Sedimentary						
	Slope						
	SlopeMax						
	Temp12_DE	Cmin					
Reference Groups	1	2	3	4	5	6	
Number of Reference Sites	13	24	28	35	32	15	
Group Error Rate	53.8% 55.2% 34.1% 52.2% 23.1% 29.4%						
Overall Model Error Rate	39.4%						
Probability of Group Membership	1.1%	0.5%	9.3%	6.8%	82.2%	0.1%	
CABIN Assessment of MOR002 on Sep 11, 2022	Mildly Divergent						

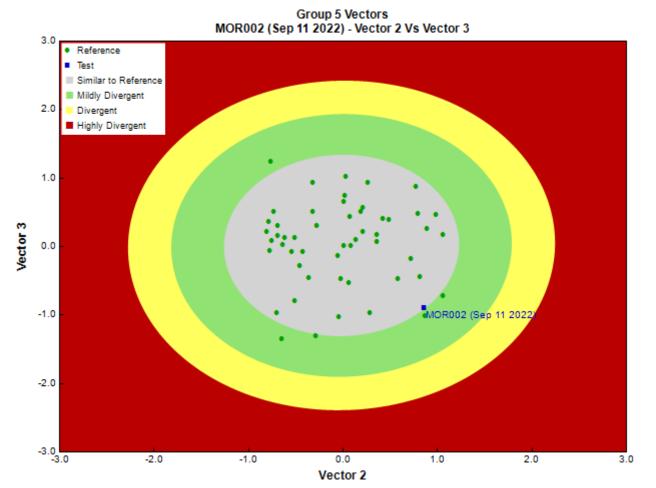


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net	
Mesh Size	400	
Sampling Time	3	
Taxonomist	Pina Viola, Consultant	
	Marchant Box	
Sub-Sample Proportion	6/100	

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Arthropoda	Arachnida	Trombidiformes	Aturidae	2	33.3
			Hydryphantidae	1	16.7
			Lebertiidae	2	33.3
			Torrenticolidae	1	16.7
	Insecta	Coleoptera	Elmidae	7	116.6
		Diptera	Chironomidae	135	2,250.0
		Ephemeroptera	Ameletidae	27	450.0
			Baetidae	39	650.0
			Ephemerellidae	7	116.7
			Heptageniidae	49	816.7
			Leptophlebiidae	5	83.3
		Plecoptera		1	16.7
			Capniidae	37	616.7
			Chloroperlidae	62	1,033.4
			Nemouridae	9	150.1
			Peltoperlidae	2	33.3

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Perlidae	5	83.3
			Perlodidae	4	66.7
		Trichoptera		2	33.3
			Brachycentridae	2	33.3
			Rhyacophilidae	6	100.0
			Uenoidae	1	16.7
			Total	406	6,766.8

Metrics

Name	MOR002	Predicted Group Reference Mean ±SD					
Bray-Curtis Distance	0.59	0.4 ± 0.1					
Biotic Indices							
Hilsenhoff Family index (Mid-Atlantic)	2.9	3.4 ± 0.4					
Hilsenhoff Family index (North-West)	2.9	3.1 ± 0.5					
Intolerant taxa		1.0 ± 0.0					
Long-lived taxa	4.0	1.7 ± 1.2					
Tolerant individuals (%)		0.3 ± 0.0					
Functiona	l Measures						
% Filterers							
% Gatherers	47.5	45.8 ± 14.9					
% Predatores	38.9	14.8 ± 9.8					
% Scrapers	23.6	59.4 ± 19.6					
% Shredder	14.0	30.7 ± 17.4					
No. Clinger Taxa	26.0	19.8 ± 4.0					
Number O	f Individuals						
% Chironomidae	33.5	7.5 ± 8.6					
% Coleoptera	1.7	0.1 ± 0.3					
% Diptera + Non-insects	35.0	10.7 ± 9.9					
% Ephemeroptera	31.5	47.2 ± 15.8					
% Ephemeroptera that are Baetidae	30.7	25.4 ± 20.8					
% EPT Individuals	63.3	89.2 ± 10.0					
% Odonata		0.0 ± 0.0					
% of 2 dominant taxa	48.9	58.3 ± 10.6					
% of 5 dominant taxa	79.9	83.6 ± 6.3					
% of dominant taxa	33.5	37.8 ± 11.1					
% Plecoptera	29.5	36.3 ± 16.7					
% Tribe Tanyatarisini							
% Trichoptera that are Hydropsychida	0.0	25.4 ± 24.6					
% Tricoptera	2.2	5.7 ± 3.9					
No. EPT individuals/Chironomids+EPT Individuals	0.7	0.9 ± 0.1					
Total Abundance	6766.7	4661.0 ± 3119.0					
Ric	ness						
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.1					
Coleoptera taxa	1.0	0.1 ± 0.3					
Diptera taxa	1.0	2.8 ± 1.0					
Ephemeroptera taxa	5.0	3.7 ± 0.5					
EPT Individuals (Sum)	4250.0	4035.4 ± 2618.4					
EPT taxa (no)	14.0	12.3 ± 1.9					
Odonata taxa		0.0 ± 0.0					
Pielou's Evenness	0.7	0.7 ± 0.1					
Plecoptera taxa	6.0	5.5 ± 1.1					
Shannon-Wiener Diversity	2.1	1.9 ± 0.3					
Simpson's Diversity	0.8	0.8 ± 0.1					
Simpson's Evenness	0.3	0.3 ± 0.1					
Total No. of Taxa	20.0	17.0 ± 3.1					
Trichoptera taxa	3.0	3.1 ± 1.2					

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Frequency of Occurrence in Reference Sites					Probability Of Occurrence at	
	Group	Group	Group	Group	Group	Group	MOR002
	1	2	3	4	5	6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	12.45
RIVPACS : Observed taxa P>0.50	10.00
RIVPACS : 0:E (p > 0.5)	0.80
RIVPACS : Expected taxa P>0.70	9.52
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : 0:E (p > 0.7)	0.84

Habitat Description

Variable	MOR002	Predicted Group Reference Mean ±SD	
Bedro	ock Geology		
Sedimentary (%)	100.00000	98.46051 ± 8.10999	
C	hannel		
Depth-Avg (cm)	8.8		
Depth-BankfullMinusWetted (cm)	78.50		
Depth-Max (cm)	15.0	28.8 ± 13.7	
Discharge (m^3/s)	0.007	0.682	
Macrophyte (PercentRange)	1		
Reach-%CanopyCoverage (PercentRange)	2.00	1.04 ± 0.95	
Reach-DomStreamsideVeg (Category(1-4))	2	3 ± 1	
Reach-Pools (Binary)	1	1 ± 0	
Reach-Rapids (Binary)	0	0 ± 0	
Reach-Riffles (Binary)	1	1 ± 0	
Reach-StraightRun (Binary)	0	1 ± 0	
Slope (m/m)	0.0151000	0.0270638 ± 0.0257534	
Veg-Coniferous (Binary)	1	1 ± 0	
Veg-Deciduous (Binary)	0	1 ± 0	
Veg-GrassesFerns (Binary)	1		
Veg-Shrubs (Binary)	1		
Velocity-Avg (m/s)	0.06	0.58 ± 0.20	
Velocity-Max (m/s)	0.12		
Width-Bankfull (m)	12.8		
Width-Wetted (m)	1.4		
XSEC-VelInstrumentDirect (Category(1-3))	3		
XSEC-VelMethod (Category(1-3))	3		
	limate		
Precip10_OCT (mm)	54.52875	64.42223 ± 33.96544	
Temp12_DECmin (Degrees Celsius)	-13.0000		
	/drology	12.7 1010 - 1.75707	
Drainage-Area (km^2)	17.89000	100.09787 ± 132.80561	
	ndcover	100.09707 ± 152.00501	
Natl-Grassland (%)	0.00000	7.47766 ± 6.29880	
Nati-ShrubLow (%)	2.38954		
Nati-Water (%)	0.00000		
Req-Ice (%)	0.00000		
	strate Data	1.20005 ± 3.54404	
%Bedrock (%)		0 ± 0	
%Boulder (%)	3		
%Cobble (%)	40		
%Cobble (%) %Gravel (%)	40		
%Pebble (%)	45		
	45		
%Sand (%)	0		
%Silt+Clay (%)	5.65		
D50 (cm)			
Dg (cm)	5.0		
Dominant-1st (Category(0-9))	6	6 ± 1	

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Variable	MOR002	Predicted Group Reference Mean ±SD
Dominant-2nd (Category(0-9))	5	6 ± 1
Embeddedness (Category(1-5))	5	4 ± 1
PeriphytonCoverage (Category(1-5))	3	2 ± 1
SurroundingMaterial (Category(0-9))	2	3 ± 1
	pography	
Reg-SlopeLT30% (%)	73.39946	20.01334 ± 7.41149
SlopeMax (%)	97.94038	488.94077 ± 542.32910
	er Chemistry 0.0000250	0.0000018 ± 0.0000013
Ag (mg/L) Al (mg/L)	0.0401000	0.0078031 ± 0.0090962
As (mg/L)	0.0002500	0.0002735 ± 0.0001787
B (mg/L)	0.0250000	0.0127286 ± 0.0135802
Ba (mg/L)	0.1600000	0.0677069 ± 0.0514113
Be (mg/L)	0.0000500	0.0000043 ± 0.0000039
Bi (mg/L)	0.0000500	0.0000018 ± 0.0000013
Br (mg/L)	0.0500000	0.0303333 ± 0.0788597
Ca (mg/L)	17.2000000	28.2142857 ± 13.7707094
Cd (mg/L)	0.0000240	0.0000100 ± 0.0000293
Chloride-Total (mg/L)	2.6500000	0.0000000 ± 0.0000000
Co (mg/L)	0.0000500	0.0000075 ± 0.000060
Cr (mg/L) Cu (mg/L)	0.0002500	$\frac{0.0001514 \pm 0.0001361}{0.0001604 \pm 0.0001447}$
F (mg/L)	0.5500000	0.0876667 ± 0.0847823
Fe (mg/L)	0.0200000	0.0101789 ± 0.0111495
General-Alkalinity (mg/L)	66.3000000	98.9704545 ± 43.8308301
General-CarbonDOC (mg/L)	1.700000	0.8383333 ± 0.4040008
General-CarbonTOC (mg/L)	1.7500000	0.5586957 ± 0.6229060
General-DO (mg/L)	10.6300000	10.7243478 ± 0.8596502
General-Hardness (mg/L)	58.500000	$109.1853659 \pm 48.3470504$
General-pH (pH)	8.6	8.0 ± 0.6
General-SolidsTSS (mg/L)	5.4000000	5.2717002 ± 27.1908288 196.0710526 ± 116.3908975
General-SpCond (µS/cm) General-TempAir (Degrees Celsius)	8.6	$\frac{196.0710326 \pm 116.3908973}{7.2 \pm 5.7}$
General-TempWater (Degrees Celsius)	7.3000000	6.2042553 ± 2.0993816
General-Turbidity (NTU)	0.5300000	0.4347619 ± 0.5563328
Hg (ng/L)	0.0000200	0.0000000 ± 0.0000000
K (mg/L)	0.4500000	0.3312424 ± 0.1572675
Li (mg/L)	0.0010800	0.0009183 ± 0.0003795
Mg (mg/L)	3.7500000	7.8748571 ± 3.9958945
Mn (mg/L) Mo (mg/L)	0.0016400	$\frac{0.0007721 \pm 0.0008518}{0.0012835 \pm 0.0042333}$
Na (mg/L)	1.5600000	0.0012833 ± 0.0042333 0.7930303 ± 0.4756164
Ni (mg/L)	0.0002000	0.0001266 ± 0.0001131
Nitrogen-NO2+NO3 (mg/L)	0.0050000	0.0287300 ± 0.0357249
Nitrogen-NO3 (mg/L)	0.0050000	0.0336397 ± 0.0328125
Nitrogen-TKN (mg/L)	0.1320000	0.0352941 ± 0.0299453
Nitrogen-TN (mg/L)	0.1320000	0.0675581 ± 0.0509763
Pb (mg/L)	0.0001000	0.0000179 ± 0.0000156
Phosphorus-OrthoP (mg/L)	0.0025000	0.1105304 ± 0.5208890
Phosphorus-TP (mg/L) S (mg/L)	0.0102000	$\frac{0.0031912 \pm 0.0087929}{3.6625000 \pm 1.5619928}$
Sb (mg/L)	0.0001000	$\frac{5.0625000 \pm 1.5619928}{0.0000337 \pm 0.0000157}$
Se (mg/L)	0.0002500	0.0002782 ± 0.0002859
Si (mg/L)	0.5000000	2.0400303 ± 0.8510321
Sn (mg/L)	0.0001000	0.0000300 ± 0.0000407
SO4 (mg/L)	5.800000	13.3070732 ± 13.0883468
Sr (mg/L)	0.1080000	0.0893414 ± 0.0805860
Te (mg/L)	0.0002500	0.0000000 ± 0.0000000
Th (mg/L)	0.0000500	0.000000 ± 0.000000
Ti (mg/L)	0.0025000	0.0003150 ± 0.0001205
TI (mg/L) U (mg/L)	0.000100	$\begin{array}{c} 0.0000040 \pm 0.000067 \\ \hline 0.0003872 \pm 0.0002299 \end{array}$
U (IIIg/L)	0.0001830	0.0003872 ± 0.0002299

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Habitat Description

Variable	MOR002	Predicted Group Reference Mean ±SD
V (mg/L)	0.0005000	0.0001617 ± 0.0001537
Zn (mg/L)	0.0020000	0.0003724 ± 0.0003377
Zr (mg/L)	0.0000500	0.0000500 ± 0.0000000



Appendix E: Stream Report

Preliminary DNA Data

Elk River watershed, BC Elk River Alliance - Community Based Water Monitoring *April 2023*



Photo: Alexander Creek, Credit: Elk River Alliance



Hajibabaei Lab, Centre for Biodiversity Genomics, University of Guelph

Environment and Climate Change Canada Living Lakes Canada

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DISCLAIMER: This report is a preliminary report based on the samples and information provided by the corresponding organisation. Identifications of taxa are based on best available information at time of analysis and reporting.

PRELIMINARY DNA DATA

1. INTRODUCTION

1.1.Benthic Macroinvertebrates

Freshwater benthic macroinvertebrates are typically insect orders, as well as crustaceans (e.g. crayfish), gastropods (e.g. snails), bivalves (e.g. freshwater mussels) and oligochaetes (e.g. worms), which are located on or within the benthic substrate of freshwater systems (i.e. streams, rivers, lakes; (Covich et al., 1999; Schmera et al., 2017). Benthic macroinvertebrates occupy important roles in the functioning of freshwater ecosystems, namely nutrient cycling within aquatic food webs and also influence numerous processes including microbial production and release of greenhouse gases (Covich et al., 1999; Schmera et al., 2017).

Biological monitoring (biomonitoring), referring to the collection and identification of particular aquatic species is an effective method for measuring the health status of freshwater systems. Currently, macroinvertebrates are routinely used for biomonitoring studies in freshwater habitats because they are relatively sedentary, have high species richness and a range of responses to different environmental stressors and contaminants, including temperature (Curry et al., 2018; Geest et al., 2010; Rosenberg and Resh, 1993; Sidney et al., 2016). Some groups of macroinvertebrates (mayflies, Ephemeroptera; stoneflies, Plecoptera and caddisflies, Trichoptera), commonly referred to as EPT groups, are more sensitive to change in the aquatic environment and are deemed important bioindicator taxa for assessing freshwater quality (Curry et al., 2018; Hajibabaei et al., 2012, 2011).

Traditionally, macroinvertebrates are identified to family level (**Figure 1**) through morphological identification using microscopy, however there has been a shift from this labour-intensive methodology to a DNA-based approach (Curry et al., 2018; Hajibabaei et al., 2012, 2011). 'Biomonitoring 2.0' combines bulk-tissue DNA collection (i.e. benthos) with next-generation sequencing (NGS), to produce highquality data in large quantities and allows identification to a finer resolution than traditional methods (Baird and Hajibabaei, 2012; Hajibabaei et al., 2012).

PRELIMINARY DNA DATA

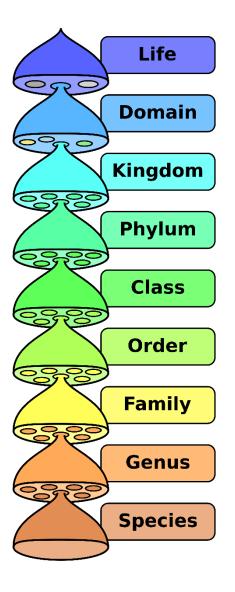


Figure 1. Graphical representation the classification of organisms.

1.2. Background of STREAM

STREAM (Sequencing The Rivers for Environmental Assessment and Monitoring), is a biomonitoring project, which involves the combination of community based monitoring and DNA metabarcoding technologies to assess the benthic macroinvertebrate communities in watersheds across Canada (**Figure 2**). STREAM is a collaboration between Living Lakes Canada (LLC) and Environmental and Climate Change Canada (ECCC), led by the Hajibabaei Lab at Centre for Biodiversity

Genomics (University of Guelph, Canada) with World Wildlife Fund Canada as a founding member organization. STREAM employs a standard sampling protocol modified from the Canadian Aquatic Biomonitoring Network (CABIN) programme. Where possible, the aquatic biodiversity data generated in STREAM will be added to the existing CABIN database, to improve our understanding of the health of Canadian watersheds.

The main objective of STREAM is to generate baseline benthic macroinvertebrate DNA data from across Canada. To understand the health status of freshwater systems, we first need to understand the natural fluctuations and trends of benthic macroinvertebrates, especially in locations which are data deficient. By building this baseline, in years to come we can investigate the longer-term trends and begin to understand the impact of issues, such as climate change, on freshwater systems. STREAM was established with the main premise of fast-tracking the generation of benthic macroinvertebrate data from 12-18 months to ~2 months, while increasing the taxonomic resolution of the data produced. To date this timeline has not been regularly met, but steps are being taken to further optimize lab processing and reporting to more regularly meet this timeline for the 2023 sampling season.

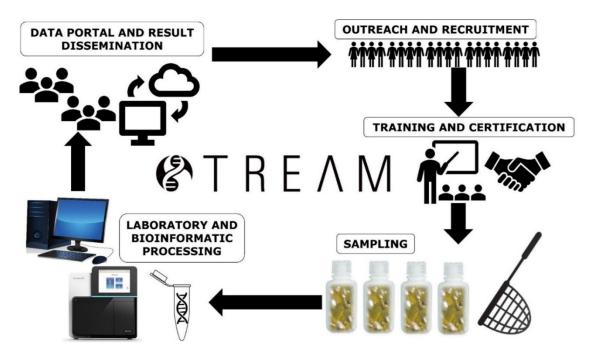


Figure 2. Graphical representation of the STREAM collaborative workflow for DNA biomonitoring of benthic invertebrates.

PRELIMINARY DNA DATA

1.3. Objective of Report

Data and information included in this report is a preliminary examination of results from the Elk River watershed, within the Columbia Basin (BC), which consists of a list of the macroinvertebrate taxa detected within the samples submitted. This report aims to highlight the different macroinvertebrate EPT taxa and provide basic richness metrics as a useful contribution for community groups to assess river health. This report also includes data from 2020 and 2021 sampling seasons.

1.4. Study Objective

Community-based water monitoring (CBWM) groups collected baseline Elk River tributary habitat data to increase community water literacy and understanding of the Elk River Watershed. Monitoring and research is conducted by trained staff and volunteers and presented in easily understood terminology to the community, including updates on the current status of aquatic health and concerns regarding future trends. Community members are educated through the sharing of data to the public at annual workshops, summer markets, direct participation with the program, and mixed media reporting. This increases water literacy and opens a two-way dialogue with residents to discuss community concerns regarding watershed health.

2. METHODOLOGY

2.1. Study Area

In September 2022 sampling was conducted at four locations within the Elk River watershed (BC; Figure 3). Sampling was conducted by the Elk River Alliance for benthic macroinvertebrate monitoring with STREAM.

Additional site information, including coordinates is provided in Appendix A

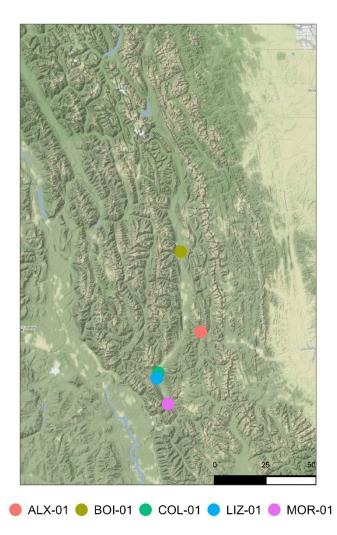


Figure 3. Map of sampling locations within the Elk River watershed (BC). Scale bar shown in kilometres.

- 2.2. DNA Sampling and Processing Methods
 - 2.2.1. Measures to Avoid DNA Contamination

Prior to sampling, kick-nets were sanitized in bleach for 5 minutes and kept in clean garbage bags until they were used in the field. Gloves were used when handling all sampling materials to avoid contamination. During the kick-netting, the surveyor in the water wore two pairs of gloves while handling the kick-net. The outer pair of gloves was removed prior to transferring the contents into sampling containers so that the gloves used when contacting the sample were guaranteed to be clean. Each sampling container was individually sealed in a Ziploc bag prior to placing them in the cooler.

2.2.2. Benthic Macroinvertebrate Field Sampling Protocol

Benthic macroinvertebrate DNA samples were collected following the STREAM Procedure for collecting benthic macroinvertebrate DNA samples in wadeable streams (v1.0 June 2019) and the CABIN Field Manual for Wadeable Streams (2012). The STREAM procedure outlines steps to minimize DNA contamination and preserve DNA samples and was employed in conjunction with sampling steps outlined in the CABIN manual. All samples collected were transported to the University of Guelph Centre for Biodiversity Genomics.

2.2.3. Laboratory Methods

Benthic samples were preserved in antifreeze and stored at -20°C until processing. Benthic samples were coarsely homogenized in a sterile blender and DNA was extracted using a DNeasy® PowerSoil® Pro kit (Qiagen, CA) kit. Extracted DNA was then processed following the standard Hajibabaei Lab protocol for Next-Generation Sequencing (NGS). Sequences were then processed through the MetaWorks (v1.11.3) pipeline: <u>https://github.com/terrimporter/MetaWorks</u>.

3. RESULTS

3.1. Overview

The raw data output from NGS produced sequences for a range of taxa. This taxa list was reduced to only sequences that identified macroinvertebrates associated with freshwater and riparian ecosystems, and that were of high enough quality to match reference sequences. These results consisted of **46 Orders**, **151 Families**, **197 Genera**, **and 174 Species of invertebrates**. After normalizing, species richness (number of species present) ranged from 13 in ALX-1C (2020) to 40 in LIZ-1C (2022) (**Figure 4**). A full taxonomic list of macroinvertebrates identified to the raw genus and species level is included as a separate Excel spreadsheet (STREAM_RP89_Taxonomy).

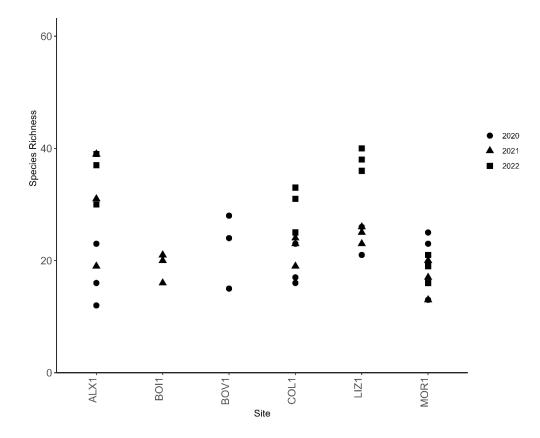


Figure 4. Species richness of each site sampled. Only species taxonomically assigned with high confidence (bootstrap support >= 0.70) are included. Based on normalized data.

3.2. Taxonomic Coverage

A range of macroinvertebrate species were detected from the 2022 samples. Traditional bioindicator EPT species were detected across the sampling sites, including 26 species of Ephemeroptera (mayflies), 27 species of Plecoptera (stoneflies) and 24 Trichoptera (caddisflies; **Table 2**). Some families of these EPT groups are typically sensitive to many pollutants in the stream environment and are therefore associated with clean water (Gresens et al., 2009; Laini et al., 2019; Loeb and Spacie, 1994).

Please refer to the 'Macroinvertebrate Bioindicator Families Guide v1.2' attached with your data or visit the corresponding website <u>here</u> for more information on approximate tolerances for the species detected in your sites.

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PRELIMINARY DNA DATA
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Note: The benthic macroinvertebrate kick-net sample procedure often results in collection of both aquatic and terrestrial taxa, however terrestrial taxa are not identified using the traditional taxonomic identification methods. Due to the nature of DNA metabarcoding, both terrestrial and aquatic macroinvertebrates are identified and described using the DNA approach in this report.

Table 1. List of Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa identified to the species level. P = present. Grey cells indicate absence. Site names for each column refer to site code (see Appendix A). Only species taxonomically assigned with high confidence (bootstrap support >= 0.70) are included.

			2022				
Order	Family	Common Name	Species	ALX_1	COL_1	LIZ_1	MOR_1
Ephemeroptera	Ameletidae	Comb-mouthed minnow mayflies	Ameletus bellulus	Ρ	Ρ		
Ephemeroptera	Ameletidae	Comb-mouthed minnow mayflies	Ameletus celer	Ρ		Ρ	
Ephemeroptera	Ameletidae	Comb-mouthed minnow mayflies	Ameletus subnotatus				Ρ
Ephemeroptera	Baetidae	Small minnow mayflies	Acentrella insignificans		Ρ		
Ephemeroptera	Baetidae	Small minnow mayflies	Acentrella turbida		Ρ	Ρ	Р
Ephemeroptera	Baetidae	Small minnow mayflies	Baetis bicaudatus	Ρ		Ρ	
Ephemeroptera	Baetidae	Small minnow mayflies	Baetis phoebus	Ρ	Ρ		
Ephemeroptera	Baetidae	Small minnow mayflies	Baetis tricaudatus	Ρ	Ρ	Ρ	Ρ
Ephemeroptera	Baetidae	Small minnow mayflies	Callibaetis ferrugineus				
Ephemeroptera	Baetidae	Small minnow mayflies	Diphetor hageni		Ρ		Ρ
Ephemeroptera	Caenidae	Small square-gilled mayflies	Caenis amica		Ρ		
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Drunella coloradensis	Ρ	Ρ	Ρ	Ρ
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Drunella doddsii	Ρ	Ρ	Ρ	Ρ
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Drunella flavilinea	Ρ	Ρ		Ρ
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Drunella grandis	Ρ	Ρ	Ρ	Ρ
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Drunella spinifera	Ρ		Ρ	
Ephemeroptera	Ephemerellidae	Spiny crawler mayflies	Ephemerella tibialis	Ρ	Ρ	Ρ	
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Cinygmula spJMW3	Ρ	Ρ	Ρ	
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Epeorus albertae		Ρ		
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Epeorus deceptivus	Ρ	Ρ	Ρ	
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Epeorus grandis	Ρ			
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Epeorus longimanus	Ρ	Ρ		
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Maccaffertium smithae				Ρ
Ephemeroptera	Heptageniidae	Flat-headed mayflies	Rhithrogena robusta	Ρ			
Ephemeroptera	Leptophlebiidae	Prong-gilled mayflies	Paraleptophlebia heteronea	Ρ	Ρ		Ρ
Ephemeroptera	Leptophlebiidae	Prong-gilled mayflies	Paraleptophlebia memorialis				Ρ

Table 1 cont.

					20	22	
				-	-	I	-1
Order	Family	Common Name	Species	ALX_1	COL	LIZ_	MOR
Plecoptera	Capniidae	Small winter stoneflies	Capnia coloradensis		P	P	-
Plecoptera	Capniidae	Small winter stoneflies	Capnia confusa		P	-	Р
Plecoptera	Capniidae	Small winter stoneflies	Capnia gracilaria			Р	
Plecoptera	Capniidae	Small winter stoneflies	Capnia petila			Р	
Plecoptera	Capniidae	Small winter stoneflies	Eucapnopsis brevicauda	Р	Р	Р	Р
Plecoptera	Capniidae	Small winter stoneflies	Utacapnia columbiana	Р	Р	Ρ	
Plecoptera	Capniidae	Small winter stoneflies	Utacapnia logana	Р	Р	Р	
Plecoptera	Capniidae	Small winter stoneflies	Utacapnia trava		Р		
Plecoptera	Chloroperlidae	Green stoneflies	Paraperla frontalis	Р			
Plecoptera	Chloroperlidae	Green stoneflies	Plumiperla diversa	Р			
Plecoptera	Chloroperlidae	Green stoneflies	Sweltsa borealis	Р			
Plecoptera	Chloroperlidae	Green stoneflies	Sweltsa coloradensis	Р	Р		
Plecoptera	Leuctridae	Rolled-winged stoneflies	Paraleuctra occidentalis	Р			
Plecoptera	Nemouridae	Spring stoneflies	Podmosta delicatula				
Plecoptera	Nemouridae	Spring stoneflies	Prostoia besametsa	Р	Р	Р	
Plecoptera	Nemouridae	Spring stoneflies	Visoka cataractae	Р	Р	Р	
Plecoptera	Perlidae	Common stoneflies	Doroneuria theodora	Р	Р	Ρ	Р
Plecoptera	Perlidae	Common stoneflies	Hesperoperla pacifica	Р		Ρ	
Plecoptera	Perlodidae	Springflies	Isoperla petersoni		Р		
Plecoptera	Perlodidae	Springflies	Isoperla sobria				
Plecoptera	Perlodidae	Springflies	Kogotus modestus	Р			
Plecoptera	Perlodidae	Springflies	Megarcys watertoni	Р	Р	Р	
Plecoptera	Perlodidae	Springflies	Setvena bradleyi	Р			
Plecoptera	Pteronarcyidae	Giant stoneflies	Pteronarcella badia		Р		
Plecoptera	Pteronarcyidae	Giant stoneflies	Pteronarcys princeps			Р	
Plecoptera	Taeniopterygidae	Winter stoneflies	Doddsia occidentalis	Р		Ρ	
Plecoptera	Taeniopterygidae	Winter stoneflies	Taenionema pallidum			Ρ	
Trichoptera	Apataniidae	Early smoky wing sedges	Apatania comosa	Р	Ρ		
Trichoptera	Brachycentridae	Humpless casemaker caddisflies	Brachycentrus americanus	Р			
Trichoptera	Brachycentridae	Humpless casemaker caddisflies	Micrasema bactro			Ρ	Ρ
Trichoptera	Glossosomatidae	Saddle casemaker caddisflies	Anagapetus debilis				
Trichoptera	Glossosomatidae	Saddle casemaker caddisflies	Glossosoma pyroxum	Р			
Trichoptera	Glossosomatidae	Saddle casemaker caddisflies	Glossosoma verdonum			Ρ	
Trichoptera	Hydropsychidae	Net-spinning caddisflies	Arctopsyche grandis	Р		Ρ	Ρ
Trichoptera	Hydropsychidae	Net-spinning caddisflies	Ceratopsyche oslari		Р	Ρ	Ρ
Trichoptera	Hydropsychidae	Net-spinning caddisflies	Parapsyche elsis	Ρ		Ρ	
Trichoptera	Hydroptilidae	Microcaddisflies	Hydroptila consimilis				
Trichoptera	Hydroptilidae	Microcaddisflies	Metrichia patagonica			Ρ	
Trichoptera	Lepidostomatidae	Bizarre caddisflies	Lepidostoma cascadense	Ρ			
Trichoptera	Lepidostomatidae	Bizarre caddisflies	Lepidostoma pluviale		Р	Р	Р
Trichoptera	Lepidostomatidae	Bizarre caddisflies	Lepidostoma rayneri		Р		
Trichoptera	Limnephilidae	Northern caddisflies	Onocosmoecus unicolor		Р		
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila angelita	Ρ			
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila bifila	Р			
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila brunnea	Р		Ρ	
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila coloradensis	Р			
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila vaccua	Ρ			
Trichoptera	Rhyacophilidae	Free-living caddisflies	Rhyacophila vagrita	Р			
Trichoptera	Uenoidae	Stonecase caddisfly	Neophylax rickeri			Ρ	
Trichoptera	Uenoidae	Stonecase caddisfly	Neophylax splendens			Ρ	
Trichoptera	Uenoidae	Stonecase caddisfly	Oligophlebodes sierra	Р		Ρ	

3.2. Whirling Disease Host Detection

Whirling Disease is a disease caused by *Myxobolus cerebralis*, a microscopic parasite that affects salmonid fish such as trout, salmon and whitefish (Gilbert and Granath, 2003). *M. cerebralis* requires a specific aquatic oligochaete (worm) intermediate host, *Tubifex tubifex* (sludge worm). This species is most commonly associated with poor-quality, eutrophic conditions (Gilbert and Granath, 2003).

While there are still <u>no documented cases of Whirling disease in BC</u>, it has been confirmed in several locations in Alberta near the BC border. No *T. tubifex* were detected in the 2022 STREAM samples. Additional samples were collected at 5 locations that were more suitable habitat for *T. tubifex* than the riffle habitat sampled through CABIN. Of these five sites, three sites had positive *Tubifex* identifications, COLA, ELKA, and MCL. The complete taxonomic results for these samples can also be found in the STREAM taxonomy report attached.

4. REFERENCES

- Baird, D.J., Hajibabaei, M., 2012. Biomonitoring 2.0: a new paradigm in ecosystem assessment made possible by next-generation DNA sequencing. Mol. Ecol. 21, 2039-2044. https://doi.org/10.1111/j.1365-294X.2012.05519.x
- Covich, A.P., Palmer, M.A., Crowl, T.A., 1999. The Role of Benthic Invertebrate Species in Freshwater Ecosystems: Zoobenthic species influence energy flows and nutrient cycling. BioScience 49, 119-127. https://doi.org/10.2307/1313537
- Curry, C.J., Gibson, J.F., Shokralla, S., Hajibabaei, M., Baird, D.J., 2018. Identifying North American freshwater invertebrates using DNA barcodes: are existing COI sequence libraries fit for purpose? Freshw. Sci. 37, 178-189. https://doi.org/10.1086/696613
- Geest, J.L.V., Poirier, D.G., Sibley, P.K., Solomon, K.R., 2010. Measuring bioaccumulation of contaminants from field-collected sediment in freshwater organisms: A critical review of laboratory methods. Environ. Toxicol. Chem. 29, 2391-2401. https://doi.org/10.1002/etc.326
- Gilbert, M.A., Granath, W.O., 2003. Whirling Disease of Salmonid Fish: Life Cycle, Biology, and Disease. J. Parasitol. 89, 658-667.
- Gresens, S.E., Smith, R.J., Sutton-Grier, A.E., Kenney, M.A., 2009. Benthic macroinvertebrates as indicators of water quality: The intersection of science and policy. https://doi.org/10.1163/187498209X12525675906077

- Hajibabaei, M., Shokralla, S., Zhou, X., Singer, G.A.C., Baird, D.J., 2011.
 Environmental Barcoding: A Next-Generation Sequencing Approach for Biomonitoring Applications Using River Benthos. PLOS ONE 6, e17497. https://doi.org/10.1371/journal.pone.0017497
- Hajibabaei, M., Spall, J.L., Shokralla, S., van Konynenburg, S., 2012. Assessing biodiversity of a freshwater benthic macroinvertebrate community through non-destructive environmental barcoding of DNA from preservative ethanol. BMC Ecol. 12, 28. https://doi.org/10.1186/1472-6785-12-28
- Laini, A., Viaroli, P., Bolpagni, R., Cancellario, T., Racchetti, E., Guareschi, S., 2019. Taxonomic and Functional Responses of Benthic Macroinvertebrate Communities to Hydrological and Water Quality Variations in a Heavily Regulated River. Water 11, 1478. https://doi.org/10.3390/w11071478

Loeb, S., L., Spacie, A., 1994. Biological Monitoring of Aquatic Systems. CRC Press.

- McQuaid, B., n.d. Watershed Science Institute 30.
- Rosenberg, D.M., Resh, V.H. (Eds.), 1993. Freshwater Biomonitoring and Benthic Macroinvertebrates. Springer US.
- Schmera, D., Heino, J., Podani, J., Erős, T., Dolédec, S., 2017. Functional diversity: a review of methodology and current knowledge in freshwater macroinvertebrate research. Hydrobiologia 787, 27-44. https://doi.org/10.1007/s10750-016-2974-5
- Sidney, L.A., Diepens, N.J., Guo, X., Koelmans, A.A., 2016. Trait-based modelling of bioaccumulation by freshwater benthic invertebrates. Aquat. Toxicol. 176, 88-96. https://doi.org/10.1016/j.aquatox.2016.04.017

5. APPENDICES

Appendix A. Summary table of sample sites, including site name, year of collection and site coordinates. Pool samples were collected due to the better suitability of habitat they provide for *Tubifex* (Annelida).

Site	River	Latitude	Longitude	Year
ALX-01	Alexander Creek	49.67394	-114.78	2020, 2021, 2022
BOI-01	Boivin Creek	50.02315	-114.916	2020, 2021
COL-01	Coal Creek	49.49556	-115.066	2020, 2021, 2022
LIZ-01	Lizard Creek	49.47094	-115.077	2020, 2021, 2022
MOR-01	Morrissey Creek	49.35806	-115.001	2020, 2021, 2022
ALX-01	Alexander Creek	49.67394	-114.7799	Pool
MCL-04	Michel Creek	49.606725	-114.791884	Pool
FOR-01	Forsyth Creek	50.231674	-114.968607	Pool
COLA-01	Coal Creek	49.508273	-115.056515	Pool
ELKA-01	Elk River	49.496074	-115.068808	Pool

6. GLOSSARY

Term	Meaning
Benthic/benthos	The ecological region at the lowest level of a body of
Dentine, Dentilos	water such as an ocean, lake, or stream, including the
	sediment surface and some sub-surface layers.
Biomonitoring	The science of inferring the ecological condition of an
Diomonitoring	ecosystem (i.e. rivers, lakes, streams, and wetlands) by
	examining the organisms that live there.
Bootstrap support	Statistical methods used to evaluate and distinguish the
	confidence of results produced.
Bulk-tissue DNA	This refers to the collection and removal of a reasonable
sample	quantity of representative material (including organisms
	such as river bugs) from a location (i.e. river bed).
DNA extraction	Isolation of DNA from either the target organism (i.e. DNA
	from an insect leg) or from an environmental sample (i.e.
	DNA from a water or benthos sample).
DNA Metabarcoding	Amplification of DNA using universal barcode primers (e.g.
	universal for invertebrates) to allow sequencing of DNA
	from target organisms (e.g. invertebrates) from
	environmental samples (e.g. river water or benthos).
Environmental DNA	The DNA released into the environment through faeces,
(eDNA)	urine, gametes, mucus, etc. eDNA can result from the
	decomposition of dead organisms. eDNA is characterized by
	a complex mixture of nuclear, mitochondrial or chloroplast
	DNA, and can be intracellular (from living cells) or
	extracellular. Environmental DNA: DNA that can be
	extracted from environmental samples (such as soil, water,
	or air), without first isolating any target organisms.
EPT groups	The three orders of aquatic insects that are common in
	the benthic macroinvertebrate community:
	Ephemeroptera (mayflies), Plecoptera (stoneflies), and
	Trichoptera (caddisflies).
Macroinvertebrate	Organisms that lack a spine and are large enough to be
	seen with the naked eye. Examples of macro-
	invertebrates include flatworms, crayfish, snails, clams
	and insects, such as dragonflies.
Metrics	The method of measuring something, or the results
	obtained from this.
Next-generation	Use of next-generation sequencers (i.e. Illumina) to
sequencing (NGS)	millions or billions of DNA strands in parallel.
Normalizing	The process of rarefying samples down to the smallest
	library size - a common practice in DNA metabarcoding
	methods.
Richness	The number of species represented in an ecological
	community, landscape or region. Species richness is
	simply a count of species, and it does not take into

	account the abundances of the species or their relative abundance distributions.
Riparian	Relating to or situated on the banks of a river.
Sample homogenization	The process of making an environmental sample (i.e. benthos) uniform. For liquid/benthos samples, this often involves mixing using a blender so that DNA is evenly distributed within the sample.
Таха	Unit used in the science of biological classification, or taxonomy.