GITANYOW AKS AYOOKXW (WATER POLICY)

Draft for 1 Year Pilot Implementation Effective July 2023-July 2024

The Gitanyow recognize the integrated and dynamic nature of aquatic ecosystems, and that healthy watersheds are maintained through a holistic, ecosystem-based approach to watershed assessment and protection. Proponents of all new activities with potential to impact water resources must adhere to this policy. Implementation of this policy is triggered whenever an activity is proposed with potential to affect water quantity and use, or impact water quality through potential contributions of contaminants, excess nutrients, erosional material, or otherwise altering its natural chemical and physical state.

Dr. Allison Oliver for the Gitanyow Hereditary Chiefs

Gitanyow Lax'yip Water Policy

Table of Contents

1. Gitanyow Jurisdiction, Governance and Responsibilities

The Gitanyow people are collectively known as the Gitanyow Huwilp, the collective of eight Wilp (house groups), organized into two P'deek (clans), the Lax Gibuu (Wolf) and the Lax Ganeda (Frog/Raven). The Lax'yip (territory) of each Wilp is embedded in the Git'mgan (totem pole) and is rooted in Adawaak (oral history of each Wilp), Ayuuks (crests), and Ayookxw (Gitanyow law). Each Wilp has jurisdiction and exclusive rights to Wilp names, Adawaak, Ayuuks, Git'mgan and Lax'yip. Each Wilp exercise jurisdiction over their territory and Wilp members on issues such as access to land and water, succession in the use of land and water, protection of land and the environment for future generations, and reaffirmation of authority and responsibility over the territory.

The Gitanyow Ayookxw establish ownership of the land, responsibility, use of and care for the environment, and relationship with one another. Ayookxw are founded on knowledge, experiences and practices that are thousands of years old and are recounted in the Adawaak and Ayuuks. Ayookxw is reaffirmed and confirmed through testimony on the Adawaak and the Li'ligit (feast), which are part of the Gitanyow legal order and governance processes of the Gitanyow people. Gwelx ye'enst is the exercise of Gitanyow rights and responsibility to hold, protect, and pass on the land in a sustainable manner from generation to generation.

A Wilp and the Huwilp may adopt new Ayookxw in order to meet new and evolving challenges of the contemporary world. The Gitanyow have documented our oral Ayookxw into *The Gitanyow Constitution* and the Gitanyow Lax'yip Land Use Plan. Contemporary expressions of Gitanyow authority are carried out through the Gitanyow Fisheries Authority and the Gitanyow Hereditary Chiefs Office. In addition to managing the salmon fishery through the Gitanyow Fisheries Authority, Gitanyow's Lax'yip Guardians provide environmental monitoring services for forestry, major project development, water quality and quantity, hunting permits, and other wildlife-related monitoring throughout the Lax'yip. A combination of fish and wildlife biologists and trained Gitanyow field technicians provide territory-based services for the good of the Gitanyow Huwilp and under the direction of the Gitanyow Hereditary Chiefs.

The people and governments of Canada recognize Gitanyow Ayookxw as part of the framework of section 35, *Constitution Act*, 1982 that affirms aboriginal rights. Additionally, both the Government of Canada and Province of British Columbia have committed to implementing the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP). Colonial legal commitments in British Columbia towards the implementation of UNDRIP include enactment of the *Declaration on the Rights of Indigenous Peoples Act* that mandates the Province of BC to align its laws with UNDRIP in consultation and collaboration with Indigenous peoples. When activities are proposed in territories, the *Act* explicitly enables consent-based processes and delegated decision making of colonial statutory powers to Indigenous bodies. The Province of British Columbia set out its initial specific policy commitments to UNDRIP implementation in the *Declaration on the Rights of Indigenous Peoples Act Action Plan (2022-2027)*, which includes the following actions:

- Negotiate new joint decision making and consent agreements (at 2.4);
- Co-develop strategic-level policies, programs and initiatives to advance collaborative stewardship of the environment, lands and resources, that address cumulative impacts and respect Indigenous knowledge (at 2.6); and
- Collaborate with First Nations to develop and implement strategies, plans and initiatives for sustainable water management, and to identify policy or legislative reforms supporting Indigenous water stewardship, including shared decision-making (at 2.7).

Gitanyow Hereditary Chiefs and the Province of British Columbia have been working towards agreement on activities within Gitanyow territory and those processes are expressed in the Gitanyow Huwilp Recognition and Reconciliation Agreement (2016), and (with the Government of Canada) the Gitanyow Governance Accord (2021).

The Gitanyow Aks Ayookxw/ Lax'yip Water Policy ("Water Policy") complements the Gitanyow Lax'yip Land Use Plan and upholds Gwelx ye'enst by establishing policy and guidelines for the management of water quality and quantity within the Gitanyow Lax'yip. It is also one of the steps in fully realizing Gitanyow Hereditary Governance within colonial Canada to achieve the shared vision of the Gitanyow Governance Accord:

> *Gitanyow Hereditary Governance is supported, rebuilt, recognized and thriving through formal recognition and respect for the Gitanyow Hereditary Governance system restored to a fully independent governing system with its own laws and structures supporting it, funding is secured and redress is achieved, with Gitanyow sharing in the resources of the Lax'yip and sustaining its own governance.*

2. Introduction

The Gitanyow Lax'yip encompasses an area of approximately 6,296 km^2 within the northwestern region of British Columbia (Fig. 1). Spanning portions of both the Nass and Skeena River watersheds, the Gitanyow Lax'yip contains countless waterbodies including creeks, rivers, lakes, wetlands, snowfields, glaciers and groundwater. These waterbodies provide high quality water and aquatic habitat that support abundant aquatic and terrestrial ecosystems, human health, Gitanyow culture, and Wilp sustainability. Wilp sustainability is a core value and requires a strong ecological foundation to maintain ecosystem function, socio-cultural, and economic well-being within a framework of low risk to ecological integrity. Waterbodies and their aquatic ecosystems are a source of cultural and spiritual value for the Gitanyow people, who utilize all aquatic resources within the Lax'yip for fishing, trapping, hunting, food and medicinal plant gathering, spiritual worship, and upholding traditional laws. Because aquatic resources are an abundant and integrated part of Gitanyow culture and the landscape of the Gitanyow Lax'yip, preserving the ecological integrity of waterbodies is central to Wilp sustainability.

As an expression of Gitanyow Ayookxw, the purpose of the Aks Ayookxw/Water Policy is to establish a framework for maintaining aquatic health within Gitanyow Lax'yip. It creates water management standards and procedures to evaluate existing and proposed activities according to Gitanyow responsibilities. The overall intent is to safeguard aquatic ecosystem health and operationalize cumulative effects assessment, particularly as the impacts of climate change amplify.

The Water Policy classifies water bodies into three risk-based categories (Type 1, Type 2, and Type 3 water bodies) based on ecological and cultural significance and reflects the level of risk associated with degradation to a water body due to project impacts. The Water Policy establishes a process for identifying site-specific Gitanyow water quality and water flow standards based on these categories and sets out the technical review process to which all defined existing and new activities will be subject.

2.1 Waters of the Gitanyow Lax'yip

There are abundant freshwater resources and aquatic ecosystems within the Gitanyow Lax'yip. Surface waters include all the water located on the earth's surface including flowing (e.g., streams, rivers) and non-flowing (e.g., lakes, wetlands) waters, snow, and ice. Below the earth's surface, groundwater provides a critical water supply to surface waters and aquatic ecosystems as well as maintains hydrologic connectivity and drives other geologic and watershed processes.

The Nass River is the integral lifeblood of the Gitanyow Lax'yip. The Nass River is the largest river in the Lax'yip; the majority of watersheds in the Lax'yip flow into the Nass River, which then flows to the Pacific Ocean. A small area of the southeastern portion of the Lax'yip is comprised of watersheds that drain to the Skeena River watershed. Although the Skeena River itself is outside of the Lax'yip, the Skeena also drains to the Pacific Ocean and is a critical hydrological connection for salmon within the Gitanyow Lax'yip. Within these major watersheds are numerous smaller watersheds containing critical surface waters (Appendix A). The northwestern region of the Gitanyow Lax'yip (Wilp 'Wii Litsxw, Wilp Gwaas Hla'am/ Biiyosxw, Wilp Luuxhon) contains sections of the Boundary Ranges, including portions of the Cambria Icefield and numerous glaciers, which contribute substantially to water quantity and water quality in some systems.

The aquatic ecosystems within the Gitanyow Lax'yip provide critical resources (e.g., flow, food, habitat) and processes (e.g., flood plain maintenance, nutrient cycling) for a variety of culturally and economically important plants (e.g., wild rice, highbush cranberry, round-leaved sundew, skunk cabbage, and others), wildlife (e.g., moose, mountain goat, grizzly bear, black bear, fisher, wolverine, and others), and fish (e.g., all five species of Pacific salmon, Steelhead/Rainbow Trout, Dolly Varden, Bull Trout, Pacific Lamprey, and others). Because of the highly-connected nature of aquatic ecosystems, even watersheds and aquatic waterbodies that don't directly support fish and wildlife are important as they support and influence downstream conditions and ecosystem function.

Historically and currently, aquatic ecosystems in the Gitanyow Lax'yip are primarily impacted and threatened by activities related to forestry, mining and industrial projects, and power generation. Lesser, but notable impacts and threats include those related to recreation, domestic development, and commercial development. This includes direct and indirect effects on water quality and quantity from infrastructure related to these activities (e.g., linear development, roads, facilities, water supply, etc.), and the activities themselves (e.g., logging removal of forest cover, ground disturbance and leaching from mining, hydropower alteration of in-stream flows, construction of impervious surfaces, use of chemicals and fertilizers, etc.). In addition, climate change is increasing the vulnerability of watersheds and aquatic ecosystems by influencing factors that interact with demands and pressures on aquatic ecosystems and watershed health, such as shifts in weather patterns, altered wildfire regimes, deglaciation, etc.

2.2 Objectives

The Gitanyow Aks Ayookxw/Lax'yip Water Policy establishes standards and procedures to address the following Gitanyow responsibilities, expressed here as management objectives for water quality and water quantity within the Gitanyow Lax'yip:

- Protect and preserve aquatic ecosystems to ensure low risk to ecological integrity while maintaining Gitanyow cultural, social, and economic interests
- Provide high quality water for human use, including cultural and spiritual needs
- Protect water quality, water quantity, and hydrologic function to preserve natural background conditions, instream flow regimes and environmental flow needs
- Preserve high quality waters and restore degraded waters

The Gitanyow recognize the integrated and dynamic nature of aquatic ecosystems, and that healthy watersheds are maintained through a holistic, ecosystem-based approach to watershed assessment and protection. A comprehensive assessment of aquatic ecosystem health should be based on assessment of the five major components that influence in-stream aquatic conditions and support ecologically healthy watersheds: water quality, hydrology, biology, connectivity, and geomorphology (EPA, 2012; Naiman et al., 1992). Some assessment approaches, such as describing environmental flow needs, integrate these components to some degree (i.e., hydrology, connectivity, geomorphology, biology). Other approaches, such as evaluating water chemistry and developing numerical or narrative Water Quality Standards, focus on a single component (i.e., water quality) to identify concentration limits that should not be exceeded in order to meet requirements or benchmarks of ecosystem health. The Water Policy describes management criteria specifically for water quality and water quantity; however consideration of additional assessments is included under the Water Management Technical Process.

3. Application of Policy/Policy scope

This policy primarily applies to new and existing proposals of industrial development, including but not limited to, mining, energy development (i.e., hydropower, extraction), forestry, transportation infrastructure, and commercial or municipal infrastructure. However, this policy also applies to community development, agriculture, and recreation or other projects with potential to impact water resources and aquatic waterbodies. Projects that support Gitanyow interests and Wilp sustainability, for example, projects aimed at improving fisheries or supporting Gitanyow economic opportunity and clean energy, are governed by internal Gitanyow Ayookxw legal and management processes.

Proponents of all new activities with potential to impact water resources must adhere to this policy. Implementation of this policy is triggered whenever an activity is proposed with potential to affect water quantity and water use, or impact water quality through potential contributions of contaminants, excess nutrients, erosional material, or otherwise altering its natural chemical and physical state. If the policy applies to the activity, the proponent must communicate with the Gitanyow technical staff to initiate the Water Management Technical Process (see Section 7).

Proponents of existing activities who intend to continue or expand operations beyond existing terms of consultation with Gitanyow must also adhere to this policy for all future operations. Proponents of existing activities who have undergone consultation and are consistent with the Gitanyow Lax'yip Land Use Plan may be asked to adopt new practices and will be given 12 months to ensure all activities are in compliance with this Policy. In all cases, communication with Gitanyow technical staff and initiation of the Water Management Technical Process is required prior to any further activity development.

Forestry operations in the Gitanyow Lax'yip that have undergone Early Engagement and Shared Engagement/Shared Decision-Making processes under the Gitanyow Lax'yip Land Use Plan and resulting in consensus recommendations will be exempt from application of this policy for a period of no less than 12 months from the effective date of the 1-year pilot. During this time, forestry companies are invited to work collaboratively with the Gitanyow to develop forestry-specific processes to uphold the objectives of this policy. The Gitanyow Lax'yip Land Use Plan already includes water management zones including Ecosystem Networks and Buffers, and Water Management Units, in addition to Equivalent Clearcut Area thresholds by watershed, and is currently adhered to by all forestry companies in the Lax'yip. This policy will supplement existing management directions and targets in the Land Use Plan, and apply in cases where cumulative impacts are of concern, significant drought or other climate-related conditions are occurring, or other factors which may exacerbate impacts from forestry.

4. Classifying waterbodies

4.1 Classifying waterbodies in the Gitanyow Lax'yip

The Water Policy uses a system of water classification to provide a proactive, structured approach to establishing water quality and quantity standards for surface waters[1] in support of water management objectives. Classifications are based on ecological, cultural, and/or hydrological significance, protection status, presence of sensitive, ecologically or culturally valuable species, resilience to climate change impacts, and other characteristics or risk factors within the watershed. Classifications represent the level of risk and/or sensitivity of a waterbody to external pressures, but do not represent the relative value of one waterbody over another: All waterbodies are considered equally valuable.

Appropriate waterbody classification in accordance with the Water Policy requires a thorough assessment of background information. This may include data collection through historical records and/or additional monitoring, compilation, and evaluation of aspects of watershed health and cultural significance. These assessments may include, but are not limited to: water quality data, instream flows and environmental flow needs, biological communities, habitat, hydrologic connectivity, cultural significance, existing and/or future use, and risk associated with climate change and other cumulative effects. Appropriate temporal and spatial scales and variability must also be considered.

Gitanyow technical staff have established classifications for some waterbodies in the Gitanyow Lax'yip (Appendix A), with the understanding that additional information, changing climate and cumulative impacts will require adaptation of these classifications over time. In addition, there are numerous waterbodies that have yet to be classified. Classification is required to properly assess and manage water management objectives prior to and during project development.

When a new activity is proposed, following initiation of the Water Management Technical Process and during project scoping, project proponents must undertake a waterbody evaluation to determine classification for any unclassified waterbodies within the project area. This requires all information be submitted, reviewed and classification approved and officially designated by Gitanyow.

4.2 Gitanyow Water Policy surface water classification

To guide management approaches under the Water Policy, surface waters within the Gitanyow Lax'yip are classified as Type I, Type II, or Type III waterbodies; these classifications are based on ecological and cultural significance and reflect the level of risk associated with degradation due to project impacts. While this Policy does not classify groundwater, as current data is incomplete and insufficient to do so, any use of groundwater in the Lax'yip should be informed by management direction for surface water and make best efforts to determine connectivity to surface waters and their respective designations.

Type I: Waterbodies of highest risk and/or sensitivity due to ecological, hydrological, and/or cultural significance or specific use. Waterbodies in this category are characterized by one or more of the following:

- Utilized for human water consumption or other direct use
- High cultural significance
- High fisheries values

[1] Surface waters include all lentic (flowing) and lotic (non-flowing) waterbodies, as well as snow, ice and wetlands. Because groundwater reflects an essential component of the hydrologic cycle and is critically connected to surface water systems, impacts to groundwater may also be assessed under this framework and groundwater considered in the context of the classification and management of proximal surface waterbodies.

- Provide unique and/or rare habitat for aquatic organisms or wildlife
- Provide habitat or other support for endangered, threatened, or species of special concern
- Provide critical hydrological linkages to other waterbodies
- Protected areas
- Highly vulnerable to climate change and cumulative effects

Protection for Type I waterbodies requires that water quality must meet or exceed current conditions, and natural flow regimes must remain unaltered. Human activities must not further impact or degrade natural/current conditions of water quality or quantity and no new discharges, withdrawals, or other allocations are permitted.

Type II: Waterbodies of high risk and/or sensitivity that provide critical upstream/downstream connectivity and processes that support human health, aquatic and terrestrial communities, and ecosystem function but may not currently directly support criteria/characteristics of Type I waterbodies. Waterbodies in this category are characterized by one or more of the following:

- Represent important upstream/downstream ecological or hydrological connectivity with a Type I waterbody.
- Support other waterbodies and/or areas of significant ecological and cultural importance
- Habitat for fish but does not directly support high fisheries values
- Habitat for other aquatic species and/or supports terrestrial species but does not directly support endangered, threatened, or species of special concern, or species of important cultural significance.
- Vulnerable to climate change and cumulative effects
- Water Management Units

Protection for Type II waterbodies requires that water quality must meet or exceed current conditions within or downstream of any zone of activity and water use of any kind must not alter water quality. Water quantity must not be altered ±10% of instantaneous flows[2] and never below environmental flow[3] needs requirements unless project criteria allow for exemptions to these standards (for list of project criteria for potential exemption from flow requirements, see Section 6). Water use and human activities are allowed but measures must be taken within the zone of activity to prevent any alteration or degradation of instream conditions and must maintain natural flow regimes.

Type III: Waterbodies that are lower risk or less sensitive due to location, species presence, water source, catchment type, and/or existing values. These waters do not fit the description of Type I or Type II waters and do not contain features that would categorize them as higher risk, and/or are maintained for specific qualities and values, or designated uses. Waterbodies in this category are characterized by one or more of the following:

- Do not fit the description of Type I or Type II waters and do not contain features that would categorize them as higher risk
- Are maintained for specific qualities, values, and uses
- Requires that water quality meet or exceed conditions to protect qualities, values, and uses while still including adequate protection of aquatic and terrestrial life, human health, recreation and aesthetics while allowing for allocation

---

[2] "Instantaneous flows" is the volume of flow measured over the shortest period of time, here this refers to the volume per second.
[3] According to the *Brisbane Declaration*, 2007: "Environmental flows describe the quantity, timing and quality of water flows required to sustain freshwater and estuarine ecosystems and the human likelihoods and well-being that depend on these ecosystems"

Water flow alteration of >10% of instantaneous flow requires extensive additional field-based assessment to determine robust environmental flow needs and flow management planning. Water quantity must never be altered below environmental flow needs requirements unless project criteria allow for exemptions to these standards.

4.3 Waters originating outside of the Gitanyow Lax'yip

Some waterbodies within the Gitanyow Lax'yip may originate outside of the territory. These include, but are not limited to, the Nass River, the Bell Irving River, the Kispiox River, as well as numerous small tributaries and icefields/glaciers that contribute water downstream to waterbodies within the Lax'yip. The classification of these systems within the Gitanyow Lax'yip reflects the level of protection and management that Gitanyow expects across the whole extent of these waterbodies. Upstream or downstream impacts may not modify natural water quality or quantity within the Lax'yip, or result in impacts to aquatic communities, aquatic ecosystem processes, or Gitanyow way-of-life.

4.4 Historic Baseline & Restoration

Human activity has degraded and impacted many waters in the Gitanyow Lax'yip. As a result, current baseline conditions at specific sites, reaches, or across whole systems may not accurately represent the "least-disturbed" or natural background conditions for that waterbody. Consideration of true baseline conditions and restoration needs of a system are critical to establishing appropriate sites for monitoring and during the development of specific quantitative water quality and water quantity targets per the Water Policy. Therefore, the process of establishing standards and guidelines must consider current and historical/legacy impacts, particularly when choosing sites for baseline monitoring. Information on impacts and restoration needs relevant to waterbodies within the Gitanyow Lax'yip can be found in the Gitanyow Lax'yip Watershed Restoration Atlas, which is updated periodically and available online or upon request.

5. Water Quality Standards

5.1 Distinguishing between Provincial Water Quality Guidelines and Water Quality Objectives

The British Columbia government establishes Water Quality Guidelines (WQG) to evaluate impacts on water quality by establishing acceptable limits or ranges for water quality constituents to achieve a desired level of ecosystem health (BC ENV, 2019). The criteria for selecting the level of ecosystem health is based on the intended use, for example, for watering of agricultural plants or livestock, human drinking water consumption, recreational use, or the protection of freshwater aquatic life. However, the applicability of a generic WQG to individual sites is not always appropriate as WQG are meant to protect specific uses but may not maintain existing conditions. In addition, site-specific factors such as background concentrations of the variable in question, background concentrations of other water quality variables with potential to influence toxicity, the sensitivity range of resident species, and analytical detection limits can influence water quality variables (CCME, 2003). In addition, while WQG are derived through detailed, scientific review of the best available toxicology studies, they have not been developed for all water quality constituents or contaminants of potential concern.

British Columbia also develops Water Quality Objectives (WQO) for specific waterbodies of various significance with the goal of protecting aquatic habitats by maintaining or improving existing water quality or protecting water quality for a specific use or value (BC ENV, 2020). These WQO are used to inform resource management decisions, support watershed planning, or to support key initiatives. While WQO are not directly enforceable, they may provide the basis for enforceable action such as issuing permits for waste discharge limits or orders and approvals. One of the methods used for development of WQO is consistent with the method used to develop Gitanyow Water Quality Standards (WQS), providing transparency and translatability between Provincial and Gitanyow approaches to quantifying water quality criteria.

5.2 Gitanyow Water Quality Standards

Proponents of existing and future projects with potential to impact water quality within the Gitanyow Lax'yip must develop and follow Gitanyow-approved site-specific numerical Water Quality Standards (WQS). Unless Gitanyow has already established WQS, is the proponent's responsibility to establish WQS with Gitanyow approval. The proponent will be required to adhere to those WQS. A table of preliminary site-specific WQS for some systems within the Gitanyow Lax'yip is provided in Appendix B.

The procedure for development of WQS for Type I and II waters differs from development of WQS for Type III waters, however, both methods require determining natural background water quality concentrations using reference sites[4] for the system in question. Reference sites should represent unimpaired or least impaired conditions, and sampling location and sampling frequency should be appropriate for capturing spatial and temporal variability[5].

The following procedures are the required minimum for proponents to address in development of WQS and focus only on water chemistry. Additional procedures may be necessary for deriving standards for other environmental variables such as chemistry or toxicity within sediments, biological tissue, or biological community composition. This will be determined by Gitanyow with the proponent as part of the Water Management Technical Process.

5.2.1 Creation of Water Quality Standards for Type I and Type II waters

For Type I and Type II surface waters, WQS are created using the background concentration procedure (CCME, 2003). The background concentration procedure is a non-degradation approach, meaning that the natural water quality must remain equivalent to or better than baseline conditions. In the background concentration procedure, the natural background concentrations of a constituent in water are determined and used to define acceptable water quality conditions at a site under consideration. The use of this approach is based on the underlying premise that surface waters with superior water quality should not be degraded (CCREM, 1987). Information on background concentrations of water quality constituents is also essential for evaluating WQS derived using other procedures.

Once the proponent collects the appropriate samples, the proponent calculates WQS using statistical procedures to define the upper and lower bounds of the natural variability ("background concentration") of a particular water quality constituent. WQS are expressed as a maximum allowable value (i.e., "short-term" or "acute") and average maximum value (i.e., "long-term" or "chronic"). For the derivation of WQS under the Water Policy, the maximum allowable value is calculated by deriving the maximum baseline value using the 95th percentile of the dataset (CCME, 2003), plus 20%. A change in 20% is considered acceptable to ensure full protection of existing water quality recognizing that precision in the

---

[4] A reference site is a site of least-impacted condition that may be used to assess the impact of disturbance or pollution events. This site may be located within the same water body as the impact, or in some cases if least-impacted locations cannot be determined, a nearby waterbody with comparable attributes. Interpretation of unimpaired or least-impacted states varies, and therefore site selection requires careful consideration in order to produce defensible guidelines (Pardo et al. 2012).

[5] Many water quality variables fluctuate across daily, seasonal, and/or annual scales or are flow or temperature-dependent. This can result in bias towards times of the year or certain conditions (e.g., high flow periods), therefore background conditions should be established for specific periods and/or normalized to other variables that can influence the parameter of interest. Extensive, representative sampling is required in systems that are subject to large variation in water quality on a daily, seasonal, or annual basis.

laboratory measurement of low-level concentrations in replicate samples is usually not better than 20%, and also accounts for the range of natural variability (BC ENV, 2020). For average maximum values, the WQS is calculated as 95% of the upper prediction limit of the mean (EPA, 2009). Average maximum values are often assessed for samples collected over a monthly time period, often using a "5 samples collected in 30 days" (i.e., "5-in-30") approach, although other timeframes can also be assessed. Standards may be established for different distinct periods of temporal representation, (e.g., seasonally, annually) depending on variability within the dataset and relevant applications.

5.2.2 Creation of Water Quality Standards for Type III waters

For Type III waters, the intent of WQS are to provide an enhanced level of protection for aquatic organisms and minimize the degradation of receiving waters while facilitating resource development. This approach follows methods described in the *Yinka Dene 'Uza'hné Guide to Surface Water Quality Standards*), "Derivation of WQS for Class II Waters: Sensitive Waters" (Version 4.1, 2016, pg 3) where allocation for changes in water quality parameters does not exceed 50% of the assimilative capacity of a water body. This procedure requires determination of background conditions and compilation of numerical BC WQG for the most sensitive water use designated for each contaminant of potential concern. The WQS for each of contaminant is then determined by:

WQS = [BKGD] + ([WQG] – [BKGD]) x 0.5

where

BKGD = background concentration of a contaminant of potential concern
WQG = Water Quality Guideline for the most sensitive water use

Note that this equation can be adjusted to calculate alternative WQS, such as assimilative capacity other than 50%, by adjusting the 0.5 in the equation to represent the alternative assimilative capacity. For example, for 40% of assimilative capacity, 0.4 will be used instead of 0.5 in the equation. Gitanyow staff will determine whether more conservative levels of assimilative capacity may need to be applied in certain circumstances or for particular contaminants. For example, an enhanced level of protection is warranted for contaminants of potential concern that are known to bioaccumulate. If BC WQG do not exist for particular contaminants of concern, Gitanyow staff may adopt WQG from other jurisdictions.

5.3 Biological community standards for water quality

Biological community composition represents an effective and insightful indicator of waterbody function and health. Aquatic organisms such as benthic macroinvertebrates or periphyton (algae), integrate water quality conditions over space and time and can serve as bellwethers of ecosystem perturbation and change. In some circumstances, direct measurement of biological health, such as assessing aquatic biological community composition, is more effective at identifying changing ecosystem conditions than evaluating chemistry via water grab samples, which represent only "snap shots" of conditions. The following guidelines should be used for establishing biological community standards for water quality:

a. Any projects where water quality may be directly impacted must also consider aquatic biological community composition as a metric for evaluating ecosystem status and impacts.
b. At a minimum, this includes evaluating the benthic macroinvertebrate community of wadable streams and lotic (non-flowing) waters, but may also consider impacts to other communities of organisms (e.g., periphyton, aquatic plants, fish).

c. Proponents must conduct aquatic benthic macroinvertebrate assessment in accordance with, at minimum, the standard protocols of the Canadian Aquatic Biomonitoring Network (CABIN)[6].
d. For all water classifications (Type I, II, and III), impacts may not degrade aquatic community composition from their current or reference state.
e. If the aquatic community is already considered degraded from reference conditions, additional measures must identify and mitigate impacts and further degradation is not permitted.
f. As water quantity can also impact bioassessment results, both water quality and water quantity should be evaluated within a whole watershed context when interpreting results.

6. Water quantity standards

Existing activities and proposed projects must preserve the natural flow regime and environmental flow needs (EFN) of aquatic waterbodies per the framework outlined in this Water Policy[7], which establishes minimum flow standards and requirements for further assessment. Criteria for exemptions to these standards are established and evaluated by Gitanyow and include:

- Projects or activities that directly support Gitanyow drinking water, water for cultural purposes and linked to exercise of Gitanyow Indigenous/Aboriginal rights, or water for essential services supporting Gitanyow community health;
- Water used for emergency services such as fire suppression or other life-threatening events;
- Projects that are able to offset impacts to natural flow regimes through other environmental, cultural, and legal mechanisms that ensure net socio-cultural benefit to the Gitanyow Huwilp through an analysis under the Gitanyow Wilp Sustainability Assessment Process or other equivalent review process;
- Projects or activities that have been designated as exempt, following a thorough and transparent assessment process and with the full and comprehensive free, prior and informed consent of all affected Gitanyow Wilp.

For Canadian rivers and streams, cumulative flow alterations of less than 10% of the magnitude of actual (instantaneous) flow in a river relative to the natural flow regime have a low probability of detectable negative impacts to ecosystems and fisheries (DFO, 2013). The Gitanyow Water Policy recommends that any cumulative flow alterations greater than 10% of the natural flow regime require more rigorous field-based assessments to evaluate potential impacts to ecosystems and more robustly define EFN. Ultimately, it is impossible to define a single threshold where flows are either "good" or "bad" (i.e., there is no ecological "edge" where the degree of impact goes from minimal to severe), therefore the Gitanyow Water Policy also requires that projects using any quantity of water estimated to be >10% of actual flow require a stream flow monitoring program to empirically determine EFN and monitor impacts (Locke and Paul, 2011). The degree of alteration and requirements for establishing additional flow management thresholds is based on stream classification and described below. Several Tier 1 (desktop) site-specific EFNs have been established in the Gitanyow Lax'yip and examples are provided in Appendix B.

[6] Canadian Aquatic Biomonitoring Network: https://www.canada.ca/en/environment-climate-change/services/canadian-aquatic-biomonitoring-network.html
[7] Additional related frameworks for management of watershed activities aimed at protecting ecological integrity of watersheds through protection of hydrologic processes, such as establishing thresholds for watershed-specific Equivalent Clearcut Areas (ECA) or development in Water Management Zones, are described in the GLLUP.

6.1 Flow management standards for Type I waters

Activities and projects occurring within Type I watersheds must not alter the natural flow regime of Type I waters, including withdrawals or discharges.

6.2 Flow management standards for Type II waters

Activities and projects occurring within Type II watersheds must not alter the natural flow regime of Type II watersheds more than a cumulative ±10% of actual (instantaneous) downstream flow relative to the natural flow regime and may not reduce daily flows below EFN at any time of year. In addition, activities that influence flow for Type II waters must not impact the natural flow regime of any downstream Type I waters, including cumulative or project-specific impacts.

For projects withdrawing <10% of instantaneous flow, proponents are not required to develop an EFN unless Gitanyow staff determine an EFN is necessary for avoiding low flow withdrawals. For example, during periods such as summer (e.g., July-September) or winter (e.g., December-March) low flows, proponents may not withdraw water unless sufficient water still remains available instream to meet EFN. If this value is unknown Gitanyow staff may request development of EFN.

Proponents can estimate site-specific EFN using a standard-setting, desktop approach that is scientifically-defensible and ecologically relevant. Appropriate methods for determining EFN should be transparent, reproducible, and used in previous similar applications and environments. The method of EFN determination is subject to review and the proponent may be responsible for providing additional information and support (including paying for 3rd party review) to justify and validate the method. Minimum data requirements for this level of assessment include high-quality stream discharge data (preferably multi-year), as well as additional biological information such as multi-species life history needs including, at a minimum, requirements for fish. If stream discharge data are not available, proponents may be asked to monitor discharge. Alternatively synthetic flows[8] may be used for setting initial EFN criteria if stream discharge data are available from suitable nearby watersheds, but these must be calibrated and validated to ensure they are representative of the specific waterbody under review. A synthetic discharge approach is subject to Gitanyow approval.

The project proponent may be required to develop and follow an acceptable flow management plan.

6.3 Flow management standards for Type III waters

Activities and projects that influence Type III waterbodies may not reduce daily flows below EFN at any time of year. For cumulative alterations greater than ±10%, proponents must conduct additional incremental (field-based) assessments including development of a hydrometric station to Grade A, RISC standards (RISC, 2018), development of more robust models of EFN thresholds for minimum flows, and refinement of daily flow prescriptions based on additional information.

Proponents must also assess potential impacts of modified flows on aquatic organisms, aquatic habitat, riparian habitat, hydrologic connectivity to aquifers and other aquatic systems, geomorphological processes, water quality, and downstream processes. Maximum flow thresholds should also be assessed to ensure that they will not negatively impact or alter the aquatic ecosystem.

The project proponent is required to develop and follow an acceptable flow management plan.

[8] Synthetic flows are modelled predictions of the stream flow in a given stream based on measured parameters, such as stream flow, from adjacent catchments experiencing similar underlying watershed characteristics, climate, and general weather patterns.

6.4 Non-flowing water bodies

Flow management standards are different for non-flowing waterbodies (e.g., lakes, wetlands, groundwater, snow, ice) but these systems still require appropriate environmental water to maintain aquatic ecosystem health and function. Non-flowing waterbodies have different requirements for aquatic health needs and use different measurement criteria for environmental water (e.g., volume, shoal area, hydrologic connectivity, geomorphology, geology, water mass balance, etc.).

Proponents must consider direct and non-direct impacts to the hydrology of non-flowing waterbodies, and develop specific plans, acceptable to Gitanyow staff, to address and monitor these impacts.

The classification of non-flowing waterbodies is the same as for flowing waterbodies (i.e., Type I, II, and III) and management of water quantity for each of these types of systems reflect the same general criteria as described for assessing stream flow. If there are instances where Gitanyow staff deem the quantitative criteria established for various classifications as inappropriate, they will adjust them to address management and conservation goals. Assessment, review, and adjustment of these criteria for non-flowing waterbodies will be included as part of the Water Management Technical Process.

7. Water Management Technical Process

The Water Management Technical Process (Fig. 2) is intended to guide collaborative assessment and implementation of the water management framework. Proponents interested in developing projects that have potential to impact water resources in the Gitanyow Lax'yip are required to participate in this process. Project proponents must complete all steps in consultation and collaboration with Gitanyow staff, and are financially responsible for covering costs associated with their compliance at all stages of the technical process.

Project proponents should contact the Gitanyow Hereditary Chiefs through the existing Early Engagement process outlined on the Gitanyow Hereditary Chiefs website to initiate this process. This process assumes an adaptive management approach; outcomes will be used to continually improve and refine the process. The Water Management Technical Process is presented in a proposed chronological order; however, it is reasonable that some steps may overlap, occur simultaneously, or be addressed in an alternative order, as directed by Gitanyow staff. The proponent may not proceed with the project until they have worked through this process and receive final approval by Gitanyow staff.

Figure 1: Map of the Gitanyow Lax'yip and Gitanyow Huwilp.

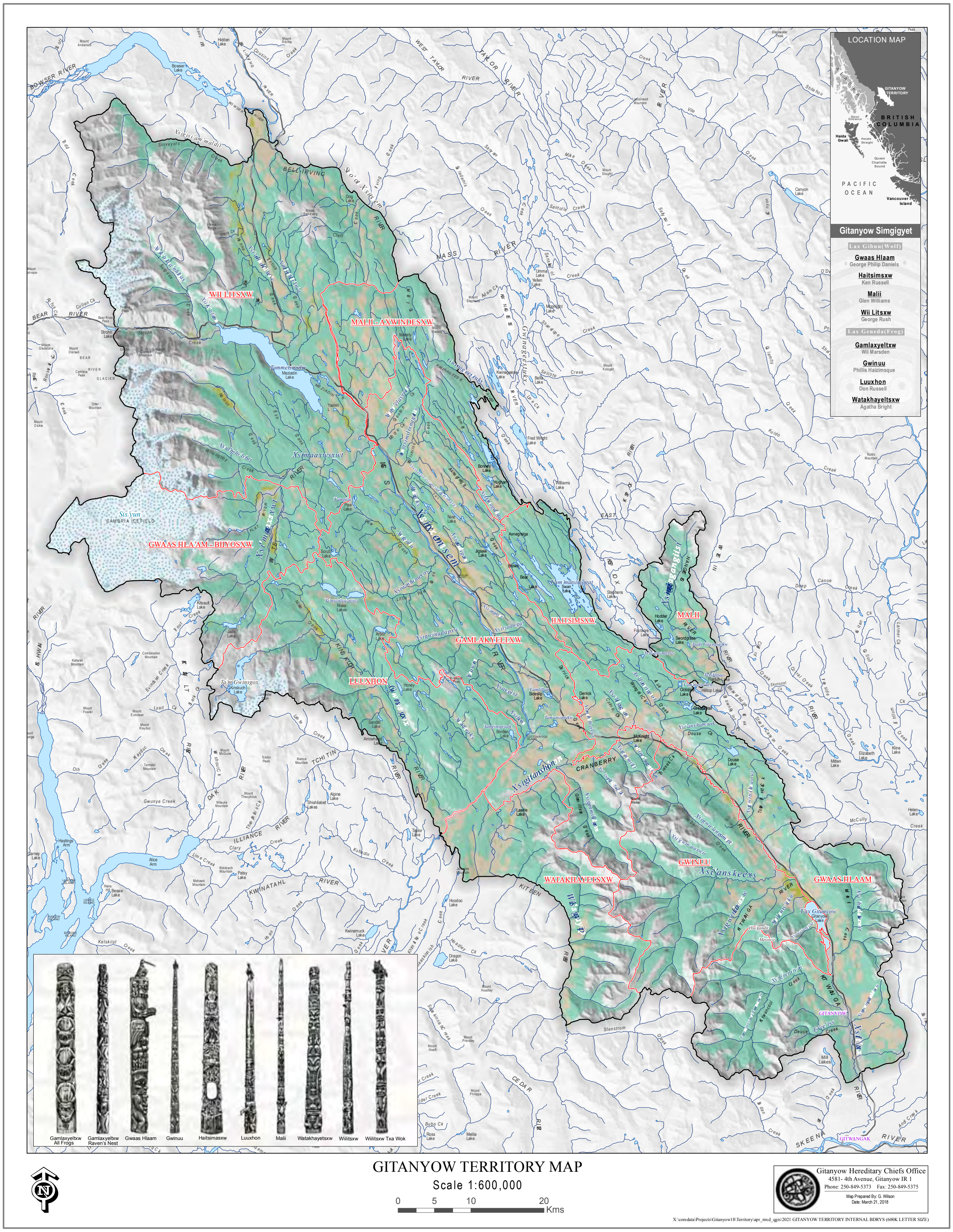
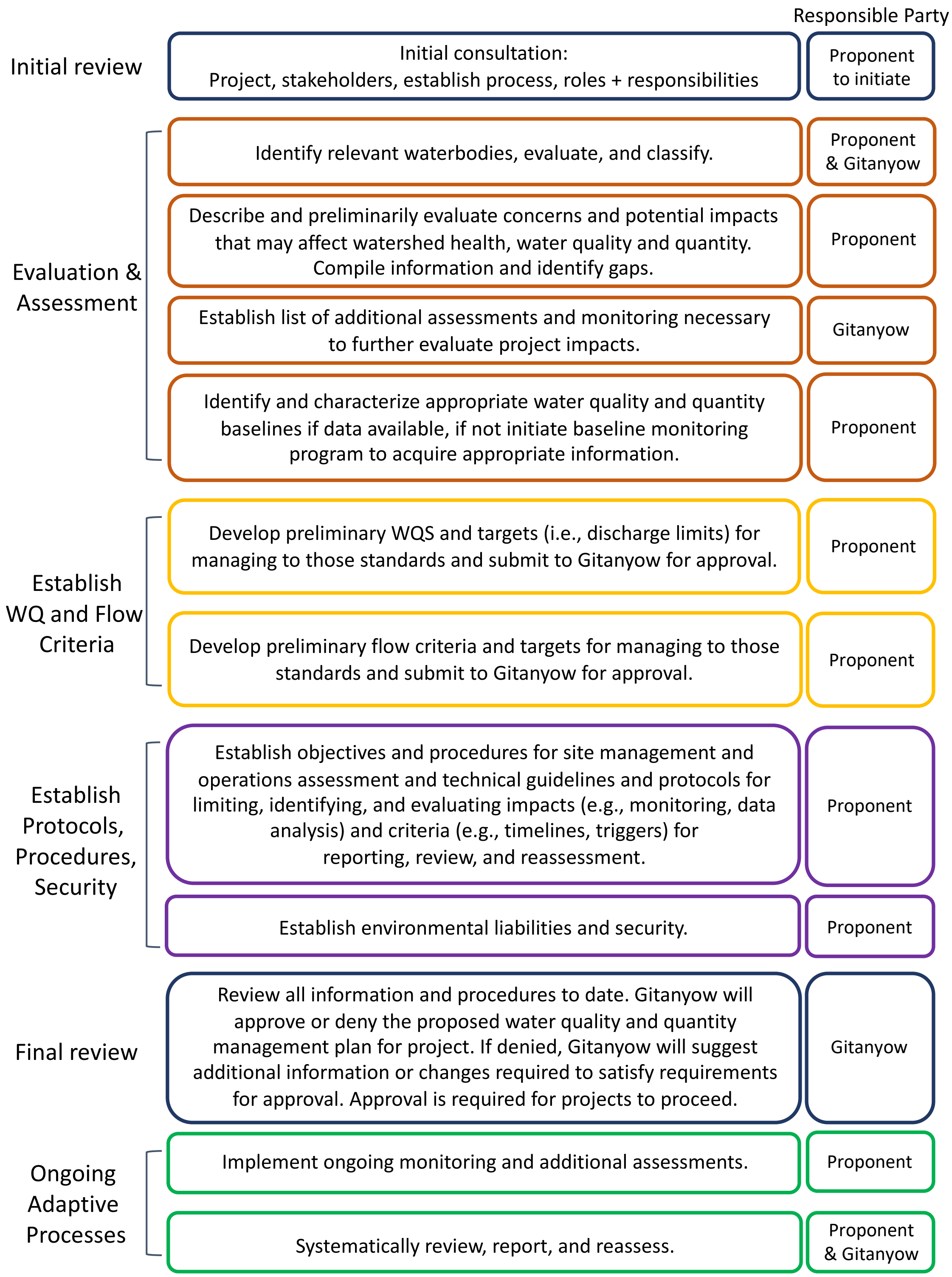


Figure 2: Conceptual framework of the Gitanyow Water Policy's Water Management Technical Process.



References

Anderson, 2020. Gitanyow Lax'yip Tier 1: Environmental Flow Needs Assessment. Prepared for Gitanyow Hereditary Cheifs/Gitanyow Fisheries Authority. Geomorphic Consulting. 48 pp.

BC MELP, 1998. Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia, Field Test Edition. Ministry of Environment, Lands, and Parks Water Quality Branch. Version 1.0. Victoria, BC.

BC ENV, 2019. Water Quality Guidelines Policy. File 77510-00. British Columbia Ministry of Environment and Climate Change Strategy. Victoria, BC.

BC ENV, 2020. Guidance for the Derivation and Application of Water Quality Objectives in British Columbia, WQO-04. British Columbia Ministry of Environment and Climate Change Strategy. Victoria, BC.

Bush, E., and Lemmon, D.S., editors. 2019. Canada's Changing Climate Report, Government of Canada, Ottawa, ON. 444 pp.

CCME, 2003. Canadian water quality guidelines for the protection of aquatic life: Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB. 145 pp.

CCME, 2015. Guidance manual for optimizing water quality monitoring program design. Canadian Council of Ministers of the Environment. Winnipeg, MB. 88 pp.

CCREM, 1987. Canadian water quality guidelines. Task Force on Water Quality Guidelines. Canadian Council of Resource and Environment Ministers. Ottawa, ON.

DFO, 2013. Framework for assessing the ecological flow requirements to support fisheries in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/017.

Dressing, S.A., and Meals, D.W. 2005. Designing water quality monitoring programs for watershed projects, Tetra Tech, Inc., Developed for the U.S. Environmental Protection Agency, Fairfax, VA, 20 pp. Accessed online Nov 20, 2020 at https://www.epa.gov/polluted-runoffnonpoint-source-pollution/nonpoint-source-monitoring-technical-notes

EPA, 2009. Statistical analysis of groundwater monitoring data at RCRA facilities; Unified Guidance. EPA 530/R-09-007. United States Environmental Protection Agency. Accessed online Jan 5, 2021 at https://www.itrcweb.org/gsmc-1/Content/Resources/Unified_Guidance_2009.pdf#18

EPA, 2012. Identifying and Protecting Healthy Watersheds. United States Environmental Protection Agency. Accessed online Nov 20, 2020, at http://water.epa.gov/healthywatersheds

GLLUP, 2012. Gitanyow Lax'yip Land Use Plan, in Gitanyow Huwilp Recognition and Reconciliation Agreement. Accessed online Nov 20, 2020 at http://www.gitanyowchiefs.com/images/uploads/land-use-plans/Gitanyow-R-R-Agreement-2012.pdf

IFC, 2002. Instream flows for riverine resource stewardship. Instream Flow Council. 411 pp.

Koch, K., and Anderson, J. 2018. Hanna, Tintina, and Strohn Creeks habitat assessment and restoration initiative year 4. Gitanyow Fisheries Authority. Report produced for Fisheries and Oceans Canada. 98 pp.

Locke, A., and Paul, A. 2011. A desk-top method for establishing environmental flows in Alberta rivers and streams. Alberta Environment, Government of Alberta. 100 pp. Accessed online Nov 20, 2020, at https://open.alberta.ca/publications/9780778599791#summary

MacDonald, D.D., Zajdlik, B., and INAC Water Resources, 2009. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Overview. Prepared for Water Resources Division, Yellowknife, Northwest Territories. Accessed online Nov 20, 2020 at www.enr.gov.nt.ca/em/resources

Naiman, R.J., Beechie, T.J., Benda, L.E., et al. 1992. Fundamental elements of ecologically healthy watersheds in the Pacific Northwest Coastal Ecoregion. In: Naiman R.J. (eds) Watershed Management, pp 127-188, Springer, New York, NY.

Pardo, I.C., Gomez-Rodriguez, J.G., Wasson, R., et al. 2012. The European Reference Condition Concept: A scientific and technical approach to identify minimally impacted river systems. Science of the Total Environment. 420:33-42.

Ptolemy, R. and Lewis, A. 2002. Rationale for multiple British Columbia instream flow standards to maintain ecosystem function and biodiversity. Draft for Agency Review. Prepared for Ministry of Water, Land, and Air Protection and Ministry of Sustainable Resource Management, British Columbia.

RISC (Resources Information Standards Committee), 2018. Manual of British Columbia Hydrometric Standards, Version 2.0, December 2018. Knowledge Management Branch, B.C. Ministry of Environment and Climate Change Strategy, Victoria, B.C.

Tennant, D.L. 1976. Instream flow regimes for fish, wildlife, recreation and related environmental resources. *In* Proceedings of the symposium and speciality conference on instream flow needs, J.F. Orsborn and C.H. Allman, eds. Vol. 11. American Fisheries Society, Bethesda, MD.

UNEP/WHO, 1996. Water Quality Monitoring – A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes. Eds. Bartram, J. and R. Ballance. Published on behalf of the United Nations Environment Programme and the World Health Organization. 348 pp.

Wagner, R.J., Boulger, R.W., Oblinger, C.J., and Smith, B.A. 2006. Guidelines and standard procedures for continuous water-quality monitors: Station operation, record computation and data recording. USGS Report 00-4252.

Yinka Dene 'Uza'hné Guide to Surface Water Quality Standards, Version 4.1, 2016, 45 pp.

Appendix A – Gitanyow Lax’yip Water Classification

Figure A-1: Map of currently designated waterbody classifications within the Gitanyow Lax’yip. Note that this map does not represent an exhaustive list of all potential waterbody classifications.

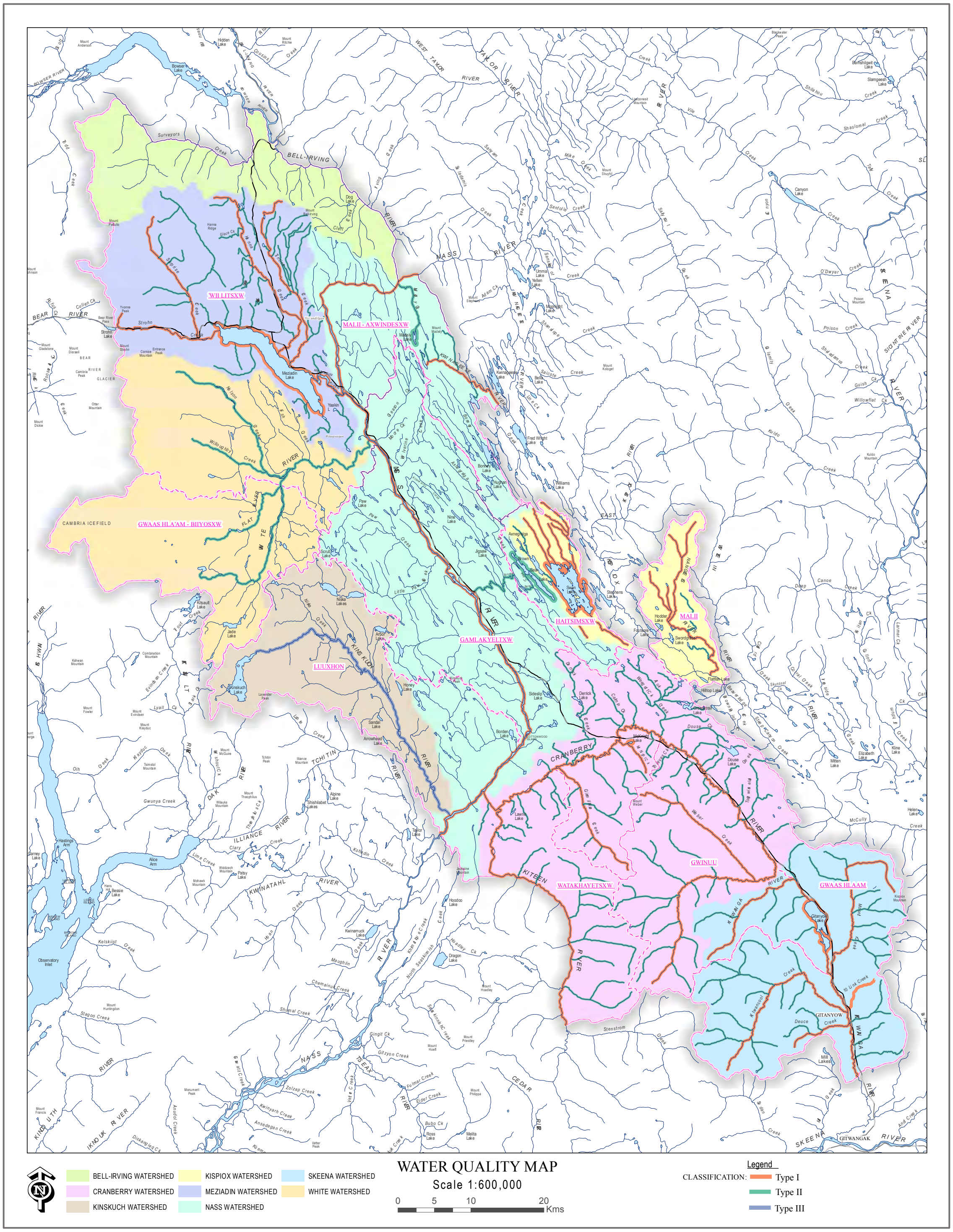


Table A-1: Major waterbodies currently classified under the Gitanyow Lax'yip Water Policy.

Waterbody	Classification	Criteria
Brown Bear Creek (below Hwy 37)	I	HFV, TS
Brown Bear Creek (above Hwy 37)	II	FV, TS
Brown Bear Lake	II	FV, CS, CCR
Cranberry River	I	HFV, CS
Deuce Creek	II	FV, TS
Flat River	II	TR, CCR, GC, UFV
Ginmilkun Creek	II	TS
Gitanyow Lake	I	HFV, WS, CS, RP, CCR
Hannah Creek	I	HFV, CS, CCR, WV
Kinskuch River	III	TS
Kiteen River	I	HFV, TS, WMU
Kitwancool Creek	I	HFV, WS, CS, RP, TR, TS
Kitwanga River	I	HFV, WS, CS, RP
Kwinageese River	I	HFV
Madely Creek	II	WMU
Madely Lake	II	WMU
McKnight Creek	I	HFV, TS
McKnight Lake	I	HFV, TS, CCR
Meziadin Lake	I	HFV, CS, CCR, WV
Meziadin River	I	HFV, CS, CCR, WV
Moonlit Creek	II	FV, TR, TS, WMU
Nangeese River	I	HFV, WMU
Nass River	I	HFV, WS, CS, TR, UFV
Nelson Creek	II	TR, CCR, GC, UFV
Strohn Creek	I	HFV, CS, CCR, WV
Surprise Creek	I	FV, UFV, CS, CCR, GC, TR
Swan Lake	I	HFV, CS, TS, CCR, WV
Ten Link Creek	I	WS
Thieves Creek	II	TS, WMU
Tintina Creek	I	HFV, CS, CCR, WV
Tsugwinselda Creek	II	TS
Weber Creek	II	TS, WMU
White River	II	TR, CCR, GC, UFV
Willoughby Creek	II	TR, CCR, GC, UFV

<u>Reviewed criteria:</u>

High Fisheries Values (known critical waters for salmon)	HFV
Fisheries Values	FV
Unknown/Future Fisheries Value	UFV
Water Supply	WS
Culturally Significant	CS
Recovery Plan	RP
Thermal Refugia	TR
Tributary of Significance	TS
Water Management Unit	WMU
Climate Change Risk	CCR
Glacier Conservation	GC
High Wildlife Value	WV

Appendix B – Gitanyow Lax'yip Water Quality Standards and Flow Criteria

1.0 Water quality

Water quality data within the Gitanyow Lax'yip is limited, however, Gitanyow Fisheries Authority (GFA) programs have contributed to better understanding of conditions in certain systems. As part of a baseline water monitoring program, GFA collected consistent, year-round water quality data for three years (2018-2020) at sites representing five watersheds (Table B-1). As a result, long-term (annual) site-specific Water Quality Standards have been developed for certain water quality constituents at these locations (Table B-3). GFA has also been conducting limnology surveys on several lakes for multiple years; these surveys include sampling of nutrients and physicochemical constituents at different dates from May-October. While the number of samples for these lake sites is not yet sufficient for developing WQS, additional data will provide appropriate sample sizes and temporal representation for development of seasonal, surface water long-term WQS at these locations.

Site-specific WQS were developed using three years of monthly water quality data sampled at the same location per stream. As a result, these WQS reflect maximum criteria for water quality characteristics across an annual period and may not reflect variability or differences between distinct hydroperiods. Watersheds in the Gitanyow Lax'yip typically follow a general seasonal pattern: 1) winter is dominated by snow and ice and flows are typically low, 2) spring represents a melt period when overland flow increases and waterbodies increase in volume and flows can reach annual maximums (i.e., "freshet"), 3) summer reflects the recession of freshet punctuated by rain events with low, warm flows typical in late July and/or August, and finally, 4) autumn river conditions can reflect a mix of high flow autumn rain events and cooler lower flow conditions. While these are general trends, it is worth noting that climate change has contributed to observable shifts in seasonal hydrologic trends throughout northern latitudes, including the Gitanyow Lax'yip (Bush and Lemmen, 2019). Seasonally, groundwater also interacts differently with surface water bodies as subsurface aquifers recharge and deplete. Due to these (and other) seasonal differences in catchment processes, development of site-specific, seasonally-representative WQS are necessary for any projects where activity may occur disproportionally at certain times of the year, or where certain types of hydrological and seasonal conditions may interact with water and land use to temporarily alter water quality conditions from seasonal status. Certain parameters may be more influenced by seasonality than others, and are important to consider when designing monitoring programs and deriving WQS.

For systems within the Gitanyow Lax'yip with existing WQS, future consideration will be given to pursuing development of seasonal WQS where proposed project planning may impact future conditions. There are also a number of important systems where water quality data is sparse or does not exist and should be collected; these systems include the Kitwanga River, the Cranberry River, and the Kiteen River, as well as any systems where projects are proposed involving significant geological disturbance, such as mining.

2.0 Water quantity

Similar to water quality data, information on water quantity in the Gitanyow Lax Yip is limited. Significant work has been done over the last decade by GFA to develop hydrometric stations in a small number of streams with high fish values, including a detailed instream flow assessment on Tintina Creek (Koch and Anderson, 2018). Within the Gitanyow Lax'yip, there are three hydrometric stations operated by the Water Survey of Canada and seven hydrometric stations currently operated by GFA (Table B-2). There may be additional seasonal stations under private operation by tenure holders. Of the existing stations, preliminary environmental flow needs (EFN) have been developed at the Tier 1 level (desktop exercise) for Hanna Creek, Tintina Creek, and the Cranberry River. Several desktop techniques were used to describe EFN (Anderson, 2020) and examples are presented in Figures B-1 to B-6.

Within the Gitanyow Lax'yip, future consideration will be given to developing EFN for systems with high priority values, high risk to water, or where proposed project planning may impact future conditions.

Table B-1: Locations with preliminary site-specific Gitanyow Water Quality Standards established by Gitanyow Fisheries Authority (GFA).

Waterbody	Site location	
	Latitude	Longitude
Hannah Creek	56.067675	-129.269042
Tintina Creek	56.062461	-129.266489
Strohn Creek	56.091593	-129.490591
Surprise Creek	56.093008	-129.471039
Meziadin River	56.027117	-129.164839
White River	55.943114	-129.225531

Table B-2: Hydrometric stations within the Gitanyow Lax'yip.

Waterbody	Latitude	Longitude	Organization	Operation
Hanna Creek	56.082229	-129.276548	GFA	Manual
Tintina Creek	56.062359	-129.266528	GFA	Manual
Cranberry River	55.60054	-128.54579	GFA	Manual
Strohn Creek	56.091904	-129.491181	GFA	Manual
Kitwanga River (Adult Fish Fence)	55.117055	-128.049312	GFA	Manual
Kitwanga River (Smolt Fence)	55.329226	-128.101426	GFA	Manual
Kitwanga River (26 Mile FSR)	55.414670	-128.158646	GFA	Manual
Kitwanga River	55.0064472	-128.050277	WSC	Seasonal – Real Time
Kelly Creek	56.2925000	-129.229444	WSC	Seasonal – Real Time
Surprise Creek	56.1091667	-129.477222	WSC	Year Round – Real Time

Table B-3: Site-specific preliminary Water Quality Standards (WQS) derived for select flowing (e.g., streams, rivers) waterbodies in the Gitanyow Lax'yip. Values represent long-term WQS. Additional samples are necessary for deriving WQS for short-term averages, i.e. 30-day, WQS for distinct seasonal hydroperiods.

Water Quality Standards – Nutrients and solids							
Waterbody	Total N mg/L	NH_4^+-N mg/L	NO_3^--N mg/L	Total P mg/L	PO_4^--P mg/L	Turbidity NTU	TDS mg/L
Hannah Creek	0.52	0.065	0.47	0.044	0.009	26	74
Tintina Creek	0.49	0.016	0.31	0.030	0.007	9.2	74
Strohn Creek	1.2	0.020	1.1	0.12	0.001	25	140
Surprise Creek	0.68	0.034	0.67	0.14	0.003	140	130
Meziadin River	0.30	0.013	0.22	0.009	0.001	2.4	86
White River	0.46	0.031	0.32	0.40	0.004	360	160

Water Quality Standards – Total Metals												
Waterbody	Al mg/L	As µg/L	Cd µg/L	Co µg/L	Cu µg/L	Fe mg/L	Pb µg/L	Mn mg/L	Mo µg/L	Se µg/L	Ag µg/L	Zn ug/L
Hannah Creek	1.1	0.82	0.025	0.91	3.1	1.8	1.1	0.20	0.16	0.23	0.027	8.4
Tintina Creek	0.51	0.66	0.015	0.46	1.9	0.88	0.20	0.21	0.28	0.14	0.011	1.8
Strohn Creek	2.2	6.8	0.18	2.0	15	3.7	3.9	0.17	4.0	0.46	0.050	23
Surprise Creek	7.6	13	0.57	4.2	11	9.7	17	0.60	2.9	0.68	0.27	76
Meziadin River	0.10	0.51	0.026	0.06	0.78	0.12	0.15	0.023	0.77	0.30	0.006	1.8
White River	8.5	11	0.62	6.8	20	13	7.4	0.52	0.81	0.36	0.15	51

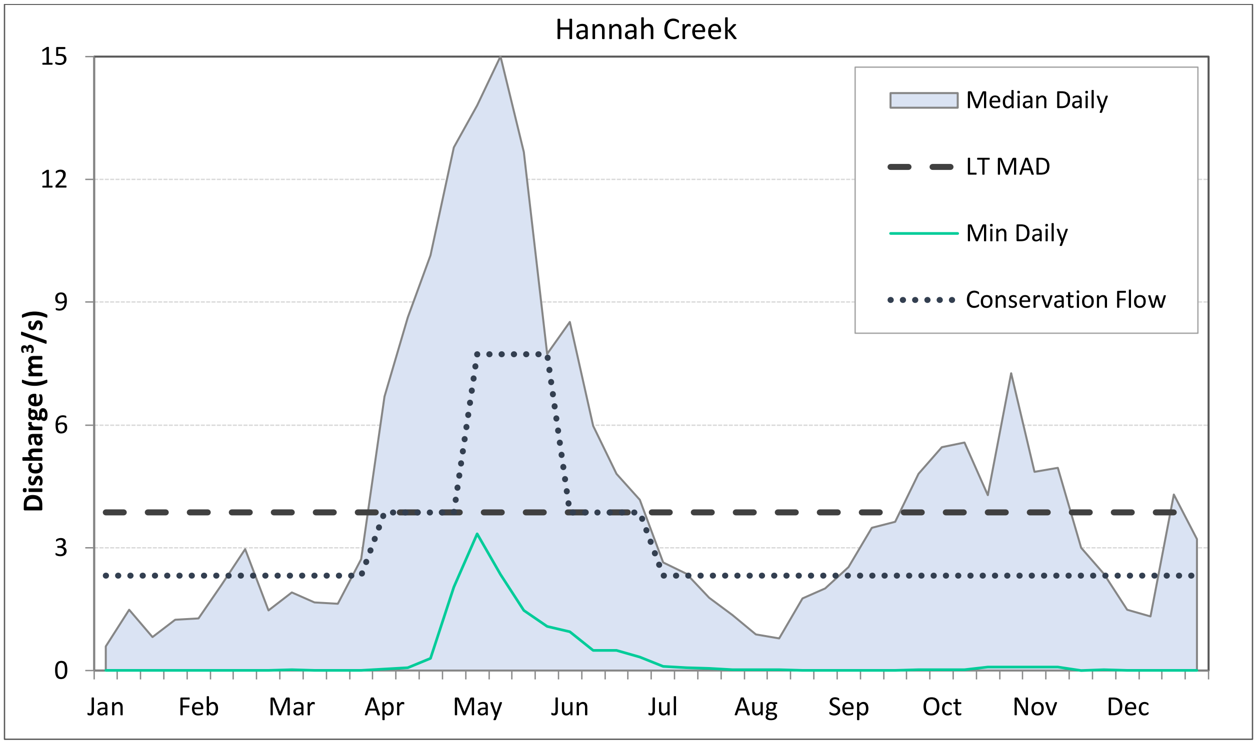


Figure B-1: Environmental flow needs (Tennant Method (Tennant, 1976)) for Hanna Creek.

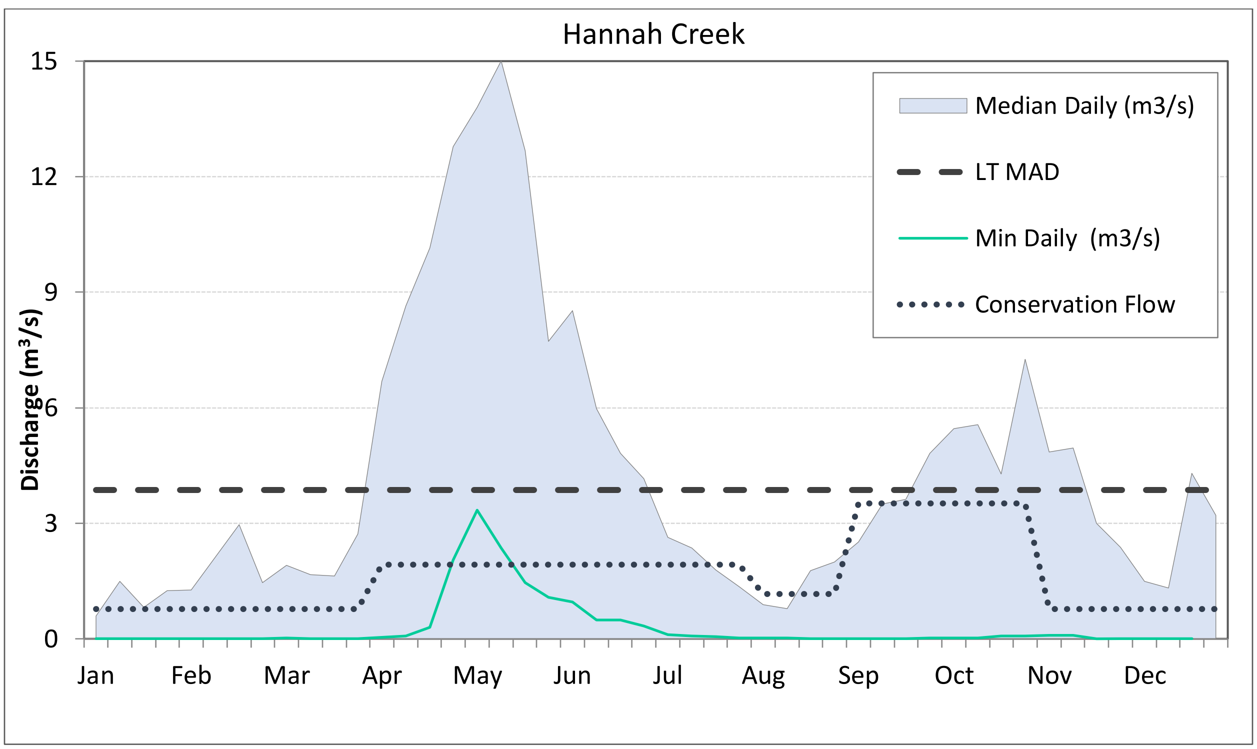


Figure B-2: Environmental flow needs (BC Modified Tennant Method (Ptolemy and Lewis, 2002) for Hannah Creek.

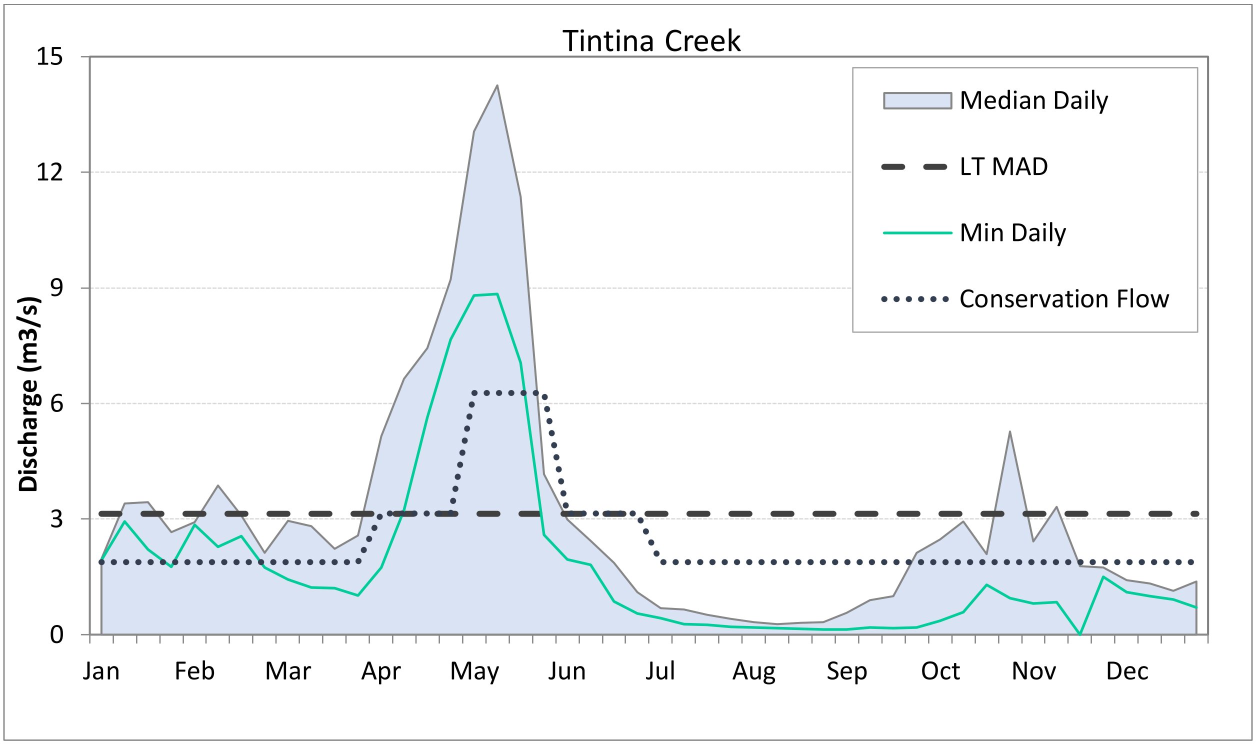


Figure B-3: Environmental flow needs (Tennant Method (Tennant, 1976)) for Tintina Creek.

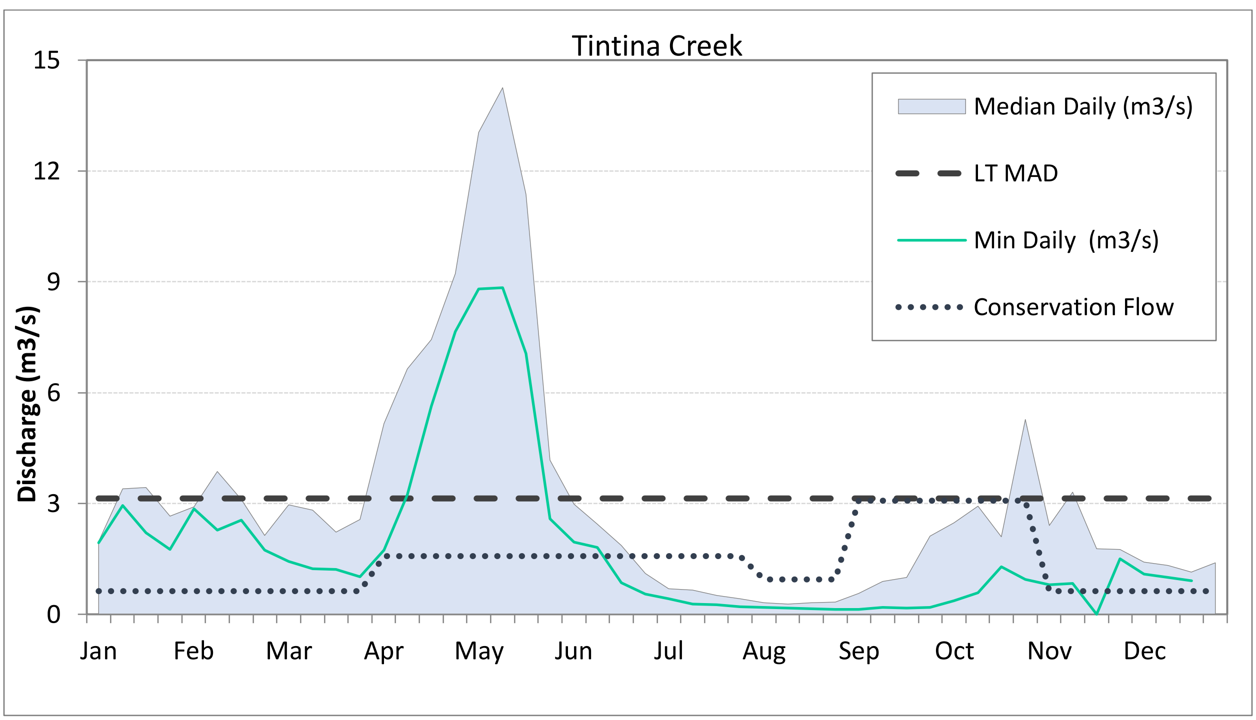


Figure B-4: Environmental flow needs (BC Modified Tennant Method (Ptolemy and Lewis, 2002)) for Tintina Creek.

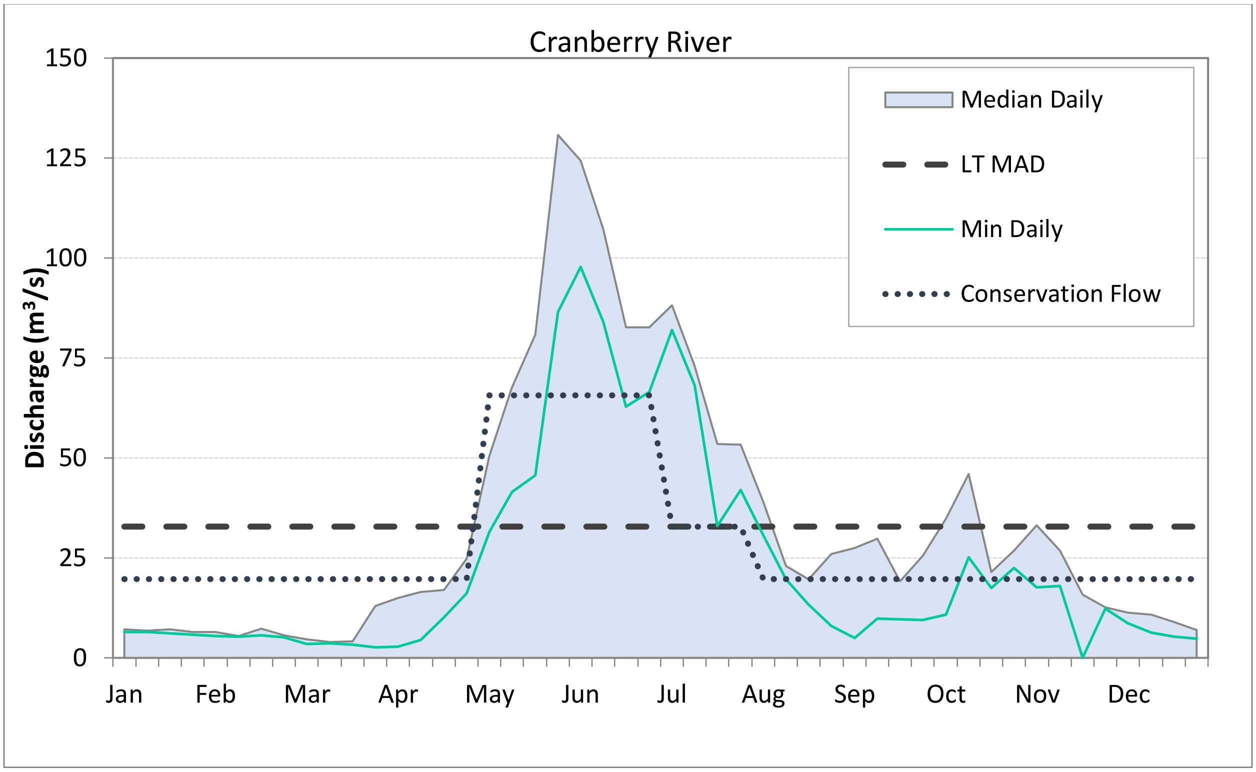


Figure B-5: Environmental flow needs (Tennant Method (Tennant, 1976)) for Cranberry River.

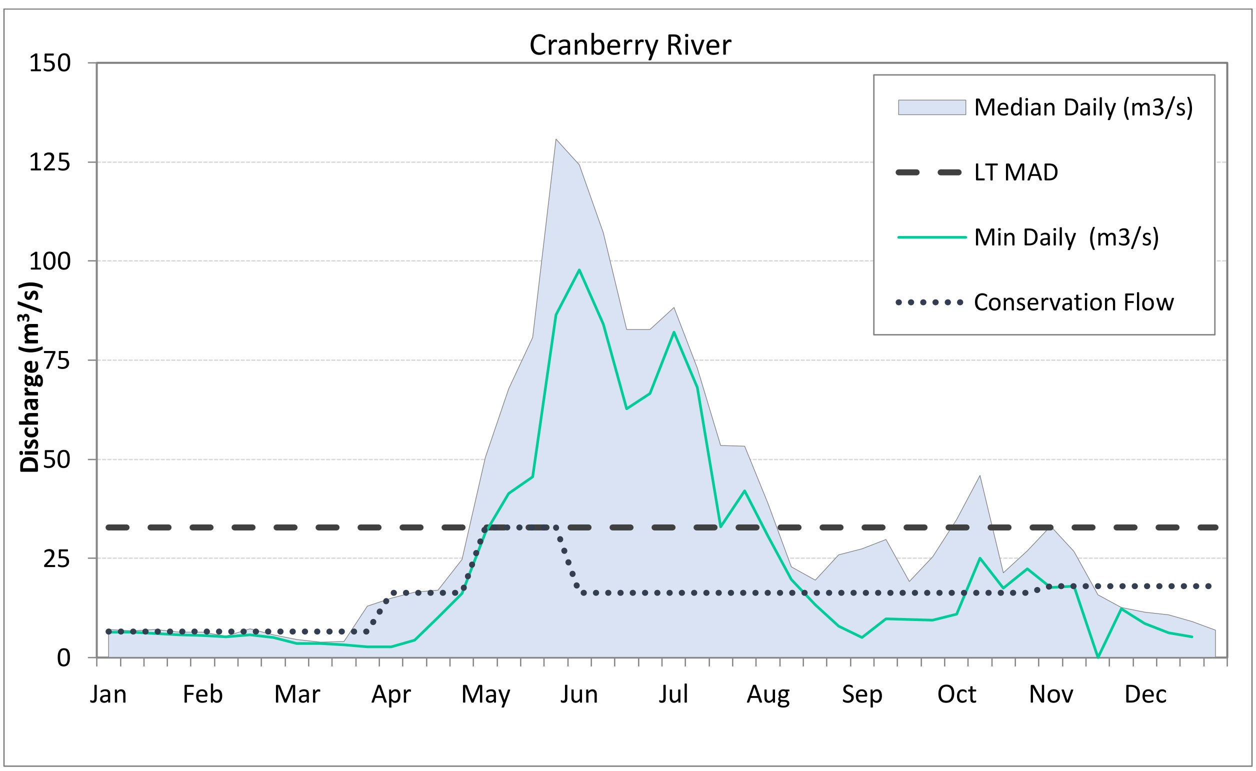


Figure B-6: Environmental flow needs (BC-Modified Tennant Method (Ptolemy and Lewis, 2002)) for Cranberry River.

Appendix C – Rational and monitoring plans for implementing water criteria

C-1. Guidelines for characterizing baseline water quality and water quantity conditions

The cornerstones of effective water management, including implementation of Gitanyow WQS and flow criteria, is characterizing the pre-development, baseline conditions of a waterbody and establishing a well-designed monitoring program. Project proponents are required to design and implement monitoring programs for all waterbodies that a project may impact. Monitoring programs provide data to thoroughly describe the physical, chemical, and biological components of each waterbody.

For water quality assessment, this includes adequate spatial and temporal sampling resolution to describe baseline conditions and variability, including measurement of constituents that reflect general ecological characteristics as well as those that might be considered potential contaminants of concern or potentially influence contaminants of concern. The sample design and sample size must be sufficient to support the development of WQS or other aquatic benchmarks or standards (e.g., biomonitoring data, sediment toxicology, etc.). Appropriate determination of baseline conditions must include, at a minimum, monthly data collection for a period of no less than three years, including four 5-in-30-day sampling events over the three years to capture conditions during critical hydroperiods including: 1) winter base flows, 2) spring flows, 3) summer base flows, and 4) fall flows. Spring and fall flows may include event or non-event flows but these should be stratified by flow and sampled as separate 5-in-30-day sampling campaigns. Gitanyow staff may require additional study designs based on the nature of individual projects and suspected impacts. As direct measures of impacts on aquatic health, proponents must conduct and evaluate biological monitoring of benthic macroinvertebrate communities via standard protocols of CABIN.

Measurement of baseline flow criteria must include a standard approach for measuring the quantity, timing, and duration of flows across the annual hydrograph to describe the natural flow regime[9]. In cases where long-term hydrological data are not available, shorter-term data may be used in conjunction with other watershed and climate attributes as well as long-term flow records from nearby, representative watersheds to construct synthetic representative hydrographs using standard methodology. These hydrographs should be refined over time as additional site-specific data area collected. A minimum of five years of hydrological data should be used to establish the natural flow regime, with data updated every year to refine results. Methods must be clearly documented, scientifically-robust, and reproducible.

Proponents must evaluate data collected for establishing baseline conditions using appropriate quality assurance, quality control, and data validation procedures. Data must be accompanied by metadata related to data collection and compiled into a project database that facilitates access by all interested parties over the life of the project (see additional information on data management in Section 6.3).

Proponents must set out their evaluation of baseline conditions in a detailed report and routinely update the dataset and report with additional monitoring results and analyses as part of the Water Management Technical Process.

C-2: Additional monitoring guidelines

Monitoring is conducted for many reasons, but in general consists of surveys designed to provide ongoing, standardized measurement and observation to define status and trends. This information is

[9] For hydrometric standards, see Manual of British Columbia Hydrometric Standards (RISC, 2018)

necessary to sustainably manage water resources, support sound decision-making, and establish accountability. As described in Section 6.2, monitoring is required for establishing baseline conditions and developing site-specific water quality and water quantity criteria. It is also necessary for evaluating impacts and trends over time, assessing the nature and significance of project-related activities, and facilitates study designs that allow for more robust statistical inquiry.

As part of project planning, proponents must establish appropriate and effective water quality, water quantity, and aquatic effects monitoring programs accompany project planning. There are many existing technical guidance documents proponents can refer to for establishing monitoring programs (e.g., UNEP/WHO 1996, BC MELP 1998, Dressing and Meals, 2005, Wagner et al. 2006, MacDonald et al., 2009, CCME 2015), and program design must follow established standardized methods appropriate for addressing questions and concerns outlined as part of the Water Management Technical Process.

Proponents must accompany implementation of WQS and flow criteria with a monitoring plan that includes, at minimum, the following components: purpose and objectives of the monitoring program, parameters to be monitored and rationale, site selection and monitoring program design (including appropriate spatial and temporal scales), data management plan, program capacity, analytical/statistical considerations (e.g., necessary sample size, sampling frequency, effects size, statistical design, etc.), and any additional reporting requirements.

Appendix D: Application of the Water Policy within the Gitanyow Lax'yip Land Use Plan

The Gitanyow Lax'yip Land Use Plan (GLLUP) includes management directions and plan goals that address water resources and aquatic habitat. In general, the objectives and management direction outlined in the GLLUP are aimed at maintaining and protecting the hydrologic integrity and hydrologic functioning of watersheds. The measures/indicators and targets used to meet these objectives address management of the watershed landscape and maintaining riparian and instream habitat and function. The purpose of the Gitanyow Water Policy is to address specific objectives and criteria for water quality and water quantity, and provide quantitative measures and indicators that can be used to evaluate in-stream conditions in conjunction with management recommendations already provided in the GLLUP.

This policy establishes supplemental and more specific management directions for water resources that compliment those established in the GLLUP. The intent is to evaluate and adapt the application of the policy to ecosystem conditions to determine whether operation of the policy is meeting management direction.

Management Direction for Water Resources under the GLLUP

Plan Goal for Water Quality and Water Quantity: Maintain ecological functioning of waterbodies and watersheds by maintaining water quality and water quantity unaltered from its natural state and within the range of natural variability to sustain healthy watershed ecosystems.

Objectives	Measures/Indicators	Targets
1.0 Manage waterbodies to adequately protect aquatic ecosystem integrity, significance, and reduce risk.	1.1 Number of waterbodies assessed and classified.	All
	1.2 Number of waterbodies in areas influenced by projects and project development whose baseline water quality and water quantity conditions are characterized using appropriate monitoring programs.	All
	1.3 Number of classified waterbodies with water quality or water quantity that do not meet designated criteria.	0
	1.4 Number of proponents whose projects may, or already do, alter or impact water resources engaged in the Gitanyow Water Management Technical Process.	All
	1.5 Number of hydropower projects that block or alter fish passage or that negatively modify upstream habitat utilized by fish as part of their natural and historic life cycles.	0
	1.6 Number of hydropower projects on the Nass River mainstem that alter water quantity or water quality or pose risks of any kind to aquatic ecosystems.	0

	1.7 Impacts to waterbodies within the Gitanyow Lax'yip as a result of project impacts on water and watersheds outside of the Gitanyow Lax'yip.	0
	Management Consideration • To ensure Gitanyow interests are recognized, proponents are to engage and collaborate with Gitanyow to develop a planning process and standardized protocol via the Gitanyow Water Management Technical Process. • Assessment of waterbodies must consider all features of watershed health that may contribute to aquatic ecosystem risk and potential degradation of water quality and/or quantity. • Monitoring plans for water quality and water quantity must be initiated for all projects with potential to alter or impact water resources. • Water utilization or project development may not negatively impact other hydrologic components including water stored as groundwater or snow and ice, or natural processes of connectivity such as maintenance of flood plains, sediment entrainment and mobilization, habitat connectivity and seasonal habitat utilized by aquatic and/or terrestrial ecosystems. • Monitoring includes consideration of waterbodies both within and downstream of projects, to assess cumulative effects of changes to water quality and quantity in context of tributary confluences and contributions from other hydrologic sources (e.g., snowmelt, groundwater, etc.). • Water licensees should evaluate existing and new licenses with consideration of the Gitanyow Water Policy. • Impacts to waters within watersheds (e.g., Nass River mainstem) with downstream connectivity to waterbodies located within the Gitanyow Lax'yip must be considered in the context of the Gitanyow Water Policy.	
2 *Protect and conserve water quality.*	2.1 Number of projects with potential to impact waterbodies who have derived site-specific, temporally-appropriate Water Quality Standards.	All
	2.2 Number of classified Type I and Type II waterbodies whose water quality is unaltered from baseline conditions and values are below site-specific Water Quality Standards.	All
	2.3 Number of classified Type III waterbodies with water quality altered < 50% of the assimilative capacity of the waterbody and not exceeding site-specific Water Quality Standards.	All

	2.4 Number of hydrologically-connected waterbodies (i.e., groundwater, wetlands, snow/ice, etc.) with altered water quality as a result of upstream impacts.	0
	2.5 Number of classified waterbodies where bioassessment of benthic macroinvertebrates or other aquatic communities indicate degradation from reference conditions.	0
	Management Consideration • Preliminary site-specific maximum Water Quality Standards have been established for Hanna Creek, Tintina Creek, Strohn Creek, Surprise Creek, Meziadin River, White River. • Water Quality Standards must be established from monitoring at sites directly downstream of project impacts, or the next best suitable and least-impaired location. • Derivation of Water Quality Standards must consider appropriate temporal scales and should be seasonally relevant to system and project. • Hydrologic connectivity and cumulative effects must be considered. • Degradation from reference conditions must prompt mitigation and/or restoration consideration and action.	
3 *Protect and conserve water quantity*	3.1 Number of projects with potential to impact flow in waterbodies that have developed criteria for environmental flow needs based on the natural flow regime.	All
	3.2 Number of projects with potential to impact natural flows that include a water quantity management strategy.	All
	3.3 Number of Type I waterbodies with unaltered flows and meeting environmental flow needs.	All
	3.4 Number of Type II waterbodies with flows altered < 10% of unaltered flows and meeting environmental flow needs.	All
	3.5 Number of Type III waterbodies whose flows meet environmental flow needs.	All
	3.6 Number of Type III waterbodies with flows altered >10% with complete additional field-based environmental flow needs and habitat impact assessments.	All
	3.7 Number of hydrologically-connected waterbodies (i.e., groundwater, wetlands, snow/ice, etc.) with altered water quantity due to upstream/downstream watershed impacts.	0

	Management Consideration • An "environmental flow need" is defined as the quantity, timing, and quality of water flow required to sustain a freshwater ecosystem and the human likelihoods and well-being that depend on that ecosystem (from definition of "environmental flows", *Brisbane Declaration*, 2007). • Gitanyow "environmental flow needs" (EFN) are defined as the desirable conditions of streams on the Lax'yip that maintain natural in-stream flow regimes and sustain healthy ecosystems. This includes flows that allow for maintenance of flow-related watershed processes (e.g., flood plain maintenance). • Tier 1 (desktop) site-specific EFN have been developed for Hanna Creek, Tintina Creek, and the Cranberry River. • Hydrometric stations used for determining EFN should be established at sites directly downstream of project impacts, or next best suitable and least-impaired location. • Hydrologic connectivity and cumulative effects across the entire watershed must be considered in the framework of healthy flows. • Degradation from reference conditions must prompt mitigation and/or restoration consideration and action.	
4 *Maintain and protect highest level of water quality and water quantity in Water Management Units, Special Management Zones, and Areas to Be Protected.*	4.1 Number of waterbodies that represent Special Management Zones, and Areas to be Protected classified as Type I waterbodies.	All
	Management Consideration • "Proper hydrologic functioning" as described in the Gitanyow Lax'yip Land Use Plan includes maintenance and protection of water quality and water quantity per the Plan Goal for Water Quality and Water Quantity.	
5 *Protection of fish and wildlife habitat includes protection of water quality and water quantity.*	5.1 Proportion of habitat where impacts to baseline water quality and water quantity, including connectivity of systems or cumulative effects, are not assessed in the context of the Gitanyow Water Policy.	0
	5.2 Proportion of fish populations deemed high priority or high risk with established benchmarks/criteria for baseline conditions of water quality and quantity from natural flow regimes.	100
	5.3 Number of habitat restoration projects, where impacts to water quality and/or water quantity have been identified, that include appropriate water quality and quantity monitoring plans and targets.	All

	5.4 Proportion of waters that originate upstream of the Gitanyow Lax'yip contributing to degradation of fish habitat due to alteration of water quality or quantity of waters within the Lax'yip.	0
	Management Consideration • Restoration of water quality and hydrologic integrity of damaged watersheds informed by the Watershed Restoration Atlas in collaboration with proponents, government, and other relevant groups. • Water quality and water quantity impacts to fish must be considered across all waters fish use throughout their life histories, including water that originates outside of the Gitanyow Lax'yip, but has downstream interaction with waters within the Lax'yip and fish populations within the Lax'yip utilize for migration and/or alternative habitat.	