APPENDIX F
Minto Mine Monitoring Programs

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MONITORING PROGRAMS

This document describes the environmental monitoring programs that are currently in place and will continue to ensure that the mining operations, including the water management activities are carried out in a manner that ensures human and environmental protection. An Environmental Monitoring Plan was submitted with the 1996 WUL application, but the information provided in this application more accurately and currently describes the monitoring initiatives and programs at the Minto Site. This section describes the broader monitoring initiatives for the entire Minto Mine.

1. Permit Conditions

Most of the originally proposed Monitoring program components for the Minto Project have been incorporated into permit or approval conditions. These include:

1.1. Water Use Licences

Water Quality Monitoring Program

- Daily, weekly, monthly and quarterly monitoring of surface water quality at various background sites, sites in the area of operations, points of compliance and receiving water sites – this program is described in more detail in the Adaptive Management Plan below;

Physical Monitoring Program

- Regular geotechnical stability monitoring of key site structures (Water Storage Pond dam, Mill Pond, waste dumps and diversion ditches) and annual physical inspection of facilities by registered professional engineer;

Stream Sediment and Benthic Invertebrate Monitoring Programs

- Annual or bi-annual monitoring of stream sediment geochemistry and benthic invertebrate population at site, receiving water and reference locations;

Acid Base Accounting Test Program

- Regular monitoring and testing of waste rock and tailings mining waste for acid generation/buffering and metal leaching potential;

Big Creek Bridge and Erosion Control Inspections

- Annual structural inspection of Big Creek Bridge and rip rap armouring and overflow protection measures implemented to protect the mine access road and bridge from flood-related impacts of Big Creek.

Adaptive Monitoring and Management Plan

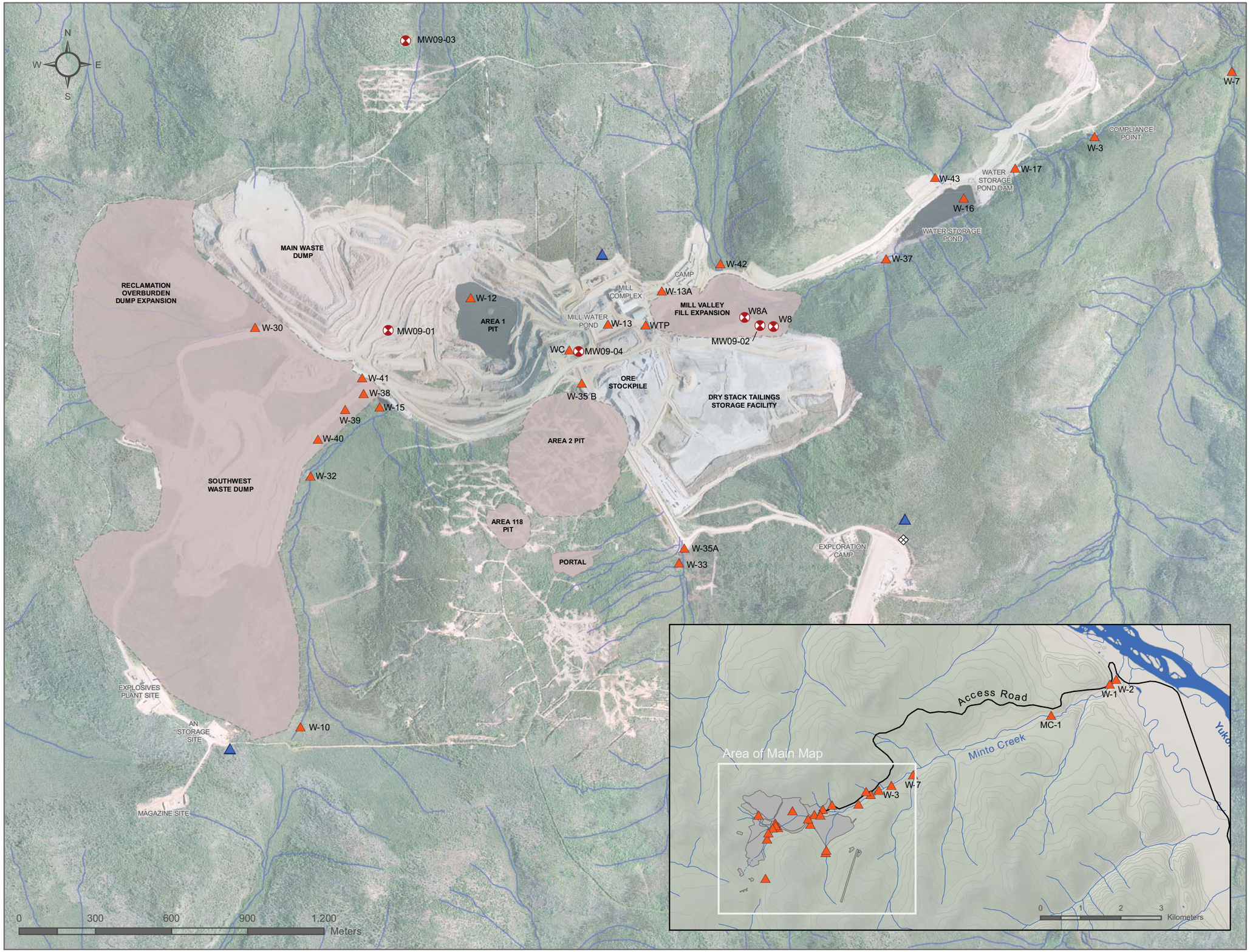
- This plan is a component of the Water Management Plan (Section 3.5 of the Project Proposal) that will ensure that control of the water management and discharge at the site is maintained, and that aquatic resources are protected through early warning and adaptation of the monitoring and response. This comprehensive water quality and adaptive management plan is key to the management of water and effluent discharge at the site, and is presented in its own Section 3 below.

Figure F-1 shows the water quality, hydrology, meteorological, and aquatic resource monitoring network.

MINTO MINE EXPANSION - PHASE IV

PROJECT PROPOSAL

Minto Explorations Ltd.
A SUBSIDIARY OF CAPSTONE MINING LTD.



- Weather Station
- Piezometer
- Surface Water Monitoring
- Snow Monitoring Station
- Proposed Mine Footprint (2014)

This is not a legal document.
Aerial photography flight date: July 13th 2009.
Ortho-rectification produced by Challenger Geomatics Ltd.
Hydrology spatial data (main map) provided by Minto Explorations Ltd, May 2009.
Hydrology spatial data (inset map) compiled by NaturalResources Canada at a scale of 1:50,000.

Digital elevation model and hillshade obtained from Geomatics Yukon, May 2010.

Datum: NAD 83
Projection: UTM Zone 8N

Figure F-1

Monitoring Station Locations

ACCESS CONSULTING GROUP

Drawn by MD	JULY 2010	Verified by SK

D:\Project\AllProjects\Minto\gis\mxd\Phase_4\Permitting\MLUP_July_2010\Water_Quality_Sampling_Locations.mxd

1.2.Metal Mining Effluent Regulations

- Weekly monitoring of effluent quality and effluent discharge rates;
- Quarterly monitoring of water quality in reference and receiving water locations;
- Bi–annual effluent sublethal toxicity testing;
- Environmental Effects Monitoring of biological communities (fish and benthic invertebrates) exposed to mine effluent compared with reference communities.

1.3.Quartz Mining Licence

Tailings Management Plan

- Regular monitoring of tailings compaction success and settling of the tailings stack and of groundwater levels and permafrost migration in the tailings foundation area;

Closure Plan

- Interim and permanent closure monitoring of surface and ground water quality, structural stability of key structures, and biological parameters;
- Permanent closure monitoring scaled back based on achieving closure success;
- Reliance on Adaptive Management Planning to compare monitoring program results to identified performance thresholds to determine management success. Failure to achieve success will result in changes to management and planning techniques and potentially to monitoring program parameters/frequencies as well.

Many of the monitoring requirements of the WUL QZ06-006 have been incorporated in QML-0001 in an effort to harmonize monitoring and reporting elements under these different departments.

1.4.Waste Management Permits

Regular monitoring and documentation of activities at site waste management facilities, including Land Treatment Facility for contaminated soils, Special Waste Storage Area, conventional dump and waste incinerator.

1.5.Reporting

All monitoring program results and observations are documented, and as a condition of various permits and authorizations, results reported monthly or annually to regulatory agencies and SFN.

2. Management Initiatives

Certain monitoring and inspection programs may not be mandated under permits or authorizations, but have been instituted in the interest of good corporate governance and workplace responsibility. This includes expanded programs currently licensed but broadened to provide statistical comparisons.

2.1.Annual Biological Monitoring

The Annual Biological Monitoring Program will serve to better understand potential impacts of discharge from the mine site on the receiving environment in Lower Minto Creek. The program will involve studies on algae (periphyton), benthic invertebrates and the fish community. To better understand the relationship between water quality and potential impacts on aquatic biota a more intensive stream sediment study will also be undertaken. Aquatic biota sampling will occur in both upper and lower Minto creek. The programs are summarized below.

2.1.1. Benthic Invertebrate Program

The current water use licence requires sampling of benthic invertebrates every two years at four stations (W2, W3, W6, and W7). Two cycles of sampling have been conducted to date and both demonstrated limitations with using W6 and W7 as reference sites. Both sites are very limiting in terms of suitable cobble substrate where benthic samples can be obtained. Therefore, reference sites will be re-situated to creeks within the vicinity of Minto Creek with similar physical characteristics. Additionally, sampling will be conducted annually as opposed to biannually and will follow protocols outlined in MMER's Environmental Effects Monitoring (EEM) Program. An effects assessment on benthic invertebrates is also required under MMER as part of the EEM program on two or three year cycles.

- Sampling for years 1 and 2 will be conducted following methods and protocols according to the MMER EEM Cycle II Study Design for the Minto Mine.
- Sampling beginning in year 3 will revert to the frequency dictated by the EEM Program (i.e. 2 to 3 year cycles)

2.1.2. Fisheries Program

Sampling for effects on fish is not currently a requirement in the WUL. An effects assessment on fish however is a requirement under MMER as part of the EEM program. As with the benthic invertebrate program, the EEM program requires studies conducted every two-three years. However, MintoEx will conduct additional fish studies in Minto Creek on an annual basis to characterise fish usage of the system (timing, duration and extent) by juvenile Chinook salmon and other species, and to monitor possible use of lower Minto Creek by adult Chinook during their spawning period. MintoEx will also

support an effects level study to determine what concentration of copper in Minto creek water may affect olfaction in juvenile Chinook salmon.

The first year of the program will include a study to determine how long individual fish stay in the system. This will be determined through a mark/recapture program (using Visible Implant Elastomer (VIE) tags or other marking methods) involving sampling and marking fish every 7-10 days from mid-June to early September. This will also serve to quantify use of the fish in the system during the current year. Sampling in subsequent years will not involve the mark/recapture component unless the first year study fails to achieve the objective of the study i.e. how long individual fish remain in Minto Creek. Year to year sampling will involve sampling throughout the open water season (i.e. June-Sept) to characterise year to year usage of the system.

2.1.3. Periphyton Program

Periphyton is a type of algae that attaches itself to stream substrate and is directly affected by physical and chemical changes that occur in a stream over time. Periphyton sampling is not a requirement under the current WUL. MintoEx however will initiate a program to track the influence of mining activity on the periphyton community in Minto Creek. Sampling for periphyton will be conducted annually assessing relative abundance and community composition.

Sampling is relatively easy and will be conducted at the same stations where benthic invertebrates will be collected. Samples will be collected from suitable substrate from a variety of habitat (i.e. pools, riffles) through scraping or brushing. Samples from each respective station will be combined to form one representative composite sample. Once collected, samples will be placed in jars and stored in a dark cool location prior to shipping to a plant (algae) taxonomist for identification. As with the benthic program, sampling will be conducted in late summer/early fall. Year to year comparisons will be made with respect to community composition, reviewing between year differences and diversity as well as a review of tolerant and/or sensitive taxonomic groups.

2.2.Health and Safety

Considerable emphasis is placed on ensuring worker health and safety. MintoEx has procedures in place to provide worker health and safety and follows all occupational requirements. All potential employees undergo a pre-employment drug screening, and all employees and visitors receive a safety induction before being allowed to move around the site. Routine health and safety meetings and briefings are undertaken for all employees, and the Minto Mine has an active Occupational Health & Safety Committee, Emergency Response Technician Program, and Mine Rescue Team. Scheduled environmental tours of the workplace occur to look for environmental and safety hazards and potential accidents, and to assess waste management activities. This information is used for feedback in safety briefings and implementation of corrective action.

Employee training is one of the tools used to manage project environmental performance and minimize potential hazards to people. Personnel training in the appropriate safety measures are on site at all times to manage and follow emergency response plans as required, including mine rescue and spill response.

2.3.Meteorological and Air Quality Monitoring

Monitoring of meteorological parameters is conducted via an Onset HOBO Weather Station, which includes meteorological instrumentation, a data logger and enclosure mounted on a 3-m tripod. The station is located approximately 100m northeast of the airstrip and has been operating since 2005. Data from the station has been collected regularly and is used for development and operational planning purposes.

Following recommendations made by RWDI AIR Inc., a research-grade weather station, including a 10-m tower, has been ordered to replace the existing HOBO weather station. Particulate matter monitoring equipment has also been purchased, to quantify the levels of PM10 and PM2.5 observed in camp. These instruments should be installed during the summer of 2010.

3. Adaptive Monitoring and Management Plan

An important part of the Water Management Plan is the ability of MintoEx to respond dynamically to changing site conditions by reacting to adaptive management triggers such as excess water volumes, process water requirements and water quality results. This will allow Minto Mine to manage water in such a way that allows for successful operation of the Minto Mine and protection of the receiving environment. The Adaptive Monitoring and Management Plan (AMMP) represents a conservative starting point from which MintoEx intends to improve its understanding and management of water at Minto Mine.

The Water Management Plan was developed based on predicted water quality and quantity at the site. As a component of the WMP, the AMMP must measure actual water quality and quantity and test the assumptions that underlie the WMP. This approach is necessary due to the inherent uncertainty involved in predicting conditions that affect water quality at the mine including weather, runoff and water levels in the region in any particular year and interactions between water and the ground surface. Efforts towards improving the understanding of the scale and frequency of these conditions and their expected impact on operations at Minto Mine will continue.

The purpose of the AMMP program is to describe how MintoEx will:

- monitor the environment;
- detect changing conditions; and
- respond to changing conditions appropriately.
- The AMMP also provides a framework for re-evaluating key elements of the WMP in a systematic and adaptive manner including:
- when monitoring frequency will increase;
- where monitoring will take place;
- when the mine will discharge water downstream ; and
- when the mine will stop discharging downstream.

The AMMP includes a reporting schedule and mechanisms for incorporating stakeholder input to ensure the principles on which the WMP is based are being applied as an increased understanding of the mines' effect on the environment is gained.

3.1.Background

The AMMP describes how monitoring at the site is to be implemented to reflect strategies for continuous improvement of water management techniques at Minto Mine. MintoEx has been actively improving water management strategies since the Minto Mine began construction and operation. These improvements have included retention and diversion structures and treatment initiatives, as well as surface water quality investigations, including a Site Specific Water Quality Objective (SSWQO) study (Minnow, 2009).

The existing Water Quality Surveillance Program in the original Water Use Licence is the basis for the AMMP. The data obtained to date during mine operations provides a much-improved understanding of water quality in the affected watershed. A predictive model has been developed using water quality data and the site water balance. Assumptions from the WMP must be tested and the accompanying water quality model calibrated regularly. In doing so, MintoEx will determine the success of the WMP by continuously asking these two key questions:

- Does the WMP protect the receiving environment; and

- Does the WMP allow the mine to operate successfully.

The AMMP describes a steady-state monitoring program which has been designed to detect changing conditions so that appropriate responses will be activated. The monitoring program will be improved continuously as operational knowledge increases and with continued sharing of stakeholder views.

3.2.AMMP Objectives and Guiding Fundamentals

The objectives of the AMMP are as follows:

- to ensure that any water discharged from the site is compliant with end-of-pipe Water Use Licence effluent quality standards;
- to monitor and respond adaptively to water quality conditions in the receiving environment;
- to put forward a reasonable management response to certain field observations including readily implemented contingency strategies that are as straightforward as possible and easily enforceable; and
- to incorporate flexibility into the plan, allowing for integration of new information as it becomes available.

The adaptive management approach for monitoring water quality parameters necessarily includes assessment and reassessment of water management decisions and their effectiveness at achieving the program's goal of meeting downstream objectives in the receiving environment. This AMMP proposes actions in response to environmental conditions encountered at the site and prescribes a systematic approach to their implementation using information gained through on-site and third-party water quality testing and hydrometric measurements. Monitoring program results will be continually assessed for trends in water quality and quantity, both short term and long term, to anticipate and mitigate effects to the receiving environment and to guide water management responses in the field.

The main components of the AMMP are:

- use of screening monitoring equipment and instrumentation at Minto Mine to make decisions on discharging to the receiving environment, and confirmation by accredited external laboratory analysis;
- monitoring at a key point in the receiving environment, with results guiding an enforceable response;
- assessment of monitoring and performance data (trend analysis);
- reporting related to monitoring results and actions;
- regular calibration of the water balance and water quality models; and
- continuously revisiting WMP assumptions, monthly reporting related to AMMP commitments, and an annual review (and accompanying report) on any proposed changes with rationale based on the monitoring program results.

3.3.AMMP Framework and Definitions

The AMMP is both a monitoring plan and a management plan that charts actions and changes that may be required to the Water Management Plan over the course of the mine life. The objective of the adaptive approach is to provide a framework for making logical decisions and taking step-wise actions based on operational conditions and scientific analysis of results.

MintoEx proposes to report on adaptive measures taken at the site in monthly water quality reports submitted to the Yukon Water Board. A template for concise and clear documentation of actions and observations is provided below.

Figure F-1 below outlines an annual cycle for review of the AMMP and related components of the WMP as well as interim reporting. Reporting and review time-frames are discussed in more detail below.

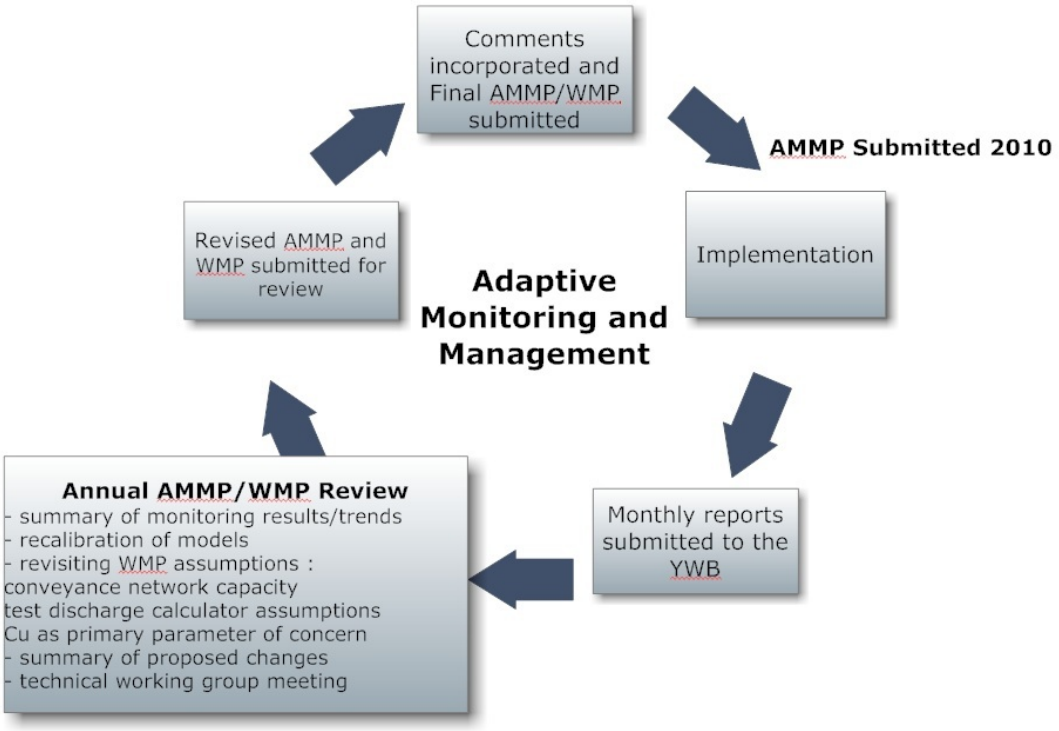


Figure F-1 Proposed Annual Cycle for Review of the WMP and AMMP

3.4.Definitions and Adaptive Management Terminology

In developing the AMMP, clearly defining the terminology used is important to allow for a consistent approach in applying adaptive responses; essential both within MintoEx and amongst stakeholders.

Event – this term will be used to indicate an event for which there is an adaptive response outlined in the AMMP.

Possible Environmental Effect – the assignment of a possible environmental effect to an event helps characterize it in order to develop an appropriate response.

Narrative Trigger – a narrative description of the trigger from the monitoring program describing a quality or testing result recognized as initiating an adaptive response. The first step will be verification of the results. An analysis will be made of the information and a reasonableness-check will be put in place to ensure the results are truly reflective of the current scenario or perhaps a one-off or unlikely result. This may involve re-sampling for verification purposes. Monitoring staff will provide analysis to identify the cause of the trigger or events leading up to the trigger activation, which will formulate part of the reporting.

Decision Trees – Once a trigger has been met it may require that MintoEx enter into a Decision Tree, which is a flow diagram of steps and measures taken prior to and following decision making.

Monitoring requirements – monitoring parameters, locations and frequencies for sampling or investigating, which may change at various stages of the AMMP.

Specific Thresholds – defines conditions for specific indicators that would lead to actions being taken. There may be a series of staged thresholds for an event.

On-site lab testing – this refers to analytical sampling that MintoEx is equipped to perform at the mine site and includes total copper (Cu-T) measurable to detectable limits aligned with Canadian Council of Ministers of the Environment (CCME) supported Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, and measurement of total suspended solids to levels of 1 mg/l.

External lab testing – this refers to third-party accredited analytical laboratory testing for the full suite of required parameters to appropriate detection limits.

3.5.Monitoring Program Summary

The monitoring program will aim to:

- Build on the already-existing water quality database;

- Continue to develop an understanding of water quality as it moves across the site;
- Monitor downstream conditions to support the decision making process of whether or not water should be discharged from the mine; and
- Identify on site water meeting effluent quality standards.

Table F-1 Water Quality Monitoring Program Summary summarizes the monitoring program while discussion is provided in the following sections.

Table F-1 Water Quality Monitoring Program Summary

Station	Description	Comments/Status	Level 1		Level 2	
			Routine Sampling Frequency	Monitoring Parmeters	Routine Sampling Frequency	Monitoring Parmeters
W8	Western Collection sump from DSTSF	Water from W8 and W8A to be collected as per Seepage Monitoring Program	W	All, FP, F, T-Cu-I, TSS-I	W	All, FP, F
W8a	Eastern Collection sump from DSTSF		W	All, FP, F, T-Cu-I, TSS-I	W	All, FP, F
W7	South side tributary to Minto Creek	Sample and note trends relative to background	M	All, FP, F, DOC	M	All, FP, F, DOC
W37	Downstream of DSTSF, upstream of WSP	Water not collected in upstream sumps	M	All, FP, F	M	All, FP, F
W12*	Water in the Main Pit	water may be groundwater inflow or stored runoff water	M	All, FP, F	M	All, FP, F
W13	Mill Water Pond	used for mill process water	M	All, FP	M	All, FP
W13A	Mill Water Pond Discharge	Overflow from millwater pond	M	All, FP, F	M	All, FP, F
W16*	Water Storage Pond (WSP)	standing water in pond - stratified sampling may be conducted and identified by depth of sample origin	W	All, FP, T-Cu-I, TSS-I	D	All, FP, T-Cu-I, TSS-I
W17*	Seepage shack at toe of water retention dam	seerpage through dam	W	All, FP, F, DOC	D	All, FP, F,T-Cu-I, TSS-I, DOC, DO
W3	WUL and MMER compliance Point	sampling compliance point for both WUL and MMER	W	All, FP, F, DOC, T-Cu-I, TSS-I	D	All, FP, F, DOC, DO, T-Cu-I, TSS-I
			M	LT50	M	LT50, CD-7d
W21	Piezometers and Thermistors on WSP Dam	Physical Monitoring Program only	M	read piezometers		read piezometers
WTP*	Treated effluent from water treatment plant	discharge upstream of W3 compliance point	n/a	All, FP, F	D	All, FP, F, DOC, DO, T-Cu-I, TSS-I
W10	Headwaters of Minto Creek (south-west fork at headwaters)	Collected at W15 Sump	M	All, FP, F	W	All, FP, F
W32	At toe of South-west Dump (south-west fork)	Collected at W15 Sump	M	All, FP, F	W	All, FP, F
W30	Headwaters Minto Creek (north west fork)	Collected at W15 Sump	M	All, FP, F	W	All, FP, F
W15*	Upper Minto Creek Stormwater Collection Point	Sump upstream of pit, water can be moved to WC Confluence area	W	All, FP, F	D	All, FP, F, DOC, DO, T-Cu-I, TSS-I
W33	Above Tailings Diversion Ditches	Collected at Confluence area	M	All, FP, F	W	All, FP, F
W35A	Stormwater Collection Point - top of South Diversion Ditch	Collected at Confluence area	M	All, FP, F	W	All, FP, F
W35B	Stormwater Collection Point - bottom of South Diversion Ditch	Collected at Confluence area	M	All, FP, F	W	All, FP, F
WC*	Confluence area where run off water is collected/diverted	Convergence point for W15 and W35 waters: options to divert downstream, to pit or Mill Pond/WTP	W	All, FP, F	D	All, FP, F, DOC, DO, T-Cu-I, TSS-I
W38	Original Ground (O/G) near SWD haul road and Pelly lay-down	To replace W11, W18, W19: run off from MWD	M	All, FP, F	M	All, FP, F
W39	Original Ground (O/G) near SWD haul road and Pelly lay-down	To replace W11, W18, W19: run off from MWD	M	All, FP, F	M	All, FP, F
W40	Original Ground (O/G) near SWD haul road and Pelly lay-down	To replace W11, W18, W19: run off from MWD	M	All, FP, F	M	All, FP, F
W41	Original Ground (O/G) near SWD haul road and Pelly lay-down	To replace W11, W18, W19: run off from MWD	M	All, FP, F	M	All, FP, F
W42	Stormwater Collection Sump - north side of Access Rd, 0.5 km	typically used during freshet only, water quality/quantity to be tested when water being dishcarged to receiving environment	W	All, FP, F	W	All, FP, F, DOC, DO, T-Cu-I, TSS-I
W43	Stormwater Collection Sump - north of Access Rd at WSP,1.5 km	typically used during freshet only, water quality/quantity to be tested when water being dishcarged to receiving environment	W	All, FP, F	W	All, FP, F, DOC, DO, T-Cu-I, TSS-I
MC-1	Minto Creek upstream of Canyon, near km 8 access road	water quality/quantity checks regularly, access safety can be an issue	W	C-F	D	C-F
W1	Lower Minto Creek	Hydrological sampling point (tendency to go dry at times during summer)	n/a (hydrology station only)	C-F	D	F
W2	Lower Minto Creek at Road Crossing	Receiving environment sampling location	W	All, FP, C-F, DOC, C-7d	D	All, FP, C-F, DOC, CD-7d

* - discharge to the downstream environment may occur from a station with an asterisk. If discharge is occuring from this point, sample results will be reported as Station Name EOP (end of pipe), e.g. WTP EOP, indicating that discharge is from the Water Treatment Plant

Note: SWD refers to South West Dump and MWD to the Main Waste Dump

Glossary:

Monitoring Parameters

T-Cu-I	Total Cu - measured internally with on-site environmental spectrophotometer
TSS-I	Total Suspended Solids measured internall with standard laboratory equipment
All	External suite B: Physical Parameters, Conductivity, Suspended Solids, Dissolved Solids, Hardness, Alkalinity, sulphate, ICP Scan - Total Metals, ICP-Dissolved Metals
N	Nutrients: Ammonia, Nitrate, Nitrite, Phosphorus
FP	Field Parameter: In-Situ Parameters: EC, Temp, pH
DO	Dissolved Oxygen, measured in the field using YSI multi-meter
DOC	Dissolved Organic Carbon
LT50	Static Bioassay, 96 hours at 100% pH non-adjusted - performed monthly
CD-7d	Chronic Tocitity, Ceriodaphnia Dubia 7 day test - performed monthly when discharging
C-F	Continuous - Flow Monitoring
F	Flow rate measured in the field

Monitoring Frequency

M	Monthly
W	Weekly
D	Daily
C	Continuously

3.6.Monitoring Stations

Monitoring station locations are listed in Table F-1 Water Quality Monitoring Program Summary and shown in Figure F-1 Monitoring Stations Network. A narrative description of the monitoring stations follows and are considered in groupings according to their collection point if applicable.

W15 Collection Area Stations

W15 – Lined Storm Water collection area in upper Minto Creek developed as part of the WMP. Water characterization here will inform decisions regarding diversion of water from this area. Stations listed below report to this area.

W10 – Headwaters of Minto Creek (southwest fork), upper watershed boundary of site, first point of monitoring for Minto Creek watershed, reporting to W15 collection area.

W32 – Intermediate between W10 and W15, helps identify any trends of impact from Southwest Waste Dump.

W30 – Headwaters of Minto Creek (northwest fork) reporting to W15 collection area. This station will be monitored as long as it is accessible, as placement of waste rock could impact it.

W38, W39, W40 and W41 – These stations are located in the vicinity of W15 and represent original ground seepage points where water does not typically surface, but these stations are monitored for purposes of characterizing seepage water from the Main Waste Dump. These stations will be monitored as long as they are accessible, as placement of waste rock could impact them.

WC, Confluence Collection Sump Stations

WC – Convergence point for W15 and W35 waters

W33 – Located above the tailings diversion ditches, represents runoff from the south entering the South Diversion Ditch (SDD).

W35A – Storm Water collection point for several streams entering the SDD.

W35B – Northern (bottom) end of SDD where other influences might be present; helps characterize water quality in the ditch prior to entering the confluence (WC) area.

W12, Pit Water Station

Pit water will be sampled weekly when present. While it is unlikely that samples collected in the pit bottom will be representative of groundwater at depth, weekly sampling will be useful as it will characterize water that may require treatment prior to discharge.

W13, W13A – Processing Water Stations

Water from W13 and 13A represent water quality in the mill pond and a spill over point located 200m downstream. Efforts will be maintained to ensure no water is spilling into W13A as this water runs to the WSP. Sampling of the mill pond water will occur monthly.

W14 – Thickener Station

W14 is a station inside the mill, typically taken at the surface of the thickener. Sampling will occur here monthly during the first calendar year following approval of water use application QZ09-094. Based on the utility of the results for water planning and metallurgical purposes, future revisions of the AMMP may not include this station.

W36, W37, W8 and W8A – Tailings Area Stations

These stations are located in and around the tailings facility. W8 and W8A are located at the downstream toe of the two main finger drains underlying the tailings. These stations will be replaced with piezometers (groundwater monitoring wells) when the Mill Valley Fill is expanded. These stations will continue to be monitored to inform the functioning of the finger drains and partially characterize water quality entering the sump upstream of the WSP. W36 is located in the tailings diversion ditch upstream of the tailings. The purpose of this diversion ditch is to prevent surface water from running over the tailings facility. W37 is located downstream where W8 and W8A seepage currently report to the Minto Creek valley where the W37 Sump collects impacted water for treatment. Results from this station guide water management and treatment decisions from the impacted areas.

W42, W43 – Storm Water Stations

Stations W42 and W43 are Storm Water collection sumps on the north side of the access road. Flow and water quality will be measured here whenever water is being discharged to the receiving environment, which typically only occurs during freshet.

W16, W17 Water Storage Pond Stations

Water will be collected and sampled from the WSP (W16) weekly when not frozen. Stratified sampling at depth may be conducted on standing water in the pond. Water will also be collected at the toe of the water storage dam (W17) so that seepage can be characterized. Infrastructure exists to move this water

back to the WSP if required. If water at station W17 is found to be compliant with effluent quality standards, seepage will be allowed to flow downstream and water will be sampled daily. Flow measurements at W17 are continuous.

W3 – Compliance Point Station

Monitoring at W3, the water use licence and federal compliance point (MMER) occurs weekly for water quality and flow. A Parker-Bowles flume is installed at this monitoring station and flow monitoring is continuous.

W2 – Receiving Environment Monitoring Station

Receiving environment monitoring station W2 is located approximately 10 km downstream of the mine site. The most appropriate location for continuous hydrology monitoring is approximately 200 m upstream of W2, at W1.

W6, W7 – Background Stations

Station W7 is located on a tributary to Minto Creek downstream of the W3 compliance point from the south and monitored/classified as the background station. W6, located in a tributary entering Minto Creek downstream of W3 from the north does not typically have flow. Historically, before a road was built to the sampling area altering surface water runoff, more surface water may have been present. In the past two years, samples collected at W6 are from standing water and have not been as useful as the W7 analyses in characterizing background conditions. W7 is the accepted background station for the Environmental Effects Monitoring program under MMER and also used to represent background water quality at the site for the purposes of the Water Use Licence as well.

Minto Canyon, MC1 Station

MC1 station is located above a steep canyon, 8 km downstream of the mine. It is thought that this is where Minto Creek has its peak flows. Water quality will be measured here to supplement data and test assumptions in the water quality model.

3.7.Monitoring Parameters

During the mine life, the scenario of discharging water will be termed an “Event” and so monitoring downstream will typically characterize non-discharging periods.

Typical parameters will be measured both in the field and at the external lab including:

- Physical measurements (pH, electrical conductivity and temperature) measured in-situ.
- Dissolved oxygen will be measured during AMMP events using a YSI multi-meter.
- Routine parameters (TSS, alkalinity, hardness, etc. Full suites of parameters listed in Table F-1).
- Total metals
    - The external laboratories' full schedule of metals will be tested initially;
    - Decreasing frequencies of some metals may be requested in future revisions of the AMMP based on consistently low results. Requests for decreasing frequencies of testing for certain parameters will be informed by section 13 of the *Metal Mine Effluent Regulations* (MMER).
- Dissolved metals
    - Dissolved metals will be measured at all stations initially. Future revisions of the AMMP may contemplate testing of only total metals for some monitoring stations where the difference between total and dissolved metals is not valuable to understanding water quality throughout the site.
    - The external laboratories' full schedule of metals will be tested for initially;
    - Decreasing frequencies of some metals may be requested in future revisions of the AMMP based on consistently low results. Requests for decreasing frequencies of testing for certain parameters will be informed by section 13 of the *Metal Mine Effluent Regulations* (MMER).
- Nutrients (ammonia, nitrate, nitrite, phosphorus, etc.)
    - Nutrients will be always be measured at W3 (compliance point), W2 (receiving environment), W12 (pit waters) and W16 (Water Storage Pond) and any other station that may assist in understanding the breakdown of ammonia.
- Dissolved Organic Carbon (DOC)
    - DOC will always be measured at downstream monitoring stations in order to develop a more detailed record of the amount of DOC in the receiving environment.
    - DOC will be measured on an as-needed basis at other monitoring stations in order to better understand background water quality.

- Discharge rates (flow) will be measured at all sites. Hand-held flow measurement devices will be used in most cases, but loggers are installed at the following locations and will be downloaded regularly to provide a continuous discharge record at key points:

  W3 – compliance point, 3 ft 60^0 Trapezoidal Flume, prefabricated by Plasti-Fab Inc., capable of gauging up to 392 L/s (0.392 m3/s), Solinst M5 Levelogger and M1.5 Barologger.

  MC1 – In-stream staff gauge and stilling well anchored on a cribbing, equipped seasonally with Solinst M5 Levelogger and M1.5 Barologger.

  W1 - the most appropriate location for the logger in the receiving environment (known as W1) is approximately 200 m upstream of W2. This station also has an in-stream staff gauge and stilling well anchored on cribbing, equipped seasonally with Solinst M5 Levelogger and M1.5 Barologger.

3.8.Monitoring Frequency

The number of samples and frequency of sampling (monitoring level) will change depending on whether or not the mine site is experiencing steady-state (i.e. non-discharging) conditions or if an AMMP "Event" (discharge) is underway.

Level 1 Monitoring

The level of monitoring conducted when no discharge is occurring and the site is experiencing normal or expected climatic conditions will be termed Level 1 monitoring. Monitoring frequency is similar to the current frequency in WUL QZ96-006, though several new stations are included to reflect the current mine layout and to track water quality as it enters and travels through the site. Stations will be sampled weekly or monthly during non-freezing conditions for the full suite of parameters described above. Some highlights to the revised monitoring plan are as follows:

- The background station (W7) will be monitored monthly;
- DOC will be measured at stations downstream of the water retention dam; and
- Nutrients will be measured in the main pit when water is being stored there and at stations downstream of the pit.

Level 2 Monitoring

When an AMMP Event is underway, monitoring frequency will increase to Level 2. This will be triggered when compliant water is identified on–site, i.e. when water meeting the WUL effluent quality standards is identified. Level 2 monitoring frequency will apply to the collection point from which water may be discharged (i.e. W16, W12, W17, W15, WC or WTP) and all stations downstream of that point. A notable exception will be stations W42 and W43 (Storm Water collection points) where water quality and flow will be measured weekly when water is flowing at these locations. Stations monitored daily for on-site analysis will be duplicated and sent for external laboratory analysis. Dissolved oxygen will also be measured daily at those stations undergoing daily monitoring frequency.

TableF-1 provides details of the proposed monitoring program including frequency of sampling.

3.9.Adaptive responses to discharge events

The approach to discharging water from Minto Mine will involve measuring water quality and quantity, deciding whether or not discharge is appropriate, and continually evaluating that decision during discharge. MintoEx will use on-site equipment to measure total and dissolved copper (Cu-T and Cu-D respectively) as well as TSS. These parameters serve as indicators to changing conditions, improving response time and addressing the issue of a minimum delay of four days in receiving external laboratory results.

MintoEx will use Cu-T measurements as the primary indicator for deciding whether or not discharging to the receiving environment is appropriate. Once discharge is occurring, TSS and Cu-T measurements will be used to decide whether or not continued discharge is appropriate. An atomic absorption spectrophotometer (AA) and graphite furnace will be used to accurately measure copper to ug/L levels in an onsite environmental laboratory. Equipment used for TSS will include standard laboratory equipment including filter paper, an oven and a scale such that TSS can be measured to detection limits of 1 mg/L. TSS levels below 25 mg/l represent a condition where contribution from all sources of all metals with a statistically significant relationship to TSS are expected to be below the CCME-SSWQOs. Adaptive monitoring will require that TSS levels above this threshold or exceedence of CCME-SSWQO guidelines at TSS levels below this threshold trigger a response. Discharge would continue until results of a rush sample analysis to the external laboratory is available to confirm the on-site analyses and check all parameter levels.

Achievability of Meeting CCME-SSWQOs in the Receiving Environment

MintoEx undertook a review of receiving water quality data collected from 1993 to present, particularly for those parameters of concern that cannot be predicted using on site methods (Cu) or relationships

with TSS. This review was deemed the best method for evaluating an important determination in the WMP, i.e. are the CCME-SSWQOs achievable in the receiving environment based on the proposed water management plan? Theoretically this is how the water management strategy was derived – to meet receiving environment targets. MintoEx expects that implementation of the WMP will result in improved water quality, as this was its fundamental objective.

The standards used in this exercise were a combination of values from the Canadian Water Quality Guidelines for the Protection of Aquatic Life supported by CCME and Site Specific Water Quality Objectives for those parameters for which the natural background concentration is higher than the CCME value (Minnow, 2009). Both sets of values are presented in the table below.

Table F-2 Receiving Environment CCME Guidelines and SSWQOs

Parameter	Parameter Code	Guidelines	
		CCME-CWQG	SSQWO
Total Arsenic	As-T	0.005	
Total Aluminum	Al-T	0.1[A]	0.62
Total Cadmium	Cd-T	0.00004	
Total Chromium	Cr-T	0.001	0.002
Total Copper	Cu-T	0.002	0.017
Total Iron	Fe-T	0.3	1.1
Total Lead	Pb-T	0.004[B]	
Total Manganese	Mn-T	1.045[B,C]	
Total Mercury	Hg-T	0.001	
Total Molybdenum	Mo-T	0.073	
Total Nickel	Ni-T	0.11[B]	
Total Selenium	Se-T	0.001	
Total Silver	Ag-T	0.0001	
Total Thallium	Tl-T	0.0008	
Total Zinc	Zn-T	0.03	
Ammonia (unionized)	NH_3	0.019	
Ammonia - N (total)	$NH_3 + NH_4^+$	0.35[D,E]	
Nitrate - N	NO_3	3[E]	
Nitrite - N	NO_2	0.06[E]	
pH	pH-Lab	6-9	

[A] *pH Dependent*

[B] *Hardness Dependent*

[C] *B.C. Water Quality Guideline*

[D] *pH and Temperature Dependent; value based on 95th percentile pH and temperature for lower Minto Creek*

[E] *the nitrogen series are reported "as N". Conversion factors are: Ammonia (as N) = 0.8*Ammonia; Nitrate (as N) = 0.23*Nitrate; Nitrite (as N) = 0.3*Ni*

Given that copper is the primary parameter of concern, MintoEx proposes that using accurate on-site Cu-T analysis (and TSS as a secondary surrogate measurement for receiving environment water quality) has been determined to be a reasonable screening methodology for the AMMP provided an appropriate monitoring program is in place. Responses and actions MintoEx will take upon analysis of monitoring results are described in subsequent sections. As part of an annual review, information will be presented regarding whether or not use of copper as the primary parameter of concern is appropriate.

Identification of Compliant Water: Discharge Decision Making: Can we discharge?

When water meeting the effluent quality standards for end-of-pipe is identified on site through Level 1 monitoring, this will trigger increased monitoring frequency for the purpose of supporting the decision making process, i.e. the decision as to whether or not water can be discharged from Minto Mine to the receiving environment (Figure F-2). Once this situation is encountered, all sampling will be duplicated and tested at an external laboratory. External laboratory samples will always take precedence over samples collected and measured on site using the Decision Trees to guide water management.

The sequence of events leading up to the decision to discharge water must be clearly articulated. The AMMP framework will be used to guide the decision making process as follows:

Event – Compliant water identified for discharge from the site to the receiving environment. A decision must be made whether or not this can occur based on the principles of the AMMP.

Possible Environmental Effect – Discharging could effect the receiving environment. Actions taken (discharging) must align with the objective of protecting the receiving environment. Potential consequences of discharging water to the receiving environment include:

- Avoidance of degraded area by fish – loss of habitat;
- Toxicity to early life stages of fish; and
- Acute toxicity to adult and juvenile fish.

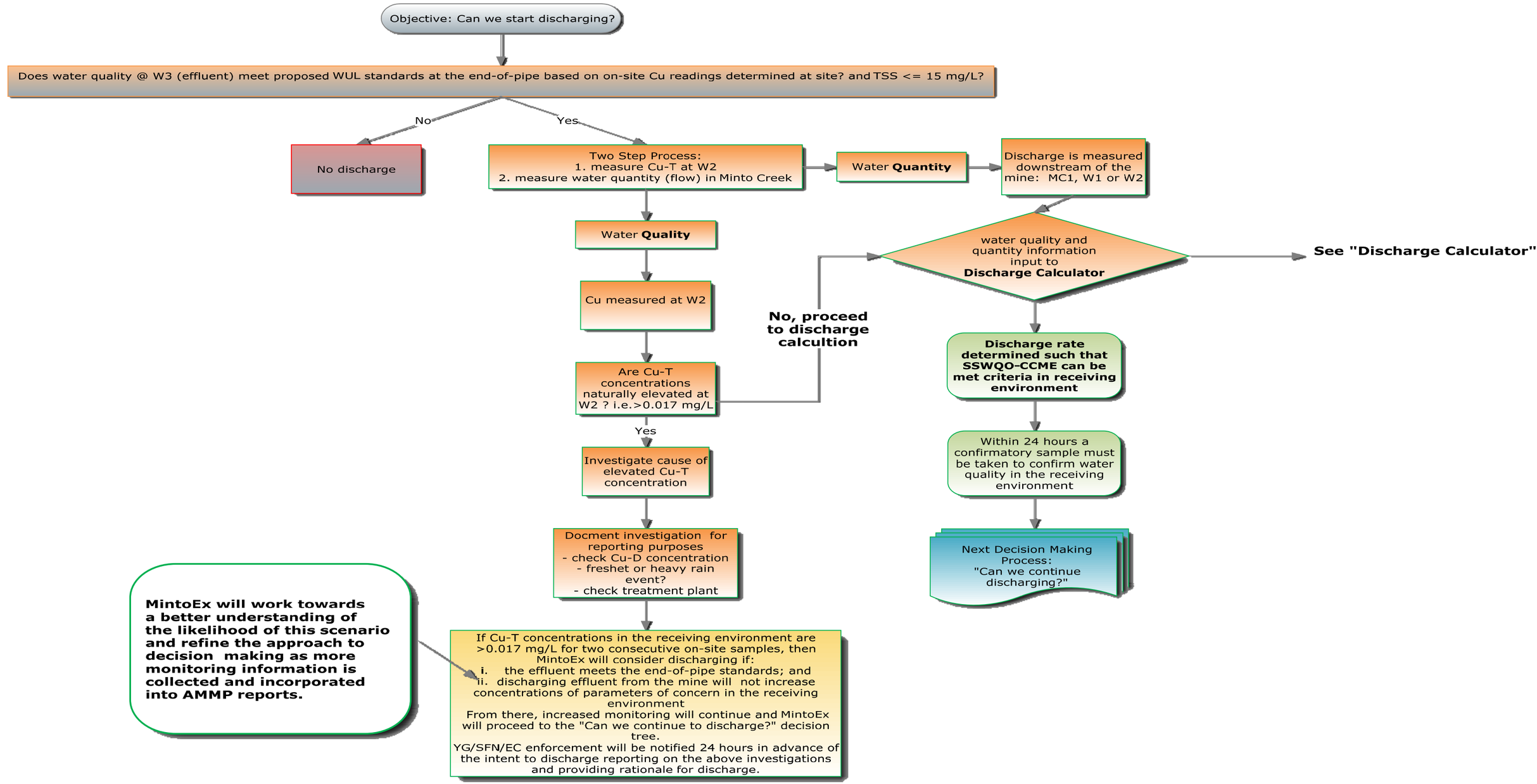


Figure F-2 Discharge Decision Tree: Can we Discharge?

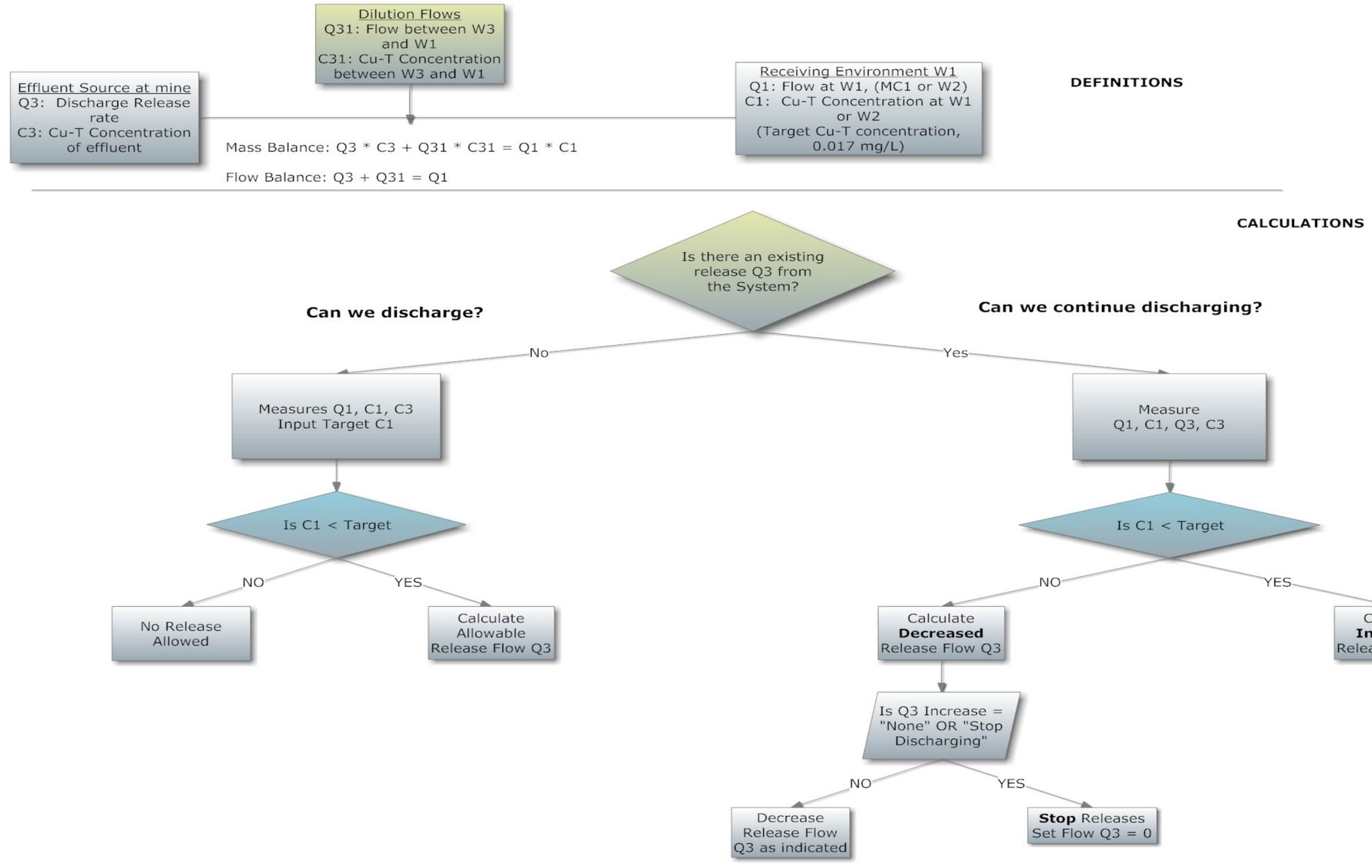


Figure F-3 Discharge Calculator

Narrative Trigger – On site laboratory results for total copper indicate water on site at one of the water conveyance network collection areas meets effluent quality standards for the end-of-pipe ("compliant" water):

- W15 sump;
- WC Confluence Sump;
- Water Treatment Plant waters; or
- WSP waters (W16).

Results will be verified through duplicate samples, external laboratory analysis and increased frequency sampling. If required, the decision to discharge will be based on copper analysis conducted onsite.

The circumstances of the trigger activation will be documented and reported.

Monitoring Requirements – When there is a desire to discharge water, monitoring frequency will increase to Level 2 at these locations:

- Source waters (one of the above locations);
- W3 (compliance point);
- MC1 (Minto Creek upstream of the Canyon); and
- W2 (receiving environment).

Decision Tree – MintoEx site staff, equipped with monitoring information will enter into the "Can we discharge?" Decision Tree (Figure F-2), which outlines the following steps in deciding whether or not discharging to the receiving environment is appropriate:

1. Firstly, the source waters or end-of-pipe waters must meet the proposed standards for Cu and TSS.

   If Cu-T <0.08 mg/l and TSS < 15 mg/l, then a two-step process follows that verifies quality and quantity of water downstream of the operation using onsite testing abilities.

2. Cu-T concentration will be measured at W2 prior to discharge. This reading along with water quantity information will be used to determine an appropriate discharge rate, i.e. what amount of discharge can be placed into the system without exceeding CCME-SSWQO thresholds for parameters of concern in the receiving environment (W2).

Where CCME-SSWQO thresholds are already exceeded at W2 prior to discharge, MintoEx will consider discharging if:

a. the effluent meets the end-of-pipe standards; and

b. discharging effluent from the mine will not increase concentrations of parameters of concern in the receiving environment.

MintoEx recognizes that this is an area of uncertainty in the adaptive approach and the likelihood of meeting this condition is low. As such, MintoEx still intends to make decisions regarding discharge based on the above criteria and notify appropriate agencies of the intent to discharge 24 hours in advance. Results of the investigation into the cause of elevated Cu-T levels in the receiving environment prior to discharge will be presented at the time of notification. All samples will be tested on-site and duplicates will be sent for external analysis.

3. Minto expects the more typical scenario wherein Cu-T levels in the receiving environment are below 0.017 mg/l prior to discharge. In this case, the next step is measuring the quantity (discharge rate) of surface water in Minto Creek downstream of the mine. This measurement will take place in one of the following locations: MC1 (Minto Canyon, approximately 8 km downstream of the mine at the top of a physical barrier between Upper Minto Creek and Lower Minto Creek), W1 (an established hydrology station in Lower Minto Creek) or W2 (receiving environment monitoring station in Lower Minto Creek approximately 11 km downstream of the mine). MintoEx requires the flexibility to measure at the most appropriate of these three stations for the following reasons:

   a. Given the steep terrain in the area, Minto Canyon may not be accessible during winter and early spring for safety reasons. Minto Canyon (MC1) is the preferred option as the flow at this location should represent the culmination of several tributaries to the creek. This is conservative in that receiving water quality will be measured downstream of this location.

   b. As with Minto Canyon, access to W1 is limited by safety protocols as it requires a 500 m hike from the mine access road. W1 is an established hydrology station used by MintoEx since 2006. It is equipped with a staff gauge and a data-logging pressure transducer that provides flow measurements. It was established in this location because the creek conditions in the area are best suited to continuous discharge measurements.

   c. W2 is the receiving environment monitoring station upstream of the confluence of Minto Creek with the Yukon River. Instantaneous measurements are collected here frequently using hand-held instrumentation.

d. Since 2006 MintoEx has observed that, at certain times of the year (typically mid to late summer), discharges in Minto Creek at station MC1 (top of canyon) are greater than those just downstream (bottom of canyon) at stations W1 and W2. This suggests that Lower Minto Creek on the floodplain of the Yukon River is an area of substantial groundwater recharge. Figure F-4 depicts this phenomenon where stream flows can be significant at MC1 but much lower (or even zero) at W2.

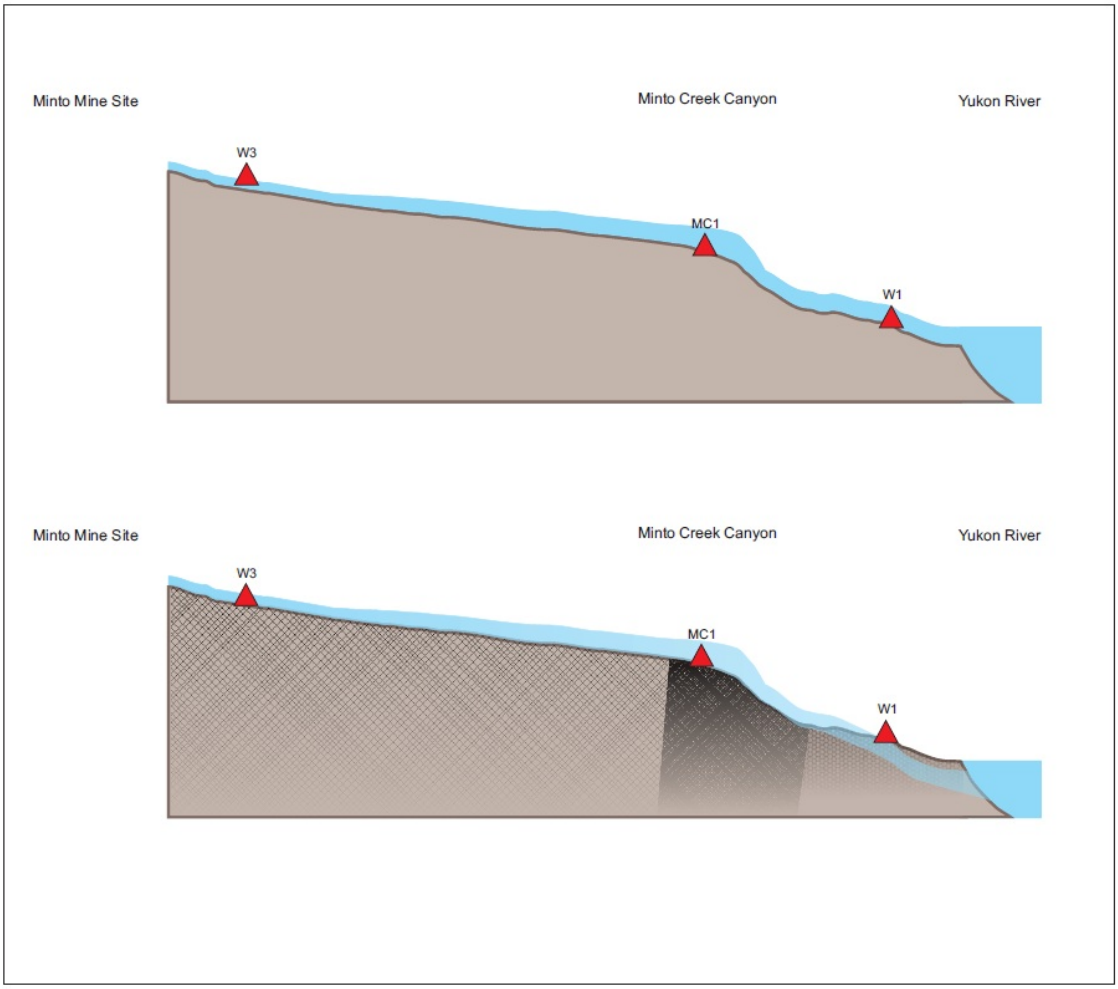
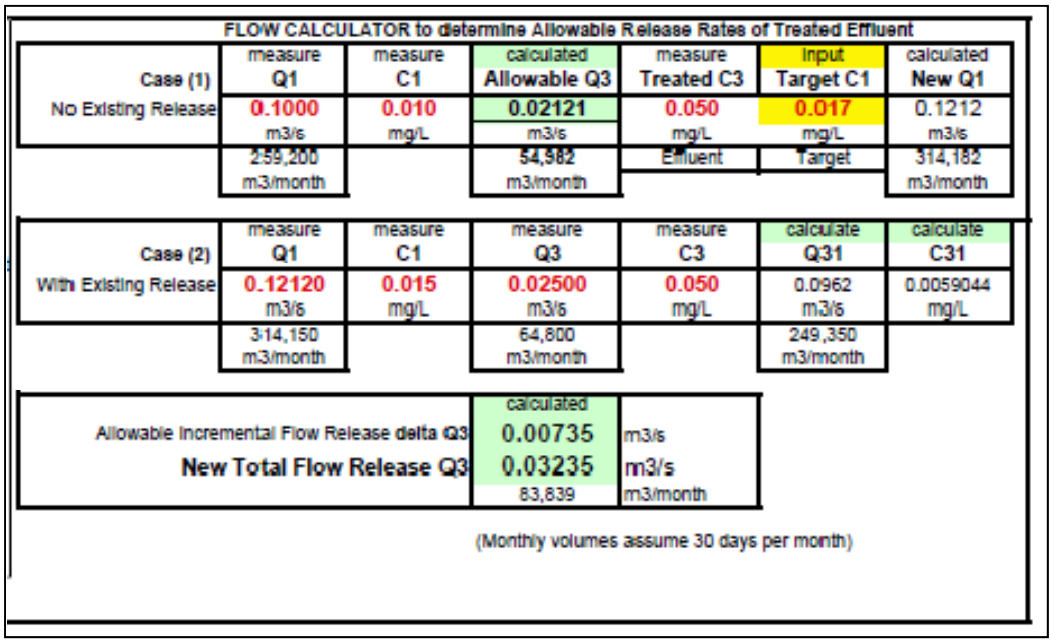


Figure F-4 Surface and groundwater flow between MC1 and W1

For these reasons, MintoEx, in implementing the AMMP, will attempt to measure flow at MC1 at this juncture in the decision making process regarding discharge. Where this is impractical one of the other locations will be used and rationale provided in associated reporting.

4. MintoEx will then use the field data from steps above (water quality and quantity information) to determine an appropriate discharge volume using a mass balance or "discharge calculator". The logic of the operations of the discharge calculator is shown in

5. Figure F-3 Discharge **Calculator**. The tool as it appears in Microsoft Excel is pictured in Figure F-5 below.



FLOW CALCULATOR to determine Allowable Release Rates of Treated Effluent

	measure	measure	calculated	measure	input	calculated
Case (1)	Q1	C1	Allowable Q3	Treated C3	Target C1	New Q1
No Existing Release	0.1000 m3/s	0.010 mg/L	0.02121 m3/s	0.050 mg/L	0.017 mg/L	0.1212 m3/s
	259,200 m3/month		54,982 m3/month	Effluent	Target	314,182 m3/month

	measure	measure	measure	measure	calculate	calculate
Case (2)	Q1	C1	Q3	C3	Q31	C31
With Existing Release	0.12120 m3/s	0.015 mg/L	0.02500 m3/s	0.050 mg/L	0.0962 m3/s	0.0059044 mg/L
	314,150 m3/month		64,800 m3/month		249,350 m3/month	

	calculated	
Allowable Incremental Flow Release delta Q3	0.00735	m3/s
New Total Flow Release Q3	0.03235	m3/s
	83,839	m3/month

(Monthly volumes assume 30 days per month)

Figure F-5 Discharge Calculator (MSExcel Version)

6. Discharge will begin at the appropriate rate and monitoring frequency will increase to daily for all samples.

On-site lab testing - Testing on site will measure Cu and TSS. Cu will be measured at the on-site environmental laboratory using the AA. TSS will be measured on-site to within 1 mg/l. Agreement to date between on-site techniques and external laboratory results has been reasonable. Based on the rationale presented above, these values will be used to guide decisions regarding discharge to the receiving environment.

External lab testing – All samples related to the discharge decision making process will be duplicated at an external accredited laboratory. These sample results will take precedence and discharge decisions made at the site will be adjusted accordingly upon receipt.

Monitoring During Discharge Events: Decision Making, Can We Continue Discharging?

Event – MintoEx is discharging compliant water downstream in accordance with the Decision Tree described above.

Possible Environmental Effects – Discharging could have negative impacts on the receiving environment. Actions taken (continued discharging) must align with the objective of protecting the receiving environment. Potential consequences of discharging water to the receiving environment include:

- Avoidance of degraded area by fish – loss of habitat;
- Toxicity to early life stages of fish; and
- Acute toxicity to adult and juvenile fish;

Narrative Trigger – Monitoring of surface waters in Minto Creek downstream of the mine site indicates that:

- downstream water quality is starting to degrade or change from compliant conditions that lead to the positive decision to discharge; OR
- downstream water quantity is decreasing from the flow conditions in Minto Creek that lead to the positive decision to discharge.

Monitoring Requirements – Monitoring stations that will be important at this stage are the downstream locations where water quantity and quality will be measured:

- W3: measure discharge volumes continuously and measure water quality daily;
- MC1/W1/W2: measure discharge volumes downstream daily;
- W2: measure water quality daily.

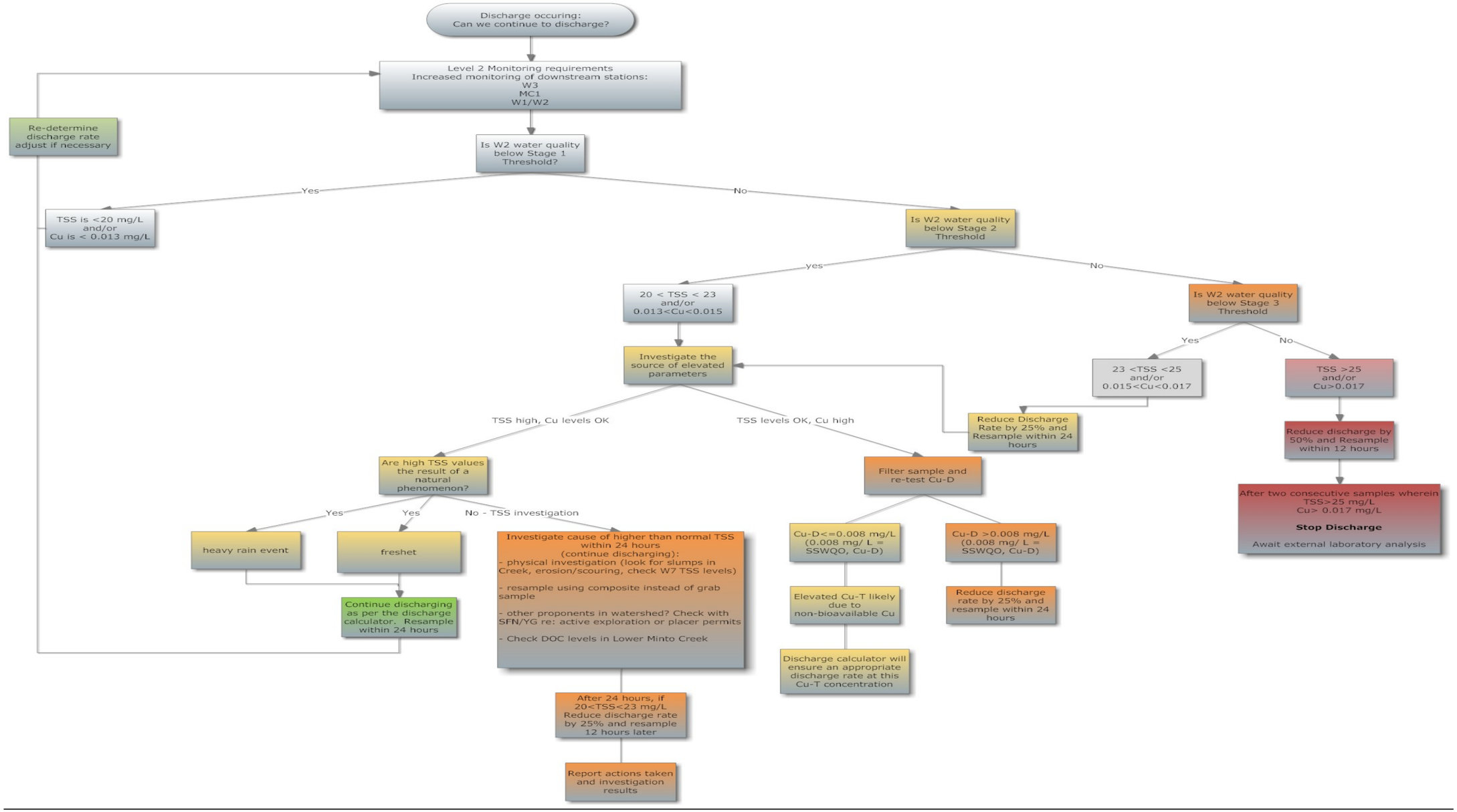


Figure F-6 Discharge Decision Tree: Can we Continue Discharging?

Specific Thresholds – TSS and copper measurements on site will be used to predict water quality in the receiving environment. Based on an investigation of the relationships between TSS and metal concentrations, combined with best management practices to prevent non-protective conditions from occurring with respect to non-conservative parameters (nutrients, temperature), MintoEx reviewed the parameters of concern and used a combination of SSWQO and CCME values to devise a reasonable threshold for maintaining protective conditions in the receiving environment:

Stage 1 threshold: TSS = 20 mg/l; Cu = 0.013 mg/l

Stage 2 threshold: TSS= 23 mg/l; Cu= 0.015 mg/l

Stage 3 threshold: TSS = 25 mg/l; Cu = 0.017 mg/l

The steps involved in deriving these threshold values were as follows:

1. The SSWQO report was undertaken to identify naturally elevated metal levels. Using CCME as the basis, site specific water quality objectives were determined for copper, aluminum, iron and chromium.

2. Water quality data collected at W2 was evaluated and compared to the SSWQO-CCME guideline values for all parameters of concern.

3. Above exercise served to identify parameters most likely to become elevated and bring about non-protective conditions during discharge.

4. The relationship between TSS and metals was evaluated and those with a statistically significant relationship to TSS were identified.

5. The TSS value at which these metals were expected to reach their SSWQO-CCME guideline value was calculated.

6. The 'lowest common denominator' in this scenario was aluminum, which is expected to reach CCME levels at a TSS level of 25 mg/l.

7. For copper, which does not have a statistically significant relationship with TSS, the ability to measure low levels will be developed at site.

8. For all other parameters for which it is difficult to predict water quality using on-site methods, sample results from an external laboratory will be compared against SSWQO and CCME levels. These results will take precedence over on-site data and guide the decision to continue discharging.

Proactive thresholds (Stage 1 and 2) will be used to identify scenarios, such as increasing TSS levels that could lead to a discharge scenario where Potential Effects could occur.

Essentially, MintoEx intends to manage the site such that total copper concentrations above 0.013 mg/L are triggering responses or actions that could result in a decision to stop discharging.

Using External Laboratory Results in the Decision Making Process

MintoEx is confident that the approach described wherein copper is used as the primary parameter of concern, along with TSS as a secondary surrogate, to guide discharge decisions is sound. At the same time, the receipt of external laboratory analyses will take precedence and discharge decisions made at the site will be adjusted accordingly upon receipt.

Event – MintoEx is discharging compliant water downstream in accordance with the Decision Tree described above. External laboratory results are received and must be interpreted for purposes of decision making.

Possible Environmental Effects – Discharging could have negative impacts on the receiving environment. Actions taken (continued discharging) must align with the objective of protecting the receiving environment. Potential consequences of discharging water to the receiving environment include:

- Avoidance of degraded area by fish – loss of habitat;
- Toxicity to early life stages of fish; and
- Acute toxicity to adult and juvenile fish.

Narrative Trigger – The external laboratory results are received and either:

- TSS and/or Cu-T levels are different from those measured on site; or
- One of the other parameters exceeds the applicable CCME or SSWQO value.

Decision Tree – Once the trigger scenario occurs, the external laboratory analyses will be used as follows:

Since external laboratory analysis takes precedence over onsite measurements, the external TSS/Cu-T amounts will be applied to the decision tree above (Can we continue discharging?) and discharge will be adjusted accordingly.

In the event that one of the other parameters exceeds the applicable level (either CCME or SSWQO, see Table F-2 Receiving Environment CCME Guidelines and SSWQOs above) discharge will be reduced by 50% and resampled. Associated reporting will log the parameter and degree of exceedance so that MintoEx can continually evaluate the primary parameter of concern at the mine. If two consecutive samples indicate the same parameter exceeds the applicable CCME or SSWQO level, then discharge will be stopped.

Monitoring Requirements – All samples will be duplicated at an external accredited laboratory. When one of the parameters of concern is exceeded and the receiving environment water is re-sampled, the sample analysis will be requested on a "rush" basis, i.e. the results will be obtained as quickly as possible.

Specific Thresholds – As described, a combination of CCME and SSWQO levels will be used to evaluate all of the parameters of concern with respect to water quality.

Contingency Planning

In Table F-3 Contingency Measures Summary: Adaptive Monitoring and Management Plan below, MintoEx has addressed some of the possible scenarios considered but not directly planned for in the decision making process described above.

Event	Monitored Item	Trigger/Threshold	Action
WATER QUANTITY			
MintoEx, in a given year, implementing proposed Water Management Plan, but in doing so is still not able to remove enough water downstream for operational flexibility due to excessive runoff	Water volumes on site heading toward freeze-up	Water is stored in pit on Nov 1 as a result of storage from the summer months	MintoEx will evaluate the need to increase treatment capacity to meet the Water Management Plan objectives.
WATER QUALITY			
MintoEx , in a given year, monitors water quality as proposed and identifies a primary parameter of concern other than copper.	Log the parameter of concern in the discharge decision making process.	More than three consecutive 'stop-discharge' decisions based on a parameter other than copper will cause an investigation	Evaluate options for optimizing treatment plant or alternative treatment technologies for primary parameter of concern.
EQUIPMENT ISSUES			
Instrumentation required for routine monitoring and/or discharge decision making malfunction.	Flow rate, water quality	Irregular reading, No readings	*Hand-held instrumentation* Purchase redundant equipment, have in stock prior to freshet. *Atomic Absorption Spectrophotometer* • Engage supplier for regular maintenance on atomic absorption. • In the case of malfunctioning, water quality samples will be sent off site for analysis on a "rush" basis.
ANALYTICAL DELAYS			
External laboratory results needed for discharge decision and unexpected delays are experienced	Water quality	Any unforeseen delay in receiving eternal laboratory results	If another laboratory can provide analyses faster, re-sample and send elsewhere. If this scenario is encountered more than twice per year, then investigate other laboratories.

Table F-3 Contingency Measures Summary: Adaptive Monitoring and Management Plan

3.10. Seepage Monitoring Program

The Seepage Monitoring Program has been developed based on observations by the engineer of record for the seepage infrastructure as construction began in 2010. Foundation soils were tested and a ground temperature cable (monitoring equipment) was installed. Some of the thresholds for adaptive responses will require further information, such as the foundation soil testing results and initial ground temperature cable readings. Using this information, baseline conditions will be established and considered along with engineering principles to determine reasonable thresholds for adaptive responses and actions. An outline of the Seepage Monitoring Program as it is currently understood is described below and qualitative thresholds are described to provide insight into the methodology for establishing adaptive responses. More details will be added as the required information becomes available.

3.10.1. Physical Monitoring

Regular physical monitoring should be carried out daily during freshet, during and after significant rainfall events and monthly at other times.

- Regular survey of the water level in the MCDS pond.
    - Survey data should be collected daily during freshet, after significant rainfall events and weekly at other times.
- Regular monitoring of volumes pumped out of the pond should be completed by Minto staff. This could be completed with survey data or using pump curves.
- Foundation Thawing:
    - Once the ground temperature cable (GTC) is installed ground temperatures will be monitored. Regular physical monitoring of structure should indicate major foundation soil distress. Survey hub(s) can be installed if distress is noted to monitor movement rates. (See Establishment of triggers for design and implementation of feasible upgrades to the proposed collection system.)
    - An increase in seepage volume may be an indicator of foundation soils thawing, and would be monitored during regular physical monitoring.
- Hydraulic Gradients:
    - Regular survey of the water level in the WSP will provide the necessary data to calculate hydraulic gradient.
- A complete survey of the area (including upstream and downstream of berm and pond) will allow a more precise calculation of hydraulic gradient.

- Contaminant Transport:
    - To be monitored by comparing samples from W16 (WSP) and samples from downstream of the berm.
    - Following analysis and comparison of sample results from W16 and downstream of the berm, MintoEx will:
        1. identify appropriate performance thresholds for the collection system;
        2. report on findings; and
        3. indicate whether modelling of water quality and loading is required.

3.10.2. Triggers and adaptive responses

- **Foundation Thawing.** If the GTC readings indicate that foundation soils are thawing, regular physical monitoring frequencies will increase.
- **Noticeable slumps/instability in berm**. Slumps/instabilities will indicate foundation soil distress. Regular checks for these indicators will be conducted through regular physical monitoring. Adaptive management responses will depend on size of slump/instability. Minor instabilities (a slump or instability that allows the structure to continue containing water to meet the design intent) would result in installation of survey hubs to monitor movement. If movement rates indicate that a major slump or instability is forthcoming, repair and/or redesign would be required. Major slumps/instabilities (a slump or instability that causes the structure to no longer contain sufficient water to meet the design intent) would require repair. Prior to repair the engineer of record will assess the likely cause(s) of the failure and determine if redesign or design upgrade is required.
- **Little or no ponded water upstream of berm**. Little or no ponding will indicate that the structure is not holding water. Regular checks for ponded waters will be conducted through regular physical monitoring and survey data. An initial adaptive management response will be a requirement to investigate the cause. This investigation could include a review of the existing data, a site visit and possibly a subsurface investigation. Once the data review is complete, the engineer of record will determine a scope of work required to effect repairs and whether redesign is required.
- **Increase in seepage volume**. An increase in seepage volume could be an indicator that something is changing in the foundation soils if no other conditions have changed. Regular

checks for seepage volume increases will be conducted through regular physical monitoring. An initial adaptive management response will be to review the data.

- Contaminant transport triggers:
    - If samples at W8/W8a indicate higher than normal concentrations of parameters of concern are entering the system upstream, sampling should be completed downstream of the structure. If an unacceptable amount of parameters of concern were found downstream, samples from the water in the Water Storage Pond should be analysed to determine what effects the increased loading is having on the WSP. If it is determined that an unacceptable amount of parameters of concern are entering the WSP, the pumping plan should be reviewed.

3.11. WMP and AMMP Review Mechanisms

MintoEx recognizes that the Water Management Plan, including the AMMP must be revisited regularly for the following reasons:

- to ensure objectives of the WMP are being met;
- to update stakeholders on successes/challenges encountered in the implementation of the WMP;
- to confirm that water management plan assumptions are being verified;
- to incorporate any changes to CCME Guidelines; and
- to confirm our commitment to/strategy for protecting the receiving environment.

A key element of revisiting the WMP assumptions will be verification of the effluent quality standards as protective of the receiving environment. Conversely, if water quality model re-calibration from routine monitoring demonstrates that the proposed effluent quality standards are overly protective and overly restrictive of operational flexibility, they should be revisited and potentially increased. MintoEx proposes to present its findings and rationale for such changes, if required, in an annual review of the WMP.

Technical Working Group

A technical working group will be established to ensure timely communication of water management strategies and other technical information to stakeholders.

The table below summarizes specific ways to facilitate information exchange related to the AMMP and lists commitments related to the monitoring program:

Issue		Proposed Action/Forum for Information Exchange	Schedule for Implementation
1.	Timely information exchange related to aspects of the Adaptive Management Plan	Establish the Minto Mine Technical Working Group (MMTWG)	MintoEx to initiate working group immediately, based on the format of meetings leading up to the licensing process.
2.	Flow measurement in Minto Creek to confirm dilutive capacity downstream of Minto Mine	Investigate methods for short and long term flow measuring solutions	In May 2010 Solinst M5 Leveloggers were installed at key stations where flow will be measured. Other improvements are currently being investigated to support the proposed AMMP data collection efforts.
3.	Water Quality trend identification	Monthly WUL reports and Annual State of the Environment report	Monthly reports will be submitted with a template to be used to track adaptive actions taken at the site. Annual State of the Environment report to be submitted along with the Annual WUL report.
4.		Annual WMP/AMMP workshop	MintoEx proposes a workshop meeting early in the calendar year (prior to the Annual Report submission) wherein any changes to the WMP/ AMMP can be discussed in advance of submitting both documents for review.

Table F-4 AMMP Continuing Dialogue and Commitments

3.12. Quality Assurance/Quality Control (QA/QC)

Currently the QA/QC measures in place related to the Water Quality Surveillance Program include:

- collection of duplicate, field blank and trip blank samples (5% of total sample volume);
- calibration of equipment (Oakton pH/Electrical Conductivity/total dissolved solids (TDS) meter, YSI meter and Global flow meter) in accordance with manufacturer's specifications;

- ordering of key instrumentation parts in January of each calendar year (dissolved oxygen membranes, pH electrodes, discharge loggers electrical conductivity electrodes, etc.) such that at least one replacement unit is on site by April 1; and

- rental of duplicate equipment during high volume sample periods.

The proposed AMMP will incorporate these features and consider others such as duplication of certain field equipment to allow for situations wherein equipment used for critical discharge decision-making is inoperable due to malfunctions. The AA will be calibrated before each use using standard solutions.

3.13. Reporting

In addition to the mandatory reporting required under the *Metal Mining Effluent Regulations*, the monthly report provided to the Yukon Water Board detailing water quality and flow data will include updates on the implementation of the AMMP and results from the expanded program in accordance with the sample frequency described in Table F-1.

A check-list on adaptive actions taken will be completed and submitted with each report with the aim of highlighting actions related to the AMMP for ease of review. As indicated in the Decision Tree (Figure F-2 Discharge Decision Tree: Can we Discharge? above), inspectors from EMR and SFN Lands and Resources will be notified when MintoEx intends to discharge water to the receiving environment based on the methodology described in this plan.

In addition to the water quality data, the following will be identified and presented:

- Noticeable trends in changes to water quantity and quality;

- Description and detail of any thresholds exceeded and the resulting response; and

- Any proposed changes to water treatment strategy.

Any exceedance of the WUL discharge criteria will be reported by telephone or email within 24 hours to the inspectors (EMR – Client Services and Inspections and SFN Lands and Resources Department). Details of any exceedance, corrective action/mitigation undertaken and inspectors' direction will be included in the monthly report.

MintoEx proposes that updates regarding the AMMP implementation be included in the WUL monthly reports currently submitted to the Yukon Water Board.

In addition to the monthly reports, an Annual State of the Environment report will be submitted at the end of each calendar year. It will summarize water management at Minto Mine and present information

related to these items of concern using plain language and adhering to a narrative-style report to the extent possible:

- Storage of water at site during the calendar year (volumes, place of storage, duration of storage);
- Quantity and quality of water released from the site;
- Effectiveness of water treatment;
- Quantity and quality of water in Upper Minto Creek;
- Quantity and quality of water in Lower Minto Creek, including information from a new station to be established between the current discharge point (W3) and the receiving environment (W2);
- Results of the sediment monitoring program;
- Results of an annual biological monitoring program including an overview of the Environmental Effects Monitoring program which is undertaken as part of MintoEx's obligations under MMER; and
- An overview of the effectiveness of the site water balance model in predicting site conditions after recalibration.

The AMMP was prepared based on ongoing dialogue with stakeholders and reviews of best available technologies and environmental practices at other sites, adapted to meet the objectives defined above in AMMP Objectives and Guiding Fundamentals. The underlying principle of the plan is to protect the receiving environment from negative impacts. MintoEx recognizes the dynamic nature of the mining industry and the need to revisit the plan frequently to ensure its success and looks to the initiatives described here, such as the technical working group, for continuous improvements to the plan.

Protecting the receiving environment requires a sound monitoring program and timely management responses/actions. Operating the mine successfully requires flexibility to manage water in accordance with end of pipe water quality standards and ensure timely discharge events if required in order to maintain mining.

The monitoring framework in this AMMP offers improvements based on two years of operating knowledge and views of stakeholders.