Blackwater Mine

Mine Site Water and Discharge Monitoring and Management Plan

Table of Contents

FIGURES

TABLES

GLOSSARY AND ABBREVIATIONS

AEMP	Aquatic Effects Monitoring Program
Application	Joint Application for *Mines Act/Environmental Management Act* Permits Application
Artemis	Artemis Gold Inc.
ARD	Acid rock drainage
BC	British Columbia
Blackwater	Blackwater Gold Project
BW Gold	BW Gold LTD.
CALA	Canadian Association of Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CDS	Central Diversion System
CEA Agency	Canadian Environmental Assessment Agency
CEO	Chief Executive Officer
CM	Construction Management
Code	Health, Safety and Reclamation Code for Mines in British Columbia
COO	Chief Operating Officer
CWTP	Central Water Transfer Pond
DAF	Dissolved aeration flotation
DGPS	Differential GPS
DOC	Dissolved Organic Carbon
DS	Decision Statement
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office

EC	Environment Canada
ECD	Environmental Control Dam
EMA	Environmental Management Act
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EMP	Environmental Management Plan
EMPR	Ministry of Energy, Mines and Petroleum Resources
EMS	Environmental Management System
ENV	Ministry of Environment and Climate Change Strategy
EPCM	Engineering, Procurement, and Construction Management
ERM	ERM Environmental Consultants Canada Ltd.
FSR	Forest Service Road
FWR	Freshwater Reservoir
FWSS	Freshwater Supply System
GM	General Manager
GMP	Groundwater Monitoring Plan
HC	Health Canada
IECD	Interim Environmental Control Dam
IFN	Instream flow needs
Km	kilometre
KP	Knight Piésold Ltd.
LDN	Lhoosk'uz Dené Nation
LGO	Low grade ore
LoM	Life of Mine
M	metre

masl	metres above sea level
MBBR	Moving bed biofilm reactor
mbgs	metres below ground surface
MELP	Ministry of Environment, Lands and Parks
MEM	Ministry of Energy and Mines
MEMPR	Ministry of Energy, Mines and Petroleum Resources
MERP	Mine Emergency Response Plan
Mine	The Blackwater Gold Mine
MOE	Ministry of Environment
MWLAP	Ministry of Water, Land and Air Protection
ML	Metal leaching
MSDP	Mine Site Water and Discharge Monitoring and Management Plan
Mtpa	Million tonnes per annum
NAG	Non acid generating
NF	Nanofiltration
NFN	Nazko First Nation
NWFN	Nadleh Whut'en First Nation
OMS	Operations, Maintenance, and Surveillance
ORP	oxidation-reduction potential
PAG	Potentially Acid Generating
PMF	Potential Failure Mode
POCs	Parameters of Concern
POPCs	Parameters of Potential Concern
Project	Blackwater Gold Project

QA/QC	Quality Assurance / Quality Control
QC	Quality Control
QRP	Qualified registered professional
RISC	Resources Information Standards Committee
RMS	Remote Monitoring System
RO	Reverse osmosis
SBEBs	Science-Based Environmental Benchmark
SCP	Sediment Control Pond
SFN	Saik'uz First Nation
SOPs	Standard Operating Procedures
StFN	Stellat'en First Nation
T	tonnes
TDS	total dissolved solids
TOC	Total Organic Carbon
TRP	Trigger Response Plan
TSF	Tailings Storage Facility
TSS	total suspended solids
UFN	Ulkatcho First Nation
VP	Vice President
VWP	vibrating wire piezometer
WAD	Weak Acid Dissociable
WBM	Water Balance Model
WMP	Water Management Pond
WQG	Water quality guideline

WQM	Water Quality Model
WTP	Water Treatment Plant
YDWL	Yinka Dene Water Law

Work Instructions

1.1.1.1 Mine Site Water and Discharge Monitoring and Management Program

Version	E.1
Replaces	D.1
Creation Date	03/28/2025

1 Project Overview

1.1 General

The Blackwater Gold Project (the Mine) is a gold and silver open pit mine located in central British Columbia (BC), approximately 112 kilometres (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver.

The Mine is presently accessed via the Kluskus Forest Service Road (FSR), the Kluskus-Ootsa FSR and an exploration access road, which connects to the Kluskus-Ootsa FSR at km 142. The Kluskus FSR joins Highway 16 approximately 10 km west of Vanderhoof. A new, approximately 13.8 km road (Mine Access Road) will be built to replace the existing exploration access road, which will be decommissioned. The new planned access is at km 124.5. Driving time from Vanderhoof to the mine site is about 2.5 hours.

Major mine components include a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and soil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps and ancillary facilities. The gold and silver will be recovered into a gold-silver doré product and shipped by air and/or transported by road. Electrical power will be supplied by a new approximately 135 km, 230 kilovolt overland transmission line that will connect to the BC Hydro grid at the Glenannan substation located near the Endako mine, 65 km west of Vanderhoof.

The Blackwater mine site is located within the traditional territories of Lhoosk'uz Dené Nation (LDN), Ulkatcho First Nation (UFN), Skin Tyee Nation, and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa FSRs and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation (NWFN), Saik'uz First Nation (SFN), and Stellat'en First Nation (StFN; collectively, the Carrier Sekani First Nations) as well as the traditional territories of the Nazko First Nation (NFN), Nee Tahi Buhn Band, Cheslatta Carrier Nation, and Yekooche First Nation (BC Environmental Assessment Office (EAO) 2019a, 2019b).

Mine development will be phased with an initial milling capacity of 15,000 tonnes per day (t/d) for the first five years of operation. After the first five years, the milling capacity will increase to 33,000 t/d for the next five-years, and to 55,000 t/d in Year +11 until the end of the 23-year mine life. The Closure Phase is Year +24 to approximately Year +45, ending when the Open Pit has filled to the target closure level and the TSF is allowed to passively discharge to Davidson Creek via a closure spillway. The Post-closure phase begins in Year +46.

New Gold Inc. received Environmental Assessment Certificate #M19-01 (EAC) on June 21, 2019 under the 2002 *Environmental Assessment Act* (BC EAO 219c) and a Decision Statement (DS) on April 15, 2019 under the *Canadian Environmental Assessment Act*, 2012 (CEA Agency 2019). In August 2020, Artemis Gold Inc. (Artemis) acquired the mineral tenures, assets, and rights in the Blackwater Project that were previously held by New Gold Inc. On August 7, 2020, the Certificate was transferred to BW Gold LTD. (BW Gold), a wholly-owned subsidiary of Artemis, under the *2018 Environmental Assessment Act*. The Impact Assessment Agency of Canada notified BW Gold on September 25, 2020 to verify that written notice had been provided within 30 days of the change of proponent as required in Condition 2.16 of the DS, and that a process had been initiated to amend the DS.

BW Gold received *Mines Act* Permit M-246 on June 22, 2021, and *Environmental Management Act* (EMA) Permit PE-110652 on June 24, 2021, authorizing early construction works for the Mine. These works included clearing, grubbing ditching, and site levelling at the Plant Site location and sediment and erosion controls, including construction of ditches, diversions, and a sediment control pond (SCP). BW Gold received an amended *Mines Act* Permit M-246 on March 8, 2023, approving the Mine Plan and Reclamation Program and superseding the previous version. BW Gold received an amended *Environmental Management Ac*t Permit PE-110652 on May 2, 2023, authorizing discharge of effluent to surface water and groundwater from the Blackwater mine. BW Gold received an amended *Mines Act* Permit M-246 on October 30, 2024, reflecting changes to the timing of when the Membrane water treatment plant (WTP) would be constructed and operational.

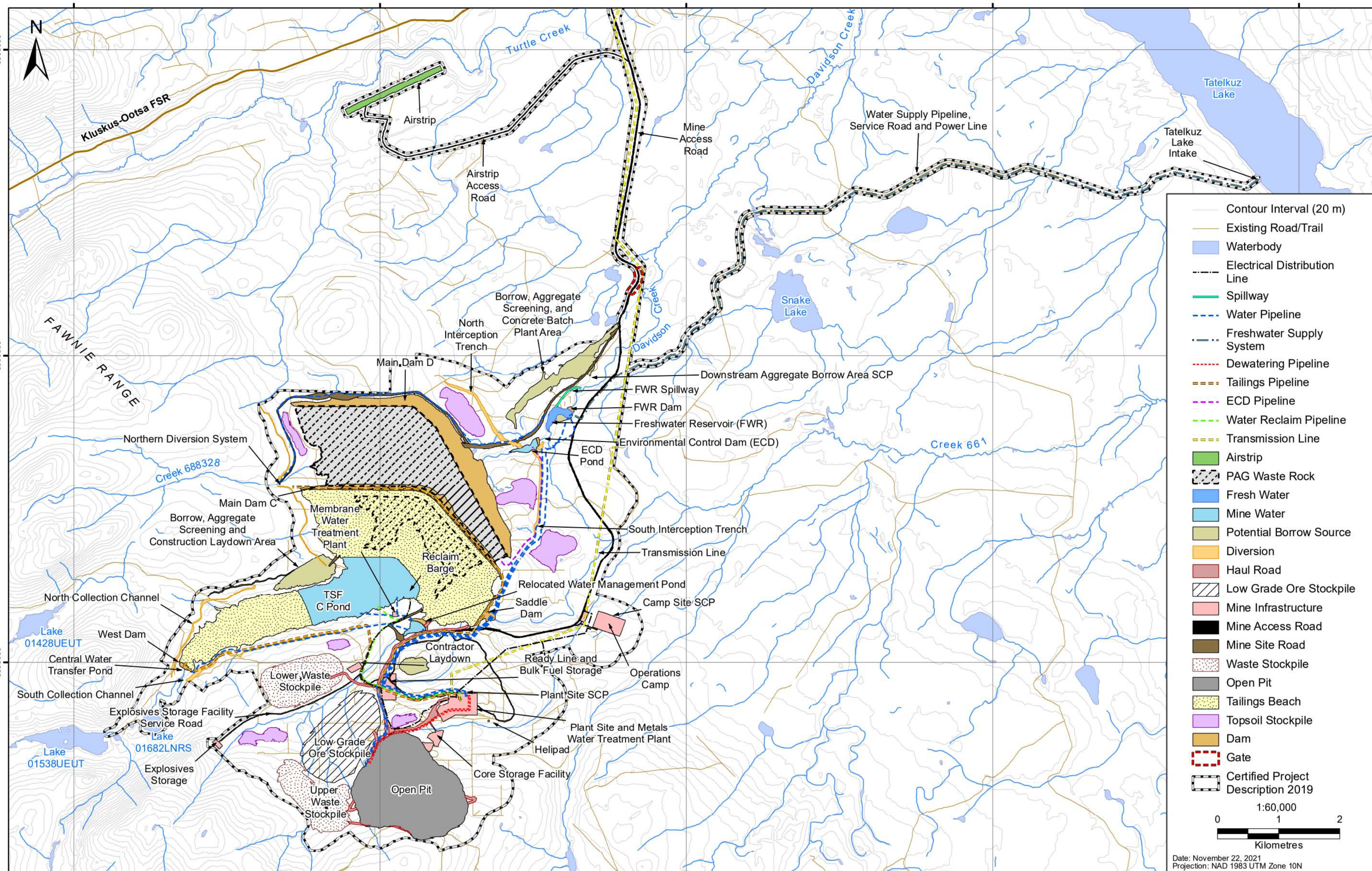


Figure 1.1-1: Mine Site General Arrangement (Year +18)

2 Purpose and Objectives

2.1 Purpose

The Mine Site Water and Discharge Monitoring and Management Plan (MSDP or plan) was originally developed to support the Joint Mines Act / Environmental Management Act Permits Application (the Application) and submitted as Appendix 9-E of the Application. The purpose of the MSDP is to:

Provide operational management for each life of mine (LoM) phase, and provide contingency measures for the effective interception, conveyance, diversion, storage, and discharge of contact and non-contact water on the mine site.

Provide a comprehensive monitoring program for surface water, groundwater, and seepage water quantity and quality within the proposed permitted area and discharge points for the Construction, Operations, and Closure phases of the Mine.

2.2 Objectives

The plan is designed to provide an early detection system and identify trends in surface water and groundwater quality so that potential impacts to the receiving environment can be investigated, mitigated, and avoided. In addition, ongoing monitoring will be used to evaluate predictions, calibrate models, and update models and mitigation options throughout the LoM.

Mine site water will be discharged to the environment from the following site infrastructure:

- Freshwater Reservoir (FWR);
- Sediment control ponds (SCPs);
- TSF Stage 1 SCP (Construction phase only);
- Downstream Aggregate Borrow Area SCP;
- Plant Site SCP (to ground, Construction phase only); and
- Groundwater seepage.

The plan integrates baseline information and modelling study results provided in the Application prepared by BW Gold (2022) as follows:

- Meteorology and climate studies (Chapter 2.2)
- Water quantity (Chapter 2.6)
- Water quality (Chapter 2.7)
- The mine plan (Chapter 3)
- Water treatment requirements (Section 5.6)
- Discharge requirements (Chapter 5.8)
- Baseline studies

Information is also integrated from the following appendices to the Application prepared by BW Gold (2022):

- Life of Mine Water Balance Model Report (KP 2021a) (Appendix 5-B),
- Water Balance and Water Quality Model Report (Lorax 2021) (Appendix 5-D),
- Water Balance/Water Quality Model Update (Lorax 2022c)
- Numerical Groundwater Modelling Report (KP 2021k) (Appendix 5-F),
- Detailed Design for The Blackwater Gold Water Treatment Plant (McCue Engineering Contractors 2021) (Appendix 5-G),
- Water Treatment Plant (WTP) for Sulphate Control at Blackwater during Operation and Post-Closure. Preliminary Design Report – Rev C (BQE Water 2021) (Appendix 5-H)
- BW Gold Ltd Blackwater Gold Project Permitting Report (Ausenco 2021) (Appendix 3-F) [lime neutralization])

This MSDP is intended to be implemented in conjunction with other management and monitoring plans developed for BW Gold (2022) pertinent to the protection of the aquatic receiving environment, including the following:

- Environment Monitoring Programs (Chapter 7 of BW Gold (2022));
- Aquatic Effects Monitoring Program (AEMP) Plan;
- Surface Erosion Prevention and Sediment Control Plan;
- Metal Leaching/Acid Rock Drainage Management Plan; and
- Trigger Response Plan for Authorized Discharges to Davidson Creek [Environmental Management Act (EMA) Permit 110652 - Section 3.4]
- Trigger Response Plan for Plan for Non-Point Source Discharges to Ground (EMA Permit 110652 - Section 3.5)
- Groundwater Monitoring Program (EMA Permit 110652 – Section 4.7)
- Closure and Post-Closure water management and monitoring is described in the Closure/Post-Closure Water Management Plan required as Condition 5(g) of Mines Act Permit M-246, Condition 3.11 of EMA Permit 110652, and Condition 34 of EA Certificate M19-01.

This plan has been developed to meet the objectives of and to facilitate compliance with the following regulatory instruments:

- Mines Act Permit M-246
- Environmental Management Act Permit 110652
- Surface water Conditional Water Licences 505078, 505081, 505082
- Groundwater Conditional Water Licences 504197, 505085

3 Roles and Responsibilities

3.1 Overview

BW Gold has the obligation of ensuring that all commitments are met and that all relevant obligations are made known to mine personnel and site contractors during all phases of the mine life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working at the mine site is essential to meet Environmental Management System (EMS) objectives.

Table 3.1-1 provides an overview of general environmental management responsibilities during all phases of the mine life for key positions that will be involved in environmental management. Other positions not specifically listed in Table 3.1-1 but that will provide supporting roles include independent environmental monitors, an Engineer of Record for each tailings storage facility and dam, an Independent Tailings Review Board, TSF qualified person, geochemistry Qualified Registered Professional (QRP), and other qualified persons and QRPs.

Table 3.1-1 BW Gold Roles and Responsibilities

Role	Responsibility
Chief Executive Officer (CEO)	The CEO is responsible for overall Project governance. Reports to the Board.
Chief Operating Officer (COO)	The COO is responsible for engineering and Project development and coordinates with the Mine Manager to ensure overall Project objectives are being managed. Reports to the CEO.
Vice President (VP) Environment & Social Responsibility	The VP is responsible for championing the Environmental Policy Statement and EMS, establishing environmental performance targets, and overseeing permitting. Reports to the COO.
General Manager (GM) Development	The GM Development is responsible for managing project permitting, the Mine's administration services and external entities, and delivering systems and programs that ensure BW Gold's values are embraced and supported: Putting People First, Outstanding Corporate Citizenship, High Performance Culture, Rigorous Project Management and Financial Discipline. Reports to the COO.
Mine Manager	The Mine Manager, as defined in the Mines Act, has overall responsibility for mine operations, including the health and safety of workers and the public, EMS implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate some of their responsibilities to other qualified personnel. Reports to the GM.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments and obligations are being met during the construction phase. Reports to the GM.

Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Mine's environmental programs and compliance with environmental permits, updating the EMS and Environmental Management Plans (EMPs). The EM will be responsible for ensuring that construction activities are proceeding in accordance with the objectives of the EMS and associated Management Plans. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. The EM discusses with the Environmental Monitors current site conditions that may influence monitoring programs. Supports the CM and reports to the Mine Manager. The EM will be accountable reviewing the approved EMPs periodically for effectiveness. The EM or designate will have the authority to stop any construction activity that is deemed to pose a risk to the environment; work will only proceed when the identified risk and concern have been addressed and rectified.
Departmental Managers	Departmental Managers (e.g., mining, milling, and plant/site services) are responsible for implementation of the EMS, management plans, and standard operating procedures relevant to their areas. Reports to the Mine Manager.
Indigenous Relations Manager	Indigenous Relations Manager is responsible for Indigenous engagement throughout the life of mine. Also responsible for day-to-day management and communications with Indigenous groups. Reports to the VP Environment & Social Responsibility.
Community Relations Advisor	Community Relations Advisor is responsible for managing the Community Liaison Committee and Community Feedback Mechanism. Reports to the Indigenous Relations Manager.
Environmental Monitors	Environmental Monitors (includes Environmental Specialists and Technicians) are responsible for tracking and reporting on environmental permit obligations through field-based monitoring programs. Report to EM.
Aboriginal Monitors	Aboriginal Monitors are required under EAC #M19-01 Condition 17 and will be responsible for monitoring for potential effects from the Mine on the Indigenous interests. Aboriginal Monitors will be involved in the adaptive management and follow-up monitoring programs. Report to the EM.
EPCM Contractor	EPCM contractors will report to the CMs, who will ultimately be responsible for ensuring that impacts are minimized, and environmental obligations are met during the Construction phase
Employees and Contractors	Employees and contractors are responsible for being aware of permit requirements specific to their roles and responsibilities. Report to Departmental Managers.
QRPs and Qualified Persons	QRPs and qualified persons will be retained to review objectives and conduct various aspects of environmental and social monitoring as specified in Environmental and Social Management Plans.

BW Gold will employ a qualified person as an EM to ensure that the EMS requirements are established, implemented, and maintained, and that environmental performance is reported to management for review and action. The EM is responsible for retaining the services of qualified persons or QRPs with specific scientific or engineering expertise to provide direction and management advice in their areas of specialization. The EM will be supported by Environmental Monitors, including Environmental Specialists and Technicians, as well as consultant subject matter experts in the fields of environmental science and engineering as needed.

During the Construction phase, BW Gold entered into multiple Engineering, Procurement and Construction contracts, for areas such as the Transmission Line, Process Plant, Tailings and Reclaim System, and 25 kV Power Distribution. Each engineer/contractor had their own CM and there will be a BW Gold responsible project manager and/or Superintendent who ultimately reports to the GM Development. Some of the scope, such as the TSF and Water Management Structures will be self-performed by BW Gold, likely using hired equipment. Other smaller scope packages may be in the form of EPCM contracts. For non-EPCM contractors, who will perform some of the minor works on site, the same reporting structure, requirements, and responsibilities will be established as outlined above. BW Gold will maintain overall responsibility for management of the construction and operation of the mine site and will therefore be responsible for establishing employment and contract agreements, communicating environmental requirements, and conducting periodic reviews of performance against stated requirements.

Environmental management during operation of the Mine will be integrated under the direction of the EM, who will liaise closely with Departmental Managers and will report directly to the Mine Manager. The EM will be supported by the VP of Environment and Social Responsibility to provide an effective and integrated approach to environmental management and ensure adherence to corporate environmental standards. All employees and contractors are responsible for daily implementation of the practices and policies contained in the EMS.

During Closure and Post-Closure, staffing levels will be reduced to align with the level of activity associated with these phases. Prior to initiating Closure activities, BW Gold will revisit environmental and health and safety roles and responsibilities to ensure the site is adequately resourced to meet permit monitoring and reporting requirements. The Mine Manager will maintain overall responsibility for management of Closure and Post Closure activities.

Pursuant to Condition 19 of the EAC #M19-01, BW Gold has established an Environmental Monitoring Committee to facilitate information sharing and provide advice on the development and operation of the Mine, and the implementation of EAC conditions, in a coordinated and collaborative manner. Committee members include representatives of the BC EAO, UFN, LDN, NWFN, StFN, SFN, NFN, BC Ministry of Mining and Critical Minerals (MCM), BC Ministry of Environment and Parks (ENV), and BC Ministry of Forests (MOF).

Pursuant to Condition 17 of the EAC #M19-01, Aboriginal Group Monitor and Monitoring Plan, BW Gold will retain or provide funding to retain a monitor for each Indigenous nation defined in the EAC #M19-01 prior to commencing construction and through all phases of the mine life. The general scope of the monitor's activities will be related to monitoring for potential effects from the Mine on Indigenous nations' interests.

4 Compliance Obligations, Guidance, and Best Management Practices

4.1 Legislation

Federal legislation pertinent to water management includes:

- Canadian Environmental Protection Act, 1999;
- Fisheries Act;
- Metal and Diamond Mining Effluent Regulations (MDMER);
- Impact Assessment Act; and
- United Nations Declaration on the Rights of Indigenous Peoples Act.
- Provincial legislation pertinent to water management includes:
- Declaration on the Rights of Indigenous Peoples Act;
- Drinking Water Protection Act;
- Environmental Assessment Act;
- Environmental Management Act;
- BC Contaminated Sites Regulation;
- Mines Act;
- Health, Safety and Reclamation Code for Mines in British Columbia (Code); and
- Water Sustainability Act.

4.2 Environmental Assessment Certificate and Federal Decision Statement Conditions

Condition 33 of the Mine's EAC #M019-01 requires the holder to develop a Mine Waste and Water Management Plan, in consultation with Aboriginal Groups, MCM, and ENV. The draft plan must be provided to MCM, ENV, Aboriginal Groups and the EAO for review a minimum of 60 days prior to the commencement of construction. BW Gold developed a separate plan to address Condition 33 requirements.

Conditions in the federal DS pertaining to water management include:

> *Condition 3.7: The Proponent shall, from operation through post-closure phase, collect and treat seepage from the tailings storage facility and any other contact water, in accordance with the requirements of the Metal and Diamond Mining Effluent Regulations and the Fisheries Act, before it is deposited into the receiving environment. When treating contact water and seepage, the Proponent shall take into account the water quality thresholds in British Columbia's Water Quality Guidelines for the Protection of Aquatic Life and any water quality standards established under the Yinka Dene 'Uza'hné Surface Water Management Policy and the Yinka Dene 'Uza'hné Guide to Surface Water Quality Standards, for Davidson Creek, Chedakuz Creek, and Tatelkuz Lake, respectively class as class III, class II and class I surface waterbodies under the Yinka Dene 'Uza'hné Surface Water Management Policy.*

Condition 3.8: The Proponent shall develop, prior to construction, measures to maintain instream flow needs in Davidson Creek. The Proponent shall maintain instream flow needs in Davidson Creek during all phases of the Designated Project at a minimum within flow rates recommended by the Proponent in Appendix 5.1.2.6D of the Environmental Impact Statement, unless otherwise authorized by Fisheries and Oceans Canada.

4.3 Existing Permits

BW Gold received *Mines Act* Permit M-246 on June 22, 2021 and *Environmental Management Act* Permit 110602 on June 24, 2021 in relation to the early works program. Part D (Reclamation and Closure Program) Condition C.4 of the *Mines Act* permit pertains to surface water management and monitoring. Permit 110602 authorizes the discharge of treated effluent from the Plant Site construction area SCP.

BW Gold received the amended *Mines Act* Permit M-246 approving the mine plan and reclamation program, superseding the previous version, on March 8, 2023. This plan will be one of the Environmental Management Plans (EMPs) required for Condition C.1. of Permit M-246. Permit M-246 was most recently amended on October 30, 2024. The MSDP is intended to meet the objectives of the Surface Water and Groundwater Management Plan, a requirement of Mines Act Permit M-246 Condition C.4(a)(i)(a). Specifically, the MSDP addresses the following requirements:

- Description and schematics of overall site water management processes and infrastructure (Section 7.1 and 7.2);
- Description of existing water management infrastructure (Section 7.2);
- Detailed monitoring and maintenance procedures, including schedules, for all site water management infrastructure (Section 7.2);
- Contingency plans for maintenance of a water cover in the TSF under variable scenarios (Section 11.3); and
- Contingency plans for storage and management of effluent on the mine site that is unable to be discharged to the environment (Sections 10 and 11).

BW Gold received *Environmental Management Act* effluent discharge Permit 110652 (PE-110652) on May 2, 2023 approving discharge of effluent to surface and ground from the authorized works. This plan meets the monitoring requirements for the following PE-100652 conditions:

- Condition 4.1 – Effluent Flow Measurement: as described in Sections 7.4, 8.0, and 9.0
- Condition 4.2 – Effluent Monitoring Program: as described in Sections 7.4, 8.0, and 9.0
- Condition 4.7 – Groundwater Monitoring Program: as summarized in Section 7.4.4 and 9.0 (KP, 2025)

The Mine has a Northern Health approval for groundwater supply well 3 (ID 31679) for a potable water supply without treatment (May 28, 2012).

4.4 Guidelines and Best Management Practices

Federal and provincial guidelines related to water management include:

- Guidelines for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia (BC Ministry of Energy and Mines (MEM) 1998a);
- Policy for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia (BC MEM & BC Ministry of Environment, Lands and Parks (MELP) 1998b);

- Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (Mine Environmental Neutral Drainage (MEND) 2009);
- Metal Mining Technical Guidance Document for Environmental Effects Monitoring (Environment Canada (EC) 2012a);
- Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Development Activities (Wels et al. 2012);
- Technical Guidance 4. Environmental Management Act Authorizations. Annual Reporting Under the Environmental Management Act. A Guide for Mines in British Columbia (BC Ministry of Environment (MOE) 2016a);
- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2016b);
- Manual of British Columbia Hydrometric Standards (Resources Information Standards Committee (RISC) 2018);
- British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary (ENV 2025);
- Parameters of Concern Fact Sheet: Defining Parameters of Concern for Mine Effluent Discharge Authorization Applications (ENV 2019b);
- Guidelines for Canadian Drinking Water Quality Summary Table (Health Canada (HC) 2020);
- Source Drinking Water Quality Guidelines (ENV 2020a);
- British Columbia Environmental Laboratory Manual (ENV 2020b);
- Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME 2021);
- British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (BC WLRS 2024); and
- BC Field Sampling Manual (Province of British Columbia 2021).

5 Adaptive Management Framework

Risks and potential impacts of mining and waste discharges to water quantity and quality are assessed in Chapter 5 of BW Gold (2022). Potential impacts were assessed based on a comparison of baseline conditions to modelled conditions, incorporating Project components and with the implementation of mitigation measures, and comparison to environmental guidelines and thresholds as appropriate. A summary of the potential impacts on water quantity and quality is presented in Section 5.1, and the adaptive management framework based on the mitigation measures and results from monitoring programs is presented in Section 5.2.

5.1 Risks and Potential Impacts

5.1.1 Water Quantity

Risks and potential impacts related to water quantity from mine development have been evaluated through the LoM WBM (KP 2021a, 2022a). The LoM WBM simulates water management flows, surface water flows, and groundwater flows using one continuous model that is built out through the entire life cycle of the mine. Flows in Davidson Creek downstream of Mine facilities are predicted to decrease during Operations through Post-Closure. The FWR is the measure proposed to mitigate the impacts on water quantity in Davidson Creek. The FWR will be constructed downstream of the TSF and the associated seepage collection works; the purpose of the FWR is to maintain a suitable source of fresh water to reduce potential environmental impacts in Davidson Creek. Average annual flows in Davidson Creek immediately downstream of the mine site are predicted to decrease by up to 47% in Operations and Closure relative to baseline flows. Average annual streamflows are predicted to decrease by up to 43% in Creek 505659 (a tributary to Creek 661) and by up to 11% in Creek 661 relative to baseline flows during the life of the Mine. This is attributed to development of the portion of the Open Pit that is in the Creek 661 watershed, which will capture runoff and groundwater flows, as well as construction of the TSF C and the TSF closure spillway which will overlay a small portion of the Creek 661 catchment. Chedakuz Creek is predicted to experience a reduction in streamflow due to the changes in streamflow at both Davidson Creek and Creek 661; average annual flows in Chedakuz Creek are estimated to decrease by up to 12% compared to baseline during operations and by 1% during Post-Closure.

Potential impacts to groundwater flows include a reduction in groundwater elevation as a result of Open Pit dewatering and depressurization wells. Flooding of the pit will be accelerated once mining ceases by diverting contact water to the pit.

The following gaps and uncertainties in the LoM WBM could present a risk to surface water and groundwater quantity:

- The majority (90%) of mill water demands are sourced from the TSF, with the remaining 10% sourced from the pit dewatering, Waste Stockpile runoff, the WMP and the FWR. Water availability from the TSF may be lower in winter months due to build up of ice, which could increase reliance on water from the WMP and the FWR.
- Less water available from Open Pit groundwater dewatering and the pit sump to serve as a reliable freshwater source for the mill during all seasons and climate conditions, which could require additional water to be sourced from the WMP or FWR.
- Less water available in the FWR from direct precipitation, non-contact runoff from the un-diverted catchment, non-contact diverted flows from the North Diversion during Years+7 to +23, and water pumped from the WMP, potentially requiring additional flows from Tatelkuz Lake water via the Fresh Water Supply System (FWSS) to mitigate risks in Davidson Creek.

- Risks to surface water and groundwater quantity if the mitigation measures fail or if flow changes are outside the range predicted by the LoM WBM will be addressed through Adaptive Management.

5.1.2 Water Quality

Risks and potential impacts to water quality from mining and waste discharge have been evaluated through the Mine Water Quality Model (Lorax 2021, 2022c), which integrates results from the LoM WBM as well as geochemical source terms, treatment systems, and the mine plan. Several plans, mitigations, and contingencies are in place to ensure the Mine meets its environmental obligations, including EA Certificate Condition 26 which requires the Mine to not cause downstream exceedances of BC WQGs or approved SBEBs. The Mine design since the EA Certificate Application has been refined with full consideration of BW Gold's obligations under the EA Certificate, the Mines Act, and the Environmental Management Act, and includes the construction and operation of two active WTPs as key mitigation features.

The WTPs represent an important backstop to prevent Mine contact waters from directly discharging to the receiving environment and prevent non-compliance with Condition 26. As such, several contingencies and mitigations have been or are committed to being developed to ensure the ongoing effective operation of the WTPs and/or water management in the event of a temporary pause in treatment. Specifically, BW Gold has developed contingency plans for water treatment during the Construction and Operations phases, and will develop a Trigger Response Plan for effluent discharges. It is anticipated that these plans will be refined as the Mine progresses and will be carried to the Post-Closure phase.

During the Construction phase, key risks to water quality are driven by sedimentation and erosion (e.g., via site clearing, grading, grubbing, construction, etc.). In the absence of mitigation, these components have potential to contribute to elevated levels of turbidity and total suspended solids (TSS) and parameters associated with suspended sediments (e.g., total metals, total phosphorus [T-P]). Associated activities, such as traffic and establishment of material stockpiles may generate fugitive dust that results in an added contribution of TSS to receiving creeks. Finally, initial material stockpiles and pit area development established during this phase may contribute to the release of metals and nitrogen (N) species to the aquatic environment. EMPs developed to address these risks include the Construction Environmental Management Plan, the Surface Erosion Prevention and Sediment Control Plan, the Soil Management Plan, and Air Quality and Fugitive Dust Management Plan.

During the Operations phase, components and activities that have potential to affect water quality in the absence of mitigation and/or management include ore processing in the mill (and mill by-products that may be ultimately discharged to the receiving environment, such as sulphate and other major ions, N, and metals), ML/ARD associated with waste rock, overburden, ore, tailings, pit walls, and other contact areas, N products from blasting, WTP by-products (e.g., sludge from Metals WTP, high-total dissolved solids (TDS) brine from the Membrane WTP), and operational surface material and traffic (contributing TSS and turbidity). Ultimately, the key pathway through which these components may affect water quality downstream of the Mine is through effluent discharge from the Mine or new or altered seepage and groundwater paths that report to the receiving environment.

With active treatment representing a key mitigation for this phase, discharge of untreated contact water to the receiving environment has potential to cause significant adverse effects to aquatic receptors depending on the parameter concentrations in untreated effluent, and the duration and volume of discharge, amongst other variables. Water quality predictions for the Mine receiving environment have been evaluated from water quality model scenarios in which no treatment benefit is assumed (Lorax 2022a). In that scenario, cadmium (Cd) represents the parameter from which the greatest aquatic risk is anticipated as a result of the high relative magnitude of guideline exceedance and constant duration of guideline exceedance in Davidson Creek. The results of these analyses highlight the importance of treatment for the Blackwater Project. In addition to treatment, several relevant plans have been developed to further mitigate potential effects, including the present document and those listed in Section 2.

During the Closure phase, the Mine area is undergoing decommissioning and reclamation, and contact waters that would otherwise be treated are directed to the pit to accelerate filling. As such, the relative risk of impacts to water quality is considered lower compared to the Operations phase with potential effects driven by sedimentation and erosion that may be associated with reclamation activities.

During the Post-Closure phase, components and activities that have potential to affect water quality in the absence of mitigation and/or management include residual by-products from ore processing in the TSF (sulphate and other major ions, N, and metals), ML/ARD associated with exposed pit walls and residual signatures (e.g., seepage) from reclaimed contact areas, and WTP by-products. Water quality predictions for the Mine receiving environment have been evaluated from water quality model scenarios in which no treatment benefit is assumed in the Post-Closure phase (Lorax, 2022b). Similar results as described above for the Operations phase apply to the Post-Closure phase. Per Mines Act permit M-246 condition C.5.(g)(i), a Post-Closure Water Management Plan was developed to define mitigation strategies for pit lake water quality with the additional objective of minimizing BW Gold's reliance on active treatment in the Post-Closure Phase.

5.2 Framework

The MSDP is a living document with the expectation that the plan will evolve and be updated in response to the results of the mine site and discharge monitoring program that have been developed based on the risks and potential impacts summarized above, changing conditions or development at the site, updates to scientific methods, and through consultation and discussions with Indigenous Groups and other stakeholders. The plan incorporates adaptive management as follows:

- **Plan:** Planned mitigation measures and monitoring programs are identified in Chapter 5 of the Application (BW Gold 2022).
- **Do:** Implementing the mitigation measures described in Chapter 5 of BW Gold (2022).
- **Monitor:** Conducting monitoring programs as described below in Section 7.3 and 8.3.
- **Adjust:** Reviewing qualitative and quantitative triggers for upset conditions to determine whether mitigation measures related to the failure of any component needs to be altered or additional measures implemented. Table 11.1-1 identifies adaptive management actions.

Adaptive management is intended to address the circumstances that will require implementation of alternate or additional mitigation measures to address effects of the Mine if the monitoring shows that those effects are approaching the triggers identified in the MSDP.

6 Site Overview

This section provides an overview of the site surface drainage and baseline environmental conditions during the baseline period as summarized from Chapter 2 of the Application.

6.1 Surface Drainage

Mine facilities are primarily located in the Davidson Creek catchment. Davidson Creek flows northeast from the mine site into lower Chedakuz Creek downstream of Tatelkuz Lake. The TSF, waste stockpiles, low-grade ore stockpile, and most mine site infrastructure areas lie within the upper Davidson Creek watershed.

The footprints of the TSF closure spillway, Plant Site, camp, and a portion of the Open Pit are located in the Creek 661 catchment. Creek 661 flows northeast from the Mine site into upper Chedakuz Creek, which flows into the southeast end of Tatelkuz Lake.

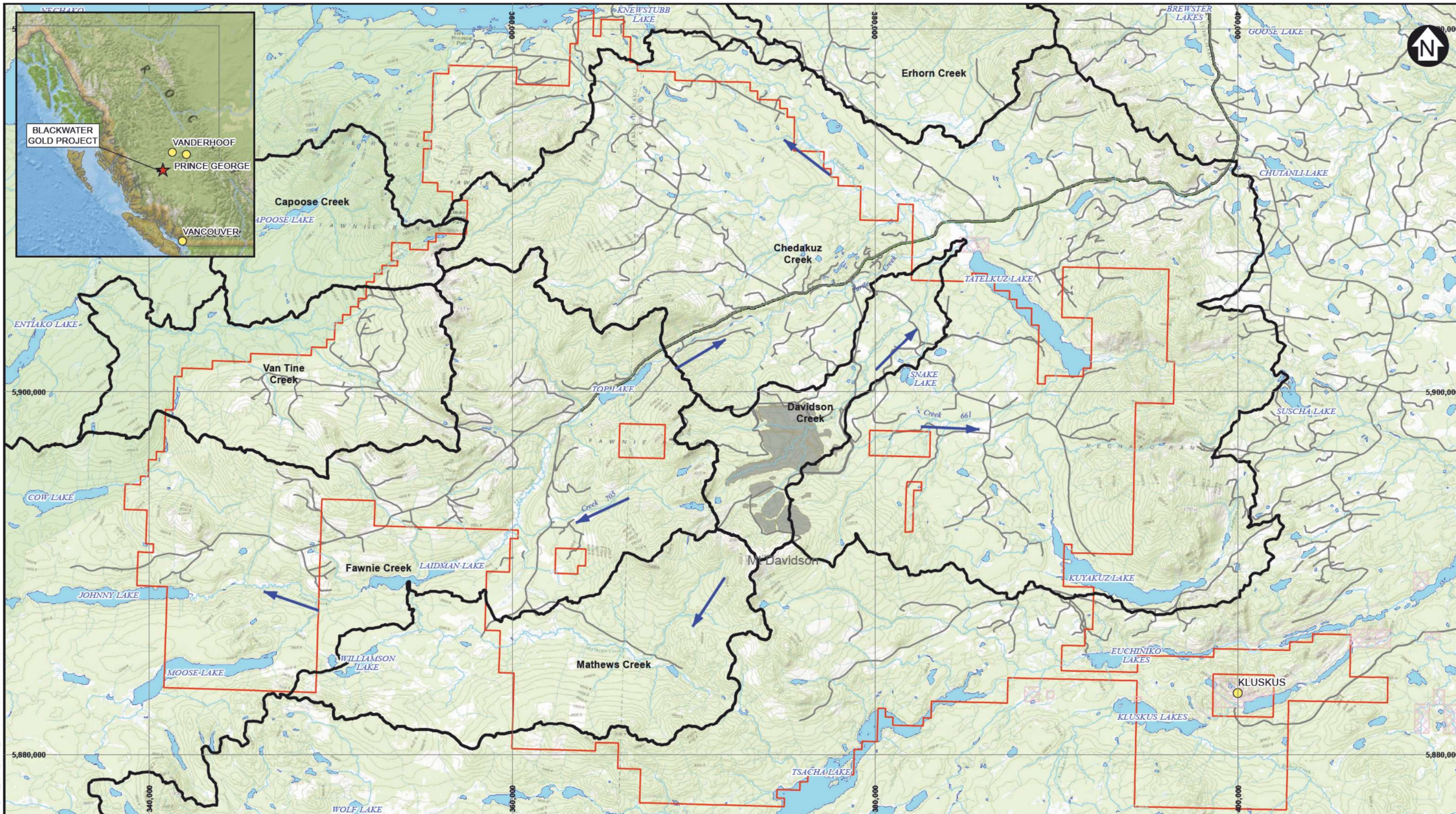
Tatelkuz Lake is located at the outlet of Creek 661 and discharges to lower Chedakuz Creek. Water from Tatelkuz Lake will be used to meet in-stream flow needs (IFN) along Davidson Creek.

Chedakuz Creek flows northwest into the Nechako Reservoir, discharging into the Chedakuz Arm of Knewstubb Lake.

To the west of the Davidson Creek watershed, Creek 705 flows southwest into Fawnie Creek. As part of the fish habitat offsetting plan, the western-most extent of the Davidson Creek watershed (Lake 01682LNRS, upstream of the TSF) will be redirected to flow westward to Lake 01538UEUT, within the Fawnie Creek watershed. There may be times during the Operations, Closure and Post Closure phases when the flows are too great for the pumping systems at the Central Water Transfer Pond, resulting in release of water to Lake 01538UEUT and through the Fawnie Creek Watershed.

The Mine footprint and watershed drainages are presented on Figure 6.1-1.

Adjacent watersheds not predicted to be impacted by the Mine include Snake Lake and Turtle Creek. Snake Lake is located between the Davidson Creek and Creek 661 watersheds and flows in a northeast direction into Tatelkuz Lake. The Turtle Creek watershed is north of the Davidson Creek watershed. Turtle Creek flows north and east before discharging to Chedakuz Creek downstream of the confluence of Davidson Creek and Chedakuz Creek.



Legend

- CITY/TOWN
- FIRST NATIONS RESERVE
- PROPERTY BOUNDARY
- PROPOSED PROJECT FACILITIES
- KLUSKUS FSR
- CATCHMENT BOUNDARY
- FLOW DIRECTION

2 1 0 2 4 6 8 10 km

NOTES:

1. BASE MAP: ESRI ARCGIS ONLINE MAP.
2. COORDINATE GRID IS IN METRES/DEGREES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:200,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. MINE INFRASTRUCTURE FOOTPRINT IS BASED ON 2020 PRE FEASIBILITY STUDY DESIGN.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	28NOV'21	ISSUED WITH REPORT	BTW	BH	JGC

BW GOLD LTD.

BLACKWATER GOLD PROJECT

DRAINAGE AREAS

Knight Piésold CONSULTING

P/A NO.	REF NO.	
VA101-457/33	VA21-02035	
FIGURE 6.1-1		REV 0

SAVED: M:\1\01\00457\33\A\GIS\Figs\VA21-02035\Fig6-1-1_DrainageAreas_r0.mxd; Nov 26, 2021 1:37 PM; kkrauszova

6.2 Meteorology and Climate

Climate baseline data started to be collected at the site in 2011. A baseline climate report summarizing data collected from 2011 to November 2020 is provided in KP (2021d). Meteorological and hydrological characterizations for the Mine, presented in terms of expected long-term climatic and hydrologic conditions at the mine site, are provided in a hydrometeorology baseline report (KP 2021g).

Two climate stations were installed at the site, one at an elevation of 1,050 metres above sea level (masl) in 2011 ('Blackwater Low') and one at an elevation of 1,470 masl in 2012 ('Blackwater High'). In addition, three snow survey stations were established in 2012 between the elevations of 1,051 masl and 1,412 masl. The stations are described further in the 2020 Baseline Climate Report (KP 2021d).

The majority of project facilities are at a similar elevation to the Blackwater High climate station. Mean annual data for the Blackwater High station for the measured parameters are:

- Air Temperature: 2.0°C
- Wind speed: 3.0 m/s
- Relative Humidity: 70%
- Solar radiation: 3.1 kWh/m^2
- Net radiation: 0.5 kWh/m^2
- Precipitation: 595 mm

The long-term mean monthly air temperature for the Blackwater High climate station is presented on Figure 6.2-1, and the estimated long-term mean monthly precipitation for the Blackwater High climate station is presented on Figure 6.2-2.

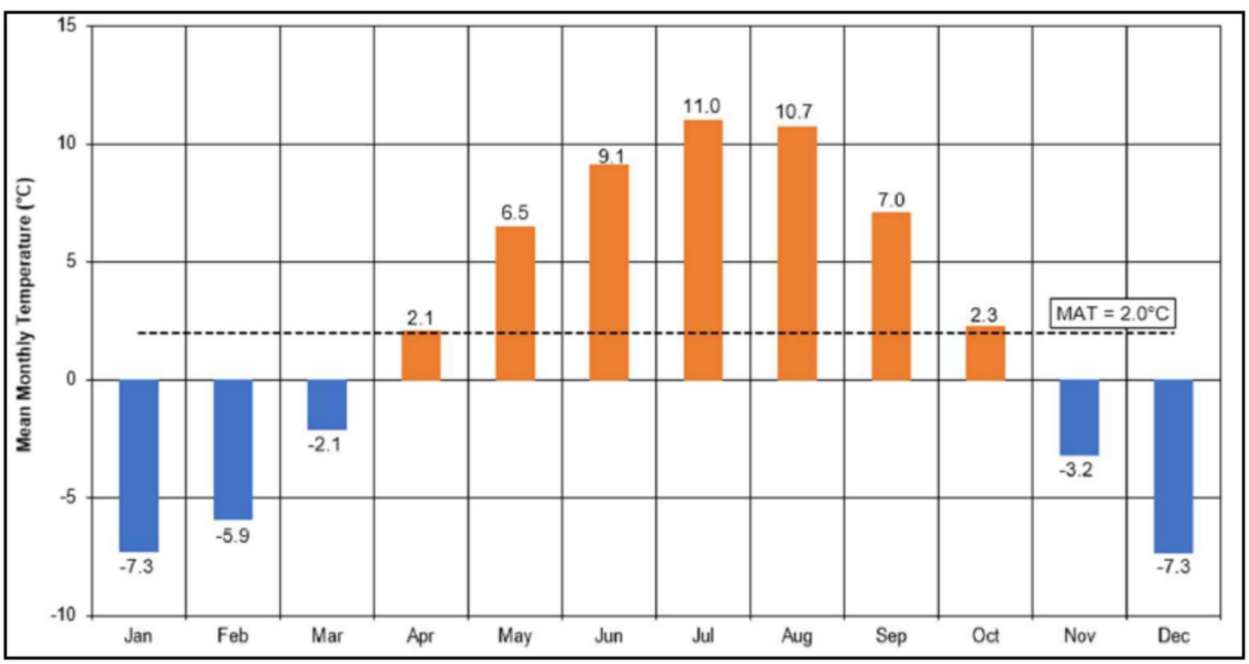


Figure 6.2—1 Blackwater High – Long-Term Mean Monthly Air Temperature

The snow survey station data are used to assess snow accumulation, snow density, and snowmelt patterns. Snow water equivalent values for the winter snowpack are estimated to be generally highest in late March/early April, with the average snowpack melt pattern (snowmelt timing) estimated to be 5% in March, 65% in April, and the remaining 30% in May.

Precipitation is split between rain and snow with approximately 41% of precipitation estimated to fall as snow on an average annual basis.

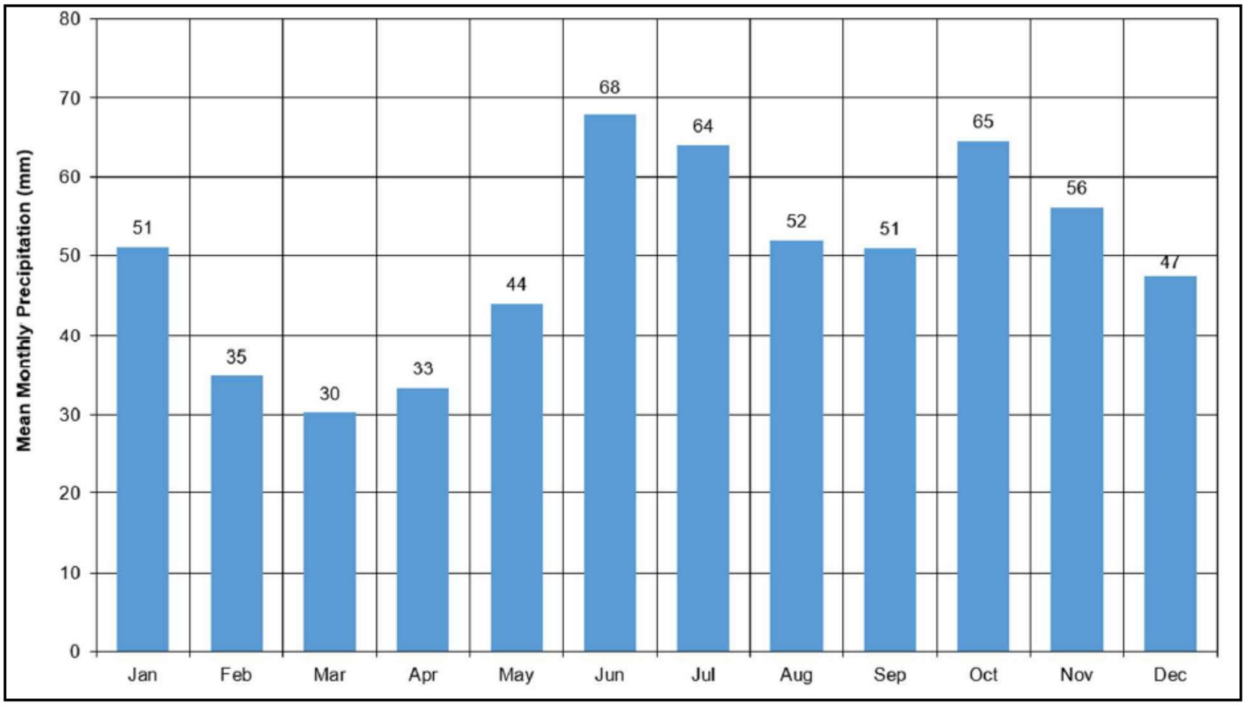


Figure 6.2—2 Blackwater High – Estimated Long-Term Mean Monthly Precipitation

6.3 Water Quantity

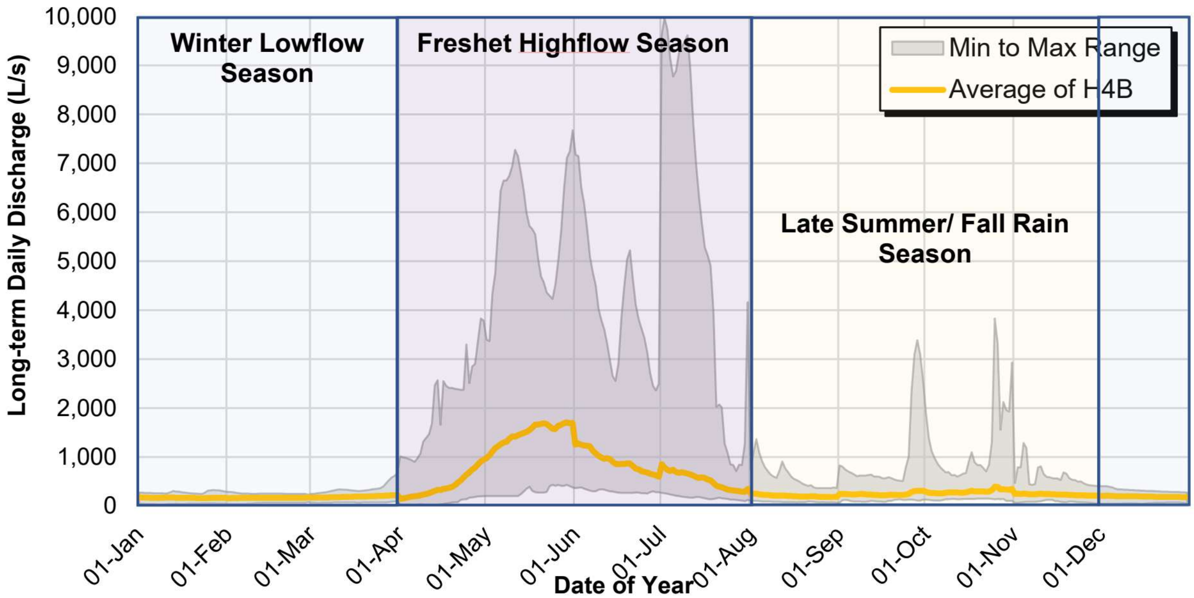
6.3.1 Surface Water Hydrology

There are 19 active hydrology stations (17 streamflow and 2 lake level) in the Mine area. The station history, rating curves, and discharge hydrographs for each hydrology station are presented in the 2020 Hydrology and Water Temperature Baseline Report (KP 2021c). The hydrological assessment of conditions in the Mine area is based on data from 10 of the active 17 streamflow stations.

Stream flow records collected at the Mine were correlated with long-term regional records to develop an estimate of the range of possible hydrologic conditions in the Mine area for use in engineering design and the assessment of long-term hydrologic impacts due to mine operations. Long-term daily discharge series specific to the Mine were developed using frequency paired regression analysis to correlate site and regional flow data. Methodology and results are presented in the 2020 Hydrometeorology Report (KP 2021g).

An example of the hydrograph (average and range) at the hydrology station DC-15 (Previously H4B) on Davidson Creek is provided on Figure 6.3-1. Station DC-15 is approximately 6 km downstream of the FWR. The greatest streamflow variability occurs during the spring freshet period of high flows, and the lowest variability occurs during the low flow summer and winter months. There are two low flow periods evident in the Mine data: a late summer period, generally between August 1 and September 30, and a winter period, generally between November 1 and March 31. The summer low flow period is a result of warm temperatures and low precipitation conditions occurring subsequent to the spring snowmelt period (freshet), while the winter low flow period is a result of precipitation being stored as ice and snowpack. During these low flow periods, stream flows are primarily due to baseflow (shallow groundwater discharge). Prolonged dry and/or freezing periods result in a reduction of groundwater recharge and corresponding groundwater discharge, therefore resulting in a reduction in the baseflows to streams.

Peak flows for the Mine area occur almost exclusively during the spring and early summer freshet period, which typically occurs in May and June. These high flows result from snowmelt events or rainfall combined with snowmelt events.



Note: Long-term synthetic record for DC-15 (Previously H4B) based on the Dean River Water Survey of Canada Gauge (08FC003) for the period 1973-2020.

Figure 6.3—1 Davidson Creek Hydrograph (at station DC-15)

6.3.2 Hydrogeology

Collection of baseline groundwater level data at the Project started in 2012. Characterization of baseline groundwater level conditions was based on water levels recorded in 24 monitoring wells, more than 70 standpipe piezometers, and vibrating wire piezometers installed in 48 drillholes. A baseline groundwater report summarizing the physical groundwater data collected at the Mine, such as water levels and permeability data, and an interpretation of groundwater flow is presented in KP (2021b).

Baseline groundwater flows conditions at the Mine primarily occurred through glaciofluvial (channel and non-channelized) deposits, coarse grained glacial till, and highly weathered bedrock. Groundwater flow in overburden was expected to be restricted by the multiple glaciolacustrine units mapped across the catchment along with lower permeability zones of glacial till and the soil-like horizon of completely weathered bedrock. Groundwater flow in bedrock was conveyed primarily in the highly weathered bedrock, with lesser amounts of flow occurring as preferential flow through fractures in less weathered bedrock. The lower permeability completely weathered bedrock horizon (with a representative hydraulic conductivity of approximately 2x10-8 m/s) in Davidson Creek valley limited groundwater flow to deeper bedrock and functioned as an aquitard due to the high fines content (KP 2021b).

Groundwater elevations in the Mine area were topographically controlled and influenced locally by differences in permeability. Perched water within the shallow overburden was common on lower permeability zones of glacial till or on glaciolacustrine deposits. Water levels across the Mine typically ranged from 3 to 20 m below ground surface (mbgs) but are as deep as 55 mbgs in upper Davidson Creek valley, within the proposed TSF C basin, and 85 mbgs in a zone of higher permeability identified in the deposit area. Downward hydraulic gradients existed in upper Davidson Creek valley upstream of the proposed TSF D Main Dam (Main Dam D) and upward hydraulic gradients existed further downstream near the proposed FWR. Artesian water levels were present at the downslope extent of the deposit, the base of Mount Davidson, and in valleys. Seasonal water level fluctuations were less than 1 m at many of the sites across the proposed TSF basin, indicating little variation in seasonal recharge rates. Water level fluctuations increased up to 7 m at sites hydraulically connected to drainages in Davidson Creek valley and over 10 m in the recharge zone of the deposit.

Depressed water levels were observed along Davidson Creek valley, likely related to a buried sand and gravel deposit. The presence of depressed water levels in these deeper sand and gravel deposits suggested the deposits are buried channels that are hydraulically connected to a downstream discharge location such as Davidson Creek or one of its tributaries. The main buried channel encountered parallel to Davidson Creek was interpreted to daylight near the toe of proposed Main Dam D on Davidson Creek, based on the existing drillhole data.

Groundwater recharge at the Mine occurred along topographic highs such as the deposit area on Mount Davidson and in the headwaters of Davidson Creek and Creek 661. The ability of groundwater to recharge the deeper overburden and bedrock was limited by the presence of low permeability strata or lenses consisting of glacial till, glaciolacustrine deposits, and completely weathered bedrock. Groundwater discharge was expected along the main drainages of Davidson Creek and Creek 661. These drainages flowed year-round, indicating groundwater discharge provided a source of water to sustain streamflow.

6.4 Water Quality

6.4.1 Surface Water Quality

A cumulative baseline surface water quality report is provided in ERM (2020) and the pertinent information is summarized in this section. The surface water quality monitoring program was designed with consideration of provincial guidance documents, EAC conditions, and the Yinka Dene Water Law (YDWL). Twenty-six stream and river sampling sites in the Creek 661, Davidson Creek, Turtle Creek, and Chedakuz Creek, Creek 705, Fawnie Creek, and the Blackwater River watersheds were monitored in the period from 2011 to 2020, as shown on Figure 6.4-1. Sampling sites were classified as near-field, mid-field, and far-field monitoring sites, or reference sites.

Sampling frequency ranged from weekly to annually. The frequency and location of sampling changed over the course of the baseline monitoring program to support updated Project designs, to meet specific Project objectives, and in consultation with regulators and Aboriginal Groups. Seventeen sites were sampled in 2020 at frequencies ranging from quarterly to monthly, and weekly during freshet (May/June) and summer low flow (August/September).

Sampling was performed in accordance with the BC Field Sampling Manual (BC MWLAP 2013). A single stream water quality grab sample was collected at each site. Duplicate samples were collected at approximately 10% of the sites during each sampling trip. Samples were collected in clean, pre-labelled bottles provided by ALS Environmental Services in Burnaby, BC. Water quality results are compared to applicable BC or CCME water quality guidelines for freshwater aquatic life.

The most commonly observed guideline exceedances (BC or CCME) in Project streams were total and dissolved aluminum (Al), total Cd, total chromium (Cr), total and dissolved copper (Cu), and total and dissolved zinc (Zn). Guideline exceedances for each of these parameters were observed in several of the Mine watersheds. Other parameters observed above guidelines in the baseline dataset were nitrite, total arsenic (As), dissolved Cd, total and dissolved iron (Fe), total mercury (Hg), and total silver (Ag). pH was observed below the BC lower guideline limit at one monitoring station in Upper Davidson Creek, but fell within the BC guideline range at all other Project sites.

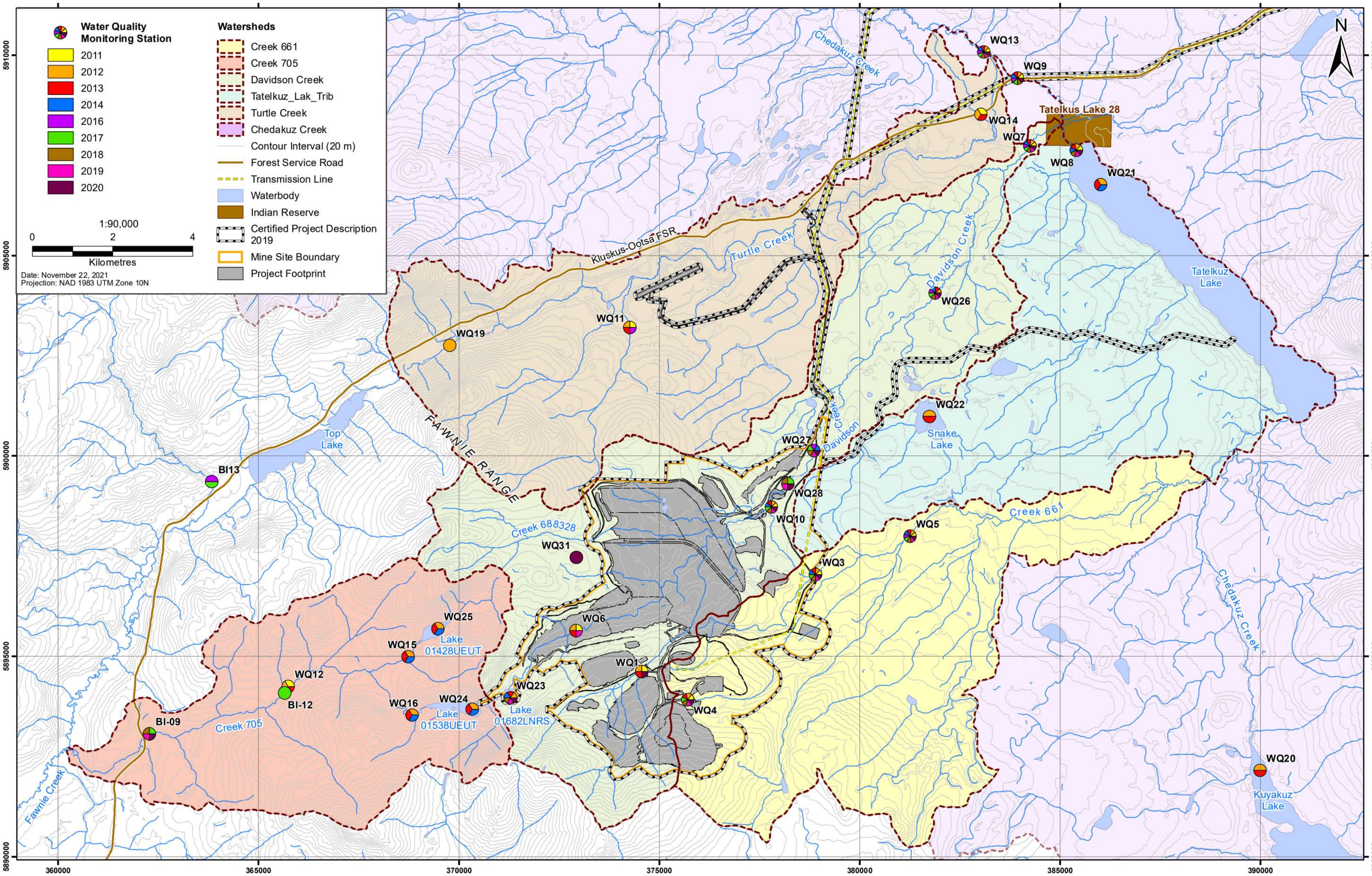


Figure 6.4-1: Surface Water Quality Sampling Locations 2011 - 2020

6.4.2 Groundwater Quality

The baseline groundwater quality data collected at the Mine is presented in the 2020 Groundwater Baseline Report (KP 2021b). The baseline groundwater quality program was developed with consideration of the Water and Air Baseline Guidance Document for Mine Proponents and Operators developed by BC MOE (2016b). Sampling was performed in accordance with the BC Field Sampling Manual (BC MWLAP 2013). Collection of baseline groundwater quality data at the Mine began in 2012.

Characterization of baseline groundwater conditions was based on sampling conducted at 21 monitoring wells, including 19 monitoring wells installed in 2012 and two monitoring wells installed in 2019. The baseline monitoring wells targeted locations that may be affected by mine development or that provided valuable information with respect to water quality intercepted in mine facilities, such as the proposed Open Pit. Paired shallow and deep monitoring wells were installed in separate boreholes at monitoring sites to characterize water quality at different depths.

Groundwater sampling events were typically conducted three times per year from 2012 through 2020. Groundwater sampling generally took place during the seasonal water level high (May/June), water level recession (September/October), and water level low (February/March) to characterize water quality during different conditions of the water level hydrograph.

A quality assurance/quality control (QA/QC) program was implemented at the start of the groundwater sampling program, which included the collection of duplicate, travel blank, and field blank samples. Samples were collected in clean, pre-labelled bottles provided by ALS Environmental Services in Burnaby, BC. Analytical sampling results were assessed against pre set data quality objectives to determine if the results were representative of background formation conditions.

Baseline groundwater in the Mine area was generally characterized as neutral to basic pH, alkaline with strong buffering capacity and variable hardness, which generally increased with depth in monitoring wells. Calcium and bicarbonate were the dominant cation and anion, respectively, in groundwater samples. A slightly higher proportion of sulphate was observed in samples collected from monitoring wells in the deposit area and screened in deeper zones in Davidson Creek valley.

Groundwater sample concentrations were conservatively screened against BC water quality guidelines (aquatic life and drinking water). Guideline exceedances were noted in groundwater samples for dissolved concentrations of Al, As, Cd, Fe, manganese (Mn), and Zn. Concentrations of major anions (chloride, fluoride, and sulphate) did not exceed BC water quality guidelines in any groundwater samples. Nitrogen species were reported at concentrations below BC guidelines in groundwater samples from all monitoring wells. Total organic carbon (TOC) exceeded BC source drinking water quality guidelines intermittently.

7 Mine Site Water Management and Monitoring

7.1 Overview of Water Management

The goal of the water management system is to meet the Mine's operational and potable water demands and requirements while limiting the amount of surplus water stored onsite and minimizing potential adverse effects to the receiving environment. Operational demands are driven by the process plant water needs and the waste management strategy to saturate potentially acid generating (PAG) and metal leaching (ML) waste materials located within the TSF.

Processing plant water demands are a function of the ore throughput rate as shown in Table 7.1-1.

Table 7.1-1 Processing Plant Water Requirements

Phase	Water Demand (Mm^3/month)	Throughput rate (million tonnes per annum (Mtpa)
Phase I (Year 1 to 5)	0.55	5.5
Phase II (Year 6 to 10)	1.2	12
Phase III (Year 11 to 23)	2.0	20

Mine waste generated on site includes PAG and ML waste rock, tailings, as well as non-acid generating (NAG) waste rock and overburden. PAG waste rock and tailings will be stored in the TSF in a saturated condition to limit the potential for acid rock drainage (ARD) and reduce ML. Some NAG waste rock with higher ML potential (NAG3) will be used to construct internal zones of the TSF embankments, with surplus co-disposed of within the TSF so that the interstitial space is saturated within three to five years. Low ML potential waste rock (NAG4 and NAG5) and overburden will either be used for TSF embankment construction, used for site infrastructure (e.g., site roads), used for reclamation, and/or be permanently stored on surface in designated stockpiles.

Low-grade ore (LGO) will be stockpiled for processing later in mine life. LGO is expected to be PAG and will therefore be stored on a lined base with design measures to enhance capture of surface and sub surface contact water in a collection pond so that it can be directed to the lime neutralization system at the processing plant. The neutralized runoff will be directed to the TSF along with the tailings slurry.

Water management objectives relating to the receiving environment include meeting IFN and water quality guidelines or approved Science-Based Environmental Benchmarks (SBEBs) in Davidson Creek and Creek 661. Condition 26 (Water Quality Management) of the Mine's EAC requires that SBEBs be developed in consultation with Aboriginal Groups and ENV considering the YDWL for Davidson Creek, and any other water policies from Aboriginal Groups for Davidson Creek and/or Creek 661 that are made available to BW Gold.

To balance the goals above, BW Gold will recycle water within the Mine areas to the maximum extent practicable to reduce consumptive uses from other freshwater sources. The plan is that 90% of process water will come from recycling water from the TSF. The remaining 10% of mill water demands are from other sources, prioritized as follows:

1. Open pit dewatering system (from within the pit sumps and pit depressurization wells)
2. Mine site treated water and upstream diversion water stored within the Water Management Pond (WMP)
3. Upstream diversion water and Tatelkuz Lake water, stored within the FWR

BW Gold will treat surplus water as needed before discharging water to Davidson Creek. Discharging treated water during the life of mine helps mitigate flow losses in Davidson Creek and reduces the volume of surplus water stored onsite.

The LoM WBM explicitly considers flows associated with the following key mine facilities and processes (KP 2021a):

- Plant Site;
- Open Pit and Pit Lake;
- TSF C and TSF D, including the ponds and water stored in the tailings and waste rock;
- Main Dam D, Main Dam C, West Dam, Saddle Dam;
- Upper and Lower Waste Stockpiles;
- LGO Stockpile;
- Water treatment (Metals WTP, Membrane WTP, and lime neutralization system);
- WMP;
- FWR;
- Surface water diversions (e.g., ditches, diversions channels);
- SCPs;
- Environmental control dams (i.e., the Interim ECD and ECD);
- Seepage collection and interception systems;
- Site water transfers (e.g., potable water, pipelines, water pumped from one location to another); and
- Freshwater Supply System (FWSS).

The water supply sources for the Mine are:

- Runoff from catchment areas upstream of the TSF;
- Precipitation onto the TSF and runoff from the mine site facilities;
- Water recycle from the TSF supernatant pond;
- Groundwater and runoff from Open Pit dewatering and depressurization wells;
- Water extracted from two wells east of the camp area (potable and firewater use); and
- Freshwater from Tatelkuz Lake (primarily to offset flow reductions in Davidson Creek in later phases of mine operations) through the FWSS.

Water losses from the Mine are:

- Discharge from the FWR;
- Evaporation;
- Water retained in the tailings and waste rock interstitial space (voids) in the TSF;
- Groundwater seepage;
- Discharge from the TSF Stage 1 SCP (during Year -2), Plant Site SCP (to ground, until Year -1), and Downstream Aggregate Borrow Area SCP; and
- Entrainment of water in ice in the TSF pond during the winter period.

Simplified schematics during Operations and Post-Closure are reproduced on Figures 7.1-1 through 7.1-7. The water management plan schedule developed to support the Application is shown in Table 7.1-2.

Permit PE-110652, Condition 1.1, authorizes discharge of tailings slurry, mine site contact water, water collected from the seepage interception system, treated effluent, Non-Contact Water from the water diversion systems to the TSF, and discharge from the FWR to Davidson Creek. Permit PE-110652, Condition 1.4, authorizes discharge of treated domestic sewage effluent from the mill, truck shop and wash, and administrative offices located in the Plant Site area to the TSF.

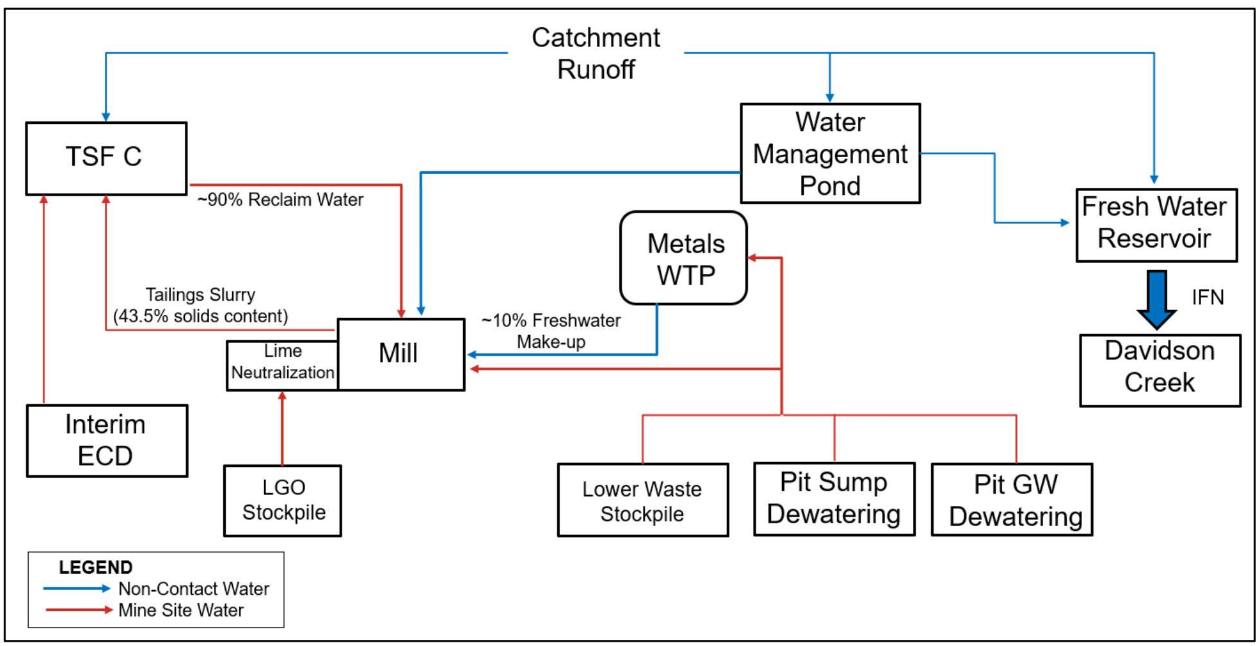


Figure 7.1—1 Simplified Flow Schematic Operations Year +1

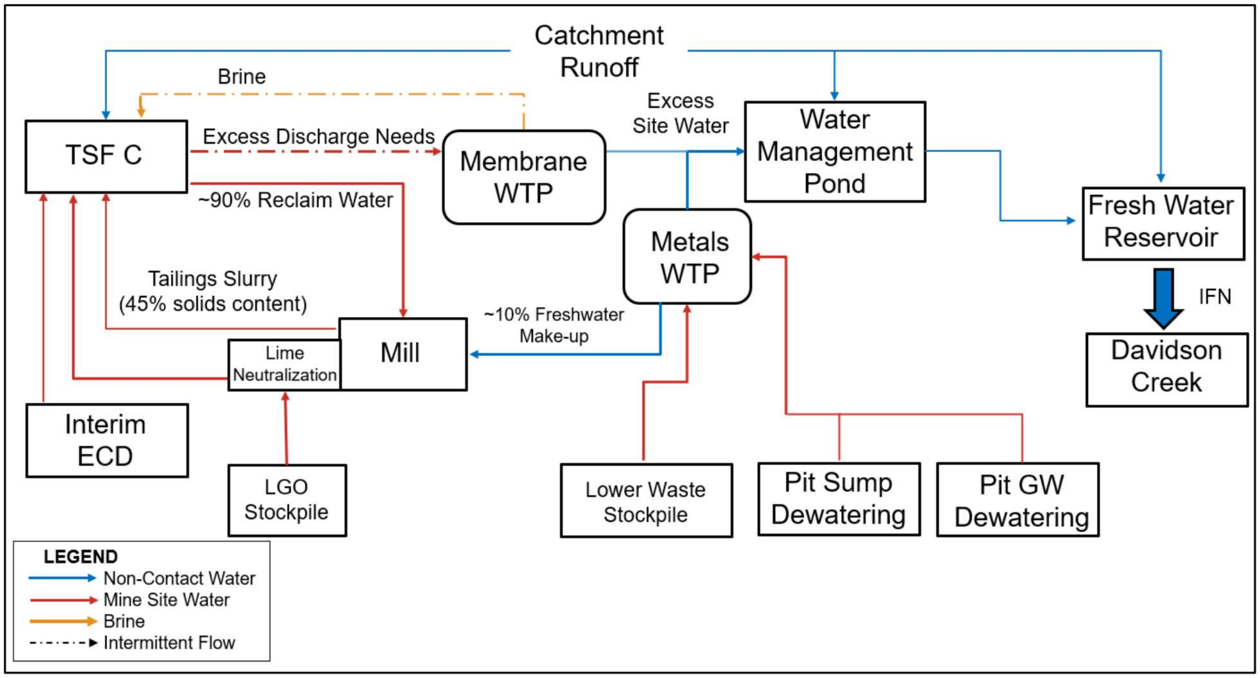


Figure 7.1—2 Simplified Flow Schematic Operations Year +2 to Year +6

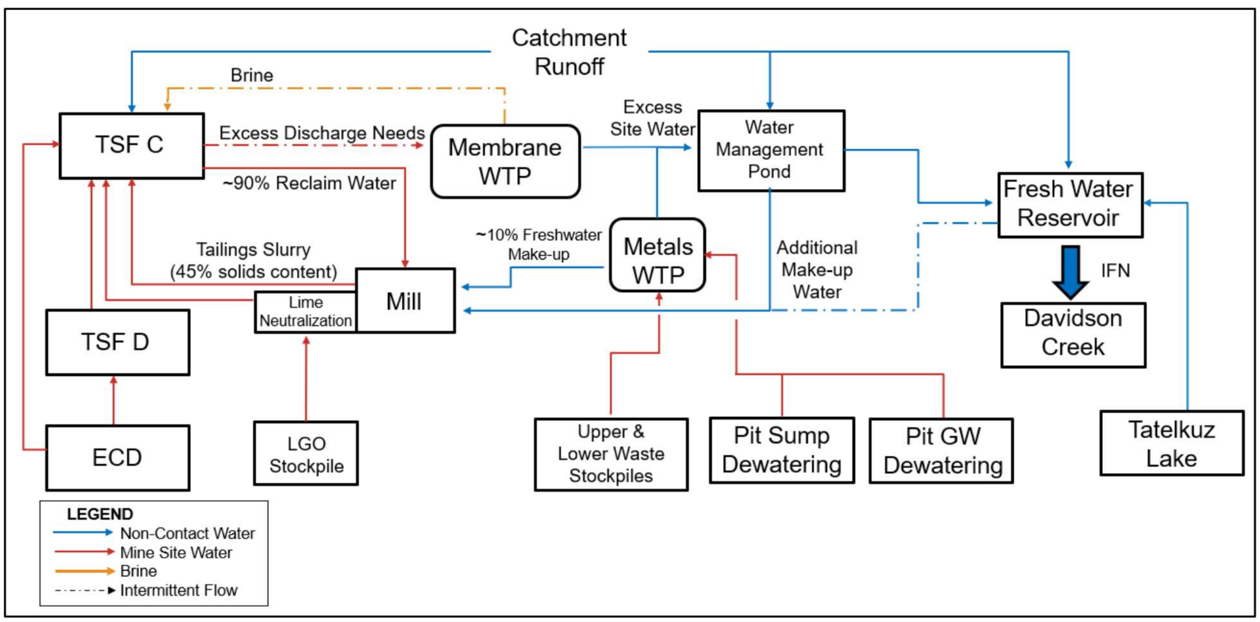


Figure 7.1—3 Simplified Flow Schematic Operations Year +7 to Year +17

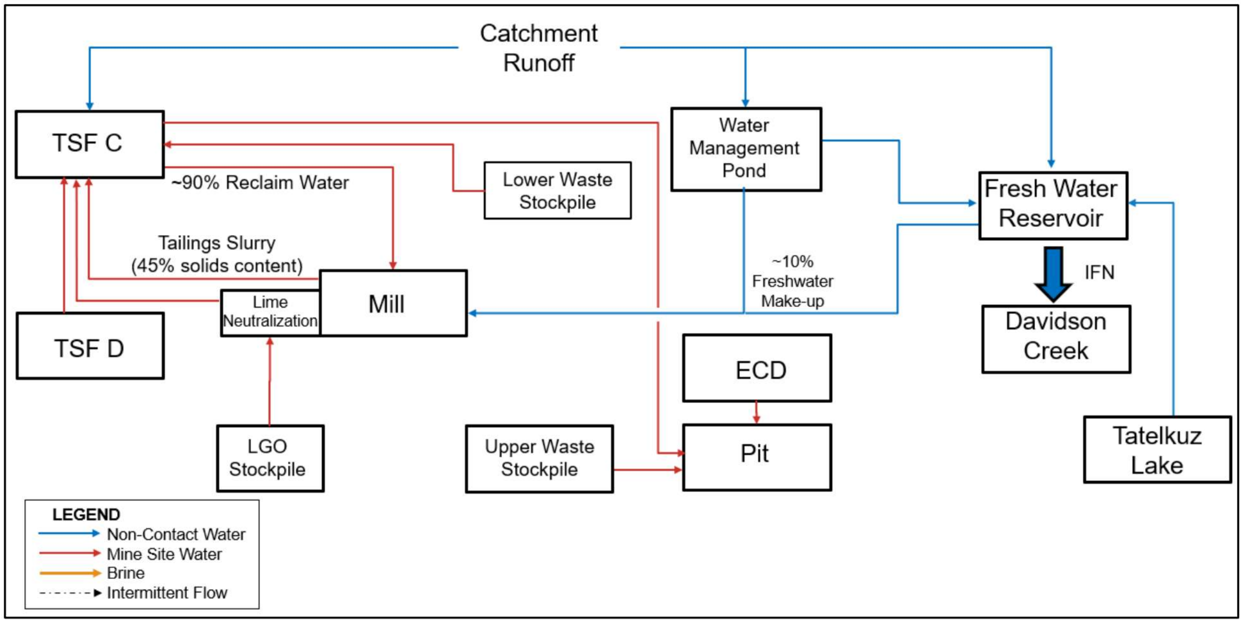


Figure 7.1—4 Simplified Flow Schematic Operations Year +18 to Year +20

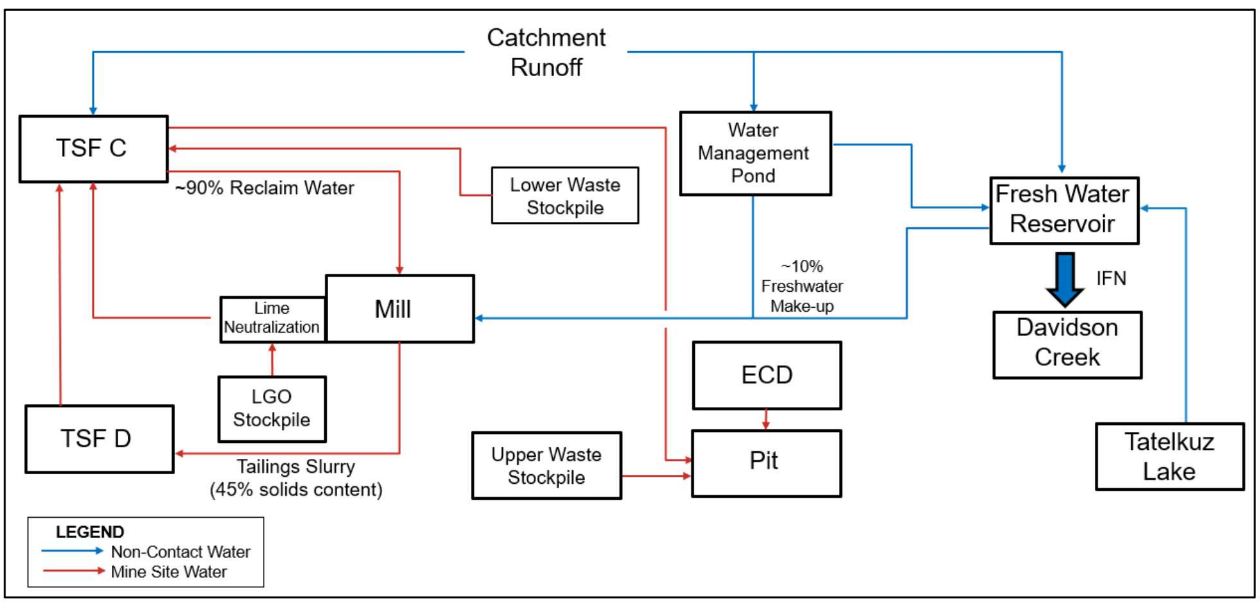


Figure 7.1—5 Simplified Flow Schematic Operations Year +21 to Year +23

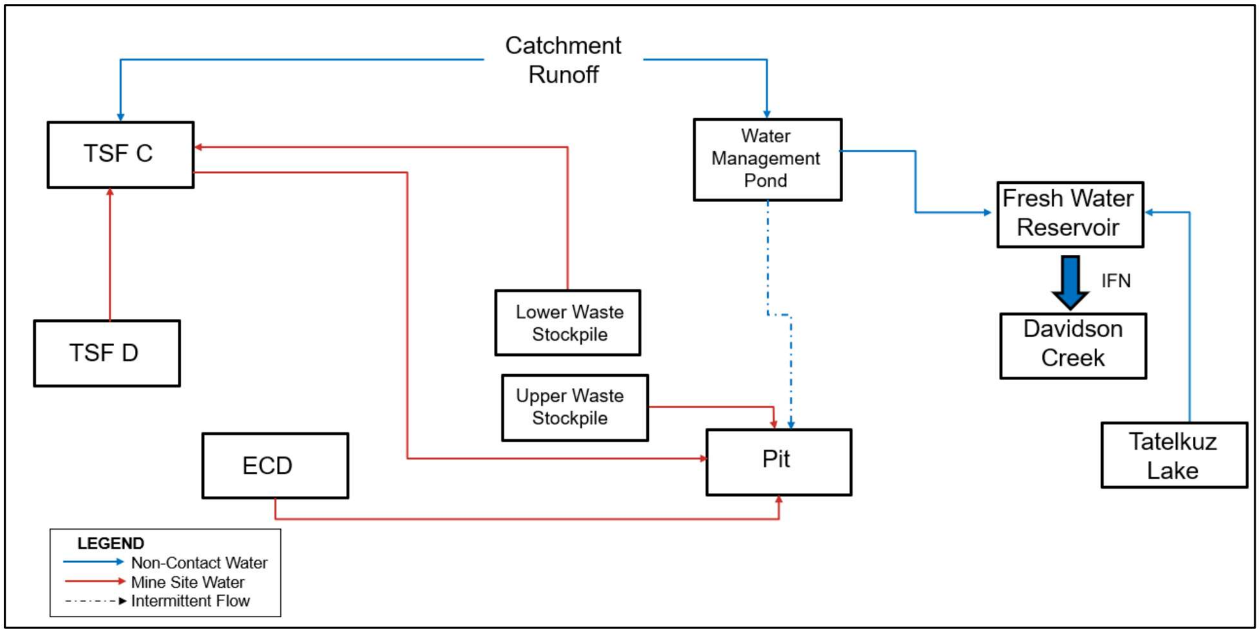


Figure 7.1—6 Simplified Flow Schematic Closure

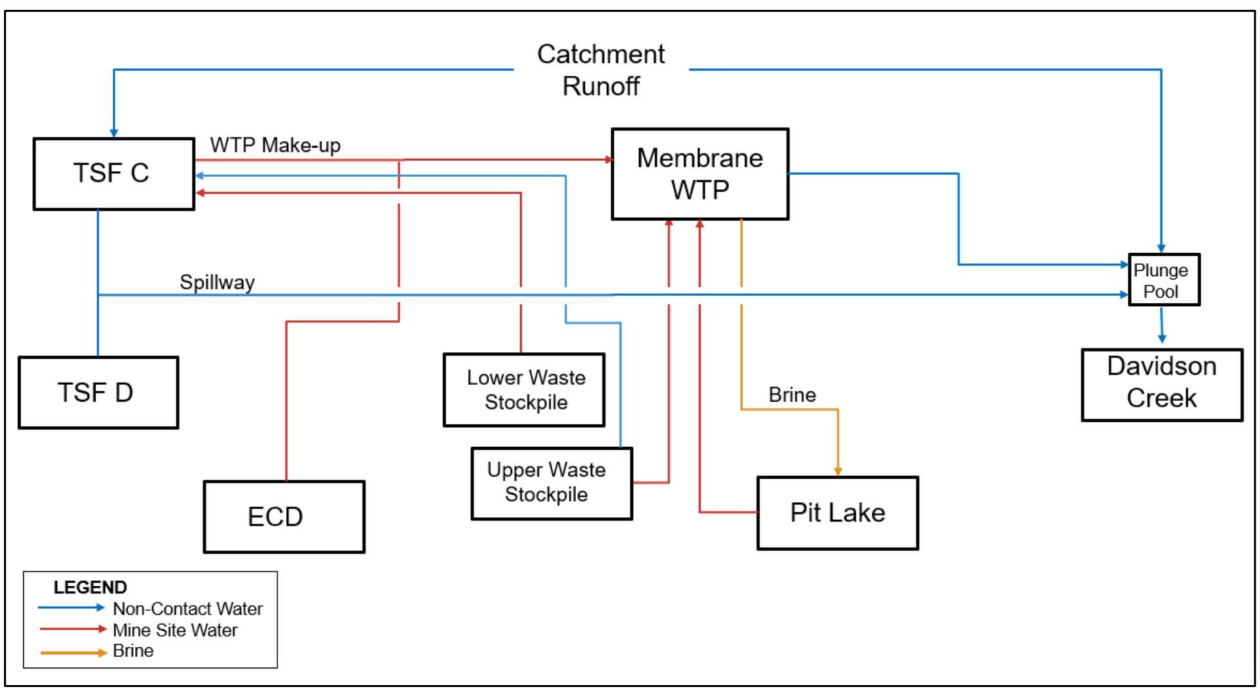


Figure 7.1—7 Simplified Flow Schematic Post-Closure

Table 7.1-2 LoM WBM Timeline of Water Management Plan (Construction through Post-Closure)

Mine Process and Water Management Activity	Construction	Operations (Mine Year)																							Closure	Post-Closure
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Mill																										
Mill Throughput (Mtpa)[2]		4.5	5.5	5.5	5.5	5.5	12	12	12	12	12	20	20	20	20	20	20	20	20	20	20	20	20	7.5	-	-
TSF C																										
Tailings Deposition																										
Waste Rock placed in TSF C																										
TSF C Pond pumped to Mill																										
TSF C Pond pumped to Pit Lake																										
TSF C Pond surplus pumped to Membrane WTP (if required)																										
TSF C Pond discharges via Closure Spillway																										
TSF D																										
Tailings Deposition																										
Waste Rock placed in TSF D																										
TSF D Pond pumped to TSF C																										
TSF D Pond discharges via Closure Spillway																										
Open Pit																										
Open Pit sump and dewatering wells to Metals WTP																										
Pit Lake filling to target elevation																										
Pit Lake pumped to Membrane WTP																										
LGO																										
LGO deposited in stockpiles																										
LGO processed from stockpiles																										
Water collected from LGO Stockpiles to TSF C																										
Water collected from LGO Stockpiles to Lime Neutralization																										

Mine Process and Water Management Activity	Construction	Operations (Mine Year)																							Closure	Post-Closure
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Upper Waste Stockpile																										
Water collected from Stockpile to Metals WTP																										
Water collected from Stockpile to Open Pit																										
Runoff from Stockpile to TSF C and Toe Discharge Collected to Membrane WTP																										
Lower Waste Stockpile																										
Water collected from Stockpile to Metals WTP																										
Runoff from Stockpile to TSF C																										
Interim ECD																										
Interim ECD collect seepage from TSF C & Pumpback to TSF C																										
ECD																										
ECD and Seepage Collection System collects seepage from TSF																										
ECD pumped to TSF D																										
ECD pumped to Pit Lake																										
ECD pumped to Membrane WTP																										
WMP																										
Water Management Pond surplus contributes to Mill freshwater																										
Water Management Pond surplus pumped to FWR																										
Water Management Pond to Pit Lake (Summer through Winter)																										
FWR																										
Fresh Water Reservoir discharges to Davidson Creek																										
FWSS																										
Pumps water from Tatelkuz Lake																										
Diversions																										
Central Diversion Area directed to WMP																										

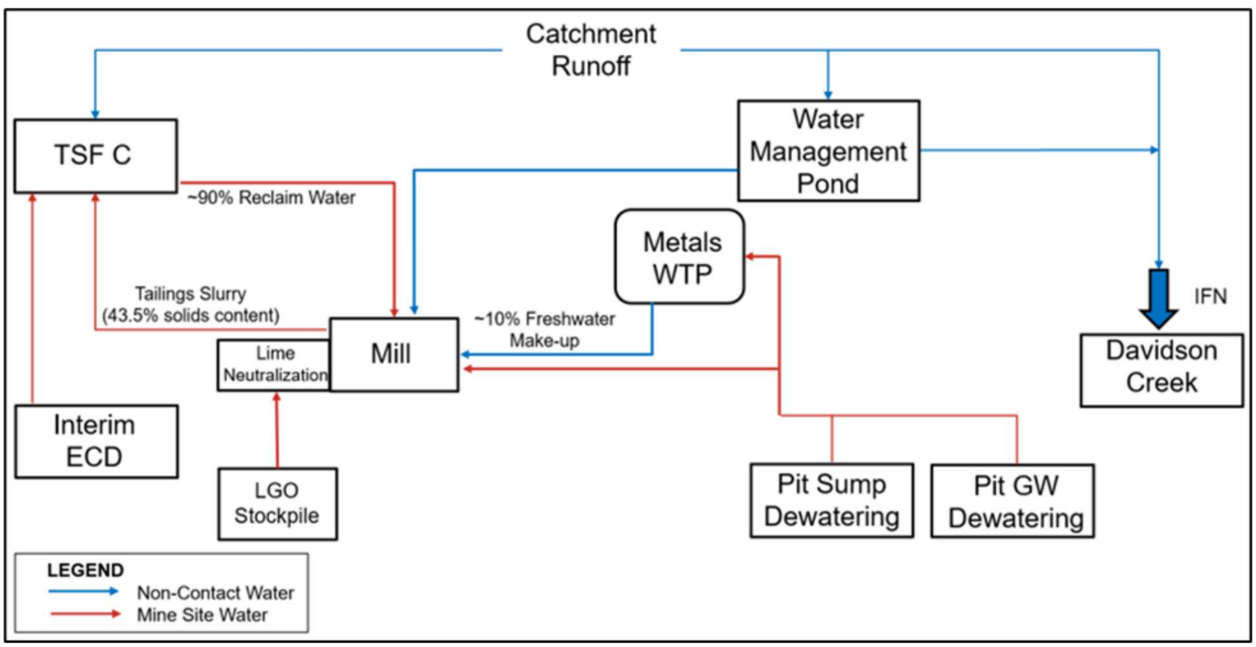
Mine Process and Water Management Activity	Construction	Operations (Mine Year)																							Closure	Post-Closure
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Central Diversion Area directed to Plunge Pool																										
Northern Diversion Area directed to FWR (and TSF as required)																										

Notes:
Post-closure begins when the Pit Lake reaches its target elevation and water discharges from the TSF via the closure spillway.
Mtpa = millions tonnes per annum.

7.2 Existing Water Management Infrastructure

A summary of the existing water management infrastructure at the Mine is provided below. Discussion of monitoring and maintenance procedures and schedules is summarized in this section, further detail is provided in BW Gold plans, which are developed and updated as water management infrastructure are constructed. Figure 7.2-1 presents a simplified schematic illustrating overall water management at the Mine in Year 1.

- TSF C - Stage 1A
- Water Management Pond
- Surface water diversions, including:
  - Central Diversion System
  - Lake 15-16 Diversion
- Sediment Control Ponds, including:
  - Plant Site SCP
  - TSF Stage 1 SCP (construction only)
- Interim Environmental Control Dam



Note: Construction of the LGO Stockpile liner and Collection Pond is underway. Stockpiling of ore has not begun.

Figure 7.2—1 Simplfied Flow Schematic Year 1

7.2.1 TSF C – Stage 1A

7.2.1.1 General

The Blackwater Mine TSF C is situated within the upper Davidson Creek catchment area and comprises a valley-fill style impoundment formed by construction of Main Dam C within the upper reaches of Davidson Creek drainage area. The interim Stage 1A configuration of TSF C was completed in 2024 to facilitate storage and containment for the first six months of mine operations. Stage 1A TSF C comprises the following relevant components:

- Main Dam C is a zoned water-retaining earth-rockfill dam constructed up to crest elevation El. 1,263 masl. The Stage 1A dam is approximately 750 m in length and averages 20 m high, with a maximum height of approximately 50 m where Davidson Creek is heavily incised. The Main Dam C includes internal filters and drainage to convey seepage and control pore water pressures within the dam. The Main Dam C upstream bench, currently constructed to approximately El. 1,242 masl, is to be maintained at or above the adjacent PAG/NAG3 waste rock dump crest elevation at all times, which is projected to reach approximately El. 1,246 masl by the end of the initial six months of operations. The downstream buttress shall be maintained at El. 1,235 masl during Stage 1 of mine operations.
- PAG/NAG3 Waste Rock Disposal Area (WRDA) is being used to dispose of waste rock directly upstream of Main Dam C during the initial 6 years of operations (duration depending on the operational mining rate). Waste rock is dumped by the mine haul fleet and spread with a bulldozer.
- Tailings distribution system will deposit tailings into TSF C from one or more points on the west side of the facility, while PAG/NAG3 waste rock is disposed of directly upstream of Main Dam C (planned to continue for approximately the first six years of operations). Tailings and supernatant water will abut the western (upstream) side of the PAG/NAG3 WRDA during Stage 1A.
- Tailings Beaches will initially develop between the discharge location at the southeast side of the facility and the WRDA, as tailings discharge down-gradient towards Main Dam C.
- Supernatant Ponding will develop from tailings deposition and is anticipated to form at the interface between the tailings disposal area and PAG/NAG3 WRDA. The positioning of the supernatant pond adjacent to the PAG/NAG3 WRDA will saturate the waste rock interstitial space (to meet geochemical objectives).
- Reclaim water system is active to reclaim supernatant water for use in the mill.
- Stage 1A Emergency Spillway is established for emergency discharge of water following extreme storm events and has been designed to pass the Inflow Design Flood.

7.2.1.2 Maintenance

Timely completion of maintenance, particularly recommendations following inspections by Facility staff and/or professionals are needed for safety and minimizing the potential risk of loss of services of the TSF C. Maintenance activities include the following:

- Access maintenance including grading and snow removal to always ensure safe access. In addition, snow must be cleared up or removed from all access points, pump pads, and working areas to provide safe access for daily inspections and maintenance activities.
- Instrumentation maintenance is required to ensure reliable transmission of surveillance data. GNSS rover, datalogger, and network gateway batteries shall be checked regularly, and batteries shall be replaced as needed. Snow/debris shall be removed from drone targets and solar panels and safe access shall be maintained to all regularly inspected instruments.

- Vegetation Removal is required as needed at the spillway stilling basin, as well as on all exterior slopes of the TSF. Vegetation root systems can penetrate and disrupt soil stability as well as obstruct visual observations of the facilities.

7.2.1.3 Monitoring

The surveillance program for the TSF C consists primarily of visual inspections and instrumentation monitoring.

Visual inspections of TSF C include coverage of the following:

- Main Dam C including the crest, upstream and downstream slopes, abutments, foundation drain outlets, and emergency spillway
- PAG/NAG3 WRDA including the crest and slopes
- Tailings Beach condition and development
- Supernatant Pond location and extent

The surface and subsurface instrumentation installed within and around the TSF C include the following:

- Vibrating wire piezometers (60 active; 36 in fill, 8 in foundation)
- Slope inclinometers (2 active, 3 planned to be installed in 2025)
- DGPS Survey Monuments (5 active)
- Stage monitoring instrumentation (Manual DGPS survey)
- Seepage monitoring instrumentation (3 to be installed in 2025)
- Aerial photogrammetry and optical imagery (collected approximately quarterly)

7.2.2 Water Management Pond

7.2.2.1 General

The WMP is a lined water management facility constructed along Mine Area Creek and within the ultimate proposed footprint of TSF C. The WMP was constructed prior to mine operations and receives runoff from the Mine Area Creek catchment and water pumped from other water collection systems. The WMP is formed using natural topography enclosed by the construction of three earthfill berms referred to as the West Berm, North Berm, and East Berm, with a maximum containment volume of approximately 672,000 m^3. The WMP berms are constructed with a crest elevation of El. 1,325.0 masl and crest widths of 16 m, 12 m, and 12 m for the West Berm, North Berm, and East Berm, respectively.

7.2.2.2 Maintenance

Maintenance activities include the following:

- Servicing and maintenance of mechanical systems according to the manufacturer.
- Checking of heat trace cables at pump station.
- Instrumentation maintenance, examples: checking of data logger batteries, snow/debris removal.
- De-silting and erosion control at all common surface water entry points to the WMP.
- Vegetation removal at the spillway stilling basin, as well as on all exterior slopes and crests of each of the WMP berms.
- General housekeeping of the WMP access points, pump pads, working areas.

7.2.2.3 Monitoring

The surveillance program for the WMP consists primarily of visual inspections and instrumentation monitoring.

Visual inspections of the WMP include coverage of the following:

- North, East, and West Berms including the crest, upstream and downstream slopes, abutments, and liner
- WMP Water Management including water level, spillway, North Berm foundation drain, West Berm outlet pipes, and pumping infrastructure
- Soil Cut Slopes along the south and west sides of the WMP

The surface and subsurface instrumentation installed within and around the WMP include the following:

- Vibrating wire piezometers (18 active)
- Slope inclinometers (3 active)
- DGPS Survey Monuments (3 active on West Berm, 5 active on North Berm, and 3 active on East Berm)
- Stage monitoring instrumentation (Manual DGPS survey)
- Aerial photogrammetry and optical imagery (collected approximately quarterly)

7.2.3 Central Diversion System

The Central Diversion System (CDS) was constructed to divert freshwater around the TSF to a tributary of Davidson Creek or to a water transfer pond where the flows can be pumped to the WMP. The design of the CDS was separated into two phases, as the system components will need to be relocated in approximately Year +6 due to the expanding footprint of the TSF. Phase 1 of the CDS will be operational from Year -1 to Year +6, while Phase 2 will be operational from Year +7 to Post-Closure.

The design of the Phase 1 CDS is presented in the Water Management Structures Detailed Design Report (KP 2021i), included as Appendix 3-O. The Phase 2 CDS is presented in the TSF Life of Mine Design Report (KP 2021e), included as Appendix 3-K of the Application.

The primary components of the Phase 1 CDS are:

- Diversion and collection channels;
- Water transfer pond; and
- Pipeline and pump system.

The Phase 1 Central Water Transfer Pond (CWTP) is constructed upstream of the TSF within the Davidson Creek watershed in the general vicinity of the existing exploration access road and has a total contributing catchment area of approximately 8.6 km^2. Water collected in the Central Water Transfer Pond can be pumped to the WMP or overflow through a spillway to TSF C, as required

The primary components of the Phase 2 CDS are the same as in Phase 1; however, the components are located further upstream to accommodate construction of the West Dam for TSF C. Two collection channels will be constructed to route water around the TSF to the Phase 2 Central Water Transfer Pond. The Phase 2 Central Water Transfer Pond is created by impounding water upstream of the West Dam and will have a total contributing catchment area of approximately 5.5 km^2. The pond will receive inflows from Davidson Creek and the Phase 2 North and South Collection Channels.

Water will be pumped from the CWTP to the WMP during the Operations and Closure phases, and into the TSF C spillway and directed to the plunge pool in Davidson Creek in post-closure.

7.2.3.1 Maintenance

Maintenance activities include the following:

- Servicing and maintenance of mechanical systems according to the manufacturer.
- Checking of heat trace cables at pump station.
- Instrumentation maintenance is required to ensure reliable transmission of surveillance data (examples: checking of data logger batteries, snow/debris removal).
- De-silting and erosion control at all common surface water entry points to the CDS.
- Vegetation removal at the spillway stilling basin, as well as on all exterior slopes and crests of each of the CDS berms.
- General housekeeping of the CDS access points, pump pads, working areas.

7.2.3.2 Monitoring

The surveillance program for the CDS consists primarily of visual inspections and instrumentation monitoring.

Visual inspections of the CDS include coverage of the following:

- CWTP Berm including the crest, upstream and downstream slopes, abutments, and emergency spillway
- CWTP Water Management including water level, spillway, and pumping infrastructure
- CDS Diversion and Collection Channels including obstructions and liner condition

The surface and subsurface instrumentation installed within and around the CDS include:

- Vibrating wire piezometers (2 active in berm fill)
- Survey monuments (DGPS)
- Stage monitoring instrumentation (Manual DGPS survey)
- Aerial photogrammetry and optical imagery (collected approximately quarterly)

7.2.4 Lake 15-16 Diversion

7.2.4.1 General

The Lake 15 – 16 Diversion Berm, Connector Arm and Channel were constructed to prevent water from flowing from Lake 16 into Davidson Creek and subsequently through the mine site. The Diversion Berm is paired with the Lake 15 – 16 Connector Arm and Channel to convey water from Lake 16 into Lake 15 and allow fish migration between the two lakes. This channel is a fish habitat offsetting project approved through FAA HPAC 21-HPAC-01447.

7.2.4.2 Maintenance

Visual inspections of the Lake 15-16 Diversion include coverage of the following:

- Inspection of geometry and condition of the diversion berm crest, upstream and downstream slopes, and abutments
- Water levels and obstructions in the Lake 15/16 connector channel

7.2.4.3 Monitoring

The surface and subsurface instrumentation installed within and around the Lake 15-16 Diversion include:

- Survey-monuments installed at the crest and downstream slope of the Diversion
- Stage monitoring instrumentation (Manual DGPS survey)
- Aerial photogrammetry and optical imagery

7.2.5 Plante Site SCP

7.2.5.1 General

The Plant Site SCP, Collection Channels, and Rapid Infiltration Basins (RIBs) are designed to manage the surface contact runoff from the Plant Site disturbance area. This runoff will be collected by the Plant Site North and South Collection Channels, which are located near the perimeter of the Plant Site and will convey surface contact runoff into the Plant Site SCP located at the northeast corner of the Plant Site. The SCP is designed to provide adequate residence time for sediment to settle out of suspension prior to water discharging into the RIBs. The RIBs are located downstream of the SCP and allow the outflow from the SCP to infiltrate into the surficial overburden layer and avoid overland discharge of water into the surrounding environment. The RIBs were active until valves were closed to the system in June 2024; water will continue to collect in the Plant Site SCP, however it will be diverted to the mill for use in processing.

7.2.5.2 Maintenance

Maintenance activities include the following:

- Clearing of vegetation from the SCP, RIBs, and collection channels, as required.
- Dredging of sediment from the SCP and RIBs, as required.

7.2.5.3 Monitoring

Visual inspections of the Plant Site SCP include coverage of the following:

- Plant Site SCP berm including the crest, upstream and downstream slopes, abutments, and emergency spillway.
- SCP water management including water level, spillway, and pumping infrastructure.
- Collection channels including obstructions and liner condition.
- RIBs including water level, and pumping infrastructure.

Instrumentation incorporated into the Plant Site SCP monitoring plan include:

- Stage monitoring instrumentation (manual DGPS survey)
- Aerial photogrammetry and optical imagery (collected approximately quarterly)

7.2.6 TSF Stage 1 SCP

The Stage 1 TSF SCP is located directly upstream of the IECD and comprises a riprap lined inlet channel and a HDPE lined sediment control pond to collect runoff from the Mine Area Creek and Davidson Creek catchments, and any flows conveyed by the MDC foundation drains. The TSF SCP will provide residence time for settlement of suspended solids prior to discharge into the IECD basin. Outflows from the TSF SCP flow to the IECD pond.

7.2.7 Interim Environmental Control Dam

7.2.7.1 General

Seepage from Main Dam C, groundwater discharge, and surface water runoff will be collected at the IECD, located approximately 500 m downstream of Main Dam C at a topographic low point in Davidson Creek. The IECD will utilize a pumpback system to convey the recovered flows to the TSF C pond. The dam will be maintained in a dewatered condition to the maximum extent practical. Seepage through the IECD will be captured in a foundation drain system and sump. The IECD will be fully constructed prior to the start of operations and was designed to manage seepage and runoff until the construction of Main Dam D beginning in approximately Year +5. The IECD is designed with a maximum storage capacity of approximately 58,000 m^3.

The IECD pumpback system comprises shore-mounted, end-suction, centrifugal pumps equipped with variable frequency drives capable of providing up to 130 m total design head at a design flowrate of 280 m^3/hr. The pump system intake will be located within the IECD pond and will discharge into TSF C with erosion protection as required. The design flowrate was selected to provide capacity to dewater the 1 in 100-year, 24-hour storm event volume, within a period of 14 days while continuously managing seepage inflows.

7.2.7.2 Maintenance

Maintenance activities include the following:

- Servicing and maintenance of mechanical systems according to the manufacturer.
- Checking of heat trace cables at pump station.
- Instrumentation maintenance is required to ensure reliable transmission of surveillance data (examples: checking of data logger batteries, snow/debris removal).
- De-silting and erosion control at all common surface water entry points to the WMP.
- Vegetation removal at the spillway stilling basin, as well as on all exterior slopes and crests of each of the WMP berms.
- General housekeeping of the IECD access points, pump pads, working areas.

7.2.7.3 Monitoring

Visual inspections of the IECD include coverage of the following:

- IECD Berm including the crest, upstream and downstream slopes, abutments, foundation drain outlets, seepage collection sump, and emergency spillway
- IECD Water Management including water level, foundation drain outlet, seepage collection sump, spillway, and pumping infrastructure

The surface and subsurface instrumentation installed within and around the IECD include:

- Vibrating wire piezometers
- DGPS Survey Monuments
- Stage monitoring instrumentation (Manual DGPS survey)
- Aerial photogrammetry and optical imagery (collected approximately quarterly)

7.3 Planned Water Management Infrastructure

7.3.1 Tailing Storage Facility

The TSF is designed to permanently store thickened slurry/tailings, PAG and ML waste rock, provide water for ore processing, and support mine site water balance management. The TSF comprises two adjacent sites, TSF C and TSF D, which in total are designed to hold 469 Mm^3 of tailings and waste rock material and up to 12 Mm^3 of pond storage. Additional freeboard allowances are included in the design to manage seasonal inflows and provide protection for severe natural flooding. The annual filling schedule for the TSF is presented in Table 7.3-1.

Construction of the Stage 1A TSF was completed in 2024, providing storage and containment for the first six-months of mine operations, as discussed in Section 7.2.1. The final raise for the TSF will occur in approximately Year +20 to contain tailings to the end of operations in Year +23. The LoM development plan for the TSF is further described in the TSF Life of Mine Design Report (KP 2021f), which is included as Appendix 3-K. The detailed design of the Stage 1 TSF is presented in the TSF Stage 1 Detailed Design Report (KP 2021g), which is included as Appendix 3-J.

The nominal TSF C and TSF D pond volumes are presented in Table 7.3-2. Nominal pond volumes for TSF C vary over the LoM, as this is the primary water source for the mill, and is based on approximately four months of processing plant water demands. The nominal pond volume for TSF D is 2 Mm^3 from Year 23 forward.

Table 7.3-1 TSF Annual Filling Schedule

Mine Period	Year	Cumulative Tailings (Mm^3)		Cumulative WR (Mm^3)		Supernatant Pond Allowance (Mm^3)	
		TSF C	TSF D	TSF C	TSF D	TSF C	TSF D
1	-2	0	0	0.05	0	0	0
2	-1	0	0	0.6	0	1	0
3	1	3	0	5	0	2	0
4	2	8	0	9	0	2	0
5	3	12	0	12	0	2	0
6	4	16	0	19	0	2	0
7	5	20	0	26	0	2	0
8	6	30	0	32	6	5	0
9	7	39	0	32	17	5	0
10	8	48	0	32	33	5	0
11	9	57	0	32	53	5	0
12	10	67	0	32	75	5	0

Mine Period	Year	Cumulative Tailings (Mm^3)		Cumulative WR (Mm^3)		Supernatant Pond Allowance (Mm^3)	
		TSF C	TSF D	TSF C	TSF D	TSF C	TSF D
13	11	82	0	32	93	10	0
14	12	97	0	32	105	10	0
15	13	113	0	32	122	10	0
16	14	128	0	32	143	10	0
17	15	143	0	32	161	10	0
18	16	159	0	32	174	10	0
19	17	174	0	32	180	10	0
20	18	190	0	32	180	10	0
21	19	205	0	32	180	10	0
22	20	220	0	32	180	10	0
23	21	232	4	32	180	10	2
24	22	232	19	32	180	10	2
25	23	232	25	32	180	10	2

Table 7.3-2 Nominal Pond Volumes

Mine Years	TSF – C Nominal Pond Volume (Mm^3)	TSF – D Nominal Pond Volume (Mm^3)
Year 1	1	-
Year 2 and 3	2 (ramping up in Year 2)	-
Year 4 to 6	5 (ramping up in Years 4 and 5)	-
Year 7 to 10	5	<0.1
Year 11 to 20	10 (ramping up in Year 11)	<0.1
Year 21 to 23	10	2
Year 24 onwards	2	2

The nominal TSF C pond volume equates to approximately four months of processing plant water supply.

The nominal TSF D pond volume is set at 2 Mm3once tailings discharge to TSF D begins.

Based on the filling schedule and water balance modelling, the time to saturate PAG waste rock within the TSF is predicted to be 12 months or less. This is aligned with the ML/ARD Management Plan (Appendix 9-D). The estimated time to saturate PAG waste rock placed in the TSF is presented in Table 7.3-3.

Table 7.3-3 Time to Saturate PAG Waste Rock Placed in TSF

Facility	Mine Year	Approximate time to Saturate (Months)
TSF C	-2 and -1	< 1
	1	1
	2	3
	3	6
	4+	12
TSF D	6	< 1
	>6	3

7.3.2 Open Pit and Pit Lake

Excavation of the Open Pit began in Year -1 and continues through Year +17, with the maximum disturbed area reached by the end of Year +13. Pit dewatering designs are provided in the Open Pit Slope Design report (KP 2021j) , and predicted changes to groundwater due to the mine development are presented in the Numerical Groundwater Modelling Report (KP 2021k).

From Year -1 until approximately the end of Year +17, pit dewatering will be achieved by pumping surface water that collects in the pit sump and groundwater from dewatering and depressurization wells; pit sump water and dewatering and depressurization well water will be sent to the Metals WTP. Water from the pit dewatering system will be treated for metals and sent to the mill to meet the freshwater reclaim requirement, and treated water in excess of the mill freshwater requirement will be sent to the WMP. Open Pit groundwater dewatering rates are predicted to increase from 10 L/s in early mining to 65 L/s as the Open Pit is advanced (KP 2021j) and are predicted to meet the mill freshwater demand in early mining. A zone of groundwater drawdown is predicted to extend outward from the Open Pit perimeter, affecting groundwater levels within a radial distance of up to 2 km south and 1.6 km east (KP 2021k).

Starting in Year +18, when mining from the Open Pit ceases and the LGO is being processed through the mill, a Pit Lake will form from natural groundwater inflows, surface water runoff and precipitation; surplus water pumped from TSF C and the ECD will accelerate filling. In Post-Closure, the surface water elevation of the Pit Lake will be maintained below the pit rim through water withdrawal and conveyance to the Membrane WTP, as required, prior to discharge to the downstream receiving environment. Seepage from the Pit Lake is predicted to report to TSF C, Creek 505659 (a tributary of Creek 661), the TSF Closure Spillway channel, and Davidson Creek. The Pit Lake Seepage Collection System is predicted to capture 85% of the seepage that discharges to the southern tributary of Creek 505659 and convey it to the Membrane WTP.

7.3.3 Low-Grade Ore Stockpile

The LGO Stockpile is located between the Open Pit and TSF C. Higher-grade LGO will be segregated and placed in the LGO Stockpile from Year +1 through Year +9, and then rehandled from the stockpile and processed from Year +9 to the end of Year +15. Lower-grade LGO will be placed in the LGO Stockpile from Year+1 through Year+17, and then rehandled and processed from Year +18 through Year +23.

Drainage from the ore stockpile is expected to be acidic and contain elevated metals; therefore, the LGO stockpile design includes a liner system across the footprint area, a series of non-contact and contact water diversion channels, and foundation drains. All runoff and seepage from the LGO stockpile will be collected in a collection pond conveyed to the lime neutralization circuit at the process plant, and discharged to TSF C.

The LGO Stockpile water management arrangement for Year -1 is shown on Figure 7.3-1 with additional details related to the LGO Stockpile seepage collection system shown on Figure 7.3-2. The LGO Stockpile water management systems required at the start of mine operations are further described in the Stockpiles Geotechnical and Water Management Design Report (KP 2021h), which is included as Appendix 3-N.

7.3.4 Lower and Upper Waste Stockpiles

Overburden and NAG waste rock with low ML potential will be stored in the Lower and Upper Waste Stockpiles. The Lower Waste Stockpile will consist of mostly overburden; it will be placed from Year +1 through Year +10. Overburden (1/3rd) and NAG4 and NAG5 waste rock(2/3rd) will be placed in the Upper Waste Stockpile beginning in approximately Year +11 and continuing to the end of operations. The Lower Waste Stockpile material will be used to support reclamation of the TSF and other infrastructure on the mine site. Any remaining material will be fully reclaimed by the start of Post-Closure, at which time the collection pond will be reclaimed. The Upper Waste Stockpile will be progressively reclaimed during Operations.

Runoff and toe discharge from the Lower Waste Stockpile will be directed to a collection pond during Operations and then to the TSF C starter pond prior to construction of the WMP; to the Metals WTP and then WMP in late Year-1 through Operations; and to the TSF C pond in Year+18 through Closure.

Groundwater seepage from the Lower Waste Stockpile footprint contributes to the TSF C Pond, Main Dam D drains, ECD, South Collection Channel, and the natural tributary contributing to the WMP.

Water from the Upper Waste Stockpile goes to a collection pond and from there to the Metals WTP beginning in Year+11 and continuing through Year+17, and to the Pit Lake from Year+18 through Closure. In post-closure, toe discharge from the Upper Waste Stockpile will continue to be collected in the collection pond and from there will be directed to the Membrane WTP, while runoff from the top of the stockpile will be directed to TSF C.

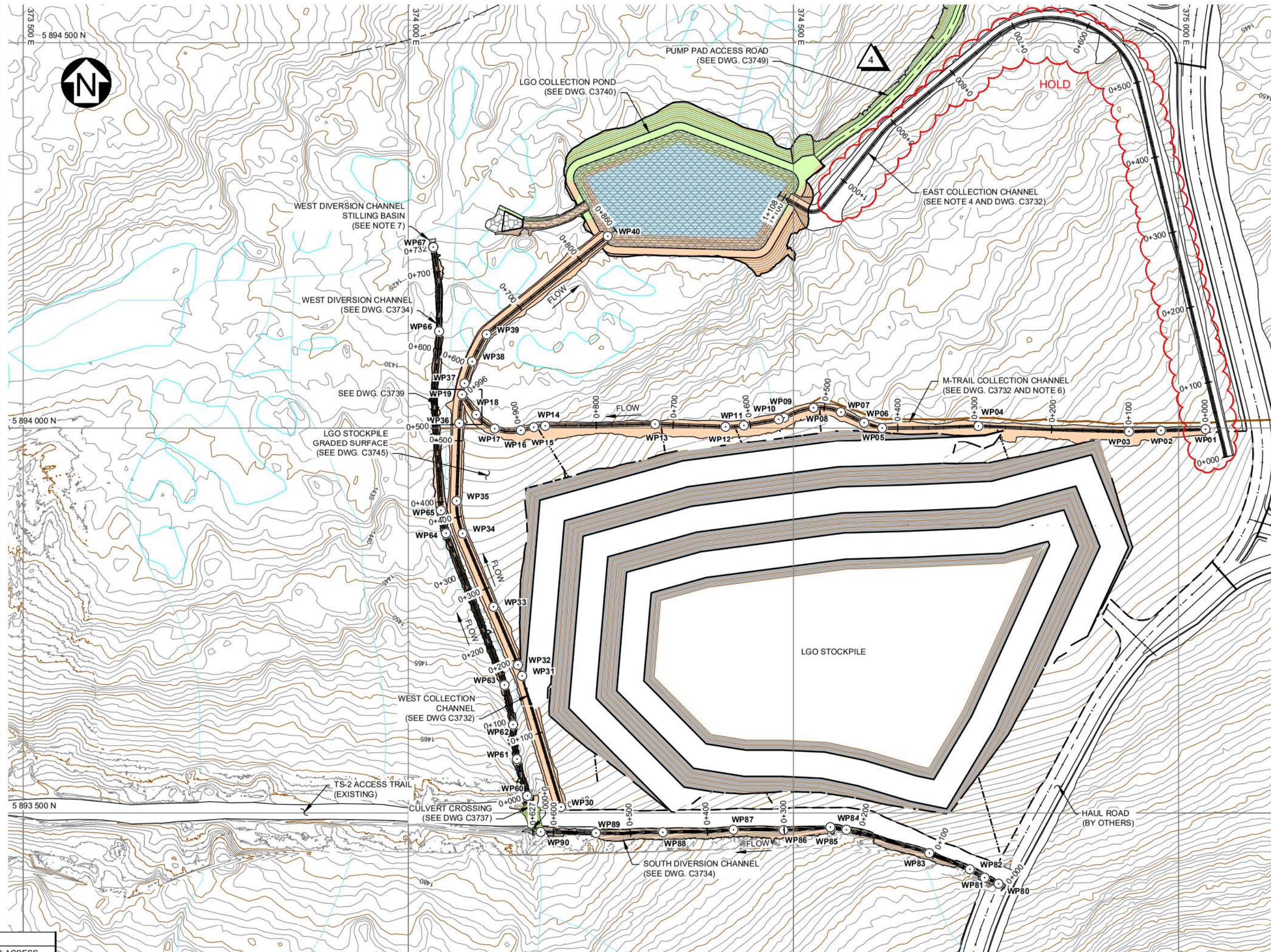
The waste stockpile water management systems required at the start of mine operations are further described in the Stockpiles Geotechnical and Water Management Design Report (KP 2021h).

M-TRAIL CHANNEL WORK POINTS				
POINT NO.	EASTING (m)	NORTHING (m)	ELEVATION (m)	STATION (m)
WP01	375035.1	5893998.7	1470.3	0+000.0
WP02	374977.3	5893996.8	1466.7	0+057.9
WP03	374935.9	5893995.5	1464.6	0+099.3
WP04	374740.4	5894002.6	1454.7	0+294.9
WP05	374615.4	5894000.0	1448.3	0+420.0
WP06	374591.9	5894006.9	1447.1	0+444.5
WP07	374561.8	5894020.8	1446.5	0+477.7
WP08	374526.3	5894026.3	1445.9	0+514.0
WP09	374488.2	5894013.5	1445.2	0+554.5
WP10	374481.1	5894011.2	1445.1	0+562.0
WP11	374435.7	5894003.5	1444.3	0+608.0
WP12	374411.9	5894001.5	1443.9	0+632.0
WP13	374320.6	5894005.3	1442.4	0+723.4
WP14	374177.8	5894002.8	1431.6	0+866.2
WP15	374163.1	5894001.2	1431.4	0+880.0
WP16	374146.3	5893996.9	1431.2	0+898.4
WP17	374112.2	5893999.4	1430.7	0+933.0
WP18	374088.3	5894017.5	1430.3	0+963.5
WP19	374069.8	5894043.4	1429.9	0+994.6

WEST COLLECTION CHANNEL WORK POINTS				
POINT NO.	EASTING (m)	NORTHING (m)	ELEVATION (m)	STATION (m)
WP30	374198.3	5893507.7	1469.7	0+000.0
WP31	374147.9	5893677.8	1453.1	0+177.5
WP32	374142.5	5893692.1	1451.6	0+192.7
WP33	374110.8	5893767.5	1445.6	0+274.5
WP34	374070.6	5893862.6	1439.7	0+377.8
WP35	374062.8	5893904.8	1437.3	0+421.0
WP36	374066.3	5894006.1	1431.5	0+522.4
WP37	374073.0	5894058.0	1429.2	0+574.8
WP38	374083.0	5894086.5	1427.9	0+605.0
WP39	374101.9	5894121.4	1426.2	0+644.9
WP40	374259.0	5894249.1	1420.9	0+847.3

WEST DIVERSION CHANNEL WORK POINTS				
POINT NO.	EASTING (m)	NORTHING (m)	ELEVATION (m)	STATION (m)
WP60	374154.6	5893522.2	1465.3	0+000
WP61	374141.1	5893569.9	1461.3	0+049.6
WP62	374136.1	5893614.6	1457.6	0+094.8
WP63	374124.8	5893665.9	1453.5	0+147.3
WP64	374049.0	5893862.9	1438.8	0+358.5
WP65	374042.5	5893892.7	1437.1	0+389.0
WP66	374040.2	5894125.5	1426.5	0+622.5
WP67	374032.5	5894234.6	1422.3	0+732.2

SOUTH DIVERSION CHANNEL WORK POINTS				
POINT NO.	EASTING (m)	NORTHING (m)	ELEVATION (m)	STATION (m)
WP80	374766.4	5893408.2	1505.8	0+008.4
WP81	374748.5	5893416.1	1504.3	0+028.0
WP82	374729.1	5893426.9	1502.6	0+050.2
WP83	374676.6	5893447.8	1498.3	0+106.8
WP84	374568.8	5893478.3	1489.8	0+219.0
WP85	374547.9	5893481.5	1488.8	0+240.1
WP86	374487.3	5893477.9	1485.9	0+300.9
WP87	374422.4	5893478.4	1482.8	0+365.8
WP88	374330.5	5893475.1	1477.3	0+457.8
WP89	374243.8	5893473.9	1472.0	0+544.6
WP90	374171.8	5893475.5	1470.1	0+617.0



LEGEND:

- MINE WATER
- FILL AREAS
- CUT AREAS
- HDPE LINER
- RIPRAP
- ACCESS ROAD
- FOUNDATION DRAIN
- WP01 WORK POINT

NOTES:

1. FOR GENERAL NOTES SEE DWG. G0006.
2. FOR COLLECTION CHANNEL PROFILES SEE DWG. C3732.
3. FOR DIVERSION CHANNEL PROFILES SEE DWG. C3734.
4. FOR FOUNDATION DRAIN DETAILS, SEE DWG. C3745.
5. EAST COLLECTION CHANNEL FOR VISUAL REFERENCE ONLY, ALIGNMENT TO BE CONFIRMED. TO BE CONSTRUCTED DURING STAGE 2.
6. M-TRAIL COLLECTION CHANNEL TO BE INCORPORATED INTO EXISTING M-TRAIL DRAINAGE DITCH.
7. STILLING BASIN TO BE FIELD FIT COMPRISING RIPRAP D_{50} = 200 (THICKNESS = 400), UNDERLAIN WITH NON-WOVEN GEOTEXTILE WITH 200 mm DEEP STILLING BASIN.

DRG. NO.	DESCRIPTION
G0006	TECHNICAL NOTES
C3749	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - PUMP PAD ACCESS ROAD - PLAN AND PROFILE
C3745	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - SEEPAGE COLLECTION SYSTEM - PLAN AND DETAILS
C3740	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - LGO COLLECTION POND - PLAN AND SECTIONS
C3739	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - M-TRAIL COLLECTION CHANNEL AND WEST COLLECTION CHANNEL CONFLUENCE
C3737	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - TS-2 ROAD CROSSING CULVERT
C3736	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - TS-2 ROAD CROSSING CULVERT EXCAVATION
C3735	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - DIVERSION CHANNELS - SECTIONS
C3734	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - DIVERSION CHANNELS - PROFILES
C3733	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - COLLECTION CHANNELS - SECTIONS
C3732	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - COLLECTION CHANNELS - PROFILES

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

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PERMIT NUMBER
1001011
EGBC PERMIT TO PRACTICE

PLAN
WATER MANAGEMENT SYSTEM
SCALE A

ISSUED FOR CONSTRUCTION

SCALE A 60 30 0 100 200 300 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
4	22NOV'24	ISSUED FOR CONSTRUCTION WITH ACCESS ROAD	JSP	RMM	MJB	DDF
3	16AUG'24	ISSUED FOR CONSTRUCTION WITH COLLECTION POND	JSP	RMM	MJB	DDF
2	15AUG'24	ISSUED FOR CONSTRUCTION	JSP	RMM	MJB	DDF
1	09APR'24	ISSUED FOR CLIENT REVIEW	JSP	SKC	MJB	JGC
0	16NOV'21	ISSUED FOR PERMITTING	KAB	ABN/RAF	CBN	DDF

REVISIONS

PROFESSIONAL ENGINEER – PROVINCE OF BRITISH COLUMBIA – M. J. BARRETT # 50410
2024-11-22

Knight Piésold CONSULTING

BW GOLD LTD.

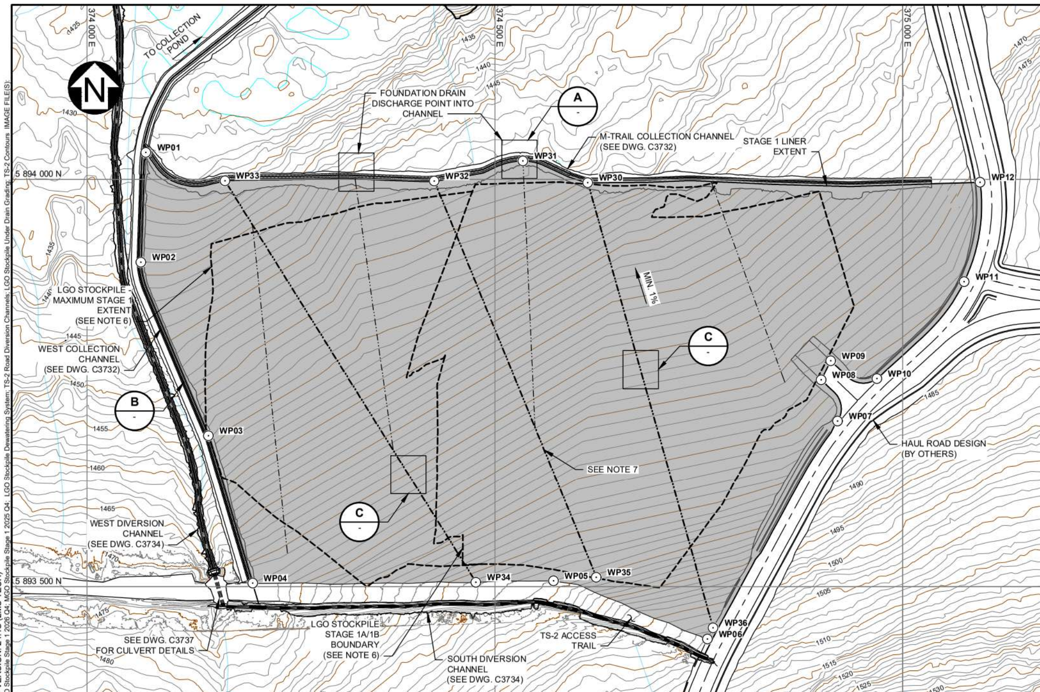
BLACKWATER GOLD PROJECT

WATER MANAGEMENT
LOW-GRADE ORE STOCKPILE STAGE 1
PLAN

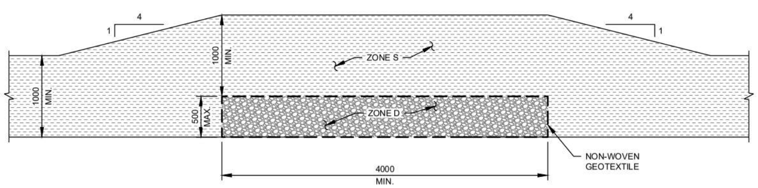
CLIENT DOCUMENT NO. BWST1-7280-CIV-DWG-3730

P/A NO.	DRAWING NO.	REVISION
VA101-457/33	C3730	4

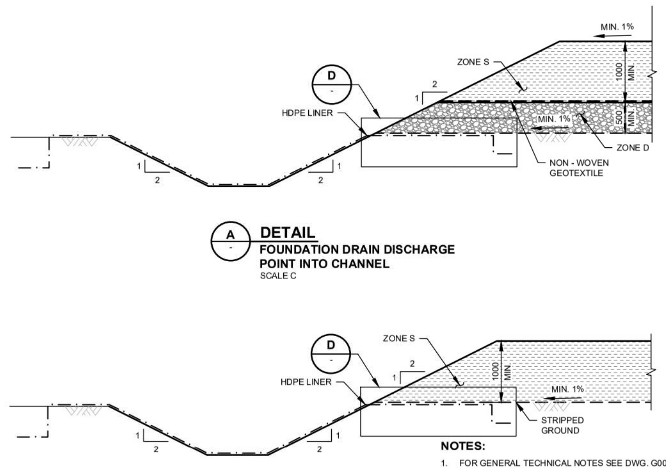
Figure 7.3—1 LGO Stockpile Water Management (Year -1)



PLAN
SCALE A

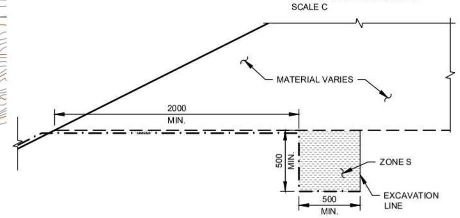


C TYPICAL DETAIL
SOIL LINER OVERLYING FOUNDATION DRAIN
SCALE B



A DETAIL
FOUNDATION DRAIN DISCHARGE POINT INTO CHANNEL
SCALE C

B TYPICAL DETAIL
ZONE S LINER DISCHARGE POINT INTO CHANNEL
SCALE C



D DETAIL
ANCHOR TRENCH
SCALE D

LEGEND:

- ZONE S
- ZONE D
- LGO STOCKPILE STAGE 1 LINER EXTENT
- PRIMARY FOUNDATION DRAIN
- AUXILIARY FOUNDATION DRAIN
- HDPE LINER
- NON-WOVEN GEOTEXTILE
- LGO STOCKPILE STAGE 1 EXTENT

NOTES:

1. FOR GENERAL TECHNICAL NOTES SEE DWG. G0006.
2. FOR CONSTRUCTION MATERIAL GRADATIONS SEE DWG. G0040
3. CONTOUR INTERVAL IS 1 METRE.
4. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS OTHERWISE NOTED.
5. FOR SOIL LINER AND STOCKPILE ARRANGEMENT DETAILS SEE DWG. C3746 AND C3747.
6. PROPOSED LGO STOCKPILE ARRANGEMENT PROVIDED BY BW GOLD (MAY 2024).
7. NATIVE SUBGRADE SHALL BE STRIPPED AND GRADED BASED ON SOIL LINER WORK POINTS. SUBGRADE SHALL BE FREE OF ORGANICS, STANDING WATER, AND OTHER DELETERIOUS OR UNSUITABLE MATERIALS. SUBGRADE SHALL BE APPROVED BY THE ENGINEER PRIOR TO PLACEMENT OF ZONE S FILL.
   7.1. SUB-EXCAVATION SHALL BE DIRECTED BY THE ENGINEER. SUB-EXCAVATED AREAS SHALL BE BACKFILLED USING ZONE S MATERIAL TO FINAL ELEVATION OF LGO LINER.
8. FOUNDATION DRAINS SHALL BE FIELD FIT BASED ON PROPOSED ALIGNMENTS AS DIRECTED BY THE ENGINEER. PRIMARY FOUNDATION DRAINS SHALL BE INSTALLED AT MINIMUM. ADDITIONAL OR ALTERNATE FOUNDATION DRAINS MAY BE REQUIRED BASED ON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
   8.1. FOUNDATION DRAINS SHALL BE BACKFILLED WITH ZONE D MATERIAL. ALTERNATIVE BACKFILL MATERIALS/METHODS MAY BE USED UPON APPROVAL BY THE ENGINEER.
   8.2. FOUNDATION DRAINS SHALL MAINTAIN MINIMUM SLOPE OF 1%.
   8.3. GEOTEXTILE INSTALLED IN FOUNDATION DRAINS SHALL HAVE MAXIMUM APPARENT OPENING OF 150 MICRONS (PER ASTM D4751). GEOTEXTILE SHALL OTHERWISE CONFORM TO PROPERTIES OUTLINED IN THE PROJECT CIVIL TECHNICAL SPECIFICATIONS.
   8.4. GEOTEXTILE SHALL BE INSTALLED WITH MINIMUM OVERLAP OF 300 MM IN DIRECTION OF DRAINAGE.
   8.5. WHEN REQUIRED, FOUNDATION DRAINS SHALL INTERSECT OBLIQUELY TO MAINTAIN CONTINUOUS POSITIVE DRAINAGE
9. HDPE LINER AND NON-WOVEN GEOTEXTILE SUBGRADE SURFACE SHALL BE FIRM, DRY, SMOOTH AND FREE OF SHARP ROCK FRAGMENTS THAT COULD PUNCTURE OR DAMAGE THE LINER. ANY HOLES, DEPRESSIONS, OR ROUGH AREAS TO BE FILLED WITH SUITABLE FILL MATERIAL FREE OF SHARP ROCK FRAGMENTS.

LGO STOCKPILE LINER WORK POINTS

ID	EASTING (m)	NORTHING (m)	ELEV. (m)
WP01	374,072.2	5,894,032.9	1,431.2
WP02	374,066.1	5,893,898.4	1,438.1
WP03	374,148.8	5,893,685.7	1,452.9
WP04	374,203.1	5,893,504.2	1,472.0
WP05	374,572.0	5,893,507.0	1,489.0
WP06	374,760.6	5,893,435.6	1,505.0
WP07	374,920.2	5,893,703.6	1,482.4
WP08	374,900.1	5,893,754.2	1,478.3
WP09	374,911.9	5,893,777.4	1,477.5
WP10	374,968.3	5,893,755.6	1,481.6
WP11	375,075.3	5,893,874.5	1,481.3
WP12	375,094.9	5,893,996.5	1,476.1
WP30	374,613.9	5,893,996.0	1,449.6
WP31	374,534.4	5,894,022.7	1,447.4
WP32	374,425.7	5,893,997.8	1,445.5
WP33	374,169.1	5,893,998.2	1,433.6
WP34	374,476.7	5,893,505.4	1,486.0
WP35	374,624.4	5,893,511.5	1,489.8
WP36	374,767.6	5,893,449.5	1,502.1

SCALE D: 0.2 0.1 0 0.2 0.4 0.6 0.8 1 m
SCALE C: 0.8 0.4 0 1 2 3 4 m
SCALE B: 0.6 0.3 0 1 2 3 m
SCALE A: 60 30 0 100 200 300 m

ISSUED FOR CONSTRUCTION

KNIGHT PIÉSOLD LTD.
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EGBC PERMIT TO PRACTICE

DRG. NO.	DESCRIPTION
G0040	CONSTRUCTION MATERIAL GRADATIONS
G0006	TECHNICAL NOTES
C3740	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - STAGE 1 LGO COLLECTION POND - PLAN AND SECTIONS
C3739	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - STAGE 1 - WEST COLLECTION CHANNEL CULVERT
C3734	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - STAGE 1 DIVERSION CHANNELS - PROFILES
C3732	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE - STAGE 1 COLLECTION CHANNELS - PROFILES
C3730	WATER MANAGEMENT - LOW-GRADE ORE STOCKPILE STAGE 1 - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	15AUG'24	ISSUED FOR CONSTRUCTION	NKJ	RMM	DDF	DDF
1	28MAR'24	ISSUED FOR CLIENT REVIEW	JSP	SKC	CBN	DDF
0	16NOV'21	ISSUED FOR PERMITTING	KAB	ABN/RAF	CBN	DDF

REVISIONS

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PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — Y. YANG # 28936 — 2024-08-15

Knight Piésold CONSULTING
BW GOLD LTD.
BLACKWATER GOLD PROJECT
WATER MANAGEMENT
LOW-GRADE ORE STOCKPILE STAGE 1
SEEPAGE COLLECTION SYSTEM
PLAN AND DETAILS

CLIENT DOCUMENT NO. BWST1-7280-CIV-DWG-3745
P/A NO. VA101-457/33 | DRAWING NO. C3745 | REVISION 2

SAVED: M:\1\01\00457\33\A\Acad\DWGS\C3745\C3745, 8/15/2024 2:36:05 PM, RMCLELLAN PRINTED: 8/15/2024 3:59:05 PM, C3745, RMCLELLAN ACAD VERSION: 24.1S (LMS TECH)

Figure 7.3—2 LGO Stockpile Seepage Collection System

7.3.5 Fresh Water Reservoir

The FWR will be constructed downstream of the TSF and the associated seepage collection works, approximately 1,800 m downstream of the MDD. The purpose of the FWR is to maintain a suitable source of fresh water to provide flows to lower Davidson Creek as required to reduce the potential environmental impacts of the Mine and to support mine operations when required. The design of the FWR is presented in the Water Management Structures Detailed Design Report (KP, 2021i).

The FWR will be formed as an in-creek reservoir using natural topography enclosed by construction of an earthfill berm on the northeast side of the reservoir. The embankment will be approximately 125 m in length and will impound a total volume of around 393,000 m^3 from its foundation level to the spillway invert elevation.

The FWR will collect direct precipitation on the FWR and runoff from contributing catchments, diverted flows (non-contact) from the Northern Diversion System during Year +7 to Year +23, water pumped from the WMP, and Tatelkuz Lake water via the FWSS. The FWSS pumps water from Tatelkuz Lake to the FWR and will be installed and operational from Year +6 through Closure. Water discharged via the FWR will report directly to Davidson Creek.

Towards the end of the active mine closure period, it is anticipated that the FWR will be drained and decommissioned, and the embankment dam will be breached. Regulation of stream flows at the FWR will cease during Closure to allow a natural flow regime to develop in Davidson Creek. Pumped flows from Tatelkuz Lake to the FWR via the FWSS will also cease.

The design of the FWR was based on storing the equivalent of approximately seven days of IFN at the maximum rate in May and June of 0.56 m^3/s. The basis for and magnitude of these flows were developed by Palmer Environmental (Palmer 2021). The discharge requirements vary throughout the year from 0.08 m^3/s during winter baseline flow to a maximum of 0.56 m^3/s for approximately seven weeks in May and June (Table 7.3-4). Releases from the FWR will be managed by at the Temperature and Flow Control Chamber located on the downstream side of the FWR embankment.

Table 7.3-4 Davidson Creek Instream Flow Needs

Period	IFN (m^3/s)	Days
January 1 to April 15	0.13	105-106
April 16 to May 10	0.15	25
May 11 to May 15 (flushing flows)	0.56	5
May 16 to June 30	0.56	46
July 1 to July 15	0.3	15
July 16 to August 31	0.15	47
September 1 to November 30	0.12	91
December 1 to December 31	0.08	31

Davidson Creek IFN values from the Blackwater Project Fisheries Offsetting Plan: Instream Flow Needs (Palmer 2021).

7.3.6 Northern Diversion System

The Northern Diversion Channel of the CDS will become the Northern Diversion System (NDS) at the end of Year +6 to allow for diversion of upstream flows from the northwest around the TSF and provide water to the FWR. The design of the NDS is presented in the TSF Life of Mine Design Report (KP 2021e).

The NDS comprises the following primary components:

- North and South Collection Channels to intercept freshwater and convey flows to the Northern Water Transfer Pond around TSF D;
- Northern Water Transfer Pond: located on an unnamed tributary west of the TSF to capture water such that it can be conveyed to the FWR; and
- Northern Diversion System Pipeline: route water around the perimeter of TSF D from the Northern Water Transfer Pond to the FWR using a gravity pipeline system.

The Northern Water Transfer Pond will be constructed upstream of the TSF within an unnamed watershed and has a total contributing catchment area of approximately 9.8 km^2. The pond has a design life of approximately 16 years and will receive inflows from the unnamed watershed and the North and South Collection Channels. Water from the pond will flow via gravity to the FWR using the Northern Diversion System Pipeline, which has a design flow of 300 L/s. Flows in excess of the pipeline capacity, leakage from the collection channels, and overflow from the diversion structure will contribute to TSF D. The NDS will be decommissioned during Closure and the flows from this catchment will report to the TSF.

7.3.7 Downstream Aggregate Borrow Area Sediment Control Pond

The Downstream Aggregate Borrow Area SCP will discharge to Davidson Creek once constructed during Operations. The SCP will be in place once constructed through to Closure, when it will be decommissioned.

7.3.8 Environmental Control Dams

The IECD was constructed in 2024, as discussed in Section 7.2.7, and will operate until Year +6 and the final Environmental Control Dam (ECD) will be constructed downstream of TSF D and functional from Year +7 through Post-Closure The design of the ECD is presented in the TSF Life of Mine Design Report (KP 2021f).

Two seepage interception trenches (north and south of Davidson Creek) will be excavated through the surficial sand and gravel terraces downstream of MDD and will report to the ECD pond. The trenches will be excavated into low-permeability subgrade soils and will each extend approximately 1.6 km north and south of the ECD. The dam will be maintained in a dewatered condition to the maximum extent practical. The ECD has a capacity of approximately 194,000 m^3. The ECD pumpback system comprises shore mounted, end-suction, centrifugal pumps. The pump system intake will be located within the ECD pond and the pipeline will discharge into TSF D with erosion protection as required. The design flowrate was selected to provide capacity to dewater the 1 in 100-year, 24-hour storm event volume within a period of 14 days, while continuously managing seepage inflows.

7.3.9 Water Treatment

Two WTPs will treat mine site water, and one domestic sewage treatment plant will treat domestic sewage on site. In addition, lime will be used to neutralize LGO Stockpile runoff and seepage through the Lime Neutralization System.

A Metals WTP will treat groundwater inflow and surface water runoff from the Open Pit and surface runoff from the Lower and Upper Waste Stockpiles to Year +17 and will target total suspended solids (TSS) and metals identified as parameters of concern (POCs) in mine contact water. McCue Engineering Contractors (McCue) developed the detailed design for the Metals WTP (McCue 2021).

A Membrane WTP will treat supernatant pond water from TSF C during Operations and primarily ECD water (i.e., TSF seepage water) in Post-Closure to remove sulphate, N-species, and trace heavy metals. During Operations, water treatment is required to reduce the water storage inventory in the TSF during wet periods. The design for the Membrane WTPs was developed by BQE Water (2021). The Membrane WTP is designed as a reverse osmosis (RO) WTP for Operations and a nanofiltration (NF) WTP will be used in Post-Closure. Treated water will be directed to the WMP during Operations, and the brine by-product from the membrane filtration unit will be recycled to the TSF. Treated water will be discharged directly to Davidson Creek in Post-Closure, with the brine by-product conveyed to the Pit Lake.

The proposed water treatment systems are summarized in Table 7.3-5.

Table 7.3-5 Summary of Project Water Treatment During Operations

Water Treatment	Influent Sources	Discharge Location
Metals WTP	Pit Sump; Pit GW dewatering; Upper and Lower Waste Stockpiles runoff	WMP
Lime neutralization	LGO Stockpile runoff and seepage	TSF C or D Pond
Membrane (RO) WTP	TSF C Pond	WMP
Domestic sewage WTP	Process Plant	TSF C or D Pond

The treatment design targets for all WTPs for mine contact water are equal to BC water quality guidelines for the protection of aquatic life, with the exception of TSS, for which design targets were set equal to MDMER effluent concentration limits (Table 7.3-6). The treatment design targets for the Membrane and Metals WTPs were also set to support adherence to YDWL Class III water quality standards, which are considered to apply to Davidson Creek and Creek 661. The YDWL Class III standards are equal to BC and CCME water quality guidelines. Calculated guidelines were based on the baseline dataset for WQ28 for hardness, chloride, pH, temperature, and dissolved organic carbon (DOC).

A lime neutralization system will neutralize water that comes in contact with the LGO Stockpile (Ausenco 2021). The lime neutralization system will operate from Year +1 through Year +23.

This plan also includes domestic wastewater discharge from the Plant Site, which will be generated from facilities at the process plant, truck shop and wash, and mine dry/office, including kitchen, washroom, showering and laundry. The Plant Site will be built during Year -2 and Year-1 and it is expected that all of the facilities generating domestic wastewater will be operational by Year +1.

The design for the conveyance system from the Lower Waste Stockpile Collection Pond to the Metals WTP can be found in the Stockpiles Geotechnical and Water Management Design Report (KP 2021l), and the design for the conveyance system from the Metals WTP at the Plant Site to the WMP is included in the Water Management Structures Detailed Design Report (KP 2021i) . The WTPs are described in Chapter 5.6 and 5.7 of the Application (BW Gold, 2022) and summarized in the following sub sections.

Table 7.3-6 Design Targets for Membrane Metals WTP Treated Effluent

Parameter	Unit	Design Target	
		Monthly Average	Instantaneous Maximum
TSS	mg/L	15	30
pH	-		6.5 to 9.0
Ammonia	mg-N/L	1.53	7.97
Nitrate	mg-N/L	3	32.8
Nitrite	mg-N/L	0.02	0.06
Sulphate	mg/L	128	
Chloride	mg/L	150	600
Fluoride	mg/L		0.514
Cyanide (Weak Acid Dissociable) (WAD)	mg/L		0.01
T-Ag	mg/L	0.00005	0.0001
T-As	mg/L		0.005
T-B	mg/L	1.2	
T-Be	mg/L	0.00013	
T-Co	mg/L	0.004	0.11
T-Cr	mg/L	0.001	
T-Fe	mg/L		1
T-Hg	mg/L	0.00002	
T-Mn	mg/L	0.53	0.546
T-Mo	mg/L	1	2
T-Ni	mg/L	0.025	
T-Pb	mg/L	0.0035	0.0061
T-Sb	mg/L	0.009	
T-Se	mg/L	0.002	
T-Tl	mg/L	0.0008	
T-U	mg/L	0.0085	
T-Zn	mg/L	0.0075	0.033
D-Al	mg/L	0.05	0.1
D-Cd	mg/L	0.000047	0.000072

Parameter	Unit	Design Target	
		Monthly Average	Instantaneous Maximum
D-Cu	mg/L	0.0006	0.0036
D-Fe	mg/L		0.35

Aluminium, ammonia, cadmium, copper, nitrite, sulphate, silver, manganese, nickel, lead, zinc guidelines are dependent on water chemistry of the receiving environment – ambient values assumed for the targets are provided in McCue Engineering Contractors. 2021.

D = dissolved; T = total

7.3.9.1 Metals WTP

The Metals WTP was constructed and commissioned in 2024, fulfilling M-246 condition C.5(a)(i). The Metals WTP will operate in Operations through Year +17, however operation of the facility has not commenced. The Metals WTP will treat Open Pit groundwater inflow, surface water runoff to the Open Pit, and surface water runoff from the Upper and Lower Waste Stockpiles. Treatment ceases starting in Year +18 when contact waters are directed to the Open Pit to accelerate filling.

Water treatment capacity will be phased as follows:

- Phase 1 (up to Year +4): two WTP trains (WTP A and B) will be designed with a total capacity of 105 L/s, and sequentially brought online to handle the maximum flow. Each train will be designed with flexibility to handle the lower flow rates expected in the winter months.
- Phase 2 (Year +5 to Year +8): an additional train (WTP C) with a design flow rate of 50 L/s will be brought online to treat the increased flow from the expanding Open Pit.
- Phase 3 (Year +9 to Year +17): a fourth train (WTP D) with a design flow rate of 50 L/s will be brought online to handle the increased flow rate.

Each train will be designed with flexibility to work at half the design capacity to account for winter and summer flow rate variations. The maximum flow rate in summer is estimated to range from 21 L/s in Year 1 to 203 L/s in Year +17, while in winter the maximum flow rate is estimated to range from 21 L/s in Year 1 to 79 L/s in Year +17, as it is expected that inflow from the pit sump will not occur during winter.

A metals treatment pond is proposed upstream of the Metals WTP to collect water from all the sources and temporarily store them before being pumped to the Metals WTP. Since the flow from the pit sump is estimated based on the average annual climate inputs, the metals treatment pond has the capacity to contain short term increases in peak precipitation flows. Two ponds are proposed: Pond 1 (4,600 m^3 volume) will handle predicted flow during Phase 1 and Pond 2 (4,400 m^3 volume) will handle the increased flow during Phase 2 and Phase 3. In the event that the metals treatment pond reaches its maximum capacity, water would be contained in the pit sump.

An influent pump with a variable frequency drive will be installed to pump water from the metals treatment pond to the Metals WTP. The flow rate, pH, and turbidity of the influent water will be monitored with instruments on the inlet line.

The treated water will be directed into the combined effluent tank for final pH monitoring and adjustment. Final monitoring of effluent quantity and quality will be performed with an inline flow meter, pH meter, and turbidity meter. If the pH is within the discharge range the water will be discharged to the WMP, otherwise the water will be recycled to the metals treatment pond.

7.3.9.2 Membrane WTP

The Operations RO Membrane WTP will treat TSF supernatant pond water for sulphate, N species, and metals and discharge treated water into the WMP. The brine by product (retentate) stream from the membrane filtration unit will be recycled to the TSF. The treatment is only predicted to be required during wet periods (as identified by the variable climate scenarios in the LoM WBM), to reduce the water storage inventory in the TSF. The design basis assumes an inflow of 72 L/s and treated discharge to the environment of 54 L/s, with 18 L/s of retentate to the TSF. The system will be designed to operate from April through October (seven months). Treatment is specified in the LoM WBM to occur when the TSF C Pond volume in Operations exceeds a minimum threshold volume, specified for modelling purposes as approximately three to four times the monthly mill reclaim requirement.

In Post-Closure, a Membrane WTP will treat water from the ECD as a priority and top up with flow from the Pit Lake and TSF C up to a maximum of 190 L/s. The system will be designed to operate year-round.

The WTP effluent discharge and recycle lines will be outfitted with automatic valves linked to pH and conductivity measurements to ensure automatic switch-over to recycle should effluent parameters go outside of limits. Off-specification plant effluent will be pumped back to the TSF. An operator will manually switch the process back to discharge mode after confirming that all parameters are within limits.

7.3.9.3 Lime Neutralization System

Runoff and infiltration into the LGO stockpile will be collected and conveyed to the process plant where it will be neutralized with lime before being discharged to the TSF. The capacity of the neutralization system is based on the predicted runoff from the LGO stockpile and will vary according to the operations phase of the processing plant: from Year +1 to Year +5 the water treatment capacity will be 57 m^3/hr, increasing to approximately 108 m^3/hr from Year +6 through Year +23. The Lime Neutralization System was constructed and commissioned in 2024, fulfilling M-246 condition C.5(b)(i), however has not yet operated.

LGO Stockpile runoff water will be pumped to two agitated neutralization tanks operating in series, and lime will be added to the first neutralization tank in the form of calcium hydroxide slurry until pH 10.0 is reached. Neutralized water will then overflow into the second neutralization tank and then will be pumped to the final tailings pumpbox. The pH of influent and effluent will be measured using pH probes and this information will be used to automate dosing of lime slurry and discharge of effluent to the tailings pumpbox. Water that meets the pH criteria for discharge will be flow by gravity to the TSF, while water that does not meet the pH criteria for discharge will be recirculated within the neutralization tanks. Lime neutralization does not affect the water balance.

7.3.9.4 Domestic Water/Sewage Treatment

Domestic wastewater from the Plant Site will be treated and directed to the TSF via the tailings line. The maximum authorized rate of discharge and quality of this discharge to the TSF are regulated under Condition 1.4 of Permit PE-110652, and are summarized in Table 7.3-7.

Table 7.3-7 Flow and Quality Criteria for Plant Site Sewage Treatment Plant Discharge to the Tailings Storage Facility

Parameter	Criteria
Discharge rate	Continuous: During Construction: 41 m^3/day (maximum) After Construction: 102 m^3/day (maximum)
pH	6.5 to 9.0 pH units
BOD5	45 mg/L (maximum)
TSS	45 mg/L (maximum)
Fecal coliform (/100 mL)	1000 CFU (maximum)

Water in the TSF will be reused for mining operations or be treated prior to being pumped to the WMP. Domestic wastewater from the Plant Site will be treated in a mechanical treatment plant using a moving bed biofilm reactor (MBBR) followed by dissolved aeration flotation (DAF) and ultraviolet treatment. The majority of the coagulant and flocculant will stay in the sludge phase and will not be discharged to the TSF. Sludge will be dewatered via a dewatering bag system, then collected and trucked off site to an approved disposal facility. The filtrate from this system will be collected and pumped back into the MBBR/DAF system. Other domestic sewage systems for the camp and other buildings are not described in this plan.

7.4 Mine Site Water Monitoring

Mine site water monitoring for quantity and quality is described below. The intent of monitoring on site is to provide an early detection system and identify trends in surface water and groundwater quality so that potential impacts to the receiving environment can be investigated, mitigated, and avoided. In addition, ongoing monitoring will be used to evaluate predictions, calibrate and update models, and update mitigation options as needed throughout the LoM. Monitoring is intended to comply with relevant legislation and reduce the likelihood of a potential non-compliance event as a result of mining operations.

7.4.1 Mine Site Surface Water Quality Monitoring

7.4.1.1 Monitoring Methods

The monitoring program will follow QA/QC procedures specified in the following documents:

- BC Field Sampling Manual (BC MWLAP 2013);
- BC Environmental Laboratory Manual (BC ENV, 2020b); and
- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2016b).

Per Permit PE-110652 Condition 4.10, quality control (QC) samples (field duplicates, field blanks, and trip blanks) for the Mine surface water program must be collected for each monitoring parameter at a frequency equal to at least 20% of all samples collected (i.e., environmental + QC samples). A given QC sample must be collected within 48-hours of its corresponding environmental sample. The QA/QC components of the mine surface water monitoring program will include:

- Equipment checks and calibration;
- Duplicate sampling;
- Blank sampling;
- Use of certified laboratories for analysis, and
- Data quality evaluation, including the assessment of ion balance (where applicable), total versus dissolved metal concentrations, and assessment of the influence of suspended solids on dissolved concentrations in groundwater samples, and flagging of outlier data points that could indicate sample contamination.

Field sampling protocols will follow guidance presented in BC MWLAP (2013), BC MOE (2016b) and MDMER and involve the procurement and preparation of appropriate equipment and materials, including:

- A field meter and appropriate calibration and maintenance materials,
- Pre-labeled, clean bottles and associated materials (e.g., gloves, labels, preservatives, filters, ice packs, coolers, travel blanks) provided by the analytical laboratory,
- A camera,
- Record-keeping materials,
- Appropriate Health and Safety equipment and general field gear.

The analytical laboratory will provide five to nine bottles (plastic and/or glass) for each sample, depending on the laboratory analytical method. Field water quality measurements will be recorded using a calibrated water quality meter. New, clean gloves will be used to collect samples at each station, and will be replaced as appropriate within a station. The sampling sites must conform to WorkSafeBC, the Code and other applicable safety requirements, and be accessible under expected weather and flow conditions.

Samples will be collected at the mid-point of the mine water flow path (if relevant), slightly below the water surface, to minimize potential contamination from disturbed sediments or air-borne particulates. To collect samples that do not require filtration (and are not pre-charged with the preservatives), the clean sample bottle will be plunged beneath the water surface with the opening facing directly down, fully submerged below the water surface if depth allows, to minimize entrainment of surface debris. Samples that will be analysed for dissolved parameters will be filtered into the appropriate bottle in the field using syringes and approved 0.45 µm filters provided by the analytical laboratory or supplied by BW Gold. Preservatives will be added to the bottles that require preservation (if the bottles are not pre-charged) in the field and immediately capped. All samples will be kept cool and in dark conditions until shipment in secured coolers with ice packs, chain of custody forms, and appropriate packing to the analytical laboratory. Every reasonable effort will be made to ensure the samples arrive at the laboratory within recommended hold times. Detailed SOPs will be developed prior to the onset of the Construction phase, following identification of the appropriate field meters and establishment of the mine monitoring sites.

7.4.1.2 Monitoring Locations

The mine site water monitoring locations and the water source at each point (contact water and non contact water) are summarized in Table 7.4-1 and shown on Figure 7.4-1 (end of Year -1) through Figure 7.4-4 (Closure). The water quality monitoring locations have been selected to enable ongoing evaluation of the quality of contact water and non-contact water that has been diverted around the mine site or captured for use in the mill process. Discharge monitoring locations are discussed in Section 8 and are therefore not included in Table 7.4-1.

7.4.1.3 Monitoring Frequency

Mine site process and clean water diversion surface water quality monitoring will be conducted monthly. WTP influent and effluent will be at a higher frequency relative to other mine site surface water quality monitoring stations and is discussed further in Section 7.4.3.

7.4.1.4 Parameters and Analysis

The parameters to be measured in mine site water (Table 7.4-2) will be a continuation from the baseline program and will include those constituents recommended by the BC MOE (2016b) as well as parameters identified as POCs and Parameters of Potential Concern (POPCs) in the Mine Conceptual Site Model (CSM; Section 5.10 of BW Gold 2022). The same parameter set will be monitored in discharge waters (Section 8.3). Analytical water quality samples will be submitted to ALS Environmental, or another Canadian Association of Laboratory Accreditation (CALA) certified analytical laboratory, as appropriate, and analyzed at a minimum for the suite of parameters and target detection limits presented in Section 8.3. Analytical testing procedures will vary with parameters. Analyses will be performed using standard analytical methods, consistent with most recent edition of the British Columbia Environmental Laboratory Manual and supplements to the manual (BC ENV 2020b).

Data analysis will include an evaluation of concentration trends and comparison to BC and/or CCME guidelines (as appropriate) and trigger levels, as relevant (Section 11). Influent and effluent waters for treatment systems will be subject to additional analyses (e.g., instantaneous in-line comparison to established benchmarks, parameter concentration ranges and central tendencies, flow vs. concentration relationships) per the operator specifications, to inform treatment operations. Field (in situ) measurements should be recorded for temperature, conductivity, pH, and turbidity for all stations, as well as dissolved oxygen and oxidation-reduction potential (ORP) at certain stations as dictated by Permit PE-110652 Appendix A (refer to Section for 9 further detail). Field measurements will be collected using a regularly calibrated multi-parameter water quality meter.

7.4.2 Mine Site Surface Water Flow Monitoring

Mine site flow monitoring is required to support the on-going evaluation and refinement of the predictions of the WBM and the surface and groundwater water quality model. Flow monitoring is also required to manage the on-site water that will be needed for ore processing at the Plant Site, and to determine when water from the TSF C pond exceeds a threshold volume that will trigger treatment of TSF C pond water via the Membrane WTP. Table 7.4-2 provides a summary of the proposed surface water flow monitoring locations – flow monitoring sites will be co-located with the mine site surface water quality monitoring locations shown on Figures 7.4-1 through 7.4-4. Monitoring details for each of the components are provided in the sections below.

Water level measurements and flow monitoring will typically occur at all water retaining ponds to monitor water levels and compliance with freeboard requirements and to measure outflows from the ponds.

Flow monitoring at effluent discharge points to the environment is discussed in Section 8.

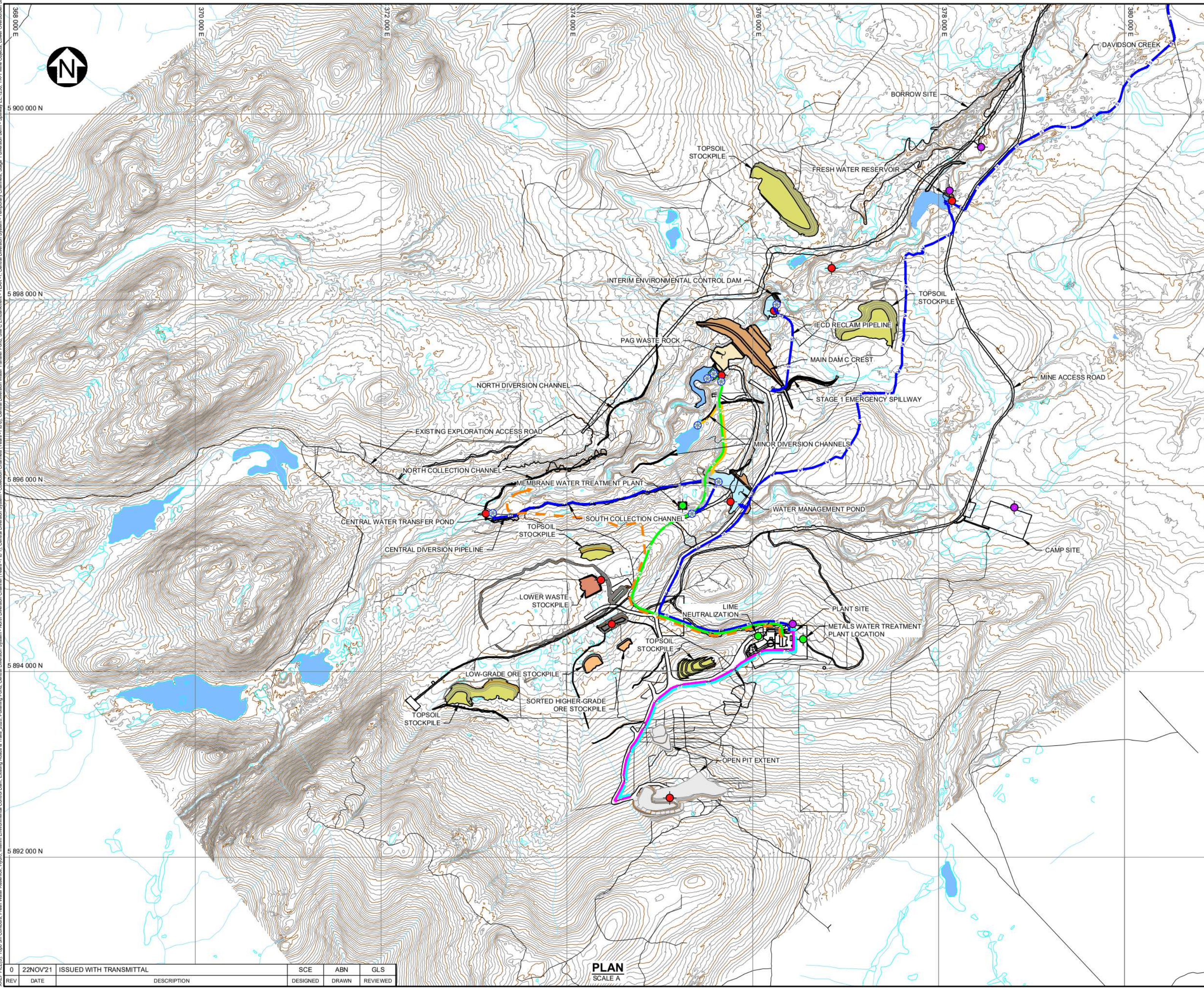
Table 7.4-1 Mine Site Process and Clean Water Diversion Water Quality Monitoring Locations

Facility	Coordinates	Mine Phase	Water Source	Water Pumped to
Upper Waste Stockpile Collection Pond⁺	TBD	Operations, Closure	Stockpile runoff and toe discharge	Metals WTP in Operations, and Pit Lake in Closure.
Lower Waste Stockpile Collection Pond⁺	5894712N, 374470E	Construction, Operations, Closure	Stockpile runoff and toe discharge	Metals WTP in construction and operations, and TSF C Pond in Closure.
LGO Stockpile Collection Pond⁺	5894510N, 374534E	Operations	Stockpile runoff and toe discharge; groundwater collected in the foundation drains.	Lime neutralization system in Operations.
Open Pit Sump⁺	5893300N, 375369E (lowest point of ultimate pit design)	Construction, Operations	Groundwater inflow and surface water from upgradient catchment; Upper Waste Stockpile seepage; precipitation on pit walls	Metals WTP in Years -1 to Year +17.
Pit Lake	5893091N, 375322E (centre of pit lake)	Operations (starting Year +18), Closure Post-Closure	Groundwater and surface water from upgradient catchment; Upper Waste Stockpile seepage; runoff from the Upper Waste Stockpile (Closure and Post-Closure); precipitation on pit walls; TSF C Pond (late Operations and Closure only); ECD pump back (late Operations and Closure only); Membrane WTP brine (post-closure only).	Membrane WTP in Post-Closure.
TSF C pond*⁺	5895923N, 374950E	All	Precipitation; water drained from waste rock voids; TSF C beach runoff and infiltration; consolidation seepage from tailings; tailings slurry water; runoff and toe discharge from Main Dam C; IECD pumpback; water pumped from TSF D pond; West Dam seepage pumpback; sewage effluent; Lower and Upper Waste Stockpiles seepage; WMP overflow; lime neutralization system effluent; Membrane WTP brine (Operations only); groundwater and surface water from upgradient catchment;	Reclaim water pumped to mill in operations; surplus water pumped to Membrane WTP in Operations; water pumped to Pit Lake in Closure; flow via spillway in Post-Closure.

Facility	Coordinates	Mine Phase	Water Source	Water Pumped to
			Central Diversion System North and South Collection Channels overflow and leakage.	
West Dam Seepage Sump+	5894906N, 371817E	Operations, Closure, Post-Closure	West Dam runoff; West Dam toe discharge; seepage from TSF C; groundwater discharge.	TSF C or Phase 2 Central Water Transfer Pond.
TSF D pond+	5898029N, 374089E	Operations, Closure, Post-Closure	Tailings slurry water; TSF D beach runoff and infiltration; precipitation; water drained from waste rock voids; ECD pumpback; consolidation seepage; Open Pit seepage in post-closure (portion not captured by seepage collection system for treatment); runoff and toe discharge from Main Dam D; runoff and toe discharge from Main Dam C; seepage from TSF C pond; groundwater and surface water from upgradient catchment Northern Diversion System flows in excess of pipeline capacity, leakage from collection channels, and diversion structure overflow.	TSF C in Operations and Closure; flow via spillway in Post-Closure.
WMP*+	5895553N, 375576E	Construction (Year -1), Operations, Closure	Effluent from Metals WTP; effluent from Membrane WTP; Upper Waste Stockpile seepage; surface water from upgradient catchment; pumped flows from the Central Diversion System.	Mill to meet processing requirements and surplus to the FWR. Flow in excess of the WMP discharge pipeline capacity overflows to TSF C Pond via the WMP pipe outlet and/or spillway.
IECD pond*+	5897905N, 376173E	Construction (Year -1), Operations (Year +1 to Year +6).	Seepage from TSF C; Main Dam C runoff and toe discharge; Lower Waste Stockpile seepage; groundwater and surface water from upgradient catchment.	TSF C
Downstream of IECD	5898337N, 376856E	Construction (Year -1), Operations (Year +1 to Year +6).	Seepage pathways through TSF C prior to construction of ECD	IECD

Facility	Coordinates	Mine Phase	Water Source	Water Pumped to
ECD pond*+	5898484N, 377431E	Operations, Closure, Post-Closure	Seepage from TSF C, TSF D, Main Dam D, Lower Waste Stockpile, Pit Lake, contact runoff, and non-contact surface and subsurface flows.	TSF D in operations, Pit Lake in closure, and Membrane WTP in Post-Closure.
FWSS	5899042N, 378139E	Operations, Closure	Non-contact water pumped from Tatelkuz Lake.	FWR
Central Diversion System Water Transfer Pond	5894821N, 371795E	Construction, Operations, Closure, Post-Closure	Non-contact water upgradient of TSF until Year +6. Pond re-located west of West Dam in Year +7.	WMP, overflow via spillway to TSF C to Year +6; During high flow events may spill to Lake 16 from Year +7 onwards.
Northern Diversion System Water Transfer Pond	5897923N, 373347E	Operations (Year +7 onwards), Closure	Non-contact water upgradient of TSF.	FWR, overflow via spillway to TSF D.

Coordinates are approximate, all station locations and coordinates will be verified upon station commissioning. Water sources may vary with mining phase.
TBD: Coordinates to be determined at a future date. The Upper Waste Stockpile Collection Pond will be designed (and coordinates identified) prior to Year 11.
*PE-110652 monitoring location
+M-246 monitoring location



LEGEND:

- MINE WATER
- FRESH WATER
- EMBANKMENT FILL
- PAG WASTE ROCK
- TOPSOIL
- PUMP STATION
- EXISTING ACCESS TRAILS
- SEEPAGE / WATER SUPPLY PIPELINES
- WATER DIVERSION PIPELINE
- OPEN PIT PERIMETER WELL DEWATERING PIPELINE
- OPEN PIT SUMP DEWATERING PIPELINE
- TSF C RECLAIM PIPELINE
- TEMPORARY DEWATERING SYSTEM PIPELINE
- CONCEPTUAL WATER MANAGEMENT PIPELINE
- TAILINGS PIPELINE
- TAILINGS DISCHARGE SPIGOT
- MINE SITE WATER SAMPLING
- DISCHARGE WATER SAMPLING
- WATER TREATMENT SAMPLING

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 10U.
2. NATURAL GROUND CONTOUR INTERVAL IS 5 METRES AND STOCKPILE CONTOUR INTERVAL IS 10 METRES.
3. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

SCALE A: 400 200 0 400 800 1200 1600 2000 m

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BLACKWATER GOLD PROJECT

MINE SITE SURFACE WATER AND DISCHARGE MONITORING (END OF YEAR -1)

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
VA101-457/33	VA21-02048	0

FIGURE 7.4-1

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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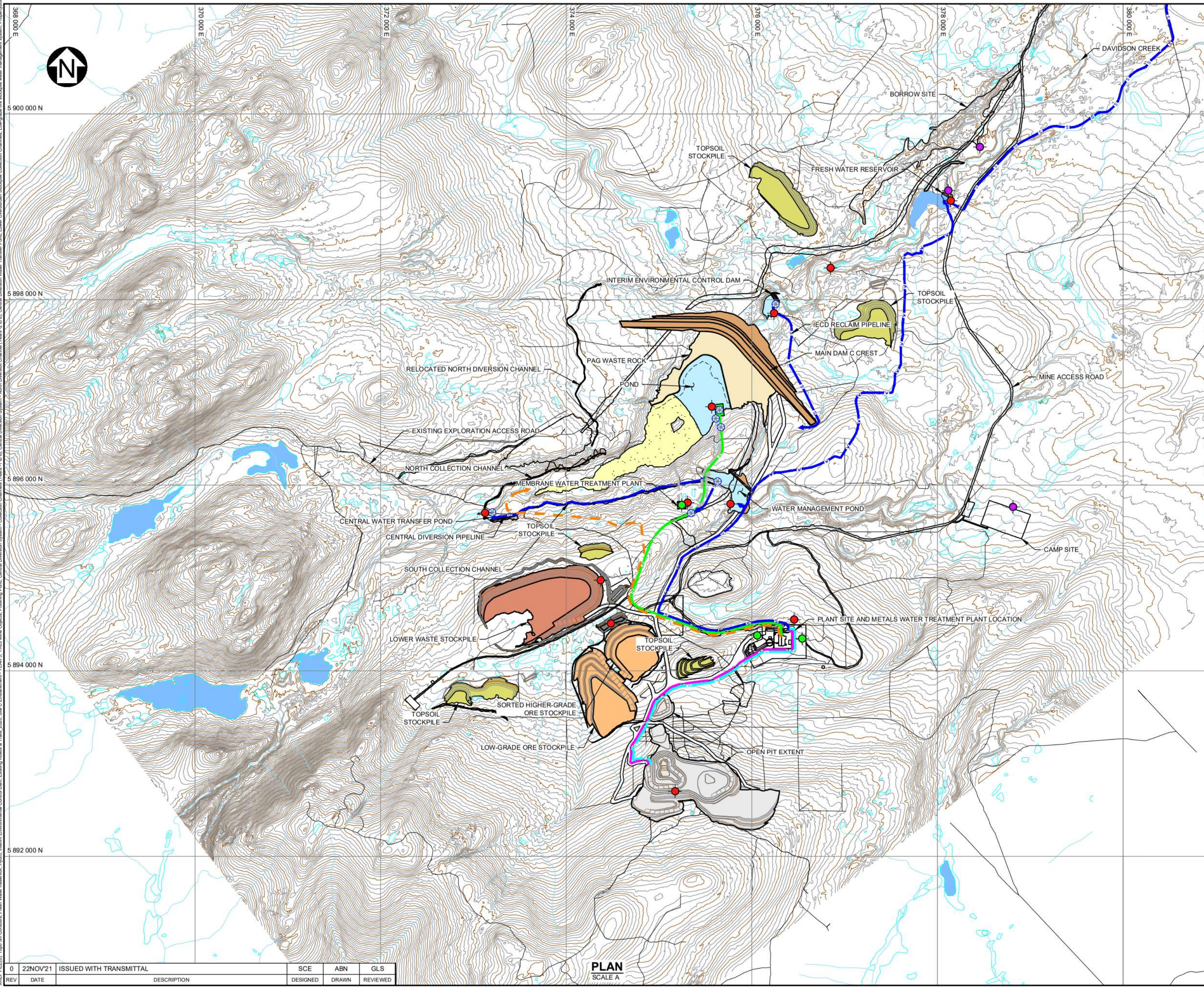
SAVED: M:\1\01\00457\33\A\Acad\FIGS\B120, 11/22/2021 3:29:47 PM , PPETKOVIC PRINTED: 11/22/2021 3:31:06 PM, FIG 7.3-1, PPETKOVIC ACAD VERSION: 23.1S (LMS TECH)



LEGEND:

- TAILINGS BEACH
- MINE WATER
- FRESH WATER
- EMBANKMENT FILL
- PAG WASTE ROCK
- TOPSOIL
- RECLAIM BARGE
- PUMP STATION
- EXISTING ACCESS TRAILS
- PROPERTY BOUNDARY
- SEEPAGE / WATER SUPPLY PIPELINES
- WATER DIVERSION PIPELINE
- OPEN PIT PERIMETER WELL DEWATERING PIPELINE
- OPEN PIT SUMP DEWATERING PIPELINE
- TSF C RECLAIM PIPELINE
- CONCEPTUAL WATER MANAGEMENT PIPELINE
- TAILINGS PIPELINE
- TAILINGS DISCHARGE SPIGOT
- MINE SITE WATER SAMPLING
- DISCHARGE WATER SAMPLING
- WATER TREATMENT SAMPLING

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 10U.
2. NATURAL GROUND CONTOUR INTERVAL IS 5 METRES AND STOCKPILE CONTOUR INTERVAL IS 10 METRES.
3. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

SCALE A: 400 200 0 400 800 1200 1600 2000 m

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MINE SITE SURFACE WATER AND DISCHARGE MONITORING (END OF YEAR 3)

Knight Piésold CONSULTING

P/A NO.	REF NO.	
VA101-457/33	VA21-02048	
FIGURE 7.4-2		REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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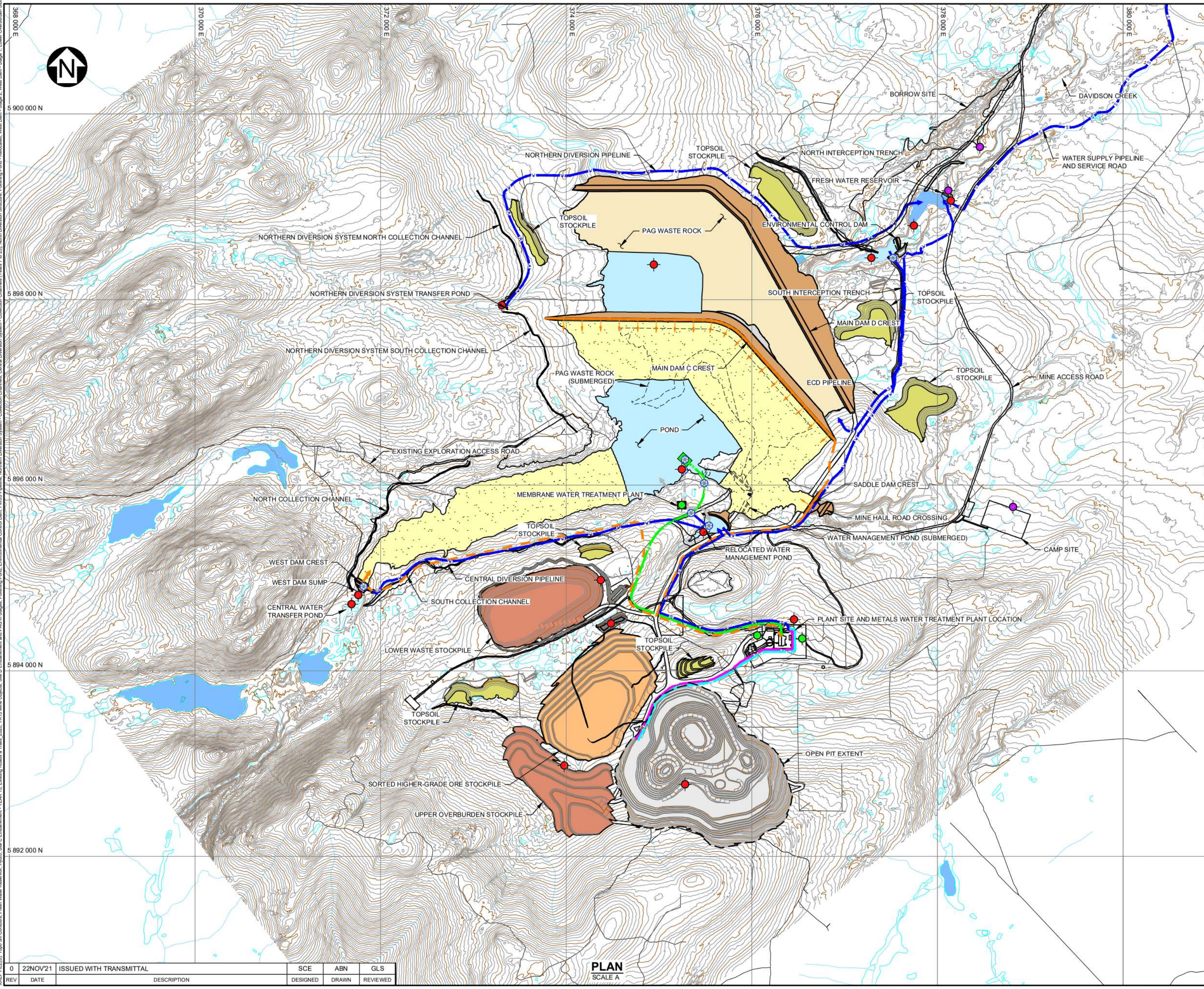

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 10U.
2. NATURAL GROUND CONTOUR INTERVAL IS 5 METRES AND STOCKPILE CONTOUR INTERVAL IS 10 METRES.
3. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

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MINE SITE SURFACE WATER AND DISCHARGE MONITORING (END OF YEAR 13)

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P/A NO.	REF NO.
VA101-457/33	VA21-02048

FIGURE 7.4-3 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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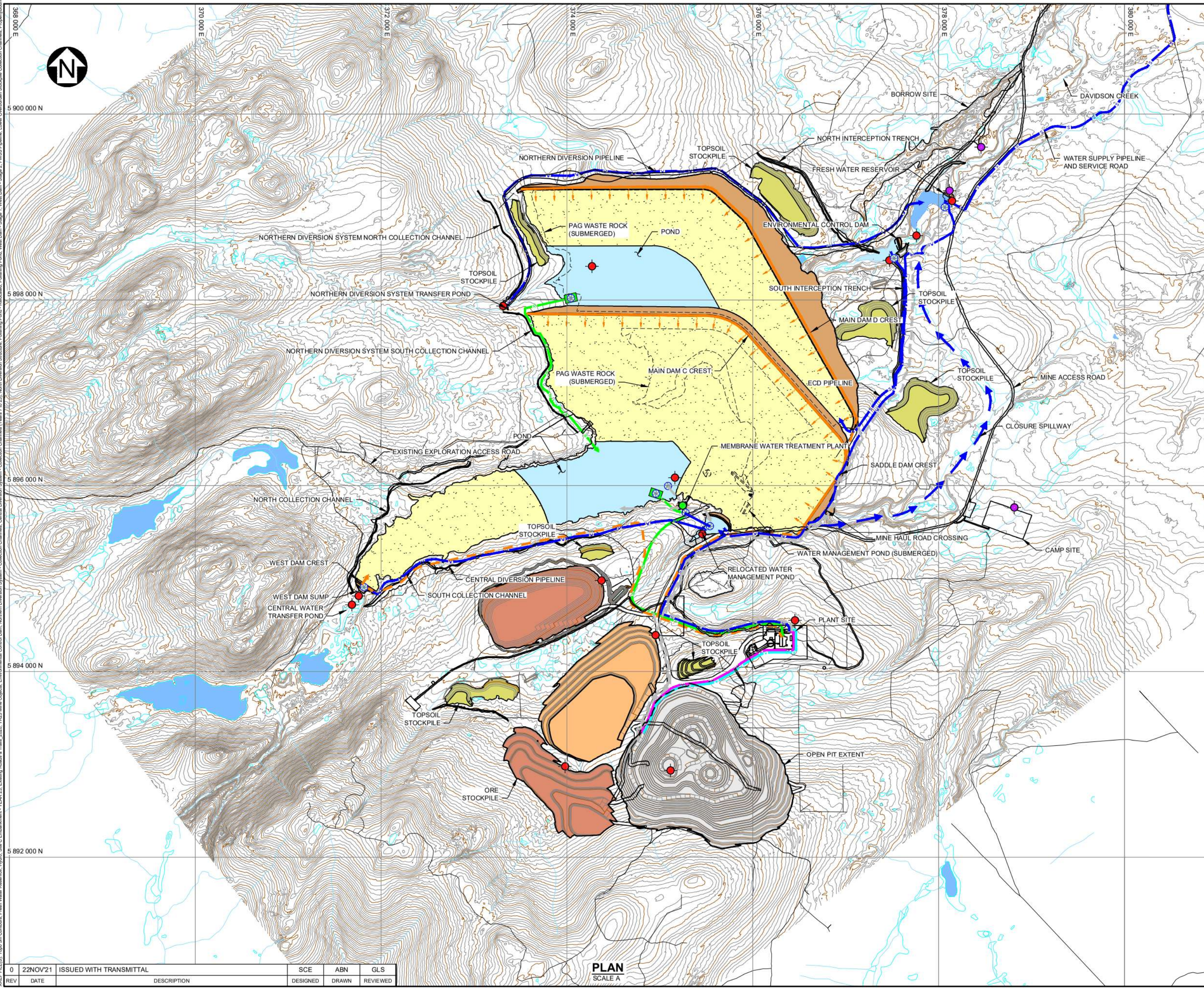

LEGEND:

- TAILINGS BEACH
- MINE WATER
- FRESH WATER
- EMBANKMENT FILL
- PAG WASTE ROCK
- TOPSOIL
- RECLAIM BARGE
- PUMP STATION
- EXISTING ACCESS TRAILS
- PROPERTY BOUNDARY
- SEEPAGE / WATER SUPPLY PIPELINES
- WATER DIVERSION PIPELINE
- OPEN PIT PERIMETER WELL DEWATERING PIPELINE
- OPEN PIT SUMP DEWATERING PIPELINE
- TSF C RECLAIM PIPELINE
- CONCEPTUAL WATER MANAGEMENT PIPELINE
- TAILINGS PIPELINE
- TAILINGS DISCHARGE SPIGOT
- TAILINGS DISCHARGE SPIGOT
- SPILLWAY
- MINE SITE WATER SAMPLING
- DISCHARGE WATER SAMPLING
- WATER TREATMENT SAMPLING

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 10U.
2. NATURAL GROUND CONTOUR INTERVAL IS 5 METRES AND STOCKPILE CONTOUR INTERVAL IS 10 METRES.
3. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

SCALE A: 400 200 0 400 800 1200 1600 2000 m

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MINE SITE SURFACE WATER AND DISCHARGE MONITORING (END OF YEAR 23)

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
VA101-457/33	VA21-02048	0

FIGURE 7.4-4

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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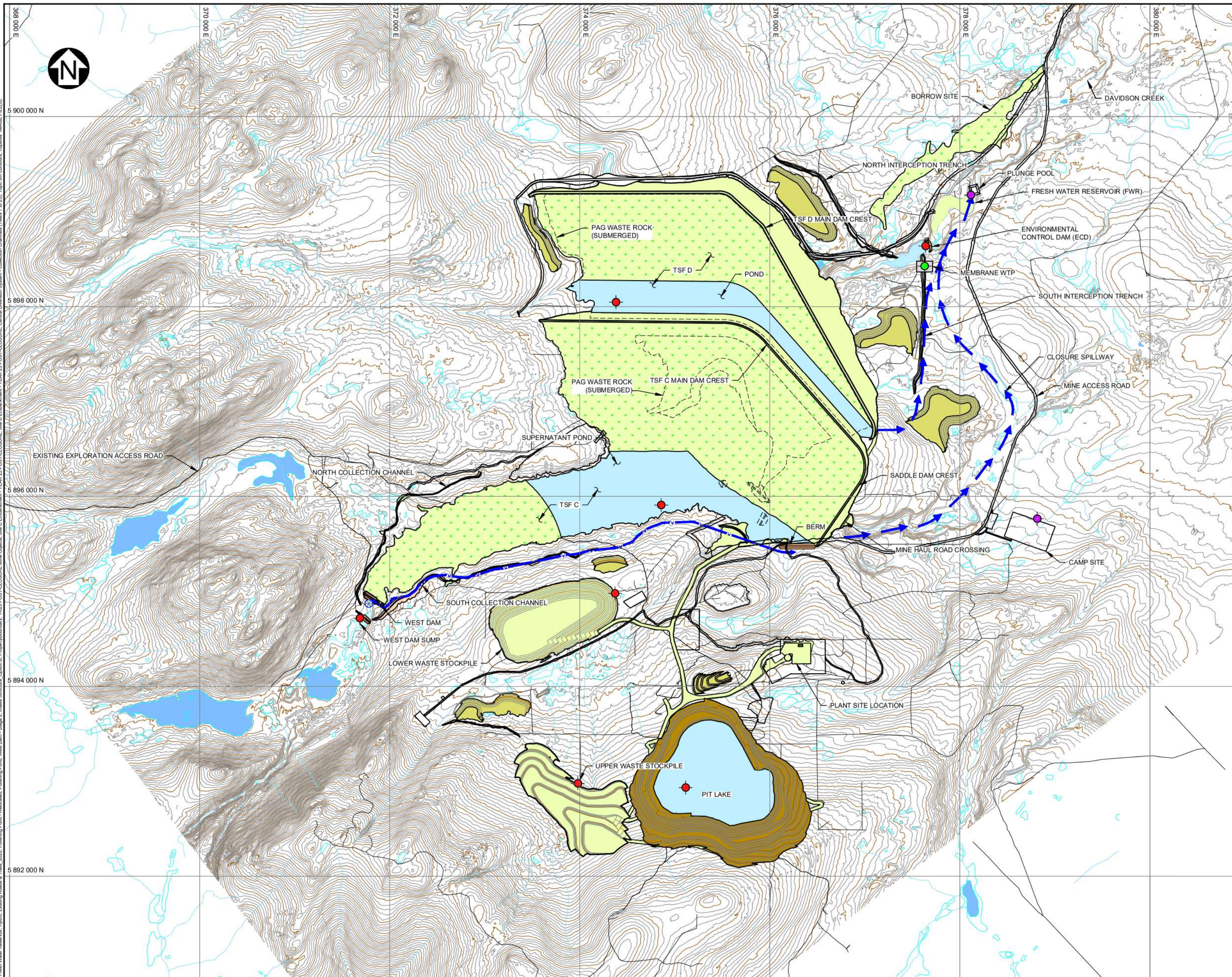

PLAN
SCALE A

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	22NOV'21	ISSUED WITH TRANSMITTAL	SCE	ABN	GLS

LEGEND:

- UPLAND BEACH
- UPLAND SLOPE
- MINE WATER
- FRESH WATER
- ROCK SLOPES
- TOPSOIL
- PUMP STATION
- EXISTING ACCESS TRAILS
- PROPERTY BOUNDARY
- WATER DIVERSION PIPELINE
- SPILLWAY
- MINE SITE WATER SAMPLING
- DISCHARGE WATER SAMPLING
- WATER TREATMENT SAMPLING

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 10U.
2. NATURAL GROUND CONTOUR INTERVAL IS 5 METRES AND STOCKPILE CONTOUR INTERVAL IS 10 METRES.
3. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
4. LOCATIONS OF WATER TREATMENT PLANTS (WTP) ARE APPROXIMATE.

SCALE A 400 200 0 400 800 1200 1600 2000 m

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BLACKWATER GOLD PROJECT

MINE SITE SURFACE WATER AND DISCHARGE MONITORING (POST-CLOSURE)

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-457/33	VA21-02048

FIGURE 7.4-5 REV 0

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Table 7.4-2 Chemistry Parameters and Detection Limits

Parameter	Detection Limit	Parameter	Detection Limit
Physical Parameters		Major Anions	
pH	0.01	Alkalinity – Total	1 mg/L
Specific Conductivity	2 µS/cm	Acidity	2 mg/L
Hardness as $CaCO_3$ (Dissolved)	1 mg/L	Chloride	0.5 mg/L
Total Dissolved Solids (TDS)	10 mg/L	Fluoride	0.02 mg/L
TSS	2 mg/L	Bromide	0.05 mg/L
Turbidity	0.1 NTU	Sulphate	0.5 mg/L
Colour	5 CU	**Organics**	
Nutrients		TOC	0.5 mg/L
Nitrate Nitrogen	0.005 mg/L	DOC	0.5 mg/L
Nitrite Nitrogen	0.005 mg/L	**Cyanide**	
Nitrogen – Total	0.05 mg/L	Total Cyanide	0.001 mg/L
Ammonia Nitrogen	0.02 mg/L	Cyanide (WAD)	0.001 mg/L
Ortho phosphorus – dissolved	0.005 mg/L		
Phosphorous – Total	0.005 mg/L		
Total and Dissolved Metals			
Aluminum	0.001 mg/L	Manganese	0.0002 mg/L
Antimony	0.0001 mg/L	Mercury	0.00001 mg/L
Arsenic	0.0002 mg/L	Molybdenum	0.0001 mg/L
Barium	0.0001 mg/L	Nickel	0.0005 mg/L
Beryllium	0.0001 mg/L	Potassium	0.1 mg/L
Bismuth	0.0005 mg/L	Selenium	0.0003 mg/L
Boron	0.01 mg/L	Silicon	0.05 mg/L
Cadmium	0.00001 mg/L	Silver	0.00001 mg/L
Calcium	0.05 mg/L	Sodium	0.1 mg/L
Chromium	0.0005 mg/L	Strontium	0.0002 mg/L
Cobalt	0.0001 mg/L	Thallium	0.00001 mg/L
Copper	0.0002 mg/L	Tin	0.0002 mg/L
Iron	0.01 mg/L	Titanium	0.01 mg/L

Lead	0.0001 mg/L	Uranium	0.00001 mg/L
Lithium	0.001 mg/L	Vanadium	0.001 mg/L
Magnesium	0.1 mg/L	Zinc	0.001 mg/L

Table 7.4-3 Mine Site Surface Water Flow Monitoring Locations

Facility	Mine Phase	Monitoring Instruments Proposed	Rationale
TSF C supernatant pond – water level*+	Construction, Operations, Closure, Post-Closure	Pressure transducers and/or lookdown water level sensors, combined with manual survey	To determine when supernatant will be sent to the Membrane WTP and confirm adequate freeboard. To inform on-going water balance model calibration.
TSF D supernatant pond – water level*+	Operations, Closure, Post-Closure	Pressure transducers and/or lookdown water level sensors, combined with manual survey	To confirm adequate freeboard. To inform on-going water balance model calibration.
Central diversion system	Operations, Closure, Post-Closure	Pressure transducers at pond, flowmeters at pumpstation, new surface flow monitoring station downstream, if required	Improve understanding of inflows and outflows, diversion efficiency, and inform on-going water balance model calibration
Northern diversion system	Operations, Closure	Pressure transducers at pond, flowmeters at outlet pipe, new surface flow monitoring station downstream, as required	Improve understanding of inflows and outflows, diversion efficiency, and inform on-going water balance model calibration
WMP	Construction (Year -1), Operations, Closure.	Pressure transducers and/or lookdown water level sensors, combined with manual survey. Flowmeters at pumpstations, v-notch weir or other surface flow monitoring technique a primary overflow outlet	Improve understanding of inflows and outflows, diversion efficiency, and inform on-going water balance model calibration.
IECD+	Construction (Year -1), Operations (Year +1 To Year +6).	Pressure transducers at pond combined with manual survey. Flowmeters at pumpstation.	Improve understanding of inflows and outflows, and inform on-going water balance model calibration
ECD+	Operations, Closure, Post-Closure	Pressure transducers at pond combined with manual survey. Flowmeters at pumpstation.	Improve understanding of inflows and outflows, and inform on-going water balance model calibration

*PE-110652 monitoring location
+M-246 monitoring location

7.4.2.1 TSF Supernatant Ponds

The design of the TSF includes water storage allowances for the supernatant pond to provide a continuous source of process water for mill operations and to manage seasonal inflows, the Environmental Design Flood, and the Inflow Design Flood (KP 2021e, KP 2021f). The LoM WBM predicts that the TSF C pond volume will fluctuate between 1 (Year+1) and 10 Mm^3 (Year +11 to Year +23), as shown in Table 7.3-2. The pond volume of TSF C in Closure is maintained near 2 Mm^3 by pumping water to the Pit Lake. The TSF D Pond is maintained at a minimum volume prior to discharge of tailings into the facility and has a nominal operating water storage allowance of 2 Mm^3 after tailings discharge begins.

The volume of water in the TSF ponds will be estimated using a combination of pond water level measurements and bathymetric surveys. Water levels will be regularly monitored, using a combination of water level monitoring instrumentation and manual survey techniques, at the TSF C supernatant pond and later at the TSF D supernatant pond, to compare current water levels with freeboard requirements. A bathymetric survey of the supernatant ponds will occur at least twice (spring and fall) per year initially to develop a good understanding the rate of TSF filling. The frequency of bathymetric surveys may be decreased to annual measurements once the TSF filling relationship is well understood. Bathymetric measurements help calibrate the understanding of the depth/area/capacity relationship of each TSF pond. A combination of frequent water level measurements and bathymetric survey data will be used to regularly estimate the volume of water in the TSF.

If the supernatant pond exceeds the nominal operating volume (Table 7.3-2), membrane water treatment of the TSF C pond water will be initiated. An OMS Manual was prepared following initial construction and prior to commissioning of the TSF to provide comprehensive operating instructions and monitoring frequencies and will identify how and when water will be pumped to the Membrane WTP. Conceptually, the Membrane WTP operating instructions described in the OMS Manual will be a tier based system, similar to a trigger action response plan, that will link treatment instructions with data from the available monitoring equipment and surveillance techniques.

7.4.2.2 Central Diversion System Water Transfer Pond

Water level monitoring within the water transfer pond is required to inform the operation of the pumping system and document when the pond has reached capacity and flow into the TSF is occurring.

The quantity of water pumped from the Phase 1 and Phase 2 CWTP outlets will be monitored using flow meters installed downstream of the centrifugal pumps. In addition, during Year -1 to Year +6, a surface water flow monitoring station downstream of the CWTP may be required to measure the quantity of water spilling from the facility and contributing to the TSF. The surface flow monitoring station will consist of a pressure transducer and data logger system to measure continuous water level, and frequent discharge measurements at varying flows to develop a stage discharge rating curve. Baseline monitoring station H10 is located downstream of the CWTP and may be used for instream flow monitoring until the tailings encroaches upon it; after this a new station will be established further upstream. The design concept for Year +7 to the end of Operations and through Post-Closure does not involve excess flow being routed to the TSF, therefore a surface water flow monitoring station will not be required.

Water levels will be monitored using a pressure transducer with an appropriate depth range. All monitoring instrumentation will incorporate a radio or telemetry system to facilitate automated data collection and to allow access to monitoring data in real time, if required.

In the event of winter ice conditions, the automated water level transducers can malfunction. In this case pond elevations will be monitored visually by means of calibrated lines marked on the banks of the facility or manual survey techniques until the automated system regains functionality.

7.4.2.3 Northern Diversion System Water Transfer Pond

Water level monitoring within the North Diversion System Water Transfer Pond is required to provide information regarding how much storage is available. Water levels will be monitored using a pressure transducer with an appropriate depth range.

Flow through the outlet of the North Diversion System Water Transfer Pond will be monitored using ultrasonic flow meters installed within the outlet pipe. In addition, a surface flow monitoring station downstream of the water transfer pond may be required to measure the volume of water spilling from the facility and contributing to the TSF. If required, the surface flow monitoring station will consist of a pressure transducer and data logger system and will require the development of a stable water level/discharge rating curve.

All monitoring instrumentation will incorporate a radio or telemetry system to facilitate automated data collection and allow access to monitoring data in real time, if required.

In the event of winter ice conditions, the automated water level transducers can malfunction. In this case pond elevations will be monitored visually by means of calibrated lines marked on the banks of the facility or using manual survey techniques until the automated system regains functionality.

7.4.2.4 Water Management Pond

A WMP Discharge Pipeline will route water from the WMP to the FWR. Water will be pumped to the FWR when not needed to support mill operations.

Water pumped from the WMP will be monitored using a flow meter installed downstream of the centrifugal pumps. The pumps will be controlled by a floating level control system in the WMP and equipped with variable frequency drives to balance the total system head from the individual units.

A culvert on the West Berm will provide supplemental outflow capacity to the TSF supernatant pond during periods of elevated runoff, and an emergency spillway will be constructed along the left abutment of the North Berm, terminating at a stilling basin in the Mine Area Creek catchment below the North Berm and upstream of Main Dam C.

7.4.2.5 IECD and ECD Ponds

The IECD water will be pumped to TSF C from Year -1 through Year +6. The ECD pumpback system is required to convey water from the ECD to TSF D beginning at the end of Year +6. Water pumped from the IECD and ECD will be monitored using flow meters installed downstream of the pumps. The pumps will be controlled by a floating level control system in the IECD and ECD and equipped with variable frequency drives.

7.4.3 Water Treatment Monitoring

Water treatment plant operations and treatment efficiencies will be monitored by WTP operators as part of internal protocols and Standard Operating Procedures (SOPs) (BQE Water 2021, McCue 2021). This monitoring will include inline recordings at various treatment stages, field test kits (HACH or equivalent) for key parameters, and analytical samples submitted to CALA certified laboratory, specific to each treatment system.

The key performance indicators that will be monitored at the Membrane WTP to determine if effluent is meeting specifications (BQE 2021) are as follows:

- For metal precipitation: pH and the residual ORP measurement. Maintaining pH on target and a slightly negative ORP ensures that treatment targets are being achieved; and

- For membrane filtration: permeate conductivity. Permeate water quality targets are achieved when the conductivity is maintained below a pre-determined setpoint.
- Final monitoring of effluent quantity and quality at the Metals WTP will be performed with an inline flow meter, pH meter, and turbidity meter (McCue 2021).

Monitoring will also be conducted by BW Gold at WTP influent and effluent points to support the evaluation of treatment efficiency and inform ML/ARD monitoring and mine water management (Table 7.3-4). WTP influent and effluent operational monitoring weekly samples will be collected during WTP operations and analyzed for the suite of parameters. . The parameters to be measured will include those identified in Permit PE-110652, summarized in Table 7.3-2. Field parameters measured in WTP influent and effluent under Permit PE-110652 (for the Metals WTP and Membrane WTP) will include turbidity, pH, conductivity, temperature, DO and OPR.

For the lime neutralization system, the influent and effluent flow and pH will be continuously monitored in the process plant control room and data will be recorded by the control system. Grab samples will be collected weekly immediately upstream and downstream of the neutralization tanks. The pH of the grab samples will be analyzed by a lab to confirm calibration of the pH probes in the lime neutralization system.

As described in Section 7.2.10.4, the current Application also considers the authorization of a sewage treatment facility at the Plant Site. This facility will treat domestic wastewater discharge generated from facilities at the processing plant, truck shop and wash, and mine dry/office, including kitchen, washroom, showering, and laundry. The facilities at the Plant Site will be built during Year -2 and Year -1, with facilities generating domestic wastewater by the start of Year +1. Domestic wastewater from the Plant Site will be treated and directed to the TSF C Pond via the tailings line. Further information is presented in Section 3.5.11.12 (Waste Management Facilities) and Section 5.7 (Domestic Water/Sewage Treatment) of the Application (BW Gold 2022).

Table 7.4-4 Summary of Water Treatment Monitoring Locations

Facility	Coordinates	Mine Phase	Description	
Metals WTP	5894248N, 376487E	Operations	Influent*	Monitored at Metals Treatment Pond. Pond for temporary storage of inlet water to Metals WTP
			WTP	Operational plant monitoring. Treats pit sump water, and Upper and Lower Waste Stockpile runoff
			Effluent*	Effluent stream (treated water)
Lime Neutralization System	5894395N, 376250E	Operations	Influent	Monitored at LGO stockpile toe
			WTP	Operational plant monitoring. Treats runoff and seepage from LGO stockpiles
			Effluent	Outflow stream of lime-adjusted water
Membrane (RO) WTP	5895780N, 375246E	Operations	Influent*	Monitored at TSF C
			WTP	Operational plant monitoring. Treats TSF C pond overflow
			Effluent*	Effluent stream (treated water)
Membrane (NF) WTP	5895780N, 375246E	Post-Closure	Influent	Influent stream to WTP
			WTP	Operational plant monitoring. Treats ECD water, TSF C overflow, Pit Lake water and collected Pit Lake seepage
			Effluent	Effluent stream (treated water)
Plant Site Sewage Treatment Facility	5894427N, 376420E	Construction, Operations, Closure	Influent	Influent stream to facility
			Effluent*	Effluent stream (treated water)

Coordinates are approximate, all station locations and coordinates will be verified upon station commissioning.
*PE-110652 monitoring location

7.4.4 Mine Site Groundwater Quality and Flow

Mining activities that may impact groundwater quality during construction and operations include stockpiling of ore and tailings and waste rock management. The Groundwater Monitoring Plan (GMP; KP 2025) defines the groundwater quality and quantity monitoring to be conducted during the development, Operations, and through Post-Closure phases of the Mine. The MSDP provides a summary of the groundwater monitoring activities at the Mine, however the GMP should be considered as the primary document of reference.

7.4.4.1 Groundwater Quality

Monitoring Methods

The groundwater sampling methods employed at the Mine are based on low-flow sampling procedures adapted from the following documents:

- BC Field Sampling Manual. Part E2 Groundwater (Draft) (Province of British Columbia 2021).
- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Prepared by the BC Ministry of Environment (BC MOE 2016b).
- Low-Flow (Minimum Drawdown) Ground-Water Sampling Procedures. 1996. United States Environmental Protection Agency. EPA/540/S-95/504 (Puls and Barcelona 1996).

The objective of low-flow groundwater sampling is to match the purge rate with the natural groundwater flow rate in the completion zone, resulting in minimal stress on the surrounding aquifer and more representative samples. When the purge rate is optimal, the water level in the monitoring well can be maintained near the initial static water level throughout the purging and sampling process (i.e., the water level does not drop). Target pump rates for low-flow minimum drawdown sampling are between 0.1 litres per minute (L/min) and 0.5 L/min but can be greater if the water level remains stable and turbidity is lower than 5 NTU (as per BC ENV, 2016). When a stable water level is achieved, the monitoring well is purged until in-situ parameters stabilize, then a sample is collected. If a stable water level cannot be achieved, the monitoring well is purged down to the pump intake, typically placed 1 m above the top of the monitoring well screen, and the sample is collected the next day. The in-situ parameters are recorded immediately prior to collection of the sample.

In-situ parameters are recorded using a multi-parameter probe and a flow-through cell, which reduces the exposure to ambient surface conditions and thus preserves the in-situ conditions. Final in-situ parameters for samples are collected once parameters stabilize, immediately prior to collecting the samples. The following in-situ parameters are recorded:

- pH
- Temperature
- Specific conductivity and conductivity
- Dissolved oxygen
- Redox potential
- Turbidity

Samples for dissolved parameters are filtered in the field by attaching a 0.45 µm in-line filter to the water line. Any required preservatives are added to samples immediately after sample collection and filtering. Using in-line filters reduces sample contact with ambient surface conditions.

Samples are placed in coolers with ice packs and shipped to the laboratory under standard chain-of-custody procedures. All efforts are made to meet holding time requirements prior to sample analysis.

Monitoring Frequency

Monitoring of groundwater quality will be conducted quarterly at all monitoring wells located downgradient of mine facilities. Monitoring of groundwater quality will be conducted annually at background monitoring wells MW12-05S/D and MW12-13S that have water quality records extending more than 10 years long.

Quality Parameters and Analyses

Groundwater samples will be submitted to ALS Environmental, or another CALA certified analytical laboratory. Groundwater samples will be submitted for the following analyses:

- Physical Tests – pH, specific conductivity, total dissolved solids (TDS), total suspended solids (TSS), hardness, acidity, alkalinity, and turbidity.
- Anions – Bromide, chloride, fluoride, and sulphate.
- Nutrients – Ammonia, nitrate, nitrite, total and dissolved phosphorus, dissolved orthophosphate, total Kjeldahl Nitrogen, and total and dissolved organic nitrogen.
- Cyanide – Total cyanide, cyanate, and thiocyanate.
- Total and Dissolved Metals – Analyzed at low level detection limits with mercury.
- Organics – Total organic carbon (TOC) and dissolved organic carbon (DOC).

Future analyses, mitigation measures, or permits may require additional parameters be analysed. Routine analysis of groundwater samples will include analysis for total cyanide. Analysis for cyanide species will be completed if concentrations of total cyanide are detected above analytical method detection limits.

7.4.4.2 Groundwater Flow

Monitoring Methods

Water level conditions will be monitored using monitoring wells, standpipe piezometers, and VWPs. Continuous monitoring of groundwater levels at the site is completed using pressure transducers installed in monitoring wells and standpipe piezometers. The pressure transducers will be downloaded when the monitoring wells are sampled. Water levels will also be measured manually during each site visit and compared to pressure transducer readings to ensure equipment is functioning correctly. A barometric pressure transducer is installed in a standpipe piezometer located near the TSF basin. The barometric data are used to compensate the groundwater elevation time-series data for fluctuations in barometric pressure.

Continuous monitoring of groundwater levels will also be completed using VWPs. VWPs were installed in drillholes by attaching the sensors to a PVC or steel pipe that was used as a tremie to backfill the drillhole with grout to ground surface. VWPs installed at each site are connected to a datalogger to continuously record water level data.

A range of screened intervals is monitored to capture impacts to both the shallow and deeper groundwater systems.

Monitoring Frequency

Water levels will be measured manually on a quarterly basis at each monitoring well and standpipe piezometer. Pressure transducers will be installed at all groundwater monitoring stations to provide a continuous water level record. Pressure transducers and VWPs will be set to record at a minimum of one-hour intervals and will be downloaded quarterly.

7.4.4.3 Groundwater Monitoring Locations

The groundwater monitoring and sampling program includes water level monitoring and water quality sampling at monitoring wells, as well as water level monitoring at standpipe piezometers and vibrating wire piezometers (VWPs). Installation details for existing and proposed groundwater monitoring locations included in the program are summarized in Tables 7.4-5 and 7.4-6. Groundwater quality data are collected at the sites listed in Table 7.3-5, while water level data are collected at the sites listed in both Tables 7.4-5 and 7.4-6. Groundwater monitoring locations at different periods of the mine life are shown on Figures 7.4-6 through 7.4-9. Instrumentation included in the monitoring network have been selected based on location relative to proposed mine infrastructure, including positions upgradient and downgradient of proposed mine facilities and depths in shallow and deep groundwater flow systems. Scheduling considerations for installation of proposed wells and decommissioning of existing monitoring sites is provided in columns at the left side of Tables 7.4-5 and 7.4-6.

The groundwater monitoring program at the Mine includes the following:

- Groundwater sampling at 31 monitoring wells on an ongoing basis (28 locations quarterly, 3 locations annually); two of these locations are typically dry.
- Manual water level measurements and downloading of pressure transducers at 48 locations on an ongoing basis (31 water quality sites and 17 water level sites; 44 sites quarterly, 4 sites bi-annually).
- Downloading data from four VWP locations on a quarterly basis.

Open Pit

Dewatering of the Open Pit is expected to result in a decrease in groundwater levels in the surrounding area. Groundwater drawdown associated with Open Pit dewatering will recover following closure of the mine and the development of a Pit Lake.

Water level monitoring sites in the Open Pit area include existing wells: MW12-03D, MW12-04D/S, MW12-10D, MW12-11D/S, GT13-25, GT13-44, and GT19-04 and DK/MW-05. An additional water level monitoring location is proposed to be installed during early Operations at GT-A to assess the groundwater level drawdown toward the Blackwater River catchment. Groundwater sampling is proposed to continue downgradient of the Open Pit at MW12-03D. Additional sites surrounding the Open Pit will be used for water level monitoring to evaluate pit slope depressurization for Open Pit stability analyses and are not included in this monitoring program.

TSF and ECD

Several existing monitoring wells and new monitoring sites will monitor water quality and water levels to assess the potential for seepage from the TSF to bypass seepage collection measures. Sentinel monitoring wells located downgradient of TSF C and TSF D and upgradient of the IECD and ECD and seepage collection trenches will monitor seepage flow paths and depths and potential for seepage to bypass the collection systems. Buried glaciofluvial sand and gravel channels and the weathered bedrock horizons are potential preferential groundwater flow pathways that may convey seepage downgradient of the TSF.

Existing monitoring wells located within the ultimate TSF C and D footprints will be decommissioned prior to the construction footprint reaching that monitoring location (approximately Year +5). These wells will be replaced by monitoring wells at seven sites (MW-F through MW-L) established downgradient of Main Dam D to evaluate seepage flow paths and depths and potential for seepage to bypass the collection systems. Monitoring sites MW-F through MW-L will be installed prior to construction of Main Dam D and the ECD. Monitoring sites MW-N and MW-O will be established prior to construction of the TSF C Saddle Dam (approximately Year +10). Proposed sites will consist of shallow and deep monitoring wells at each location to monitor groundwater conditions at different depths.

Long-term monitoring wells are already established adjacent to Davidson Creek downgradient of the FWR (MW12-08D/S and MW12-09D/S) and downgradient of the TSF and Closure Spillway in the Creek 661 catchment (MW12-12D/S). Proposed monitoring site MW-A will be installed upgradient of TSF C during early Operations to monitor background water level and water quality conditions throughout Operations and Closure.

LGO Stockpile and Upper and Lower Waste Stockpiles

Monitoring wells are located downgradient of the LGO Stockpile and Upper and Lower Waste Stockpiles to provide early warning of possible seepage from the facilities. Existing monitoring wells (MW23-03D/S, MW23-04D/S, and MW24-01D(A)/S) monitor groundwater conditions downgradient of the three stockpiles.

Proposed monitoring site MW-R will be installed following construction of the LGO Collection Pond in Year 1; due to limited available area between the pond and Mine Area Creek during construction. Groundwater quality conditions downgradient of the proposed stockpile footprint are presently monitored at monitoring wells MW23-03D/S and MW24-01D/S, as well as in Mine Area Creek in conjunction with the surface water sampling program.

Plant Site and Operations Camp

Monitoring wells are located downgradient of the Plant Site to provide early warning of possible seepage quantity or quality concerns. These include existing monitoring wells MW23-01 and MW23-02D/S located downgradient of the Plant Site and rapid infiltration basins (RIBs), respectively. Groundwater conditions downgradient of the Camp Site are monitored at monitoring wells MW12-12D/S situated along Creek 505659, an upper tributary of Creek 661.

The Plant Site SCP (authorized by Mines Act M-246 [Early Works]) will provide controlled discharge to ground through a RIB system during Construction. Water from the Plant Site SCP will be directed to the Mill during Operations and to TSF C in Closure until the Plant Site is reclaimed and the SCP decommissioned.

Table 7.4-5 Mine Site Groundwater Quality Monitoring Locations

Drillhole ID	Location Monitored	Status of Monitoring Well	Proposed Decommissioning Rationale	Coordinates		Top of Screen	Bottom of Screen	Sampling Frequency	Geologic Unit	Notes
				Easting	Northing					
				(m)	(m)	(mbgs)	(mbgs)			
Monitoring Wells Located Between TSF C and the IECD										
GT20-04	TSF C	Existing	Before filling of TSF D (approximately Year 5-7).	376,215	5,898,081	22.17	27.94	Quarterly	Glacial Till (Undifferentiated)	
GT21-03S		Existing		376,287	5,897,943	16.64	19.78	Quarterly	Glaciofluvial	
MW22-02D		Existing		376,429	5,897,628	42.52	45.42	Quarterly	Glaciofluvial	Sentinel well
MW22-02S				376,432	5,897,619	14.07	15.54	Quarterly	Glaciofluvial	Sentinel well Monitoring well is dry, collect sample if water is found.
MW22-03D		Existing		376,067	5,897,828	31.40	34.40	Quarterly	Glaciofluvial	Sentinel well
MW22-03S				376,059	5,897,829	10.61	12.08	Quarterly (see note)	Glaciofluvial	Sentinel well Monthly sampling to continue through Q1 2025. KP will review and reassess the sampling frequency at the end of the quarter.
MW23-05D		Existing		375,972	5,898,012	32.33	35.38	Quarterly	Glaciofluvial	Sentinel well
MW23-05S				375,972	5,898,012	5.94	8.99	Quarterly (see note)	Glacial Till	Sentinel well Monthly sampling to continue through Q1 2025. KP will review and reassess the sampling frequency at the end of the quarter.
Monitoring Wells Located Between TSF D and the ECD / Seepage Collection Trenches										
MW12-07D	TSF D	Existing	Prior to construction of the North Interception Trench, if located in the trench alignment.	376,395	5,899,440	35.40	38.60	Quarterly	Glaciofluvial	
MW12-07S				376,399	5,899,440	19.80	22.90	Quarterly	Glaciofluvial	
MW-F[6]		Proposed Approximately Year 5	-	-	-	-	-	Quarterly	Well screens to be installed in horizons that could be potential seepage pathways (i.e., glacial till, glaciofluvial, and/or weathered bedrock).	Paired deep and shallow monitoring wells located downgradient of TSF D. Sentinel wells (except MW-J).
MW-G			-	-	-	-	-	Quarterly		
MW-H			-	-	-	-	-	Quarterly		
MW-I			-	-	-	-	-	Quarterly		
MW-J			-	-	-	-	-	Quarterly		
MW-L			-	-	-	-	-	Quarterly		
Monitoring Wells Located at the FWR and Downgradient										
MW12-08D	TSF and ECD	Existing	-	377,889	5,899,192	32.60	35.60	Quarterly	Glacial Till	
MW12-08S			-	377,899	5,899,198	16.20	19.30	Quarterly	Glaciofluvial Channel	
MW12-09D		Existing	-	378,334	5,899,688	30.50	33.60	Quarterly	Glacial Till	
MW12-09S			-	378,324	5,899,687	10.36	15.85	Quarterly	Glacial Till	
Monitoring Wells Located at the Saddle Dam and Spillway										
MW12-12D	TSF	Existing	-	378,486	5,896,260	31.20	34.20	Quarterly	Glacial Till	
MW12-12S			-	378,493	5,896,256	11.20	14.20	Quarterly	Glaciofluvial Channel	
MW-K		Proposed Approximately Year 5	-	-	-	-	-	Quarterly	Well screens to be installed in horizons that could be potential seepage pathways (i.e., glacial till, glaciofluvial, and/or weathered bedrock).	Paired deep and shallow monitoring wells located downgradient of TSF C.
MW-O		Proposed Approximately Year 10	-	-	-	-	-	Quarterly		Paired deep and shallow monitoring wells located downgradient of TSF Spillway.
MW-N			-	-	-	-	-	Quarterly		Paired deep and shallow monitoring wells located downgradient of Saddle Dam.

Drillhole ID	Location Monitored	Status of Monitoring Well	Proposed Decommissioning Rationale	Coordinates		Top of Screen	Bottom of Screen	Sampling Frequency	Geologic Unit	Notes
				Easting	Northing					
				(m)	(m)	(mbgs)	(mbgs)			
Monitoring Wells Downgradient of Stockpiles Area										
MW12-02S	LGO	Decommissioned	Prior to construction of haul road to Lower Waste Stockpile in Year -1	374,704	5,894,670	8.20	9.80	Discontinued	Glacial (Lodgement) Till	Decommissioned August 16, 2024.
MW23-03D	LGO	Existing	-	374,841	5,894,551	32.11	35.07	Quarterly	Highly Weathered Bedrock	
MW23-03S	LGO	Existing	-	374,848	5,894,547	5.50	8.46	Quarterly	Glaciofluvial	Limited water column in well.
MW24-01D	LGO	Existing	-	374,784	5,894,807	17.80	20.73	Quarterly (see note)	Intact Bedrock	Monthly sampling to continue through Q1 2025. KP will review and reassess the sampling frequency at the end of the quarter.
MW24-01S	LGO	Existing	-	374,793	5,894,814	10.00	11.50	Quarterly (see note)	Glaciofluvial	Monthly sampling to continue through Q1 2025. KP will review and reassess the sampling frequency at the end of the quarter.
MW23-04D	LWS	Existing	-	374,754	5,894,905	32.50	35.55	Quarterly	Highly Weathered Bedrock	
MW23-04S	LWS	Existing	-	374,749	5,894,900	14.23	17.28	Quarterly	Glacial Till	
MW-R		Proposed Year 1 or 2	-	-	-	-	-	Quarterly (see note)	Well screens to be installed in horizons that could be potential seepage pathways (i.e., glacial till, glaciofluvial, and/or weathered bedrock).	Paired deep and shallow monitoring wells located downgradient of LGO. Proposed monitoring well installed after construction of the LGO Collection Pond. Groundwater sampling to be completed at a monthly frequency for a 3-month period, following installation and development of the monitoring well.
Monitoring Wells Downgradient of Deposit Area										
MW12-03D	Open Pit	Existing	-	376,013	5,893,860	33.50	36.60	Quarterly	Glacial (Lodgement) Till	
GT13-44	Open Pit	Existing	-	376,538	5,893,844	61.42	64.42	Quarterly	Glacial (Lodgement) Till	
Monitoring Wells Downgradient of Plant Site Area										
MW23-01	Plant Site	Existing	-	376,270	5,894,090	50.09	53.14	Quarterly	Glacial Till	
MW23-02D	Plant Site RIBs	Existing	-	376,556	5,894,566	30.21	33.26	Quarterly	Glacial Till	Monitoring well is dry, collect sample if water is found.
MW23-02S	Plant Site RIBs	Existing	-	376,564	5,894,575	7.88	9.35	Quarterly (see note)	Glacial Till	Monthly sampling to continue through Q1 2025. KP will review and reassess the sampling frequency at the end of the quarter.
Background Monitoring Wells										
MW12-01D	-	Existing	Decommissioned if Main Dam D Construction footprint overtakes location (Year 7).	374,655	5,899,360	36.60	39.60	Quarterly	Moderately Weathered Bedrock	
MW12-05D	-	Existing	-	371,310	5,896,210	23.20	26.20	Annual (see note)	Moderately Weathered Andesite	Manual water level measurements and transducer downloads conducted bi-annually.
MW12-05S	-	Existing	-	371,309	5,896,210	7.60	10.70	Annual (see note)	Glacial (Lodgement) Till	Manual water level measurements and transducer downloads conducted bi-annually.
MW12-13S	-	Existing	-	370,809	5,893,841	10.00	13.10	Annual	Glaciofluvial Channel	
MW-A	-	Proposed Year 1 or 2	-	-	-	-	-	Quarterly	Shallowest and deeper water bearing zone.	Paired deep and shallow monitoring wells located upstream of TSF. Proposed background monitoring well installed during early Operations

Coordinates presented in UTM Zone 10U NAD 83.
All installations are in vertical drillholes.
Sentinel monitoring will is located upgradient of seepage collection measures for the facility and provides an early warning for impacted groundwater.

Table 7.4-6 Mine Site Groundwater Flow Monitoring Locations

Drillhole ID	Type	Status of Monitoring Well	Proposed Decommission-ing Rationale	Coordinates		Installation Details			Water Level Measurement / Download Frequency	Pressure Transducer or Data Logger Presently Installed	Notes
				Easting	Northing	Top of Screen	Bottom of Screen	VWP Sensor Depth			
				(m)	(m)	(mbgs)	(mbgs)	(m)		(Y/N)	
Water Level Monitoring Locations in the TSF Area											
GT21-03D	SP	Existing	Before filling of TSF D (approximately Year 5-7).	376,286	5,897,943	45.1	50.6	-	Quarterly	Y	
GT12-01	SP	Existing	Decommissioned prior to construction of Main Dam D Embankment (approximately Year 5).	376,021	5,898,690	68.6	71.6	-	Quarterly	Y	
	VWP					-	-	23.6		N/A	
GT12-02	VWP	Existing		376,420	5,898,110	-	-	95	Quarterly	N/A	
								36			
								13			
GT13-02	VWP	Existing	-	376,737	5,898,895	-	-	86.6	Quarterly	N/A	
								60			
								36			
GT12-09	SP	Existing	Before filling of TSF D (approximately Year 5-7).	376,624	5,897,640	106.7	109.7	-	Quarterly	Y	
GT12-10	SP	Existing		376,926	5,897,280	28.3	31.4	-	Quarterly	Y	
GT12-11	SP	Existing		377,036	5,896,980	11.6	14.6	-	Quarterly	Y	
GT13-19	SP	Existing		377,072	5,896,582	7.0	10.1	-	Quarterly	Y	
GT13-20	SP	Existing		377,111	5,897,022	32.5	35.1	-	Quarterly	Y	
GT13-21	SP	Existing		377,080	5,897,297	69.2	72.1	-	Quarterly	Y	
Water Level Monitoring Locations in the Open Pit Area											
MW12-04D	SP	Existing	Before placement of material at the Upper Waste Stockpile (approximately Year 11)	374,110	5,892,500	31.8	38.0	-	Bi-Annual	Y	
MW12-04S	SP	Existing		374,116	5,892,500	9.0	14.8	-	Bi-Annual	Y	Well plug is installed during winter months.
MW12-10D	SP	Existing	Before being overtaken by the Open Pit (prior to Year 13)	375,045	5,892,263	33.2	42.1	-	Quarterly	Y	
MW12-11D	SP	Existing		375,773	5,892,168	36.3	46.6	-	Quarterly	Y	
MW12-11S	SP	Existing		375,782	5,892,171	14.0	19.8	-	Quarterly	Y	
GT19-04	VWP	Existing	-	374,872	5,893,713	-	-	15.8	Quarterly	N/A	
								4			
GT13-25	SP	Existing	-	375,849	5,893,706	25.3	28.4	-	Quarterly	Y	
GT19-03	SP	Existing	Prior to construction of haul road to Lower Waste Stockpile in Year -1	375,109	5,893,991	16.3	19.4	-	Discontinued	Y	Decommissioned October 5, 2024
DK/MW-05	SP	Existing	-	376,757	5,894,076	35.3	38.4	-	Quarterly	Y	
GT-A	-	Proposed Year 1	-	-	-	-	-	-	-	N/A	Drillhole proposed with nested VWP sensors.
Background Water Level Monitoring Locations											
MW12-01S	SP	Existing	Decommissioned if Main Dam D Construction footprint overtakes location (Year 7).	374,658	5,899,360	7.6	13.6	-	Quarterly	Y	
MW12-13D	SP	Existing	-	370,815	5,893,844	34.9	39.0	-	Quarterly	Y	

Coordinates presented in UTM Zone 10U NAD 83.
SP = standpipe piezometer; VWP = vibrating wire piezometer
All installations are in vertical drillholes.

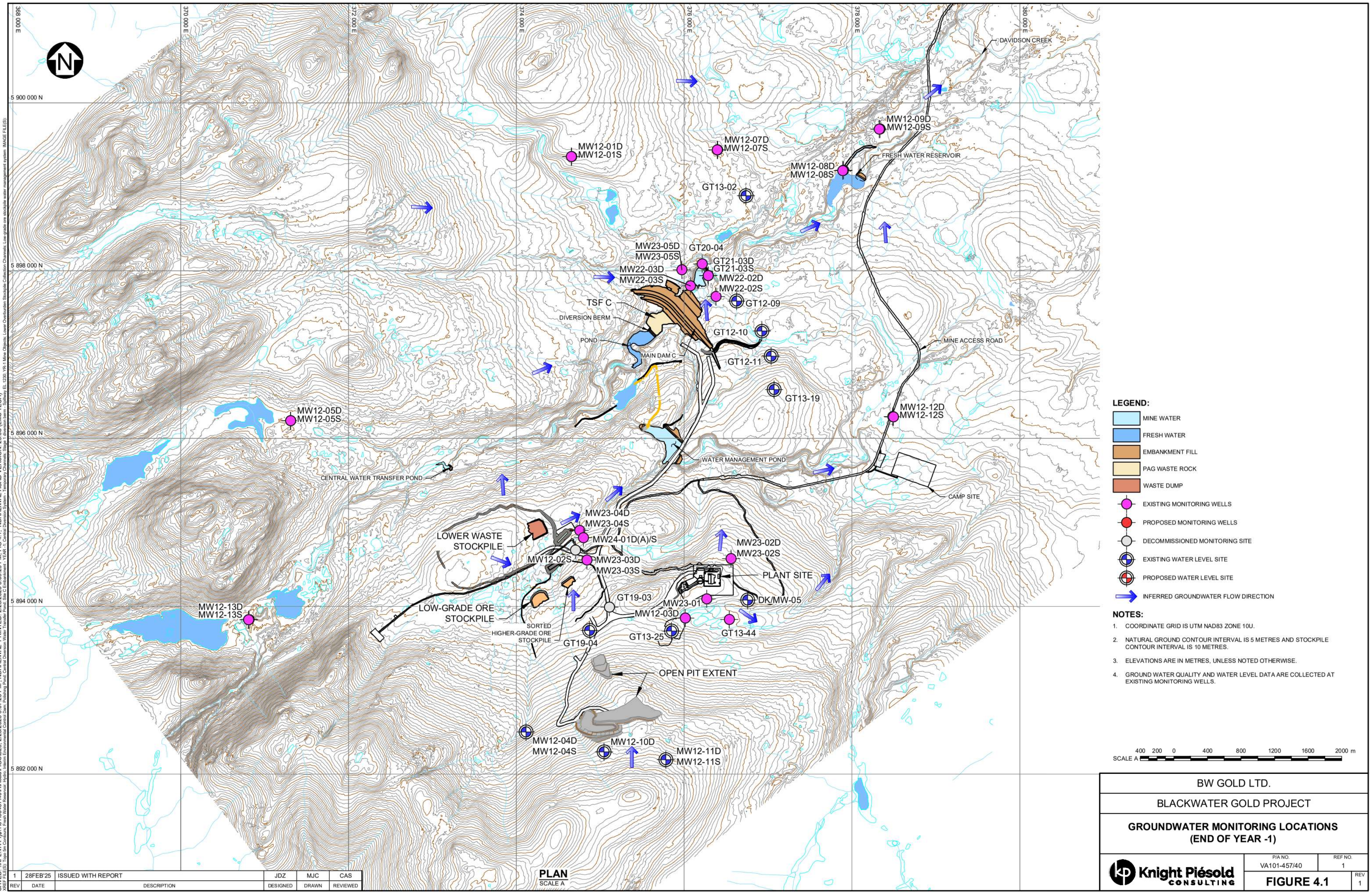


Figure 7.4—6 Groundwater Monitoring Locations (End of Year -1)

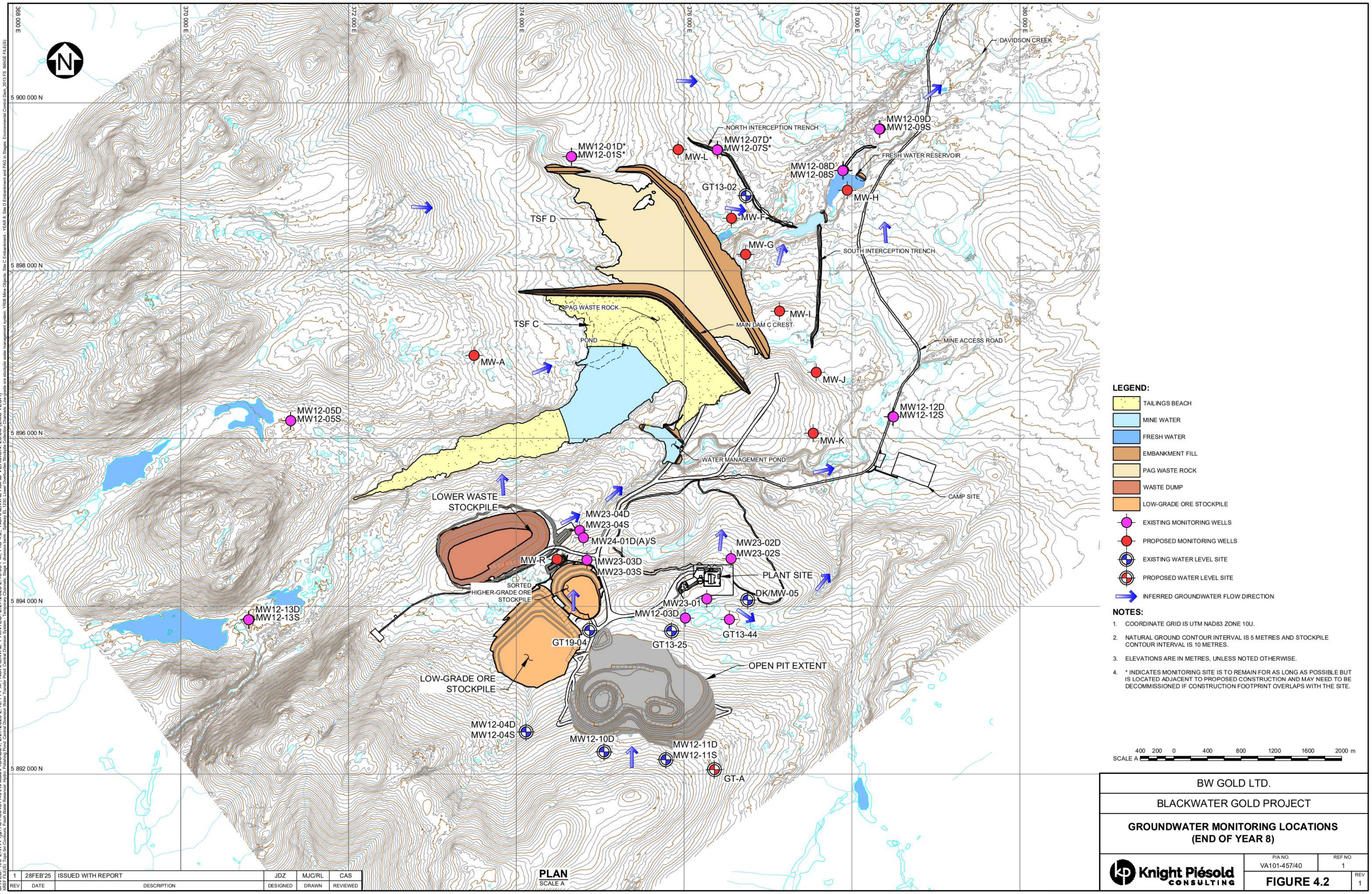


Figure 7.4—7 Groundwater Monitoring Locations (End of Year +8)

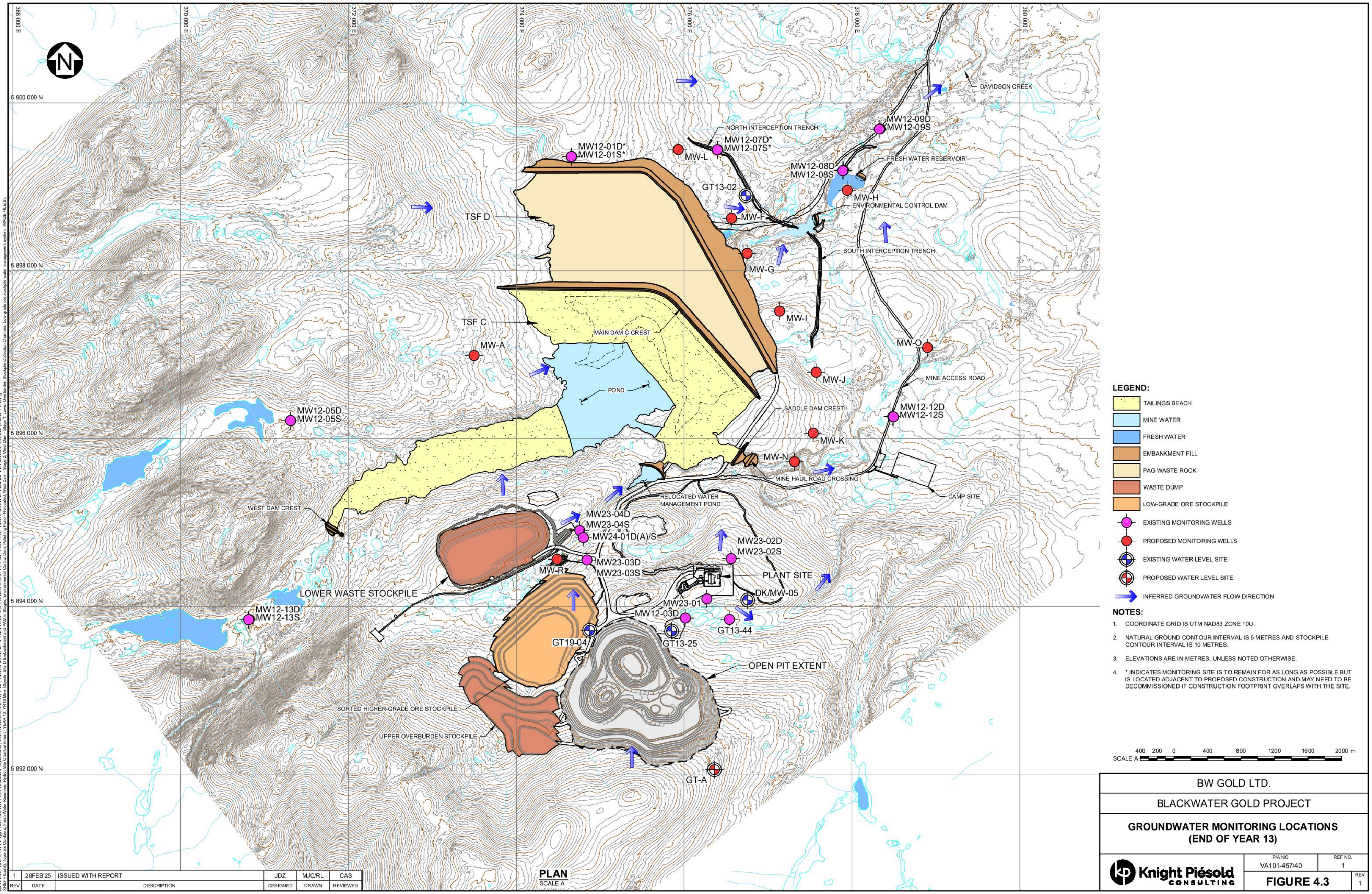


Figure 7.4—8 Groundwater Monitoring Locations (End of Year +13)

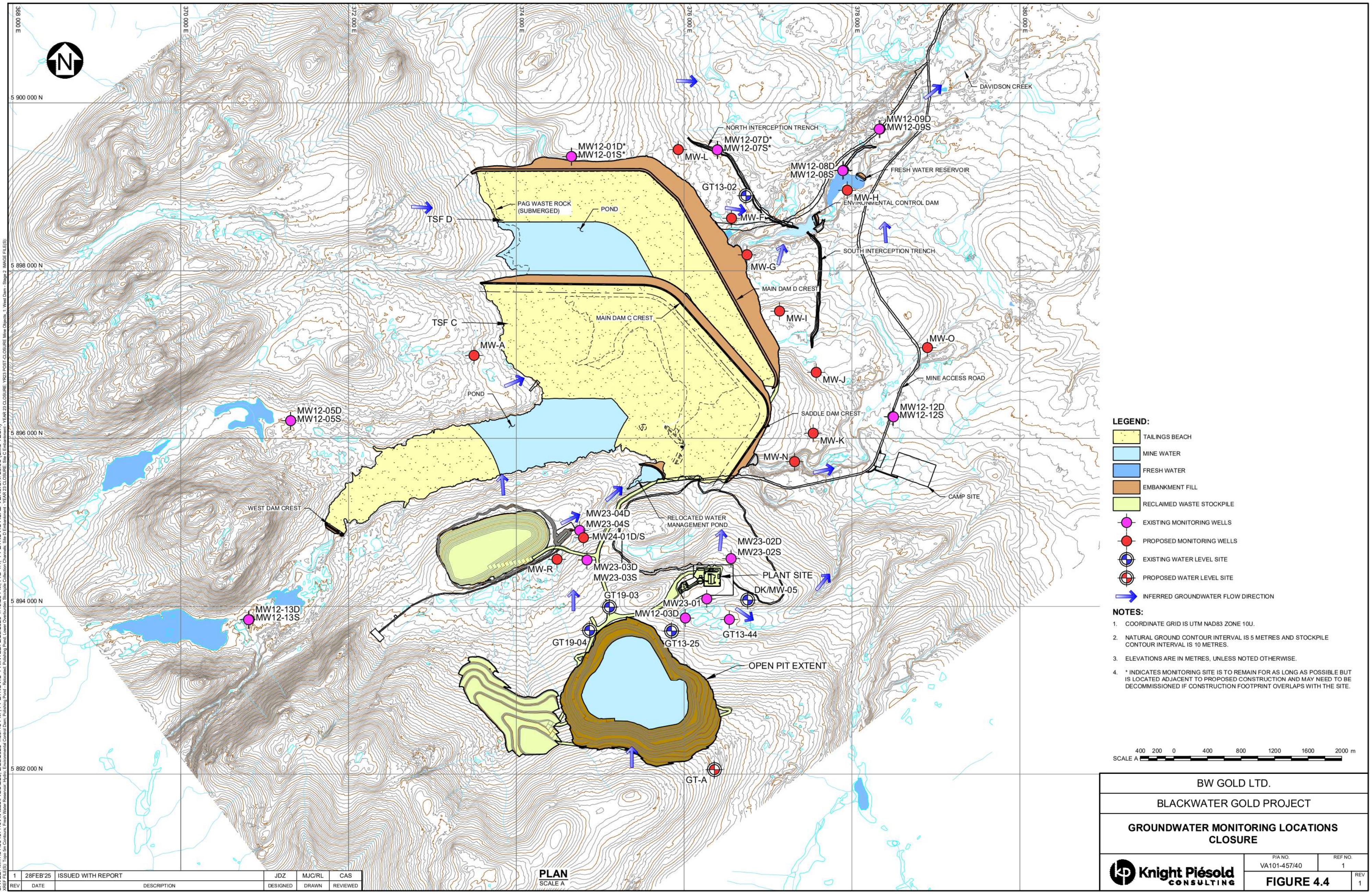


Figure 7.4—9 Groundwater Monitoring Locations (Closure)

7.4.4.4 Seeps

Seep surveys are conducted to detect potential influence of contact water quality in seeps located downgradient of mine facilities and to identify potential changes in groundwater flow. Seep surveys are conducted annually during the construction and operations phases during dry periods when seeps can be more easily distinguished from surface runoff. Seep surveys include descriptions of seeps and waterbodies encountered during mapping, their locations, elevation, water quality, and frequency. Field parameters (pH, temperature, electrical conductivity, and turbidity) are recorded, along with the estimated volume and flow rate when applicable. Where sufficient flows exist, water quality samples of the seep are collected following the same QA/QC procedures established for groundwater sampling.

Results of seep surveys are compared against results of previous surveys to assess potential groundwater flow pathways from the mine to the receiving environment and potential for impacts to surface water from groundwater. Seep surveys are conducted in areas where potential seepage from the Mine may occur. Seep surveys will include areas downgradient of the Open Pit and TSF and along the drainage downslope of the stockpiles that contributes to the WMP in accordance with permit M-246.

Electrical conductivity surveys are completed on a bi-annual basis during dry periods along Mine Area Creek to assess for potential LGO seepage contributions. Seven survey locations are established along Mine upstream and downstream of the LGO Collection Pond, as summarized in Table 7.4-7.

Table 7.4-7 Mine Area Creek Electrical Conductivity Survey Locations

Site ID	Location	Coordinates		Frequency	Notes
		Easting (m)	Northing (m)		
Flow 1	Upgradient of LGO	372,320	5,893,306	Bi-Annual	Location coincides with surface water quality sampling location 704-01.
Flow 2		373,106	5,893,991	Bi-Annual	
Flow 3		373,641	5,894,160	Bi-Annual	
Flow 4	Downslope of LGO Collection Pond	374,183	5,894,396	Bi-Annual	
Flow 5	Downgradient of LGO	374,546	5,894,611	Bi-Annual	
Flow 6		374,636	5,894,724	Bi-Annual	
Flow 7		375,073	5,895,177	Bi-Annual	Location coincides with surface water quality sampling location 704-03.

Coordinates presented in UTM Zone 10U NAD 83.
LGO = Low-Grade Ore

8 Discharge Management and Monitoring

8.1 Overview

The goal of the discharge management system is to release diverted and site water to the receiving environment in a manner that minimizes the potential for adverse effects to downstream receptors (flow and water quality), while contributing to the objective of maintaining site water balance requirements. The goal of the discharge monitoring program is to evaluate and record the quantity and quality of mine-related water released to the receiving environment. This information is subsequently used to:

- Evaluate compliance with regards to applicable regulatory requirements;
- Evaluate the performance of mine water management, adaptive management, and relevant mine and EMPs;
- Support WB/WQM updates as appropriate; and
- Facilitate environmental planning through the LoM.

All anticipated discharges for the Mine area to the receiving environment are summarized in Table 8.1-1. A description of each discharge is presented in further detail in Section 5.8 (Effluent Discharge) of BW Gold (2022). The management of water associated with each discharge is presented in this document in Section 8.2 and corresponding monitoring methods are described in Section 8.3 of BW Gold (2022). Note that discharges from mine facilities directed to the TSF, as approved under PE-110652, are described in Section 7.

Table 8.1-1 Approved Discharges to the Environment from the Mine Area by Phase

Location	Coordinates	Phase	Nature of Discharge	Receiving Catchment
FWR	5899167N, 377870E	Operations, Closure	Surface	Davidson Creek
TSF Stage 1 SCP	5897749N, 376190E	Construction (first year of construction only)	Surface	Davidson Creek
Plant Site SCP	5894512N, 376428E	Construction	Ground	Creek 661
Downstream Aggregate Borrow Area SCP	5899644N, 378457E	Operations	Surface	Davidson Creek
Membrane WTP	5898478N, 377546E	Post-Closure	Surface	Davidson Creek
TSF Spillway	5898467N, 377801E	Post-Closure	Surface	Davidson Creek
Non-point source discharges	n/a	Construction, Operations, Closure, Post-Closure	Groundwater	Davidson Creek, Creek 661

Coordinates are approximate, all station locations and coordinates will be verified upon station commissioning.

In addition to surface mine water discharge via the surface outflows described above, non-point discharges from the mine site are anticipated to report to Davidson Creek and Creek 661 through subsurface flow paths. Non-point source discharge of mine contact water seepage from the TSF, Camp Site area, upper and lower waste rock stockpiles and low-grade ore stockpile to ground is approved under Permit PE-110652 Condition 1.5. Management and monitoring of these flows within the mine site footprint are addressed in Section 7.3 of the present plan. Monitoring the influence of mine-related groundwater flows that enter the receiving environment beyond the mine site footprint is incorporated as part of the AEMP.

8.2 Discharge Management

8.2.1 Freshwater Reservoir

Mine surface contact water is planned to discharge to the receiving environment via the FWR outlet during the Operations, and Closure phases. The FWR receives: 1) direct precipitation on the FWR and non-contact runoff from contributing catchments, 2) water pumped from the WMP, which includes both contact water and diverted non-contact water, 3) diverted non-contact water via the Northern Diversion System, and 4) Tatelkuz Lake water via the FWSS. Water discharged via the FWR outlet reports directly to Davidson Creek, which in turn enters Chedakuz Creek downstream of Tatelkuz Lake.

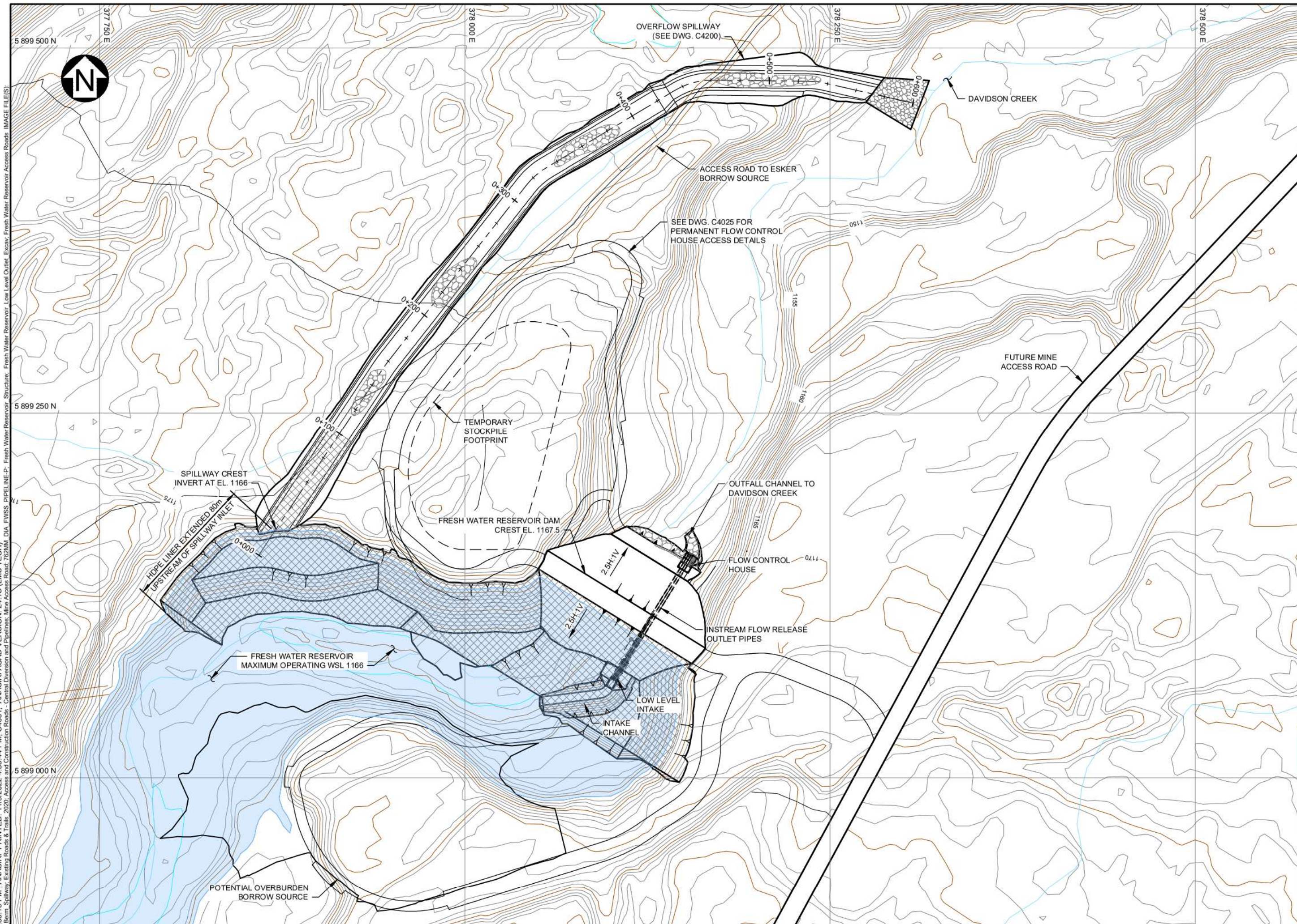
The management of Project discharges via the FWR outlet will be primarily dependent on:

- Management and treatment of surface contact water that reports to the WMP and is subsequently conveyed via a pump system and pipeline to the FWR; and
- Management of non-contact waters that are diverted to the WMP and FWR to fulfill mill make-up needs as well as satisfy IFN for Davidson Creek.

Water releases from the FWR will be managed using the primary outlet works with an overflow spillway designed to maintain dam safety. The outlet design considers a maximum release of up to 1.68 m^3/s (1.12 m^3/s through the low-level outlet and 0.56 m^3/s through the surface-level outlet), providing some system redundancy at the planned flowrates and flexibility for adaptive management if IFN are adjusted in the future based on the results of environmental monitoring programs. Water pumped from Tatelkuz Lake via the FWSS in later years of mine operations will typically be routed to the FWR to provide an additional source of water to maintain discharges to Davidson Creek, but can also be directed to Davidson Creek via connection to the Temperature and Flow Control Chamber if required due to FWR maintenance or to meet discharge temperature targets.

Each outlet pipe from the FWR will be fitted with a main valve and a maintenance valve with the ability to regulate flows according to water surface levels, mill needs, and IFN requirements. The FWR general arrangement is shown on Figure 8.2-1. The outlet works are shown on Figure 8.2-2. The outlet pipes will feed into the Temperature and Flow Control Chamber, which will provide further flow regulation.

The required characteristics of FWR discharges are summarized in Table 8.2-1. Mine site water management will be optimized with the objective of achieving water quality that meets BC water quality guidelines or approved SBEBs at the FWR outlet in the Operations phase under a range of climate conditions. The quality of water discharged via the FWR is largely dependent on the quality of mine contact waters that report to the WMP. Water treatment is a primary mitigation strategy to maintain the quality of FWR discharge and to protect water quality in Davidson Creek. As such, a Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per Permit PE-110652 Condition 3.4.



PLAN
SCALE A

LEGEND:

- HDPE LINER
- RIPRAP
- CONSTRUCTION ROAD
- ACCESS ROAD
- EXISTING ACCESS TRAILS

NOTES:

1. FOR GENERAL NOTES SEE DRAWING G0006 AND G0007.
2. FOR FRESH WATER RESERVOIR INSTRUMENTATION SEE DRAWING C1506.
3. SEE DRAWINGS C4010, C4020 AND C4025 FOR ACCESS ROAD DETAILS.

DETAILED DESIGN
NOT FOR CONSTRUCTION

SCALE A 30 15 0 50 100 150 m

KNIGHT PIÉSOLD LTD.
PERMIT NUMBER
— 1001011 —
EGBC PERMIT TO PRACTICE

DRG. NO.	DESCRIPTION
C4200	FRESH WATER RESERVOIR - OVERFLOW SPILLWAY - PLAN AND PROFILE
C4025	FWR - CONSTRUCTION ACCESS ROADS - FINAL ACCESS ROAD - PLAN AND PROFILE
C4020	FWR - CONSTRUCTION ACCESS ROADS - PHASE 2 ACCESS ROAD - PLAN AND PROFILE
C4010	FWR - CONSTRUCTION ACCESS ROADS - PHASE 1 ACCESS ROAD - PLAN AND PROFILE
C1506	TSF - STAGE 1 INSTRUMENTATION - SECTIONS (SHEET 2 OF 3)
G0006	TECHNICAL NOTES

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	10NOV'22	ISSUED FOR INFORMATION	KTW	ELG/ABN	DDF	DDF
0	29OCT'21	ISSUED FOR PERMITTING	CBN	ELG/ABN	JPH	DDF

REVISIONS

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PROVINCE OF BRITISH COLUMBIA
2022-11-10
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BW GOLD LTD.

BLACKWATER GOLD PROJECT

FRESH WATER RESERVOIR
SITE OVERVIEW PLAN
GENERAL ARRANGEMENT

CLIENT DOCUMENT NO. BWST1-2900-CIV-DWG-4001

P/A NO. VA101-457/33 | DRAWING NO. C4001 | REVISION 1

SAVED: M:\1\01\00457\33\A\Acad\DWGS\C4001\C4001, 11/9/2022 4:30:16 PM, ANASIRI PRINTED: 11/9/2022 4:36:44 PM, C4001, ANASIRI ACAD VERSION: 24.1S (LMS TECH)
XREF FILE(S): Topo 1m Contours; Hydro; TrimRoads UTM10; Fresh Water Reservoir Berm Spillway; Existing Roads & Trails 2020; Access and Construction Roads - Central Diversion and Pipelines; Mine Access Road; 762MM DIA FWSS PIPELINE-P; Fresh Water Reservoir Structure; Fresh Water Reservoir Low Level Outlet Excav; Fresh Water Reservoir Access Roads IMAGE FILE(S):

Figure 8.2—1 Freshwater Reservoir Embankment and Spillway General Arrangement

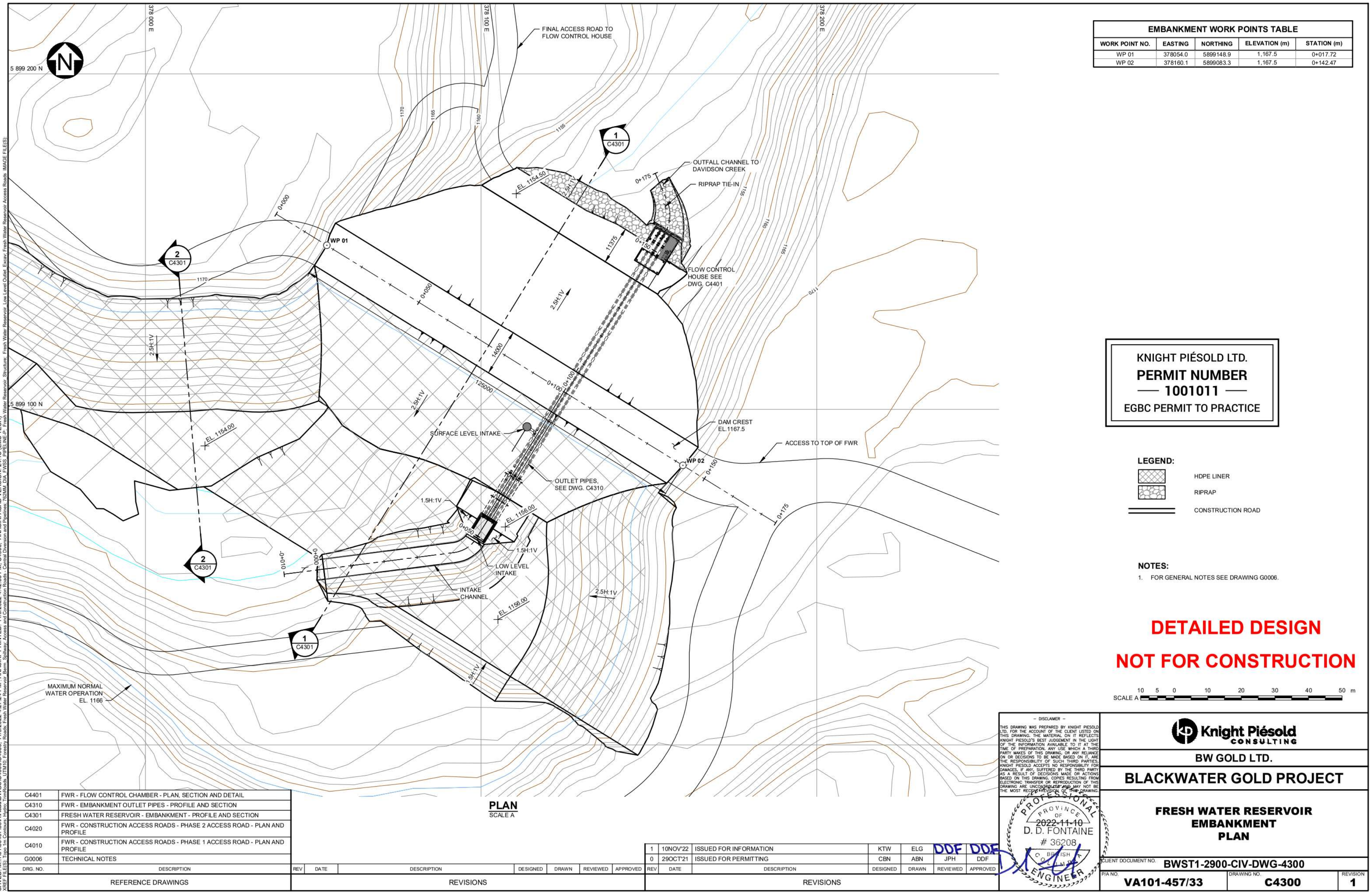

Figure 8.2—2 Freshwater Reservoir Outlet Works

Table 8.2-1 Flow, Water Quality and Toxicity Criteria for Freshwater Reservoir Discharge

Parameter	Criteria
Discharge rate	Continuous: 300,000 m^3/day (maximum)* 48,500 m^3/day (annual average)
96-hr RBT test	Must pass in 100% effluent concentration**
48-hr *D. magna* test	Must pass in 100% effluent concentration ***
pH	6.5 to 9.0 pH units
TSS	30 mg/L (maximum) 15 mg/L (maximum monthly average)
Nitrite-N	0.06 mg/L as N (maximum) 0.02 mg/L as N (maximum monthly average)
Sulphate	218 mg/L (maximum monthly average)
Dissolved Aluminum	January to March 0.05 mg/L (maximum) April to July 0.28 mg/L (maximum) August to December 0.13 mg/L (maximum)
Ammonia-N	7.97 mg/L (maximum) 1.53 mg/L (maximum monthly average)
Total Zinc	0.033 mg/L (maximum) 0.0075 mg/L (maximum monthly average)
Dissolved Cadmium	0.000258 mg/L (maximum) 0.000118 mg/L (maximum monthly average)
Total Arsenic	0.005 mg/L (maximum monthly average)

*The maximum authorized rate has been set to enable the calculation of discharge fees as required by the Permit and Approval Fees and Charges Regulation.
** Effluent is acutely toxic if there is greater than 50% mortality during a 96-hour Rainbow Trout (Oncorhynchus mykiss) single concentration acute toxicity test in a 100% effluent concentration using "Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13 Second Edition December 2000". For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test fish die after 96-hours of exposure, the test is considered to have failed (Fail) if > 50% of the test fish die after 96-hours. Test results must be reported in percent (%) mortality.
***Effluent is acutely toxic if there is greater than 50% mortality during a 48-Hr Daphnia magna single concentration acute toxicity test in a 100% effluent concentration using "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna, EPS 1/RM/14 Second Edition December 2000." For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test D. magna die after 48 hours of exposure, the test is considered to have failed (Fail) if > 50% of the test D. magna die after 48 hours of exposure. Test results must be reported in percent (%) mortality.

8.2.2 Sediment Control Ponds

Surface discharge will occur from two SCPs:

- TSF Stage 1 SCP (Construction only); and
- Downstream Aggregate Borrow Area SCP (Operations through Closure).

Permit PE-110652 also approves discharge of the Plant Site SCP to ground for the Construction phase (Condition 1.7). SCPs will be designed following the Ministry of Environment (2015) guidance document on sizing and operation. The ponds will be designed to accommodate a live storage equal to an established storm event with freeboard; storage will depend on the size of the runoff area and the life of the structure. The minimum design flow for removal of suspended solids in sediment ponds will correspond to the 10-year, 24-hour runoff flow (BC MOE 2015). The ponds will be designed with spillways to convey larger storm events to maintain a minimum 0.5 m freeboard on the embankment during the structural design run-off event (minimum 1-in-200 years) (BC MOE 2015).

Particle size analyses (the fraction of minus 2 and minus 10 micron particles) in representative soil samples will be determined, along with settling analysis required for effective sediment pond design. The potential need for and use of flocculant, or other Best Management Practices associated with erosion prevention and sediment control, will follow methods described in the Surface Erosion Prevention and Sediment Control Plan (Appendix 9-A of BW Gold 2022). Discharge associated with each pond is described below.

As described in Section 7.2 and 7.3, the TSF Stage 1 SCP discharged through 2024, and no additional discharge will occur. While the Downstream Aggregate Borrow Area SCP has not been constructed.

8.2.2.1 TSF Stage 1 Sediment Control Pond

The TSF Stage 1 SCP collects runoff from the Mine Area Creek and Davidson Creek catchments, and any flows conveyed by the MDC foundation drains, as discussed in Section 7.2.6.

Discharge criteria for the TSF Stage 1 SCP, per Permit PE-110652 Condition 1.6, are summarized in Table 8.2-2. Criteria for pH, TSS, and toxicity testing reflect effluent quality requirements under MDMER. The discharge limit for Cr is equal to the former BC working WQG for Cr (VI) based on water quality model output (Base Case, 95th percentile of the v13e Variable Climate Case model; Lorax 2022c) screening against 80% BC WQGs, which identified Cr as a POPC.. Refer to BW Gold (2022) Application Section 5.4 (Water Quality Model) and Section 5.8 (Effluent Discharge) for further detail.

Table 8.2-2 Flow, Water Quality and Toxicity Criteria for TSF Stage 1 Sediment Control Pond Discharge

Parameter	Criteria
Discharge rate	Continuous: 6,600 m^3/day (maximum)*
pH	6.5 to 9.0 pH units
Total suspended solids	30 mg/L (maximum) 15 mg/L (maximum monthly average)
Dissolved Cr	0.001 mg/L (maximum)
96-hr RBT test	Must pass in 100% effluent concentration**
48-hr D. magna test	Must pass in 100% effluent concentration ***

* The maximum authorized rate has been set to enable the calculation of discharge fees as required by the Permit and Approval Fees and Charges Regulation.

** Effluent is acutely toxic if there is greater than 50% mortality during a 96-hour Rainbow Trout (Oncorhynchus mykiss) single concentration acute toxicity test in a 100% effluent concentration using “Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13 Second Edition December 2000”. For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test fish die after 96-hours of exposure, the test is considered to have failed (Fail) if > 50% of the test fish die after 96-hours. Test results must be reported in percent (%) mortality.

***Effluent is acutely toxic if there is greater than 50% mortality during a 48-Hr Daphnia (Daphnia magna) single concentration acute toxicity test in a 100% effluent concentration using “Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna, EPS 1/RM/14 Second Edition December 2000.” For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test D. magna die after 48 hours of exposure, the test is considered to have failed (Fail) if > 50% of the test D. magna die after 48 hours of exposure. Test results must be reported in percent (%) mortality.

8.2.2.2 Downstream Aggregate Borrow Area Sediment Control Pond

The Downstream Aggregate Borrow Area SCP will be located downstream of the TSF footprint, on the north-western bank of Davidson Creek. This pond will capture surface runoff within the Borrow Area catchment from Construction phase through to the Closure phase. It is not anticipated that NAG waste rock or overburden will be stored in this catchment, and therefore the potential for water quality alterations will be limited to water interactions with borrow sources (e.g., cut and fill surfaces). Accordingly, water quality in this pond is expected to largely reflect a background water signature, with the exception of elevated TSS associated with local earthworks. Discharge from the Downstream Aggregate Borrow Area SCP will be directed to Davidson Creek between monitoring stations DC-10 and DC-15.

Discharge criteria for this SCP, per Permit PE-110652 Condition 1.3, are summarized in Table 8.2-3. Discharge targets for pH, TSS, and toxicity testing reflect effluent quality requirements under MDMER. Discharge limits for total Ag, total As, total Zn, dissolved Cd, and dissolved Cu are informed by the Application model Upper Case source terms which assume that 50% of the area will be covered by overburden fill and 50% of the area will remain undisturbed. Refer to BW Gold (2022) Application Section 5.4 (Water Quality Model) and Section 5.8 (Effluent Discharge) for further detail.

Table 8.2-3 Flow, Water Quality and Toxicity Criteria for Downstream Aggregate Borrow Area Sediment Control Pond Discharge

Parameter	Requirement
Discharge rate	Continuous: 1,100 m^3/day (maximum)*
pH	6.5 to 9.0 pH units
Total suspended solids	30 mg/L (maximum) 15 mg/L (maximum monthly average)
Total Silver	0.000050 mg/L (maximum)
Total Arsenic	0.0093 mg/L (maximum monthly average)
Total Zinc	0.033 mg/L (maximum)
Dissolved Cadmium	0.000258 mg/L (maximum)
Dissolved Copper	0.0030 mg/L (maximum)
96-hr RBT test	Must pass in 100% effluent concentration**
48-hr *D. magna* test	Must pass in 100% effluent concentration***

* The maximum authorized rate has been set to enable the calculation of discharge fees as required by the Permit and Approval Fees and Charges Regulation.
** Effluent is acutely toxic if there is greater than 50% mortality during a 96-hour Rainbow Trout (Oncorhynchus mykiss) single concentration acute toxicity test in a 100% effluent concentration using “Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13 Second Edition December 2000”. For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test fish die after 96-hours of exposure, the test is considered to have failed (Fail) if > 50% of the test fish die after 96-hours. Test results must be reported in percent (%) mortality.
***Effluent is acutely toxic if there is greater than 50% mortality during a 48-Hr Daphnia (Daphnia magna) single concentration acute toxicity test in a 100% effluent concentration using “Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna, EPS 1/RM/14 Second Edition December 2000.” For the pass/fail of a single concentration test an effluent sample is considered to have passed (Pass) if at 100% effluent concentration ≤ 50% of the test D. Magna die after 48 hours of exposure, the test is considered to have failed (Fail) if > 50% of the test D. Magna die after 48 hours of exposure. Test results must be reported in percent (%) mortality.

8.2.2.3 Plant Site Sediment Control Pond

Discharge from the Plant Site SCP will be directed to ground via RIBs in the Creek 661 catchment. This discharge is authorized for the Construction phase only, per Permit PE-110652 Condition 1.7, and the maximum authorized rate is indeterminate.

Concentration criteria for this discharge are not defined, but Condition 1.7 of Permit PE-110652 states the characteristics of the discharge must be typical of sediment control pond effluent as described in Table 5.8-8 of BW Gold (2022). Table 5.8-8 of BW Gold (2022) is reproduced below for convenience (Table 8.2-4). Predicted concentrations are informed by the Application model Base Case and Upper Case source terms and preliminary estimates of contact materials that may occur in the Plant Site Area SCP catchment area (i.e., overburden and NAG5 waste rock). Refer to BW Gold (2022) Section 5.4 (Water Quality Model) and Section 5.8 (Effluent Discharge) for further detail.

Table 8.2-4 Reproduction of Table 5.8-8 from BW Gold (2022) showing predicted parameter concentrations in Plant Site Sediment Control Pond

Parameter	Units	Base Case	Upper Case	100% BC WQG-AL or SBEB		80% BC WQG-AL		POPC
				Short-term	Long-term	Short-term	Long-term	
NH_3-N	mg/L	0.06	0.2	5.6	0.88	4.5	0.70	
NO_3-N	mg/L	3.5	5.3	32.8	3	26.2	2.4	**Y**
NO_2-N	mg/L	0.037	0.055	0.06	0.02	0.048	0.016	**Y**
Cl	mg/L	1.5	2.9	600	150	480	120	
F	mg/L	0.71	0.74	1.5	-	1.2	-	
SO_4	mg/L	88	120	-	309	-	247	
T-Ag	mg/L	0.00011	0.00014	0.0030	0.0015	0.0024	0.0012	
D-Al	mg/L	0.0063	0.0016	SBEB		-	-	
T-As	mg/L	0.023	0.057	0.005	-	0.004	-	**Y**
T-B	mg/L	0.099	0.11	-	1.2	-	0.96	
T-Ba	mg/L	0.024	0.026	-	1	-	0.8	
T-Be*	mg/L	0.00099	0.0011	-	0.00013	-	0.00010	
D-Ca	mg/L	50	52	-	-	-	-	
D-Cd	mg/L	0.0005	0.0013	0.00085	0.00028	0.00068	0.00022	**Y**
T-Co	mg/L	0.0061	0.008	0.11	0.004	0.088	0.0032	**Y**
T-Cr	mg/L	0.00022	0.0009	-	0.001	-	0.0008	**Y**
D-Cu	mg/L	0.0032	0.0058	0.0038	0.00064	0.0030	0.00051	**Y**
D-Fe	mg/L	0.0034	0.011	0.35	-	0.28	-	
T-Hg*	mg/L	0.000079	0.000087	-	0.00002	-	0.00001 6	
D-K	mg/L	35	48	-	-	-	-	
D-Li	mg/L	0.036	0.051	-	-	-	-	
D-Mg	mg/L	2.6	3.3	-	-	-	-	
T-Mn	mg/L	0.67	3.8	2.1	1.2	1.7	0.99	**Y**
T-Mo	mg/L	0.012	0.027	2	1	1.6	0.8	
D-Na	mg/L	7.4	11	-	-	-	-	
T-Ni	mg/L	0.0061	0.013	-	0.13	-	0.10	
D-P	mg/L	0.0018	0.018	-	-	-	-	
T-Pb	mg/L	0.00066	0.00073	0.13	0.0084	0.10	0.0067	
T-Sb	mg/L	0.014	0.014	-	0.009	-	0.0072	**Y**
T-Se	mg/L	0.0011	0.0016	-	0.002	-	0.0016	**Y**
D-Si	mg/L	7.9	7.9	-	-	-	-	
D-Sr	mg/L	0.29	0.36	-	-	-	-	
D-Tl	mg/L	0.00036	0.00043	-	-	-	-	
T-U	mg/L	0.0011	0.0024	-	0.0085	-	0.0068	
D-V	mg/L	0.011	0.013	-	-	-	-	
T-Zn	mg/L	0.028	0.086	0.073	0.048	0.059	0.038	**Y**
Hardness	mg/L	135.7	143.5					

BC WQG-AL = British Columbia Water Quality Guidelines for the Protection of Aquatic Life; D = dissolved; POPC = parameter of potential concern; SBEB = Science-Based Environmental Benchmark; T= total; Y = yes
Light grey shading indicates an exceedance of 80% of the short-term BC WQG; dark grey shading indicates an exceedance of 80% of the long-term BC WQG. Assumes Average Climate Case and Base Case source terms.
Ammonia BC WQG-AL calculated using pH 8 and temperature of 18°C. Copper BC WQG-AL calculated using pH 8 and DOC of 1 mg/L. Hardness dependent guidelines are based on Upper Case hardness (143.5 mg/L).
*T-Be and T-Hg are not considered parameters of potential concern due to concentrations being linked to the use of high detection limits in the calculation of loadings from humidity cell data.

8.2.3 Membrane NF Water Treatment Plant

During the Post-Closure phase, a Membrane NF WTP will treat TSF seepage water collected at the ECD up to a maximum rate of approximately 190 L/s. To maintain a constant inflow rate, water from the Pit Lake and TSF Pond will provide make up water to the Membrane NF WTP. Treated water from this WTP will be discharged directly to Davidson Creek. Therefore, the Membrane NF WTP outlet is anticipated to represent a final point of discharge in the Post-Closure phase.

The Membrane NF WTP has been developed using the same effluent concentration design targets identified for Operation phase WTPs, including British Columbia water quality guidelines for the protection of aquatic life and MDMER effluent concentration limits for TSS (Table 7.2-6). The Membrane NF WTP discharge will be managed based on automated inline monitoring, field (HACH or equivalent) test kits and laboratory analysis of grab samples. Should parameter concentrations in the Membrane NF WTP treatment stages or discharge exceed acceptable concentrations, discharge of WTP effluent to Davidson Creek will cease. Specifically, water will be recycled within the WTP and re-routed for temporary storage on site, per the operator's standard operating procedure, until WTP discharge is demonstrated to meet required discharge characteristics. Discharge limits for the Membrane WTP for the Post-Closure period phase will be proposed in subsequent regulatory applications.

8.2.4 TSF Spillway

In Post-Closure, a pond will remain in both TSF C and TSF D areas. Ponds have been sized to minimize geotechnical risks while optimizing the degree to which tailings and waste rock will remain saturated. In this manner, the ponds serve as a mitigation measure to minimize ARD/ML from the PAG tailings and PAG and ML waste rock in the long-term. Surface drainage will be conveyed to the ponds, and if the water quality is suitable to discharge, it will be released to Davidson Creek via the TSF Spillway. The TSF Spillway will function as a passive overflow channel. Therefore, the TSF Spillway is anticipated to represent a final point of discharge in the Post-Closure phase. If water quality is not suitable for direct discharge to Davidson Creek, it will be pumped to the Membrane NF WTP for treatment prior to discharge to Davidson Creek. Discharge limits for the TSF Spillway for the Post-Closure period will be proposed in subsequent regulatory applications. Adequate personnel will be on-site or otherwise employed into Post-Closure to implement the Post-Closure phase water management and treatment plan.

8.3 Discharge Monitoring

Sampling methods for surface discharges will follow best practices as outlined in the BC Field Sampling Manual, Part E Water and Wastewater Sampling (BC MWLAP 2013) and MDMER requirements. The sampling sites must conform to the Mines Act/Health and Safety Reclamation Code, WorkSafeBC and other applicable safety requirements, and be accessible under expected weather and flow conditions. Monitoring methods will be detailed in SOPs in a subsequent update of this plan and prior to discharge. The following sections present the monitoring for discharge quantity and quality to the receiving environment by discharge location. The discharge monitoring locations are presented on Figures 7.4-1 through 7.4-5.

8.3.1 Discharge Quantity

Flow monitoring associated with each final discharge point for the Mine is described below. The monitoring described herein is designed to be consistent with, and facilitate adherence to, the requirements for effluent monitoring under PE-110652, the MDMER and the *BC Environmental Management Act*, and to align with monitoring components and objectives of the AEMP.

8.3.1.1 FWR

Daily measurement of FWR flow is required per Appendix A of Permit PE-110652, and measurement of water level is required weekly. Water from the reservoir released through the outlets will be monitored using flow meters installed at each of the discharge outlets for compliance reporting requirements. The general arrangement of the outlet works and flow monitoring chamber location are provided on Figure 8.2-2.In addition, an in-stream flow monitoring station downstream of the FWR within Davidson Creek may be required as a back-up station to confirm the IFN release, should the flowmeters require maintenance or in the event that they are damaged. Baseline monitoring station H2B is located in Davidson Creek between the FWR pipe outlets and the FWR spillway outlet. Monitoring at H2B and a spillway monitoring device could be used in combination to determine the total flow from the FWR. If additional precision is required, a more permanent structure such as a weir could be installed in place of hydrometric station H2B or further downstream below where the FWR spillway re-enters Davidson Creek, so that the contributing flow includes the overflow spillway and water released through the FWR pipe outlets.

In addition to flow monitoring, water level monitoring within the reservoir will inform the operation of the outlets. Water level monitoring will also provide information related to how much storage is available within the reservoir and will also be used to indicate when the reservoir capacity has been reached and flow through the spillway is occurring. Water levels will be monitored using a pressure transducer with an appropriate depth range.

8.3.1.2 Sediment Control Ponds

Appendix A of Permit PE-110652 requires daily monitoring of surface discharge rates from Downstream Aggregate Borrow Area SCP (when discharging). Discharge rates will be monitored using ultrasonic or inline flow meters on outlet pipes or other monitoring devices, such as a v-notch weir with a lookdown sensor depending on the discharge arrangement. It is noted these ponds are intended to primarily capture surface runoff; as such, surface discharge from these locations is expected to occur only in certain months of the year.

8.3.1.3 Membrane NF WTP

Discharge monitoring for the Membrane WTP through the Post-Closure phase will continue following similar methods outlined for the Operations phase. Monitoring of Membrane NF WTP discharge will follow high-frequency operational requirements, per the operator's standard procedures, that include automated flow readings at a number of stages within the plant to guide the automatic operation of the WTP, provide key input for process and safety interlocks, and provide operations personnel with key insights on plant performance. As part of this flow monitoring and management system, the flow rate of treated effluent generated by the Membrane NF WTP will be monitored continuously.

8.3.1.4 TSF Spillway

It is anticipated a continuous flow logger will be used to record discharge released from the Mine via the TSF Spillway in the Post-Closure phase. The location, design, and implementation of flow monitoring equipment for the TSF Spillway will be detailed in parallel with the final spillway design.

8.3.2 Discharge Quality

This section summarizes the discharge quality monitoring program for final discharge points. This plan is designed to be consistent with the requirements for effluent monitoring in the M-246 and PE-110652 permits, and to align with monitoring requirements under the MDMER and the AEMP. Further detail on the predicted quality of mine water discharge is presented in Chapter 5 of BW Gold (2022; Modelling, Mitigation, and Discharge, Section 5.8 Effluent Discharge).

An overview of monitoring components and frequencies for final discharge points is presented in Table 8.3-1. A detailed list of mine water and discharge monitoring locations, components, frequencies, and their rationale is presented in Table 9.1-1. Discharge quality will be monitored via field parameters measured in situ, grab samples, and toxicity testing. Analytical samples for discharge quality will be collected following methods outlined in Section 7.3.1.1. Field measurements will be collected at the same time as analytical sample collection. Similarly, water aliquots collected for acute and sublethal toxicity testing will be collected at the same time as field measurements and analytical sample collection. Monitoring of discharge quality in the Post-Closure phase will continue following similar methods and frequencies described for the Construction, Operation, and Closure phases, but parameters and/or sampling frequencies may be reduced as appropriate.

Table 8.3-1 Discharge Quality Monitoring Program Overview

Monitoring Component*	Description	Sampling Frequency
Field measurements	• Turbidity, pH, conductivity, temperature (all discharges) • Dissolved oxygen**, ORP* (all discharges except Plant Site SCP)	Weekly
Turbidity	-	Daily***
Analytical chemistry	▪ Physical parameters ▪ Nutrients, organics, and cyanide species ▪ Major anions ▪ Total and dissolved metals	Weekly
Acute toxicity	▪ Rainbow trout acute lethality test (EPS 1/RM/13, second edition, December 2000) ▪ *Daphnia magna* acute lethality test (EPS 1/RM/14, second edition, December 2000 with February 2016 amendments)	Monthly
Sublethal toxicity (FWR only)	▪ Fish species (early life stage rainbow trout Reference Method EPS 1/RM/28) ▪ Invertebrate (*Ceriodaphnia dubia* Report EPS 1/RM/21) ▪ Plant (*Lemna minor* Reference Method EPS 1/RM/37) ▪ Alga (Pseudokirchneriella subcapitata Report EPS 1/RM/25)	Twice per year

* Certain parameters may be monitored at a higher frequency as needed depending on discharge works design and associated infrastructure. Monitoring to occur when discharging.
**DO and ORR not required for Plant Site SCP in PE-110652.
***Except for Plant Site SCP, for which PE-110652 requires weekly monitoring.

Analytical water quality samples will be submitted to ALS Environmental, or another CALA-certified analytical laboratory, as appropriate, and analyzed at a minimum for the suite of parameters and corresponding detection limits presented in Table 8.3-2. Analytical testing procedures will vary with parameters. Analyses will be performed using standard analytical methods, consistent with most recent edition of the British Columbia Environmental Laboratory Manual and supplements to the manual (BC ENV 2020b).

The parameters measured in mine discharge will include those prescribed under MDMER, the baseline surface water monitoring program (per BC MOE, 2016b), and parameters identified as POCs and POPCs for aquatic life in the Mine Conceptual Site Model (CSM; Section 5.10 of BW Gold, 2022). Routine analysis of discharge monitoring data will include a comparison to discharge limits prescribed in the Permit PE-110652, BC and/or CCME water quality guidelines, and MDMER maximum authorized concentrations, as appropriate. Water quality data results may be compared to WB/WQM predictions to ensure predicted concentrations are reasonable, and may be used to update the surface water quality model as appropriate.

Table 8.3-2: Discharge Quality Monitoring Parameters and Target Detection Limits

Parameter	Detection Limit	Parameter	Detection Limit
Physical Parameters		**Major Anions**	
pH	0.01	Alkalinity – Total	1 mg/L
Specific Conductivity	2 µS/cm	Acidity	2 mg/L
Hardness as $CaCO_3$ (Dissolved)	1 mg/L	Chloride	0.5 mg/L
Total Dissolved Solids	10 mg/L	Fluoride	0.02 mg/L
Total Suspended Solids	2 mg/L	Bromide	0.05 mg/L
Turbidity	0.1 NTU	Sulphate	0.5 mg/L
Colour	5 CU	**Organics**	
Nutrients		TOC	0.5 mg/L
Nitrate Nitrogen	0.005 mg/L	DOC	0.5 mg/L
Nitrite Nitrogen	0.005 mg/L	**Cyanide**	
		Total Cyanide	0.001 mg/L
Ammonia Nitrogen	0.02 mg/L	Cyanide (WAD)	0.001 mg/L
Ortho phosphorus – dissolved	0.005 mg/L		
Phosphorous – Total	0.005 mg/L		
Total and Dissolved Metals		**Total and Dissolved Metals**	
Aluminum	0.001 mg/L	Mercury	0.00001 mg/L
Antimony	0.0001 mg/L	Molybdenum	0.0001 mg/L
Arsenic	0.0002 mg/L	Nickel	0.0005 mg/L
Barium	0.0001 mg/L	Potassium	0.1 mg/L
Beryllium	0.0001 mg/L	Selenium	0.0003 mg/L
Bismuth	0.0005 mg/L	Silicon	0.05 mg/L
Boron	0.01 mg/L	Silver	0.00001 mg/L
Cadmium	0.00001 mg/L	Sodium	0.1 mg/L
Calcium	0.05 mg/L	Strontium	0.0002 mg/L
Chromium	0.0005 mg/L	Thallium	0.00001 mg/L
Cobalt	0.0001 mg/L	Tin	0.0002 mg/L
Copper	0.0002 mg/L	Titanium	0.01 mg/L
Iron	0.01 mg/L	Uranium	0.00001 mg/L
Lead	0.0001 mg/L	Vanadium	0.001 mg/L
Lithium	0.001 mg/L	Zinc	0.001 mg/L
Magnesium	0.1 mg/L	Radium 226*	0.01 Bq/L
Manganese	0.0002 mg/L		

*Per MDMER, the sampling frequency for radium 226 at a final discharge point may be reduced to not less than once in each calendar quarter (where each test is conducted at least one month apart) if the concentration of radium 226 at that final discharge point is less than 0.037 Bq/L for 10 consecutive weeks. Weekly radium 226 monitoring must resume if the concentration is equal to or greater than 0.037 Bq/L.

Data analysis will further include evaluations of concentration trends, QA/QC analysis as described in Section 7.3.1.1, and data evaluation as required for MDMER reporting (Section 12.1.1), EMA annual reporting (Section 12.1.2), and annual reclamation reporting (Section 12.1.3).

Field parameters will be collected at the time of each grab sample collection for each surface discharge, and will include at minimum:

- Temperature;
- Turbidity;
- Dissolved oxygen;
- Conductivity;
- pH;
- Dissolved oxygen; and
- ORP.

For Plant Site SCP discharge, only field turbidity, pH, conductivity, and temperature are required. Note field parameters at all sites should be recorded at the same time analytical samples are collected.

Per Permit PE-110652 Condition 4.10, quality control (QA) samples (field duplicates, filed blanks, and trip blanks) for the Mine surface water program must be collected for each monitoring parameter at a frequency equal to at least 20% of all samples collected (i.e., environmental + QC samples). A given QC sample must be collected within 48-hours of its corresponding environmental sample. Further, the monitoring program should follow QA/QC procedures specified in the following documents:

- BC Field Sampling Manual (BC MWLAP 2013);
- BC Environmental Laboratory Manual (BC ENV, 2020b);
- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2016b); and
- MDMER.

The QA/QC components of discharge quality monitoring will include:

- Equipment checks and calibration;
- Use of appropriate detection limits for analytical samples;
- Field replicate sampling and data evaluation;
- Field and trip blank sample data evaluation; and
- Sample data evaluation, including the assessment of total versus dissolved metal concentrations, suspended sediment concentrations and their potential influence on reported metal concentrations, and potential outlier data points.

In addition to the above surface point discharges, non-point discharges from the Mine are expected to report via groundwater to Davidson Creek and Creek 661. Monitoring of such sub-surface discharges is integrated with the monitoring program outlined in Section 7.3.4 and the AEMP (Appendix 7-A of BW Gold, 2022) for Davidson Creek and Creek 661. The programs include routine surface water quality and hydrology (water level, flow, as appropriate) monitoring at various locations.

9 Monitoring Summary

9.1 Overview

A comprehensive list of the monitoring locations, monitoring type, and sampling frequency discussed in previous sections is presented in Table 9.1-1. This table includes all monitoring locations required under PE-110652 and other stations useful to inform ML/ARD management, monitoring for the WTP and treatment system efficiency, and for ongoing water balance analysis and verification. Supplemental to monitoring stations identified here, additional stations exist as part of the AEMP as mine infrastructure design and discharge works are refined. If any monitoring requirements cannot be completed due to ice or unsafe conditions during winter months, the rationale must be provided in the quarterly and annual reporting.

Table 9.1-1 Summary of All Mine Water and Discharge Monitoring Locations

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
Effluent Discharge					
FWR Pond*	FWR-P EMS: E331135	Flow	Flow: daily Water level: weekly	Final discharge point to Davidson Creek: Construction, Operations, Closure. Turbidity (daily), toxicity testing, and flow measurements to occur when discharging only.	Federal and provincial regulatory requirement.
		Turbidity	Daily		
		Field	Weekly		
		Analytical Chemistry	Weekly		
		Acute toxicity	Monthly		
		Sublethal toxicity	Twice per year		
Membrane NF WTP Effluent		Flow	Continuous	Final discharge point to Davidson Creek: Post-Closure.	Federal and provincial regulatory requirement.
		Field	Weekly***		
		Chemistry	Weekly***		
		Acute toxicity	Monthly		
		Sublethal toxicity**	Twice per year		
TSF Spillway		Flow	Continuous	Final discharge point to Davidson Creek: Post-Closure. TSF C is anticipated to release water via the spillway on a monthly basis throughout Post-Closure under average climate conditions. TSF D is anticipated to discharge via the spillway in Post-Closure during freshet months in average climate conditions and during additional months under wet climate conditions, depending on the amount of flow diverted to Davidson Creek via the Northern Diversion System. Detail on the discharge regime of the TSF ponds in Post-Closure will be refined during detailed Closure planning.	Federal and provincial regulatory requirement.
		Temperature	Continuous		
		Field	Weekly***		
		Chemistry	Weekly***		
		Acute toxicity	Monthly		
Effluent Discharge *(cont'd)*					
Plant Site SCP*	PS-SCP-D EMS: E331138	Flow	Daily	Final discharge point to ground within Creek 661: Construction. Monitoring to occur when discharging only. Collects surface runoff from Plant Site construction area. This water is pumped to the mill during Operations and is directed to TSF C after completion of ore processing until it is reclaimed in Closure.	Federal and provincial regulatory requirement.
		Analytical Chemistry	Weekly		
		Turbidity	Weekly		
		Field	Weekly		
TSF Stage 1 SCP*	TSFC-SCP-D EMS: E331136	Flow	Daily	Final discharge point to Davidson Creek: Construction (Year -2 only). Monitoring to occur when discharging only. Located approximately 300 m downstream of the TSF Stage 1 Main Dam C centreline. Constructed prior to the start of Main Dam C construction. This pond will be decommissioned following construction of the IECD (Year -1) and FWR.	Federal and provincial regulatory requirement.
		Analytical Chemistry	Weekly		
		Turbidity	Daily		
		Field	Weekly		
		Acute toxicity	Monthly		
Downstream Aggregate Borrow Area SCP*	DA-SCP-D EMS: E331134	Flow	Daily	Final discharge point to Davidson Creek: Construction, Operations, Closure. Monitoring to occur when discharging only. Pond captures run-off from aggregate/ esker borrow area and concrete batch plant.	Federal and provincial regulatory requirement.
		Turbidity	Daily		
		Field	Weekly		
		Analytical Chemistry	Weekly		
		Acute toxicity	Monthly		
Mine Site Surface Water					
Upper Waste Stockpile Collection Pond		Field	Monthly	Collection pond for stockpile runoff and toe discharge: Construction, Operations, Closure. Flows routed to TSF C pond prior to construction of WMP in Construction phase, Metals WTP in Operations phase, and Pit Lake in Closure phase.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly		
		Flow	Continuous, when discharging		
Lower Waste Stockpile Collection Pond		Field	Monthly	Collection pond for stockpile runoff and toe discharge: Operations, Closure. Flows routed to Metals WTP in Operations phase and TSF C Pond in Closure phase.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly		
		Flow	Continuous, when discharging		
Open Pit Sump		Field	Monthly	Sump within Open Pit that collects non-contact and contact waters: Construction, Operations. Water pumped to Metals WTP in Years -1 to +17.	Water balance and geochemical monitoring; inform adaptive management, as appropriate. Track volume sent to mill and to the Metals WTP. Determine if process water will need to be sourced from the WMP.
		Analytical chemistry	Monthly		
		Flow	Continuous, when pumping		

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
Pit Lake		Analytical chemistry	Monthly	In-Pit Lake that forms at cessation of mining: Operations (starting Year +18), Closure, Post-Closure. Approximately 2 Mm^3 water pumped annually to the Membrane WTP in Post-Closure.	Geochemical monitoring.
Tailings supernatant		Field	Five samples per quarter	Tailings slurry collected at outlet pipe to TSF in a bucket and allowed to settle before siphoning off the supernatant for sampling: Operations.	Geochemical monitoring. Refer to Appendix C (Standard Operating Procedure – Tailings Monitoring) of ML/ARD Management Plan for further detail.
		Analytical chemistry	Five samples per quarter		
Mine Site Surface Water ***(cont'd)***					
TSF C *	TSFC-Pond EMS: E331272	Field	Monthly	Supernatant pond representative of various inputs (e.g., tailings slurry, water released from tailings voids, contact and non-contact surface and ground waters): Operations, Closure, Post-Closure. Sample collected from reclaim barge. Reclaim water pumped to mill in operations; surplus water pumped to Membrane WTP in operations; water pumped to Pit Lake in Closure phase. Twice annual bathymetry not required in PE-110652 but recommended.	Geochemical monitoring. Water level monitoring and bathymetry required to determine when supernatant will be sent to the Membrane WTP. Water level monitoring to confirm adequate freeboard available.
		Analytical chemistry	Monthly		
		Water level / Bathymetry	Weekly / Twice per year		
		Flow	Daily when pumping		
West Dam Seepage Sump		Field	Monthly	Collection pond for seepage emanating from West dam, seepage from TSF C, and surface runoff: Operations, Closure, Post-Closure. Seepage pumped to TSF C.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly		
		Flow	Continuous, when pumping		
TSF D		Field	Monthly	Supernatant pond representative of various inputs (e.g., tailings slurry, contact and non-contact surface and ground waters, pumpback from ECD) directed to TSF: Operations (from Year +7), Closure, Post-Closure. Sample collected from reclaim barge. Water pumped to TSF C in Operations and Closure.	Water balance and geochemical monitoring; inform adaptive management, as appropriate. Water level monitoring to confirm adequate freeboard available.
		Analytical chemistry	Monthly		
		Water level / Bathymetry	Weekly / Twice per year		
		Flow	Continuous, when pumping		

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
Mine Site Surface Water *(cont'd)*					
WMP*	WMP-D EMS: E331271	Field	Monthly	Water storage and management pond for treated WTP effluent, contact seepage, non-contact runoff and diverted non-contact water: construction (Year -1), Operations, Closure. Water pumped to mill to meet processing requirements and surplus to the FWR monitored with inline flow meters. Flow exceeding pump operation rates overflows to TSF C Pond when WMP is full via the pipe overflow outlet or emergency spillway.	Key mine water management feature, discharges directly to FWR; inform adaptive management, as appropriate.
		Turbidity	Continuous		
		Analytical chemistry	Monthly		
		Flow	Daily when pumping		
IECD Pond*	IECD EMS: E331273	Field	Monthly	Temporary collection pond for seepage from TSF C, Lower Waste Stockpile seepage, contact runoff, and non-contact surface and subsurface flows: Construction (Year -1), Operations (Year +1 to Year +6). Water pumped back to TSF C.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly		
		Flow	Daily when pumping		
ECD pond*	ECD EMS: E331274	Field	Monthly	Collection pond for seepage from TSF C, TSF D, Main Dam D, Upper and Lower Waste Stockpiles, and the Pit Lake, contact runoff, and non-contact surface and subsurface flows: Operations, Closure, Post-Closure. Flows pumped to TSF D in operations, Pit Lake in Closure, and Membrane WTP or Pit Lake in Post-Closure.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly		
		Flow	Daily when pumping		

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
Mine Site Surface Water *(cont'd)*					
Seeps to surface		Field	Monthly, when flow observed	Seepage surveys will be carried out regularly to identify seep locations, per Section 7.3.4.4: Construction, Operations, Closure.	Water balance and geochemical monitoring; inform adaptive management, as appropriate.
		Analytical chemistry	Monthly, when flow observed		
Water Treatment Plants					
Metals Treatment Pond*	MTP-Inf EMS: E331277	Field	Weekly	Pond for temporary storage of inlet water to Metals WTP: Operations. Location intended to represent Metals WTP influent. Location may need to be adjusted to ensure sample is representative of WTP influent.	Treatment efficiency monitoring.
		Turbidity	Continuous		
		Analytical chemistry	Weekly		
		Flow	Daily when pumping		
Metals WTP		In-line (pH, turbidity, level)	Continuous	Treatment plant operations during the Operations phase. In-line monitoring occurs at different stages of water treatment, including treated effluent.	Operational plant monitoring.
Metals WTP Effluent*	MTP-Eff EMS: E331278	Field	Weekly	Metals WTP effluent stream (treated water): Operations.	Operational plant monitoring; key mine water management feature.
		Analytical chemistry	Weekly		
		Flow	Daily when pumping		
Lime Neutralization System		In-line (flow, pH)	Continuous	System operations during the Operations phase. In-line flow and pH monitoring occurs at influent and effluent stages.	Operational plant monitoring.
		Analytical chemistry – pH only	Weekly		
		Analytical chemistry	Monthly		
Lime Neutralization System Effluent		Field	Monthly	Outflow stream of lime-adjusted water stream: Operations.	Operational plant monitoring.
		Analytical chemistry	Monthly		
Membrane RO WPT influent*	ROPlant-Inf EMS: E331275	Field	Weekly	Membrane WTP effluent stream (treated water): Operations. TSF C water (monitored monthly) is planned to be primary influent to WTP.	Treatment efficiency monitoring.
		Turbidity	Continuous		
		Analytical chemistry	Weekly		
		Flow	Daily when pumping		
Water Treatment Plants *(cont'd)*					
Membrane RO WTP		In-line (level, pressure, pH, ORP, conductivity [as a proxy for brine quality], turbidity)	Continuous	Treatment plant operations: Operations. In-line monitoring occurs at different stages of water treatment, including treated effluent and brine, and is automatically logged into a data historian. HACH kit analysis and analytical chemistry samples will be collected by operators using water collected at different stages of water treatment throughout plant. Frequency may be reduced as operating trends are established.	Operational plant monitoring.
		HACH kit or equivalent (sulphate and/or ammonia and/or other parameters as a proxy for brine quality)	Daily		
		Analytical chemistry***	Monthly		
Membrane RO WTP Effluent*	ROPlant-Eff EMS: E331276	Field	Weekly	Membrane WTP effluent stream (treated water): Operations.	Operational plant monitoring; key mine water management feature.
		Analytical chemistry	Weekly		
		Flow	Daily when pumping		
Membrane NF WTP Influent		Field	Weekly	Membrane WTP influent stream: Post-Closure. Includes TSF C overflow, ECD water, Pit Lake water, collected Pit Lake seepage. Effluent from WTP is monitored as post-closure final discharge point.	Operational plant monitoring.
		Analytical chemistry	Weekly		
Membrane NF WTP		In-line (flow, level, pressure, pH, ORP, conductivity, turbidity)	Continuous	Treatment plant Operations: , Post-Closure. In-line monitoring is automatically logged into a data historian. Silt density index test will be conducted by operators, and is conducted on water directed to NF membrane. HACH kit analysis and analytical chemistry samples will be collected by operators using water collected at different stages of WTP.	Operational plant monitoring.
		Silt density index	Daily		
		HACH kit (sulphate and/or ammonia)	Daily		
		Analytical chemistry****	Monthly		
Water Treatment Plants *(cont'd)*					
Plant Site Sewage Treatment Facility Influent		Visual inspection	Daily	Sewage treatment facility influent; represents domestic water collected from the mill, truckshop, and administrative areas.	Operational plant monitoring.
		Five day biological oxygen demand, TSS	Monthly		
Plant Site Sewage Treatment Facility Effluent*	STP-D EMS: E331137	Visual inspection	Daily	Treated effluent is directed to the TSF. Daily visual inspection not required in PE-110652 but recommended.	Operational plant monitoring.
		pH, five day biological oxygen demand (BOD_5), TSS, faecal coliform	Weekly		

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
		Flow	Daily when pumping		
Non-Contact Mine Surface Waters					
FWSS		Field	Monthly, when pumped to FWR	Non-contact water pumped from Tatelkuz Lake to support IFN or to the FWR to provide make up water for the mill: Operations, Closure.	Monitor quality and quantity of background/non-contact water directed to FWR.
		Analytical chemistry	Monthly, when pumped to FWR		
		Flow	Continuous using inline flow meters		
Central Diversion System Water Transfer Pond		Field	Monthly	Collection and storage pond for diverted, non-contact water: Operations, Closure, post-closure. Water pumped to WMP or flows over weir to TSF C (Year -1 to Year +6). Pond relocated in Year+7 west of West Dam. Water level monitored using pressure transducer; water pumped from pond monitored using inline flow meters. Manual discharge measurements downstream of pond when spilling into TSF C.	Monitor quality and quantity of background/non-contact water diverted to WMP (or bypass to FWR if WMP is at capacity). Water level monitoring within the water transfer pond required to inform the operation of the pumping system and document when flow into TSF C is occurring.
		Analytical chemistry	Monthly		
		Flow	Continuous		
Non-Contact Mine Surface Waters *(cont'd)*					
Central Diversion System Water Transfer Pond *(cont'd)*				From Year+7 onward, during high flow events, when the storage capacity of the pond and outlet pump are exceeded, emergency discharge to Lake 16 could occur	
Northern Diversion System Water Transfer Pond		Field	Monthly	Collection and storage pond for diverted, non-contact water: Operations (Year +7 onwards), Closure. Water conveyed to FWR by pipeline, flows in excess of pipeline capacity and overflow via spillway contribute to TSF D pond. Water level monitored using pressure transducer; water pumped from pond monitored using inline flow meters. Manual discharge measurements downstream of pond when spilling into TSF C.	Monitor quality and quantity of background/non-contact water diverted to FWR. Water level monitoring within the water transfer pond required to inform the operation of the pumping system and document when flow into TSF D is occurring.
		Analytical chemistry	Monthly		
		Flow	Continuous		

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
Mine Site Groundwater					
Between TSF C and IECD	GT20-04 GT21-03S MW22-02D/S MW22-03D/S MW23-05D/S	Field	Quarterly	Water level monitored using a pressure transducer. Decommissioned prior to construction of Main Dam D.	Monitor quality and groundwater level to inform adaptive management, as appropriate.
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Between TSF D and ECD / Seepage Collection Trenches	MW12-07D/S	Field	Quarterly	Water level monitored using a pressure transducer Decommissioned prior to construction of ECD North Interception Trench.	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
	MW -F (S/D) MW-G (S/D) MW-I (S/D) MW-J (S/D) MW-L (S/D)	Field	Quarterly	Proposed sites. Install in Year 5	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
	GT13-02	Water Level	Continuous	Water level monitored using a VWP.	Monitor groundwater level to inform adaptive management, as appropriate
FWR and Downgradient	MW12-08D/S	Field	Quarterly	Water level will be monitored using a pressure transducer	Monitor quality and groundwater level to inform the environmental monitoring program
	MW12-09D/S	Analytical chemistry	Quarterly		
		Water Level	Continuous		
	MW-H (S/D)	Field	Quarterly	Proposed sites. Install in Year 5	Monitor quality and groundwater level to inform the environmental monitoring program
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Monitoring Wells Located Between Saddle Dam and Spillway	MW12-12D/S MW12-09D/S	Field	Quarterly	Water level monitored using a pressure transducer	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
	MW-K (S/D) MW-O (S/D)	Field	Quarterly	Proposed site. Install prior to Year 5.	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
	MW-N (S/D)	Field	Quarterly	Proposed site. Install prior to Year 10.	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Stockpiles Area	MW23-03D/S MW23-04D/S MW24-01D(A)/S	Field	Quarterly	Water level monitored using a pressure transducer.	
		Field	Annual		Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Annual		
		Water Level	Continuous		
	MW-R	Field	Quarterly	Proposed site. Install Year 1 or 2.	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Open Pit Area	MW12-03D GT13-44	Field	Quarterly	Water level monitored using a pressure transducer	

Facility	ID	Monitoring Type**	Frequency	Description	Rationale
		Analytical chemistry	Quarterly	MW12-11D/S wells will be lost in Year+13 when the pit reaches its maximum extent.	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Water Level	Continuous		
	MW12-04D/S	Water Level	Continuous	Water level monitored using a pressure transducer MW12-11D/S wells will be lost in Year+13 when the pit reaches its maximum extent	Monitor groundwater level to inform adaptive management, as appropriate
	MW12-10D				
	MW12-11D/S				
	GT13-25				
	GT19-04				
	DK/MW-05				
	GT-A	Water Level	Continuous	Proposed site. Install Year 1.	Monitor groundwater level to inform adaptive management, as appropriate
Downgradient of Plant Site	MW23-01 MW23-02D/S	Field	Quarterly	Water level monitored using a pressure transducer	Monitor quality and groundwater level to inform adaptive management, as appropriate
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Background Wells	MW12-01D	Field	Quarterly	MW12-01D to be decommissioned if Main Dam D Construction footprint overtakes location (Year 7). Water level monitored using a pressure transducer.	Upgradient reference site. Monitor quality and groundwater level
	MW12-05D/S	Analytical chemistry	Quarterly		
	MW12-13S	Water Level	Continuous		
	MW-A (S/D)	Field	Quarterly	Proposed site. Install Year 1 or 2.	Upgradient reference site. Monitor quality and groundwater level
		Analytical chemistry	Quarterly		
		Water Level	Continuous		
Seep Survey Locations	Seeps downgradient of the Open Pit and TSF, and along the drainage contributing to the WMP	Seep mapping	Annually	Where sufficient flow exists, water quality samples of the seep will be collected following the same QA/QC procedures established for surface water sampling	To collect information on potential changes to water quality and flow at groundwater discharge points.

*Surface water monitoring required under PE-110652.
**Monitoring type and parameters include:
Field = pH, conductivity, turbidity, temperature, measured using an appropriate, calibrated field meter. Field dissolved oxygen and OPR must also be recorded at surface discharge points (FWR, Downstream Aggregate Borrow Area SCP, and TSF Stage 1 SCP) and water treatment plant influent and effluent streams.
Analytical chemistry = Includes:
Physical parameters and dissolved anions: pH (laboratory), turbidity (laboratory), specific conductivity (laboratory), total suspended solids, total dissolved solids, hardness (as CaCO3), total alkalinity (as CaCO3), acidity (as CaCO3), bromide, chloride, fluoride, and sulphate.
Nutrients/cyanides/organic carbon: ammonia (as N), nitrate (as N), nitrite (as N), total phosphorus, ortho-phosphate, total cyanide, cyanide Weak Acid Dissociable, TOC, and DOC.
Metals (total and dissolved): aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium, and zinc.

Water level – Quarterly = water levels in groundwater wells will be measured as metres below ground surface; sub-set of wells will be monitored continuously using pressure transducers.
Acute toxicity = Rainbow trout acute lethality test (EPS 1/RM/13, second edition, December 2000) and Daphnia magna acute lethality test (EPS 1/RM/14, second edition, December 2000 with February 2016 amendments).
Sublethal toxicity = Sublethal toxicity tests using a fish species (early life stage rainbow trout Reference Method EPS 1/RM/28), an invertebrate (Ceriodaphnia dubia Report EPS 1/RM/21), a plant (Lemna minor Reference Method EPS 1/RM/37), and an alga (Pseudokirchneriella subcapitata Report EPS 1/RM/25).

10 Nonconformity and Corrective Actions

10.1 Overview

This section summarizes potential nonconformities and corresponding corrective actions (i.e., mitigation measures) associated with mine site discharges. The present plan and the information provided below are intended to form the foundation of a detailed TRP that will be developed prior to the Operations phase, per PE-110652.

Because groundwater seepage that reports to the Mine receiving environment will represent a non point source discharge, discharge quality and quantity limits (and corrective actions in the event of a limit exceedance) are not proposed. Instead, regulation, mitigations and adaptive management of this discharge type will occur through mine site groundwater management and monitoring and the AEMP (Appendix 7-A of BW Gold 2022).

In support of the Application, BW Gold has committed to a wide range of mitigations that minimize potential effects of the Mine to the downstream receiving environment, including source control of ML/ARD, management control, and containment (Section 5.4 of the Application (BW Gold 2022); ML/ARD Management Plan (Appendix 9-D of BW Gold, 2022)). BW Gold has further committed to the operation of two active WTPs during the Operations phase (one metals removal system and one membrane reverse osmosis system) as a result of a rigorous and comprehensive best achievable technology evaluation (Section 5.4 of the Application (BW Gold 2022)). The above mitigations yield a comprehensive water management strategy for the Mine that affords flexibility and is supported by contingency options. This strategy has been scrutinized and validated in the LoM WB/WQM using a variable climate case. In the event that mine waters do not meet acceptability thresholds for discharge, contingencies identified in Table 10.1-1 may be implemented. In most cases, the initial response to a non conformity event constitutes immediate confirmatory or supplemental sampling. This is conducted in parallel with the implementation of mine site water management options to minimize the quantity of non conforming water discharged to the environment until the water is shown to be suitable for discharge.

Reclamation research is also proposed to both address potential uncertainties in discharge conformity with regulatory limits and investigate opportunities to improve the Reclamation and Closure Plan. The intent of the research is to support a Post-closure landscape that reflects the end land use objectives. Potential areas of research include the use of wetlands to treat water, and Pit Lake amendments to reduce concentrations of POPCs in the water column. These research options and others are discussed in further in Chapter 4 of the Application (BW Gold 2022).

Table 10.1-1 *Effluent Discharge Non-Conformities and Corrective Actions*

Facility	Event	Response
FWR outlet	Flow less than IFN	See Trigger Action Response Plan defined in the Aquatic Effects Monitoring Plan (AEMP) Appendix 7-A.
	Temperature not within proposed targets	See Trigger Action Response Plan defined in the AEMP Appendix 7-A.
	Discharge quality does not meet required characteristics	▪ Confirmatory discharge quality sampling (including toxicity testing, as appropriate) will be conducted and an investigation will be launched to identify the cause of FWR discharge quality exceedance and to identify appropriate remedial actions, per the TRP. ▪ Management of water in the FWR will be initiated to minimize discharge to Davidson Creek and mitigate potential effects until FWR water is confirmed suitable for discharge. Management actions may include: ○ Construct additional measures to route non-contact diversion water around the WMP to the FWR; ○ Discontinue pumping water from the WMP if it is identified as a source of water affecting FWR water suitability; ○ Temporary containment of normal inflow sources to the FWR within TSF C or TSF D to limit flows to the FWR; ○ Implementing additional sediment and erosion controls; ○ Implementing localized pH-adjustment; ○ Increasing the treatment rate at the Metals WTP during winter months (when the Metals WTP is not operating at its design hydraulic capacity); ○ Initiating Membrane WTP during winter months (e.g., November through March); and ○ Increasing the WTP capacity.
Membrane NF WTP Effluent (Post-closure only)	WTP effluent concentration exceeds design targets	▪ Discharge from the WTP will be cycled per the operator standard operating procedure. An investigation of WTP operations will be conducted by the WTP operator to identify the cause of and rectify the non-conformity (Application Appendices 5-H (Membrane WTP Design Report)). ▪ Response steps in the event of higher than predicted WTP influent concentrations are discussed under adaptive management (Section 11).
TSF Spillway (post-closure only)	Discharge quality does not meet required characteristics	▪ Confirmatory discharge quality sampling (including toxicity testing, as appropriate) will be conducted and an investigation will be launched to identify the cause. ▪ Management will be initiated to minimize discharge to Davidson Creek and mitigate potential effects until water is confirmed suitable for discharge. Management actions may include: ○ Routing water to Pit Lake, TSF C or TSF D for temporary containment; ○ Increasing WTP capacity; ○ Implementing additional sediment and erosion controls; and ○ Implementing localized pH-adjustment.
TSF Stage 1 SCP (construction only)	Discharge quality does not meet	▪ Confirmatory discharge quality sampling will be conducted and an investigation will be launched to identify the cause.

Facility	Event	Response
	required characteristics	▪ Management will be initiated to minimize discharge to Davidson Creek and mitigate potential effects until water is confirmed suitable for discharge. Management actions may include: o Implementing additional sediment and erosion controls; o Implementing localized pH-adjustment; and o Adding flocculant or other settling aids.
Downstream Aggregate Borrow Area SCP	Discharge quality does not meet required characteristics	▪ Confirmatory discharge quality sampling will be conducted and an investigation will be launched to identify the cause. ▪ Management will be initiated to minimize discharge to Davidson Creek and mitigate potential effects until water is confirmed suitable for discharge. Management actions may include: o Implementing additional sediment and erosion controls; o Routing water to the WMP, TSF C or TSF D for temporary containment; o Implementing localized pH-adjustment; and ▪ Adding flocculant or other settling aids.

11 Adaptive Management

11.1 Overview

BW Gold is committed to continual improvement of its environmental management and performance. The MSDP will be reviewed annually to verify implementation and the continued suitability, adequacy and effectiveness, in conjunction with annual (or more frequent, as needed) review of monitoring data.

The MSDP is a "living" document, therefore updates to the plan may be required periodically. Circumstances that trigger an update to the MSDP may include changes to:

- Infrastructure or processes;
- The mine plan and schedule;
- Other relevant EMPs;
- Response requirements;
- Regulations; and
- Incidents.

Preliminary triggers for additional mitigation, management and/or monitoring are described in Table 11.1-1. Triggers identified for mine site water quality are heavily focused on ML/ARD management within the mine site due to the potential magnitude of effect to mine water and discharge quality associated with ML/ARD processes. A TRP will be developed per PE-110652 with consideration of these potential effects. The effectiveness of the mitigation strategies implemented as part of the adaptive management response will be monitored and evaluated. The mitigation strategies may be subsequently altered or additional mitigation measures considered depending on the results of the monitoring program, as appropriate.

The primary focus of mine site surface water quality monitoring in support of adaptive management will be the TSF ponds and pit water, as these are dominant loading sources for the Mine where variability in water chemistry has the potential to impact downstream water quality. In addition, TSF D pond water quality has the potential to have a long-term impact on groundwater quality through seepage flow paths. Due to the predicted rapid onset of ARD for PAG mine rock, a portion of the PAG mine rock placed in the TSF basin may become acid generating prior to flooding. The proposed trigger for changes in pH in the TSF ponds will be a pH reading below pH 6.5.

Both Mines Act permit M-246 and EMA PE-110652 include annual reporting requirements for facility (e.g., waste dumps, stockpiles) and treatment performance. PE-110652 further includes the requirement to review water management, effluent discharge, and receiving environment monitoring, as well as the most recent site-wide water quality model predictions compared to measured data. These reviews are anticipated to inform Project adaptive management and identify potential areas that may require further investigation.

Table 11.1-1 Mine Site Water Adaptive Management Actions

Facility	Event	Response
Upper and Lower Waste Stockpile Collection Ponds	Concentrations exceed predictions	Follow-up investigation will be initiated to confirm and characterize measured concentrations, which may include additional sampling and increasing monitoring frequency. Investigation of material source will be triggered and may require reactive management strategies. Investigation to confirm Metals WTP will be able to accommodate the change and adjust the treatment if necessary.
	Surface flow rate exceeds predictions	Investigation to confirm Metals WTP will be able to accommodate the change and adjust the treatment if necessary.
LGO Stockpile Collection Pond	pH lower than anticipated	Follow-up investigation will be initiated to confirm and characterize pH measurements, which may include additional sampling, comparison of laboratory and field measurements, and increasing monitoring frequency. If appropriate, lime addition in the lime neutralization system will be increased within the lime neutralization system.
	Runoff volumes / flow rates exceed the capacity of the lime neutralization system	Capacity of the lime neutralization system will be increased, as needed. Pumping capacity of the LGO collection pond system will be increased, as needed. Evaluate if water could be directed to the Metals WTP.
Open Pit Sump	Concentrations exceed predictions	Follow-up investigation will be initiated to confirm and characterize measured concentrations, which may include additional sampling and increasing monitoring frequency. Investigation to confirm that Metals WTP will be able to accommodate the change and adjust the treatment if necessary. Pit wall mine rock exposures (e.g., PAG1, PAG2, NAG3, etc.) will be reviewed relative to expected mine rock types used in source term development. Results will be evaluated to determine if an update to the water quality model is required.
	Dewatering rates are lower than predicted	Source additional mill freshwater from the WMP
	Dewatering rates are greater than predicted	Optimize rates to align with WTP capacity needs and increase capacity of the WTP if necessary
	Drawdown surrounding the Open Pit is greater than predicted	Monitor tributaries to Creek 661 to evaluate potential impacts to streamflows and consider implementing additional groundwater contingencies, such as diverting water to Creek 661 in the event that groundwater drawdown is reducing streamflow.
	Concentrations exceed predictions	Follow-up investigation will be initiated to confirm and characterize measured concentrations, which may include additional sampling and monitoring downgradient.

Facility	Event	Response
TSF C and D Ponds	pH instability (i.e., pH < 6.5)	Follow-up investigation will be initiated to confirm and characterize measured values, which may include additional sampling, comparison of laboratory and field measurements, and an increased monitoring frequency. As appropriate, management actions will be initiated and may include: ■ Consider lime dosing in the mill; ■ Adjusting the waste rock flooding schedule; and ■ Temporary lime addition to re-establish neutral pH conditions in the pond environment. PAG quantities will be reviewed relative to expected PAG quantities used in source term development. If a higher proportion of waste rock is PAG, mine rock classification will be revisited and management strategies will be adjusted. Results will be evaluated to determine if an update to the water quality model is required.
	Concentrations approach or exceed predictions	Follow-up investigation will be initiated to confirm and characterize measured concentrations, which may include additional sampling and increasing monitoring frequency. Confirm Membrane WTP will be able to accommodate the change and adjust the treatment if necessary. The material source will be investigated. Depending on the material type or condition causing the increased metal mobility, reactive management strategies may be imposed. Results will be evaluated to determine if an update to the water quality model is required. Subsequent management actions may include: ■ Adjusting the waste rock flooding schedule; ■ Consider lime dosing in mill; ■ Optimizing spigot placement and discharge plans for the TSF to limit tailings beaches exposure time; and ■ Implementing WTP actions described below.
	Pond volume exceeds the nominal volume needed to support mine operations	■ Follow latest tier-based operational instructions in OMS Manual providing threshold values and associated response plans. ■ Convey surplus water to the Membrane WTP before discharge to the WMP.
WMP	Concentrations exceed predictions and water is not suitable for conveyance to the FWR	■ Follow-up investigation will be initiated to confirm and characterize measured concentrations, which may include additional sampling and an increased monitoring frequency at locations upstream. Pathways to investigate will include: ○ Membrane WTP and Metal WTP effluent; ○ Groundwater quality at wells upgradient of the WMP; and ○ Other potential flow paths to the WMP. ■ As appropriate, management actions may be initiated, including: ○ Temporary lime addition to re-establish neutral pH conditions in the pond environment; ○ Implementing WTP influent and effluent actions described below; ○ Directing water to TSF C; and ○ Treating water before discharge to the FWR.
	Water level	■ Water will be pumped to the FWR and/or to support ore processing when required to limit accumulation of surplus water. Additional WMP outlets are available to passively manage water levels include pipe overflow outlet and emergency spillway.
ECD and IECD Pond	Concentrations exceed predictions	■ No actions are proposed for the IECD and ECD since the water will remain on-site and directly impacts the water quality in TSF C and D. Potential actions are described under TSF C and D. The IECD and ECD

Facility	Event	Response
		will be monitored to support the understanding of water on site, and implications for long-term treatment.
	Pond volume is greater than expected	■ Increase pumping rates to decrease water volumes. ■ Provide additional pumping capacity to meet demand.
Water Treatment Plants		
WTP influent	Concentrations approach or exceed predictions	Follow-up investigation will be conducted to explore potential sources of the exceedance and potential implications on treatment, including re-sampling of WTP influent and effluent. Additional monitoring will be initiated at relevant upstream and downstream stations as appropriate to characterize sources. Results of the follow-up investigation will be used to determine if mitigation measures are required. Investigation will be conducted with the objective of confirming that WTP can accommodate increased influent concentrations. Additional management options that may be considered (dependent on parameter(s) showing elevated concentrations) include: ■ Adjustments in the mill process; ■ Modifications to the WTP systems (e.g., increased reagent concentration, new reagents, new processes); ■ Changing blasting practices; and ■ Evaluation of the cyanide destruction process. Additional monitoring will be implemented to determine the effectiveness of mitigation measures. If long-term changes to WTP influent are identified, the water quality model and WTP treatment requirements will be evaluated as needed.
WTP effluent	WTP effluent exceeds its design target	Discharge from the WTP will be cycled per the operator standard operating procedure. An investigation of WTP operations will be conducted by the WTP operator to identify the cause of and rectify the non-conformity (BW Gold (2022) Appendices 5-H (Water Treatment Plant for Sulphate Control), 5-G (Detailed Design for Blackwater Gold Water Treatment Plant)). In the event that treatment rates or efficiency are insufficient, the treatment capacity may be increased or system adjusted.
Lime neutralization system effluent	pH exceeds or falls below target	An investigation of treatment system operations will be conducted by the operator to identify the cause of and rectify the non-conformity. Reagent dosing and/or hydraulic residence time may be modified.

11.2 Groundwater Adaptive Management and Contingency Actions

The Non-Point Source Discharge to Ground TRP for the Mine serves as a proactive tool to identify the potential signs of contact water (seepage) in the groundwater system and promote a response or remedial action, if required, to manage, mitigate and minimize the risk of impacts of seepage to the receiving environment. This groundwater TRP applies to authorized non-point source discharges listed in Section 1.5 of permit PE-110652, which include the TSF, Upper and Lower Waste Rock Stockpiles, LGO Stockpile, and Operations Camp Site area through the life of mine. Permit PE-110652 requires that the groundwater TRP be reviewed and updated every three years, or as needed, by a Qualified Professional with the first review conducted in 2026. This review will take into consideration the effectiveness of the groundwater TRP, comparison against the results of the most recent numerical groundwater model and the need for adaptive management and implementation of contingencies.

Key information included in the groundwater TRP are as follows:

- Defined groundwater quality triggers set relative to baseline data and the Contaminated Sites Regulation (CSR) groundwater standards in accordance with PE-110652.
- Summary of the monitoring wells included in the TRP through the life of the mine.
- Documentation and rationale for parameters considered key indicators of seepage water quality from facilities. Indicator parameters are select parameters that were identified to have higher concentrations in seepage source terms than in baseline groundwater concentrations.
- Outlined trigger levels that followed a tiered framework based on escalating risk. Trigger levels identify preliminary signs of contact seepage (Level 1), and promote a response or remedial action, should they be required to manage and mitigate the seepage (Level 2 and Level 3).

Conceptual seepage control and mitigation measures that could be implemented to restrict or capture seepage include the following as outlined in the groundwater TRP:

- Source Control: Implement source control measures to minimize introduction of contact water to the groundwater system. Source control measures could include improved run-off management infrastructure, installation of liner or cover systems, changes to waste management practices, or adjustment of mine plans.
- Groundwater barrier or cut-off wall: Construct a groundwater flow barrier or cut-off wall to intercept and control groundwater flow. Barriers are installed vertically to into the sub-surface to restrict or control seepage. Groundwater flow barriers could be constructed from low-permeability soil available on site, bentonite slurry, or sheet piles.
- Interception trench or gravity drainage system: Construct a passive drainage system involving perforated PVC pipes or trenches to intercept shallow seepage. The system may be designed to passively collect and divert shallow groundwater toward a collection point. Implementation of the drainage or trench system may include a lower permeability cut-off trench on the downstream side.
- Well points: Install well points in select locations to intercept shallow groundwater. Well points are most effective for intercepting groundwater up to a few meters below ground surface.
- Pumping wells: Install groundwater pumping wells in strategic locations to capture seepage. Pumping well designs (screen length/depth, casing diameter, pump system, etc.) will be optimized to best suit the specific nature of seepage from the facility. Pumping wells are considered suitable to capture seepage associated with shallow or deeper flow paths.

- Two pumping wells were installed downgradient of Main Dam C in 2024 to facilitate hydraulic testing of a subsurface sand and gravel unit present beneath and downgradient of the embankment. The pumping wells are available as a mitigation measure to capture seepage downgradient of Main Dam C, if required.

In Post-Closure, groundwater-related contingencies may also include:

- Lowering the Pit Lake level in post-closure so that some or all of the Pit Lake seepage and some of the Upper Waste Stockpile seepage flows towards the pit rather than to downstream sites; and
- Installing thicker engineered covers on the Upper and Lower Waste Stockpiles and on the TSF beaches and embankments to reduce infiltration and seepage.

11.3 Contingency Plans for TSF Water Cover

Results of sensitivity modelling with the LoM WBM using variable climate inputs (KP 2022b) indicate that a nominal pond in TSF D and saturation of the waste rock can be maintained in TSF D during all climate conditions if water is allowed to bypass the diversions and flow onto the TSF. Contingencies that could be considered if extreme dry conditions occur and water is required to maintain saturation of the PAG waste rock in the TSF and adequate flows are maintained in the downstream environment include:

- Direct water from the FWSS (via the FWR) to the TSF during Operations
- Pump less water from the TSF to the pit lake in Closure
- Direct water from the ECD to the TSF D pond in Closure
- Treat water from the ECD and/or TSF at the Membrane WTP for discharge downstream to maintain streamflows in Davison Creek in Closure
- Direct water from the ECD to the waste rock in the TSF, facilitated by injection wells installed in the waste rock or similar strategy, in Post-Closure.

12 Reporting and Record Keeping

12.1 Reporting

management are described below. Reporting requirements related to water management are also informed by the Mines Act and Environmental Management Act permits issued for the Mine. In addition to reporting requirements, the Code (Part 10, section 10.4.1) requires after commencement of operations, the water balance and water management plans under section 10.1.12 (Permit Application) of the Code be reconciled annually and updated as required.

Monitoring reports will be submitted as required by the federal or provincial regulations, guidance or permit and hard and electronic copies provided to Aboriginal Groups. Where required, monitoring data will be uploaded to government databases.

Additionally, Permit PE-110652 includes the following reporting conditions that may apply in emergency and/or non-compliance events, in addition to quarterly and annual reporting conditions detailed below in Section 12.1.2:

- Condition 2.2 (Emergency Procedures)
- Condition 5.5 (Toxicity Test Reporting)
- Condition 6.1 (Non-compliance Notification)
- Condition 6.2 (Non-compliance Reporting)
- Condition 6.3 (Non-compliance Reporting and Exceedances)
- Condition 5.9 (Reporting to Indigenous Groups) of PE-110562 requires copies of the plans, reports, and notifications, including process modifications, toxicity test failures, and non-compliance event notifications, required under Permit PE-110652 be submitted by email to the LDN, UFN and CSFNs.

12.1.1 Metal and Diamond Mining Effluent Regulations Reporting

Environmental effects monitoring reporting is required by the MDMER. Division 2 of the MDMER sets out effluent monitoring conditions and monitoring reporting requirements are set out in section 21. Annual reporting requirements set out in section 22 (Division 2 of the MDMER; EC 2012).

12.1.2 Environmental Management Act Quarterly and Annual Reporting

Routine reporting is required for permits issued under the Environmental Management Act. These reports are public documents and prepared by QPs. Separate reports or sections of the annual report are expected for air, refuse and water/receiving environment. In some cases, a separate biological effects report or water quality report may be required (BC MOE 2016a). Reporting requirements are described in Technical Guidance 4 (BC MOE 2016a).

With respect to Permit PE-110652, quarterly reporting requirements are prescribed under Condition 5.2 of Permit PE-110652, which requires:

a) Submission of all available monitoring results, as specified in section 4 (Monitoring) of PE-110652, including tabulated field and laboratory data and associated quality assurance data, to ENV within 30 days of the end of the quarter in which the sampling occurred.

b) Identification of monitoring results that exceed permit limits, accepted Science-Based Environmental Benchmarks (SBEBs), along with a discussion of any potential impacts to the receiving environment as a result of the exceedances, responses and associated mitigation actions undertaken by the permittee.

c) Identification of any missed sampling events/missing data with an explanation provided.

Annual reporting requirements are prescribed under Condition 5.3 of Permit PE-110652, which states the Annual Report must include (but is not limited to):

a) The AEMP interpretation report specified in section 4.6 of Permit PE-110652, as an appendix to the Annual Report.

b) The results of the plume delineation study specified in section 3.13 of Permit PE-110652, as an appendix to the Annual Report.

c) The Water Treatment Performance Report specified in section 3.12 of Permit PE-110652, as an appendix to the Annual Report.

d) Implementation schedule for any alterations to the Plant Site Sewage Treatment, Metals Water Treatment Plant and Membrane Water Treatment Plant and disposal of treatment sludge or by-products which may impact the quality and/or quantity of authorized discharge specified in section 1 of Permit PE-110652.

e) Evaluation of the impacts of the mining operation on the receiving environment from the previous year, considering any non-compliance events.

f) Summary of any non-compliance events and other incidents, and all spills.

g) A review of the surface water effluent and receiving environment water quality monitoring program required in sections 4.2 and 4.3 of PE-110652 (refer to Condition 5.3.3 (g) for further detail),

h) A review of the groundwater monitoring program required in section 4.7 of Permit PE-110652 (refer to Condition 5.3.3 (h) for further detail).

i) A review of the effluent (flow) monitoring programs required in sections 4.1 and 4.2 of Permit PE-110652 (refer to Condition 5.3.3 (i) for further detail).

j) A review of the meteorological monitoring program required in section 4.5 of Permit PE-110652 (refer to Condition 5.3.3 (j) for further detail).

k) A review of the receiving environment hydrometric monitoring program required in section 4.4 of Permit PE-110652 (refer to Condition 5.3.3 (k) for further detail).

l) A review of the most recent site-wide water quality model required in section 3.8 of Permit PE-110652 (refer to Condition 5.3.3 (l) for further detail).

If any of the above requirements from (a) to (l) were not completed during the previous year, the Annual Report must include a statement to that effect with rationale as to why the requirement did not apply for that year. Annual Reports must be submitted on March 31st of each year. The Annual Status Form must also be submitted on March 31st of each year, per Condition 5.4 of Permit PE-110652, and must include:

a) An assessment of compliance against the requirement for the previous year, determining whether the permittee was in compliance, out of compliance, or if the requirement did not apply for that year, and

b) Justification for the compliance determination.

12.1.3 Annual Reclamation Reporting

The Mine's annual reclamation report will describe the Environmental Protection Program over the past year, next year, and projected over the 5 years (in summary) and will include (but is not limited to) the following (EMLI 2021b):

12.1.3.1 WillSurface Water Quality and Quantity

Per Condition C.4.(d) of Permit M-246, the results of surface water and groundwater monitoring, including QA/QC results. This reporting will include various components identified under Condition C.4.d, including but not limited to the items below:

- Summarize the drainage monitoring program, including flows and water quality at monitoring locations both on and off of the mine property.
- Include data range and central tendencies for data summaries.
- Include maps depicting hydrologic features and monitoring locations.
- Include figures illustrating time series of parameters including pH, sulphate, alkalinity, acidity, base cations, major metals, trace elements, and major nutrients.
- Identify any water quality trends or issues and any actions that have or will be undertaken to address.

12.1.3.2 Groundwater Quality and Quantity

As above under Surface Water Quality and Quantity.

12.1.3.3 Water Quality Prediction, Mitigation, and Treatment

Per Condition C.5.(e) of Permit M-246, information on the performance of all water collection and treatment plants, including but not limited to the items below:

- Include a comparison of predicted water quality versus measured water quality, including key source terms used in predictions.
- Summarize and assess effectiveness of water quality protection and mitigation measures for the mine, including ML/ARD.
- Identify any issues encountered or expected and actions that have been or will be undertaken to address.
- Water Management
- Describe and map pre-mining drainages/watersheds.
- Describe and map the current configuration of water management conveyance features and infrastructure, and changes to natural drainages/watersheds.

12.1.3.4 Water Management

- Describe and map pre-mining drainages/watersheds.
- Describe and map the current configuration of water management conveyance features and infrastructure, and changes to natural drainages/watersheds.

12.2 Record Keeping

The EM is responsible for data management and reporting related to water management. The data management system will include conducting routine inspections and monitoring, and providing these results to appropriate parties as required. The EM will also report key results of waste management monitoring and related environmental, health and safety incidents to the Blackwater Life of Mine Committee per Permit PE-110652 Condition 3.7.

Monitoring data will be entered into a secure, electronic, dedicated database and have quality control checks completed upon receipt of results, per Condition C.4.(b)(ii) of permit M-246. Data will be entered into a standard format that allows for data reporting and analyses. Data and data comparisons will be stored in a single file format for each type of survey or monitoring activity. Monitoring data will be stored for the LoM, and uploaded to the ENV Environmental Monitoring System (EMS) database per Permit PE-110652 Condition 5.6. This condition specifies that data for sites specified in the effluent permit must be uploaded to the EMS using the appropriate EMS site identification numbers (per Appendices A, B, and C of Permit PE-110652) within 60 calendar days of the end of each quarter during which samples were collected.

13 Plan Revision

The MSDP will undergo an annual review to ensure its implementation and to assess its ongoing suitability, adequacy, and effectiveness. This review will be conducted alongside the annual—or more frequent, if necessary—evaluation of monitoring data. As a "living" document, the MSDP may require periodic updates. Section 11.1 outlines the circumstances that may prompt such revisions.

14 References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Acronyms and Abbreviations section.

14.1 Legislation

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Environmental Assessment Act, SBC 2018, c 51.

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Approval Signature Record

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