# 2. Purpose and Objectives

The objective of the MWMP is to minimize the effect of surface water movement and storage onsite on Project-Area watercourses (water quality and quantity). Specifically, the MWMP aims to:

- reduce Project water requirements by incorporating water recycling and waste dewatering processes into the mining process (e.g., processed rock dewatering);
- reduce impacts to streams downstream of the Project by maintaining as small a footprint as practical, incorporating clean water diversions, and maintaining pre-mining drainage patterns where feasible;
- reduce need for sourcing water from watercourses for water cover or potable water use;
- manage seasonal discharge to maintain natural flow conditions;
- maintain minimum water cover requirements to reduce risk of metal leaching (ML)/acid rock drainage (ARD) from PAG rock;
- reduce water quality impacts by collecting and treating potentially high sediment water during all phases of the Project (i.e., surface water runoff from Mine Infrastructure Complex (MIC), open pit, management pond embankments and buttresses, haul roads, service roads, stockpiles. and material storage piles) that have the potential to impair water quality of the receiving streams; and
- reduce water flowing into the open pit and other active mining areas to keep operating areas as dry as possible.

All designs were prepared in accordance with the Health, Safety and Reclamation Code for Mines in British Columba (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] 2021) (Code), British Columbia Ministry of Environment (BC MOE) Technical Guidance 7 in Environmental Management: Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining (BC MOE 2015) and the Memorandum of Understanding - Regulation of Impoundments and Diversions on a Mine Site between the British Columbia Ministry of Energy and Mines (BC MEM), the British Columbia Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO), and the BC MOE (2014).

# 3. Scope and Scale

The scope of this MWMP is defined within the Project Area and includes all activities in the Construction, Operation, Decommissioning and Reclamation, and Post-Closure phases, as well as any operation and/or construction activities that are directly associated with the Project that may exist outside of the Project Area.

The MWMP is in effect during all Project phases and ceases to be in force at the final closure of the Project as approved by the regulatory authorities.

As part of the MWMP development, the following activities were completed:

- Develop water management design basis inputs based on site hydrology (SRK Consulting (Canada) Inc. [SRK] 2021a) and water and load balance modelling (SRK 2021b), to support design of water management infrastructure. Results with inputs to infrastructure designs are summarized in **6.3**;
- Develop a water management strategy to address requirements of the Application Information Requirements (AIR), as outlined in **Section (S) 1.0-Chapter (C) 1 Description of Project** of the **Environmental Assessment Certificate (EAC) Application**;
- Develop feasibility-level designs of water management infrastructure to achieve the water management strategy;
- Design of CPP pumping system from the Tenas Control Pond (described in Sedgman 2018);
- Water treatment plant designs for potable water and sewage treatment (described in Radloff 2021);
- Groundwater management plans (described in SRK 2021h);
- Metal leaching (ML)/ acid rock drainage (ARD) management and PAG management alternatives (described in SRK 2021i);
- Water management within the Rail Infrastructure area (described in **S1.0-C1 Description of Project** of the **EAC Application**);
- Water management along the Tenas Access Corridor (TAC) (described in DWB 2019 and **S1.0-C1 Description of Project** of the **EAC Application**); and
- Geotechnical embankment design for the water management and control ponds (as described in **S1.0-C1 Description of Project** of the **EAC Application**).

# 4. Compliance Obligations

## 4.1 Regulatory Requirements

Several legislative requirements are applicable to the MWMP. A short list of these and their major applicable components are provided in **Table 4.1-1**.

**Table 4.1-1: Legislation and Guidelines Relevant to the Minesite Water Management Plan (MWMP)**

| Legislation, Regulations, and Guidelines | Applicable Information |
|---|---|
| Approved *(and Working)* Water Quality Guidelines (British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019, 2020, 2021) | Provides guidance on water quality for the protection of aquatic life, wildlife, and agriculture. |
| *Canada Water Act,* RSC 1985, c -11<br>(Government of Canada [GovCan] 1985a) | Provides the framework for joint federal-provincial management of Canada's water resources. |
| Dam Safety Guidelines 2007 (2013 edition).<br>(Canadian Dam Association [CDA] 2013) | Provides Safety Guidelines for the construction of Dams. |
| *Canadian Environmental Protection Act,* 1999, SC 1999, c 33<br>(GovCan 1999) | Legislation to authorize discharge of water. |
| Canadian Water Quality Guidelines<br>(Canadian Council of Ministers of the Environment [CCME] 2001, 2003, 2017) | Provides guidance on water quality for the protection of both freshwater and marine aquatic life. |
| Coal Mining Effluent Regulations - pending | Forthcoming addition to the *Fisheries Act*,1985, c F-14 (GovCan 1985) specifying discharge requirements for new coal mines. |
| Dam Safety Regulations, BC Reg 40/2016<br>Government of British Columbia [GovBC] 2016) | Provides requirements for dam safe construction and operation of dams in BC. |
| *Environmental Assessment Act*, SBC 2018, c 51<br>(GovBC 2018) | Regulates discharge of liquid effluent and refuse into the environment, the management of hazardous wastes, and spills and spill reporting. |
| *Fisheries Act,*1985, c F-14<br>(GovCan 1985b) | Prohibits serious harm to fish that are part of a commercial, recreational, or Indigenous fishery, including the permanent destruction of habitat |
| Health, Safety and Reclamation Code for Mines in British Columbia<br>(British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] 2021) (Code) | Protects workers and the public through provisions for minimizing the health, safety and environmental risks related to mining activities. |
| Memorandum of Understanding - Regulation of Impoundments and Diversions on a Mine Site<br>(British Columbia Ministry of Energy [BC MEM] et al. 2014) | Memorandum of Understanding about regulations for dams and diversions on a mine site between the British Columbia Ministry of Energy and Mines (BC MEM), the British Columbia Ministry of Forests (BC MOF), British Columbia Ministry of Lands and Natural Resource Operations (BC MLNRO), and the British Columbia Ministry of Environment (BC MOE). (Pending update) |

| Legislation, Regulations, and Guidelines | Applicable Information |
|---|---|
| Metal and Diamond Mining Effluent Regulation, SOR/2002-222 (GovCan 2002) | Allows for the designation of a water body for the deposition of metal and diamond mine waste and outlines requirements for mine-related discharges. |
| *Mines Act,* RSBC 1996, c 293 (GovBC 1996a) | Provides guidance and approvals for all activities on the Minesite, throughout the life-of-mine (LOM). |
| *Water Protection Act,* RSBC 1996, c 484 (GovBC 1996b) | Provides guidelines for the issuance of approvals to make changes in or about a stream. It is the primary legislation for regulating surface water diversion, storage, and use, and managing water quality. |
| *Water Sustainability Act,* BC Reg. 36/2016 (GovBC 2016a) and Water Sustainability Regulation, BC Reg 36/2016 (GovBC 2016b) | Provides regulations to ensure a sustainable supply of fresh, clean water that meets the needs of British Columbia (BC) residents. |

The Joint Application Information Requirements for *Mines Act* and *Environmental Management Act* Permits (British Columbia Ministry of Energy, Mines and Petroleum Resources [BC MEMPR] and British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019) (JAIR) provides direction on the objectives for a MWMP in Section 9.6 of the JAIR document. This MWMP is designed to fulfill these objectives which are for each phase of mine life, including details on:

- objectives of the MWMP, and relationship to other management plans;
- Minesite employee roles and responsibilities;
- regulatory requirements and relevant authorizations;
- site overview including environmental and climatic conditions;
- details on use(s) of existing drainages;
- proposed water usage and water sources for the mine, detailing the watershed or source area boundary for the water supply;
- the layout of all water management infrastructure;
- a description of sources, flow paths, storage facilities, and discharges for all surface water;
- figures that illustrate the site-wide water balance, including flow rates;
- risks and potential impacts of mining and waste discharges to water quality and quantity;
- monitoring locations for surface water and groundwater quality and quantity;
- monitoring program details including the rationale for each monitoring location, coordinates, frequencies, analyzed and/or measured parameters, Standard Operating Procedures (SOPs), Quality Assurance/Quality Control (QA/QC) program, and reporting details;
- integration of any water quality or quantity mitigation measures required during the mine life (e.g., water treatment, groundwater interception, flow augmentation, etc.);
- assessment of upset conditions (e.g., extreme flow conditions, icing, etc.) and impacts on the performance of relevant infrastructure;
- Trigger Action Response Plan (TARP) for upset conditions, and contingency plans for mitigating potential impacts related to failure of any component(s) of the plan;
- analysis of potential impacts if contingencies fail; and

- any other relevant information.

## 4.2 Standard Practices and Procedures (SPPs)

All TCL Standard Practices and Procedures (SPPs) will conform to the Code. In addition to regulatory requirements, the Project will implement SPPs that meet or exceed the required laws and regulations.

# 5. Relationship to Other Management Plans

The Project is governed by an **Environmental Management System (S13.0-C1) (EMS)**, an overarching management plan strategy comprising a set of processes and practices which enable TCL to manage its environmental and safety performance in a holistic way, within an integrated framework. While the management plans are part of the **EMS**, the **EMS** is not just a collection of management plans.

In addition to the overall guidance of the **EMS**, this MWMP has a relationship with other management plans that also present mitigation measures. Those management plans and their relationship to this MWMP are listed in **Table 5-1**.

**Table 5-1: Management Plans with a Relationship to the Minesite Water Management Plan (MWMP)**

| Management Plans | Nature of Relationship |
|---|---|
| Environmental Management System (S13.0-C1) (EMS) | All management plans are part of the EMS. |
| Construction Environmental Management Plan (S13.0-C4) (CEMP) | Water management specific to the Construction Phase will occur in accordance with the CEMP. |
| Discharge Management Plan (S13.0-C5) (DMP) | All discharges mentioned in the MWMP are addressed in the DMP. |
| Explosives Management Plan (S13.0-C6) (EMP) | Water management structures at the Explosive Facility and Explosive Magazine are governed by this MWMP. |
| Metal Leaching (ML)/Acid Rock Drainage (ARD) Management Plan (S13.0-C12) (ML/ARDMP) | Water management specifically related to the control of ML/ARD is addressed in the ML/ARDMP. |
| Mine Emergency Response Plan (MERP) (S13.0-S9) | Any emergencies related to MWMP are governed by the MERP. |
| Occupational Health and Safety Program (S13.0-C13) (OHSP) | Safety of personnel and systems related to the MWMP are handled by the OHSP. |

# 6. Details of the Minesite Water Management Plan (MWMP)

## 6.1 Supporting Climate Analysis

Climate and hydrologic analyses completed for pre-feasibility (SRK 2017) and feasibility study (SRK 2019) were reviewed and updated to include recent meteorological and hydrometric data collected for the Project. A climate change assessment for the Project was also completed using the fifth version of the Coupled Model Intercomparison Project (CMIP5). The update is presented in **Appendix 1.0-R SRK, Baseline Hydrometeorological Report** of the **EAC Application** (SRK 2021a). The following subsections include the inputs relevant to water management infrastructure designs, including temperature variability, extreme rainfall and snowmelt magnitudes, unit runoff rates and lake evaporation. Each subsection summarizes the potential impacts of climate change, relevant to that parameter, where applicable.

Design parameters were estimated for the Project by developing a site-specific long-term synthetic climate dataset, based on correlations between the short-term Project climate recorded at the Tenas Deposit Meteorological Station, and longer-term records from Smithers Airport and other regional stations, and supported by the results of selected climate reanalysis packages. This is described in further detail in SRK 2021a.

### 6.1.1 Temperature

Regionally, mean annual temperature decreases with increasing elevation. The elevation of the Project ranges from 750 to 1,050 metres above sea level (masl). Monthly correction factors were developed to adjust temperatures recorded at the Smithers Airport station for the Project catchments based on a correlation between temperatures at both locations. **Table 6.1-1** summarizes expected monthly air temperatures at the elevation of the Tenas Project's Meteorological Station. The mean annual temperature is 2.2 degrees Celsius (°C).

**Table 6.1-1: Project Temperature Summary (degrees Celsius [ºC])**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum | -5.8 | -1.8 | 2.2 | 7.4 | 12.9 | 16.5 | 19.0 | 18.6 | 13.7 | 6.5 | -0.8 | -4.6 | 7.0 |
| Average | -9.2 | -6.1 | -2.7 | 2.1 | 6.8 | 10.7 | 13.0 | 12.5 | 8.4 | 2.6 | -3.8 | -7.9 | 2.2 |
| Minimum | -12.6 | -10.4 | -7.5 | -3.1 | 0.8 | 4.7 | 6.9 | 6.4 | 3.1 | -1.4 | -6.8 | -11.2 | -2.6 |

***Source:*** *SRK 2021a*

The mean annual temperature is expected to increase by between 2 and 5°C by the year 2100. The increase was evaluated monthly, which showed a consistent increase for all months. This may result in an earlier spring snowmelt, with a peak flow occurring in late March and April as opposed to April and May based on historic flow datasets.

### 6.1.2 Precipitation

Mean annual precipitation for the Project is 608 millimetres (mm), approximately 20 percent (%) greater than at the Smithers Airport station (**Table 6.1-2**).

Table 6.1-2: Project Precipitation Summary (millimetres [mm])

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall | 8.0 | 9.7 | 10.4 | 21.5 | 35.9 | 45.7 | 48.1 | 43.1 | 50.8 | 58.6 | 20.0 | 8.0 | 359.9 |
| Snowfall | 61.8 | 35.9 | 22.0 | 4.9 | 0.7 | 0.0 | 0.0 | 0.0 | 0.3 | 13.6 | 49.4 | 59.7 | 248.1 |
| **Total** | **69.7** | **45.6** | **32.4** | **26.4** | **36.6** | **45.7** | **48.1** | **43.1** | **51.1** | **72.2** | **69.4** | **67.7** | **608.0** |

***Source:*** *SRK 2021a*
***Note:*** *Snowfall presented as snow water equivalent.*

**Figure 6.1-1** illustrates the average monthly precipitation distribution as rain and snow-water equivalent (SWE). Precipitation typically falls as snow from October to April. Average snowfall (314 mm SWE) is approximately 50% of mean annual precipitation.

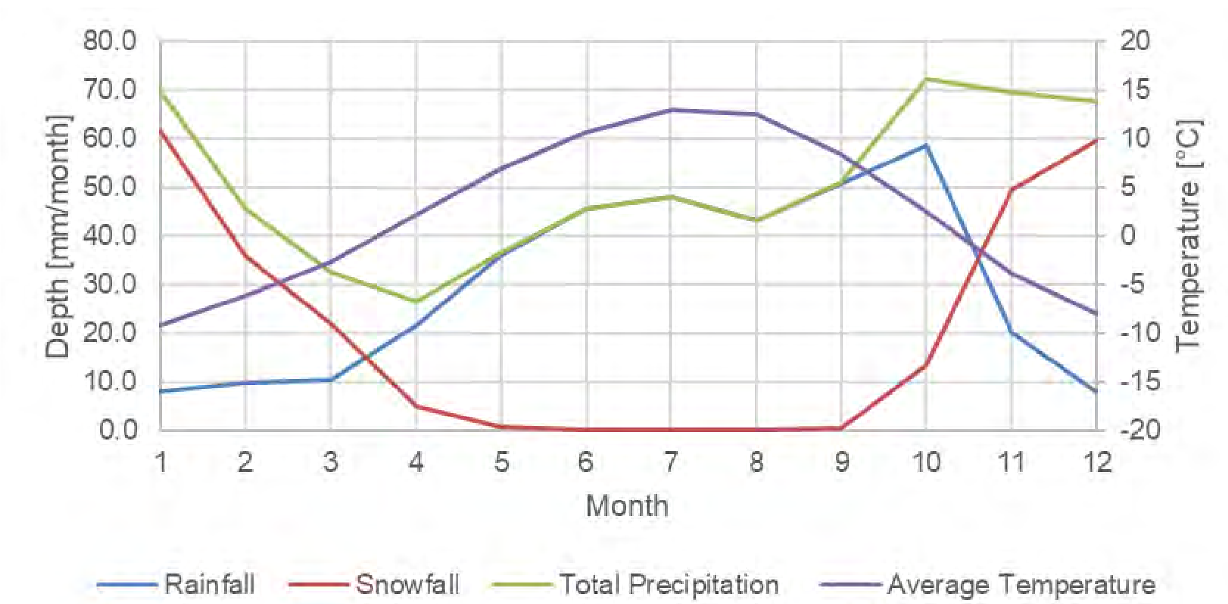



Figure 6.1-1: Monthly precipitation as snow and rain

Based on the assembled median data from the CMIP5 and representative concentration pathway 4.5, the mean annual precipitation for the Project is expected to increase by 75 mm to 175 mm by the year 2100. An increase in precipitation is expected for all months except July and August, which are expected to decrease until 2070, after which August will begin to increase, and July will continue to decrease through 2100. This could result in lower streamflow during dry months of July and August.

#### *6.1.2.1 Annual Frequency Analyses*

A frequency analysis was performed on the long-term precipitation record generated for the Project to evaluate extreme annual precipitation magnitudes (**Table 6.1-3**)

Table 6.1-3: Annual Precipitation Frequency Analysis

| Hydrological Condition | Return Period [years] | Annual Precipitation [mm] |
|---|---|---|
| Wet | 1000 | 997 |
| | 500 | 964 |
| | 200 | 918 |
| | 100 | 882 |
| | 50 | 843 |
| | 25 | 803 |
| | 20 | 789 |
| | 10 | 743 |
| | 5 | 690 |
| Median | 2 | 608 |
| Dry | 5 | 517 |
| | 10 | 479 |
| | 20 | 448 |
| | 25 | 440 |
| | 50 | 416 |
| | 100 | 396 |
| | 200 | 378 |
| | 500 | 357 |
| | 1000 | 343 |

***Source:*** *SRK 2021a*

#### *6.1.2.2 Depth Duration Frequency Curves*

Depth-duration-frequency curves were developed for the Project to define storm hyetographs. The storm hyetographs are used in the hydrologic modelling system designed to simulate the precipitation-runoff processes of dendritic drainage basins (HEC-HMS) rainfall-runoff model, described in **6.3.1**, to evaluate peak flows for water management infrastructure design. Precipitation depth-duration-frequency (DDF) curves were generated for the Project, with and without climate change (up to 2100). All water management designs incorporate the climate change-adjusted curves, so only these results are presented.

DDF curves for the Project were developed using a frequency analysis for 24-hour and 72-hour precipitation depths and a web-based tool (IDF_CC Tool, version 3) (Institute for Catastrophic Loss Reduction [ICLR] 2018).

The IDF_CC tool (ICLR 2018) includes a procedure to evaluate changes associated with climate change. The tool includes 9 bias-corrected Global Circulation Models (GCMs), and 24 raw GCMs, for a total of 33 GCM datasets. The available range for predictions is from 2006 to 2100 (Schardon et al. 2018). GCMs in the IDF_CC tool are for future emission scenarios based on representative concentration pathways of 2.6, 4.5 and 8.5.

The DDF curve for return periods 2 to 100 years were developed for the Project based on the synthetic Project daily climate datasets and the Smithers short-duration DDF curves (SRK 2021a).

The Pacific Climate Impacts Consortium (PCIC) attach no probability or likelihood of occurrence to the different representative concentration pathways and leave it up to each designer/stakeholder to judge (PCIC 2014). Climate change-adjusted DDF data for Project were developed using bias corrected representative concentration pathways 4.5 GCMs for the time-period 2006 to 2100. **Table 6.1-4** summarizes the DDF for the Project, with climate change. The 200-year, and 1,000-year return period curves were developed by extrapolation.

**Table 6.1-4: Project Depth-Duration-Frequency (DDF) Data with Climate Change, Year 2100 (Precipitation Depth – millimetres [mm])**

| Duration (minute) | Return Period | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 1000 |
| 5 | 4.7 | 7.3 | 8.9 | 10.5 | 11.8 | 12.7 | 15.7 | 19.7 |
| 10 | 6.7 | 10.4 | 12.8 | 15.3 | 17.3 | 18.8 | 23.4 | 29.2 |
| 15 | 8.1 | 12.3 | 14.9 | 17.4 | 19.5 | 20.9 | 25.8 | 32.2 |
| 30 | 11.3 | 16.5 | 19.5 | 22.4 | 24.7 | 26.1 | 32.0 | 40.0 |
| 60 | 15.4 | 22.7 | 26.9 | 30.9 | 33.9 | 35.7 | 43.6 | 54.6 |
| 120 | 20.1 | 29.0 | 33.9 | 38.2 | 41.6 | 43.3 | 52.3 | 65.8 |
| 360 | 32.8 | 45.9 | 52.2 | 56.7 | 59.8 | 61.6 | 72.3 | 91.5 |
| 720 | 40.4 | 57.7 | 67.0 | 75.0 | 81.2 | 84.3 | 101.4 | 127.5 |
| 1,440 | 49.2 | 70.6 | 84.2 | 98.4 | 110.6 | 119.7 | 150.7 | 187.0 |

***Source:*** *SRK 2021a*

#### *6.1.2.3 Extreme Precipitation*

The probable maximum precipitation (PMP) was calculated using the Hershfield methodology (World Meteorological Organization [WMO] 2009) for the spring and summer/autumn conditions, based on the synthetic long-term project climate dataset. **Table 6.1-5** presents the PMPs for the Project where summer/autumn was defined as July 1 to October 31.

**Table 6.1-5: Tenas Project Probable Maximum Precipitation (PMP)**

| Season | PMP (mm) |
|---|---|
| Spring | 250 |
| Summer/Autumn | 277 |

***Source:*** *SRK 2021a*
***Notes:*** *mm=millimetres; PMP=Probable Maximum Precipitation*

**Table 6.1-6** illustrates the duration curve for the PMP distribution using duration factors consistent with the 1:1,000-year return period. The PMP was not adjusted for climate change at this time (Alberta Transportation 2004).

Table 6.1-6: Tenas Baseline Project Probable Maximum Precipitation (PMP) Inflow Design Flood (IDF) Curve

| Duration (minute) | Applied Duration Factors* | PMP Depth (mm) | |
|---|---|---|---|
| | | Spring | Summer |
| 5 | 0.11 | 26.3 | 29.1 |
| 10 | 0.16 | 39.0 | 43.2 |
| 15 | 0.17 | 43.1 | 47.7 |
| 30 | 0.21 | 53.5 | 59.2 |
| 60 | 0.29 | 73.0 | 80.9 |
| 120 | 0.35 | 87.9 | 97.4 |
| 360 | 0.49 | 122.3 | 135.5 |
| 720 | 0.68 | 170.4 | 188.8 |
| 1440 | 1.00 | 250.0 | 277.0 |

***Source:*** *SRK 2021a*
***Notes:*** *IDF=inflow design flood; mm=millimetres; PMP=Probable Maximum Precipitation*
**Duration factors based on the distribution of the 1:1,000-year depth-duration-frequency (DDF) curve (**Table 6.1-4**)*

### 6.1.3 Snowmelt

A snowmelt model was developed for the Project and validated using regional snow pillow data (SRK 2021a). Snowmelt at the Project was determined to typically start in April and peak in May. On average, by end of June, snow on the ground is gone. **Table 6.1-7** summarizes maximum daily snowmelt for a range of return periods.

Table 6.1-7: Project Daily Snowmelt Depth Frequency Analysis

| Return Period [years] | 1-day Snowmelt Depth [mm] |
|---|---|
| **2** | 23 |
| **5** | 27 |
| **10** | 29 |
| **25** | 32 |
| **50** | 33 |
| **100** | 35 |
| **200** | 36 |
| **500** | 38 |
| **1000** | 39 |

***Source:*** *SRK 2021a*
*Notes: mm=millimetres*

Snowmelt was also evaluated considering the impacts of climate change on both temperature and precipitation datasets. Results confirmed an earlier snowmelt with above-zero temperatures beginning in March, resulting in a lesser snowpack and lower magnitude snowmelt events. For this reason, the historical snowmelt statistics were used for design.

### 6.1.4 Tenas Project Runoff

Ruoff rates were calculated for the Project based on a rainfall-runoff model, calibrated to local streamflow gauges (SRK 2021a). The average monthly runoff distribution is presented in **Table 6.1-8** and the frequency analysis for annual runoff rates is presented in **Table 6.1-9**.

**Table 6.1-8: Tenas Project Monthly Runoff Distribution (percent [%])**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Runoff Distribution | 2% | 2% | 3% | 15 % | 34 % | 11 % | 7% | 5% | 6% | 8% | 6% | 2% | 100% |

***Source:*** *SRK 2021a*
***Note:*** *%=percent*

**Table 6.1-9: Annual Runoff Frequency Analysis**

| Hydrological Condition | Return Period [years] | Annual Precipitation [mm] |
|---|---|---|
| Wet | 100 | 294 |
| | 50 | 285 |
| | 25 | 275 |
| | 10 | 272 |
| | 5 | 260 |
| | Mean | 246 |
| Dry | 5 | 219 |
| | 10 | 191 |
| | 25 | 177 |
| | 50 | 165 |
| | 100 | 162 |

***Source:*** *SRK 2021a*
***Note:*** *mm=millimetre*

### 6.1.5 Evaporation

Lake surface evaporation for the Project was developed using the Morton Complimentary Relationship Wet Environment Model (CRWE) shallow lake evaporation method (Morton 1983). Mean annual evaporation for the Project was determined to be 529 mm (**Table 6.1-10**).

**Table 6.1-10: Tenas Project Monthly Evaporation Rates (millimetres [mm])**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Evaporation (mm) | 0 | 0 | 0 | 60 | 97 | 108 | 116 | 99 | 50 | 0 | 0 | 0 | 529 |

***Source:*** *SRK 2021a*
***Note:*** *mm=millimetre*

Climate change analyses indicate a net increase in lake evaporation for all months of the year, with an annual increase of 2% to 5% by 2100, with monthly increases of up to 8% during the open water season, April through September.

## 6.2 Surface Water Management Plan

The water management strategy for the Project is to collect and control all surface runoff in a series of engineered channels, ponds, and spillways. Due to the presence of PAG material, three (3) management ponds will be constructed and filled with PAG material and processed rock during the life-of-mine (LOM). These management ponds require a minimum of 1 m of water cover to prevent oxidation and acid rock generation. The PAG management strategy is discussed in detail in the PAG Management Alternatives Assessment Memo (SRK 2021g). Channel alignments were chosen to optimize the volume of water directed to each management pond and to prevent the release of turbid water to the environment.

### 6.2.1 Summary of Water Management Infrastructure

Proposed water management infrastructure consists of engineered channels, management ponds and associated spillways, sedimentation ponds, culvert road crossings, and pumping systems (**Table 6.2-1** and **Figure 1** in **Appendix 13.11-A Engineering Drawings**).

Table 6.2-1: Water Management Infrastructure

| Structure Type | Structure Name / Description |
|---|---|
| Sedimentation Ponds | Tenas Control Pond |
| | Coal Processing Plant (CPP) Sedimentation Pond |
| | Rail Infrastructure Sedimentation Pond |
| | Explosives Magazine Sedimentation Pond |
| | Explosives Facility Sedimentation Pond |
| Management Ponds | North Management Pond |
| | East Management Pond |
| | West Management Pond |
| Other Ponds | Wastewater Storage Pond |
| | Potable Water Storage Pond |
| | Soil Treatment Facility Pond |
| Collection Channels | C-01: Collect potentially high-sediment runoff and seepage from East Management Pond dam and buttress, with optional contributions of water from C-02 and the Potable Water Storage Pond |
| | C-02: Collect undisturbed runoff upstream of East Management Pond and pond locally in the Potable Water Storage Pond. Discharge direction controlled by a flow control valve to connect to C-01 or to discharge into Four Creek |
| | C-03: Collect potentially high-sediment runoff from West Management Pond and North Management Pond dam and buttress |
| | C-04: Collect high-sediment runoff along the toe of the Tenas Control Pond dam. Discharge back into the Tenas Control Pond or to the tributary of Goathorn Creek |
| | C-05: Divert undisturbed runoff around southern extents of open pit to Four Creek. |

| Structure Type | Structure Name / Description |
|---|---|
| Pumping Systems | Pump System 1 (PMP_SYS-01): Tenas Control Pond to Goathorn tributary |
| | Pump System 2 (PMP_SYS-02): Tenas Control Pond to management ponds |
| | Pump System 3 (PMP_SYS-03): management ponds to Tenas Control Pond |
| | Pump System 4 (PMP_SYS-04): CPP Sedimentation Pond to Tenas Control Pond |
| | Pump System 5 (PMP_SYS-05): Sedimentation Pond to tributary of Goathorn Creek |
| | Pump System 6 (PMP_SYS-06): Open pit to management ponds |
| Culvert Road Crossings | CU-01: Convey flows from channel C-01 through the North Management Pond haul ramp into Tenas Control Pond |
| | CU-02: Convey flows from channel C-02 through service road |
| | CU-03: Convey flows from West Management Pond to North Management Pond |
| | CU-04: Convey flows from East Management Pond to North Management Pond |
| | CU-05: Convey flows discharged from Tenas Control Pond into Goathorn Creek tributary beneath the Explosives Magazine access road |

### 6.2.2 Surface Water Management Phases

Water management through the mine life is represented by a series of phases as listed below:

- Phase 1: Construction;
- Phase 2: Operation;
- Phase 3: Decommissioning and Reclamation; and
- Phase 4: Post-closure.

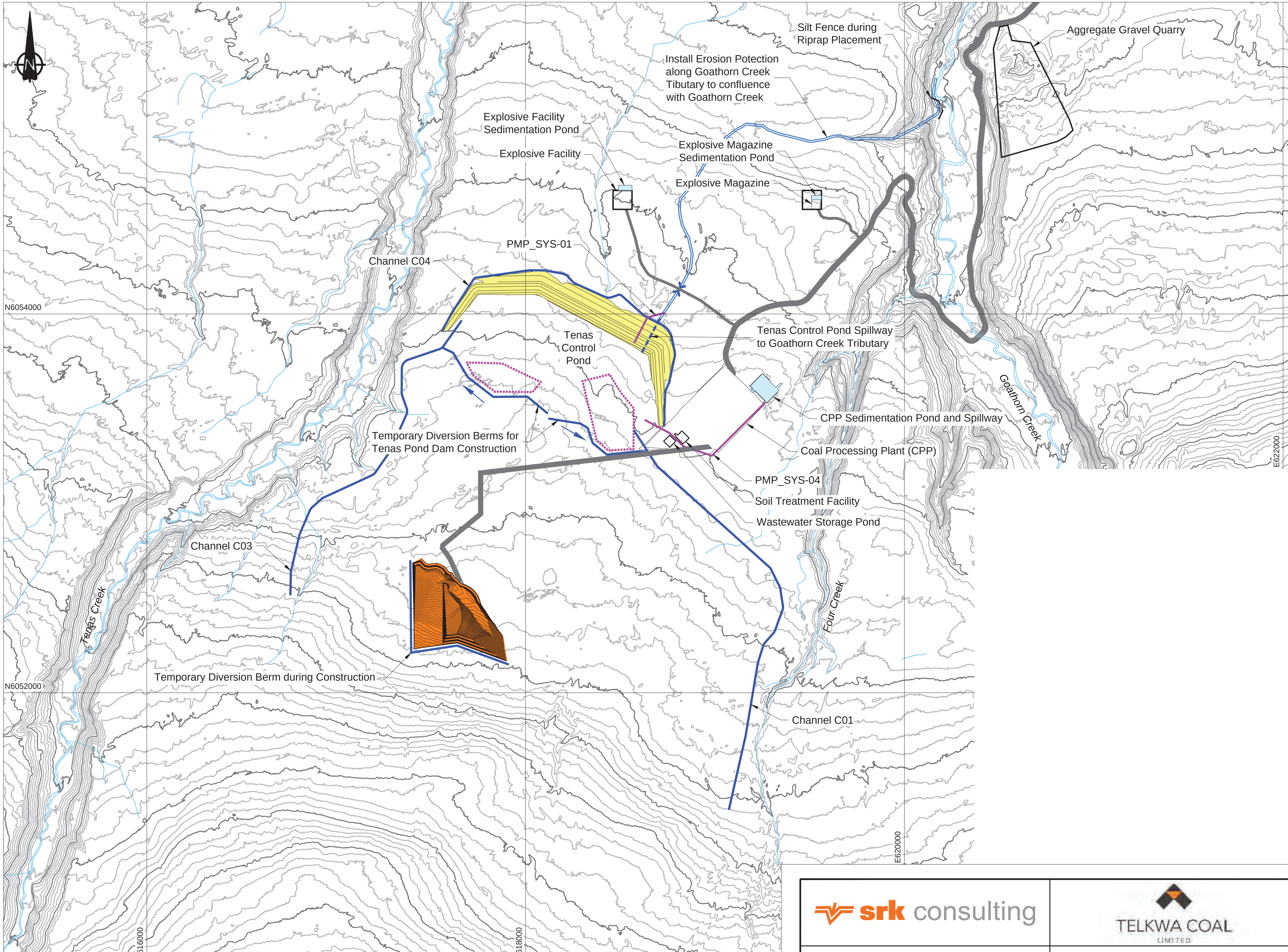
**Table 6.2-2** describes activities related to water management throughout each phase of the Project. **Figure 6.2-1** through **Figure 6.2-6** present a selection of water management plan layouts by year and phase.

### Table 6.2-2: Surface Water Management Activities by Project Phase

| Phase | Year | Water Management Activities |
|---|---|---|
| Construction | End of Year (EOY) 0 | ▪ Construct perimeter channels C-01, C-02, C-03 and C-04 and associated culverts<br>▪ Install temporary channels to divert water around proposed Tenas Control Pond dam and control erosion and sedimentation.<br>▪ Construct the Tenas Control Pond, Coal Processing Plant (CPP) Sedimentation Pond and Rail Infrastructure Sedimentation Pond including the associated spillways and erosion protection<br>▪ Install pumping system from CPP Sedimentation Pond to Tenas Control Pond (PMP_SYS-03)<br>▪ Construct North Management Pond dam, including spillway to Tenas Control Pond<br>▪ Pre-stripping of pit begins. Water collected and pumped to Tenas Control Pond for sediment control |
| Operation | EOY1 | ▪ Convey surface runoff to the North Management Pond<br>▪ Deposition of potentially acid generating (PAG) material to the North Management Pond<br>▪ Begin construction of East Management Pond dam<br>▪ Active open pit excavation begins. Water collected in pit is pumped to North Management Pond (pump system design by others).<br>▪ Install pumping system between Tenas Control Pond and North Management Pond (PMP_SYS-01)<br>▪ If needed, pump water from the Tenas Control Pond to the North Management Pond to maintain minimum water cover in North Management Pond |
| | EOY2 | ▪ Place non-potentially acid generating (non-PAG) and overburden buttress around North Management Pond dam and East Management Pond dam<br>▪ Convey water to East Management Pond prior to PAG placement<br>▪ Placement of PAG material in North Management Pond is complete<br>▪ Deposition of PAG material transitions to East Management Pond<br>▪ Transition PMP_SYS-01 to connect Tenas Control Pond and East Management Pond<br>▪ Active open pit excavation area expands<br>▪ Place non-PAG rock and soil cover on North Management Pond<br>▪ If needed, pump water between the Tenas Control Pond, North Management Pond, and East Management Pond to maintain minimum water cover over PAG materials |
| | EOY3 | ▪ PAG material deposition continues in East Management Pond<br>▪ Convey water to Tenas Control Pond and East Management Pond<br>▪ Active open pit excavation area expands<br>▪ non-PAG and overburden placed as buttress along East Management Pond dam<br>▪ non-PAG backfill begins in southwestern portion of pit<br>▪ Continue to pump water between the Tenas Control Pond, the North Management Pond, and the East Management Pond to maintain minimum water cover during deposition |

| Phase | Year | Water Management Activities |
|---|---|---|
| | EOY4 | ▪ PAG material deposition continues in East Management Pond<br>▪ Convey surface runoff to Tenas Control Pond and East Management Pond<br>▪ Continue to add non-PAG and overburden buttress along East Management Pond and North Management Pond dams<br>▪ non-PAG backfill in southwestern portion of pit continues<br>▪ Active open pit excavation area expands<br>▪ Continue to pump water between the Tenas Control Pond, the North Management Pond, and the East Management Pond to maintain minimum water cover during deposition. |
| | EOY5 | ▪ PAG material deposition continues in East Management Pond<br>▪ Convey water to Tenas Control Pond and East Management Pond<br>▪ Continue to add non-PAG and overburden buttress along East Management Pond and North Management Pond dams<br>▪ Active open pit excavation area expands<br>▪ non-PAG backfill in southwestern portion of pit continues<br>▪ Start construction of West Management Pond dam<br>▪ Continue to pump water between the Tenas Control Pond, the North Management Pond, and the East Management Pond to maintain minimum water cover during deposition |
| | EOY7 | ▪ Deposition of PAG material transitions to West Management Pond<br>▪ Convey water to Tenas Control Pond and West Management Pond<br>▪ Continue to add non-PAG and overburden buttress along East Management Pond, West Management Pond, and North Management Pond dams<br>▪ Active open pit excavation area expands<br>▪ non-PAG backfill in southwestern portion of pit continues<br>▪ Place rock cover on East Management Pond<br>▪ Construct C-05 channel prior to pit excavation in the southeastern area of Project<br>▪ Continue to pump water between the Tenas Control Pond, the North Management Pond, the West Management Pond, and the East Management Pond to maintain minimum water cover during deposition |
| | End of Mining (EOM)/EOY21 | ▪ Operations and West Management Pond PAG material deposition complete<br>▪ Placement of PAG material in West Management Pond is complete<br>▪ Backfill of non-PAG rock in open pit is complete, leaving a single exposed Pit Lake<br>▪ Continue required water management activities such as pumping to maintain minimum water covers |
| Decommissioning and Reclamation | EOY 25 | ▪ Placement of overburden cover across non-PAG backfill in open pit<br>▪ Placement of overburden cover across exposed pit wall<br>▪ Placement of non-PAG rock and soil cover on West Management Pond |

| Phase | Year | Water Management Activities |
|---|---|---|
| | | ▪ Maintain existing water management infrastructure (i.e., collection channels and Tenas Control Pond) until water quality objectives are achieved<br>▪ Tenas Control Pond is dewatered, and dam is breached.<br>▪ Decommission sedimentation ponds<br>▪ Decommission channels and road crossings |
| Post-closure | EOY50 | ▪ Pit Lake reaches maximum level and discharges through non-PAG backfill towards West Management Pond<br>▪ Maintain collection channel systems upslope of management ponds (C-02 and C-05) to divert water to Four Creek.<br>▪ Maintain management pond spillways and embankments in perpetuity |




## LEGEND

- Water Management Feature
- Water Flow Direction
- Spillway
- Culvert
- Existing Watercourse
- Pipeline
- Proposed Road
- Dam and Buttress
- Pit Excavation
- Sedimentation and Control Pond
- Topsoil Stockpile

## NOTES

1. Contours shown at 5.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. Erosion protection along Goathorn Creek tributary to be completed during winter or low flow period.
4. Silt fencing and Best Management Practices for sediment control during riprap placement.
5. Channel C04 and temporary diversion berms constructed prior to construction of Tenas Control Pond dam.
6. Plant Sedimentation Pond to be constructed prior to Coal Processing Plant and associated pad for sediment control.

## REFERENCE

NAD83 UTM Zone 9.

0m 200 400 600 800

srk consulting

SRK JOB NO.: 1CT027.003

FILE NAME: 1CT027.003 Construction.dwg

TELKWA COAL LIMITED

Telkwa Coal

Environmental Assessment

Water Management
Construction Phase
Year -0.5

DATE: 2021/07/16

APPROVED: SAB

FIGURE: 6.2-1

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