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PERMIT AMENDMENT APPLICATION

UNDER THE BRITISH COLUMBIA *MINES ACT*

MOUNT POLLEY MINE

Springer Expansion

PREPARED FOR

THE MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION
and
The Ministry of Environment and Climate Change Strategy

PREPARED BY

MOUNT POLLEY MINING CORPORATION

November 26, 2024

Revision Log

Rev #	Date	Revisions
1	July 5, 2024	• Addressed screening review comments from EMLI, ENV, and First Nations on Springer Expansion
2	August 1, 2024	• Updated the title of Appendix 2-3 • Replaced duplicated document in Appendix 5-3 • Addressed comments submitted by EMLI on July 18, 2024 which includes changes to Figure 5.5-2 through 5.5-5 and an updated WMP in Appendix 9-4A.
3	November 26, 2024	• Responded to Round 1 comments from EMLI, ENV, and First Nations and Public on Springer Expansion and Interim TSF Raise.

EXECUTIVE SUMMARY

This permit amendment application is made on behalf of Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation, owner of Mount Polley mine and property. Mount Polley mine is an open pit copper/gold mine located in central British Columbia, 56 km northeast of Williams Lake (latitude 52° 33' N and longitude 121° 38' W) and the Mount Polley property consists of 43 mineral claims encompassing 16,478 hectares and five mining leases totalling 1,867 hectares.

This application is being submitted as a requirement under Section 10 of the *Mines Act* of British Columbia to apply for an amendment to Permit M-200, and the key benefit of this project will be to increase the mine life until 2031.

Key components include:

- an expansion of the Springer Pit by mining the saddle between Cariboo and Springer pits, deepening both pits and creating two starter pits CX and W2.
- an extension of the Southeast Rock Disposal Site (SERDS),
- an extension to the duration of treated water discharge to Quesnel Lake to be throughout mining operations in 2031,
- interim raise in the elevation of the tailing storage facility (TSF) to 974 m from 970 m,
- and an extension of the Northwest Potentially Acid Generating (PAG) Stockpile disposal date,
- and a modernization of the Neutralizing Potential Ratio (NPR) to lower the ratio from 2 to 1.5.

Consultants were retained to complete work deemed to be outside the expertise of in-house personnel. Studies address all proposed work and include storage of Potentially Acid Generating material (SRK Consulting and WSP Canada Inc.); geotechnical analysis of the proposed footprint (WSP Canada Inc.); and fish habitat assessment (Minnow Environmental).

Wide distribution of project information and consultations with the public and First Nations are key expectations of the mine project review process. Public consultation measures taken will be in compliance with the Ministry of Energy, Mines and Low Carbon Innovation (EMLI) Public Consultation Policy, and relevant guidance may also be obtained from the Provincial Policy for Consultation with First Nations.

All work presented has been completed during open discussion with EMLI and Ministry of Environment and Climate Change Strategy (ENV) representatives and reflects a comprehensive and accurate representation of planned mining and construction. Project planning and review conducted both internally by MPMC and externally by consultants retained (as outlined above) confirms that all aspects of the project are feasible and abide by the regulations of all governing bodies.

On August 4, 2014, a breach occurred in the Perimeter Embankment of the TSF; this event is referred to as the “breach”. The breach released tailings, water, and embankment construction materials to the downstream environments of Polley Lake, Hazeltine Creek, and Quesnel Lake. Following the breach, mine operations ceased. Restricted operations, with tailings being deposited in Springer Pit, commenced on August 4, 2015. On November 6, 2015, MPMC applied for an amendment to the M-200 to allow for a return to full operations, including the use of the TSF for tailings deposition. On June 23, 2016, this amendment was provided by EMLI, and on June 27, 2016, MPMC resumed deposition of tailings into the TSF.

On January 7, 2019, MPMC announced a decision to go on suspended operations (Care and Maintenance) beginning May 31 of that year, citing low metal prices. When entering Care and Maintenance, MPMC had been executing Phase 3 of 4 permitted phases for the Springer-Cariboo Pit. As noted in the August 25, 2021, communication regarding “Notice of Mount Polley Mine Restart”, operations were planned to restart in 2021. Restart was initiated in response to improving market conditions and, as of November 2021, MPMC has started to return to operations. Mining activities occurring on site follow the activities approved by the March 17, 2014, M-200 amendment Approving Cariboo Phase 4 Expansion and the June 23, 2016, M-200 amendment Approving Return to Full Operations and Use of the TSF.

Phase 4 contains ~16 Mt of material that will be processed by the mill, resulting in tailings material for deposition in the TSF. This material will come from mining the saddle between Cariboo and Springer Pits, and further developing the combined pit. Non acid generating (NAG) waste rock will be placed in the Southeast Rock Disposal Site (SERDS) or used in construction of the TSF dam, while potentially acid generating waste rock (PAG) will report to the Temporary Northwest PAG Stockpile.

The proposed Springer Expansion includes Phase 5, Phase 6, C2, and WX and will supplement ore production into the year 2031. The Springer Expansion (SP6-V4) pushes back the extents of the Phase 4 Springer pit, as well as deepens. Two starter pits (C2 and WX) will also be deepened in the later years of the Life of Mine. The WX and C2 pits will follow many of the same design principles as already existing in operating pits at Mount Polley mine.

The TSF is required to be raised to accommodate the Springer Expansion and in this application MPMC proposes an interim raise to 974 m. In a subsequent application MPMC will provide the designs for the final raise to 987 m which is associated with the Life of Mine.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 3
1 INTRODUCTION 23
1.1 Application Background 23
1.1.1 Application Outline 24
1.2 Proponent Information 25
1.3 Project Overview 25
1.3.1 Project History 25
1.3.2 Overview of Products and Markets, and Projected Project Benefits 27
1.3.3 Location, Access, and Land and Resource Use 28
1.3.4 Mine Components and Off-Site Infrastructure 32
1.3.5 Mine Development and Operations 34
1.3.6 Mine Design and Assessment Team 35
1.3.7 Spatial Data 36
1.3.8 Concordance with Environmental Assessment Certificate 40
1.4 Regulatory Framework 41
1.5 Indigenous Engagement 42
1.5.1 Background 42
1.5.2 Asserted and Established Rights and Interests 44
1.5.3 Engagement Efforts 44
1.6 References 45
2 ENVIRONMENTAL BASELINE 47
2.1 Summary 47
2.2 Meteorology and Climate 47
2.2.1 Air Temperature 49
2.2.2 Precipitation 50
2.2.3 Relative Humidity 51
2.2.4 Solar Radiation 52
2.2.5 Evaporation 53
2.2.6 Wind Speed and Direction 56
2.2.7 Snow Cover Properties 58

2.3 Geology 59
2.3.1 Regional Geology 59
2.3.2 Deposit (Ore) Geology 62
2.3.3 Surficial Geology, Terrain, and Geohazard Mapping 63
2.3.4 Natural and Seismic Hazards Assessment 63
2.3.5 Soil Survey and Soil Characterization for Reclamation 64
2.4 Geochemical Characterization and Source Terms 65
2.4.1 Geochemical Characterization 66
2.4.2 Geochemical Source Terms 68
2.5 Topography and Surface Drainage Features 68
2.6 Water Quantity 73
2.6.1 Surface Water Quantity 73
2.6.2 Groundwater Quantity 73
2.7 Water Quality 73
2.7.1 Surface Water Quality 73
2.7.2 Groundwater Quality 87
2.8 Sediment Quality 91
2.9 Fisheries and Aquatic Resources 98
2.9.1 Periphyton and Benthic Invertebrate Community Measures 98
2.9.2 Plankton Communities 101
2.9.3 Fish and Fish Habitat 102
2.9.4 Fish Habitat Remediation 104
2.9.5 Tissue Residues 109
2.10 Ecosystems and Wildlife 120
2.10.1 Ecosystems 121
2.11 Land Status and Use 127
2.11.1 Wildlife 128
2.12 Archaeology 134
2.12.1 Previous Archaeological Studies 134
2.12.2 HCA Permitting and Further Archaeological Assessment 136
2.13 Cultural Use 137
2.14 References 137
3 MINE PLAN 143
3.1 Mine Plan Overview 143
3.2 Existing Development 143
3.3 Life of Mine Plan 144

3.3.1 Production Schedule and Profiles 146
3.3.2 Surface Disturbances 151
3.3.3 Waste Rock 164
3.3.4 Southeast Rock Disposal Site Construction 164
3.4 Detailed Five Year Mine Plan 169
3.5 Mine Facility Designs and Development 169
3.5.1 Open Pits 169
3.5.2 Underground Workings 169
3.5.3 Processing Plant (Mill) and Associated Facilities 169
3.5.4 Tailings Storage Facilities and Associated Infrastructure 169
3.5.5 Waste Rock Dumps 171
3.5.6 Water Management Structures 171
3.5.7 Ore, Overburden, Soil and Construction Stockpiles 171
3.5.8 Mine Access and Mine Haulage Roads 171
3.5.9 Power Supply and Distribution Infrastructure 172
3.5.10 Explosives Storage Facilities 172
3.5.11 Ancillary Facilities and Support Infrastructure 172
3.6 References 172
4 RECLAMATION AND CLOSURE PLAN 173
4.1 Definitions 174
4.2 Closure Objectives 175
4.2.1 Projected End Land Uses and Ecosystems 175
4.2.2 Landform Design and Erosion Control 180
4.2.3 Revegetation Strategy 180
4.2.4 Progressive Reclamation/Sequencing 181
4.2.5 Reclamation Research 181
4.2.6 Reclamation Monitoring 181
4.2.7 Habitat Compensation Works 181
4.3 Reclamation Approaches 181
4.3.1 Soil Resources 182
4.3.2 Landform Design and Erosion Control 187
4.3.3 Revegetation Strategy 189
4.3.4 Progressive Reclamation/Sequencing 192
4.3.5 Reclamation Research 194
4.3.6 Reclamation Monitoring 194
4.3.7 Habitat Compensation Works 196

4.4 Trace Element Uptake in Soils and Vegetation....196
4.5 Contaminated Sites, Human Health, and Ecological Risk Assessment....196
4.6 Disposal of Chemicals, Reagents, Hazardous Materials and Contaminated Materials....197
4.7 Ground Water Well Decommissioning....198
4.8 Reclamation and Closure Prescriptions....198
4.8.1 Structures and Equipment....198
4.8.2 Waste Rock Dump Reclamation....198
4.8.3 Tailings Storage Facility Reclamation....199
4.8.4 Open Pit Reclamation Prescriptions....199
4.8.5 Watercourse Reclamation Prescriptions....199
4.8.6 Road Reclamation....199
4.8.7 Schedule....199
4.9 Reclamation and Closure Prescriptions....199
4.9.1 Structures and Equipment....199
4.9.2 Waste Rock Dump Reclamation....199
4.9.3 Tailings Storage Facility Reclamation....200
4.9.4 Open Pit Reclamation Prescriptions....200
4.9.5 Watercourse Reclamation Prescriptions....202
4.9.6 Road Reclamation....202
4.9.7 Schedule....203
4.10 Detailed Five-Year Mine Reclamation Plan....203
4.11 Temporary Shutdown....203
4.12 Post-Closure Monitoring and Maintenance....205
4.12.1 Contingencies....209
4.13 Reclamation Cost Estimate....209
4.14 References....210
5 WATER MANAGEMENT (MODELLING, MITIGATION, AND DISCHARGES)....211
5.1 Summary....211
5.1.1 Springer Pit....211
5.1.2 Interim Raise to 974 m....211
5.2 Conceptual Site Model....212
5.3 Site-Wide Water Balance Model....212
5.4 Surface Water Quality Model....212
5.5 Groundwater Model....213
5.5.1 Conceptual Hydrogeologic Model....213
5.5.2 Numerical Hydrogeological Model....222

5.6 Mitigation Methods 228
5.6.1 Best Available Technology 228
5.6.2 Volume and Quantity Control Methods 228
5.6.3 Geochemical Attenuation Processes 230
5.6.4 Water Treatment 230
5.7 Domestic Water/Sewage Treatment 233
5.8 Effluent Discharge 233
5.9 Initial Dilution Zone 234
5.10 References 238
6 ENVIRONMENTAL EFFECTS PREDICTIONS AND ASSESSMENT 240
6.1 Aquatic Resources 240
6.1.1 Surface Water Quantity 240
6.1.2 Surface Water Quality 240
6.2 Terrestrial Resources 248
6.2.1 Vegetation 248
6.2.2 Wildlife 250
6.3 References 252
7 ENVIRONMENTAL MONITORING 254
7.1 Environmental Monitoring Program Design 254
7.2 Mine Site Water Monitoring Program 255
7.3 Discharge Monitoring Program 272
7.4 Environment Monitoring Program 277
7.5 Post-Closure Environmental Monitoring Program 278
7.5.1 Monitoring of Geotechnical Structures 280
7.5.2 Monitoring of Water Quantity, Quality and Aquatic Effects 281
7.5.3 Soils and Vegetation Monitoring 282
7.6 Aquatic Effect Monitoring Program 283
7.7 References 291
8 HEALTH AND SAFETY 293
8.1 Occupational Health Risk Assessment 293
8.1.1 Occupational Health Risk Assessment 293
8.1.2 Ergonomics 293
8.1.3 Emergency Wash Facilities 293
8.1.4 Hazardous Dust 293
8.1.5 Lunchrooms, Mine Dry, and Sanitary Conveniences 293
8.2 Post Permitting Requirements 293

8.2.1 Issued for Construction Plans 293
8.2.2 Letters of Assurance 293
8.2.3 Occupational Health Programs 293
8.2.4 Workplace Hazardous Materials Information System (WHMIS) 293
8.2.5 Additional Information and Certifications 293
9 MANAGEMENT PLANS 294
9.1 Environmental Management System 294
9.2 Surface Erosion Prevention and Sediment Control Plan 299
9.2.1 Methods of Erosion Prevention and Sediment Control 299
9.2.2 Roles, Responsibilities and Training Requirements 306
9.2.3 Monitoring 307
9.2.4 Erosion and Sediment Control during Construction 308
9.2.5 Stabilization and Treatment Methods 309
9.2.6 Runoff Collection Ditches 310
9.2.7 Sediment Control Ponds 310
9.2.8 Severe Weather Shutdown 310
9.2.9 Emergency Release of Water 311
9.2.10 Collection and Analysis of Relevant Data and Risk Assessment 311
9.2.11 Erosion and Sediment Control during Mine Operation 313
9.2.12 Implementation of the Plan 313
9.2.13 Reporting and Record Keeping 315
9.3 Soil Management Plan 315
9.3.1 Soil Characterization 315
9.3.2 Soil Salvage 316
9.3.3 Soil Stockpiling 317
9.3.4 Soil Stockpile Inspections 317
9.3.5 Soil Amendment 318
9.3.6 Soil Application 318
9.3.7 Reporting 318
9.3.8 Responsibilities 319
9.4 Construction Environmental Management Plan 320
9.5 ML/ARD Management Plan 320
9.5.1 Background 321
9.5.2 Determination of ML/ARD Potential 321
9.5.3 Material Characterization Overview 323
9.5.4 Tailings Monitoring 327

9.5.5 NAG Material Monitoring....327
9.5.6 Response to Finding PAG in NAG Areas....328
9.5.7 In-Pit Monitoring....328
9.5.8 Management of PAG Rock....329
9.6 Mine Site Water Management Plan....330
9.6.1 Background....330
9.6.2 Approach....331
9.6.3 Final Design and Technology Development....331
9.7 Discharge Management Plan....332
9.7.1 Trigger Response Plan....333
9.7.2 Effluent Limits (end-of-pipe)....333
9.7.3 Edge of Quesnel Lake Initial Dilution Zone....335
9.7.4 Reporting....338
9.8 Vegetation Management Plan....338
9.9 Invasive Plant Management Plan....338
9.9.1 Identification of Potential Sources of Invasive Plant Ingress....338
9.9.2 Best Management Practices....339
9.9.3 Monitoring Program....341
9.9.4 Program Review and Continuous Improvement....342
9.9.5 Responsibilities....344
9.10 Wildlife Management Plan....345
9.10.1 Permit Requirements....345
9.10.2 Timing Windows....345
9.10.3 Wildlife Encounters....347
9.10.4 General Best Management Practices....352
9.10.5 Wildlife Monitoring....356
9.10.6 Reclamation Requirements....357
9.10.7 Stakeholder Consultation....357
9.11 Archaeological Management and Impact Mitigation Plan....357
9.12 Mine Emergency Response Plan....358
9.12.1 Scope....358
9.12.2 Definition of an Emergency....358
9.12.3 Goals....358
9.12.4 Training....359
9.13 Mine Site Traffic Control Plan....359
9.14 Fuel Management and Spill Control Plan....361

9.14.1 Potential Spill Materials: 361
9.14.2 Potential Spill Types: 361
9.14.3 Potential Spill Locations: 362
9.14.4 Spill Response Materials Locations: 362
9.14.5 Spill Assessment Potential 363
9.14.6 Response 364
9.14.7 Contact Group 364
9.14.8 First on Scene Personnel Responsibilities 364
9.14.9 Level of Emergency 366
9.14.10 Main Response Elements 366
9.14.11 Personnel Responsibilities 367
9.14.12 Emergency Response Team Members: 369
9.15 Combustible Dust Management Plan 369
9.16 Chemicals and Materials Storage, Transfer, and Handling Plan 369
9.17 Waste (Refuse and Emissions) Management Plan 369
9.18 References 370

LIST OF TABLES, FIGURES AND PHOTOS

Table 1.1-1: Application Structure 24
Table 1.3-1: Estimated Material Volumes Associated with the Project 27
Table 1.3-2: Summary of the Project Components and Permit Amendments 32
Table 1.3-3: Project Qualified Professional Team 35
Table 1.5-1: Summary of Quesnel Lake Interim Discharge Extension Engagement 44
Table 2.2-1: Local and Regional Climate Stations for the Mount Polley Mine 48
Table 2.2-2: Local Snow Course Sites at the Mount Polley Mine 49
Table 2.2-3: Derived Air Temperature (°C) Statistics for Mount Polley Mine, 1974 to 2021 49
Table 2.2-4: Long-Term Precipitation at the Mount Polley Mine Site 51
Table 2.2-5: Derived Monthly and Annual Relative Humidity Statistics for the Site (1974-2021) 52
Table 2.2-6: Estimated Solar Radiation Statistics for the Site (1974-2001) 53
Table 2.2-7: Estimated Monthly and Annual Shallow Lake Evaporation Statistics for the Site (1974-2001) 54
Table 2.2-8: Estimated Monthly and Annual PET Statistics for the Mount Polley Mine Site (1974-2001) 54
Table 2.2-9: Estimated Monthly and Annual AET Statistics for the Mount Polley Mine Site (1974-2001) 55
Table 2.2-10: Comparison of Relative Frequency of Wind Speed from Mill Weather Station and Weather Station 1 for the Site 58
Table 2.2-11: Snow Water Equivalent for the Site (1997-2021) 59

Table 2.7-1: BC WQGs for Receiving Environment Uses 74
Table 2.9-1: Statistical Comparisons of Benthic Invertebrate Community Metrics for Deep Near field Area or Quesnel Lake, 2014 to 2022 (Table 5.19 of Appendix 2-6) 99
Table 2.9-2: Documented Fish Species in Quesnel Lake 103
Table 2.10-1: Site Series Observed during the Field Reconnaissance....124
Table 2.10-2: Site Series Obtained from Publicly Available Databases....125
Table 2.10-3: Tree Species listed from Vegetation Resources Inventory and Species Identified during Field Reconnaissance on 08 and 09 August 2023 in the SERDS Expansion Area....126
Table 3.3-1: LoM Waste Mined (t) 147
Table 3.3-2: LoM Ore Mined (t) 148
Table 3.3-3: LoM Mill Feed by Source (t)....149
Table 3.3-4: Mine Development Schedule....151
Table 3.3-5: Area Disturbance 152
Table 3.3-6: Open Pit Design Parameters....155
Table 3.3-7: Quantities of NAG and PAG Generated from Mining Phases 164
Table 3.3-8: Storage Capacity of Facilities....164
Table 4.2-1: Mount Polley Closure Objectives....175
Table 4.2-2: End Land Uses by Site Series and Structural Stage for the Springer Expansion Area 176
Table 4.2-3: Predicted Change in Vegetation Site Series from Pre-disturbance to Post-Closure* 179
Table 4.2-4: Potential Challenges Associated with Post-Closure Landscape Establishment....179
Table 4.3-1: Reclamation Prescriptions Discussed in the MPMC's 5-Year MPRP....181
Table 4.3-2: Mine Site Coversoil Balance as of November 2023 184
Table 4.3-3: Mine Site Revegetation Prescriptions (MPMC 2022a)....190
Table 4.3-4: Summary of Completed Progressive Reclamation at the Mine Site (MPMC 2022b)....193
Table 4.3-5: Mine Site Reclamation Closure Objective 195
Table 4.6-1: Typical Waste Classifications 198
Table 4.9-1: Closure Schedule 203
Table 4.11-1: Temporary Care and Maintenance Notification Requirements 204
Table 4.12-1: Requirements in the Event of Mine Closure Period....206
Table 5.5-1: Monitoring Well Network....215
Table 5.5-2: Hydrogeological Model Parameter Value Comparison and 2024 Modifications 222
Table 5.5-3: Predicted Seepage Quantities for the Ultimate Configuration of the Springer/Cariboo Pit Lake 223
Table 5.5-4: Predicted Groundwater Flows for the Wight Pit 225
Table 5.5-5: Estimated Seepage Outflows from the Boundary Pit....226
Table 5.5-6: Seepage Flow Rates 227
Table 5.5-7: Tailings Beach Width....227
Table 5.5-8: Tailings Beach Width at Last Year of Operation and Closure 228
Table 5.6-1: Hourly Maximum Wind Speed at the Williams Lake A Station 229
Table 5.6-2: Tailings Storage Facility Required Freeboard Results....230

Table 5.9-1: Evaluation of Quesnel Lake IDZ against Technical Guidance 11 234
Table 6.1-1: Summary of Permit Limit Exceedances at HAD-3 244
Table 7.2-1: Surface Water Chemistry Parameters 256
Table 7.2-2: Surface Water Monitoring Overview 257
Table 7.2-3: Groundwater Chemistry Parameters 264
Table 7.2-4: Groundwater Monitoring Overview 265
Table 7.2-5: Seepage Water Chemistry Parameters 269
Table 7.2-6: Seep Monitoring Overview 270
Table 7.2-7: Pit Seepage Monitoring Overview 270
Table 7.3-1: Permit 11678 and MDMER Schedule 4 Treated Effluent Compliance Limits for Direct Discharge to Quesnel Lake 273
Table 7.3-2: Effluent Chemistry Parameters 274
Table 7.3-3: Effluent Monitoring Overview 275
Table 7.5-1: Reclamation Monitoring Criteria Framework 279
Table 7.6-1: Plankton and Chlorophyll *a* Parameters 288
Table 7.6-2: Plankton and Chlorophyll *a* Monitoring Overview 289
Table 9.2-1: Risk Assessment of Receiving Waterbodies and Watercourses Adjacent to Mount Polley Mine Site (Appendix 9-1) 302
Table 9.9-1: Potential Sources of Invasive Plant Ingress and/or Spread at the Mount Polley Mine Site 339
Table 9.9-2: Invasive Plant Management Program Review Process 343

Figure 1.3-1: Location Map 28
Figure 1.3-2: Mine Site Location 29
Figure 1.3-3: Figure of the Site Mining Tenures and Site Access 30
Figure 1.3-4: Permit Boundary and Components 37
Figure 1.3-5: Springer Expansion Component 38
Figure 1.3-6: Overview 39
Figure 1.5-1: Map of established and/or asserted traditional territories of potentially affected Indigenous groups. 43
Figure 2.2-1: MPMC Station Monitoring Period and Seasonal Wind Roses – 29 August 1997 to 27 November 2003 57
Figure 2.3-1: Regional Geology of the Mount Polley Property 60
Figure 2.3-2: Simplified Geology of the Mount Polley Intrusive Complex 61
Figure 2.5-1: Major Drainages and Flow Monitoring Stations 70
Figure 2.5-2: Major Drainages and Flow Monitoring Stations 71
Figure 2.5-3: Topography and Surface Drainage Features in the Mine Site Area 72
Figure 2.7-1: Surface Water Quality Sampling Locations 77
Figure 2.7-2: Monthly Average Copper Concentration from 2015 to 2022 at Stations Representing the IDZ (QUL 57, QUL 58, QUL 59) and the Reference Stations in Quesnel Lake (QUL 2a and QUL 120a) 78

Figure 2.7-3 Copper Concentration from 2015 to Recent at Stations Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a, QUL-120a).....80
Figure 2.7-4: Boxplot of Copper Concentrations from 2015 to 2022 Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a) 81
Figure 2.7-5: Monthly Average Selenium Concentration from 2015 to 2022 at Stations Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a). 82
Figure 2.7-6: Boxplot of Selenium Concentrations from 2015 to 2022 Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a) 83
Figure 2.7-7: Total (top) and Dissolved (bottom) Copper Concentrations in Surface Water Samples from Hazeltine Creek (HAC13, HAC-05a, HAC-14, HAC-08) and Edney Creek (EDC-01a, W10) from 2015 to Present.....85
Figure 2.7-8: Total (top) and Dissolved (bottom) Selenium Concentrations in Surface Water Samples from Hazeltine Creek (HAC13, HAC-05a, HAC-14, HAC-08) and Edney Creek (EDC-01a, W10) from 2015 to Present.....86
Figure 2.7-9: Groundwater Monitoring Locations.....88
Figure 2.7-10: Boxplot of Copper Concentrations from 2015 to 2022 Representing the Monitoring Wells on the East (GW96-7, GW16-8, GW16-7, GW05-01) and the West side of Springer Pit (GW15-1a, GW15-1b, GW12-2a, GW12-2b, GW15-2a, GW15-2b).....89
Figure 2.7-11: Boxplot of Selenium Concentrations from 2015 to 2022 Representing the Monitoring Wells on the East (GW96-7, GW16-8, GW16-7, GW05-01) and the West side of Springer Pit (GW15-1a, GW15-1b, GW12-2a, GW12-2b, GW15-2a, GW15-2b).....90
Figure 2.8-1: Sediment Quality Sampling Locations.....92
Figure 2.8-2: Boxplot of Copper Concentrations in Sediment Collected from 2015 to 2022 at Quesnel Lake Reference Stations (QUL-PREF1, QUL-LREF1, and QUL-LREF5) and Stations Representative of Exposed Areas (QUL-PNF, QUL-PFF1, QULP-16, QUL-I, QUL-LNF1, and QUL-LFF) 93
Figure 2.8-3: Boxplot of Selenium Concentrations in Sediment Collected from 2015 to 2022 at Quesnel Lake Reference Stations (QUL-PREF1, QUL-LREF1, and QUL-LREF5) and Stations Representative of Exposed Areas (QUL-PNF, QUL-PFF1, QULP-16, QUL-I, QUL-LNF1, and QUL-LFF) 94
Figure 2.8-4: *Hyalella azteca* Survival Responses (14-day) for Sediment Toxicity Testing from from Reference (QUL-LREF1) and Exposed (QUL-LNF1) Samples in Quesnel Lake 95
Figure 2.8-5: Sediment Copper, Selenium, and Total Organic Carbon Concentrations for Upper Hazeltine Creek (HAC-U; Exposed) and Upper Edney Creek (EDC-U; Reference), 2018 to 2022 96
Figure 2.8-6: Sediment Copper, Selenium, and Total Organic Carbon Concentrations for Lower Hazeltine Creek (HAC-D; Exposed) and Lower Edney Creek (EDC-D; Reference), 2018 to 2022.....97
Figure 2.9-1: Boxplot of Copper Concentrations in Fish Tissue from Samples Collected from Exposed and Reference Areas in Quesnel Lake from 2015 to 2022.....110
Figure 2.9-2: Boxplot of Selenium Concentrations in Fish Tissue from Samples Collected from Exposed and Reference Areas in Quesnel Lake from 2015 to 2022.....111

Figure 2.9-3: Boxplot of Copper Concentrations in Zooplankton Tissue Samples Collected from Exposed (QUL-ZOO-1) and Reference (QUL-ZOO-7, QUL-ZOO-8) Stations in Quesnel Lake from 2015 to 2022 113
Figure 2.9-4: Boxplot of Selenium Concentrations in Zooplankton Tissue Samples Collected from Exposed (QUL-ZOO-1) and Reference (QUL-ZOO-7, QUL-ZOO-8) Stations in Quesnel Lake from 2015 to 2022 114
Figure 2.9-5: Composite-Taxa Benthic Invertebrate Tissue Copper and Selenium Concentrations for Upper Hazeltine Creek Monitoring Stations HAC-R1 (left) and HAC-U (right) Compared to Pre-Breach Data in 2010 and the Reference Station in Upper Edney Creek (EDC-U) from 2018 to 2022 116
Figure 2.9-6: Caddisfly Tissue Copper and Selenium Concentrations for Upper Hazeltine Creek Monitoring Stations HAC-R1 (left) and HAC-U (right) Compared to the Reference Station in Upper Edney Creek (EDC-U) from 2018 to 2022 117
Figure 2.9-7: Composite-Taxa Benthic Invertebrate Tissue (left) and Caddisfly Tissue (right) Copper and Selenium Concentrations for Lower Hazeltine Creek Monitoring Station (HAC-D) Compared to Available Pre-Breach data from 2010 and the Reference Station in Lower Edney Creek (EDC-D) from 2018 to 2022....118
Figure 2.9-8: Periphyton Tissue Concentrations for Upper Hazeltine Creek (HAC-U; left) and Lower Hazeltine Creek (HAC-D; right) Compared to Available Pre-Breach data from 2010 and the Corresponding Reference Station in Upper Edney Creek (EDC-U) and Lower Edney Creek (EDC-D) from 2018 to 2022 119
Figure 2.10-1: Vegetation Resources....122
Figure 2.11-1: Wildlife Resources....130
Figure 3.3-1: Mine Site Facilities 145
Figure 3.3-2: LoM Waste Mined (t) 148
Figure 3.3-3: LoM Ore Mined (t) 149
Figure 3.3-4: LoM Mill Feed by Source 150
Figure 3.3-5: LoM Total Material Moved (t) 150
Figure 3.3-6: Water Management Infrastructure 154
Figure 3.3-7: Plan View of Phase 5 157
Figure 3.3-8: Plan View of Phase 6 159
Figure 3.3-9: Plan View of C2 161
Figure 3.3-10: Plan View of WX....163
Figure 3.3-11: SERDS LoM....166
Figure 3.3-12: Temporary NW PAG Stockpile LoM 168
Figure 4.2-1: Post-Closure Ecosystem Map Springer Expansion....177
Figure 4.2-2: Post-Closure Ecosystem Map SERDs....178
Figure 4.3-1: Soil Stockpile Locations 183
Figure 4.3-2: Proposed Coversoil Profiles Based on Desired Ecosystem and End Land Use....185
Figure 4.3-3: Projected Surface Water Catchments at Closure 188
Figure 5.5-1: Groundwater Monitoring Report 214
Figure 5.5-2: Groundwater Flow 218
Figure 5.5-3: Water Level of Monitoring Wells on the West Side of the Site 219

Figure 5.5-4: Water Level of Monitoring Wells on the East Side of the Site 220
Figure 5.5-5: Water Level of Monitoring Wells Near the TSF 221
Figure 6.1-1: Monthly Average Copper Concentration from 2015 to 2023 at Stations Representing Water Treatment Plant Effluent Quality (HAD-3) 241
Figure 6.1-2: Boxplot of Copper Concentrations from 2015 to 2023 at Stations Representing the Water Treatment Plant Effluent Quality (HAD-3) 242
Figure 6.1-3: Monthly Average Selenium Concentration from 2015 to 2023 at Stations Representing Water Treatment Plant Effluent Quality (HAD-3) 243
Figure 6.1-4: Boxplot of Selenium Concentrations from 2015 to 2023 at Stations Representing the Water Treatment Plant Effluent Quality (HAD-3) 243
Figure 7.1-1: CEMP (2019) Integration Framework 254
Figure 7.2-1: CEMP Monitoring Locations – Surface Water Monitoring 262
Figure 7.2-2: CEMP Monitoring Locations – Groundwater Monitoring 267
Figure 7.2-3: CEMP Monitoring Locations – Seep Monitoring 271
Figure 7.3-1: CEMP Monitoring Locations – Effluent Monitoring 276
Figure 7.6-1: CEMP Monitoring Locations – Plankton and Chlorophyll *a* Monitoring 290
Figure 9.2-1: Surface Water Monitoring Sites 312
Figure 9.13-1: Traffic Control Plan 360

Photo 2.9-1: Sockeye Salmon in Lower Hazeltine Creek, September 13, 2021 105

LIST OF APPENDICES

APPENDIX 1-1: Information Requirements Table – Springer Expansion
APPENDIX 1-2: Information Requirements Table – TSF Interim Raise to 974 m
APPENDIX 1-3: Tailings Storage Facility - Detailed Design to Elevation 974 m
APPENDIX 1-4: TSF Site Characterization Report
APPENDIX 1-5: Author Statements
APPENDIX 2-1: Climate Baseline
APPENDIX 2-2: Geochemical Source Terms
APPENDIX 2-3: Site Wide Water Balance Model Update and Calibration Technical Memorandum
APPENDIX 2-4: 2023 Annual Reclamation Report for the Mt Polley Mine
APPENDIX 2-5: Water Quality Screening Tables
APPENDIX 2-6: Sediment and Aquatic Life Monitoring Report
APPENDIX 2-7: Hazeltine Creek Monitoring Technical Memorandum
APPENDIX 2-8: Annual Groundwater Monitoring Report
APPENDIX 2-9: 2023 Hazeltine Channel Groundwater Monitoring Program
APPENDIX 2-10: Groundwater Quality Screening Tables
APPENDIX 2-11: Sediment Quality Screening Table

APPENDIX 2-12: Species at Risk

APPENDIX 3-1: LOM Sequencing

APPENDIX 3-2: SERDS LOM Design Report

APPENDIX 3-3: Northwest Potentially Acid Generating (PAG) Dump Geotechnical Assessment Life of Mine Open Pit Design Review

APPENDIX 3-4: Life of Mine Open Pit Design Review

APPENDIX 4-1A: Mine Plan and Reclamation Program

APPENDIX 4-1B: Geochemistry of Tailings from the Mount Polley Mine, British Columbia

APPENDIX 5-1: NPR Criterion Report

APPENDIX 5-2: Water Infrastructure Design Report

APPENDIX 5-3: Site-Wide Water Balance Model

APPENDIX 5-4: Responses to Comments from the Ministry of Environment and Climate Change Strategy – Technical Assessment Report for the Quesnel Lake Interim Discharge Extension

APPENDIX 5-5: Weekly TSF & Water Management Systems Status

APPENDIX 5-6: Email with Mathieu O'Leary August 1, 2023

APPENDIX 5-7: 2023 Annual Dam Safety Inspection for Tailings Storage Facility Embankment

APPENDIX 5-8: Recalibration of the Groundwater Flow Model for the Springer/Cariboo Open Pit and Predictions of Hydrogeological Conditions Near the Pits at Closure – Mount Polley Mine, BC

APPENDIX 5-9: Near Field Dispersal Model Verification

APPENDIX 5-10: Long Term Far Field Diffuser Modelling

APPENDIX 6-1: Effluent Quality Screening Table

APPENDIX 7-1: Comprehensive Environmental Monitoring Plan (CEMP)

APPENDIX 9-1: Surface Erosion Prevention and Sediment Control Plan

APPENDIX 9-2: Soil Management Plan

APPENDIX 9-3: ML/ARD Management Plan

APPENDIX 9-4A: Mine Site Water Management Plan

APPENDIX 9-4B: 2024 Water Management Plan Remodeling Summary

APPENDIX 9-5: 2023 11678 BAT Assessment Plan

APPENDIX 9-6: 2021 Discharge Management Plan

APPENDIX 9-7: Invasive Plant Management Plan

APPENDIX 9-8: Wildlife Management Plan

APPENDIX 9-9: Chance Find Management Plan

APPENDIX 9-10: Mine Emergency Response Plan

LIST OF ABBREVIATIONS

%	Percent
°C	Degrees Celsius
µg	micrograms
ABA	Acid-Base Accounting
ADP	Annual Discharge Plan
AET	Actual Evapotranspiration
AIA	archaeological impact assessment
AL	aquatic life
ANOVA	Analysis of Variance
AOP	area of potential
AP	Acid Potential
ARD	acid rock drainage
BC	British Columbia
BC CDC	BC Conservation Data Centre
BC CSR	British Columbia Contaminated Sites Regulation
BC ENV	British Columbia Ministry of Environments
BEC	Biogeoclimatic Ecosystem Classification
C%	carbon percentage
CDA	Canadian Dam Association
CEMP	Comprehensive Environmental Management Plan
cm	centimeter
COI	communities of interest
CORMIX	Cornell Mixing Zone Expert System
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSM	conceptual site model
CSR	Contaminated Sites Regulations
DOC	dissolved organic carbon
EAC	Environmental Assessment Certificate
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
ELU	end land use
EMA	Environmental Management Act
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EPN	Environmental Protection Notice
EPT	Ephemeroptera, Plecoptera, and Trichoptera

ERA	Environmental Risk Assessment
ESCP	Erosion and Sediment Control Plan
FN	First Nations
FSR	Forest Service Road
GIS	geographic information system
Golder	Golder Associates Ltd.
Ha	hectares
HCA	Heritage Conservation Act
HHRA	human health risk assessment
HROA	heritage resource overview assessment
HRWG	Habitat Remediation Working Group
HSRC	Health, Safety and Reclamation Code
ICH	Interior Cedar-Hemlock
IDZ	Initial Dilution Zone
km	Kilometer
km/hour	Kilometer per hour
kV	kilovolt
L/s	Liters per Second
LIMS	Laboratory information management system
LoM	Life of Mine
LOR	Limit of Reporting
LTWMP	Long-term Water Management Plan
M	Million
m3	cubic metres
m3/d	Cubic metres per day
m3/day	cubic meters per day
masl	metres above sea level
MBCA	Migratory Birds Convention Act
MDMER	Metal and Diamond Mining Effluent Regulations
MEM	Ministry of Energy and Mine
mg/kg	Milligrams per kilogram
mg/kg-dw	Milligrams per kilogram dry weight
mg/L	Milligrams per litre
mg-N/L	Milligrams nitrogen per litre
mg-P/L	Milligrams phosphorus per litre
ML/ARD	metal leaching and acid rock drainage
mm	millimetre

MMO	Major Mines Office
BC MoE	British Columbia Ministry of Environments
MPIC	Mount Polley Intrusive Complex
MPM	Mount Polley Mine
MPMC	Mount Polley Mining Corporation
MPRP	Mine Plan and Reclamation Plan
NAG	non-acid-generating
NEZ	Northeast Zone
NP	Neutralization potential
NPR	Neutralization Potential Ratio
NTU	Nephelometric Turbidity Unit
NW	Northwest Potentially acid generating
OMS	Operation Maintenance and Surveillance
Orica	Orica Canada Inc.
PAG	potentially-acid-generating
PET	Potential Evapotranspiration
PFR	preliminary field reconnaissance
PLC	Public Liaison Committee
QA/QC	Quality Assurance and Quality Control
QEP	qualified environmental professional
QP	Qualified Professional
RCP	reclamation and closure plan
RDS	rock disposal stockpile
RPD	Relative Percent Difference
S%	sulphur percentage
SAG	semi-autonomous grinding
SAR	Species-at-risk
SARA	Species at Risk Act
SERDS	Southeast Rock Dump Site
SMNEA	Southern Mountain National Ecological Area
SMP	Soil Management Plan
SPE	Springer Expansion
sph	stems per hectare
SRK	SRK Consulting (Canada) Inc.
SWE	Snow-water-equivalent
SWL	Static water level
SWWBM	site-wide water balance model

SWWQM	site-wide water quality model
t	tonne(s)
t/d	Tonnes per Day
TAR	Technical Assessment Report
TEM	Terrestrial Ecosystem Mapping
TIC	Total Inorganic Carbon
TRP	Trigger Response Plan
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
VRI	Vegetation Resources Inventory
WLFN	Williams Lake First Nation
WLRS	Water, Land and Resource Stewardship
WMP	Water Management Plan
WQG	Water Quality Guideline
WSP	WSP Canada Inc.
WSQG	Working Sediment Quality Guidelines
WTP	Water treatment plant
µS/cm	Convert Microsiemens per Centimeter

1 INTRODUCTION

1.1 Application Background

Mount Polley Mine is a copper gold mine operating in central British Columbia (BC), approximately 80 km southeast of Quesnel, BC, adjacent to Polley Lake and Hazeltine Creek, which flows into Quesnel Lake and then the Quesnel River.

Mount Polley Mining Corporation (MPMC) has prepared a joint *Mines Act* and *Environmental Management Act* Permit M-200 Amendment Application to support the Springer Expansion Project at the Mount Polley Mine that will extend the life of the mine until 2031. Mining of Phase 4 is anticipated to finish in approximately two (2) years (early 2025), this represents the end of the permitted operational mining activities under permit M-200. However, the opportunity exists to extend the mine's life with the development of the "Springer Expansion" project (the Project). This proposed project falls within the existing mine boundary and would support an additional approximately eight (8) years of operation, depending on market conditions.

The full scope of the application includes the following:

- an expansion of the Springer Pit by mining the saddle between Cariboo and Springer pits, deepening both pits and creating two starter pits CX and W2.
- an extension of the Southeast Rock Disposal Site (SERDS),
- an extension to the duration of treated water discharge to Quesnel Lake to be throughout mining operations in 2031,
- interim raise in the elevation of the tailing storage facility (TSF) to 974 m from 970 m,
- and an extension of the Northwest Potentially Acid Generating (PAG) Stockpile disposal date,
- and a modernization of the Neutralizing Potential Ratio (NPR) to lower the ratio from 2 to 1.5.

These components are further described in Section 1.3.4.

The M-200 authorizes construction of the embankment to an elevation of 970 m. Construction to raise the embankment to 970 m was started in July 2022 and completed in 2023. The Springer Expansion will require an additional raise of the TSF. The TSF will be raised in a series of lifts over the course of several years, the first of which would include the interim increase to 974 m to avoid potential impacts to operations and support the full implementation of Phase 4, as well as future mining Phases 5 and 6. The design of the final TSF raise to 987 m is ongoing, but is not expected to be complete until Q1 2025, and included in a separate permit amendment application. In the interim, MPMC is proposing to raise the TSF to 974 m to maintain mining operations into 2025.

Some water management structures will extend beyond the M-200 boundary, and an extension of the M-200 boundary is required to cover the planned disturbance areas (see Section 5.1.2). To avoid duplication (i.e., environmental baseline information, management plans) and the development of a separate joint *Mines Act and Environmental Management Act* Permit M-200 Amendment Application, information regarding the interim raise to 974 m has been added to this application during the Response to Screening Comments Period with approval from EMLI and ENV.

1.1.1 Application Outline

This document's structure and content follows guidance provided in the Joint Application Information Requirements for *Mines Act* and *Environmental Management Act* Permits (EMPR and BC ENV 2019). Table 1.1-1 provides the application structure by section number and a high-level description of the information provided. The Joint Application Information Requirements table for the Springer Expansion and the TSF interim raise to 974 m is provided in Appendix 1-1 and Appendix 1-2, respectively. The section "Health and Safety" provided in the Joint Application Information Requirements was not required for this application and therefore no information has been included in this application; however, to maintain consistent numbering for sections (i.e., Health and Safety) and sub-sections that are not required in the application, the heading title has been retained in this application along with a statement and a rationale as to its exclusion.

Table 1.1-1: Application Structure

Section Number	Chapter Name	Description
1.0	Introduction and Project Overview	Provides the Project background information, including proponent identification, application background, mine overview and development proposal, regulatory framework, and the mine design and assessment team.
2.0	Baseline Information	Describes the baseline environmental conditions, and the results of any baseline characterization and monitoring studies regarding biophysical and socio-cultural components (such as meteorology and climate, geology, water quantity, water quality, aquatic resources, ecosystems, wildlife, land use, archaeology, and cultural use).
3.0	Mine Plan	Provides a detailed discussion on the Project Mine Plan, including mine facility designs and development occurring throughout the life of mine.
4.0	Reclamation and Closure Plan	Summarizes the reclamation planning, approaches, and methods used to meet the end land use and land capability objectives for the Project. Presents contingencies to address predicted challenges to achieving this objective.
5.0	Modelling, Mitigation, and Discharges	Provides an overview the qualitative hydrology and water quality assessments evaluating the potential effects of the Project. Detailing the operational efficiency and reliability of the water treatment plant.
6.0	Environmental Assessment Predictions	Accesses of potential Project residual effects on the environment and provides an evaluation of the risks on aquatic and terrestrial resources.

Table 1.1-1: Application Structure

Section Number	Chapter Name	Description
7.0	Environmental Monitoring	Summarizes the monitoring programs for the Project that support ongoing evaluation of the efficacy of proposed mitigations and evaluate on-going conditions of the receiving environment. Appendices attached to the Application, where the full monitoring program designs are located
8.0	Health and Safety	Information health and safety not required to be provided with the application.
9.0	Management Plans	Provides a summary of each management plan developed in support of the Project with reference to corresponding Appendices attached to the Application, where the full site-specific management plans are located.

1.2 Proponent Information

MPMC is a wholly-owned subsidiary of Imperial Metals Corporation, a Canadian mining company active in the acquisition, exploration, development, mining, and production of base and precious metals, with a focus on western North America. Key properties are: Mount Polley Mine; Huckleberry Mine, an open pit copper/molybdenum mine in west-central BC; Red Chris Mine (30% interest), an operating copper-gold property in northwest BC; and Ruddock Creek, a pre-development stage zinc/lead property in southeast BC.

The main contact information for MPMC is:

Imperial Metals Corporation
Don Parsons, Chief Compliance Officer
200 – 580 Hornby Street
Vancouver BC V6C 3B6
604.669.8959 | www.imperialmetals.com

1.3 Project Overview

1.3.1 Project History

The development of the Mount Polley Mine was approved by a Mine Development Certificate issued in October 1992 (Project Approval Certificate #96-07, now called Environmental Assessment Certificate #96 07). Clearing of the site and construction of the entire facility began in 1995, with the mill commissioned in June 1997. In July 1997, the Ministry of Energy, Mines, and Low Carbon Initiatives (EMLI) approved the Mount Polley Mine Reclamation and Closure plan, which resulted in the issuance of the M-200. The first full year of mining and milling at Mount Polley Mine took place in 1998. The mine suspended operations in October 2001 due to low metal prices, reopening in December 2004, with mill production commencing in March 2005.

On August 4, 2014, a breach occurred in the Perimeter Embankment of the Tailing Storage Facility (TSF); this event is referred to as the "breach". The breach released tailings, water, and embankment construction materials to the downstream environments of Polley Lake, Hazeltine Creek, and Quesnel Lake.

Following the breach, mine operations ceased and the Freshet Embankment was constructed to elevation 950 m through the breach area to allow the capture and temporary storage of the 2015 and 2016 freshet flows in 2015. Restricted operation, with tailings being deposited in Springer Pit, commenced on August 4, 2015. As the mine returned to operation, an effluent permit was required and the Long-term Water Management Plan – Technical Assessment Report (the "Long-term Water Management Plan" or LTWMP) dated October 17, 2016, was produced to support the application process (Golder 2016). On November 6, 2015, MPMC applied for an amendment to the M-200 to allow for a return to full operations, including construction of the TSF to elevation 970 m (Golder 2015a) and the use of the TSF for tailings deposition. On June 23, 2016, this amendment was provided by EMLI, and on June 27, 2016, MPMC resumed deposition of tailings into the TSF. On April 26, 2017, the Minister of Environment and the Minister of Energy and Mines gave their consent to a material alteration of the Environmental Assessment Certificate (EAC) allowing for discharge to Quesnel Lake in accordance with the Long-term Water Management Plan for the remainder of the operational life of the mine (M. Polak and B. Bennett 2017):

> *"NOW THEREFORE:*
>
> *The undersigned Ministers pursuant to Condition 2 of the EAC hereby do consent to the Long-Term Water Management Plan, involving operational discharge to Quesnel Lake and discharge at closure involving passive water treatment at the mine site, as a material alteration to the EAC.".*

On January 7, 2019, MPMC announced a decision to go on suspended operations (Care and Maintenance) beginning May 31 of that year, citing low metal prices. Mount Polley Mine was in care and maintenance since, which resulted in an extension to the operational period needed to develop Phase 4, as permitted by the *Mine's Act* Permit M-200 (M-200).

As noted in the August 25, 2021, communication regarding "Notice of Mount Polley Mine Restart", operations were planned to restart in 2021. This was initiated in response to improving market conditions, and as of November 2021 MPMC has started to return to operations. Mining activities occurring on site follow the activities approved by the March 17, 2014, M-200 amendment *Approving Cariboo Phase 4 Expansion* and the June 23, 2016 M-200 amendment *Approving Return to Full Operations and Use of the Tailings Storage Facility*.

The opportunity exists to extend the mines life until approximately 2031, and the economic benefits to the community along with that, with the development of the Springer Expansion Project.

As for the TSF, by September 2018, construction of the TSF had been completed to elevation 968 m (Golder 2019). A feasibility design for raising the embankment of the TSF to an elevation of 984 m was completed in 2014 (Golder 2015b). The aim of the feasibility assessment was to identify potential considerations, constraints, or conflicts that may limit the elevation to which the TSF could be raised. The results of the study indicated that a raise of the facility is feasible. In 2021, MPMC updated the Life of Mine (LoM) plan, and a crest elevation of approximately 987 m was determined to be required to store the LoM tailings. An additional geotechnical investigation and laboratory testing is ongoing to assess potential strength gains from reconsolidation of the upper glaciolacustrine unit (UGLU) that sheared during the breach in 2014. This interim design to elevation 974 m was developed assuming no strength gains of the upper GLU that sheared in 2014. A remoulded undrained shear strength equal to the average minus one standard deviation of the measured values as part of the forensic investigation in 2014 was adopted as in previous analyses and designs (Golder 2015a, 2015c). An interim design elevation of 974 m was selected to enable short-term operations of the TSF.

1.3.2 Overview of Products and Markets, and Projected Project Benefits

The Project represents an additional ~8 years of mining at approximately 20,000 tonnes per day (t/d), consistent with that undertaken during previous years of operations and planned for the development of Phase 4, and the interim raise to 974 m will enable short-term operations of the TSF. Estimated material volumes associated with the operation phase of the Project are presented in Table 1.3-1.

Table 1.3-1: Estimated Material Volumes Associated with the Project

	Springer Expansion (Life of Mine) Material Tonnages (Mt)
Ore Processed by Mill	**52.7**
Waste Rock – Total	**158.7**
PAG	39.1
NAG	119.6
Tailings	**50**

When in operation, Mount Polley Mine supports the local economies of Likely, Horsefly, and Williams Lake through employment of residents and purchases in these communities. As the mine returns to operation, benefits to these communities, as well as the province, include:

- Direct support of 350 jobs with an average annual salary of $123,000 per annum.
- Indirect support of 700 jobs.
- $75 million per operating year in payments to suppliers in BC.

In addition to economic support within local communities MPMC has signed a Participation Agreement with the Williams Lake First Nation and is in negotiation with Xatśūll First Nation as well. The participation agreements are impact benefit agreements that consider financial support, education and training, employment, business and contract opportunities and environmental considerations. These agreements are expected to persist until the end of the mine life and provide continuous support for community members, initiatives and social services.

1.3.3 Location, Access, and Land and Resource Use

Mount Polley Mine is an open pit copper/gold mine located in central BC, 56 km northeast of Williams Lake (latitude 52° 33’ N and longitude 121° 38’ W) in BC’s Cariboo Region. The mine site location is displayed in Figure 1.3-1 and Figure 1.3-2.

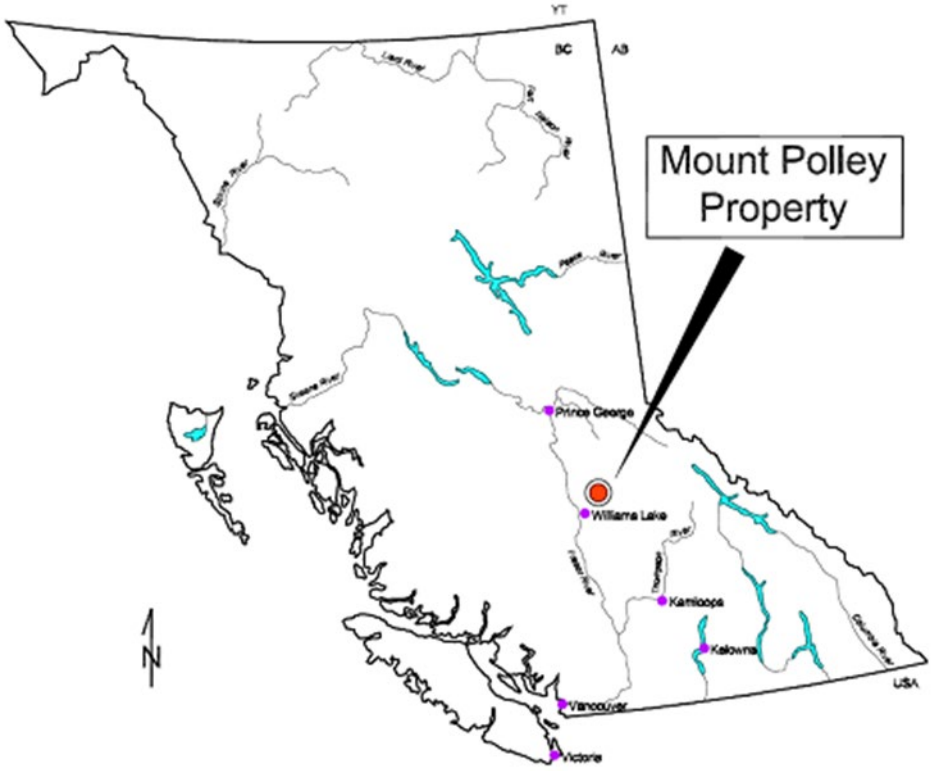


Figure 1.3-1: Location Map

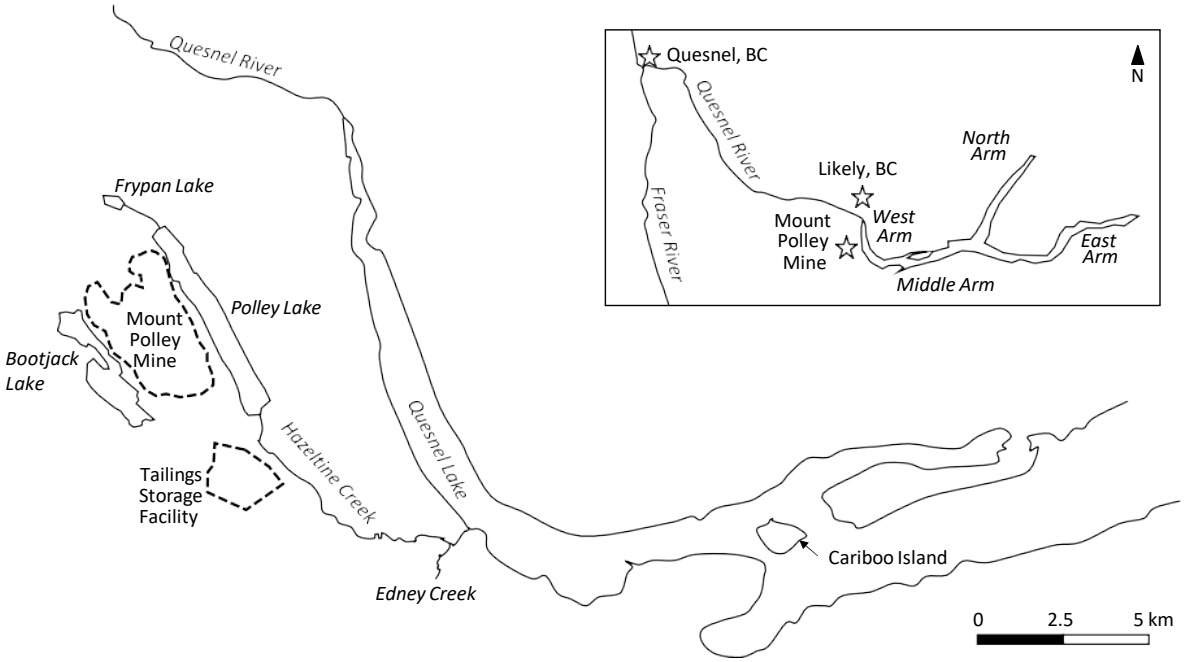


Figure 1.3-2: Mine Site Location

Currently, the property encompasses 24,096 hectares consisting of seven mining leases (2,007 hectares) and 52 mineral claims (22,089 hectares) and shown in Figure 1.3-3 below. A production royalty is payable on ore mined from Mining Lease 933970.

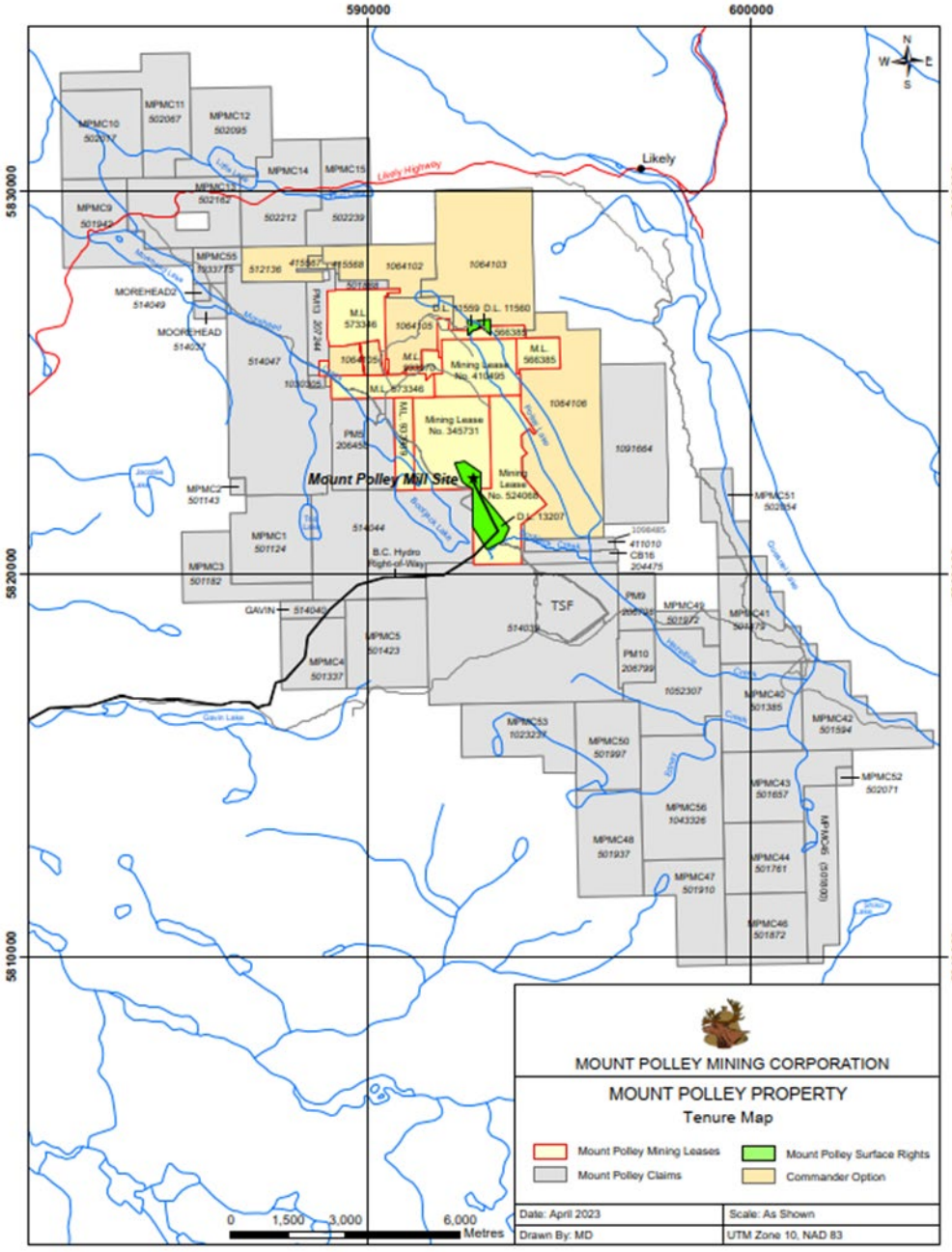


Figure 1.3-3: Figure of the Site Mining Tenures and Site Access

In October 2019, MPMC Corporation optioned seven adjacent mineral tenures (3,331 hectares) and the option was subsequently exercised on December 30, 2022. These claims are subject to a production royalty payable on ore mined from the claims and milled in the Mount Polley processing plant. There is no production royalty payable on the current tenures which are being mined.

Access to the mine occurs via the Morehead-Bootjack Forest and Service Road from Likely Road. Traffic is managed by existing traffic and access standard practices and procedures maintained by MPMC.

Regional public land uses associated with the area are fishing, hiking, camping, motorized vehicle use, skiing, snowmobiling, trapping, and hunting. Industrial uses, including forestry, sawmilling, ranching, and fisheries also occur in the area. These uses do not occur within the *Mines Act* M-200 permit boundary, where public access is prohibited under the *Mines* and *Trespass Act*.

Mount Polley Mine operates on the traditional territory of the Williams Lake First Nation and the Xatśūll First Nation. Traditional uses including plant and animal harvesting and fishing occur within the region and may, in the future, occur in areas near the Project. Current use of the Project footprint by Williams Lake First Nation and the Xatśūll First Nation citizens is restricted given that the area is within the existing M-200 permit boundary, which maintains public and worker safety. Representatives of these Nations are engaged through the Public Liaison Committee (PLC), permitting applications, and the terms of the Impact Benefit Agreements.

Contact water from the Mount Polley Mine is collected and treated via the Veolia ACTIFLO® system and discharged to Quesnel Lake. Known environmental uses of Quesnel Lake water, particularly with respect to the West Basin, were identified to determine the most sensitive water use for the receiving environment. The following environmental uses were identified for Quesnel Lake by Golder (2016) and remain applicable in the present day:

- Commercial, recreational, and aboriginal fisheries.
- Recreational uses such as scenery and wildlife viewing, swimming, boating, kayaking, canoeing, and waterskiing/tubing/wakeboarding, and in the winter, snowmobiling and ice fishing when ice conditions allow.
- Drinking and residential water use for domestic purposes.

1.3.4 Mine Components and Off-Site Infrastructure

This Project consists of six main components and the permit amendments associated with these components are summarized in Table 1.3-2 below.

Table 1.3-2: Summary of the Project Components and Permit Amendments

Project Component	Condition Reference	Condition	Scope and Function	Section
Springer Expansion	M-200	N/A	Expand Springer Pit to access additional resources. This will occur largely within existing mine footprints.	Section 3.3
SERDS Tailings Storage Facility	M-200 B.5.a.ii	The Permittee is authorized to construct the SERDS to a maximum elevation of 1,135 m.	Expand the SERDS to store NAG waste rock associated with Springer Pit Mining.	Section 3.3.4, Section 3.5.4.1, Appendix 3-2
Quesnel Lake Discharge [Operational]	PE-11678 1.2.3	This section applies to the discharge of treated effluent from the site runoff and seepage water collection and management systems to Quesnel Lake as sampled at the Treatment Plant Outlet (HAD-03). The site reference for this discharge is E304230. The discharge period is authorized until June 30, 2025 but it is needs to be extended to 2031 to the Life of Mine[1].	To discharge to Quesnel Lake via the WTP for the extent of operations.	Appendix 5.3
Northwest PAG Stockpile Disposal Date	M-200 D.3.c.i.c	The Permittee shall permanently dispose of all PAG waste rock stored in the Temporary NW PAG dump by back filling the material into the Cariboo/Springer Pit, by December 31, 2027.	Allow the disposal of PAG at the completion of operations.	Section 3.3.3

[1] An application for amendment of PE-11678 to extend the discharge period has been applied for and is with BC ENV for processing. MPMC expects the permit validity period to be extended to the end of Life of Mine.

Table 1.3-2: Summary of the Project Components and Permit Amendments

Project Component	Condition Reference	Condition	Scope and Function	Section
Reduce the NPR ratio from 2.0 to 1.5	M-200 D.3.b.iii	The Permittee shall classify all waste rock, quarry rock, borrow materials and tailings as PAG if they have a NP/AP ratio of less than 2.0.	To improve efficiencies during the return to operations and reduce the disturbance associated with future operations, while maintaining protection of the receiving environment, MPMC is working with a Qualified Professional (QP) to determine the possibility of reducing the PAG NPR from 2 to 1.5. This reduction is anticipated to allow for the remaining permitted capacity (~30 Mt) of the Temporary NW PAG Stockpile to facilitate the volume of PAG associated with Springer Pit Mining.	Appendix 5-1
Tailings Storage Facility	M-200	N/A	Raise the elevation of the TSF on an interim basis to continue mining current approved phase and in preparation for future expansion to the Life of Mine where TSF will be raise to 987 m	Section 3.5.4.2, Appendix 1-3

PAG = Potentially Acid Generating; NAG = Non-acid Generating; NPR = Neutralization Potential Ratio; SERDS = Southeast Rock Disposal Site; WTP = Water Treatment Plant.

The detailed design report for the TSF interim raise to elevation 974 m is included in Appendix 1-3 and the TSF Site Characterization Report is included in Appendix 1-4.

1.3.5 Mine Development and Operations

Currently, operations at Mount Polley mine include the open-pit mining of the Springer and Cariboo pits, with an average daily mill throughput being 20,000t. The majority of mining occurs in the Springer and Cariboo Pit. The current plan in this application has a life of mine concluding in 2031 then rehandled PAG material back into the pit until end of 2033 as outlined in Section 3.3, Table 3.3-2.

The Springer Pit is currently mined to Phase 4 at a depth of 928m from surface. Dewatering from the Springer Pit will require establishing temporary sumps in the mine working usually at the lowest working bench. Electric or diesel pumps will convey water to a large sump located in the Cariboo pit. The Cariboo Pit will be pumped to the West collection ditch and then to the Perimeter Embankment Till Borrow Pond which acts as an influent pond for the water treatment plant.

The Springer Expansion involves four Phases: Phase 5, Phase 6, WX and C2. It pushes back the extents of the Phase 4 Springer pit as well as deepening it. Phase 5 is proposed to commence in 2025 and be completed in approximately 2028 and involves a pushback of the east wall near the backfilled Bell pit. The pit is roughly 1446m long, 898m wide, a maximum of 396m deep. Access to the pit will be via temporary NW PAG Stockpile and off the Bootjack Forest Service Road.

Phase 6 is proposed to commence in 2027 and will be completed in approximately 2031, and involves deepening the existing Springer Pit. The pit is roughly 842m long, 648m wide, a maximum of 348m deep. Access to the pit will be via the main haul road.

Two starter pits (WX and C2) will also be deepened in the later years of the life of mine commencing in 2029 and completed by approximately 2031. The WX and C2 pits will follow the same design principles as already existing in operating pits at Mount Polley Mine. Additional Mine Plan details are provided in Section 3: Mine Plan.

The interim raise of the TSF to 974 m will allow MCMP to maintain mining operations through 2024. Engineering design is ongoing for a future application for the subsequent raise of the TSF to 987 m which will contain the LoM tailings as mining is advanced. The TSF water management infrastructure for the raise to 974 m will be designed in alignment with the ultimate embankment raise for 987 m. Some structures will extend beyond the M-200 boundary, and an extension of the M-200 boundary is required to cover the planned disturbance areas, as shown on the TSF water management infrastructure drawings.

1.3.6 Mine Design and Assessment Team

Table 1.3-3 identifies the professionals, reviewers, and authors with primary responsibility for preparing this Application. Each identified Qualified Professional author has provided a signed statement, where a signed report is not already included in the Application, specifying the section they are responsible for and confirming that the information is true and complete based on their professional knowledge and judgement. The signed statements are provided as Appendix 1-5. Minnow Environmental Inc. (Minnow) signed statements are provided in Appendix 2-7.

Table 1.3-3: Project Qualified Professional Team

Company	Project Team			
	Name	Registration Number	Role	Sections
MPMC	Mathieu O'Leary, Technical Services Superintendent	NA	Reviewer	All
WSP	Lee Nikl, MSc, RPBio, Senior Environmental Scientist, Fellow	601, RPBio	Reviewer	All
	Drew Kaiser, RPBio, Senior Principal Biologist	2332, RPBio	Reviewer	All
	Samantha Lundquist, BSc, BIT, Intermediate Environmental Scientist (under direct supervision of Lee Nikl, MSc, RPBio)	4010, BIT (author) 601, RPBio (responsible QP)	Author, Reviewer	All
	Jesse Maddaloni, MASc, P.Eng, Senior Mechanical Engineer	36620, P.Eng	Author, Reviewer	Section 2.6.1, 5.4, 5.6, 5.8
	Steve Mitchell, MASc, Water Quality Modeller (under direct supervision of Lee Nikl, MSc, RPBio)	601, RPBio (Lee Nikl)	Author, Reviewer	Sections 2.5.1, 6.2, 7.1
	Jordan Laskosky, MSc, P.Ag, Senior Mine Reclamation and Closure Consultant	4447, P.Ag	Author, Reviewer	Sections 2.3.5, 4.0, 7.5
	Jacqueline Foley, PL.Geo, MSc, Senior Principal Hydrogeologist	130626, PL.Geo	Author, Reviewer	Sections 2.8, 6.4, 7.2
	Barbara Wernick, MSc, RPBio, Senior Principal Environmental Scientist	1171, RPBio	Reviewer	Sections 2.7, 2.8, 2.9, 6.1
	Rachelle Smith, MSc, RPBio, Intermediate Biologist	3960, RPBio	Author	Sections 2.10, 6.2, 9.10
	Tanya Seebacher, MSc, RPBio, Terrestrial Biologist	2191, RPBio	Reviewer	Sections 2.10, 6.2, 9.10
	Christopher Dodd, BA, RPCA, Lead Archeologist	NA, RPCA	Author, Reviewer	Sections 2.12, 9.11
	Alannah Gray Hubbard, P.Eng, Lead Senior Geological Engineer	48028, P.Eng	Author, Reviewer	Sections 3.5.1, 3.5.5

Table 1.3-3: Project Qualified Professional Team

Company	Project Team			
	Name	Registration Number	Role	Sections
	Andrew McIntosh, M.Eng, Peng, Project Manager	210306, P.Eng	Author, Reviewer	Section 9.2
SRK Consulting	Shauna Litke, MASc, P.Eng, Senior Geochemistry Consultant	49392, P.Eng	Geochemistry Source Terms	Sections 2.4, 9.5
	Jonathon Doherty, P.Eng, Senior Geochemistry Consultant	56775, P.Eng	Geochemistry Source Terms	Sections 2.4, 9.5
	Stephen Day, P.Eng, Corporate Geochemistry Consultant	18467, P.Eng	Geochemistry Source Terms	Sections 2.4, 9.5
Minnow Environmental Ino.	Katharina Batchelar, MSc, RPBio, Aquatic Scientist	3103, RPBio	Hazeltine Creek Baseline	Sections 2.7, 2.8, 2.9
	Pierre Stecko, RPBio, Senior Aquatic Scientist, Managing Principal	1709, RPBio	Hazeltine Creek Baseline	Sections 2.7, 2.8, 2.9

MPMC = Mount Polley Mining Corporation.

1.3.7 Spatial Data

Figures displaying the permit boundary and project components including the Springer Expansion, the SERDS extension, and the temporary Northwest PAG stockpile are provided in Figure 1.3-4 and Figure 1.3-5. Figure 1.3-6 provides the projected disturbed areas overview for the configuration of these project components at the end of operations.

Temporary NW PAG Stockpile

Springer Pit Expansion

SERDS Extension

Polley Lake

Boojack Lake

Quesnel Lake

LEGEND

- QUESNEL LAKE DISCHARGE POINT
- PROJECT COMPONENT
- PROJECT COMPONENT

MOUNT POLLEY MINING CORPORATION

FIGURE 1.3-4
PERMIT BOUNDARY AND COMPONENTS

DATE: 2024-07-04 DRAWN: CDB

0 1,000 2,000

1:50,000 METRES

PATH: Y:\burnaby\CAD-GIS\Client\Imperial_Metals_Corp\Mount_Polley_Mine\99_PROJECTS\23590\87191\10080\1112\Doc zzz\02_PRODUCT\QNM\MXD\Report\23590\871_81100_81112_01_03_04_PERMIT_BOUNDARY_COMPONENTS.mxd PRINTED ON: 2024-07-04 AT: 3:18:45 PM

Temporary NW
PAG Stockpile

Springer Pit
Expansion

Boojack Lake

LEGEND

PROJECT COMPONENT

PROJECT COMPONENT

**MOUNT POLLEY
MINING CORPORATION**

**FIGURE 1.3-5
SPRINGER PIT EXPANSION
COMPONENT**

DATE: 2024-07-04 DRAWN: CDB

0 150 300

1:7,500 METRES

PATH: Y:\Burnaby\CAD-GIS\Client\Imperial_Metals_Corp\Mount_Polley_Mine\99_PROJECTS\23990671\81100\81112\Doc zz.z02_PRODUCTION\MXD\Report\23990671_81100_81112_01_03_05_SPRINGER_PIT_EXPANSION_COMPONENT.mxd PRINTED ON: 2024-07-04 AT: 3:18:08 PM

Mount Polley Mining Corporation

Mount Polley Life of Mine Joint Application Overview

1:20,000

Gabriel Holmes
Date: 5/21/2024
Photo Dates: 2013, 2023

0 200 400 800 1,200 1,600
Meters

20m Contours

Temporary NW PAG Stockpile

Springer Pit

South East Rock Disposal Site

1.3.8 Concordance with Environmental Assessment Certificate

MPMC was initially issued Mine Development Certificate M92-13 on October 6, 1992. This certificate continues in force as Project Approval Certificate M96-07 pursuant to the *Environmental Assessment Act* R.S.B.C. 1996 c. 119 and as Environmental Assessment Certificate M96-07 pursuant to the *Environmental Assessment Act* S.B.C 2002, c.43 (Certificate). This certificate was last amended on May 19, 2016.

The Project does not require an amendment to the M96-07, however the following conditions have been identified as relevant.

Condition 2: Imperial Metals [MPMC] shall, prior to any material alteration of the Development as described in the Application, obtain the written consent of the Minister and the Minister of Environment, Lands and Parks and the Minister may determine what constitutes a material alteration.

Condition 6: This Certificate is not a Mines Act Permit nor Part thereof, nor does it limit the ability of the Chief Inspector, District Inspector, or an Inspector of the Ministry of Energy, Mines, and Petroleum Resources to immediately enforce any requirements or exercise any discretion or authority under the Mines Act, its Code, or Orders or Directions thereunder.

Condition 8: Imperial Metals [MPMC] shall comply with all applicable orders, directions and conditions, and obtain and comply with all applicable tenures, licenses, regulations, approvals, standards and permits which may include or result from, but are not necessarily limited to, the following:

- *Commercial transport Act*
- *Environment management Act*
- *Fire Services Act*
- *Fisheries Act*
- *Gas Safety Act*
- *Health Act*
- *Heritage Conservation Act*
- *Highway Act*
- *Land Act*
- *Mineral Tenure Act*
- *Mines Act*

- *Mining Right of Way Act*
- *Municipal Act*
- *Pesticide Control Act*
- *Pipeline Act*
- *Power Engineers & Boiler & Pressure Vessel Safety Act*
- *Railway Act*
- *Transport of Dangerous Goods Act*
- *Utilities Commission Act*
- *Waste Management Act*
- *Water Act*

With regards to these conditions MPMC acknowledges the requirement to acquire authorization from the appropriate source. For this Project, MPMC is seeking an amendment to the M-200 and PE-11678, no additional amendments or authorizations are required to support the activities (Section 1.1).

1.4 Regulatory Framework

MPMC has permits that allow for operation and waste management. In addition, MPMC has certificates and similar instruments that enable provincial ministries to make decisions respecting permits (i.e., approximately equivalent to present day EAC). These include:

- M-200, issued by EMLI.
- *Environmental Management Act* Permits issued by Ministry of Environment and Climate Change Strategy (BC ENV) to authorize discharge into the receiving environment (Permits 11678, PE-11678, 15968, 15087, and 14590).
- *Environmental Assessment Act* Mine Development Certificate Project Approval Certificate M96-07 (M96-07), issued by the Environmental Assessment Office (EAO).

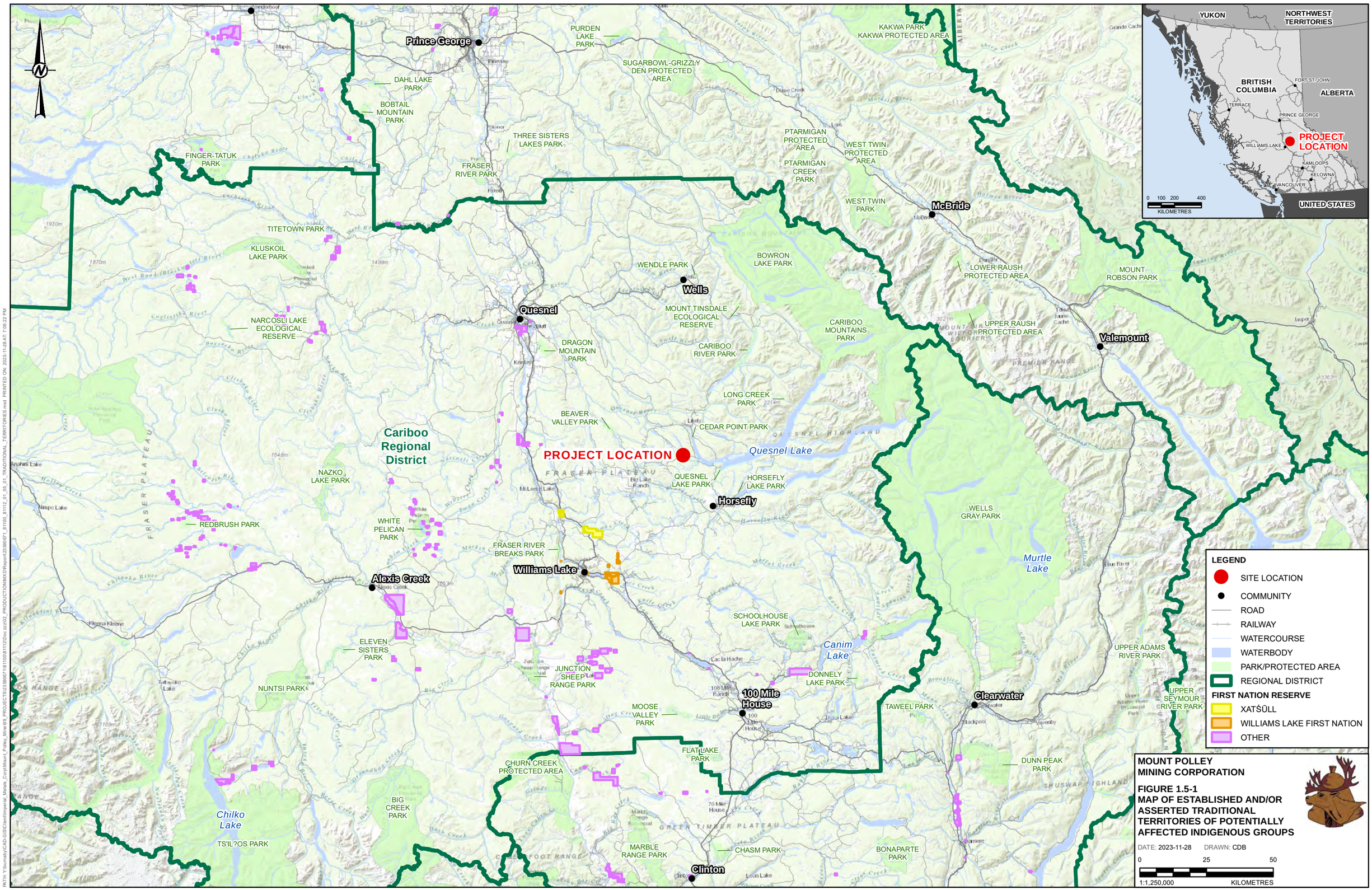
To support the implementation of the Project, and those related projects (Section 1.1.1) , MPMC is seeking an amendment to the M-200. The Project does not require changes to environmental discharge (Section 1.1.1) or relate to those conditions included in M96-07 (Section 1.3.8).

This Project does not require the alteration of a water way. This negates the need for permitting through the federal *Navigation Protection Act* or the *Fisheries Act*.

1.5 Indigenous Engagement

1.5.1 Background

MPMC operates in the recognized claimed traditional territory of the Williams Lake First Nation (WLFN) and the Xatśūll First Nation. The WLFN and the Xatśūll First Nation are members of the Secwepemc Nation located in the Cariboo region of the Central Interior region of BC. The traditional language of the WLFN and the Xatśūll First Nation is Secwepemc (or Shuswap). The WLFN reserve land area covers 1983.4 ha. The Xatśūll First Nation reserve land totals 2092.7 ha. Established and/or asserted traditional territories are provided in Figure 1.5-1. Land use is described in Section 1.3.3.



PATH: Y:\burnaby\CAD-GIS\Client\Imperial_Metals_Corp\Mount_Polley_Mine\9_PROJECTS\23\9067\18\1100\81112\Doc.zz\02_PRODUCTION\MXD\Report\23\9067_81100_81112_01_05_01_TRADITIONAL_TERRITORIES.mxd PRINTED ON: 2023-11-28 AT 7:06:22 PM

1.5.2 Asserted and Established Rights and Interests

In 2011 and 2012, MPMC executed Participation Agreements with the WLFN and the Xatśūll First Nation, respectively. WLFN renewed the Participation Agreement on April 12, 2022, with MPMC. Meetings with the WLFN have taken place since March 16, 2012, and since July 19, 2012, with the Xatśūll First Nation. Effective October 18, 2012, Joint Implementation Committee meetings have been held with representatives from MPMC, the WLFN, and the Xatśūll First Nation. Joint Implementation Committee meetings are held at minimum quarterly. These meetings and associated documentation (Terms of Reference, minutes, and action items) provide a well-defined, constructive forum in which issues, reviews, and comments relating to the current and anticipated future operations of the Mount Polley Mine may be discussed.

1.5.3 Engagement Efforts

A summary of the engagement regarding the discharge to Quesnel Lake thus far is provided in Table 1.5-1, and further details regarding these engagements will be provided in a Consultation Report.

Although the Quesnel Lake Interim Discharge Extension is a minor amendment, as defined by Section 1.2 of the Public Notification Regulation under the *Environmental Management Act*, additional consultation and engagement was requested by BC ENV on February 4, 2022, via email, and by members of the PLC during the January 27, 2022, PLC meeting. An Environmental Protection Notice (EPN) was also posted in the Williams Lake Tribune, and a Community Engagement Meeting was held March 28, 2022, in Likely. The PLC was given an opportunity to comment on the draft technical assessment report and comments were received from one PLC member.

As of writing, consultation is ongoing, and a separate consultation report will be submitted by MPMC.

Table 1.5-1: Summary of Quesnel Lake Interim Discharge Extension Engagement

Date	Attendees	Activity	Communication
January 19, 2022	Xatśūll First Nation	Xatśūll First Nation Open House	A poster regarding the Interim Quesnel Lake Discharge Extension was presented during the open house.
January 27, 2022	Public Liaison Committee	Quarterly PLC Meeting	As part of the quarterly PLC meeting the Interim Quesnel Lake Discharge Extension was introduced to members.
March 3, 2022	N/A	Environmental Protection Notice posted in the Williams Lake Tribune	An EPN regarding the Quesnel Lake Interim Discharge was posted to support public engagement.
March 28, 2022	Community of Likely and General Public invited	Community Open House	A presentation outlining the amendment application, poster stations, Questions and Answers

Table 1.5-1: Summary of Quesnel Lake Interim Discharge Extension Engagement

Date	Attendees	Activity	Communication
N/A	N/A	Public Feedback	Letters received by MPMC and BC ENV in response to the EPN (compiled in Consultation Report)
April 1, 2022 April 26, 2022	N/A	Public Liaison Committee Member Feedback	Document with comments from Mr. Doug Watt (PLC member)
June 30, 2025	-	-	-

BC ENV = Ministry of the Environment and Climate Change Strategy; EPN = Environmental Protection Notification; MPMC = Mount Polley Mining Corporation; N/A = Not Applicable; PLC = Public Liaison Committee.

See consultation report for updated additional engagement since application was submitted.

MPMC commenced communications regarding the Project in July 2021 as part of those conversations intended to describe the mines plan to return to operation. These communications have included meetings with regulators through bi-weekly meetings and calls specific to the Project, introductions to the Project presented through community meetings, and discussions with additional stakeholders through the PLC. A summary of those communication can be provided upon request.

In 2022, MPMC and the Williams Lake First Nation renewed the participation agreement established in 2011. This agreement sets out commitments and obligations for both parties. MPMC will keep regulators informed on the progress of the Project, and feedback received from through the pre-application process will be documented and incorporated into the Application as applicable.

1.6 References

British Columbia Ministry of Energy, Mines and Petroleum Resources and Birtish Columbia Ministry of Environment and Climate Change Strategy (EMPR and BC ENV). 2019. Joint Application Information Requirements for Mines Act and Environmental Management Act Permits. Victoria, BC. September 2019.

Golder. 2015a. Mount Polley mine tailings storage facility detailed design to elevation 970 m. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-074-R-Rev0-3000. November 3, 2015.

Golder. 2015b. Tailings storage facility life of mine feasibility design. Document prepared for Mount Polley Mining Corporation. Golder Doc No. 1413803-072-R-Rev0-9000. November 3, 2015.

Golder 2015c. Mount Polley Mine 2015 Freshet Management Embankment Design. Mount Polley Tailings Storage Facility. Prepared for Mount Polley Mining Corporation. Document No. 1413803-088-R-Rev3-2000. May 8, 2015.

Golder. 2019b. 2018 tailings storage facility construction record report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1894924-075-R-Rev0-52292; 27 March 2019.

Golder Associates Ltd. (Golder). 2016."Mount Polley Mine: Long-term Water Management Plan. Permit Amendment Application under the Environmental Management Act: Technical Assessment Report," Golder Associates Report No. 1411734-162-R-Rev0-16000, Vancouver, BC, 2016.

M. Polak and B. Bennett. 2017 *Consent for Material Alteration – Pursuant to the Environmental Assessment Act,* Victoria, BC: Minister of Environment and Minister of Energy and Mines, 2017.

2 ENVIRONMENTAL BASELINE

2.1 Summary

The following section will summarize the environmental baseline conditions in areas of the Mount Polley Mine site affected by the proposed Springer Expansion project. The following environmental components were identified to be assessed for this baseline information section:

- Meteorology and climate
- Geology
- Soil
- Geochemistry
- Surface water and groundwater quantity
- Surface water and groundwater quality
- Sediment quality
- Fisheries and aquatic resources
- Terrestrial Biodiversity (Ecosystems and Wildlife)
- Land use
- Archaeology
- Cultural use

2.2 Meteorology and Climate

In 2022, WSP Canada Inc. (WSP) updated the climate baseline data for the Mount Polley Mine site, included in Appendix 2-1, to include the most recent climate data. The climate of the Mine Site was characterized in the Baseline Climate Update Report (Golder 2022) using historical measurements recorded at local climate stations, supported by data collected from the five nearby regional Environment and Climate Change Canada (ECCC) climate stations. The baseline climate update report is summarized below, and more details can be found in Golder 2022.

MPMC has operated climate stations on site since 1995, although the station data records are not continuous. From 1995 through 2012, MPMC maintained one climate station at the Mill Site that measured and recorded rainfall (1997 to 2012), temperature (1995 to 2012) and wind velocity and direction (1997 to 2003). In 2012, this station was replaced with two stations: one near the mill site (WS1) and one adjacent to the TSF (WS2). These new stations measure and record wind speed, relative humidity, solar radiation, temperature, and rainfall.

Five ECCC climate stations: Likely, Spokin Lake, Williams Lake, Barkerville, and Quesnel, were selected to support and extend the long-term climate dataset for the Site due to their proximity to the Site, length of record, elevation range, and concurrent period of record with the local climate stations at the Site. In addition, the ECCC Prince George climate station was added to include an additional station with solar radiation data. Historical records were retrieved from ECCC's Historical Climate Data web server (ECCC 2022a). More recent records were compiled through e-mail correspondence with ECCC staff (ECCC 2022b).

The details of these stations are shown in Table 2.2-1. The locations of the mine weather stations are shown in Appendix 9-4A, Figure 8.

Table 2.2-1: Local and Regional Climate Stations for the Mount Polley Mine

Station Name (ID)	Northing (m N)[1]	Easting (m E)[1]	Elevation (masl)	Approximate Distance to Site (km)	Data Type	Period of Record[2]
Mill Site Weather Station	5822420	592495	1,118	-	R, T, WS, WD	1995-2012
Weather Station #1 (WS1) [near mill]	5822420	592792	1,171	-	R, T, RH, SR, E, WS	2012-2021[4]
Weather Station #2 (WS2) [TSF]	5819955	594059	964	-	R, T, RH, SR, E, WS	2012-2021[4]
Likely (1094616)	5828785	599332	724	9	P, R, S, T	1974-1993
Williams Lake A (1098940)	5781820	564666	940	50	P, R, S, T, RH, SR	1961-2021[4]
Spokin Lake 4E (1097646)	5782274	589827	1,033	40	P, R, S, T	1983-2021[4]
Barkerville (1090660)	5880996	599515	1,283	59	P, R, S, T	1888-2021[3, 4]
Quesnel A[5] (1096630)	5873987	546720	545	80	P, R, S, T, RH	1946-2021[4]
Prince George A (1096450)	5971423	521103	691	163	P, R, S, T, RH, SR	1973-1995

1) UTM Coordinate system – Zone 10U.
2) Length of record from start year to end year may not reflect the number of complete years of data.
3) Provisional data for the period January 2016 to December 2021 were provided by ECCC.
4) Station still in operation.
5) Combined record from Quesnel A and Quesnel Airport Auto stations. Stations are located at the same location.

ID = Identification; masl = metres above sea level; km = kilometre.
P = Precipitation; R = Rainfall; S = Snowfall; T = Temperature; RH = Relative Humidity; SR = Solar Radiation.

During the winter, snowpack is measured at four snow course sites at a minimum frequency of once per month, with more frequent measurements typically being taken during the melt phase. The details of these stations are provided in Table 2.2-2, and their locations are shown in Appendix 9-4A, Figure 8.

Table 2.2-2: Local Snow Course Sites at the Mount Polley Mine

Station Name	ID	Northing (m N)[1]	Easting (m E)[1]	Approximate Elevation (m)[2]	Period of Record
Snow Course # 1 (near mill)	N/A	5823182	592792	1,171	1997–2010, 2015–current
Snow Course # 2 (near TSF)	N/A	5819976	594092	964	1997–current
Snow Course # 3	N/A	5823895	593632	976	2012–current
Snow Course # 4	N/A	5823537	590835	1,112	2015–current

1) UTM Coordinate system – Zone 10U.

2) Elevation for on-site climate stations measured with handheld GPS device.

Masl = metres above sea level; N/A = not applicable; TSF = Tailings Storage Facility.

2.2.1 Air Temperature

Air temperature statistics for the Mine Site were developed using historical data from the nearby ECCC climate station in Likely approximately 9 km northeast of the Mine Site. The historical Likely data set was adjusted to the average elevation of the Site by applying the regional monthly lapse rate (Golder 2022). Data gaps were infilled using data from the four regional ECCC climate stations in a prioritized sequence and applying the monthly temperature lapse rate to adjust for elevation.

Monthly and annual air temperature statistics for the Mine Site (1974-2021) are presented in Table 2.2-3. The estimated mean annual temperature varies between 1.7°C and 6.3°C, with a long-term mean of 3.9°C. Mean monthly temperatures vary between –6.7°C in January and 15.1°C in July. The historical daily maximum and minimum air temperature from the derived long-term data set was 38.1°C in June 2021 (measured at the Site) and -39.8°C in December 1996, respectively.

Table 2.2-3: Derived Air Temperature (°C) Statistics for Mount Polley Mine, 1974 to 2021

Month	Temperature (°C)							
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile	Daily Maximum	Daily Minimum
January	-16.0	-6.7	-0.3	-8.7	-6.3	-4.0	11.2	-39.4
February	-13.0	-4.8	0.7	-7.7	-4.3	-2.1	13.6	-35.4
March	-6.7	-1.0	3.2	-2.2	-0.8	0.5	18.4	-32.7
April	-0.7	3.7	12.0	2.8	3.7	4.3	27.5	-16.7
May	5.2	8.5	13.1	7.5	8.3	9.6	33.1	-7.9
June	8.6	12.2	15.5	11.1	12.2	13.2	38.1	-4.9
July	11.8	15.1	21.2	13.3	14.8	16.4	36.0	0.6
August	11.0	14.6	17.1	13.6	14.8	15.7	33.0	-4.1
September	6.8	10.0	14.2	8.7	9.6	11.2	36.3	-7.1
October	0.8	4.1	8.7	3.4	4.1	4.7	31.1	-26.4
November	-13.7	-2.4	2.6	-3.8	-2.1	-0.4	17.3	-36.9
December	-13.7	-6.6	-1.2	-9.5	-5.5	-3.9	11.3	-39.8
Annual	**1.7**	**3.9**	**6.3**	**3.2**	**3.9**	**4.5**	**38.1**	**-39.8**

2.2.2 Precipitation

The MPMC precipitation dataset was extended and infilled using the available data record from the five regional stations as described below to derive a daily and 24-hour long-term synthetic precipitation dataset for the Mine Site. The Likely ECCC Station data were used to extend the precipitation record for the Mine Site given the station's length of record and proximity to the Mine Site.

Precipitation data gap infilling was completed following a priority sequence determined by analyzing measured daily rainfall from April to November for all climate stations; it was assumed that precipitation occurring between December and March occurred as snowfall. The regional climate station priority sequence considered the best-fit measured concurrent daily rainfall correlation (Rainfall Correlation), rainfall ranking correlation (Rainfall Rank), and percentage of time rain was recorded on the same day (Concurrent Daily Rain) between the raw data collected at the MPMC climate stations and each ECCC climate station (Golder 2022).

A precipitation-elevation orographic factor was applied to adjust the raw precipitation data from the ECCC climate stations used to infill gaps. The adjustment was based on the April-to-November rainfall ranking factor of the raw ECCC climate station and Mine Site rainfall records.

The Mine Site experiences high summer precipitation due to summer storms, with the lowest monthly precipitation occurring in February. Precipitation typically occurs as snowfall starting in November and accumulates until March. Average annual precipitation at the Mine Site is estimated to be 612 mm with a standard deviation of 118 mm. Frequency analyses of the derived long-term precipitation time series for the Site were undertaken to generate the variability in monthly and annual precipitation of the Mine Site. Estimated annual wet and dry precipitation depths for a range of return periods are shown in Table 2.2-4.

Table 2.2-4: Long-Term Precipitation at the Mount Polley Mine Site

Month[1]	Precipitation (mm)				
	Average	1:200 Year Wet	1:25 Year Wet	1:25 Year Dry	1:200 Year Dry
January	49.4	74.3	66.5	33.2	28.2
February	35.8	54.0	48.3	24.1	20.5
March	29.7	44.7	40.0	20.0	16.9
April	44.7	67.3	60.2	30.1	25.5
May	49.9	75.2	67.2	33.6	28.5
June	70.8	107	95.4	47.7	40.4
July	63.6	95.8	85.7	42.9	36.3
August	50.6	76.2	68.1	34.1	28.8
September	52.3	78.8	70.5	35.2	29.9
October	58.1	87.5	78.2	39.1	33.1
November	49.8	75.0	67.1	33.5	28.4
December	57.6	86.8	77.7	38.8	32.9
Annual Total[2]	**612**	**922**	**825**	**412**	**349**

1) Wet and Dry Monthly values assumed to follow the same monthly distribution as the Average.
2) Annual total precipitation depths were rounded to the nearest mm for presentation purposes; therefore, it may appear the sum of the monthly values do not equal the annual total.

2.2.3 Relative Humidity

Relative humidity data are available for the Site from 2019 to 2021 and for ECCC climate stations Quesnel (1953 to 2021) and Williams Lake (1961 to 2021). The MPMC WS1 relative humidity record is more complete than WS2's record; therefore, WS1 data were used for the analysis and infilled with WS2 data where necessary and if available. However, relative humidity data for the Site are insufficient for characterizing long-term climatic conditions of the Site due to the short period of record. Therefore, data from Quesnel and Williams Lake stations were reviewed and analyzed to define a representative relative humidity estimate for the Site. A long-term relative humidity time series for the Site was developed using ECCC Williams Lake A data infilled with ECCC Quesnel A data with an adjustment factor of 1.13 and 1.04 (Golder 2022).

Statistics for relative humidity are presented in Table 2.2-5. Mean annual relative humidity is 68.1%. Monthly mean values vary between 57.7% in April to 82.2% in December. The 25th and 75th percentiles for monthly relative humidity show little variation from the median indicating the Site experiences relatively constant relative humidity on a monthly basis from year to year.

Table 2.2-5: Derived Monthly and Annual Relative Humidity Statistics for the Site (1974-2021)

Month	Relative Humidity (%)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	69.2	81.3	90.1	78.9	81.7	84.0
February	65.5	75.0	84.8	72.0	75.6	77.8
March	55.4	64.9	76.2	61.0	64.0	68.3
April	47.9	57.7	69.4	54.9	57.4	60.5
May	45.6	58.1	70.3	54.1	57.8	61.5
June	44.2	60.4	72.4	54.4	60.2	67.7
July	42.2	59.0	72.9	52.6	58.6	65.9
August	48.4	60.2	81.2	55.0	58.8	63.6
September	47.5	66.4	79.1	61.3	66.1	71.3
October	54.3	72.3	86.7	69.7	72.0	76.1
November	61.4	80.1	87.8	77.6	80.4	83.5
December	70.8	82.2	89.3	78.9	82.6	85.0
Annual	**54.4**	**68.1**	**80.0**	**64.2**	**67.9**	**72.1**

2.2.4 Solar Radiation

Solar radiation data are available for the Mine Site from 2001 to 2003 and 2019 to 2021, and for ECCC climate stations Williams Lake (1961 to 2001) and Prince George (1973 to 1995). Solar radiation data for the Mine Site are insufficient for characterizing climatic conditions of the Mine Site due to the short period of record, and as the data recorded in 2001 is incomplete and not concurrent with either ECCC climate station. Solar radiation statistics for the Site were determined from the ECCC Williams Lake data. Missing values were infilled by adjusting the Prince George records by a factor of 1.04 (Golder 2022).

Statistics for solar radiation for the Mine Site are presented in Table 2.2-6. Mean annual solar radiation is 135 W/m^2, with a minimum of 127 W/m^2 and maximum of 148 W/m^2. Mean monthly solar radiation varies between 20 W/m^2 in December to 257 W/m^2 in July following the same seasonal pattern for monthly air temperature. The 25th and 75th percentiles show greatest variation in solar radiation occurs in the summer months when solar radiation is greatest during the year, and less variation in winter months when solar radiation is lowest.

Table 2.2-6: Estimated Solar Radiation Statistics for the Site (1974-2001)

Month	Solar Radiation (W/m^2)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	16	27	40	23	27	32
February	37	60	86	54	61	67
March	85	114	152	108	113	123
April	143	180	215	161	179	201
May	196	230	275	214	227	250
June	192	246	302	228	244	267
July	211	257	318	234	258	276
August	158	225	261	211	228	248
September	99	152	188	139	149	168
October	55	79	103	71	79	86
November	23	33	50	28	32	37
December	12	20	27	18	20	23
Annual	**127**	**135**	**148**	**132**	**135**	**140**

2.2.5 Evaporation

Evaporation monitoring data are available for the Mine Site from 2019 to 2021; however, the data are not continuous, and the length of record is not sufficient for characterizing the evaporation conditions at the Mine Site. Therefore, a mathematical model (Morton 1983) was used to calculate evaporation and evapotranspiration (actual and potential) for the Mine Site based on the long-term synthetic records for air temperature, relative humidity, and solar radiation. Evaporation is defined as free water evaporation, or the amount of evaporation from open/free water surfaces (i.e., the water is returned to the atmosphere from lakes, ponds, and watercourses). Potential evapotranspiration (PET) is the water loss that occurs from a vegetated natural surface if there is no deficiency of water in the soil for use by vegetation (Thornthwaite 1948). Actual evapotranspiration (AET) is the water loss that occurs from a vegetated natural surface considering the availability of water in the soil for use by vegetation. Estimated monthly and annual shallow lake evaporation, PET, and AET values are provided in Table 2.2-7, Table 2.2-8, and Table 2.2-9 respectively.

The mean annual shallow lake evaporation rate is estimated to be 673 mm, varying between 606 mm and 762 mm. Mean monthly evaporation rates vary between 0 mm in December to 138 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly evaporation occurs in July when evaporation is greatest, and lowest variation occurs in January and December when evaporation is lowest.

Table 2.2-7: Estimated Monthly and Annual Shallow Lake Evaporation Statistics for the Site (1974-2001)

Month	Shallow Lake Evaporation (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	4	0	0	1
February	1	7	12	4	7	10
March	24	32	43	29	32	34
April	52	66	79	59	67	72
May	86	105	140	96	102	115
June	95	122	155	110	121	132
July	110	138	173	123	136	153
August	80	115	137	107	113	130
September	37	61	80	54	60	70
October	18	22	28	20	21	23
November	0	4	8	1	4	6
December	0	0	3	0	0	1
Annual	**606**	**673**	**762**	**648**	**670**	**699**

The mean annual PET rate is estimated to be 863 mm, varying between 744 mm and 1022 mm. Mean monthly PET rates vary between 1 mm in December and January to 171 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly PET occurs in July when PET is greatest, and lowest variation occurs in January and December when PET is lowest.

Table 2.2-8: Estimated Monthly and Annual PET Statistics for the Mount Polley Mine Site (1974-2001)

Month	Potential Evapotranspiration (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	5	0	0	2
February	1	7	11	4	7	10
March	24	41	59	34	42	45
April	68	92	112	83	93	102
May	103	134	178	120	131	149
June	113	150	195	125	155	174
July	124	171	240	151	166	191
August	84	151	199	135	152	174
September	54	89	117	71	89	108
October	17	24	40	20	23	26
November	0	4	9	1	4	6
December	0	1	4	0	0	1
Annual	**744**	**863**	**1022**	**815**	**856**	**925**

The mean annual AET rate is estimated to be 399 mm, varying between 319 mm and 449 mm. Mean monthly AET rates vary between 1 mm in December and January to 89 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly AET occurs in July when AET is greatest, and lowest variation occurs in January and December when AET is lowest. On an annual basis, AET at the Site is less than shallow lake evaporation and PET rates because AET is limited by the availability of water, particularly during the summer months when the air temperature is highest.

Table 2.2-9: Estimated Monthly and Annual AET Statistics for the Mount Polley Mine Site (1974-2001)

Month	Actual Evapotranspiration (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	5	0	0	2
February	1	7	11	4	7	9
March	15	18	25	17	18	19
April	16	31	47	26	30	35
May	42	64	84	60	63	68
June	48	80	98	75	80	86
July	61	89	105	83	89	99
August	51	63	78	57	63	69
September	10	23	35	18	22	29
October	11	17	22	16	17	18
November	0	4	9	1	4	6
December	0	1	4	0	0	1
Annual	**319**	**399**	**449**	**370**	**409**	**419**

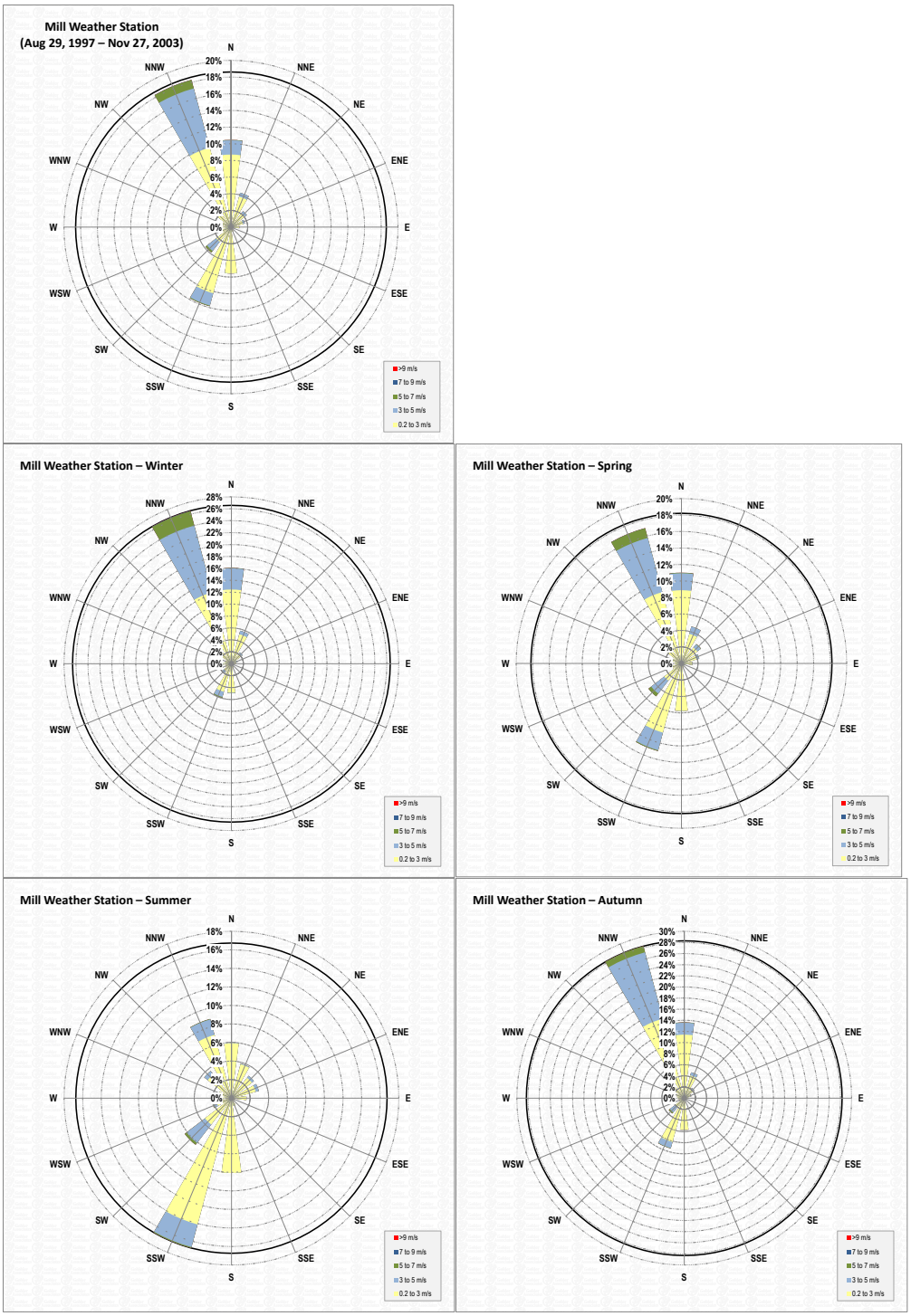
2.2.6 Wind Speed and Direction

Hourly wind speed and direction data are available for the Mine Site from 1997 to 2003, and daily wind speed data are available from 2019 to 2021; however, the data are not continuous. The hourly wind speed and direction data available from 1997 to 2003 were used to develop wind rose plots. A wind rose depicts the relative frequency of wind from a given direction on a 16-point compass. Each ring on the wind rose represents a frequency of 2% of the data period. The length of the shaded bars on each wind rose petal represents the frequency of wind recorded from a given direction within a defined wind speed range. A wind rose is provided for the period of August 1997 to November 2003, and seasonal wind roses are presented to display seasonal variability in wind patterns, where the seasons have been defined as follows:

- Winter – December to February
- Spring – March to May
- Summer – June to August
- Autumn – September to November

Daily wind data recorded from 2019 to 2021 from WS1 and WS2 were wind speed only, no direction. The period of record for WS2 in 2020 are incomplete and are not included in the analysis. The relative frequency (%) of the magnitude of the daily wind speed data recorded at WS1 for 2019 and 2021 were compared to the relative frequency (%) of wind speed magnitude of the data from 1997 to 2003.

A wind rose plot for the Site depicting the relative frequency of mean hourly wind speed and direction, and the seasonal distribution, between 29 August, 1997 and 27 November, 2003 is shown in Figure 2.2-1.



Spring = March, April, May; Summer = June, July, August; Autumn = September, October, November; Winter = December, January, February.

Figure 2.2-1: MPMC Station Monitoring Period and Seasonal Wind Roses – 29 August 1997 to 27 November 2003

Winds measured at the Mine Site typically blew from the north-northwest, north, and south-southwest directions, with minimal winds from the east and the west. The spring, autumn, and winter seasonal wind roses were consistent with the wind rose pattern for the entire monitoring period; however, during the summer months, the majority of winds were from the south-southwest. Similarly, wind speeds in spring, autumn, and winter were generally consistent with the wind rose for the entire monitoring period, while wind speeds in summer were generally lower.

Wind speed measured and seasonal distributions at the Mine Site from 2019 to 2021 were consistent with the relative frequency of wind speed magnitudes and the seasonal distributions recorded between 29 August 1997 and 27 November 2003 (Table 2.2-10). It is noted that the data from 2019 and 2021 are daily wind speed rather than hourly wind speed and only the relative frequency (%) of wind speed magnitude was compared.

Table 2.2-10: Comparison of Relative Frequency of Wind Speed from Mill Weather Station and Weather Station 1 for the Site

Wind Speed (m/s)	Mill Weather Station 29 August 1997 to 27 November 2003[1]	Weather Station 1 1 January 2019 to 31 December 2021[2]
calm	35%	28%
0.2 to 3 m/s	50%	56%
3 to 5 m/s	14%	13%
5 to 7 m/s	2%	3%
7 to 9 m/s	0%	0%
>9 m/s	0%	0%

1) Recorded as hourly wind speed.
2) Recorded as daily wind speed.

2.2.7 Snow Cover Properties

Snow cover data at the Mine Site are available monthly from manual measurements from 1997 to 2022, recorded as snow-water-equivalent (SWE). Measurements, although not continuous, are typically recorded at the beginning and end of a month, with the latter being representative of the monthly SWE. Snow cover monthly statistics, reported as SWE, are presented in Table 2.2-11. At 50% exceedance, snow begins accumulating in November and achieves its maximum in March, reducing to 0 mm in April. The 5th and 95th percentiles and standard deviation values demonstrate the variability in the amount of SWE at the Mine Site, with March having the greatest variability from year to year.

Table 2.2-11: Snow Water Equivalent for the Site (1997-2021)

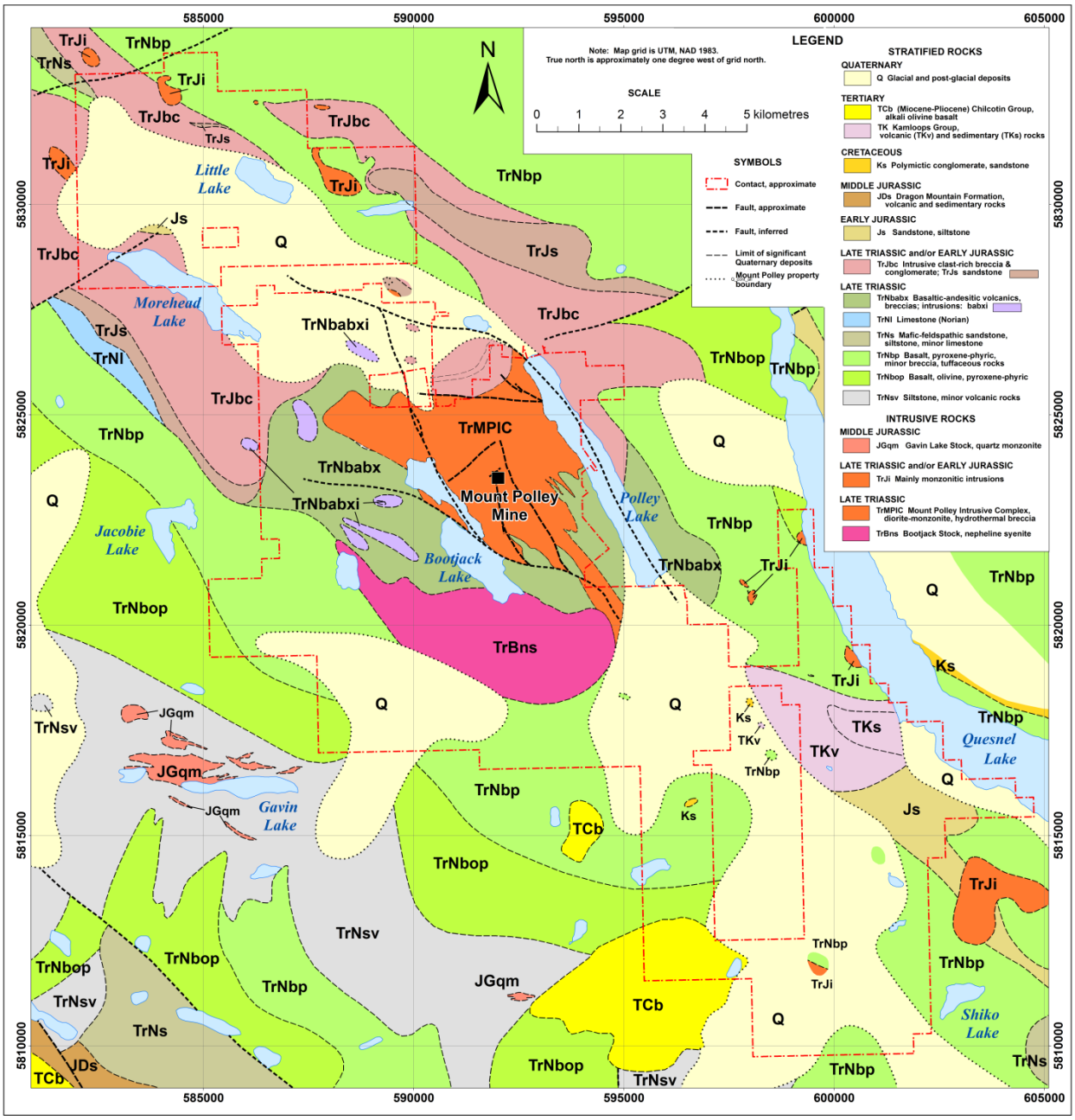
Month	Number of Measurements	Mean (mm)	Minimum (mm)	Percentile					Maximum (mm)	Standard Deviation (mm)
				5%	25%	50%	75%	95%		
January	22	147	76	88	120	139	164	327	339	56
February	22	182	99	104	131	193	222	338	344	61
March	22	185	0	6	97	198	257	403	411	108
April	21	33	0	0	0	0	81	177	177	58
November	22	17	0	0	0	9	37	72	72	25
December	22	102	32	50	77	101	122	193	196	44

2.3 Geology

An understanding of the regional and local geology and the geochemical characteristics of the different mine materials (e.g., waste rock, ore) aids in developing an understanding of how these materials will weather, and to identify the processes that will control the release of constituents under ambient conditions. The following subsections (adapted from the Technical Assessment Report [TAR]) provide a summary of the mine geology and geochemical characteristics that were subsequently used to derive the geochemical source terms (refer to Appendix C of the TAR, Golder 2016a; SRK 2015) for inclusion into the site-wide water quality model (refer to Appendix D of the TAR, Golder 2016a). The subsections of Section 2.3 were written by SRK Consulting (Canada) Inc. (SRK).

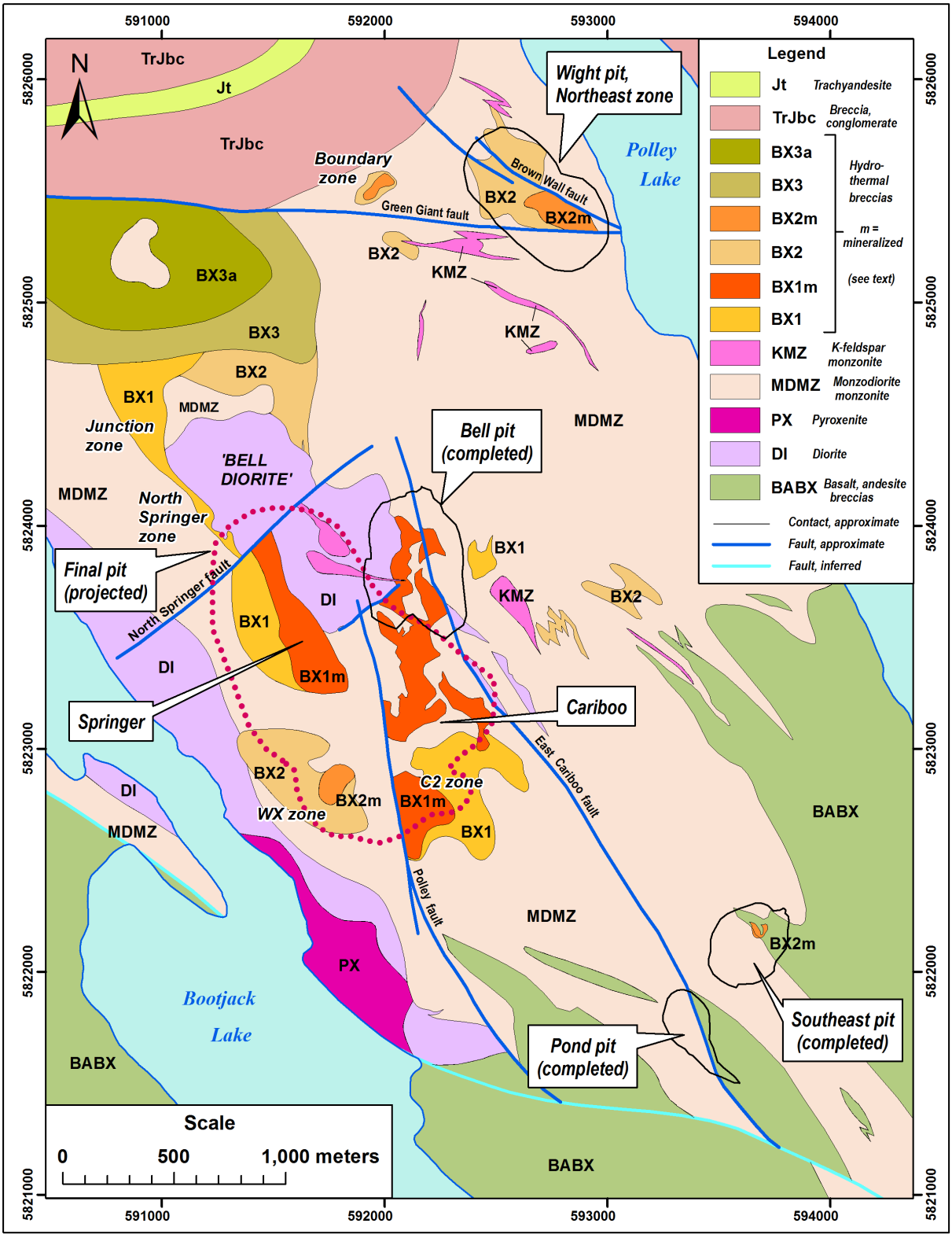
2.3.1 Regional Geology

The mine is in Quesnellia, an accreted terrane in the Intermontane Belt of the Canadian Cordillera. Quesnellia is characterized by Triassic to Jurassic volcanic, sedimentary, and mafic to intermediate intrusive rocks formed in a west-facing arc that developed west of the continental margin of ancestral North America. The mine is within the Mount Polley Intrusive Complex (MPIC), situated in the Central Quesnel Belt, a region of Quesnellia roughly between latitudes 51.5° and 53.5°N (Figure 2.3-1 and Figure 2.3-2). In this area, the arc and a marginal basin immediately to its east were obducted eastwards onto the then continental margin in the late Early Jurassic. Continued crustal shortening in the Middle Jurassic resulted in regional metamorphism and southwest-verging back-folding of the now coupled arc-marginal basin and continental margin assemblages. The mine lies in the core of a broad regional, northwest-trending upright syncline at the western limit of this Middle Jurassic folding. Regional metamorphic grade at the mine is no more than zeolite facies.



Source: Rees 2013.

Figure 2.3-1: Regional Geology of the Mount Polley Property



Source: Rees 2013.

Figure 2.3-2: Simplified Geology of the Mount Polley Intrusive Complex

Stratified Triassic rocks surrounding the site are assigned to the Nicola Group, the type-area of which is in southern Quesnellia, where the Nicola hosts other porphyry copper deposits such as the Highland Valley, Copper Mountain, and New Afton mines. The arc stratigraphy in the Mount Polley district extends from the Middle and Late Triassic Nicola Group into the Early Jurassic. From the base, the Nicola Group consists of Middle to early Late Triassic sedimentary and minor volcanic rocks, overlain by a thick Late Triassic succession of submarine, trachybasaltic volcanics and related tuffaceous sediments and volcaniclastic breccias.
The youngest assemblage, which extended into the Early Jurassic, consists of volcanic, plutonic, and sedimentary rocks representing a more mature stage of arc activity, and more differentiated magmatism, when the MPIC was formed. The youngest arc rocks are polymictic breccia and conglomerate that unconformably overlie the MPIC, and are products of late arc uplift and erosion. In the southern part of the Mount Polley property, Nicola Group country rocks are covered by post-accretion units, including outliers of unnamed Cretaceous sandstone and conglomerate, early Tertiary andesitic volcanic and sedimentary rocks of the Kamloops Group, and Miocene-Pliocene basaltic volcanics of the Chilcotin Group.

2.3.2 Deposit (Ore) Geology

Geological details of the Mount Polley deposit are found in Rees (2013) and the findings are summarized below.

The MPIC hosts the Mount Polley copper-gold porphyry deposit (Figure 2.3-1 and Figure 2.3-2). It is a Late Triassic magmatic centre approximately 6 km by 4 km, elongated in a north-northwest direction. It consists of alkalic, marginally silica-undersaturated intrusions and magmatic-hydrothermal breccias. The age of the deposit is approximately 205 million years based on uranium-lead isotopic dating; there is close agreement between age determinations from MPIC intrusions and minerals associated with sulphide mineralization. Mineralization occurs in almost all constituent rock types of the MPIC, and thus occurred late in its formation. Nearly all economic mineralization is in breccias, or in mineralized stockwork veins in adjacent wall rock intrusion. Country rocks of the Nicola Group closest to the MPIC are mafic to intermediate volcanic and subvolcanic coherent rocks, and related breccias, and may form components of mineralized hydrothermal breccias in the periphery of the MPIC.

2.3.3 Surficial Geology, Terrain, and Geohazard Mapping

The Site is located near the eastern edge of the Fraser Plateau physiographic subdivision, approximately 10 km west of its boundary with the Quesnel Highland subdivision, as defined by Holland (1976). Within the Site, the plateau has somewhat stronger relief, with the Site rising approximately 300 metres (m) above the surrounding terrain. Topographically, the Site area consists of north-south trending ridges of moderate elevation and relief. Local elevations range from 922 masl at Polley Lake to 1,266 masl at the top of Polley Mountain. The area is within the Quesnel Highlands Ecosection as described by Demarchi et al. (1990), and the area has been previously glaciated, which has resulted in the over-deepened Polley and Bootjack lakes.

2.3.4 Natural and Seismic Hazards Assessment

An assessment of geology of the Springer and Cariboo pits was conducted to support an interim pushback of for Phase 5 of mining as a Notice of Departure. The report is titled “Notice of Departure Support Springer Pit Interim Phase 5 Pushback (WSP 2023e). The results of the assessment determined that several major continuous faults are interpreted to exist in the Springer Expansion area, as shown on Figure 2.3-2 (WSP 2023e), and have been exposed along the current pit walls. The approximate surface traces of these major structures on the proposed Interim Phase 5 pushback design are shown in (WSP 2023e). The major structures that will intersect the Interim Phase 5 pushback design are as follows:

- The South Wishbone Fault is a vertical, northeast/southwest trending fault that truncates the mineralized breccia zone to the northwest (WSP 2023e). The Springer Pit wall has performed adequately in the area of the South Wishbone Fault previously with minor raveling along the fault (WSP 2023e). As a result, the South Wishbone Fault is not expected to be a slope stability issue.
- The Springer Fault is a steep, north-south trending, easterly-dipping fault with a dip of approximately 77 degrees. This fault is shown to terminate at the South Wishbone Fault and the Southwest Boundary Fault, to the northwest and southeast, respectively. It intersects the northwest side of the Interim Phase 5 pushback design at an oblique angle. The Springer Pit wall has performed adequately in the area of the Springer Fault previously with limited impact on the overall wall slope stability. As a result, the Springer Fault is not expected to be a slope stability issue.
- The Polley Fault is a wide, steep, north/south trending, easterly-dipping zone of poor quality rock that dips at approximately 73 degrees. The Polley Fault will intersect the central portion of the northeast wall of the Interim Phase 5 pushback design (WSP 2023e). The Polley Fault is a broad zone that raveling has occurred in as mining has progressed and it is anticipated that similar behaviour will occur in the Interim Phase 5 pushback design. As benches are excavated in the Polley Fault, each bench will need to be cleaned prior to excavating the next to maintain adequate catchment for the ravel material.

- The Polley South Boundary Fault is a northeast-southwest trending fault. This fault offsets the mineralized breccia zone and is shown to terminate at the Southwest Boundary Fault to the south. It is difficult to determine an exact fault trace in the current pit wall. It is anticipated that the Polley South Boundary Fault will intersect the Interim Phase 5 pushback design near the Polley and Cariboo South Boundary Faults. The confluence of these faults may cause an area of raveling, but should not affect the overall slope stability due to the oblique angles at which the faults intersect the wall.
- The Cariboo South Boundary Fault is a northeast-southwest trending fault that dips to the southwest at approximately 73 degrees. The fault is pervasive throughout the entire Springer Pit and does not truncate on any other faults. It is difficult to determine an exact fault trace in the current pit wall. It is anticipated that the Cariboo South Boundary Fault will intersect the Interim Phase 5 pushback design near the Polley and Polley South Boundary Faults. The confluence of these faults may cause an area of raveling but should not affect the overall slope stability due to the oblique angles at which the faults intersect the wall.
- The East Cariboo Fault is a northwest-southeast striking fault that dips steeply to the northeast at approximately 86 degrees. The East Cariboo Fault is anticipated to intersect the Interim Phase 5 pushback design in the east corner. Toppling instability has been observed to occur along the easterly dipping faults and joints in the upper weathered monzonite which is in the hanging wall of the East Cariboo Fault. Similar rock mass behavior is anticipated in the area of the Interim Phase 5 pushback as new benches are excavated.

2.3.5 Soil Survey and Soil Characterization for Reclamation

The following description is based on Meister (2010). Most soils at the Mine Site are derived from morainal deposits overlying bedrock. The soils are typically loam to sandy loam in texture and contain 15% to 35% (by volume) coarse fragment content (>2 mm diameter). The pH of the parent material ranges from 6.0 to 7.5 ($CaCl_2$ solution). This reflects the calcareous nature of the underlying bedrock. The calcareous horizon occurs generally at 120 to 150 centimetres (cm) in depth. The organic matter content of the mineral soil is low. The dominant soil development process is the downward translocation of clay particles, resulting in a Bt horizon (characterized by the accumulation of clay) and the development of Brunisolic Gray Luvisol soils. In areas where the Luvisolic soil development is weak, soils are therefore classified as Orthic or Eluviated Eutric Brunisols, reflecting a weaker rate of soil formation. In more acidic areas, the soils are classed as Dystric Brunisols. Detailed soil descriptions and terrain classification from inventories carried out for the Site are provided in Appendix C of the Five-Year Mine Plan and Reclamation Plan (MPRP; Appendix 4-1A).

2.4 Geochemical Characterization and Source Terms

This section provides a summary of the geochemical characterization and source terms for the Mount Polley Mine. A geochemical characterization and analysis of geochemical source terms was updated in 2023 by SRK Consulting, titled “Mount Polley Mine Geochemical Source Terms – 2023 Update” (SRK Consulting 2023, Appendix 2-2).

Supporting analyses for this application involves modelling of water quality at the site and in the receiving environment. Inputs to this model are geochemical source terms which are estimations of the chemistry of water in contact with materials and surfaces exposed by mining activity. Source terms mainly consider the potential for metal leaching and acid rock drainage (ML/ARD).

This section characterizes the materials that will be mined as part of the Project, including an assessment outlining the estimated time to onset of acid rock drainage and/or metal leaching and how it relates to the proposed timeline of the Project, and to describe the derivation and use of the source terms.

The Mount Polley deposit is classified as an alkalic porphyry copper gold deposit. The deposit has been mined from several mineralized zones (Springer, Cariboo, Bell, Southeast, Northeast, Boundary). The proposed extension of the existing Springer and Cariboo pits includes mining in three new zones: Springer Deep Zone, WX Zone, and C2 Zone). With the exception of the distinctive small Pond Zone skarn deposit, all other zones have common geological features including mainly a monzonitic plutonic host rock, association with breccia bodies in the intrusion, dominantly potassic hydrothermal alteration, lack of pronounced pyrite haloes, enrichment in copper and selenium relative to global norms, pervasive calcite, and natural oxide alteration. As a result, geochemical characteristics are consistent between zones, allowing a site- wide approach to geochemical characterization.

The PAG and non-PAG waste rock materials occur locally as pyrite zones but non-PAG dominates. The acid rock generating (ARD) potential was used to segregate waste rock, with non-PAG waste rock being placed in several waste rock dumps and PAG waste rock either deposited in completed pits that are projected to flood at the closure of the mine (in accordance with the management practice of subaqueous disposal) or placed in a temporary stockpile for final disposal in the Springer-Cariboo Pit. Based on review of operational processes and data, non-PAG waste rock is expected to be non-acidic in perpetuity.

Tailings are classified as non-PAG based on operational monitoring and testing of tailings spilled into Hazeltine Creek in August 2014.

Major geochemical sources were identified as waste rock stockpiles and the tailings. Other sources include backfilled waste rock, ore processing, pit walls, ore stockpiles, and magnetite stockpiles. Source terms were mainly developed from conceptual geochemical models then

interpretation of rock geochemical characteristics and seepage data rather than scale-up of laboratory kinetic test data. Pit wall source terms (including PAG walls) were obtained by scaling of kinetic test data. Source terms were not specifically developed for the magnetite stockpiles because they are small sources.

The geochemical characterization and source terms are provided in the Mount Polley Mine Geochemical Source Terms – 2023 Update (SRK Consulting 2023, Appendix 2-2). The updated ML/ARD management program is provided in Section 9.5 of this application.

Waste rock produced by mining has varying degrees of ARD potential which is managed by MPMC to limit the potential for development of ARD in the future. The metric used to date to classify waste rock is the total inorganic carbon neutralization potential (TIC-NP) to acid potential (AP) ratio (TIC-NP/AP) with TIC-NP/AP≤2 defining potentially ARD generating (PAG) materials. SRK Consulting (SRK) has been working with MPMC to refine acid-base accounting procedures and understand the specific factors controlling ARD potential at MPM to support mining of the Springer Deep and WX zones. This work has resulted in development of site-specific acid-base accounting procedures for these specific geological zones that will be mined consistent with theoretical considerations and similar approaches used at other mining operations in BC. An assessment of the NPR to reduce the ratio from 2.0 to 1.5 is provided in the attached document prepared by SRK titled "Evaluation of Acid-Base Accounting Procedures and the Criterion for Classifying ARD Potential of Waste Rock – Springer Deep and WX Zones" (SRK 2023) attached in Appendix 5-1.

2.4.1 Geochemical Characterization

Additional information related to geochemical characterization of materials at the Mine Site can be found in Appendix L of the 5-Year MPRP (Appendix 4-1A). Information contained in this appendix, includes:

- Background of MPMC's geochemical characterization programs
- Information the distribution and ARD potential of the Mine Site
- Plans for PAG disposal
- Sampling procedures
- Responses to finding PAG in non-acid-generating (NAG) areas

Along with other information. Conceptual geochemical modeling of Mount Polley was conducted in 2023 by SRK (Appendix 2-2); information related to geochemical characterization and modelling can be found in the associated report.

Sampling methods for operations are outlined in the ML/ARD Management Plan (Appendix 9-7). Overviews of the geochemical characterizations reported by SRK (2023a; Appendix 2-2) are as follows:

Rock

Understanding of waste rock geochemical characteristics has been accumulated from a variety of sources including diamond drill core tested prior to mining, blast hole cuttings to inform waste rock management operations in the pit during operations, and post-depositional monitoring (Table 3; Appendix 2-2). The database is dominated by the data gathered to operationally characterize waste rock in the Springer Pit, including the Springer Deep Zone. However, the database is incomplete because some of the earlier data were lost, and blast hole data are lacking for Cariboo Pit and Bell Pit. For Cariboo Pit and Wight Pit, confirmatory post-depositional data partly address this gap. For Cariboo Pit, data gathered to operationally characterize waste rock during more recent mining operations in the pit from 2016 – 2019 also addresses this gap.

The inventory primarily contains static ARD potential data, though trace element scans are also available for all zones except the Boundary Pit. Drill core analyses were primarily performed by off-site laboratories and included total sulphur, sulphate, sulphide by difference, total carbonate, neutralization potential (NP by Sobek method), and paste pH. For some samples, a trace element scan was performed. On-site tests were total sulphur and total carbon. The former is assumed to be a proxy for sulphide sulphur because other forms of sulphur (including sulphate) are not common at MPM. The latter is assumed to be a proxy for reactive carbonate minerals.
The assumption is supported by the observed dominance of calcite, the lack of reported iron carbonate and the strong correlation and equivalence of total carbon and total inorganic carbon (TIC) (Figure 3; Appendix 2-2). The dominant plutonic geological setting supports the lack of non-carbonate carbon. As TC equals TIC, NP is represented by carbonate content as represented by TC (NP*).

Tailings

A summary of available data is presented in Table 5: Appendix 2-2. Monthly composite samples of tailings have been collected in the mill when processing since 1997. Tailings samples were also collected from the banks of Hazeltine Creek in 2014 after the TSF breach (“spilled tailings”) along eighteen parallel transects oriented perpendicular to the course of Hazeltine Creek, as described in SRK (2015). Two types of tailings-bearing samples were observed along Hazeltine Creek. They were classified in the field as ‘grey tailings’ and ‘magnetite sands.’ This classification was based on physical and mineralogical characteristics as follows:

- Grey tailings were dominantly grey in colour and had a finer texture (silty sand) than the magnetite sands. They had a strong reaction (referred to as “fizz”) with 10% HCl and did not contain sulphide minerals that were visible by examination with a hand lens.

Mineral identification was difficult due to small grain size, but the dominant minerals included potassium feldspar and plagioclase, with minor biotite mica and quartz.

- Magnetite sands were speckled pinkish-orange and black. They were strongly magnetic and coarser (sand) than the grey tailings. They had weak fizz and trace (less than 1%) sulphide minerals were infrequently noted. The dominant minerals identified included plagioclase feldspar and magnetite. Biotite mica and quartz appeared more abundant than in the grey tailings.

Similar to waste rock, total sulphur is assumed to be a proxy for sulphide sulphur because other forms of sulphur are not common in Mount Polley tailings (SRK 2015a).

Other Sources

Two other sources were identified as potentially requiring geochemical source terms.

Magnetite is recovered from MPM tailings to generate a concentrate for use as a dense medium in coal processing. The magnetite stockpiles are located adjacent to the ore processing plant.

Sulphur was imported in 2004 as part of evaluations of recovery of copper present as oxide. Excess sulphur was stored in a nearby stockpile, first in the Cariboo Pit (2006-2009) and then moved to a crushed rock pad beside the heap leach pad (2009-2018) when mining resumed in the Cariboo Pit. SRK (2022) found the elemental sulphur was composed of about 90% sulphur, and assumed the material had no neutralization potential. Oxidation of the sulphur generated sulphuric acid, which markedly increased the solubility of metals in the surrounding materials that would not otherwise be leachable at neutral pH. In 2018, the excess sulphur was relocated on top of the lined leach pad after evidence showed that water quality on the mine may be affected by contaminated drainage from below the sulphur stockpile (Litke et al. 2019). The affected drainage is seepage from the Northeast Zone (NEZ) Dump, located east of the Test Heap Leach Facility.

2.4.2 Geochemical Source Terms

The geochemical source terms information and analyses including methods, inputs, and model results are provided in Appendix 2-2 (SRK 2023).

2.5 Topography and Surface Drainage Features

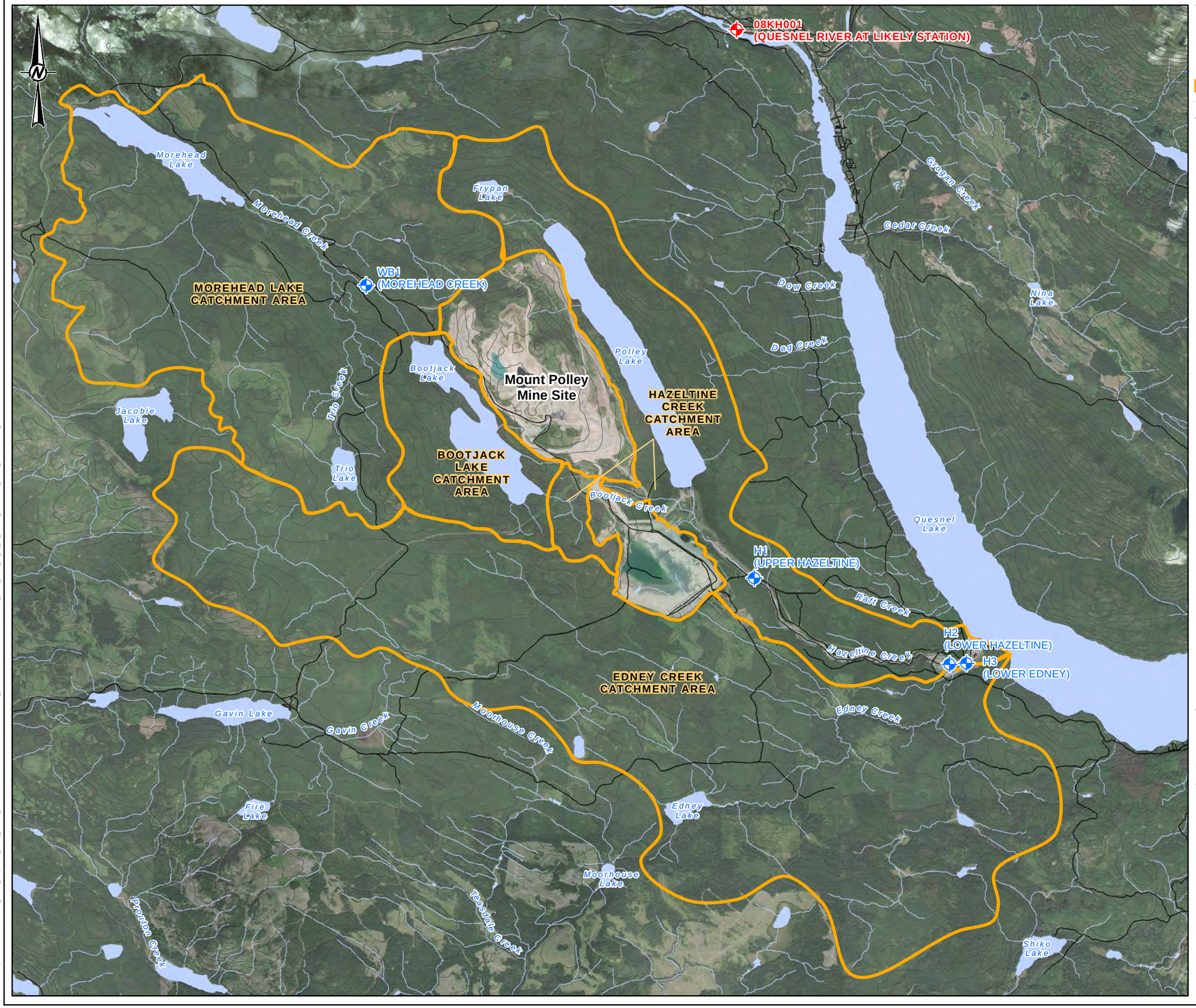
The mine is drained by three main watersheds: Hazeltine Creek (30.2 km^2) at Quesnel Lake, Edney Creek (87.4 km^2) at Quesnel Lake, and the Morehead Lake (62.7 km^2) watersheds (Figure 2.5-1). The Hazeltine Creek watershed also conveys water from Polley Lake, and non-contact water from the east side of the mine and the area surrounding the TSF.
The Morehead Creek watershed encompasses the Bootjack Lake catchment area (11.2 km^2).
The watershed areas listed here exclude the mine, which covers part of the original watersheds.

Both the Hazeltine Creek and the Morehead Creek watersheds were significantly altered by historical (i.e., pre-Mount Polley Mine) water diversions. Bootjack Creek, a small remnant of which now flows into Polley Lake via a constructed diversion channel, historically conveyed water from Bootjack Lake to Hazeltine Creek. In 1913, flow from Bootjack Lake was reversed by miners (not associated with MPMC) damming the east end of Bootjack Lake and digging a new outlet westward to Morehead Creek. Around the same time, a water control structure was also built at the outlet of Polley Lake (Hazeltine Creek), and Hazeltine Creek water was diverted to Bullion Pit to support hydraulic placer mining. Flow from Polley Lake to Hazeltine Creek was restored with the abandonment of mining at Bullion Pit during World War II. However, the flow from Bootjack Lake to Hazeltine Creek was never restored.

Prior to the TSF breach, Edney Creek and Hazeltine Creek converged just prior to discharging into Quesnel Lake. The mouths of the two creeks were separated following the breach and interim remediation works. As of late summer, 2020, Edney Creek and Hazeltine Creek have been reconnected, with in-stream habitat features installed, as part of the conclusion of habitat construction works in the lower Hazeltine Creek and Edney Creek area.

MPMC has maintained a hydrological monitoring station on upper Hazeltine Creek (station H1) that was originally installed by the Water Survey of Canada (08KH027) in 1994. A second gauge (H2) was installed in July 2015 on the lower half of Hazeltine Creek. In general, the hydrology of Hazeltine Creek (and by extension, the mine area), can be described as snowmelt driven, with the majority of annual runoff occurring during the spring snowmelt in April and May (Knight Piesold Ltd. 2014).

The surface water drainage features located on the mine site are provided in Figure 2.5-2. A description of the current drainage system is provided in Section 4.5.1 of the WMP (Appendix 9-4A). Figure 2.5-3 provides the proposed infrastructure topography cross-sections profiles of the Springer Expansion and the SERDS extension.



LEGEND

- MPMC HYDROMETRIC STATION
- ENVIRONMENT CANADA HYDROMETRIC STATIONS
- WATER CATCHMENT AREA
- CONTOUR (10m)
- ROAD
- WATERCOURSE
- WATERBODY

0 1.6 3.2

1:80,000 KILOMETRES

REFERENCES

1. CONTOURS, ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
MAJOR DRAINAGES AND FLOW MONITORING STATIONS

CONSULTANT

wsp

YYYY-MM-DD	2023-11-28
DESIGNED	SC
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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LEGEND

WATER COLLECTION SYSTEMS

- CLEAN WATER DITCH
- CONTACT WATER DITCH
- PIPELINE

0 600 1,200

1:30,000 METRES

REFERENCES

1. WATER MANAGEMENT INFRASTRUCTURE INFORMATION PROVIDED BY MOUNT POLLEY MINING CORPORATION (2016)
2. BASE IMAGERY COPYRIGHT © 20210621 ESRI AND ITS LICENSORS. SOURCE: MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED.
3. DATUM: NAD 1983 UTM ZONE 10N

CLIENT

MOUNT POLLEY MINING CORPORATION

PROJECT

MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE

MOUNT POLLEY MINE LAYOUT

CONSULTANT

wsp

YYYY-MM-DD	2023-11-28
DESIGNED	SL
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
23590671	81100/81112	0	**2.5-2**

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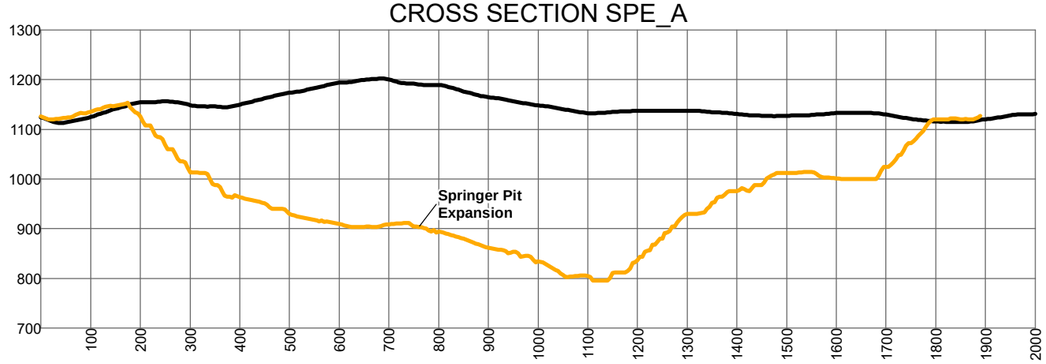

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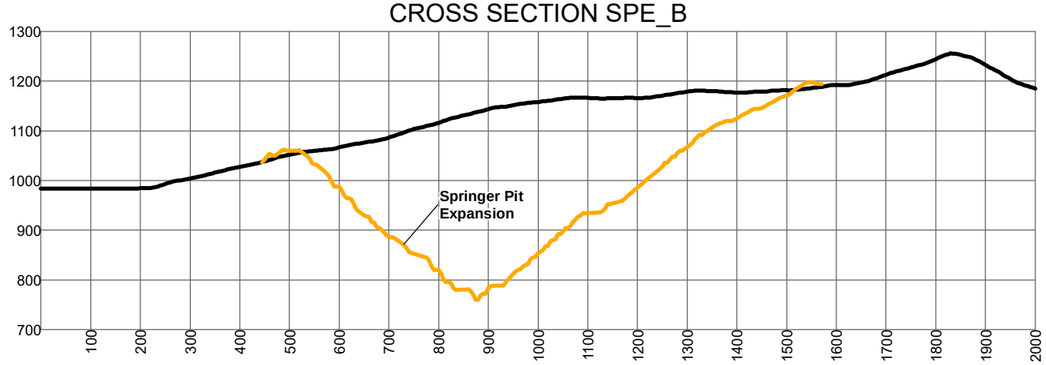

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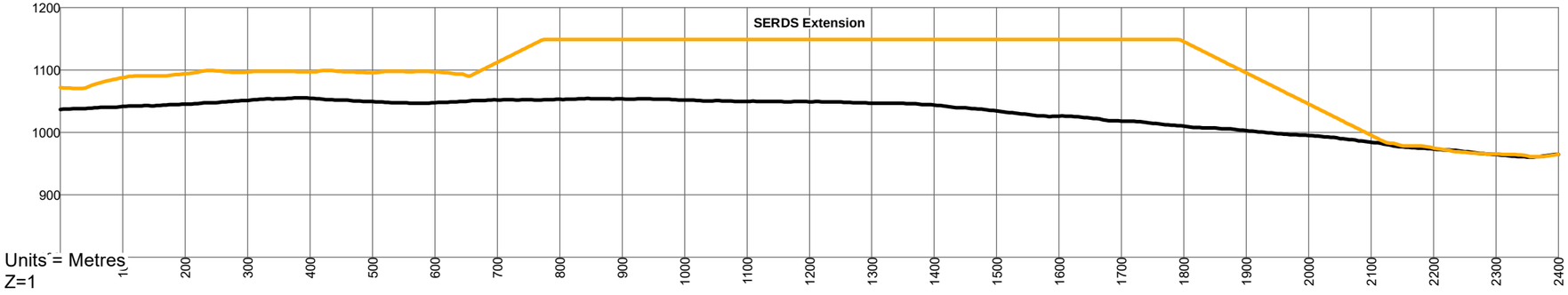

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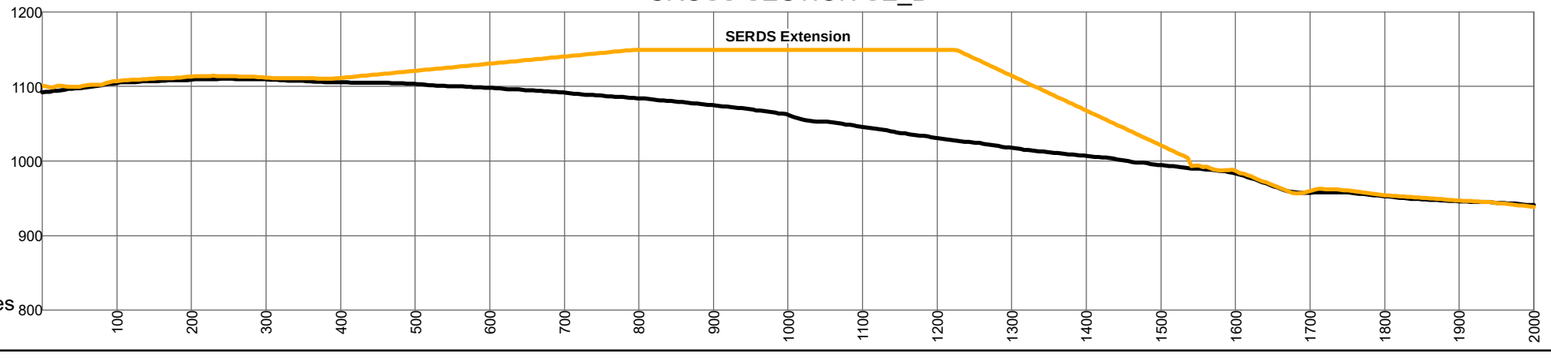

Units = Metres
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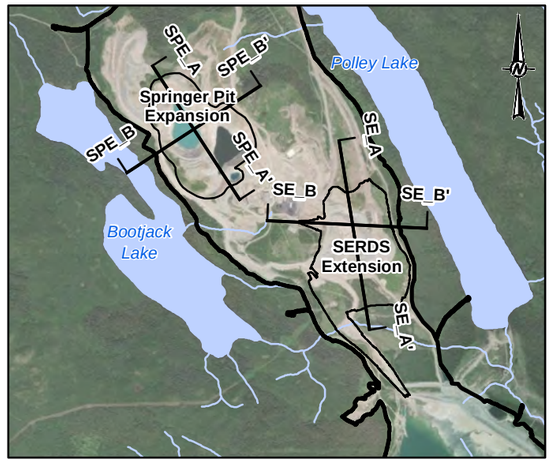
LEGEND

- CROSS-SECTION
- PROJECT COMPONENT
- PERMIT BOUNDARY
- WATERCOURSE
- WATERBODY



0 1,500 3,000

1:75,000 METRES

REFERENCES

1. PERMIT BOUNDARY PROVIDED BY MOUNT POLLEY MINING CORPORATION (2022).
2. BASE DATA CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA.
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4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
TOPOGRAPHY AND SURFACE DRAINAGE FEATURES IN THE MINE SITE AREA

CONSULTANT
wsp

YYYY-MM-DD	2023-11-28
DESIGNED	SL
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
23590671	81100/81112	0	**2.5-3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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2.6 Water Quantity

2.6.1 Surface Water Quantity

The surface water quantity and hydrological information for Mount Polley Mine is provided in Section 3.2.2 of the Water Management Plan (WMP) located in Section 9.6 (Appendix 9-4A; WSP 2023a). The WMP (2023) summarizes the Mine Site drainage and surface hydrology for the three main watersheds: Hazeltine Creek at Quesnel Lake, the Edney Creek at Quesnel Lake, and Morehead Lake watershed. The Site Wide Water Balance Model Update and Calibration technical memorandum is also included in Appendix 2-3.

Baseline hydrology for the site is presented in MPMC's Annual Reclamation Report. For the 2023 report (Appendix 2-4 of this application), hydrology is discussed in Section 4.8 and in Appendix L of the 2023 Annual Reclamation Report.

2.6.2 Groundwater Quantity

In 2016, Golder Associates Ltd. (Golder), now WSP Canada Inc. (WSP) assessed groundwater flow for the following three open pits at the mine: Springer and Cariboo pits, Wight Pit and Boundary Pit. The analysis for each pit was described in a series of technical memoranda in Appendix B of the TAR (Attachments C, D, E, and F; Golder 2016a). Hydrogeological assessments for the pits were conducted as part of the TAR to provide estimates of seepage into and out of the pits. The hydrogeological model recalibration and update was completed by WSP in May 2024. Results are provided in WSP (2024) and summarized in section 5.5.2 herein.

2.7 Water Quality

The quality of surface and groundwater is summarized in this section. Monitoring in Quesnel Lake and of groundwater on the Mine Site is ongoing, following the methods outlined in the Comprehensive Environmental Monitoring Plan (CEMP; Appendix 7-1). Additional information regarding the on-going water monitoring programs is provided in Section 9.0 Management Plans. Historic and current surface water quality for the PAG stockpile and of NAG storage facilities that are intended to receive material with NPR between 2 and 1.6 are discussed in Section 2.6.3 of the Site-Wide Water Quality Report (Appendix B of the WMP; Appendix 9-4A).

2.7.1 Surface Water Quality

2.7.1.1 Selection of Water Quality Guidelines

BC Water Quality Guidelines (WQGs) have been developed by BC ENV to be protective of various water uses, such as aquatic life, wildlife, drinking water sources, recreational contact, and agriculture (livestock watering and irrigation). Based on the uses identified for Quesnel Lake in Section 1.3.3, guidelines protective of aquatic life, wildlife, drinking water sources, and recreational contact are applicable to these receiving environments, and when WQGs for the protection of aquatic life are met, other water uses are expected to be protected (Table 2.7-1) because water quality guidelines are generally more conservative than the guidelines for other uses. An exception is for molybdenum, for which the WQG for the protection of wildlife is the lowest guideline.

Table 2.7-1: BC WQGs for Receiving Environment Uses

Parameter	Unit	Maximum BC Drinking Water Guidelines	Maximum BC WQGs		Chronic BC WQGs	
			Aquatic Life	Wildlife	Aquatic Life	Wildlife
General Water Quality Parameters						
pH	-	6.5-8.5	6.5-9	5-9.5	6.5-9	5-9.5
Dissolved Oxygen	mg/L	-	5[a]	-	8[a]	-
Total Dissolved Solids	mg/L	-	-	-	-	1000
Major Ions						
Calcium	mg/L	-	-	-	-	1000
Chloride	mg/L	250[b]	600	600	150	-
Fluoride	mg/L	1.5	1.1[I]	1.5	-	1.0
Sulphate	mg/L	500[b]	-	-	218[d]	1000
Nutrients						
Ammonia	Mg-N/L	-	1.29[e]	-	0.175[e]	-
Nitrate	mg-N/L	10	32.8	100	3	-
Nitrite	mg-N/L	1	0.060[f]	10	0.02[f]	-
Total Phosphorus	mg-P/L	0.01[c]	-	-	0.005–0.015	-
Total Metals						
Aluminum	mg/L	9.5	-	5	0.19[g]	-
Antimony	mg/L	0.006	-	-	0.009W	-
Arsenic	mg/L	0.01	-	-	0.005	0.025M
Barium	mg/L	-	-	-	1W	-
Beryllium	mg/L	0.004W	-	-	0.00013W	0.1
Boron	mg/L	5	-	-	1.2	5
Cadmium	mg/L	0.005	-	0.08	-	-
Chromium	mg/L	-	-	-	0.001W[h]	0.05W[h]
Cobalt	mg/L	-	0.11	-	0.004	1
Copper	mg/L	2	-	0.3	-	-
Iron	mg/L	-	1	-	-	-
Lead	mg/L	0.005	0.037[i]	0.1	0.0048[i]	-
Manganese	mg/L	-	1.1[j]	-	0.84[j]	-
Mercury	mg/L	0.001	-	0.003	0.00001[k]	-
Molybdenum	mg/L	0.088	46	-	7.6	0.034/0.284[l]
Nickel	mg/L	0.08	-	-	0.025W[m]	1
Selenium	mg/L	0.01	-	-	0.002	0.002
Silver	mg/L	-	0.0001[n]	-	0.00005[n]	-
Thallium	mg/L	0.002	-	-	0.0008W	-
Uranium	mg/L	-	-	-	-	0.2
Vanadium	mg/L	-	-	-	-	0.1
Zinc	mg/L	3	-	-	-	2

Table 2.7-1: BC WQGs for Receiving Environment Uses

Parameter	Unit	Maximum BC Drinking Water Guidelines	Maximum BC WQGs		Chronic BC WQGs	
			Aquatic Life	Wildlife	Aquatic Life	Wildlife
Dissolved Metals						
Cadmium	mg/L	-	0.00031[(q)]	-	0.00013[(q)]	-
Copper	mg/L	-	0.0070[(r)]	-	0.0022[(r)]	-
Iron	mg/L	-	0.35	-	-	-
Zinc	mg/L	-	28.4[(s)]	-	5.29[(s)]	-

Note:

(a) = Guideline for dissolved oxygen is the water column instantaneous minimum value for embryo / alevin life stages. The water column 30-day mean for embryo / alevin life stages is 8 mg/L.

(b) = Guideline is based on an aesthetic objective rather than a health-based objective.

I(c) = Hardness dependent fluoride guideline: BC Max WQG (mg/L) = 0.4 mg/L if hardness <10 mg/L, otherwise use -51.73+(92.57*log(hardness))*0.01 mg/L.

(d) = Hardness dependent sulphate guideline: BC 30-day WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determined base on site water.

(e) = pH and temperature dependent ammonia guideline: values selected from the BC WQGs for Nitrogen (Nitrate, Nitrite, and Ammonia) technical document based on a temperature of 20°C and 8.7 pH.

(f) = Chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 mg/L = 0.30, at Cl >10 mg/L = 0.6; BC 30-day WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 mg/L = 0.2, determined based on Cl <2 mg/L considered representative of average conditions in the receiving environment.

(g) = Hardness, pH and dissolved organic carbon dependent total aluminum guideline: BC Max WQG (mg/L) = ((*e*^((0.645∗ln(DOC)+(2.255∗ln(hardness))+(1.995∗pH)+(−0.284 ∗(ln(hardness) ∗ pH))−9.898))/3)/1000

(h) = Guideline is for chromium VI (Cr(VI)).

(i) = Hardness dependent lead guideline: BC Max WQG (mg/L) = 0.003 mg/L if hardness <8, otherwise use exp(1.273*ln(hardness)-1.46)/1000 mg/L; BC 30-day WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) – 4.704))/1000 at hardness >8 mg/L.

(j) = Hardness dependent manganese guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-day WQG (mg/L) = 0.0044*hardness+0.605.

(k) = Mercury BC 30-day WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

(l) = Molybdenum guideline for wildlife is specific to wildlife physiology, ruminant (0.034 mg/L) and non-ruminant (0.284 mg/L) wildlife.

(m) = Hardness dependent nickel guideline: BC 30-day WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.11 at hardness >180 mg/L.

(n) = Hardness dependent silver guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-day WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.0015.

(o) = Hardness dependent zinc guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-day WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

(p) = pH dependent dissolved aluminum guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = exp(1.209-2.426*(pH)+0.286*(pH2)); BC 30-day WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = exp(1.6-3.327*(median pH)+0.402*(median pH2), determined based on 7.0 pH.

(q) = Hardness dependent dissolved cadmium guideline: BC Max WQG (mg/L) = (exp(1.03*ln(hardness)-5.274))/1000; BC 30-day WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

(r) = Hardness, dissolved organic carbon, and pH dependent copper guideline is applied to total and dissolved fraction. The guideline is selected from the Copper Water Quality Guideline Look-up Table. The copper guideline is based on mean baseline hardness (54 mg/L), pH (8.8), and DOC (0.05 mg/L) in Quesnel Lake, considered representative of average conditions in the receiving environment.

(s) = Zinc guideline for aquatic life is pH, DOC, and hardness dependent. BC Max WQG (mg/L) = exp(0.833[ln(hardness)] + 0.240[ln(DOC)] + 0.526)/2*1000 between hardness 23.4 and 399 (mg CaCO3/L), pH 6.5 and 8.13 and DOC of 0.3 to 22.9 (mg/L) and BC 30-day WQG (mg/L) = exp(0.947[ln(hardness)] − 0.815[pH] + 0.398[ln(DOC)] + 4.625)/2*1000 between hardness 23.4 and 399 mg CaCO3/L, pH 6.5 and 8.13 and DOC 0.3 to 22.9 mg/L

Physical parameters with WQGs such as dissolved oxygen, TSS, turbidity, and pH were not modelled.

W = working guideline; M = interim guideline; Min = Minimum concentration requirement based on life stage; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; TSS = total suspended solids.

2.7.1.2 Quesnel Lake

Water quality data collected routinely by MPMC from 2015 to present in Quesnel Lake are summarized here to characterize water quality at the point of discharge in Quesnel Lake and compare the water quality to reference locations.

Surface water quality sampling is conducted at a minimum four times per year at the following exposure locations (Figure 2.7-1):

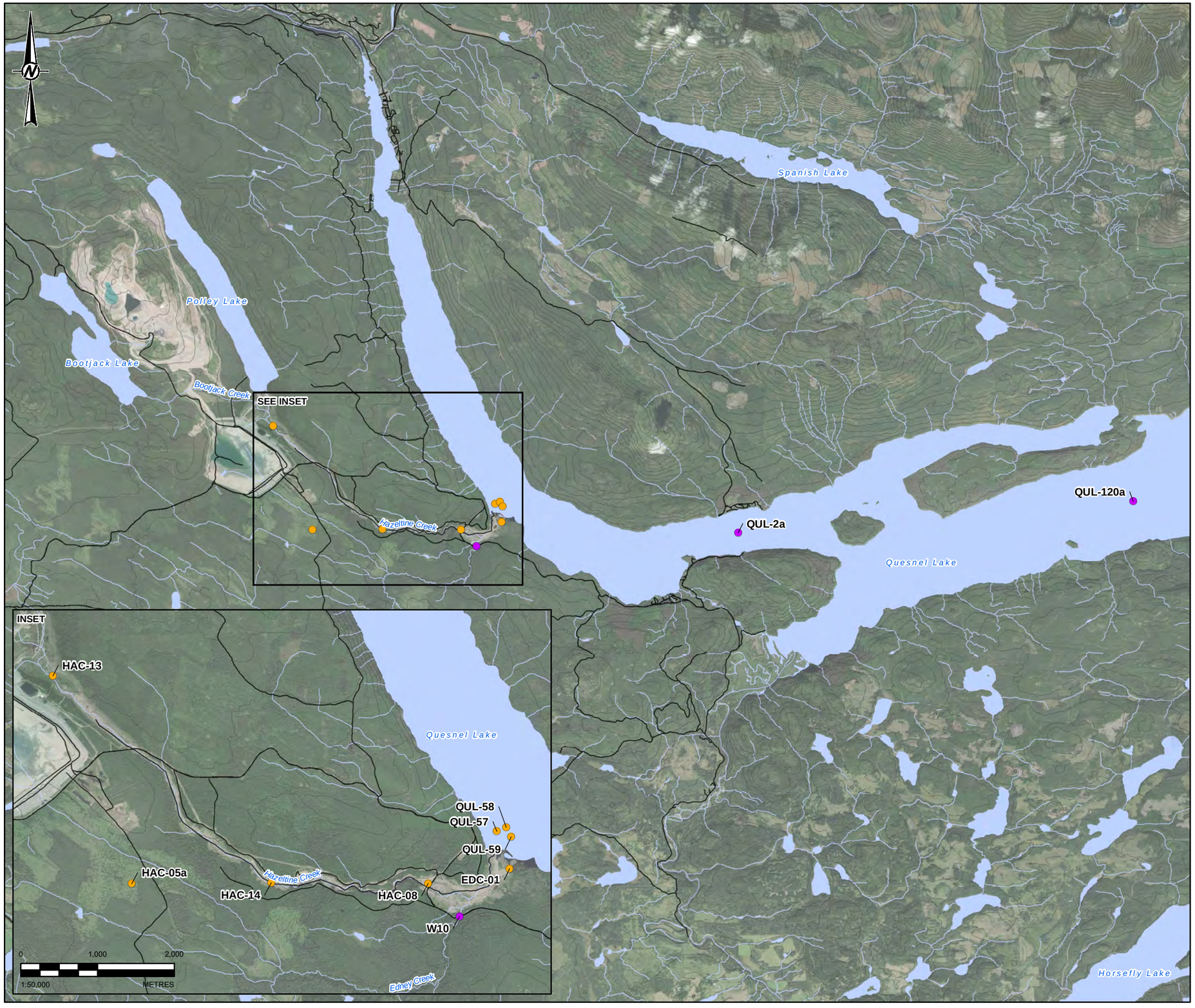
- Stations QUL-57, QUL-58, and QUL-59, which are at the edge of the Initial Dilution Zone (IDZ) 100 m from the point of discharge. Per the CEMP, the objective of this sampling is to "verify that the discharge of treated effluent is not causing an exceedance of the applicable ambient BC Water Quality Guidelines at the edge of the IDZ, as required by the Permit, and to verify the discharge model, as described in the Annual Discharge Plan (ADP; MPMC 2018)".

Reference samples are collected from the following stations:

- **QUL-2a –** (four times per year) in the West Basin upstream of the mouth of Hazeltine Creek, to monitor for potential eastward flow of effluent due to seiche (wind-driven) events. Per the CEMP, QUL-2a is monitored for the purpose of model verification and is considered a Quesnel Lake reference site.
- **QUL-120a –** (twice per year) east of Cariboo Island in the main portion of the West Arm of Quesnel Lake. Per the CEMP, QUL-120a is monitored for the purpose of model verification and is considered a Quesnel Lake reference site.

Background concentrations were not readily available during model derivation as only one year (2015) of relevant water quality data for Quesnel Lake sites was available at that time, and sites nearest the discharge were potentially affected by the 2014 tailings breach. Considerable effort was made to source pre-breach background data on Quesnel Lake water quality; however, relevant data could not be located (McMahen 2015). Therefore, background conditions were defined based on the most distant upgradient site available, QUL-120a. MPMC continues to collect sample data from both QUL-120a and QUL-2a to fulfill reference requirements and regulatory expectations.

Between 2015 and 2022, all sampling events for these locations occurred as required by the applicable Discharge Management Plan (2015), or CEMP, as summarized in the Annual Environmental Reports. Further details on the monitoring program are provided in Section 9.0.



LEGEND

SAMPLING LOCATION

- EXPOSED
- REFERENCE
- ROAD
- CONTOUR (10m)
- WATERCOURSE
- WATERBODY

0 2,000 4,000

1:100,000 METRES

REFERENCES

1. BASE DATA CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA.
2. BASE IMAGERY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY.
3. DATUM: NAD 1983 UTM ZONE 10N

CLIENT

MOUNT POLLEY MINING CORPORATION

PROJECT

MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE

2015 TO 2023 WATER QUALITY SAMPLING LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2023-11-28
DESIGNED	KM
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
23590671	81100/81112	0	**2.7-1**

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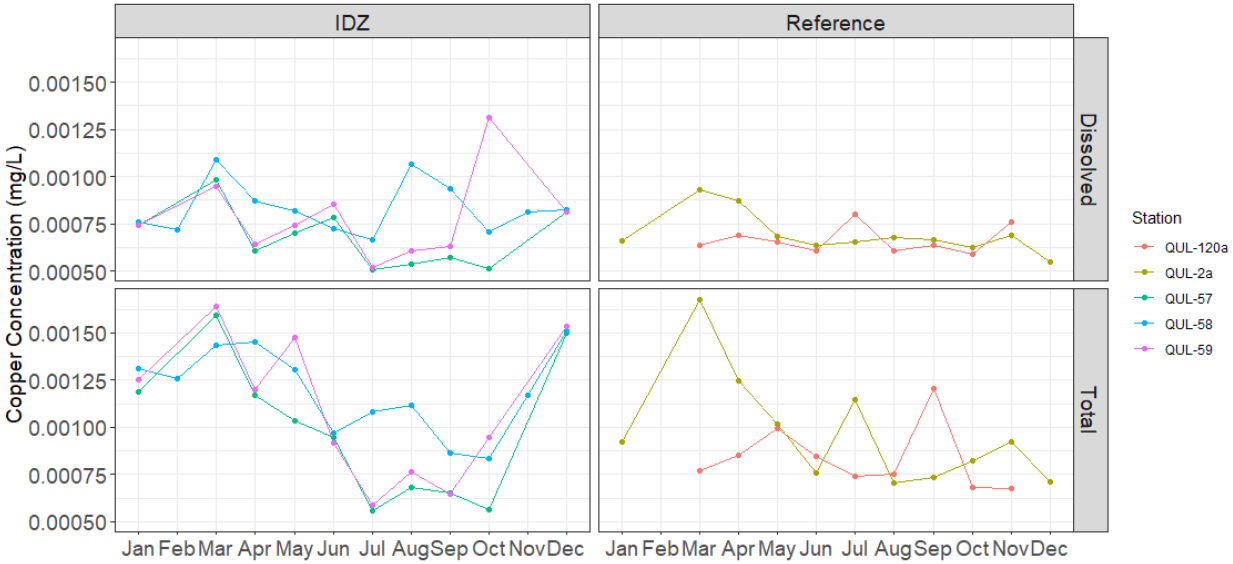
The water quality results for 2015 to present is provided in Appendix 2-5 and are screened against BC WQGs in Appendix 2-5 Tables 2-2A and 2-2B. Copper and selenium are discussed here because their concentrations in effluent from the WTP were greater than their respective BC WQGs. The remainder of measured parameters were consistently below their respective BC WQGs.

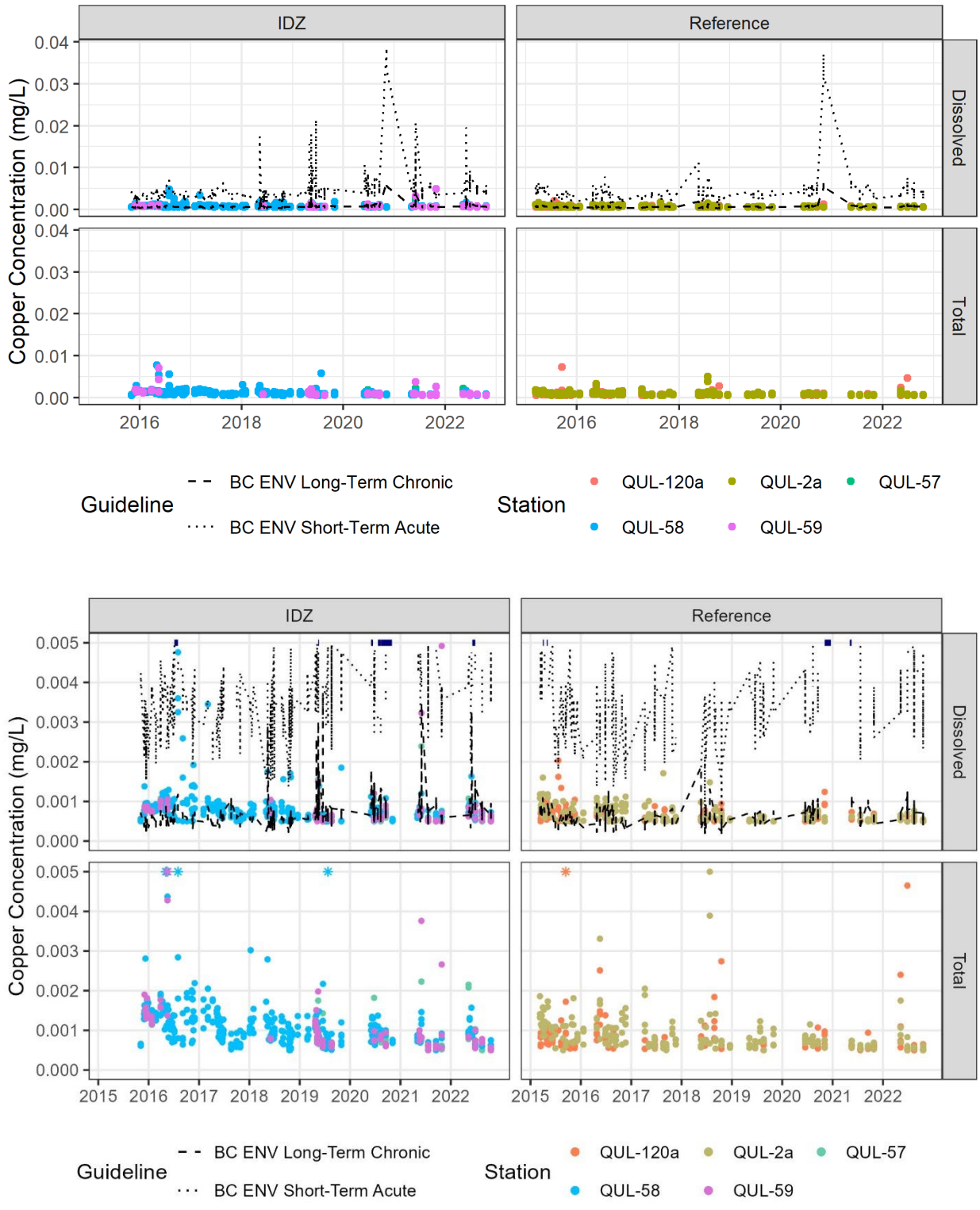
The monthly average concentrations from 2015 to 2022 for total and dissolved copper were plotted for the reference (QUL-2a and QUL-120a) and IDZ (QUL-57, QUL-58, and QUL-59) stations in Quesnel Lake (Figure 2.7-2). The copper concentrations at both reference and IDZ stations fluctuate throughout the year, with the highest average concentrations in early spring or late fall. Monthly average copper concentrations in samples collected at reference stations are generally within the same range of the monthly average copper concentrations for samples collected at the IDZ. The October average of 0.0013 mg/L dissolved copper observed at station QUL-59 in Figure 2.7-2 was influenced by a transient event observed at HAD-3 resulting in a copper concentration at QUL-59 of 0.0049 mg/L (see Table 6.1-1, 27 October 2021, and the Trigger Response Plan [MPMC 2018]). Mount Polley has attributed this transient event is likely due to three corresponding phenomena on Site; change in water chemistry in the Springer Pit during dewatering, overflow from the TSF booster station, and treatment plant optimization that relied on outdated site water storage chemistry. The monthly average for October at QUL-59 excluding the transient event is 0.00059 mg/L in comparison to 0.0013 mg/L.



mg/L = milligrams per litre.

Figure 2.7-2: Monthly Average Copper Concentration from 2015 to 2022 at Stations Representing the IDZ (QUL 57, QUL 58, QUL 59) and the Reference Stations in Quesnel Lake (QUL 2a and QUL 120a)

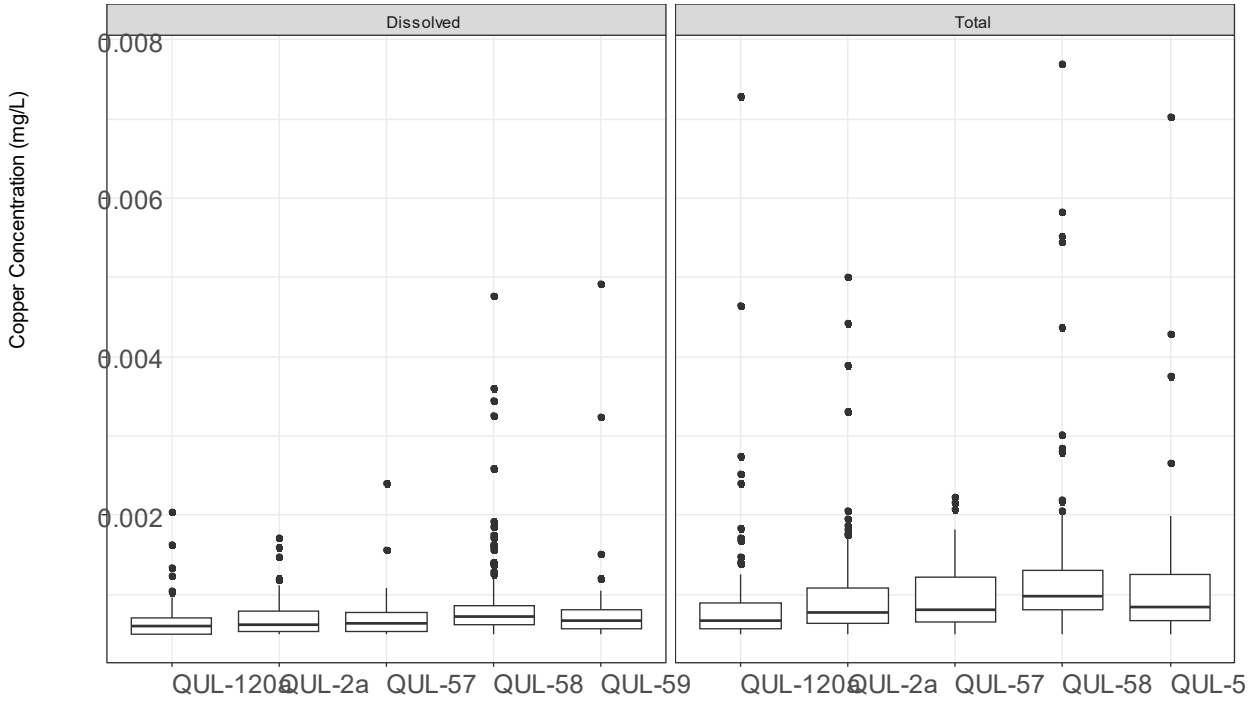
The dissolved copper concentrations measured at IDZ stations (QUL-57, QUL-58, QUL-59) and the reference stations (QUL-2a, QUL-120a) in Quesnel Lake from 2015 to present were screened against chronic and acute BC WQGs (Figure 2.7-3, Appendix 2-4C and 2-4D). The chronic and acute BC WQGs for copper are dependent on the exposure and toxicity modifying factors: hardness, pH, and dissolved organic carbon. Sample-specific exposure and toxicity modifying factors were used to determine the chronic and acute BC WQGs. Dissolved copper concentrations were consistently above the sample-specific long-term chronic BC WQG and below the short-term acute BC WQG.



Notes: The BC ENV copper water quality guidelines are sample-specific and determined using hardness, pH, and dissolved organic carbon (Appendix 2-4C and 4D). For data readability, the y-axis is from 0.000 mg/L to 0.005 mg/L. Measured copper concentrations greater than 0.005 mg/L are noted with an asterisk and water quality guidelines greater than 0.005 mg/L are noted with a navy line.

Figure 2.7-3 Copper Concentration from 2015 to Recent at Stations Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a, QUL-120a)

Boxplots were also generated with total and dissolved copper concentrations from samples collected from 2015 to 2022 at reference and IDZ stations (Figure 2.7-4). The boxplots display summary statistics for a large dataset and illustrate water quality parameter variability between monitoring locations (i.e., the larger the box, the larger the interquartile range and increased variability within the dataset). The boxes for the reference stations (QUL-2a, QUL-120a) overlap with the boxes for the IDZ stations (QUL-57, QUL-58, QUL-59) suggesting copper concentrations in Quesnel Lake at the edge of the IDZ are similar to the furthest reference station.



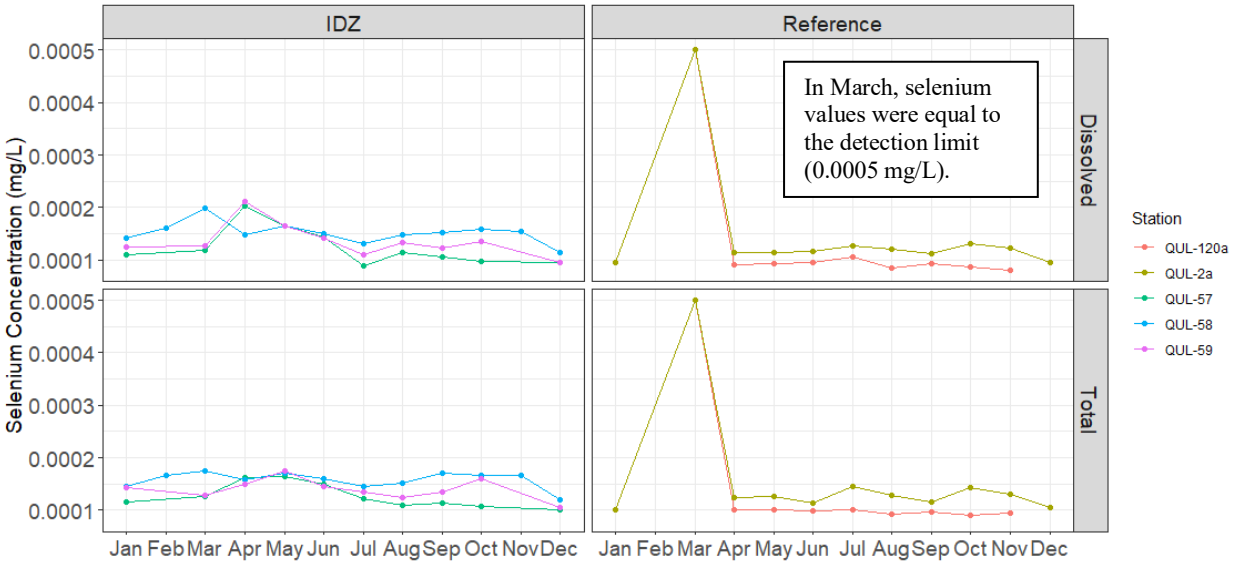
Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.
Dissolved copper: QUL-120a (n = 166), QUL-2a (n = 204), QUL-57 (n = 79), QUL-58 (n = 345), QUL-59 (n = 86).

Total copper: QUL-120a (n = 166), QUL-2a (n = 204), QUL-57 (n = 79), QUL-58 (n = 345), QUL-59 (n = 86).

Mg/L = milligrams per litre.

Figure 2.7-4: Boxplot of Copper Concentrations from 2015 to 2022 Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a)

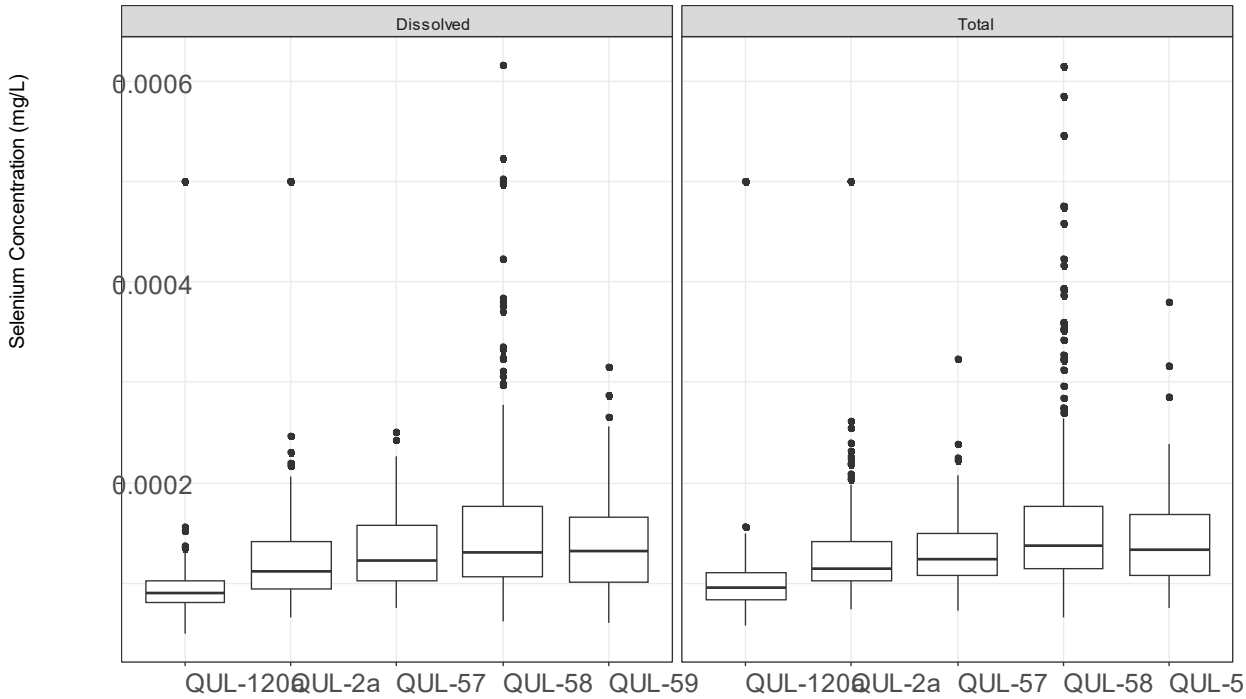
The monthly average concentrations for total and dissolved selenium were similarly plotted as time series (Figure 2.7-5) and boxplots (Figure 2.7-6). Monthly average selenium concentrations were similar from month to month at both the edge of the IDZ and reference stations and were below the BC WQG. The samples collected from reference stations in March (in 2015, the only year from 2015 to 2020 when water quality monitoring was conducted in March) had a detection limit of 0.0005 mg/L, which is above the detected concentrations in samples collected in other months.



The value at reference sites in March was represented by one sampling event in which the detection limit was 0.0005 mg/L (i.e., the illustrated value is the detection limit).

Mg/L = milligrams per litre.

Figure 2.7-5: Monthly Average Selenium Concentration from 2015 to 2022 at Stations Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a).



Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

Dissolved selenium: QUL-120a (n = 166), QUL-2a (n = 204), QUL-57 (n = 79), QUL-58 (n = 345), QUL-59 (n = 86).

Total selenium[a] QUL-120a (n = 33[a]), QUL-2a (n = 410), QUL-57 (n = 181), QUL-58 (n = 577), QUL-59 (n = 201).

mg/L = milligrams per litre.

Figure 2.7-6: Boxplot of Selenium Concentrations from 2015 to 2022 Representing the IDZ (QUL-57, QUL-58, QUL-59) and the Reference Stations in Quesnel Lake (QUL-2a and QUL-120a)

2.7.1.3 Hazeltine Creek

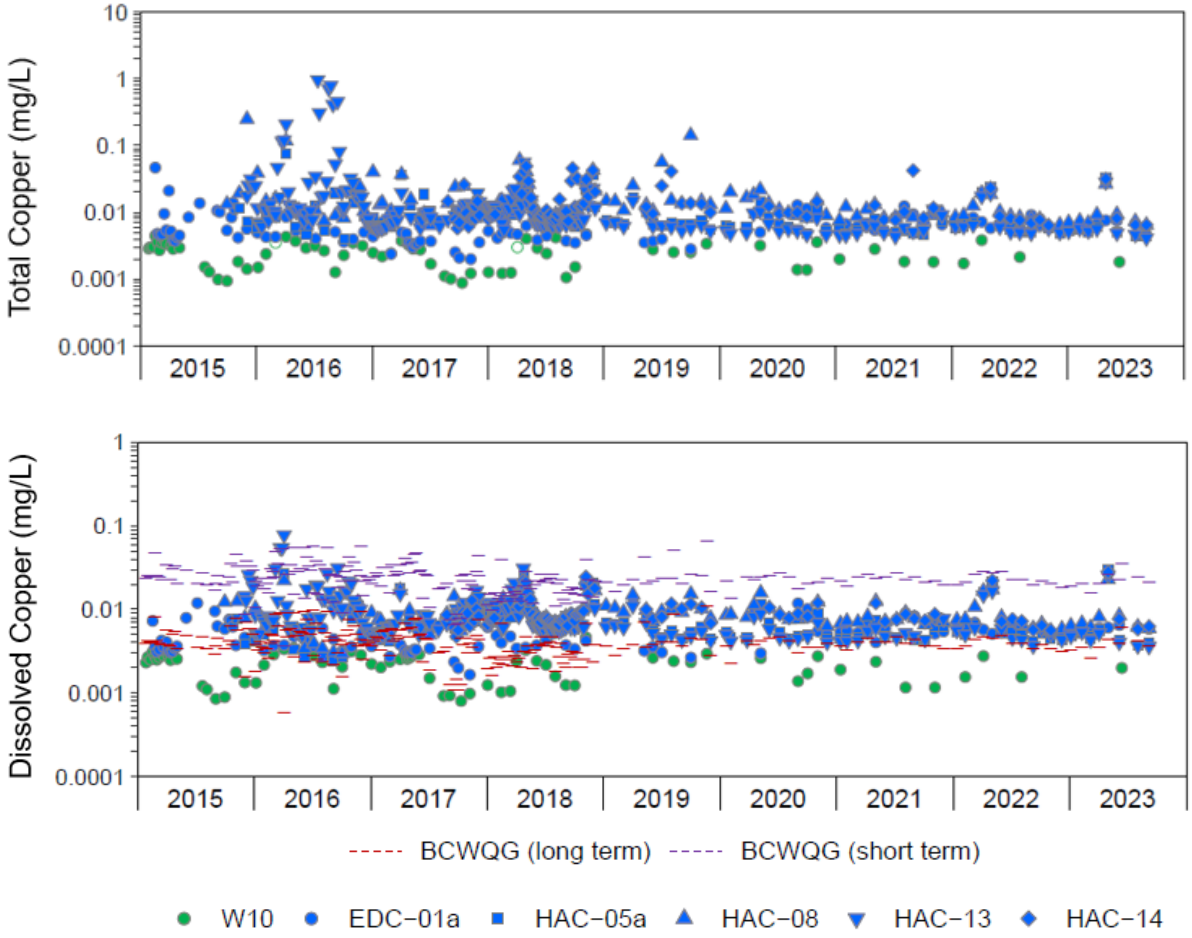
Water quality data collected routinely by MPMC from 2015 to present are summarized here and were originally presented in the 2021 and 2022 Mount Polley CEMP – Sediment and Aquatic Life reports (Appendix 2-5).

The objective of the effluent monitoring program is to verify that the discharged water chemistry and toxicity results meet the applicable regulatory limits at the point of discharge (Metal and Diamond Mine Effluent Regulations [MDMER] Schedule 4 and Section 1.2.4 of PE-11678, and that the discharge flow rate does not exceed the permitted rates of a maximum 52,000 m^3/day and an annual average of 29,000 m^3/day [Section 1.2.1 in PE-11678]). The influent is also sampled to allow for evaluation of treatment efficacy and identification of potential/emerging source control needs.

For effluent characterization, the following routinely monitored mine-influenced stations within Hazeltine Creek are reported on (HAC-05a and HAC-13 [Upper Hazeltine Creek], HAC-08 and HAC-14 [Lower Hazeltine Creek]) and compared to an associated reference area (lower Edney Creek at station W10). Sample collection and analysis methods are described in Appendix 2-6.

The water quality results for in Hazeltine Creek stations HAC-05a, HAC-08, HAC-13, HAC-14, and EDC-01a, and the reference location in Edney Creek (W10) from 2015 to present were screened against BC WQGs (Appendix 2-7). Copper and selenium are discussed here as their concentrations in effluent from the WTP were greater than the BC WQGs.

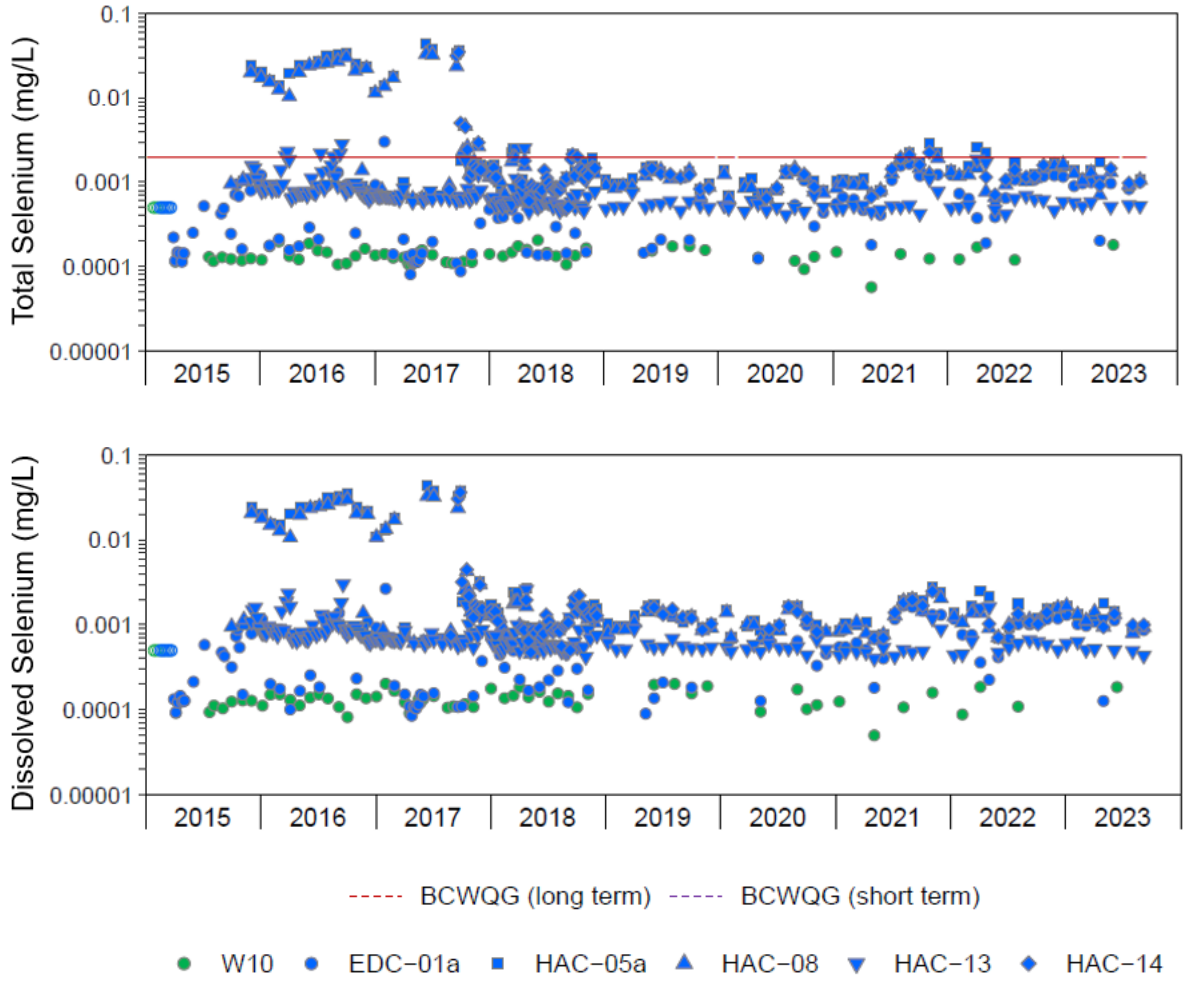
Total and dissolved copper concentrations from 2015 to present in Hazeltine Creek were consistently above copper concentrations in the associated reference location, Edney Creek (W10; Figure 2.7-7). Total copper concentrations were greatest at HAC-08 in 2016 with maximum total copper concentrations of approximately 1 mg/L, Mount Polley hypothesized that the elevated concentrations were likely related to spring runoff flows that conveyed higher total suspended solids (TSS) loads and associated copper to the WTP and discharge was ceased until copper concentrations met the effluent quality defined by the permit (see Table 6.1-1, April 2016 and the Trigger Response Plan [MPMC 2018]). Concentrations of dissolved copper were generally above the long-term chronic BC WQG and below the short-term acute BC WQG. Copper concentrations were relatively consistent from 2019 to recent, with some seasonal fluctuations associated with freshet.



Note: mg/L = milligrams per litre, BC WQG = British Columbia Water Quality Guideline. Green represents reference stations and blue represents exposed stations. Concentrations reported the detection limit are open symbols at the detection limit. Values displayed for the BCWQG are condition specific (based on hardness, pH, and DOC calculated with Biotic Ligand Model). Monitoring station EDC-01 was relocated in Q4 2020 and renamed as EDC-01a for a new monitoring station. Figures are from Minnow 2023.

Figure 2.7-7: Total (top) and Dissolved (bottom) Copper Concentrations in Surface Water Samples from Hazeltine Creek (HAC13, HAC-05a, HAC-14, HAC-08) and Edney Creek (EDC-01a, W10) from 2015 to Present

Total and dissolved selenium concentrations from 2015 to present in Hazeltine Creek were consistently higher than selenium concentrations in the associated reference location, Edney Creek (W10) and generally lower than the long-term chronic BC WQG (Figure 2.7-8). Exceptions occurred at HAC-05a and HAC-08 in 2016 and 2017 likely a result of residual breach-related influence on water quality in Hazeltine Creek.



Note: mg/L = milligrams per litre, BC WQG = British Columbia Water Quality Guideline. Green represents reference stations and blue represents exposed stations. Concentrations reported the detection limit are open symbols at the detection limit. Total selenium BC WQG is 0.002 mg/L. Monitoring station EDC-01 was relocated in Q4 2020 and renamed as EDC-01a for a new monitoring station. Figures are from Minnow 2023.

Figure 2.7-8: Total (top) and Dissolved (bottom) Selenium Concentrations in Surface Water Samples from Hazeltine Creek (HAC13, HAC-05a, HAC-14, HAC-08) and Edney Creek (EDC-01a, W10) from 2015 to Present

2.7.2 Groundwater Quality

Groundwater monitoring has been ongoing at the mine site since 1995 with the objectives to monitor direction, quantity, and quality of groundwater seepage near the mine (Appendix 2-8). The groundwater monitoring program outlined in the Annual Groundwater Monitoring Report (Appendix 2-8) consists of numerous multi-level monitoring wells (deep and shallow wells), and single wells surround the mine site. Sample collection and analysis methods are provided in Appendix 2-8. Monitoring locations were selected and assessed here to characterize existing groundwater quality near Springer Pit and are shown in Figure 2.7-9. Below is a summary of the selected groundwater monitoring wells and the sampling frequency:

- In 2022, the groundwater samples collected on the west side of Springer Pit (GW15-1a, GW15-1b, GW12-2a, GW12-2b, GW15-2a, GW15-2b) were sampled semi-annually (spring and fall) with the exception GW15-2a, GW12-2(a,b) which were sampled quarterly and GW15-2b which was sampled three times.
- In 2022, the groundwater samples collected on the east side of Springer Pit (GW96-7, GW16-8, GW16-7, GW05-01) were sampled more than quarterly with the exception of GW96-7 which was sampled once.

A groundwater monitoring program also occurs along Hazeltine Channel and recent results from this program can be found in Appendix 2-9.

LEGEND

GROUNDWATER MONITORING WELL

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1:50,000 KILOMETRES

REFERENCE(S)

1. IMAGERY COPYRIGHT © 20210621 ESRI AND ITS LICENSORS. SOURCE: MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED.
2. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
GROUNDWATER QUALITY SAMPLING LOCATIONS

CONSULTANT

YYYY-MM-DD	2024-07-04
DESIGNED	KM
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
23590671	81100/81112	0	2.7-9

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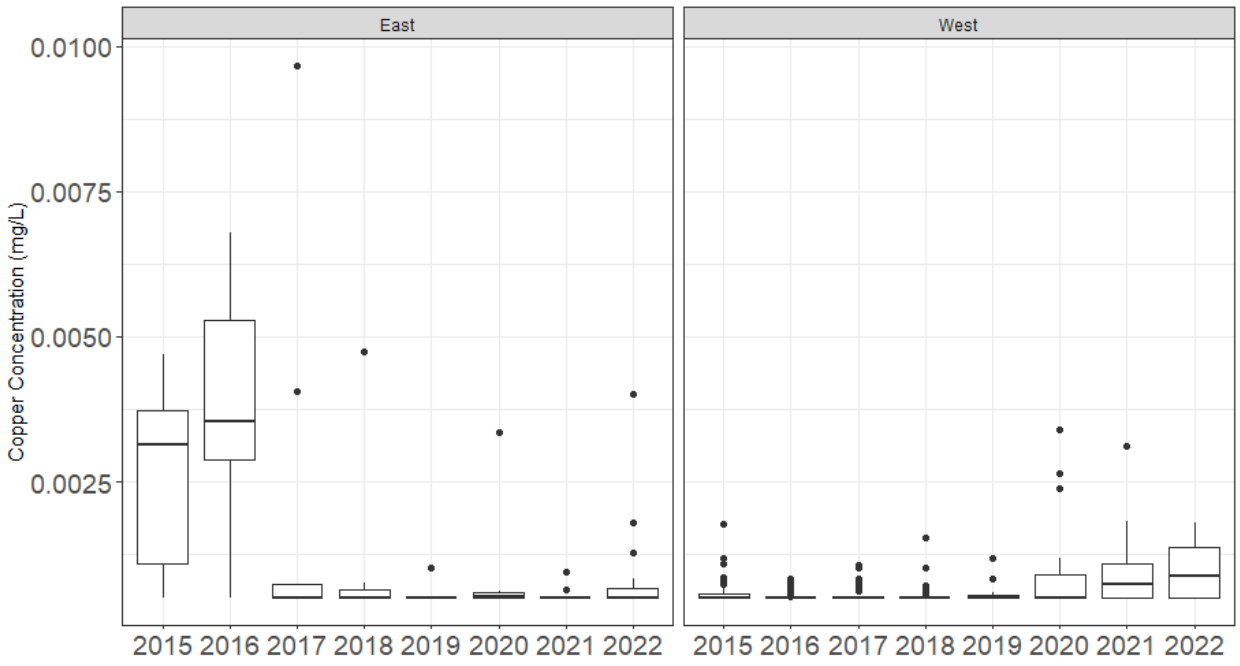
Samples collected at groundwater monitoring wells from 2015 to 2022 near Springer Pit were screened against BC contaminated sites regulation standards and BC WQGs to comment on the existing groundwater quality (BC CSR 2021). The groundwater quality for 2015 to present is provided in Appendix 2-10 and are screened against standards and guidelines in Appendix 2-10 Tables 2-6A to 2-6J. Copper and selenium are discussed here because their concentrations in effluent from the WTP are greater than a standard or guideline.

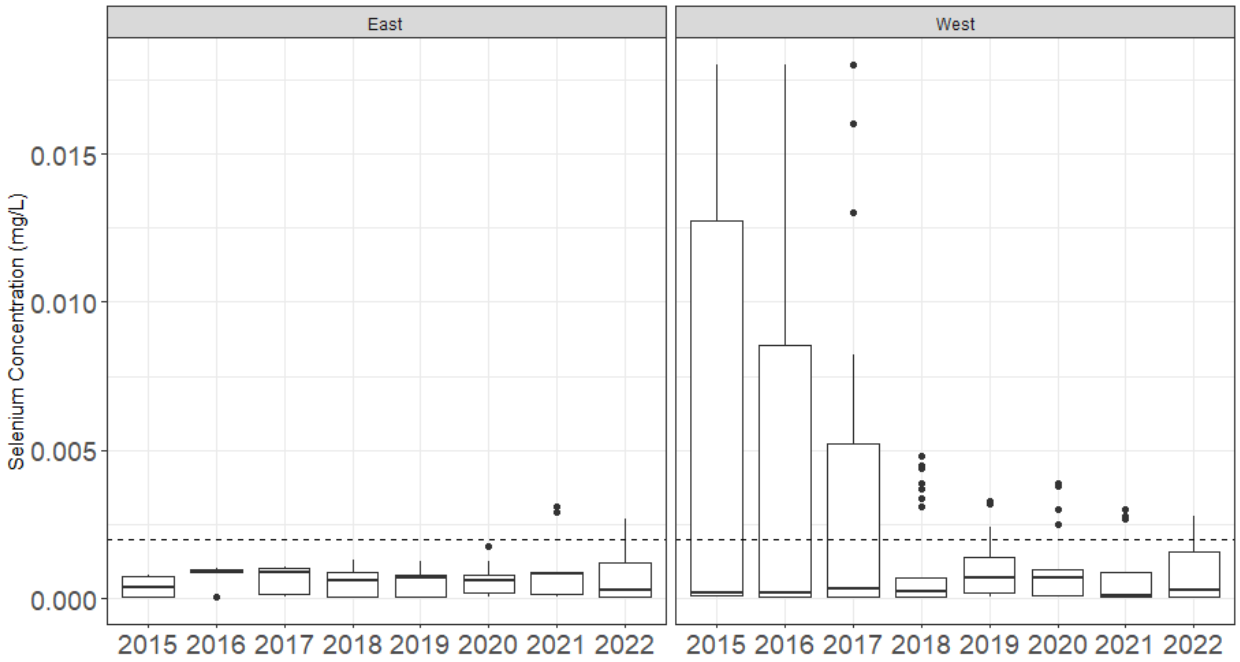
Copper concentrations in groundwater samples collected on the east side of Springer Pit were higher in 2015 and 2016 compared to the following years, where copper concentrations remained relatively similar (Figure 2.7-10). Copper concentrations in groundwater samples collected on the west side of Springer Pit remain relatively similar from 2015 to 2019 with increased variability in copper concentrations from 2020 to 2022.



Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.
East (2015 n = 6, 2016 n = 5, 2017 n = 9, 2018 n = 13, 2019 n = 9, 2020 n = 8, 2021 n = 9, 2022 n = 18)
West (2015 n = 38, 2016 n = 72, 2017 n = 60, 2018 n = 46, 2019 n = 19, 2020 n = 17, 2021 n = 16, 2022 n = 15)
mg/L = milligrams per litre.

Figure 2.7-10: Boxplot of Copper Concentrations from 2015 to 2022 Representing the Monitoring Wells on the East (GW96-7, GW16-8, GW16-7, GW05-01) and the West side of Springer Pit (GW15-1a, GW15-1b, GW12-2a, GW12-2b, GW15-2a, GW15-2b)

Selenium concentrations in groundwater samples collected on the east side of Springer Pit remain relatively consistent from 2015 to 2022 with exceedances of the BC WQG (0.002 mg/L) in samples collected in 2021 and 2022 (Figure 2.7-11). Selenium concentrations in groundwater sample collected on the west side of Springer Pit were greatest from 2015 to 2017 and decreased in 2018 with similar concentrations until 2022.



Note: Long-term chronic BC WQG for protection of aquatic health for selenium is shown (0.002 mg/L).
Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.
East (2015 n = 6, 2016 n = 5, 2017 n = 9, 2018 n = 13, 2019 n = 9, 2020 n = 8, 2021 n = 9, 2022 n = 18)

West (2015 n = 38, 2016 n = 72, 2017 n = 60, 2018 n = 46, 2019 n = 19, 2020 n = 17, 2021 n = 16, 2022 n = 15)
mg/L = milligrams per litre.

Figure 2.7-11: Boxplot of Selenium Concentrations from 2015 to 2022 Representing the Monitoring Wells on the East (GW96-7, GW16-8, GW16-7, GW05-01) and the West side of Springer Pit (GW15-1a, GW15-1b, GW12-2a, GW12-2b, GW15-2a, GW15-2b)

2.8 Sediment Quality

2.8.1.1 Quesnel Lake

Sediment quality and toxicity samples are routinely collected from exposed (QUL-LNF1, QUL-PNF) and reference (QUL-LREF1) locations in Quesnel Lake from 2014 to 2022 to determine the potential for mine influence as required by the CEMP (Appendix 7-1). Sediment quality and toxicity data are summarized below to characterize the potential for mine influence on sediments within Quesnel Lake.

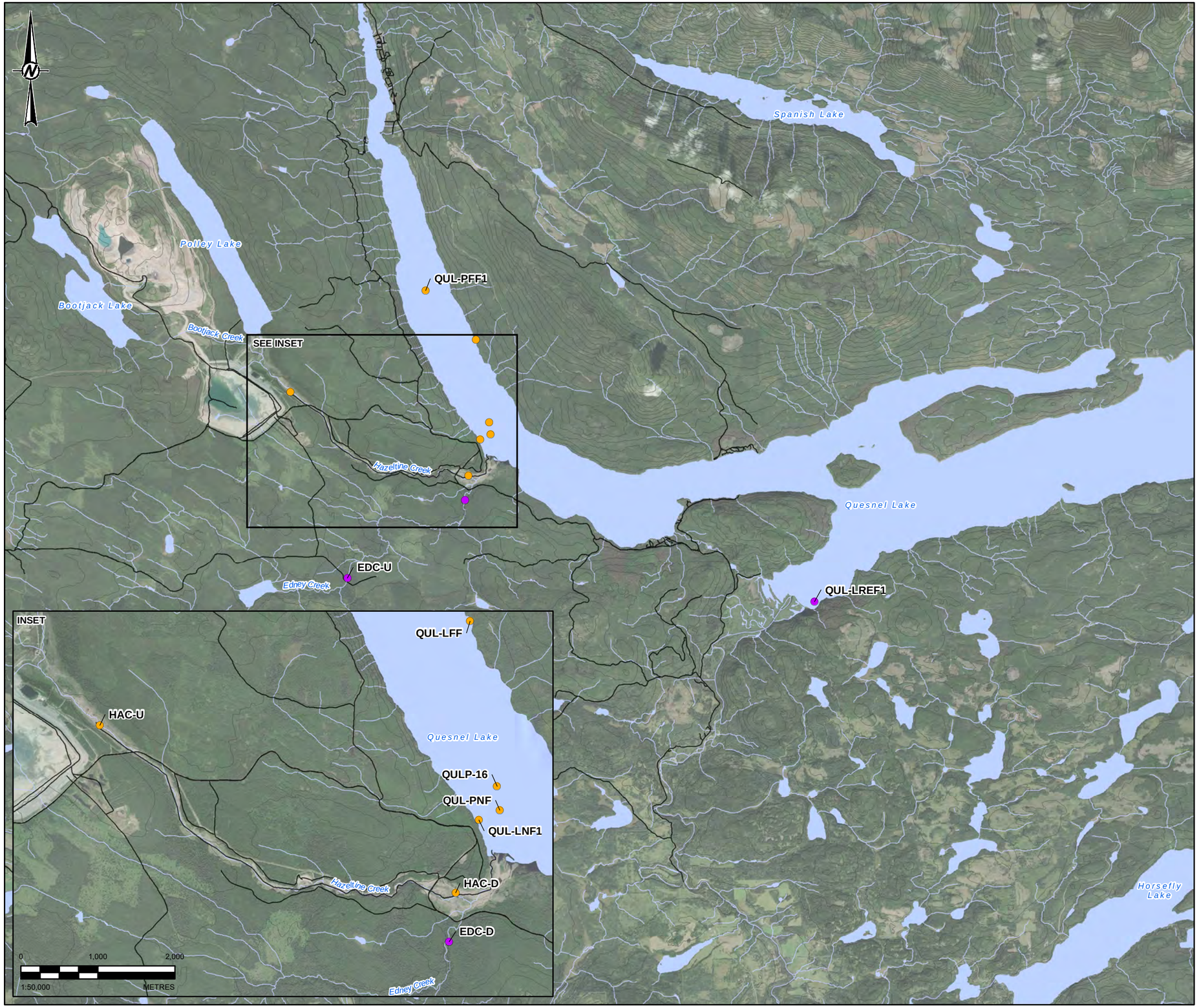
As described by Minnow (2023; Appendix 2-6), sediment is currently collected from shallow near-field (QUL-LNF1) and reference (QUL-LREF1) and deep near-field (QUL-PNF) areas of Quesnel Lake (Figure 2.8-1), with the following objectives:

- Sediment from the shallow monitoring areas (QUL-LNF1 and QUL-LREF1) was collected to support 14-day *Hyalella azteca* toxicity testing from 2015 to 2022 and 10-day *C. dilutus* toxicity testing from 2015 to 2021, as required by the CEMP approval conditions dated March 14, 2019.
- Sediment was collected from the deep near-field area of Quesnel Lake (QUL-PNF), but not reference (QUL-PREF1), to support benthic invertebrate community monitoring in this area.

Sample collection and analysis methods are provided in Appendix 2-6. Raw sediment quality data and sediment toxicity data are provided in Appendix 2-11 and screened against working sediment quality guidelines (WSQGs). Copper and selenium are discussed below as they are indicators of potential mine influence.

Boxplots were generated using sediment quality data from Quesnel Lake reference stations (QUL-PREF1, QUL-LREF1, and QUL-LREF5) and stations representative of the exposed areas (QUL-PNF, QUL-PFF1, QULP-16, QUL-I, QUL-LNF1, and QUL-LFF), collected from 2015 to 2022. The yearly average copper concentrations in sediment samples collected at the reference stations were consistently lower than yearly average copper concentrations in sediment at the exposed stations, reflecting the influence of material deposited on the lakebed by the breach (Figure 2.8-2). Selenium concentrations are also higher in sediments from exposed stations compared to reference stations (Figure 2.8-3).

The increased sediment concentrations of these parameters in the exposed area reflect the entry of breach outwash materials in 2014 (Golder 2016b).



LEGEND

SAMPLING LOCATION

- EXPOSED
- REFERENCE
- ROAD
- CONTOUR (10m)
- WATERCOURSE
- WATERBODY

0 2,000 4,000

1:100,000 METRES

REFERENCES

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2. BASE IMAGERY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY.
3. DATUM: NAD 1983 UTM ZONE 10N

CLIENT

MOUNT POLLEY MINING CORPORATION

PROJECT

MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE

2015 TO 2023 SEDIMENT QUALITY AND BENTHIC INVERTEBRATE SAMPLING LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2023-11-28
DESIGNED	KM
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	PHASE	REV.	FIGURE
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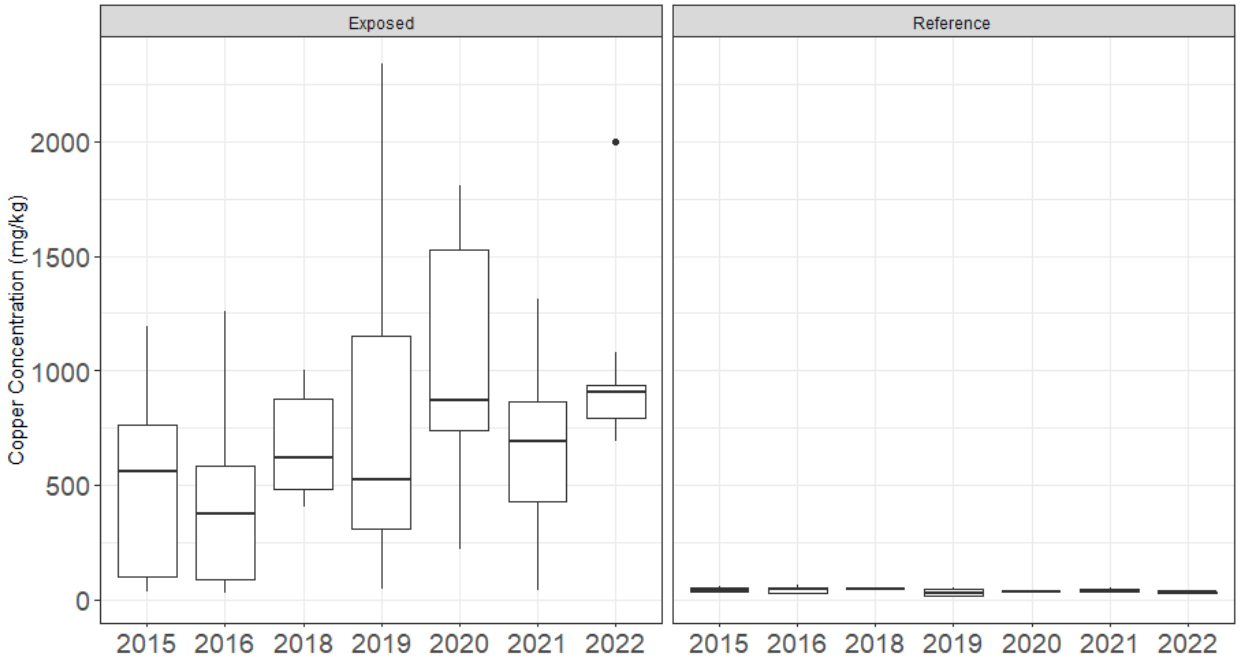


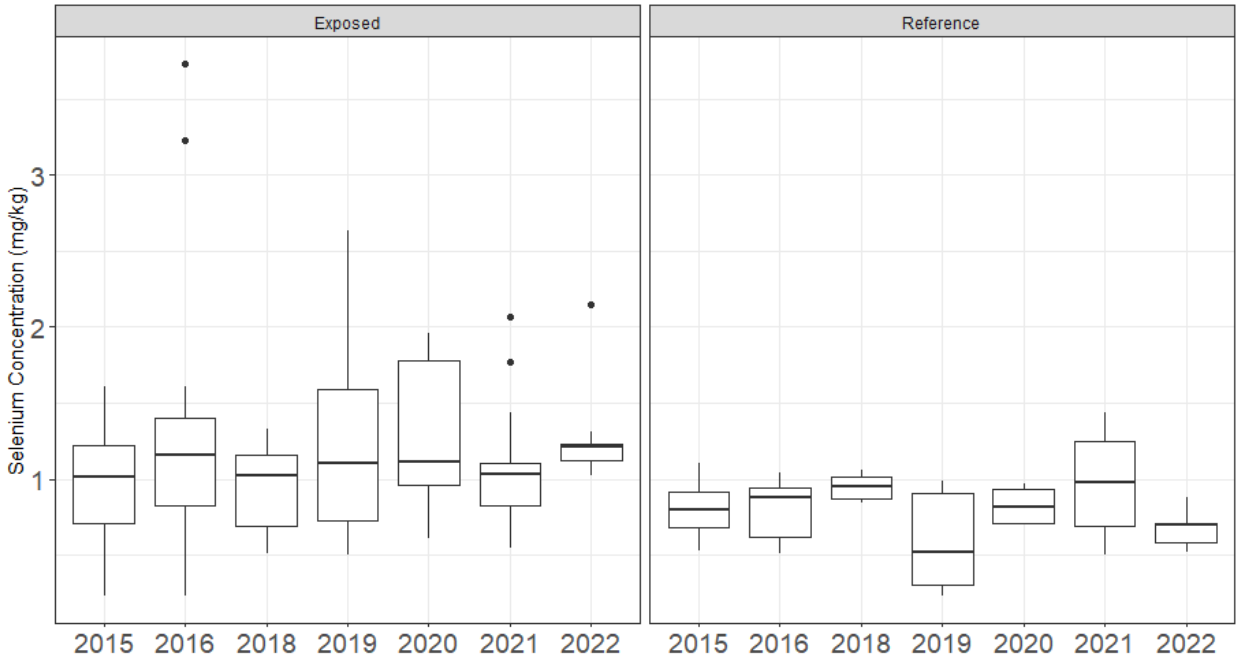
Note: Boxes represent the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

Exposed (2015 n = 15, 2016 n = 52, 2017 n = 0, 2018 n = 10, 2019 n = 15, 2020 n = 5, 2021 n = 30, 2022 n = 10)

Reference (2015 n= 6, 2016 n = 15, 2017 n = 0, 2018 n = 5, 2019 n = 25, 2020 n = 10, 2021 n = 10, 2022 n = 5)

mg/kg = milligrams per kilogram.

Figure 2.8-2: Boxplot of Copper Concentrations in Sediment Collected from 2015 to 2022 at Quesnel Lake Reference Stations (QUL-PREF1, QUL-LREF1, and QUL-LREF5) and Stations Representative of Exposed Areas (QUL-PNF, QUL-PFF1, QULP-16, QUL-I, QUL-LNF1, and QUL-LFF)



Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

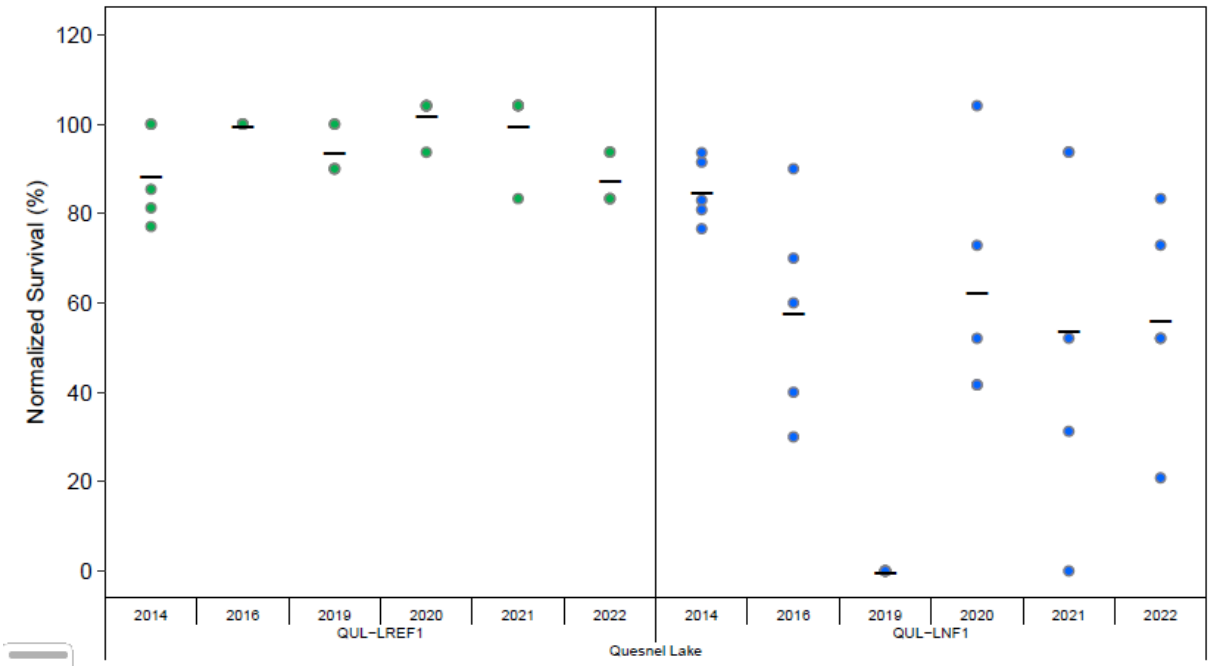
Exposed (2015 n = 15, 2016 n = 52, 2017 n = 0, 2018 n = 10, 2019 n = 15, 2020 n = 5, 2021 n = 30, 2022 n = 10).

Reference (2015 n = 6, 2016 n = 15, 2017 n = 0, 2018 n = 5, 2019 n = 25, 2020 n = 10, 2021 n = 10, 2022 n = 5) .

mg/kg = milligrams per kilogram.

Figure 2.8-3: Boxplot of Selenium Concentrations in Sediment Collected from 2015 to 2022 at Quesnel Lake Reference Stations (QUL-PREF1, QUL-LREF1, and QUL-LREF5) and Stations Representative of Exposed Areas (QUL-PNF, QUL-PFF1, QULP-16, QUL-I, QUL-LNF1, and QUL-LFF)

Survival of *H. azteca* exposed to QUL-LNF1 sediments in 2022 showed a moderate response (44 to 45%), which is similar to results in 2020 (39%) and 2021 (46%). These results were much higher*H. azteca* survival in 2019, which had 0% survival for similar 14-day standard static tests (Figure 2.8-4, Appendix 2-6). Minnow (2023) states that copper concentrations within test water concentrations were 97-times higher than *in situ* concentrations in 2022, which was similar to previous toxicity test concentrations in 2020 (47-times) and 2021 (114-times), but much lower than in 2019 (175-times; Appendix 2-6). A relationship between percent survival and dissolved copper concentrations was observed in the overlying water, consistent with the fact that *H. azteca* have been documented to derive little nutrition from sediment and respond primarily to contaminants dissolved within the water. Overall, temporal trends of *H. azteca* survival suggest a residual breach-related influence on sediments within Quesnel Lake. However, Minnow (2023) state the substantial difference in copper concentrations in toxicity test waters compared to in situ concentrations may not accurately reflect conditions and furthermore potential for toxicity in Quesnel Lake.



Note: Percent survival data were normalized to the control acceptance criteria, and the samples were calculated as a percentage of normalized control performance. Toxicity test conditions were standard 14-day standard static tests.

Figure 2.8-4: *Hyalella azteca* Survival Responses (14-day) for Sediment Toxicity Testing from from Reference (QUL-LREF1) and Exposed (QUL-LNF1) Samples in Quesnel Lake

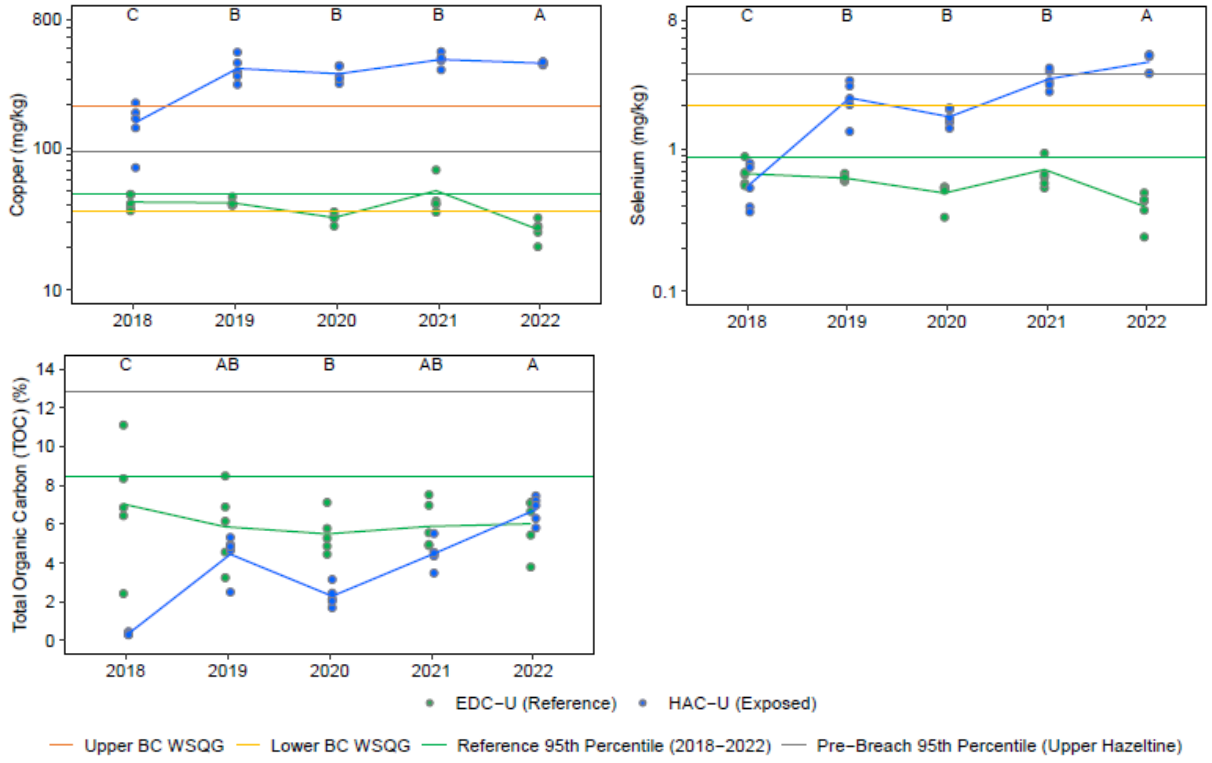
2.8.1.2 Hazeltine Creek

As described by Minnow (Appendix 2-7), sediment quality has been monitored annually since the CEMP was initiated in 2018, at upper Hazeltine Creek (HAC-U) and lower Hazeltine Creek (HAC-D) with associated reference locations, upper Edney Creek (EDC-U) and lower Edney Creek (EDC-D), respectively. In addition, samples were intermittently collected prior to 2014 (prebreach monitoring) and 95th percentile values were calculated to compare recent conditions to prebreach conditions. These data are presented in Appendix 2-7 screened against WSQGs and compared to the 95th percentile of prebreach monitoring data.

Sample collection and analysis methods are provided in Appendix 2-7. Copper and selenium are discussed below as they are indicators of potential mine influence.

In upper Hazeltine Creek, mean concentrations of copper and selenium at HAC-U in sediments were significantly higher than reference sediments in 2022 than previously observed (2018 to 2021) (Figure 2.8-5; Appendix 2-7). However, this difference appeared to be related to a decrease in copper and selenium concentrations at the reference area (EDC-U) rather than an increase in concentrations in upper Hazeltine Creek. Copper sediment concentrations at HAC-U were greater than the upper WSQG consistently from 2019 to 2022 and selenium sediment concentrations at HAC-U were greater than the lower WSQG in 2019, 2021, and 2022.

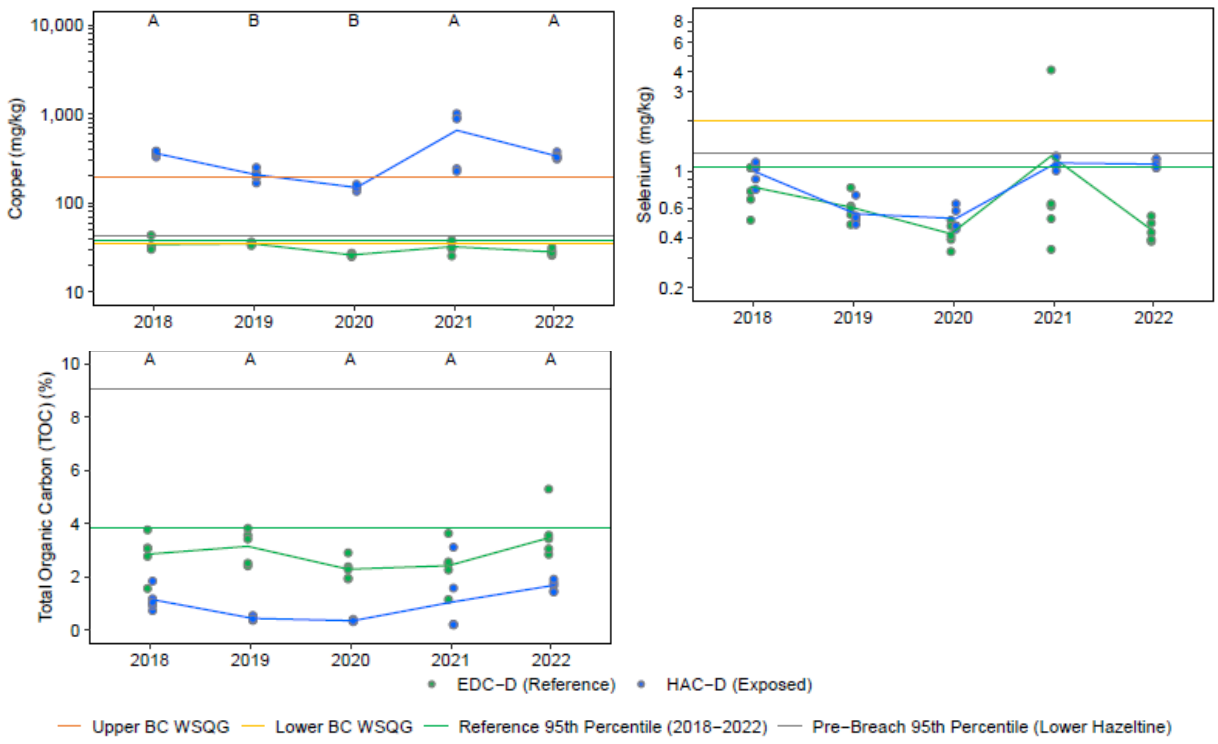
The significantly higher selenium concentrations in HAC-U sediments observed in 2022 (compared to 2018 and 2020) coincided with significantly higher total organic carbon content (Figure 2.8-5) and lower sand content of the sediment at HAC-U in 2022. Minnow (2023) suggested that the temporal difference in copper and selenium may have been influenced by the opportunistic nature of the sampling when fine sediments were limited, rather than due to changes in mine influences in the creek.



Note: Individual samples are plotted and lines join the least-squares estimated mean value for years included in statistical analysis. Statistical analyses were conducted using two-way analysis of variance (ANOVA) with Area and Year. The models were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have differences in concentrations (Exposed – Reference) that do not differ significantly (p – value <0.05) among years.

Figure 2.8-5: Sediment Copper, Selenium, and Total Organic Carbon Concentrations for Upper Hazeltine Creek (HAC-U; Exposed) and Upper Edney Creek (EDC-U; Reference), 2018 to 2022

In lower Hazeltine Creek, mean sediment concentrations of copper and selenium were similar to or lower than those observed in 2018, indicating sediment concentrations of these analytes have not significantly increased from 2018 to 2022. Concentrations of copper in sediment at HAC-D were at or above the upper WSQGs from 2018 to 2022 and consistently greater than the analyte concentrations at the reference area in Edney Creek (EDC-D; Figure 2.8-6; Appendix 2-7). Sediment selenium concentrations at HAC-D were consistently below the lower WSQG from 2018 to 2022. The total organic carbon content of lower Hazeltine Creek sediments has remained unchanged relative to reference from 2018 to 2022.



Note: Individual samples are plotted and lines join the least-squares estimated mean value for years included in statistical analysis. Statistical analyses were conducted using two-way ANOVA with Area and Year. The models were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have differences in concentrations (Exposed – Reference) that do not differ significantly (p – value <0.05) among years.

Figure 2.8-6: Sediment Copper, Selenium, and Total Organic Carbon Concentrations for Lower Hazeltine Creek (HAC-D; Exposed) and Lower Edney Creek (EDC-D; Reference), 2018 to 2022

2.9 Fisheries and Aquatic Resources

2.9.1 Periphyton and Benthic Invertebrate Community Measures

Quesnel Lake

Benthic invertebrate sampling is conducted to assess the potential for effects of operational activities of the mine and to monitor the recovery of the benthic environment following the breach. Monitoring has been undertaken in the deep near-field area of Quesnel Lake (QUL-PNF) and a reference area (QUL-PREF1) since 2014, initially as part of the breach response. Since 2018, the monitoring program described in Section 7.4 and in the CEMP (Appendix 7-1) requires benthic invertebrate community monitoring every three years in deep areas of Quesnel Lake.

The results of the benthic invertebrate sampling program are provided in greater detail by Minnow (Appendix 2-6).

Table 2.9-1 presents a statistical comparison of benthic invertebrate community metrics for the deep near-field area (QUL-PNF) of Quesnel Lake from 2015 to 2022. Following the breach in 2014, the benthic invertebrate community was observed to have lower abundance and diversity than reference areas. Benthic invertebrate data collected since 2015 shows that the benthic invertebrate community has started to recover in the vicinity of Hazeltine Creek. Mean benthic invertebrate density at QUL-PNF has increased, with mean organism density in 2022 significantly higher than in 2014 and 2015. Organism densities have not changed significantly since 2018. Taxonomic richness in 2022 was statistically similar to results in 2014 to 2021.

The relative densities of the major taxonomic groups (including Chironomidae) have shown temporal stability since 2014, except for a temporary increase in Ephemeroptera, Plecoptera, and Trichoptera (EPT) proportions in 2019 (Appendix 2-7). Densities of Chironomidae at QUL-PNF have been temporally stable since 2016 and were significantly higher in 2018 to 2022 compared to 2014 and 2015. Compared to reference, densities and relative densities (%) of EPT (taxon known to be sensitive to habitat disturbances and water pollution) and Arachnida have been similar to reference in all years. Chironomidae (%) has been similar to reference since 2018 (and in 2014), while Oligochaeta (%) was lower than reference in 2015, 2016, and 2021 (for years when comparison to reference is possible). Since 2014, densities of EPT and Arachnida have been similar to reference, while densities of Chironomidae and Oligochaeta have been lower than reference (Appendix 2-7).

Table 2.9-1: Statistical Comparisons of Benthic Invertebrate Community Metrics for Deep Near field Area or Quesnel Lake, 2014 to 2022 (Table 5.19 of Appendix 2-6)

Parameter	P-value	Mean								MOD Relative to Baseline[(a)]							
		2014	2015	2016	2018	2019	2020	2021	2022	2014	2015	2016	2018	2019	2020	2021	2022
Density (#/m^2)	**<0.001**	36.4	216	590	1,061	1,899	915	1,473	995	B	*2.8*	*4.6*	*5.8*	*6.5*	*5.6*	*6.3*	*5.7*
Richness (# of Taxa)	**0.007**	2.2	4.6	6.2	7.0	8.2	8.2	6.6	6.2	B	ns	ns	*2.1*	*2.6*	*2.6*	ns	ns
Simpson's Evenness	**<0.001**	0.907	0.752	0.329	0.417	0.213	0.297	0.347	0.332	B	ns	*-3.8*	*-3.0*	*-5.3*	*-4.1*	*-3.7*	*-3.7*
Simpson's Diversity	**0.023**	0.362	0.670	0.438	0.592	0.378	0.568	0.502	0.486	B	ns	ns	ns	ns	n	ns	

(a) Magnitude of difference (MOD) calculated for two-way ANOVA as (Exposed Mean - Reference Mean)/SD (or [Mean - Baseline Mean]/SD for temporal comparisons) on the transformed scale, where SD was the pooled standard deviation of the model residuals. MOD calculated for Kruskal-Wallis (i.e., rank-transformed data) as (Exposed Median - Reference Median)/MAD, where MAD was the pooled Median Absolute Deviation.

Bold = P-value <0.1; *Italics* = MOD >± 2.

Hazeltine Creek

Benthic invertebrate and periphyton community and productivity have been monitored in Hazeltine Creek as well as the reference location in Edney Creek since the initiation of the CEMP in 2018. Upper Hazeltine Creek (HAC-R1, HAC-U) and reference in Upper Edney Creek (EDC-U) have been monitored annually since 2018 and lower Hazeltine Creek (HAC-D) and reference in lower Edney Creek (EDC-D) have been monitored every second year since 2017 for benthic invertebrates and 2019 for periphyton. Data are presented in Appendix 2-7.

Community measures for benthic invertebrates and periphyton (total density, taxon richness, and Simpson's Evenness and Simpson's Diversity) for samples collected from Hazeltine Creek were compared to reference locations and to pre-breach conditions (data collected in 2007).

Benthic invertebrate taxon richness at HAC-R1 in 2022 was significantly lower than pre-breach conditions but similar to reference conditions. Benthic invertebrate productivity (dry weight biomass) at HAC-R1 and HAC-U was consistent from 2019 to 2022 and was either similar to or higher than reference in each year from 2018 to 2022. The benthic invertebrate community of lower Hazeltine Creek in 2021 had lower density, taxon richness, and productivity (dry weight biomass) compared to pre-breach conditions and the reference area, as well as lower Simpson's Diversity compared to the reference area. Comparison of pre-breach conditions and the reference area to lower Hazeltine Creek indicate lower relative abundances of sensitive EPT taxa and Arachnida and higher relative abundance of Chironomidae in 2021. The differences in primary benthic community metrics and composition are consistent with expected effects from recent remediation works at HAC-D in 2021, suggesting the area remained in a state of recovery during sampling.

Periphyton productivity was characterized by chlorophyll-a concentrations and ash-free dry mass compared to reference and pre-breach data among years. Mean chlorophyll *a* concentrations in upper Hazeltine Creek in 2022 were below the BCWQG of 100 mg/m^2 and above the threshold for moderately enriched streams (BC ENV 2021). Both chlorophyll *a* and ash-free dry mass at the upper Hazeltine Creek areas (HAC-R1 and HAC-U) have been similar to or significantly higher than reference since 2018, and higher than pre-breach data since 2019 at HAC-R1, and since 2021 at HAC-U. The primary periphyton community metrics (density, richness, Simpson's Evenness, and Simpson's Diversity) in Upper Hazeltine Creek compared to reference areas in most years indicate relatively stable periphyton communities at the remediated upper Hazeltine Creek.

Mean chlorophyll *a* concentrations in lower Hazeltine Creek in 2021 were below the BCWQG and below the threshold indicative of moderately enriched streams (BC ENV 2021). Chlorophyll *a* and ash-free dry mass in lower Hazeltine Creek decreased significantly between 2019 and 2021, to values that were lower than or similar to reference in 2021 but higher than in 2017. The periphyton community at HAC-D was characterized in 2019 and 2021 by total density

higher than reference, Simpson's Evenness and Diversity similar to reference, and significantly lower total and diatom richness than the reference area. These results are indicative of ongoing periphyton community recovery and is consistent with the disturbance of this area for channel remediation works in 2021.

2.9.2 Plankton Communities

Phytoplankton and zooplankton sampling is undertaken in Quesnel Lake to evaluate the potential effects of MPMC operations and the TSF breach on plankton communities and productivity. Phytoplankton productivity is evaluated based on chlorophyll *a* concentrations. Zooplankton tissue quality monitoring provides an indication of lower trophic level exposure to parameters that are potentially influenced by the mine and an estimate of exposure by fish through diet.

There are currently two plankton monitoring sites in Quesnel Lake (Figure 3.3-1). Site QUL-ZOO-1 (exposed) is located in the centre of the West Basin and QUL-ZOO-7 (reference) is located in front of Horsefly Bay, as described in the CEMP (Appendix 7-1). Sampling at QUL-ZOO-8, a reference location at the junction of the north and east arms of Quesnel Lake, was discontinued in 2019. Phytoplankton and zooplankton monitoring in Quesnel Lake began after the breach, with annual phytoplankton and zooplankton monitoring beginning in 2016 and 2014, respectively. In 2020, sampling was undertaken monthly during summer. Single replicate phytoplankton and zooplankton samples and zooplankton tissue quality samples were collected in June and August at each monitoring area, and replicate (n = 5) samples were collected in July at each monitoring area.

Historically, chlorophyll *a* samples in Polley and Quesnel Lakes were generally collected two times (i.e., June and August) per growing season. In 2017, an additional sample was collected at QUL-58; no samples were collected at QUL-ZOO-8 due to unsafe conditions from wildfires. In 2018, some chlorophyll *a* samples were collected in July and September as samples were missed at QUL-58 and QUL-2a in June, and QUL-ZOO-1, -7, and -8 and QUL-2a in August due to the proximity of forest fires which affected visibility and air quality. In 2019, only one sample was collected from QUL-ZOO-8 as it was removed from the sampling program later in the year.

A summary of the results collected by Minnow is presented below and provided in detail in the 2022 Minnow report (Appendix 2-6).

Phytoplankton density at the exposed location (QUL-ZOO-1) was consistently higher than the reference location (QUL-ZOO-7) from 2019 to 2022. Higher densities of phytoplankton at QUL-ZOO-1 were attributed largely to greater densities of Chrysophytes and Dinoflagellates than at QUL-ZOO-7 (Appendix 2-6). Taxon richness was stable and similar to reference from 2019 to 2021 at QUL-ZOO-1; however, richness decreased significantly in 2022 to a mean result lower than previous monitoring years (2019 to 2022) and lower than the reference. At both QUL-ZOO-1 and QUL-ZOO-7, mean chlorophyll-*a* concentrations decreased significantly each year from 2019 to 2021 but were higher in 2022 relative to previous years.

The higher chlorophyll-*a* concentrations observed in 2019 to 2022 compared to previous years may have resulted from a combination of different sampling timing in June and August/September instead of July and changes in sampling methodology (Appendix 2-6).

Zooplankton density and Simpson's Evenness at the exposed location (QUL-ZOO-1) were consistently similar to the reference location (QUL-ZOO-7) from 2019 to 2022 but lower in 2021. Taxon richness was higher at QUL-ZOO-1 than at QUL-ZOO-7 in 2019, 2020, and 2022, but was lower in 2021. Simpson's Diversity at QUL-ZOO-1 was similar (2019 and 2021) or significantly higher (2020 and 2022) compared to QUL-ZOO-7. The relative density and density of dominant for zooplankton taxa groups have been similar at QUL-ZOO-1 and QUL-ZOO-7 for each of the monitoring years (2019 to 2022), with two exceptions. The relative density and density of Cyclopoida was lower at QUL-ZOO-1 than at QUL-ZOO-7 in 2019, and the relative density of copepod nauplii was higher at QUL-ZOO-1 than at QUL-ZOO-7 in each monitoring year and temporally stable at QUL-ZOO-1 from 2019 to 2022. The densities of major zooplankton taxonomic groups showed similar spatial and temporal patterns to relative density data (Appendix 2-6). Mean total zooplankton biomass (dry weight) was consistently similar between exposed (QUL-ZOO-1) and reference (QUL-ZOO-7) areas in Quesnel Lake from 2019 to 2022. The similar temporal changes in zooplankton biomass at both areas was likely driven by natural variability in environmental parameters similar between the two areas.

2.9.3 Fish and Fish Habitat

The following characterization of fish and fish habitat is primarily based on information provided in SNC-Lavalin (2015). This report was part of the Post-Event Environmental Impact Assessment Report (MPMC 2015) that evaluated the impact of the TSF foundation failure on the aquatic receiving environment.

Quesnel Lake supports a varied fish community, with approximately 20 documented fish species that include migratory salmonids (coho, chinook, and sockeye), resident salmonids (kokanee, rainbow trout, bull trout, and lake trout), and benthic and forage fish species (Table 2.9-2). The majority of these fish species inhabit the littoral and limnetic zones of the lake:

- Migratory salmonids typically use both the littoral and limnetic zones as rearing and foraging habitat for young-of-year and juvenile life stages until they smolt and migrate downstream towards the marine environment.
- Sockeye salmon are known to shoreline spawn in select littoral zone areas where suitable gravels and groundwater upwelling occurs.
- Resident salmonids may spawn in the littoral zone (with the exception of bull trout) and typically rely on littoral and limnetic habitat for rearing young-of-year and juveniles and foraging.

- Benthic and forage fish typically rely on littoral and benthic habitat for spawning, rearing, and foraging. Benthic species are usually only present in the limnetic zone for a short period of time after hatching and consequently rear in the pelagic column until settling to the benthic zone. Forage species may be present in the limnetic zone during foraging activities. Adult burbot will make vertical migrations from the benthic zone to the open water column in search of food (SNC-Lavalin 2015).

Bull trout is a Blue-listed species of special concern and is the only fish species at risk listed in the Cariboo region, based on the Ministry of Environment (BC ENV) Species and Ecosystems Explorer (BC CDC 2023). Coho salmon present in Quesnel Lake are part of the Interior Fraser Coho population that has been identified as "endangered" by the Committee on the Status of Endangered Wildlife in Canada. Coho is a species under consideration for addition to the *Species at Risk Act* (SNC-Lavalin 2015). A small subset of the Interior Fraser coho population spawns in Quesnel River and several other tributaries to Quesnel Lake (Cariboo Envirotech Ltd. 2009).

Table 2.9-2: Documented Fish Species in Quesnel Lake

Fish Group	Common Name	Scientific Name
Migratory salmonids	Sockeye salmon	*Oncorhynchus nerka*
	Coho salmon	*O. kisutch*
	Chinook salmon	*O. tshawytscha*
Resident salmonids	Kokanee	*O. nerka*
	Rainbow trout	*O. mykiss*
	Bull trout	*Salvelinus confluentus*
	Lake trout	*S. namaycush*
	Pygmy whitefish	*Prosopium coulteri*
	Mountain whitefish	*P. williamsoni*
	Lake whitefish	*Coregonus clupeaformis*
Benthic species	Burbot	*Lota lota*
	Largescale sucker	*Catostomus macrocheilus*
	Longnose sucker	*C. catostomus*
	Slimy sculpin	*Cottus cognatus*
Forage species	Northern pikeminnow	*Ptychocheilus oregonensis*
	Peamouth chub	*Mylocheilus caurinus*
	Lake chub	*Couesius plumbeus*
	Leopard dace	*Rhinichthys falcatus*
	Longnose dace	*R. cataractae*
	Redside shiner	*Richardsonius balteatus*

Source: Adapted from SNC-Lavalin (2015).

Foreshore inventory and mapping characterized the shore type near the mouth of Edney Creek as predominantly gravel beach (49% of the study area) and rocky shore (more than 35%), and aquatic vegetation, dominated by emergent grasses and herbaceous vegetation, covered 36% of the shoreline. Approximately 50% of the shoreline was ranked as high or very high value, 48% as moderate value, and less than 2% as low or very low value (Ecoscape 2012). High juvenile rearing values were identified along 20% of the shoreline (Ecoscape 2012).

2.9.4 Fish Habitat Remediation

The remediation of Hazeltine and Edney Creek following the TSF Breach has proceeded as described in the Remediation Plan (Golder 2019) and instream work has now concluded. Riparian planting has taken place and the riparian zone is growing well. The remediation of Hazeltine and Edney Creek is comprised of the following activities (Golder 2019):

- A preference for a diversity of habitat types through the creek (i.e., higher channel complexity), such as repeated sequences of riffle, run/glide, and pool habitat types.
- Relatively high percentages of pool habitat (up to 60% surface area of the creek).
- Instream cover provided by large woody debris to approach or exceed 20% the surface area within constructed pool habitat.
- Available spawning substrate sizes within all wetted areas of the creek, specifically greater than 25% spawning gravel cover.
- Self-sustaining riparian vegetation that provides cover, insect drop, and eventually large woody debris to Hazeltine and Edney Creeks.

Recent evaluations of baseline and post-breach conditions in Hazeltine Creek and Edney Creek concluded that the constructed fish habitat is performing as designed and expected for Rainbow Trout populations (WSP 2023a). Recent monitoring of adult Rainbow Trout has also described the successful return of spawning adults from Polley Lake to Hazeltine Creek to spawn during the spring seasons of 2018 – 2022 (Minnow 2022). Riparian vegetation is established, actively growing, and is providing overhead cover in upper sections of the creek where remediation efforts were first initiated after the breach (DWB 2022). Similarly, monitoring of lower Edney Creek by Minnow (2022) concluded that the constructed fish habitat is as good or better than unimpacted habitat and is effectively meeting design objectives. Based on fish usage and spawning survey data collected from 2016 to 2021, it appears that remediation objectives are being met for not only Rainbow Trout, but also Interior Fraser River Coho Salmon (Coho) and Sockeye Salmon (Sockeye) (Minnow 2022). Since the reopening of lower Hazeltine Creek to fall spawning fish, hundreds of spawning Sockeye Salmon have been observed each year since 2021 (Photo 2.9-1).

Photo 2.9-1: Sockeye Salmon in Lower Hazeltine Creek, September 13, 2021

2.9.4.1 Rainbow Trout Habitat Remediation

Quantification of habitat balances were carried out for Rainbow Trout in Hazeltine and Edney Creeks. These habitat balances were based on an evaluation of both productive capacity and productivity. To do this, annual estimates of Rainbow Trout abundance were generated to represent fisheries productivity for baseline and post-remediation conditions. A combination of previously collected field data and desktop modelling methods for habitat quality and population size were used to provide an outlook on the recovery trajectory of the Rainbow Trout populations relative to pre-breach (baseline) conditions for the population that utilizes the upper Hazeltine Creek immediately downstream of Polley Lake, as well as the population in lower Hazeltine Creek and Edney Creek, immediately upstream of Quesnel Lake. The objectives of this evaluation were achieved, in part, through a comparison of modelled abundance estimates generated from the as-constructed post-breach remediation case versus the historical baseline. The population models consider assessments of habitat quality (or suitability) as being related to carrying capacity inputs for each of the modelled scenarios.

The habitat data used for quantifying habitat quality for pre-disturbance and post-remediation conditions included depths, wetted and bankfull widths, abundance of channel unit habitat types (pool, run/glide, and riffle), substrate composition (proportion of organics, silt, sand, gravel, cobble, and boulder), abundance of instream cover (proportion of large boulders and woody debris), and abundance of riparian cover (proportion of forest, shrub, grass, and herbaceous layers). Data used for pre-disturbance habitat conditions were sourced from habitat tables and text in Bruce and Slaney (1991) and Minnow (2007), whereas data for post-remediation conditions were sourced from Minnow (2020), design and record drawings, and georeferenced drone imagery of the creek flown in August 2019 and 2021.

Using a standard habitat modelling method to rank the summarized information on each study reach, results demonstrated that habitat quality (productive capacity) for the post-remediation condition in upper and lower portions of the creeks ranked higher (each by a minimum of 1.3-times) than the pre-breach condition. This outcome reflected the specific habitat design targets for spawning and rearing habitat achieved through direct collaboration with environmental agencies and First Nations, as well as their technical advisors, through the Habitat Remediation Working Group (HRWG).

For each case or scenario that was examined, simulations based on age-based Leslie matrices of Rainbow Trout vital rates (mortality and fecundity rates) were executed to track the abundance of fish per age cohort over time, providing a direct link to changes in fisheries productivity. Although the effect of the breach was modelled as 100% failure of young-of-year recruitment over a 4-year (2014–2017) and 8-year period (2014–2021) for upper and lower reaches, respectively, the population models illustrated a relatively rapid recovery of the population upon reopening of Hazeltine and Edney creeks to spawning, suggesting that the foundation for a quick recovery of population sizes was in place. The recovery was provided by the remaining adult population size that persisted through the reconstruction period in both Polley and Quesnel Lakes, combined with the high-quality habitat features installed during remediation, and unobstructed stream conditions.

Modelled trajectories of the post-breach population and the initial field observations made in 2018 through 2021 in both Hazeltine Creek and Edney Creek provide evidence for a recovery of the Rainbow Trout populations in each habitat. For upper Hazeltine Creek, simulated population trajectories reach the natural range of baseline projections as early as 2023 and stabilize within 20 years of the breach. In lower Hazeltine Creek and Edney Creek, the extended construction period and unique life history characteristics of that population resulted in a delayed population recovery and stabilization, compared to the upper Hazeltine Creek population. While the simulated population trajectories reach baseline projections by 2029, the longer lifespan and later age at maturity of the Rainbow Trout that originate from Quesnel Lake may drive population sizes to fluctuate as the age structure stabilizes through, and potentially beyond the 40-year modelling period.

The predicted increase in abundance and gain in fish production from installed habitat features are expected to continue in the short-term under unobstructed creek conditions for spawning fish movements from their respective overwintering location. The magnitude of the difference in final abundance over the simulated study period ranged from 3.4 to 9.5-times higher for the post-remediation recovery scenarios relative to baseline for the upper and lower Hazeltine Creek populations, respectively.

Additional information on the evaluation of Rainbow Trout habitat remediation is provided in WSP (2023b)

2.9.4.2 Interior Fraser Coho and Sockeye Salmon Habitat Remediation

The evaluation of the quality and quantity of habitat for Interior Fraser Coho and Sockeye Salmon under baseline and post-remediation conditions used a habitat suitability modelling procedure to quantify improvements to the productive capacity of habitat for Coho and Sockeye. As was done for Rainbow Trout (WSP 2023a), this procedure included the application of a Habitat Suitability Index (HSI) (USFWS 1981), a commonly used model for quantifying species-specific habitat quality. The formula for the HSI attributes a biologically relevant value to physical habitat features on a numerical scale (i.e., 0-1) and is intended to provide a transparent, scientifically defensible tool to complement HRWG criteria for evaluating the productive capacity of the affected habitat and resulting construction design. The HSI model uses physical habitat variables (e.g., water depth, substrate composition, riparian cover, stream geomorphology) to express linear or curvilinear relationships depending on the response of a species to changing environmental conditions. Once a suitability curve is established based on species-specific environmental factors, the HSI is calculated. Subsequently, the HSI can be used in combination with spatial information to create a habitat quality map or a weighted usable area statistic, typically defined as a habitat unit (HU) (e.g., De Kerckhove et al. 2008; DFO 2015, 2016).

For Hazeltine and Edney Creek, the selected HSI model was based on that previously developed for Coho Salmon by McMahon (1983), and similar adaptations of that model for evaluating fish habitat (Bryant and Woodsmith 2009; Myers and Nieraeth 2016). It was assumed that this model was also applicable for mapping and quantifying spawning and rearing habitat for Sockeye Salmon, which share similar habitat requirements for spawning and rearing as Coho Salmon.

Results from the habitat suitability modelling indicate that the post-remediated habitat is of higher quality for Pacific Salmon species compared to pre-breach conditions. This is similar to the results for Rainbow Trout (WSP 2023b that saw a significant increase in HSI values and habitat units following remediation to lower Hazeltine and Edney Creek based on the design criteria determined and implemented under the guidance of the HRWG.

The HSI value for lower Hazeltine Creek and Edney Creek, based on weighted average, was 1.3-times greater for post-remediation habitat versus pre-breach baseline habitat for Coho and Sockeye Salmon. The pre-breach HSI value for above (Reach 7+8 in Minnow 2007) and below (Reach 9 in Minnow 2007) the Edney Creek confluence was 0.22, versus the post-remediation HSI value of 0.28 for Reach 5 and 6 of Hazeltine Creek and Edney Creek. The reach above the Edney Creek confluence for the pre-breach baseline was of higher quality (HSI value of 0.231) compared to the reach below the Edney Creek confluence (HSI value of 0.214). For the post-remediation habitat, the highest quality reach was Reach 5, which is also above the confluence (HSI value of 0.280); whereas the post-remediation HSI value downstream of the confluence in Reach 6 was 0.253.

The largest difference in calculated scores between pre-breach baseline and post-remediation habitat for the life stage components was the pool habitat, which was 2.67-times higher for post-remediation habitat. The canopy cover component was the only component with a lower score for post-remediation habitat versus baseline habitat. At the time of the 2021 drone survey, there was a significant portion of the area that was classified as grass or low shrub vegetation. It is expected that the canopy cover and riparian index will increase as the riparian zones quickly regenerate after the breach and remediation efforts to the creek.

When expressed as Habitat Units and assuming similar flow conditions, the total weighted useable area statistic for Coho and Sockeye Salmon increased under post-remediation conditions for all scenarios that were considered. This is similar to the results observed for Rainbow Trout in lower Edney Creek (WSP 2023c).

Under the baseline (pre-breach) scenarios, the weighted useable area ranged from a minimum of 208 habitat units for the Baseline Beaver-Obstructed Scenario to a maximum 1,167 habitat units for the Baseline Unobstructed Scenario. Under the post-remediation scenario, the weighted useable area was 1,656 habitat units for the Current Post-Remediation Scenario, and up to 1,750 habitat units for the Future Post-Remediation Scenario when riparian habitat returns to conditions observed under the pre-breach baseline. This equates to an 8-times increase in habitat units for the post-remediation habitat compared to the pre-breach (baseline) beaver-obstructed condition.

The Current Post-Remediation Scenario considered present creek conditions, including riparian habitat quality based on recent monitoring data. Recent aerial drone surveys indicate that there is currently a significant portion of the floodplain that is classified as grass or low shrub vegetation, which does not provide significant instream cover for fish, thus reducing the riparian habitat component scores of the HSI. As the canopy cover continues to recover, the riparian habitat component scores will increase as the vegetation along lower Hazeltine and Edney Creeks regenerates following the breach and remediation efforts. Higher component scores will ultimately translate into more weighted useable area. Under current conditions, the weighted

useable area was measured as 1,656 habitat units, with the potential to increase to 1,750 habitat units for the Future Post-Remediation Scenario as riparian habitat fully recovers.

In summary:

- The results of the HSI modelling confirmed the suitability of the HRWG design criteria and the construction work for enhancing the productive capacity of Hazeltine and Edney Creek for Pacific Salmon species.
- Comparison of baseline and post-remediation scenarios show a higher weighted useable area statistic post-remediation, and therefore, a higher productive capacity of habitat for the post-remediation versus pre-disturbance condition. Habitat units increased by up to 8 times in the post-remediated habitat, compared to pre-breach baseline conditions.
- Interior Fraser River Coho and Sockeye Salmon have been repeatedly observed in lower Hazeltine and Edney Creek since the remediated habitats have been reopened.

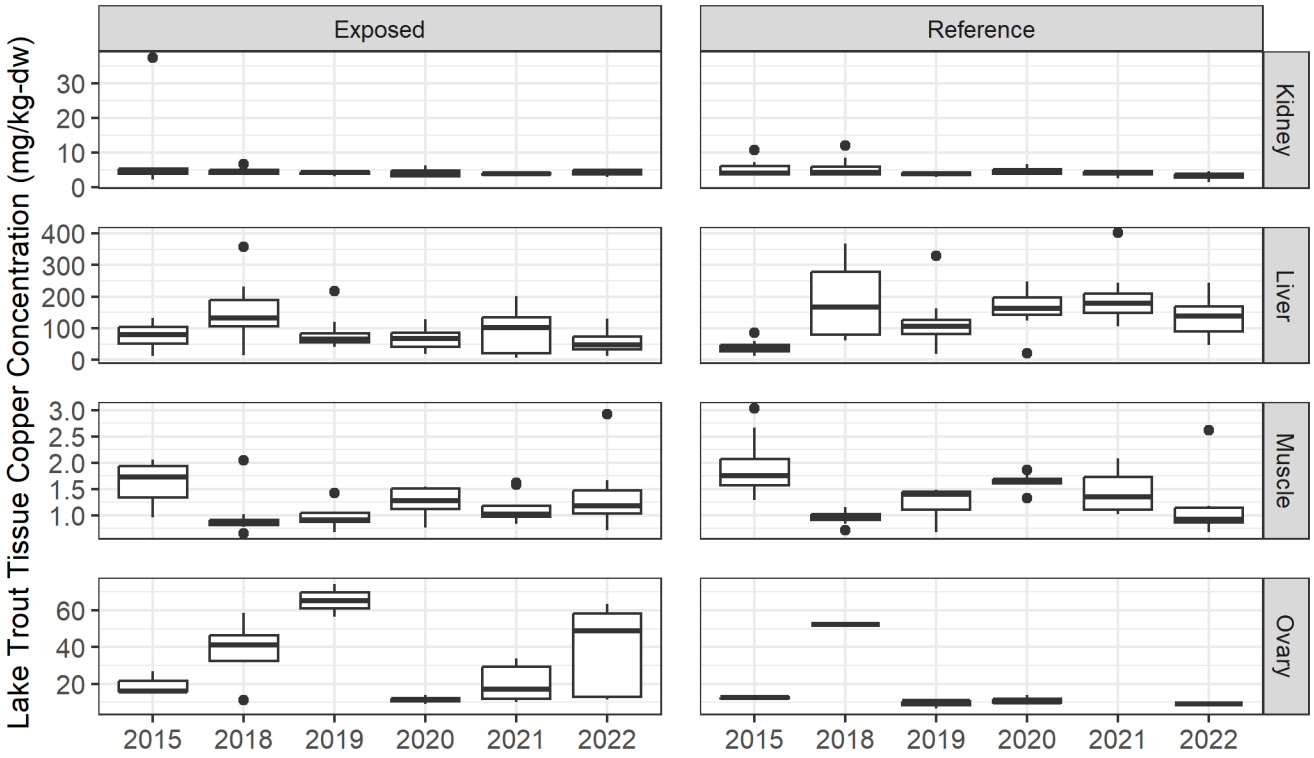
Additional information on the evaluation of Coho and Sockeye Salmon habitat remediation is provided in WSP (2023d).

2.9.5 Tissue Residues

Quesnel Lake

In Quesnel Lake, fish community and tissue quality monitoring has been conducted since 2015 to monitor potential effects of the breach and mine effluent discharges on the health of fish populations over time. Fish monitoring data have been collected in Quesnel Lake near Hazeltine Creek and Cedar Point, and at multiple reference areas in the north and east arms of Quesnel Lake. The fish monitoring program is described in Section 7.4 and detailed in the CEMP found in Appendix 7-1. Fish tissue samples from Quesnel Lake from 2015 to 2022 include the following species Lake Trout (*Salvelinus namaycush*), Burbot (*Lota lota*), Kokane (*Oncorhynchus nerka*), Peamouth Chub (*Mylocheilus caurinus*), Northern Pikeminnow (*Ptycheilus oregonensis*), Largescale sucker (*Catostomus macrocheilus*), and Redside Shiner (*Richardsonius balteatus*). Analysis of lake trout tissue data was performed as tissue samples were collected from fish captures in exposed and reference areas over multiple years.

Detailed results of the fish monitoring program are presented in the 2022 Minnow report (Appendix 2-5). Boxplots of lake trout tissue (kidney, liver, muscle, and ovary) concentrations collected in Quesnel Lake exposed and reference stations from 2015 to 2022 were generated to determine temporal trends. Copper concentrations in lake trout tissue samples collected at exposed and reference areas in Quesnel Lake remain relatively consistent from 2015 to 2022 (Figure 2.9-1). Selenium concentrations in lake trout tissue collected at exposed areas of Quesnel Lake have higher variability than observed in lake trout tissue from reference areas (Figure 2.9-2). The average selenium concentration from 2015 to 2022 remains relatively consistent from 2015 to 2022 at both exposed and reference areas.

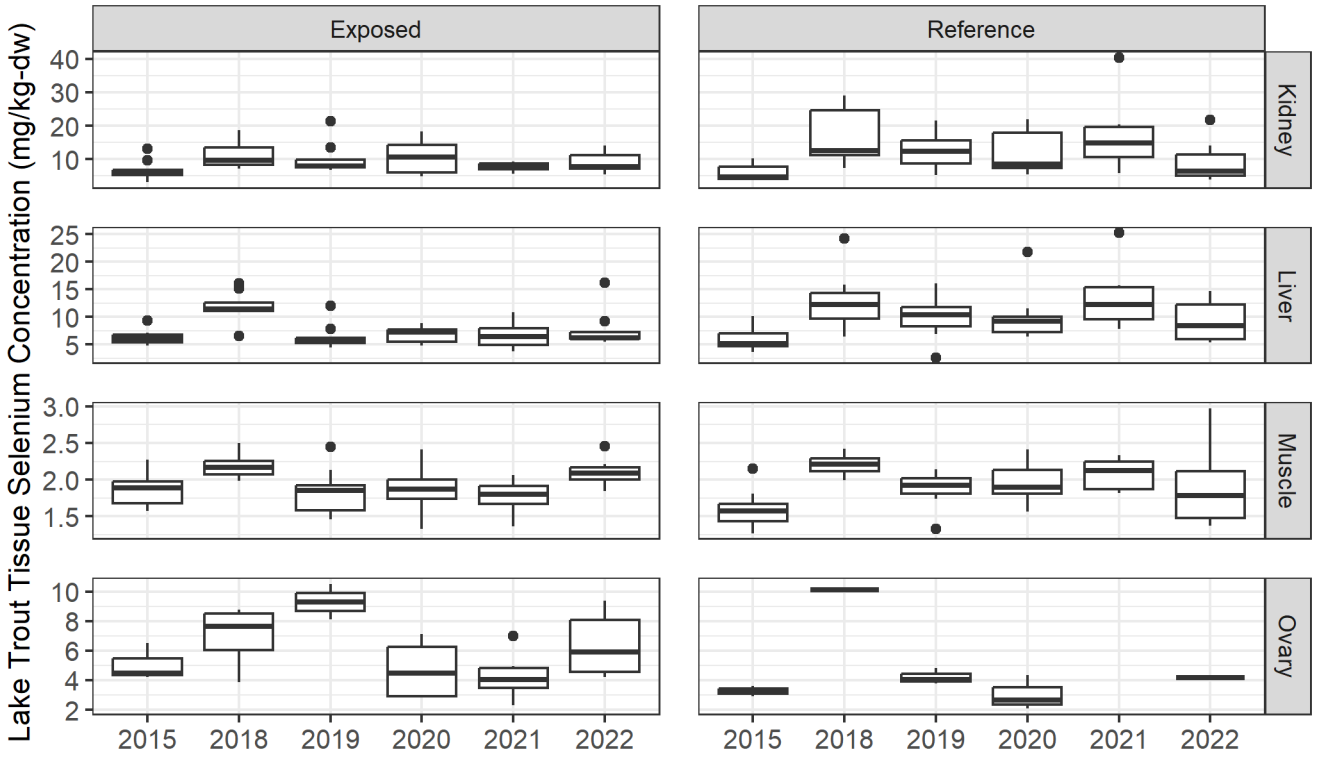


Boxes represent the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

Exposed (2015 n = 9 [kidney], 10 [liver], 10 [muscle], 3 [ovary], 2018 n = 8 [kidney], 8 [liver], 8 [muscle], 4 [ovary], 2019 n = 9 [kidney], 9 [liver], 9 [muscle], 2 [ovary], 2020 n = 8 [kidney], 8 [liver], 8 [muscle], 4 [ovary], 2021 n = 8 [kidney], 8 [liver], 8 [muscle], 6 [ovary], 2022 n = 8 [kidney], 8 [liver], 8 [muscle], 5 [ovary])

Reference (2015 n = 10 [kidney], 10 [liver], 10 [muscle], 2 [ovary], 2018 n = 8 [kidney], 8 [liver], 8 [muscle], 1 [ovary], 2019 n = 8 [kidney], 8 [liver], 8 [muscle], 3 [ovary], 2020 n = 8 [kidney], 8 [liver], 8 [muscle], 3 [ovary], 2021 n = 8 [kidney], 8 [liver], 8 [muscle], 0 [ovary], 2022 n = 8 [kidney], 8 [liver], 8 [muscle], 1 [ovary])
mg/kg dw = milligrams per kilogram dry weight.

Figure 2.9-1: Boxplot of Copper Concentrations in Fish Tissue from Samples Collected from Exposed and Reference Areas in Quesnel Lake from 2015 to 2022



Boxes represent the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

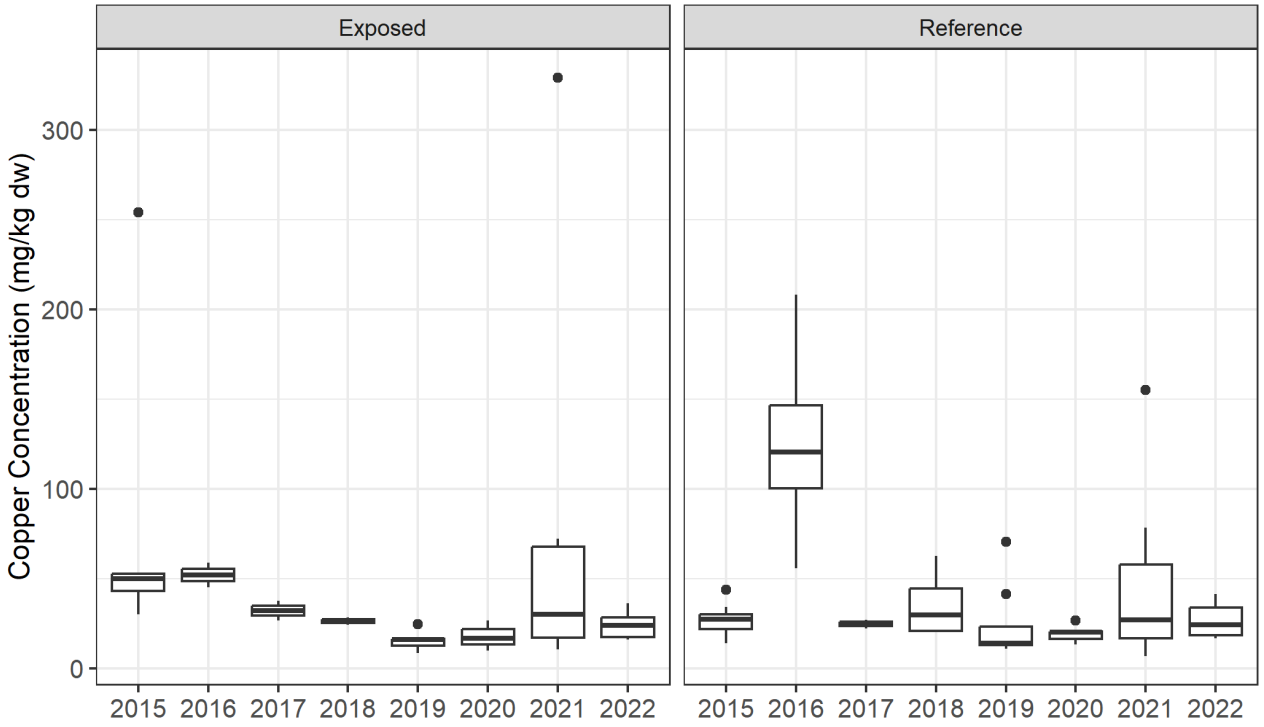
Exposed (2015 n = 9 [kidney], 10 [liver], 10 [muscle], 3 [ovary], 2018 n = 8 [kidney], 8 [liver], 8 [muscle], 4 [ovary], 2019 n = 9 [kidney], 9 [liver], 9 [muscle], 2 [ovary], 2020 n = 8 [kidney], 8 [liver], 8 [muscle], 4 [ovary], 2021 n = 8 [kidney], 8 [liver], 8 [muscle], 6 [ovary], 2022 n = 8 [kidney], 8 [liver], 8 [muscle], 5 [ovary])

Reference (2015 n = 10 [kidney], 10 [liver], 10 [muscle], 2 [ovary], 2018 n = 8 [kidney], 8 [liver], 8 [muscle], 1 [ovary], 2019 n = 8 [kidney], 8 [liver], 8 [muscle], 3 [ovary], 2020 n = 8 [kidney], 8 [liver], 8 [muscle], 3 [ovary], 2021 n = 8 [kidney], 8 [liver], 8 [muscle], 0 [ovary], 2022 n = 8 [kidney], 8 [liver], 8 [muscle], 1 [ovary])
mg/kg dw = milligrams per kilogram dry weight.

Figure 2.9-2: Boxplot of Selenium Concentrations in Fish Tissue from Samples Collected from Exposed and Reference Areas in Quesnel Lake from 2015 to 2022

Tabulated zooplankton tissue chemistry results from 2015 to 2022 are presented in Appendix 2-6. Boxplots of copper and selenium within zooplankton tissue samples collected from 2015 to 2022 at reference (QUL-ZOO-7, QUL-ZOO-8) and exposed (QUL-ZOO-1) monitoring stations within Quesnel Lake were plotted to visualize temporal trends. The copper concentrations in 2015 and 2016 at exposed stations in Quesnel Lake were greater than other years and a decreasing trend in copper concentration from 2016 to 2019 is seen (Figure 2.9-3). In 2016 at the reference stations, the copper concentrations increased significantly relative to other years and decreased in 2017 to a similar concentration seen in 2015. Concentrations of copper in zooplankton tissue in 2021 increase relative to previous years, however an increase in copper concentrations in the reference area was also observed. Copper concentrations in zooplankton are below the dietary threshold of 500 mg/kg (dry weight) for fish, indicating that zooplankton in the exposed areas do not pose a dietary risk to fish from consumption.

The selenium concentrations from 2015 to 2017 were greater than selenium concentrations from 2018 to 2022 at exposed stations in Quesnel Lake (Figure 2.9-4). At the reference stations, selenium concentrations increased in 2016 compared to other years and decreased in 2017 to similar concentrations seen in 2015.



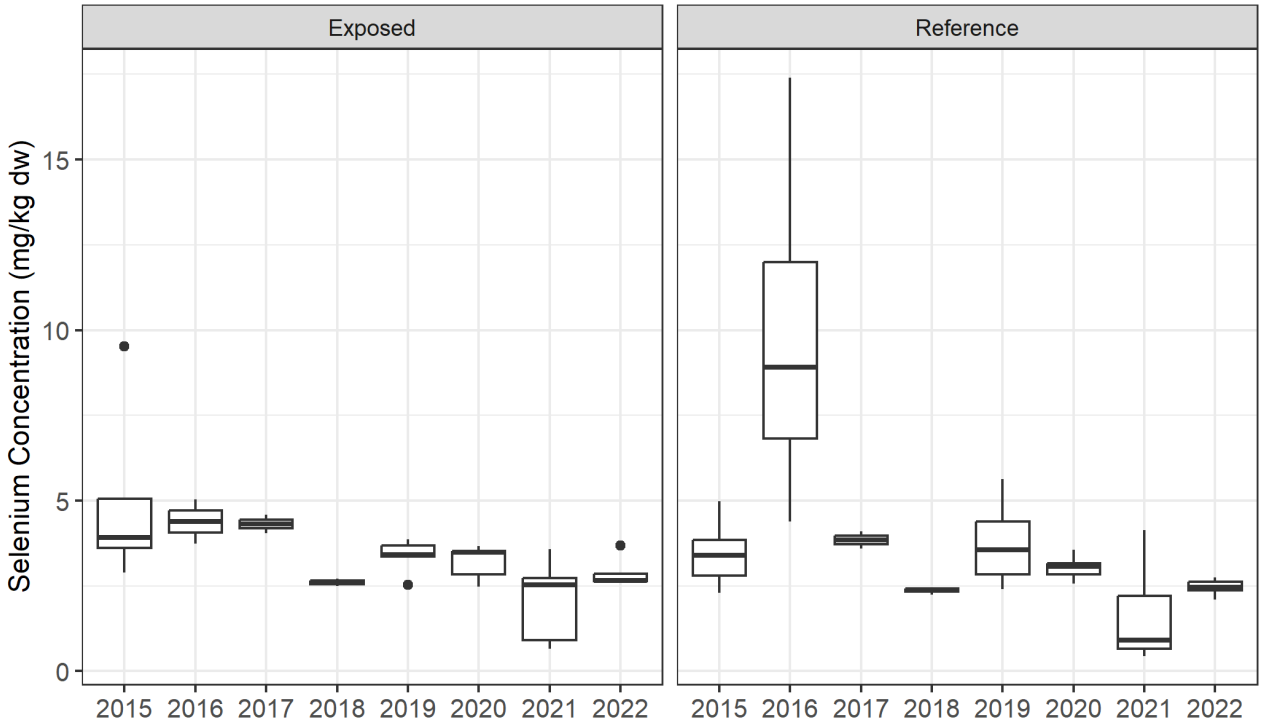
Note: Boxes represent the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

Exposed (2015 n = 5, 2016 n = 2, 2017 n = 2, 2018 n = 2, 2019 n = 7, 2020 n = 7, 2021 n = 7, 2022 n = 7).

Reference (2015 n = 10, 2016 n = 4, 2017 n = 2, 2018 n = 4, 2019 n = 8, 2020 n = 7, 2021 n = 7, 2022 n = 7).

mg/kg dw = milligrams per kilogram dry weight.

Figure 2.9-3: Boxplot of Copper Concentrations in Zooplankton Tissue Samples Collected from Exposed (QUL-ZOO-1) and Reference (QUL-ZOO-7, QUL-ZOO-8) Stations in Quesnel Lake from 2015 to 2022



Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution.

Exposed (2015 n = 5, 2016 n = 2, 2017 n = 2, 2018 n = 2, 2019 n = 7, 2020 n = 7, 2021 n = 7, 2022 n = 7).

Reference (2015 n = 10, 2016 n = 4, 2017 n = 2, 2018 n = 4, 2019 n = 8, 2020 n = 7, 2021 n = 7, 2022 n = 7).

mg/kg dw = milligrams per kilogram dry weight.

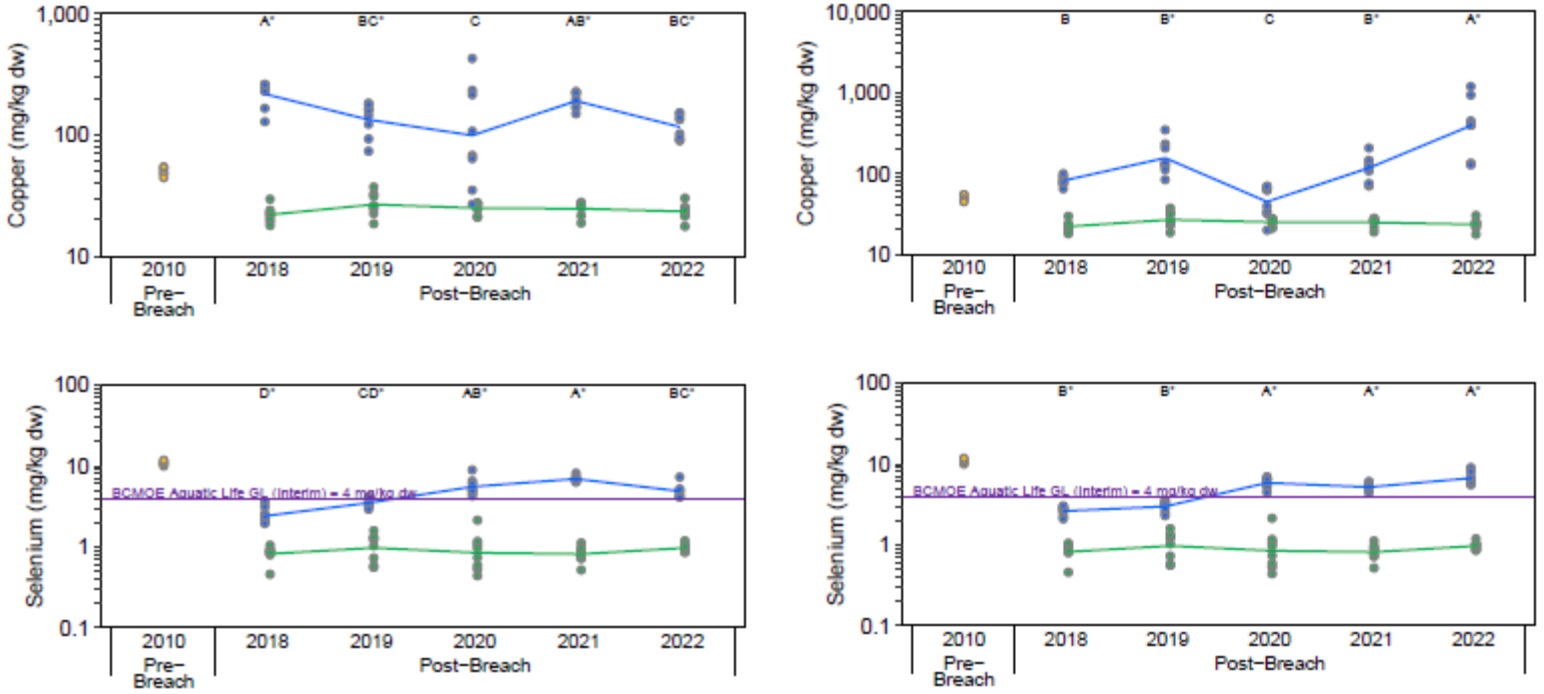
Figure 2.9-4: Boxplot of Selenium Concentrations in Zooplankton Tissue Samples Collected from Exposed (QUL-ZOO-1) and Reference (QUL-ZOO-7, QUL-ZOO-8) Stations in Quesnel Lake from 2015 to 2022

Hazeltine Creek

Benthic invertebrate and periphyton tissue quality has been monitored consistently in Hazeltine Creek and reference areas since the initiation of the CEMP in 2018 (Appendix 7-1). Upper Hazeltine Creek (HAC-R1, HAC-U) and associated reference in Edney Creek (EDC-U), as well as lower Hazeltine Creek (HAC-D) and associated reference in Edney Creek (EDC-D) have been monitored annually since 2018, with select monitoring prior to 2018 including pre-breach sample collected. Benthic invertebrate tissue quality samples collected since 2018 include two sample types: composite-taxa benthic samples (mixture of benthic invertebrate taxa representative of the sampling area) and single taxon samples (caddisfly). Copper and selenium tissue concentrations are discussed here as their concentrations in effluent from the WTP are greater than the BC WQGs.

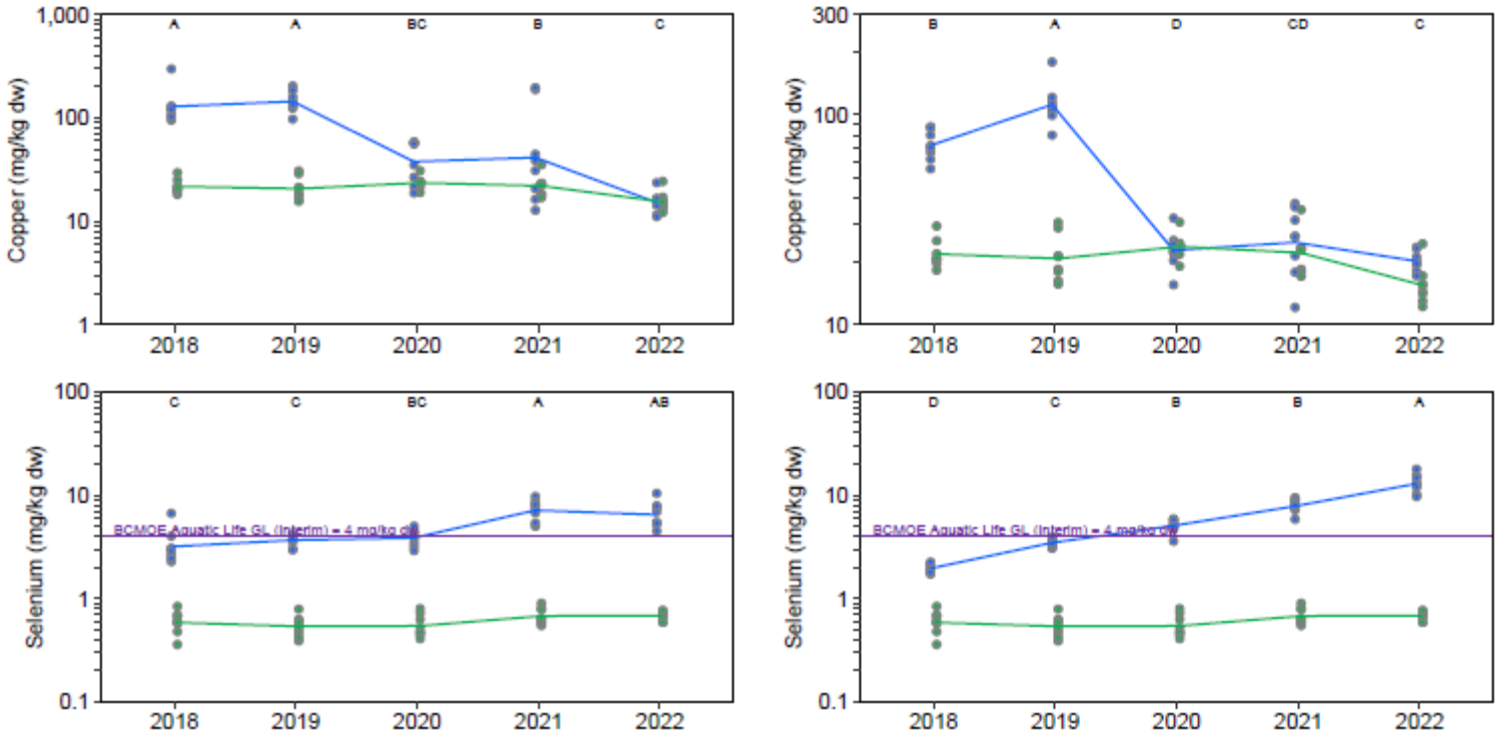
Benthic invertebrate and periphyton tissue concentrations of copper and selenium in upper and lower Hazeltine Creek were higher than reference and increased over time and showed some evidence of moderately higher bioavailability and/or trophic transfer of selenium and copper in upper Hazeltine Creek, and selenium in lower Hazeltine Creek (Figure 2.9-5, Figure 2.9-6, Figure 2.9-7, Figure 2.9-8; Appendix 2-7). Copper benthic invertebrate tissue concentrations were elevated relative to reference in 2022, and higher than pre-breach in most tissues and sampling years; however, the difference relative to reference has been similar to reference over monitoring years except at HAC-U where concentrations in composite taxa-benthic invertebrate samples were higher in 2022 than 2018 to 2022 (relative to reference). Mean trophic transfer of copper was stable or decreasing over time and lower than pre-breach, except for in composite taxa-benthic invertebrates from HAC-U which had mean trophic transfer that increased over time and was higher than pre-breach. The temporal increase in trophic transfer and copper concentrations in benthic invertebrates in 2022 was limited to composite taxa-benthic invertebrate tissues from HAC-U and was not observed in caddisfly tissues from HAC-U nor in benthic invertebrate tissues from HAC-R1 of upper Hazeltine Creek, indicating a potentially localized increase (Appendix 2-7).

Selenium concentrations in most tissues (upper and lower Hazeltine Creek) have increased since 2018 compared to reference (except composite-taxa benthic invertebrate samples from lower Hazeltine Creek), suggesting a mine influence on tissue concentrations. Mean selenium concentrations in benthic invertebrate tissue have exceeded the BC interim guideline since 2020 and 2022 in upper (HAC-R1 and HAC-U) and lower (HAC-D) Hazeltine Creek, respectively, suggesting potential selenium-associated risks to aquatic life.



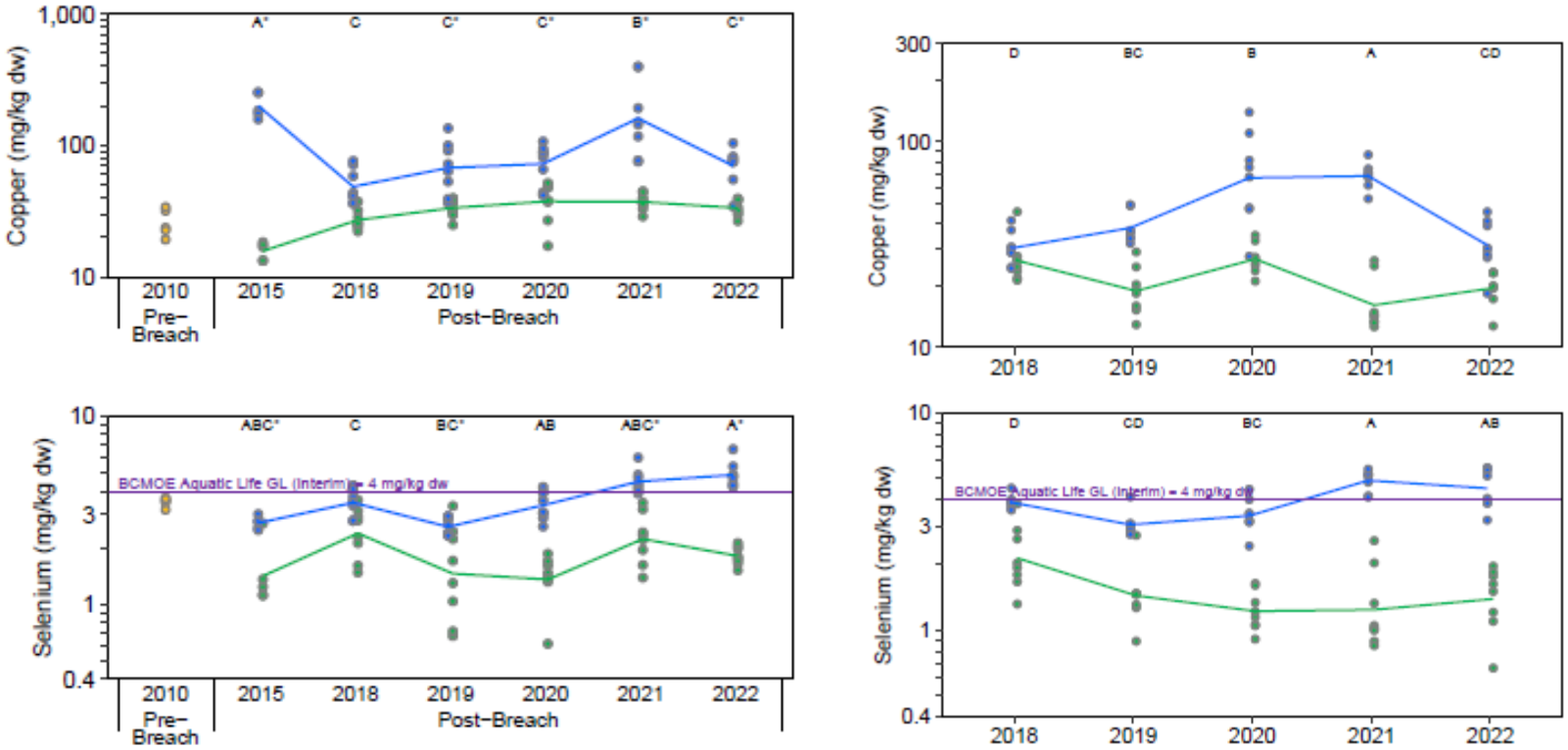
Note: Blue circles represented data from exposed locations in Hazeltine Creek, green circles represent reference data from Edney Creek, and yellow circles represent pre-breach data from Edney Creek. Concentrations below the detection limit are plotted as open symbols at the detection limit. Individual samples are plotted and lines join the least-squares estimated mean values for years included in the statistical analysis (i.e., not less than the detection limit). Statistical analyses were conducted using a two-way ANOVA with factors Area and Year. The mdoels were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have ratios of concentrations (Exposed:Reference) that do not differ significantly (p-value <0.05) amoung years. Letter A was assigned to the year with the highest ratio of concentrations (Exposed:Reference). Only years with samples from both reference and exposed areas were plotted. Letters with a * designate years where the exposed site is different than pre-breach conditions.

Figure 2.9-5: Composite-Taxa Benthic Invertebrate Tissue Copper and Selenium Concentrations for Upper Hazeltine Creek Monitoring Stations HAC-R1 (left) and HAC-U (right) Compared to Pre-Breach Data in 2010 and the Reference Station in Upper Edney Creek (EDC-U) from 2018 to 2022



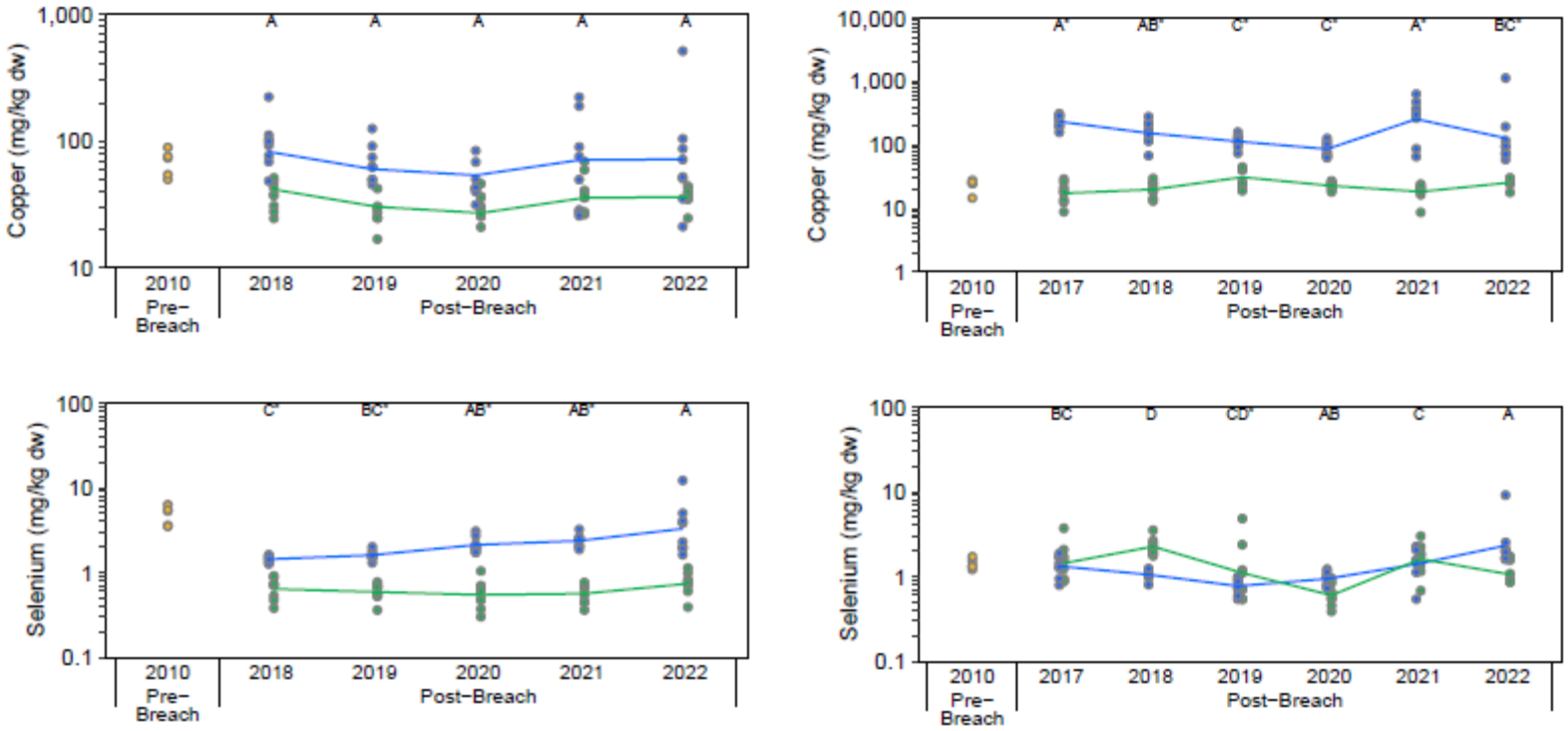
Note: Blue circles represented data from exposed locations in Hazeltine Creek, green circles represent reference data from Edney Creek, and yellow circles represent pre-breach data from Edney Creek. Concentrations below the detection limit are plotted as open symbols at the detection limit. Individual samples are plotted and lines join the least-squares estimated mean values for years included in the statistical analysis (i.e., not less than the detection limit). Statistical analyses were conducted using a two-way ANOVA with factors Area and Year. The mdoels were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have ratios of concentrations (Exposed:Reference) that do not differ significantly (p-value <0.05) amoung years. Letter A was assigned to the year with the highest ratio of concentrations (Exposed:Reference). Only years with samples from both reference and exposed areas were plotted. Letters with a * designate years where the exposed site is different than pre-breach conditions.

Figure 2.9-6: Caddisfly Tissue Copper and Selenium Concentrations for Upper Hazeltine Creek Monitoring Stations HAC-R1 (left) and HAC-U (right) Compared to the Reference Station in Upper Edney Creek (EDC-U) from 2018 to 2022



Note: Blue circles represented data from exposed locations in Hazeltine Creek, green circles represent reference data from Edney Creek, and yellow circles represent pre-breach data from Edney Creek.Concentrations below the detection limit are plotted as open symbols at the detection limit. Individual samples are plotted and lines join the least-squares estimated mean values for years included in the statistical analysis (i.e., not less than the detection limit). Statistical analyses were conducted using a two-way ANOVA with factors Area and Year. The mdoels were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have ratios of concentrations (Exposed:Reference) that do not differ significantly (p-value <0.05) amoung years. Letter A was assigned to the year with the highest ratio of concentrations (Exposed:Reference). Only years with samples from both reference and exposed areas were plotted. Letters with a * designate years where the exposed site is different than pre-breach conditions.

Figure 2.9-7: Composite-Taxa Benthic Invertebrate Tissue (left) and Caddisfly Tissue (right) Copper and Selenium Concentrations for Lower Hazeltine Creek Monitoring Station (HAC-D) Compared to Available Pre-Breach data from 2010 and the Reference Station in Lower Edney Creek (EDC-D) from 2018 to 2022



Note: Blue circles represented data from exposed locations in Hazeltine Creek, green circles represent reference data from Edney Creek, and yellow circles represent pre-breach data from Edney Creek. Concentrations below the detection limit are plotted as open symbols at the detection limit. Individual samples are plotted and lines join the least-squares estimated mean values for years included in the statistical analysis (i.e., not less than the detection limit). Statistical analyses were conducted using a two-way ANOVA with factors Area and Year. The models were fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Years that share a letter (e.g., A, B, C) have ratios of concentrations (Exposed:Reference) that do not differ significantly (p-value <0.05) amoung years. Letter A was assigned to the year with the highest ratio of concentrations (Exposed:Reference). Only years with samples from both reference and exposed areas were plotted. Letters with a * designate years where the exposed site is different than pre-breach conditions.

Figure 2.9-8: Periphyton Tissue Concentrations for Upper Hazeltine Creek (HAC-U; left) and Lower Hazeltine Creek (HAC-D; right) Compared to Available Pre-Breach data from 2010 and the Corresponding Reference Station in Upper Edney Creek (EDC-U) and Lower Edney Creek (EDC-D) from 2018 to 2022

2.10 Ecosystems and Wildlife

To characterize the baseline terrestrial conditions in the area within the Mine Site affected by the expansion of the SERDS resulting from the Springer Expansion, a background information review and two-day field reconnaissance was conducted by two WSP biologists on 8 and 9 August 2023. The objective of the reconnaissance was to verify and supplement information gathered during the background review and characterize terrestrial resources in the Project Area that could potentially be adversely affected by the proposed Project. Meander transects were traversed on foot throughout the Project Area. Information gathered included:

- Structure and composition of vegetation communities
- Wildlife habitat features
- Chance encounters with wildlife and wildlife sign
- Potential for habitat to support provincially and/or federally designated species
- Occurrence of invasive plants
- Presence/absence of aquatic features and wetted areas

Field descriptions and geo-referenced photos were collected to document and record the location of observed habitat features. Information derived from the reconnaissance survey was then used to describe the general habitat types available within the Project Area and to further refine the assessment of potential species at risk (SAR) presence.

Characterization of baseline terrestrial conditions within the TSF area to accommodate the TSF interim raise to 974 m was limited to a desktop assessment. Field surveys will be conducted in the Project footprint of the TSF final raise to 987 m and the findings will be included in a future application associated with the final Life of Mine.

The desktop review for the TSF interim raise to 974 m was based on publicly available information including government databases, web-based resource maps and inventories, and previous reports provided by MPMC. Information sources included:

- Background Reports Provided by MPMC:
  - The Mount Polley Mine Project Reclamation Plan (Hallam Knight Piésold Ltd. 1996)
  - 2021 Annual Reclamation Report for the Mount Polley Mine (MPMC 2022)
- Publicly Available Resources:
    - BC Conservation Data Centre (CDC) Species and Ecosystems Explorer (BC CDC 2023)
  - InvasivesBC database (Government of BC 2023a)
  - Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia

(Government of BC 2023b)

- iMapBC online mapping database (Government of BC 2023c)
- Habitat Wizard online mapping database (Government of BC 2023d)
- Federal Species at Risk Public Registry (Government of Canada 2023)
- Great Blue Heron Nesting Atlas (GBHMT 2023)
- Wildlife Tree Stewardship (WiTS) Atlas of Raptor Nests (WiTS 2023)

2.10.1 Ecosystems

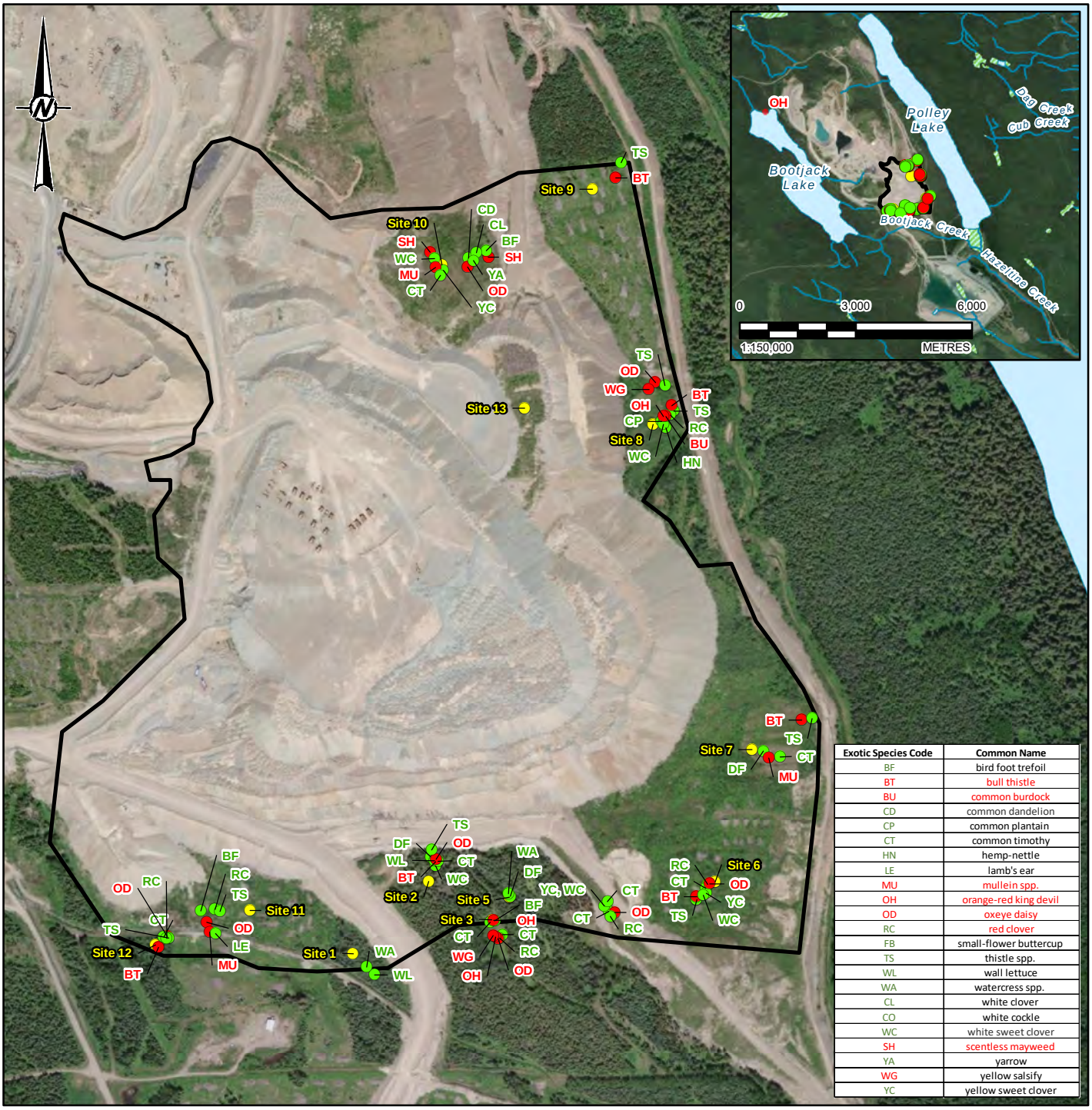
2.10.1.1 Ecological Context

British Columbia has been classified into biogeoclimatic zones based on vegetation, geological, and climatic conditions and uses local climate and landform conditions to reflect the distribution and presence of specific plant communities and ecosystems.

Both the SERDS and interim TSF areas are located within the Interior Cedar-Hemlock (ICH) Biogeoclimatic Ecosystem Classification (BEC) zone, moist cool (mk) subzone, and horsefly (3) variant (ICHmk3). The ICHmk3 occurs in areas with elevations ranging from 780 m to 1,250 m along the eastern flank of the Fraser Plateau as well as in sections of the Quesnel Highland (Steen and Coupé 1997). Characteristic zonal (i.e., medium moisture and medium nutrient) forested areas are dominated by western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*), and lodgepole pine (*Pinus contorta* var. *latifolia*) while paper birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*) dominate areas previously burned by fires. The understorey is typically dominated by black huckleberry (*Vaccinium membranaceum*), falsebox (*Paxistima myrsinites*), feathermoss (*Pleurozium* sp.) and other low-growing herbs (Steen and Coupé 1997).

2.10.1.2 Vegetation

The Mine Site is primarily comprised of an anthropogenically disturbed rock disposal area and access roads associated with the Mount Polley Mine; however, the south and east portions of the SERDS expansion area contain more naturalized vegetated areas (Figure 2.10-1). A total of 11 field plots were sampled during the field reconnaissance to characterize vegetation present in these areas. Four of the sites (Site 1, 2, 5 and 12) surveyed were located in forested areas comprised of mature deciduous and coniferous trees, shrubs and forbs. Sites 3, 6, 7, 9, and 11 were in areas with young seral vegetation including coniferous and deciduous trees/shrubs, grasses and forbs. Two of the sites (8 and 10) had recent anthropogenic disturbance with surrounding vegetation sparse. Site 13 is part of the current SERDs with no vegetation present and Site 4 was not surveyed.



Exotic Species Code	Common Name
BF	bird foot trefoil
BT	bull thistle
BU	common burdock
CD	common dandelion
CP	common plantain
CT	common timothy
HN	hemp-nettle
LE	lamb's ear
MU	mullein spp.
OH	orange-red king devil
OD	oxeye daisy
RC	red clover
FB	small-flower buttercup
TS	thistle spp.
WL	wall lettuce
WA	watercress spp.
CL	white clover
CO	white cockle
WC	white sweet clover
SH	scentless mayweed
YA	yarrow
WG	yellow salsify
YC	yellow sweet clover

LEGEND

TERRESTRIAL SURVEY LOCATION

- INVASIVESBC SPECIES
- NON-REGULATED EXOTIC SPECIES
- SITE
- TERRESTRIAL SURVEY AREA
- WATERCOURSE
- WATERBODY
- WETLAND

0 200 400

1:10,000 METRES

REFERENCE(S)

1. BASE DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – BRITISH COLUMBIA.
2. IMAGERY COPYRIGHT © 20210621 ESRI AND ITS LICENSORS. SOURCE: MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
VEGETATION RESOURCES

CONSULTANT

wsp

YYYY-MM-DD	2023-11-28
DESIGNED	DS
PREPARED	CDB
REVIEWED	DS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
23590671	81100/81112	0	2.10-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

25mm

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PATH: Y:\burnaby\CAD-GIS\Client\Imperial Metals Corp\Mount Polley Mine\93 PROJECTS\23590671\81100\81112\Doc.zzz\02 PRODUCTION\MXD\Report\23590671 81100 81112 02 10 01 VEGETATION RESOURCES.mxd PRINTED ON: 2023-11-28 AT 7:57:09 PM

A total of 81 plant species were recorded during the field reconnaissance, including western redcedar, white spruce (*Picea glauca*), Douglas-fir, alder (*Alnus alnobetula),* black cottonwood (*Populus thrichocarpa*), sitka willow (*Salix sitchensis*), devil's club (*Oplopanax horridus*), oak fern (Gymnocarpium *dryopteris),* spiny wood fern (*Dryopteris expansa*), bunchberry (*Cornus canadensis*), hair cap moss (*Polytrichum* spp.) and horsetail (*equisetum* spp.). A list of plant species observed during the field reconnaissance can be found in Appendix 2-12.

The InvasivesBC provincial invasive plant mapping tool had no records of invasive plants occurring in or adjacent to the SERDS and TSF raise to 974 m areas (Government of BC 2023a). However, during the field reconnaissance, 23 exotic plant species were observed in the SERDS expansion area, and of these, 6 species are considered invasive plants of concern by the province or regionally noxious in the Cariboo region (Government of BC 2023b).

- Bull thistle (*Cirsium vulgare*) [Listed as an invasive plant of concern in BC (Government of BC 2023b)]
- Common burdock (*Arctium minus*) [Listed as regionally noxious in the Cariboo region (Government of BC 2023b)]
- Orange-red king devil (*Pilosella aurantiaca*), also known as orange hawkweed [Listed as regionally noxious in the Cariboo region (Government of BC 2023b)]
- Oxeye daisy (*Leucanthemum vulgare*) [Listed as regionally noxious in the Cariboo region (Government of BC 2023b)]
- Scentless mayweed (*Tripleurospermum inodorum*) [Listed as regionally noxious in the Cariboo region (Government of BC 2023b)]
- Yellow salsify (*Tragopogon dubius*) [Listed as an invasive plant of concern in BC (Government of BC 2023b)].

All invasive plants were identified in areas of anthropogenic disturbance such as adjacent to access roads. Other non-regulated exotic plant species were identified generally in disturbed areas, including bird foot trefoil (*Lotus corniculatus*), common dandelion (*Taraxacum officinale*), lamb's ears (*Stachys byzantina*), wall lettuce (*Mycelis muralis*), watercress (*Nasturtium* sp.), white sweet-clover (*Melilotus alba*) and yellow sweet-clover (*Melilotus officinalis*). Exotic agronomic species such as red clover (*Trifolium pratense*) and common timothy (*Phleum pratensis*), may have been used during previous reclamation activities within the SERDS expansion area. A list of non-native species can be found in Appendix 2-12.

Terrestrial Ecosystem Mapping (TEM) was not available for the SERDS expansion area; therefore, site series were determined based on vegetation characteristics and slope morphology observed during the field reconnaissance, as possible (

Table 2.10-1). Although site series were determined based on existing sites conditions, sites were highly disturbed due to legacy forest clearing and rockfall from the nearby rock deposits. Sites series could not be determined for the remaining sites due to anthropogenic disturbance.

Table 2.10-1: Site Series Observed during the Field Reconnaissance

Site Parameter	Site 1	Site 5	Site 12
BEC subzone/variant	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)
Map Code	RH	RD	RH
Site Series	07	06	07
Site Series Name	western redcedar / devil's club / common horsetail Site Series	western redcedar / devil's club / lady fern Site Series	western redcedar / devil's club / common horsetail Site Series
Slope (%)	12	13	>10
Aspect	140	36	-
Mesoslope position	Toe	Toe	Toe
BC List	Yellow	Yellow	Yellow

TEM data overlaps the eastern portion of the TSF raise to 974 m area; therefore, site series data presented in Table 2.10-2 was obtained from publicly available databases and was not collected by WSP (Government of BC 2023c).

Table 2.10-2: Site Series Obtained from Publicly Available Databases

BEC subzone/variant	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)	Interior cedar-hemlock moist cool subzone, Horsefly Variant (ICHmk3)
Map Code	RF	SO	RD
Site Series	01	04	06
Site Series Name	CwSxw – Falsebox – Knight's plume	CwSxw – Oak fern – Cat's tail moss	CwHw – Devil's club – Lady fern
Typical Situation	typically occurs on deep, medium-textured, mesic soils; gently to moderately sloping moraine	typically occurs on deep, medium-textured, subhygric soils; gentle lower slopes on moraine and fluvial deposits	typically occurs on deep, medium-textured, subhygric soils; gentle lower, moisture receiving slope positions with seepage
Modifiers	c,g,h,k,n,r,s,t,w[1]	c,g,k,n,s,t,w[1]	c,g,k,n,p,s,w[1]

[1] Soils
- c coarse-textured soils
- p peaty material
- s shallow soils

Topography
- g gullying occurring
- h hummocky terrain
- k cool aspect
- n fan
- r ridge
- t terrace
- w warm aspect

Vegetation Resources Inventory (VRI) spatial datasets overlap the SERDS expansion area and provide additional information on tree species reported in the area (Government of BC 2023c). Table 2.10-3 shows tree species listed under the VRI dataset compared with tree species identified during the field reconnaissance. The projected tree age for each specific site varied; however, age estimates of trees observed on site did not match VRI 'projected' tree age. For example, the VRI data for Sites 9 and 11 indicate the projected age as 173 years and 233 years, respectively. Old growth trees were not observed in the Site due to previous forest harvesting (Appendix 2-12). Conversely, Sites 1 and 5 had a VRI-projected age listed as 36 years while mature trees observed on these sites varied between 50 to 80 years.

The desktop review found no wetland habitat overlapping with the SERDS expansion area; however, a swamp ecosystem was observed at Site 5 while ephemerally wetted areas were observed at Sites 7 and 11 with cattail growing in the depression areas.

Table 2.10-3: Tree Species listed from Vegetation Resources Inventory and Species Identified during Field Reconnaissance on 08 and 09 August 2023 in the SERDS Expansion Area

Sites	VRI[1]	Survey
1	hybrid spruce (*Picea glauca* x *engelmannii*), Douglas-fir, western redcedar, poplar (*Populus* sp.) and subalpine fir (*Abies lasiocarpa*)	Douglas-fir, western redcedar, white spruce, alder, spruce sp. (*Picea* sp.).
2	hybrid spruce, Douglas-fir, trembling aspen	Douglas-fir, western redcedar, alder, black cottonwood
3		western redcedar, trembling aspen, lodgepole pine, black cottonwood, spruce sp.
5		Douglas-fir, western redcedar, alder, spruce sp.
6	hybrid spruce, Douglas fir, western redcedar, poplar	western redcedar, black cottonwood, trembling aspen, Douglas maple
7		western redcedar, black cottonwood, Douglas-fir, Douglas maple, trembling aspen, lodgepole pine
9	hybrid spruce, Douglas-fir, western redcedar	western redcedar, Douglas maple, Douglas-fir, white spruce, juniper (*Juniperus scopulorum*), trembling aspen, black cottonwood and lodgepole pine.
8 & 10	No VRI data	black cottonwood
11	hybrid spruce, western redcedar, poplar, subalpine fir	black cottonwood
12	Douglas-fir, spruce hybrid, poplar, subalpine fir	Douglas-fir, wester redcedar, alder, white spruce.

1) VRI data extracted from iMapBC under vegetated land cover (Government of BC 2023c).

VRI data for the TSF raise to 974 m area is based solely on information obtained from publicly available databases (Government of BC 2023c). VRI data indicates that forested regions south of the south embankment consist of western hemlock, aged 314 years, hybrid spruce, aged between 104 and 234 years, and black spruce, aged 154 years (Government of BC 2023c). Forested regions south of the main embankment consist of hybrid spruce aged between 54 and 114 years, and western redcedar, aged 12 years (Government of BC 2023c). Projected age estimates of trees from the VRI database were not confirmed in the field and therefore it is possible the existing vegetated land cover varies from the mapped data.
The desktop review found no wetland habitat overlapping the TSF raise to 974 m area; however, two wetlands are mapped approximately 70 m south of the existing south embankment and 115 m south of the main embankment (Government of BC 2023c).

2.10.1.3 Species at Risk

2.10.1.3.1 Ecological Communities

The BC Conservation Data Centre (BC CDC) query produced seven provincially listed (red- or blue-listed) ecological communities with the potential to occur regionally (BC CDC 2023). Based on a review of the listed ecological communities in comparison to the ecological communities observed during the field reconnaissance, none are expected to occur in the SERDS expansion area. A list of the provincially listed ecological communities with the potential to occur in the regional area from the BC CDC query is provided in Appendix 2-12.

The background desktop review found no element occurrence records of at-risk ecological communities mapped overlapping the SERDS expansion area and TSF raise to 974 m areas (Government of BC 2023a). A 2024 field survey did not identify sitka willow – pacific willow – skunk cabbage, which is a provincial blue-listed ecological community (BC CDC 2023), at site 1 or site 12 in the SERDS expansion area.

2.10.1.3.2 Vegetation

The BC CDC query for plant SAR produced two vascular, two non-vascular, and nine lichen species with the potential to occur regionally with either federal designation as Endangered, Threatened or Special Concern, or provincial red- or blue-listed designation (BC CDC 2023). A list of plant species returned in the BC CDC query is provided in Appendix 2-12. No plant species at risk were observed during the field reconnaissance; however, the field reconnaissance was not carried out during the appropriate floristic period for identification of at-risk plants. Potential of occurrence was not assessed for plants as species-specific surveys would be required during the appropriate seasons to confirm the potential for at-risk plants.

2.11 Land Status and Use

The majority of the mine footprint is located on Crown Lands, with the exception of one rural, private land parcel that overlaps the project area (PID 027-454-231), and three private land parcels that are outside of the project area on the northeast end of Bootjack Lake and the north end of Polley Lake (iMapBC 2023). Mineral claims consist of 342 units representing a total surface area of 8,550 ha (MPMC 1996). Mount Polley Mine is accessed via Likely Road and Morehead-Bootjack Forest Service Road (Figure 1.3-3). Transportation within the mine site is via access roads for light duty vehicles and large haul roads for heavy equipment.

Prior to mine operations, commercial forestry was the predominant land use activity within the project area. Significant portions of the project area were clearcut, and the cutblocks were replanted for either commercial timber use or a combination of silviculture and cattle grazing use (MPMC 1996). Six active forest harvest authorizations and twelve active forest cut blocks overlap the project area, all of which are owned by MPMC (iMapBC 2023). The nearest land represented by the Agricultural Land Reserve is located approximately 500 m south of the Tailings Storage Facility (iMapBC 2023).

Hunting, guiding and trapping are common recreational activities in the region, and the network of active forest service roads around the mine site is used by both locals and non-residents (MPMC 1996). The project area is entirely within the registered trapping area TR0502T056 (iMapBC 2023). The northern extent of the project area overlaps an active guide outfitter area, held by Brian Iverson. The southern extent of the project area overlaps an active range tenure, held by U2 Cattle Co. Ltd. (iMapBC 2023). Outdoor recreational activities around the mine site include lake fishing, camping, hiking, snowmobiling and cross-country skiing (MPMC 1996).

The campgrounds on Bootjack and Polley Lakes are used throughout the camping season and the forest service roads are used year-round for recreational purposes.

First nations with recognized claimed traditional territory for the Mount Polley Mine are the T'exelcemc (Williams Lake First Nation) and the Xatśūll First Nation. Pre-mining studies noted that the project area had low heritage resource potential due to the extensive disturbance from logging and earlier mining projects (MPMC 2021).

2.11.1 Wildlife

2.11.1.1 Herptiles

Amphibians in BC are grouped into either aquatic breeding obligates (frogs, toads, newts and mole salamanders [*Ambystomatidae*]) or terrestrial breeding obligates (lungless salamanders [*Plethodontidae*]; BC MoE 2014). Aquatic breeding obligates lay their eggs in freshwater including warm, shallow, roadside ditches and stormwater ponds (BC MoE 2020).
Adult amphibians occurring in terrestrial environments generally require moist habitat with cover objects such as logs, shrubs, tree hollows, and rock crevices to provide thermoregulatory and shelter sites.

Amphibian species with ranges that overlap the SERDS and TSF raise to 974 m areas include western toad (*Anaxyrus boreas*), Columbia spotted frog (*Rana luteiventris*), wood frog (*Rana sylvatica*), and long-toed salamander (*Ambystoma macrodactylum*). The field reconnaissance was conducted on August 8 and 9, 2023 during dry conditions. No evidence of amphibian breeding was noted; however, there is potential for breeding sites to develop within the SERDS expansion area earlier in the breeding season and during periods of heavy rainfall. A wetland with the potential to support amphibian breeding was also observed outside of the SERDS area approximately 700 m southeast of Site 5. Two adult western toads were observed during the field reconnaissance in a moist, forested area comprised of mature deciduous and coniferous trees, shrubs and forbs at Site 1 (Figure 2.11-1).

The TSF raise to 974 m area was not assessed during the August 2023 field reconnaissance; however, western toad and Columbia spotted frog have been documented to occur in Polley Flats, north of the Perimeter Embankment Till Borrow Pond (PETBP; Government of BC 2023c). While there are no documented occurrences of amphibians within the South Embankment Seepage Collection Pond or the Main Embankment Seepage Collection Pond, these ponds have the potential to support amphibian breeding. In addition, two wetlands are mapped approximately 70 m south of the existing south embankment and approximately 115 m south of the existing main embankment (Government of BC 2023c). Western toad is provincially yellow-listed and federally listed as Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA).

Reptile species with ranges that overlap the SERDS and TSF raise to 974 m areas include painte– turtle - Intermountain – Rocky Mountain Population (*Chrysemys picta* pop. 2), common garter snake (*Thamnophis sirtalis*) and western terrestrial garter snake (*Thamnophis elegans).* Suitable reptile habitat generally provides access to food sources (i.e., small mammals, amphibians, invertebrates), thermoregulatory habitat such as sunning outcrops and cover objects, shelter from predators, and access to hibernation sites (BC MoE 2014). Garter snakes may forage in vegetated areas of the Site, particularly where shrub cover is available. Suitable denning (hibernacula) habitat was not observed within the SERDS expansion area. No reptiles were observed during the field reconnaissance.

LEGEND

- WILDLIFE RESOURCE
- SITE
- POND
- SERDS TOE
- TERRESTRIAL SURVEY AREA
- WATERCOURSE
- WATERBODY
- WETLAND
- UNGULATE WINTER RANGE - APPROVED
- CARIBOU HERD BOUNDARY
- CRITICAL HABITAT FOR FEDERALLY LISTED SPECIES AT RISK - POSTED

SPECIES AND ECOSYSTEMS AT RISK - PUBLICLY AVAILABLE OCCURRENCES - CDC

- ANIMAL - VERTEBRATE

0 200 400
1:10,000 METRES

REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
WILDLIFE RESOURCES

CONSULTANT

YYYY-MM-DD	2023-11-28
DESIGNED	RS
PREPARED	CDB
REVIEWED	RS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
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2.11.1.2 Birds

Passerine species use a variety of habitat types depending on life requisites, such as nesting and foraging. Suitable nesting sites are available throughout the SERDS and TSF raise to 974 m areas, such as in trees or shrubs. The nearest reported hotspot for bird sightings is “Gavin Lake” located approximately 7.5 km southwest of the mine site, where 89 species observations have been recorded (eBird, 2023).

Limited suitable nesting habitat for raptor species such as bald eagle (*Haliaeetus leucocephalus*) and red-tailed hawk (*Buteo jamaicensis*) was observed within the SERDS expansion area; however, raptor species likely forage in the area. A search of the *Wildlife Tree Stewardship Atlas* (WiTS 2018) and the *Great Blue Heron Nesting Atlas* (GBHMT 2018) did not return results of reported bald eagle, osprey (*Pandion haliaetus*), or great blue heron (*Ardea herodias*) nests within the SERDS or TSF raise to 974 m areas. The closest great blue heron colony (GBHE-502-005) was recorded approximately 6 km north of the Site. No stick nests were observed within the SERDS expansion area during the field reconnaissance; however, two wildlife trees containing cavities were observed at Sites 2 and 3 that may be used by woodpecker species for foraging (Figure 2.11-1). A group of snags was also observed at the north boundary of Site 2 that may contain wildlife habitat, and bird activity was noted in the area. Forested regions south of the south and main embankments, and north of the PETBP were not assessed during the field reconnaissance; however, these areas likely provide suitable nesting habitat for raptor species.

Mature forests in and adjacent to the SERDS and TSF raise to 974 m areas may provide suitable nesting and foraging habitat for grouse species. According to the Mount Polley Mine Project Reclamation Plan (Hallam Knight Piésold Ltd. 1996), ruffed grouse (*Bonasa umbellus*) were commonly found within the mine footprint in deciduous and mixed-wood forest and the dusky grouse (*Dendragapus obscurus*) (previously known as blue grouse) was commonly found in mature to old coniferous forests dominated by western redcedar and Douglas-fir. Waterfowl are not anticipated to be present within the SERDS expansion area due to limited suitable aquatic habitat; however, would likely be present in Polley Lake and adjacent wetland habitat. Based on aerial imagery, waterfowl may also be present in the South and Main Embankment Seepage Collection Ponds, the PETBP, and the South Till Borrow ponds.

Six bird species were observed within the SERDS expansion area during the field reconnaissance:

- Western tanager (*Piranga ludoviciana*)
- Warbling vireo (*Vireo gilvus*)
- Yellow-rumped warbler (*Setophaga coronata*)
- American robin (*Turdus migratorius*)

- Rufous hummingbird (*Selasphorus rufus*)
- Western wood-pewee (*Contopus sordidulus*)

The area was primarily dominated by deciduous trees and shrubs due to previous forest harvesting. Songbirds that are typically associated with young clearcuts and recent burns include chipping sparrow (*Spizella passerine*), dark-eyed junco (*Junco hyemalis*), Hammond's flycatcher (*Empidonax hammondii*), western wood-pewee, warbling vireo, orange-crowned warbler (*Vermivora celata*) and American robin (Hallam Knight Piésold Ltd. 1996).

Field verification was not completed in the TSF raise to 974 m areas in 2023 as the interim raise will primarily affect previously disturbed areas, but field surveys will be conducted in 2024 for the TSF raise to 987 m required for the LoM.

2.11.1.3 Mammals

Small mammals, such as insectivores (i.e., moles, shrews) and rodents (i.e., mice, rats), are expected to occur in and around the SERDS and TSF interim raise to 974 m areas. Two unidentified small mammal species were observed within the SERDS expansion area during the field reconnaissance. Deer mouse (*Peromyscus maniculatus*), northern red-backed vole (*Myodes rutilus*) and meadow vole (*Microtus pennsylvanicus*) are known to be the most common small mammals within the mine footprint (Hallam Knight Piésold Ltd. 1996). Insects, seeds, and berries provide suitable foraging material for small mammals. Several yellow pine chipmunks (*Neotamias amoenus*) and middens were observed during the field reconnaissance. Bats may forage over vegetated areas in and surrounding the Site and the group of snags observed at Site 2 may potentially provide bat roosting habitat. No bats were observed during the field reconnaissance.

Large mammals such as black bear (*Ursus americanus*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*) and moose (*Alces alces*) are expected to occur in and around the SERDS and TSF interim raise to 974 m areas. A female mule deer was observed at Site 1 during the field reconnaissance on August 9, 2023. Mule deer are not designated by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or listed under SARA, and provincially, they are a yellow-listed species ranked as S5.

Ungulate (caribou and moose) scat and tracks were observed at Sites 6 and 7. Ungulate scat and tracks were also observed at Sites 1, 8 and 11. Lichen species are an important forage species for caribou and were observed on rock and fallen tree branches at Sites 1, 3, 5 and 11. Furthermore, a mineral lick was identified adjacent to Beaver Lake Rd, approximately 315 m south of the existing south embankment near the TSF interim raise to 974 m area (Figure 2.11-1). Mineral licks are naturally occurring mineral deposits used by animals to obtain essential mineral nutrients. Mineral licks are frequented by ungulates throughout the year, but particularly during periods when bone, antler, horn, and muscle growth peak (i.e., spring and summer; MECCS

2018). Woodland caribou in BC occur in 52 populations that have been classified into three ecotypes – mountain, northern and boreal – based primarily on feeding behaviour and habitat associations (Province of BC 2020). The Site overlaps with the Wells Gray North sub-population of the Southern Mountain population of caribou (*Rangifer tarandus* pop. 1). The Wells Gray North caribou subpopulation is located within the Southern Mountain National Ecological Area and are listed as Threatened by the COSEWIC and appear on Schedule 1 of the SARA, is provincially red-listed and ranked S1 (critically imperilled). The most recent population estimate for the Wells Gray North sub-population is 236 caribou (Province of BC 2020).

A female moose and her calf were observed outside of the Site in the wetland located approximately 700 m southeast of Site 5. Moose are not federally designated by COSEWIC or SARA and are considered a yellow-listed species ranked S5 in the province of BC. They are regionally important to various stakeholders such as outfitters and guides as well as to Indigenous peoples.

2.11.1.4 Invertebrates

Vegetated areas within the SERDS and TSF interim raise to 974 m areas are expected to a host a variety of invertebrates (i.e., insects, spiders, worms) which likely provide prey items for herptiles (i.e., frogs, salamanders), birds, and mammals. No invertebrates were identified during the field reconnaissance on August 8 and 9, 2023.

2.11.1.5 Species at Risk and Critical Habitat

The BC CDC query produced 96 wildlife species that could potentially be present within the SERDS and TSF interim raise to 974 m areas with either federal designation as Endangered, Threatened or Special Concern, or provincial designation as red- or blue- listed (BC CDC 2023). This included a total of 2 amphibians, 6 reptiles, 46 birds, 18 mammals, and 24 invertebrates. A full list of wildlife species returned in the BC CDC query is provided in Appendix 2-12.

The background desktop search did not return any occurrences of wildlife species at risk mapped overlapping the SERDS and TSF interim raise to 974 m areas (Government of BC 2023d). The closest non-sensitive occurrence record of a wildlife species at risk is woodland caribou (Southern Mountain population) mapped approximately 6 km east of the expansion areas. In addition, the Wells Gray North caribou herd boundary (Herd ID No. 11) directly overlaps a portion of the SERDS expansion area and the entire TSF interim raise to 974 m area (Figure 2.11-1).

Critical habitat is defined as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy, or in an action plan for the species” (Government of Canada 2002). Under the *Species at Risk Act*, critical habitat is federally protected from activities that result in the destruction or degradation of designated habitat.

The SERDS and TSF interim raise to 974 m areas overlap with designated critical habitat for woodland caribou (Southern Mountain population). The critical habitat polygon encompasses a 704,258-hectare area and is of the variant “unmapped range”, meaning that additional information about the specific location would be required to determine whether it is located within high elevation, low elevation or matrix critical habitat (Government of BC 2023c; Figure 2.11-1). The background desktop search did not return any occurrences of ungulate winter range overlapping the SERDS or TSF interim raise to 974 m areas. The closest record of ungulate winter range is for mule deer and is mapped approximately 6.2 km east of the SERDS expansion area and5.4 km east of the TSF interim raise to 974 m area (Government of BC 2023c; Figure 2.11-1).

2.12 Archaeology

Five archaeological assessments have previously been conducted at the Site, three of which directly overlap or bound the Springer Pit, SERDS, or TSF interim raise to 974 m areas and two of which are in close proximity. These previous assessments are summarized below.

Further, an archaeological preliminary field reconnaissance (PFR) was conducted by WSP in October 2023 and has been summarized below as it relates to the proposed Springer Expansion, SERDS, and TSF interim raise to 974 m areas.

2.12.1 Previous Archaeological Studies

Heritage Resource Overview Assessment – Points West (1989)

Points West Heritage Consulting conducted a heritage resource overview assessment in 1989 at the mine site (Points West 1989). The heritage resource overview assessment focused on the proposed impacts at the time, which partially overlaps the Project area. PFR was conducted during the heritage resource overview assessment but was limited to the east and south edges of Bootjack Lake, as well as the access road connecting the mine to Likely Road.

The majority of the 1989 study area was classified as having low archaeological potential, with some areas classified as having low-moderate archaeological potential (along the access road but outside the Project area) and one area classified as having moderate archaeological potential at the south end of Bootjack Lake (also outside the Project area).

Archaeological Impact Assessment – Permit 1996-143 – I.R. Wilson (1996)

I.R. Wilson Consultants Ltd. conducted an archaeological impact assessment (AIA) in 1996 at a proposed dam enhancement area at the south end of Bootjack Lake and at two areas along a proposed transmission line (I.R. Wilson 1996a). The eastern-most transmission line area is located west of the Project area, east of the south end of Bootjack Lake. This work was conducted under *Heritage Conservation Act* Permit 1996-143.

During the AIA of the dam enhancement area, archaeological site FdRj-5, a subsurface stone artifact scatter, was identified on the north bank of Bootjack Creek, approximately 50 m east and downstream from Bootjack Lake and 620 m southwest of the SERDS expansion area. Archaeological site FdRj-4, an isolated stone artifact, was identified on the north bank of Bootjack Creek, approximately 450 m east and downstream from Bootjack Lake and 540 m southwest of the SERDS expansion area.

Archaeological Impact Assessment – Permit 1996-236 – I.R. Wilson (1996)

I.R. Wilson Consultants Ltd. conducted an AIA in 1996 for a proposed pump station and water pipeline (I.R. Wilson 1996b). The pump station is located on the west shore of Polley Lake and the water pipeline extends southwest from the lake, then south along the east edge of the SERDS expansion area until intersecting with the tailings pond area and the TSF interim raise to 974 m area. Subsurface testing was placed at the substation location; however, no archaeological materials were identified. The water pipeline crossing at Bootjack Creek was described as another area that may have archaeological potential; however, further described as hummocky and ultimately not determined to require subsurface testing. No archaeological sites were identified along the water pipeline route.

Preliminary Field Reconnaissance – I.R. Wilson (2004)

I.R. Wilson Consultants Ltd. conducted a PFR in 2004 for newly proposed developments at the Site, including what is described as the northeast zone, an access road leading south from this area, and a proposed dump location at the south end (I.R. Wilson 2004). These areas are located along the west side of Mount Polley Lake along its northern half, with the proposed dump area entering the SERDS expansion area. No areas of archaeological potential or archaeological sites were identified during the PFR.

Preliminary Field Reconnaissance – Terra Archaeology (2009)

Terra Archaeology conducted a PFR in 2009 for 13 proposed drill locations and associated access roads, all located north of the Project area (Terra 2009). No areas of archaeological potential or archaeological sites were identified during the PFR.

2023 Preliminary Field Reconnaissance

In advance of this application, WSP conducted a PFR in October 2023 of the Springer Expansion, SERDS, and TSF interim raise to 974 m areas.

The vast majority of the Springer Expansion and SERDS areas was determined to have low archaeological potential due to steeply sloping or rocky and undulating terrain which has been heavily disturbed as a result of previous logging and mining activities. The area in the vicinity of Bootjack Creek, in the southeast portion of the SERDS expansion area, is the least disturbed (still with past logging disturbance observed) and is considered, in part, to have high archaeological potential given the presence of the Bootjack Creek, level areas along the top of the ravine in which the creek is located, and that this may have served as the best route for

people to travel between Bootjack Lake and Polley Lake. One area of potential (AOP) in which subsurface testing is recommended was identified during the PFR on the north side of Bootjack Creek; however, systematic survey along the entirety of the creek was not conducted at the time of the PFR and should be done during a subsequent AIA to determine if additional AOPs are present within the area.

The TSF interim raise to 974 m area was determined to have low archaeological potential due to the generally undifferentiated or low-lying terrain and the high degree of previous disturbance that has occurred, including the presence of large berms and other artificially built-up areas. No evidence of previously existing landforms that may have contained potential were observed in these heavily disturbed areas.

2.12.2 HCA Permitting and Further Archaeological Assessment

MPMC will prepare and submit a *Heritage Conservation Act* (HCA) Section 12.2 Inspection Permit and conduct an AIA under the Inspection permit in the vicinity of Bootjack Creek within the SERDS expansion area. The AIA will consist of a systematic survey to identify AOPs or evidence of archaeological features (e.g., cultural depressions, culturally modified trees). Surficial exposures encountered during the survey will also be inspected for archaeological materials. Subsurface testing at identified AOPs will then be carried out, including the AOP identified during the PFR. Subsurface tests will measure approximately 0.35 x 0.35 m and will generally be placed at 5 m spacing with sediment screened through ¼ inch mesh, with spacing potentially increasing depending on the size of the landform. A modest amount of larger subsurface test units (i.e., evaluative units), generally measuring 1 x 1 m, may be used to further evaluate an archaeological site should additional information be required to assess the site type and context. Should a large or complex archaeological site be identified, a larger mitigation program comprised of additional 1 x 1 m subsurface test units may be required by the Archaeology Branch under a separate S12.2 Investigation permit. Should an Investigation permit be required, similar application and reporting processes would apply. Based on the results of the PFR, it is not anticipated that these types of larger or complex sites will be found; however, that will be confirmed during the AIA.

Any archaeological materials recovered will be collected and archaeological sites will be recorded in the field. Archaeological site boundaries will be established using either the extent of positive subsurface tests, the extent of the landform, or the Project area boundary. Following the AIA, an interim report will be written outlining the results, provided to the Archaeology Branch for review, and further distributed to the appropriate Indigenous groups. All archaeological methods, including those described above, will be outlined in the Inspection permit which is reviewed by the Archaeology Branch and provided to the Indigenous groups for referral prior to issuance.

Should an archaeological site be identified, and avoidance of Project impacts not be possible, an HCA Section 12.4 (Alteration) permit would also be required to authorize impacts. Similar to the Inspection permit, the Alteration permit application would be provided to the Archaeology Branch for review, who in turn would provide to the appropriate Indigenous groups for referral. Additional archaeological work that may be required under the Inspection permit, following issuance of the Alteration permit, includes concurrent monitoring and sampling during site impacts as well as a post-impact assessment. All impacts conducted under the Alteration permit would also be summarized in a final Alteration permit report. Note that the above information is accurate as of the date of this permit application and is subject to change should the Archaeology Branch adjust their permitting process.

2.13 Cultural Use

There is currently no identified cultural use of the area impacted by the Springer Expansion, SERDS area, and TSF interim raise to 974 m area. The William Lake First Nation and the Xatśūll First Nation traditional territories overlap the area and both have been consulted on the proposed expansion and participated in the most recent PFR to assess heritage potential of the area affected by the proposed Springer Expansion and TSF interim raise to 974 m.

2.14 References

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3 MINE PLAN

3.1 Mine Plan Overview

Mount Polley is an alkalic porphyry copper/gold deposit hosted within brecciated plagioclase porphyry. While the principal copper-bearing mineral is chalcopyrite, other copper minerals are present, especially in oxidized zones. These other minerals include bornite, malachite, chrysocolla, and azurite. Gold is present principally as inclusions in copper sulphides and as free liberated grains. MPMC recovers copper and gold from porphyry-style mineralization by open pit using conventional truck and shovel operation. The plant is capable of processing 22,000 t/d of ore using standard mineral flotation technology. Mount Polley Mine is an established open pit with various smaller satellite pits which were mined from 1997 to 2017. The majority of mining currently occurs in the Springer and Cariboo Pit which is also the focus of the Life of Mine (LoM) plan. This application has the life of mine extending to approximately 2031 then rehandled PAG material back into the pit until end of 2033.The open pit mining operation mines would on average 6.1 million tonnes of ore and 7.7 mining tonnes of waste per annum (peaking at 35.5 million tonnes in 2025).

3.2 Existing Development

Existing development and operations at Mount Polley mine include the open-pit mining of the Springer and Cariboo pits, with an average daily mill throughput being 20,000t. Additionally Mount Polley mine has acquired the onsite Mag plant to operate in the collection of magnetite. Figure 1.3-6 show the existing site conditions and infrastructure within the M-200 permit boundary including watercourse locations.

Current mine operations involve the permitted Phase 4 in the Springer and Cariboo pits.
The loading equipment is a combination of P&H 2300 shovel, Komatsu PC4000 and PC3000 diesel shovels, and the haulage fleet includes Caterpillar 785 and Caterpillar 789 trucks.
The primary crusher pocket has capacity to accept material from a 180t truck and ore is processed through a crushing circuit, a three-stage grinding circuit consisting of rod, ball and pebble mills, flotation and dewatering circuits to produce a copper/gold concentrate.
The Springer Pit is currently mined to Phase 4 at a depth of 928m from surface. Dewatering from the Springer pit will require establishing temporary sumps in the mine working usually at the lowest working bench. Electric or diesel pumps will convey water to a large sump located in the Cariboo pit. The Cariboo Pit will be pumped to the West collection ditch and then to the Perimeter Embankment Till Borrow Pond which acts as an influent pond for the water treatment plant.

In the Mount Polley mill, run-of-mine ore from the open pit is dumped into the feed pocket of the primary gyratory crusher to reduce the rock to a nominal 200mm. A hydraulic rock breaker is used to break the oversize material, and the crushed ore is discharged onto an apron feeder that feeds onto a conveyor to the coarse stockpile. Ore is reclaimed from underneath the stockpile by four vibrating feeders and conveyed to a vibrating screen.

In preparation for flotation, ore from the feed stockpile is conveyed to a grinding circuit, consisting of parallel rod mill/ball mill circuits and a pebble mill circuit; crusher product is first fed to a rod mill, and then to a ball mill. Ball mill discharge is pumped to cyclones, where the coarse particles are separated to return to the ball mill, while the finer particles proceed to the three pebble mills. Cyclones are again used to return oversize material to the mills, while the fines, now at the necessary size for mineral separation, are pumped to the flotation circuit.

The flotation circuit separates the valuable minerals from the waste rock, producing a concentrate. Initial separation is done in a rougher/scavenger circuit, where tailings flow by gravity to the TSF. Rougher concentrate is further upgraded in a cleaner circuit to produce the final product. Cleaner tailings are recycled to the rougher/scavenger circuit.

The concentrate is dewatered in two stages: settling reduces the water content to roughly 35- 40%, while pressure filtration further reduces it to approximately 8%. Water removed is utilized as process water. Concentrate is stored in the load-out building and loaded on to 40t trucks for shipping.

3.3 Life of Mine Plan

Figure 3.3-1 illustrates the life of mine plan showing the major mine site facilities. (Yellow – Pits, Blue – Dumps/Road Development). Appendix 3-1 includes figures illustrating the LOM sequencing.

Mount Polley Mining Corporation

Mount Polley Life of Mine
Joint Application
Major Mine Site Facilities

1:25,000

Gabriel Holmes
Date: 5/21/2024
Photo Dates: 2013, 2023

0 200 400 800 1,200 1,600
Meters

- Sprinklers
- Booster Tanks
- Barges
- Sumps/Ponds
- Pipelines
- Diversion Ditches
- Collection Ditches
- 20m Contours

Polley Lake

Bootjack Lake

TSF

South East Rock Disposal Site

Springer Pit

Temporary NW PAG Stockpile

Wight Pit Sump
Wight Pit Booster Blue
Wight Pit Dewatering Line
SERD to Wight Pit
NEZ to Wight Pit Gravity Feed
NEZ Booster to Mill
Wight Pit Booster To Mill
Wight Pit North Diversion
Wight Pit Central Diversion
Boundary Pit
Cavins Ditch
Cavins Creek Collection Dam
Fresh_RD Ditch
NEZ Sump
Long Ditch Sump
Bootjack Creek Diversion
WTP Discharge Line
Peninsula Emb
WTP Sludge Pond
Corner 2 Ditch
PETEP to TSF
Main Seepage Pond Ditch
MESCP
Sprinkler Line
Tailings Storage Facility Supernatant
Central Collection Sump
Breach Sump
Tailings Corner 1 Line
CCS to TSF
Settling Pond
TSF Reclaim Barge
TSF Diversion
Tailings Corner 4 Line
SESCP
SESCP Dewatering Line
South Seepage Pond Ditch
Long Ditch Pipe
SERD Pipe
Bootjack Creek Sump
Upper Long Ditch Sumps
Unnamed Sump
Tailings/Reclaim Lines
Reclaim Booster
SERD Ditch
Tailings Pipe Containment Ditch
Leach Pad to Mill
Mill Site Ditch
Mill Site Sump
Caribou Pit
Caribou Rd to West Ditch
Springer Pit
Springer Pit to SERD Ditch
West Ditch West Portion
Lime Drainage Creek Sump
Lime Seepage Collection Sump
Lime Ditch
Northwest Sump
NW Sump to Springer Pit
Lime Sump to NW Sump

3.3.1 Production Schedule and Profiles

The production schedules and profiles are presented in Table 3.3-1 to Table 3.3-3 and Figure 3.3-2 to Figure 3.3-4. A Life of Mine total material moved is shown in Figure 3.3-5.

Table 3.3-1: LoM Waste Mined (t)

	Total Waste Mining by Pit Phase (NAG)							Total Waste Mining by Pit Phase (PAG)					
	C2-B/Car RR-NAG	WX-NAG	Springer 4 - NAG	Springer 5 - NAG	Springer 6 - NAG	Un-Prod Waste RH	Spr Tails/ Dump Fill	C2-B/Car RR-PAG	WX-PAG	Springer 4 - PAG	Springer 5 - PAG	Springer 6 - PAG	PAG ReHandle
2024			1,090,714	17,263,779		735,262	1,671,460			233,148	921,548		
2025	2,223,438		278,717	21,627,577		843,869	375,554	340,301		35,350	803,264		
2026				22,028,147		725,000	11,627				386,955		
2027				14,094,795	2,385,013	689,769	18,825				398,216	407,957	
2028				1,476,896	11,813,839	827,026	41,801				732	13,015,868	
2029	840,294	1,999,546			8,114,673	756,210	1,912,244	38,380	12,173			11,060,273	
2030		5,817,474			7,383,626	700,000	9,326		2,869,174			6,503,661	
2031		2,391,839			101,651	841,868	4,110		2,346,898			38,282	22,500,000
2032													30,000,000
2033													21,429,209

PAG = potentially-acid generating; NAG = non-acid-generating; Car = Cariboo Pit; WX = Wight Pit .

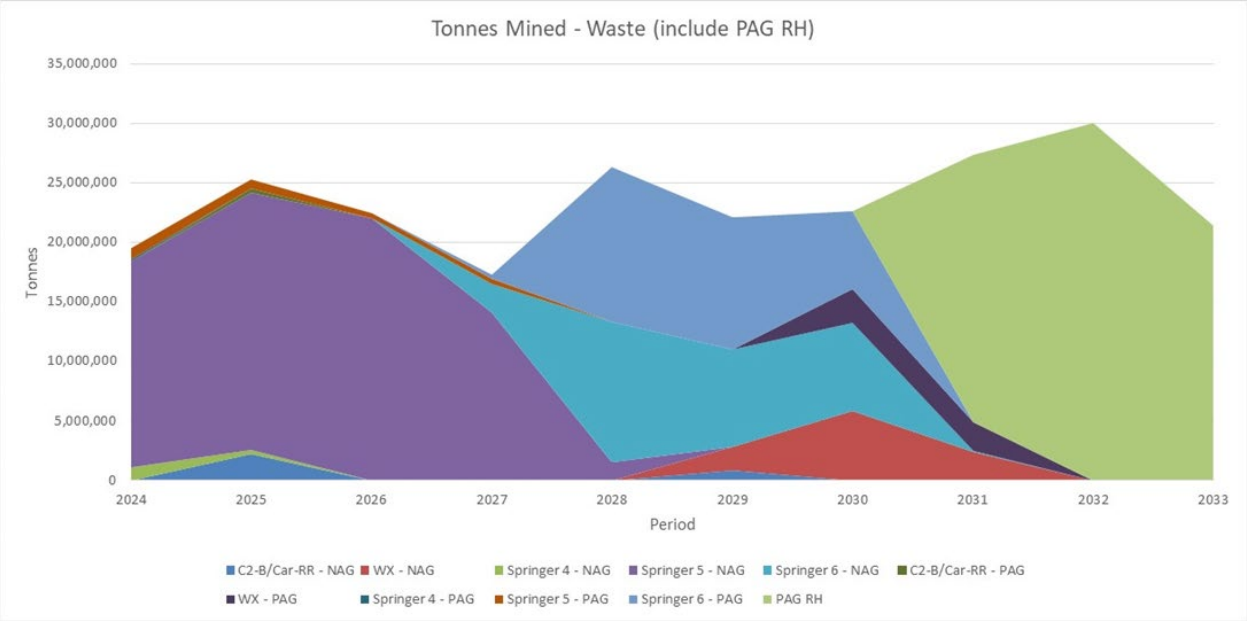


Figure 3.3-2: LoM Waste Mined (t)

Table 3.3-2: LoM Ore Mined (t)

	ORE Above C/O by Pit Phase				
	C2-B/Car-RR	**WX**	**Springer 4**	**Springer 5**	**Springer 6**
2024			5,733,351	1,326,649	
2025	1,626,030		3,883,659	1,550,312	
2026				5,795,978	
2027				8,131,599	72,751
2028				4,013,289	1,258,489
2029	1,908,094	48,935			550,232
2030		802,009			6,083,558
2031		495,484			1,802,980
2032					
2033					

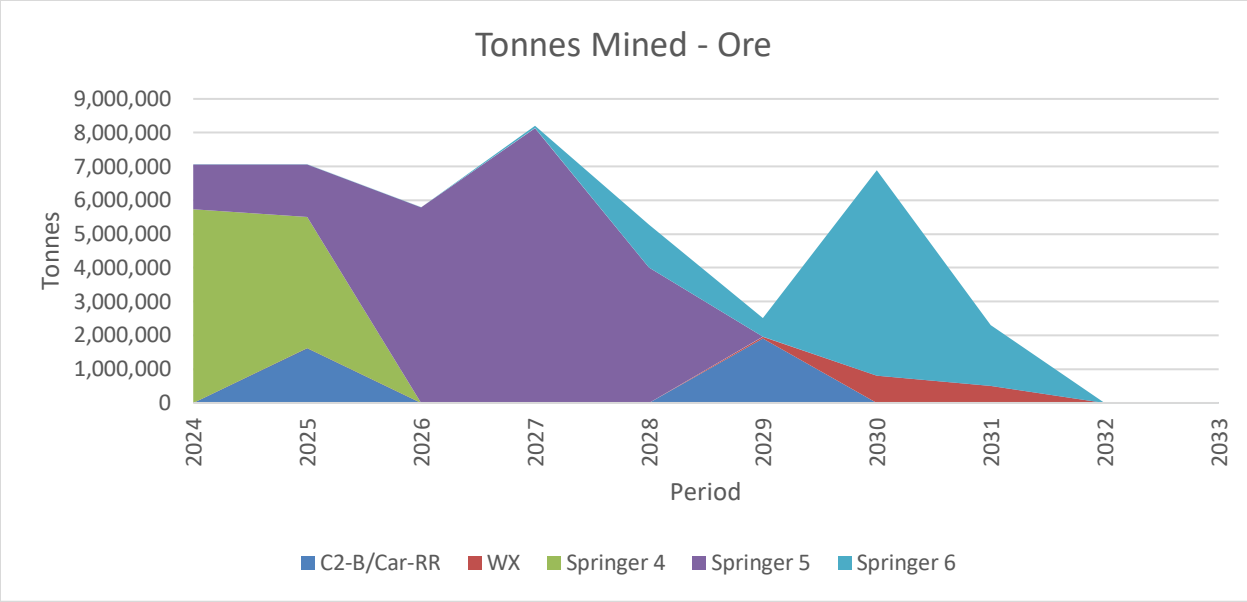


Figure 3.3-3: LoM Ore Mined (t)

Table 3.3-3: LoM Mill Feed by Source (t)

	Plant Feed By Source								
	C2-B/Car-RR	WX	Springer 4	Springer 5	Springer 6	UG/PAG RH	Tailings/ BZ OP	STKPL	Total
2024			5,733,351	1,326,649				240,000	7,300,000
2025	1,626,030		3,883,659	1,550,312				240,000	7,300,000
2026				5,795,978				1,504,022	7,300,000
2027				7,018,688	41,312			240,000	7,300,000
2028				4,013,289	1,258,489			2,028,222	7,300,000
2029	1,908,094	48,935			550,232			4,792,738	7,300,000
2030		802,009			6,083,558			414,434	7,300,000
2031		149,267			1,419,100			38,911	1,607,278
2032									
2033									

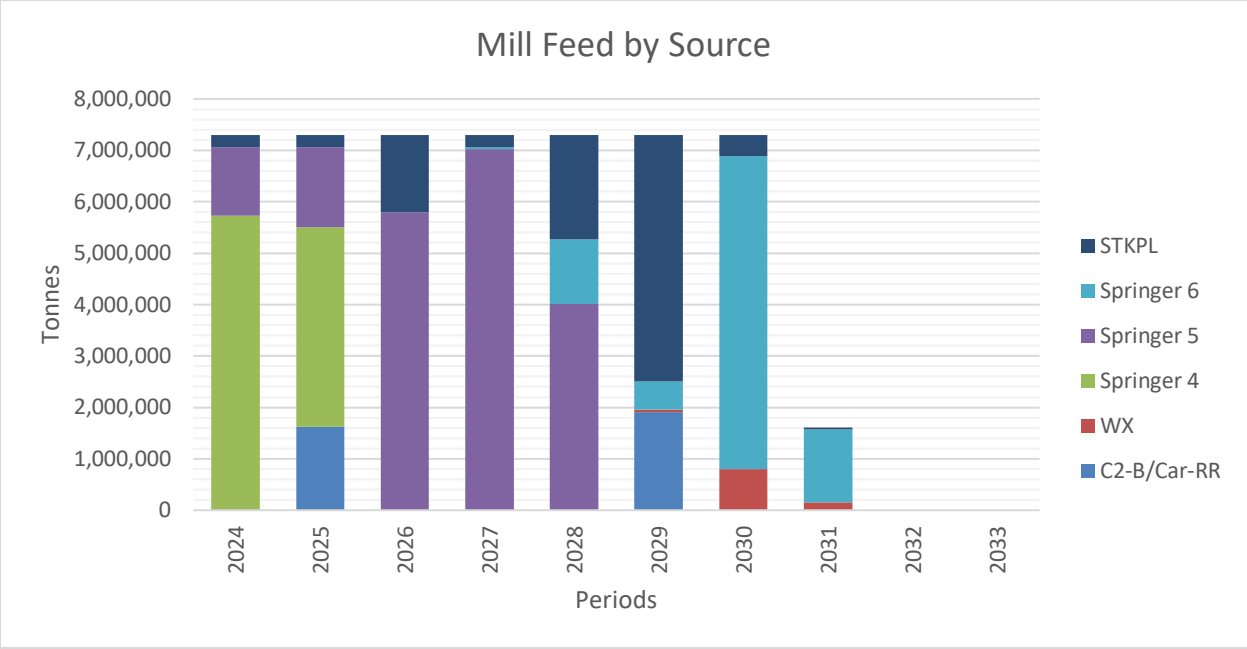


Figure 3.3-4: LoM Mill Feed by Source

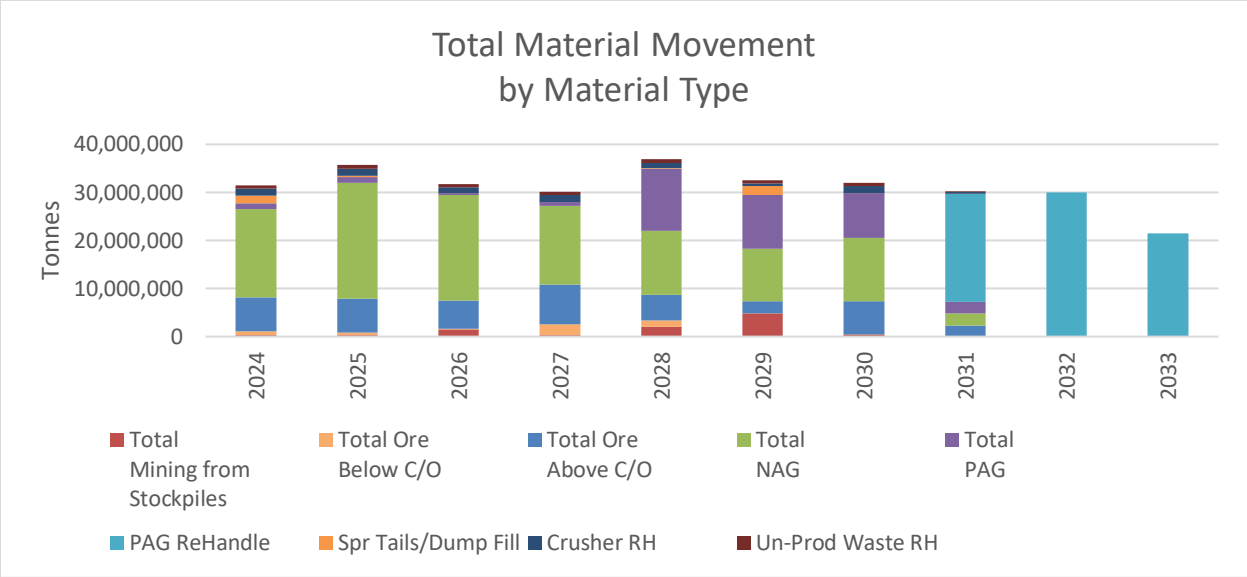


Figure 3.3-5: LoM Total Material Moved (t)

Below is a table of the development dates for each phase of the LoM (Table 3.3-4).

Table 3.3-4: Mine Development Schedule

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Springer 4										
Springer 5										
C2-B/Car-RR										
Springer 6										
WX										
PAH RH										

3.3.2 Surface Disturbances

The development of Springer Expansion pit will require little stripping or preparation as the area has been previously disturbed mining the Bell, C2 and Cariboo pits. Table 3.3-5 provides an inventory of areas disturbed to date, and projection of the land to be disturbed up to the projected end of mine life.

Table 3.3-5: Area Disturbance

Area	Existing Area (ha)	Closure Area (if changed) (ha)	Reclaimed Area (ha)	Lake Area (ha)	Reclamation Area (ha)
Dumps					
Bell Dump	59.12	-	30.58	-	28.54
Boundary Dump	4.84	-	4.7	-	0.14
East RDS	50.95	-	6.37	-	44.58
Highway to Heaven	16.24	-	9.47	-	6.77
NEZ Dump	22.9	-	5.13	-	17.77
North Bell Dump	62.08	-	26.97	-	34.73
SERDS	108.5	***117.69***	-	-	117.69
Temporary NW PAG Stockpile	81.13	***82.55***	-	-	82.55
Total	**405.76**	**200.24**	**83.22**	**0**	**332.77**
Pits					
Boundary Pit	12.1	***19.21***	-	2.74	16.47
~~C2 Pit (Buried)~~	-	-	-	-	-
~~Cariboo Pit (Buried)~~	-	-	-	-	-
~~Pond Zone Pit Buried)~~	-	-	-	-	-
TSF Quarry	11.04	-	-	-	11.04
~~SEZ Pit (Buried)~~	-	-	-	-	-
Cariboo-Springer Pit	133.84	***162.14***	-	49.7	112.44
Wight Pit	38.7		-	14.61	24.09
Total	**195.68**	**181.35**	**0**	**67.05**	**164.04**
Stockpiles					
#1 Stockpile	10.91	***10.58***	-	-	10.58
Biosolids	2.84	-	-	-	2.84
High Ox Stockpile	10.23	-	-	-	10.23
Mount Polley Soil	4.06	-	-	-	4.06
NEZ Soil	9.41	-	-	-	9.41
Cariboo Ore Stockpile	8.83	-	-	-	8.83
Pond Zone	2.83	-	-	-	2.83
SERDS Soil Stockpile	11.66	***10.97***	-	-	10.97
Tailings Soil	2.95	-	-	-	2.95
Total	**63.72**	**21.55**	**0**	**0**	**62.7**
Roads					
Boundary/Wight Pit Connector Road	1.67	-	-	-	1.67
Crusher Road	2.29	-	-	-	2.29
Mill/TSF Connector Road	17.27	-	-	-	17.27
New Access Road	26.9	-	-	-	26.9
Old Tailings Haul Road	12.35	-	-	-	12.35
Old Wraparound Road	11	-	-	-	11
Ore Switchback Road	12.12	-	-	-	12.12
Polley Lake Access Road	0.72	-	-	-	0.72
West Haul Road	60.73	***104.81***	1.81	-	103
Wight Pit Haul Road	14.33	-	-	-	14.33
Wight Pit/Tailings Road	17.37	-	-	-	17.37
Total	**176.75**	**104.81**	**1.81**	**0**	**219.02**
TSF					
Corner 4 to Corner 5	11.34	-	-	-	11.34
Corner 4 to Corner 5 Light Duty Access Road	6.31	-	-	-	6.31
East Till Borrow	12.81	-	-	-	12.81
Hazeltine Discharge Pipe Grade	2.92	-	-	-	2.92
Main Embankment	30.36	-	-	-	30.36
Perimeter Embankment	46.93	-	-	-	44.61
South Embankment	9.17	-	-	-	9.17
Southeast Till Borrow	26.27	-	23.95	-	2–32
TSF - South and Main Ponds	9.4	-	-	-	–.4
TSF - Southwest Pond	3.83	-	-	-	3.83
Tailings Access Road Till Borrow	3.891	3.981	-	-	-
TSF Surface	214.28	-	-	32.14	182.14
Total	**377.511**	**3.981**	**23.95**	**32.14**	**315.21**
Miscellaneous					
Geology Area	2.75	-	-	-	2.75
Helipad	3.13	-	1.53	-	1.6
Hydro Line	3.21	-	-	-	3.21
Long Ditch	7.94	-	-	-	7.94
Mill Area	20.19	-	-	-	20.19
Old Orica Sites	1.79	***0.81***	-	-	0.81
South SERDS Ditch	2.65	***2.21***	-	-	2.21
Warehouse Area	13.64	-	-	-	13.64
Constructed Wetland Treatment System	1.05	***0.55***	-	-	0.55
West Ditch	11.52	-	-	-	11.52
Total	**67.87**	**3.57**	**1.53**	**0**	**64.42**
Total Disturbed Area:	**1,287.29**	**515.50**	**110.51**	**99.19**	**1,158.16**

All water flow interacting with mine activities will utilize existing water management infrastructure. Currently, all mine water is collected in existing ditch systems, and so new construction will require catchment of only additional water as created by the proposed work (Figure 3.3-6).

Mount Polley Mining Corporation

Mount Polley Life of Mine
Joint Application
Water Management Infrastructure

1:25,000

Gabriel Holmes
Date: 5/15/2024
Photo Dates: 2013, 2023

0 200 400 800 1,200 1,600 Meters

- Sprinklers
- Booster Tanks
- Barges
- Sumps/Ponds
- Pipelines
- Diversion Ditches
- Collection Ditches
- 20m Contours

Polley Lake

Bootjack Lake

TSF

Wight Pit Sump
Wight Pit Booster Blue
Wight Pit Dewatering Line
SERD to Wight Pit
NEZ to Wight Pit Gravity Feed
NEZ Booster to Mill
Wight Pit Booster To Mill
Wight Pit North Diversion
Wight Pit Central Diversion
Boundary Pit
Cavins Ditch
East RD Ditch
Long Ditch Sump
Long Ditch Pipe
SERD Pipe
SERD Sump
Bootjack Creek Diversion
Bootjack Creek Sump
BJ Creek Upstream Sump
Upper and Lower Long Ditch Sumps
Central Collection Sump
CCS to TSF
Tailings Corner 1 Line
Breach Sump
Penmeter Emb
WTP Sludge Pond
PETEP to TSF
Corner 2 Ditch
WTP Discharge Line
Main Seepage Pond Ditch
MESCP
Sprinkler Line
Tailings Storage Facility Supernatant
Settling Pond
TSF Reclaim Barge
Tailings/Reclaim Lines
TSF Diversion
Tailings Corner 4 Line
SESCP
SESCP Dewatering Line
South Seepage Pond Ditch
Cariboo Pit
Springer Pit
Leach Pad to Mill
Mill Site Ditch
Mill Site Sump
Reclaim Booster
Tailings Pipe Containment Ditch
SERD Ditch
Cariboo Pit to West Ditch
Springer Pit to SERD Ditch
West Ditch West Portion
Unnamed Drainage Creek Sump
NW Sump to Springer Pit
Junction Zone Seepage Collection Sump
Sump to NW Sump
Northwest Sump
Boss Creek Cutter Dam
Wight Pit Diversion

The Springer Pit is currently mined to Phase 4 at a depth of 928m from surface. Dewatering from the Springer Pit will require establishing temporary sumps in the mine working usually at the lowest working bench. Electric or diesel pumps will convey water to a large sump located in the Cariboo pit. The Cariboo Pit will be pumped to the West collection ditch and then to the Perimeter Embankment Till Borrow Pond which acts as an influent pond for the WTP.

All roads are designed, constructed and maintained in accordance with the *Mines Act*. Haulage roads are designed with a 33-meter width plus 3 meters for berm width to provide for two-way traffic, and both internal pit roads and haul roads have a maximum grade of 10%. All existing traffic control plans satisfy EMLI requirements, and construction and operation of all new roads will adhere to existing policy.

Haul road construction is designed to avoid (or minimize where possible) the potential mobilization and erosion of sediment with potential to enter into water bodies. Where avoidance is not possible, mitigation measures are adopted to reduce and prevent impacts to fish and fish habitat. The projected timing of construction projects will be reviewed to reduce potential downstream effects. For further detail, see Section 9.2: Erosion Prevention and Sediment Control Plan.

3.3.2.1 Springer Expansion (LoM)

The Springer Expansion pushes back the extents of the Phase 4 Springer Pit and deepens it. Additionally, two starter pits (WX and C2) will also be deepened in the later years of the LoM. The WX and C2 pits will follow many of the same design principles as already existing in operating pits at Mount Polley Mine. Modeling was done using the Lerch-Grossman pit optimization method, with Table 3.3-6 describing parameters used in design of the pits.

Table 3.3-6: Open Pit Design Parameters

Design Parameter	Value
Bench Operating Height	10 or 12 metres
Interberm Height	24 metres
Bench Face Angle	65 degrees
Safety Berm	8.5 metres
Inter-ramp Wall Angle	42-46 degrees
Haul Road Internal Max. Grade	10%
Haul Road External Grade	7%
Haul Road Double Lane Width	27 metres
Swell Factor	33%
RDS Angle of Repose	37 degrees
RDS Angle of Reslope	2:1 (H:V)

Ten metre (Boundary zone) and 12-metre (C2 zone) bench heights were chosen after considering ore grade control requirements, blast energy distribution using 9 7/8” blast holes, and muck pile height using P&H 2100 shovels and Caterpillar 992 loaders.

The Springer Expansion pit which includes Phase 5, Phase 6, C2, WX will supplement ore production into the year 2031.

Phase 5 involves a pushback of the east wall near the backfilled Bell pit. The pit is roughly 1446m long, 898m wide, a maximum of 396m deep. Access to the pit will be via temporary Northwest Potentially Acid Generating (NW PAG) Stockpile and off the Bootjack Forest Service Road. The pit contains approximately 98,700,000t of material, 19.7 million of which is projected to be ore. Majority of the waste material is expected to be NAG, and similar in nature to material mined from the Springer Pit. Phase 5 will be completed in 2028.

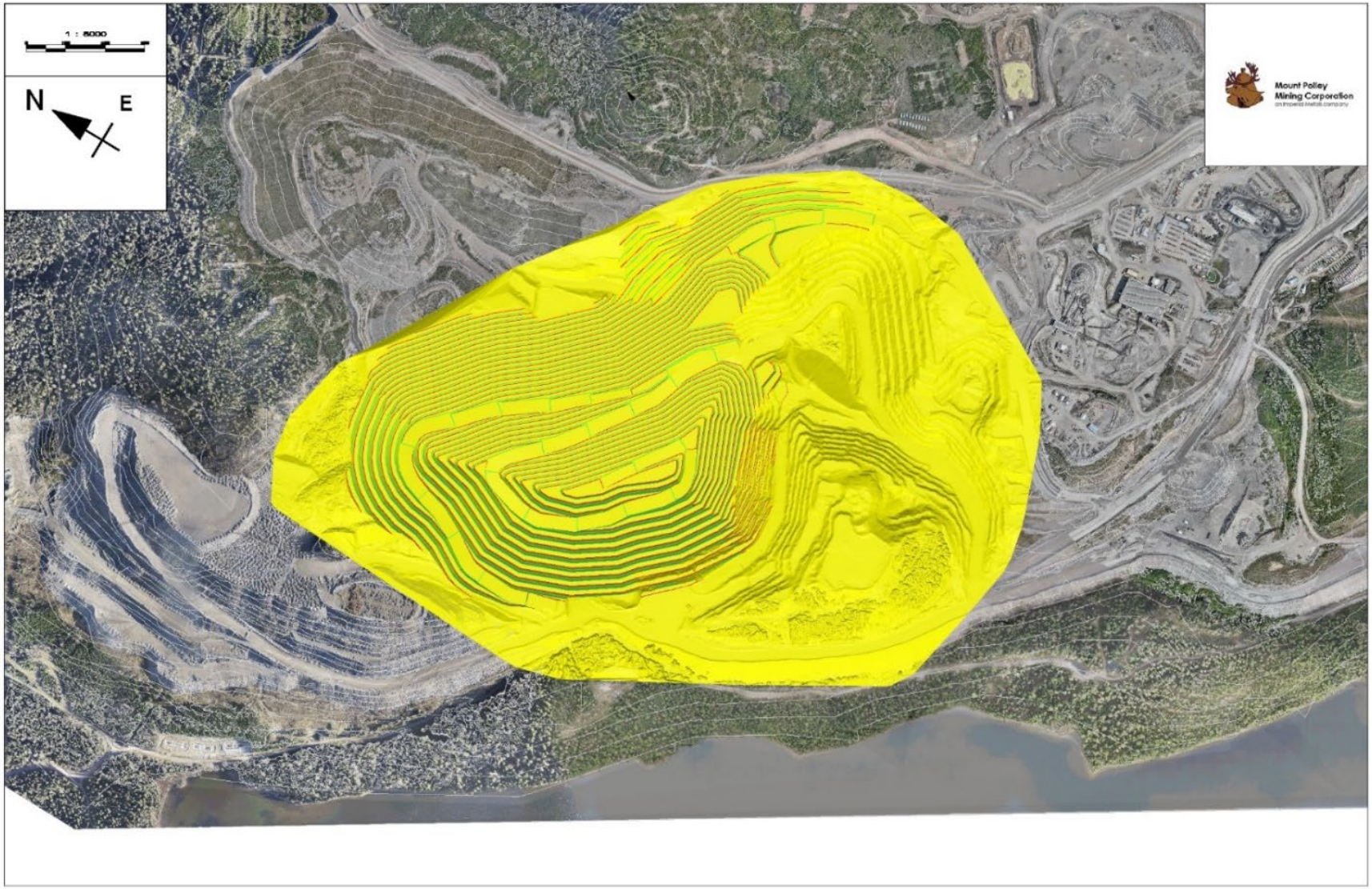


Figure 3.3-7: Plan View of Phase 5

Phase 6 involves deepening the existing Springer Pit. The pit is roughly 842m long, 648m wide, a maximum of 348m deep. Access to the pit will be via the main haul road. The pit contains approximately 70,200,000t of material, 9.3 million of which is projected to be ore. The majority of the waste material is expected to be NAG, and similar in nature to material mined from the Springer Pit. Phase 6 will be completed in approximately 2031.

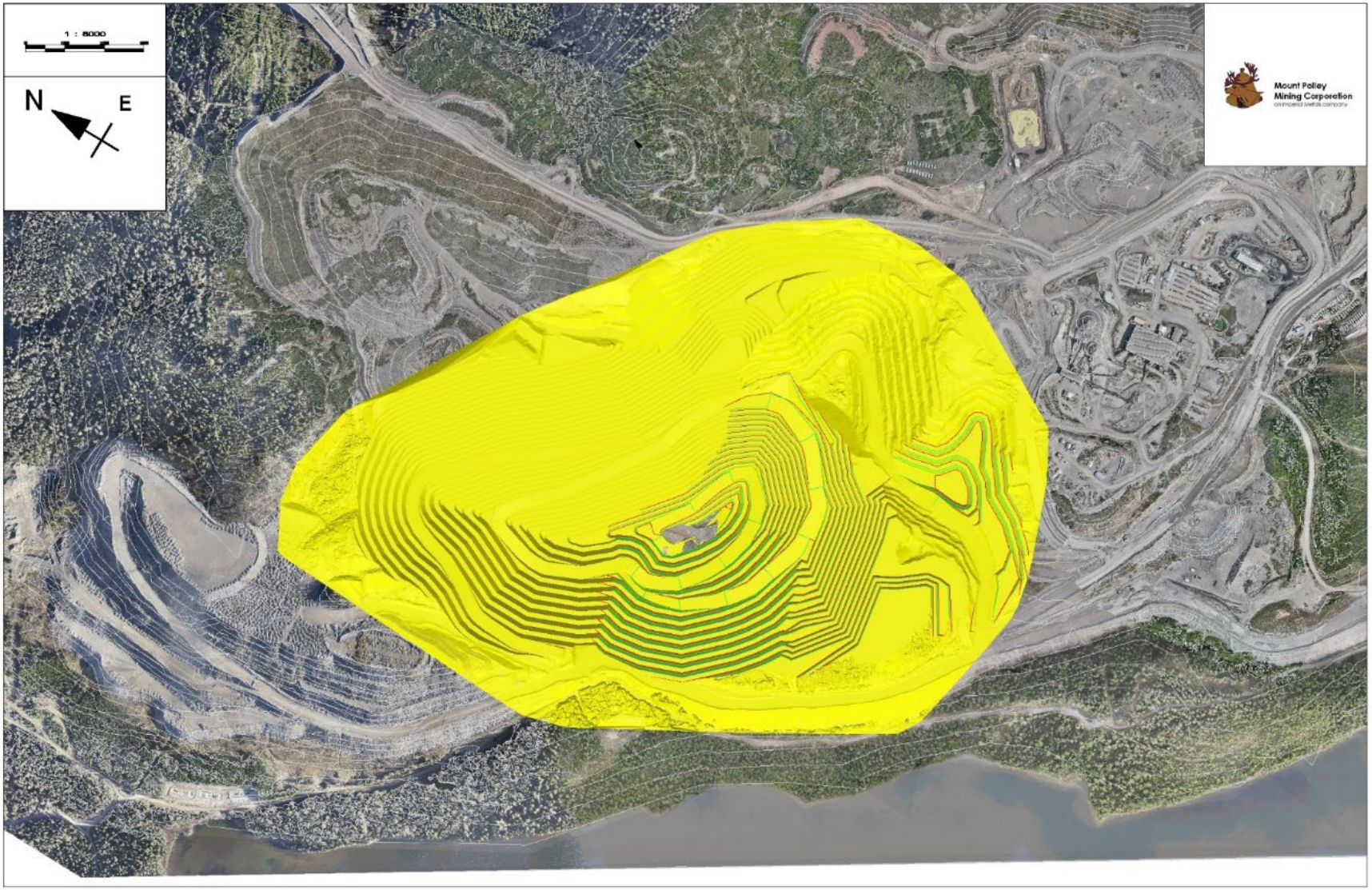


Figure 3.3-8: Plan View of Phase 6

C2 is an existing satellite pit located between the current Springer Pit and the crusher building, adjacent to the former Cariboo pit and will commence mining in 2025 and 2029. Total material movement will be 9,200,000t. The pit is roughly 516m long, 216m wide, a maximum of 120m deep. Access to the pit will be via benches which daylight and connect directly to the Springer/Cariboo haul road. The pit contains approximately 9,200,000t of material, 3.5 million of which is projected to be ore. The majority of the waste material is expected to be NAG, and similar in nature to material mined from the Cariboo pit. Run-off will be within the watershed of the west-ditch.

Figure 3.3-9: Plan View of C2

WX is the final phase in the Springer Expansion and is scheduled to commence in 2029. WX is a satellite pit adjacent to the former Cariboo pit and contains 16,400,000t, 1.0 million of which is projected to be ore. The phase will deepen the existing WX pit and will be completed in approximately 2031. The majority of the waste material is expected to be NAG, and similar in nature to material mined from the Cariboo pit.

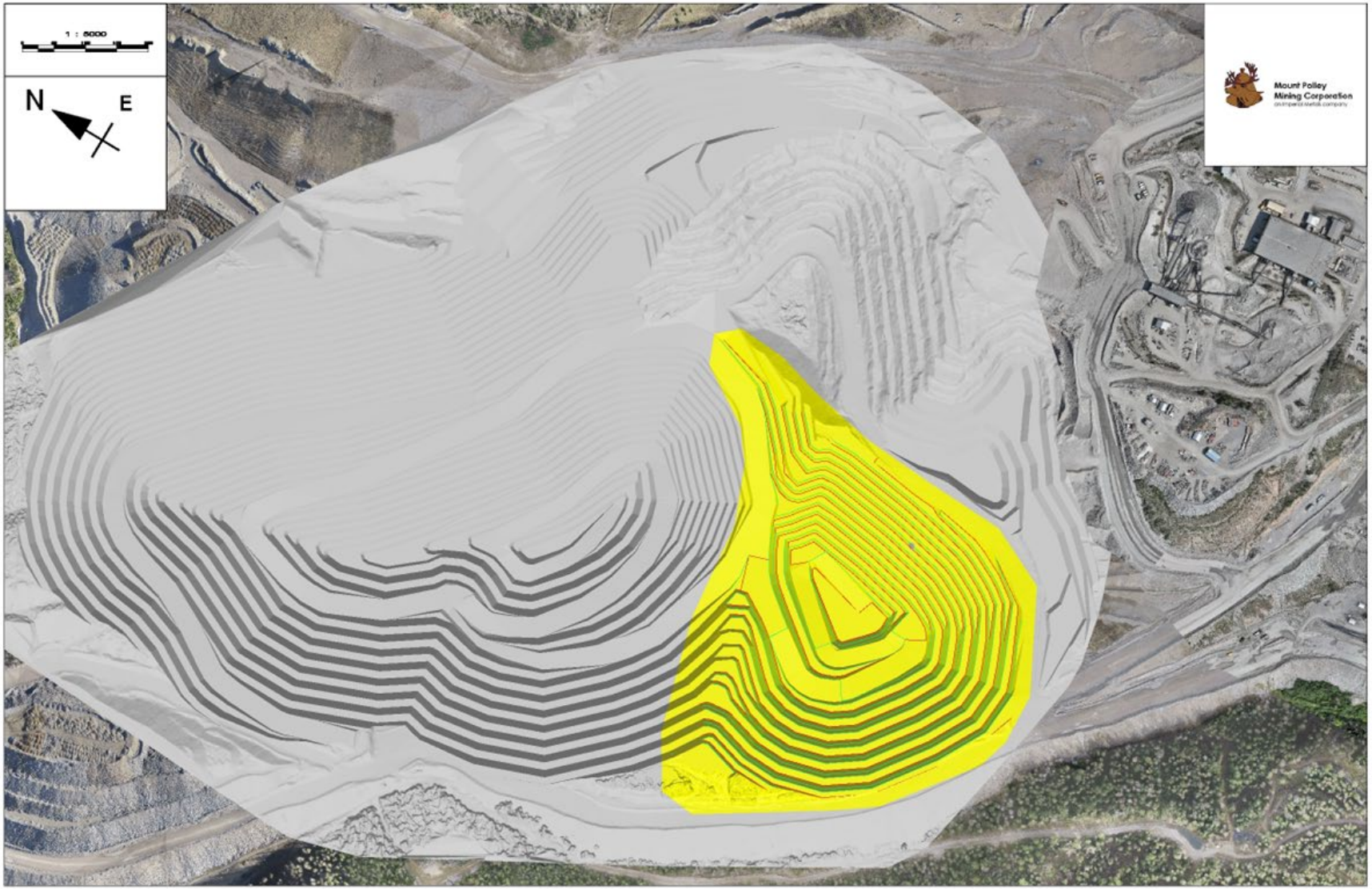


Figure 3.3-10: Plan View of WX

3.3.3 Waste Rock

Additional PAG and NAG material mined as a result of the development of the Springer Expansion will be placed in two locations:

- Temporary NW PAG Stockpile
- Southeast Rock Disposal Site

Dumps will be constructed by end-dumping in 20m lifts from the haulage road at an overall slope of 2:1 (to minimize the need for re-sloping and assist in reclamation work). Quantities of NAG and PAG waste are included in Table 3.3-7.

Table 3.3-7: Quantities of NAG and PAG Generated from Mining Phases

Phase	Material (Tonnes)	
	NAG	PAG
C2-B/Car-RR	3,063,732	378,681
WX	10,208,858	5,228,244
Springer 5	76,491,195	2,510,716
Springer 6	29,798,801	31,026,041
Totals	119,562,586	39,143,682

Storage and material capacities of each of the project components is as outlined in Table 3.3-8.

Table 3.3-8: Storage Capacity of Facilities

Component	Material (t)		
	NAG	PAG	Total
SERDS	152,169,152	-	152,169,152
Nag Pad for West Pag	17,612	-	17,612
Pag for West Pag	-	12,442,468	12,442,468

3.3.4 Southeast Rock Disposal Site Construction

Development of the Springer Expansion pits will require additional rock disposal capacity of approximately 121,000,000t of NAG waste rock including 1,300,000t which is authorized in the M-200 permit as Phase 4 mining. NAG material will be stored within the SERDS or existing pits.

A foundation analysis was conducted in 2022 encompassing 28 test pits and drill holes to ensure adequate information to used to design and update a stability analysis of the proposed rock disposal site.

Dumps will be constructed by end-dumping in 20m lifts from the haulage road at an overall slope of 2:1 to minimize the need for re-sloping and assist in reclamation work. Further design description is as included in Section 3.3.3: Waste Rock.

Polley Lake

Mount Polley Mining Corporation

Mount Polley Life of Mine
Joint Application
South East Rock Disposal Site (SERDS)

1:10,000

Gabriel Holmes
Date: 5/21/2024
Photo Dates: 2013, 2023

0 100 200 400 600 800
Meters

20m Contours

Northwest PAG Stockpile (NW PAG)

The PAG will be hauled to the temporary Northwest PAG Stockpile for short term storage before it is permanently stored in the Springer Pit under subaqueous conditions at the end of mine life. The total amount of PAG material from the Springer Expansion will be 74,000,00t.

Polley Lake

Bootjack Lake

Mount Polley Mining Corporation

Mount Polley Life of Mine
Joint Application
Temporary NW PAG Stockpile

1:5,000

Gabriel Holmes
Date: 5/21/2024
Photo Dates: 2013, 2023

0 50 100 200 300 400
Meters

20m Contours

3.4 Detailed Five Year Mine Plan

This section is not required as part of the joint application per the information requirements table.

3.5 Mine Facility Designs and Development

3.5.1 Open Pits

A detailed open pit design report is being completed by WSP and will be submitted as available. The open pit design report will include a review of the proposed ultimate pit (SP-6-RR) detailing previous geotechnical information collected from site to formulate a geotechnical model, a slope stability review, and design recommendations for the open pit slopes.

3.5.2 Underground Workings

This section is not required as part of the joint application per the information requirements table.

3.5.3 Processing Plant (Mill) and Associated Facilities

This section is not required as part of the joint application per the information requirements table.

3.5.4 Tailings Storage Facilities and Associated Infrastructure

3.5.4.1 SERDS

The amendment proposes to revise the deadline for M-200 Permit Condition B.5.(c) (iii) from March 31, 2025 to March 31, 2026. Rationale for the revision includes:

1) The SERDS Co-Disposal Facility is not fully constructed because the waste rock cover to elev. 1,135 m has not been placed. Waste rock cover placement started in Q3 2024 and is expected to take several months to complete.

2) To inform the report intended to address Permit Condition B.5.(c) (iii), the intention is to drill boreholes and complete field testing in the tailings cells, complete laboratory testing on samples collected during drilling, and install pore pressure monitoring instruments in the tailings cells and collect instrumentation data for one year, to characterize and evaluate the tailings deposit.

A detailed design report for the SERDS Life of Mine (LOM) design is provided (Appendix 3-2). Because the SERDS does not store a water pond, slips surfaces for critical slope instability failure modes do not reach the tailings, and will not result in the loss of tailings, the SERDS LOM is designed to be operated and closed as a waste rock storage facility.

Future construction of the Tailings Access Road (TAR) will impact surface water conveyance channels and culverts in the area of the TAR. The SERDS ditch (downstream continuation from West Ditch) and the Orica Ditch both cross the existing road between the SERDS and the TSF.

Currently culverts exist beneath the existing road that allow the ditches to cross the road. When the TAR is constructed, it will be constructed overtop of this existing road and the ditch crossings will require modification to allow the ditches to cross the future TAR, either through culvert design appropriate for the TAR conditions, or re-routing of ditches as required. Design for these ditch crossing modifications and the revised TAR configuration are not included in this current application..

3.5.4.2 TSF Interim Raise to 974 m

The TSF is located approximately 3 km southeast of the mill and includes one embankment that is approximately 4.8 km in length (Drawing 02, Appendix A of the design report in Appendix 1-3. The embankment is subdivided into three sections: the Main Embankment, Perimeter Embankment, and South Embankment (Drawing 03, Appendix A of the design report in Appendix 1-3). The embankment has incorporated a staged expansion design utilizing modified centreline and centreline construction methods. The general zoning of the TSF embankment consists of the following:

- upstream fill comprising tailings sand and select fill (e.g., rockfill)
- low-permeability till core
- filter zone
- transition zone
- rockfill

Rockfill forms the downstream wedge of the embankments and the downstream buttress along the Perimeter and Main embankments.

A detailed design report for the TSF interim raise to elevation 974 m is included in Appendix 1-3.

3.5.5 Waste Rock Dumps

A detailed geotechnical assessment is included in Appendix 3-3. A test pit program was completed in September 2023 along the toe of the NW PAG Dump and an additional drilling program was completed in January 2024. The data acquired from the drilling program will be incorporated into a geotechnical assessment including (but not limited to) slope stability analyses demonstrating compliance with target factors of safety and run out analyses will be completed.

NAG waste rock will be stored in the SERDS LoM and associated tailings access road (TAR). The foundations of the SERDS LoM and TAR have been characterized by geotechnical investigation. The design considers run-out failure modes that involve the foundation. The SERDS LoM design and assessments are presented in a detailed design report.

3.5.6 Water Management Structures

For a description of the water management infrastructure please refer to the WMP provided in Appendix 9-4A.

3.5.7 Ore, Overburden, Soil and Construction Stockpiles

A detailed open pit design and waste dump report is included in Appendix 3-4.

3.5.8 Mine Access and Mine Haulage Roads

Existing road access from Williams Lake is 15km southeast on Highway 97 to 150 Mile House, 76km north on the Likely Highway to Morehead Lake, and 12km east on the unpaved Bootjack Forest Service Road to the mine site. Williams Lake is approximately 75 minutes from the mine.

Proposed work as included in the Application will not affect existing access and transportation for mine personnel or mine supplies and products. Road access restrictions, radio frequency use, and land tenure are all currently approved by EMLI, and will remain so as new work will in no way affect them.

All roads are designed, constructed and maintained in accordance with the Mines Act. Haulage roads are designed with a 33-meter width plus 3 meters for berm width to provide for two-way traffic, and both internal pit roads and haul roads have a maximum grade of 10%. All existing traffic control plans satisfy EMLI requirements, and construction and operation of all new roads will adhere to existing policy.

Haul road construction is designed to avoid (or minimize where possible) the potential mobilization and erosion of sediment with potential to enter into water bodies. Where avoidance is not possible, mitigation measures are adopted to reduce and prevent impacts to fish and fish habitat. The projected timing of construction projects will be reviewed to reduce potential downstream effects.

3.5.9 Power Supply and Distribution Infrastructure

The Mount Polley Mine owns a main electrical substation (MTP) located outside the site concentrator and administration building. The substation connects to the BC Hydro 66 kV transmission network and is located 74 km away from BC Hydro's 230 kV/66 kV Soda Creek substation. The peak power demand remains at 30 MW (0.95 power factor lagging) at the MTP 66 kV bus.

The site loads are served by step-down transformers within the MTP for distribution to mine operations at 13.8 kV via site powerlines to in-pit mobile substations and to the concentrator Motor Control Units at 4.16 kV. The voltage is stepped down further to power support equipment and administration facilities. The mill programmable logic controller was modernized in 2022 prior to restart of operations after a 3-year Care and Maintenance period.

3.5.10 Explosives Storage Facilities

A licensed explosives contractor, presently Orica Canada Inc. (Orica), has been retained to supply explosive products. Two licensed storage magazines, an 8'x16' powder magazine and an 8'x12' detonator magazine provide storage for blasting accessories. Both magazines have sufficient storage capacity for future blasting activities. Bulk explosives products are stored in on-site facilities located in the Old NAG Quarry under the supervision of Orica. The emulsion is delivered from a manufacturing plant located in the region.

Orica delivers bulk products to the blasthole in Mobile Manufacturing Units (MMU) trucks. The blastholes are charged with Orica products by MPMC employed Blasters. Electronic detonators are used for blasthole initiation under the supervision of MPMC Blasters and Shiftbosses.

3.5.11 Ancillary Facilities and Support Infrastructure

The existing ancillary facilities and support infrastructure will service the proposed extension to the life-of-mine. The mining and milling rates are planned not to exceed existing permit authorizations. The shops, warehouse, laboratories, fueling stations, offices, lunchrooms, and sanitary conveniences will remain as currently located on the Mine Site.

3.6 References

BC Hydro, 2023, Mount Polley (MTP) Load Increase SIS (Part 1) Load Interconnection System Impact Study 2023 Jan 05

4 RECLAMATION AND CLOSURE PLAN

The Mount Polley Mine contains two main pits, Cariboo Pit and Springer Pit, which abut one another. A small saddle is the sole boundary between the two pits which are collectively referred to as the Cariboo-Springer Pit. MPMC proposes to extend their life of mine until approximately 2031 and are applying for an expansion of the Cariboo-Springer Pit's footprint, referred to as the Springer Expansion. In 2022, MPMC updated their 5-Year MPRP (MPMC 2022a), as required by (EMLI).

This reclamation and closure plan (RCP) is specific to the proposed Springer Expansion. It is designed to align with the existing 5-Year (Appendix 4-1A; MPMC 2022a) and is tailored to specifically address the extent of the proposed Springer Expansion. Major components, such as targeted end land use (ELU) objectives and reclamation approaches have generally not changed from what was presented in the existing MPRP (Appendix 4-1A). The addition of the expanded Springer Pit will result in an extended LoM, which is now expected to mine until approximately 2031 and operate until 2033 to rehandle PAG material back into the expanded Springer Pit. Figure 1.3-6 provides an overview of the Mount Polley Mine in its current configuration. The proposed Springer Expansion includes changes to the following components:

- Expansion of the Springer Pit footprint (Figure 3.3-8)
- Raising of the TSF on an interim basis to 974 and then ultimately to 987 metres above sea level (masl);
- Expansion of the Southeast Rock Disposal (Figure 3.3-11) to accommodate co-disposal of waste rock from the Springer Expansion and additional tailings associated with the milling of the ore

No changes to post-closure pit lake elevations are predicted due to the porous nature of rock above 1050 masl (current pit lake elevation design) and the invert of the Springer Expansion spillway (1050.5 masl).

The RCP presented within this section is conceptual and designed to be integrated into future site wide 5-Year MPRPs. Further, the RCP is designed to evolve over time and to be informed by updates to reclamation research, changes in mine plans, advances in technology, and input from parties of interest (e.g., First Nations, communities of interest, and regulators).

4.1 Definitions

To have a clear understanding of MPMC's closure vision, key definitions are provided below:

- **Life of Mine (LoM)**: The operating period of a mine, where ore is mined and milled, and waste rock and tailings are generated. This period is determined by the mine plan.
- **Active Closure:** The timeframe immediately following operations. During this stage, activities to construct the post-closure landscape and associated ecosystems are underway. Infrastructure is removed, contaminated areas remediated, major landscape features are established (via recontouring), coversoil is placed, and prescribed species are planted. This period is currently expected to last 10 years.
- **Post-Closure:** The timeframe immediately after active closure. During this stage, desired post-closure landscape and plant communities have been established, and the previously disturbed areas of the mine are beginning to recover. Efforts to encourage recovery (e.g., monitoring and maintenance) are conducted with decreasing intensity as time progresses and ecosystem trajectory becomes more certain.
- **Closure Vison:** the amalgamation of several closure objectives into one comprehensive vision. A mission statement that guides all closure activity. An example closure vision statement would be: "*The Cariboo-Springer Pit is geotechnically and geochemically stable, and supports wildlife habitat and traditional land uses"*.
- **Closure Objective:** an objective that must be met to realize the target ELU for the landscape. These are generally broad statements that algin with the overall closure vision of the landscape. Currently, MPMC's closure vision is: "…*to return all areas that have been disturbed by mining operations (except pit walls) to equivalent or greater land capability than existed prior to mining on an average property basis"* (MPMC 2022a).
- **End Land Use:** The desired post-closure use of the reclaimed landscape. A landscape, or portion of a landscape can support multiple ELUs, depending on what they are, and ELUs are expected to change over time. ELUs can include social (e.g., traditional use), economic (e.g., forestry, commercial, power) or biodiversity (e.g., wildlife habitat) orientated land uses. To achieve these ELUs, ELU objectives must be met.

4.2 Closure Objectives

To achieve successful closure, a mine must meet its closure objectives. MPMC's closure objectives are outlined in Table 4.2-1 and derived from MPMC (2022a) in Appendix 4-1A.

Table 4.2-1: Mount Polley Closure Objectives

Closure Objectives	
Landforms have geotechnical stability	Terrestrial and aquatic vegetation common to the surrounding area is established
Landscape enhancements are appropriate to the ecosystem and increase the diversity	The reclaimed landscape provides commercial forest (where designated as an ELU)
The Mine Site's water balance meets the needs of the post-closure landscape	The reclaimed landscape provides for biodiversity
Reclamation materials are placed appropriate to the landform	Traditional ecological values are realized
The post-closure landscape is geochemically stable	

ELU = End Land Use.

To attain these closure objectives (Table 4.2-1), components of the Mine Site will be broken into master areas (e.g., reclamation polygons). Each master area will receive its own reclamation prescription and encompass its own unique challenges during closure. A comprehensive breakdown of MPMC's closure strategy is available in Appendix 4-1A (MPMC 2022a), while, Section 4.3 of this document provides reclamation approaches intended to meet MPMC's ELUs and ecosystem targets for the Springer Expansion, which are outlined in Section 4.2.1.

4.2.1 Projected End Land Uses and Ecosystems

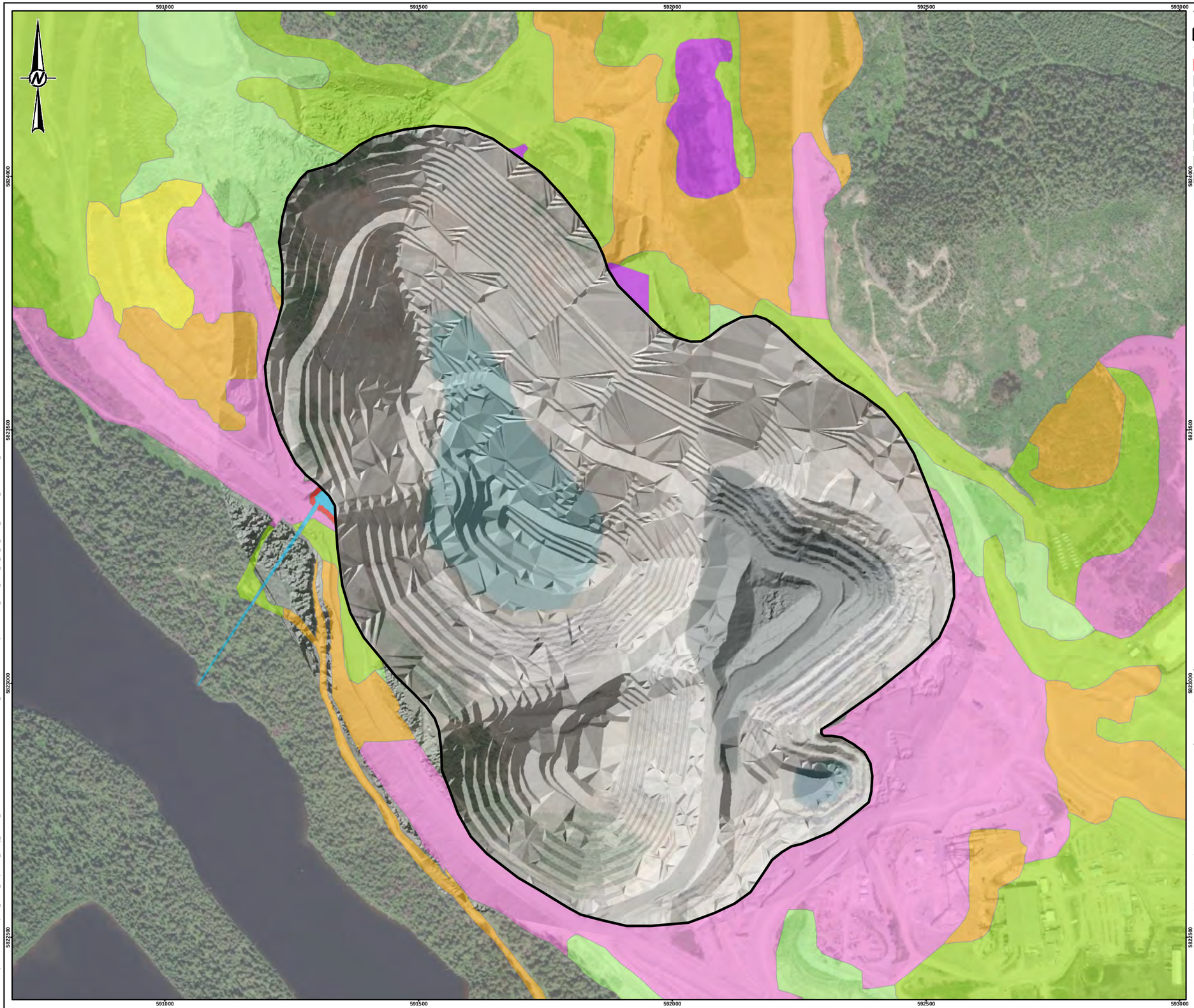
Prior to the development of the Mine Site, the key land uses were commercial forestry and wildlife habitat (MPMC 2022a). Portions of the Mine Site footprint were also used for cattle grazing, recreational activities, hunting, and trapping. Appendix C of MPMC (2022a; Appendix 4-1A) provides and overview of the valued ecosystem components identified through out the environmental assessment process.

The targeted post-closure ecosystems for Springer Expansion are tied directly to existing target ELUs and post-closure ecosystems (Figure 4.2-1; derived from MPMC 2022a), and align closely with pre-mining land uses and ecosystems (Table 4.2-3). Target post-closure ecosystems for SERDs are provided in Figure 4.2-2. Most of the ELU targets envisioned for the Springer Expansion consist of wildlife habitat, but traditional and recreational uses are also considered. The ELU Plan for the Springer Expansion (Table 4.2-2) considers ELUs across a range of structural stages and ties each ELU to a natural ecosystem equivalent. Each ecosystem can support a variety of ELUs at any given time, and these ELUs are expected to evolve as reclaimed ecosystems mature. the target post-closure ecosystems and associated ELUs aim to support MPMC's closure vision of returning the post-closure landscape to an equivalent or greater capability compared to pre-development conditions.

Table 4.2-2: End Land Uses by Site Series and Structural Stage for the Springer Expansion Area

Ecosystem	TEM/BEC Site Series	Structural Stage 1 to 3 (Sparse – Shrub/Herb)	Structural Stage 4 to 5 (Young Forest)	Structural Stage 6 (Mature Forest)	Structural Stage 7 (Old Growth Forest)
Dry Forest	ICHmk3_02 ICHmk3_03	Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Ungulate) Wildlife Habitat (Birds, Small Mammals) Wildlife Habitat (Black Bear) Livestock Grazing	Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Lynx)	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Cavity Dependent)	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Cavity Dependent) High Biodiversity Value Rare and Listed Plant Habitat
Mesic Forest	ICHmk3_01 ICHmk3_04 ICHmk3_05	Recreation First Nation Cultural Use Wildlife Habitat (Summer Range - Ungulate) Wildlife Habitat (Birds, Small Mammals) Wildlife Habitat (Black Bear) Livestock Grazing	Recreation First Nation Cultural Use Wildlife Habitat (Summer Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Lynx)	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Summer Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Cavity Dependent)	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Summer Range - Ungulate) Wildlife Habitat (Birds) Wildlife Habitat (Cavity Dependent) High Biodiversity Value Rare and Listed Plant Habitat
Wet Forest	ICHmk3_06	Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Moose) Wildlife Habitat (Birds, amphibians) High Biodiversity Value Rare and Listed Plant Habitat	Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Moose) Wildlife Habitat (Birds, amphibians) Wildlife Habitat (Lynx) High Biodiversity Value Rare and Listed Plant Habitat	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Moose) Wildlife Habitat (Birds, amphibians) Wildlife Habitat (Cavity Dependent) High Biodiversity Value Rare and Listed Plant Habitat	Commercial Forestry Recreation First Nation Cultural Use Wildlife Habitat (Winter Range - Moose) Wildlife Habitat (Birds, amphibians) Wildlife Habitat (Cavity Dependent) High Biodiversity Value Rare and Listed Plant Habitat
Rocky Talus Cliffs	Rocky Outcrop	Recreation First Nation Cultural Use Wildlife Habitat (Birds, Small Mammals) Wildlife Habitat (Escape Terrain) Rare and Listed Plant Habitat	n/a	n/a	n/a
Pond/Pit Lake	n/a	n/a	n/a	n/a	n/a

TEM = Terrestrial Ecosystem Mapping; BEC = Biogeoclimatic Ecosystem Classification; FN = First Nations; n/a = not applicable.



LEGEND

SPRINGER PIT EXPANSION

VEGETATION TYPE

- SNOWBERRY - RED-OSIER DOGWOOD FLOODPLAIN (ICHMK3_00)
- CWSXW - FALSEBOX - KNIGHT'S PLUME (ICHMK3_01)
- FDCW - WAVY-LEAVED MOSS (CHMK3_02)
- CWSXW - SOOPOLALLIE (ICHMK3_03)
- CWSXW - OAK FERN - CAT'S-TAIL MOSS (ICHMK3_04)
- SXWCW - OAK FERN (ICHMK3_05)
- CWHW - DEVIL'S CLUB - LADY FERN (ICHMK3_06)
- ROCKY OUTCROP
- POND / PIT LAKE

0 150 300

1:7,500 METRES

REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
POST-CLOSURE VEGETATION
SPRINGER PIT EXPANSION

CONSULTANT

wsp

YYYY-MM-DD	2023-11-29
DESIGNED	JL
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	CONTROL	REV.	FIGURE
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LEGEND

SERDS EXTENSION

VEGETATION TYPE

- SNOWBERRY - RED-OSIER DOGWOOD FLOODPLAIN (ICHMK3_00)
- CWSXW - FALSEBOX - KNIGHT'S PLUME (ICHMK3_01)
- FDCW - WAVY-LEAVED MOSS (CHMK3_02)
- CWSXW - SOOPOLALLIE (ICHMK3_03)
- CWSXW - OAK FERN - CAT'S-TAIL MOSS (ICHMK3_04)
- SXWCW - OAK FERN (ICHMK3_05)
- CWHW - DEVIL'S CLUB - LADY FERN (ICHMK3_06)
- CWSXW - DEVIL'S CLUB - HORSETAIL (ICHMK3_07)
- NON-FORESTED
- ROCKY OUTCROP
- POND / PIT LAKE

0 250 500

1:12,000 METRES

REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
POST-CLOSURE VEGETATION
SERDS EXTENSION

CONSULTANT

wsp

YYYY-MM-DD	2023-11-29
DESIGNED	JL
PREPARED	CDB
REVIEWED	DK
APPROVED	DK

PROJECT NO.	CONTROL	REV.	FIGURE
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Table 4.2-3 provides a breakdown of predicted changes from pre-disturbance to target post-closure ecosystems. Due the disturbance associated with surface mining, operators, such as MPMC, often face numerous challenges in re-establishing planned ELUs. Some of these challenges are presented in Table 4.2-4

Table 4.2-3: Predicted Change in Vegetation Site Series from Pre-disturbance to Post-Closure*

Site Series	Description Area [ha]	Pre-disturbance		Post-closure		Difference	
		Area [ha]	%	Area [ha]	%	Area [ha]	%
ICHmk3_00	Non-forested wetland	27	2	5	1	-22	-82
ICHmk3_01	*CwSxw - Falsebox - Knight's plume*	505	44	286	28	-260	-60
ICHmk3_02	FdCw - Wavy-leaved moss	1	0	30	3	29	2,900
ICHmk3_03	CwSxw - Soopolallie	51	4	4	0	-2	84
ICHmk3_04	CwSxw - Oak fern - Cat's-tail moss	116	10	96	9	-20	-17
ICHmk3_05	SxwCw - Oak fern	45	4	85	8	39	87
ICHmk3_06	CwHw - Devil's club - Lady fern	92	8	339	30	247	279
ICHmk3_07	CwSxw - Devil's club - Horsetail	31	3	11	1	-20	-65
Non-Forested	Grassland / Shrubland	4	0	106	9	102	2,550
Rocky Outcrop	Exposed Rocky Slopes	0	0	15	3	15	1,500
Water	Lakes and Rivers	<1	<1	50	9	50	5,000
Disturbed	Clearcuts / Burns / Development	284	25	0	0	-284	-100
	TOTAL	**1,156**	**100**	**1,026****	**100**	**-**	**-**

*= considers both the existing Mine Site and the Springer Expansion extents; ** = some portions of the Mine Site footprint will remain undisturbed, and therefore are not covered by post-closure ecosystem mapping. See 79 and Figure 4.2-2 for more information.

Table 4.2-4: Potential Challenges Associated with Post-Closure Landscape Establishment

Discipline	Issue	Impact on Successful Closure	Potential Contingencies
Geotechnical	▪ RDSs, Pit, TSF, or other components are physically unstable	▪ Negative impact on public safety ▪ Prevention of reclamation activities	▪ Erosion management ▪ Geomorphic design ▪ Bioengineering ▪ Buttressing with borrow material
Geochemical	▪ RDSs, Pits, or the TSF create ML/ARD issues	▪ Negative impact on public and environmental safety ▪ Risks to wildlife though metals uptake ▪ Risks to water quality	▪ Burial or submersion of ML/ARD material ▪ Water treatment
Soils	▪ Compacted soils ▪ Poor fertility profiles ▪ Shortage of coversoil ▪ Shortages of subsoil/till	▪ Poor plant establishment and survival ▪ Inadequate nutrient profile alters recovery trajectory, and ultimately ecosystem outcome ▪ Inadequate rooting depth leads to high mortality, tree throws	▪ Decompaction ▪ Application of soil amendments ▪ Borrowing from existing borrow areas for additional subsoil ▪ Mixing tailings with till

Table 4.2-4: Potential Challenges Associated with Post-Closure Landscape Establishment

Discipline	Issue	Impact on Successful Closure	Potential Contingencies
Vegetation	▪ Ecosystem trajectory does not match post-closure targets due to weeds ▪ High mortality of planted species	▪ Negative impact on land uses and habitat establishment ▪ Continued erosion risk	▪ Weed management (pulling, mowing, spraying) ▪ Infill planting ▪ Assessment and mitigation of growth limiting factors (e.g., soil chemistry)
Water	▪ Positive water balance ▪ Water quality does not meet Guidelines	▪ Risk of failure of water treatment or water management facilities ▪ Realized post-closure water discharge and quality do not meet projected models, yielding increased risk to humans and wildlife	▪ Activation of the Trigger Response Plan (see (MPMC 2018) ▪ Storage of excess contact water ▪ Enhanced water treatment

ML/ARD = metal leaching/acid rock drainage; RDS = rock disposal site; TSF = tailings storage facility; WQ = water quality.

The challenges outlined in Table 4.2-4 can result in failure to meet closure objectives and establish self-sustaining vegetation communities. To maximize the likelihood of successful reclamation, MPMC uses progressive reclamation, reclamation research, and reclamation monitoring to determine the real-time trajectory of the recovering landscape and ecosystems and the efficacy of proposed reclamation strategies. Deviation from the desired reclamation trajectories may trigger the contingencies outlined in Section 5.10 of Appendix 4-1A (MPMC 2022a) and associated adaptive management strategies. Contingency plans are found in the existing 5-Year MPRP, Appendix 4-1A (MPMC 2022a).

Plans for reclamation research and progressive reclamation can be found in Appendix 4-1A (MPMC 2022a), and will ultimately be used to test reclamation approaches (Section 4.3) and revegetation strategies, to maximize the likelihood of achieving the target ELUs and closure vison for the Mine Site.

4.2.2 Landform Design and Erosion Control

Landform design and erosion control is described in the Mine Plan and Reclamation Program, provided Appendix 4-1A additional information regarding erosion control is included in the Surface Erosion Prevention and Sediment Control Plan, provided in Appendix 9-1.

4.2.3 Revegetation Strategy

The revegetation is described in the Mine Plan and Reclamation Program, provided in Appendix 4-1A.

4.2.4 Progressive Reclamation/Sequencing

Information regarding progressive reclamation is described in the M Mine Plan and Reclamation Program, provided in Appendix 4-1A.

4.2.5 Reclamation Research

This section is not required as part of the joint application per the information requirements table.

4.2.6 Reclamation Monitoring

Reclamation monitoring criteria is described in the Mine Plan and Reclamation Program, provided in Appendix 4-1A.

4.2.7 Habitat Compensation Works

The Fish Habitat Compensation Agreement from 1996 is described in the Mine Plan and Reclamation Program, provided in Appendix 4-1A.

4.3 Reclamation Approaches

To achieve the closure and ELU objectives outlined Section 4.2, MPMC has developed strategies to promote physical stability, water quality protection, watercourse protection, sediment retention and erosion control, appropriate soil handling, suitable revegetation, and invasive species management. However, some components of these strategies are still partially in the conceptual phase, as reclamation and closure strategies are designed to be adaptable and evolve based on findings from progressive reclamation, site monitoring and research, and advancements in engineering and science. The following sections outline progressive reclamation and research activities MPMC is currently undertaking, the results of which will continue to influence progressive reclamation, active closure, and post-closure. Reclamation plans and protocols for the topics provided in Table 4.3-1 are provided in Appendix 4-1A (MPMC 2022a).

Table 4.3-1: Reclamation Prescriptions Discussed in the MPMC's 5-Year MPRP

Section in MPRP	Reclamation Prescription	Subtopics
5.1	Physical Stability	▪ Waste Dump Stability ▪ Pit Wall Stability ▪ Road Stability ▪ TSF Reclamation Stability ▪ Underground Stability
5.2	Water Quality and Watercourse Protection	▪ Erosion control ▪ Material Characterization ▪ Water Quantity and Quality Modeling ▪ Closure Water Management ▪ Closure Water Management Planning

Table 4.3-1: Reclamation Prescriptions Discussed in the MPMC's 5-Year MPRP

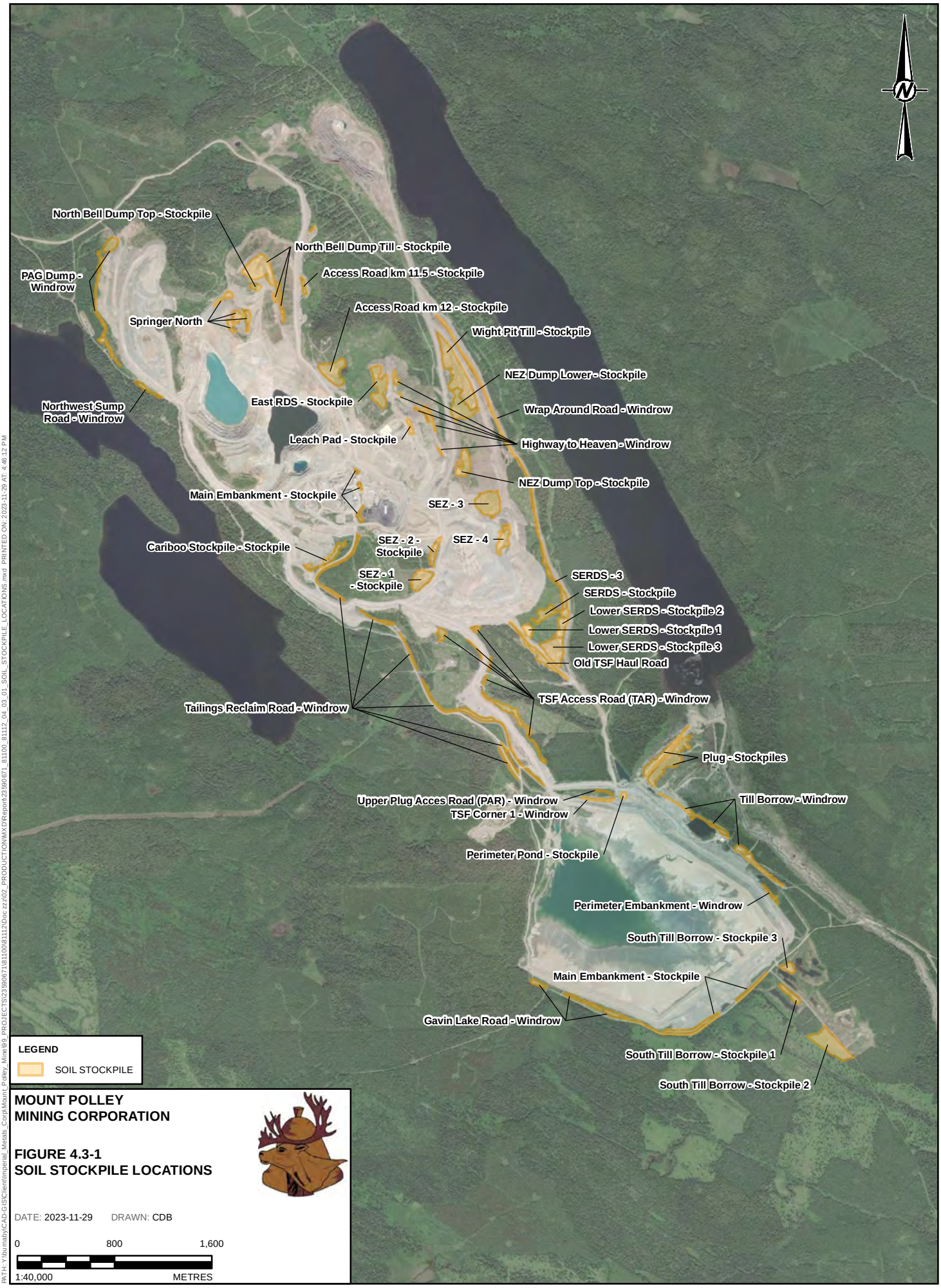
Section in MPRP	Reclamation Prescription	Subtopics
5.3	End Land Use Plan	▪ n/a
5.4	Soil Management	▪ Soil Use in Reclamation ▪ Estimated Soil Balances
5.5	Revegetation	▪ Species Selection ▪ Planting Strategies ▪ Alignment with ELUs
5.6.	Environmental Risk Assessment	▪ n/a
5.7	Invasive Plant Management	▪ n/a
5.8	Fugitive Particle Management	▪ n/a
5.9	Waste Management	▪ n/a

4.3.1 Soil Resources

MPMC has developed a Soil Management Plan (SMP), which includes protocols for soil salvage, stockpiling, and soil use in reclamation [Appendix M of Appendix 4-1A (MPMC 2022a)]. The SMP recommends the salvage of topsoil, subsoil, organic soil, and woody debris. In general, accessible soils within the Springer Expansion area will be salvaged, unless soil quality concerns are noted during preliminary sampling, or observed in the field (e.g., excessively high coarse fragment content). The SMP describes the procedure for salvaging materials, along with best management practices to maximize soil quality, and maintain the integrity of soil stockpiles. Previously collected soil quality data are also presented in the SMP.

4.3.1.1 Estimated Soil Balance

Currently, there's an estimated 1,694,010 m^3 of coversoil (e.g., suitable growth media that can support higher plants) (adjusted from MPMC 2022a; Appendix 4-1A) available to complete reclamation activities within the Mine Site; a surplus of approximately 220,081 m^3 (Table 4.3-2. However, the Mine Site is short approximately 1,032,028 m^3 of till (subsoil; adjusted from MPMC 2022a; Appendix 4-1A) material. To address this shortage, MPMC will likely borrow additional till material from areas surrounding the TSF, or by mixing tailings with till (as the Mine Site's tailings are relatively inert), provided future reclamation research indicates that this is suitable as a subsoil horizon in reclamation profiles (MPMC 2022a). The geochemistry of the tailings at the Mine Site is included in Appendix 4-1B. Figure 4.3-1 provides the location of existing stockpiles at the Mine Site, which will ultimately be used for reclamation.



MOUNT POLLEY MINING CORPORATION

FIGURE 4.3-1
SOIL STOCKPILE LOCATIONS

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Table 4.3-2: Mine Site Coversoil Balance as of November 2023

Vegetation Type	Area Requiring Coversoil[(1)] [ha]	Average Coversoil Placement Depth [cm]	Required Coversoil Volume [m^3]	Average Till Placement Depth [cm]	Required Till Volume [m^3]	Available Biosolids Volume[(2)] [m^3]	Available Coversoil [m^3]	Available Till [m^3]
ICHmk3_00	8.36	5	2,437	10	4,873	0	**1,695,595**	**160,551**
ICHmk3_01	278.47	20	556,937	10	278,468	0		
ICHmk3_02	33.66	15	50,490	10	33,660	0		
ICHmk3_03	7.81	15	73,501	10	49,001	0		
ICHmk3_04	98.93	15	148,390	15	148,390	0		
ICHmk3_05	94.91	15	142,365	15	142,365	0		
ICHmk3_06	355.11	15	532,662	15	532,662	0		
ICHmk3_07	10.81	15	16,215	15	16,215	0		
Non-Forested / TSF	105.53	5	52,764	5	52,764	164,000		
TOTAL	**1,011.86**	**-**	**1,573,324**	**-**	**1,253,525**	**164,000**		

Note:

ICHmk3 = Interior Cedar Hemlock Zone; Horsefly variant.

The sum of each column may not add exactly due to rounding.

Volumes are estimated and may vary based on-site conditions and handling. Excess material will be spread on site, shortages will be handled as detailed in Section 5.4.2 of Appendix 4-1A (MPMC 2022a)

1) Excludes areas that have already had coversoil placed or do not require coversoil placement (e.g., watercourses, rocky outcrops).

2) Biosolids may be used on other areas of the Mine and will be acquired in volumes sufficient to meet reclamation targets.

4.3.1.2 Soil Application

The SMP describes coversoil application methods in detail, including strategies for reducing compaction Table 4.3-2 details placement depths for the Springer Expansion based on desired post-closure ecosystems and ELUs, while Figure 4.3-2 provides visual representations of these placement depths. The SMP provides information on soil handling methods and best management practices, while Section 4.9.7 of this document provides details on the scheduling of soil placement.

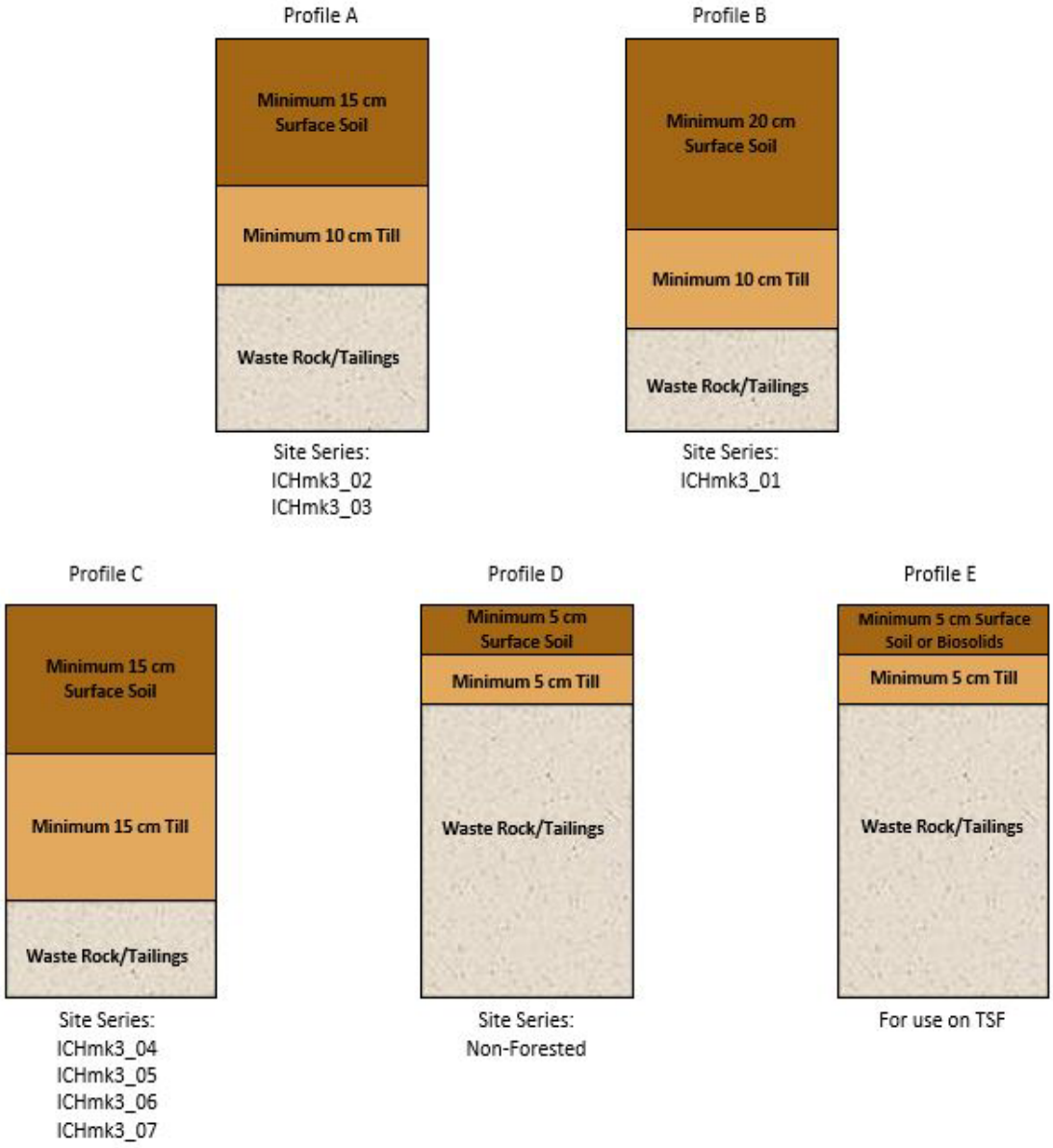


Figure 4.3-2: Proposed Coversoil Profiles Based on Desired Ecosystem and End Land Use

While a shortage of coversoil is not expected, and creation of growth media using amendments is not anticipated, soil amendments may be required to bolster soil quality of previously stockpiled soils. Soil amendments can be any additional materials that are added to reclamation sites to increase soil fertility, improve soil structure, provide better growing conditions for vegetation, or provide enhanced habitat features for target wildlife species. Where possible, on-site soil amendments will be used to reduce costs, make use of waste, and prevent potential ingress of non-native species through importing soil from off-site. Researched soil amendments are detailed comprehensively in the 2017 MPRP Update (MPMC 2017) and summarized below.
Results from ongoing site-specific research will continue to provide guidance on when soil amendments are necessary, and what types and quantities to use. Research will include long-term considerations, as soil amendments are typically only a short-term nutrient source.

Biosolids

Biosolids have been studied on research plots since 1998. Biosolids are available in large quantities for use on the Mine Site. The overall findings are that biosolids can be effective in encouraging initial tree establishment and root development. Biosolids can even act as a replacement for standard growth mediums in some cases. Overall, biosolids have been shown to be an effective soil amendment, at least with regards to establishing desirable vegetation.

Tailings

Initial trials have been conducted into seeding grasses directly into tailings and mixing tailings with till as a growth medium. Seeding grasses into tailings has generally been successful, and initial trials to combine tailings with till and biosolids have been successful (McMahen and Simard 2018). However, evidence from the TSF embankment breach terrestrial ecosystem assessment has indicated that in some cases tailings can be too fine, resulting in poor drainage, excess water retention, and decreased oxygen in the rooting zone, resulting in die off of vegetation.

Fertilizer

Contrasting with biosolids, fertilizer has not been found to be an effective soil amendment. “Tea bag” packages planted with trees were found to reduce long-term growth, and broadcast fertilizer can result in heavy ground cover (grass) development, which provides competition for target tree and shrub species. Results from ongoing site-specific research will continue to provide guidance on when soil amendments are necessary, and what types and quantities to use. This will include long-term considerations, as soil amendments are typically only a short-term nutrient source.

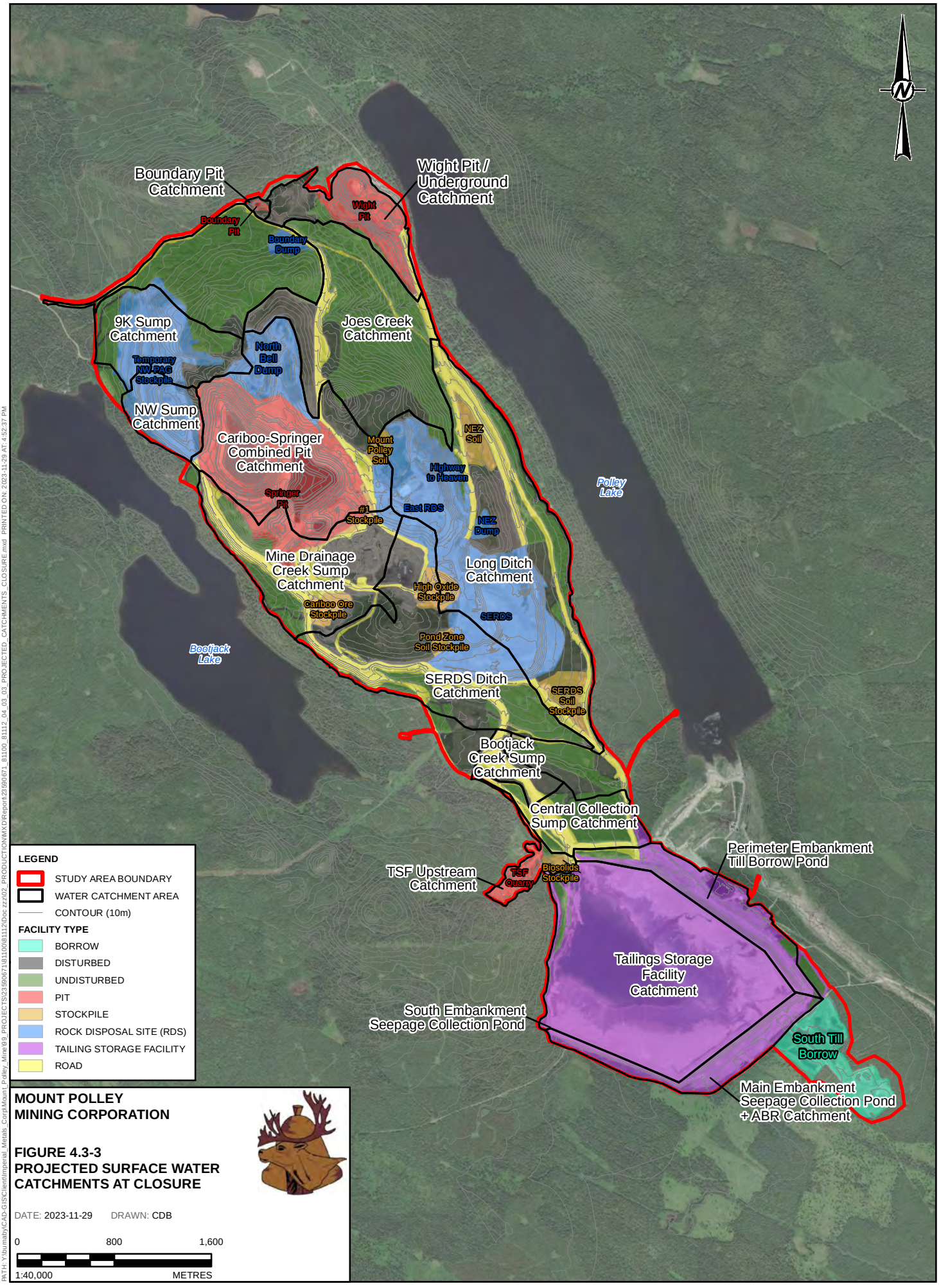
Woody Debris

Following soil application, woody debris (if not already incorporated into soil) should be placed, if available, to enhance microsite diversity and habitats, retain moisture, contribute to long-term soil organic matter, and improve catch of native seeds. If woody debris is not available, boulders or rock fragments can be placed in piles and individually. Although rocks are not a source of nutrients, over time, like woody debris, they can increase moisture retention, promote plant microsite diversity, provide habitat, and reduce soil erosion. Application of boulders or small rock piles will also continue to be carried out as a method of creating varied habitats on reclamation sites.

4.3.2 Landform Design and Erosion Control

Development of an open pit mine and associated works creates surface disturbances that may result in erosion and alteration to watersheds. As such, erosion prevention strategies for construction activities and active closure are outlined in MPMC's Sediment and Erosion Control Management Plan [Appendix K of Appendix 4-1A (MPMC 2022a)].

Erosion control is key to preventing sediment transport and negative impacts on the environment and promoting geotechnical stability of structures. Revegetation is a highly effective and permanent erosion control measure; thus, disturbed areas are seeded and planted at the earliest opportunity. Re-sloping and surface preparation are other erosion control measures used by MPMC. Typically, these methods entail site preparation and creation of microtopography and the direction of surface flow away from slope faces to minimize surface water erosion, where possible. In addition to the measures described in the Sediment and Erosion Control Management Plan, a geomorphic approach is incorporated, where practicable, as an overall strategy for active closure design. Guidance documents for this geomorphic approach have been created (e.g., Golder 2017; Golder 2019) to minimize the erosion of the post-closure landscape to that of natural analogues. Figure 4.3-3 shows expected watersheds at closure.


Boundary Pit Catchment
Wight Pit / Underground Catchment
Wight Pit
Boundary Pit
Boundary Dump
9K Sump Catchment
Joes Creek Catchment
North Bell Dump
Temporary NW PAG Stockpile
NW Sump Catchment
Cariboo-Springer Combined Pit Catchment
Mount Polley Soil
NEZ Soil
Highway to Heaven
Polley Lake
Springer Pit
#1 Stockpile
East RDS
NEZ Dump
Mine Drainage Creek Sump Catchment
Long Ditch Catchment
High Oxide Stockpile
Cariboo Ore Stockpile
SERDS
Pond Zone Soil Stockpile
Bootjack Lake
SERDS Ditch Catchment
SERDS Soil Stockpile
Bootjack Creek Sump Catchment
Central Collection Sump Catchment
Perimeter Embankment Till Borrow Pond
TSF Upstream Catchment
TSF Quarry
Biosolids Stockpile
Tailings Storage Facility Catchment
South Embankment Seepage Collection Pond
South Till Borrow
Main Embankment Seepage Collection Pond + ABR Catchment
LEGEND
STUDY AREA BOUNDARY
WATER CATCHMENT AREA
CONTOUR (10m)
FACILITY TYPE
BORROW
DISTURBED
UNDISTURBED
PIT
STOCKPILE
ROCK DISPOSAL SITE (RDS)
TAILING STORAGE FACILITY
ROAD
MOUNT POLLEY MINING CORPORATION
FIGURE 4.3-3
PROJECTED SURFACE WATER CATCHMENTS AT CLOSURE
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4.3.3 Revegetation Strategy

Ingress of native species has been observed at the Mine Site (e.g., South Till Borrow), and is expected to continue. To support natural colonization, active planting and seeding of native vegetation associated with target post-closure ecosystems (Appendix C of Appendix 4-1A; MPMC 2022a) is conducted to promote development of desirable post-closure ecosystems. Planting vegetation prevents erosion, limits establishment of invasive species, and initiates the process of natural succession. Vegetative growth increases soil organic matter, provides native seed sources, and begins to create microsites that will, in time, be appropriate for growth of secondary successional species. For instance, early seral stage conifers used in the logging industry (e.g., lodgepole pine and Douglas-fir) are planted at the Mine Site in areas ready for revegetation, with climax woody species such as Western red cedar, subalpine fir, and hybrid spruce expected to ingress naturally when microsite conditions are appropriate. Ultimately, revegetation efforts promote ELU and closure objectives, such as wildlife values and biodiversity.

To achieve desired ecosystems on the post-closure landscape, conifer species are planted at a roughly uniform density, while targeting ideal, moist, protected microsites. Deciduous tree and shrub species are planted in a similar manner. Variable land surfaces with diverse macro- and microtopography are important to improve vegetation establishment and biodiversity. Land features, such as depressions, on recontoured landscapes, may be supported through targeted plantings, such as densely planted biodiversity islands of deciduous trees and shrubs, or possibly collection and spreading of seeds of more diverse species. Additionally, timing of planting has been shown to affect overall revegetation success. Fall seeding of grass species has been successful on the Mine Site, while tree and shrub planting in the spring is more favourable than during other seasons. The seeding method used also influences revegetation success, with hand seeding being more cost-effective compared to hydroseeding with equally successful results. Finally, rationale for selection of species is provide in Table 4.3-3 and planting strategies are provided in Section 4.3.3.1.

Table 4.3-3: Mine Site Revegetation Prescriptions (MPMC 2022a)

Site Series		Moisture	Gradient (%)	Slope Position	Aspect	Soil Profile Type[7]	Grasses/Forbs[1,2]	Deciduous Trees[3]	Coniferous Trees[4]	Shrubs[5] 200 – 500 sph
Zonal	ICHmk3/01	Mesic/submesic	0 to 20	Middle	Variable	B	native grasses/forbs (30 kg/ha)	black cottonwood – 200 sph trembling aspen – 50 sph paper birch – 50 sph	Douglas fir – 1400 sph lodgepole pine – 600 sph hybrid spruce[e] Western redcedar[e] alpine fir[e]	Sitka alder, saskatoon, prickly rose, willow, huckleberry, blueberry, common juniper [8], soopolallie
Xeric to Subxeric	ICHmk3/02	Xeric, subxeric	0 to 10	Crest	South or west facing	A		trembling aspen – 200 sph	Douglas fir – 1400 sph lodgepole pine – 600 sph hybrid spruce	
	ICHmk3/03		50 to 70	Upper	Variable	A		trembling aspen – 200 sph	Douglas fir – 1400 sph lodgepole pine – 600 sph Western redcedar[e] hybrid spruce[e]	
Mesic to Moist Nutrient Rich	ICHmk3/04	Subhygric, mesic	10 to 35	Lower, middle	Variable	C		black cottonwood – 200 sph trembling aspen – 50 sph paper birch – 50 sph	Douglas fir – 1400 sph hybrid spruce – 600 sph alpine fir[e] Western redcedar[e] lodgepole pine[e]	
	ICHmk3/05	Subhygric		Middle, lower	Variable			black cottonwood – 200 sph trembling aspen – 50 sph	hybrid spruce – 1400 sph lodgepole pine – 600 sph Western redcedar[e] alpine fir[e]	
Moist, Very Rich	ICHmk3/06	Subhygric, mesic	0 to 25	Lower, middle	Variable	C		black cottonwood – 200 sph trembling aspen – 50 sph paper birch – 50 sph	Douglas fir – 1400 sph hybrid spruce – 600 sph Western redcedar[e] alpine fir[e] lodgepole pine[e]	
	ICHmk3/07	Hygric	0	Toe of long slopes or depression	Level			black cottonwood – 200 sph	hybrid spruce – 1400 sph western redcedar – 600 sph alpine fir[e] lodgepole pine[e]	
Organic non-Forested	Non-forested	Subhygric	0	Depression	Level	D		n/a	n/a	
TSF		Hygric	0	Lower	Level	E		black cottonwood – 500 sph	n/s	

Note:

1) Grass and forb seeding rate should be reduced (5 to 10 kg/ha) if amendments such as biosolids or fertilizer are used.
2) Grass and forb mixture shown in Table 5-8 of MPMC (2022a).
3) Species chosen based on BC Forest Development Stocking Standards (ICHmk3 biogeoclimatic subzone).
4) Species chosen based on BC Forest Development Stocking Standards (ICHmk3 biogeoclimatic subzone).
5) Later successional species to be considered for underplanting after primary canopy is established.
6) Shrub species to be selected appropriate for each site based on research and availability.
7) Refer to Figure 4.3-2 for profile descriptions.
8) Juniper will be targeted for drier sites.

sph = stems per hectare; n/a = not applicable.

4.3.3.1 Species Selection

MPMC's overarching goal is to re-establish pre-disturbance vegetation communities that support multiple ELUs. Because of this, MPMC uses an approach for revegetative species selection that is based on the BEC system. Appendix C of Appendix 4-1A (MPMC 2022a) describes the BEC zone and site series that were present on the Mine Site prior to development, and these zones and series have been considered in species selection. MPMC's approach for selecting a revegetation prescription for a given area considers slope, elevation, and aspect through Geographic Information System **(**GIS) modelling. This is further informed by site-specific substrate characteristics that suggest soil moisture and nutrient conditions. A generalized GIS matrix is then used to aid in identifying the most appropriate treatment for an area. This approach is not designed to be rigid, and flexibility is maintained to allow for alternative treatments or trials on designated sites, and input of professional discretion in localized areas.

The general steps for species selection are:

1) determine which species are locally common to each site series and those that existed on the landscape prior to development
2) review government regulations for reforestation guidelines and dominant overstory and understorey species for each post-closure site series
3) determine which species are commercially available, or easily harvested on the Mine Site
4) work with First Nations and local communities to determine species that are important for traditional use and support target wildlife species
5) add selected species to the newly reclaimed sites (e.g., immediately after coversoil placement)
6) monitor the progress of reclamation sites to determine which species (or combination of species) are performing well and at which locations (site series)
7) adapt reclamation prescriptions to incorporate learnings from monitoring results
8) incorporate refined prescriptions into progressive reclamation and reclamation research activities to further develop best practices for establishment of high priority target species
9) continue to adapt prescriptions and research trials as new information is gathered and additional target species are identified

Table 4.3-3 shows general prescriptions by site series for reclamation because of this process. Candidate species are then further evaluated for social and economic considerations.

4.3.4 Progressive Reclamation/Sequencing

Currently, progressive reclamation sites at the Mine Site are treated as large-scale research projects, with outcomes influencing future reclamation plans and prescriptions. MPMC intends to take the same approach with progressive reclamation of the Springer Expansion; however, given that this feature is tied directly to operations, it is unlikely to undergo progressive reclamation until much later in the Mine Site's life cycle.

Much of the progressive reclamation to date at the Mine Site occurred in the 2010's. Results from this work can be found in Appendix 4-1A (MPMC 2022a). Additional detailed information on historical results of these trials can be found in the 2017 MRP (MPMC 2017), and Annual Reclamation Reports (e.g., MPMC 2022b). Most monitoring programs associated with progressive reclamation have been executed as planned or have been put on hold due to the Mine Site's recent care and maintenance status.

More recent progressive reclamation programs included salvage of approximately 7,838 m^3 of soil from Cariboo Pit Access and subsequent placement of the salvaged soil at SEZ-1 and Mill Site 1 in 2017. In 2018, approximately 3,691 m^3 of till was placed in the Breach Zone (Lower SERDS-1 to Corner 1 Buttress), the NEZ Dump, and the 9 km Wetland. Tree planting also occurred in 2018 on the North Bell Dump. Table 4.3-4 lists the areas that have been re-contoured, received fertilizer or biosolids, and have been seeded and/or planted as of 2021 (MPMC 2022b). Detailed reclamation prescriptions for all reclamation and research sites within the Mine Site are also provided in MPMC (2022b).

Table 4.3-4: Summary of Completed Progressive Reclamation at the Mine Site (MPMC 2022b)

Area	Parcel	Re-contoured (ha)	Coversoil Applied (ha)	Seeded (ha)	Fertilizer/Biosolids (ha)	Tree Planted (ha)
		Total	Total	Total	Total	Total
NEZ Dump	2a, 2b1, 2b2	5.13	5.13	5.13	5.13	5.13
	Beside 2a/2b	2.47	0.00	0.00	0.00	0.00
NBD	Parcels 1-10	9.45	11.59	11.59	11.59	11.59
	South Triangle	1.30	1.30	1.30	1.30	1.30
	Phase 1	2.21	2.21	2.21	2.21	2.21
	Phase 2	2.87	2.87	2.87	2.87	2.87
	Metro Van Research 1	2.81	2.81	1.87	2.34	2.34
	Wrap Around Toe	0.00	2.20	2.20	0.00	0.00
	Beside Research 1	4.76	1.99	0.00	0.00	0.00
	Metro Van Research 2	2.00	2.00	1.33	1.66	2.00
	Beside Research 2	2.73	0.00	0.00	0.00	0.00
	Beside BJ FSR	0.90	0.00	0.00	0.00	0.00
Boundary Zone	Dump	4.70	4.70	0.00	0.00	4.70
East RDS	Above Access Road	3.42	4.06	4.06	0.00	2.75
	Highway to Heaven	11.53	9.47	6.58	0.00	9.47
	Tree Plots	2.31	2.31	2.31	1.20	2.31
Waste Haul Road	Above WHR	1.81	1.81	1.81	0.00	0.00
	Below Helipad	1.53	1.53	1.53	1.53	1.53
South Till Borrow		23.25	0.00	14.75	12.00	0.00
TOTAL		**85.18**	**55.98**	**59.54**	**41.83**	**48.20**

BJ FSR = Bootjack Forest Service Road; ha = hectares; NBD = North Bell Dump; NEZ = Northeast Zone; RDS = rock disposal stockpile.; WHR = West Haul Road

4.3.5 Reclamation Research

This section is not required as part of the joint application per the information requirements table. However, a summary of terrestrial reclamation research to date can be found in MPMC (2017) and MPMC (2022b). Terrestrial reclamation research has paused temporarily (along with progressive reclamation) due to the recent care and maintenance status of the Mine Site. Most of the reclamation research since the previous 5-Year MPRP (MPMC [2017]) has been related to water treatment. Appendix G of Appendix 4-1A (MPMC 2022a) provides a comprehensive overview of the research trials into water treatment technologies considered for the Mine Site. Please see the appropriate supporting documentation for further information.

4.3.6 Reclamation Monitoring

MPMC has numerous monitoring plans (appendices of Appendix 4-1A MPMC [2022a]). These monitoring plans will be used throughout the closure lifecycle to minimize environmental risk, and to provide quality control during closure activities. A general schedule for reclamation assessments is as follows:

- post-application inspections (e.g., soil test pits) after placement of coversoil to assess placement depth and to verify if recommended reclamation methods described in Section 4.3.1 and the SMP (Appendix M of Appendix 4-1A [MPMC 2022a]) were appropriately implemented
- assessment of revegetated areas following the first growing season to determine species composition (including presence of invasive species) and cover, as well as documentation of areas of erosion
- observations of wildlife or grazing occurrences and usage
- survival surveys of planted trees and shrubs (for quality control purposes) following their first growing season
- periodic assessments of tree survival/growth and ground cover vegetation, decreasing in frequency over time (e.g., years two, five, and ten)

Table 4.3-5 provides an overview of MPMC's closure objectives, indicators, and measures for the overall Mount Polley Mine Site and proposed Springer Expansion, which directly relate to the ELUs listed in Table 4.2-2. Monitoring will continue with additional reclamation activities occurring in an adaptive management process until objectives have been met. Trends and data associated with monitoring events will be captured in MPMC's annual reclamation reports issued to EMLI. Once closure objectives (and therefore ELU objectives) have been met, the landscape is considered successfully reclaimed. Post-closure monitoring (Section 4.12) is conducted to monitor the status of the reclaimed landscape, so that maintenance, if required, can be conducted.

Table 4.3-5: Mine Site Reclamation Closure Objective

Closure Objective	Indicator	Measure
Landform Function		
Landforms have geotechnical stability	Geotechnical stability	Visual inspection for the presence/absence of subsidence, erosion, deposition of sediment in low lying areas, ponding, gullying, rilling or slumping, including bank stability round watercourses and waterbodies
Landscape enhancements are appropriate to the ecosystem and increase the diversity of the landscape	Landscape enhancements	Presence of rocks, coarse woody debris, standing woody debris, brush piles, snags, bird/bat boxes
Water		
The Mine Site's water balance meets the needs of the post-closure landscape	Successful function of the TSF and Expanded Springer Pit spillways	Assessment of water levels in the TSF and expanded Springer Pit No signs of instability of the TSF, or the TSF and expanded Springer Pit spillways
	Water quality parameters	Water quality parameters support discharge of water to the receiving environment
	Pit lake elevation	Pit lake elevations align with projected modeling. Pit lake elevations successfully cover PAG material
Geochemical Stability		
Mine components with potential for ML/ARD generation have covers that prevent oxygen from interacting with ML/ARD sources	Water quality parameters	Cover Run-off and seepage water quality, if a dry cover is used.
		Overall water quality of the pit lake, if a wet cover is used to contain ML/ARD generating waste rock
	cover stability (or elevation, if water is used)	Visual inspection for the presence/absence of subsidence, erosion, or slumping.
		Measurement of waterbody (e.g., pit lake) elevation
Soil		
Reclamation materials are placed appropriate to the landform	Soil depth	Average placement depth (m)
	Soil pH	Soil pH
	Soil moisture regime	Soil texture/particle size analysis (percent sand, percent silt, percent clay), placement depth, topography
Vegetation		
Terrestrial and aquatic vegetation common to the surrounding area is established	Plant community composition (terrestrial, riparian and, marsh/aquatic)	Presence, percent cover, distribution of noxious and prohibited noxious weeds
		Species inventory and percent cover by layer and species. Include damage codes (e.g., insect, browse)
The reclaimed landscape provides commercial forest (where designated as an ELU within the reclamation plan)	Regeneration of trees (commercial stocking)	Stocking (the percentage of a polygon that contains acceptable tree regeneration) (Information gathered to support this includes height, diameter at breast height (DBH) and age for potentially commercial tree species)
	Mortality of trees	Percent mortality between planting and ten years after planting
	Insects and disease	Percent of trees with signs of chewing, spots, eggs, nests, or galls
	Browsing pressure	Percent of trees with signs of browsing on new shoots, bark damage
	Limitations to vegetation growth	Percent of trees with signs of chlorosis, stunting, unusual formations
Emergent Properties		
The reclaimed landscape provides for biodiversity	Patch size and shape	Patch sizes (ha)
	Food vegetation species	Food species for target wildlife species are present
	Plant community composition – diversity, richness, evenness, and abundance	Species inventory, percent cover and density (stems/ha)
Traditional Ecological Value	Wildlife habitat that supports traditional use	Derived from Plant Community Composition
	Biodiversity that supports traditional use	Derived from Plant Community Composition and incidental wildlife observations
	Vegetation that supports traditional use	Derived from Plant Community Composition

ELU = End Land Use; PAG = Potentially Acid Generating.

4.3.7 Habitat Compensation Works

This section is not required as part of the joint application per the information requirements table.

4.4 Trace Element Uptake in Soils and Vegetation

This section is not required as part of the joint application per the information requirements table.

4.5 Contaminated Sites, Human Health, and Ecological Risk Assessment

Appendix Q of Appendix 4-1A (MPMC 2022a) provides detail on MPMC's conceptual Contaminated Site Assessment. The conceptual plan focuses on areas that store or dispense hydrocarbons, chemicals, blasting products, and stockpiled materials (e.g., ore or PAG waste rock).

At closure, an environmental site assessment will be conducted by a professional approved by the Contaminated Sites Approved Professionals Society of BC. Contaminated areas identified through the environmental site assessment will be remediated. Where possible, contaminated soils will be treated or disposed of on-site. Contaminated soil or overburden that cannot be disposed of or treated on-site will be removed from site and hauled to an appropriate disposal facility. After remediation, site conditions will be compared to the Contaminated Sites Regulation (CSR; BC Government 1997) standards that are most appropriate to the target ELUs.

Appendix N of Appendix 4-1A (MPMC 2022a) provides a preliminary Environmental Risk Assessment (ERA) for the Mine Site. A conceptual site model (CSM) was created for this work. The CSM will be used to assist in mitigation planning. At or before the onset of closure, a human health and environmental risk assessment will be conducted, and the CSM will be updated. The existing CSM will also be used to help plan other sampling programs, if possible.

4.6 Disposal of Chemicals, Reagents, Hazardous Materials and Contaminated Materials

At closure, MPMC will remove chemicals, reagents, explosives, and hazardous materials and return them to suppliers or dispose of them in a designated facility. Modular buildings, small structures, and mobile equipment will be removed for reuse, sale, or salvage. All tanks and fuel storage facilities will be emptied of their contents before they are removed from their foundations. Tank residues will be transferred by a proven and reputable waste oil reprocessing company or waste recycling company, as appropriate. This will follow similar procedures that have been in place throughout the operating period of the Mine. Unused reagents and laboratory chemicals will be repackaged and shipped to other authorized users, or to an appropriate waste disposal facility. Contaminated soils will be collected and stockpiled for treatment or disposed of in an approved manner.

Wastes associated with decommissioning activities (Table 4.6-1) will be disposed of near the date of mine closure, when detailed estimates of waste stream volumes and corresponding landfill capacity and design have been advanced. Wastes associated with decommissioning generally will fall into the categories provided below and will be managed accordingly:

- **Non-salvageable, non-combustible, and non-recyclable materials:** these materials will be buried within the on-site landfill, covered with waste rock, and reclaimed to match the target ecosystem of the surrounding area(s). Any materials that would require the landfill to have an engineered cover will be disposed of off-site.
- **Combustible, non-salvageable materials**: these materials will be burned pending receipt of a refuse permit, and the burned residues will be buried in the onsite landfill.
- **Structural steel, heavy gauge, shred, ferrous, and non-ferrous metals:** these will all be segregated and sheared to scrap metal industry sizing.
- **Concrete rubble:** this material may be used for filling in basements and regrading surfaces in the mill area. For the entire Mine Site, it is assumed that concrete rubble will be pulverized using a heavy excavator equipped with a pulverizing jaw attachment. The pulverized concrete rubble collected from each area will be stockpiled until the end of the demolition phase of the active closure work. Once the demolition phase is complete, the pulverized concrete rubble can be placed in an RDS or other suitable location. Alternatively, it may be preferable to process the concrete rubble through a crushing plant to obtain a 2-inch (50 mm) minus crushed material. This material can be used as cover material for other aspects of demolition (e.g., cover material for foundations) during active closure.

Table 4.6-1: Typical Waste Classifications

Item	Name	Description
1	Total metal (recyclable)	Structural steel (heavy, light, shred), non-ferrous (copper, aluminum).
2	Wood/plywood/mixed wood	Interior wall partitions, wood structures and sheds, exterior wood cladding, shelving, core boxes, interior finishes.
3	Painted/laminated/wood	Counters, wooden and laminate office furniture and lab installations, cabinets, etc.
4	Plastic	Anything plastic within contents of buildings. A significant portion of the contents were observed to have plastics as the primary material.
5	Particle board/tile	Interior finishes and bathrooms.
6	Concrete	Steel reinforced cast in place concrete structures, foundations, footings, interior and exterior slabs, core slabs, cast in place structure elements.
7	Concrete Masonry Units	Concrete masonry units – block walls, etc.
8	Brick (clay based)	Terracotta block, speed block, clay-based exterior brick veneers.
9	Mixed debris/demolition waste	Mixed waste generated from the demolition of the structures, and is combination of small pieces of recyclables, concrete, wood, insulation, and other demolition debris.
10	Interior contents	Interior contents of buildings which are removed prior to structural demolition and segregated from demolition waste and building debris. Recyclables will be removed from this waste stream as practical.
11	Sulphur stockpiles	Excess elemental sulphur stockpiled before use as sulphuric acid in copper ore leaching process

4.7 Ground Water Well Decommissioning

This section is not required as part of the joint application per the information requirements table.

4.8 Reclamation and Closure Prescriptions

4.8.1 Structures and Equipment

Refer to Appendix 4-1A Section 6.1.1, Section 6.2, Section 6.10.1, and Section 6.11.1 for details on the removal of structures and equipment across the Mount Polley Mine Site.

4.8.2 Waste Rock Dump Reclamation

Refer to Appendix 4-1A, Sections 6.5 to 6.6 for information on reclamation and closure of waste rock dumps (i.e., Rock Disposal Stockpiles – RDSs). As indicated, all RDSs that will remain into post-closure will consist of NAG rock, while PAG rock (e.g., that contained within the Temporary PAG Stockpile) will report to the Cariboo-Springer Pit, and then covered by 22 m of water. Submerging the PAG rock aligns with MPMC's '*geochemical stability*' closure objective presented in Table 4.2-1.

Given that the remaining RDSs will comprise of NAG rock, Figure 4.3-2, therefore, illustrates the closure cover designs for the remaining RDSs. Text within Section 4.7.2 of the application has been updated to provide further detail. In short, soil profiles (total surface soil and placed till depths) will range between 25-30 cm, which is congruent with existing academic research (Jackson 2009; Turner 2013; Bockstette 2018; Mackenzie and Naeth 2024) and best management practices in other jurisdictions.

4.8.3 Tailings Storage Facility Reclamation

This section is not required as part of the joint application per the information requirements table.

4.8.4 Open Pit Reclamation Prescriptions

Refer to Appendix 4-1A, Section 6.4 for information related to open pit reclamation. While the footprint of the pit area will change with the expansion of Springer Pit, overall reclamation strategies will remain the same.

4.8.5 Watercourse Reclamation Prescriptions

Refer to Appendix 4-1A, Sections 5.2 and 6.9 for information related to watercourse reclamation.

4.8.6 Road Reclamation

Refer to Appendix 4-1A, Section 6.8 for information related to road reclamation. Note that roads at the Mount Polley Mine have been constructed out of NAG and are not potential sources of ML/ARD, and thus align with the closure objectives outlined in Table 4.2-1.

4.8.7 Schedule

Refer to Section 10.1 in Appendix 1-3 for the construction schedule.

4.9 Reclamation and Closure Prescriptions

4.9.1 Structures and Equipment

No structures or equipment will be affected by the Springer Expansion, nor will any additional structures or equipment be needed to support Springer Expansion related operations.

4.9.2 Waste Rock Dump Reclamation

With the expansion of the Springer Expansion, additional waste rock will need to report to SERDS. At closure, the Mine Site is projected to have 434.21 ha of waste rock dumps including areas that are currently undergoing progressive reclamation. The SERDs will expand to accommodate the extra waste rock associated with the Springer Expansion, pushing its total footprint to 181.05 ha (from 103.71 ha pre-Springer Expansion development). Figure 3.3-11

provides the life of mine SERDs footprint. The SERDs will not receive any PAG during its extended lifespan, and any PAG associated with the expansion will be managed separately, so that SERDs, during post-closure can align with MPMC's geochemical stability closure objective (e.g., Table 4.2-1). At the onset of closure, if necessary, recontouring will occur to achieve a 2H:1V slope. Landform design and aesthetics will be considered to promote natural integration of reclamation sites into the surrounding landscapes and pre-mining drainage pathways.
As with other rock disposal stockpiles (RDSs), the SERDs will be designed using a geomorphic approach to minimize water infiltration and to integrate surface water flow into the closure water management design (Figure 4.3-3; Figure 13 of the WMP [Appendix 9-4A]). Expected drainage patterns of the Mine Site at closure are provided in Figure 4.3-3.

Following recontouring of RDSs, coversoil will be placed as indicated Figure 4.3-2, with a total reclaimed soil profile ranging between 25 cm and 30 cm in thickness. Actual coversoil placement depths will vary based on material availability, landscape, site preparation techniques used, and equipment used for application. Soil amendments may be added to the profiles, should soil quality parameters indicate organic material deficiencies. Best management practices outlined in the SMP [Appendix M of Appendix 4-1A (MPMC 2022a)] will be followed during reclamation to maximize the likelihood of successful revegetation with early successional species.

Following soil application, woody debris (if not already incorporated into soil) will be placed, if available. Revegetation prescriptions will follow those shown in Table 4.3-3, and where possible, important traditional use species (Table 4.2-2) will be incorporated. During revegetation efforts, wildlife habitat enhancements will also be established to encourage wildlife usage in alignment with the ELUs associated with the desired post-closure ecosystems (Figure 4.2-1; Figure 4.2-2: ; Table 4.2-2). Once the vegetation community is stable enough, agroforestry practices will be implemented in select areas to allow for livestock forage in young forests and open canopy forests. Other ELUs may also be supported, such as recreation.

4.9.3 Tailings Storage Facility Reclamation

This section is not required as part of the joint application per the information requirements table.

4.9.4 Open Pit Reclamation Prescriptions

The Springer Expansion footprint is approximately 135 ha. At closure, the expansion area will fill to 1050 masl, creating a pit lake. At the onset of active closure, PAG material will be placed in the Springer Pit, to an elevation of 1,004 masl, to algin with MPMC's geochemical stability closure objective (see Table 4.2-1). Following this, the pit will accumulate water, and the water level is expected to reach 1050.5 masl (Springer-Pit Expansion [SPE] spillway inlet) by approximately 2063. Above 1050.5 masl (SPE spillway inlet), the pit will overflow and discharge down the SPE spillway, with water ultimately reporting to Bootjack Lake (Figure 13 of the WMP; Appendix 9-4A).

Water quality modelling indicates that the water in pit lakes (including the Springer Expansion) will be suitable for wildlife and livestock. Predicted concentrations are below the screening level for livestock and wildlife of 10 mg/L for molybdenum, and selenium will be managed in the pit lake in response to measured water quality, through measures such as carbon addition to reduce selenate and precipitate selenite, if necessary. The need for this mitigation will be confirmed by monitoring the actual water quality observed in the active closure and post-closure periods. Detailed information on water quality modeling is available in Appendix I of Appendix 4-1A (MPMC 2022a).

Public safety is paramount during the reclamation of the open pits. When mining of the Springer Expansion is complete, berms and signage will be installed around the pit perimeter. Remaining exposed pit walls will have a slope ranging between 40° and 50° and are exempt from reclamation pursuant to Section 10.7.13 of the Health, Safety and Reclamation Code for Mines in British Columbia (BC EMLI 2022). The unvegetated pit walls have potential to add to the post-closure landscape's biodiversity by providing microhabitats that did not exist prior to the Mine Site development. Cliff faces, particularly those with ledges, boulder piles, crevices, and overhangs, may provide nest sites for a variety of cliff nesting birds, such as the common raven (*Corvus corax*), birds of prey, cliff swallows (*Petrochelideon pyrrhonota*), barn swallows (*Hirundo rustica*), and Say's phoebe (*Sayornis saya*). Cavities in boulder piles can provide nesting and denning habitat for bats (*Chiroptera* spp.), the bushy-tailed woodrat (*Neotoma cinerea*), deer mice (*Peromyscus* spp.), the northwestern chipmunk (*Tamias minimus*), and other small mammals.

Ramps down to the level of flooding will be decompacted with heavy equipment and reclamation will occur as outlined for ICHmk3_02 BEC series. Flooded pits will have little potential as fish habitat. However, the surface waters of the ponds have potential to support aquatic invertebrates and may provide useable spawning habitat for western toad and spotted frog. To promote aquatic habitat, species including duckweed (*Lemna* spp.), pond weed (*Potamogeton* spp.), yellow pond lily (*Nuphar variegata*), water sedge (*Carex aquatilis*), beaked sedge (*Carex utriculata*), common cattail (*Typha latifolia*), and river horsetail (*Equisetum fluviatile*) will be considered in revegetation. Floating species help build up organic matter, creating potential habitats for riparian species to be introduced over time. Such plants may also help remediate pit water quality through microbial activity, while the pit lakes may have the potential to act as a drinking water source for wildlife, depending on water quality and access.

4.9.5 Watercourse Reclamation Prescriptions

Section 5.2.4, Appendix H, and Appendix I of Appendix 4-1A (MPMC 2022a) provide information on projections related to post-closure water balance, water management, and water quality and the assumptions for these models. Additionally, Appendix N of Appendix 4-1A (MPMC 2022a) provides detail on the research towards the development of a site-specific passive water treatment technology as presented in the post-closure water management model, which details how water will be routed and managed following reclamation and closure efforts.

In general, contact water will be collected and treated prior to discharge to the receiving environment, as required to avoid adverse effects on the receiving aquatic environments. Collection system ditches that remain in perpetuity (e.g., the SERDS Ditch and Long Ditch as per the conceptual long-term plan) will be further armoured as required, with the banks and adjacent areas revegetated with riparian species, such as black cottonwood, willow (plugs or wattles and live stakes), and Sitka alder, as outlined in Figure 4.2-1; Figure 4.2-2: ; and Table 4.3-3. At closure, habitats for riparian species and aquatic life will be established that will also provide forage for wildlife in wetland and riparian areas.

4.9.6 Road Reclamation

Two types of roads exist at the Mine Site: light vehicle roads (often old forestry roads that pre-date mine operations) and large haul roads made from NAG waste rock (often built up and are essentially linear RDSs). In general, both types of roads will be reclaimed to align with the adjacent ELUs (generally wildlife habitat and forestry), as shown in Figure 4.2-1; and Table 4.3-1, with roads not required post-closure, reclaimed during active closure.
Some additional haul roads may be required to access the Springer Expansion; however, they will be reclaimed as outlined in Section 6.8 of Appendix 4-1A (MPMC 2022a), and will follow monitoring and maintenance activities as outlined in Section 7 of Appendix 4-1A (MPMC 2022a).

4.9.7 Schedule

A conceptual schedule for the Mine Site active closure and post-closure periods are presented in Table 4.9-1.

This schedule can be expected to evolve based on findings of reclamation research and progressive reclamation projects. It is also subject to change in accordance with changes to the mine plan.

Table 4.9-1: Closure Schedule

Component	Phase	Phase Start Date	Phase End Date
SPE	Operation	01-Jul-2024	31-Dec-2031
	PAG disposal	01-Jan-2031	01-Dec-2033
	Pit Flooding	02-Jan-2036	31-Dec-2054
SERDS	Operation	01-Jan-2024	31-Dec-2033
	Reclamation and Closure	01-Jan-2034	19-Feb-2036

SPE = Springer-Pit Expansion; SERDS = Southeast Rock Disposal Stockpile.

4.10 Detailed Five-Year Mine Reclamation Plan

Appendix 4-1A (MPMC 2022a) provides a comprehensive reclamation plan for the next five years of the Mine Site operation. As the Mine Site was recently in care and maintenance, progressive reclamation activities have been postponed. It is expected that reclamation activities will resume with the approval of the Springer Expansion and will only occur in areas of the Mine Site that are no longer required for operation.

4.11 Temporary Shutdown

There are two scenarios where operations are suspended due to unplanned events; these are temporary Care and Maintenance and unexpected Care and Maintenance. The definitions of these two scenarios are provided below:

- **Temporary Care and Maintenance:** An unplanned halt in production and operations due to changes in economic conditions.
- **Unexpected Care and Maintenance:** an unplanned halt in productions and operations due to a more rapid development of unfavourable conditions. This definition includes cases such as an engineering failure or a shutdown due to environmental conditions.

In both cases, a Care and Maintenance Plan will be developed and submitted to the EMLI for review, as resumption of activities is anticipated in the foreseeable future. This plan will include infrastructure preservation and health, safety and environmental maintenance, and surveillance programs. During Care and Maintenance, MPMC employees will conduct ongoing inspections of the site. Reasonable measures will be taken by MPMC to maintain both the safety of the public and the security of infrastructure and equipment, including:

- Locking access road gates.
- Posting signs prohibiting access by unauthorized personnel.
- Restricting site access, via foot or recreational vehicle traffic, to authorized persons only through use of fencing, where required, or by using existing topography and vegetation (i.e., dense forest) as barriers.
- Conducting regular security walk arounds and inspections (e.g., signs of erosion).
- Securing buildings and equipment against vandalism using a combination of fencing, video surveillance, and security personnel.
- Maintaining roads within the Mine Site to allow safe access for monitoring and maintenance.
- Conducting routine monitoring programs (e.g., water quality and water balance)
- Continued operation of site contact water management systems, including the water treatment plant.

As the size of the Mine Site does not allow for exclusion fencing of the entire area, priority will be placed on preventing public access to high-risk areas in the Mine Site. A contact person(s) will be designated for authorized access to the site and the name and telephone number of the contact person(s) will be kept clearly posted on access gates.

Section 10.6 of the Health, Safety and Reclamation Code in BC, requires that proponents notify the EMLI prior to entering Care and Maintenance. Table 4.11-1 provides an overview of these notification requirements.

Table 4.11-1: Temporary Care and Maintenance Notification Requirements

Length of Mine Closure	Notice Required	Type of Closure
<1 year	▪ Continue to carry out the conditions of the Permit ▪ Carry out a program of site monitoring and maintenance	Care and Maintenance
>1 year	▪ Apply for an amendment to the Permit setting out a revised program for approval by the Chief Inspector ▪ Identify the hazards and provide detailed engineering drawings respecting such hazards to local emergency agencies, and update the drawings as required ▪ If practicable, make such plans available on-site at a conspicuous location	Unexpected Closure*

* Unexpected Closure = unplanned closure of the mine; care and maintenance activities are not conducted, and the RCP is executed.

In some scenarios, the conditions that triggered Care and Maintenance do not relent, and a mine progresses to a state of unexpected closure. In the event of unexpected closure, the procedures detailed in Appendix 4-1A (MPMC 2022a) will be implemented, as appropriate, given the mine plan status and the degree of permanence of the closure.

Site water management requirements within the EMA permit continue during Mine operation suspensions, including capture, conveyance, storage, treatment, and discharge of contact water on the Mine.

4.12 Post-Closure Monitoring and Maintenance

Post-closure monitoring and maintenance differs from reclamation monitoring and maintenance with respect to their objectives. Reclamation monitoring and maintenance is geared towards ensuring ecosystem recovery is on the correct trajectory to meet the desired ecosystems and ELUs. Meanwhile, post-closure monitoring and maintenance focuses on ensuring that the newly reclaimed landscape continues to achieve a relatively steady-state configuration that permits the uses outlined by ELU objectives. The Mine Site Post-Closure Monitoring Requirements are presented in Table 4.12-1.

Table 4.12-1: Requirements in the Event of Mine Closure Period

Monitoring Activity	Frequency	Location	Parameter	Success Criteria
Geotechnical Stability	Annually After extreme rainfall events[1]	TSF	Visual inspection of the Mine Site Component by a qualified geotechnical Engineer	No signs of erosion or forms of geotechnical instability to the Mine Site Component
		RDSs		
Surface Water Quality[2]	▪ Quarterly during Active Closure. ▪ Monthly to Annually (location dependent) during the first 5 years of Post-Closure ▪ Quarterly to annually for the remainder of Post-Closure	BC ENV permit Locations	Parameters outlined in BC Water Quality Guidelines	Water quality meets BC Water Quality Guidelines for Freshwater Aquatic Life.
		Water Management Infrastructure	Visual inspection of water management infrastructure by qualified personnel	Water Management Infrastructure supports its intended use
	As outlined in CEMP until distributed discharge is obtained	Quesnel Lake Discharge	Parameters outlined in BC Water Quality Guidelines	Water quality meets BC Water Quality Guidelines for Freshwater Aquatic Life
	Weekly, decreasing to monthly sampling over time	▪ Distributed discharge locations ▪ Quesnel Lake and other receiving environment locations		
Aquatic Effects	▪ Every 3 Years as per MDMER 2022 ▪ Decreasing to every 6 Years as results stabilize	Receiving environments with aquatic invertebrates or fish populations	Field and laboratory testing by a qualified professional.	Sediment chemistry, fish populations, fish tissue, and aquatic invertebrate populations align with observations from natural reference sites

Table 4.12-1: Requirements in the Event of Mine Closure Period

Monitoring Activity	Frequency	Location	Parameter	Success Criteria
Ground Water Quality and Levels	Daily until water levels are stable, followed by annual sampling for approximately 5 years.	▪ Cariboo-Springer Pit wells ▪ Nested monitoring wells near the Cariboo-Springer Pit ▪ Wells adjacent to Wight Pit	Parameters outlined in BC Water Quality Guidelines	▪ Long-term monitoring trends are stable and water quality meets BC Water Quality Guidelines ▪ Water levels follow those modeled for Post-Closure
	Biannually (every 6 months) until trends are stable, and the water chemistry and flow patterns have been adequately characterized.	Water Management Infrastructure is deemed		
Soil Replacement	Immediately after placement	All areas undergoing terrestrial reclamation	Field and laboratory testing by a qualified professional.	▪ Soil depth is within 80% of desired placement depth ▪ Soil pH is not rated as 'unsuitable[3]'
Revegetation and Invasive Plants	▪ Immediately after planting ▪ 1, 2, 5, and 10 years after planting	All revegetated areas via PSPs	▪ Ecosystem composition ▪ Plant mortality ▪ Percent cover ▪ Abundance of invasive plants ▪ Grazing/browsing signs ▪ Disease and infestation signs	▪ The reclaimed plant community supports its intended ELU ▪ The reclaimed plant community dynamics are similar to natural reference sites
Metal Uptake in Vegetation	1, 2, 5, and 10 years after planting	Revegetation PSPs	▪ Trace elements in soil ▪ Trace elements in plant tissue for each primary type of lifeform (e.g., grass, tree, shrub)	Metal uptake into vegetation on reclaimed sites is not significantly different than natural analogues

Table 4.12-1: Requirements in the Event of Mine Closure Period

Monitoring Activity	Frequency	Location	Parameter	Success Criteria
Wildlife	In conjunction with revegetation monitoring	Transects	▪ Population dynamics ▪ Species richness and diversity	▪ Mine Site population dynamics are similar to those in undisturbed areas ▪ Ecosystem dynamics (e.g., species richness) matches that of natural analogues

1) Rainfall exceeds design return period.

2) See Table 7-1 of Appendix 4-1A (MPMC 2022a) for further details

3) As defined by AAFRD (1987).

CEMP = Comprehensive Environmental Monitoring Plan; ELU = End Land Use; PSP = permanent sampling plot; RDS = Rock Disposal Stockpile; TSF; Tailings Storage Facility

4.12.1 Contingencies

It is possible that during post-closure monitoring, maintenance is required. Risks to successful closure will be partially mitigated through adaptive planning and decision-making.
The underlying strategy for reclamation and closure is that it is founded on a management approach that is based on iterative inputs from reclamation monitoring results, research findings, and changes to best practice and regulations. To this end, progressive reclamation activities provide opportunities to test, monitor, and adapt reclamation strategies, where required.
MPMC will use a ground-based sampling program as an effective method to measure success of reclamation and to help support the adaptive management approach to reclamation by identifying areas for mitigation and improvement in reclamation design.

Maintenance is planned for, and is included in, MPMC's long-term reclamation planning. Long-term monitoring and maintenance will be conducted until the Project is ready for certification. If, during monitoring, sites are found that are not performing as expected, mitigations may be applied including, but not limited to:

- Infill planting
- Fertilization
- Mulching, weed control and pest control
- Irrigation
- Further investigations into soil and foliar chemistry

If required, MPMC will work with the EMLI to determine appropriate mitigations based on best practices, experience at other mine sites, and results of academic and on-site research. Where uncertainty remains about the performance of reclamation activities, adaptive management strategies will be used to formulate an appropriate response.

4.13 Reclamation Cost Estimate

Reclamation cost estimates are provided under separate cover.

4.14 References

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5 WATER MANAGEMENT (MODELLING, MITIGATION, AND DISCHARGES)

5.1 Summary

5.1.1 Springer Pit

MPMC has a permit to discharge treated effluent from the Mine under the *Environmental Management Act* (EMA;) as Permit 11678. The permit was issued on May 30, 1997, and most recently amended through a Consent Order on 18 September 2020. An interim extension to Section 1.2.3 of PE-11678 was granted by Ministry of Environment and Climate Change Strategy (BC ENV) in 2022, allowing the existing discharge to Quesnel Lake to continue until 30 June 2025. The (2022) TAR provided an update on, among other things, receiving environment data and, in aggregate, provided scientific rationale to support the view that the discharge is not causing pollution. Under Section 1.2.3 of Permit 11678, the "authorized discharge period" for discharge of effluent to Quesnel Lake expires on June 30, 2025. This discharge period is anticipated to support the permitted Phase 4 Cariboo-Springer Pit. However, MPMC is pursuing an extension to the life of the Mount Polley mine with the development of the Springer Expansion, which will add approximately 8 years of operational mining life. Approval of this project will be sought through a Joint Application through the EMLI and the BC ENV, with the request to BC ENV being an extension of the discharge period beyond 2025.

The 2024s WMP provided in Appendix 9-4A, addresses permit requirements for assumed future operations of the site, which at the time of writing are expected to run through 31 March 2031. This WMP also summarizes and discusses predicted water quantity, quality, and treatment during closure (1 April 2031 through 31 March 2041) and post-closure (1 April 2041 through 31 March 2131) phases. It should be noted that these dates are expected dates for mining operations; however, as with all mines, such schedules are subject to changes that result from commodity pricing and other factors.

5.1.2 Interim Raise to 974 m

During construction for the TSF interim raise to 974 m, a portion of the existing diversion and collection channels and ponds that are currently in place around the TSF will be partially or fully covered by the new TSF embankment. Water management infrastructure around the TSF will be impacted, including the following modifications:

- Relocation of the south embankment pond and main embankment pond, as well as the relocation of collection channels that feed these ponds.
- Expansion of the PETBP and relocation of channels that feed this pond.

The TSF water management infrastructure will be designed in alignment with the ultimate embankment raise for 987 m. Some structures will extend beyond the M-200 boundary, and an extension of the M-200 boundary is required to cover the planned disturbance areas, as shown on the TSF water management infrastructure drawings. Additional information including a detailed description of water management structures associated with the TSF interim raise to 974 m is included in the Water Infrastructure Design Report included in Appendix 5-2.

5.2 Conceptual Site Model

This section is not required as part of the joint application per the information requirements table.

5.3 Site-Wide Water Balance Model

A site-wide water balance model (SWWBM) was developed as part of the WMP which describes proposed water management quantities for operations, closure, and post-closure phases of the Mine. A discussion of water treatment during operations and closure/post-closure is also provided, including treatment design bases for these LOM phases. Refer to Appendix 5-3 or Appendix A of the WMP (Appendix 9-4A) for a detailed description and results of the SWWBM or to Appendix 5-4 for the operational efficiency and reliability of the WTP.

Note that the surface model already includes assumptions regarding lift of the TSF to 974m and ultimately to 987m. Stage-storage curves and seepage quantity estimates in the model already account for these lifts to ultimate 987m.

To support this application, EMLI application reviewers have requested two references cited in the SWWBM report:

- Reference MPMC 2023a from the SWWBM Report: Weekly TSF & Water Management System Status. May 2, 2023. Included as Appendix 5-5.
- Reference MPMC 2023b from the SWWBM Report: Meeting Summary Confirmation. Email from Mathieu O'Leary. August 1, 2023. Included as Appendix 5-6.

5.4 Surface Water Quality Model

A site-wide water quality model (SWWQM) was developed as part of the WMP which describes proposed water management quality for operations, closure, and post-closure phases of the Mine. A discussion of water treatment during operations and closure/post-closure is also provided, including treatment design bases for these LOM phases. Refer to Appendix B of the WMP (Appendix 9-4A) for a detailed description and results of the SWWQM.

An additional objective of the WMP is to provide updates on treatment technology development and alternative water treatment strategies that are being assessed by MPMC for implementation both in operations and upon closure of the site.

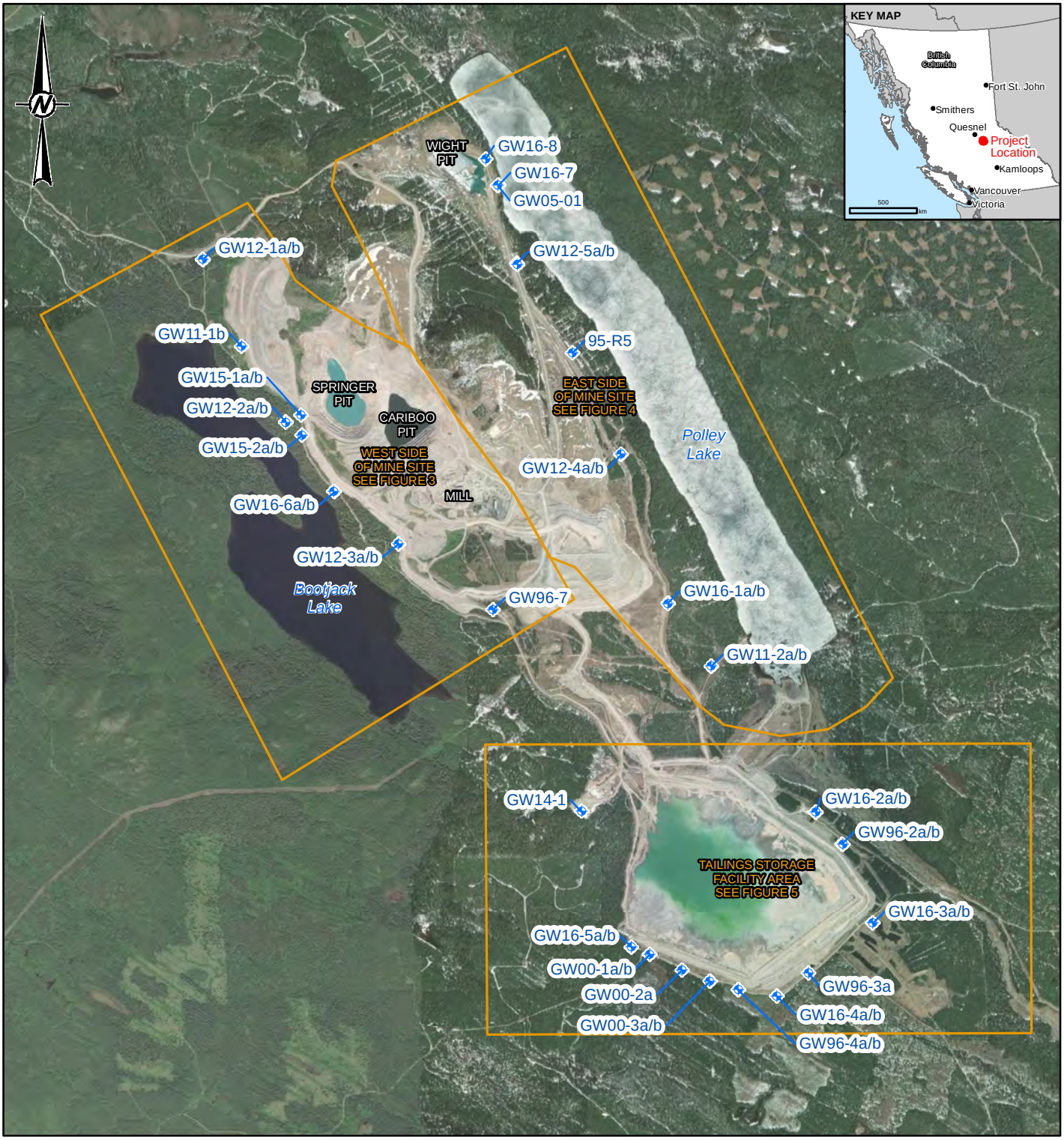
5.5 Groundwater Model

5.5.1 Conceptual Hydrogeologic Model

5.5.1.1 Site Wide

Situated on a topographic high and centred on Polley Mountain is the main mine site, which reaches an elevation of approximately 1250 metres above sea level (masl). Bootjack Lake is located to the southwest of the mine site, and Polley Lake is located to the northeast of the mine site. Infrastructure of note at the mine site consists of the mill, in the approximate centre of the mine site, the TSF, located about 3 km southeast of the mill in a topographically low area, several pits (Springer, Cariboo, Wight, and Boundary) and Hazeltine Creek (Figure 5.5-1). Hazeltine Creek flows southeast and then east from Polley Lake to Quesnel Lake; Quesnel Lake is located approximately 5 km to the east of the TSF. Numerous groundwater monitoring wells are located throughout the site (see Table 5.5-1)

The climate is described as a humid, continental climate with the driest season in spring and the wettest season in summer. Groundwater recharge occurs through the infiltration of precipitation in the topographic high area of Polley Mountain and the surrounding slopes, excluding the existing mine pits. The open pits act as sinks for groundwater flow when they are dewatered, and as both sinks and sources of groundwater seepage when flooded to the spillover elevation. The primary groundwater discharge areas next to the mine site are: Polley Lake to the east, Bootjack Lake to the west, and an area near the TSF and Hazeltine Creek (located to the southeast of the TSF). Bootjack Lake, Polley Lake, and Quesnel Lake, the largest lake in the area located about 5 km to the east of the mine site, strongly control regional groundwater flow and act as significant hydrogeological boundaries.



LEGEND

GROUNDWATER MONITORING WELL

MAP EXTENT - REFER TO FIGURES 3, 4 AND 5

0 1 2

1:50,000 KILOMETRES

REFERENCE(S)

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2. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
SITE PLAN

CONSULTANT

YYYY-MM-DD	2024-07-04
DESIGNED	OK
PREPARED	CDB
REVIEWED	OK
APPROVED	JF

PROJECT NO.	PHASE	REV.	FIGURE
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The mine site is underlain by monzonite bedrock that has been intruded by hydrothermal breccias and intersected by northwest–southeast striking faults. The bedrock in the area of the Springer and Cariboo pits is overlain by a discontinuous and relatively thin (i.e., a few metres) layer of overburden of glacio-lacustrine and glacio-fluvial origin, primarily silt/clay. Near the Wight Pit, a thicker zone of overburden is identified between the southeast crest of the pit and Polley Lake, with coarser and more permeable sand/gravel sediments present at depth directly above bedrock.

Prior to mining of the site, the direction of groundwater flow was inferred to be from areas of topographic high (i.e., the top of the ridge between Polley Lake and Bootjack Lake) to areas of topographic low (i.e., the lakes). However, after mining commenced, and as a result of mine dewatering, the groundwater flow direction at the mine site has changed. Mine dewatering has lowered the groundwater elevation and created localized radial flow towards the various pits.

Table 5.5-1: Monitoring Well Network

Year	Well Series	Well Numbers	Comments
1995	95	R5	Several wells were drilled in 1995; however, only 95-R5 still exists.
1996	GW96	1b[(a)]; 2a, b; 3a, b[(b)]; 4a, b; and 7	Initially nine wells were drilled with eight installed as multi-level wells. Currently only six monitoring wells[(c)] are monitored (two multi-level wells and two single well locations).
2000	GW00	1a, b; 2a, and 3a, b	Installed along southeast embankment of TSF.
2005	GW05	1	GW05-1 was installed as a pumping well to capture groundwater moving from Polley Lake towards the Wight Pit, pumping it back into Polley Lake.
2011	GW11	1a, b; and 2a, b	Two pairs of multi-level wells were installed to monitor potential impacts from newly disturbed areas.
2012	GW12	1a, b; 2a, b; 3a, b; 4a, b; and 5a, b	Five pairs of multi-level wells were installed to collect additional groundwater information.
2014	GW14	1	Domestic well at Orica site.
2015	GW15[(d)]	1a, b; and 2a, b	Two pairs of multi-level wells installed to monitor seepage conditions associated with Springer Pit Lake.
2016	GW16	1a, b; 2a, b; 3a, b; 4a, b; 5a, b; 6a, b; 7; and 8	Additional monitoring wells installed at various locations to monitor current groundwater quality, and eventually at closure.

Note:

In multi-level well installations, “a” represents deep well, and “b” represents shallow well.

Only wells identified in the most recent CEMP have been identified in the table.

(a) Groundwater monitoring at GW96-1a, and GW96-1b was ceased in 2018 based on Golder’s recommendation, and has been removed from the CEMP sampling requirements; however historical data is included in the chemistry plots.

(b) Groundwater monitoring well is decommissioned.

(c) Currently monitored wells consist of GW96-2a, GW96-2b, GW96-3a, GW96-4a, GW96-4b, and GW96-7.

(d) Only groundwater level was monitored at GW15-1a and GW15-1b.

5.5.1.2 Springer-Cariboo Pit

Hydrogeological conditions around the Springer-Cariboo Pit are described in Golder (2016a), Golder (2017) and WSP (2024). A key hydrogeological feature that affects groundwater movement out of the pit is a groundwater "mound" to the west of the pit. The elevation of the mound rises and falls in response to changes in surrounding water levels, including those in Springer Pit. When water levels in Springer Pit rise above approximately 1,020 masl, a small flux (~20 m^3/day) of groundwater toward Bootjack Lake is anticipated. This volume has been estimated to increase to 90 m^3/day at an elevation of 1,030 masl and 360 m^3/day at 1,050 masl (WSP, 2024).

Water levels in Springer Pit in 2023 were reported to range from 974.89 masl (January) to 975.25 masl (March). Surface water elevations for Springer Pit were not provided beyond April 2023. In 2023, surface water elevations at Springer Pit were generally lower than the groundwater elevations within monitoring wells associated with the west side of the mine site (Figure 5.5-2 through

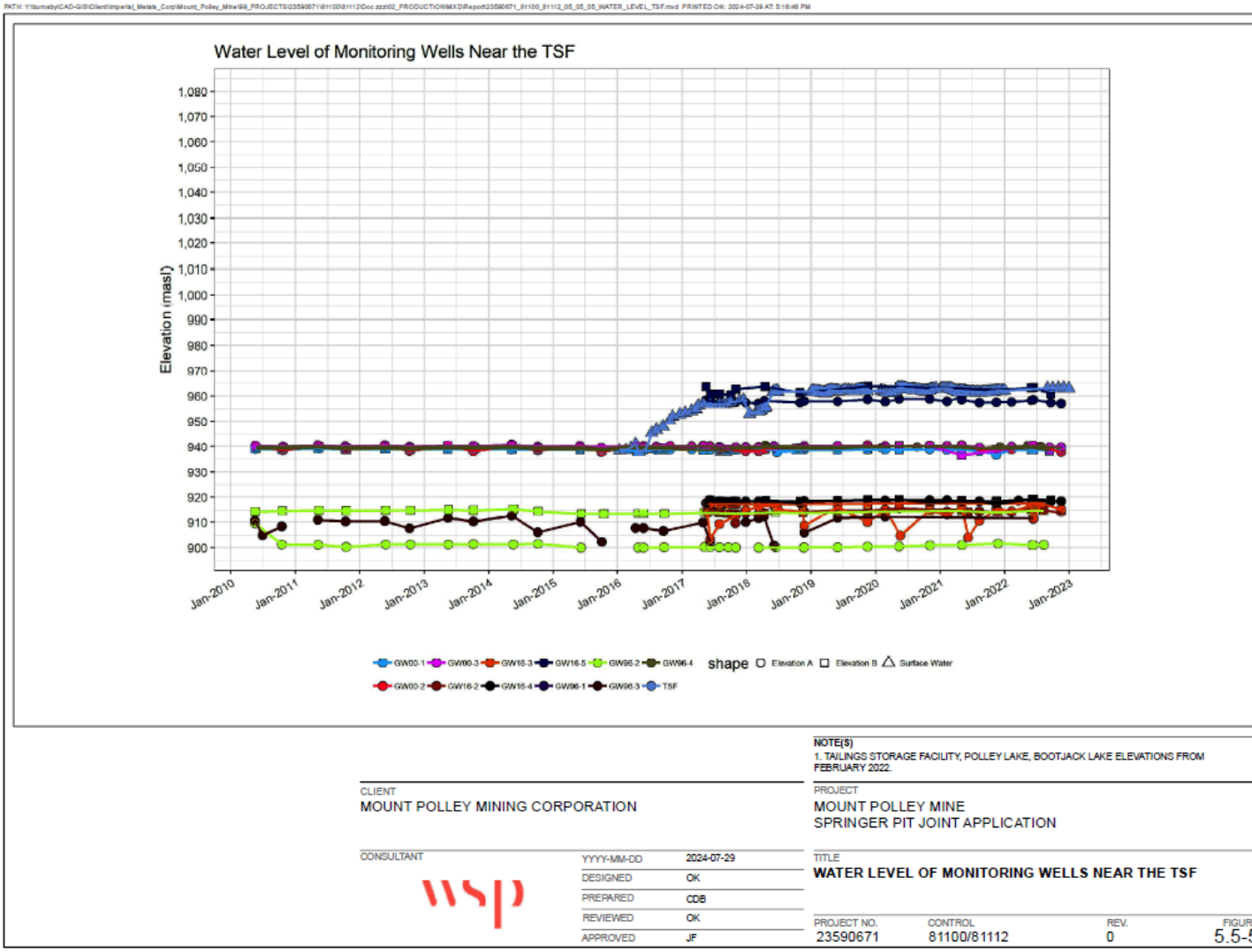
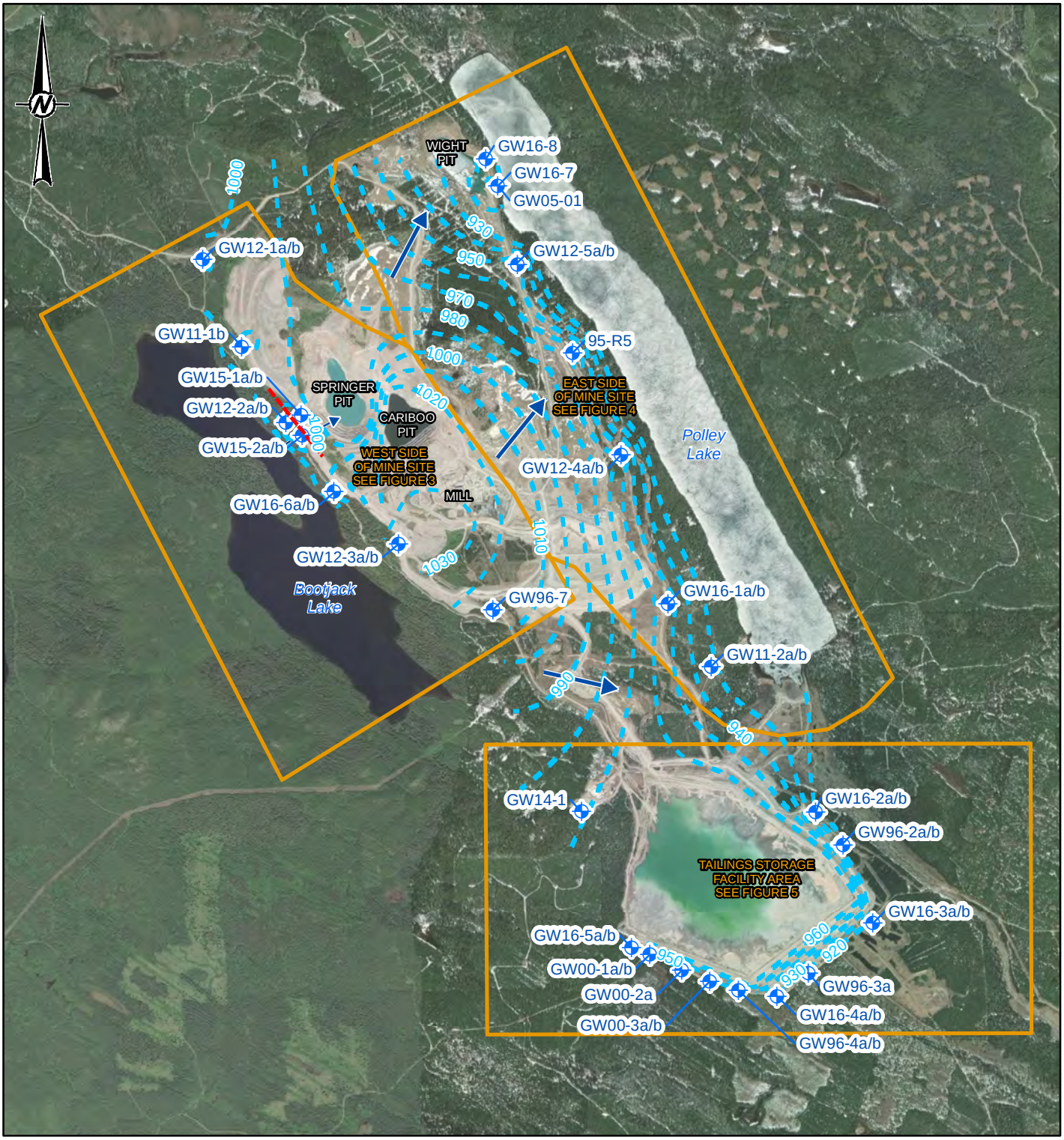


Figure 5.5-5). Water levels in Cariboo Pit in 2023 were reported to peak in January (974.31 masl), after which they stabilized at an elevation of 950.23 masl (August). Water levels in Cariboo Pit have been decreasing since May 2022.

Based on a review of groundwater elevations on the west side of the mine site, it can be inferred that a groundwater divide between the Springer Pit and Bootjack Lake remains in the area of GW12-2(a,b) and GW15-2(a,b), as groundwater elevations at these wells remained higher than the surface water elevation in Springer Pit; there continues to be no leakage from Springer Pit to Bootjack Lake. This groundwater divide results in groundwater flow both towards the east and west from the groundwater divide.



LEGEND

- GROUNDWATER MONITORING WELL
- INFERRED DIRECTION OF GROUNDWATER FLOW
- INFERRED GROUNDWATER DIVIDE
- GROUNDWATER ELEVATION CONTOUR
- MAP EXTENT (SEE FIGURES 3, 4 AND 5)

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1:50,000 KILOMETRES

NOTE(S)

1. TAILINGS STORAGE FACILITY, POLLEY LAKE, BOOTJACK LAKE ELEVATIONS FROM FEBRUARY 2022.

REFERENCE(S)

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2. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

TITLE
GROUNDWATER FLOW DIRECTION PLAN (JUNE 2022)

CONSULTANT
wsp

YYYY-MM-DD	2024-07-29
DESIGNED	OK
PREPARED	CDB
REVIEWED	OK
APPROVED	JF

PROJECT NO.	PHASE	REV.	FIGURE
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NOTE(S)

1. TAILINGS STORAGE FACILITY, POLLEY LAKE, BOOTJACK LAKE ELEVATIONS FROM FEBRUARY 2022.

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

CONSULTANT

YYYY-MM-DD	2024-07-29
DESIGNED	OK
PREPARED	CDB
REVIEWED	OK
APPROVED	JF

TITLE
WATER LEVEL OF MONITORING WELLS ON THE WEST SIDE OF THE SITE

PROJECT NO.	CONTROL	REV.	FIGURE
23590671	81100/81112	0	5.5-3

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NOTE(S)

1. TAILINGS STORAGE FACILITY, POLLEY LAKE, BOOTJACK LAKE ELEVATIONS FROM FEBRUARY 2022.

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

CONSULTANT

YYYY-MM-DD	2024-07-29
DESIGNED	OK
PREPARED	CDB
REVIEWED	OK
APPROVED	JF

TITLE
WATER LEVEL OF MONITORING WELLS ON THE EAST SIDE OF THE SITE

PROJECT NO.	CONTROL	REV.	FIGURE
23590671	81100/81112	0	5.5-4

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NOTE(S)

1. TAILINGS STORAGE FACILITY, POLLEY LAKE, BOOTJACK LAKE ELEVATIONS FROM FEBRUARY 2022.

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
SPRINGER PIT JOINT APPLICATION

CONSULTANT

YYYY-MM-DD	2024-07-29
DESIGNED	OK
PREPARED	CDB
REVIEWED	OK
APPROVED	JF

TITLE
WATER LEVEL OF MONITORING WELLS NEAR THE TSF

PROJECT NO.	CONTROL	REV.	FIGURE
23590671	81100/81112	0	5.5-5

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5.5.2 Numerical Hydrogeological Model

In 2016, Golder assessed groundwater flow for the following three open pits at the mine: Springer and Cariboo pits, Wight Pit and Boundary Pit. The analysis for each pit was described in a series of technical memoranda in Appendix B of the TAR (Attachments C, D, E, and F; Golder 2016a). Hydrogeological assessments for the pits were conducted as part of the TAR to provide estimates of seepage into and out of the pits. A provision to update the WMP and provide an updated seepage assessment is included as part of the revision trigger and frequency table under the implementation plan and schedule in Section 5.0 of the WMP. The Springer Pit three-dimensional model was updated and recalibrated in 2023/2024 based on more recent data since 2016 and on an updated mine plan. The changes to the model hydrogeological parameters resulting from model recalibration are summarized in Table 5.5-2 below.

Table 5.5-2: Hydrogeological Model Parameter Value Comparison and 2024 Modifications

Item	2016 Model Value	2024 Model Value
K value - Shallow bedrock between the pit crest and GW15-01A/B	3×10^{-6} m/s	5×10^{-6} m/s
K value - Zone of the brecciated bedrock extending along the southwest portion of the Springer Pit and south of the Cariboo Pit	2×10^{-6} m/s	5×10^{-6} m/s
K value - Bedrock at depth between 40 m and 100 m	2×10^{-7} m/s	1×10^{-7} m/s
Anisotropy - Zone characterized with lower hydraulic conductivity around monitoring well GW12-2	Anisotropy – 1	Anisotropy – 5
Recharge from precipitation was increased by approximately 20% from average value based on climate data	October to April	April to June

The recalibrated model was used to estimate updated seepage into and out of the ultimate Springer/Cariboo Pit during closure. The results of this assessment are presented in WSP, 2024 and are summarized in the section below. Similarly, estimates of seepage into and out of the TSF was also assessed using a three-dimensional model (Golder 2016b). The three-dimensional model for the TSF is currently being updated and recalibrated.

Springer/Cariboo Pit

The combined Springer/Cariboo Pit will be mined to the ultimate depth of approximately 763 masl based on the ultimate pit shape provided by MPMC. During closure, the combined Springer/Cariboo Pit will be allowed to flood. The spillway elevation for this pit lake will be approximately 1,050 m elevation. PAG materials will be placed in the combined Cariboo-Springer Pit at closure and stored sub-aqueously to mitigate acid generation and metal leaching, in accordance with standard mine waste handling practices (MEND 2015), and to help achieve MPMC's geochemical stability closure objective (Table 4.2-1).

A hydrogeological assessment was conducted to predict the quantity of long-term groundwater seepage from the combined Springer/Cariboo pit towards Bootjack Lake for the Phase 4 Cariboo-Springer Pit mine plan (WSP, 2024). Similarly to the previous assessment, in these model simulations, it was assumed that the PAG materials that will be placed in the Springer/Cariboo Pit will have a hydraulic conductivity significantly higher than the surrounding rock mass, and thus offer no resistance to seepage entering or exiting the pit lake. Results showed that, as the pit lake level increases to between 1,020 and 1,030 m elevation, seepage in the range of 20 to 90 m^3/d from the Springer/Cariboo Pit Lake into the subsurface was predicted to occur (Table 5.5-3). Seepage was found to gradually increase to approximately 360 m^3/d when the pit lake reaches the spillway elevation of 1,050 m.

At this elevation, the pit lake was predicted to act as a "flow-through" lake with groundwater recharge occurring from the uplands located northeast from both pits and recharge to groundwater occurring towards the southwest.

Table 5.5-3: Predicted Seepage Quantities for the Ultimate Configuration of the Springer/Cariboo Pit Lake

Springer-Cariboo Pit Lake Elevation (m)	Base Case		Upperbound		Lowerbound	
	Groundwater Flow (m^3/day)		Groundwater Flow (m^3/day)		Groundwater Flow (m^3/day)	
	Into the Lake	Out of the Lake	Into the Lake	Out of the Lake	Into the Lake	Out of the Lake
760	640	-	1120	-	420	-
800	640	-	1120	-	420	-
850	640	-	1110	-	420	-
900	630	-	1090	-	410	-
940	620	-	1080	-	410	-
960	610	-	1040	-	400	-

Table 5.5-3: Predicted Seepage Quantities for the Ultimate Configuration of the Springer/Cariboo Pit Lake

Springer-Cariboo Pit Lake Elevation (m)	Base Case		Upperbound		Lowerbound	
	Groundwater Flow (m^3/day)		Groundwater Flow (m^3/day)		Groundwater Flow (m^3/day)	
	Into the Lake	Out of the Lake	Into the Lake	Out of the Lake	Into the Lake	Out of the Lake
980	580	-	980	-	390	-
1000	520	-	850	-	360	-
1020	430	20	690	60	320	<10
1030	390	90	620	200	300	30
1040	360	200	560	440	280	80
1050	330	360	510	780	270	150

Source: WSP, 2024.

masl = metres above sea level.

Wight Pit

Hydrogeological modelling was carried out for the Wight Pit (Golder 2016a), and is considered to be generally representative of current conditions. The results from the hydrogeological model indicate that under steady-state conditions Table 5.5-4, groundwater inflow to the Wight Pit is projected to gradually decrease from 2,600 m^3/d at an elevation of 880 m to 600 m^3/d at an elevation of 926 m (Golder 2016a).

Table 5.5-4: Predicted Groundwater Flows for the Wight Pit

Pit Lake Elevation (masl)	Groundwater Flow (m^3/d)	
	Into the Lake	Out of the Lake
Base Case		
880	2,600	0
900	2,500	0
910	2,100	0
920	800	0
926	600	500
Lower Bound		
926	400	300
Upper Bound		
926	700	800

Source: Golder 2016a.

masl = metres above sea level.

Boundary Pit

At present, hydrogeological data specific to the Boundary Pit are not available. However, MPMC indicated that during mining seepage was not observed along the pit walls. This is considered reasonable due to the relatively shallow depth of this pit and depth to water table measured at monitoring wells that were installed near other mine facilities. It is thus considered likely that the water table was located near or below the floor of the Boundary Pit before mining at this location commenced.

Although seepage to the Boundary Pit from the surrounding rock mass is not expected, seepage out of this pit could occur due to water entering the pit via surface water runoff and direct precipitation. An estimate of these potential seepage rates out of the pit was made to provide input to the pit water balance and to characterize a potential seepage pathway originating from this pit (Golder 2016a).

Seepage rates out of the Boundary Pit have been estimated from a Darcy's Law calculation that considers changes in the dimensions of the seepage area as the pit is being flooded. The estimated seepage rate from the Boundary Pit when the pit lake level is 5 m above its base (1,073 m) is approximately 59 m^3/d, with a potential range between 35 and 177 m^3/d due to uncertainty in bedrock permeability (Table 5.5-5).

Table 5.5-5: Estimated Seepage Outflows from the Boundary Pit

Water Level (masl)	Estimated Groundwater Outflow (m^3/d)		
	Lower Bound	Base Case	Upper Bound
1,068	2	3	10
1,069	6	10	29
1,070	12	20	61
1,071	16	26	79
1,072	32	53	159
1,073	35	59	177

Source: Golder 2016a.

masl = metres above sea level.

Seepage from the Tailings Storage Facility

WSP is currently designing a new upstream drainage system to accommodate the increase in the TSF pond elevation (WSP 2023b). The new upstream drain system will capture water within the tailings above 970 m and convey it to the seepage collection system, downstream of the TSF embankment. WSP has estimated the water flows through the upstream drains based on the distance between the pond and the embankment (beach width). Estimation of flows have been made for each embankment:

- S1: South Embankment
- S2: Main Embankment
- S4: Corner 1 Embankment
- S5: Perimeter Embankment

Seepage flows from the TSF (S1 to S5) during operations were estimated using a two-dimensional numerical groundwater flow model to quantify anticipated seepage rates through the embankment and foundation. A three-dimensional numerical groundwater flow model will be updated in 2024 to aid in further seepage assessment and refinement.

Using the two-dimensional model, seepage analyses were conducted for typical sections of the elevation of 987 m configuration of the South Embankment, Main Embankment, Perimeter Embankment, and Corner 1 Embankment under steady-state conditions. The analyses were conducted using GeoStudio 2021, developed by GEOSLOPE International Ltd. Seepage from the TSF has been defined to occur continuously without interruption in the SWWBM. Table 5.5-6 presents the estimated seepage flow rates through each embankment with dependency on the beach width.

Table 5.5-6: Seepage Flow Rates

Beach (m)	Seepage Flow Rate (L/s)			
	S1	S2	S4	S5
0	79	96	81	89
50	39	50	53	46
100	25	32	38	31
200	14	18	23	18
300	9	12	15	13

Note: includes flows through upstream drains and embankment. All flows estimated for the 987 m raise.

The progressive location of the TSF pond will depend on operational decisions during the deposition of tailings; thus, the change in beach widths have been assumed consistent for each embankment. Based on estimates of the TSF pond volume and satellite imagery of the pond location since restart of operation in 2016, an estimation of embankment beach width has been made for different pond sizes. The estimates are provided in Table 5.5-7, which outline a conservative scenario, in terms of seepage flow quantities.

Table 5.5-7: Tailings Beach Width

TSF Pond Volume (m^3)	Beach Width (m)			
	S1	S2	S4	S5
0	300	300	300	300
1,500,000	300	300	300	300
2,500,000	200	200	200	200
3,000,000	100	100	100	100
5,500,000	0	0	0	0

The model uses both Table 5.5-6 and Table 5.5-7 presented above to calculate the beach width and consequently the seepage flow rates through the embankments during operations. For every time step the model calculates the TSF volume and consequently the beach width, and finally the seepage flow rate. Seepage parameters in these tables are developed from work outlined in Appendix 5-7.

Starting from four months into closure (1 August 2031), the TSF pond reduces its volume to 0.25 M-m^3 within two months due to the construction of the closure TSF spillway. This is estimated to increase the seepage flow rate on the perimeter embankment close to corner 1, as the TSF pond will be pushed to that corner. For modelling purposes, it is considered that the seepage flow rate in Table 5.5-8 will be in effect 6 months after the end of the operation phase and throughout the closure and post-closure phases.

Table 5.5-8: Tailings Beach Width at Last Year of Operation and Closure

Flow Rate (L/s)			
S1	**S2**	**S4**	**S5**
70	0	0	0

Note: Values start 6 months after end of operation. Maximum capacity of TSF pond is limited to 250,000 m³.

5.6 Mitigation Methods

5.6.1 Best Available Technology

This section is not required as part of the joint application per the information requirements table.

5.6.2 Volume and Quantity Control Methods

During normal operations, the TSF will be managed by maintaining the pond volume within the operating range for reclaim water and make-up water. The SWWBM developed as part of the WMP shows that the maximum TSF pond volume during the operational phase remains within the normal operating range during average conditions (50th percentile) and increases to approximately 3.5 million m3, which represents the 99.5th percentile volume.

The inflows that directly contribute to the TSF volume are from precipitation on the direct footprint of the TSF and runoff from the catchment directly above the TSF. The major contribution to TSF supernatant volume is site contact water pumped from facilities including the Central Collection Sump and Perimeter Embankment Till Borrow Pond.

Temporary detention of water in the TSF is necessary to manage large site runoff volumes that can be generated during freshet; however, a fundamental basis of the water management plan is to not accumulate water on site year over year within the TSF by treating and discharging water.

A freeboard and water level assessment (WSP 2024) was completed for the TSF interim raise to 974 m to assess a minimum freeboard that needs to be maintained to prevent overtopping of the TSF by wave action. The freeboard and water level assessment included wave run-up calculations, hydrology and hydraulic modelling, and spillway sizing as an emergency control measure to maintain the minimum freeboard. The freeboard and water lever assessment is summarized below and more details can be found in WSP 2024 in Appendix 5-8.

The design criteria for the spillway are described in the technical basis memorandum document for the TSF Raise to Elevation 974 m (WSP 2023) and inputs to the TSF freeboard and water level assessment are found in WSP 2024.

5.6.2.1 TSF Freeboard

The freeboard for a water-retaining structure can be defined as the minimum vertical distance between the still pool reservoir level and the crest of the retaining structure (CDA 2013, 2019). This distance needs to be maintained at all times to prevent overtopping of the containing structure by waves resulting from wind and wave set-up and run-up. The Canadian Dam Association provides the following definitions to calculate the freeboard (CDA 2013):

- Normal freeboard is the difference in elevation between the dam crest and the maximum operating water level of the facility. The normal freeboard is required to protect the structure from overtopping by 95% of waves caused by wind with an annual exceedance probability of 1:1,000-year event with the reservoir at maximum normal elevation.
- Minimum freeboard is the difference in elevation between the dam crest and the maximum water level that would result from the peak design inflow. The minimum freeboard is required to protect the structure from overtopping by 95% of waves caused by the most critical wind when the reservoir is at its maximum level during the inflow design flood (IDF). The wind for the significant consequence dam has an annual exceedance probability of a 1:10 year event.

The freeboard calculations follow the procedures and equations discussed in CDA (2013, 2019). Wind speeds, pond depth, and dam slope geometry were considered to determine the greatest wave uprush value for the normal and minimum freeboard scenarios.

Hourly wind speed and direction data for the study site are only available from 1997 to 2003, and daily wind speed data are available from 2019 to 2021. Thus, hourly data from the Environment and Climate Change Canada Williams Lake A climate station from 1961 through 2023 (ECCC 2023) were used as the basis for the frequency analysis to estimate extreme hourly wind speed for a range of annual exceedance probabilities. The results are provided in Table 5.6-1.

Table 5.6-1: Hourly Maximum Wind Speed at the Williams Lake A Station

Annual Exceedance Probability (years)	Maximum Hourly Wind Speed (m/s)
10	26.3
1000	32.1

m/s = metre per second.

Wave run-up was calculated using the random wave run-up height on gentle slope method by Mase (1989). A contingency of 0.3 m was applied to account for uncertainty due to settlement, crest irregularities, and construction tolerances for crest and spillway invert elevation (ANCOLD 2012). Table 5.6-2 provides the results of the normal and minimum freeboard calculations and 0.7 m is recommended for the minimum freeboard when passing the IDF through the spillway.

Table 5.6-2: Tailings Storage Facility Required Freeboard Results

Description	Unit	Minimum	Normal
Design wind speed	m/s	26 (1:10-year)	32 (1:1,000-year)
TSF Dam crest elevation	m	974	974
Wave height	m	0.76	0.97
Wind setup	m	0.08	0.11
Wave run-up [(a)]	m	0.31	0.39
Wave uprush (setup and run-up)	m	0.4	0.5
Contingency	m	0.3	0.3
Freeboard (wave uprush plus contingency)	m	0.7	0.8

(a) Calculated using the method by Masse (1989).

m/s = metre per second; m = metre.

5.6.2.2 Tailings Storage Facility Hydrologic and Hydraulic Modelling

The IDF for the TSF was selected as the probable maximum flood (PMF). The PMF was estimated using the 72-hour probable maximum precipitation (PMP) event plus snowmelt (snowmelt calculated using the mean Aril temperature and the PMP rainfall). Rainfall and snowmelt depths used to estimate the inflows to the TSF for the IDF event are presented in .

Duration	Mean April Temperature[(a)] (°C)	Depth[(b)] (mm)		
		PMP Rainfall	Total Snowmelt	Total Rainfall Plus Snowmelt
24-hour	3.7	224[(a)]	23	247
48-hour		278	38	316
72-hour		339[(a)]	54	393

(a) Source: WSP 2022.

(b) Values rounded to the nearest millimetre.

PMP = probable maximum precipitation; °C = degree Celsius; mm = millimetre.

5.6.3 Geochemical Attenuation Processes

This section is not required as part of the joint application per the information requirements table.

5.6.4 Water Treatment

Information and discussion on the anticipated changes to water quantity and quality as informed by the SWWBM and SWWQM, and how these predictions relate to the water treatment effectiveness and capacities are provided in Sections 4.3 (SWWBM), 4.4 (SWWQM), 4.7.1 (Treatment Design Bases), and 4.7.2 (Treatment Technology Update) of the WMP (Appendix 9-4A).

5.6.4.1 Description

A description of the existing water treatment system is provided in Section 4.1 and 4.7.1 of the WMP (Appendix 9-4A).

The interim TSF raise to 974 m will use the existing water treatment structures.

5.6.4.2 Location

The location of the existing water treatment system is provided in Figure 3 – Mine Site Layout of the WMP (Appendix 9-4A).

The interim TSF raise to 974 m will use the existing water treatment structures.

5.6.4.3 Detailed Design

A detailed design report for the TSF interim raise to elevation 974 m is included in Appendix 1-3.

5.6.4.4 Treatment Effectiveness

Information and discussions on the anticipated changes to water quantity and quality as informed by the Surface Water Balance and Surface Water Quality Models, and how these predictions relate to the water treatment effectiveness and capacities are provided Sections 4.3 (SWWBM), 4.4 (SWWQM), 4.7.1 (Treatment Design Bases), and 4.7.2 (Treatment Technology Update) of the WMP (Appendix 9-4A).

5.6.4.5 Performance Risks

Refer to Section 7.12 in Appendix 1-3 for the geotechnical risk associated with the TSF interim raise to 974 m.

5.6.4.6 Influent and Effluent Water Quality

Predictions for changes to WTP influent and effluent volume and quality resulting from the Springer Expansion are provided in Section 4.7.1 and 4.7.2 of the WMP (Appendix 9-4A).

5.6.4.7 Waste and By-Products

Only one existing treatment plant provides contact water treatment for the Mine site and this plant is expected to continue operating for the remainder of the proposed life-of-mine period and potentially into closure. One waste stream is produced from the treatment plant: settled solids sludge removed from the contact water during the ballasted settling within the plant. This waste stream is currently pumped from the plant to the TSF (under current permit), and this is proposed to continue for the remaining Mine operating period.

5.6.4.8 Maintenance

The TSF interim raise to 974 m will not impact maintenance at the TSF.

5.6.4.9 Emergency Response Plans

The TSF interim raise to 974 m will not impact emergency response procedures at the TSF.

5.6.4.10 Monitoring Plans

The CEMP (Appendix 7-1) is a unique and integrated monitoring plan that has been developed to capture a number of independent and interdependent monitoring programs, including site monitoring, water discharge, MDMER requirements, and TSF embankment breach response and remediation. Monitoring programs are normally developed by requirements of sector-specific regulations (e.g., MDMER of the federal *Fisheries Act*) or by conditions in a permit with a specific monitoring plan that ties together permit-required and MDMER-required monitoring. As there is no BC ENV Technical Guidance document for this type of plan, the CEMP has been developed through an extensive consultative process that encompasses a number of permitting and other regulatory processes. Through these efforts, it has been suggested by various parties that all of the monitoring programs (e.g., water discharge monitoring, MDMER, TSF embankment breach response, etc.) be combined into one overarching program that takes advantage of the broader data set.

5.6.4.11 Schedule

This section provides a description of the forecasted future mining phases associated with the Springer Expansion LOM Plan:

- **Future operational phase:** The Mine has resumed operation since June 2022 under the current EMA Permit 11678. The future operational phase is assumed for the period from 2 May 2023 through 31 March 2031, in line with the Springer Expansion LOM Plan. Future operations are anticipated to include the following:
  - Full mining and milling activities will resume, including deepening of the Cariboo and Springer pits (Phases 5, 6, C2, WX).
  - Tailings will be deposited into the TSF until March 2031 (subject to approvals for dam raises in the interim to 974 m and ultimately to 987 m).
- **Closure phase:** will begin when mining is finished and will include closure and reclamation activities as identified in the RCP (Appendix 4-1A; MPMC 2022) over the period of 1 April 2031 through 31 March 2041.

- **Post-Closure phase:** will begin when the closure period is finished and will continue indefinitely. For the purposes of modelling and this WMP, post-closure has been assumed over the period of 1 April 2041 through 31 March 2131 (100 years including the closure phase). Pit lakes will develop in the combined Springer-Cariboo Pit and Wight Pit.

It should again be noted that these mine phase dates are assumed for the general purpose of modelling and that this mine life may change as a result of metal prices, new exploration, care and maintenance periods, revisions to the mine plan, and other factors that are common to mining operations.

As the closure phase ends and the post-closure phase begins, it is assumed that some catchments will produce non-contact water as areas are successfully remediated, and some sump pumping systems are assumed to be decommissioned to allow overflow from sumps and or pits directly into the environment rather than being pumped into the contact-water system for treatment. More details regarding the closure and post-closure assumptions regarding operating or decommissioned water management components within the mine facilities may be found in the Water Balance Model Report (Appendix A of the WMP [Appendix 9-4A]).

5.6.4.12 Cost Estimate

The annual contract water capacity within the water treatment plan is not expected to change with the TSF interim raise to 974 m; therefore, a cost estimate is not applicable.

5.7 Domestic Water/Sewage Treatment

This section is not required as part of the joint application per the information requirements table.

5.8 Effluent Discharge

The mine discharges two types of contact water/effluent, namely point source and non-point source discharges. Point source discharges consist of effluent discharged from the water treatment plan via pipeline to Quesnel Lake. Details on proposed mitigation, including WTP capacity, performance, and adequacy in mitigating the effluent discharge are provided in Section 4.71 and 4.7.2 of the WMP (Appendix 9-4A).

The non-point source effluent consists of discharge to ground from the various mine facilities, including pits, waste rock dumps and the TSF. The non-point source discharge to ground is further divided into 1) recoverable seepage (i.e., seepage ponds, collection ditches and sumps) and 2) non-recoverable seepage, which is any seepage that bypasses the collection systems and migrates to the downstream environment. Recoverable seepage is seepage that makes it into the mine contact water system, is captured within the Mine's water management components and is treated at the WTP and discharged to Quesnel Lake. Non-recoverable seepage is evaluated through numerous monitoring wells completed throughout the Site. These monitoring wells

allow for the collection of groundwater quality throughout the year and an evaluation of the groundwater quality against applicable provincial standards. Information regarding groundwater quality is reported on annually within the CEMP report. WSP/Golder (2023) provides detailed information regarding groundwater quality around the Site, with sections divided into monitoring wells in the east portion of the mine, the west portion of the mine and the TSF.

5.9 Initial Dilution Zone

A plume dispersion model was developed by Golder for the near-field (i.e., in the vicinity of the IDZ), and a hydrodynamic model of Quesnel Lake has been developed and calibrated by Tetra Tech EBA to predict effluent transfer throughout the West Basin of Quesnel Lake and to evaluate the potential for build up (Golder 2016a). Monitoring at the near-field station, along with monitoring at other Quesnel Lake receiving environment stations, are used to verify the near-field and lake-wide hydrodynamic models. The near-field and the hydrodynamic models, as described in the LTWMP, serve as the basis for the Trigger Response Plan incorporated in the ADP (MPMC 2018).

Since the discharge to Quesnel Lake was originally authorized, BC ENV published guidance on use of initial dilution zones (BC ENV 2019). The guidance provides considerations for IDZs and the siting of a discharge. Table 5.9-1 provides an evaluation of the existing IDZ under Permit 11678 against those considerations. The analysis provided, together with the absence of change in discharge volume or quality limits, shows that the previously established IDZ remains appropriate for discharge.

Table 5.9-1: Evaluation of Quesnel Lake IDZ against Technical Guidance 11

Considerations for Use of an IDZ	Evaluation of Quesnel Lake IDZ
An IDZ should be as small as possible to minimize the extent of the receiving environment potentially exposed to chronic toxicity levels[1]	The size of the IDZ is based on the common dimensions of an IDZ (a radius of 100 m from the outfall terminus) as is commonly used and represents a very small portion of the surface area of the West Arm of Quesnel Lake. BC ENV guidance (2019) states that the IDZ should be less than 5% of the surface area of a lake. The surface area of the West Arm of Quesnel Lake is approximately 90 km^2. An IDZ with a radius of 100 m has a surface area of approximately 31,000 m^2, which is 0.03% of 90 km^2
An IDZ should not adversely affect sensitive aquatic habitats. These include, but are not limited to: ▪ Spawning, hatching, or rearing areas for fish, overwintering habitats for fish or migratory waterfowl, ecosystems ranked as at risk as per the BC Conservation Data Centre and ecosystems of regional, provincial or national importance (e.g., unique to the region, province); and, ▪ Aquaculture and marine protected areas;	The discharge location is at depth, on the order of minus 50 m depth (the diffusers are at staggered depths). There is spawning habitat available in lower Hazeltine Creek and Sockeye Salmon were observed spawning there during fall of 2022. There may also be some shore spawning by Kokanee in the vicinity of Hazeltine Creek. However, as noted, the diffusers are located at depth to optimize dispersion and separation from sensitive habitats.

Table 5.9-1: Evaluation of Quesnel Lake IDZ against Technical Guidance 11

Considerations for Use of an IDZ	Evaluation of Quesnel Lake IDZ
An IDZ should maintain adequate zones of passage for migrating fish that do not deter the fish from passing through, do not affect their sense of orientation, and do not pose health risks to migrating species	There are adequate zones of passage and spawning salmon are arriving in spawning streams unimpeded by the IDZ.
▪ An IDZ should not result in an adverse effect at the edge of the IDZ on designated water uses in the area: ▪ Designated uses include aquatic life, wildlife, agriculture (e.g., livestock watering and irrigation), and drinking water and recreation. ▪ An IDZ should not be sited near drinking water intakes or food harvesting areas (e.g., shellfish beds or Indigenous Peoples traditional harvesting locations);	Water quality guidelines for designated uses are met at the edge of the IDZ (see Section 2.7.1).
An IDZ should consider setbacks from sensitive areas	There are no identified sensitive areas such as Wildlife Management Areas near the IDZ. The outfall terminus and IDZ is removed from spawning or migration pathways.
An IDZ should avoid highly-frequented recreational water use areas (e.g., public beach)	The IDZ does not overlap with recreational use areas. The nearest recreation area is the Raft Creek campsite, which is located approximately 1 km away.
At the edge of the IDZ, water quality should not result in short-term or long-term effects to aquatic life	The water quality at the edge of the IDZ meets WQG (short term and 30-d average) which are protective against short-term or long-term effects to aquatic life.
IDZs for adjacent authorized effluent discharges should not overlap with each other	There are no nearby authorized effluent discharges.
The effluent plume within the IDZ should not contact the shoreline of a water body in any manner that would prevent effective mixing and/or result in accumulation of Constituents of Potential Concern in the sediments	The plume does not contact the shoreline.
Diffusers used to discharge effluent into an IDZ should be designed to maximize mixing effectiveness	The 4-port diffuser configuration is the result of plume dispersion and dilution modeling including both nearfield and far-field modeling with 10 year forecasting (Golder 2016a). The diffuser depth also considers the presence of a thermocline, when it exists.

1) The surface area of the West Arm of Quesnel Lake is approximately 90 square kilometers. An IDZ with a radius of 100m has a surface area of approximately 31,000 m2, which is 0.03% of 90 square kilometers.

Quesnel Lake Near-Field Model

To predict near field behaviour of the discharge plume from the WTP, concentrations at the edge of the 100 m IDZ were estimated using Cornell Mixing Zone Expert System (CORMIX; Doneker 2007). This model was used to develop an outfall design that maximizes dispersion at the IDZ under a variety of seasonal and wind-driven current conditions. CORMIX provides predictions within the near-field (i.e., at the scale of metres to hundreds of metres, including the edge of the IDZ). A number of individual scenarios were simulated within CORMIX to estimate the dilution factor under a range of expected conditions. Conditions that were varied include discharge rate, ambient water current, temperature, and thermocline depth.

Basin-wide increases in constituent concentrations, and corresponding decreases in dilution beyond the IDZ, as a well as “re-dosing” with the IDZ, are not represented by the CORMIX model. Therefore, a far field model was also used to simulate these processes.

The objective of water quality modelling in Quesnel at the boundary of the IDZ is to verify that the discharge of treated effluent is not causing exceedances of the applicable ambient BC WQGs at the edge of the IDZ, as required by the permit, and to verify the discharge model described in the ADP.

The above assessment did not identify any Constituents of Potential Concern and showed that pollution (as per the EMA definition) is unlikely to occur as a result of the proposed Quesnel Lake discharge. Specifically, adverse effects on aquatic life and impairment of other receiving environment uses identified for the West Basin of Quesnel Lake are not expected based on predicted concentrations at the edge of the IDZ in Quesnel Lake. The treated whole effluent at the point of discharge is not expected to be acutely lethal to aquatic life. Following dilution and mixing, conditions within the IDZ would likewise not be expected to be toxic to aquatic life. Chronic toxicity is not expected beyond the IDZ boundary. Based on this assessment, no additional parameters are identified for assessment or regulation in the proposed permit amendment. Instead monitoring presented in the CEMP is followed to verify predictions at the end-of-pipe and at the IDZ in Quesnel Lake.

Verification of this model has occurred in 2018, 2019, 2020, 2021, and 2022 (Appendix 5-9). This is done by calculating near-field dilution using measured water chemistry data at “end-of-pipe”, in Quesnel Lake background, and at the IDZ. While this method can lead to large variations in calculated dilution factor on a parameter-by-parameter basis, it is the only validation method available that does not entail adding a chemical tracer to the effluent. Adding a tracer, especially one that might introduce colour to the lake, was not considered for these studies because local stakeholders have expressed a strong desire to avoid adding chemicals to Quesnel Lake.

The 2016 near-field model predicted that the minimum dilution factor at the boundary of the IDZ would range from approximately 40 to well above 100. The calculated dilution factors for those years where verification data are consistent with these predictions. Further, the data presented show that the effluent mixing in Quesnel Lake tends to be higher than predicted, indicating that the results of the 2016 model may be conservative.

Based on the results of this verification process of the 2016 near-field modelling that predicted a dilution rate at the edge of the IDZ of approximately 40 to well above 100, no changes to the model are required to support the extension of the discharge to March 2031. Annual verification will continue to occur to support this determination.

Quesnel Lake Far-Field Model

Far-field transport within Quesnel Lake was modeled using H3D, a proprietary three-dimensional hydrodynamic model maintained by Tetra Tech. The model was derived from GF8 (Doneker 2007) developed for Fisheries and Oceans Canada. It simulated temporally and spatially varying conditions throughout the lake based on external drivers such that inflows and atmospheric processes. The model has been calibrated and verified based on historical and recent conditions in Quesnel Lake (BC MoE 2013). Tetra Tech used the United States Environmental Protection Agency Visual Plumes UM3 model, embedded in H3D, to evaluate the behaviours of the outfall plume in Quesnel Lake. UM3 is a near-field numerical model for outfall discharge into the marine and freshwater environments. Its near-field results were consistent with those produced by CORMIX near-field modelling. The salient difference between the long-term three-dimensional approach (H3D-UM3) and the near-field approach (CORMIX) is the possibility of building up a background concentration of effluent in the three-dimensional model of the lake, which accounts for periods of reduced diffuser effectiveness regardless of near-field hydraulic performance.

The H3D model was used to simulate far-field transport over 10 years of varying meteorological conditions to evaluate potential accumulation of effluent in the West Basin of Quesnel Lake and transport to the Quesnel River. This model dynamically simulates circulation and vertical stratification over the modelled time frame. The spatial discretization of the model setup (grid cells approximately 100 m in width near discharge location) limits the model's ability to simulate near-filed conditions, which was instead modelled using CORMIX. However, it has been shown to accurately reproduce Quesnel Lake hydrodynamic conditions at the far-field points of interest (BC MoE 2013). The model setup, assumptions and results of the discharge modelling are detailed in Appendix 5-10.

The dilution ratio at any point in time in the far-field is predicted to remain above the level predicted at the IDZ (40:1). Therefore, the concentrations due to discharge to Quesnel Lake are expected to remain below the predicted concentrations at the IDZ and below levels assessed throughout Quesnel Lake and throughout the operations phase. As shown in Appendix 5-10, concentrations in the far-field of Quesnel Lake approach a quasi-steady state condition after approximately two years, so an extension of the period of discharge (i.e., if the mine life is extended beyond the approved four years) would not significantly change the results of this assessment, provided quantity and quality limits are not increased.

To verify the far-field modelling, monitoring to confirm the attainment of BC WQGs at the IDZ occurs. This monitoring has occurred since discharge began in 2015, and has validated the models applied in 2015, insofar as 1) BC WQGs have been consistently met, and 2) dilution has consistently exceeded the predicted dilution factor.

The monitoring routine includes routine (e.g., monthly) monitoring of limnological profiles and water chemistry at the edge of the IDZ in Quesnel Lake to confirm that BC WQGs are met at the edge of the IDZ. Far-field monitoring is conducted at locations eastward and westward of the diffuser outfall to monitor for potential detection of effluent. Continued monitoring of water quality parameters used in the derivation of effluent treatment targets is recommended to support the potential refinement of targets for the receiving environment.

Monitoring of the far-field receiving environment in Quesnel Lake in the West Basin will be carried out downstream and upstream (for reference) of the mouth of Hazeltine Creek for the verification of the discharge model as described in the ADP.

5.10 References

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6 ENVIRONMENTAL EFFECTS PREDICTIONS AND ASSESSMENT

6.1 Aquatic Resources

As discussed elsewhere in this document, the purpose of the application is to support the approval of the continued discharge of existing treated effluent from the mine through the Life of Mine. No changes to the permitted water quality, quantity, or monitoring requirements are being requested and thus an assessment of effects is not required. Rather, the following section provides an overview of surface water quantity and quality that has been provided in previous permitting documents.

6.1.1 Surface Water Quantity

As discussed in Section 5.3 and Section 5.4, respectively, the SWWBM and SWWQM were developed as part of the WMP (Appendix 9-4A) and describe proposed water management quantities and qualities for operations, closure, and post-closure Mine Phases. The SWWBM has been calibrated on an annual basis (refer to Golder [2021] for 2020 annual calibration).

The SWWBM update is intended to reflect the site internal water transfer capacities and mine plan. The mine has a positive water balance, with discharge required during mine operations to prevent year-to-year accumulation of water. Currently, the only permitted discharge of treated water occurs through the existing WTP and the Quesnel Lake pipe and diffusers. The site treatment capacity is approximately 0.31 m^3/s. The WTP discharge pipeline to Quesnel Lake has a design capacity of 0.6 m^3/s, which equivalent to the permitted maximum daily instantaneous rate. The existing WTP is considered Best Achievable Technology (BC ENV 2015),.

It is noted that temporary water storage may be required during freshet or during large storm events throughout the course of permitted operations. This is consistent with the water management strategy outlined in the TAR (WSP 2022) and the quantitative performance objective requirements for the TSF (Golder 2020).

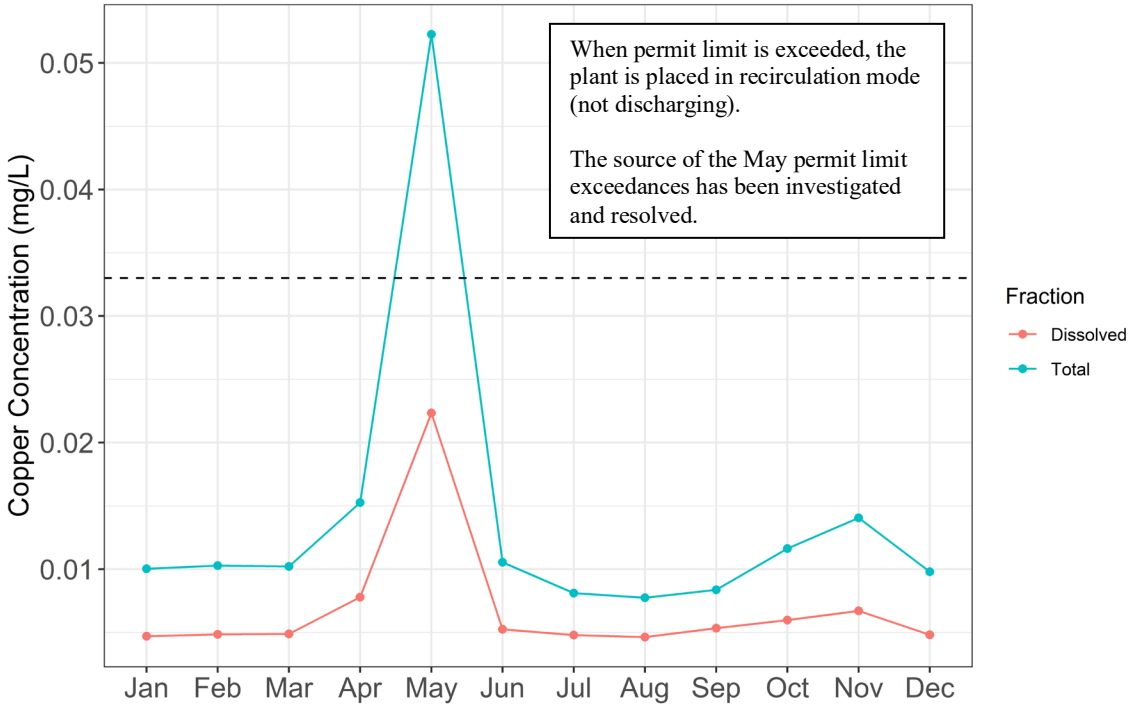
6.1.2 Surface Water Quality

To predict the potential influence of treated mine influenced water on the water quality of Quesnel Lake near field and far field dilution characteristics of the discharge were developed as part of the LTWMP (Golder 2016). Effluent quality was not predicted for the Project phases; however, there are no proposed changes to discharge volumes or permit limits for water quality parameters. As a result, existing modelling and field verification of effluent quality remain valid (WSP 2023). Existing effluent quality from 2015 to 2023 is summarized below.

Effluent Quality

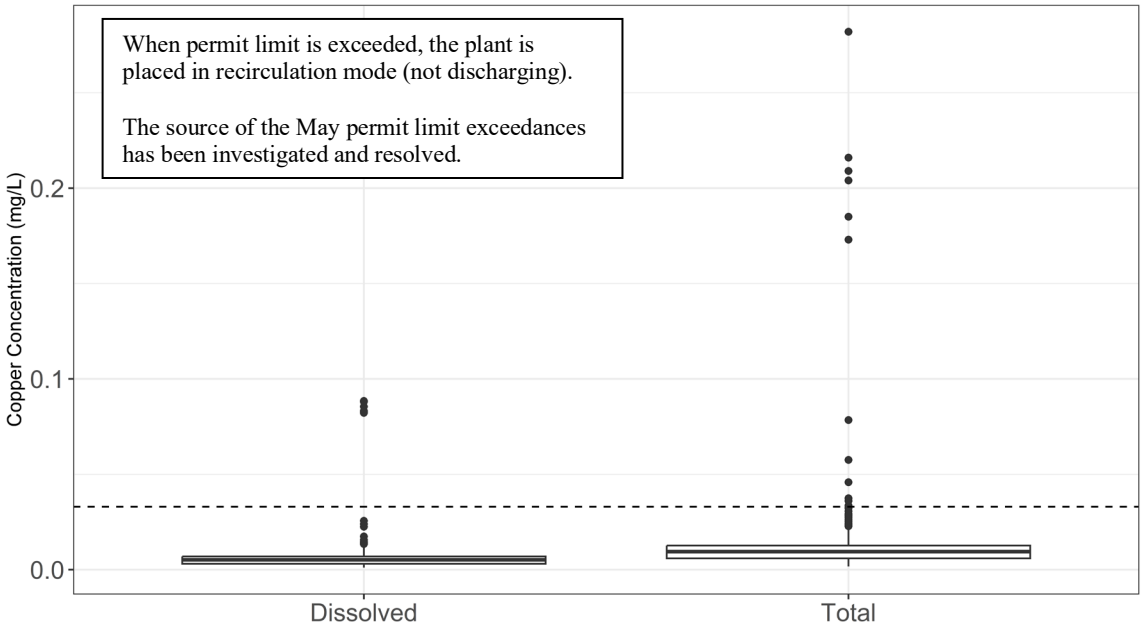
Existing effluent chemistry data were screened against permit limits (Table 6.1-1, Appendix 6-1), and exceedances are discussed in below. Boxplots and monthly average dot plots were created for parameters of interest (copper and selenium) to visualize temporal and spatial trends in the data.

The monthly average total and dissolved copper concentrations in effluent at HAD-3 for 2015 to 2021 were plotted to display temporal trends in copper concentration (Figure 6.1-1). A notably higher average copper concentration was observed in May for both total and dissolved copper. In 2018, an investigation of this trend determined that the cause was two seeps from the North East Zone (NEZ) waste rock pile. To mitigate this source, the seep water is now collected in a sump and pumped to the mill. Following this change MPMC has not seen elevated copper concentrations in May (as noted in Table 6.1-1, the May 2021 exceedance was attributed to a laboratory error). Further to this, continued assessment and optimization of the WTP (as per Section 2.9 of PE-11678 and summarized in the Annual Environmental Report), have resulted a further reduction in copper loading to Hazeltine Creek during freshet. Per the boxplot (Figure 6.1-2), lower variability in copper concentrations in the effluent suggests the WTP can effectively stabilize copper concentrations within the effluent.



Note: The horizontal dished line represents the permit limit for copper (0.033 mg/L). mg/L = milligrams per litre.

Figure 6.1-1: Monthly Average Copper Concentration from 2015 to 2023 at Stations Representing Water Treatment Plant Effluent Quality (HAD-3)

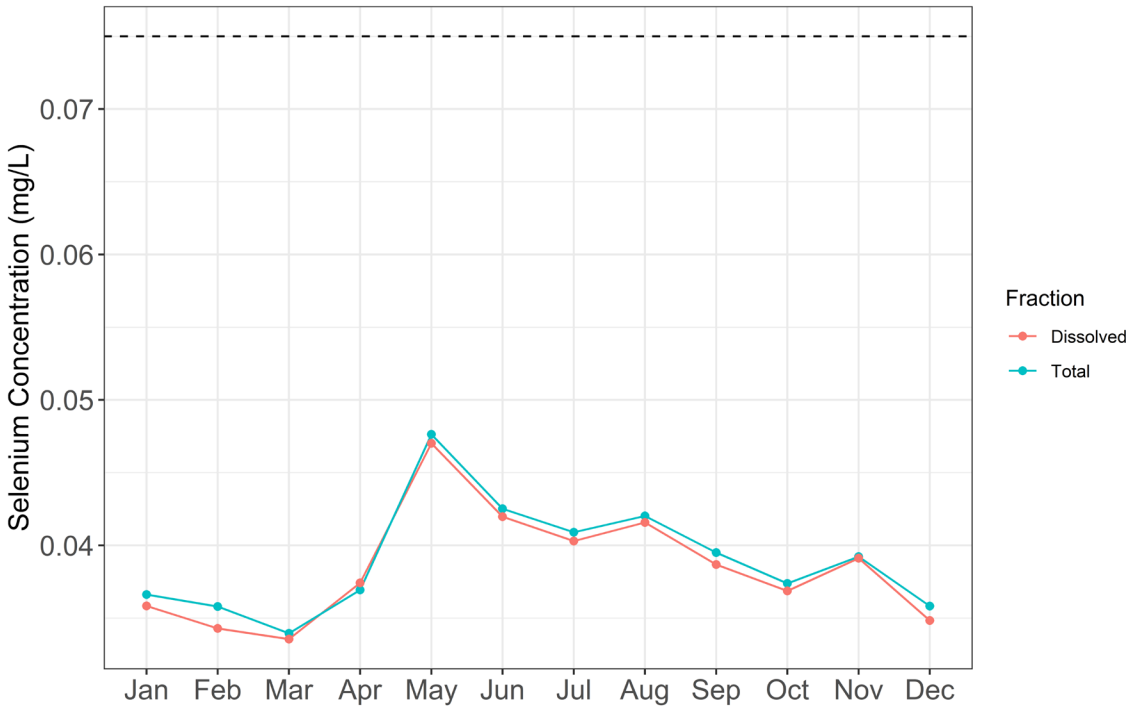


Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution. The horizontal dashed line represents the permit limit for copper (0.033 mg/L).

mg/L = milligrams per litre.

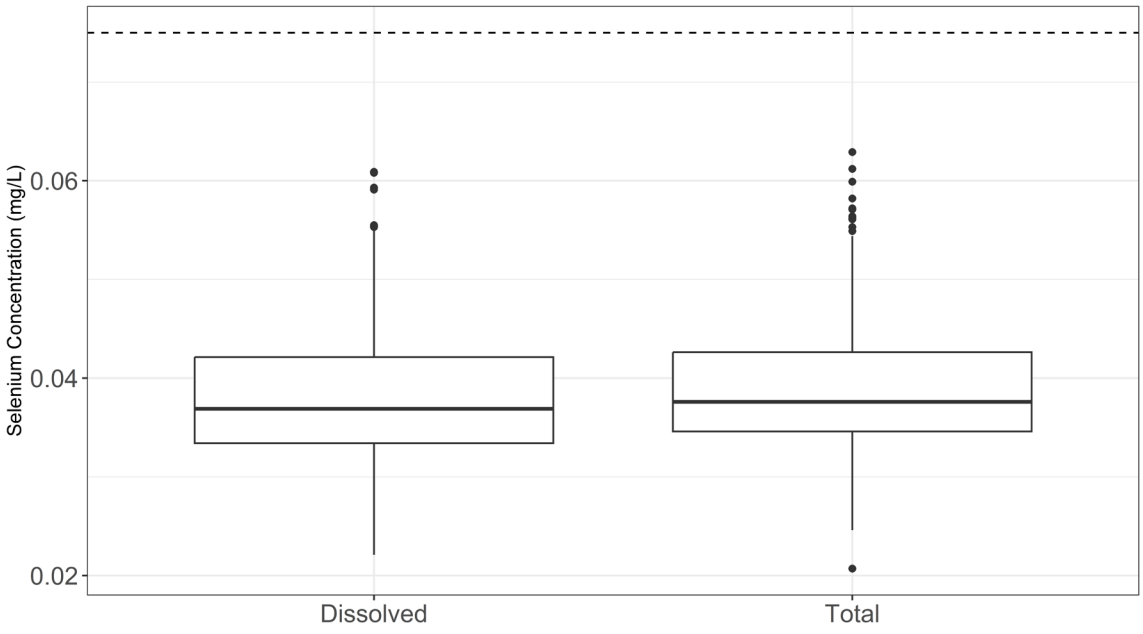
Figure 6.1-2: Boxplot of Copper Concentrations from 2015 to 2023 at Stations Representing the Water Treatment Plant Effluent Quality (HAD-3)

The monthly average total and dissolved selenium concentrations were plotted for the WTP effluent (HAD-3) for samples collected from 2015 to 2021 to display temporal trends in selenium concentrations (Figure 6.1-3). Fluctuations of selenium concentrations are seen in the effluent, with an increase in average selenium concentration in May. There is little variation between the interquartile ranges for total and dissolved selenium concentrations in the WTP effluent (Figure 6.1-4).



Note: The horizontal dashed line represents the permit limit for selenium (0.075 mg/L). mg/L = milligrams per litre.

Figure 6.1-3*:* **Monthly Average Selenium Concentration from 2015 to 2023 at Stations Representing Water Treatment Plant Effluent Quality (HAD-3)**



Note: Boxes enclose the interquartile range (Q1 to Q3) of the data, the horizontal line within the box indicates the median value, and the vertical lines show the range of values outside the interquartile range but fall within normal distribution. The horizontal dashed line represents the permit limit for selenium (0.075 mg/L).

mg/L = milligrams per litre.

Figure 6.1-4*:* **Boxplot of Selenium Concentrations from 2015 to 2023 at Stations Representing the Water Treatment Plant Effluent Quality (HAD-3)**

Effluent Permit Limit Exceedances

From 2015 to 2023, samples from HAD-3 occasionally had concentrations that were above the permit limits. Each time, MPMC notified the required parties, undertook an investigation, and implemented actions as specified in the Trigger Response Plan. For example, when copper exceeds the limit set in PE-11678, the WTP is set to recirculation mode and discharge is suspended. Each event in which a permit limit was exceeded was also investigated, and a summary report was provided to BC ENV. Table 6.1-1 outlines each exceedance and the outcome of the investigations.

As a result of the investigations, actions have been taken to improve the effectiveness of the WTP, including projects such as redirecting the NEZ seeps discussed in Table 6.1-1. This is supported by continued efforts to assess and optimize the performance of the WTP (as per Section 2.9 of PE-11678 and summarized in the Annual Environmental Report), such as:

- adjusting site works to reduce TSS, and associated metals, in the WTP influent
- automation and recording capabilities upgrades
- testing with trimercaptotriazine to enhance copper removal

This work has resulted in a reduced frequency of permit exceedances and resulting Trigger-Response Plan actions at HAD-3, notably during freshet.

Table 6.1-1*:* Summary of Permit Limit Exceedances at HAD-3

Date	Parameter	Expected Cause and Actions Taken
January 16, 2016	TSS	Each time, effluent discharge was ceased upon identification of the TSS exceedances and the Director was notified. These permit limit exceedances were related to WTP commissioning and low suspended solids in the influent, which hindered floc formation in the WTP. Discharge then resumed after subsequent samples confirmed that effluent quality met the permit requirements. The permit limit was amended on 19 September 2016 to reflect the MMER limits allowing a maximum discharge of 30 mg/L TSS, and a 15 mg/L monthly average limit for TSS was introduced.
February 9, 2016	TSS	
May 24, 2016	TSS	
January 12, 2016	Total zinc	This exceedance was an isolated incident and occurred prior to the approval of a temporary permit limit for total zinc.
April 4, 11, 13, and 1 9, 2016	Total copper	The observed increase in the effluent copper concentration was likely related to spring runoff flows that conveyed higher TSS loads and associated copper to the WTP. Effluent discharge was ceased upon identification of the copper exceedances, and the Director was notified. Discharge was only resumed after subsequent samples confirmed that effluent quality met the requirements outlined in the permit.

Table 6.1-1*:* Summary of Permit Limit Exceedances at HAD-3

Date	Parameter	Expected Cause and Actions Taken
June 27, 2016	Total copper	Was not attributed to any environmental conditions or remedial works, and samples taken on previous and subsequent sampling events (23 and 29 June 2016) were below the permit limit. Effluent discharge was ceased upon identification of the copper exceedances, and the Director was notified. Discharge was only resumed after subsequent samples confirmed that effluent quality met the requirements outlined in the permit.
January 3, 2017	Total zinc	Expected to be due to sample bottle contamination Proper handling procedures reviewed by MPMC field crews to avoid contamination of sampling equipment in the future.
February 20, 2018	Dissolved aluminum	MPMC requested emergency turnaround for the subsequent samples, a recheck of the result, and the WTP was put into recirculation mode. Attributed to sampling error, as other locations sampled the same day also had relatively elevated dissolved aluminum and subsequent samples were below the permit limit.
April 17, 2018	Dissolved aluminum	MPMC notified all required parties and requested emergency turnaround for the subsequent samples and a recheck. All additional samples were below the permit limit and therefore the WTP was not shut down. Due to possible sporadic problems with the WTP system or the mixing reagents and testing and sampling of various dosages were scrutinized.
May 10, 2018	Total copper Dissolved cadmium	MPMC notified all required parties and the WTP was put into recirculation mode. Investigation into the cause indicated that two seeps from the NEZ waste rock pile were elevated in copper and other metals (but the pH remained relatively neutral). Measures were taken to mitigate the influence of the seeps into the WTP feed by constructing a sump at the base of the seeps and pumping the water to the mill.
August 16, 2018	Dissolved aluminum	MPMC notified all required parties and requested emergency turnaround for the subsequent samples and a recheck. The WTP was put into recirculation mode. Expected analysis error and reanalysis of the sample returned a dissolved aluminum concentration below the limit. WTP resumed discharge.
December 27, 2018	Total phosphorus	The WTP was shut down, required parties notified, and a recheck and reanalysis requested. Expected sample mix-up, the actual result was below the permit limit. MPMC notified BC ENV, retracted the total phosphorus exceedance, and the WTP resumed discharging.
June 17, 2019	Total chromium	The WTP was promptly shut down, required parties notified, and recheck and reanalysis requested. Expected laboratory error, confirmed by ALS as a sample mix-up, and the actual result was below the permit limit. MPMC emailed BC ENV, retracting the total chromium exceedance, and the WTP resumed discharging.

Table 6.1-1*:* Summary of Permit Limit Exceedances at HAD-3

Date	Parameter	Expected Cause and Actions Taken
January 21, 2020	Total copper	Sample on 15 January 2020 was within 80% of the permit limit, which initiated a Level 1 Trigger: End-of-Pipe (HAD-3) 80% Early Warning Threshold – Monitoring and Response as per MPMC 2019 ADP. WTP throughput reduced by 20%. Results from the 21 January 2020 sample exceeded permit limit. WTP shut down and the BC ENV notified. On 23 January 2020 water was pumped from the TSF to the Perimeter Embankment Till Borrow Pond to raise the pond level and to create influent water that would be amenable to discharge. The NEZ pipeline was thawed, and the NEZ Sump resumed normal operation pumping water to the Wight Pit. On 27 January 2020 the WTP was run in recirculation mode for ~2.5 hours and samples were taken at E19 (WTP influent) and WTP-RC (equivalent to HAD-3 when in recirculation mode but the sample is taken from the outflow trough in the clarifying tank and not the sample port in the discharge pipe). Sample results below the permit limit and the 80% threshold that would trigger additional sampling. WTP resumed normal operation on 30 January 2020 in accordance with the ADP.
March 3 and 10, 2020	Total copper	On 3 and 10 March 2020, HAD-3 total copper concentrations were within 80% of the EMA Permit 11678 limit; however, concentrations decreased below the 80% threshold and did not exceed the permit limit. This incident was also investigated, and an investigation report submitted to BC ENV.

Table 6.1-1*:* Summary of Permit Limit Exceedances at HAD-3

Date	Parameter	Expected Cause and Actions Taken
April 14, 2020	Total copper	Sample on 7 April 2020 was within 80% of the permit limit, which initiated a Level 1 Trigger: End-of- Pipe (HAD-3) 80% Early Warning Threshold – Monitoring and Response as per the MPMC 2020 ADP. WTP throughput was reduced by 20%. Results from the sample collected on 14 April 2020 yielded a concentration exceeding the permit limit. Site management and the Director were notified of the Level 2 Trigger immediately and the Level 2 Trigger: End-of-Pipe (HAD-3) Permit Exceedance – Monitoring and Response procedure was initiated as per the MPMC 2020 ADP. WTP remained in recirculation mode and an additional sample was collected from WTP-RC and E19 on 20 April 2020 and priority service was requested from the lab. The results from the sample indicated a total copper concentration above the permit limit and the WTP was promptly shut down. The WTP was put into recirculation mode from 25 April 2020 to 9 May 2020 for Golder to complete a field trial of trimercaptotriazine usage to reduce copper concentrations within the discharged water. After the trial, the WTP was shut down for the remainder of freshet. The WTP was started in recirculation mode on 27 May 2020 and samples were collected from WTP-RC and E19 and priority service was requested from the lab. The WTP was shut down again following sample collection on 27 May 2020. The results from the sample taken on 27 May 2020 was below the permit limit and as a result, the WTP was restarted and resumed normal operation on 1 June 2020. MPMC Environmental staff collected samples from HAD-3, E19 and QUL-58 (the Quesnel Lake IDZ) on 2 June 2020 and requested priority service from the lab. The results from the samples collected on 2 June 2020 indicated a total copper concentration below the permit limit at HAD-3 and QUL-58 and the WTP continued normal operation.
November 11, 2020	Total copper	Total copper from a 11 November 2020 sample was above the permit limit. This initiated a Level 2 Trigger: End-of- Pipe (HAD-3) Permit Exceedance – Monitoring and Response as per the MPMC 2020 ADP. Site management and the Director were notified immediately and WTP was shut down. The results from the sample collected on 17 November 2020 was within 80% of the permit limit. Site management was notified of the Level 1 Trigger immediately and the Level 1 Trigger: End-of-Pipe (HAD-3) 80% Early Warning Threshold – Monitoring and Response procedure was initiated as per the MPMC 2020 ADP. The WTP was restarted with a 20% reduction in throughput on 24 November, and samples were collected from HAD-3 and E19 later that day with priority service requested from the lab. The results from the sample taken on 24 November 2020 were below the permit limit and 80% early warning threshold. WTP resumed normal operation on 27 November 2020.
May 19, 2021	TSS	This exceedance was attributed to a laboratory error.

Table 6.1-1*:* Summary of Permit Limit Exceedances at HAD-3

Date	Parameter	Expected Cause and Actions Taken
October 27 and November 2, 2021	Total copper	The exceedance event is not believed to have a singular cause, but is likely the result of three known corresponding phenomena, any of which in isolation would not be sufficient to result in an exceedance. These causes are change in water chemistry in the Springer Pit during dewatering, overflow from the TSF booster station, and treatment plant optimization that relied on outdated site water storage chemistry.
May 31 and June 6, 2022	Total copper	NR
June 6, 2022	TSS	NR

Note: NR = not reported at time of submission.

Source: Mount Polley Mining Corporation.

6.2 Terrestrial Resources

6.2.1 Vegetation

Characterization of existing conditions of vegetation resources in the Mine site combined with an understanding of the Springer Pit and TSF interim raise to 974 m activities, and potential changes to the biophysical environment from the proposed expansion, were used to classify and assess the potential effects.

Project-related interactions with vegetation include the following potential effects:

- Loss or alteration of vegetation during Project expansion
- Introduction and proliferation of invasive plants species
- Effects to vegetation communities from fugitive dust
- Effects to vegetation communities from spills of deleterious substances
- Change in area of suitable habitat for at-risk plant species during the Springer Expansion and TSF interim raise to 974 m
- Loss of at-risk plant species during Project expansion

6.2.1.1 Loss or Alterations of Vegetation Communities

The proposed expansion will require the removal of vegetation within the SERDS expansion area. Minimal loss of existing vegetation is expected as a result of the TSF interim raise to 974 m as the TSF area has been previously disturbed.

Introduction and Proliferation of Invasive Plant Species

The Springer Expansion and TSF interim raise to 974 m also have the potential to result in the accidental introduction and/or proliferation of invasive or non-native plant species, particularly those species observed in the area such as bull thistle and yellow salsify. The introduction and proliferation of invasive species can lower the quality of remaining native vegetation by outcompeting native species and reducing plant diversity.

Transportation of equipment and material to the Mine Site from off-site during vegetation clearing, demobilization of equipment post-construction, and disturbance of new areas may result in the introduction of new invasive plant species, or the proliferation of invasive species existing in the area. Plant seeds and parts can be transported in various ways, including via the tracks of machinery, treads of boots, or on clothing. Invasive plants can proliferate from seeds and remanent parts of plants, such as roots stems, on work truck tire treads.

Vehicles, equipment, and clothing can also carry parts and seeds of invasive plants from infested areas of the Mine Site, especially during muddy conditions, depositing them in new locations (BC MFLNRO and ISCBC 2013). Invasive plants may also be introduced to an area through gravels and soils contaminated with seeds and parts of plants (BC MFLNRO and ISCBC 2013). Activities that disturb soil and vegetation, such as clearing/grubbing and road building/widening, can contribute to proliferation of invasive plants as freshly disturbed soils are especially susceptible to the establishment of invasive species (BC MFLNRO and ISCBC 2013).

An Invasive Plant Management Plan (Section 9.9) including a monitoring program will be implemented to reduce the potential for ingress of invasive plants.

Effects to Vegetation Communities from Fugitive Dust

Various construction activities, such as site preparation, vegetation clearing, construction and widening of roads, and transportation of materials could produce dust. Dust may affect the health, growth, and development of affected vegetation, and may shift plant community structure (Prusty et al. 2005). The primary effects of dust are generally confined to the immediate area next to access roads or other disturbance areas (Bignal et al 2004; Everett 1980). Mount Polley Mine controls dust emissions and monitors air quality.

6.2.1.2 Effects to Vegetation Communities from Spills of Deleterious Substances

Accidental spills of deleterious substances, such as hydrocarbons, during the Springer Expansion and TSF interim raise to 974 m may potentially adversely affect vegetation resources through loss of extent. Spills of deleterious substances may require the removal of plants during clean up resulting in loss of vegetation extent. Further, spills may result in effects to vegetation communities via soil contamination. A spill management plan is in place to address avoidance of spills, responses, notification and remediation (Section 9.14).

6.2.1.3 Change in Area of Suitable Habitat for At-Risk Plant Species

Clearing of vegetation for the proposed expansions will result in a decrease in potential habitat for at-risk plant species. In addition, increased sediment input through erosion and sedimentation and fugitive dust as well as releases of deleterious substances into wetland habitat adjacent to the Project Area may decrease the suitability for at-risk plant species. As a rare plant survey was not conducted as part of the field reconnaissance the current abundance and distribution of at-risk plant species in the expansion areas are unknown.

6.2.1.4 Loss of At-Risk Plant Species

Clearing of vegetation in the expansion areas could result in the direct removal of at-risk plant species. While the majority of the Mine Site has been previously disturbed and the reconnaissance-level surveys to date have not identified the presence of at-risk plants, their absence cannot be confirmed. The current abundance and distribution of at-risk plant species in vegetated areas proposed to be cleared during the expansions are unknown.

6.2.2 Wildlife

Effects on wildlife resources are expected to be primarily limited to the immediate expansion area, mainly where vegetation and habitat loss occurs. Potential Project-related interactions with wildlife resources include the following general effects:

- Direct loss of potential breeding, foraging, and living habitat due to clearing and grubbing
- Indirect loss of potential breeding, foraging, and living habitat due to:
  - Changes in habitat quality
  - Sensory disturbance (i.e., noise, dust)
- Creation of barriers to movement and habitat fragmentation
- Change in mortality rates due to:
  - Direct mortality from clearing, rock disposal and construction activities
  - Direct loss of egg masses or nests
  - Indirect mortality due to interactions with SERDS extension construction activities

6.2.2.1 Habitat Loss

Direct habitat loss will result from vegetation clearing during the Springer Expansion. Removal of vegetation will result in the loss of habitat, specifically breeding and foraging habitat for some wildlife species. The removal of wildlife trees, understory, slash, and general woody debris present within the proposed expansion area may result in a loss or alteration of:

- Upland habitat for adult western toad

- Living habitat for garter snake
- Nesting and living habitat for some songbirds
- Foraging habitat for various bird and mammals species

Habitat alteration in support of industrial activities (e.g., oil and gas drilling, mining, renewable energy, logging) is one of the main threats to southern mountain caribou populations (COSEWIC 2014). Changes in habitat composition can lead to increased predation rates on caribou because of facilitated predator movement. The Springer Expansion and TSF interim raise to 974 m are expected to result in the direct loss of some southern mountain caribou critical habitat (unmapped range) and habitat restoration and management will likely be required.

6.2.2.2 Disruption to Movement

Disruption to movement patterns may occur during all phases of the Springer Expansion and TSF interim raise to 974 m that may impact terrestrial wildlife, such as amphibians, reptiles, ungulates and medium to large carnivores. While the proposed expansion areas are located within highly fragmented and previously disturbed areas within the Mine Site, expansion activities have the potential to create barriers to movement and impact wildlife movement among habitats that provide different resources needed to satisfy life history requirements (Government of Canada 2014). Western toads are more vulnerable in fragmented habitats when they are required to travel extensively in terrestrial habitats and long distances between breeding, hibernation, and foraging areas (Government of Canada 2020). The proposed expansion areas are enlargements of existing mine footprints into areas that have been previously disturbed and are therefore not expected to create additional habitat fragmentation based on the current proposed design.

6.2.2.3 Sensory Disturbance

Noise and other sensory disturbances to wildlife are anticipated throughout the Mine Site. The proposed expansion areas are within the existing Mine Site footprint, and as such, wildlife using the expansion area are expected to be habituated to an existing level of noise and disturbance. Increased traffic along Beaver Lake Rd associated with the TSF interim raise to 974 m has the potential to deter wildlife from the mineral lick located adjacent to the road.

6.2.2.4 Mortality

Mortality to wildlife has the potential to occur during clearing activities, rock disposal and as a result of increased traffic in and adjacent to the proposed expansion areas. Less mobile wildlife, such as amphibians and garter snakes, are susceptible to vehicle-wildlife collisions, especially when moving to seek mates and breeding habitat, during migration to and from breeding sites and hibernacula, and dispersal of young. Existing access roads to the proposed expansion areas are adjacent to suitable amphibian habitat. Mine Site activities that require ground disturbance

(e.g., clearing and grubbing) during winter months may result in mortality of hibernating amphibians while disturbance to natal ponds during the breeding season could adversely affect amphibian egg masses and tadpoles. Garter snakes have the potential to be harmed through the removal of coarse woody debris, rock piles, and other structures that provide shelter sites.

It is anticipated that the majority of potential adverse effects to terrestrial wildlife can be avoided, reduced, or mitigated through the Best Management Practices described in the Wildlife Management Plan (DWB Consulting Services Ltd. 2021) provided in Section 9.10 of this application.

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7 ENVIRONMENTAL MONITORING

7.1 Environmental Monitoring Program Design

The environmental monitoring program designs for Mount Polley Mine are described in the CEMP and summarized in the following sections. The CEMP is provided in Appendix 7-1. The linkages between the CEMP monitoring programs are illustrated in Figure 7.1-1.

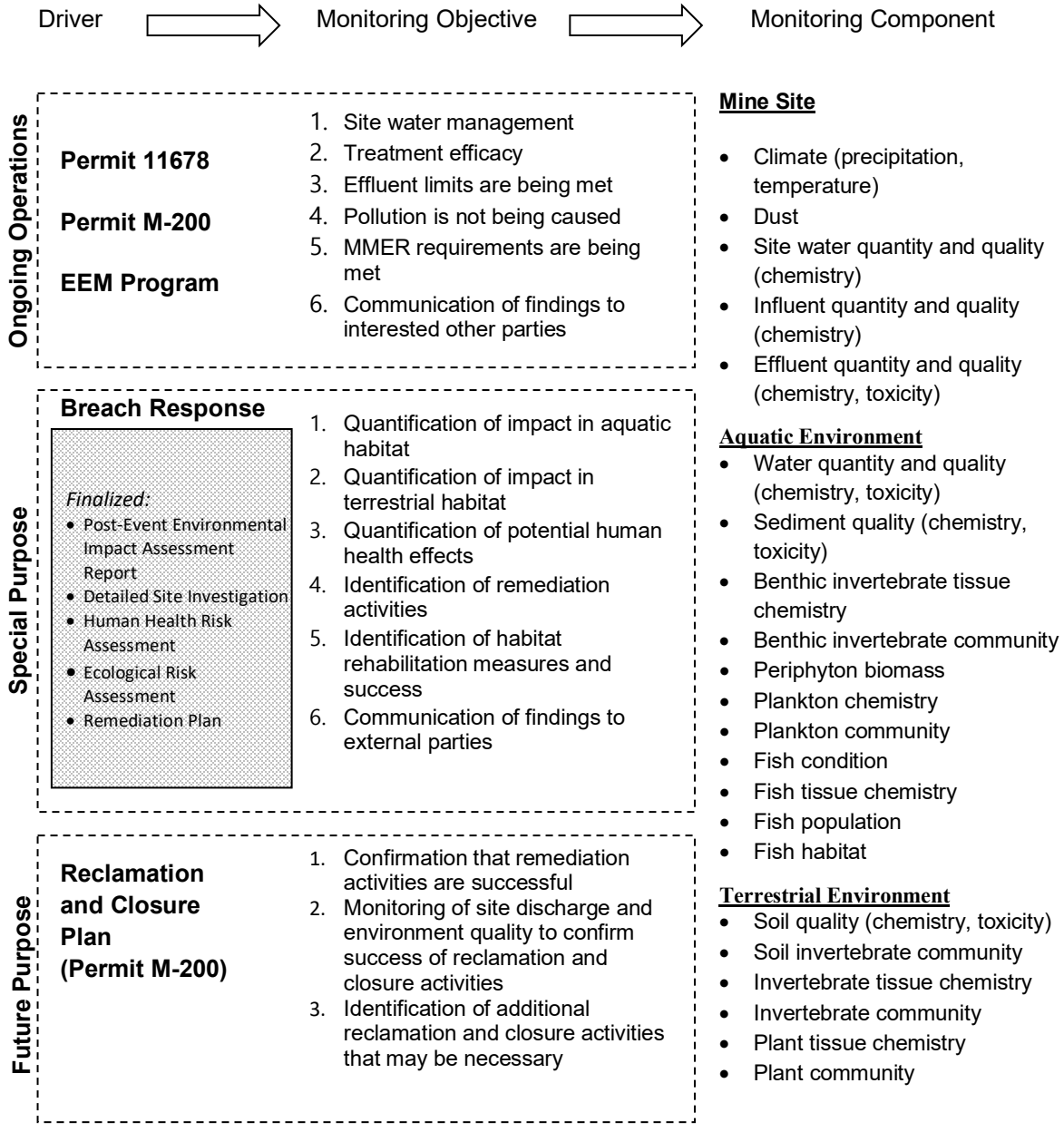

Figure 7.1-1: CEMP (2019) Integration Framework

Monitoring procedures carried out at the Mine Site are consistent with guidance from the BC Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples (2013 or most recent version, herein referred to as the "BC Field Sampling Manual"; BC MoE 2013). As appropriate, monitoring procedures will also be consistent with the Metal Mining Technical Guidance for Environmental Effects Monitoring (EEM) (Environment Canada 2012) and the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MoE 2012). Mount Polley Mine's procedures are also consistent with applicable sections of the British Columbia Environmental Laboratory Manual (BC MoE 2015), such as sample collection and preservation requirements.

7.2 Mine Site Water Monitoring Program

Surface Water

Table 7.2-1 summarizes the parameters analysed for surface water quality. The lake field parameters are measured at each sampling depth and for each limnological profile (excluding Secchi depth, which is taken from the surface of each lake sampling point). Table 7.2-2 provides an overview of the surface water monitoring. The location "Mine Site" refers to the streams and creeks adjacent to the mine site. Further details of monitoring sites, including site access descriptions, access or safety concerns, and a brief rationale for monitoring, is provided in the Site Matrix in Appendix D of the CEMP (Appendix 7-1). Figure 7.2-1 shows monitoring locations of the surface water sampling locations.

Table 7.2-1: Surface Water Chemistry Parameters

Parameter	LOR	Unit
Field Parameters - Lake		
pH	-	pH
Specific conductance	-	µS/cm
Temperature	-	°C
Turbidity	-	NTU
Dissolved oxygen	-	%, mg/L
Secchi depth	-	m
Field Parameters - General		
pH	-	pH
Conductivity	-	µS/cm
Temperature	-	°C
Turbidity	-	NTU
Physical Tests		
Conductivity	2	µS/cm
Hardness (as $CaCO_3$)	0.5	mg/L
pH	0.1	pH
Total Suspended Solids	1	mg/L
Total Dissolved Solids	10	mg/L
Turbidity	0.1	NTU
Anions and Nutrients		
Alkalinity, Total (as $CaCO_3$)	1	mg/L
Ammonia, Total (as N)	0.005	mg/L
Chloride (Cl)	0.5	mg/L
Fluoride (F)	0.02	mg/L
Nitrate and Nitrite (as N)	0.003	mg/L
Nitrate (as N)	0.001	mg/L
Nitrite (as N)	0.005	mg/L
Total Nitrogen	0.03	mg/L
Orthophosphate-Dissolved (as P)	0.001	mg/L
Phosphorus (P)-Total Dissolved	0.002	mg/L
Phosphorus (P)-Total	0.002	mg/L
Sulfate (SO_4)	0.3	mg/L
Organic / Inorganic Carbon		
Dissolved Organic Carbon	0.5	mg/L

Parameter	LOR	Unit
Total and Dissolved Metals		
Aluminum (Al)	0.003	mg/L
Antimony (Sb)	0.0001	mg/L
Arsenic (As)	0.0001	mg/L
Barium (Ba)	0.0001	mg/L
Beryllium (Be)	0.0001	mg/L
Bismuth (Bi)	0.00005	mg/L
Boron (B)	0.01	mg/L
Cadmium (Cd)	0.000005	mg/L
Calcium (Ca)	0.05	mg/L
Chromium (Cr)	0.0005	mg/L
Cobalt (Co)	0.0001	mg/L
Copper (Cu)	0.0005	mg/L
Iron (Fe)	0.03	mg/L
Lead (Pb)	0.00005	mg/L
Lithium (Li)	0.001	mg/L
Magnesium (Mg)	0.1	mg/L
Manganese (Mn)	0.0001	mg/L
Molybdenum (Mo)	0.00005	mg/L
Nickel (Ni)	0.0005	mg/L
Potassium (K)	0.05	mg/L
Selenium (Se)	0.00005	mg/L
Silicon (Si)	0.1	mg/L
Silver (Ag)	0.00001	mg/L
Sodium (Na)	0.05	mg/L
Strontium (Sr)	0.0002	mg/L
Thallium (Tl)	0.00001	mg/L
Tin (Sn)	0.0001	mg/L
Titanium (Ti)	0.01	mg/L
Uranium (U)	0.00001	mg/L
Vanadium (V)	0.0005	mg/L
Zinc (Zn)	0.003	mg/L
EEM Parameters		
Mercury (Hg)-Total	0.000005	mg/L

LOR = Limit of Reporting; EEM = Environmental Effects Monitoring.

Table 7.2-2: Surface Water Monitoring Overview

Location	Station Name	EMS Code	Description	Frequency	Depths	Parameters Measured	Guidelines
Mine Site	W1	E225084	Morehead Creek	Quarterly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W4a	E298551	North Dump Creek below Wight Pit Road	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W5	E208039	Bootjack Creek Above Hazeltine Creek	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W8	E216743	NE Edney Creek Tributary	Quarterly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W8Z	E223292	SW Edney Creek Tributary	Quarterly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W10	E291209	Lower Edney Creek (upstream of breach impact)	Semi-annually[1]	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W12	E216744	6 km Creek at Road	Quarterly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Mine Site	W20	E297070	W20 Creek Tributary to Bootjack Lake	Semi-annually	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL

Table 7.2-2*:* Surface Water Monitoring Overview

Location	Station Name	EMS Code	Description	Frequency	Depths	Parameters Measured	Guidelines
Edney Creek	EDC-01	E303014	Lower Edney Creek (remediated reach)	Semi-annually[1]	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-10	E303010	Upper Hazeltine Creek at Polley Lake outlet	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-13	E304810	End of Reach 1 in Hazeltine Creek	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-14	pending	Middle Hazeltine Creek upstream of the canyon	Monthly[2]	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-05a	E304510	Upper Hazeltine Creek at Gavin Lake FSR Bridge	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-08	E303013	Lower Hazeltine Creek at Ditch Road Bridge	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Hazeltine Creek	HAC-01c	E303953	Lower Hazeltine Creek outflow to Quesnel Lake	Monthly	Surface	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL

Table 7.2-2: Surface Water Monitoring Overview

Location	Station Name	EMS Code	Description	Frequency	Depths	Parameters Measured	Guidelines
Bootjack Lake	B1	E207975	Bootjack Lake deepest area at north end	Semi-annually[3]	Surface (0 m), 1 m above thermocline (AT) and 1 m below thermocline (BT) OR mid-depth if no thermocline (MID), bottom (B)	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
				Monthly[4]Limnological profile	Field parameters - lake	BC WQG - AL	
Bootjack Lake	B2	E215897	Bootjack Lake deepest area at south end	Semi-annually[3]	Surface (0 m), 1 m above thermocline (AT) and 1 m below thermocline (BT) OR mid-depth if no thermocline (MID), bottom (B)	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
				Monthly[4]Limnological profile	Field parameters - lake	BC WQG - AL	
Bootjack Lake	B4	E216744	Bootjack Lake (potential zone of influence from seepage from Springer Pit)	For closure only[5]	For closure only[5]	For closure only[5]	-
Polley Lake	P1	E207974	Polley Lake deepest area at north end	Spring overturn, twice in summer, fall overturn, once under ice[6]	Surface (0 m), 1 m above thermocline (AT) and 1 m below thermocline (BT) OR mid-depth if no thermocline (MID), bottom (B)	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
				Monthly[4]	Limnological profile	Field parameters - lake	BC WQG - AL
Polley Lake	P2	E207975	Polley Lake deepest area at south end	Spring overturn, twice in summer, fall overturn, once under ice[6]	Surface (0 m), 1 m above thermocline (AT) and 1 m below thermocline (BT) OR mid-depth if no thermocline (MID), bottom (B)	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
				Monthly[4]	Limnological profile	Field parameters - lake	BC WQG - AL

Table 7.2-2: Surface Water Monitoring Overview

Location	Station Name	EMS Code	Description	Frequency	Depths	Parameters Measured	Guidelines
Quesnel Lake	QUL-58	E304876	Quesnel Lake discharge IDZ	Four times annually[7, 11, 12]	Limnological profile, If plume detected: middle of plume (MP), 5 m above (AP), 5 m below plume (BP) If plume not detected: surface (S), 1 m above thermocline (AT) and 1 m below thermocline (BT) OR mid-depth if no thermocline (MID), bottom (B)	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals, EEM parameter (total mercury)[8]	BC WQG - AL
Quesnel Lake	QUL-57	E304874	Quesnel Lake IDZ	Four times annually[7, 11, 12]	Limnological profile, sample depths as for QUL-58	Field parameters - lake	BC WQG - AL
Quesnel Lake	QUL-59	E304875	Quesnel Lake IDZ	Four times annually[7, 11, 12]	Limnological profile, sample depths as for QUL-58	Field parameters - lake	BC WQG - AL
Quesnel Lake	QUL-18	E303019	Quesnel Lake far-field, downstream of Hazeltine Creek	Four times annually[7, 11]	Limnological profile, 0 m, 20 m, 50 m, 100 m[9]	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Quesnel Lake	QUL-2a	E303020	Quesnel Lake far-field, upstream of Hazeltine Creek (reference)	Four times annually[7, 11]	Limnological profile, 0 m, 20 m, 40 m, 60 m	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals, EEM parameter (total mercury)[8]	BC WQG - AL
Quesnel Lake	QUL-120a	E303022	Quesnel Lake station east of Cariboo Island for model verification	Semi-annually[7, 11]	Limnological profile, If lake is stratified: 0 m, 40 m, 80 m, 120 m, 140 m If lake is well-mixed: 0 m, 80 m, 190 m	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL

Table 7.2-2*:* Surface Water Monitoring Overview

Location	Station Name	EMS Code	Description	Frequency	Depths	Parameters Measured	Guidelines
Quesnel Lake	QUL-ZOO-1	E306455	Quesnel Lake in centre of West Basin (zooplankton station)	Semi-annually[10, 11]	Limnological profile, surface	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Quesnel Lake	QUL-ZOO-7	E306456	Quesnel Lake near Cariboo Island (reference zooplankton station)	Semi-annually[10, 11]	Limnological profile, surface	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL
Quesnel Lake	QUL-ZOO-8	E306457	Quesnel Lake at Junction (reference zooplankton station)	Semi-annually[10, 11]	Limnological profile, surface	Field parameters - lake, physical tests, anions and nutrients, DOC, total and dissolved metals	BC WQG - AL

1) In June and October due to access.
2) May to November only due to restricted access in winter.
3) At spring overturn and late summer.
4) Between spring and fall overturn.
5) Monitoring will depend on closure conditions.
6) If ice and weather conditions meet safety requirements.
7) Taken at evenly spaced time series plus or minus one month.
8) Total mercury will be collected at MID or BT for QUL-58 and at 40 m for QUL-2a as part of EEM four times per year (no less than 1 month apart). Parameter only reported to MDMER.
9) QUL-18 is approximately 110 m deep. 100 m sample depth is collected for historical consistency.
10) Taken in conjunction with plankton sampling (see Section 7.6).
11) When sampling is less frequent than monthly, sampling at Quesnel Lake operational surface water monitoring stations (as identified in Table 7.2-2) will be undertaken when effluent discharge to Quesnel Lake is discharging. In the event of an unexpected shutdown of the water treatment plant, reasonable efforts will be made to re-sample within the timeframe of the quarterly or other specified time period sampling upon restart of effluent discharge to Quesnel Lake.
12) Samples will be taken at HAD-3 on the same day as samples collected from QUL-57, -58, and -59.

DOC = dissolved organic carbon; BC WQG = British Columbia Water Quality Guidelines; AL = aquatic life; FSR = Forest Service Road; EEM = Environmental Effects Monitoring; IDZ = initial dilution zone.

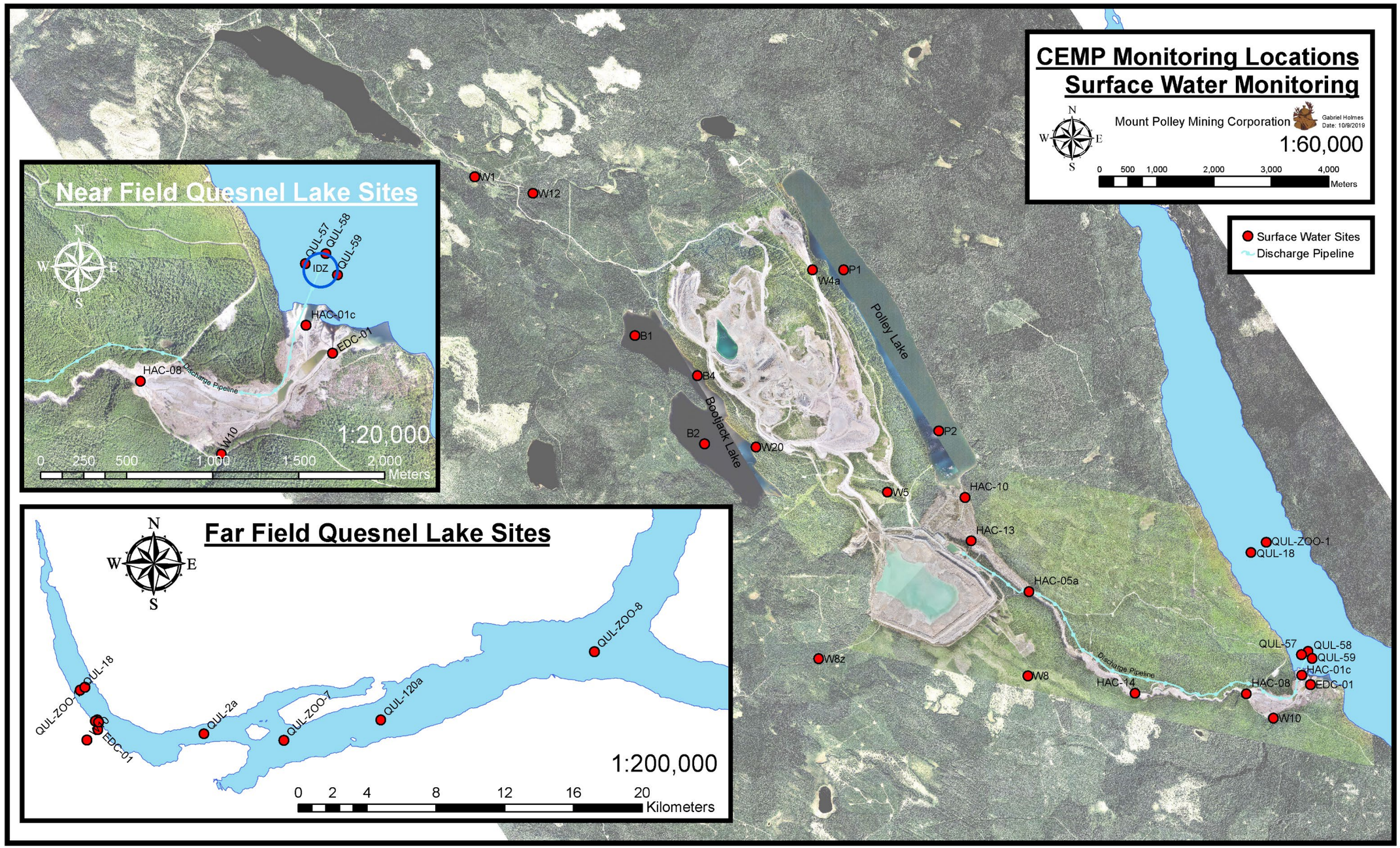

Figure 7.2-1: CEMP Monitoring Locations – Surface Water Monitoring

Groundwater

Groundwater monitoring wells around the mine site are installed in the area around the TSF, the Springer Pit, downstream of waste rock dumps and haul roads, and in other areas on or surrounding the mine. Sampling events at times of maximum and minimum hydrologic conditions to account for seasonal variability will be conducted when appropriate (i.e., spring and late summer/fall). Static water level (SWL) of all wells will be monitored on the same day at minimum once annually to allow for comparison across the Mine Site.

Groundwater monitoring wells were also installed along the Hazeltine Creek in 2015 and 2016. Monitoring of surface water in Hazeltine Creek captures the potential effects of groundwater discharged to the Hazeltine Channel system (Golder 2017). No further monitoring is planned at these groundwater wells. Table 7.2-3 summarizes the parameters analysed for groundwater quality. Table 7.2-4 provides an overview of the groundwater monitoring. Further details of monitoring sites, including site access descriptions, access or safety concerns, and a brief rationale for monitoring, is provided in the Site Matrix in Appendix D of the CEMP (Appendix 7-1). Figure 7.2-2 shows monitoring locations of the groundwater sampling locations.

Table 7.2-3: Groundwater Chemistry Parameters

Parameter	LOR	Unit
Field Parameters		
pH	-	pH
Conductivity	-	µS/cm
Temperature	-	°C
Physical Tests		
Conductivity	2	µS/cm
Hardness (as $CaCO_3$)	0.5	mg/L
pH	0.1	pH
Turbidity	0.1	NTU
Anions and Nutrients		
Alkalinity, Total (as $CaCO_3$)	1	mg/L
Ammonia, Total (as N)	0.005	mg/L
Chloride (Cl)	0.5	mg/L
Fluoride (F)	0.02	mg/L
Nitrate and Nitrite (as N)	0.003	mg/L
Nitrate (as N)	0.001	mg/L
Nitrite (as N)	0.005	mg/L
Total Nitrogen	0.03	mg/L
Phosphorus (P)-Total Dissolved	0.002	mg/L
Phosphorus (P)-Total	0.002	mg/L
Sulfate (SO_4)	0.3	mg/L

Parameter	LOR	Unit
Dissolved Metals		
Aluminum (Al)	0.003	mg/L
Antimony (Sb)	0.0001	mg/L
Arsenic (As)	0.0001	mg/L
Barium (Ba)	0.0001	mg/L
Beryllium (Be)	0.0001	mg/L
Bismuth (Bi)	0.00005	mg/L
Boron (B)	0.01	mg/L
Cadmium (Cd)	0.000005	mg/L
Calcium (Ca)	0.05	mg/L
Chromium (Cr)	0.0005	mg/L
Cobalt (Co)	0.0001	mg/L
Copper (Cu)	0.0005	mg/L
Iron (Fe)	0.03	mg/L
Lead (Pb)	0.00005	mg/L
Lithium (Li)	0.001	mg/L
Magnesium (Mg)	0.1	mg/L
Manganese (Mn)	0.0001	mg/L
Molybdenum (Mo)	0.00005	mg/L
Nickel (Ni)	0.0005	mg/L
Potassium (K)	0.05	mg/L
Selenium (Se)	0.00005	mg/L
Silicon (Si)	0.1	mg/L
Silver (Ag)	0.00001	mg/L
Sodium (Na)	0.05	mg/L
Strontium (Sr)	0.0002	mg/L
Thallium (Tl)	0.00001	mg/L
Tin (Sn)	0.0001	mg/L
Titanium (Ti)	0.01	mg/L
Uranium (U)	0.00001	mg/L
Vanadium (V)	0.0005	mg/L
Zinc (Zn)	0.003	mg/L

LOR = Limit of Reporting.

Table 7.2-4: Groundwater Monitoring Overview

Station Name	EMS Code	Description	Frequency	Parameters Measured	Guidelines
GW96-2a	E229681	Tailings Impoundment East Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW96-2b	E229682	Tailings Impoundment East Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW96-3a	E229683	Tailings Impoundment SE Well (deep)	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW96-4a	E229685	Tailings Impoundment SW Well (deep)	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW96-4b	E229686	Tailings Impoundment SW Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW96-7	E229690	SE Sed Pond Well	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW00-1a	E242385	Tailings Impoundment West Well (deep)	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW00-1b	E242384	Tailings Impoundment West Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW00-2a	E242387	Tailings Impoundment West Well (deep)	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW00-3a	E242389	Tailings Impoundment West Well (deep)	Annually[1]	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly[1]	SWL	N/A
GW00-3b	E242388	Tailings Impoundment West Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
95-R-5	E229695	Lower SERDS Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW05-01	E258923	Wight Pit/Polley Lake Interface Well	Quarterly[2]	Field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW11-1a	E291210	Below Temporary PAG Dump (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW11-1b	E291211	Below Temporary PAG Dump (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW11-2a	E291212	Below SERDS (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW11-2b	E291213	Below SERDS (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-1a	E291969	NW of Temporary PAG Dump (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-1b	E291970	NW of Temporary PAG Dump (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-2a	E291971	Springer Pit Well (deep)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Continuous	SWL (level logger installed in well)	N/A
GW12-2b	E291972	Springer Pit Well (shallow)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Continuous	SWL (level logger installed in well)	N/A
GW12-3a	E291973	Below Waste Haul Road (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-3b	E291974	Below Waste Haul Road (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-4a	E291976	Below NEZ Dump (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-4b	E291977	Below NEZ Dump (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-5a	E291978	Below Wight Pit Road (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW12-5b	E291979	Below Wight Pit Road (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW14-1	E301973	Groundwater well at New Orica Site	Quarterly[2]	Field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW15-1a	E303210	Springer Pit Well North (deep)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Continuous[3]	SWL (level logger installed in well)	N/A
GW15-1b	E303211	Springer Pit Well North (shallow)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Continuous[3]	SWL (level logger installed in well)	N/A
GW15-2a	E303212	Springer Pit Well South (deep)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Weekly	SWL (if required under the Springer Pit Response Plan)	N/A

Table 7.2-4: Groundwater Monitoring Overview

Station Name	EMS Code	Description	Frequency	Parameters Measured	Guidelines
GW15-2b	E303213	Springer Pit Well South (shallow)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Weekly	SWL (if required under the Springer Pit Response Plan)	N/A
GW16-1a	E308529	Below SERDS (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-1b	E308530	Below SERDS (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-2a	E308531	Tailings Impoundment North Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly	SWL	N/A
GW16-2b	E308532	Tailing Impoundment North Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-3a	E308533	Tailings Impoundment SE Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly	SWL	N/A
GW16-3b	E308534	Tailings Impoundment SE Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-4a	E308535	Tailings Impoundment S Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly	SWL	N/A
GW16-4b	E308536	Tailings Impoundment S Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-5a	E308537	Tailings Impoundment W Well (deep)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
			Quarterly	SWL	N/A
GW16-5b	E308538	Tailings Impoundment W Well (shallow)	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-6a	E308539	West of Cariboo Pit (deep)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-6b	E308540	West of Cariboo Pit (shallow)	Quarterly	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-7	E308541	Between Wight Pit and Polley Lake	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG
GW16-8	E308542	Between Wight Pit and Polley Lake	Semi-annually	SWL, field parameters, physical tests, anions and nutrients, dissolved metals	CSR Schedule 3.2 AL Standards; BC WQG

1) Wells show stable chemistry. If an unexpected change in SWL is observed, well water will be sampled.
2) Wells provide domestic water for personnel
3) Leveloggers have been removed from GW15-1a and 1b as wells are dry. Leveloggers will be reinstalled once water is above well screen.

BC WQG = British Columbia water quality guideline; SWL = static water level; CSR = Contaminated Sites Regulations; AL = aquatic life.

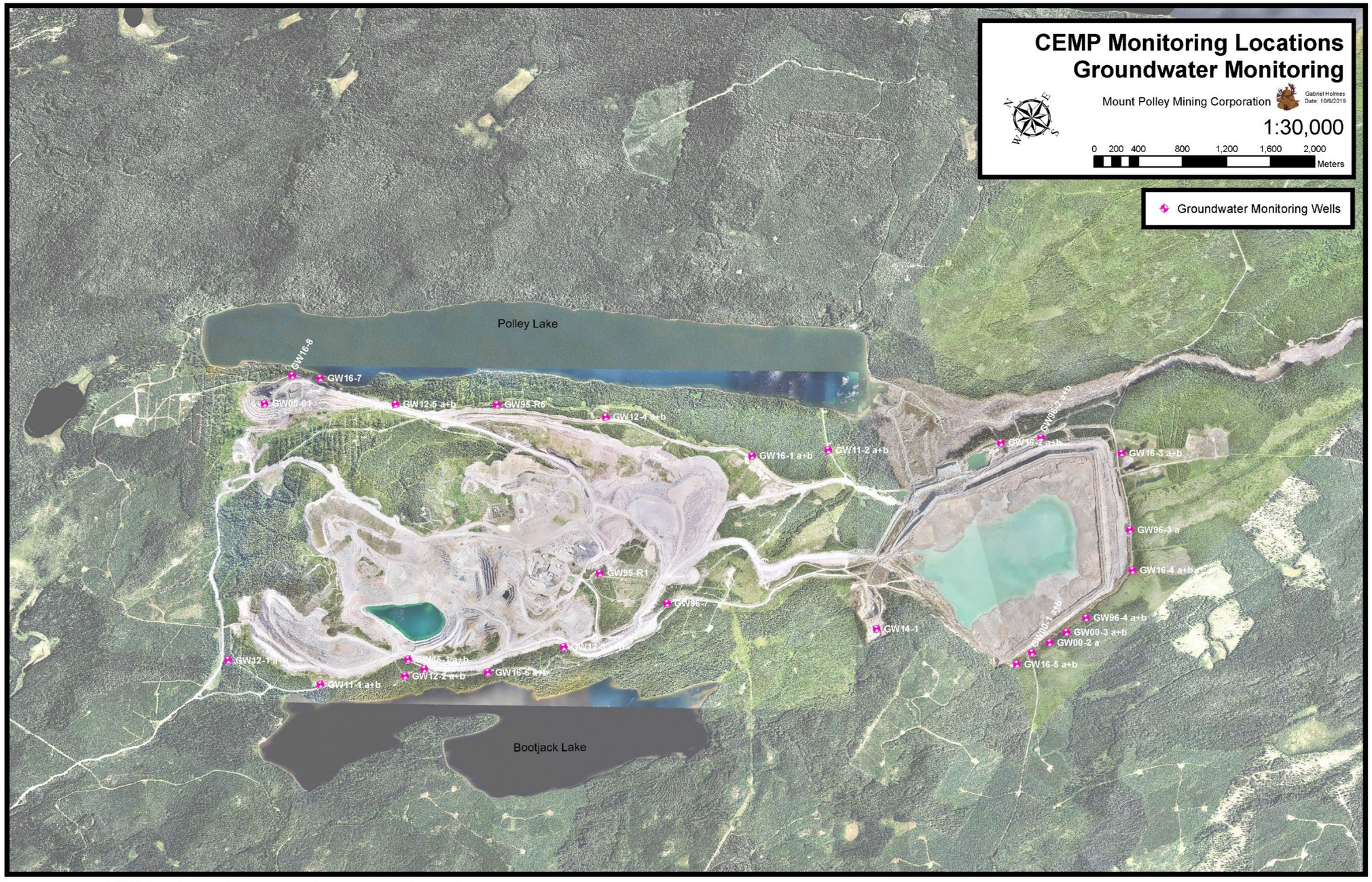

Figure 7.2-2: CEMP Monitoring Locations – Groundwater Monitoring

Seepage Water

Monitoring included in this subsection fall under BC *Mines Act* Permit M-200 and is only described here for completeness. Monitoring is summarized and changes will be presented in the CEMP, but changes to this monitoring are subject to BC *Mines Act* Permit M-200 and not Section 7 in the CEMP or Section 5 in the CEMP TOR (Appendix A of Appendix 7-1).

Under the BC *Mines Act* Permit M-200 seepage monitoring program, monitoring of waste rock dump seepages is conducted under a bi-annual seep survey program of all waste rock dumps on site, with representative seeps being monitored more frequently when possible (numerous seeps stop flowing during dry periods). Table 7.2-5 summarizes the parameters analysed for seepage water quality. A list of dumps and pits that are sampled, along with the representative sample locations, is provided in Table 7.2-6 and Table 7.2-7, respectively. Figure 7.2-3 shows monitoring locations of the seepage sampling locations.

Table 7.2-5: Seepage Water Chemistry Parameters

Parameter	LOR	Unit
Field Parameters - General		
pH	-	pH
Conductivity	-	µS/cm
Temperature	-	°C
Turbidity	-	NTU
Physical Tests		
Conductivity	2	µS/cm
Hardness (as $CaCO_3$)	0.5	mg/L
pH	0.1	pH
Total Suspended Solids	1	mg/L
Total Dissolved Solids	10	mg/L
Turbidity	0.1	NTU
Anions and Nutrients		
Alkalinity, Total (as $CaCO_3$)	1	mg/L
Ammonia, Total (as N)	0.005	mg/L
Chloride (Cl)	0.5	mg/L
Fluoride (F)	0.02	mg/L
Nitrate and Nitrite (as N)	0.003	mg/L
Nitrate (as N)	0.001	mg/L
Nitrite (as N)	0.005	mg/L
Total Nitrogen	0.03	mg/L
Orthophosphate-Dissolved (as P)	0.001	mg/L
Phosphorus (P)-Total Dissolved	0.002	mg/L
Phosphorus (P)-Total	0.002	mg/L
Sulfate (SO_4)	0.3	mg/L
Organic / Inorganic Carbon		
Dissolved Organic Carbon	0.5	mg/L

Parameter	LOR	Unit
Total and Dissolved Metals		
Aluminum (Al)	0.003	mg/L
Antimony (Sb)	0.0001	mg/L
Arsenic (As)	0.0001	mg/L
Barium (Ba)	0.0001	mg/L
Beryllium (Be)	0.0001	mg/L
Bismuth (Bi)	0.00005	mg/L
Boron (B)	0.01	mg/L
Cadmium (Cd)	0.000005	mg/L
Calcium (Ca)	0.05	mg/L
Chromium (Cr)	0.0005	mg/L
Cobalt (Co)	0.0001	mg/L
Copper (Cu)	0.0005	mg/L
Iron (Fe)	0.03	mg/L
Lead (Pb)	0.00005	mg/L
Lithium (Li)	0.001	mg/L
Magnesium (Mg)	0.1	mg/L
Manganese (Mn)	0.0001	mg/L
Molybdenum (Mo)	0.00005	mg/L
Nickel (Ni)	0.0005	mg/L
Potassium (K)	0.05	mg/L
Selenium (Se)	0.00005	mg/L
Silicon (Si)	0.1	mg/L
Silver (Ag)	0.00001	mg/L
Sodium (Na)	0.05	mg/L
Strontium (Sr)	0.0002	mg/L
Thallium (Tl)	0.00001	mg/L
Tin (Sn)	0.0001	mg/L
Titanium (Ti)	0.01	mg/L
Uranium (U)	0.00001	mg/L
Vanadium (V)	0.0005	mg/L
Zinc (Zn)	0.003	mg/L

LOR = Limit of Reporting.

Table 7.2-6: Seep Monitoring Overview

Waste Rock Dump	Representative Sample	Representative Sample Frequency	Parameters Measured	Guidelines
North Bell Dump	Joe's Creek Pipe	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Boundary Dump	Boundary Seep 2	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
East RDS	-	-	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
NEZ Dump	NEZ Seep 1	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Waste Haul Road	Mine Drainage Creek Culvert	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Temporary NW PAG Dump	PAG Seep 15	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
TSF Haul Road	-	-	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
SERDS	SERD Seep 13	Quarterly	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A

Table 7.2-7: Pit Seepage Monitoring Overview

Pit	Station Name	Sample Frequency	Parameters Measured	Guidelines
Cariboo Pit	E8	Semi-annually[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Wight Pit	E10	Semi-annually[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Springer Pit	E11	Semi-annually[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
Boundary Pit	Boundary Pit	Semi-annually[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A

1) When pit is not storing water from other sources on site.

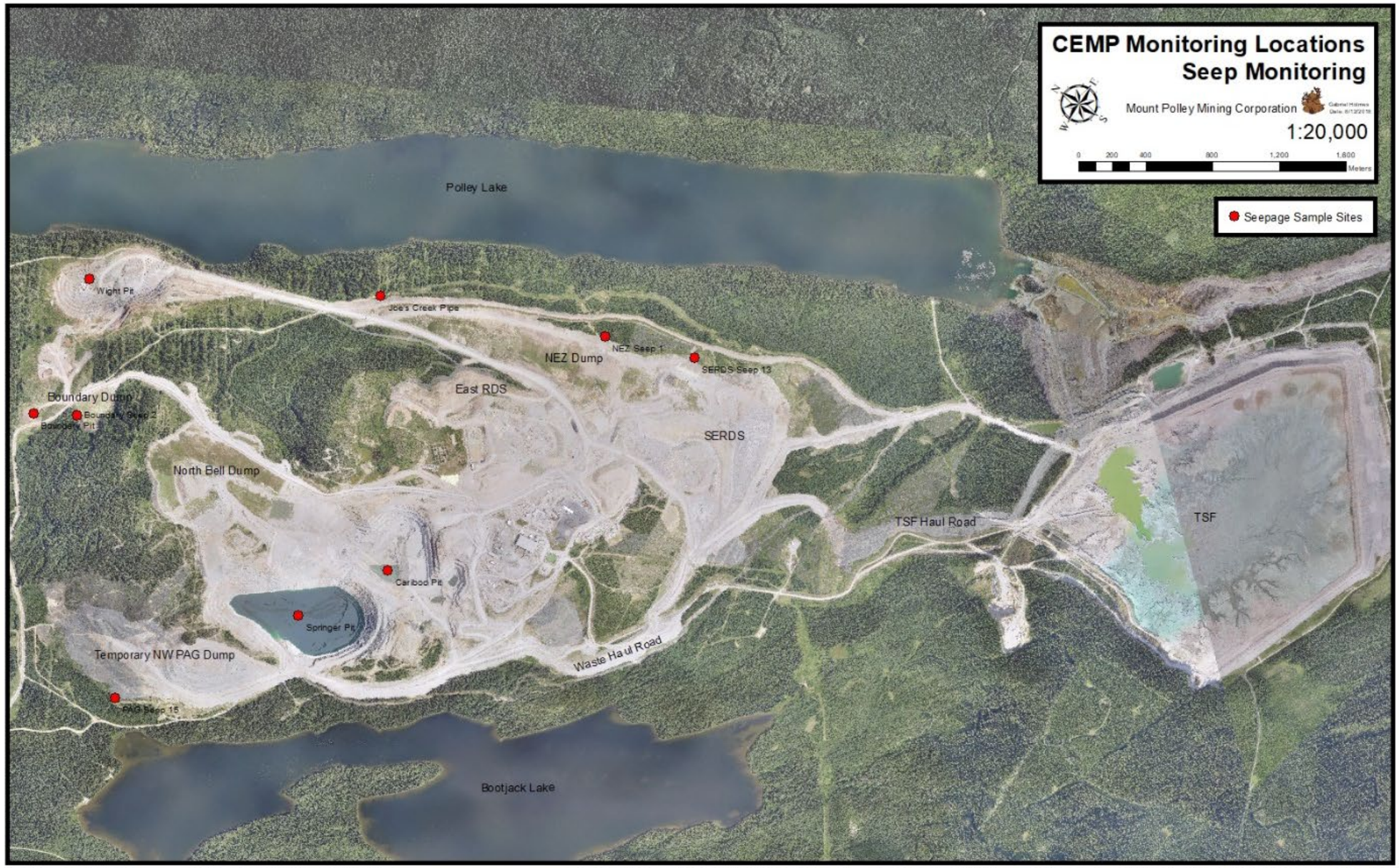

Figure 7.2-3: CEMP Monitoring Locations – Seep Monitoring

7.3 Discharge Monitoring Program

Effluent Monitoring

The objective of the effluent monitoring program is to verify the water chemistry complies with the applicable regulatory limits at the point of discharge (MDMER Schedule 4 and the Permit limits in Table 7.3-1; see Section 1.2.3 in the Permit), and that the discharge flow rate does not exceed the permitted rates of a maximum of 52,000 m^3/day and an annual average of 29,000 m^3/day (see Section 1.2.1 in the Permit). The influent is also sampled to allow for analysis of treatment efficacy.

The flow rate, temperature, and TSS of the effluent will be continuously monitored and recorded in the Veolia WTP HMI. Mount Polley Mine may consider less frequent sampling (MDMER minimum is quarterly) if the monthly mean concentrations of parameters are <10% of the MDMER guidelines for 12 months, as described Section 13 (1) of the MDMER. To make this change if these conditions are met, MPMC will follow the process outlined in Section 7 of CEMP (Appendix 7-1). Table 7.3-2 summarizes the parameters analysed for effluent quality and Table 7.3-3 provides an overview of the effluent monitoring. Further details of monitoring sites, including site access descriptions, access or safety concerns, and a brief rationale for monitoring, is provided in the Site Matrix in Appendix D of the CEMP (Appendix 7-1). Figure 7.3-1 shows monitoring locations of the effluent sampling locations. Reporting of the monitoring data is outlined in Section 9 of the CEMP (Appendix 7-1).

Table 7.3-1: Permit 11678 and MDMER Schedule 4 Treated Effluent Compliance Limits for Direct Discharge to Quesnel Lake

Constituent	Units	Permit Limit		MDMER Schedule 4: Authorized Limits	
		Interim [1]	Final [2]	MAX Monthly Mean	MAX Grab Sample
Non-Metal Constituents					
pH	pH	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5	6.0 - 9.5
Total Suspended Solids	mg/L	15 (mean)/30 (max)		15	30
Total Sulphate	mg/L	720	1,100	-	-
Total Ammonia	mg/L (as N)	0.41	1.21	-	-
Total Nitrate	mg/L (as N)	9.7	34	-	-
Total Nitrite	mg/L (as N)	0.78		-	-
Total Phosphorus	mg/L	0.09		-	-
Fluoride	mg/L	17			
Cyanide [3]	mg/L	-		1	2
Radium 226 [4]	Bq/L	-		0.37	1.11
Total Metals					
Arsenic	mg/L	0.0034	0.028	0.5	1
Chromium	mg/L	0.0011	0.004	-	-
Copper	mg/L	0.012	0.033	0.3	0.6
Iron	mg/L	1		-	-
Lead	mg/L	-		0.2	0.4
Manganese	mg/L	3.4		-	-
Molybdenum	mg/L	0.36		-	-
Selenium	mg/L	0.06	0.075	-	-
Silver	mg/L	0.00024		-	-
Zinc	mg/L	0.059		-	-
Dissolved Metals					
Aluminum	mg/L	0.75		-	-
Cadmium	mg/L	0.00034		-	-
Iron	mg/L	0.35		-	-
Acute Toxicity Testing Results					
96h LC50 Rainbow Trout	Mortality in 100% effluent	50%		-	LC50 >100%
48h LC50 *D. magna*		50%		-	LC50 >100%

1) Maximum discharge limits until toxicity testing on final effluent concentrations is conducted.
2) Maximum discharge limits applicable after BC ENV is satisfied that toxicity testing demonstrates that the final effluent will not cause mixture toxicity. This requirement has been met.
3) MDMER requirement only; if cyanide is not used in the mining/milling process, then it does not have to be analysed. Since cyanide is not used in the mining/milling process at Mount Polley, the effluent is not analysed for cyanide.
4) MDMER requirement only; if 10 consecutive samples show radium 226 as less than 0.037 Bq/l then frequency of sampling for radium 226 can be reduced to once a quarter. This has been satisfied, and radium 226 analysis is currently conducted quarterly.

Table 7.3-2: Effluent Chemistry Parameters

Parameter	LOR	Unit
Field Parameters - General		
pH	-	pH
Conductivity	-	µS/cm
Temperature	-	°C
Turbidity	-	NTU
Physical Tests		
Conductivity	2	µS/cm
Hardness (as $CaCO_3$)	0.5	mg/L
pH	0.1	pH
Total Suspended Solids	1	mg/L
Total Dissolved Solids	10	mg/L
Turbidity	0.1	NTU
Anions and Nutrients		
Alkalinity, Total (as $CaCO_3$)	1	mg/L
Ammonia, Total (as N)	0.005	mg/L
Chloride (Cl)	0.5	mg/L
Fluoride (F)	0.02	mg/L
Nitrate and Nitrite (as N)	0.003	mg/L
Nitrate (as N)	0.001	mg/L
Nitrite (as N)	0.005	mg/L
Total Nitrogen	0.03	mg/L
Orthophosphate-Dissolved (as P)	0.001	mg/L
Phosphorus (P)-Total Dissolved	0.002	mg/L
Phosphorus (P)-Total	0.002	mg/L
Sulfate (SO_4)	0.3	mg/L
Organic / Inorganic Carbon		
Dissolved Organic Carbon	0.5	mg/L

Parameter	LOR	Unit
Total and Dissolved Metals		
Aluminum (Al)	0.003	mg/L
Antimony (Sb)	0.0001	mg/L
Arsenic (As)	0.0001	mg/L
Barium (Ba)	0.0001	mg/L
Beryllium (Be)	0.0001	mg/L
Bismuth (Bi)	0.00005	mg/L
Boron (B)	0.01	mg/L
Cadmium (Cd)	0.000005	mg/L
Calcium (Ca)	0.05	mg/L
Chromium (Cr)	0.0005	mg/L
Cobalt (Co)	0.0001	mg/L
Copper (Cu)	0.0005	mg/L
Iron (Fe)	0.03	mg/L
Lead (Pb)	0.00005	mg/L
Lithium (Li)	0.001	mg/L
Magnesium (Mg)	0.1	mg/L
Manganese (Mn)	0.0001	mg/L
Molybdenum (Mo)	0.00005	mg/L
Nickel (Ni)	0.0005	mg/L
Potassium (K)	0.05	mg/L
Selenium (Se)	0.00005	mg/L
Silicon (Si)	0.1	mg/L
Silver (Ag)	0.00001	mg/L
Sodium (Na)	0.05	mg/L
Strontium (Sr)	0.0002	mg/L
Thallium (Tl)	0.00001	mg/L
Tin (Sn)	0.0001	mg/L
Titanium (Ti)	0.01	mg/L
Uranium (U)	0.00001	mg/L
Vanadium (V)	0.0005	mg/L
Zinc (Zn)	0.003	mg/L

LOR = Limit of Reporting.

Table 7.3-3: Effluent Monitoring Overview

Station Name	EMS Code	Description	Frequency	Parameters Measured	Guidelines
E19	E305050	WTP influent	Weekly[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals	N/A
HAD-3	E304230	WTP treated effluent	Continuous[1]	TSS (calculated), temperature, flow rate	Permit 11678
			Weekly[1]	Field parameters, physical tests, anions and nutrients, DOC, total and dissolved metals, radium 226[2], total mercury[3]	Permit 11678; MDMER; EEM
			Monthly	Acute toxicity tests: ▪ - Rainbow trout: *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout* (Reference Method EPS1/RM/13) ▪ - Daphnia Magna: *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna* (Reference Method EPS1/RM/14) ▪ - or most recent methods, as per MDMER	Permit 11678; MDMER[4]
			Semi-annually[5]	Chronic toxicity tests: ▪ - Biological Test Method: *Toxicity Tests Using Early Life Stages of Salmonid Fish* (Rainbow Trout) (Reference Method EPS 1/RM/28) ▪ - Invertebrate species: *Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia* (Report EPS 1/RM/21) ▪ - Plant species: *Biological Test Method: Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte, Lemna minor* (Reference Method EPS 1/RM/37) ▪ - Algal species: *Biological Test Method: Growth Inhibition Test Using Freshwater Alga Selenastrum capricornutum* (Report Method EPS 1/RM/25)	MDMER

1) Only when discharging.

2) MDMER requirement only; if 10 consecutive samples show radium 226 as less than 0.037 Bq/l then frequency of sampling for radium 226 can be reduced to once a quarter. This has been satisfied and radium 226 analysis is currently conducted quarterly.

3) EEM requirement only; can be discontinued if concentration is less than 0.10 µg/L in 12 consecutive samples. This has been satisfied and mercury analysis has been discontinued.

4) MDMER June 2018 Part 2 Division 2 16 (1): frequency may be reduced to quarterly if discharge is determined not to be acutely lethal for 12 consecutive months.

5) Chronic/sub-lethal toxicity tests are conducted semi-annually for 3 years. MDMER June 2018 Schedule 5, 6 (1-3): after 3 years, frequency will be increased to once per calendar quarter on the sub lethal species whose results of sub lethal tests produce the lowest geometric mean, taking into account the inhibition concentration that produces a 25% effect or effective concentration of 25%.

N/A = not applicable; TSS = total suspended solids; DOC = dissolved organic carbon; MDMER = Metal and Diamond Mining Effluent Regulations; EEM = Environmental Effects Monitoring.

Figure 7.3-1: CEMP Monitoring Locations – Effluent Monitoring

7.4 Environment Monitoring Program

The CEMP includes surface water, groundwater, sediment, soil, and various environmental receptors (e.g., benthic invertebrates, soil invertebrates, plankton and chlorophyll a, periphyton, fish, wildlife, amphibians and reptiles, and vegetation). The surface water and groundwater monitoring are outlined in Section 7.2 of the CEMP (Appendix 7-1). sediment, benthic invertebrates, plankton and chlorophyll a, periphyton, and fish are outlined in Section 7.6 of the CEMP (Appendix 7-1). Full descriptions of the monitoring programs are provided in Section 6 of the CEMP (Appendix 7-1).

The objective of water chemistry monitoring in Quesnel Lake at the boundary of the IDZ is to verify that the discharge of treated effluent is not causing an exceedance of the applicable ambient BC Water Quality Guidelines at the edge of the IDZ, as required by the Permit, and to verify the discharge model, as described in the ADP.

For the edge of the IDZ sampling, limnological profiles of field parameters (specific conductance, temperature, and turbidity) will be carried out in an attempt to identify the location of the plume from the outfall (i.e., direction of flow). MPMC is committed to spending a reasonable level of effort and time to detect the plume and direction of flow. The reasonable level of effort and time will vary depending on the health and safety risks associated with the weather conditions and season. Vertical profiles of field measurements and water chemistry samples will be taken at the inferred centerline of the plume at the edge of the IDZ (station QUL-58).

A plume dispersion model was developed by WSP, for the nearfield (i.e., in the vicinity of the IDZ), and a hydrodynamic model of Quesnel Lake has been developed and calibrated by Tetra Tech EBA to predict effluent transfer throughout the West Basin of Quesnel Lake and potential for buildup (Golder 2015). Monitoring at the near-field station, along with monitoring of other Quesnel Lake receiving environment stations, will be used to verify the near-field and lake-wide hydrodynamic models. It should be noted that the nearfield and the hydrodynamic models, as described in the LTWMP, serve as the basis for the Trigger Response Plan incorporated into the 2018 ADP.

7.5 Post-Closure Environmental Monitoring Program

MPMC has developed a criterion-indicator framework (Reclamation Monitoring Criteria) that will be used to determine post-closure success, once the Mount Polley Mine Site enters the post-closure. The framework aligns carefully with MPMC's End Land Use Plan. MPMC's post-closure environmental monitoring program components include:

- monitoring of geotechnical structures
- monitoring of water quantity, quality and aquatic effects
- soils and vegetation monitoring

The Reclamation Monitoring Criteria can be found in Table 7.5-1.

Table 7.5-1: Reclamation Monitoring Criteria Framework

Criteria	Indicator	Measure
Landform Function		
Landforms have geotechnical stability	Geotechnical stability	Visual inspection for the presence/absence of subsidence, erosion, deposition of sediment in low lying areas, ponding, gullying, rilling or slumping, including bank stability round watercourses and waterbodies
Landscape enhancements are appropriate to the ecosystem and increase the diversity of the landscape	Landscape enhancements	Presence of rocks, coarse woody debris, brush piles, snags, bird/bat boxes, etc.
Water		
The Mine Site's water balance meets the needs of the post-closure landscape	Successful function of the TSF and Cariboo-Springer Pit Spillways	▪ Assessment of water levels in the TSF and Cariboo-Springer Pit ▪ No signs of instability of the TSF, or the TSF and Cariboo-Springer Spillways
	Water quality parameters	Water quality parameters support discharge of water to the receiving environment
	Pit lake elevation	▪ Pit lake elevations align with projected modelling. ▪ Pit lake elevations successfully cover PAG material
Geochemistry		
Mine components with potential for ML/ARD generation have covers that prevent oxygen from interacting with ML/ARD sources	Water quality parameters	▪ Cover Run-off and seepage water quality, if a dry cover is used.
		▪ Overall water quality of the pit lake, if a wet cover is used to contain ML/ARD generating waste rock
	cover stability (or elevation, if water is used)	▪ Visual inspection for the presence/absence of subsidence, erosion, or slumping.
		▪ Measurement of waterbody (e.g., pit lake) elevation
Soil		
Reclamation materials are placed appropriate to the landform	Soil depth Average placement depth (m)	Soil depth Average placement depth (m)
	Soil pH	Soil pH
	Soil moisture regime	Soil texture/particle size analysis (percent sand, percent silt, percent clay), placement depth, topography

Table 7.5-1: Reclamation Monitoring Criteria Framework

Criteria	Indicator	Measure
Vegetation		
Terrestrial and aquatic vegetation common to the surrounding area is established	Plant community composition (terrestrial, riparian and, marsh/aquatic)	Presence, percent cover, distribution of noxious and prohibited noxious weeds
		Species inventory and percent cover by layer and species. Include damage codes (e.g., insect, browse)
The reclaimed landscape provides commercial forest (where designated as an end land use within the reclamation plan)	Mortality of trees	Percent mortality between planting and ten years after planting
	Insects and disease	Percent of trees with signs of chewing, spots, eggs, nests or galls
	Browsing pressure	Percent of trees with signs of browsing on new shoots, bark damage
	Limitations on vegetation growth	Percent of trees with signs of chlorosis, stunting, unusual formations
Emergent Properties		
The reclaimed landscape provides for biodiversity	Patch size and shape	Patch sizes (ha)
	Food vegetation species	Food vegetation species Food species for target wildlife species are present
	composition – diversity, richness, evenness and abundance	Species inventory, percent cover and density (stems/ha)
Traditional Ecological Value	Wildlife habitat that supports traditional use	Derived from Plant Community Composition
	Biodiversity that supports traditional use	Derived from Plant Community Composition and incidental wildlife observations
	Vegetation that supports traditional use	Derived from Plant Community Composition

7.5.1 Monitoring of Geotechnical Structures

The post-closure monitoring program for the inspection and monitoring of the TSF will be aligned with the recommendations of the Canadian Dam Association for tailings facilities that cannot be decommissioned (CDA 2014). During early post-closure the TSF will undergo a dam safety inspection, carried out annually by a qualified geotechnical engineer, with additional extra inspections possible after extreme events (such as rainfall exceeding a selected design return period). The inspections will focus on any conditions that could adversely impact the long-term function and stability of the structure. Annual inspection reports will be submitted to EMLI for review. It is anticipated that the monitoring frequency may be reduced, potentially supplemented by remote monitoring of site instrumentation, as post-closure advances. Major features, such as waste rock dumps and pits will be visually inspected annually, and after major rainfall events, for signs of erosion, rilling, slumping or other forms of instability. As the reclaimed landform revegetates, it is expected that the need for inspections will decrease, as the vegetation cover helps limit issues associated with erosion and gullying.

7.5.2 Monitoring of Water Quantity, Quality and Aquatic Effects

The existing hydrometric stations on receiving water creeks will continue operations during active closure and post-closure. Continuous water level monitoring equipment (pressure transducer and data logger) will continue to be operated at each site during non-freezing periods, and the rating curves will be updated and maintained, as required. While hydrometric stations are only currently present at receiving locations, water levels will be measured quarterly in the TSF pond, and the expanded Springer, Wight, and Boundary pits during post-closure.

Until MPMC's passive/semi-passive water treatment system has been demonstrated to be able to be scaled up and implemented (and permitted), mine contact water will continue to be managed through the centralized system (e.g., WTP) with a single discharge to Quesnel Lake. Monitoring of this discharge will occur according to a monitoring plan that will require BC ENV approval and will likely be similar to the monitoring plan for operational water discharge.

Surface water quality monitoring will continue during active closure for the same parameters monitored during operations (total and dissolved metals, nutrients, physical parameters, ions, and dissolved organic carbon), with quality assurance and quality control quality assurance and quality control sampling procedures to continue. Monitoring locations are available in MPMC (2022). During active closure, mine contact water will continue to be produced, and thus BC ENV permit locations will continue to be monitored, and will follow the CEMP (MPMC 2019). In post-closure, sampling intensity is expected to reduce, as areas that once generated contact water have been revegetated, and post-closure water management infrastructure is in its final configuration. In general, post-closure water quality monitoring will consist of quarterly to annual monitoring frequencies.

Groundwater monitoring well locations are available in MPMC (2022). During active closure and post-closure groundwater monitoring will likely consist of:

- sampling of the Springer Pit wells quarterly and measurements of water levels daily until conditions are stable and appropriately characterized, and then reducing monitoring frequency to annual monitoring for approximately five years
- sampling of a nested pair of monitoring wells near the Cariboo Pit
- sampling of reconditioned wells adjacent to the Wight Pit
- continued bi-annual (i.e., every six months) monitoring of wells adjacent to other facilities until trends are stable and the water chemistry and flow patterns are appropriately characterized, at which point the monitoring frequency will be reduced.

During post-closure, monitoring of point of discharge required under EMA Permit 11678 will continue. In general, routine (likely monthly) sampling in the receiving environment is also anticipated, along with biological monitoring (fish population and fish tissues, sediment chemistry, and benthic invertebrate monitoring). Biological monitoring will continue every three years as per the MDMER (Canada 2022), with the frequency of all monitoring decreasing as results stabilize, until such time when treatment of Mine Site runoff is not required, or passive systems are deemed to be sufficiently effective and not requiring long-term monitoring. Following this, Mount Polley Mine will apply to become a closed mine under the MDMER (Canada 2022), which includes conducting a final biological monitoring study.

7.5.3 Soils and Vegetation Monitoring

Soil and vegetation monitoring will typically be completed in the summer when plants are most easily identifiable. A general schedule for reclamation assessments is as follows:

- post-application visual inspections (e.g., soil test pits) after placement of cover soil to assess placement depth and to verify if reclamation methods outlined in (MPMC 2022) were appropriately implemented
- assessment of revegetated areas following the first growing season to determine species composition (including presence of invasive species) and cover, as well as documentation of any areas of erosion
- observations of wildlife or grazing occurrences and usage
- survival surveys of planted trees and shrubs immediately after planting (for quality control purposes)
- survival surveys of planted trees and shrubs following their first growing season
- periodic assessments of tree survival/growth and ground cover vegetation, decreasing in frequency over time (e.g., years two, five, and ten)

The 2022 Environmental Risk Assessment (ERA) (WSP 2022) discusses methods for evaluating potential pathways for uptake of metals by ecological receptors at the Mine Site. Preliminary results indicate that there is minimal risk of metal uptake from reclaimed soil into vegetation and wildlife. Methods described in (WSP 2022) will coincide with the vegetation monitoring schedule.

7.6 Aquatic Effect Monitoring Program

As part of the annual CEMP, a sediment and aquatic life assessment is conducted. The objectives and overview of monitoring programs for sediment, benthic invertebrates, fish, periphyton, and plankton and chlorophyll a are described below. The detailed monitoring programs are provided in the CEMP (Appendix 7-1).

Sediment

As outlined in Appendix B.1 of the CEMP (Appendix 7-1), the objectives of sediment quality monitoring are to:

- "Evaluate the influence of mine activities on the receiving environments (e.g., Hazeltine Creek, Polley Lake, and Quesnel Lake) in comparison to baseline and/or reference conditions";
- "Determine potential implications to aquatic life by applying a variety of interpretive tools";
- "Provide data to support exposure assessment as part of the ERA and human health risk assessment (HHRA)";
- "Provide supporting information for benthic invertebrate community monitoring"; and,
- "Advance technical understanding of the stability or mobility and potential bioavailability of metals and metalloids in lake sediments affected by the TSF Breach".

Sediment quality monitoring under the CEMP is proposed to meet the combined needs of:

1) Operational monitoring (including the discharge of treated effluent to Quesnel Lake);
2) Monitoring of the impact of the 2014 perimeter embankment failure; and
3) Monitoring of response to reclamation activity following the perimeter embankment failure.

An overview of the proposed sediment quality monitoring program is provided in Table 2 and Figures 5 and 6 of Appendix B.1 of the CEMP (Appendix 7-1). Sediment quality monitoring is focused on Polley Lake, Hazeltine Creek, and Quesnel Lake, with reference areas identified for each mine-influenced sampling area (i.e., Bootjack Lake for Polley Lake, unaffected areas of Quesnel Lake for impacted areas of Quesnel Lake). Table 3 in Appendix B.1 of the CEMP (Appendix 7-1) summarizes the analytes and laboratory reporting limits for the sediment quality monitoring program.

The monitoring program is divided into lake monitoring and creek monitoring and will include physical and chemical characterisation of deposited sediments. Sediment quality sampling will be supported by measurements of temperature, dissolved oxygen, pH, and specific conductance near the sediment-water interface at all sampling stations. Some additional monitoring of the stability and potential bioavailability of metals associated with sediments impacted by the TSF Breach may be undertaken (e.g., deployment of Diffusive Gradients in Thin Films devices to

monitor labile metal concentrations; toxicity testing using *Hyalella azteca*). More detail is provided in Appendix B.1 of the CEMP (Appendix 7-1).

Benthic Invertebrates

As outlined in Appendix B.2 of the CEMP (Appendix 7-1), the objectives of benthic invertebrate monitoring are to:

- "Evaluate the influence of Mount Polley Mine activities on benthic invertebrate communities, productivity, and tissue quality in receiving environments (e.g., Polley Lake, Hazeltine Creek, Edney Creek, and Quesnel Lake) in comparison to baseline and/or reference conditions";
- "Determine potential implications to aquatic life (e.g., through assessment of benthic invertebrate community and productivity endpoints, and comparison of benthic tissue quality results to available guidelines; BC MoE 2014) and to aquatic ecosystem health by providing supporting information for the assessment of potential effects to higher trophic levels (e.g., fish and fish habitat quality)"; and,
- "Provide data to support exposure assessment as part of the ERA and HHRA."

Benthic invertebrate community monitoring is also required as part of EEM under the MDMER. The objective of the MDMER EEM benthic invertebrate monitoring identified in Appendix B.2 of the CEMP (Appendix 7-1); is to "evaluate whether there are effects to benthic invertebrate community characteristics between the area of Quesnel Lake exposed to Mount Polley mine effluent and a reference area (Environment Canada 2012)."

Benthic invertebrate monitoring under the CEMP (Appendix 7-1) is designed to meet the combined needs of:

1) Operational monitoring (including the discharge of treated effluent to Quesnel Lake);
2) Monitoring of the impact of the 2014 TSF embankment breach; and
3) Monitoring of the response to reclamation activity following the TSF embankment breach.

An overview of the proposed benthic invertebrate monitoring program is provided in Table 3 of Appendix B.2 of the CEMP (Appendix 7-1), and includes benthic invertebrate community, productivity, and tissue quality. Benthic invertebrate monitoring is focused on Polley Lake, Hazeltine Creek, lower Edney Creek, Quesnel Lake, and associated reference areas (Figures 6 and 7 of Appendix B.2 of the CEMP [Appendix 7-1]). Table 4 in Appendix B.2 of the CEMP (Appendix 7-1); summarizes the analytes and laboratory reporting limits for the benthic invertebrate monitoring program. The sampling frequency at this time is once every three years.

Fish

The objectives of fish monitoring, as outlined in Appendix B.4 of the CEMP (Appendix 7-1), are to;

- "Evaluate the influence of Mount Polley Mine activities on fish communities, populations, and tissue quality in receiving environments (Hazeltine Creek, Polley Lake, and Quesnel Lake) in comparison to baseline and/or reference conditions";
- "Determine potential implications to aquatic ecosystem health and human health (e.g., relative to available fish tissue quality guidelines [BC MoE 2014; CFIA 2015])";
- "Provide data to support exposure assessment as part of the ERA and HHRA"; and,
- "Document fish habitat utilization in creek and lake areas that were physically impacted by the TSF breach (most notably Hazeltine Creek and the lower segment of Edney Creek), thereby documenting the effectiveness of fish habitat rehabilitation efforts".

From Appendix B.4 of the CEMP (Appendix 7-1), the objective of the MDMER EEM fish monitoring is to "evaluate whether there are differences in population endpoints (survival, growth, and reproduction) of sentinel fish species between the area of Quesnel Lake exposed to Mount Polley mine effluent and a reference area (Environment Canada 2012)." Evaluation of selenium in fish tissues is also triggered under the MDMER on the basis of current selenium concentrations in effluent.

Fish monitoring under the CEMP is designed to meet the combined needs of:

1) Operational monitoring (including the discharge of treated effluent to Quesnel Lake);
2) Monitoring of the impact of the 2014 TSF embankment breach; and
3) Monitoring of the response to remediation following the TSF embankment breach.

As previously indicated, fish monitoring includes fish tissue quality monitoring, sentinel fish population monitoring, fish habitat characterization and fish usage monitoring, and fish community monitoring. An overview of the proposed fish monitoring program is provided in Table 8 and Figures 5 and 6 of Appendix B.4 of the CEMP (Appendix 7-1). Table 9 in Appendix B.4 of the CEMP (Appendix 7-1) summarizes the fish tissue analytes and laboratory reporting limits for the fish monitoring program.

Periphyton

As outlined in Appendix B.3 of the CEMP (Appendix 7-1), the objectives of periphyton monitoring are to:

- "Evaluate the influence of mine activities (related to mine operations, the TSF breach, and/or rehabilitation activities) on Hazeltine Creek (the creek receiving environment directly influenced by mine activity) and lower Edney Creek (a creek environment directly influenced by the TSF breach)";
- "Serve as supporting information for the determination of potential effects to aquatic life at higher trophic levels (benthic invertebrates and fish)";
- "Provide supporting information for the assessment of benthic invertebrate tissue quality, benthic invertebrate community condition, and fish habitat productivity"; and,
- "Provide data to support exposure assessment as part of the and HHRA".

Periphyton monitoring will include assessment of productivity, community composition, and tissue quality, with comparison to previous and/or reference conditions, to applicable guidelines (i.e., chlorophyll *a*; BC MoE 2018), and to literature-based criteria (or classification ranges) for productivity.

Periphyton monitoring under the CEMP is proposed to meet the combined needs of:

1) Operational monitoring (including the previous discharge of treated effluent to Hazeltine Creek);
2) Monitoring of the impact of the 2014 TSF breach; and
3) Monitoring of the response to reclamation activity following the TSF breach.

An overview of the proposed periphyton monitoring program is provided in Table 1 and Figure 4 of Appendix B.3 of the CEMP (Appendix 7-1). Periphyton monitoring is focused on Hazeltine Creek and lower Edney Creek with reference areas identified for each mine-influenced sampling area (i.e., upper Edney Creek and Frypan Creek for upper Hazeltine Creek, and an unaffected area of lower Edney Creek for rehabilitated areas of lower Edney Creek and lower Hazeltine Creek). Table 2 in Appendix B.3 of the CEMP (Appendix 7-1) summarizes the analytes and laboratory reporting limits or the periphyton monitoring program.

Plankton and Chlorophyll a

Table 7.6-1 summarizes the parameters analysed for plankton and chlorophyll *a* monitoring. Chlorophyll *a*, phytoplankton taxonomy and biomass, and zooplankton taxonomy and metal tissue samples will continue to be collected concurrently with water chemistry samples (including field parameters) three times per year to capture early and late growing seasons as outlined in Table 7.6-2. Growing seasons were determined after monthly sampling was conducted in 2015; data analysis of zooplankton community is presented in Golder (2016). Further details of monitoring sites, including site access descriptions, access or safety concerns, and a brief rationale for monitoring, is provided in the Site Matrix in Appendix D of the CEMP (Appendix 7-1). Figure 7.6-1 shows monitoring locations of the plankton and chlorophyll *a* sampling locations.

Table 7.6-1: Plankton and Chlorophyll *a* Parameters

Parameter	LOR	Unit
Taxonomy		
Phytoplankton	-	-
Zooplankton	-	-
Total Metals in Tissue		
Aluminum (Al)	2	mg/kg
Antimony (Sb)	0.01	mg/kg
Arsenic (As)	0.02	mg/kg
Barium (Ba)	0.05	mg/kg
Beryllium (Be)	0.01	mg/kg
Bismuth (Bi)	0.01	mg/kg
Boron (B)	1	mg/kg
Cadmium (Cd)	0.005	mg/kg
Calcium (Ca)	20	mg/kg
Chromium (Cr)	0.005	mg/kg
Cobalt (Co)	0.05	mg/kg
Copper (Cu)	0.02	mg/kg
Iron (Fe)	0.1	mg/kg
Lead (Pb)	3	mg/kg
Lithium (Li)	0.02	mg/kg
Magnesium (Mg)	0.5	mg/kg
Manganese (Mn)	2	mg/kg
Molybdenum (Mo)	0.05	mg/kg
Nickel (Ni)	0.02	mg/kg
Potassium (K)	0.2	mg/kg
Selenium (Se)	10	mg/kg
Silicon (Si)	20	mg/kg
Silver (Ag)	0.05	mg/kg
Sodium (Na)	0.05	mg/kg
Strontium (Sr)	20	mg/kg
Thallium (Tl)	0.05	mg/kg
Tin (Sn)	0.02	mg/kg
Titanium (Ti)	0.002	mg/kg
Uranium (U)	0.1	mg/kg
Vanadium (V)	0.002	mg/kg
Zinc (Zn)	0.1	mg/kg
Plant Pigments (Water)		
Chlorophyll *a*	0.01	µg

LOR = Limit of Reporting.

Table 7.6-2: Plankton and Chlorophyll *a* Monitoring Overview

Station Name	EMS Code	Description	Frequency	Parameters Measured	Guidelines
P2	E307975	Polley Lake deepest area at south end	Three times between June 15 and September 15, at least 30 days apart	Chlorophyll *a*, Phytoplankton taxonomy and biomass Zooplankton metals, taxonomy, and biomass	N/A
B2	E215897	Bootjack Lake deepest area at south end	Three times between June 15 and September 15, at least 30 days apart	Chlorophyll *a*, Phytoplankton taxonomy and biomass Zooplankton metals, taxonomy, and biomass	N/A
QUL-ZOO-1	E306455	Quesnel Lake zooplankton station at Hazeltine	Three times between June 15 and September 15, at least 30 days apart	Chlorophyll *a*, Phytoplankton taxonomy and biomass Zooplankton metals, taxonomy, and biomass	N/A
QUL-ZOO-7	E306456	Quesnel Lake zooplankton station at Horsefly	Three times between June 15 and September 15, at least 30 days apart	Chlorophyll *a*, Phytoplankton taxonomy and biomass Zooplankton metals, taxonomy, and biomass	N/A

N/A = not applicable; IDZ = initial dilution zone.

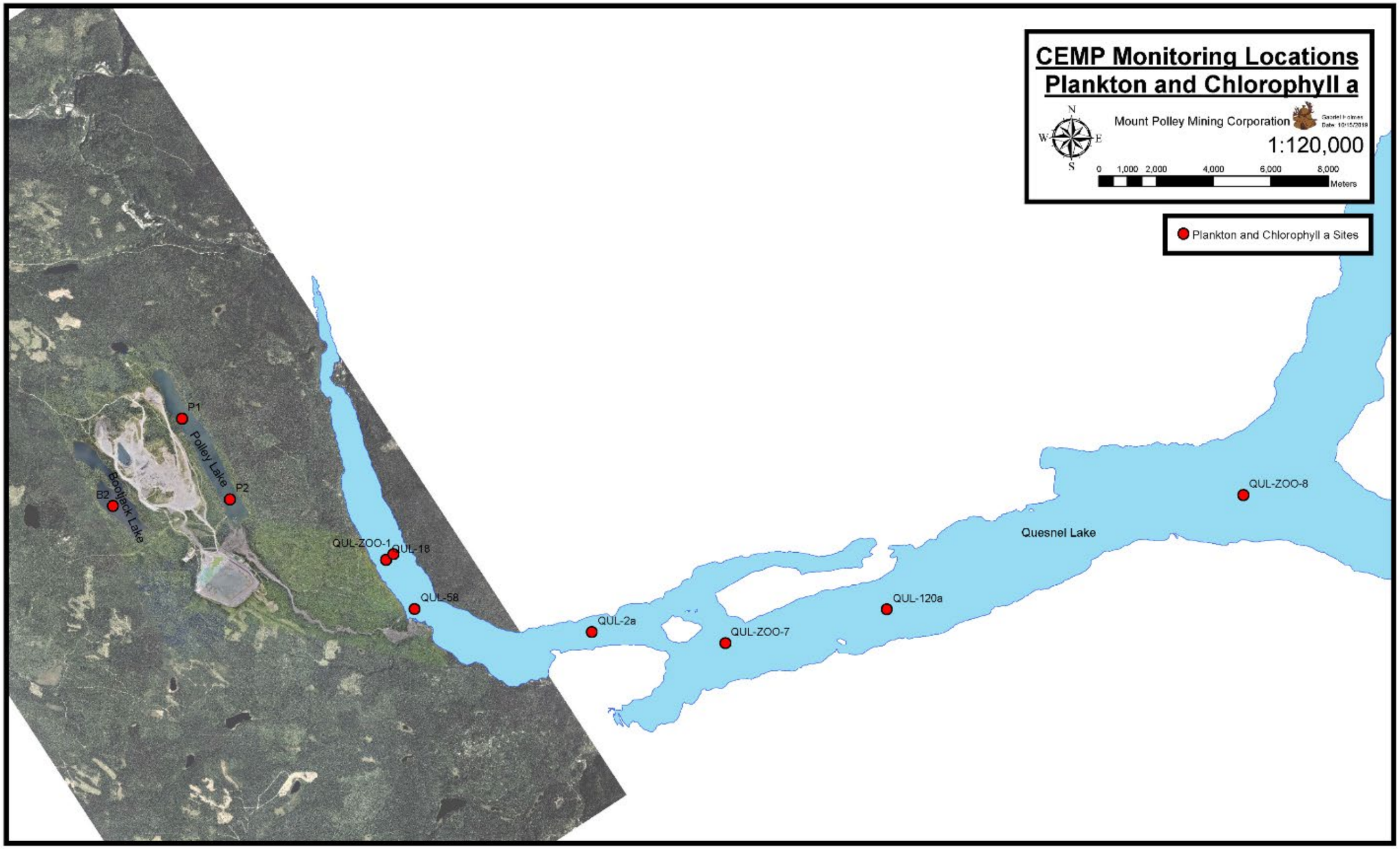

Figure 7.6-1: CEMP Monitoring Locations – Plankton and Chlorophyll *a* Monitoring

7.7 References

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8 HEALTH AND SAFETY

8.1 Occupational Health Risk Assessment

8.1.1 Occupational Health Risk Assessment

This information is not required in the permit application for the Project.

8.1.2 Ergonomics

This information is not required in the permit application for the Project.

8.1.3 Emergency Wash Facilities

This information is not required in the permit application for the Project.

8.1.4 Hazardous Dust

This information is not required in the permit application for the Project.

8.1.5 Lunchrooms, Mine Dry, and Sanitary Conveniences

This information is not required in the permit application for the Project.

8.2 Post Permitting Requirements

This information is not required in the permit application for the Project.

8.2.1 Issued for Construction Plans

Issued for constructions plans are included in the detailed design report for the TSF interim raise to elevation 974 m is included in Appendix 1-3.

8.2.2 Letters of Assurance

This information is not required in the permit application for the Project.

8.2.3 Occupational Health Programs

This information is not required in the permit application for the Project.

8.2.4 Workplace Hazardous Materials Information System (WHMIS)

This information is not required in the permit application for the Project.

8.2.5 Additional Information and Certifications

This information is not required in the permit application for the Project.

9 MANAGEMENT PLANS

9.1 Environmental Management System

MPMC’s Environmental Management System (EMS) is a structured framework that helps identify, monitor, manage, and continuously improve environmental performance. The primary goal of the EMS is to integrate environmental considerations into MPMC's overall business strategy and operations. Here is a summary of key components and principles of the EMS:

4) **Policy and Procedure Development:** Establishing an environmental policy that reflects MPMC's commitment to compliance with applicable environmental laws and regulations, pollution prevention, and continual improvement.

5) **Planning:** Conducting an initial environmental review to identify significant environmental aspects and impacts, legal requirements, and stakeholder expectations. This information is used to set environmental objectives and targets.

6) **Implementation and Operation**: Allocating responsibilities, providing training, and establishing communication processes to ensure that the environmental policy is implemented effectively. This includes developing procedures and documentation to support environmental management.

7) **Monitoring and Measurement:** Regularly monitoring and measuring key environmental performance indicators to track progress toward objectives and targets. This involves routine inspections, data collection, analysis and interpretation.

8) **Evaluation of Compliance:** Ensuring that MPMC is aware of and compliant with relevant environmental legislation and regulations. This involves continuous compliance tracking and assessment.

9) **Review and Improvement:** Conducting periodic management reviews to evaluate the effectiveness of the EMS and management plans, assess progress toward objectives, and identify opportunities for improvement. This includes updating the environmental policy and objectives as needed.

10) **Documentation and Record Keeping:** Maintaining accurate and up-to-date documentation of the EMS, including quality assurance and quality control strategies, policies, procedures, and records of environmental performance.

11) **Emergency Preparedness and Response:** Establishing procedures to identify and respond to potential environmental emergencies or accidents.

Environmental Policy

At Imperial Metals, the pursuit of sustainability guides our approach to business. Our objective is to manage and protect the air, water, land, vegetation, wildlife, and heritage resources of the land, on which our mines are active, to support returning land use objectives following closure of the mine. Through this policy we commit to:

- Comply with applicable legal, regulatory, and other requirements which relate to our operations identified environmental aspects.
- Annually update our Comprehensive Environmental Monitoring Plan (CEMP) to evaluate the effects of mining related activities on surface and groundwater quality, sediments, soils, aquatic ecosystems, fish, vegetation, and wildlife.
- Maintain a positive water balance by minimizing site contact water, recycling on-site water, using enhanced evaporation techniques, and sending excess contact water to an on-site water treatment plant.
- Share information about mine activities and results of monitoring programs with the Mount Polley Public Liaison Committee (PLC) members, and for the members to ask questions regularly with the T'exelc First Nation and the Xatśūll First Nation as a component of the Partnerships Agreement.
- Prevention of pollution.
- Making this policy available to our employees, contractors, visitors, and the public.
- Raising the environmental awareness of our employees, contractors, and visitors.

Environmental management roles and responsibilities are distributed as follows:

General Manager

- General oversight regarding environmental department activities as reported by the Environmental Superintendent. Responsible for budgetary oversight.

Environmental Superintendent

- Oversight regarding all Environmental Department activities including budgetary oversight, permit compliance, resource management, stakeholder engagement, EMS implementation, environmental research and development and regulatory reporting.

Environmental Coordinator

- Oversight regarding all Environmental Department activities including day to day environmental operations and supports activities regarding permit compliance, resource management, stakeholder engagement, EMS implementation, environmental research and development and regulatory reporting.

MPMC is an operating mine that is subject to extensive environmental regulatory oversight. The following is a list of relevant acts, and regulation MPMC is subject to:

Provincial Acts and Regulations

- *BC Drinking Water Protection Act*
- *BC Environmental Assessment Act*
- *BC Environmental Management Act* (EMA)
  - EMA Permit 11678
  - EMA Permit 14590
  - EMA Permit15968
  - EMA Permit 15087
- *BC Forest Act*
- *BC Greenhouse Gas Industrial Reporting and Control Act*
- *BC Heritage Conservation Act*
- *BC Land Act*
- *BC Mineral Land Tax Act*
- *BC Mineral Tax Act*
- *BC Mineral Tenure Act*
- *BC Mines Act*
  - *Mines Act* Permit M-200
- *BC Range Act*
- *Riparian Areas Protection Act*
- *BC Trasport of Dangerous Goods Act*
- *BC Water Protection Act*
- *BC Water Sustainability Act*
  - Conditional Water License 132360
  - Conditional Water License 500331
- *BC Weed Control Act*
- *BC Wildfire Act*
- BC Contaminated Sites Regulation

- BC Greenhous Gas Emission Reporting Regulation
- BC Hazardous Waste Regulation
- BC Municipal Wastewater Regulation
- BC Spill Reporting Regulation
- BC Spill Contingency Planning Regulation

Federal Acts and Regulations

- *Canadian Environmental Protection Act*
- *Canadian Fisheries Act*
- *Canadian Species at Risk Act*
- *Canadian Migratory Birds Convention Act*
- *Canadian Wildlife Act*
- *Canadian Environmental Assessment Act*
- *Canadian Environmental Enforcement Act*
- *Canadian Environmental Violations Administrative Monetary Penalties Act*
- *Canadian Navigable Waters Protection Act*
- Metal and Diamond Mine Effluent Regulation
- Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulation

In addition, MPMC's management practices align with provincial and federal best management practices. The following is a list of relevant best management practices applied at Mount Polley Mine:

- BC Field Sampling Manual
- BC Laboratory Manual
- Requirements and Best Management Practices for Making Changes In and About a Stream
- Timing Windows and Measures to Adequately Manage and Conserve Aquatic Resources in the Cariboo Region
- Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in BC
- Best Management Practices for Bats in BC – 2016
- Best Management Practices for Amphibian and Reptile Salvages in BC

Organizational Structure

Mount Polley Mining Corporation is a hybrid centralized and decentralized organizational structure with static and dynamic elements. Organizational function is distributed departmentally with a hierarchy of responsibility built into respective departments and overall company structure. Static elements include operational processes infrastructure connected by operational objectives. Dynamic elements include implementation of mining technologies and mining workflow systems.

Training

Relevant environmental management training in all applicable departments is ongoing at Mount Polley Mine. Management and frontline supervisors are trained on MPMC's EMS components on an ongoing basis because they are "live" documents and are modified periodically. Management and frontline supervisors are expected to disseminate management plans and expectations when applicable. The following plans are examples of training materials provided to staff at the mine:

- MPMC Annual Discharge Plan
- MPMC Biosolids Management Plan
- MPMC Environmental Communications Plan
- MPMC Fugitive Dust Management Plan
- MPMC Environmental Emergency Response Plan
- MPMC Flocculant Management Plan
- MPMC Ground Control Plan
- MPMC Invasive Plant Management Plan
- MPMC Nitrogen Management Plan
- MPMC ML/ARD Management Procedure Manual
- MPMC Sediment and Erosion Control Management Plan
- MPMC Soil Management Plan
- MPMC Wildlife Management Plan

In addition, site wide training programs for waste management, spill response and bear awareness have also been developed.

9.2 Surface Erosion Prevention and Sediment Control Plan

The Surface Erosion Prevention and Sediment Control Plan is provided in Appendix 9-1 along with the declaration of competency and conflict of interest for the signing professional engineer. In 2010, MPMC prepared an Erosion and Sediment Control Plan (ESCP) in compliance with their EMA Permit 11678. The Plan addresses existing and potential surface erosion and sediment mobilization impacts associated with mine expansion, operation, and decommissioning activities, and applies to all MPMC employees and contractors. The main objective of the Plan is to prevent erosion and intercept potential sediments as close to the source as possible. Erosion and sediment control measures and best management practices are incorporated in the Plan as approaches to prevent erosion and the introduction of sediment into natural watercourses and water bodies adjacent to the Mine site. The Plan is designed to be updated to incorporate advancements in erosion and sediment control science and Best Management Practices technology.

The MPMC discharge Permit 11678 was amended in December 2022 with some new and additional requirements, one of which is that a QP review the current ESCP. QPs in WSP with experience in erosion and sediment control reviewed the ESCP as per this requirement.
A technical memo summarizing the findings of the review was submitted to MPMC for inclusion with their 2023 annual report to regulators. The 2023 update of the Plan is based on recommendations of the review.

9.2.1 Methods of Erosion Prevention and Sediment Control

Surface erosion prevention and sediment control at the Mine site involves planning, implementation, operation, and monitoring of Best Management Practices in order to limit the mobilization and transport of sediment from the site to the receiving environment. The ESCP consists of three components:

- Site control: upstream diversion channels are used to reduce water contact with disturbed areas.
- Source Control: Active and passive control methods are used to minimize erosion.
- Conveyance and sediment control: This is used to control mobilization of sediment.

Activities during construction, operation and decommissioning during which erosion and sediment control measures are used include:

- Vegetation clearing
- Topsoil stripping
- Topsoil stockpiling
- Road and infrastructure construction
- Tailings and water management structures construction.

The ESCP has been developed for the Mine site for activities during the three phases of construction, operation and decommissioning. Short-term and long-term methods of erosion and sediment control include structural and non-structural measures.

Non-structural methods include:

- Inspection
- Contact Water Monitoring
- Receiving Environment Monitoring
- Management of Emergency Release of Water
- Conducting work during regulated in-stream work windows
- Complying with permitting, notification and reporting requirements of projects
- Provision of appropriate training and awareness to supervisors, employees, and contractors regarding their responsibilities to comply with water quality legislation.

Structural methods are used to stabilize areas to prevent movement of sediment into watercourses and waterbodies. These include:

- Gravel and straw cover
- Rip-rap
- Slope flattening or benching
- Surface ripping and roughening to promote infiltration
- Diversion berms and drains
- Sandbags
- Erosion blankets
- Geosynthetic membranes
- Concrete canvass.

Treatment methods to manage sediment delivery to watercourses and waterbodies include:

- Check dams
- Sediment ponds
- Silt fences/straws
- Runoff collection ditches

During decommissioning and reclamation, the following steps would be implemented to reduce erosion and meet land use and land capability objectives:

- Grade and contour any disturbed areas to promote drainage and conform to adjacent topography.
- Apply soil in a rough manner to create microtopography.
- Apply coarse woody debris, as available, to the reclamation site if it is not already incorporated into the soil.
- Seed and/or plant disturbed areas with a suitable mixture of grass, legume and woody species to establish ground cover and provide stabilization in a timely manner.
- On disturbed areas with potential to impact natural water bodies or watercourses, maintain temporary stabilization measures, such as geotextile or mulch until a vegetative cover is established.

Site monitoring and inspections of sediment and erosion control systems are based on associated risk to the environment. Table 9.2-1 relates potential sediment sources to these sensitive areas and assigns a level of risk based on sensitivity of the receiving environment (receiver size, fish bearing status, etc.) adjacent to Mount Polley Mine site and erosion potential.

Table 9.2-1: Risk Assessment of Receiving Waterbodies and Watercourses Adjacent to Mount Polley Mine Site (Appendix 9-1)

Receiving Environment Area	Area Sensitivity	Primary Potential Source(s)	Secondary Potential Source(s)[a]	Erosion Potential Considerations[b]	Risk[c]
6 km Creek	▪ Not fish bearing in upper reaches. ▪ Variable forest buffer.	▪ Access road. ▪ Junction Zone Ditch or 9 km Sump.	▪ NW PAG Stockpile soil stockpiles ▪ NW PAG Stockpile/Junction Zone Ditch access roads. ▪ NW Sump.	▪ Established gravel ditch bottom. ▪ Upstream area mostly covered with waste rock. ▪ Soil stockpiles revegetation. ▪ Two high traffic road crossings.	Medium.
Mine Drainage Creek	▪ Not fish bearing. ▪ Connected to Bootjack Lake.	▪ Mine Drainage Creek Sump. ▪ West Ditch.	▪ Waste Haul Road. ▪ Helipad reclamation parcel. ▪ Crusher Access Road. ▪ Ore Switchback Road. ▪ Cariboo. Stockpile and soil stockpiles. ▪ Pipeline from Springer Pit to water treatment plant.	▪ Some unarmoured ditch sections. ▪ Some till placed on outer slope of Waste Haul Road. ▪ Active haul traffic on roads (can develop sediment-laden puddles). ▪ Caribou Stockpile soil stockpiles new. ▪ Helipad reclamation parcel revegetating. ▪ Majority of runoff into ditch (including from reclamation and soil stockpile areas) filters through rock haul road. ▪ Water in pipeline to treatment plant contains low total suspended solids.	Medium.
W20 Creek	▪ Fish bearing (very low productivity). ▪ Variable forest buffer.	▪ West Ditch. ▪ West Ditch Access Road.	▪ Light Vehicle Tailings Road. ▪ Waste Haul Road. ▪ Above Waste Haul Road reclamation parcel. ▪ Pipeline from Springer Pit to water treatment plant.	▪ Ditch armoured. ▪ Reclamation parcel revegetating; upstream of Waste Haul Road. ▪ Active haul traffic on roads (can develop sediment-laden puddles). ▪ Water in pipeline to treatment plant contains low suspended solids. ▪ Majority of runoff into ditch filters though rock haul road.	Medium.

Table 9.2-1: Risk Assessment of Receiving Waterbodies and Watercourses Adjacent to Mount Polley Mine Site (Appendix 9-1)

Receiving Environment Area	Area Sensitivity	Primary Potential Source(s)	Secondary Potential Source(s)[a]	Erosion Potential Considerations[b]	Risk[c]
Bootjack Lake	▪ Fish bearing. ▪ Medium sized receiver. ▪ Variable forest buffer.	▪ NW Sump. ▪ NW Ditch. ▪ Mine Drainage Creek Sump. ▪ West Ditch. ▪ West Ditch Access Road. ▪ Mine Drainage Creek. ▪ W20 Creek.	▪ Waste Haul Road. ▪ Helipad reclamation parcel. ▪ Crusher Access Road. ▪ Ore Switchback Road. ▪ Caribou Stockpile and soil stockpiles. ▪ Light Vehicle Tailings Road. ▪ Waste Haul Road. ▪ Above Waste Haul Road reclamation parcel. ▪ Pipeline from Springer Pit to water treatment plant.	▪ Some unarmoured ditch sections. ▪ Some till placed on outer slope of Waste Haul Road. ▪ Active haul traffic on roads (can develop sediment-laden puddles). ▪ Caribou Stockpile soil stockpiles new. ▪ Reclamation parcels revegetating. ▪ Water in pipeline to treatment plant contains low total suspended solids. ▪ Majority of runoff into ditch filters through rock dumps and rock haul roads.	Medium.
North Dump Creek	▪ Not fish bearing in upper reaches. ▪ Variable forest buffer.	▪ Joe's Creek Coffer Dam. ▪ Joe's Creek Pipeline. ▪ Gavin's Ditch (clean water diversion). ▪ Wight Pit Ditch (clean water diversion). ▪ Wight Pit Haul Road.	▪ North Bell Dump reclamation areas and soil stockpiles. ▪ Access Road. ▪ East Dump reclamation areas and soil stockpiles.	▪ Joe's Creek Coffer Dam/Pipeline water very low turbidity/suspended solids. ▪ Ditches armoured or have established of have low-erodibility substrates except some potentially erodible sections in Wight Pit Ditch. ▪ East Dump reclamation area in early stages of revegetation. ▪ Varying levels of soil stockpile revegetation (some new). ▪ Two moderate use road crossings.	Medium.

Table 9.2-1: Risk Assessment of Receiving Waterbodies and Watercourses Adjacent to Mount Polley Mine Site (Appendix 9-1)

Receiving Environment Area	Area Sensitivity	Primary Potential Source(s)	Secondary Potential Source(s)[a]	Erosion Potential Considerations[b]	Risk[c]
Bootjack Creek	▪ Not fish bearing ▪ Connected to Polley Lake.	▪ Bootjack Creek Sump. ▪ Tailings Access Road Ditch. ▪ SERDS Ditch.	▪ Tailings Access Road. ▪ Tailings Access Road soil stockpiles. ▪ SERDS access roads. ▪ Southeast Zone soil stockpiles.	▪ Some erodible ditch sections. ▪ Portion of runoff into ditches filters through waste rock roads/dumps. ▪ Three high use road crossings.	Medium.
Polley Lake	▪ Fish bearing. ▪ Undergoing rehabilitation. ▪ Sedimentation ponds constructed at outflow.	▪ Wight Pit Ditch (clean water diversion). ▪ Long Ditch. ▪ North Dump Creek.	▪ North Bell Dump reclamation areas and soil stockpiles. ▪ Access Road. ▪ NEZ Dump reclamation area and soil stockpile. ▪ East Dump reclamation areas and soil stockpiles. ▪ Tailings Access Road. ▪ Tailings Access Road soil stockpiles. ▪ SERDS access roads. ▪ Southeast Zone/SERDS soils stockpiles.	▪ Varying levels of revegetation of upstream reclamation areas and soil stockpiles. ▪ Ditches armoured or have established low-erodibility substrates except some potentially erodible sections of Wight Pit Ditch.	Low.

Table 9.2-1: Risk Assessment of Receiving Waterbodies and Watercourses Adjacent to Mount Polley Mine Site (Appendix 9-1)

Receiving Environment Area	Area Sensitivity	Primary Potential Source(s)	Secondary Potential Source(s)[a]	Erosion Potential Considerations[b]	Risk[c]
Hazeltine Creek[d]	▪ Fish bearing. ▪ Undergoing rehabilitation. ▪ Sedimentation ponds constructed at outflow.	▪ Polley Lake. ▪ Long/SERDS Ditch (combined). ▪ Central Collection Sump. ▪ Perimeter Till Borrow Pit and ditch from Central Collection Sump. ▪ Pipeline from Springer Pit to water treatment plant. ▪ Edney Creek.	▪ TSF and associated infrastructure. ▪ TSF Perimeter Embankment and PAR soil stockpiles. ▪ TSF Ditch (clean water diversion). ▪ TSF South Toe Drain Ditch. ▪ TSF Main Seepage Pond. ▪ ABR/Main Seepage Pond Ditch.	▪ High volume water transfers. ▪ Water has time to settle in the TSF and Perimeter Embankment Till Borrow Pit. ▪ Water in pipeline to treatment plant contains low total suspended solids. ▪ Soil stockpiles varying levels of revegetation. ▪ South Till Borrow area revegetation is advanced. ▪ Active TSF construction upstream.	Medium (Risk will increase when the creek returns to fish-bearing status).
Edney Creek	▪ Fish bearing. ▪ Forest/wetland buffer.	▪ TSF Ditch (clean water diversion). ▪ TSF South Seepage Pond. ▪ TSF South Toe Drain Ditch. ▪ TSF Main Seepage Pond. ▪ ABR/Main Seepage Pond Ditch. ▪ South Till Borrow reclamation area.	▪ TSF and associated infrastructure. ▪ South and Main Embankment soil stockpiles.	▪ Few erodible ditch sections. ▪ Low water volumes managed. ▪ Water seepage ponds contain low turbidity/suspended solids. ▪ New soil stockpiles (early stages of revegetation). ▪ Active TSF construction upstream. ▪ South Till Borrow area revegetation is progressing.	Low.

a) Secondary sources are potential sources of sediment that are upstream of (i.e., potentially contribute to) primary erosion.

b) Historic turbidity and total suspended data in relevant water collection infrastructure were considered when assessing erosion potential; water management contingency measures in place across water management system.

c) Based on combination of area sensitivity and erosion potential.

d) Sediment and erosion control in Hazeltine Creek beyond the mine footprint related to the Tailings Storage Facility embankment breach is managed under a separate program.

9.2.2 Roles, Responsibilities and Training Requirements

Mine Manager: The Mine Manager will be aware of the ESCP and how the proposed mining activities could affect soil erosion potential and sediment delivery to adjacent watercourses and water bodies. The Mine Manager is accountable for allocating resources for implementing the erosion prevention and sediment control measures outlined in the ESCP to comply with relevant water quality guidelines and applicable water quality objectives.

Environmental Manager: The Environmental Manager will be primarily accountable for implementing the requirements of the ESCP, including monitoring and reporting activities. The Environmental Manager will be aware of the relevant legislation and permit requirements listed in Section 2.2 of Appendix 9-1 for the purpose of ensuring compliance with the regulatory requirements. Responsibilities of the Environmental Manager will include:

- Implementation and ongoing maintenance and update of the ESCP.
- Tracking compliance with provincial and federal legislation and applicable permit conditions.
- Communicating environmental requirements to the Mine Manager.
- Investigating and reporting environmental incidents.
- Developing and implementing adaptive management strategies to address environmental risks, incidents, and non-compliance situations.

The Environmental Manager will use an external QP who has specific expertise in erosion protection and sediment control as may be necessary for appropriate implementation of the ESCP. This may require retaining a QP to provide topic-specific training to the Environmental Manager and any other employees and contractors of MPMC for implementation of specific tasks needed to implement the ESCP.

Employees: All employees and contractors involved in the planning, design, and carrying out of earth disturbance works at the Mine site will be required to undergo a basic orientation and to become familiar with the contents of the ESCP. Training will be provided to all such employees and contractors.

9.2.3 Monitoring

Daily inspections of site water containment infrastructure are carried out as per the Water Management Inspection Manual to verify the collection system is working as designed. As per this document, inspections are done at least once on day shift and night shift during high-risk periods (i.e., freshet). The inspection form template is included as Appendix C of Appendix 9-1. Completed forms are provided to the Environmental Department for review and filing at the end of each seven (7) day set. Note that protocols and triggers are in place for immediate notifications to occur if deficiencies are observed. Daily inspections are the responsibility of Mill Maintenance, and the Environmental and Engineering Departments are responsible for updating the Water Management Inspection Manual, which is a component of the site Operation Maintenance and Surveillance Manual.

Inspections of all site water management infrastructure (sumps, ditches, culverts, etc.) are carried out in spring after freshet and in fall prior to freeze up, as per EMA Permit 11678. This is the responsibility of the Environmental Department. Results are documented in the inspection form (refer to the template provided as Appendix D of Appendix 9-1) and filed internally. Inspection results are used to inform upgrades of water management infrastructure components. Noted deficiencies, including areas of sedimentation or erosion, are compiled and prioritized in a project list which is provided to the Engineering Department to address, based on the identified levels of urgency.

9.2.3.1 Contact Water Monitoring

Routine monitoring of mine site contact water conveyed through various infrastructure components is conducted as per Mines Act Permit M-200. This sampling program, including sample locations, frequencies, and quality assurance and quality control quality procedures, is detailed in the site Operation Maintenance and Surveillance Manual, which is regularly updated to account for operational changes at the mine site. All routine samples collected on site are analysed for physical parameters (including total suspended solids and turbidity), anions, nutrients, and total and dissolved metals. Monitoring locations and frequencies (at the time of this update) are shown in Figure 3 of the Surface Erosion Prevention and Sediment Control Plan in Appendix 9-1.

These sample results are included in the Annual Environmental and Reclamation Report to BC ENV and the EMLI, which is written and submitted by the Environmental Department.

9.2.3.2 Receiving Environment Monitoring

The Environmental Department conducts water quality monitoring in receiving environment water bodies and watercourses as per MPMC's CEMP, which is required under EMA Permit 11678. Note that chemistry and flow monitoring at a few contact water sites is included under this program, as opposed to the EMLI program, including monitoring related to the permitted effluent discharge. In addition to regular sampling (e.g., monthly, quarterly), a five (5) week intensive turbidity and total suspended solids monitoring program is conducted in spring and fall in receiving environment streams that could potentially be impacted by erosion from the mine. This includes the following creeks downstream of inflows from runoff diversion ditches:

- North Dump Creek;
- Bootjack Creek;
- Edney Creek; and
- Hazeltine Creek (temporarily suspended due to the TSF breach).

9.2.4 Erosion and Sediment Control during Construction

Construction should comply with the plans developed in the pre-construction phase so that work is conducted in a manner that avoids or minimizes erosion and the discharge of silt, sediment or other deleterious substances (as defined in the *Fisheries Act*) into a watercourse, thereby preventing "pollution" (as defined in the EMA). Changes to the construction plan are to be reviewed by the appropriate Environmental Department and Engineering Department staff prior to implementation to allow sediment and erosion control plans to be revised accordingly.

Monitoring is to be carried out throughout the construction phase. Actions and maintenance that may be required based on monitoring observations include:

- Correcting deficiencies of the erosion and sediment control measures as soon as they are observed.
- Removal of any sediment and debris accumulation that compromises the effectiveness of the erosion and sediment control measures.
- Implementation of additional stabilization and treatment measures.

Additional measures recommended for all stages of construction include:

- Monitor weather forecasts for upcoming rainfall or other climatic conditions that may affect the construction works and surrounding environment.
- Suspend work in areas adjacent to natural water bodies or watercourses during heavy precipitation or runoff conditions.

- Follow the project CEMP (especially for pumping, diversion, or relocation of water undertaken) and revise it if the project work plan changes.
- Refer to the site Emergency Response Plan in the event of a major incident.

9.2.5 Stabilization and Treatment Methods

Sediment control measures are to be planned and, if required, installed prior to clearing or earthwork activities. Stabilization measures are put in place to prevent or reduce the mobilization of sediment by stabilizing the source (e.g., exposed soils). Typical interim measures that may be used to stabilize areas that have the potential to be sources of sediment to water bodies or watercourses include:

- Non-vegetative cover (e.g., gravel and straw);
- Rip-rap placement;
- Slope modification to reduce erosive energy (e.g., flattening or benching);
- Surface ripping and roughening to promote infiltration;
- Diversion berms and drains (in particular to intercept upstream runoff);
- Chute construction;
- Sandbags;
- Buffer zones; and
- Erosion blankets.

While pro-active stabilization measures are used to avoid the presence of sediment laden water, treatment measures may be necessary when it is not possible to completely prevent the mobilization of sediment. Typical treatment measures that may be used to manage sediment in contact water include the following:

- Check dams or weir drop structures;
- Outlet protection;
- Sediment retention ponds, sediment traps and sediment basins;
- Silt fence or similar barrier, such as straw; and
- Swales.

9.2.6 Runoff Collection Ditches

Runoff collection ditches may be either temporary or permanent structures. Permanent surface runoff control works should be sized to convey runoff from a 1 in 10 year 24-hour flood flow and to withstand a 1 in 200-year 24-hour event without significant damage as per BC ENV Permit 11678.

The design of sections of ditch may depend on topography, excavation material (till or bedrock) and design discharge. Different material gradations or design approaches may be used for armouring depending on site-specific conditions and material availability. Any convergences with other ditches or streams should be armoured.

Some initial flushing, erosion and self-armouring are expected following construction, and appropriate measures should be taken for non-contact water ditches discharging into the receiving environment. For example, small ponds with rock overflow weirs can be constructed or this water can temporarily be collected in mine contact water systems until it is of appropriate quality to discharge. With aging, erosion and sediment runoff will be controlled to be comparable to natural conditions; however, inspections and monitoring (refer to Section 7 of Appendix 9-1) are required to confirm appropriate sediment control.

9.2.7 Sediment Control Ponds

A sediment control pond is used to detain runoff from a disturbed area so that sediment can settle out of the water column. Sediment control ponds should be designed according to the "Guidelines for the Design, Size, and Operation of Sedimentation Ponds used in Mining" (BC MoE, 2002), where applicable.

9.2.8 Severe Weather Shutdown

In the event that an emergency release of water from the site collection system occurs, the protocol in the Water Management Inspection Manual outlining responsibilities, notification requirements, documentation (refer to the form in Appendix E of Appendix 9-1), and actions to carry out would apply. One key action is the installation of sediment and erosion control materials and/or structures.

Monitoring associated with an emergency release of water is the responsibility of the Environmental Department, and should include the following:

- Assessment of the spatial extent of the release and if the release reached receiving environment waterways or water bodies;
- Monitoring of water released (visual observations, flow measurements/estimates, field parameters including turbidity, and/or sampling, based on the observed location, conditions and size of the release); and

- Monitoring (visual observations, field parameters including turbidity, and sampling) of downstream waterways or waterbodies into which water was released.

Reporting to Emergency Management BC and follow up reporting to provincial regulatory agencies will likely require this information, in addition to the information required to be collected as per the Water Management Inspection Manual.

9.2.9 Emergency Release of Water

If emergency release of water from the site water collection system should occur, sediment and erosion control materials are to be installed, as required, to avoid the displacement of sediment as water moves over land. These materials are stored in the Environmental C-Can located beside the Leach Pad, and the Environmental Department staff is available to guide proper installation. The Mount Polley Emergency Response Plan and Water Management Inspection Manual outline in more detail response protocol for such events, and Section 7.2 of Appendix 9-1 outlines event-based monitoring procedures.

9.2.10 Collection and Analysis of Relevant Data and Risk Assessment

Site monitoring and inspections of sediment and erosion control systems are based on associated risk to the environment. Figure 9.2-1 identifies environmentally sensitive areas (i.e., receiving environment waterways) adjacent to the Mount Polley Mine footprint that could potentially be impacted by sedimentation (). It also shows the location of contact water conveyance structures, areas undergoing progressive reclamation and soil stockpile locations, which are potential sources of sediment. Table 2 of Appendix 9-1 relates potential sediment sources to these sensitive areas and assigns a level of risk based on sensitivity of the receiving environment (receiver size, fish bearing status, etc.) and erosion potential. Note that Hazeltine Creek and adjacent areas impacted by the August 4, 2014, TSF breach are outside of the scope of this document.

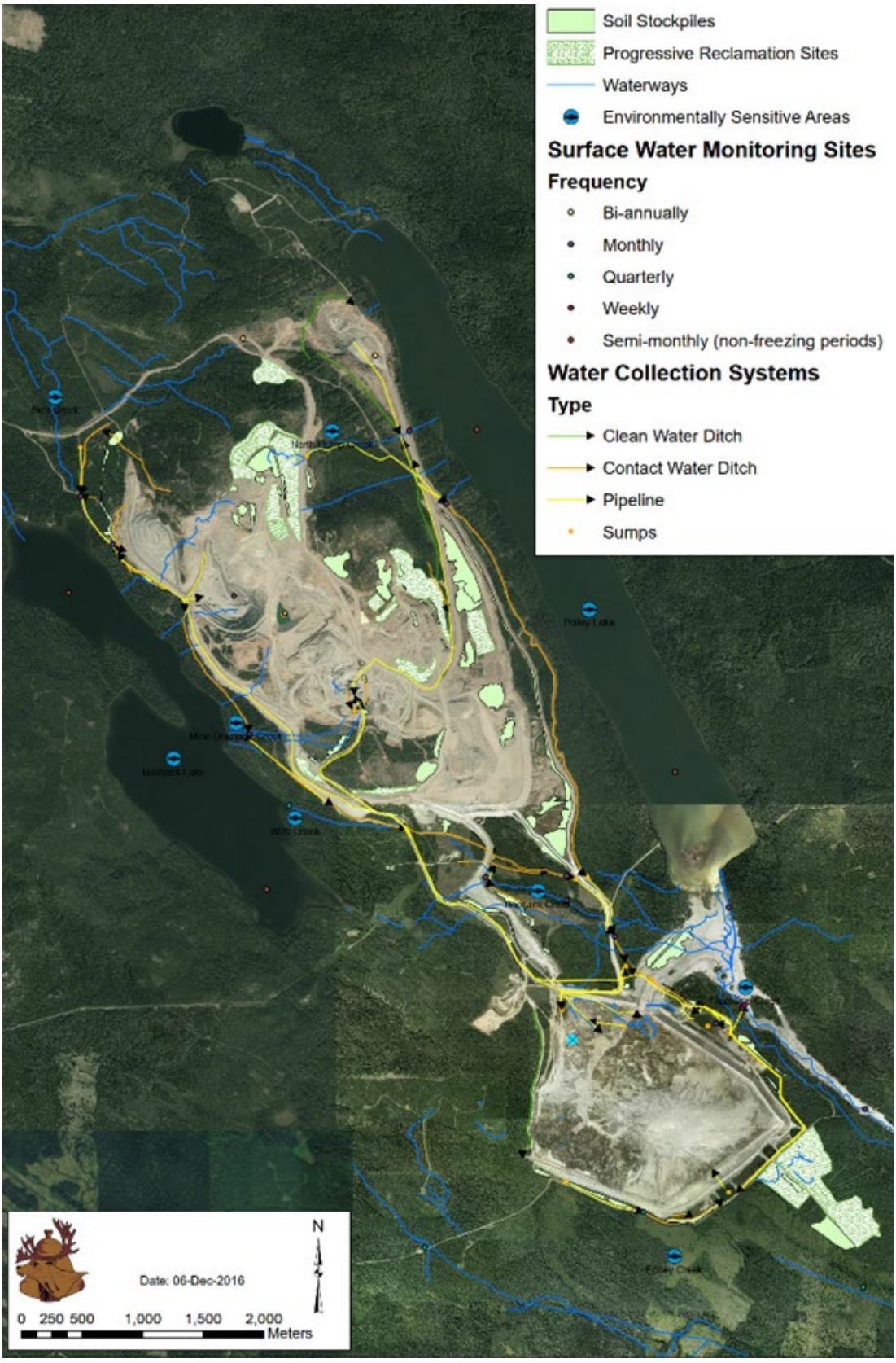


Figure 9.2-1: Surface Water Monitoring Sites

9.2.11 Erosion and Sediment Control during Mine Operation

9.2.11.1 Collection of Mine Contact Water

Collection of runoff from disturbed areas on site that may impact water quality in the receiving environment is to be carried out across the mine site. Thus, runoff from disturbed areas that potentially contains sediments is not directly released to the environment. Water from these collection systems is stored on site and is not permitted to be discharged to the environment unless specific regulatory requirements are met. These requirements include maximum allowable total suspended solids and turbidity levels, necessitating removal of suspended sediments through active or passive treatment prior to discharge.

To minimize the volume of contact water collected and stored at the site, upstream ditches to divert non-site contact water may be constructed. As water from these works enters the receiving environment, for construction of new diversion ditches, an environmental management plan will be developed and followed for construction and commissioning.

9.2.11.2 Emergency Release of Water

If emergency release of water from the site water collection system should occur, sediment and erosion control materials are to be installed, as required, to avoid the displacement of sediment as water moves over land. These materials are stored in the Environmental C-Can located beside the Leach Pad, and the Environmental Department staff is available to guide proper installation. The Mount Polley Emergency Response Plan and Water Management Inspection Manual outline in more detail response protocol for such events.

9.2.12 Implementation of the Plan

9.2.12.1 Closure

At closure, MPMC is responsible for leaving the mine site in compliant with all regulations, including site runoff water quality and revegetation to meet end land use and land capability objectives. The following steps should be implemented during reclamation works to reduce erosion:

- Grade and contour any disturbed areas to promote drainage and conform to adjacent topography.
- Apply soil in a rough manner to create microtopography.
- Apply coarse woody debris, as available, to the reclamation site if it is not already incorporated into the soil.
- Seed and/or plant disturbed areas with a suitable mixture of grass, legume and woody species to establish ground cover and provide stabilization in a timely manner.

- On disturbed areas with potential to impact natural water bodies or watercourses, maintain temporary stabilization measures, such as geotextile or mulch until a vegetative cover is established.

Detailed soil application and revegetation plans that include methods for reducing erosion are included in the site Reclamation and Closure Plan.

9.2.12.2 Soil Salvage

Under MPMC's Mines Act Permit M-200, surficial soils are required to be stripped from the areas to be disturbed in advance of construction of works including waste rock dumps, waste or ore stockpiles, and roads. Stockpiles are often required to store salvaged soils for later use in reclamation, and further erosion control considerations apply, in addition to the earthworks project considerations discussed above. Stockpile locations should have minimal exposure to wind, southwest sun, and runoff pathways. Stockpiles should be promptly seeded with a native seed mixture containing grasses and/or forbs. If stockpiles have the potential to impact natural watercourses or water bodies, temporary erosion and control measures should be installed and maintained until a vegetative cover is established. Refer to the MPMC SMP for additional details on the site protocol for soil salvage.

9.2.12.3 Post-Construction

When a project is completed, long-term sediment retention and erosion control measures should be implemented. These measures may include elements of the stabilization and treatment options as well as:

- Restricting access to areas being rehabilitated.
- Establishing a vegetative cover.
- Armouring areas receiving surface runoff.
- Slope modification to reduce erosive energy, such as flattening or benching.
- Surface ripping and roughening to promote infiltration.
- Diversion berms and drains (in particular to intercept upstream runoff).

Any interim measures should remain in place until long-term controls are established. When monitoring and inspections find long-term measures are sufficient, interim or temporary erosion and sediment control features may be reclaimed.

9.2.13 Reporting and Record Keeping

9.2.13.1 Annual Reporting

Site inspections and monitoring activities associated with surface erosion prevention and sediment control during the three phases of construction, operations, and closure will be documented and reported in accordance with the requirements of MPMC's EMA Permit 11678 and *Mines Act* Permit M-200.

9.2.13.2 Incident Reporting

Significant releases of sediment-laden water from onsite disturbed areas will be appropriately characterized concerning extent and loading and reported to Emergency Management BC and follow up reporting to provincial regulatory agencies as required by regulations and permits. The Environmental Manager will review the reports internally to identify necessary improvements in water management procedures.

9.3 Soil Management Plan

The SMP is provided in Appendix 9-2. The purpose of this Plan is to outline the procedures to characterize, salvage, store, and apply suitable growth material in accordance with regulatory requirements and to support reclamation of the Mine site to the desired land capability and end land uses. All surficial soil at the Mount Polley Mine identified through soil surveys as being appropriate for plant growth are salvaged and either used immediately in the reclamation program or stored in a suitable manner for future use. For convenience, the following subsections outline procedures for soil handling and management through the different stages of the mine life at the Mount Polley Mine. However, the reader is referred to the SMP in Appendix 9-2 for more detail.

9.3.1 Soil Characterization

Site-specific soil surveys must be completed for areas scheduled for disturbance by a qualified individual and submitted to the EMLI Chief Inspector for approval. The following survey procedure is recommended and is consistent with soil surveys previously conducted at Mount Polley Mine; however, this methodology may be modified by a qualified individual based on site conditions, existing information, and their experience.

1) Pre-stratify the area according to terrain using aerial photographs. Confirm the stratification is appropriate with a site inspection.
2) Select soil pit locations at representative sites or using a predetermined systematic grid or transect. Soil pit density may range from one pit per half hectare to one pit per two hectares, depending on site variability.

3) Expose the soil profile by machine excavation or hand-dug holes. Existing road cuts and excavations can also be cleaned for use.

4) Describe the soil and site characteristics at each soil profile location as per the BC Ministry of Environment standards and guidance in the "Field Manual for Describing Terrestrial Ecosystems" (BC MoE, 2010).

5) Sample soils at select, representative sites to provide local soil quality data. Sampling intensity may be adapted based on the level of preexisting soil quality data for the area.

6) Present and interpret the soil survey data in a report and recommend salvage depths for (1) soil appropriate for reclamation, and (2) subsoil which could be used in reclamation with soil amendments or as a subsoil.

9.3.2 Soil Salvage

9.3.2.1 Salvage Materials and Depths

Material to be salvaged is grouped into four types as described below, which should be stripped and stockpiled separately. Delineation of these materials in the field is to be supported by a qualified individual; however, some general field guidance is as follows.

1) Non-merchantable woody debris is to be salvaged prior to removing soil and stockpiled for use in reclamation (or immediately used in reclamation, if possible). Small woody debris may be stripped with soil and incorporated into soil stockpiles.

2) Soil appropriate for reclamation should be salvaged to the depth pre-determined in the site specific survey described in Section 2.1 of Appendix 9-2; however, as a general guide, soils are to be salvaged to the effective rooting depth.

3) Underlying subsoil is classified as the material between the soil horizons appropriate for reclamation and the soil parent material.

4) Organic soils from wetlands are recognizable by their black colour and "mucky" texture.

9.3.2.2 Procedure

A qualified individual representing the Environmental Department should train and oversee equipment operators to ensure salvage operations are completed to the specifications described in this Plan. Non-merchantable coarse woody debris is to be salvaged first and stockpiled (small woody debris can be mixed in with topsoil piles). Organic matter (grass, plants, chipped woody material, etc.) is to be incorporated into the topsoil piles by salvaging plant materials on the surface with the topsoil. Soil inventory and strata delineation information collected prior to salvaging will guide the stripping depths and are to be verified in the field by the Environmental Department representative overseeing salvage operations. Desired volumes of subsoil material are to be stripped in a second lift and stored in separate stockpiles from the topsoil.

9.3.3 Soil Stockpiling

When possible, it is preferable for soil to be directly applied for reclamation, allowing microbes and viable seeds to remain in the soil. If this is not possible:

1) Carefully select the storage location because once stockpiled, the soil should not be disturbed again until it is used in final reclamation. Minimize exposure to wind, southwest sun, and water/flooding. To minimize risk of sedimentation of natural water courses, stockpiles should, where possible, be located upstream of site water collection ditches.
2) Stockpile the soil in a manner that maximizes surface area and minimizes soil depth. When possible, the maximum depth should be the height of a pile dumped from a haul truck (~2.5m).
3) Promptly seed stockpiles with the custom MPMC native grasses and forbs blend or, in areas where invasive plant establishment is a concern (i.e., seed sources are present nearby), the custom MPMC aggressive seed mix. Both seed mixes are certified weed free. Revegetation will help to mitigate wind and water erosion, reduce risk of weedy species ingress, and maintain microbial activity.
4) Take a representative sample of the stockpile to assess soil quality, as per the procedure in Appendix A of Appendix 9-2.
5) Place signage on the stockpiles to avoid accidental disturbance.
6) Enter stockpile construction date, soil type, location, and soil volume into the Soil Stockpile Inventory spreadsheet and associated GIS map file. Document seeding in the Environmental Department Reclamation Field Book.
7) Add stockpile locations to site maps and plans for Mine Operations to avoid disturbance or loss of stockpiles.

9.3.4 Soil Stockpile Inspections

Inspection of soil stockpiles is to be completed annually. For each soil stockpile, the following information should be documented: date; photo number (if a photo is taken); percent vegetation coverage; percent invasive plant coverage; species present; signs of erosion and/or sedimentation; any erosion prevention works; and any additional comments or observations. Where possible, inspections should be completed in the summer months when vegetation is actively growing and easiest to identify. Results are to be reviewed and any stockpiles exhibiting erosion and/or poor vegetation coverage are to be added to MPMC's bi-annual seeding list for re-seeding in spring or fall when weather conditions are most appropriate for seeding. Alternative options for more significant erosion may be implemented, as per the MPMC Sediment and Erosion Control Plan (Section 9.2), such as berms or silt fences. Occurrences of invasive species are to be managed as per MPMC's Invasive Plant Management Plan

(Section 9.9). If a stockpile has been seeded twice, and still exhibits low vegetation cover, alternative vegetation options can be investigated, including:

- Amending the soil with compost tea or compost;
- Hydroseeding with a mulch/tackifier mixture designed for poor soil and/or steep slopes;
- Installation of horizontally placed logs to act as catch berms and retain moisture;
- Development of a seed mixture specifically designed for poor quality soils;
- Planting with primary successional shrubs. Willow and cottonwood can be planted using bioengineering techniques, such as live stakes and wattles, for additional erosion control.

9.3.5 Soil Amendment

Recommendations for amendment of soils to be used in reclamation are based on results from a site soil stockpile quality assessment conducted in September 2013, as well as results from ongoing reclamation research and progressive reclamation, provided in Appendix B of Appendix 9-2. Soil amendments may include biosolids and fertilizer, and recommendations for use are detailed in the site Reclamation and Closure Plan. If biosolids are used as a soil amendment, they can be mixed with the soil prior to application to ensure thorough mixing and to reduce compaction caused by the dual application of soil followed by biosolids.

9.3.6 Soil Application

Soil should be replaced to the depths specified for that Mine site unit in the site Reclamation and Closure Plan (Section 4.0) or research trial design. Following soil application, the site should be inspected and test pits dug to verify that the target soil depth was achieved across the site (accounting for the variability associated with site preparation).

9.3.7 Reporting

The following information will be submitted to the MEM, as well as the BC Ministry of Environment, each year in the MPMC Annual Environmental and Reclamation Report:

- An update of soil management and handling activities, including erosion and sediment control measures, and soil replacement depths on reclamation sites;
- An updated soil stockpile inventory, including stockpile volumes and locations;

MPMC also is required to submit an updated Reclamation and Closure Plan to MEM every five years (a minimum), as well as with all major permit amendment applications for changes to the mine plan. The Reclamation and Closure Plan is to include an updated material balance to verify that sufficient quantities of suitable soil are present to reclaim existing and planned disturbed areas to the recommended prescriptions (i.e., soil depths) for meeting land capability objectives.

Contingency options are to be assessed if sufficient volumes of suitable soil may not be available.

9.3.8 Responsibilities

Responsible individuals for implementing this Plan are described below.

Environmental Superintendent or designate (e.g., Environmental Coordinator):

- Be knowledgeable of and adhere to all aspects of this Plan.
- Ensure all other responsible individuals have reviewed the most up to date version of this Plan.
- Be aware of high level mine planning, to ensure that soil characterization and stripping supervision are incorporated into plans.
- Schedule and assign staff or external contractors to carry out all requirements of this Plan, including soil baseline characterizations, overseeing stripping operations, annual inspections, seeding, and reporting.
- Ensure that individuals conducting soil characterization surveys, overseeing soil stripping, and inspecting soil stockpiles have appropriate training.
- Ensure that this Plan is routinely updated to reflect changes in site conditions and procedures, and that the revised plan is submitted to MEM in the Annual Environmental and Reclamation Report and/or a Reclamation and Closure Plan update.

Qualified individual overseeing salvage operations (likely an Environmental Technician/Technologist):

- Be knowledgeable of and adhere to all aspects of this Plan.
- Coordinate with and supervise Mine Operations to ensure soil handling and management.
- procedures are followed during stripping operations.
- Maintain an up-to-date soil stockpile inventory and provide a soil management update in the Annual Environmental and Reclamation Report, as directed by the Environmental Superintendent.

Mine Planning Engineer and General Foreman:

- Notify the Environmental Superintendent or designate of planned disturbances that will require soil salvaging. Work with that individual to ensure that the soil is characterized prior to stripping and a qualified individual is present to oversee salvage operations.
- Assign appropriate equipment for handling soil.
- Work with the Environmental Superintendent or designate to assign areas for soil to be stockpiled or directly placed.
- Ensure that all material suitable for reclamation is stripped prior to expansion of mine works.

Mine Operations Supervisors:

- Coordinate with the qualified individual overseeing a salvage operation (likely an Environmental Technician or Technologist).
- Only allow operations to proceed when weather and soil moisture conditions are appropriate.
- Notify the General Foreman and qualified individual overseeing the salvage operation of any concerns that arise and address these concerns prior to proceeding with the work.

Mine Operations Operators:

- Follow instructions from the qualified individual overseeing a salvage operation (likely an Environmental Technician or Technologist) and Mine Operations Supervisors.
- Clarify uncertainties or address any concerns that arise with the Mine Operations Supervisor and/or qualified individual overseeing the salvage operation prior to proceeding with work.

9.4 Construction Environmental Management Plan

This section is not required as part of the joint application per the information requirements table. However, as part of the normal course of events, it is available to government on request.

9.5 ML/ARD Management Plan

The Metal Leaching/Acid Rock Drainage Management Plan is provided in Appendix 9-3.
The objective of these ML/ARD management procedures is to provide detail on how ML/ARD potential is considered in material management at the Mount Polley Mine (MPM). These management procedures summarize the various methods, procedures and considerations related to ML/ARD potential through mine life processes.

9.5.1 Background

Metal leaching and acid generation are naturally occurring chemical processes which may have negative impacts on the receiving environment. The potential environmental impact of ML/ARD will depend on their magnitude, the sensitivity of the receiving environment, dilution and/or attenuation, as well as any mitigation measures that are in place.

Metal leaching occurs as a result of weathering of metal-containing minerals (i.e., exposure to water and oxygen), drainage conditions that increase solubility, and flow of water through source materials. Acid generation occurs when minerals containing reduced sulphur (e.g., sulphide and elemental sulphur) are exposed to the weathering effects of oxygen and water. In iron sulphide minerals (e.g., pyrite) acidity is also generated when ferric iron precipitates. Other minerals in the source rock, primarily calcium and magnesium carbonates can neutralize the acid. ARD occurs when the amount of acid-generation exceeds the ability of the source rock to neutralize this acid. Any surplus acid is entrained in water and can create acidic and metal-containing run-off.

Pre-mining and operational geochemical characterization has shown that ARD potential at Mount Polley Mine is restricted due to the abundance of acid-consuming carbonate minerals compared to acid generating sulphide minerals. In addition, the presence of natural carbonate and oxide copper minerals in the pre-mining weathering zone reinforce the expectation that weathering conditions are dominantly basic. However, due to the potential consequences of acid generation for long term management of the site, MPMC actively manages waste rock based on its ARD potential as described in the ML/ARD Management Plan (Appendix 9-3) and as summarized below from that plan.

MPMC has focused on managing potential for ARD due to the link between acid generation and enhanced solubility of copper which is expected to be the primary concern for metal leaching. Selenium leaching has also been identified as occurring at MPM. Selenium is released by oxidation of sulphide minerals, but leaching is not necessarily associated with pH depression. Selenium leaching occurs regardless of whether waste rock is classified as potentially ARD generating (PAG) or non-PAG (referred to as NAG at Mount Polley Mine).

9.5.2 Determination of ML/ARD Potential

Waste rock on site is separated into two categories, NAG and PAG, using NPR defined as:

$$NPR = NP/AP.$$

Acid Potential (AP) (in kg CaCO3/t) is measured from:

- Total sulphur (%) x 31.25

Neutralizing Potential (in kg CaCO3/t) is measured from total carbonate NP determined from:

- Total carbon (%C) x 83.33.

Due to the dominantly intrusive rock host at MPM, total carbon is an appropriate proxy for carbonate (SRK 2023a).

9.5.2.1 NPR Criterion

A site-specific criterion (NPR) of 1.6 was developed by SRK for Springer Deep and WX Zones (SRK 2023b). To derive the NPR*, the stable rate of sulphate release was compared to the relative rate of acid neutralization by calcium and magnesium carbonate minerals, as well as potassium and sodium to account for cation exchange. The data showed a tendency toward consumption of approximately 1.6 moles of calcium, magnesium, sodium, and potassium per mole of sulphate released.

Rock sourced from other zones is defined as PAG when NPR $\leq$ 2.

9.5.2.2 Blast Fractionation

SRK was retained by MPMC to refine ABA procedures and understand the specific factors controlling ARD potential at MPM to support mining of the Springer Deep and WX zones. This work has led to the development of site-specific ABA procedures for these particular geological zones. An excerpt from the summary report provided by SRK (2023b) is included below.

> "Mineral partitioning during blasting can have an effect on the classification of waste rock ARD potential since fines tend to be more reactive. If carbonate minerals preferentially partition into the blast fines, the use of a bulk TIC-NP/AP classification factor can lead to misclassification of rock that will probably not generate acid as PAG. The reverse can also occur if sulphide minerals preferentially partition to the fines."

Review of SRK's results of blast fractionation for the Springer Deep and WX Zones showed:

- No difference in levels of total sulfur in the fine and bulk fraction.
- NP (calculated from TIC) was enriched in the fine fraction compared to the bulk fraction.

SRK (2023b) derived a regression for the NP/AP relationship between the fines and the bulk fraction.

An NPR* of 0.7 in the blast hole cuttings is used to determine dig limits for PAG rock because this is equivalent to an NPR* of 1.6 in the blast fines, which is the reactive component in the rock. For all other rock types, an NPR of 2 in the blast hole cuttings will be used to determine dig limits until a relationship is confirmed.

9.5.3 Material Characterization Overview

The MPM program characterizes all material types that will be handled during the mine life. Analysis is completed on site by Mount Polley's LECO™ instrument, allowing MPMC to best manage mine waste by directing it to suitable storage sites, or to construction usage when required (and if deemed suitable).

On each bench, a sample of cuttings is collected from each blast hole and analyzed for total copper, non-sulphide copper, iron, and gold. Areas of ore and waste are identified by interpolation of these assay results and the economic analysis of the resulting metal grades. Ore/waste boundaries are then established based on the calculated mill head values.

In areas which have proven to be consistently NAG on previous adjacent benches in blasthole samples, the waste tonnage in each blast is divided by 40,000 in order to determine the number of ABA samples to be ML/ARD Management Procedure Manual 5/12 submitted (i.e., one per 40,000 tonnes (t) of waste). However, in areas where PAG has been modelled through either exploration sampling, or results of previous blasthole sampling on other benches, (or where NAG and PAG may coincide), the sample density is doubled to one per 20,000 t. This approach results in greater sampling density in areas of suspected NAG/PAG boundaries and increases the certainty of defining PAG. Typically structures at MPM are vertically oriented, and relatively continuous. This provides some assurance that blasthole samples from previously mined benches have relevance for determining where additional samples should be taken on new benches.

Any ore that will be stockpiled rather than processed immediately is sampled at a frequency of one (1) per 20,000 t to determine if it is classified as PAG or NAG. Mill feed ore areas are excluded from ABA analysis, as this material is processed through the Mill.

Composite tailings samples are collected and analyzed every month when processing of ore occurs to represent the tonnage of tailings deposited.

Water treatment wastes are quantified monthly and sampled quarterly, with material characterization performed to assess ML/ARD potential and contribute to a material inventory.

As a confirmatory sampling measure, the Environmental Department takes random weekly grab samples from the NAG waste dump when NAG is being dumped and/or used for construction, to verify that material is being appropriately characterized and handled.

In the event that a confirmatory sample or other activities result in the discovery of PAG material in a NAG designated area, a QP is to be informed without delay, who will dictate the response actions in coordination with site contacts. Mount Polley is permitted to blend pockets of less than 1,000 t of PAG materials with non-PAG materials at a ratio of 20:1, as described in Mines Act Permit M-200 Section D.3.(c)(i)(d). If these conditions cannot be met; it may be necessary to remove PAG material from NAG areas.

Water chemistry monitoring of seepage from rock dumps, water treatment plant wastes, and contact water from the site water collection systems is also conducted by the Environmental Department to inform development of geochemical source terms and long-term water quality predictions. Similarly, tailings composites and monthly random drill pulp samples are sent to a third-party laboratory for metals analysis as an additional source of data for site geochemical models.

9.5.3.1 In-Pit Segregation

Blast Hole Sampling:

1) After the production drill has completed and moved away from the hole, the sample may be taken.
2) Using a tube sampler, the Driller will take a representative sample of the cuttings pile.
3) Samples are to be collected in a clean plastic sample bag.
4) The Driller is to complete a Blasthole Sample Tag, tearing off the tag once completed and inserting it into sample bag.
5) The sample bag is to be tied off using ribbon.
6) In the case where multiple composite samples are to be taken from a single hole, the remaining cuttings after the sample are to be removed by the Driller so a clean new pile of cuttings can be formed.
7) Completed samples are to be left on the drill by the Driller. At the end of shift, the Mine Operations Pit Supervisor (or designate) will collect all samples and deliver them to the Bucking Room.

Bucking Room:

1) Each sample is to be transferred from the sample bag to a clean metal tray. The Blasthole Sample Tag is to be kept with the sample.
2) The sample is to be dried at 105°C.
3) The sample is then to be crushed in the Primary Crusher.
4) The sample is then to be crushed in the Fine Crusher.
5) The sample is to be split until the sample size is approximately 200 g.
    a) Reject from the sample is to be wasted.
6) The sample is then to be pulverized for 75 seconds.
7) The sample is to be placed in a pouch with the Blasthole Sample Tag stapled to the pouch.

8) If the pouch is a pit sample, it is to be sent to Assay Lab 1. If the sample is an ABA sample, it is to be sent to Assay Lab 2.

Assay Lab 1:

1) The Assay Lab is to run the sample through the atomic absorption analyzer which automatically transfers the copper (CU), non-sulphide copper (CUNS) and iron (FE) values into the Laboratory Information Management System (LIMS) database.
2) The samples for gold analysis are to be fire assayed and analyzed by atomic absorption which automatically transfers the gold (AU) value into the LIMS database.
3) The sample is then to be placed into storage. Pit samples are to be stored for 21 days.

Ore Control Technician 1:

1) Once assays have been entered into the LIMS database, the Ore Control Technician will review the data and roughly determine where in the blast any Mill Feed Ore will be located.
2) Once the Ore Control Technician drafts the Mill Feed Ore locations, the Ore Control Technician will evenly select holes in the non-Mill Feed Ore areas (including materials designated for ore stockpiles) at a ratio of one (1) sample per 20,000 t of rock. This equates to about one for every nine blast holes. Additional samples can be requested whenever additional data is desired for improving understanding of the geological conditions. An example of a sample layout is displayed in Figure 1 of the ML/ARD Management Plan in Appendix 9-3.
3) The Ore Control Technician is to then make an Analysis Request with the holes selected to the Assay Lab.

Assay Lab 2:

1) If the Assay Lab receives an Analysis Request, they will retrieve the sample pouch from storage, otherwise the sample will be delivered to the Bucking Room.
2) The Assay Lab will run the sample through the LECO CS230 Carbon Sulphur Analyzer.
3) Once analyzed, the machine transfers the carbon percentage (C%) and the sulphur percentage (S%) to a spreadsheet where NPR, NP and AP are calculated.
4) The NPR, NP, AP, C% and S% are transferred automatically to the LIMS database.
5) The sample is then to be placed into storage. ABA samples are to be stored for 14 days.

Ore Control Technician 2:

1) Once all the assays and ABAs have been entered into the LIMS database, the Ore Control Technician is to review the data and model the blast.
2) Modeling the blast
    a) The software used is MineSight.
    b) The model is based on a 5 metre (m) x 5 m x 12 m block system.
    c) The block closest to the ABA sample will closely match the sample.
    d) The blocks between the samples receive a weighted average of the sample carbon and sulfur grades.
    e) Once each block gets the weighted C% and S%, then the AP, NP and NPR is calculated for each block.
    f) Using the calculated NPR value, the model is to be coded as Ore/NAG/PAG by the Ore Control Technician and the resulting markup design is to be provided to the Surveyor.
3) The Ore Control Technician is responsible for the release of the final ore markup to the Surveyor.

An example of a sample layout is displayed in Figure 2 of the ML/ARD Management Plan in Appendix 9-3.

Surveyor:

1) The Surveyor will be responsible for the layout all Ore/NAG/PAG, as determined by the Ore Control Technician, in the field.
2) Using four (4) foot stakes spaced approximately 5 m apart, the Surveyor will mark out the contacts using marked placards.
    a) Red Placard = High Grade Ore
    b) White Placard = Super High Grade Ore
    c) Green Placard = Low Grade Ore
    d) Yellow Placard = PAG
    e) Blue Placard = NAG
    f) Pink Ribbon = High Grade Mill Feed Ore
3) Once complete, the Surveyor will print out maps of the area delineating material types for the shovel operator(s), and, if required, provide field verification of material types.

9.5.4 Tailings Monitoring

Mill Metallurgy

1) The Mill Metallurgy Department is to take a monthly composite sample of the tailings generated through the month.
    a) Slurry is to be sampled every two (2) hours and made into a composite for the shift.
    b) The shift composite is then to be added to a monthly composite.
    c) At the end of the month, the monthly composite is to be given to the Bucking Room and prepared for ABA total sulfur and carbon analysis.
2) The Environmental Department is to send the monthly tailings composite sample to a third-party laboratory (typically ALS Environmental in Burnaby, BC) for element analysis by inductively coupled plasma mass spectrometry following aqua regia digestion to provide data for site geochemical modelling.

9.5.5 NAG Material Monitoring

Environment Department:

1) As a confirmatory sampling measure, the Environmental Department is to take ABA grab samples from the NAG Dump and any area where NAG rock is used for construction on a weekly basis, while NAG dumping and/or NAG rock construction is occurring. Sampling will conform with MPMC-SOP-016: ABA and Soil Sampling.
2) To assure data quality, as recommended in the BC Field Sampling Manual, a minimum of one in ten samples will be a duplicate sample, as written in MPMC-SOP-016.
3) Seeps and contact water collected on site are sampled to provide data for site geochemical modelling. Samples are collected as per MPMC-SOP-002: Surface Water Quality Monitoring. The frequency and locations of these monitoring sites are updated regularly to reflect changes to the mine site are summarized in the Comprehensive Environmental Management Plan.

Ore Control:

1) As a blast fractionation confirmatory sampling measure, ten samples of blast muck will be collected each year. Blast to sample will be selected based on mining activities and by targeting a range of sulfur contents.

9.5.6 Response to Finding PAG in NAG Areas

Environmental Department

1) Upon reviewing data indicating PAG material has been found in a NAG area, without delay contact one or more QPs listed in this document, and the Pit Supervisor or designate to pass along the relevant data and sampling location.
2) Return to the location where PAG material was discovered and stake the sampling location. Note that material may have been dozed, buried or pushed down the dump face, in which case personnel are to mark as close as possible.
3) At the discretion of QPs, undertake additional ABA sampling to assess the prevalence of PAG material.

Pit Supervisor:

1) Discuss NAG/PAG separation with shovel and haul truck operators and investigate the possibility of a loading or dumping mix-up. This is not a punitive activity but meant to identify potential causes and estimate material volume.
2) At the discretion of QPs, organize the removal of PAG material from the non-PAG area.

ML/ARD Qualified Professional

1) Work with site contacts to develop an appropriate plan of action to address the situation.
2) If it is not possible to demonstrate that PAG material meets conditions outlined in M-200 Section D.3.(c)(i)(d), it may be necessary to remove recoverable PAG material.

9.5.7 In-Pit Monitoring

Shovel Operator:

The Shovel Operator follows the staking of the Surveyor. Any material marked out as PAG is only to be hauled to approved locations. If a discrepancy is found, the Surveyor is to be called out to verify the material markup.

Pit Supervisor:

Throughout the shift, the Pit Supervisor will check in with the Shovel Operator and confirm the material type being loaded and that the destination is correct.

Haul Truck Driver:

If the Haul Truck Driver is uncertain of the material loaded, the Haul Truck Driver will confirm with the Shovel Operator or the Pit Supervisor.

Ore Control Technician:

The Ore Control Technician is to check Shovel Operator dig faces and confirm that the markup is appropriate, and material is being routed appropriately.

Surveyor:

The Surveyor is to verify that material staking is visible and correct.

Environmental Department:

Once a month, the Environmental Department is to send a randomly selected drill hole pulp sample that MPMC analyzed for total sulfur and total carbon at the Assay Lab to a third-party laboratory (typically ALS Environmental in Burnaby, BC) for element analysis by inductively coupled plasma mass spectrometry following aqua regia digestion as an additional source of data to support site geochemical models.

Additionally, the Environmental Department takes water samples from all pit sumps to inform long-term geochemical predictions. Samples are collected as per MPMC-SOP-002: Surface Water Quality Monitoring. Monitoring locations and frequencies are regularly updated to reflect site developments and are summarized in the Comprehensive Environmental Management Plan.

9.5.8 Management of PAG Rock

Best practice for management of PAG rock is subaqueous disposal in a configuration that provides permanent and low maintenance containment. At MPM, this has been implemented by disposing of waste rock in completed open pits that will subsequently fill with water. Mine planning is carried out at MPM such that the open pits have sufficient capacity that PAG material can be re-handled into the open pits and stored sub-aqueously at closure. The following pits are available for subaqueous disposal (in sequence):

- Cariboo Pit
- Bell Pit
- Pond Zone Pit
- Southeast Zone Pit
- Wight Pit
- Cariboo-Springer Pit.

For the Springer Pit, backfill locations are not currently available. The PAG rock is therefore stockpiled adjacent to the open pit in the Temporary Northwest PAG Stockpile for backhauling to the Cariboo Springer Pit upon completion of mining.

For the small Pond Zone Pit, low sulfur PAG waste rock is layered with NAG waste rock.

Onset of acidic conditions in waste rock at MPM takes at least decades as shown by humidity cells, and the lack of acidification in the natural exposure of the deposit indicates that flooding of PAG waste rock does not need to be immediate. The current approaches of backfilling into dry pits and stockpiling following by backfilling allows PAG rock to be submerged before it acidifies.

9.6 Mine Site Water Management Plan

The Springer Expansion LOM Plan – Water Management Plan is provided in Appendix 9-4A, and the executive summary of the plan is provided. Additional information can be found in the 2024 Water Management Plan Remodeling Summary in Appendix 9-4B.

9.6.1 Background

In 2016, MPMC submitted a TAR to the British Columbia Ministry of Environment and Climate Change Strategy. The TAR provided details of the proposed LTWMP for the Mine, including the discharge quantity and quality for the operations, closure, and post-closure phases of mine life. It included a technical assessment of the effluent discharge during operations to identify whether or not receiving water uses would be impaired, and recommended a preferred discharge approach using an active treatment system and a pipeline discharging treated mine water at depth in Quesnel Lake.

Under Section 1.2.3 of Permit 11678, the “authorized discharge period” for discharge of effluent to Quesnel Lake expires on June 30, 2025. This discharge period is anticipated to support the permitted Phase 4 Cariboo-Springer Pit. However, MPMC is pursuing an extension to the life of the Mount Polley Mine with the development of the Springer Expansion Project, which will add approximately 8 years of operational mining life. If market conditions remain favourable and operations occur continuously, the mine would operate beyond June 30, 2025.

The WMP addresses permit requirements for assumed future operations of the site, which at the time of writing are expected to run through March 31, 2031. The WMP also summarizes and discusses predicted water quantity, quality, and treatment during closure (April 1, 2031, through March 31, 2041) and post-closure (April 1, 2041, through March 31, 2131) phases. It should be noted that these dates are expected dates for mining operations; however, as with all mines, such schedules are subject to changes that result from commodity pricing and other factors.

9.6.2 Approach

The timeline for operations and closure has been assumed based on mine planning information available at the time of writing and is subject to change over time. The current Reclamation and Closure Plan (MPMC 2022a) describes the plan for closing the site.

This WMP describes the water management approach for the Site during both operations and closure. The regulatory framework for the Site is described in detail, including a table of concordance outlining how the WMP addresses the Joint Application information requirements. The proposed mine plan is described, including the assumed dates for operation, closure, and post-closure phases for modelling purposes.

Baseline information is summarized for the Site, including geology, climate, hydrology, and the receiving environment water quality (Quesnel Lake discharge via submerged diffuser). A major component of this WMP is a summary of the water balance and water quality models developed for the Mine, including a summary of inputs into these models and a summary of the results. These two models are described in detail in the appended reports (Appendix A and Appendix B of Appendix 9.4). The results of the water balance and quality models provides critical information to define the design basis for water treatment for the site (summarized in this WMP), during operations and during closure/post-closure. An update of treatment technology development for closure/post-closure is also provided.

The WMP also provides discussion regarding remediation of landforms on mine sites during closure and post-closure activities.

9.6.3 Final Design and Technology Development

For the purposes of the revised WMP, the “final design” of the site is defined as the water management infrastructure design in place at closure of the site. During operations, the water management infrastructure (i.e., collection ditches, pipes, sumps, pumps, etc.) will remain in its current configuration. During the remainder of operations, plans will be put in place to develop the final design for water management and treatment into closure and post-closure.

A key component of developing the final design during operations is developing alternative treatment technologies that could be considered for closure of the site. The WMP provides an update on progress on a number of possible treatment technologies included in the water treatment technology inventory.

The recommended steps to bring the technologies to readiness are described in Section 4.6.2 of the WMP, specifically the framework and estimated durations in WMP Figure 31, and the progress of each technology through that framework in WMP Table 49. Additionally, development timelines were estimated in early 2023 when the BAT Assessment Plan under EMA permit requirement 2.11.1(a) was submitted. This BAT Assessment Plan is provided in Appendix 9-5.

9.7 Discharge Management Plan

The discharge management plan is a component of the CEMP, the 2021 Annual Discharge Plan is provided in Appendix 9-6. The overall water management at the mine is described in detail in the WMP submitted in 2023 (WSP 2023).

The Annual Discharge Plan includes the expected volume, timing, and quality of effluent released to Quesnel Lake, and plan the discharge in such a manner that avoids "pollution", as defined in EMA and as determined by the simple evaluation of parameter concentrations at the edge of the IDZ in Quesnel Lake. Parameter concentrations at the edge of the IDZ will be monitored using a model-based approach as part of a Trigger Response Plan (TRP) designed such that three key priorities (in order) will be met:

Protection of human safety (specifically, the safety of MPMC Environmental Department monitors)

1) Protection of the environment and compliance with environmental laws.
2) Related to item 2, the TRP has been designed to reflect the importance for MPMC to be able to effectively manage its site water balance so that it does not accumulate impounded water. The management of site water while minimizing water impoundment has been identified as an important priority not only by MPMC but also by First Nations, Ministry of Energy and Mines, BC ENV and our Independent Expert Review Panel (IERP).

These key priorities helped form the premises for the TRP and subsequent actions. Two major premises have formed the basis of the development of the TRP:

1) The TRP and the actions it contains must be implementable.
2) Modelling of dilution in the Quesnel Lake IDZ can reasonably rely on the near-field dispersion model (CORMIX – Golder) and far-field hydrodynamic model (Tetra Tech EBA) developed for Quesnel Lake.

This model-based TRP approach is in keeping with input from BC ENV and will help alleviate some of the safety concerns associated with sampling in inclement weather while providing reliable estimates of water quality at the edge of the IDZ. The Mine's effluent discharge is also regulated by the Metal and Diamond Mining Effluent Regulations (MDMER) under the Federal Fisheries Act. This Plan has been developed for submission to BC ENV and

Environment and Climate Change Canada to satisfy the applicable requirements of both EMA Permit 11678 and the MDMER.

9.7.1 Trigger Response Plan

As detailed in the TAR (Golder 2016a), derivation of the effluent permit limits was based on attainment of Best Achievable Technology, attainment of the BC WQGs at the edge of the IDZ in Quesnel Lake and absence of acute lethality at the end-of-pipe. As such, compliance will be determined as follows:

- End-of-pipe (HAD-3): compliance with the effluent limits in EMA Permit 11678
- Quesnel Lake IDZ: execution of the Trigger and Response Plan

The model-based TRP approach helps to address several of the safety concerns associated with sampling in inclement weather while providing reliable but cautionary estimates of water quality at the edge of the IDZ. An updated model validation shows that modelled dilution factors previously determined for EMA Permit 11678 amendment continue to provide reasonable, though conservative predictions of water quality at the IDZ and that the overall dilution factor achieved by the effluent infrastructure is protective of Quesnel Lake (Golder 2018c). Sampling in Quesnel Lake may be impeded if safety is considered to be a concern.

9.7.2 Effluent Limits (end-of-pipe)

MPMC maintains an end-of-pipe sampling point at the outlet of the WTP referenced as HAD-3 (EMS code E304230). This sample location is monitored at a 5-sample 30-day frequency as outlined in the CEMP (Appendix 7-1; MPMC 2016a). Samples are collected and shipped to a certified laboratory as outlined in the most current version of the Quality Assurance Manual, and required by Section 3.8 of EMA Permit 11678. It should be noted that under Levels 1 and 2, samples collected on the weekend (Friday to Sunday) cannot be shipped to the lab until the following Monday.

9.7.2.1 Level 1 Trigger: End-of-Pipe (HAD-3) 80% Early Warning Threshold– Monitoring and Response

Level 1 monitoring and response is undertaken should any parameter listed in Section 1.2.3 of EMA Permit 11678 exceed 80% of the discharge limit in the permit (with the exception of pH). Level 1 monitoring and response is triggered when a database alert (automatically issued) indicates an exceedance of the 80% discharge limit. When this alert is received, the following response plan is initiated:

- Step 1: Collect effluent sample at HAD-3 and send for analysis.
- Step 2: Compare HAD-3 sample results to permit limits.
  - If sampling indicates levels less than 80%, proceed to Step 7.
  - If sampling indicates levels remain at or above 80%, proceed to Step 3.

- Step 3: Reduce discharge flows by 20% of the discharge at the time of the increased parameter values.
- Step 4: Review influent (E19) water quality data and compare to historic values.
- Step 5: Notify BC ENV Director of the Level 1 Alert.
- Step 6: Investigate cause and short term trends of rise in parameter values. Return to Step 1.
- Step 7: Once sampling indicates levels less than 80%, resume normal operations.
- Step 8: Document exceedance of the 80% target and investigation results in monthly report.

Sample(s) at HAD-3 will be collected as soon as reasonably possible. A "Priority" request will be made to the lab on any such additional sample such that turn around time to receive analytical results for the sample is reduced to two (2) or three (3) business days. It should be noted that samples collected on the weekend (Friday to Sunday) cannot be shipped to the lab until the following Monday.

9.7.2.2 Level 2: End-of-Pipe (HAD-3) Permit Exceedance – Monitoring and Response

Level 2 monitoring and response is undertaken should any parameter, listed in Section 1.2.3 of EMA Permit 11678, exceed the compliance limit (the "Final" concentrations specified in Section 1.2.3 of EMA Permit 11678). The Level 2 trigger is initiated by a database alert (automatically issued), or when review of the data indicates an exceedance of a permit limit. When this alert is received, the following response plan is initiated:

- Step 1: Place WTP in recirculation mode or shut down (following internal communication plan)
- Step 2: Notify BC ENV Director of exceedance
- Step 3: Collect samples of influent (E19) and effluent (HAD-3) and send for analysis. If weather conditions allow, collect sample at Quesnel Lake IDZ (QUL-58) and send for analysis.
  - Step 3a: If exceedance at QUL-58, proceed to Level 3 Alert. If no exceedance, take no further action.
  - Step 3b: Compare HAD-3 sample results to permit limits.
    - If sampling indicates levels less than 80%, proceed to Step 5.
    - If sampling indicates levels at or above 80%, proceed to Step 3 of the Level 1 Alert.
    - If sampling indicates levels exceeding the permit limits, proceed to Step 4.
- Step 4: Investigate influent water quality and water treatment plant operations to determine cause of exceedance.

- Step 5: Notify BC ENV Director, and communicate progress and findings of investigation throughout the process.
- Step 6: Resume normal operation
- Step 7: Submit exceedance investigation report to BC ENV Director

Sample(s) at HAD-3 will be collected as soon as reasonably possible. Sample(s) at QUL-58 will be collected as soon as reasonably possible, weather and safety permitting. A "Priority" request will be made to the lab on any such additional sample such that turn around time to receive analytical results for the sample is reduced to two (2) or three (3) business days. Since sampling at QUL-58 may not be possible for safety reasons, resumption of the discharge during a Level 2 Alert will be dependent on the effluent (HAD-3) meeting the permit limits in Section 1.2.3 of EMA Permit 11678. Concurrently, an investigation will be implemented to determine the cause of the exceedance of the permit limit. Once the monitoring and the investigation has been completed, a report will be submitted to the Director as outlined in EMA Permit 11678 Section 3.11. This report will include:

a) All relevant test results related to the exceedance event(s)

b) An explanation of the most probable cause(s) of the exceedance(s), and

c) A plan to prevent similar exceedance(s)

9.7.3 Edge of Quesnel Lake Initial Dilution Zone

MPMC maintains a sampling point at the edge of the IDZ referenced as QUL-58 (EMS code E304876). This sample location is monitored four times per year, as outlined in the CEMP (Appendix 7-1; MPMC 2016a). Samples are collected and shipped to a certified laboratory as outlined in the most current version of the Quality Assurance Manual, which is required by Section 3.8 of EMA Permit 11678. Ongoing sampling at QUL-58 will serve as a model verification for the near-field dispersion model (CORMIX – Golder).

9.7.3.1 Level 3: Exceedance of Receiving Environment Trigger Levels – Monitoring and Response

Level 3 monitoring and response is undertaken if any parameter listed in Section 1.2.3 of EMA Permit 11678 exceeds the receiving environment trigger levels set out in the right-most column of Table 4. Monitoring and response is triggered when a sample taken at QUL-58, either as part of routine sampling or following a Level 2 Alert, indicates an exceedance of these trigger levels. When this alert is received, the following response plan is initiated:

- Step 1: Place WTP in recirculation mode or shut down (following internal communication plan).
- Step 2: Notify BC ENV Director of exceedance.

- Step 3: Determine if weather conditions allow samples to be taken on Quesnel Lake safely.
  - If yes, sample QUL-58 and QUL-2a and send for analysis.
  - If no, use HAD-3 sample and most recent QUL-2a sample to model water quality at QUL-58.
- Step 4: Compare modelled and measured (if available) QUL-58 results to receiving environment trigger levels.
  - If exceedance, proceed to Step 5.
  - If no exceedance, proceed to Step 8.
- Step 5: Continue investigation of Quesnel Lake water quality by comparing current water quality data to historic data and modelled (TAR) data and dilution modelling.
- Step 6: Use water quality data and dilution modelling to determine discharge rate based on assimilative capacity.
- Step 7: Based on data, and subject to any directions the Director may give:
  - If data does not support resuming operations, return to Step 5.
  - Resume operation. If discharge rate is less than permitted discharge rate, return to Step 3 and repeat the analysis. Otherwise, proceed to Step 10.
- Step 8: Notify BC ENV Director.
- Step 9: Resume normal operation.
- Step 10: Submit exceedance investigation report to BC ENV Director.

Sample(s) at QUL-58 and at QUL-2a will be collected as soon as reasonably possible, weather permitting. A “Priority” request will be made to the lab so that turn around time to receive analytical results for the sample is reduced to two (2) or three (3) business days. It should be noted that samples collected on the weekend (Friday to Sunday) cannot be shipped to the lab until the following Monday.

A review and comparison of the re-sample data with parameter concentrations at the reference station QUL-2a (located in the West Arm of Quesnel Lake), which will serve as a reference comparison, shall be made, and the Relative Percent Difference (RPD) shall be calculated.

- If the RPD is ≤ 20%, the sampling results are considered to be analytically indistinguishable from the reference concentrations. The dilution capacity of Quesnel Lake will be assumed to be diminished and discharge will only be resumed as described below.

- If the RPD is >20%, then a review of the existing monitoring data for the effluent discharge, the edge of the IDZ, and other monitoring points outside the IDZ in the receiving environment (e.g., QUL-2a, Edney Creek, Hazeltine Creek) shall be undertaken. This review shall include an evaluation of the estimated dilution at the edge of the IDZ. The estimated dilution shall be compared with the dilution factors predicted in the TAR.
- If the dilution is less than the minimum dilution predicted in the TAR:
  - An evaluation of the effluent and ambient conditions shall be undertaken to resolve the discrepancy. Depending on the outcome, the evaluation may include an inspection of the outfall pipes and diffuser ports to confirm that they are intact.
  - MPMC shall investigate and present the findings to the BC ENV Environmental Protection Director identifying the likely cause of the low dilution and its remedy.
  - MPMC shall provide an Interim Discharge Plan to the BC ENV Environmental Protection Director that outlines interim measures to be undertaken by MPMC to manage the water balance in accordance with EMA Permit 11678 and any requirements under Mines Act Permit M-200.
- If the dilution is greater than the minimum dilution predicted in the TAR, it is assumed that background concentrations are elevated and the dilution capacity of Quesnel Lake is diminished. Discharge will be resumed when resampling the effluent discharge (while in recirculation mode) and resampling at QUL-58 indicate that the receiving environment trigger levels can be met using the minimum dilution predicted in the TAR (i.e., the dilution capacity of Quesnel Lake is no longer predicted to be diminished). The flow rate of the effluent discharge can be managed accordingly depending on the sampling results.

When monitoring and analysis has determined the WTP is effectively treating water to meet the end-of pipe permit limit, and the dilution model indicates that the IDZ does not exceed the Edge of the IDZ trigger levels in Table 4, the Director will be notified and the WTP effluent will be redirected to the discharge pipeline.

Once the monitoring and the investigation has been completed, a report will be submitted to the Director as outlined in EMA Permit 11678 Section 3.11. This report will include:

- All relevant test results related to the exceedance event(s)
- An explanation of the most probable cause(s) of the exceedance(s), and
- A plan to prevent similar exceedance(s)

9.7.4 Reporting

Reporting procedures to the Ministry of Environment, Environment Canada, and Local Communities are outlined in the Discharge Plan (Appendix 9-6).

9.8 Vegetation Management Plan

This section is not required as part of the joint application per the information requirements table. However, the Vegetation Management Plan, like all environmental management plans is available to government on request.

9.9 Invasive Plant Management Plan

The Invasive Plant Management Plan is summarized below and provided in Appendix 9-7 and summarized here.

9.9.1 Identification of Potential Sources of Invasive Plant Ingress

Mining activities can facilitate the introduction or spread of invasive plants by removing native vegetation, which decreases competition for weedy plants, and creating exposed soil in disturbed areas. Exposed areas create a soil bed which may allow invasive plants to establish. These areas include:

- Soil stockpiles and areas from which the soil was salvaged
- Soil applied to reclamation areas
- Road and powerline construction and maintenance activities
- Exposed areas around the Mill site, maintenance areas and other associated infrastructure

Table 9.9-1 provides an overview of potential sources of invasive plant ingress to the site. Each potential source is classified into if control is possible or not. If control is not possible, for example the movement of wildlife or wind transport of seed, only prevention methods (and, if necessary, mitigation measures) are applicable to management.

Table 9.9-1: Potential Sources of Invasive Plant Ingress and/or Spread at the Mount Polley Mine Site

Category	Source	Control Method Possible
Animals	Livestock	x
	Wildlife	x
Natural spread	Wind (long-distance)	x
	Rhizome spread or seed drop (short-distance)	✓ (within Mine site only)
Human-mediated spread	People – on-site (e.g., employees, and contractors)	✓
	People – off-site (e.g., tourists and recreationists; spread to areas immediately adjacent to site)	x
	Vehicles and equipment – on-site	✓
	Vehicles and equipment – off-site (spread to areas immediately adjacent to site)	x
Reclamation Activities	Application of soil from contaminated soil stockpiles	✓
	Use of contaminated seed or soil amendments	✓
	Use of contaminated soil amendments	✓

9.9.2 Best Management Practices

9.9.2.1 Prevention Measures

The primary goal involved in managing invasive plant infestations in the project area is to carry out mining activities in a manner that prevents the introduction or spread of invasive plants and supports the ability to establish desired species during site reclamation activities.

MPMC is to implement the following best management practices for preventing invasive plant establishment on disturbed areas at the Mine, which are to minimize disturbance during all phases of the mining operation in order to limit the availability of exposed, un-vegetated ground to invasive plant seed deposition; and establish a vegetative cover as soon as possible after ground disturbance. Specifics for establishing ground cover vegetation are as follows:

- Seed ground disturbed due to construction or mining activity with a rapidly establishing seed mix for erosion protection and invasive plant control if reclamation of the area is not imminent. Active areas (e.g., open pits or areas without appropriate substrates for vegetation growth) at the Mine do not require invasive plant control as vegetation does not have a chance to become established;
- Seed soil stockpiles; water management features such as ditches and sediment pond berms; borrow pits; road edges; powerline access roads and power pole installation sites; inactive sections of mill site areas, storage and equipment yards; and generally any disturbed ground where invasive plant establishment is possible;

- Use only high-quality grade seed in the reclamation and interim invasive plant control seed mixtures. Low quality grade seed may contain a higher portion of weed seed in the seed lot. At minimum, ensure that the seed used for revegetation is of the grade Common #1 Forage Mixture or Canada No. 1 Ground Cover Mixture.
- Assess soil amendments that may contain invasive plant seeds or propagules. This is currently only applicable to biosolids, and MPMC's supplier (Metro Vancouver) tests the material to verify that invasive plant seeds are not present.

MPMC typically conducts a seeding program annually in the spring and/or fall, and any disturbed areas (as described above) or areas that were previously seeded but lack appropriate native vegetative cover, should be added to the list of areas to be seeded.

9.9.2.2 Control Measures

If monitoring results (Section 5 of Appendix 9-7) show areas of invasive species infestation that are not consistent with the objectives of this Plan (Section 2 of Appendix 9-7), available control or mitigation options for managing established invasive plants include mechanical, biological, and chemical methods. Mechanical methods include:

- Hand weeding or pulling (if plants are hand-pulled, propagules are to be removed from the site and disposed of in a way that does not allow the spread of seeds. i.e., burned, not composted);
- Mowing or cutting; and
- Burning

Biological control agents are natural organisms that are another option for reducing invasive species populations. Typically, they are insects, nematodes, fungi or viruses that infect or invade the invasive plants and weaken the target species by decreasing seed production and reducing density. Biological control is only an option for select invasive species.

Chemical control through application of herbicides will be the method of last resort because applications are limited by proximity to watercourses and can potentially have detrimental effects on native vegetation.

In addition to these mitigation methods, contingency control programs that could be reviewed for feasibility and implemented are:

- Inspection and/or cleaning of vehicles or equipment coming from offsite or moving from an infested area to an uninfested area within the site;
- Refraining from driving through areas infested with invasive plants;
- Limiting road maintenance to the road surface to retain vegetation along the roadsides;

- Keeping equipment yards and vehicle storage facilities free of invasive plants; and
- Training personnel on preventing invasive plant spread by checking and removing seeds from clothing and equipment.

It is important to note that majority of the invasive plants observed at the Mine are designated in the Cariboo Chilcotin Coast Invasive Plant Committee Regional Strategic Plans as "established" or are designated as non-native species (not invasive species), and management options are not implemented regionally because control of these species is not currently feasible. As such, MPMC does not actively manage these species, unless they are directly impeding reclamation efforts. These aforementioned control measures are listed as options for future use, as required, and are currently not a routine component of MPMC's invasive plant management activities, as the Plan objectives are being met without their use.

Mitigation measures will focus on the "new invaders" and "containment" categories, as well as any "established" species if they are directly impeding reclamation efforts. Consistent with the Regional Strategic Plan, the treatment goal for "new invaders" is eradication (elimination of all individuals and their propagules), while the treatment objective for species listed for "containment" is prevention of invasive plants from spreading to uninfested areas. For species that are impeding reclamation revegetation, but are regionally listed under "containment" or "established" categories, the primary option will be suppression (reduction in plant population size and abundance). These control measures generally follow the following process, based on the level of infestation:

1) Prevent new infestations from becoming established;
2) Eradicate small or isolated "satellite" infestations;
3) Contain the perimeter of large "core" infestations; and
4) Suppress the interior of large "core" infestations.

If control measures area applied in the future, any sites that have treatments applied will be monitored through the established methods (described in Section 5 of Appendix 9-7) in subsequent years to assess if treatment measures have been successful.

9.9.3 Monitoring Program

The MPMC invasive plant monitoring program includes visual surveys conducted in combination with routine assessments of progressive reclamation sites and annual soil stockpiles inspections; invasive plant species present and their percent cover are documented and compiled with revegetation results.

In addition, more formal invasive plant inventories are to be conducted routinely at the Mine site. These inventories should encompass disturbed areas, including any that are undergoing reclamation, as well as adjacent undisturbed areas from which invasive plants could ingress. Inventories may be conducted by MPMC Environmental Department staff with sufficient expertise or an external consultant. Each inventory should include the following items, with the results presented in a report:

- Surveying and mapping of infestation locations, with a focus on reclamation areas and soil stockpiles;
- Identification of invasive plant species present;
- Assessment of the degree of invasive plant growth, distribution, and density present at infestation sites;
- Assessment of success of any prevention and control measures that were previously implemented;
- Recommendations for any prevention and control measures that should be implemented; and
- Recommendations for when the next inventory should be conducted.

Where possible, all assessments and inventories should take place in the late spring/early summer so that eradication measures can be undertaken prior to seed dispersal in late summer/early fall. Alternatively, assessments and inventories can be conducted in mid to late summer, when plants are readily identifiable, with interpretation of results to take place over winter and management applications to be implemented early the following growing season.

9.9.4 Program Review and Continuous Improvement

Each year, the results of invasive species monitoring should be reviewed with respect to the objectives outlined in Section 2 of Appendix 9-7, and the Plan and associated site invasive plant management activities should be updated accordingly. Specific items that should be reviewed and associated actions are listed in Table 9.9-2. When the Plan is updated, it is to be submitted to the Ministry of Energy and Mine with the Annual Environmental and Reclamation Report. In addition, an update on invasive plant monitoring, prevention and control activities at the Mine (including any pertinent results from progressive reclamation and soil stockpile inspections, and site invasive plant inventory reports) is to be included in the Annual Environmental and Reclamation Report each year.

Table 9.9-2: Invasive Plant Management Program Review Process

Item to Review	Associated Actions
Verify that all seed mixes used were certified weed-free (i.e., comply with Canadian Food Inspection Agency standards).	If seed utilized is not certified weed-free (or invasive plants were suspected to be present in the seed mixtures used): ▪ Change seed suppliers and/or seed mixtures.
Verify that all soil amendments (where appropriate) were tested to confirm they did not contain invasive plant propagules or seeds.	If soil amendments were not tested: ▪ Conduct post-application assessments for any soil amendments not tested; ▪ Discontinue use of any soil amendments not tested until appropriate testing has been completed; and ▪ Plan appropriately to test all amendments prior to use in the future.
Verify that no invasive plants identified in monitoring are on provincial noxious weed lists.	If any noxious weeds are identified: ▪ Implement appropriate control measures, with the objective of eradication; and ▪ Ensure that measures taken are monitored as per the program in Section 5 of Appendix 9-7.
Verify that all invasive plants identified in monitoring are being managed according to the most recent Cariboo Chilcotin Coast Invasive Plant Committee Annual Strategic Plan.	If invasive plant management is inconsistent with the Regional Strategic Plan: ▪ Implement prevention and/or control actions until management actions are consistent with the Regional Strategic Plan; and ▪ Ensure that measures taken are monitored as per the program in Section 5 of Appendix 9-7.
Verify that results from reclamation revegetation assessments are consistent with closure objectives (with respect to species composition and/or functional groups). If results are not consistent, verify that invasive plants are not a constraining factor. The prioritization matrix in Figure 1 of the Invasive Plant Management Plan in Appendix 9-7, can be used to aid in separating innocuous from disruptive species in reclamation areas and prioritize management actions accordingly.	If invasive plants are identified as a constraint to meeting revegetation objectives: ▪ Delineate the specific species and areas of concern; ▪ Implement prevention and/or control actions (Section 4 of Appendix 9-7) appropriate for the level of infestation, the life history of the identified invasive plants, and available control options; and ▪ Ensure that measures taken and target native reclamation species are monitored in the identified reclamation areas as per the program in Section 5 of Appendix 9-7.

9.9.5 Responsibilities

Responsible individuals for implementing this Plan are described below.

Environmental Superintendent or Designate (e.g., Environmental Supervisor):

- Be knowledgeable of, adhere to, and coordinate implementation of all aspects of this Plan;
- Ensure all other responsible individuals have reviewed the most up to date version of this Plan;
- Ensure this Plan and monitoring data are reviewed annually and updated accordingly, with updates submitted in the Annual Environmental and Reclamation Report and appropriate management actions implemented;
- Be aware of high level mine planning to ensure that seeding of disturbed areas can be done in a timely manner and transport of soil is appropriately managed;
- Review updates to the MPMC Mines Act Permit 11678, BC Mines Act, Cariboo Chilcotin Coast Invasive Plant Committee Regional Strategic Plan and provincial noxious weed lists and regulations;
- Schedule and assign staff or external contractors to carry out all requirements of this Plan, including monitoring programs and reporting;
- Plan and budget for necessary invasive plant control measures;
- Obtain and permits or authorizations required for control measures that are implemented; and
- Ensure that individuals conducting monitoring, data interpretation, reporting, and planning and implantation of prevention and control measures have appropriate training.

Qualified Individual Conducting Monitoring and Reporting (e.g., Environmental Technician, contractor):

- Be knowledgeable of and adhere to all aspects of this Plan;
- Conduct assigned activities, such that all requirements of this Plan (at minimum) are met; and
- Have appropriate training and expertise for assigned components of this Plan.

Staff or Contractors Conducting Control Measures

- Have appropriate training and expertise for prevention and control actions they are implementing.

Mine Planning Engineer and General Foreman

- Notify the Environmental Superintendent or designate of planned disturbances and any transport of soil materials;
- Where possible, minimize the disturbance of vegetated areas; and
- Transmit relevant information related to the aforementioned points to the Mine Operations Supervisors.

Mine Operations Supervisors:

- Supervise operators such that new disturbances and soil handling are conducted as planned.

9.10 Wildlife Management Plan

The Wildlife Management Plan is provided in Appendix 9-8 and is outlined here.

9.10.1 Permit Requirements

The Wildlife Management Plan is a component of the CEMP (Appendix 4-1A) which is a requirement of Permit 11678 issued under the provision of the EMA by the BC Ministry of Environment and Climate Change Strategy. The implementation of wildlife monitoring programs that track the progress of wildlife and wildlife habitat impacted by mine-related activities is one of the objectives of the CEMP and is addressed in Section 6.17 of the CEMP in Appendix 7-1.

The Wildlife Management Plan also addresses conditions outlined in the M-200 Permit issued under the provision of the *Mines Act* (RSBC 1996, c. 293) by the BC EMLI, formerly known as the Ministry of Energy, Mines and Petroleum Resources (MEMPR, 2020). Conditions under the M-200 Permit include restrictions and requirements that protect wildlife and personnel and ensure wildlife habitat is incorporated into long-term land use goals during reclamation and closure planning.

9.10.2 Timing Windows

Reduced Risk Timing Windows for fish and wildlife are intended to provide specific timing windows to target during operational planning to lower the potential for adverse effects to fish and wildlife. Reduced risk timing windows vary based on geography, and regional differences in fish and wildlife species. Reduced risk timing windows typically coincide with the breeding period for a given species, although they may also encompass other life history activities, such as juvenile dispersal and migration events. These timing windows do not guarantee that there will be zero risk to fish and wildlife during these periods, and do not authorize activities or participating in activities that may contravene applicable legislation (e.g., provincial *Wildlife Act*, federal *Migratory Birds Convention Act*).

9.10.2.1 Fisheries Timing Window

To reduce the risk of contravening the *Water Sustainability Act*, all work activities that occur instream should utilize the appropriate fisheries timing window for the region. Fisheries timing windows (also referred to as in-stream work windows) apply to all fish-bearing streams and watercourses that have direct connectivity to fish-bearing waters downstream. Within the Central Cariboo District, tributary streams located at elevations of less than 1,325 m to the Quesnel River have a reduced risk timing window of July 22– August 15 to account for the presence of both spring and fall spawning fish species occupying the system (Province of BC, 2004). However, this timing window does not necessarily protect anadromous salmonids in freshwater systems; therefore, the regional Department of Fisheries and Oceans should be consulted prior to working in any streams where salmon may be present to determine whether adjustments to the reduced risk timing window are required.

If instream works must occur outside of the reduced risk fisheries timing window, a Change Approval may be required under the *Water Sustainability Act* through the Ministry of Water, Land and Resource Stewardship (WLRS) or a *Fisheries Act* Authorization may be required through Department of Fisheries and Oceans. In addition, the implementation of risk-management strategies under the direction of a qualified environmental professional (QEP) may be a condition of authorization.

9.10.2.2 Bird Nesting Window

To reduce the potential risk of contravening the BC *Wildlife Act* and the federal *Migratory Birds Convention Act*, any activity that may impact breeding birds, including their eggs and nests, should be conducted outside of the peak breeding period for birds in the region; for example, vegetation clearing or removal of buildings that birds are actively nesting on. The least-risk period for nesting birds in the region is from August 12 – April 14, which is the period when less than 5% of the majority of actively breeding birds in forest and wetland habitat are expected to be present within the region (ECCCS, 2018). In addition, any nest belonging to an eagle, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl is protected year-round regardless of whether the nest is active (*Wildlife Act*, RSBC 1996, c. 488., s. 34). Should an inactive nest belonging to one of these species require removal, authorization through WLRS would be required. In addition, updates to the Migratory Birds Regulations under the *Migratory Birds Convention Act* in 2022 have afforded year-round protection to 18 species, including pileated woodpecker (*Dryocopus pileatus*). Prior to removing a tree that has a pileated woodpecker nest cavity, a 36-month waiting period is required, and permitting may be required.

If the peak nesting period cannot be avoided, additional risk-management strategies may be required under the direction of a QEP (see Section 9.10.3.1).

9.10.2.3 Amphibian and Reptile Window

An amphibian and reptile timing window has not been formally developed for the Cariboo Region. However, to avoid contravention of the BC *Wildlife Act*, operational activities should avoid areas where amphibian and reptile species have been confirmed hibernating, breeding or migrating. Amphibian species native to the Cariboo region require different habitat types (both aquatic and terrestrial) at different times of the year. Adult aquatic breeding obligate amphibians breed and lay eggs in freshwater, where they hatch into aquatic larvae, that grow and metamorphose into semiterrestrial juveniles. Highest risk periods for amphibians are typically related to movement of individuals between different habitat types, including migration of adults between aquatic breeding habitat and upland foraging or overwinter sites, or dispersal of juvenile amphibians from aquatic breeding sites to nearby terrestrial habitats. Although reptiles in the region, such as the painted turtle (Chrysemys picta *pop. 2*), common garter snake (*Thamnophis sirtalis*), and terrestrial garter snake (*Thamnophis elegans*), do not breed aquatically, their life history is also characterized by seasonal movements between different habitats. Due to both groups' heavy reliance on, and association with, freshwater habitats, any work in and around wetlands, streams, or small water bodies (including water-filled ditches), may also pose a risk of harm to individuals or damage to habitat. The highest risk period for amphibians and reptiles occurs between April 1 and September 30, when individuals of these species are expected to be active on the landscape (i.e., not hibernating) (BC MoE, 2017). Therefore, the reduced risk timing window for amphibians and reptiles is estimated to be October 1 – March 31 for the Cariboo Region.

If amphibians or reptiles have the potential to be impacted by an activity, such as a clearing and grubbing, the completion of a pre-disturbance survey under the direction of a QEP may be required to determine if amphibians, reptiles, or their habitats, are present, and/or at risk. If amphibians or reptiles cannot be avoided, a salvage that has been authorized by WLRS through a General Wildlife Permit may be required so that amphibians or reptiles can be safely translocated from the site to nearby suitable habitat.

9.10.3 Wildlife Encounters

To avoid contravention of the relevant wildlife legislation, wildlife-specific strategies may be required during human-wildlife encounters at the Mine Site, or within the surrounding areas. In most circumstances, allowing the animal to leave the area and reporting the incident to the Operations Supervisor or Accountable Facility Representative, will be the best course of action. In certain situations, further mitigation may be required based on the time of year, status of the species, and nature of the anticipated work activity. Individuals should consult with the Operations Supervisor or Accountable Facility Representative if they have any questions regarding protocols for a particular situation that involves a wildlife encounter. Additional in-house training may be required to ensure personnel have the skills to safely handle human-wildlife conflicts, such as bear encounters, and identify sensitive wildlife features.

9.10.3.1 Birds

The majority of birds in BC are collectively protected under the BC *Wildlife Act*, Canada *Migratory Birds Convention Act*, and/or Canada's SARA, which generally acknowledge that birds are most vulnerable during the breeding period when adults are caring for nests, eggs, and young. The following mitigation measures will be implemented if actively breeding birds are encountered at the Facility or in the Surrounding Areas:

- The destruction or disruption of migratory birds, nests, and eggs, is prohibited, including during travel to and from work sites. If destruction or disruption occurs in the form of incidental harm (i.e., unintentional), the incident will be immediately reported to the Operations Supervisor or Accountable Facility Representative.
- To reduce the risk of encountering and disturbing breeding birds, any activity (e.g., vegetation clearing) that has the potential to disturb and harm birds, nests, eggs, or young, should be completed outside of the peak avian breeding period for the region (see Section 9.10.2.2).
- Report any active bird nests, or repeat observations of breeding pairs, to the Operations Supervisor or Accountable Facility Representative. Birds that are observed at the same location on consecutive days, hover in close proximity to humans, or display agitated behaviour such as persistent alarm-calling or dive-bombing (i.e., swooping down close, before veering away) are evidence that a breeding pair and nest may be present.
- If an active nest or established breeding pair continue to occupy an area of the Facility where the presence of personnel is only periodic and work activity is not constantly occurring (e.g., water sampling), the Accountable Facility Representative may recommend the installation of a buffer around the nest site to signal to other crew members to avoid the area to reduce disturbance. Only the periphery of the buffer should be marked and never the nest or nest tree, itself. Common buffer sizes used according to different avian groups, include (MFLNRO, 2013; MFLNRO, 2014):
  - Songbirds – 30 m radius,
  - Waterfowl – 100 m radius,
  - Swallow colonies – 50 m radius, and
  - Raptors: 100 – 500 m radius (species dependent)
- If an active nest or established breeding pair continue to occupy an area of the Facility where personnel will be regularly present for mine activities that occur for an extended period of time (e.g., geotechnical drilling), or the species is determined to be a designated SAR from Table 1 in Appendix 9-8, the Accountable Facility Representative may consult with a QEP to determine the most suitable mitigation measures appropriate for the species, habitat, and magnitude of the anticipated disturbance.

- Report the presence of any stick nests or cavity nests (e.g., pileated woodpecker) to the Operations Supervisor or Accountable Facility Representative since some stick nests and nesting cavities are protected year-round regardless of occupancy. Should removal of a wildlife tree containing a pileated woodpecker nesting cavity be required to be removed, ECCC must be notified, and monitored for 36 months to ensure the nest is abandoned (Government of Canada, 2023a). Prior to vegetation clearing, a thorough assessment for pileated woodpecker cavities of trees to be felled should be completed.
- Any birds nesting on anthropogenic structures (e.g., barn swallows and cliff swallows) must be allowed to finish nesting once nesting has commenced. If a building with intact barn swallow nests has been scheduled for demolition or removal outside the peak breeding period, consultation with WLRS will be required since barn swallows (and their nests) are protected under Schedule 1 of SARA.

9.10.3.2 Mammals

Small and large mammals are regularly documented at the Facility, including black bears, coyotes, lynx, moose, and mule deer. Signs of caribou presence (scat and tracks) were noted within the proposed SERDS expansion area during the field reconnaissance on August 8 and 9, 2023. Additional mitigation measures are recommended as the southern mountain population of caribou is considered Endangered by COSEWIC, Threatened under Schedule 1 of SARA and is provincially red-listed and ranked S1 (critically imperilled). Harvesting of timber, for example in southern mountain caribou critical habitat is not compatible with the province of BC's commitment to incrementally increasing southern mountain caribou habitat over the course of five years (Government of Canada, 2023b); however, there are currently no federal prohibitions that legally prevent such activities on provincial Crown land. The following general mitigation measures are proposed to avoid and minimize project-related effects to southern mountain caribou and associated critical habitat:

- As per the Joint Application Information Requirements for *Mines Act* and EMA Permits, Section 9.10, specific management plans may be required to address individual wildlife species, particularly those designated as SAR. As such, a Caribou Mitigation and Monitoring Plan may be required for the Expansion Areas. Mitigation measures should conform to the mitigation hierarchy guidance outlined in the provincial Procedures for Mitigating Impacts on Environmental Values (BC MoE, 2014) which is, in order of priority: avoid, minimize, restore on-site, and offset or compensate (off-site or on-site).
- Although the SERDS and TSF expansion footprints do not overlap with the mineral lick located approximately 315 m south of the existing south embankment, it is recommended that a conservative disturbance buffer be established. A 100 m buffer of intact forest should be maintained around significant licks (MECCS 2018). This buffer should include at least two primary trails leading to the lick and connect adjacent forest to provide a windfirm travel corridor. In addition, construction activities should be avoided within 100 m of a significant

lick during the sensitive period (April 1 to October 1). A field reconnaissance and monitoring of the mineral lick to determine ungulate use (e.g., through the installation of wildlife cameras) is recommended prior to the TSF final raise to 987 m.

- Review the federal Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada (Government of Canada 2014).
- All project personnel should receive site orientation and training which will address specific education on mountain caribou and identify specific procedures for managing effects to caribou, including no harassment of caribou, immediate reporting of encounters with caribou, and vehicle operations and methods that can minimize caribou vehicle collisions.

Although the presence of some mammal species on the mine is to be expected due to the remote location of the Facility, the objective is to minimize interactions and, thereby, risks to personnel and animals. The following measures should be implemented if mammals are encountered at the Facility or in the Surrounding Areas:

- Reduce driving speeds to avoid a potential collision with mammal species, especially during hours at dawn and dusk when wildlife activity is heightened, and along known wildlife migration corridors; refer to Section 9.10.4.2 for further guidelines to prevent wildlife-vehicle collisions.
- Avoid approaching or feeding wildlife. Food and waste should be securely stored in buildings, approved waste receptacles, or vehicles at all times; Refer to Section 9.10.4.3 for further guidelines on how to manage for wildlife attractants.
- If wildlife is a designated SAR (e.g., caribou), as listed in Table 1 in Section 4.0 of Appendix 9-8, disturbance should be reduced to a minimum until the animal has left the area. If driving, temporarily stop the vehicle or pull over if it is safe to do so. If the animal has occupied a work area where mine activities are occurring, temporarily suspend works until the animal has moved out of the work area. All sightings of SAR at the Facility should be reported to the Operations Supervisor or Accountable Facility Representative as soon as possible. If repeated observations of a SAR occur at a specific location at the Facility, or in the Surrounding Areas, consultation with a QEP may be required to determine the appropriate course of action for that species.
- If a suspected residence (e.g., den or borrow) of a mammal species is encountered, a GPS coordinate will be collected (if possible) and the location will be immediately reported to the Operations Supervisor or Accountable Facility Representative. If there is evidence the suspected residence of a large mammal species is active due to the presence of recent scat, hair, and/or tracks, the crew will immediately leave the area of the residence until further instructions can be provided by the Accountable Facility Representative.

- If a kill site (e.g., carcass locations that will attract wildlife) or mineral lick (e.g., an area where ungulates regularly congregate to obtain mineral nutrients) is discovered, immediately report the location to the Operations Supervisor or Accountable Facility Representative.
- If conflict wildlife, such as habituated bears or cougars, are observed at the Facility or in the Surrounding Areas, the observation should be reported to the Operations Supervisor or Accountable Facility Representative so that the regional Conservation Officer Service can be notified. Personnel should never attempt to engage with conflict wildlife.
- Mine personnel and visitors whose job responsibilities may place them in a situation where a bear encounter is possible must have bear safety awareness training and be trained on how to safely carry and deploy bear deterrents, such as bear spray.

9.10.3.3 Amphibians and Reptiles

Amphibians and reptiles rely on aquatic and terrestrial habitat to carry out their necessary biological functions. However, western toad and painted turtles are particularly vulnerable to road mortality due to the distance the two species will travel between breeding and overwintering grounds in the spring and fall (PWTWG, 2014; BC MoE, 2017); both are a designated SAR in Table 1 in Section 4.0 of Appendix 9-8. Two western toad were observed during the field reconnaissance conducted on August 8 and 9, 2023; therefore, the species is confirmed to be present within the Expansion Areas. Large congregations of western toad adults or juveniles crossing roadways can be a common phenomenon where roads bisect crucial aquatic (breeding) habitat and suitable upland (overwintering) habitat (PWTWG, 2014). In contrast, painted turtle rely on suitable aquatic habitat for overwintering and move to terrestrial habitats in the spring to breed (BC MoE, 2017). Painted turtles exist in significantly lower numbers in the Cariboo Region compared to other amphibian and reptile species and should be reported if observed (BC MoE, 2017). The common and terrestrial garter snake have the potential to occur at the Facility and in the Surrounding Areas, and both species den communally in hibernacula.

Aquatic habitat, particularly riparian and wetland habitat, are present in the Surrounding Areas around the Facility and, therefore, personnel should be aware that amphibians and reptiles have the potential to be present on commute roads. The following measures will be implemented to reduce the risk to amphibians and reptiles:

- The federal Management Plan for the western toad (*Anaxyrus boreas*) in Canada will be reviewed and applicable management measures will be implemented.
- Mine activities will consider the reduced-risk window for amphibians and reptiles during project planning, as outlined in Section 9.10.2.3. Activities that occur outside the reduced-risk window should determine the level of risk to amphibians and reptiles at the project location prior to commencing.

- If mine activities are occurring outside the reduced-risk window in an area that has been determined to be high-risk for the presence of amphibians and reptiles, the Accountable Facility Representative may request that additional mitigation is implemented at the site, such as temporary installation of exclusion fencing to keep amphibians and reptiles out of the area of disturbance.
- If amphibians and reptiles are occurring inside the boundaries of the work site, an amphibian and reptile salvage may be required by a QEP under the authorization of a Wildlife Permit through WLRS. Handling of amphibians and reptiles by unauthorized personnel is prohibited due to the potential to transfer disease between individuals and incidentally cause harm.
- Observations of large aggregations of amphibians, including migrations across roadways, will be immediately reported to the Operations Supervisor or Accountable Facility Representative so that further mitigation can be implemented, as necessary. Mitigation may include ensuring all personnel are aware to avoid that location, posting signage, installing temporary exclusion fencing, or having a QEP conduct an authorized salvage. The same procedures apply for a single observation of a painted turtle, which occur in lower numbers. Aggregations of snakes may indicate the presence of a hibernacula, which should also be similarly reported.
- Mine activities must not disturb any wetlands, streams or water features, including small, ephemeral (temporary) pools and water-filled ditches, as such habitats can provide important breeding, foraging, and hydration sites for amphibians.
- Any activities near aquatic habitats should avoid impact to shallow water areas and associated riparian vegetation; these areas serve as breeding habitat and cover for many amphibians.

9.10.4 General Best Management Practices

9.10.4.1 General Restrictions

To ensure compliance with Section D-12 of the M-200 permit, the following provisions and restrictions apply:

- No hunting or shooting shall occur within any area encompassed by the mine permit,
- No fishing or hunting shall occur while on company business, or while commuting to and from the mine for all MPMC personnel and contractors,
- Any exclusion fencing (e.g., electric fencing) that is installed shall be regularly maintained to ensure it is effectively functioning at all times while staff are present on site.

To provide compliance with relevant wildlife regulations, the following general provisions and restrictions apply:

- Feeding wildlife is prohibited and is inconsistent with the provisions of the BC *Wildlife Act*. Feeding wildlife may result in wildlife becoming attracted to human foods and habituated to human presence, which can result in the creation of 'conflict wildlife' and have serious consequences for the animal and other people.
- Cooking outside and using outdoor cooking appliances is prohibited.
- Littering is prohibited. All garbage, including organic wastes (e.g., banana peels, pear cores, etc.), should be stored in wildlife-proof temporary containers and removed and appropriately disposed of off-site (see Section 9.10.4.3).
- Harassment of wildlife is prohibited and is inconsistent with the provisions of the BC *Wildlife Act*. Harassment of wildlife can lead to the abandonment of habitat or the disruption of critical activities (e.g., nesting), and may result in injury to wildlife and/or humans.
- Potentially sensitive wildlife features, including bird nests, dens, roosts, hibernacula, kill sites (e.g., carcass locations that will attract wildlife), and mineral licks (e.g., an area where ungulates regularly congregate to obtain mineral nutrients) will be reported to the Operations Supervisor or Accountable Facility Representative. The Accountable Facility Representative may implement measures to avoid or reduce adverse effects to known wildlife features from mine-related activities, which could include restricting the knowledge of the feature location to reduce traffic at the site and prevent vandalism.

9.10.4.2 Equipment and Vehicles

To reduce incidents of wildlife-vehicle collisions and near-misses at the Facility, the following general provisions and restrictions apply:

- The Accountable Facility Representative will be familiar with the BC Wildlife Collision Prevention Program (http://www.wildlifecollisions.ca) and will be responsible for ensuring all mine personnel and visitors are orientated on best management practices for preventing wildlife collisions.
- When travelling to and from the mine, Facility personnel and visitors are required to report incidental wildlife observations. This information will be valuable in identifying areas where potential wildlife-vehicle collisions have a higher chance of occurring.
- Road signage that informs mine personnel (and other road users) to be attentive for wildlife will be established, as necessary. Signage will be placed where potential collisions are predicted (e.g., at known wildlife crossings, blind hills, blind corners, etc.) or have already occurred. All Facility personnel and visitors must obey traffics signs.

- On public gravel or forest service roads, the maximum speed limit is 60 km/hour or per posted signage. During poor road conditions when visibility and traction are reduced, personnel are encouraged to slow down and drive safely to the conditions.
- The maximum speed limit on the mine property is 40 km/hour in ideal driving conditions.
- Wildlife has the right-of-way, except in select circumstances when it is unsafe to apply the brake or come to a complete stop. When wildlife is present on a road, slow down or stop and allow the animal(s) to depart the roadway.
- Limit access to deactivated trails, seasonally or permanently, using signage and high visibility barricades.
- Report wildlife remains observed along access roads at the Facility, and in the Surrounding Areas, to the Operations Supervisor or Accountable Facility Representative. Wildlife carcasses have the potential to lure other wildlife onto the roadway, which may result in an increased likelihood of wildlife-vehicle collisions. MPMC will relay reports of wildlife remains along highways to the regional Conservation Officer Service.
- Wildlife-vehicle collisions that cause injury or death to wildlife must be reported immediately. If an animal is killed as a result of a vehicle collision, the Accountable Facility Representative will notify the regional Conservation Officer Service so the remains can be removed from the road in a timely fashion, suitably disposed of, and documented in an Incident Report. The Royal Canadian Mounted Police must be notified if damage is greater than $1,000 or if there are human injuries. If an animal is injured as a result of a vehicle collision, the Accountable Facility Representative will contact the regional Conservation Officer Service to determine the best course of action (e.g., animal destruction). Some injured animals may present a safety hazard (e.g., bears, moose, deer, etc.); consequently, personnel should not approach injured animals.
- A near-miss animal-vehicle collision will be reported as an “incident” as this information will be important for determining high-risk collision areas that may require warning signage.

9.10.4.3 Waste Management

Garbage and food waste are wildlife attractants which may lure and create conflict wildlife, such as bears, foxes, and coyotes. In addition, wildlife attractants may include vegetation growing along the roadside (e.g., grasses), chemicals (e.g., gasoline), waste containers (e.g., empty fuel cannisters), and wildlife remains. Conflict wildlife can create unsafe working conditions for personnel and result in damage to facility structures and equipment.

The following waste management measures will be followed to reduce wildlife conflicts related to food waste and garbage:

- Adhere to the guidelines outlined in the General Restrictions (Section 9.10.4.1).

- Food waste, sewage, and mechanical maintenance waste (e.g., motor oil) will be handled and disposed of appropriately under the direction of the Accountable Facility Representative.
- Temporary recycling and garbage containers shall not be placed or stored outside.
- Wildlife incidents related to garbage or human food attractants will be promptly reported to the Accountable Facility Representative.
- Waste disposed of incorrectly will be reported promptly to the Accountable Facility Representative. The Accountable Facility Representative will affirm that any inappropriately disposed of waste, within and around the Facility, is correctly disposed of.
- Regular site inspections will be conducted of waste transfer areas to ensure site cleanliness, adequate bear-proofing features, and to document improper garbage storage.
- When seeding along road corridors is required at the Facility, the Accountable Facility Representative will select seed mixes that do not contain wildlife attractants (e.g., clover), as these can result in an increase in animal-vehicle collisions.

9.10.4.4 Reporting Wildlife Observations and Incidents

Observations of wildlife or wildlife incidents by mine personnel and visitors must be documented and reported to the Accountable Facility Representative. An observation is defined as physical observations of wildlife or identification of signs that wildlife may be present in the area (e.g., nests, scat, tracks, dens, etc.). An incident may include animal-vehicle collisions, strange behavior (e.g., the animal behaving aggressively or losing its fear of humans), close encounters on foot or within a vehicle, or witnessing deceased or wounded animals.

Reports of wildlife observations and incidents provide information that can help determine:

- Hazardous circumstances requiring intervention (e.g., conflict wildlife).
- Whether notification to the regional Conservation Officer Service is required (e.g., roadkill).
- If there are deficiencies in the conflict wildlife mitigation and waste management measures.
- Areas along roadways that are potential hotspots for animal-vehicle collisions and, thus, require warning signs.

9.10.4.4.1 Wildlife Observations

Observations of wildlife and wildlife habitat features (e.g., nests, dens, wildlife trees, cavities, etc.), provide important data on wildlife habitat usage and behavior patterns at the Facility and in the Surrounding Areas. Wildlife observations will be collected and documented by the Operations Supervisor who will forward the information to the Accountable Facility Representative. All observations will be reviewed to assess the potential for conflict wildlife and

to ensure current guidelines are sufficient in protecting personnel and wildlife. Wildlife observations will be included in MPMC's annual reporting.

Most wildlife and wildlife habitat observations will be discussed at health and safety meetings. However, the location of sensitive wildlife habitat features (e.g., mineral licks) may be disclosed to a restricted number of mine personnel at the discretion of the Accountable Facility Representative.

9.10.4.4.2 Wildlife Incidents

Mine personnel and visitors are required to promptly notify wildlife incidents to the Operations Supervisor or Accountable Facility Representative, who may request the completion of an Incident Report. Incident Reports regarding wildlife will be reviewed for any evidence of conflict wildlife development, to ensure current guidelines are sufficient in protecting personnel and wildlife, and for annual reporting purposes.

9.10.5 Wildlife Monitoring

In accordance with the permit requirements, monitoring programs will be developed to evaluate the effects of mining-related activities on wildlife and wildlife habitat at the Facility and in the Surrounding Areas. Wildlife monitoring will also help determine the success of remediation works completed at Polley Flats and the Hazeltine Creek Corridor, as well as the success of any future remediation that is implemented to achieve long-term reclamation and closure objectives. All monitoring programs will incorporate adaptive management to optimize procedures and outcomes as new information becomes available. The design and development of specialized projects may be done in consultation with QEPs, as required.

An Ecological Risk Assessment was conducted for Polley Flats and the Hazeltine Creek Corridor in 2017 to determine the potential impact of heavy metals on biological receptors and to determine the direction of future remediation and monitoring efforts (Golder 2016).
The assessment determined that the risk of metal uptake was low in aquatic and terrestrial systems and was less likely to cause adverse impacts to wildlife than the effects of the physical disruption to functional habitat (Golder 2016). For further details regarding wildlife monitoring requirements, refer to the CEMP (Appendix 7-1) (MPMC 2019).

9.10.5.1 Reporting

A summary of the effectiveness of the Plan will be included in the annual reclamation report.
In addition, summary reports of wildlife-related mitigation measures, incidents, and observations will be generated annually and will form the basis of adaptive management strategies to address compliance issues and conflict wildlife. These summary reports will be provided to WLRS and First Nations upon request.

9.10.5.2 Adaptive Management

The Plan will be adapted based on the results of ongoing wildlife monitoring programs, reclamation planning, incident and summary reports, and employee education programs. The adaptive management framework recognizes that new information obtained from those sources of information should be used to inform future planning, decision-making, mitigation, and program design to help MPMC maintain compliance. An annual review of the Plan to determine the potential need for revisions will also be required to ensure adaptive management strategies can be successfully identified and integrated.

9.10.6 Reclamation Requirements

MPMC has identified wildlife habitat as one of the primary land-use objectives during reclamation and closure planning, which will fulfill the requirements outlined in Section E-2 of the M-200 permit. Reclamation initiatives will utilize a variety of different strategies to achieve self-sustaining ecosystems that will create long-term habitat for wildlife, including soil amendments to improve soil conditions, revegetation of native species, enhanced landscape features that attract wildlife, and construction of habitat systems that provide ecosystem functions for many species. For further details on how wildlife habitat will be incorporated into long-term reclamation and closure planning, refer to the Reclamation and Closure Plan Update by MPMC (2017).

9.10.7 Stakeholder Consultation

In accordance with the MPMC Communication Plan as a condition of Permit 11678, environmental data will be shared with the Xatśūll First Nation, Williams Lake First Nation, Cariboo Regional District, and the Community of Likely. First Nation and community stakeholders will be provided avenues for discussing and communicating concerns regarding the Plan, including the implementation and results of the wildlife monitoring programs. For further details regarding First Nation and community stakeholder participation, refer to the Communication Plan by MPMC (2016b).

9.11 Archaeological Management and Impact Mitigation Plan

Archaeological sites are protected under the HCA, whether in an intact or disturbed context and impacts to an archaeological site can only be conducted under an HCA Section 12.4 Alteration permit. In order to acquire an Alteration permit, additional site inspection under an HCA Section 12.2 Inspection or Investigation permit may first be required.

On behalf of Mount Polley Mine, WSP is in the process of applying for an Inspection permit to both conduct AIA in the vicinity of Bootjack Creek (see Section 2.12) and to respond to any chance (incidental) finds that might be encountered. Should chance finds occur prior to issuance of the Inspection permit, an archaeologist could still be engaged to determine if the chance find

is archaeological in nature; however, they would be unable to carry out subsurface testing to aid in that determination. A stand-alone Chance Find Management Plan (CFMP) has been provided in Appendix 9-9. The CFMP outlines the process to follow should chance finds occur and will be made available to mine employees and contractors prior to construction activities occurring. The CFMP further provides relevant contact names and details and examples of archaeological materials or features that might be encountered (i.e., what to look for). As no registered (i.e., known) archaeological sites are located within the Springer Expansion area, specific impact mitigation plans have not been provided. Should archaeological sites be identified during the AIA or through the chance find process, these mitigation plans will be developed should site avoidance not be possible. Should archaeological sites need to be impacted under an Alteration permit, the CFMP will be presented by a WSP archaeologist to the construction crew, in addition to reviewing the methods under which the construction can proceed under the Alteration permit (i.e., monitoring or post-impact assessment using methods outlined in the Inspection permit).

9.12 Mine Emergency Response Plan

The Emergency Response Plan is provided in Appendix 9-10, and an overview of the plan is provided herein.

9.12.1 Scope

Being prepared for a mine site emergency is critical in order to effectively respond and control any unexpected occurrence.

The following Mine Emergency Response Plan has been designed and developed for Mount Polley mine to coordinate and effectively respond to any and all mine emergencies.

This is a requirement of the Health, Safety and Reclamation Code for Mines in British Columbia health, safety and reclamation code 3.7.1

9.12.2 Definition of an Emergency

A current or imminent situation that requires prompt coordination of actions of trained personnel to protect health, safety, or welfare of people and to limit damage to property and to the environment.

9.12.3 Goals

- To identify and ensure adequate resources are available on site and off site in order to facilitate effective emergency response.
- To introduce and train management in the roles of the “Control Group” To introduce and train workers in the relevance of the Mine Emergency Response Plan.

- To ensure and maintain a high standard of emergency response training for mine personnel.

9.12.4 Training

For the ERP Training Program to be successful, with adequate revision of this Plan, it is necessary to establish a Drill Program. The Health and Safety, Environmental and any other operational areas will take part in the drills.

All personnel assigned specific duties within this plan shall review pertinent sections of the plan.

All personnel in positions of leadership shall be trained in the Incident Command System.

Emergency Response Drill Schedule

- LEVEL 1 Once every 6 months - Area specific evacuation practice
- LEVEL 2 Once every year / Mine Site wide Involving the Mine Rescue Team
- LEVEL 3 Once every two years / Involving the Mine Rescue Team and Activating the Emergency Operation Centre

9.13 Mine Site Traffic Control Plan

The Traffic Management Plan is provided in Figure 9.13-1.

Mount Polley
Mining Corporation
an Imperial Metals company

TRAFFIC
MANAGEMENT PLAN
MOUNT POLLEY MINE
DATE: 2022/11/12

N
E

LEGEND
- Pickup Access
- 0 - 1% Grade
- 1 - 5 % Grade
- 5 - 10% Grade
- Cross Over
- Single Lane Traffic
- Public Access
- Run Away Lane
- Gates
- Spill Kits
- Yield Sign
- Stop Sign

Radio Channels / Frequencies (MHz)
1 - Tailings - 170.670
2 - Mill T/A - 170.790
3 - RR-25 - 151.310
4 - Old Bootjack - 153.635
5 - Pit Ops 1 - 167R910 & 170T430
~~6 - Pit Ops 2 - 162R075 & 167T055~~ Not Active
7 - Pit T/A - 167.910
8 - Maintenance - 166.020
9 - Supervisor - 164.425

*Designated as CH# on Map
*All vehicles to be on 5/6 when in pit
*All vehicles to be on 1 when at TSF
*Warehouse is on 8
*Surface Crew is on 2/5/6

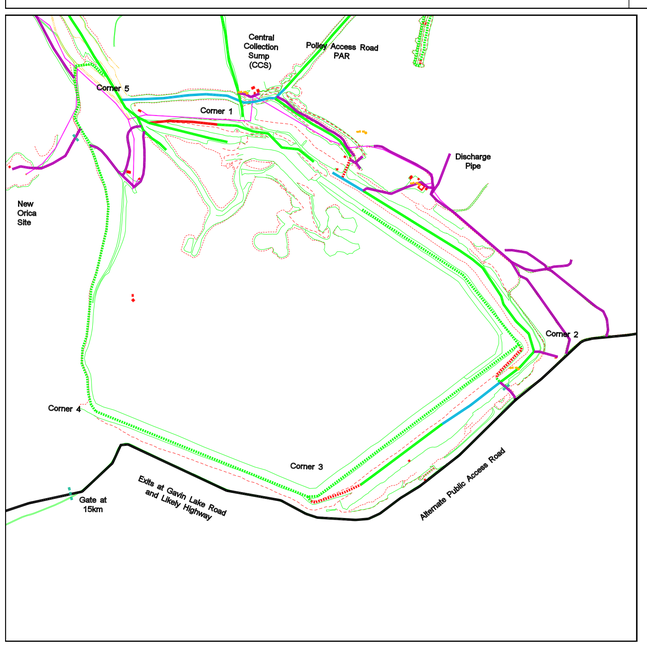
Priority of Right of Way for vehicles on the minesite
1. All Emergency Vehicles
2. Crew Buses
3. Loaded Haul Trucks
4. Empty Haul Trucks
5. Explosive Trucks
6. Ancillary Equipment
7. Personal Vehicles

Refer to Mine Operations Procedure MO-6 for:
-Maximum Speeds
-Rules for Passing
-Rules of Priority

Date Updated: April 26, 2022

TSF

MILL AREA



Bootjack Road (CH3)
Boundary Dump
North Bell Dump
Bootjack Road
9K Sump Road
Springer Pit
Cariboo Pit FLOODED
Wight Pit PAG Dump
Polley Lake Road
Run Away Lane
Wight Pit Haul Road
Wight Pit Till Dump
Wrap Around Dump Road
Tailings Dam Road (Polley Lake Road)
Leach Pad
Limestone Stockpile
Ore Stockpiile
Primary Crusher
Mine Rescue
Parking Lot
First Aid
High Grade Leach Stock Pile
Wight Pit Rock Dump
Till Stock Pile
Wrap Around Expansion Dump
LSW Dump
Mine Drainage Sump
In-Pit Washrooms
Core Palace
Landfill
SERD Dump
Booster Station
Old Orica Site
Tailings Access Road TAR
Tailings Dam Road
Tailings Hot Line
CH1
CH5

9.14 Fuel Management and Spill Control Plan

The Emergency Spill Response Contingency Plan is provided in Appendix D of the Emergency Response Plan (Appendix 9-10) and is summarized herein.

9.14.1 Potential Spill Materials:

1) Gasoline
2) Diesel Fuel
3) Waste Oil
4) Coolant
5) Hydraulic Fluid
6) Mill Tailings
7) Propane
8) Lime
9) Mill Reagent NaHS
10) Acids
11) Methyl Isobutyl Carbinol (W22)
12) Concentrate
13) Mine Influenced Water
14) Till/mud/soil/rock
15) IPAC

9.14.2 Potential Spill Types:

1) Minor spills from equipment due to leaks.
2) Minor spills from containers being damaged or knocked over.
3) Minor/Major spills from fueling stations.
4) Major spills from storage tanks outside the Mill.
5) Major spills from storage tanks inside the Mill.
6) Major spills form transportation and delivery vehicles.
7) Spills from slurry tailings line.
8) Releases of mine influenced water from water collection or transportation facilities.

9.14.3 Potential Spill Locations:

1) General Mine-site grounds.
2) Mill Building and surrounding areas.
3) Fueling station.
4) Access road to mine site.
5) Access road around mine site.
6) Open Pits.
7) Ditches and pipeline routes.
8) Water storage sumps and ponds.
9) Creeks, lakes and surface water bodies in and around the mine site, including the Hazeltine Creek effluent discharge site.

9.14.4 Spill Response Materials Locations:

1) Light vehicle fuel island (Warehouse).
2) Fuel Island (beside the Crusher).
3) Maintenance areas (Pit Shop, Finning/Shovel Crew Laydown)
4) Springer Pit (MDG)
5) Warehouse (Entrance and in yard, with spare materials in stock).
6) Lower Hazeltine
7) Reach 3 Creek Construction
8) Cold-Water Pump location (Weir)
9) 9K Sump
10) Mine Drainage Sump
11) Central Collection Sump
12) South Seepage Sump

9.14.5 Spill Assessment Potential

Transportation:

The area of greatest vulnerability for spills is transport related incidents resulting from road conditions, and mechanical failures. Contingency plans are filed by the Shipper of the transport company with Transport Canada and drivers are required to be in possession of these files in order to address these types of incidents. Ensure that Shipping Paper is carried in the cabin of the transport vehicle.

The Company:

Undertakes to provide information to the Shipper on avoidance of poor road conditions and rescheduling of deliveries, if necessary. Ensures to maintain the mine road conditions in as favourable condition as possible. Provides the manpower and equipment required to control and minimize the effects on the environment.

Fuels:

Standard procedures are in effect for the safe unloading of fuels to storage tanks and safety berms are provided to contain spills at the storage facilities. Emergency Contingency Plans for effective response to spills are addressed in this document.

Lime:

Unloading of granular quicklime from bulk tank trucks can result in spillage. These spillages, if any, will be cleaned up with a front-end loader and disposed of.

Explosives:

Transport, handling and transfer of explosives are addressed within the Emergency Contingency plan of this document. Explosive materials storage is in separate containers and conform to the Ministry of Mines and Transport Canada standards.

Tailings:

The tailings lines are protected by against vehicle collision. The pipeline is also contained in a ditch along the access road to the tailings pond.

Mine Influenced Water:

Site water collection sumps, ponds, and ditches, water transport pipes, and the Hazeltine Creek Discharge System, all have the potential to release water into the environment, possibly entering surface water bodies. Breaches may occur due extreme runoff events, physical damage to pipes or other facilities, or pump failure.

Other Consumables:

All consumables are contained within their original shipment containers prior to transfer to end user containers. End user spillage Emergency Contingency Plans are addressed in this document.

9.14.6 Response

9.14.7 Contact Group

Spills of chemicals, fuels and other substances may occur as isolated events or they may occur with other emergencies such as fire, explosion, natural causes or accident.

A number of response personnel may be involved to protect mine property and the health and safety of mine personnel and the public.

The key persons involved during a spill occurrence would be as follows:

- The person discovering the spill, and his/her Supervisor.
- The General Manager or his designate (who may be the On-Call Supervisor if the General Manger cannot be reached outside of regular hours).
- The Area Superintendent.
- The Safety Department.
- Mine Rescue trained personnel.
- The clean-up crews.

The responsibilities of key personnel are outlined in the Personnel Responsibilities section.

Applicable telephone numbers are kept current and posted at the mine-site.

9.14.8 First on Scene Personnel Responsibilities

9.14.8.1 Person Discovering the Spill:

- Assess the hazard to one's own health and safety and to others in the vicinity.
- If the risk of gas poisoning exists ensure to conduct atmospheric testing with the appropriate equipment prior to entry.
- If fire or explosion hazards are perceived immediately retreat to safe distance.

9.14.8.2 In both these situations:

- Barricade/Flag the area.
- Place physical guards at a safe distance.
- Warn others in the immediate vicinity of the situation.
- Notify the Area Supervisor IMMEDIATELY following initial response action.
- Arrange for appropriate operating equipment to be shut down, if applicable, to minimize the extent of the spill.
- If warranted, notify designated First Aid Attendant for first aid.
- Firefighting response will be trained site personnel backed up by Mine Rescue trained personnel.
- The Supervisor or the person discovering the spill with the following information must contact the General Manager or his designate IMMEDIATELY following initial response action:
  - Name of person discovering the spill.
  - The time of the spill.
  - The location of the spill.
  - The type of substance spilled.
  - The quantity of material been spilled.
  - The cause of the spill.
  - The weather conditions.
  - Perceived potential for hazard, and any injury to aquatic systems, wildlife or people.
  - Actions already taken.
  - Whether a fire or explosion hazard is deemed to exist.
  - Personnel already notified.
  - If the spill is contained.
  - Any environmental effects that have or could occur.
  - Any injuries.

9.14.9 Level of Emergency

- **Level 1-** A spill that is **below the external reportable quantity** or an emergency where the **potential health and safety risks are low** (no employees are injured). Incidents that can be cleaned up or resolved with little impact on the mine and or environment. No command post is necessary in such an incident.
- **Level 2**- A spill that is **above the external reportable quantity** or an emergency whereby the **health and safety of staff member(s) may be jeopardized**. It is a spill that requires the initiation of the emergency measures. No external help is needed in this situation, but a command post may need to be established.
- **Level 3**- A spill that is **above the external reportable quantity** or an emergency where there is **great potential health and safety risks**. There may be casualties. This type of emergency requires internal and (may require) external intervention. A command post may be set up both onsite and offsite.

	Is the spill above external report quantity?	Potential Health and Safety Risk	Emergency Operations Center	External Support
Level 1	No	Low	No	No
Level 2	Yes	Maybe	Maybe	No
Level 3	Yes	Yes	Yes	Maybe/yes

9.14.10Main Response Elements

Find and Identify

- Mitigate the Source of the Spill
- Establish Communication
- System Collect Information
- Isolate the Emergency Scene

Notify

- Site supervisors, managers, and employees (according to procedures outlined in this document).
- Regulatory bodies and agencies as required (Ministry of Environment, Environment Canada, Provincial Emergency Program), if required.
- Soda Creek Indian Band and Williams Lake Indian Band, if required.
- Notification to public and media, if required.

Ensure Public Health and Safety Protection

- Work with appropriate first responders:
  - Mine Rescue Team and site First Aid attendants
  - Ambulance
  - Fire Department
  - Police
  - Search and Rescue

Environmental Protection

- Establish spill plan
- Manage spill response equipment and resources
- Conduct spill material clean up

Terminate the Incident

- Complete an incident report

9.14.11Personnel Responsibilities

General Manager/Designate:

Deploy response crews and equipment operators to undertake the actual clean-up and supervise their work. Notifies Corporate, Emergency Management BC, First Nations groups, and Media. Maintain responsibility for the activities at the site of the spill.

Maintain contact with and co-ordinate work with the Environmental Superintendent, Terminates the Incident, conducts brief.

- Notifies Government Agencies.
- Monitors Environmental Impact.
- Establishes decontamination measures with safety coordinator.
- Update the Spill Contingency Plan as required, for all potentially hazardous materials, accurate names of personnel and phone numbers.
- Plan and co-ordinate required skills.
- Be responsible for assessing new spill hazards as they develop and take preventative actions, whether covered in the manual or not.

- Check and maintain the operating status of required response equipment, which may be required at a spill.
- Train emergency response personnel with respect to their duties, or work with the Safety Department to do so.

Superintendent of Affected Area:

- Has authority to direct response operations.
- Needs to clear incident action plan with the General Manager (or designate).
- Determines level of Incident.
- Assigns Command Post if necessary.
- Executes the incident action plan.
- Enforces worker safety and environmental protection.
- Briefs team on specific assignment.

Communications:

- Responsible for the communication and emergency assistance
- Notifies emergency response personnel by telephone or radio in the event of an emergency
  - Assigns scribe
  - Records incident details and subsequent developments as they occur.
  - Responsible for establishing communication and emergency assistance.
  - Establishes external support system (if required)
  - Assisting Safety Supervisor.
  - Maintains communication contact with the work parties via walkie-talkies, signal horns, or other means

Health and Safety:

- Advises the incident commander on all aspects of health and safety on the site.
- Recommends stopping the work if any of the work operations threaten worker or public safety.
- Ensure proper personal protective equipment is used and maintained.
- Controls entry and exit at the access control points.
- Monitors onsite hazards and conditions.

- Enforces the Buddy system.
- Control the decontamination of all equipment, personnel and samples from the contaminated areas.
- Assist In the disposal of contaminated clothing and materials.
- Advise medical personnel of potential exposures and consequences.

9.14.12Emergency Response Team Members:

- Consult the Mine Emergency Response Plan to review the site plan relative to building location of the spilled material and specific location of the material within the building/site.
- Consult the appropriate ACTION PLAN contained in this document, to review the properties of the spilled material and recommended response actions.
- If further information is required, contact one of the resource services listed in Heading 2 of this document.
- Assess the spill requirements for manpower, equipment, materials, tools and protective gear to contain the spill, in consideration of the resources available.
- Mobilize these resources and take responsibility for implementation of the response actions in the spill site.
- If the spill is too large or complex to be handled entirely by the Company's resources, call an appropriate group or agency listed on page 3 of this document.
- Contact the Area Superintendent to determine what, if any, sampling should be done and to discuss the spill and any environmental implications.
- Once the initial response action is underway, contact the General Manager or designate to review the situation and strategy.

9.15 Combustible Dust Management Plan

This section is not required as part of the joint application per the information requirements table.

9.16 Chemicals and Materials Storage, Transfer, and Handling Plan

This section is not required as part of the joint application per the information requirements table.

9.17 Waste (Refuse and Emissions) Management Plan

This section is not required as part of the joint application per the information requirements table.

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