

BRUCEJACK GOLD MINE PROJECT

APPLICATION FOR AN ENVIRONMENTAL ASSESSMENT CERTIFICATE / ENVIRONMENTAL IMPACT STATEMENT

Table of Contents

PART A - INTRODUCTION AND BACKGROUND

Table of Concordance

Preface

Executive Summary

Acknowledgements

Table of Contents

List of Figures	TOC 79
List of Tables	TOC 97
List of Plates	TOC 128
List of Appendices	TOC 131

Acronyms and Abbreviations

Glossary

1. Introduction and Project Overview	1-1
1.1 Proponent Description	1-1
1.1.1 Proponent	1-1
1.1.2 Corporate Governance and Management Structures	1-1
1.1.3 Environment, Health, and Safety Management System	1-2
1.2 Guiding Principles	1-3
1.2.1 Precautionary Principle	1-3
1.2.2 Community Knowledge and Aboriginal Traditional Knowledge	1-3
1.2.3 Public Consultation	1-4
1.2.4 Aboriginal Consultation	1-4
1.3 Purpose of the Project	1-4
1.4 Project Location, Access, and History	1-5
1.4.1 Location	1-5

1.4.2	Project Location in Relation to Aboriginal Traditional Territories and Lands Defined under the <i>Nisga'a Final Agreement</i>	1-5
1.4.3	Access.....	1-10
1.4.4	History	1-10
1.5	Project Tenure.....	1-13
1.6	Regional Area	1-22
1.7	Project Scope	1-29
1.7.1	Provincial Scope of the Project	1-29
1.7.2	Federal Scope of the Project	1-29
1.8	Project Schedule	1-30
1.8.1	Construction Phase	1-30
1.8.2	Operation Phase.....	1-32
1.8.3	Closure Phase.....	1-33
1.8.4	Post-closure.....	1-33
1.9	Project Benefits	1-33
1.9.1	Regulatory and Policy Framework	1-33
1.9.2	Natural Resource Industry Overview	1-33
1.9.3	Project Economic Feasibility.....	1-34
1.9.3.1	Production and Market Prices	1-34
1.9.3.2	Project Mineral Production	1-35
1.9.3.3	Economic Returns.....	1-40
1.9.3.4	Mine Construction Expenditures.....	1-40
1.9.3.5	Mine Operation Expenditures.....	1-42
1.9.3.6	Mine Closure Expenditures	1-43
1.9.4	Revenues	1-44
1.9.4.1	Economic Impact Analysis	1-44
1.9.4.2	Mine Construction Impacts	1-46
1.9.4.3	Mine Operation Impacts	1-51
1.9.4.4	Mine Closure Impacts.....	1-55
1.9.4.5	Local Procurement and Community Development	1-56
1.9.5	Employment	1-56
1.9.5.1	Mine Construction Employment	1-58
1.9.5.2	Mine Operation Employment.....	1-62
1.9.5.3	Mine Closure Employment	1-65
1.9.5.4	Proponent's Employment Policies	1-65
1.9.6	Summary.....	1-65
	References.....	1-67
2.	Assessment Process	2-1
2.1	Provincial and Federal Environmental Assessment Requirements	2-1
2.1.1	British Columbia Environmental Assessment Requirements.....	2-1
2.1.1.1	British Columbia <i>Environmental Assessment Act</i>	2-1

TABLE OF CONTENTS

2.1.1.2	Reviewable Projects Regulation (BC Reg. 370/2002).....	2-2
2.1.1.3	Prescribed Time Limits Regulation (BC Reg. 372/2002)	2-2
2.1.1.4	Public Consultation Policy Regulation (BC Reg. 373/2002).....	2-2
2.1.1.5	Concurrent Approval Regulation (BC Reg. 371/2002)	2-2
2.1.1.6	Guidance Documents.....	2-3
2.1.2	Canadian Environmental Assessment Requirements.....	2-3
2.1.2.1	<i>Canadian Environmental Assessment Act, 2012</i>	2-3
2.1.2.2	Regulations Designating Physical Activities (SOR/2012-147).....	2-4
2.1.2.3	Prescribed Information for the Description of a Designated Project Regulations (SOR/2012-148)	2-4
2.1.2.4	Policy Statements and Guidance Documents	2-4
2.2	Environmental Assessment Process.....	2-5
2.2.1	Provincial Environmental Assessment Process.....	2-5
2.2.1.1	Pre-Application Stage	2-5
2.2.1.2	Application Stage	2-8
2.2.2	Federal Standard Environmental Assessment Process.....	2-9
2.2.3	Joint Environmental Assessment Working Group.....	2-13
2.3	Authorizations.....	2-14
2.3.1	Provincial Authorizations	2-16
2.3.1.1	Concurrent Approvals Framework	2-16
2.3.1.2	Coordinated Authorization Framework	2-16
2.3.2	Federal Authorizations.....	2-17
2.4	Transboundary Effects.....	2-18
2.5	Regional Studies	2-18
2.6	Nisga'a Final Agreement	2-19
	References.....	2-20
3.	Information Distribution and Consultation.....	3-1
3.1	Introduction	3-1
3.1.1	Information Distribution and Consultation Objectives	3-1
3.2	Consultation Requirements	3-1
3.2.1	Provincial Requirements.....	3-1
3.2.2	Federal Requirements.....	3-3
3.2.3	Application Information Requirements	3-3
3.2.3.1	Notification of November 2013 Open Houses and Draft Application Information Requirements Public Comment Period	3-4
3.2.4	Project Description and Environmental Impact Statement Guidelines.....	3-4
3.3	Brucejack Gold Mine Project Technical Working Group	3-4
3.4	Project Materials and Information Dissemination	3-5
3.5	Aboriginal Information Distribution and Consultation	3-7
3.5.1	<i>Nisga'a Final Agreement</i>	3-7

3.5.2	Pre-Application/Pre-EIS Consultation with Aboriginal Groups	3-8
3.5.2.1	Aboriginal Consultation Plan.....	3-8
3.5.2.2	Notification of the Brucejack Gold Mine Project.....	3-13
3.5.2.3	Brucejack Gold Mine Project Environmental Assessment Working Group.....	3-13
3.5.2.4	Application Information Requirements	3-14
3.5.2.5	Field Assistants and Project Employment	3-15
3.5.2.6	Traditional Knowledge and Traditional Use Studies	3-15
3.5.2.7	Nisga'a Economic, Social, and Cultural Impact Assessment....	3-15
3.5.2.8	Training.....	3-15
3.5.2.9	Site Visits and Mine Tours	3-16
3.5.2.10	Aboriginal Consultation Reports.....	3-16
3.5.3	Issues Raised by Aboriginal Groups and Responses	3-17
3.5.3.1	Outstanding Issues	3-18
3.5.4	Proposed Plan for Consultation with Aboriginal Groups during the Application/EIS Review	3-18
3.5.5	Proposed Plan for Consultation with Nisga'a Nation during the Application/EIS Review	3-19
3.6	Government Agency Information Distribution and Consultation	3-20
3.6.1	Pre-Application/Pre-EIS Consultation with Government Agencies	3-20
3.6.1.1	Application Information Requirements	3-20
3.6.1.2	Site Visits and Mine Tours	3-20
3.6.2	Issues Raised by Government Agencies and Responses	3-21
3.6.2.1	Outstanding Issues	3-21
3.6.3	Proposed Plan for Consultation with Government Agencies during the Application/EIS Review	3-21
3.7	Public Information Distribution and Consultation	3-22
3.7.1	Pre-Application/Pre-EIS Consultation with the Public	3-22
3.7.1.1	Communities near the Project	3-22
3.7.1.2	Public Consultation Plan.....	3-22
3.7.1.3	Application Information Requirements and Open Houses	3-24
3.7.1.4	Consultations with Tenure and Licence Holders	3-28
3.7.1.5	Consultations with Local Governments	3-28
3.7.1.6	Conferences and Panels	3-29
3.7.1.7	Donations.....	3-29
3.7.1.8	Community Contact	3-29
3.7.1.9	Public Consultation Reports.....	3-29
3.7.2	Issues Raised by the Public and Responses	3-30
3.7.2.1	Outstanding Issues	3-31
3.7.3	Proposed Plan for Consultation with the Public during the Application/EIS Review	3-31
	References.....	3-33

TABLE OF CONTENTS

4.	Project Design and Alternatives Assessment	4-1
4.1	Introduction	4-1
4.2	Methods	4-1
4.2.1	Screening Potential Options	4-4
4.2.2	Detailed Assessment of Alternative Means of Carrying Out the Project	4-4
4.2.2.1	Performance Objectives	4-4
4.2.2.2	Attribute Ranking System	4-5
4.3	Screening	4-6
4.3.1	Ground Access from Highway 37 to Knipple Transfer Area.....	4-13
4.3.1.1	Background.....	4-13
4.3.1.2	Technical and Economic Feasibility Assessment	4-13
4.3.1.3	Selected Option	4-14
4.3.2	Ground Access from Proposed Knipple Transfer Area to the Brucejack Mine Site.....	4-14
4.3.2.1	Background.....	4-14
4.3.2.2	Technical and Economic Feasibility Assessment	4-14
4.3.2.3	Selected Option	4-15
4.3.3	Power for the Project.....	4-15
4.3.4	Mining Method	4-15
4.3.4.1	Background.....	4-15
4.3.4.2	Technical and Economic Feasibility Assessment	4-15
4.3.4.3	Selected Option	4-17
4.3.5	Location of Initial Ore Processing into Flotation Concentrate.....	4-18
4.3.5.1	Purpose and Background.....	4-18
4.3.5.2	Technical and Economic Feasibility Assessment	4-18
4.3.5.3	Screening Result	4-18
4.3.6	Sewage Treatment and Discharge Location.....	4-18
4.3.6.1	Background.....	4-18
4.3.6.2	Technical and Economic Feasibility Assessment	4-19
4.3.6.3	Screening Result	4-20
4.3.7	Contact Water Treatment Method and Discharge Location	4-20
4.3.7.1	Background.....	4-20
4.3.7.2	Technical and Economic Feasibility Assessment	4-20
4.3.7.3	Screening Result	4-21
4.4	Alternative Means Assessments	4-21
4.4.1	Access Method (Personnel)	4-22
4.4.1.1	Purpose and Background.....	4-22
4.4.1.2	Alternatives Identification	4-22
4.4.1.3	Alternatives Comparison.....	4-22
4.4.1.4	Selected Alternative	4-29

4.4.2	Ore Comminution	4-29
4.4.2.1	Purpose and Background.....	4-29
4.4.2.2	Alternatives Identification	4-29
4.4.2.3	Alternatives Comparison.....	4-29
4.4.2.4	Selected Alternative	4-30
4.4.3	Location of Final Flotation Concentrate Processing into Gold-Silver Doré .	4-33
4.4.3.1	Purpose and Background.....	4-33
4.4.3.2	Alternatives Identification	4-33
4.4.3.3	Alternatives Comparison.....	4-33
4.4.3.4	Selected Alternative	4-40
4.4.4	Tailings Disposal Method.....	4-40
4.4.4.1	Purpose and Background.....	4-40
4.4.4.2	Alternatives Identification	4-40
4.4.4.3	Alternatives Comparison.....	4-41
4.4.4.4	Selected Alternative	4-47
4.4.5	Waste Rock Disposal Method.....	4-47
4.4.5.1	Purpose and Background.....	4-47
4.4.5.2	Alternatives Identification	4-48
4.4.5.3	Alternatives Comparison.....	4-49
4.4.5.4	Selected Alternative	4-50
4.4.6	Controlling Sediment Release from the Lake	4-54
4.4.6.1	Purpose and Background.....	4-54
4.4.6.2	Alternatives Identification	4-54
4.4.6.3	Alternatives Comparison.....	4-55
4.4.6.4	Selected Alternative	4-56
4.4.7	Solid Waste Disposal Method for Non-hazardous Waste.....	4-56
4.4.7.1	Purpose and Background.....	4-56
4.4.7.2	Alternatives Identification	4-56
4.4.7.3	Alternatives Comparison.....	4-56
4.4.7.4	Selected Alternative	4-63
4.5	Summary of Alternatives Assessments	4-63
4.6	Project Design Changes	4-63
	References.....	4-69
5.	Project Description.....	5-1
5.1	Introduction	5-1
5.1.1	Regulatory Framework.....	5-4
5.2	Location and Current Access	5-5
5.3	Mineral Tenures.....	5-5
5.4	Regional and Project Geology and Mineralization	5-5
5.4.1	Regional Geology.....	5-5

TABLE OF CONTENTS

5.4.2	Local Geology - the Sulphurets Mining Camp	5-8
5.4.2.1	Stratigraphic Setting and Major Mineral Deposits.....	5-8
5.4.2.2	Alteration and Mineralization.....	5-12
5.4.2.3	Structural Setting and Metamorphism.....	5-13
5.4.3	Property Geology	5-14
5.4.3.1	Lithology and Stratigraphy	5-15
5.4.3.2	Alteration and Mineralization.....	5-16
5.4.3.3	Structure and Metamorphism	5-29
5.4.3.4	Geochronology	5-32
5.4.4	Deposit Types.....	5-34
5.5	Mineral Resources	5-34
5.6	Geochemical Characterization	5-37
5.6.1	Sample Selection.....	5-37
5.6.2	Waste Rock.....	5-39
5.6.2.1	Static Testing	5-42
5.6.2.2	Shake Flask Extractions	5-45
5.6.2.3	Kinetic Testing	5-45
5.6.3	Flotation Tailings, Sludge, Paste, and Ore	5-46
5.6.3.1	Static Testing	5-46
5.6.3.2	Shake Flask Extractions	5-47
5.6.3.3	Kinetic Testing	5-47
5.6.4	Site Characterization Materials	5-47
5.6.5	Main Conclusions	5-48
5.7	Construction.....	5-55
5.7.1	Construction Overview.....	5-55
5.7.2	Pre-production Underground Development	5-55
5.7.3	Pre-production Underground Development Equipment	5-57
5.7.4	Construction of On-site and Off-site Surface Facilities	5-59
5.7.5	Surface Construction Equipment	5-61
5.8	Mine Development and Operations	5-62
5.8.1	Overview	5-62
5.8.2	Mine Design	5-64
5.8.2.1	Geotechnical Assessment.....	5-64
5.8.2.2	Access and Ramp Infrastructure.....	5-67
5.8.2.3	Level Development	5-68
5.8.2.4	Stope Design	5-68
5.8.2.5	Stope Cycle	5-68
5.8.2.6	Stope Sequence	5-78
5.8.2.7	Blasting	5-78
5.8.2.8	Backfilling	5-81
5.8.2.9	Potential for Surface Subsidence at the Brucejack Gold Mine Project	5-85

5.8.3	Mine Production Schedule	5-86
5.8.4	Underground Infrastructure.....	5-86
5.8.4.1	Mine Dewatering	5-86
5.8.4.2	Ore Handling.....	5-89
5.8.4.3	Ventilation	5-92
5.8.4.4	Underground Electrical Demand and Distribution.....	5-94
5.8.4.5	Compressed Air.....	5-95
5.8.4.6	Service Water Supply.....	5-95
5.8.4.7	Fueling and Lubrication.....	5-95
5.8.4.8	Workshop and Stores	5-95
5.8.4.9	Explosives Magazine	5-96
5.8.4.10	Refuge Stations.....	5-96
5.8.4.11	Portal Structure	5-96
5.8.4.12	Underground Communications.....	5-97
5.8.5	Production Equipment	5-98
5.9	Mineral Processing.....	5-99
5.9.1	Introduction.....	5-99
5.9.2	Summary.....	5-99
5.9.3	Primary Crusher and Mill Feed Surge Bin	5-101
5.9.4	Mill Building.....	5-101
5.9.5	Primary Grinding, Classification, and Primary Gravity Concentration	5-102
5.9.6	Rougher and Scavenger Flotation	5-102
5.9.7	Slimes Flotation	5-102
5.9.8	Cleaner Flotation	5-102
5.9.9	Concentrate Handling	5-103
5.9.10	Gravity Concentrate Upgrading	5-103
5.9.11	Reagent Handling and Storage.....	5-103
5.9.12	Plant Control	5-104
5.10	Water Management	5-104
5.10.1	Construction Phase Water Management	5-104
5.10.2	Operation Phase Water Management.....	5-107
5.10.3	Freshwater Diversion Channels	5-108
5.10.4	Contact Water.....	5-108
5.10.5	Process Water Requirements	5-110
5.10.6	Water Supply	5-110
5.10.6.1	Freshwater Supply System	5-111
5.10.6.2	Process Water Supply System.....	5-111
5.10.6.3	Potable Water Treatment Plants.....	5-111
5.10.7	Water Balance Model.....	5-111
5.11	Waste Management	5-114
5.11.1	Waste Rock.....	5-114
5.11.1.1	Waste Rock Characterization	5-114

TABLE OF CONTENTS

5.11.1.2	Historical Waste Rock Management	5-115
5.11.1.3	Waste Rock Schedule.....	5-115
5.11.1.4	Deposition in Brucejack Lake	5-117
5.11.2	Tailings	5-118
5.11.2.1	Overview	5-118
5.11.2.2	Brucejack Lake	5-122
5.11.2.3	Tailings Characterization.....	5-125
5.11.2.4	Mixing Tank	5-125
5.11.2.5	Tailings Pipeline.....	5-125
5.11.2.6	Air Valves.....	5-129
5.11.2.7	Deposit over the Pipeline Terminus	5-129
5.11.2.8	Experience at Other Operations with Similar Disposal Method.....	5-129
5.11.2.9	Operation.....	5-130
5.11.2.10	Switching Outfalls	5-130
5.11.3	Air Emissions.....	5-130
5.11.4	Hazardous Waste.....	5-131
5.11.5	Non-hazardous Waste Management.....	5-134
5.11.6	Sewage.....	5-134
5.12	Ancillary Infrastructure.....	5-134
5.12.1	Mine Site Geohazards	5-134
5.12.2	Internal Site Roads and Pad Areas	5-135
5.12.3	Camp	5-136
5.12.4	Assay and Metallurgical Laboratories.....	5-136
5.12.5	Warehouse Facility	5-138
5.12.6	Mine Dry	5-138
5.12.7	Truck Shop	5-138
5.12.8	First Aid.....	5-138
5.12.9	Administration Office	5-138
5.12.10	Fuel Handling, Transportation, and Storage	5-138
5.12.10.1	Mine Area Surface Fuel Storage	5-139
5.12.10.2	Underground Fuel Storage.....	5-139
5.12.10.3	Knipple Transfer Area Fuel Storage	5-139
5.12.11	Explosives Storage and Use	5-139
5.12.12	Concentrate Storage	5-141
5.12.13	Concentrate Transportation	5-141
5.12.14	Power Supply	5-141
5.12.15	Communications	5-142
5.12.16	Treatment Plant for Underground Mine and Surface Water.....	5-143
5.12.17	Laydown Area.....	5-145
5.12.18	Helicopter Pads	5-145

5.12.19	Operations Mobile Equipment	5-145
5.12.20	Quarry.....	5-146
5.12.21	Brucejack Lake Outlet Weir.....	5-147
5.12.22	Turbidity Curtain.....	5-147
5.13	Off-site Infrastructure	5-148
5.13.1	Project Access and Transportation Corridor	5-148
5.13.1.1	Overview	5-148
5.13.1.2	Knipple Glacier.....	5-150
5.13.1.3	Operation.....	5-155
5.13.1.4	Traffic.....	5-155
5.13.2	Transmission Line	5-157
5.13.2.1	Transmission Line Construction	5-159
5.13.2.2	Transmission Line Operations, Maintenance, and Emergency Response	5-160
5.13.3	Knipple Transfer Area.....	5-160
5.13.3.1	Site Preparation.....	5-162
5.13.3.2	Camp	5-162
5.13.3.3	Fuel Storage	5-162
5.13.3.4	Maintenance and Emergency Vehicle Building.....	5-162
5.13.3.5	Waste Management.....	5-162
5.13.3.6	Temporary Facilities	5-162
5.13.4	Bowser Aerodrome.....	5-163
5.13.5	Tide Staging Area	5-165
5.14	Avalanche Hazard	5-165
5.14.1	Mine Site Avalanche Hazards	5-165
5.14.2	Access Road Avalanche Hazards.....	5-168
5.14.3	Knipple Transfer Area Avalanches	5-168
5.14.4	Transmission Line	5-170
5.15	Closure and Reclamation.....	5-170
5.15.1	Closure Phase Activities	5-171
5.15.2	Post-closure Phase	5-171
5.16	Project Workforce.....	5-171
5.16.1	Construction	5-171
5.16.2	Operation.....	5-180
5.16.3	Closure and Post-closure	5-180
5.17	Project Capital and Operating Costs	5-180
5.17.1	Capital Costs.....	5-180
5.17.2	Operating Costs	5-182
	References.....	5-184
6.	Assessment and Methodology.....	6-1
6.1	Introduction	6-1

TABLE OF CONTENTS

6.2	Regulatory Framework	6-3
6.3	Baseline Characterization.....	6-3
6.3.1	Regional Overview	6-3
6.3.2	Historical Activities.....	6-4
6.3.3	Site-specific Baseline Studies.....	6-4
6.3.3.1	Data Sources	6-5
6.3.3.2	Methods.....	6-6
6.3.3.3	Characterization of Baseline Condition	6-6
6.4	Establishing the Scope of the Effects Assessment	6-6
6.4.1	Selecting Candidate Components	6-7
6.4.1.1	Scoping Potential Interactions between the Project and Candidate Components	6-8
6.4.1.2	Consultation Feedback on Valued Components	6-18
6.4.1.3	Summary of Intermediate Components and/or Receptor Valued Components Included/Excluded in the Application for the Application/Environmental Impact Statement	6-18
6.4.2	Assessment Boundaries	6-24
6.4.3	Identifying Potential Effects.....	6-27
6.5	Effects Assessment and Mitigation	6-28
6.5.1	Identifying Key Effects.....	6-28
6.5.2	Implementing Mitigation Measures	6-29
6.6	Residual Effects.....	6-32
6.6.1	Residual Effects Remaining After Mitigation.....	6-32
6.7	Characterizing Residual Effects, Likelihood, Significance, and Confidence	6-33
6.7.1	Characterizing Residual Effects	6-33
6.7.2	Likelihood of Residual Effects	6-34
6.7.3	Significance of Residual Effects	6-35
6.7.4	Confidence in and Risk of Residual Effects.....	6-36
6.7.4.1	Characterizing Confidence	6-36
6.7.4.2	Risk Assessment	6-36
6.7.4.3	Follow-up Program	6-37
6.8	Summary of Residual Effects and Significance	6-37
6.9	Cumulative Effects Assessment	6-37
6.9.1	Types of Cumulative Effects	6-39
6.9.2	Projects and Activities Considered	6-39
6.9.2.1	Past Projects.....	6-49
6.9.2.2	Present Projects	6-56
6.9.2.3	Reasonably Foreseeable Future Projects	6-60
6.9.2.4	Non-traditional Land Use Activities	6-77
6.9.2.5	Traditional Land Use Activities (Aboriginal Harvest)	6-91

6.9.3	Establishing the Scope of the Cumulative Effects Assessment.....	6-91
6.9.3.1	Cumulative Effects Assessment Boundaries	6-92
6.9.4	Cumulative Effects and Mitigation.....	6-92
6.9.4.1	Potential Cumulative Effects	6-99
6.9.4.2	Implementing Mitigation Measures for Cumulative Effects....	6-100
6.10	Cumulative Residual Effects.....	6-100
6.10.1	Cumulative Residual Effects Remaining After Mitigation	6-100
6.11	Characterizing Cumulative Residual Effects, Likelihood, Significance, and Confidence.....	6-101
6.11.1	Likelihood of Cumulative Residual Effects	6-101
6.11.2	Significance of Cumulative Residual Effects	6-101
6.11.3	Confidence, Uncertainty, and Risk of Cumulative Residual Effects	6-102
6.11.3.1	Characterizing Confidence	6-102
6.11.3.2	Risk Assessment	6-102
6.11.3.3	Follow-up Program	6-102
6.11.4	Cumulative Residual Effects Summary	6-102
6.12	Conclusion	6-104
	References.....	6-105

PART B - PREDICTIVE STUDIES

7.	Air Quality Predictive Study	7-1
7.1	Introduction	7-1
7.2	Regulatory and Policy Framework.....	7-1
7.3	Baseline Characterization.....	7-4
7.3.1	Regional Overview	7-4
7.3.1.1	Meteorology.....	7-4
7.3.1.2	Air Quality.....	7-5
7.3.2	Historical Activities.....	7-5
7.3.3	Baseline Studies	7-6
7.3.3.1	Meteorology.....	7-6
7.3.3.2	Air Quality.....	7-9
7.3.4	Characterization of Baseline Condition	7-14
7.3.4.1	Meteorology.....	7-14
7.3.4.2	Air Quality.....	7-18
7.4	Establishing the Scope of the Predictive Study	7-20
7.4.1	Selecting Intermediate Components	7-20
7.4.1.1	Potential Interactions between the Project and Intermediate Components.....	7-21
7.4.1.2	Consultation Feedback on Intermediate Components.....	7-26
7.4.1.3	Summary of Intermediate Components Included/Excluded in the Application/EIS	7-26

TABLE OF CONTENTS

7.4.2	Predictive Study Boundaries	7-26
7.4.2.1	Spatial Boundaries	7-26
7.4.2.2	Temporal Boundaries.....	7-28
7.4.3	Identifying Key Potential Effects on Air Quality.....	7-28
7.4.3.1	Construction	7-32
7.4.3.2	Operation.....	7-32
7.4.3.3	Closure.....	7-32
7.4.3.4	Post-closure.....	7-32
7.5	Predictive Study Methods for Air Quality.....	7-33
7.5.1	Air Emission Inventory	7-33
7.5.1.1	Construction	7-33
7.5.1.2	Operation.....	7-36
7.5.2	Air Emissions Dispersion Modelling.....	7-38
7.6	Predictive Study Results for Air Quality	7-42
7.6.1	Air Emission Inventory	7-42
7.6.1.1	Construction	7-42
7.6.1.2	Operation.....	7-42
7.6.2	Predicted Dispersion Model Results for Construction Phase	7-42
7.6.2.1	Nitrogen Dioxide	7-42
7.6.2.2	Sulphur Dioxide.....	7-52
7.6.2.3	Carbon Monoxide.....	7-52
7.6.2.4	Total Suspended Particulate	7-52
7.6.2.5	PM ₁₀	7-52
7.6.2.6	PM _{2.5}	7-64
7.6.2.7	Dust Deposition.....	7-64
7.6.2.8	Acid Deposition.....	7-68
7.6.3	Predicted Dispersion Model Results for Operation Phase	7-68
7.6.3.1	Nitrogen Dioxide	7-68
7.6.3.2	Sulphur Dioxide.....	7-68
7.6.3.3	Carbon Monoxide.....	7-77
7.6.3.4	Total Suspended Particulate	7-77
7.6.3.5	PM ₁₀	7-77
7.6.3.6	PM _{2.5}	7-77
7.6.3.7	Dust Deposition.....	7-85
7.6.3.8	Acid Deposition.....	7-85
7.7	Mitigation Measures for Air Quality	7-85
7.7.1	Underground Mining Process	7-85
7.7.2	Equipment and Vehicles	7-88
7.7.3	Unpaved Access Road	7-88
7.7.4	Baghouse and Scrubber	7-88
7.7.5	Best Practices	7-89

7.8	Predicted Changes on Air Quality	7-89
7.9	Air Quality as a Pathway to Receptor Valued Components	7-89
7.10	Cumulative Change for Air Quality	7-91
7.10.1	Establishing the Scope of the Cumulative Change Assessment	7-91
7.10.1.1	Identifying Intermediate Components for the Cumulative Change Assessment	7-91
7.10.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Air Quality	7-92
7.10.1.3	Spatio-temporal Boundaries of the Cumulative Change Assessment.....	7-93
7.10.1.4	Potential for Cumulative Changes	7-94
7.10.2	Analysis of Cumulative Changes.....	7-94
7.10.3	Mitigation Measures to Address Cumulative Predicted Changes.....	7-97
7.10.4	Predicted Cumulative Changes for Air Quality	7-97
7.10.5	Characterizing Predicted Cumulative Changes for Air Quality.....	7-99
7.10.6	Air Quality as a Pathway for Interaction with Receptor Valued Components..	7-99
7.10.6.1	Air Quality Pathway for Interaction with Human Health ..	7-99
7.11	Summary and Conclusions for Air Quality	7-100
	References.....	7-102
8.	Noise Predictive Study.....	8-1
8.1	Introduction	8-1
8.2	Regulatory and Policy Framework	8-2
8.2.1	Noise Level Metrics Considered for Impact on Humans	8-3
8.2.1.1	Sleep Disturbance.....	8-3
8.2.1.2	Interference with Speech Communication	8-4
8.2.1.3	Complaints	8-4
8.2.1.4	High Annoyance	8-4
8.2.2	Noise Level Metrics Considered for Impacts on Wildlife	8-5
8.2.2.1	Loss of Wildlife Habitat and Disturbance of Wildlife	8-5
8.3	Baseline Characterization.....	8-6
8.3.1	Regional Overview	8-6
8.3.2	Historical Activities.....	8-7
8.3.3	Baseline Studies	8-7
8.3.3.1	Data Sources	8-8
8.3.3.2	Methods.....	8-8
8.3.4	Characterization of Noise Baseline Condition	8-10
8.4	Establishing the Scope of the Assessment for Noise.....	8-11
8.4.1	Selecting Intermediate Components	8-11
8.4.1.1	Potential Interactions between the Project and Intermediate Components.....	8-11
8.4.1.2	Consultation Feedback on Intermediate Components.....	8-16

8.4.1.3	Summary of Intermediate Components Included/Excluded in the Application/EIS	8-16
8.4.2	Assessment Boundaries for Noise	8-16
8.4.2.1	Spatial Boundaries	8-16
8.4.2.2	Temporal Boundaries.....	8-18
8.4.3	Identifying Key Potential Changes to Noise	8-18
8.4.3.1	Construction	8-22
8.4.3.2	Operation.....	8-23
8.4.3.3	Closure.....	8-23
8.4.3.4	Post-closure.....	8-23
8.5	Predictive Study Methods for Noise	8-23
8.5.1	Sensitive Receptors.....	8-24
8.5.2	Construction Phase Noise Sources	8-24
8.5.3	Operation Phase Noise Sources.....	8-24
8.5.4	Outdoor-to-Indoor Transmission Loss.....	8-26
8.5.5	Limitations	8-27
8.6	Predictive Study Results for Noise.....	8-28
8.6.1	Project Construction	8-28
8.6.1.1	Human Receptors	8-28
8.6.1.2	Wildlife	8-31
8.6.2	Operation Phase.....	8-31
8.6.2.1	Human Receptors	8-31
8.6.2.2	Wildlife	8-38
8.7	Mitigation Measures for Noise	8-39
8.8	Predicted Changes to Noise Levels.....	8-40
8.9	Noise as a Pathway to Receptor Valued Components.....	8-41
8.10	Cumulative Change Assessment for Noise.....	8-41
8.10.1	Establishing the Scope of the Cumulative Change Assessment	8-43
8.10.1.1	Identifying Intermediate Components for the Cumulative Change Assessment	8-43
8.10.1.2	Boundaries of the Cumulative Change Assessment	8-43
8.10.1.3	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Noise	8-43
8.10.2	Analysis of Cumulative Changes.....	8-44
8.10.3	Mitigation Measures to Address Cumulative Predicted Changes.....	8-45
8.10.4	Predicted Cumulative Changes for Noise	8-45
8.10.5	Characterizing Predicted Cumulative Changes for Noise	8-45
8.10.6	Noise as a Pathway for Interaction with Receptor Valued Components	8-45
8.10.6.1	Noise Pathway for Interaction with Human Health	8-45
8.10.6.2	Noise Pathway for Interaction with Wildlife	8-46
8.11	Summary and Conclusions for Noise.....	8-46
	References.....	8-47

9.	Hydrogeology Predictive Study.....	9-1
9.1	Introduction	9-1
9.2	Regulatory and Policy Framework.....	9-2
9.3	Baseline Characterization.....	9-5
9.3.1	Regional Overview	9-5
9.3.2	Historical Activities.....	9-6
9.3.3	Baseline Studies	9-8
9.3.3.1	Data Sources	9-8
9.3.3.2	Methods.....	9-9
9.3.4	Characterization of Hydrogeology Baseline Conditions	9-22
9.3.4.1	Hydrogeological Parameters	9-22
9.3.4.2	Groundwater Levels and Flow Directions.....	9-22
9.3.4.3	Groundwater Quality.....	9-22
9.3.4.4	Hydrogeological Dewatering Activities.....	9-24
9.3.4.5	Hydrogeological Numerical Modelling and Sensitivity Analyses	9-24
9.4	Establishing the Scope of the Assessment for Hydrogeology	9-46
9.4.1	Selecting Intermediate Components	9-46
9.4.1.1	Potential Interactions between the Brucejack Gold Mine Project and Intermediate Components	9-49
9.4.1.2	Consultation Feedback on Intermediate Components.....	9-55
9.4.1.3	Summary of Intermediate Components Included/Excluded in the Application/EIS	9-55
9.4.2	Assessment Boundaries for Hydrogeology	9-55
9.4.2.1	Spatial Boundaries	9-56
9.4.2.2	Temporal Boundaries.....	9-59
9.4.3	Identifying Key Potential Effects on Hydrogeology	9-59
9.4.3.1	Primary Groundwater Quantity Effects	9-59
9.4.3.2	Primary Groundwater Quality Effects	9-62
9.4.3.3	Negligible to Minor Effects	9-63
9.4.3.4	Construction Phase	9-64
9.4.3.5	Operation Phase.....	9-64
9.4.3.6	Closure Phase.....	9-65
9.4.3.7	Post-closure Phase.....	9-65
9.5	Predictive Study Methods for Hydrogeology	9-66
9.5.1	Groundwater Quantity	9-66
9.5.1.1	Mine Construction and Operation	9-66
9.5.1.2	Closure and Reclamation and Post-closure.....	9-69
9.5.2	Groundwater Quality.....	9-69
9.5.2.1	Quarry Runoff	9-70
9.5.2.2	Plant-Site Runoff.....	9-70

TABLE OF CONTENTS

	9.5.2.3 Underground Mine Discharge	9-72
9.6	Predictive Study Results for Hydrogeology	9-76
9.6.1	Predictive Study for Groundwater Quantity	9-76
9.6.1.1	Mine Construction and Operation	9-76
9.6.1.2	Closure and Reclamation and Post-closure.....	9-83
9.6.1.3	Sensitivity Analyses.....	9-84
9.6.2	Predictive Study for Groundwater Quality	9-84
9.6.2.1	Construction	9-84
9.6.2.2	Operation.....	9-84
9.6.2.3	Closure.....	9-84
9.6.2.4	Post-closure.....	9-88
9.7	Mitigation Measures for Hydrogeology	9-99
9.7.1	Mitigation Methods for Groundwater Quantity	9-102
9.7.2	Mitigation Methods for Groundwater Quality	9-102
9.8	Predicted Changes on Hydrogeology	9-103
9.8.1	Characterization of Predicted Changes in Groundwater Quantity	9-103
9.8.2	Characterization of Predicted Changes in Groundwater Quality	9-104
9.9	Hydrogeology as a Pathway to Receptor Valued Components.....	9-104
9.10	Cumulative Effect Assessment for Hydrogeology	9-107
9.10.1	Establishing the Scope of the Cumulative Effects Assessment.....	9-107
9.10.1.1	Identifying Intermediate Components for the Cumulative Effects Assessment	9-107
9.10.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Hydrogeology	9-108
9.10.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	9-109
9.10.1.4	Potential for Cumulative Changes	9-110
9.10.2	Analysis of Cumulative Changes.....	9-110
9.10.3	Mitigation Measures to Address Cumulative Predicted Changes.....	9-110
9.10.4	Predicted Cumulative Changes for Hydrogeology	9-111
9.10.5	Characterizing Predicted Cumulative Changes for Hydrogeology	9-111
9.10.6	Hydrogeology as a Pathway for Interaction with Receptor Valued Components.....	9-111
9.11	Summary and Conclusions for Hydrogeology	9-111
	References.....	9-112
10.	Surface Water Hydrology Predictive Study	10-1
10.1	Introduction	10-1
10.2	Regulatory and Policy Framework.....	10-2
10.3	Baseline Characterization.....	10-3
10.3.1	Regional Overview	10-3
10.3.2	Historical Activities.....	10-6

10.3.3	Baseline Studies	10-7
10.3.3.1	Data Sources	10-7
10.3.3.2	Methods.....	10-13
10.3.4	Characterization of Surface Water Hydrology Baseline Condition	10-13
10.3.5	Climate Change	10-18
10.3.5.1	Air Temperature	10-18
10.3.5.2	Precipitation.....	10-21
10.3.5.3	Streamflow.....	10-21
10.3.5.4	Extreme Events.....	10-22
10.3.5.5	Glacial Recession and Thinning.....	10-22
10.4	Establishing the Scope of the Assessment for Surface Water Hydrology	10-22
10.4.1	Selecting Intermediate Components	10-22
10.4.1.1	Potential Interactions between the Project and Surface Water Hydrology	10-25
10.4.1.2	Consultation Feedback on Intermediate Components.....	10-29
10.4.1.3	Summary of Intermediate Components Included/Excluded in the Application/EIS	10-29
10.4.2	Assessment Boundaries for Surface Water Hydrology	10-30
10.4.2.1	Spatial Boundaries	10-30
10.4.2.2	Temporal Boundaries.....	10-33
10.4.3	Identifying Key Potential Effects on Surface Water Hydrology	10-33
10.4.3.1	Construction	10-35
10.4.3.2	Operation.....	10-35
10.4.3.3	Closure and Reclamation	10-35
10.4.3.4	Post-closure.....	10-35
10.5	Predictive Study Methods for Surface Water Hydrology	10-36
10.5.1	Streamflows.....	10-36
10.5.1.1	Brucejack Creek.....	10-36
10.5.1.2	Sulphurets Creek and Unuk River	10-39
10.5.1.3	Bowser River, Scott Creek, Todedada Creek, Wildfire Creek, and Salmon River	10-40
10.5.2	Channel Morphology	10-40
10.5.3	Glaciers	10-40
10.5.3.1	Effects of the Access Road on Knipple Glacier	10-40
10.5.3.2	Effects of the Fugitive Dust Deposition on Knipple Glacier ...	10-40
10.6	Predictive Study Results for Surface Water Hydrology	10-41
10.6.1	Change in Streamflows.....	10-41
10.6.1.1	Mean Annual Flow	10-41
10.6.1.2	Monthly Distribution of Runoff	10-52
10.6.1.3	Peak Flow	10-52
10.6.1.4	Low Flow	10-52

10.6.1.5	Potential Effects of Climate Change on Streamflow	10-70
10.6.2	Channel Morphology Alteration.....	10-72
10.6.2.1	Wildfire Creek Watershed	10-74
10.6.2.2	Scott Creek Watershed	10-74
10.6.2.3	Todedada Creek Watershed.....	10-74
10.6.2.4	Bowser River Watershed	10-74
10.6.3	Effects on Knipple Glacier	10-75
10.6.3.1	Effects of the Brucejack Access Road on Knipple Glacier	10-75
10.6.3.2	Effects of the Fugitive Dust Deposition on Knipple Glacier ...	10-75
10.6.4	Potential Receptor VCs	10-75
10.7	Mitigation Measures for Surface Water Hydrology.....	10-78
10.7.1	Construction	10-78
10.7.1.1	Clearing and Grubbing	10-78
10.7.1.2	Earthworks	10-79
10.7.1.3	Access Road Upgrades and Transmission Line Construction...	10-79
10.7.2	Operation.....	10-80
10.7.3	Closure and Reclamation	10-80
10.7.4	Residual Effects	10-81
10.8	Predicted Changes on Surface Water Hydrology	10-81
10.9	Surface Water Hydrology as a Pathway to Receptor Valued Components.....	10-83
10.10	Cumulative Effect Assessment for Surface Water Hydrology	10-83
10.10.1	Establishing the Scope of the Cumulative Change Assessment	10-85
10.10.1.1	Identifying Intermediate Components for the Cumulative Effects Assessment	10-85
10.10.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Surface Water Hydrology ...	10-85
10.10.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	10-87
10.10.1.4	Potential for Cumulative Changes	10-88
10.10.2	Analysis of Cumulative Changes.....	10-88
10.10.2.1	Cumulative Changes on Channel Morphology	10-88
10.10.3	Mitigation Measures to Address Cumulative Predicted Changes.....	10-91
10.10.3.1	Mitigation Measures to Address Cumulative Changes on Channel Morphology	10-91
10.10.4	Predicted Cumulative Changes for Surface Water Hydrology	10-91
10.10.5	Characterizing Predicted Cumulative Changes for Surface Water Hydrology .	10-91
10.10.5.1	Cumulative Residual Change Characterization for Channel Morphology.....	10-92
10.10.6	Surface Water Hydrology as a Pathway for Interaction with Receptor Valued Components	10-92
10.10.6.1	Channel Morphology Pathway for Interaction with Receptor Valued Components	10-92

10.11	Summary and Conclusions for Surface Water Hydrology	10-92
	References.....	10-94
11.	Terrain and Soils Predictive Study.....	11-1
11.1	Introduction	11-1
11.2	Regulatory and Policy Framework.....	11-1
11.3	Baseline Characterization.....	11-2
11.3.1	Regional Overview	11-2
11.3.2	Historical Activities.....	11-5
11.3.3	Baseline Studies	11-5
11.3.3.1	Data Sources	11-6
11.3.3.2	Methods.....	11-6
11.3.4	Characterization of Terrain and Soils Baseline Condition	11-11
11.3.4.1	Terrain Mapping.....	11-11
11.3.4.2	Soils Mapping and Classification.....	11-12
11.3.4.3	Soil Analytical Results.....	11-16
11.3.5	Characterization of Baseline Terrain Stability.....	11-17
11.4	Establishing the Scope of the Assessment for Terrain and Soils	11-19
11.4.1	Selecting Intermediate Components	11-19
11.4.2	Potential Interactions between the Project and Intermediate Components..	11-20
11.4.2.1	Consultation Feedback on Intermediate Components.....	11-24
11.4.2.2	Summary of Intermediate Components Included in the Application/EIS	11-24
11.4.3	Assessment of Boundaries for Terrain and Soils	11-25
11.4.3.1	Spatial Boundaries	11-25
11.4.3.2	Temporal Boundaries.....	11-25
11.4.3.3	Administrative Boundaries	11-26
11.4.4	Identifying Key Potential Effects on Terrain and Soils	11-26
11.4.4.1	Construction	11-28
11.4.4.2	Operation.....	11-28
11.4.4.3	Closure	11-29
11.4.4.4	Post-closure.....	11-29
11.5	Predictive Study Methods for Terrain and Soils	11-29
11.6	Predictive Study Results for Terrain and Soils	11-30
11.6.1	Loss of Soil Quantity.....	11-30
11.6.1.1	Loss of Soil due to Erosion	11-32
11.6.2	Potential Alteration and Degradation of Soil Quality.....	11-32
11.6.2.1	Alteration or Degradation due to Soil Erosion and Compaction	11-33
11.6.2.2	Alteration or Degradation due to Loss of Soil Fertility.....	11-33
11.6.2.3	Alteration or Degradation due to Soil Contamination	11-34
11.6.3	Effects of the Project on Terrain Stability	11-34

TABLE OF CONTENTS

11.7	Mitigation Measures for Terrain and Soils.....	11-35
11.7.1	Mitigation for Loss of Soil due to Footprint Development	11-35
11.7.2	Mitigation for Bulk Soil Erosion.....	11-35
11.7.3	Mitigation for Soil Degradation.....	11-36
11.7.4	Mitigation for Terrain Stability	11-36
11.8	Predicted Changes on Terrain and Soils	11-37
11.8.1	Predicted Changes to Soil Quantity.....	11-37
11.8.2	Predicted Changes to Soil Quality	11-37
11.8.3	Predicted Changes to Terrain Stability	11-38
11.9	Terrain and Soils as a Pathway to Receptor Valued Components.....	11-38
11.9.1	Terrestrial Ecology	11-40
11.9.2	Wildlife and Wildlife Habitat	11-41
11.9.3	Human Health	11-41
11.9.4	Wetlands	11-41
11.9.5	Fish and Fish Habitat.....	11-41
11.9.6	Surface Water Quality	11-42
11.10	Cumulative Effect Assessment for Terrain and Soils	11-42
11.10.1	Establishing the Scope of the Cumulative Change Assessment	11-42
11.10.1.1	Identifying Intermediate Components for the Cumulative Effects Assessment	11-42
11.10.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Terrain and Soils	11-43
11.10.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	11-45
11.10.1.4	Temporal Boundaries.....	11-50
11.10.1.5	Potential for Cumulative Changes	11-50
11.10.2	Analysis of Cumulative Changes.....	11-51
11.10.2.1	Cumulative Changes on Soil Quantity	11-52
11.10.2.2	Cumulative Changes on Soil Quality	11-52
11.10.3	Mitigation Measures to Address Cumulative Predicted Changes.....	11-52
11.10.3.1	Project-specific Cumulative Effects Mitigation for Loss of Soil Quantity	11-53
11.10.3.2	Other Project/Activity Mitigation to Address Loss of Soil Quantity	11-53
11.10.3.3	Project-specific Cumulative Effects Mitigation for Loss of Soil Quality.....	11-53
11.10.4	Predicted Cumulative Changes for Terrain and Soils	11-53
11.10.5	Characterizing Predicted Cumulative Changes for Terrain and Soils	11-54
11.10.6	Cumulative Residual Change Characterization	11-54
11.10.6.1	Cumulative Residual Change Characterization for Soil Quantity	11-54
11.10.6.2	Cumulative Residual Change Characterization for Soil Quality .	11-55

11.10.7	Terrain and Soils as a Pathway for Interaction with Receptor Valued Components.....	11-55
11.11	Summary and Conclusions for Terrain and Soils Effects Assessment	11-55
	References.....	11-57

PART C - ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS - BIOPHYSICAL ENVIRONMENT

12.	Assessment of Potential Climate Effects	12-1
12.1	Introduction	12-1
12.2	Regulatory and Policy Framework.....	12-1
12.2.1	Greenhouse Gas Emission Reporting and Reduction Requirements	12-3
12.3	Baseline Characterization.....	12-4
12.3.1	Scientific Background	12-4
12.3.2	Historical Activities.....	12-4
12.3.2.1	The International Greenhouse Gas Setting	12-5
12.3.2.2	The National and Provincial Greenhouse Gas Setting	12-5
12.4	Establishing the Scope of the Effects Assessment for Climate	12-6
12.4.1	Selecting Valued Components and Indicators.....	12-9
12.4.1.1	Potential Interactions between the Project and Climate	12-9
12.4.1.2	Consultation Feedback on Receptor Valued Components	12-14
12.4.1.3	Summary of Receptor Valued Components Included/Excluded in the Application for an Environmental Assessment Certificate/Environmental Impact Statement ...	12-14
12.4.2	Assessment Boundaries for Climate	12-14
12.4.2.1	Spatial Boundaries	12-14
12.4.2.2	Temporal Boundaries.....	12-15
12.4.3	Identifying Potential Effects on Climate.....	12-15
12.4.3.1	Construction	12-15
12.4.3.2	Operation.....	12-17
12.4.3.3	Closure.....	12-17
12.5	Effects Assessment and Mitigation for Climate	12-17
12.5.1	Identifying Key Effects on Climate	12-17
12.5.2	Mitigation Measures for Climate	12-21
12.6	Residual Effects on Climate	12-23
12.6.1	Facility-level Greenhouse Gas Emissions	12-24
12.6.1.1	Facility-level Greenhouse Gas Emissions Calculation Methodology	12-24
12.6.1.2	Facility-level Greenhouse Gas Emission Calculation Results ..	12-25
12.6.2	Comparison of Project Greenhouse Gas Emission Levels	12-26
12.6.2.1	Provincial, National, and International Comparison of Project Greenhouse Gas Emissions	12-26
12.6.2.2	Sector Comparison.....	12-26

TABLE OF CONTENTS

12.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Climate .	12-27
12.7.1	Residual Effects Characterization for Climate.....	12-28
12.7.1.1	Likelihood for Residual Effects on Climate.....	12-29
12.7.1.2	Significance of Residual Effects on Climate.....	12-31
12.7.1.3	Characterization of Confidence for Residual Effects on Climate	12-31
12.8	Summary of Residual Effects and Significance for Climate	12-31
12.9	Cumulative Effects Assessment for Climate	12-31
12.10	Effects Assessment Conclusions for Climate.....	12-31
	References.....	12-33
13.	Assessment of Potential Surface Water Quality Effects	13-1
13.1	Introduction	13-1
13.2	Regulatory and Policy Framework.....	13-1
13.3	Baseline Characterization.....	13-3
13.3.1	Regional Overview	13-3
13.3.2	Historical Activities.....	13-8
13.3.3	Approach and Methodology	13-10
13.3.3.1	Data Sources	13-11
13.3.3.2	Methods.....	13-11
13.3.4	Characterization of Surface Water Quality Baseline Condition.....	13-15
13.3.4.1	Mine Site Area: Brucejack Watershed.....	13-15
13.3.4.2	Mid- and Far-field Downstream Receiving Environment: Sulphurets/Unuk Watersheds	13-29
13.3.4.3	Off-site Project Infrastructure: Bowser River and Wildfire/Scott/Todedada Creek Watersheds	13-43
13.4	Establishing the Scope of the Effects Assessment for Surface Water Quality	13-44
13.4.1	Selecting Receptor Valued Components	13-44
13.4.1.1	Potential Interactions between the Project and Valued Components.....	13-57
13.4.1.2	Consultation Feedback on Valued Components	13-61
13.4.1.3	Summary of Valued Components Included/Excluded in the Application/EIS	13-62
13.4.1.4	Assessment Boundaries for Surface Water Quality.....	13-62
13.4.1.5	Spatial Boundaries	13-62
13.4.1.6	Temporal Boundaries.....	13-64
13.4.2	Identifying Potential Effects on Surface Water Quality.....	13-64
13.4.2.1	Construction	13-67
13.4.2.2	Operation.....	13-67
13.4.2.3	Closure and Reclamation	13-68
13.4.2.4	Post-closure.....	13-68

13.5	Effects Assessment and Mitigation for Surface Water Quality.....	13-69
13.5.1	Identifying Key Effects: Mine Site Area	13-69
13.5.1.1	Discharges	13-69
13.5.1.2	Metal Leaching/Acid Rock Drainage	13-73
13.5.1.3	Erosion and Sedimentation.....	13-74
13.5.1.4	Nitrogen Loading from Blasting Residues.....	13-75
13.5.1.5	Groundwater Interactions and Seepage.....	13-75
13.5.1.6	Atmospheric Deposition.....	13-76
13.5.2	Mitigation Measures: Mine Site Area.....	13-76
13.5.2.1	Discharges	13-77
13.5.2.2	Metal Leaching/ Acid Rock Drainage	13-77
13.5.2.3	Erosion and Sedimentation.....	13-79
13.5.2.4	Nitrogen Loading from Blasting Residues	13-80
13.5.2.5	Groundwater Interactions and Seepage.....	13-80
13.5.2.6	Atmospheric Deposition.....	13-80
13.5.2.7	Residual Effects	13-81
13.5.3	Identifying Key Effects: Off-site Areas.....	13-82
13.5.3.1	Discharges	13-82
13.5.3.2	Metal Leaching/ Acid Rock Drainage	13-82
13.5.3.3	Erosion and Sedimentation.....	13-83
13.5.3.4	Nitrogen Loading from Blasting Residues	13-84
13.5.3.5	Groundwater Interactions and Seepage.....	13-84
13.5.3.6	Atmospheric Deposition.....	13-84
13.5.4	Mitigation Measures: Off-site Areas	13-85
13.5.4.1	Discharges	13-85
13.5.4.2	Metal Leaching/ Acid Rock Drainage	13-85
13.5.4.3	Erosion and Sedimentation.....	13-86
13.5.4.4	Nitrogen Loading from Blasting Residues	13-86
13.5.4.5	Groundwater Interactions and Seepage.....	13-87
13.5.4.6	Atmospheric Deposition.....	13-87
13.5.4.7	Residual Effects	13-88
13.6	Residual Effects on Surface Water Quality.....	13-88
13.6.1	Predictive Water Quality Modelling	13-89
13.6.1.1	General Model Approach and Assumptions	13-89
13.6.1.2	Sensitivity Analyses: Water Quality Modelling Cases	13-90
13.6.1.3	Screening of Contaminants of Potential Concern	13-91
13.6.2	Residual Effects on Water Quality: Mine Site Area and Receiving Environment	13-94
13.6.2.1	Brucejack Lake Outflow	13-121
13.6.2.2	Brucejack Creek (BJ 200m D/S)	13-123
13.6.2.3	Sulphurets and Unuk Watersheds	13-126

TABLE OF CONTENTS

13.6.3	Residual Effects: Off-site Areas	13-128
13.6.3.1	Change in Surface Water Quality	13-128
13.7	Characterizing Residual Effects, Significance, Likelihood and Confidence on Surface Water Quality	13-132
13.7.1	Characterizing Residual Effects	13-132
13.7.2	Residual Effects Characterization: Mine Site Area.....	13-137
13.7.2.1	Characterizing Residual Effects: Mine Site Area	13-137
13.7.2.2	Likelihood for Residual Effects on Surface Water Quality: Mine Site Area	13-139
13.7.2.3	Significance of Residual Effects on Surface Water Quality: Mine Site Area	13-139
13.7.2.4	Characterization of Confidence for Residual Effects on Surface Water Quality: Mine Site Area.....	13-140
13.7.3	Residual Effects Characterization: Off-site Areas	13-141
13.7.3.1	Characterizing Residual Effects: Off-site Areas	13-141
13.7.3.2	Likelihood for Residual Effects on Surface Water Quality: Off-site Areas.....	13-141
13.7.3.3	Significance of Residual Effects on Surface Water Quality: Off-site Areas.....	13-141
13.7.3.4	Characterization of Confidence for Residual Effects on Surface Water Quality: Off-site Area.....	13-141
13.8	Summary of Residual Effects and Significance for Surface Water Quality	13-142
13.9	Cumulative Effects Assessment for Surface Water Quality	13-142
13.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	13-143
13.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	13-143
13.9.1.2	Potential Interaction of Projects and Activities with the Project for Surface Water Quality	13-144
13.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	13-145
13.9.1.4	Potential for Cumulative Effects.....	13-149
13.9.2	Analysis of Cumulative Effects	13-151
13.9.2.1	Cumulative Effects on Surface Water Quality: Mine Site Area.	13-151
13.9.2.2	Cumulative Effects on Surface Water Quality: Off-site Areas	13-152
13.9.3	Mitigation Measures to Address Cumulative Effects	13-152
13.9.3.1	Mitigation Measures to Address Cumulative Effects: Mine Site Area.....	13-152
13.9.4	Cumulative Residual Effects for Surface Water Quality	13-152
13.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood and Confidence for Surface Water Quality	13-153
13.10	Effects Assessment Conclusions for Surface Water Quality	13-153
	References.....	13-158

14.	Assessment of Potential Aquatic Resources Effects	14-1
14.1	Introduction	14-1
14.2	Regulatory and Policy Framework.....	14-2
14.3	Baseline Characterization.....	14-3
14.3.1	Regional Overview	14-3
14.3.2	Historical Activities.....	14-4
14.3.3	Approach and Methodology	14-4
14.3.3.1	Data Sources	14-4
14.3.3.2	Methods.....	14-7
14.3.4	Characterization of Aquatic Resources	14-17
14.3.4.1	Mine Site Area: Brucejack Lake Watershed	14-17
14.3.4.2	Mid- and Far-field Downstream Receiving Environment: Sulphurets/Unuk Watersheds	14-20
14.3.4.3	Off-site Project Infrastructure Areas: Bowser River and Scott/Todedada/Todd Creek Watersheds	14-22
14.4	Establishing the Scope of the Effects Assessment	14-25
14.4.1	Selecting Valued Components and Indicators.....	14-25
14.4.1.1	Potential Interactions between the Project and Valued Components and Indicators	14-26
14.4.1.2	Consultation Feedback on Valued Components	14-31
14.4.1.3	Summary of Valued Components Included/Excluded in the Application/EIS	14-31
14.4.2	Assessment Boundaries for Aquatic Resources	14-32
14.4.2.1	Spatial Boundaries	14-32
14.4.2.2	Temporal Boundaries.....	14-34
14.4.3	Identifying Potential Effects on Aquatic Resources.....	14-34
14.4.3.1	Categories of Potential Effects on Aquatic Resources	14-34
14.4.3.2	Mine Site Area	14-38
14.4.3.3	Off-site Project Infrastructure	14-39
14.5	Effects Assessment and Mitigation for Aquatic Resources	14-41
14.5.1	Identifying Key Effects: Mine Site Area	14-46
14.5.1.1	Erosion and Sedimentation.....	14-46
14.5.1.2	Changes in Surface Water Quantity.....	14-48
14.5.1.3	Changes in Surface Water Quality	14-48
14.5.1.4	Changes in Sediment Quality	14-51
14.5.1.5	Habitat Loss.....	14-52
14.5.2	Identifying Key Effects: Off-site Project Infrastructure	14-52
14.5.2.1	Erosion and Sedimentation.....	14-52
14.5.2.2	Changes in Surface Water Quantity.....	14-53
14.5.2.3	Changes in Surface Water Quality	14-53
14.5.2.4	Changes in Sediment Quality	14-55
14.5.2.5	Habitat Loss.....	14-56

14.5.3	Mitigation Measures for Aquatic Resources	14-56
14.5.3.1	Erosion and Sedimentation.....	14-56
14.5.3.2	Changes in Surface Water Quantity.....	14-58
14.5.3.3	Changes in Surface Water Quality	14-59
14.5.3.4	Changes in Sediment Quality	14-61
14.5.3.5	Habitat Loss.....	14-61
14.6	Residual Effects on Aquatic Resources	14-62
14.6.1	Residual Effects in the Mine Site Area	14-63
14.6.1.1	Erosion and Sedimentation.....	14-63
14.6.1.2	Changes in Surface Water Quantity.....	14-64
14.6.1.3	Changes in Surface Water Quality	14-64
14.6.1.4	Residual Effects due to Changes in Sediment Quality	14-69
14.6.1.5	Residual Effects due to Habitat Loss	14-70
14.6.1.6	Summary of Residual Effects in the Mine Site Area.....	14-70
14.6.2	Residual Effects in Off-site Project Infrastructure Areas.....	14-70
14.6.2.1	Residual effects due to Erosion and Sedimentation	14-70
14.6.2.2	Residual effects due to Changes in Surface Water Quality....	14-73
14.6.2.3	Summary of Residual Effects in Off-site Project Infrastructure Areas	14-73
14.7	Characterizing Residual Effects on Aquatic Resources	14-74
14.7.1	Residual Effects Characterization for Aquatic Resources in the Mine Site Area	14-74
14.7.1.1	Residual Effects from Erosion and Sedimentation	14-74
14.7.1.2	Residual Effects from Changes in Surface Water Quantity	14-75
14.7.1.3	Residual Effects from Changes in Surface Water Quality.....	14-75
14.7.1.4	Residual Effects from Changes in Sediment Quality	14-76
14.7.1.5	Residual Effects from Habitat Loss	14-76
14.7.1.6	Significance of Residual Effects in the Mine Site Area	14-79
14.7.1.7	Characterization of Likelihood and Confidence for Residual Effects on Aquatic Resources in the Mine Site Area	14-79
14.7.2	Residual Effects Characterization for Aquatic Resources in the Off-site Project Infrastructure Areas	14-81
14.7.2.1	Residual Effects from Erosion and Sedimentation	14-81
14.7.2.2	Residual Effects from Changes in Surface Water Quality.....	14-81
14.7.2.3	Significance of Residual Effects on Aquatic Resources in the Off-site Project Infrastructure Areas.....	14-81
14.7.2.4	Characterization of Likelihood and Confidence for Residual Effects on Aquatic Resources in the Off-site Project Infrastructure Areas	14-81
14.8	Summary of Residual Effects on Aquatic Resources.....	14-83
14.9	Cumulative Effects Assessment for Aquatic Resources	14-84
14.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	14-84

14.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	14-84
14.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Aquatic Resources.....	14-86
14.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	14-86
14.9.1.4	Potential for Cumulative Effects.....	14-91
14.9.2	Analysis of Cumulative Effects	14-93
14.9.2.1	Cumulative Effects on Erosion and Sedimentation in the Mine Site Area	14-93
14.9.2.2	Cumulative Effects on Surface Water Quantity in the Mine Site Area.....	14-93
14.9.2.3	Cumulative Effects on Surface Water Quality in the Mine Site Area.....	14-94
14.9.2.4	Cumulative Effects on Sediment Quality in the Mine Site Area	14-94
14.9.2.5	Cumulative Effects on Habitat Loss in the Mine Site Area.....	14-94
14.9.2.6	Cumulative Effects in the Off-site Infrastructure Areas	14-94
14.9.3	Mitigation Measures to Address Cumulative Effects	14-94
14.9.4	Cumulative Residual Effects for Aquatic Resources	14-95
14.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Aquatic Resources.....	14-95
14.10	Conclusion of Effects Assessment for Project Effects on Aquatic Resources	14-97
	References.....	14-101
15.	Assessment of Potential Fish and Fish Habitat Effects	15-1
15.1	Introduction	15-1
15.2	Regulatory and Policy Framework.....	15-1
15.2.1	<i>Canada Fisheries Act</i>	15-1
15.2.2	Metal Mining Effluent Regulations	15-2
15.2.3	<i>Canada Species at Risk Act</i>	15-3
15.2.4	Canadian Biodiversity Strategy	15-3
15.2.5	<i>British Columbia Water Act</i>	15-3
15.2.6	<i>British Columbia Fish Protection Act</i>	15-3
15.2.7	<i>British Columbia Environmental Management Act</i>	15-3
15.2.8	Management Plans and Agreements	15-3
15.3	Baseline Characterization.....	15-4
15.3.1	Regional Overview	15-4
15.3.2	Historical Activities.....	15-4
15.3.3	Baseline Studies	15-6
15.3.3.1	Data Sources	15-7
15.3.3.2	Methods.....	15-7
15.3.4	Characterization of Fish and Fish Habitat Baseline Condition	15-15

TABLE OF CONTENTS

15.3.4.1	Overview	15-15
15.3.4.2	Unuk River Watershed	15-16
15.3.4.3	Bowser River Watershed.....	15-22
15.3.4.4	Scott Creek Watershed	15-25
15.3.4.5	Wildfire Creek Watershed	15-25
15.3.4.6	Bell-Irving Watershed	15-28
15.3.4.7	Todd Creek Watershed.....	15-29
15.3.4.8	Todedada Creek Watershed.....	15-29
15.3.4.9	Salmon River Watershed.....	15-30
15.4	Establishing the Scope of the Assessment For Fish and Fish Habitat.....	15-31
15.4.1	Selecting Receptor Valued Components	15-31
15.4.1.1	Potential Interactions between the Project and Fish and Fish Habitat	15-32
15.4.1.2	Consultation Feedback on Receptor Valued Components	15-36
15.4.1.3	Summary of Receptor Valued Components Included/Excluded in the Application for an Environmental Assessment Certificate/ Environmental Impact Statement ...	15-37
15.4.2	Assessment Boundaries for Fish and Fish Habitat	15-38
15.4.2.1	Spatial Boundaries	15-39
15.4.2.2	Temporal Boundaries.....	15-39
15.4.3	Identifying Potential Effects on Fish and Fish Habitat	15-40
15.4.3.1	Overview	15-40
15.4.3.2	Construction	15-43
15.4.3.3	Operation.....	15-44
15.4.3.4	Closure.....	15-44
15.4.3.5	Post-closure.....	15-44
15.5	Effects Assessment and Mitigation for Fish and Fish Habitat	15-44
15.5.1	Key Effects on Fish and Fish Habitat	15-44
15.5.1.1	Identifying Key Effects.....	15-44
15.5.1.2	Mitigation Measures for Fish and Fish Habitat	15-56
15.6	Residual Effects on Fish and Fish Habitat.....	15-60
15.6.1	Direct Mortality	15-60
15.6.2	Erosion and Sedimentation.....	15-60
15.6.3	Change in Water Quality.....	15-63
15.6.3.1	Residual Effects for Metals.....	15-63
15.6.3.2	Residual Effects for Process Chemicals	15-65
15.6.3.3	Residual Effects for Petroleum Products	15-66
15.6.3.4	Residual Effects for Nitrogen and Phosphorus	15-66
15.6.3.5	Summary of Potential for Residual Effects due to Changes in Water Quality	15-67
15.6.4	Habitat Loss.....	15-68

15.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Fish and Fish Habitat	15-68
15.7.1	Residual Effects Characterization for Fish and Fish Habitat	15-68
15.7.1.1	Characterizing Residual Effects	15-68
15.7.1.2	Likelihood for Residual Effects on Fish and Fish Habitat	15-75
15.7.1.3	Significance of Residual Effects on Fish and Fish Habitat	15-75
15.7.1.4	Characterization of Confidence for Residual Effects on Fish and Fish Habitat.....	15-76
15.8	Summary of Residual Effects and Significance for Fish and Fish Habitat.....	15-76
15.9	Cumulative Effects Assessment for Fish and Fish Habitat.....	15-77
15.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	15-77
15.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	15-77
15.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Fish and Fish Habitat	15-78
15.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	15-79
15.9.1.4	Potential for Cumulative Effects.....	15-83
15.9.2	Analysis of Cumulative Effects	15-83
15.9.2.1	Cumulative Effects on Fish and Fish Habitat.....	15-84
15.9.3	Mitigation Measures to Address Cumulative Effects	15-85
15.9.3.1	Mitigation Measures to Address Cumulative Effects on Fish and Fish Habitat.....	15-85
15.9.4	Cumulative Residual Effects for Fish and Fish Habitat.....	15-86
15.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Fish and Fish Habitat	15-87
15.9.5.1	Cumulative Residual Effects Characterization for Fish and Fish Habitat	15-87
15.9.5.2	Likelihood of Cumulative Residual Effects on Fish and Fish Habitat.....	15-88
15.9.5.3	Significance of Cumulative Residual Effects on Fish and Fish Habitat.....	15-88
15.9.5.4	Confidence of Cumulative Residual Effects on Fish and Fish Habitat.....	15-88
15.10	Conclusions for Fish and Fish Habitat.....	15-93
	References.....	15-95
16.	Assessment of Potential Terrestrial Ecology Effects	16-1
16.1	Introduction	16-1
16.2	Regulatory and Policy Framework	16-1
16.3	Baseline Characterization.....	16-3
16.3.1	Regional Overview	16-3
16.3.1.1	Protected Areas	16-4
16.3.2	Historical Activities.....	16-4

TABLE OF CONTENTS

16.3.3	Baseline Studies	16-7
16.3.3.1	Data Sources	16-7
16.3.3.2	Methods.....	16-8
16.3.4	Characterization of Terrestrial Ecology Baseline Condition.....	16-13
16.3.4.1	Regional Study Area	16-14
16.3.4.2	Boreal Altai Fescue Alpine – Undifferentiated Parkland (BAFAunp)	16-14
16.3.4.3	Coastal Mountain-Heather Alpine – Undifferentiated Parkland (CMAunp)	16-14
16.3.4.4	Coastal Western Hemlock Wet Maritime Subzone (CWHwm) .	16-19
16.3.4.5	Mountain Hemlock Leeward Moist Maritime Variant (MHmm2)	16-19
16.3.4.6	Interior Cedar Hemlock Very Wet Cold Subzone (ICHvc)	16-19
16.3.4.7	Engelmann Spruce Wet Very Cold– Subalpine Fir Subzone (ESSFwv)	16-19
16.3.4.8	Local Study Area	16-20
16.3.4.9	Brucejack Mine Site Sub-area: Terrain and Ecosystems	16-27
16.3.4.10	Brucejack Access Road Sub-area: Terrain and Ecosystems....	16-29
16.3.4.11	Brucejack Transmission Line Sub-area: Terrain and Ecosystems	16-31
16.3.5	Listed Ecosystems.....	16-34
16.3.6	Culturally and/or Economically Important Plant Species.....	16-35
16.3.7	Invasive Plants.....	16-40
16.3.8	Rare Plant and Lichen Species.....	16-40
16.3.9	Laboratory Metal Analyses	16-48
16.4	Establishing the Scope of the Effects Assessment	16-48
16.4.1	Selecting Receptor Valued Components	16-49
16.4.2	Potential Interactions between the Project and Terrestrial Ecology.....	16-50
16.4.2.1	Consultation Feedback on Valued Receptor Valued Components.....	16-55
16.4.2.2	Summary of Valued Receptor Valued Components Included/Excluded in the Application/EIS.....	16-55
16.4.3	Assessment Boundaries for Terrestrial Ecology.....	16-56
16.4.3.1	Spatial Boundaries	16-56
16.4.3.2	Temporal Boundaries.....	16-57
16.4.3.3	Administrative Boundaries	16-57
16.4.4	Identifying Potential Effects on Terrestrial Ecology.....	16-58
16.4.4.1	Loss of Ecosystem Function and Extent.....	16-58
16.4.4.2	Alteration of Ecosystem Function and Extent	16-58
16.5	Effects Assessment and Mitigation for Terrestrial Ecology.....	16-66
16.5.1	Risk Model for Terrestrial Ecology Effects.....	16-66
16.5.2	Determination of Probability of an Effect.....	16-66
16.5.3	Determination of Consequence of an Effect	16-68

16.5.4	Determination of Risk of an Effect	16-76
16.5.5	Key Effects on Terrestrial Ecology	16-76
16.5.5.1	Identifying Key Effects on Alpine Ecosystems	16-76
16.5.5.2	Identifying Key Effects on Parkland Ecosystems	16-94
16.5.5.3	Identifying Key Effects on Forested Ecosystems	16-95
16.5.5.4	Identifying Key Effects on Floodplain Ecosystems	16-97
16.5.5.5	Identifying Key Effects on Rare Ecosystems.....	16-98
16.5.5.6	Key Effects on Culturally/Economically Important Plant Habitat.....	16-99
16.5.5.7	Key Effects on Rare Plants and Lichens and their Habitat	16-99
16.5.6	Summary of Key Effects on Terrestrial Ecology	16-116
16.5.7	Mitigation Measures for Terrestrial Ecology.....	16-119
16.5.7.1	Ecosystem Management Plan	16-119
16.5.7.2	Invasive Plant Management Plan	16-121
16.5.7.3	Rare Plant and Lichen Management Plan.....	16-122
16.6	Residual Effects on Terrestrial Ecology.....	16-123
16.6.1	Residual Effects on Alpine Ecosystems.....	16-123
16.6.2	Residual Effects on Parkland Ecosystems.....	16-123
16.6.3	Residual Effects on Forested Ecosystems.....	16-124
16.6.4	Residual Effects on Floodplain Ecosystems.....	16-125
16.6.5	Residual Effects on Culturally or Economically Important Plants	16-125
16.6.6	Residual Effects on Rare Plants and Lichens	16-126
16.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Terrestrial Ecology	16-126
16.7.1	Residual Effects Characterization for Terrestrial Ecology.....	16-127
16.7.1.1	Likelihood	16-128
16.7.1.2	Confidence	16-128
16.8	Evaluation of Residual Effects and Significance for Terrestrial Ecology.....	16-129
16.8.1	Alpine Ecosystems	16-129
16.8.1.1	Characterization	16-129
16.8.1.2	Probability	16-129
16.8.1.3	Significance	16-129
16.8.1.4	Confidence	16-131
16.8.2	Parkland Ecosystems	16-131
16.8.2.1	Characterization	16-131
16.8.2.2	Probability	16-131
16.8.2.3	Significance	16-131
16.8.2.4	Confidence	16-131
16.8.3	Forested Ecosystems	16-131
16.8.3.1	Characterization	16-131
16.8.3.2	Probability	16-132

TABLE OF CONTENTS

16.8.3.3	Significance	16-132
16.8.3.4	Confidence	16-132
16.8.4	Floodplain Ecosystems	16-132
16.8.4.1	Characterization	16-132
16.8.4.2	Probability	16-132
16.8.4.3	Significance	16-132
16.8.4.4	Confidence	16-133
16.8.5	Culturally/Economically Important Plant Habitat	16-133
16.8.5.1	Characterization	16-133
16.8.5.2	Probability	16-133
16.8.5.3	Significance	16-133
16.8.5.4	Confidence	16-133
16.8.6	Rare Plant and Lichens and Associated Habitat	16-134
16.8.6.1	Characterization	16-134
16.8.6.2	Probability	16-134
16.8.6.3	Significance	16-134
16.8.6.4	Confidence	16-134
16.9	Summary of Residual Effects on Terrestrial Ecology	16-134
16.10	Cumulative Effects Assessment for Terrestrial Ecology	16-136
16.10.1	Establishing the Scope of the Cumulative Effects Assessment.....	16-136
16.10.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	16-136
16.10.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Terrestrial Ecology	16-137
16.10.3	Spatiotemporal Boundaries of the Cumulative Effects Assessment.....	16-139
16.10.3.1	Spatial Boundaries	16-139
16.10.3.2	Temporal Boundaries.....	16-139
16.10.3.3	Ecological Boundaries	16-139
16.10.4	Identification of Cumulative Effects	16-140
16.10.5	Analysis of Cumulative Effects	16-140
16.10.5.1	Terrestrial Ecosystems	16-140
16.10.5.2	Rare Plants and Lichens	16-175
16.10.6	Mitigation Measures to Address Cumulative Effects	16-178
16.10.7	Cumulative Residual Effects for Terrestrial Ecology	16-179
16.10.7.1	Residual Effects on Alpine Ecosystems.....	16-179
16.10.7.2	Residual Effects on Forested Ecosystems.....	16-180
16.10.7.3	Residual Effects on Floodplain Ecosystems.....	16-180
16.10.7.4	Residual Effects on Rare Plants and Lichens	16-180
16.10.8	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence.....	16-180
16.10.8.1	Characterizing Cumulative Residual Effects	16-180

16.10.8.2	Likelihood	16-181
16.10.8.3	Significance	16-181
16.10.8.4	Confidence	16-181
16.10.9	Evaluation of Cumulative Residual Effects and Significance	16-182
16.10.9.1	Alpine Ecosystems	16-182
16.10.9.2	Forested Ecosystems	16-182
16.10.9.3	Floodplain Ecosystems	16-184
16.10.9.4	Rare Plants and Lichens	16-185
16.11	Effects Assessment Conclusions for Terrestrial Ecology	16-185
	References.....	16-188
17.	Assessment of Potential Wetlands Effects	17-1
17.1	Introduction	17-1
17.2	Regulatory and Policy Framework.....	17-1
17.2.1	<i>Mines Act</i>	17-2
17.2.2	Federal Policy of Wetland Conservation.....	17-2
17.2.3	<i>Forest and Range Practices Act</i>	17-2
17.2.4	<i>Species at Risk Act</i>	17-2
17.2.5	BC Conservation Data Centre	17-2
17.2.6	<i>Fisheries Act (Federal)</i>	17-2
17.2.7	<i>Fish Protection Act</i>	17-3
17.2.8	<i>Weed Control Act</i>	17-3
17.2.9	<i>Wildlife Act</i>	17-3
17.2.10	<i>Environmental Management Act</i>	17-3
17.2.11	<i>Environmental Protection Act</i>	17-3
17.3	Existing Environment	17-4
17.3.1	Regional Overview	17-4
17.3.2	Historical Activities.....	17-4
17.3.3	Baseline Studies	17-5
17.3.3.1	Data Sources	17-6
17.3.3.2	Methods.....	17-6
17.3.4	Characterization of Wetland Ecosystem Baseline Condition	17-8
17.3.5	Wetland Functions	17-12
17.3.5.1	Bog Wetland Function.....	17-14
17.3.5.2	Fen Wetland Functions.....	17-14
17.3.5.3	Marsh Wetland Functions	17-15
17.3.5.4	Swamp Wetland Functions	17-16
17.3.5.5	Shallow Open Water Wetland Functions	17-17
17.4	Establishing the Scope of the Assessment For Wetlands	17-17
17.4.1	Selecting Receptor Valued Components	17-18
17.4.1.1	Potential Interactions between the Project and Wetlands....	17-18

17.4.1.2	Consultation Feedback on Receptor Valued Components	17-18
17.4.1.3	Summary of Receptor Valued Components Included/Excluded in the Application for Environmental Assessment Certificate / Environmental Impact Statement ..	17-22
17.4.2	Assessment Boundaries for Wetlands.....	17-24
17.4.2.1	Spatial Boundaries	17-24
17.4.2.2	Temporal Boundaries.....	17-26
17.4.2.3	Other Boundaries	17-26
17.4.3	Potential Effects Assessment	17-29
17.4.3.1	Hydrologic Effects	17-30
17.4.3.2	Fragmentation Effects	17-30
17.4.3.3	Edge Effects	17-31
17.4.3.4	Dust Effects	17-31
17.4.3.5	Sedimentation and Waterborne Pollutant Effects	17-32
17.4.3.6	Invasive Species Effects	17-32
17.4.3.7	Construction	17-33
17.4.3.8	Operation.....	17-35
17.4.3.9	Closure.....	17-35
17.4.3.10	Post-closure.....	17-35
17.5	Effects Assessment and Mitigation for Wetlands.....	17-36
17.5.1	Key Effects on Wetland Extent	17-36
17.5.1.1	Identifying Key Effects on Wetland Extent	17-36
17.5.2	Key Effects on Wetland Function	17-37
17.5.2.1	Identifying Key Causes of Effects on Wetland Function.....	17-37
17.5.2.2	Mitigation Measures for Alteration of Wetland Functions	17-37
17.5.2.3	Wetland Buffers	17-39
17.5.2.4	Additional Mitigation Measures.....	17-40
17.6	Residual Effects on Wetlands	17-40
17.6.1	Residual Effects on Wetland Functions	17-42
17.6.2	Probability of Project Effects on Wetland Extent and Function.....	17-42
17.6.3	Consequence of Project Effects on Wetland Extent and Function	17-45
17.6.4	Probability Analysis Components and Project Specific Effects	17-46
17.6.4.1	Hydrological Connectivity Component	17-46
17.6.4.2	Loss and Fragmentation Component	17-47
17.6.4.3	Edge Effect Component.....	17-48
17.6.4.4	Dust Component	17-48
17.6.4.5	Sedimentation and Water Quality Component	17-49
17.6.4.6	Invasive Species Component	17-49
17.6.4.7	Probability of Adverse Effects on Wetlands.....	17-50
17.6.5	Consequence Analysis Components and Project-specific Ratings	17-50
17.6.5.1	Rare and Listed Species or Ecosystems Component	17-50

17.6.5.2	Hydrological Function Component	17-50
17.6.5.3	Biochemical Function Component	17-53
17.6.5.4	Functional Diversity Component	17-53
17.6.5.5	Habitat Function Component	17-54
17.6.5.6	Consequence Ratings for Wetland Functions	17-54
17.6.6	Final Risk Determination	17-57
17.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Wetlands	17-57
17.7.1	Residual Effects Characterization for Wetland Functions	17-57
17.7.1.1	Likelihood for Residual Effects on Wetland Function	17-58
17.7.1.2	Significance of Residual Effects on Wetland Function	17-63
17.7.1.3	Characterization of Confidence for Residual Effects on Wetland Function	17-63
17.8	Summary of Residual Effects For Wetlands	17-63
17.9	Cumulative Effects Assessment for Wetlands	17-65
17.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	17-66
17.9.1.1	Identifying Intermediate Components and Receptor VCs for the Cumulative Effects Assessment	17-66
17.9.1.2	Potential Interaction of Projects and Activities with the Project for Wetlands	17-66
17.9.1.3	Spatial-Temporal Boundaries of the Cumulative Effects Assessment.....	17-68
17.9.1.4	Potential for Cumulative Effects.....	17-71
17.9.2	Analysis of Cumulative Effects	17-71
17.9.2.1	Cumulative Effects on Wetlands	17-73
17.9.3	Mitigation Measures to Address Cumulative Effects	17-73
17.9.4	Cumulative Residual Effects for Wetlands	17-73
17.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Wetlands	17-74
17.9.5.1	Cumulative Residual Effects Characterization for Wetlands ..	17-74
17.9.5.2	Likelihood of Cumulative Residual Effects on Wetlands	17-74
17.9.5.3	Significance of Cumulative Residual Effects on Wetlands	17-74
17.9.5.4	Confidence of Cumulative Residual Effects on Wetlands.....	17-75
17.10	Effects Assessment Conclusions for Wetlands	17-75
	References.....	17-78
18.	Assessment of Potential Wildlife Effects	18-1
18.1	Introduction	18-1
18.2	Regulatory and Policy Framework	18-1
18.2.1	Wildlife Legislation	18-1
18.2.2	Land Management Plans	18-3
18.3	Existing Environment	18-5
18.3.1	Regional Overview	18-7

TABLE OF CONTENTS

18.3.1.1	Regional Ecology	18-7
18.3.1.2	Protected Areas	18-8
18.3.1.3	Wildlife Habitats with Development Guidelines.....	18-8
18.3.1.4	Species of Conservation Concern	18-11
18.3.1.5	Species or Groups of Local Interest.....	18-11
18.3.2	Historical and Current Activities	18-11
18.3.2.1	Industrial Projects	18-11
18.3.2.2	Forestry.....	18-15
18.3.2.3	Recreational Activities.....	18-16
18.3.2.4	Fur Harvest.....	18-16
18.3.2.5	Wildlife Hunting.....	18-16
18.3.2.6	Aboriginal Harvest	18-17
18.3.3	Baseline Studies	18-18
18.3.3.1	Objectives.....	18-18
18.3.3.2	Methods.....	18-19
18.3.3.3	Baseline Study Areas	18-22
18.3.4	Mammal Characterization	18-23
18.3.4.1	Ungulates.....	18-24
18.3.4.2	Bears	18-31
18.3.4.3	Furbearers.....	18-35
18.3.4.4	Hoary Marmot	18-39
18.3.4.5	Bats.....	18-42
18.3.5	Avian Characterization.....	18-42
18.3.5.1	Raptors	18-44
18.3.5.2	Waterbirds	18-44
18.3.5.3	Landbirds	18-51
18.3.6	Amphibian (Western Toad) Characterization	18-53
18.3.6.1	Western Toad.....	18-53
18.4	Establishing the Scope of the Effects Assessment for Wildlife	18-54
18.4.1	Selecting Receptor Valued Components	18-56
18.4.1.1	Potential Interactions between the Project and Wildlife	18-58
18.4.1.2	Consultation Feedback on Receptor Valued Components	18-62
18.4.1.3	Summary of Valued Components Included/Excluded in the Application/EIS	18-63
18.4.2	Assessment Boundaries for Wildlife and Wildlife Habitat	18-64
18.4.2.1	Spatial Boundaries	18-66
18.4.2.2	Temporal Boundaries.....	18-68
18.4.3	Identifying Potential Effects on Wildlife.....	18-68
18.4.3.1	Construction	18-69
18.4.3.2	Operation.....	18-69
18.4.3.3	Closure and Post-closure	18-70

18.5	Effects Assessment and Mitigation for Wildlife	18-70
18.5.1	Habitat Loss and Alteration	18-71
18.5.1.1	Mitigation for Habitat Loss and Alteration	18-72
18.5.2	Sensory Disturbance	18-72
18.5.2.1	Light.....	18-73
18.5.2.2	Noise	18-73
18.5.2.3	Methodology for Assessing Effects of Sensory Disturbance on Wildlife	18-74
18.5.2.4	Mitigation for Sensory Disturbance	18-75
18.5.3	Disruption of Movement	18-75
18.5.3.1	Mitigation for Disruption of Movement.....	18-77
18.5.4	Direct Mortality	18-77
18.5.4.1	Mitigation for Direct Mortality.....	18-79
18.5.5	Indirect Mortality	18-79
18.5.5.1	Mitigation for Indirect Mortality.....	18-80
18.5.6	Attractants	18-80
18.5.6.1	Mitigation for Attractants	18-81
18.5.7	Chemical Hazards	18-81
18.5.7.1	Methodology for Assessing Effects of Chemical Hazards on Wildlife	18-82
18.5.7.2	Mitigation for Chemical Hazards	18-91
18.6	Residual Effects on Wildlife	18-93
18.6.1	Potential Residual Effects on Moose.....	18-93
18.6.1.1	Identifying Key Effects.....	18-93
18.6.1.2	Habitat Loss and Alteration	18-93
18.6.1.3	Sensory Disturbance	18-96
18.6.1.4	Disruption of Movement	18-101
18.6.1.5	Direct Mortality	18-102
18.6.1.6	Indirect Mortality	18-108
18.6.1.7	Attractants.....	18-109
18.6.2	Potential Residual Effects on Mountain Goats	18-110
18.6.2.1	Identifying Key Effects.....	18-110
18.6.2.2	Habitat Loss and Alteration	18-111
18.6.2.3	Sensory Disturbance	18-112
18.6.2.4	Disruption of Movement	18-129
18.6.2.5	Direct Mortality	18-129
18.6.2.6	Indirect Mortality	18-130
18.6.2.7	Attractants.....	18-130
18.6.2.8	Chemical Hazards.....	18-131
18.6.3	Potential Residual Effects on Grizzly Bears	18-132
18.6.3.1	Identifying Key Effects.....	18-132

18.6.3.2	Habitat Loss and Alteration	18-132
18.6.3.3	Sensory Disturbance	18-136
18.6.3.4	Disruption of Movement	18-147
18.6.3.5	Direct Mortality	18-148
18.6.3.6	Indirect Mortality	18-149
18.6.3.7	Attractants.....	18-150
18.6.3.8	Chemical Hazards.....	18-151
18.6.4	Potential Residual Effects on American Marten	18-152
18.6.4.1	Identifying Key Effects.....	18-152
18.6.4.2	Habitat Loss and Alteration	18-153
18.6.4.3	Disruption of Movement	18-159
18.6.4.4	Direct Mortality	18-160
18.6.4.5	Attractants.....	18-160
18.6.4.6	Chemical Hazards.....	18-161
18.6.5	Potential Residual Effects on Hoary Marmots.....	18-161
18.6.5.1	Identifying Key Effects.....	18-161
18.6.5.2	Habitat Loss and Alteration	18-163
18.6.5.3	Direct Mortality	18-164
18.6.5.4	Chemical Hazards.....	18-169
18.6.6	Potential Residual Effects on Bats	18-169
18.6.6.1	Identifying Key Effects.....	18-169
18.6.6.2	Habitat Loss and Alteration	18-170
18.6.6.3	Sensory Disturbance	18-171
18.6.6.4	Direct Mortality	18-172
18.6.6.5	Attractants.....	18-181
18.6.7	Potential Residual Effects on Raptors.....	18-181
18.6.7.1	Identifying Key Effects.....	18-181
18.6.7.2	Habitat Loss and Alteration	18-182
18.6.7.3	Sensory Disturbance	18-184
18.6.7.4	Direct Mortality	18-193
18.6.7.5	Attractants.....	18-199
18.6.8	Potential Residual Effects on Migratory Waterbirds	18-199
18.6.8.1	Identifying Key Effects.....	18-199
18.6.8.2	Habitat Loss and Alteration	18-199
18.6.8.3	Sensory Disturbance	18-202
18.6.8.4	Direct Mortality	18-215
18.6.8.5	Attractants.....	18-216
18.6.9	Potential Residual Effects on Migratory Landbirds.....	18-229
18.6.9.1	Identifying Key Effects.....	18-229
18.6.9.2	Habitat Loss and Alteration	18-230
18.6.9.3	Sensory Disturbance	18-231

18.6.9.4	Direct Mortality	18-232
18.6.9.5	Attractants.....	18-233
18.6.10	Potential Residual Effects on Western Toads	18-233
18.6.10.1	Identifying Key Effects.....	18-233
18.6.10.2	Habitat Loss and Alteration	18-233
18.6.10.3	Disruption of Movement	18-236
18.6.10.4	Direct Mortality	18-236
18.6.10.5	Attractants.....	18-245
18.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Wildlife	18-245
18.7.1	Residual Effects Assessment for Moose	18-246
18.7.1.1	Residual Effects of Disruption of Movement on Moose	18-246
18.7.1.2	Residual Effects of Direct Mortality on Moose	18-250
18.7.1.3	Residual Effects of Indirect Mortality on Moose	18-250
18.7.1.4	Residual Overall Effects on Moose	18-251
18.7.2	Residual Effects Assessment for Mountain Goats.....	18-251
18.7.2.1	Residual Effects of Sensory Disturbance on Mountain Goats	18-251
18.7.2.2	Residual Effects of Indirect Mortality on Mountain Goats ...	18-253
18.7.2.3	Residual Overall Effects on Mountain Goats	18-254
18.7.3	Residual Effects Assessment for Grizzly Bears.....	18-254
18.7.3.1	Residual Effects of Disruption of Movement on Grizzly Bears	18-254
18.7.3.2	Residual Effects of Direct Mortality on Grizzly Bears	18-256
18.7.3.3	Residual Effects of Indirect Mortality on Grizzly Bears	18-257
18.7.3.4	Residual Effects of Attractants on Grizzly Bears	18-258
18.7.3.5	Residual Overall Effects on Grizzly Bears	18-259
18.7.4	Residual Effects Assessment for American Marten.....	18-259
18.7.4.1	Residual Effects of Attractants on Marten	18-259
18.7.5	Residual Effects Assessment for Western Toads.....	18-261
18.7.5.1	Residual Effects of Direct Mortality on Western Toads	18-261
18.8	Summary of Residual Effects and Significance for Wildlife	18-263
18.9	Cumulative Effects Assessment for Wildlife	18-264
18.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	18-264
18.9.1.1	Identifying Receptor Valued Components for the Cumulative Effects Assessment	18-264
18.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Wildlife	18-266
18.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	18-268
18.9.1.4	Potential for Cumulative Effects.....	18-277
18.9.2	Analysis of Cumulative Effects	18-284
18.9.2.1	Cumulative Effects on Moose	18-285
18.9.2.2	Cumulative Effects on Mountain Goats	18-288

TABLE OF CONTENTS

18.9.2.3	Cumulative Effects on Grizzly Bears.....	18-289
18.9.2.4	Cumulative Effects on American Marten.....	18-293
18.9.2.5	Cumulative Effects on Western Toads	18-294
18.9.3	Mitigation Measures to Address Cumulative Effects	18-295
18.9.3.1	Mitigation Measures to Address Cumulative Effects of Sensory Disturbance	18-295
18.9.3.2	Mitigation Measures to Address Cumulative Effects of Disruption of Movement	18-295
18.9.3.3	Mitigation Measures to Address Cumulative Effects of Direct Mortality.....	18-296
18.9.3.4	Mitigation Measures to Address Cumulative Effects of Indirect Mortality	18-296
18.9.3.5	Mitigation Measures to Address Cumulative Effects of Attractants.....	18-296
18.9.4	Cumulative Residual Effects for Wildlife	18-296
18.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Wildlife.....	18-296
18.9.5.1	Cumulative Residual Effects Assessment for Moose	18-298
18.9.5.2	Cumulative Residual Effects Assessment for Mountain Goats	18-300
18.9.5.3	Cumulative Residual Effects Assessment for Grizzly Bears..	18-302
18.9.5.4	Cumulative Residual Effects Assessment for American Marten	18-306
18.9.5.5	Cumulative Residual Effects Assessment for Western Toads	18-308
18.10	Effects Assessment Conclusions for Wildlife.....	18-308
	References.....	18-312

PART D - ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS - HUMAN ENVIRONMENT

19.	Assessment of Potential Economic Effects.....	19-1
19.1	Introduction	19-1
19.2	Regulatory and Policy Framework.....	19-1
19.3	Baseline Characterization.....	19-2
19.3.1	Regional Overview	19-2
19.3.1.1	Population and Demographics	19-2
19.3.1.2	Economic Activity.....	19-3
19.3.1.3	Employment and Income	19-5
19.3.1.4	Regional Government Expenditures and Operating Budgets ...	19-6
19.3.2	Historical Activities.....	19-6
19.3.3	Baseline Studies	19-8
19.3.3.1	Data Sources	19-8
19.3.3.2	Methods.....	19-9
19.3.3.3	Characterization of Economic Baseline Conditions	19-12
19.3.4	Summary of Baseline Characterization	19-18

19.4	Establishing the Scope of the Economic Effects Assessment	19-18
19.4.1	Selecting Receptor Valued Components	19-18
19.4.1.1	Potential Interactions between the Project and Economic Conditions	19-19
19.4.1.2	Consultation Feedback on Receptor Valued Components	19-20
19.4.1.3	Summary of Receptor Valued Components Included/Excluded in the Application/EIS.....	19-21
19.4.2	Assessment Boundaries for the Economic Effects Assessment	19-21
19.4.2.1	Spatial Boundaries	19-21
19.4.2.2	Temporal Boundaries.....	19-22
19.4.2.3	Administrative Boundaries	19-22
19.4.2.4	Technical Boundaries	19-22
19.4.3	Identifying Potential Effects on Economic Conditions	19-22
19.4.3.1	Effects Included in the Assessment of Potential Project Effects	19-22
19.4.3.2	Effects Not Included in the Assessment of Potential Project Effects	19-23
19.5	Identifying Key Effects on the Labour Market.....	19-25
19.5.1.1	Changes to Employment and Labour Participation of Vulnerable Groups	19-26
19.5.1.2	Increased Competition for Labour and Wage Inflation.....	19-29
19.5.1.3	Decrease in Employment at Closure.....	19-32
19.6	Residual Effects on the Economy	19-33
19.6.1	Residual Effects on the Labour Market Remaining after Mitigation Measures	19-33
19.6.1.1	Increased Competition for Labour and Wage Inflation.....	19-33
19.6.1.2	Decrease in Employment at Project Closure.....	19-33
19.7	Characterizing Residual Effects, Likelihood, Significance, and Confidence	19-34
19.7.1	Characterizing Residual Effects	19-34
19.7.1.1	Characterization of Residual Effects for Labour Market	19-35
19.7.2	Likelihood of Residual Effects	19-37
19.7.2.1	Characterization of Likelihood for Residual Effects on Labour Market	19-37
19.7.3	Significance of Residual Effects	19-37
19.7.3.1	Characterization of Significance of Residual Effects on Labour Market	19-38
19.7.4	Confidence in Residual Effects	19-38
19.7.4.1	Characterization of Confidence for Residual Effects on Labour Market	19-38
19.8	Summary of Residual Economic Effects and Significance	19-38
19.9	Cumulative Economic Effects Assessment	19-39
19.9.1	Establishing the Scope of the Economic Cumulative Effects Assessment ..	19-39
19.9.1.1	Identifying Intermediate Components and Receptor VCs for the Economic Cumulative Effects Assessment	19-41

19.9.1.2	Potential Interaction between the Projects and Other Relevant Activities Affecting Economic Conditions	19-41
19.9.1.3	Cumulative Effects Assessment Boundaries	19-43
19.9.1.4	Potential for Cumulative Effects.....	19-44
19.9.2	Cumulative Economic Effects and Mitigation	19-47
19.9.2.1	Potential Cumulative Effects on the Labour Market.....	19-47
19.9.2.2	Mitigation Measures to Address Cumulative Effects on the Labour Market	19-48
19.10	Cumulative Residual Effects for Economy	19-49
19.10.1	Cumulative Residual Effects Remaining after Mitigation	19-49
19.11	Characterizing Cumulative Residual Effects, Likelihood, Significance, and Confidence.....	19-49
19.11.1	Characterization of Cumulative Residual Effects for Labour Market	19-50
19.11.1.1	Increased Competition for Labour and Wage Inflation.....	19-50
19.11.1.2	Decrease in Employment at Closure.....	19-50
19.11.2	Characterization of Likelihood for Cumulative Residual Effects on Labour Market	19-52
19.11.2.1	Increased Competition for Labour and Wage Inflation.....	19-52
19.11.2.2	Decrease in Employment at Closure.....	19-52
19.11.3	Characterization of Significance for Cumulative Residual Effects on Labour Market	19-52
19.11.3.1	Increased Competition for Labour and Wage Inflation.....	19-52
19.11.3.2	Decrease in Employment at Closure.....	19-52
19.11.4	Characterization of Confidence for Cumulative Residual Effects on Labour Market	19-52
19.11.4.1	Increased Competition for Labour and Wage Inflation.....	19-52
19.11.4.2	Decrease in Employment at Closure.....	19-52
19.11.5	Cumulative Residual Effects Summary	19-53
19.12	Conclusions	19-53
	References.....	19-55
20.	Assessment of Potential Social Effects	20-1
20.1	Introduction	20-1
20.2	Regulatory and Policy Framework.....	20-1
20.3	Baseline Characterization.....	20-2
20.3.1	Regional Overview	20-2
20.3.2	Historical Activities.....	20-3
20.3.3	Baseline Studies	20-5
20.3.3.1	Data Sources	20-7
20.3.3.2	Indicators.....	20-8
20.3.4	Characterization of Social Environment Baseline Condition	20-9
20.3.4.1	Overview of Communities in the Local Study Area	20-9
20.3.4.2	Population and Demographics	20-10

20.3.4.3	Education, Skills Development, and Training	20-12
20.3.4.4	Community Infrastructure, Services, and Housing	20-17
20.3.4.5	Emergency, Health, and Social Services	20-18
20.3.4.6	Family and Worker Well-being	20-21
20.4	Establishing the Scope of the Assessment for Social Environment	20-24
20.4.1	Selecting Receptor Valued Components	20-24
20.4.1.1	Potential Interactions between the Project and Social Environment	20-25
20.4.1.2	Consultation Feedback on Receptor Valued Components	20-26
20.4.1.3	Summary of Receptor Valued Components Included in the Application/EIS	20-26
20.4.2	Assessment Boundaries for Social Environment	20-28
20.4.2.1	Spatial Boundaries	20-28
20.4.2.2	Temporal Boundaries	20-28
20.4.2.3	Administrative Boundaries	20-29
20.4.3	Identifying Potential Effects on the Social Environment	20-30
20.4.3.1	Construction	20-31
20.4.3.2	Operation	20-32
20.4.3.3	Closure and Post-closure	20-33
20.4.3.4	Effects Not Included in the Assessment	20-34
20.5	Effects Assessment and Mitigation for the Social Environment	20-35
20.5.1	Effects on Education, Skills Development, and Training	20-35
20.5.1.1	Identifying Effects	20-35
20.5.1.2	Mitigation Measures for Education, Skills Development, and Training	20-38
20.5.2	Key Effects on Community Infrastructure, Services, and Housing	20-38
20.5.2.1	Identifying Key Effects	20-38
20.5.2.2	Mitigation Measures for Community Infrastructure, Services, and Housing	20-43
20.5.3	Key Effects on Family and Worker Well-being	20-44
20.5.3.1	Identifying Key Effects	20-44
20.5.3.2	Mitigation Measures for Family and Worker Well-being	20-48
20.6	Residual Effects on Social Environment	20-49
20.6.1	Residual Effects on Education, Skills Development, and Training	20-49
20.6.1.1	Increased Demand for Educational Programs in the Local Study Area	20-49
20.6.2	Residual Effects on Community Infrastructure, Services, and Housing	20-49
20.6.2.1	Increased Demand for Infrastructure and Housing as a Result of Population In-migration	20-49
20.6.2.2	Increased Demand on Health and Social Services	20-52
20.6.3	Residual Effects on Worker and Family Well-being	20-52

20.6.3.1	Increase in Transient Workers Coming into Local Study Area Communities	20-52
20.6.3.2	Increased Levels of Stress and Anxiety on Workers and Families due to Rotational Work	20-52
20.6.3.3	Increase in Poor Lifestyle Choices	20-52
20.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Social Environment.....	20-52
20.7.1	Residual Effects Characterization for Social Environment	20-52
20.7.1.1	Likelihood for Residual Effects on Education, Skills Development, and Training	20-54
20.7.1.2	Likelihood for Residual Effects on Community Infrastructure, Services, and Housing	20-54
20.7.1.3	Likelihood for Residual Effects on Family and Worker Well-being.....	20-54
20.7.1.4	Significance of Residual Effects on Education, Skills Development, and Training	20-55
20.7.1.5	Significance of Residual Effects on Community Infrastructure, Services, and Housing	20-55
20.7.1.6	Significance of Residual Effects on Worker and Family Well-being.....	20-55
20.7.1.7	Characterization of Confidence for Residual Effects on Education, Skills Development, and Training	20-57
20.7.1.8	Characterization of Confidence for Residual Effects on Community Infrastructure, Services, and Housing	20-59
20.7.1.9	Characterization of Confidence for Residual Effects on Family and Worker Well-being	20-59
20.8	Summary of Residual Effects and Significance for Social Environment	20-60
20.9	Cumulative Effects Assessment for Social Environment	20-60
20.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	20-63
20.9.1.1	Identifying Receptor Valued Components for the Cumulative Effects Assessment	20-63
20.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Social Environment	20-65
20.9.1.3	Spatio-temporal Boundaries of the CEA	20-65
20.9.1.4	Potential for Cumulative Effects.....	20-68
20.9.2	Analysis of Cumulative Effects	20-73
20.9.2.1	Cumulative Effects on Education, Skills Development, and Training.....	20-73
20.9.2.2	Cumulative Effects on Community Infrastructure, Services, and Housing	20-73
20.9.2.3	Cumulative Effects on Worker and Family Well-being	20-74
20.9.3	Mitigation Measures to Address Cumulative Effects	20-76
20.9.3.1	Mitigation Measures to Address Cumulative Effects on Education, Skills Development, and Training	20-77

20.9.3.2	Mitigation Measures to Address Cumulative Effects on Community Infrastructure, Services, and Housing	20-77
20.9.3.3	Mitigation Measures to Address Cumulative Effects on Family and Worker Well-being	20-77
20.9.4	Cumulative Residual Effects for Social Environment	20-77
20.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Social Environment.....	20-79
20.9.5.1	Cumulative Residual Effects Characterization for all VCs in the Social Environment	20-79
20.9.5.2	Likelihood of Cumulative Residual Effects on Education, Skills Development, and Training	20-79
20.9.5.3	Significance of Cumulative Residual Effects on Education, Skills Development, and Training	20-80
20.9.5.4	Confidence of Cumulative Residual Effects on Education, Skills Development, and Training	20-80
20.9.5.5	Likelihood of Cumulative Residual Effects on Community Infrastructure, Services, and Housing	20-80
20.9.5.6	Significance of Cumulative Residual Effects on Community Infrastructure, Services, and Housing	20-81
20.9.5.7	Confidence of Cumulative Residual Effects on Community Infrastructure, Services, and Housing	20-81
20.9.5.8	Likelihood of Cumulative Residual Effects on Worker and Family Well-being.....	20-82
20.9.5.9	Significance of Cumulative Residual Effects on Worker and Family Well-being.....	20-82
20.9.5.10	Confidence of Cumulative Residual Effects on Worker and Family Well-being.....	20-84
20.10	Effects Assessment Conclusions for Social Environment.....	20-84
	References.....	20-89
21.	Assessment of Potential Health Effects	21-1
21.1	Introduction	21-1
21.2	Regulatory and Policy Framework	21-2
21.2.1	Noise	21-2
21.2.2	Air Quality.....	21-3
21.2.3	Drinking Water	21-5
21.2.4	Country Foods	21-6
21.3	Baseline Characterization.....	21-6
21.3.1	Regional Overview	21-6
21.3.1.1	Noise	21-6
21.3.1.2	Air Quality.....	21-7
21.3.1.3	Drinking Water	21-7
21.3.1.4	Country Foods	21-7
21.3.2	Historical Activities.....	21-8

TABLE OF CONTENTS

21.3.3	Baseline Studies	21-8
21.3.3.1	Noise	21-9
21.3.3.2	Air Quality.....	21-9
21.3.3.3	Drinking Water	21-12
21.3.3.4	Country Foods	21-21
21.3.4	Characterization of Human Health Baseline Conditions	21-37
21.3.4.1	Noise	21-37
21.3.4.2	Air Quality.....	21-37
21.3.4.3	Drinking Water	21-38
21.3.4.4	Country Foods	21-39
21.4	Establishing the Scope of the Assessment for Human Health.....	21-42
21.4.1	Selecting Receptor Valued Components	21-43
21.4.1.1	Potential Interactions between the Project and Human Health.....	21-45
21.4.1.2	Consultation Feedback on Receptor Valued Components	21-45
21.4.1.3	Summary of Receptor Valued Components and Sub-components Included/Excluded in the Application/EIS ..	21-50
21.4.2	Assessment Boundaries for Human Health	21-51
21.4.2.1	Spatial Boundaries	21-51
21.4.2.2	Temporal Boundaries.....	21-57
21.4.2.3	Other Boundaries - Human Receptor Locations and Other Considerations.....	21-58
21.4.3	Identifying Potential Effects on Human Health.....	21-59
21.4.3.1	Construction	21-59
21.4.3.2	Operation.....	21-60
21.4.3.3	Closure and Reclamation	21-61
21.4.3.4	Post-closure.....	21-62
21.5	Effects Assessment and Mitigation for Human health.....	21-62
21.5.1	Key Effects on Human Health due to Noise	21-67
21.5.1.1	Identifying Potential Key Health Effects due to Noise	21-67
21.5.1.2	Mitigation Measures for Noise	21-71
21.5.2	Key Effects on Human Health due to Air Quality.....	21-71
21.5.2.1	Identifying Potential Key Health Effects due to Air Quality...	21-71
21.5.2.2	Mitigation Measures for Air Quality	21-75
21.5.3	Key Effects on Human Health due to Drinking Water Quality.....	21-75
21.5.3.1	Identifying Potential Key Health Effects due to Drinking Water Quality.....	21-75
21.5.3.2	Mitigation Measures for Drinking Water Quality.....	21-77
21.5.4	Key Effects on Human Health due to Country Foods Quality	21-79
21.5.4.1	Identifying Potential Key Health Effects due to Changes in Country Foods Quality	21-79
21.5.4.2	Mitigation Measures for Country Foods Quality.....	21-82

21.6	Residual Effects on Human Health	21-83
21.6.1	Residual Effects on Human Health due to Noise	21-83
21.6.1.1	Methodology and Assumptions.....	21-83
21.6.1.2	Human Receptors for Noise	21-83
21.6.1.3	Exposure Assessment.....	21-83
21.6.1.4	Summary of Residual Effects due to Noise	21-89
21.6.2	Residual Effects due to Air Quality	21-90
21.6.2.1	Methodology and Assumptions.....	21-90
21.6.2.2	Risk Assessment for Human Health Due to Air Quality	21-90
21.6.3	Residual Effects due to Drinking Water Quality	21-98
21.6.3.1	Methodology and Assumptions.....	21-98
21.6.3.2	Qualitative Assessment of the Potential for Residual Effects on Human Health due to Drinking Water Quality	21-104
21.6.4	Residual Effects due to Country Foods Quality	21-104
21.6.4.1	Methodology and Assumptions.....	21-104
21.6.4.2	Risk Assessment for Human Health due to Country Foods...	21-107
21.6.5	Summary of Residual Effects on Human Health	21-120
21.7	Characterizing Residual Effects, Significance, Likelihood and Confidence on Human Health	21-121
21.7.1	Residual Effects Characterization for Human Health due to Noise	21-121
21.7.1.1	Characterizing Human Health Residual Effects due to Noise	21-121
21.7.1.2	Likelihood for Residual Effects on Human Health due to Noise	21-126
21.7.1.3	Significance of Residual Effects on Human Health due to Noise	21-126
21.7.1.4	Characterization of Confidence for Residual Effects on Human Health due to Noise	21-129
21.7.2	Residual Effects Characterization for Human Health due to Air Quality.	21-129
21.7.2.1	Characterizing Human Health Residual Effects for Air Quality	21-129
21.7.2.2	Likelihood for Residual Effects on Air Quality	21-130
21.7.2.3	Significance of Residual Effects on Air Quality	21-131
21.7.2.4	Characterization of Confidence for Residual Effects on Air Quality	21-131
21.7.3	Residual Effects Characterization for Human Health due to Drinking Water Quality.....	21-131
21.7.3.1	Characterizing Human Health Residual Effects for Drinking Water Quality.....	21-131
21.7.3.2	Likelihood for Residual Effects on Drinking Water Quality ..	21-132
21.7.3.3	Significance of Residual Effects on Drinking Water Quality .	21-132
21.7.3.4	Characterization of Confidence for Residual Effects on Drinking Water Quality.....	21-132
21.8	Summary of Residual Effects and Significance for Human Health.....	21-133

21.9	Cumulative Effects Assessment for Human Health	21-133
21.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	21-133
21.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	21-137
21.9.1.2	Potential Interaction of Projects and Activities with the Project for Human Health	21-137
21.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment.....	21-140
21.9.1.4	Potential for Cumulative Effects.....	21-146
21.9.2	Analysis of Cumulative Effects	21-150
21.9.2.1	Cumulative Effects on Human Health from Air Quality	21-150
21.9.3	Mitigation Measures to Address Cumulative Effects	21-152
21.9.3.1	Mitigation Measures to Address Cumulative Human Health Effects due to Air Quality	21-152
21.9.4	Cumulative Residual Effects for Human Health	21-157
21.9.5	Characterizing Cumulative Residual Effects, Significance, Likelihood, and Confidence for Human Health.....	21-158
21.9.5.1	Cumulative Residual Effects on Human Health due to Air Quality	21-158
21.10	Effects Assessment Conclusions for Human Health.....	21-161
21.10.1	Human Health Effects due to Noise	21-164
21.10.2	Human Health Effects due to Air Quality.....	21-164
21.10.3	Human Health Effects due to Drinking Water Quality.....	21-165
21.10.4	Human Health Effects due to Country foods Quality	21-165
	References.....	21-166
22.	Assessment of Potential Heritage Effects	22-1
22.1	Introduction	22-1
22.2	Regulatory and Policy Framework	22-1
22.3	Baseline Characterization.....	22-5
22.3.1	Regional Overview	22-5
22.3.1.1	Paleoenvironmental Setting	22-6
22.3.1.2	Biophysical Setting	22-8
22.3.1.3	Cultural Setting	22-9
22.3.1.4	Historical Setting	22-10
22.3.1.5	Paleontological Setting	22-13
22.3.1.6	Previous Archaeological Studies.....	22-13
22.3.1.7	Regional Heritage Sites	22-13
22.3.2	Historical Activities.....	22-14
22.3.3	Baseline Studies	22-15
22.3.3.1	Data Sources	22-15
22.3.3.2	Methods.....	22-16
22.3.4	Characterization of Heritage Resources Baseline Conditions	22-19

22.3.4.1	Protected Archaeological Sites within the Regional Study Area	22-20
22.3.4.2	Protected Archaeological Sites within the Local Study Area	22-20
22.3.4.3	Protected Historical Sites	22-25
22.3.4.4	Protected Paleontological Sites	22-25
22.4	Establishing the Scope of the Effects Assessment for Heritage Resources	22-25
22.4.1	Selecting Receptor Valued Components	22-26
22.4.1.1	Potential Interactions between the Project and Heritage Resources.....	22-26
22.4.1.2	Consultation Feedback on Valued Components	22-31
22.4.1.3	Summary of Valued Components Included/Excluded in the Application for an Environmental Assessment Certificate/Environmental Impact Statement	22-31
22.4.2	Assessment Boundaries for Heritage Resources	22-32
22.4.2.1	Spatial Boundaries	22-32
22.4.2.2	Temporal Boundaries.....	22-32
22.4.3	Identifying Potential Effects on Heritage Resources	22-33
22.4.3.1	Construction	22-33
22.4.3.2	Operation.....	22-34
22.4.3.3	Closure.....	22-34
22.4.3.4	Post-closure.....	22-34
22.5	Effects Assessment and Mitigation for Heritage Resources	22-34
22.5.1	Key Effects on Heritage Resources	22-34
22.5.1.1	Identifying Key Effects on Heritage Resources	22-35
22.5.1.2	Mitigation Measures for Heritage Resources	22-36
22.6	Residual Effects on Heritage Resources	22-37
22.7	Cumulative Effects Assessment for Heritage Resources	22-38
22.8	Effects Assessment Conclusions for Heritage Resources.....	22-38
	References.....	22-40
23.	Assessment of Potential Navigation Effects	23-1
23.1	Introduction	23-1
23.2	Regulatory and Policy Framework.....	23-1
23.2.1	Definition of Navigable Waters	23-2
23.2.2	Applicable Sections of <i>Navigation Protection Act (1985)</i>	23-2
23.2.3	Land Use Planning Objectives	23-3
23.3	Baseline Characterization.....	23-4
23.3.1	Regional Overview	23-4
23.3.1.1	Physical Navigation Setting	23-4
23.3.1.2	Commercial/Recreational Navigation Setting	23-6
23.3.1.3	Aboriginal Navigation Setting	23-6
23.3.1.4	Summary.....	23-9

23.3.2	Historical Activities.....	23-9
23.3.3	Baseline Studies	23-10
23.3.3.1	Data Sources	23-10
23.3.3.2	Methods.....	23-11
23.3.4	Characterization of Navigable Waters Baseline Condition	23-15
23.3.5	Proponent's Assessment of Navigability	23-16
23.3.5.1	Consultation Feedback on Valued Components	23-17
23.3.5.2	Navigation Based on Physical Characteristics.....	23-18
23.3.5.3	Navigation Based on Public Utility	23-18
23.4	Establishing the Scope of the Effects Assessment for Navigation.....	23-20
23.4.1	Selecting Receptor Valued Components	23-20
23.4.1.1	Potential Interactions between the Project and Navigation ..	23-21
23.4.1.2	Summary of Receptor Valued Components Included/Excluded in the Application/EIS.....	23-25
23.4.2	Assessment Boundaries for Navigation	23-25
23.4.2.1	Spatial Boundaries	23-25
23.4.2.2	Temporal Boundaries.....	23-26
23.4.3	Identifying Potential Effects on Navigation	23-26
23.4.3.1	Construction	23-26
23.4.3.2	Operation.....	23-27
23.4.3.3	Closure and Reclamation	23-27
23.4.3.4	Post-closure.....	23-27
23.5	Effects Assessment and Mitigation for Navigation	23-27
23.5.1	Identifying Key Effects.....	23-27
23.5.1.1	Effects on Ability to Safely Navigate Waters.....	23-28
23.5.1.2	Effects on Navigational Access	23-31
23.5.2	Mitigation Measures for Navigation	23-31
23.6	Cumulative Effects	23-32
23.7	Summary of Effects on Navigation	23-32
	References.....	23-34
24.	Assessment of Potential Commercial and Non-commercial Land Use Effects	24-1
24.1	Introduction	24-1
24.2	Regulatory and Policy Framework.....	24-1
24.3	Baseline Characterization.....	24-2
24.3.1	Historical Activities.....	24-2
24.3.2	Baseline Studies	24-3
24.3.2.1	Baseline Study Areas and Methods	24-3
24.3.3	Regional Overview	24-5
24.3.4	Regional Land and Resource Management Plans	24-7
24.3.4.1	Cassiar Iskut-Stikine Land and Resource Management Plan	24-7
24.3.4.2	Nass South Sustainable Resource Management Plan.....	24-7

24.3.5	Hunting	24-9
24.3.5.1	Resident and Non-resident Harvest Data (2002 to 2011)	24-9
24.3.5.2	Guide Outfitting.....	24-11
24.3.6	Trapping	24-13
24.3.6.1	Trapline Harvest Data.....	24-13
24.3.6.2	Trapline Licence Holder Level of Use	24-15
24.3.7	Commercial Recreation Licences	24-15
24.3.7.1	Last Frontier Heli-skiing (Licence 6406136) and Rivers West Enterprises Ltd. (Licence 6407499).....	24-15
24.3.7.2	Spey Lodge/Boundary Lodge (Licence 6407503)	24-16
24.3.7.3	Bear Enterprises (Licence 6406985)	24-16
24.3.7.4	Explorers League: World and Wilderness Rafting (Licence 6406943)	24-16
24.3.8	Forestry.....	24-18
24.3.9	Mineral Exploration and Mining.....	24-18
24.3.10	Water Licences	24-19
24.3.11	Public Recreation	24-19
24.3.12	Transportation and Utilities	24-19
24.3.12.1	Roads.....	24-19
24.3.12.2	Power	24-22
24.3.13	Visual Quality.....	24-22
24.4	Establishing the Scope of the Assessment For Land Use.....	24-23
24.4.1	Selecting Receptor Valued Components	24-23
24.4.1.1	Potential Interactions between the Project and Commercial and Non-Commercial Land Uses.....	24-24
24.4.1.2	Consultation Feedback on Receptor Valued Components	24-29
24.4.1.3	Summary of Receptor Valued Components Included/Excluded in the Application/EIS.....	24-29
24.4.2	Assessment Boundaries for Land Use	24-32
24.4.2.1	Spatial Boundaries	24-32
24.4.2.2	Temporal Boundaries.....	24-32
24.4.3	Identifying Potential Effects on Land Use	24-34
24.4.3.1	Construction	24-34
24.4.3.2	Operation.....	24-34
24.4.3.3	Closure.....	24-35
24.4.3.4	Post-closure.....	24-35
24.5	Effects Assessment and Mitigation for Land Use	24-35
24.5.1	Change in Access or the Ability to Access or Use Land Use Areas.....	24-36
24.5.2	Change to the Quality of Experience of the Natural Environment	24-36
24.5.3	Change to the Abundance and Distribution of Wildlife	24-37
24.5.4	Mitigation Measures for Commercial Land Use-Related Effects	24-38
24.6	Residual Effects on Land Use.....	24-38

TABLE OF CONTENTS

24.6.1	Potential Residual Effect on Guide Outfitter Licence 601036	24-38
24.6.2	Potential Residual Effect on Commercial Recreation Licence 6406136....	24-39
24.6.3	Potential Residual Effect on Commercial Recreation Licence 6406985....	24-39
24.7	Characterizing Residual Effects, Likelihood, Significance, and Confidence on Land Use	24-39
24.7.1	Residual Effects Characterization for Commercial Land Use	24-39
24.7.1.1	Residual Effects Assessment- Commercial Recreation Licence 64069856	24-42
24.7.1.2	Residual Effects Assessment - Commercial Recreation Licence 6406985	24-42
24.8	Summary of Residual Effects and Significance for Commercial Land Use	24-43
24.9	Cumulative Effects Assessment for Land Use.....	24-43
24.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	24-44
24.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	24-44
24.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Commercial Land Use	24-44
24.9.1.3	Spatial-temporal Boundaries of the Cumulative Effects Assessment.....	24-46
24.9.1.4	Potential for Cumulative Effects.....	24-46
24.9.2	Analysis of Cumulative Effects	24-50
24.9.2.1	Cumulative Effects on Guide Outfitter 60136	24-50
24.9.2.2	Cumulative Effects on Commercial Recreation Licence 6406985	24-50
24.9.3	Mitigation Measures to Address Cumulative Effects on Commercial Land Use.....	24-50
24.9.4	Cumulative Residual Effects for Land Use.....	24-50
24.9.4.1	Guide Outfitter Licence 601036.....	24-50
24.9.4.2	Commercial Recreation Licence 6406985	24-51
24.9.5	Characterizing Cumulative Residual Effects, Likelihood, Significance, and Confidence for Commercial Land Use	24-51
24.9.5.1	Cumulative Residual Effects Characterization for Land Use ..	24-52
24.10	Effects Assessment Conclusions for Land Use	24-52
	References.....	24-54
25.	Assessment of Potential Effects to Current Use of Lands and Resources for Traditional Purposes.....	25-1
25.1	Introduction	25-1
25.2	Regulatory and Policy Context	25-1
25.2.1	Provincial Land and Resource Management Plans.....	25-1
25.2.1.1	Cassiar Iskut Stikine Land and Resource Management Plan	25-1
25.2.1.2	Nass South Sustainable Resource Management Plan.....	25-2
25.2.2	<i>Canadian Environmental Assessment Act, 2012</i>	25-2

25.2.3	Nisga'a Final Agreement.....	25-3
25.3	Baseline Characterization.....	25-3
25.3.1	Regional Overview	25-3
25.3.2	Baseline Study Methodology	25-4
25.3.2.1	Information Sources and Methods.....	25-4
25.3.2.2	Study Areas	25-5
25.3.3	Resource Use by Aboriginal Group	25-5
25.3.4	Skii km Lax Ha Current Use of Lands and Resources	25-7
25.3.4.1	Background.....	25-7
25.3.5	Nisga'a Nation Current Use of Lands and Resources.....	25-14
25.3.5.1	Background.....	25-14
25.3.6	Tahltan Nation Current Use of Lands and Resources	25-19
25.3.6.1	Background.....	25-19
25.3.7	Métis Nation of BC Current Use of Lands and Resources.....	25-21
25.3.7.1	Background.....	25-21
25.3.7.2	Current Use of Lands and Resources	25-21
25.4	Establishing the Scope of the Assessment for Current Aboriginal Use	25-22
25.4.1	Selecting Receptor Valued Components	25-22
25.4.1.1	Potential Interactions between the Project and Current Aboriginal Use	25-23
25.4.1.2	Consultation Feedback on Receptor Valued Components	25-28
25.4.1.3	Summary of Receptor Valued Components Included and Excluded in the Application/EIS.....	25-28
25.4.2	Assessment Boundaries for Current Aboriginal Land and Resource Use	25-29
25.4.2.1	Spatial Boundaries	25-29
25.4.2.2	Temporal Boundaries.....	25-30
25.4.3	Identifying Potential Effects on Current Aboriginal Land and Resource Use	25-30
25.4.3.1	Effects Included for Assessment	25-30
25.4.3.2	Effects Excluded from Assessment.....	25-31
25.4.3.3	Construction	25-31
25.4.3.4	Operation.....	25-31
25.4.3.5	Closure.....	25-32
25.4.3.6	Post-closure.....	25-32
25.5	Effects Assessment and Mitigation for Current Aboriginal Use	25-32
25.5.1	Key Effects on Fishing Opportunities and Practices	25-33
25.5.1.1	Identifying Key Effects.....	25-33
25.5.1.2	Change in Access or Ability to Access or Use Fishing Areas	25-33
25.5.1.3	Change in Quality of Experience of the Natural Environment	25-33
25.5.1.4	Change in the Abundance and Distribution of Fish Species Harvested	25-34
25.5.1.5	Change to the Quality of Resources	25-34

25.5.1.6	Mitigation- Fishing Opportunities and Practices.....	25-35
25.5.2	Key Effects on Hunting and Trapping Opportunities and Practices	25-35
25.5.2.1	Identifying Key Effects.....	25-35
25.5.2.2	Change in Access or Ability to Access or Use Hunting Areas ..	25-36
25.5.2.3	Change in Quality of Experience of the Natural Environment...	25-36
25.5.2.4	Change in the Abundance and Distribution of Resources	25-36
25.5.2.5	Change to the Quality of Resources	25-39
25.5.2.6	Mitigation - Hunting Opportunities and Practices.....	25-39
25.5.3	Key Effects on Gathering Opportunities and Practices.....	25-40
25.5.3.1	Identifying Key Effects.....	25-40
25.5.3.2	Change in Access or Ability to Access or Use Gathering Areas ..	25-40
25.5.3.3	Change to the Abundance and Distribution of Plant Resources..	25-40
25.5.3.4	Change to the Quality of Resources	25-41
25.5.3.5	Mitigation - Gathering Opportunities and Practices	25-42
25.5.4	Key Effects on Habitations, Trails, Burial Sites, and Cultural Landscapes	25-42
25.5.4.1	Identifying Key Effects.....	25-42
25.5.4.2	Change in Access or Ability to Access or Use Habitations, Trails, Burial Sites and Cultural Landscapes	25-42
25.5.4.3	Mitigation - Habitations, Trails, Burial Sites, and Cultural Landscapes.....	25-43
25.6	Residual Effects on Current Aboriginal Use	25-43
25.6.1	Residual Effects on Hunting and Trapping Opportunities and Practices ...	25-43
25.7	Characterizing Residual Effects, Significance, Likelihood, and Confidence on Current Aboriginal Use	25-45
25.7.1	Residual Effects Characterization for Hunting and Trapping Opportunities and Practices	25-45
25.7.1.1	Likelihood for Residual Effects on Hunting and Trapping Opportunities and Practices	25-45
25.7.1.2	Significance of Residual Effects on Hunting and Trapping Opportunities and Practices	25-45
25.7.1.3	Characterization of Confidence for Residual Effects on Hunting and Trapping Opportunities and Practices	25-45
25.8	Summary of Residual Effects and Significance for Current Aboriginal Use.....	25-47
25.9	Cumulative Effects Assessment for Current Aboriginal Use.....	25-47
25.9.1	Establishing the Scope of the Cumulative Effects Assessment.....	25-49
25.9.1.1	Identifying Intermediate Components and Receptor Valued Components for the Cumulative Effects Assessment	25-49
25.9.1.2	Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Current Aboriginal Use	25-51
25.9.1.3	Spatio-temporal Boundaries of the Cumulative Effects Assessment	25-53
25.9.1.4	Potential for Cumulative Effects.....	25-54
25.9.2	Analysis of Cumulative Effects	25-54

25.9.3	Mitigation Measures to Address Cumulative Effects	25-61
25.9.3.1	Mitigation Measures to Address Cumulative Effects on Hunting and Trapping Opportunities and Practices.....	25-61
25.9.4	Cumulative Residual Effects for Current Aboriginal Use.....	25-62
25.9.5	Characterizing Cumulative Residual Effects, Likelihood, Significance, and Confidence for Current Aboriginal Use	25-62
25.9.5.1	Cumulative Residual Effects Characterization for Current Aboriginal Use: Hunting and Trapping Opportunities and Practices.....	25-63
25.10	Effects Assessment Conclusions for Current Aboriginal Use	25-65
	References.....	25-66

PART E - ABORIGINAL GROUPS AND NISGA'A NATION

26.	Assessment of Effects on Asserted or Established Aboriginal Rights and Interests	26-1
26.1	Introduction	26-1
26.1.1	Background on Aboriginal Rights, Title, and Treaty Rights.....	26-1
26.1.2	Location of the Project in relation to Aboriginal Traditional Territories ...	26-3
26.1.2.1	Skii km Lax Ha	26-3
26.1.2.2	Tahltan Nation	26-5
26.2	Aboriginal Setting	26-5
26.2.1	Skii km Lax Ha.....	26-5
26.2.1.1	Social Setting	26-5
26.2.1.2	Economic Setting	26-5
26.2.1.3	Health Setting	26-7
26.2.1.4	Cultural Heritage	26-7
26.2.1.5	Current Use of Lands and Resources for Traditional Purposes	26-7
26.2.2	Tahltan Nation	26-8
26.2.2.1	Social Setting	26-8
26.2.2.2	Economic Setting	26-9
26.2.2.3	Health Setting	26-10
26.2.2.4	Culture and Heritage	26-11
26.2.2.5	Current Use of Land and Resources for Traditional Purposes.	26-11
26.2.3	Métis	26-12
26.2.3.1	Social Setting	26-12
26.2.3.2	Economic Setting	26-13
26.2.3.3	Culture and Heritage	26-13
26.2.3.4	Current Use of Lands and Resources for Traditional Purposes	26-14
26.3	Aboriginal Consultation.....	26-14
26.3.1	Introduction.....	26-14
26.3.2	EA Working Group.....	26-14
26.3.3	Capacity Funding.....	26-14

TABLE OF CONTENTS

26.3.4	Consultation Activities	26-15
26.3.5	Aboriginal Traditional Knowledge.....	26-15
26.3.5.1	Project Design Phase	26-22
26.3.5.2	Baseline Information Collection.....	26-22
26.3.5.3	Project Scoping and Valued Component Selection.....	26-23
26.3.5.4	Effects Assessment and Determination of Significance	26-24
26.3.5.5	Mitigation, Monitoring, and Follow-up	26-25
26.3.6	Planned Aboriginal Consultation during the Application/EIS Review Stage	26-25
26.4	Métis Interests	26-26
26.5	Assessment Methods	26-26
26.6	Scoping the Aboriginal Rights Assessment	26-27
26.6.1	Potential Effects on Aboriginal Rights	26-27
26.6.1.1	Indirect Effects on Valued Components	26-28
26.6.1.2	Direct Effects on Valued Components.....	26-28
26.6.1.3	Spatial Boundaries	26-34
26.7	Assessment of Impacts on Aboriginal Rights	26-34
26.7.1	Skii km Lax Ha.....	26-34
26.7.1.1	Impact to the Exercise of Fishing Rights.....	26-35
26.7.1.2	Impact to the Exercise of Hunting and Trapping Rights	26-35
26.7.1.3	Impact to the Exercise of Gathering Rights	26-36
26.7.1.4	Assessment of Overall Impacts on the Exercise of Skii km Lax Ha Aboriginal Rights	26-37
26.7.2	Tahltan Nation	26-37
26.7.2.1	Impact to the Exercise of Fishing Rights.....	26-38
26.7.2.2	Impact to the Exercise of Hunting Rights.....	26-38
26.7.2.3	Impact to the Exercise of Gathering Rights	26-39
26.7.2.4	Assessment of Overall Impacts on the Exercise of Tahltan Aboriginal Rights	26-40
26.8	Other Interests of Aboriginal Groups and Mitigation Measures.....	26-40
26.8.1	Employment and Economic Opportunities.....	26-40
26.8.2	Aboriginal Education, Skills, and Training.....	26-41
26.8.3	Concern over Economic Losses from a Change in Use of Lands and Resources.....	26-41
26.9	Summary	26-42
	References.....	26-44
27.	Assessment of Nisga'a Nation Treaty Rights, Interests, and Information Requirements	27-1
27.1	Introduction	27-1
27.1.1	Location of the Project in Relation to Nisga'a Lands, Nass Wildlife Area, and Nass Area as Defined in the <i>Nisga'a Final Agreement</i>	27-4
27.1.2	Nisga'a Treaty Rights and Interests under the <i>Nisga'a Final Agreement</i> ...	27-4
27.2	Nisga'a Nation Context and Overview	27-6

27.2.1	Social Setting	27-6
27.2.1.1	Political Structure	27-6
27.2.1.2	Population and Communities	27-6
27.2.1.3	Social Organization	27-6
27.2.1.4	Housing and Community Infrastructure	27-7
27.2.1.5	Education Facilities, Programs, and Post-secondary	27-8
27.2.2	Economic Setting	27-8
27.2.2.1	Employment	27-8
27.2.2.2	Income and Earnings	27-9
27.2.2.3	Nisga'a Nation Businesses	27-9
27.2.3	Health Setting	27-10
27.2.3.1	Community Health Facilities and Services	27-10
27.2.3.2	Emergency and Social Services	27-10
27.2.3.3	Health and Community Well-being	27-10
27.2.4	Heritage Setting	27-11
27.2.5	Current Use of Lands and Resources	27-12
27.3	Summary of Nisga'a Consultation Activities	27-13
27.3.1	Capacity Funding and Agreements	27-13
27.3.2	Aboriginal Consultation Plan and Aboriginal Consultation Reports	27-13
27.3.3	EAO Working Group	27-13
27.3.4	Consultation on Draft Conclusions Related to Nisga'a Rights and Interests	27-14
27.3.5	Proposed Nisga'a Consultation - Application/EIS Review Stage	27-14
27.3.6	Issues raised by Nisga'a to Date	27-15
27.4	Assessment of Environmental Effects Pursuant to Paragraph 8(e) of Chapter 10 of the <i>Nisga'a Final Agreement</i>	27-15
27.4.1	Establishing the Scope of the 8(e) Assessment	27-15
27.4.1.1	Spatial and Temporal Boundaries	27-20
27.4.2	Assessment of Effects under Paragraph 8(e)	27-20
27.4.2.1	Effects on Nisga'a Nation Interests in Fish and Aquatic Plants	27-20
27.4.2.2	Effects on Nisga'a Citizens to Harvest Migratory Birds	27-26
27.5	Assessment of Effects Pursuant to Paragraph 8(f) of Chapter 10 of the <i>Nisga'a Final Agreement</i>	27-30
27.5.1	Establishing the Scope of the Assessment	27-30
27.5.1.1	Spatial and Temporal Boundaries	27-31
27.5.2	Assessment of Effects under Paragraph 8(f)	27-31
27.5.2.1	Effects on Nisga'a Economic Well-being	27-31
27.5.2.2	Effects on Nisga'a Social Well-being	27-34
27.5.3	Effects on Nisga'a Cultural Well-being	27-38
27.6	Effects to Other Nisga'a Nation Interests and Mitigation Measures	27-39
27.6.1	Effects on the Knipple Glacier	27-39
27.6.2	Effects of the Access Road on Moose	27-40

27.7	Summary	27-41
	References.....	27-43

PART F - ENVIRONMENTAL MANAGEMENT PLANS AND REPORTING

28.	Environmental Management System	28-1
28.1	Context.....	28-1
28.2	Objectives	28-1
28.3	Generic Environmental Management System Principles	28-2
28.4	Company Policy	28-2
28.5	Resources and Responsibilities.....	28-3
28.5.1	Human Resources	28-3
28.5.2	Material Resources.....	28-4
28.6	Way Forward	28-4
28.6.1	Initial Environmental Management System.....	28-4
28.6.1.1	Environmental Policy.....	28-4
28.6.1.2	Identification of Risks and Related Effects.....	28-4
28.6.1.3	Specific Subject Area Environmental Management Plans.....	28-4
28.6.1.4	Allocation of Resources, Roles, and Responsibilities	28-5
28.6.1.5	Emergency Preparedness	28-5
28.6.1.6	Monitoring and Review.....	28-5
28.6.2	Currently Envisaged Environmental Management Plans.....	28-5
	References.....	28-7
29.	Environmental Management and Monitoring Plans	29-1
29.1	Introduction to Environmental Management and Monitoring Plans.....	29-1
29.1.1	Context	29-1
29.1.2	Principles of Environmental Management Planning.....	29-1
29.1.3	Environmental Management Plans for the Brucejack Gold Mine Project ...	29-1
29.1.3.1	Structure	29-1
29.1.3.2	Responsibilities.....	29-2
29.1.3.3	Subject Area Environmental Management Plans	29-3
29.2	Air Quality Management Plan	29-3
29.2.1	Purpose	29-3
29.2.2	Regulatory and Policy Framework	29-4
29.2.3	Performance Objectives	29-7
29.2.4	Environmental Protection Measures	29-7
29.2.4.1	Equipment and Vehicles	29-7
29.2.4.2	Generators and Incinerators	29-8
29.2.4.3	Fugitive Dust from Ore Processing	29-8
29.2.4.4	Unpaved Roads	29-8
29.2.5	Monitoring Program.....	29-8
29.2.6	Work Planning and Schedule	29-9

29.2.7	Reporting Requirements	29-10
29.3	Aquatic Effects Monitoring Plan	29-10
29.3.1	Purpose	29-10
29.3.2	Regulatory and Policy Framework	29-11
29.3.2.1	Applicable Regulations.....	29-11
29.3.2.2	Guidelines	29-12
29.3.2.3	Guidance Documents.....	29-12
29.3.3	Performance Objectives	29-12
29.3.4	Environmental Protection Measures	29-13
29.3.5	Aquatic Effects Monitoring Program.....	29-14
29.3.6	Work Planning, Scheduling, and Reporting.....	29-15
29.3.6.1	Annual Aquatic Effects Monitoring Program Report	29-15
29.3.6.2	Reports under Metal Mining Effluent Regulation	29-16
29.3.7	Follow-up Program	29-16
29.4	Avalanche Management Plan	29-16
29.4.1	Purpose	29-16
29.4.2	Regulatory and Policy Framework	29-17
29.4.3	Performance Objectives	29-17
29.4.4	Environmental Protection Measures	29-17
29.4.4.1	Weather Monitoring	29-18
29.4.4.2	Communication.....	29-18
29.4.4.3	Explosives	29-18
29.4.4.4	Signage.....	29-18
29.4.4.5	Equipment for Avalanche Safety	29-18
29.4.4.6	Training.....	29-18
29.4.4.7	Emergency Response	29-19
29.4.5	Monitoring Program.....	29-19
29.4.5.1	Mapping.....	29-19
29.4.5.2	Operational Checklist	29-19
29.4.6	Work Planning and Schedule	29-19
29.4.7	Reporting Requirements	29-19
29.5	Ecosystem Management Plan	29-19
29.5.1	Purpose	29-19
29.5.2	Regulatory and Policy Framework	29-19
29.5.3	Performance Objectives	29-20
29.5.4	Environmental Protection Measures	29-21
29.5.5	Monitoring Program.....	29-22
29.5.6	Work Planning and Schedule	29-22
29.5.7	Reporting Requirements	29-23
29.6	Emergency Response Plan	29-24
29.6.1	Purpose	29-24

TABLE OF CONTENTS

29.6.2	Regulatory and Policy Framework	29-24
29.6.3	Performance Objectives	29-25
29.6.4	Emergency Preparedness Measures.....	29-25
29.6.4.1	Policy Directive	29-26
29.6.4.2	Emergency Response Plan Coordinator and Emergency Response Planning Committee	29-27
29.6.4.3	Emergency Identification, Prevention, and Protection	29-27
29.6.4.4	Duties and Responsibilities of Personnel	29-27
29.6.4.5	Emergency Notification Plan.....	29-28
29.6.4.6	Emergency Operations Centre	29-28
29.6.4.7	Mine Emergency Response Procedures.....	29-28
29.6.4.8	Action Plans.....	29-28
29.6.4.9	Mine Plan	29-29
29.6.4.10	Evacuation Plan and Map of Escape Routes	29-29
29.6.4.11	Check-in/Check-out Procedure for Emergency Operations ...	29-29
29.6.4.12	Mine Rescue Equipment Inventory	29-29
29.6.4.13	Mutual Aid Agreement	29-29
29.6.4.14	First Responders Consultation	29-30
29.6.4.15	Communication Services.....	29-30
29.6.4.16	System for the Dissemination of Information	29-30
29.6.4.17	Training Plan.....	29-31
29.6.4.18	Practice Session Plan.....	29-31
29.6.4.19	Plan for Review and Updating	29-31
29.6.4.20	Costs	29-31
29.6.4.21	Mine Rescue.....	29-31
29.6.4.22	Firefighting.....	29-32
29.6.4.23	First Aid.....	29-32
29.6.4.24	Evacuation	29-33
29.6.4.25	Snow Avalanche	29-33
29.6.4.26	Power Failure.....	29-33
29.6.4.27	Road Closure.....	29-34
29.6.4.28	Water or Tailings Management Failure.....	29-34
29.6.5	Monitoring Program.....	29-35
29.6.6	Work Planning and Schedule	29-35
29.6.7	Reporting Requirements.....	29-35
29.6.7.1	Reports	29-35
29.6.7.2	Reporting Responsibilities	29-36
29.7	Hazardous Materials Management Plan.....	29-36
29.7.1	Purpose	29-36
29.7.2	Regulatory and Policy Framework	29-36
29.7.3	Performance Objectives	29-37

29.7.4	Environmental Protection Measures	29-38
29.7.4.1	Dangerous Goods and Hazardous Materials.....	29-38
29.7.4.2	Explosives	29-45
29.7.5	Monitoring Program.....	29-47
29.7.6	Work Planning and Schedule	29-48
29.7.7	Reporting Requirements.....	29-48
29.7.7.1	Reports	29-48
29.7.7.2	Reporting Responsibilities	29-48
29.8	Heritage Management Plan	29-48
29.8.1	Purpose	29-48
29.8.2	Regulatory and Policy Framework	29-49
29.8.3	Performance Objectives	29-49
29.8.4	Environmental Protection Measures	29-49
29.8.4.1	General Heritage Management and Mitigation Strategies	29-50
29.8.4.2	Protected Heritage Sites within the RSA	29-52
29.8.4.3	Protected Heritage Sites within the LSA and Site Specific Effects, Management, and Mitigation	29-52
29.8.4.4	Revisions to Project Footprint during Construction, Operation, and Closure	29-53
29.8.5	Monitoring Program.....	29-53
29.8.5.1	Site Monitoring and Flagging.....	29-53
29.8.5.2	Field Notes, Photographs, Logistics, and Management	29-54
29.8.5.3	Heritage Chance Find Procedure.....	29-55
29.8.6	Work Planning and Schedule	29-55
29.8.7	Reporting Requirements	29-56
29.8.7.1	Mitigation Reporting.....	29-56
29.8.7.2	Monitoring Reporting	29-56
29.9	Invasive Plants Management Plan	29-56
29.9.1	Purpose	29-56
29.9.2	Regulatory and Policy Framework	29-57
29.9.3	Performance Objectives	29-58
29.9.4	Environmental Protection Measures	29-58
29.9.5	Monitoring Program.....	29-60
29.9.6	Work Planning and Schedule	29-61
29.9.7	Reporting Requirements	29-61
29.10	ML/ARD Management	29-62
29.10.1	Introduction.....	29-62
29.10.2	Monitoring Methods.....	29-62
29.10.2.1	Surface Material and Mine Waste Sampling	29-63
29.10.2.2	Mine-related Contact Water	29-65
29.10.2.3	Chemical Analyses	29-67

TABLE OF CONTENTS

29.10.2.4	Management Criteria	29-67
29.10.3	Waste Rock, Ore and Underground Exposures	29-68
29.10.3.1	Waste Rock Management	29-68
29.10.3.2	ML/ARD Assessment	29-68
29.10.3.3	Monitoring.....	29-68
29.10.3.4	Prevention and Mitigation.....	29-71
29.10.3.5	Performance Monitoring and Contingency.....	29-71
29.10.4	Tailings and Paste Backfill	29-76
29.10.4.1	Tailings and Paste Backfill Management	29-76
29.10.4.2	ML/ARD Assessment	29-77
29.10.4.3	Monitoring.....	29-77
29.10.4.4	Prevention and Mitigation.....	29-77
29.10.4.5	Performance Monitoring and Contingency.....	29-79
29.10.5	Surface Materials	29-79
29.10.5.1	Management of Surface Materials	29-79
29.10.5.2	ML/ARD Assessment	29-79
29.10.5.3	Monitoring.....	29-80
29.10.5.4	Prevention and Mitigation.....	29-80
29.10.5.5	Performance Monitoring and Contingency.....	29-81
29.10.6	Treatment Solids from Waste Treatment Plant	29-82
29.10.6.1	Management of Treatment Solids.....	29-82
29.10.6.2	ML/ARD Assessment	29-83
29.10.6.3	Monitoring.....	29-84
29.10.6.4	Prevention and Mitigation.....	29-85
29.10.6.5	Performance Monitoring and Contingency.....	29-87
29.10.7	Post-closure Monitoring.....	29-89
29.10.7.1	Brucejack Lake	29-89
29.10.7.2	Adits.....	29-89
29.10.7.3	Brucejack Creek.....	29-90
29.10.8	Temporary or Early Closure Scenarios	29-90
29.10.8.1	Temporary Closure	29-90
29.10.8.2	Early Closure.....	29-90
29.11	Noise Management Plan	29-90
29.11.1	Purpose	29-90
29.11.2	Regulatory and Policy Framework	29-91
29.11.3	Performance Objectives	29-92
29.11.4	Environmental Protection Measures	29-92
29.11.4.1	Controlling Noise at the Source	29-92
29.11.4.2	Controlling the Noise Pathway	29-92
29.11.4.3	Controlling Noise at the Receptor	29-93
29.11.4.4	Mobile Equipment.....	29-93

29.11.4.5	Stationary Equipment	29-93
29.11.4.6	Blasting	29-94
29.11.4.7	Indoor Equipment	29-94
29.11.4.8	Mitigation Plans	29-94
29.11.4.9	Complaint Procedure and Register	29-94
29.11.5	Monitoring Program.....	29-95
29.11.6	Work Planning and Schedule	29-95
29.11.7	Reporting Requirements.....	29-95
29.12	Rare Plant Management Plan.....	29-97
29.12.1	Purpose	29-97
29.12.2	Regulatory and Policy Framework	29-97
29.12.3	Performance Objectives	29-98
29.12.4	Environmental Protection Measures	29-98
29.12.5	Work Planning and Schedule	29-99
29.12.6	Reporting Requirements	29-100
29.13	Soils Management Plan	29-100
29.13.1	Purpose	29-100
29.13.2	Regulatory and Policy Framework	29-100
29.13.3	Soil Salvage and Handling	29-102
29.13.3.1	Performance Objectives	29-102
29.13.3.2	Environmental Protection Measures	29-102
29.13.3.3	Monitoring Program.....	29-104
29.13.3.4	Reporting Requirements	29-104
29.13.4	Soil Erosion Prevention and Sediment Control.....	29-105
29.13.4.1	Performance Objectives	29-105
29.13.4.2	Environmental Protection Measures	29-105
29.13.4.3	Monitoring Program.....	29-108
29.13.4.4	Reporting Requirements	29-108
29.13.5	Soil Metal Contamination Prevention Plan	29-109
29.13.5.1	Performance Objectives	29-110
29.13.5.2	Environmental Protection Measures	29-110
29.13.5.3	Monitoring Program.....	29-110
29.13.5.4	Reporting Requirements	29-111
29.14	Spill Prevention and Response Plan	29-111
29.14.1	Purpose	29-111
29.14.2	Regulatory and Policy Framework	29-112
29.14.3	Performance Objectives	29-112
29.14.4	Environmental Protection Measures	29-113
29.14.4.1	Spill Prevention	29-113
29.14.4.2	Risk Assessment	29-113
29.14.4.3	Materials-specific Actions	29-114

29.14.4.4	Spill Emergency Response	29-115
29.14.5	Monitoring Program.....	29-118
29.14.6	Work Planning and Schedule	29-119
29.14.7	Reporting Requirements	29-119
29.14.7.1	Reports	29-119
29.14.7.2	Reporting Responsibilities	29-120
29.15	Tailings Management Plan	29-120
29.15.1	Purpose	29-120
29.15.2	Regulatory and Policy Framework	29-120
29.15.3	Performance Objectives	29-121
29.15.4	Environmental Protection Measures	29-122
29.15.5	Monitoring Program.....	29-124
29.15.6	Work Planning and Schedule	29-124
29.15.7	Follow-up Program	29-124
29.15.8	Reporting Requirements	29-125
29.15.8.1	Reports	29-125
29.15.8.2	Reporting Responsibilities	29-125
29.16	Transportation and Access Management Plan	29-125
29.16.1	Purpose	29-125
29.16.2	Regulatory and Policy Framework	29-126
29.16.3	Performance Objectives	29-126
29.16.4	Environmental Protection Measures	29-126
29.16.4.1	Surfaced Roads	29-126
29.16.4.2	Glacier Road	29-129
29.16.5	Monitoring Program.....	29-130
29.16.6	Work Planning and Schedule	29-131
29.16.7	Reporting Requirements	29-131
29.16.7.1	Reports	29-131
29.16.7.2	Reporting Responsibilities	29-131
29.17	Waste Management Plan	29-132
29.17.1	Purpose	29-132
29.17.2	Regulatory and Policy Framework	29-132
29.17.3	Performance Objectives	29-133
29.17.4	Environmental Protection Measures	29-133
29.17.4.1	Waste Reduction, Reuse, Recycling, and Recovery.....	29-133
29.17.4.2	Waste Types	29-134
29.17.4.3	Waste Collection and Disposal Facilities.....	29-134
29.17.4.4	Procedures for Managing Specific Waste	29-137
29.17.4.5	Hazardous Waste.....	29-137
29.17.4.6	Non-hazardous Waste	29-140
29.17.4.7	Transporting Waste	29-142

29.17.4.8	Closure and Decommissioning	29-142
29.17.5	Monitoring Program.....	29-143
29.17.6	Work Planning and Schedule	29-143
29.17.7	Reporting Requirements	29-143
	29.17.7.1 Reports	29-143
	29.17.7.2 Reporting Responsibilities	29-144
29.18	Waste Rock Management Plan	29-144
29.18.1	Purpose	29-144
29.18.2	Regulatory and Policy Framework	29-144
29.18.3	Performance Objectives	29-145
29.18.4	Environmental Protection Measures	29-146
	29.18.4.1 Transport and Handling.....	29-148
	29.18.4.2 Deposition.....	29-148
	29.18.4.3 Physical Controls.....	29-149
29.18.5	Monitoring Program.....	29-149
	29.18.5.1 Physical Conditions	29-149
	29.18.5.2 Water Quality.....	29-150
29.18.6	Work Planning and Schedule	29-150
29.18.7	Follow-up Program	29-150
29.18.8	Reporting Requirements	29-150
	29.18.8.1 Reports	29-150
	29.18.8.2 Reporting Responsibilities	29-151
29.19	Water Management Plan	29-151
29.19.1	Purpose	29-151
29.19.2	Regulatory and Policy Framework	29-152
29.19.3	Performance Objectives	29-153
29.19.4	Environmental Protection Measures	29-153
	29.19.4.1 General Actions to Avoid, Control, and Mitigate	29-153
	29.19.4.2 Actions to Avoid, Control, and Mitigate during Construction ..	29-157
	29.19.4.3 Actions to Avoid, Control, and Mitigate during Operation...	29-158
	29.19.4.4 Actions to Avoid, Control, and Mitigate during Closure and Post-closure.....	29-164
29.19.5	Water Management Monitoring Program.....	29-164
29.19.6	Work Planning and Schedule	29-165
29.19.7	Reporting Requirements	29-166
29.20	Wetlands Monitoring Plan	29-167
29.20.1	Purpose	29-167
29.20.2	Regulatory and Policy Framework	29-167
29.20.3	Monitoring Program.....	29-168
29.20.4	Site Selection	29-168
29.20.5	Schedule.....	29-171

TABLE OF CONTENTS

29.20.6	Ecological Function.....	29-171
29.20.6.1	Surface and Subsurface Hydrology.....	29-171
29.20.7	Ecological Function.....	29-171
29.20.7.1	Wetland Extent Survey.....	29-171
29.20.8	Habitat Function	29-171
29.20.8.1	General Wildlife Observations.....	29-171
29.20.9	Work Planning and Schedule	29-172
29.20.10	Reporting Requirements.....	29-172
29.21	Wildlife Management and Monitoring Plan.....	29-172
29.21.1	Purpose	29-172
29.21.2	Regulatory and Policy Framework	29-173
29.21.3	Performance Objectives and Targets	29-174
29.21.4	Wildlife Protection Measures	29-174
29.21.4.1	Project Design Considerations.....	29-174
29.21.4.2	Construction Phase	29-175
29.21.4.3	Operation.....	29-181
29.21.4.4	Temporary Shut-down.....	29-183
29.21.4.5	Closure and Post-closure	29-183
29.21.5	Wildlife Access and Traffic Management Plan	29-184
29.21.5.1	Access Management	29-184
29.21.5.2	Prevent Barriers to Movement.....	29-184
29.21.5.3	Avoid Wildlife/Vehicle Interactions	29-185
29.21.5.4	Monitoring.....	29-186
29.21.6	Wildlife Helicopter Management Plan.....	29-187
29.21.7	Wildlife Light Management Plan	29-187
29.21.8	Employee Wildlife Education and Training Program.....	29-187
29.21.9	Wildlife Effects Monitoring Program.....	29-188
29.21.9.1	Moose Monitoring Program	29-188
29.21.9.2	Mountain Goat Monitoring Program.....	29-190
29.21.10	Work Plan and Schedule	29-191
29.21.11	Follow-up Program	29-192
29.21.12	Reporting Requirements	29-192
29.22	Reporting	29-193
29.22.1	Introduction.....	29-193
29.22.2	Compliance Reporting Requirements.....	29-193
29.22.3	Voluntary Reporting	29-193
29.22.4	Reporting Responsibility.....	29-193
29.22.5	Notification	29-198
	References.....	29-199

30.	Closure and Reclamation.....	30-1
30.1	Introduction	30-1
30.2	Regulatory Framework	30-2
30.2.1	British Columbia Mines Act and Health, Safety and Reclamation Code	30-2
30.2.2	Metal Mine Effluent Regulations	30-2
30.2.3	<i>Environmental Management Act and Canadian Environmental Protection Act</i>	30-3
30.2.4	<i>Water Act</i>	30-3
30.3	Closure and Reclamation Objectives.....	30-3
30.3.1	Provision of Stable Landforms	30-4
30.3.2	End Land Use Objectives	30-4
30.3.2.1	Brucejack Mine Site	30-5
30.4	Detailed Soil Management Plan	30-10
30.4.1	Brucejack Mine Site	30-10
30.4.1.1	Soil Assessment.....	30-10
30.4.1.2	Soil Salvage	30-11
30.4.1.3	Soil Stockpiling	30-15
30.4.2	Bowser Aerodrome.....	30-15
30.4.2.1	Soil Suitability	30-17
30.4.2.2	Soil Salvage	30-17
30.4.2.3	Soil Stockpiling	30-20
30.4.3	Knipple Transfer Area Facility.....	30-20
30.4.3.1	Soil Suitability	30-20
30.4.3.2	Soil Salvage	30-20
30.4.3.3	Soil Stockpiling	30-22
30.4.4	Tide Staging Area	30-22
30.4.4.1	Soil Suitability	30-22
30.4.4.2	Soil Salvage	30-24
30.4.5	Access Road.....	30-25
30.4.5.1	Soil Suitability	30-25
30.4.5.2	Soil Salvage	30-25
30.4.5.3	Soil Stockpiling	30-25
30.4.6	Brucejack Transmission Line.....	30-26
30.5	Closure and Reclamation Planning	30-26
30.5.1	Introduction.....	30-26
30.5.2	Brucejack Mine Site	30-26
30.5.2.1	Mill Building	30-30
30.5.2.2	Pipelines.....	30-31
30.5.2.3	Portals, Vent Raises, and Underground	30-31
30.5.2.4	Operations Camp/Sewage Treatment Plant.....	30-33
30.5.2.5	Truck Shop	30-34

TABLE OF CONTENTS

30.5.2.6	Fuel Storage	30-34
30.5.2.7	Detonator and Explosives.....	30-35
30.5.2.8	Incinerator and Waste Sorting Area	30-35
30.5.2.9	Contact Water Collection Pond	30-35
30.5.2.10	Core Shack and Core	30-35
30.5.2.11	Turbidity Curtains Brucejack Lake.....	30-36
30.5.2.12	Other Structures	30-36
30.5.2.13	Batch Plant.....	30-36
30.5.2.14	Main Substation	30-36
30.5.2.15	Quarry.....	30-37
30.5.2.16	Pre-production Ore and Waste Rock Transfer Storage	30-37
30.5.2.17	Constructed Pads	30-37
30.5.2.18	Diversion and Collection Ditches.....	30-39
30.5.2.19	Site Roads	30-39
30.5.3	Bowser Aerodrome.....	30-40
30.5.4	Knipple Transfer Area.....	30-46
	30.5.4.1 Facility.....	30-46
	30.5.4.2 Closure.....	30-46
	30.5.4.3 Reclamation	30-48
30.5.5	Brucejack Transmission Line.....	30-49
	30.5.5.1 Closure and Reclamation	30-49
30.5.6	Access Road.....	30-49
	30.5.6.1 Closure.....	30-49
	30.5.6.2 Reclamation	30-49
30.6	Progressive Closure and Reclamation	30-50
	30.6.1 Brucejack Mine Site	30-50
	30.6.2 Tide Staging Area	30-53
	30.6.3 Bowser Camp	30-53
30.7	Closure and Reclamation Schedule.....	30-55
30.8	Temporary Mine Shutdown	30-56
30.9	Research Programs	30-57
30.10	Closure Costing	30-57
	30.10.1 Closure Costing.....	30-57
30.11	Closure and Post-closure Monitoring	30-59
	30.11.1 Structural Stability	30-59
	30.11.2 Stability of Decommissioned Openings.....	30-60
	30.11.3 Surface Stability	30-60
	30.11.4 Reclamation	30-60
	30.11.5 Underground.....	30-60
	30.11.6 Groundwater Quality	30-60
	30.11.7 Surface Water Quality	30-60

30.11.8	Aquatic Resources	30-60
30.11.9	Monitoring Costs	30-61
	References.....	30-62

PART G - OTHER REQUIREMENTS

31.	Accidents and Malfunctions.....	31-1
31.1	Background	31-1
31.2	Scope	31-2
31.3	Approach.....	31-3
31.4	Failure Mode and Effects Analysis	31-3
31.5	Data Input	31-4
31.5.1	Component Categories.....	31-6
31.5.2	Activity/Step/Area or Category	31-6
31.5.3	Hazard/Aspect or Threat	31-6
31.5.4	Unwanted Event.....	31-6
31.5.5	Life of Mine	31-6
31.5.6	Existing Controls and Contributing Factors.....	31-7
31.5.7	Impact Categories	31-7
31.5.8	Residual and Inherent Risks.....	31-7
31.5.8.1	Likelihood	31-8
31.5.8.2	Severity	31-8
31.5.9	Rank and Risk Level	31-8
31.5.10	Recommended Action	31-10
31.6	Risk Registers and Risk Matrices	31-10
31.6.1	Risk across All Impact Categories	31-10
31.6.2	Evaluation of Environmental Failure Modes.....	31-11
31.6.3	Low Environmental Risks	31-11
31.6.4	Medium Environmental Risks.....	31-12
31.6.4.1	Medium Environmental Risks - Underground Failure Modes ...	31-12
31.6.4.2	Medium Environmental Risks - Surface Failure Modes.....	31-19
31.7	Assessment of Potential Environmental Effects.....	31-19
31.7.1	Identification of Potential Interactions between Failure Modes with Intermediate and Receptor Valued Components	31-20
31.7.2	Spatial and Temporal Boundaries	31-29
31.7.3	Summary of Assessments for the Medium Environmental Risks.....	31-30
31.7.4	Sediment in Tailings Discharge and Waste Rock.....	31-30
31.7.4.1	Surface Water Quality	31-30
31.7.4.2	Aquatic Resources	31-33
31.7.4.3	Fish and Fish Habitat.....	31-34
31.7.5	Spill/Fuel - Land, Water	31-34
31.7.5.1	Terrain and Soil	31-35

TABLE OF CONTENTS

31.7.5.2	Surface Water Quality	31-35
31.7.5.3	Aquatic Resources	31-35
31.7.5.4	Fish and Fish Habitat.....	31-36
31.7.5.5	Wetlands	31-36
31.7.5.6	Terrain and Soils (Riparian)	31-37
31.7.6	Spill/Concentrate - Land, Water.....	31-37
31.7.6.1	Terrain and Soil	31-38
31.7.6.2	Air	31-38
31.7.6.3	Surface Water Quality	31-39
31.7.6.4	Aquatic Resources	31-39
31.7.6.5	Fish and Fish Habitat.....	31-40
31.7.6.6	Wetlands	31-40
31.7.7	Vehicle Collisions/Congestion - Surface	31-41
31.7.7.1	Terrain and Soil	31-42
31.7.7.2	Surface Water Quality	31-43
31.7.7.3	Wetlands	31-43
31.7.7.4	Wildlife and Wildlife Habitat	31-44
31.7.7.5	Aquatic Resources and Fish and Fish Habitats	31-44
31.7.8	Loss of Vehicles on the Glacier/Avalanche Zones.....	31-45
31.7.8.1	Surface Water Quality	31-45
31.8	Conclusions	31-46
	References.....	31-48
32.	Effects of the Environment on the Project	32-1
32.1	Introduction	32-1
32.2	Climate and Meteorology	32-2
32.2.1	Climate	32-2
32.2.1.1	Regional Climate	32-2
32.2.1.2	Regional Climatic Patterns	32-2
32.2.1.3	Local Climate	32-3
32.2.2	Precipitation.....	32-4
32.2.2.1	Typical Precipitation	32-4
32.2.2.2	Storms (High Rainfall and Snowfall)	32-6
32.2.2.3	Drought (Low Precipitation)	32-8
32.2.3	Air Temperature and Freeze-Thaw Cycles	32-8
32.2.3.1	Effects on the Project	32-10
32.2.3.2	Mitigation Measures	32-10
32.2.4	Wind.....	32-11
32.2.4.1	Effects on the Project	32-11
32.2.4.2	Mitigation Measures	32-11

32.3	Surface Water Flow	32-11
32.3.1	Typical Surface Water Flows.....	32-12
32.3.1.1	Effects on the Project	32-12
32.3.1.2	Mitigation Measures	32-13
32.3.2	Floods	32-13
32.3.2.1	Effects on the Project	32-14
32.3.2.2	Mitigation Measures	32-16
32.3.3	Low Flows	32-17
32.3.3.1	Effects on the Project	32-18
32.3.3.2	Mitigation Measures	32-18
32.4	Permafrost.....	32-18
32.5	Geophysical Effects	32-18
32.5.1	Landslides	32-19
32.5.1.1	Effects on the Project	32-19
32.5.1.2	Mitigation Measures	32-19
32.5.2	Snow Avalanches	32-20
32.5.2.1	Effects on the Project	32-20
32.5.2.2	Mitigation Measures	32-21
32.5.3	Glaciers.....	32-21
32.5.3.1	Effects on the Project	32-22
32.5.3.2	Mitigation Measures	32-22
32.5.4	Seismic Activity	32-23
32.5.4.1	Effects on the Project	32-23
32.5.4.2	Mitigation Measures	32-23
32.5.5	Volcanic Activity	32-24
32.5.5.1	Effects on the Project	32-24
32.5.5.2	Mitigation Measures	32-25
32.6	Wildfires	32-25
32.6.1	Effects on the Project	32-26
32.6.2	Mitigation Measures	32-27
32.7	Climate Change	32-28
32.7.1	Recent Climate Change: Community Observations	32-28
32.7.2	Past Climate Change: Proxy Records and the Meteorological Record	32-28
32.7.3	Climate Change Projections for the Project Area.....	32-28
32.7.3.1	Air Temperature	32-29
32.7.3.2	Precipitation.....	32-29
32.7.3.3	Streamflow.....	32-32
32.7.3.4	Extreme Events.....	32-34
32.7.3.5	Glacial Recession and Thinning.....	32-34
32.7.3.6	Mass Movements, Wind Velocity, and Wildfires	32-34

TABLE OF CONTENTS

32.7.4	Project-related Adaptation and Mitigation Measures	32-34
32.7.4.1	Air Temperature	32-37
32.7.4.2	Precipitation.....	32-37
32.7.4.3	Streamflow and Flooding	32-37
32.7.4.4	Glacial Recession and Thinning.....	32-37
32.7.4.5	Mass Movements, Wind Velocity, and Wildfires	32-38
32.7.5	Climate Change Regulatory Context and Adaptation.....	32-38
32.7.5.1	Regulatory Context of Climate Change	32-38
32.7.5.2	Climate Change Adaptation.....	32-38
	References.....	32-40
33.	Federal Summaries	33-1
33.1	Changes to Components of the Environment within Federal Jurisdiction	33-1
33.1.1	Fish and Fish Habitat	33-1
33.1.1.1	Direct Mortality	33-2
33.1.1.2	Erosion and Sedimentation.....	33-3
33.1.1.3	Water Quality.....	33-6
33.1.1.4	Habitat Loss.....	33-12
33.1.1.5	Summary of Effects to Fish and Fish Habitat	33-13
33.1.2	Aquatic Species at Risk	33-13
33.1.3	Migratory Birds	33-13
33.1.3.1	Habitat Loss and Alteration	33-14
33.1.3.2	Sensory Disturbance	33-16
33.1.3.3	Direct Mortality	33-18
33.1.3.4	Attractants	33-19
33.1.3.5	Summary.....	33-20
33.2	Changes to the Environment that Would Occur on Federal or Transboundary Lands ...	33-20
33.2.1	Flow Change	33-21
33.2.1.1	Potential Changes.....	33-21
33.2.1.2	Mitigation Measures	33-22
33.2.1.3	Residual Change.....	33-22
33.2.1.4	Significance of Residual Change.....	33-22
33.2.2	Water Quality Change in the Unuk River	33-22
33.2.2.1	Potential Changes.....	33-22
33.2.3	Summary of Transboundary Changes	33-23
33.3	Changes to The Environment that are Directly Linked or Necessarily Incidental to Federal Decisions	33-24
33.3.1	<i>Navigation Protection Act</i>	33-24
33.3.2	<i>Transportation of Dangerous Goods Act</i>	33-28
33.3.2.1	Fugitive Dust on Knipple Glacier	33-29

33.4	Effects of Changes to the Environment.....	33-30
33.4.1	Effects of Changes to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions.....	33-30
	References.....	33-32
34.	Federal Cumulative Effects Assessment	34-1
34.1	Introduction	34-1
34.2	Methods	34-1
34.2.1	Identifying Intermediate or Receptor Valued Components for the Cumulative Effects Assessment	34-2
34.2.2	Cumulative Effects Assessment Boundaries	34-4
34.2.3	Identification of Potential Cumulative Effects	34-13
34.2.4	Types of Cumulative Effects	34-13
34.3	Regional Projects and Activities	34-13
34.4	Cumulative Change Assessment on Intermediate Components.....	34-17
34.4.1	Air Quality.....	34-17
34.4.1.1	Summary of Project-specific Predicted Changes on Air Quality .	34-17
34.4.1.2	Cumulative Predicted Change Assessment Boundaries for Air Quality.....	34-18
34.4.1.3	Cumulative Predicted Change Assessment on Air Quality	34-18
34.4.1.4	Mitigation Measures to Address Cumulative Predicted Change on Air Quality	34-33
34.4.1.5	Summary of Predicted Cumulative Change on Air Quality....	34-33
34.4.2	Noise	34-35
34.4.2.1	Summary of Project-specific Predicted Changes for Noise	34-35
34.4.2.2	Cumulative Effects Assessment Boundaries for Noise	34-36
34.4.2.3	Cumulative Predicted Change Assessment for Noise	34-37
34.4.2.4	Mitigation Measures to Address Cumulative Predicted Change for Noise	34-37
34.4.2.5	Summary of Predicted Cumulative Changes for Noise	34-38
34.4.3	Hydrogeology	34-38
34.4.3.1	Summary of Project-specific Predicted Changes for Hydrogeology	34-38
34.4.3.2	Cumulative Predicted Change Assessment Boundaries for Hydrogeology	34-40
34.4.3.3	Cumulative Predicted Change Assessment for Hydrogeology .	34-40
34.4.4	Surface Water Hydrology	34-40
34.4.4.1	Summary of Project-specific Predicted Changes for Surface Water Hydrology	34-40
34.4.4.2	Cumulative Predicted Change Assessment Boundaries for Surface Water Hydrology	34-42
34.4.4.3	Cumulative Predicted Change Assessment for Surface Water Hydrology.....	34-45

TABLE OF CONTENTS

34.4.4.4	Mitigation Measures to Address Cumulative Predicted Change for Surface Water Hydrology.....	34-45
34.4.4.5	Summary of Predicted Cumulative Changes for Surface Water Hydrology	34-46
34.4.5	Terrain and Soils	34-46
34.4.5.1	Summary of Project-specific Predicted Changes for Terrain and Soils	34-46
34.4.5.2	Cumulative Predicted Change Assessment Boundaries for Terrain and Soils	34-47
34.4.5.3	Cumulative Predicted Change Assessment for Terrain and Soils 34-49	
34.4.5.4	Mitigation Measures to Address Cumulative Predicted Change for Terrain and Soils.....	34-50
34.4.5.5	Summary of Predicted Cumulative Changes for Terrain and Soils	34-50
34.5	Cumulative Effects Assessment on Receptor Valued Components.....	34-52
34.5.1	Climate	34-52
34.5.2	Surface Water Quality	34-53
34.5.2.1	Summary of Project-specific Residual Effects on Surface Water Quality.....	34-53
34.5.2.2	Cumulative Effects Assessment Boundaries for Surface Water Quality.....	34-54
34.5.2.3	Cumulative Effects Assessment on Surface Water Quality	34-54
34.5.2.4	Mitigation Measures to Address Cumulative Effects on Surface Water Quality	34-57
34.5.2.5	Summary of Residual Cumulative Effects on Surface Water Quality	34-57
34.5.3	Aquatic Resources	34-58
34.5.3.1	Summary of Project-specific Residual Effects on Aquatic Resources.....	34-58
34.5.3.2	Cumulative Effects Assessment Boundaries for Aquatic Resources.....	34-60
34.5.3.3	Cumulative Effects Assessment on Aquatic Resources	34-60
34.5.3.4	Mitigation Measures to Address Cumulative Effects on Aquatic Resources	34-63
34.5.3.5	Summary of Residual Cumulative Effects on Aquatic Resources.	34-64
34.5.4	Fish and Fish Habitat	34-64
34.5.4.1	Summary of Project-specific Residual Effects on Fish and Fish Habitat	34-64
34.5.4.2	Cumulative Effects Assessment Boundaries for Fish Habitat..	34-65
34.5.4.3	Cumulative Effects Assessment on Fish Habitat.....	34-65
34.5.4.4	Mitigation Measures to Address Cumulative Effects on Fish and Fish Habitat.....	34-69
34.5.4.5	Summary of Residual Cumulative Effect on Fish Habitat	34-70

34.5.5	Terrestrial Ecology	34-72
34.5.5.1	Summary of Project-specific Residual Effects on Terrestrial Ecology	34-72
34.5.5.2	Cumulative Effects Assessment Boundaries for Terrestrial Ecology	34-72
34.5.5.3	Cumulative Effects Assessment on Terrestrial Ecology	34-78
34.5.5.4	Mitigation Measures to Address Cumulative Effects on Terrestrial Ecology	34-78
34.5.5.5	Summary of Residual Cumulative Effects on Terrestrial Ecology	34-79
34.5.6	Wetlands	34-81
34.5.6.1	Summary of Project-specific Residual Effects on Wetlands ...	34-81
34.5.6.2	Cumulative Effects Assessment Boundaries for Wetlands	34-83
34.5.6.3	Cumulative Effects Assessment on Wetlands	34-83
34.5.6.4	Mitigation Measures to Address Cumulative Effects on Wetlands	34-87
34.5.6.5	Summary of Residual Cumulative Effects on Wetlands	34-87
34.5.7	Wildlife	34-89
34.5.7.1	Summary of Project-specific Residual Effects on Wildlife.....	34-89
34.5.7.2	Cumulative Effects Assessment Boundaries for Wildlife	34-90
34.5.7.3	Cumulative Effects Assessment on Wildlife	34-91
34.5.7.4	Mitigation Measures to Address Cumulative Effects on Wildlife	34-107
34.5.7.5	Summary of Residual Cumulative Effects on Wildlife	34-108
34.5.8	Economics	34-108
34.5.8.1	Summary of Project-specific Residual Effects on Economics ..	34-108
34.5.8.2	Cumulative Effects Assessment Boundaries for Economics..	34-108
34.5.8.3	Cumulative Effects Assessment on Economics.....	34-115
34.5.8.4	Mitigation Measures to Address Cumulative Effects on Economics	34-116
34.5.8.5	Summary of Residual Cumulative Effects on Economics	34-117
34.5.9	Social.....	34-117
34.5.9.1	Summary of Project-specific Residual Effects on Social Valued Components	34-117
34.5.9.2	Cumulative Effects Assessment Boundaries for Social Valued Components.....	34-119
34.5.9.3	Cumulative Effects Assessment on Social Valued Components	34-123
34.5.9.4	Cumulative Effects on Worker and Family Well-being	34-125
34.5.9.5	Mitigation Measures to Address Cumulative Effects on Social Valued Components	34-127
34.5.9.6	Summary of Residual Cumulative Effects on Social Valued Components.....	34-128

TABLE OF CONTENTS

34.5.10	Health.....	34-129
34.5.10.1	Summary of Project-specific Residual Effects on Health	34-129
34.5.10.2	Cumulative Effects Assessment Boundaries for Health	34-133
34.5.10.3	Cumulative Effects Assessment on Health.....	34-134
34.5.10.4	Mitigation Measures to Address Cumulative Effects on Health.	34-147
34.5.10.5	Summary of Residual Cumulative Effects on Health.....	34-148
34.5.11	Heritage	34-148
34.5.12	Navigation.....	34-148
34.5.13	Land Use.....	34-150
34.5.13.1	Summary of Project-specific Residual Effects on Land Use .	34-150
34.5.13.2	Cumulative Effects Assessment Boundaries for Commercial Land Use.....	34-150
34.5.13.3	Cumulative Effects Assessment on Commercial Land Use ...	34-153
34.5.13.4	Cumulative Effects on Guide Outfitter Licence 601036.....	34-153
34.5.13.5	Cumulative Effects on Commercial Recreation Licence 6406985	34-153
34.5.13.6	Mitigation Measures to Address Cumulative Effects on Land Use.....	34-153
34.5.13.7	Guide Outfitter Licence 601036.....	34-154
34.5.13.8	Commercial Recreation Licence 6406985	34-154
34.5.14	Current Aboriginal Land and Resource Use.....	34-154
34.5.14.1	Summary of Project-specific Residual Effects on Current Aboriginal Land and Resource Use	34-154
34.5.14.2	Cumulative Effects Assessment Boundaries for Current Aboriginal Land and Resource Use	34-156
34.5.14.3	Cumulative Effects Assessment on Current Aboriginal Land and Resource Use	34-156
34.5.14.4	Mitigation Measures to Address Cumulative Current Aboriginal Land and Resource Use	34-159
34.5.14.5	Summary of Residual Cumulative Effects on Current Aboriginal Land and Resource Use	34-160
	References.....	34-162

PART H - SUMMARY AND CONCLUSIONS

35.	Summary and Conclusions.....	35-1
35.1	Introduction	35-1
35.2	Summary of Public Concerns and Mitigation.....	35-2
35.3	Summary of Aboriginal Consultation, Impacts on Rights and Interests, and Mitigation	35-2
35.3.1	Skii km Lax Ha.....	35-2
35.3.2	Tahltan Nation	35-5
35.3.3	Nisga'a Nation.....	35-7
35.3.4	Métis	35-8

35.4	Summary of Residual Effects and Mitigation Measures	35-8
35.4.1	Predictive Studies: Summaries and Conclusions.....	35-19
35.4.1.1	Air Quality.....	35-19
35.4.1.2	Noise	35-19
35.4.1.3	Hydrogeology	35-19
35.4.1.4	Surface Water Hydrology	35-20
35.4.1.5	Terrain and Soils	35-20
35.4.2	Biophysical Assessments: Summaries and Conclusions	35-20
35.4.2.1	Climate	35-20
35.4.2.2	Surface Water	35-21
35.4.2.3	Aquatic Resources	35-22
35.4.2.4	Fish and Fish Habitat.....	35-22
35.4.2.5	Terrestrial Ecology	35-23
35.4.2.6	Wetlands	35-23
35.4.2.7	Wildlife	35-24
35.4.3	Human Environment Assessments: Summaries and Conclusions	35-25
35.4.3.1	Economic	35-25
35.4.3.2	Social.....	35-26
35.4.3.3	Health.....	35-27
35.4.3.4	Heritage	35-28
35.4.3.5	Navigation.....	35-29
35.4.3.6	Commercial and Non-commercial Land Use.....	35-29
35.4.3.7	Current Use of Lands and Resources for Traditional Purposes	35-29
35.5	Follow-up Program	35-30
35.5.1	Verification of Environmental Assessment Conclusions	35-30
35.5.2	Determination of Mitigation Effectiveness (Monitoring)	35-31
35.6	Table of Commitments	35-37
35.7	Conclusion	35-38
	References.....	35-40

List of Figures

FIGURE	PAGE
Figure 1.3-1. Historical World Demand for Gold	1-6
Figure 1.3-2. Historical World Demand for Silver	1-7
Figure 1.4-1. Location of Brucejack Gold Mine Project.....	1-8
Figure 1.4-2. Skii km Lax Ha Traditional Territory	1-9
Figure 1.4-3. Nass Area, Nass Wildlife Area, and Nisga'a Lands as Defined in the Nisga'a Final Agreement	1-11
Figure 1.4-4. Tahltan Nation Traditional Territory	1-12
Figure 1.5-1. Outline of Mineral Tenures held by Pretivm in the Brucejack Project Area, as of May 2014	1-14
Figure 1.5-2. Outline of Placer Claims in the Brucejack Project Area as of January 2014	1-15
Figure 1.6-1. Land and Resource Management Plans in the Brucejack Gold Mine Project Area.....	1-24
Figure 1.6-2. Brucejack Gold Mine Project: Past, Present, and Reasonably Foreseeable Projects within the Region.....	1-27
Figure 1.8-1. Brucejack Gold Mine Project Development Schedule	1-31
Figure 1.9-1. British Columbia Gold Production.....	1-36
Figure 1.9-2. British Columbia Silver Production	1-37
Figure 1.9-3. Monthly Gold and Silver Prices, US\$/oz (Average).....	1-38
Figure 1.9-4. British Columbia Annual Employment in Metal Mines, 1980 to 2012	1-57
Figure 2.2-1. Provincial Environmental Assessment Process for the Brucejack Gold Mine Project	2-6
Figure 2.2-2. The Standard Environmental Assessment Process under CEAA, 2012	2-10
Figure 3.5-1. Skii km Lax Ha Traditional Territory	3-9
Figure 3.5-2. Tahltan Nation Traditional Territory	3-10
Figure 3.5-3. Nisga'a Lands, the Nass Wildlife Area, and the Nass Area	3-11
Figure 3.7-1. Brucejack Gold Mine Project - Communities in the Regional Area	3-23
Figure 4.1-1. Overall Layout of the Brucejack Project	4-2
Figure 4.1-2. Mine Area - Current General Arrangement.....	4-3
Figure 4.4-1. Proposed Off-site Leach Facility and Potential Leach Tailings Facility Locations	4-35
Figure 4.4-2. Brucejack Project Tailing Storage Facility Alternatives Considered.....	4-43
Figure 4.5-1. Brucejack Gold Mine Project Final Mine Area Plan	4-64

Figure 5.1-1. Overall Layout of the Brucejack Gold Mine Project	5-2
Figure 5.1-2. Mine Area General Arrangement	5-3
Figure 5.3-1. Pretivm's Brucejack Gold Mine Mineral Claim Holdings	5-6
Figure 5.4-1. Tectonic Setting of the Brucejack Property in the Northwest Cordillera.....	5-7
Figure 5.4-2. Regional Structural and Stratigraphic Setting of the Brucejack Project Property and Sulphurets Mining Camp in Northwest BC	5-9
Figure 5.4-3. Local Structural and Stratigraphic Setting of the Brucejack Property and Sulphurets Mining Camp.....	5-10
Figure 5.4-4. Sulphurets Mining Camp Geology and Mineralization	5-11
Figure 5.4-5. Brucejack Property Geology	5-17
Figure 5.4-6. Historical Map with Mineral Deposits and Occurrences	5-21
Figure 5.4-7. Brucejack Property Mineralization Zones	5-22
Figure 5.4-8. 1,450 m Level Plan of the VOK Zone	5-23
Figure 5.4-9. South-North Cross-section along Easting 426625 E, VOK Zone.....	5-24
Figure 5.4-10. VOK to West Zone Geological Section 426600 E - Looking West	5-27
Figure 5.4-11. West Zone Drillholes and Assay Cross-section.....	5-28
Figure 5.4-12. Trace Element Analysis by Lithology for VOK and West Zone	5-31
Figure 5.4-13. Brucejack Property Geochronology	5-33
Figure 5.4-14. Brucejack Deposit Mineralization within Context of Porphyry Systems	5-35
Figure 5.5-1. Brucejack Property Diamond Drillhole Plan.....	5-38
Figure 5.6-1. Total Ore and Waste Rock Amounts from Brucejack Underground Workings	5-40
Figure 5.6-2. Contributions from Geological Model Units to Total Generated Waste Rock	5-41
Figure 5.6-3. Comparison of Total-S (%) versus Sulphide-S (%) from Waste Rock Samples	5-43
Figure 5.6-4. Comparison of Sobek NP Values versus CaNP Values from Waste Rock Samples	5-44
Figure 5.6-5. Overview of Location of Brucejack Mine Site Characterization Samples	5-49
Figure 5.6-6. Location of Brucejack Plant-Site Samples.....	5-51
Figure 5.6-7. Location of Site Characterization Samples along Access Road and Aerodrome	5-53
Figure 5.7-1. Conceptual Construction Schedule	5-56
Figure 5.7-2. Extent of Mine Development at the Main Onset of VOK Stoping	5-58
Figure 5.8-1. Mine Access and Development Infrastructure	5-63
Figure 5.8-2. Brucejack Twin Declines and Ramp System.....	5-69

TABLE OF CONTENTS

Figure 5.8-3. VOK Zone Sublevel Arrangement - Long Section	5-70
Figure 5.8-4. Typical Level Plan - 1,270 Level in the VOK Zone	5-71
Figure 5.8-5. Standard Design - Hanging Wall Drive.....	5-73
Figure 5.8-6. Standard Design - Main Decline	5-74
Figure 5.8-7. Mineable Stope Shapes - VOK Zone.....	5-75
Figure 5.8-8. Mineable Stope Shapes - West Zone.....	5-76
Figure 5.8-9. Typical LHOS Design.....	5-79
Figure 5.8-10. Example of Primary/Secondary LHOS at the Brucejack Mine	5-80
Figure 5.8-11. Main Body Drill Ring Pattern for Down-hole Stope (Primary Mining).....	5-82
Figure 5.8-12. Main Ring Blast Timing for Transverse Down-hole Stope	5-83
Figure 5.8-13. Lateral Development - Drill Layout and Blast Timing.....	5-84
Figure 5.8-14. Life of Mine Production Schedule by Mining Block	5-87
Figure 5.8-15. Life of Mine Production Schedule by Activity	5-88
Figure 5.8-16. Crusher Tipping	5-90
Figure 5.8-17. Crusher	5-91
Figure 5.8-18. Brucejack Ventilation System - Looking West.....	5-93
Figure 5.9-1. Simplified Process Flowsheet.....	5-100
Figure 5.10-1. Freshwater Diversion and Contact Water Collection Systems	5-105
Figure 5.10-2. Brucejack Lake Water Balance Model Schematic - Operations.....	5-113
Figure 5.11-1. Waste Rock Disposal by Year	5-116
Figure 5.11-2. Cross-sections of Tailings and Waste Rock Pile in Brucejack Lake over Time	5-119
Figure 5.11-3. Tailings Disposal by Year	5-121
Figure 5.11-4. Surface Extent of the Tailings Mound at Various Periods	5-123
Figure 5.11-5. Brucejack Lake Bathymetry 2013.....	5-124
Figure 5.11-6. Tailings Particle Size Distribution	5-126
Figure 5.11-7. Plan and Profile of Tailings Discharge Pipelines	5-127
Figure 5.12-1. Mill Building Plan	5-137
Figure 5.13-1. Access Road Alignment.....	5-149
Figure 5.13-2. Access Road Upgrade Locations	5-151
Figure 5.13-3. Brucejack Access Road - Knipple Glacier Area.....	5-153

Figure 5.13-4. Transmission Line Corridor	5-158
Figure 5.13-5. Knipple Transfer Area Layout	5-161
Figure 5.13-6. Bowser Aerodrome	5-164
Figure 5.13-7. Tide Staging Area.....	5-166
Figure 5.14-1. Mine Site Area Avalanche Hazards	5-167
Figure 5.14-2. Access Road Avalanche Hazards	5-169
Figure 5.16-1. Underground Workforce Distribution by Year	5-181
Figure 5.17-1. Overall Operating Cost Distribution.....	5-183
Figure 6.1-1. Overview of the Environmental Assessment Process	6-2
Figure 6.4-1. Linkages between Intermediate and Receptor Valued Components.....	6-19
Figure 6.4-2. Brucejack Gold Mine Project: Project Footprint and Assessment Footprint	6-26
Figure 6.5-1. Avoidance and Mitigation Hierarchy.....	6-30
Figure 6.9-1. Steps to Cumulative Effects Assessment	6-40
Figure 6.9-2. Past, Present and Reasonably Foreseeable Projects with Potential to Interact with the Brucejack Gold Mine Project	6-47
Figure 6.9-3. Guide Outfitting, Transportation and Utilities in the Brucejack Gold Mine Project Regional Study Area.....	6-79
Figure 6.9-4. Wildlife Management Units in the Brucejack Gold Mine Project Regional Study Area ..	6-81
Figure 6.9-5. Trapline Areas in the Brucejack Gold Mine Project Regional Study Area.....	6-83
Figure 6.9-6. Commercial Recreation and Forestry Licences in the Brucejack Gold Mine Project Regional Study Area.....	6-84
Figure 6.9-7. Mineral Claims in the Brucejack Gold Mine Project Regional Study Area.....	6-86
Figure 6.9-8. Placer Claims in the Brucejack Gold Mine Project Regional Study Area	6-88
Figure 6.9-9. Present and Future Project Traffic Routes.....	6-89
Figure 6.9-10. Temporal Overlap between All Other Projects and Activities and the Brucejack Mine Project.....	6-97
Figure 6.9-10. Temporal Overlap between All Other Projects and Activities and the Brucejack Mine Project.....	6-97
Figure 7.3-1. Locations of On-site and Regional Meteorological Stations, and On-site Snow Course Surveys	7-7
Figure 7.3-2. Dustfall and PASS Monitoring Stations	7-12
Figure 7.3-3. Brucejack Lake Annual, Summer, and Winter Windroses, 2010 to 2012	7-15

TABLE OF CONTENTS

Figure 7.3-4. Scott Creek Annual, Summer, and Winter Windroses, 2010 to 2012	7-16
Figure 7.3-5. Wildfire Creek Annual, Summer, and Winter Windroses, 2010 to 2012.....	7-17
Figure 7.4-1. Brucejack Air Dispersion Modelling Domain.....	7-27
Figure 7.5-1. Brucejack Gold Mine Project: Layout of Mine and Mill Surface Infrastructure	7-39
Figure 7.6-1. Maximum 1-hour NO ₂ Concentration during Construction	7-53
Figure 7.6-2. Maximum 24-hour NO ₂ Concentration during Construction.....	7-54
Figure 7.6-3. Annual NO ₂ Concentration during Construction	7-55
Figure 7.6-4. Maximum 1-hour SO ₂ Concentration during Construction	7-56
Figure 7.6-5. Maximum 24-hour SO ₂ Concentration during Construction	7-57
Figure 7.6-6. Annual SO ₂ Concentration during Construction.....	7-58
Figure 7.6-7. Maximum 1-hour CO Concentration during Construction	7-59
Figure 7.6-8. Maximum 8-hour CO Concentration during Construction	7-60
Figure 7.6-9. Maximum 24-hour TSP Concentration during Construction.....	7-61
Figure 7.6-10. Annual TSP Concentration during Construction.....	7-62
Figure 7.6-11. Maximum 24-hour PM ₁₀ Concentration during Construction	7-63
Figure 7.6-12. Maximum 24-hour PM _{2.5} Concentration during Construction.....	7-65
Figure 7.6-13. Annual PM _{2.5} Concentration during Construction	7-66
Figure 7.6-14. Maximum 30-day Dust Deposition during Construction	7-67
Figure 7.6-15. Annual Acid Deposition during Construction	7-69
Figure 7.6-16. Maximum 1-hour NO ₂ Concentration during Construction.....	7-71
Figure 7.6-17. Maximum 24-hour NO ₂ Concentration during Operation	7-72
Figure 7.6-18. Annual NO ₂ Concentration during Operation	7-73
Figure 7.6-19. Maximum 1-hour SO ₂ Concentration during Operation	7-74
Figure 7.6-20. Maximum 24-hour SO ₂ Concentration during Operation.....	7-75
Figure 7.6-21. Annual SO ₂ Concentration during Operation.....	7-76
Figure 7.6-22. Maximum 1-hour CO Concentration during Operation	7-78
Figure 7.6-23. Maximum 8-hour CO Concentration during Operation	7-79
Figure 7.6-24. Maximum 24-hour TSP Concentration during Operation.....	7-80
Figure 7.6-25. Annual TSP Concentration during Operation	7-81
Figure 7.6-26. Maximum 24-hour PM ₁₀ Concentration during Operation.....	7-82

Figure 7.6-27. Maximum 24-hour PM _{2.5} Concentration during Construction.....	7-83
Figure 7.6-28. Annual PM _{2.5} Concentration during Operation.....	7-84
Figure 7.6-29. Maximum 30-day Dust Deposition during Operation	7-86
Figure 7.6-30. Annual Acid Deposition during Operation.....	7-87
Figure 7.9-1. Linkage between Air Quality and Receptor Valued Components.....	7-90
Figure 7.10-1. Air Quality CEA Boundary Showing All Other Projects and Activities Relevant to Air Quality in the Vicinity of the Brucejack Gold Mine Project	7-95
Figure 8.3-1. Noise Monitoring Locations.....	8-9
Figure 8.4-1. Regional Study Area for Noise Modelling	8-17
Figure 8.5-1. Human Health Receptor Locations for Noise	8-25
Figure 8.6-1. Predicted Daytime Noise Levels during Construction	8-29
Figure 8.6-2. Predicted Nighttime Noise Levels during Construction	8-30
Figure 8.6-3. Predicted Helicopter Sound Exposure Level	8-32
Figure 8.6-4. Predicted Blasting L _{peak} Noise from Brucejack Mine Site during Construction	8-33
Figure 8.6-5. Predicted Blasting L _{peak} Noise from Quarry during Construction	8-34
Figure 8.6-6. Predicted Sound Exposure Level from Access Road Traffic	8-35
Figure 8.6-7. Predicted Daytime Noise Levels during Operation.....	8-36
Figure 8.6-8. Predicted Nighttime Noise Levels during Operation.....	8-37
Figure 8.9-1. Linkage between Noise and Receptor Valued Components	8-42
Figure 9.3-1. Regional Study Area Site Plan	9-11
Figure 9.3-2. Monitoring Well and Drill Hole Locations.....	9-19
Figure 9.3-3. Observed and Model-Calibrated Hydraulic Conductivity vs. Depth	9-23
Figure 9.3-4. Interpreted Groundwater Elevation Contour Map - Summer	9-25
Figure 9.3-5. Interpreted Groundwater Elevation Contour Map - Winter	9-27
Figure 9.3-6. Hydrogeological Cross-Section A	9-29
Figure 9.3-7. Hydrogeological Cross-Section B	9-31
Figure 9.3-8. Piper Diagram Showing Median Groundwater Concentrations Measured from Brucejack Monitoring Wells.....	9-33
Figure 9.3-9. Model Hydraulic Conductivity Distribution	9-35
Figure 9.3-10. Model Recharge Distribution	9-38
Figure 9.3-11. Steady State Calibration Results for Hydraulic Head Targets	9-41

TABLE OF CONTENTS

Figure 9.3-12. Simulated Groundwater Elevation Contours - Pre-disturbance Steady State.....	9-43
Figure 9.4-1. Linkages between Hydrogeology and Receptor Valued Components	9-50
Figure 9.4-2. Brucejack Hydrogeology RSA and LSA, Groundwater Flow Divides and Discharge	9-57
Figure 9.5-1. Underground Workings for Selected Years Showing Arrangement of Drains	9-67
Figure 9.6-1. Simulated Inflow to Underground Workings.....	9-77
Figure 9.6-2. Maximum Simulated Drawdown for Year 12 of Mining Operations.....	9-78
Figure 9.6-3. Simulated Groundwater Elevation Contours - End of Mine Life	9-79
Figure 9.6-4. Simulated Drawdown - End of Mine Life	9-81
Figure 9.6-5. Simulated Groundwater Elevation Contours - Post-closure	9-85
Figure 9.6-6. Simulated Drawdown Post-closure.....	9-87
Figure 9.6-7. Predicted Residual Groundwater Quality Effect - Plant Site Area	9-94
Figure 9.6-8. Post-closure Groundwater Flow Paths from Underground Working Cells in Model Layers 1-4.....	9-98
Figure 10.3-1. Brucejack Gold Mine Project: Overview	10-4
Figure 10.3-2. Regional Hydrological Setting of the Project Area	10-5
Figure 10.3-3. Surface Water Quantity Station Locations 2008 to 2012, Brucejack Gold Mine Project ..	10-8
Figure 10.3-4. BC Hydrologic Zones: Regional Hydrometric Stations.....	10-12
Figure 10.3-5. Global Climate Model Predictions for Brucejack Lake: Annual Averages and Inter-GCM Variability	10-19
Figure 10.3-6. Global Climate Model Predictions for Brucejack Lake: Monthly Averages for the A2 GCM Scenario and Climatic Normals	10-20
Figure 10.4-1. Linkage between Surface Water Hydrology and Receptor Valued Components.....	10-24
Figure 10.4-2. Regional and Local Study Areas for Surface Water Hydrology Effects Assessment	10-31
Figure 10.5-1. Streamflow Assessment Points within the Local and Regional Study Areas.....	10-37
Figure 10.6-1. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Base Case Scenario	10-42
Figure 10.6-2. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the 100-Year Dry Precipitation Scenario ...	10-44
Figure 10.6-3. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the 100-Year Wet Precipitation Scenario ...	10-45
Figure 10.6-4. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Low Dry Density Scenario.....	10-46

Figure 10.6-5. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the High Hydraulic Conductivity Scenario ..	10-47
Figure 10.6-6. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Low Hydraulic Conductivity Scenario ...	10-48
Figure 10.6-7. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project with East Lake Contribution	10-49
Figure 10.6-8. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Increased Snowmelt in April-May Scenario	10-50
Figure 10.6-9. Mean Annual Flows in Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Synthetic Variable Flow Scenario.....	10-51
Figure 10.6-10. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Base Case Scenario.....	10-61
Figure 10.6-11. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the 100-Year Dry Precipitation Scenario	10-62
Figure 10.6-12. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the 100-Year Wet Precipitation Scenario	10-63
Figure 10.6-13. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Average Precipitation with Low Dry Density Scenario	10-64
Figure 10.6-14. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Average Precipitation with High Hydraulic Conductivity Scenario	10-65
Figure 10.6-15. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Average Precipitation with Low Hydraulic Conductivity Scenario.....	10-66
Figure 10.6-16. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Average Precipitation with East Lake Contribution Scenario	10-67
Figure 10.6-17. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Average Precipitation with Increased Snowmelt in April-May Scenario	10-68
Figure 10.6-18. Monthly Distribution of Runoff at Brucejack Creek (Station BJL-H1) for the Baseline Condition and during Different Phases of the Project under the Synthetic Variable Flow Scenario.....	10-69
Figure 10.6-19. Summary Statistics for Culverts on the Brucejack Access Road	10-73
Figure 10.6-20. Maximum 30-day Dust Deposition during Construction.....	10-76

TABLE OF CONTENTS

Figure 10.6-21. Maximum 30-day Dust Deposition during Operation	10-77
Figure 10.10-1. Steps to Cumulative Effects Assessment.....	10-84
Figure 10.10-2. Surface Water Hydrology CEA Boundary Showing all Other Projects and Activities Relevant to Surface Water Hydrology in the Vicinity of the Brucejack Gold Mine Project....	10-89
Figure 11.3-1. Terrain and Soils Study Areas	11-7
Figure 11.9-1. Linkages between Intermediate and Receptor Valued Components	11-39
Figure 11.10-1. Spatial Distribution of Human Activities within the Brucejack Cumulative Effects Assessment Area	11-46
Figure 12.4-1. Greenhouse Gas Assessment: Scoping Framework	12-16
Figure 12.5-1. Conceptual Greenhouse Gas Mitigation Hierarchy	12-22
Figure 13.3-1. Water Quality Baseline Study Area, Brucejack Gold Mine Project	13-5
Figure 13.4-1. Regional and Local Study Areas for the Surface Water Quality Assessment, Brucejack Gold Mine Project	13-65
Figure 13.6-1. Screening Process for Selection of Contaminants of Potential Concern (COPC) for Surface Water Quality Assessment, Brucejack Gold Mine Project.....	13-93
Figure 13.6-2. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Lake Outlet, Construction	13-111
Figure 13.6-3. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Lake Outlet, Operation.....	13-112
Figure 13.6-4. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Lake Outlet, Closure	13-113
Figure 13.6-5. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Lake Outlet, Post-closure	13-114
Figure 13.6-6. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Creek, Construction.....	13-115
Figure 13.6-7. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Creek, Operation	13-116
Figure 13.6-8. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Creek, Closure	13-117
Figure 13.6-9. Water Quality Predictions for the Base Case and Upper Case (High K): Brucejack Creek, Post-closure	13-118
Figure 13.9-1. Surface Water Quality CEA Boundary Showing All Other Projects and Activities Relevant to Surface Water Quality in the Vicinity of the Brucejack Gold Mine Project	13-147
Figure 14.3-1. Aquatic Resources Setting Study Area, Brucejack Gold Mine Project.....	14-5
Figure 14.3-2. Aquatic Sediment Sampling Sites, Brucejack Gold Mine Project, 1988 to 2013.....	14-11

Figure 14.3-3. Aquatic Biology Sampling Sites Brucejack Gold Mine Project, 2008 to 2013	14-15
Figure 14.4-1. Regional and Local Study Areas, Aquatic Resources Effects Assessment, Brucejack Gold Mine Project	14-35
Figure 14.9-1. Approach to Cumulative Effects Assessment	14-85
Figure 14.9-2. Aquatic Resources Cumulative Effects Assessment Boundary Showing All Other Projects and Activities Potentially Affecting Aquatic Resources in the Vicinity of the Brucejack Gold Mine Project	14-89
Figure 15.3-1. Baseline Fish and Fish Habitat Study Area.....	15-9
Figure 15.3-2. Baseline Fish and Fish Habitat Sampling Sites, 2010 to 2012.....	15-11
Figure 15.3-3. Watershed Boundaries and Fish Passage Barriers in the Baseline Fish and Fish Habitat Study Area	15-17
Figure 15.3-4. Fish Species Captured in the Baseline Fish and Fish Habitat Study Area.....	15-19
Figure 15.4-1. Fish and Fish Habitat Local and Regional Study Areas.....	15-41
Figure 15.9-1. Cumulative Effects Assessment Boundary Showing all other Projects and Activities Relevant to Fish and Fish Habitat near the Project	15-81
Figure 16.3-1. Distribution of Ecoregions	16-5
Figure 16.3-2. Terrestrial Ecosystems Study Areas	16-9
Figure 16.3-3a. Distribution of General Ecosystem Types in the Regional Study Area - Map 1	16-15
Figure 16.3-3b. Distribution of General Ecosystem Types in the Regional Study Area - Map 2	16-17
Figure 16.3-3c. Exploration Access Road Sub-area Terrestrial Ecosystem Map.....	16-21
Figure 16.3-3d. Brucejack Mine Site Sub-area Terrestrial Ecosystem Map	16-23
Figure 16.3-3e. Brucejack Transmission Line Sub-area Terrestrial Ecosystem Map	16-25
Figure 16.3-4. Predicted Habitat for <i>Sheperdia canadensis</i> (Soapberry) in the Local Study Area	16-37
Figure 16.3-5. Predicted Habitat for <i>Oplopanax horridus</i> (Devil's Club) in the Local Study Area	16-41
Figure 16.3-6. Predicted Habitat for <i>Tricholoma magnivelare</i> (Pine Mushroom) in the Local Study Area	16-43
Figure 16.3-7a. Rare Plant and Lichen Observations within the Mine Site and Access Road Sub-areas ..	16-45
Figure 16.3-7b. Rare Plant and Lichen Observations within the Transmission Line Sub-area	16-47
Figure 16.4-1. Predicted Annual Rates of Nitrogen Deposition in the Vicinity of the Proposed Project...	16-63
Figure 16.4-2. Predicted Annual Rates of Phosphorus Deposition in the Vicinity of the Proposed Project	16-64
Figure 16.4-3. Predicted Annual Rates of Acid Deposition in the Vicinity of the Proposed Project ..	16-65

TABLE OF CONTENTS

Figure 16.5-1. Probability and Consequence Model used to Evaluate Project Effects on Terrestrial Ecology Receptor Valued Components.....	16-67
Figure 16.5-2a. Probability Rating Map Brucejack Mine Site Sub-area.....	16-69
Figure 16.5-2b. Probability Rating Map Brucejack Access Road Sub-area	16-71
Figure 16.5-2c. Probability Rating Map Brucejack Transmission Line Sub-area	16-73
Figure 16.5-3a. Consequence Rating Map Brucejack Mine Site Sub-area	16-77
Figure 16.5-3b. Consequence Rating Map Brucejack Access Road Sub-area	16-79
Figure 16.5-3c. Consequence Rating Map Brucejack Transmission Line Sub-area	16-81
Figure 16.5-4a. Risk Rating for the Brucejack Mine Site Sub-area.....	16-87
Figure 16.5-4b. Risk Rating for the Brucejack Access Road Sub-area	16-89
Figure 16.5-4c. Risk Rating for the Brucejack Transmission Line	16-91
Figure 16.5-5. Rare Plant and Lichen Observations in the Brucejack Local and Regional Study Areas .	16-101
Figure 16.5-6. Probability and Consequence Assessment to Guide Risk Management	16-120
Figure 16.10-1. Cumulative Effects Scoping: Projects and Activities Interacting with the Brucejack Gold Mine Project for Terrestrial Ecology	16-141
Figure 17.3-1. Wetland Local Study Area and 2012 Survey Locations.....	17-7
Figure 17.4-1. Wetland Local Study Area and Mapped Wetlands	17-25
Figure 17.4-2. Wetland Study Areas.....	17-27
Figure 17.6-1. Probability and Consequence Assessment to Guide Risk Management Planning	17-43
Figure 17.6-2. Probability and Consequence Model used to Evaluate Project Effects on Wetland Function.....	17-44
Figure 17.6-3. Probability Component Ratings for Wetlands	17-51
Figure 17.6-4. Consequence Component Ratings for Wetlands.....	17-55
Figure 17.6-5. Final Risk Ratings for Wetlands	17-59
Figure 17.9-1. Cumulative Effects Scoping: Projects and Activities Interacting with the Project for Wetland Ecosystems	17-69
Figure 18.3-1. Regional Study Area and Local Study Area for Wildlife Baseline Studies.....	18-6
Figure 18.3-2. Moose Observed during Baseline Surveys and High-quality Winter Habitat	18-25
Figure 18.3-3. Mountain Goats Observed during Winter Baseline Surveys and High-quality Winter Habitat	18-28
Figure 18.3-4. Mountain Goats Observed during Summer Baseline Surveys and High-quality Summer Habitat	18-29

Figure 18.3-5. High-quality Grizzly Bear Habitat	18-33
Figure 18.3-6. Wolverine Observed during Baseline Track Surveys and Den Surveys.....	18-37
Figure 18.3-7. High-quality American Marten Winter Habitat	18-40
Figure 18.3-8. Hoary Marmot Colonies Observed during Baseline Surveys and High-quality Habitat.	18-41
Figure 18.3-9. Bat Maternal Roosting Habitat in the Regional Study Area	18-43
Figure 18.3-10. Raptors Observed during Baseline Surveys	18-45
Figure 18.3-11. Waterbirds of Conservation Concern Observed during Baseline Surveys.....	18-47
Figure 18.3-12. Waterbirds Observed during Spring Staging Surveys.....	18-48
Figure 18.3-13. Waterbirds Observed during Fall Staging Surveys.....	18-49
Figure 18.3-14. Waterbirds Observed during Breeding Surveys	18-50
Figure 18.3-15. Landbird Breeding Observations and Species of Conservation Concern.....	18-52
Figure 18.3-16. Amphibian Observations during Baseline Surveys	18-55
Figure 18.4-1. Regional Study Area and Local Study Area for Wildlife Effects Assessment	18-67
Figure 18.6-1a. Moose High-quality Early and Late Winter Habitat Lost or Altered due to the Project	18-97
Figure 18.6-1b. Moose High-quality Early and Late Winter Habitat Lost or Altered due to the Project	18-99
Figure 18.6-2. Functional Loss of High Quality Habitat for Moose due to Noise - Construction	18-103
Figure 18.6-3. Functional Loss of High Quality Habitat for Moose due to Noise - Operation	18-105
Figure 18.6-4. Mountain Goat Winter Habitat Lost or Altered due to the Project.....	18-113
Figure 18.6-5. Mountain Goat Winter Habitat Lost or Altered due to the Project.....	18-115
Figure 18.6-6a. Mountain Goat Summer Habitat Lost or Altered due to the Project.....	18-117
Figure 18.6-6b. Mountain Goat Summer Habitat Lost or Altered due to the Project	18-119
Figure 18.6-7. Functional Loss of High-quality Habitat for Mountain Goats due to Noise - Construction.....	18-123
Figure 18.6-8. Functional Loss of High-quality Habitat for Mountain Goats due to Noise - Operation	18-125
Figure 18.6-9. Functional Loss of High-quality Habitat for Mountain Goats due to Noise - Aircraft and Helicopter	18-127
Figure 18.6-10. Grizzly Bear High-quality Habitat Lost or Altered due to the Project.....	18-137
Figure 18.6-11. Grizzly Bear High-quality Habitat Lost or Altered due to the Project.....	18-139

TABLE OF CONTENTS

Figure 18.6-12a. Functional Loss of High-quality Habitat for Grizzly Bears due to Noise - Construction.....	18-141
Figure 18.6-12b. Functional Loss of High-quality Habitat for Grizzly Bears due to Noise - Operation	18-143
Figure 18.6-12c. Functional Loss of High-quality Habitat for Grizzly Bears due to Noise - Aircraft ...	18-145
Figure 18.6-13a. American Marten High-quality Winter Habitat Lost or Altered due to the Project ..	18-155
Figure 18.6-13b. American Marten High-quality Winter Habitat Lost or Altered due to the Project..	18-157
Figure 18.6-14a. Hoary Marmot High-quality Habitat Lost or Altered due to the Project.....	18-165
Figure 18.6-14b. Hoary Marmot High-quality Habitat Lost or Altered due to the Project.....	18-167
Figure 18.6-15a. Bat Maternal Roosting Habitat Lost or Altered due to the Project.....	18-173
Figure 18.6-15b. Bat Maternal Roosting Habitat Lost or Altered due to the Project.....	18-175
Figure 18.6-16a. Functional Loss of Suitable Maternal Roosting Habitat due to Noise - Construction..	18-177
Figure 18.6-16b. Functional Loss of Suitable Maternal Roosting Habitat due to Noise - Operations...	18-179
Figure 18.6-17a. Raptor Habitat Lost or Altered due to the Project.....	18-185
Figure 18.6-17b. Raptor Habitat Lost or Altered due to the Project.....	18-187
Figure 18.6-18a. Short-eared Owl Habitat Lost or Altered due to the Project.....	18-189
Figure 18.6-18b. Short-eared Owl Habitat Lost or Altered due to the Project.....	18-191
Figure 18.6-19a. Functional Loss of Habitat for Raptors due to Noise - Construction	18-195
Figure 18.6-19b. Functional Loss of Habitat for Raptors due to Noise - Operation.....	18-197
Figure 18.6-20a. Wetland Bird Habitat Lost or Altered due to the Project	18-203
Figure 18.6-20b. Wetland Bird Habitat Lost or Altered due to the Project	18-205
Figure 18.6-21a. Cavity-nesting Waterfowl Habitat Lost or Altered due to the Project.....	18-207
Figure 18.6-21b. Cavity-nesting Waterfowl Habitat Lost or Altered due to the Project.....	18-209
Figure 18.6-22a. Riverine Bird Habitat Lost or Altered due to the Project	18-211
Figure 18.6-22b. Riverine Bird Habitat Lost or Altered due to the Project	18-213
Figure 18.6-23a. Functional Loss of Suitable Habitat for Wetland Birds due to Noise - Construction ..	18-217
Figure 18.6-23b. Functional Loss of Suitable Habitat for Wetland Birds due to Noise - Operation ...	18-219
Figure 18.6-24a. Functional Loss of Suitable Habitat for Cavity-nesting Waterfowl due to Noise - Construction.....	18-221
Figure 18.6-24b. Functional Loss of Suitable Habitat for Cavity-nesting Waterfowl due to Noise - Operation	18-223

Figure 18.6-25a. Functional Loss of Suitable Habitat for Riverine Birds due to Noise - Construction ..	18-225
Figure 18.6-25b. Functional Loss of Suitable Habitat for Riverine Birds due to Noise - Operation	18-227
Figure 18.6-26a. Western Toad Wetland Habitat Lost or Altered due to the Project.....	18-237
Figure 18.6-26b. Western Toad Wetland Habitat Lost or Altered due to the Project.....	18-239
Figure 18.6-26c. Western Toad Wetland Habitat Lost or Altered due to the Project.....	18-241
Figure 18.6-26d. Western Toad Breeding Habitat that may be Degraded due to the Project	18-243
Figure 18.9-1. Approach to Cumulative Effects Assessment	18-265
Figure 18.9-2. Moose Cumulative Effects Assessment Area and Movement Area	18-270
Figure 18.9-3. Mountain Goat Cumulative Effects Assessment Area and Movement Area	18-271
Figure 18.9-4. Grizzly Bear Cumulative Effects Assessment Area and Movement Area	18-272
Figure 18.9-5. American Marten Cumulative Effects Assessment Area	18-273
Figure 18.9-6. Western Toad Cumulative Effects Assessment Area	18-274
Figure 19.3-1. Brucejack Gold Mine Project Economic Regional and Local Study Area Communities	19-11
Figure 19.9-1. Steps to Cumulative Effects Assessment	19-40
Figure 19.9-2. Economic Cumulative Effects Assessment Boundary Showing All Other Projects and Activities Relevant to Economic Conditions in the Vicinity of the Brucejack Gold Mine Project...	19-45
Figure 20.3-1. Brucejack Gold Mine Project Regional and Local Study Areas	20-6
Figure 20.3-2. Population Trends in Local Study Area Communities, 1996 to 2011	20-13
Figure 20.3-3. Educational Attainment as a Percentage of the Population in Municipal LSA Communities, the Regional District of Kitimat-Stikine, and British Columbia, 2006	20-14
Figure 20.3-4. Educational Attainment as a Percentage of the Population in Aboriginal Study Area Communities, 2006	20-16
Figure 20.9-1. Steps to Cumulative Effects Assessment	20-64
Figure 20.9-2. Cumulative Effects Scoping: Projects and Activities Interacting with the Brucejack Gold Mine Project for Socio-economics	20-69
Figure 21.3-1. Noise Baseline Local Study Area and Monitoring Locations	21-10
Figure 21.3-2. Baseline Dustfall and PASS Monitoring Stations.....	21-13
Figure 21.3-3. Drinking Water Baseline Local and Regional Study Areas and Surface Water Quality Sampling Locations.....	21-15
Figure 21.3-4. Water Licence Points of Diversion and Groundwater Wells near the Brucejack Gold Mine Project (as of March 2014) and Current Use Lodges.....	21-17
Figure 21.3-5. Country Foods Baseline Local and Regional Study Areas	21-31

TABLE OF CONTENTS

Figure 21.3-6. Skii km Lax Ha Traditional Territory and Traditional Knowledge and Use Sites in relation to the Country Foods Local and Regional Study Areas	21-33
Figure 21.3-7. Areas Defined under <i>the Nisga'a Final Agreement</i> in relation to the Country Foods Local and Regional Study Areas.....	21-35
Figure 21.3-8. Tahltan Nation Traditional Territory in relation to the Country Foods Local and Regional Study Areas.....	21-36
Figure 21.4-1. Noise Regional Study Area and Human Health Receptor Locations for Noise	21-52
Figure 21.4-2. Air Quality Regional Study Area and Human Health Receptor Locations.....	21-53
Figure 21.4-3. Drinking Water Local and Regional Study Areas	21-55
Figure 21.4-4. Country Foods Local and Regional Study Areas	21-56
Figure 21.5-1. Conceptual Model for Potential Human Receptor Exposure to Contaminants for the Brucejack Gold Mine Project	21-73
Figure 21.6-1. Screening Process for Selection of Criteria Air Contaminants for Air Quality Effects Assessment	21-91
Figure 21.6-2. Screening Process for Selection of Contaminants of Potential Concern for Country Foods Effects Assessment	21-106
Figure 21.9-1. Steps to Cumulative Effects Assessment	21-136
Figure 21.9-2. Noise CEA Boundary Showing all Other Projects and Activities Relevant to Noise in the Vicinity of the Brucejack Gold Mine Project.....	21-141
Figure 21.9-3. Air Quality CEA Boundary Showing all Other Projects and Activities Relevant to Air Quality in the Vicinity of the Brucejack Gold Mine Project.....	21-143
Figure 21.9-4. Drinking Water CEA Boundary Showing all Other Projects and Activities Relevant to Drinking Water in the Vicinity of the Brucejack Gold Mine Project.....	21-147
Figure 22.1-1. Regional and Local Study Areas for Heritage Resources in the Brucejack Gold Mine Project	22-2
Figure 23.3-1. Brucejack Project Regional Hydrological Setting.....	23-5
Figure 23.3-2. Navigable Waters Study Area.....	23-13
Figure 24.3-1. Land and Resource Management Plans near the Brucejack Gold Mine Project Land Use Study Areas.....	24-8
Figure 24.3-2. Wildlife Management Units in the Brucejack Gold Mine Project Land Use Study Areas...	24-10
Figure 24.3-3. Guide Outfitting Licence Areas within the Brucejack Gold Mine Project Land Use Study Areas	24-12
Figure 24.3-4. Trapline Licence Areas in the Brucejack Gold Mine Project Land Use Study Areas ...	24-14
Figure 24.3-5. Commercial Recreation Licences in the Brucejack Project Land Use Study Areas	24-17
Figure 24.3-6. Mineral Claims in the Brucejack Project Land Use Study Areas (as of January 2014)....	24-20

Figure 24.3-7. Transportation and Utilities in the Brucejack Gold Mine Project Land Use Study Areas ...	24-21
Figure 24.4-1. Brucejack Gold Mine Project Land Use Study Areas	24-33
Figure 24.9-1. Cumulative Effects Scoping: Projects and Activities Interacting with Land Use in the Vicinity of the Brucejack Gold Mine Project.....	24-47
Figure 25.3-1. Skii km Lax Ha Traditional Territory, Brucejack Gold Mine Project	25-9
Figure 25.3-2. Skii km Lax Ha Fishing Areas in Relation to Project Components and Activities.....	25-10
Figure 25.3-3. Skii km Lax Ha Hunting and Trapping Areas in Relation to Project Components and Activities	25-11
Figure 25.3-4. Skii km Lax Ha Plant Gathering Sites and Areas in Relation to Project Components and Activities.....	25-12
Figure 25.3-5. Skii km Lax Ha Habitations, Trails, Burial Sites, and Cultural Landscapes in Relation to Project Components and Activities	25-13
Figure 25.3-6. Nass Area, Nass Wildlife Area, and Nisga'a Lands as defined in the Nisga'a Final Agreement	25-15
Figure 25.3-7. Location of the Nass Area and Nass Wildlife Area in Relation to Project Components and Activities	25-17
Figure 25.3-8. Tahltan Nation Traditional Territory, Brucejack Gold Mine Project	25-20
Figure 25.9-1. Steps to Cumulative Effects Assessment	25-50
Figure 25.9-2. Current Aboriginal Use: Cumulative Effects Assessment Spatial Boundary	25-55
Figure 26.1-1. Skii km Lax Ha Traditional Territory, Brucejack Gold Mine Project	26-4
Figure 26.1-2. Tahltan Nation Traditional Territory, Brucejack Gold Mine Project	26-6
Figure 27.1-1. Nisga'a Lands, the Nass Wildlife Area, and the Nass Area	27-2
Figure 27.1-2. <i>Nisga'a Final Agreement</i> , Brucejack Gold Mine Project	27-3
Figure 27.4-1. Location of the Nass Area and Nass Wildlife Area in Relation to the Fish and Fish Habitat Study Areas	27-23
Figure 27.4-2. Location of the Nass Area and Nass Wildlife Area in Relation to the Wildlife Study Areas	27-27
Figure 29.8-1. Regional and Local Study Areas for Heritage Resources in the Brucejack Gold Mine Project	29-51
Figure 29.10-1. Brucejack Gold Mine Project Site Layout.....	29-69
Figure 29.10-2. Brucejack Gold Mine Project Water Monitoring, 2014	29-73
Figure 29.18-1. Waste Rock Disposal by Year	29-147
Figure 29.19-1. Freshwater Diversion and Contact Water Collection Systems	29-159

TABLE OF CONTENTS

Figure 29.19-2. Brucejack Lake Water Balance Model Schematic	29-161
Figure 29.20-1. Proposed Wetland Monitoring Sites.....	29-169
Figure 30.4-1. Terrain Mapping Polygons in the Brucejack Mine Site Area.....	30-13
Figure 30.4-2. Soil Mapping of the Existing Bowser Camp, Historic Airstrip, and Proposed Aerodrome Facility	30-16
Figure 30.4-3. Soil Mapping of the Proposed Knipple Transfer Area Facility	30-21
Figure 30.4-4. Brucejack Gold Mine Project Off-site Infrastructure	30-23
Figure 30.4-5. Access Road Upgrade Locations	30-27
Figure 30.5-1. Brucejack Mine Site Layout.....	30-29
Figure 30.5-2. Brucejack Gold Mine Project: Layout of Mine Site Infrastructure – End of Closure Phase/Monitoring Phase.....	30-41
Figure 30.5-3. Brucejack Gold Mine Project: Layout of Mine Site Infrastructure – End of Post-closure Phase	30-43
Figure 30.5-4. Bowser Aerodrome Closure Phase	30-45
Figure 30.5-5. Knipple Transfer Area Facility Closure Phase	30-47
Figure 30.6-1. Areas Identified for Progressive Reclamation of the Brucejack Mine Site	30-51
Figure 30.6-2. Progressive Reclamation – Bowser Camp.....	30-54
Figure 32.7-1. Global Climate Model Predictions for Brucejack Lake: Annual Averages and Inter-GCM Variability	32-30
Figure 32.7-2. Global Climate Model Predictions for Brucejack Lake: Monthly Averages for the A2 GCM Scenario and Climatic Normals	32-31
Figure 32.7-3. Global Climate Model Predictions for Brucejack Lake: Annual Average Streamflow at BJL-H1 for the A2B1 GCM Scenario.	32-33
Figure 34.2-1. Steps to Cumulative Effects Assessment	34-3
Figure 34.2-2. Temporal Overlap between All Other Projects and Activities and the Brucejack Gold Mine Project	34-5
Figure 34.3-1. Past, Present, and Reasonably Foreseeable Projects within the Region	34-15
Figure 34.4-1. Air Quality CEA Boundary Showing All Other Projects and Activities Relevant to Air Quality in the Vicinity of the Brucejack Gold Mine Project	34-31
Figure 34.4-2. Surface Water Hydrology CEA Boundary Showing all Other Projects and Activities Relevant to Surface Water Hydrology in the Vicinity of the Brucejack Gold Mine Project....	34-43
Figure 34.4-3. Spatial Distribution of Human Activities within the Brucejack Cumulative Effects Assessment Area	34-48

Figure 34.5-1. Surface Water Quality CEA Boundary Showing All Other Projects and Activities Relevant to Surface Water Quality in the Vicinity of the Brucejack Gold Mine Project	34-55
Figure 34.5-2. Aquatic Resources CEA Boundary Showing All Other Projects and Activities Potentially Affecting Aquatic Resources in the Vicinity of the Brucejack Gold Mine Project	34-61
Figure 34.5-3. Cumulative Effects Assessment Boundary Showing All Other Projects and Activities Relevant to Fish and Fish Habitat near the Brucejack Gold Mine Project.....	34-67
Figure 34.5-4. Cumulative Effects Scoping: Projects and Activities Interacting with the Brucejack Gold Mine Project for Terrestrial Ecology	34-75
Figure 34.5-5. Cumulative Effects Scoping: Projects and Activities Interacting with the Project for Wetland Ecosystems	34-85
Figure 34.5-6. Moose Cumulative Effects Assessment Area and Movement Area	34-92
Figure 34.5-7. Mountain Goat Cumulative Effects Assessment Area and Movement Area.....	34-93
Figure 34.5-8. Grizzly Bear Cumulative Effects Assessment Area and Movement Area	34-94
Figure 34.5-9. American Marten Cumulative Effects Assessment Area	34-95
Figure 34.5-10. Western Toad Cumulative Effects Assessment Area	34-96
Figure 34.5-11. Economic Cumulative Effects Assessment Boundary Showing All Other Projects and Activities Relevant to Economic Conditions in the Vicinity of the Brucejack Gold Mine Project.....	34-113
Figure 34.5-12. Cumulative Effects Scoping: Projects and Activities Interacting with the Brucejack Gold Mine Project for Socio-economics	34-121
Figure 34.5-13. Noise CEA Boundary Showing All Other Projects and Activities Relevant to Noise in the Vicinity of the Brucejack Gold Mine Project	34-135
Figure 34.5-14. Air Quality CEA Boundary Showing All Other Projects and Activities Relevant to Air Quality in the Vicinity of the Brucejack Gold Mine Project	34-137
Figure 34.5-15. Drinking Water CEA Boundary Showing All Other Projects and Activities Relevant to Drinking Water in the Vicinity of the Brucejack Gold Mine Project.....	34-139
Figure 34.5-16. Cumulative Effects Scoping: Project and Activities Interacting with Land Use in the Vicinity of the Brucejack Gold Mine Project.....	34-151
Figure 34.5-17. Current Use of Lands and Resources for Traditional Purposes: Cumulative Effects Assessment Spatial Boundary for Environmental Effects	34-157

List of Tables

TABLE	PAGE
Table 1.5-1. Mineral Claims for Brucejack Property	1-13
Table 1.5-2. Mineral Claims for the Bowser Property as of May 2014.....	1-16
Table 1.6-1. Crown-granted Tenures, Land Uses within the Vicinity of the Project and Overlapping the Project Footprint	1-25
Table 1.6-2. Past, Current, and Reasonably Foreseeable Projects	1-26
Table 1.9-1. Valley of the Kings Mineral Resource	1-39
Table 1.9-2. West Zone Mineral Resource.....	1-39
Table 1.9-3. Valley of the Kings Mineral Reserve	1-39
Table 1.9-4. West Zone Mineral Reserve	1-39
Table 1.9-5. Project's Projected Production and Processing.....	1-40
Table 1.9-6. Summary of Pre-tax and Post-tax Economic Returns.....	1-41
Table 1.9-7. Construction Costs by Expenditure Category	1-41
Table 1.9-8. Operating Costs by Expenditure Category (Life of Mine)	1-42
Table 1.9-9. Annual Operating Expenditures (Life of Mine)	1-43
Table 1.9-10. Mine Closure Costs	1-44
Table 1.9-11. Provincial Input-Output Multipliers	1-46
Table 1.9-12. Total Impacts of Construction Activities in Canada.....	1-47
Table 1.9-13. Total Economic Impacts	1-48
Table 1.9-14. Tax Revenue Derived from Direct Project Expenditures.....	1-49
Table 1.9-15. Tax Revenue Derived from Indirect and Induced Project Expenditures.....	1-49
Table 1.9-16. GDP Impacts of the Construction Phase in Top Five Supplier Industries	1-50
Table 1.9-17. Regional Supplier Impacts Estimates	1-51
Table 1.9-18. Total Impacts of Operation Activities in Canada	1-51
Table 1.9-19. Total Economic Impacts	1-52
Table 1.9-20. Tax Revenue Derived from Project Expenditures	1-53
Table 1.9-21. Tax Revenue Derived from Indirect and Induced Project Expenditures.....	1-54
Table 1.9-22. GDP Impacts of Mine Operation in Top Five Supplier Industries (Life of Mine)	1-54
Table 1.9-23. Regional Supplier Impact Estimates	1-55

Table 1.9-24. Population in the Project's Regional and Local Economic Study Area.....	1-58
Table 1.9-25. Employment Impact of Project Construction (Person-years).....	1-59
Table 1.9-26. Employment by Job Category during Project Construction (Person-years).....	1-59
Table 1.9-27. Total Employment Impact in BC during Construction (Person-years).....	1-60
Table 1.9-28. Employment Impacts in Top Five Supplier Industries.....	1-60
Table 1.9-29. Regional Employment Impacts in Supplier Industries (Person-years)	1-61
Table 1.9-30. Employment Impact of Mine Operation (Person-years)	1-62
Table 1.9-31. Employment during the Operation of the Mine (Person-years)	1-62
Table 1.9-32. Total Employment Impact during the Operation of the Mine (Person-years)	1-63
Table 1.9-33. Employment Impacts in Top Five Supplier Industries.....	1-64
Table 1.9-34. Regional Employment Impacts in Supplier Industries (Person-years)	1-64
Table 2.2-1. Participant Funding Program Allocations.....	2-12
Table 2.2-2. Assessment Process Milestones for the Brucejack Gold Mine Project	2-13
Table 2.2-3. Membership of the Brucejack Gold Mine Project Environmental Assessment Working Group	2-13
Table 2.3-1. Potential Provincial Authorizations Required	2-14
Table 2.3-2. Anticipated Federal Authorization Requirements	2-17
Table 3.3-1. Summary of Working Group Meeting Dates, Locations, Topics, and Participants.....	3-6
Table 3.6-1. Government Agency Site Visits.....	3-21
Table 3.7-1. Summary of Comments Received during the Draft AIR Public Comment Period	3-25
Table 3.7-2. Summary of British Columbia Environmental Assessment Office Open Houses.....	3-25
Table 3.7-3. Summary of Comments and Questions Raised at the British Columbia Environmental Assessment Office Open Houses	3-26
Table 3.7-4. Summary of Interviews with Tenure and Licence Holders	3-28
Table 3.7-5. Participation in Conferences and Panels	3-29
Table 3.7-6. Summary of Donations.....	3-30
Table 4.2-1. Brucejack Gold Mine Project Alternatives Assessment Performance Objectives.....	4-4
Table 4.2-2. Project Alternatives Attribute Rating System	4-5
Table 4.3-1. Brucejack Gold Mine Project Alternative Means Screening Table Based on Basic Technical and Economic Feasibility Criteria.....	4-7
Table 4.3-2. Brucejack Gold Mine Project Sewage Treatment Specifications and Options	4-20

TABLE OF CONTENTS

Table 4.4-1. Evaluation of Brucejack Gold Mine Project Alternatives for Personnel Transport to Proposed Knipple Transfer Area	4-23
Table 4.4-2. Intermediate and Receptor Valued Component Attributes Compared for Personnel Access Method Assessment	4-28
Table 4.4-3. Evaluation of Brucejack Gold Mine Project Alternative Methods for Ore Comminution	4-31
Table 4.4-4. Valued Component Attributes Compared for Ore Comminution Alternatives	4-31
Table 4.4-5. Evaluation of Brucejack Gold Mine Project Alternatives for Location of Final Processing of Gold-Silver Flotation Concentrate into Doré	4-37
Table 4.4-6. Valued Component Attributes Compared for Final Ore Concentrate Processing.....	4-39
Table 4.4-7. Evaluation of Brucejack Gold Mine Project Alternatives for Tailings Disposal Method ..	4-45
Table 4.4-8. Valued Component Attributes Compared for Tailings Disposal Alternatives.....	4-45
Table 4.4-9. Evaluation of Brucejack Gold Mine Project Alternatives for Waste Rock Disposal Method ..	4-51
Table 4.4-10. Valued Component Attributes Compared for Waste Rock Disposal Alternatives.....	4-53
Table 4.4-11. Life of Mine Backfilling - Waste Rock and Mill Tailings.....	4-53
Table 4.4-12. Evaluation of Brucejack Gold Mine Project Alternatives for Sediment Control Method ...	4-57
Table 4.4-13. Typical Solid Non-hazardous Waste Generated at the Brucejack Gold Mine Project ...	4-59
Table 4.4-14. Valued Component Attributes Compared for Solid Waste Disposal Alternatives	4-59
Table 4.4-15. Evaluation of Brucejack Gold Mine Project Alternatives for Solid Waste Disposal Method for Non-hazardous Materials.....	4-61
Table 4.5-1. Summary of Project Alternatives Evaluation	4-65
Table 4.6-1. Key Brucejack Gold Mine Project Design Changes and Related Environmental and Social Benefits	4-67
Table 5.5-1. VOK Mineral Resource Estimate Based on a Cut-off Grade of 5 g/t AuEq - December 2013	5-36
Table 5.5-2. West Zone Mineral Resource Estimate Based on a Cut-off Grade of 5 g/t AuEq - April 2012	5-37
Table 5.6-1. Description of Pretivm Geological Model Units	5-39
Table 5.6-2. Composition of Static Test Samples Submitted for ML/ARD Characterization.....	5-42
Table 5.7-1. Cut and Fill Slope Angles	5-60
Table 5.7-2. Conceptual List of Equipment Required for Surface Facilities Construction.....	5-61
Table 5.8-1. Rock Mass Properties.....	5-64
Table 5.8-2. Ground Support Recommendations.....	5-66
Table 5.8-3. Development Design Parameters	5-72

Table 5.8-4. Stope Design Parameters.....	5-72
Table 5.8-5. Life of Mine Development Requirements.....	5-77
Table 5.8-6. Life of Mine Backfilling - Waste Rock and Mill Tailings	5-85
Table 5.8-7. Life of Mine Tonnes and Grades	5-89
Table 5.8-8. Primary Fan Specifications.....	5-94
Table 5.8-9. Underground Development and Production Equipment.....	5-98
Table 5.8-10. Support Equipment	5-98
Table 5.10-1. Freshwater Diversion Channel Specifications	5-108
Table 5.10-2. Contact Water Ditch Specifications.....	5-109
Table 5.11-1. Typical Dangerous Goods and Hazardous Materials on Site by Project Phase	5-132
Table 5.12-1. Conceptual List of Equipment for Project Surface Activities	5-145
Table 5.13-1. Geohazard Types Identified along the Brucejack Access Road	5-150
Table 5.13-2. Summary of Anticipated Project-related Traffic between Highway 37 and the Knipple Transfer Area during Operation	5-155
Table 5.13-3. Summary of Anticipated Project-related Loads between the Knipple Transfer Area and the Mine during Operation, Assuming Transport by Tracked or Otherwise Appropriately Equipped Vehicles	5-156
Table 5.13-4. Summary of Anticipated Project-related Traffic between Highway 37 and the Knipple Transfer Area during Construction	5-156
Table 5.14-1. Mine Site Avalanche Hazard Areas	5-168
Table 5.14-2. Access Road Avalanche Hazard Areas	5-170
Table 5.16-1. Construction and Operations Workforce	5-172
Table 5.17-1. Summary of Project Initial Capital Cost	5-180
Table 6.3-1. Summary of Field-based Baseline Studies for the Brucejack Gold Mine Project	6-4
Table 6.4-1. Likelihood of the Brucejack Gold Mine Project Interacting and Affecting Environmental, Social, Economic, Heritage, and Health Candidate Components	6-9
Table 6.4-2. <Subject Area> Intermediate Component(s)/Receptor Valued Components Included in the Application/EIS	6-18
Table 6.4-3. <Subject Area> Intermediate Component(s)/Receptor Valued Components Excluded from the Application/EIS.....	6-20
Table 6.4-4. Selected Intermediate Components and Receptor Valued Components for the Brucejack Gold Mine Project	6-20

TABLE OF CONTENTS

Table 6.5-1. Example of Ranking Potential Effects on Intermediate Components or Receptor Valued Components	6-29
Table 6.6-1. Summary of Residual Effects / Predicted Changes after Mitigation.....	6-33
Table 6.7-1. Characterization of Residual Effects, Likelihood, Significance, and Confidence	6-38
Table 6.8-1. Summary of Residual Effects, Mitigation, and Significance.....	6-38
Table 6.9-1. Past, Present and Reasonably Foreseeable Future Projects with the Potential to Interact with the Brucejack Gold Mine Project	6-41
Table 6.9-2. Past, Present and Reasonably Foreseeable Future Activities with the Potential to Interact with the Brucejack Gold Mine Project	6-46
Table 6.9-3. Summary of Non-traditional Land Use Activities in Brucejack Gold Mine Project Regional Area	6-78
Table 6.9-4. Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project	6-93
Table 6.9-5. Potential Cumulative Effects between the Brucejack Gold Mine Project and Other Projects and Activities	6-99
Table 6.10-1. Summary of Cumulative Residual Effects.....	6-100
Table 6.11-1. Significance Determination of Cumulative Residual Effects for <Subject Area> or <Sub-Component 1> - Future Case with the Project	6-103
Table 6.11-2. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance ...	6-103
Table 7.2-1. Federal and Provincial Ambient Air Quality Criteria	7-2
Table 7.3-1. Summary of Ambient Air Quality Concentrations from Other Sources	7-10
Table 7.3-2. Summary of Dustfall Deposition Rates from Other Sources	7-10
Table 7.3-3. Ambient Concentrations of SO ₂ , NO ₂ , and O ₃	7-18
Table 7.3-4. Summary of Ambient Air Quality Concentrations Representative of the Project Area.....	7-18
Table 7.3-5. Total Dustfall Results at Brucejack Gold Mine Project 2012.....	7-19
Table 7.3-6. Calculated Acid Deposition Load	7-20
Table 7.4-1. Interaction of Project Components and Physical Activities with Air Quality	7-22
Table 7.4-2. Air Quality Intermediate Components Included in the Application/EIS.....	7-26
Table 7.4-3. Ranking Potential Effects on Air Quality	7-28
Table 7.5-1. Building Heights.....	7-38
Table 7.5-2. CALPUFF Model Switch Settings.....	7-40
Table 7.5-3. Point Sources Dispersion Modelling Parameters.....	7-41
Table 7.5-4. Size Parameters for Dry Deposition of Particles	7-41

Table 7.6-1. Annual Emissions from Stacks during Construction	7-42
Table 7.6-2. Annual Equipment Tailpipe Emissions during Construction	7-43
Table 7.6-3. Annual Emissions from Aircraft during Construction	7-46
Table 7.6-4. Annual Emissions from Unpaved Road Dust during Construction.....	7-46
Table 7.6-5. Annual Emissions from Mining Activities during Construction	7-46
Table 7.6-6. Annual Emissions from All Activities during Construction	7-47
Table 7.6-7. Concentrations of Pollutants from Air Raisers.....	7-47
Table 7.6-8. Annual Emissions from Generators, Incinerators, and Heaters during Operation.....	7-47
Table 7.6-9. Annual Emissions from Ore Processing during Operation.....	7-47
Table 7.6-10. Annual Equipment Tailpipe Emissions during Operation	7-48
Table 7.6-11. Annual Emissions from Aircraft during Operation	7-49
Table 7.6-12. Annual Emissions from Unpaved Road Dust during Operation.....	7-49
Table 7.6-13. Annual Emissions from Mining Activities during Operation	7-50
Table 7.6-14. Annual Emissions during Operation	7-50
Table 7.6-15. Maximum Concentration and Deposition Rate during Construction	7-51
Table 7.6-16. Maximum Concentration and Deposition Rate during Operation	7-70
Table 7.8-1. Summary of Predicted Changes after Mitigation for Air Quality	7-89
Table 7.10-1. Potential Cumulative Change Interactions for Air Quality.....	7-92
Table 7.10-2. Potential Cumulative Changes between the Brucejack Gold Mine Project Air Quality and Other Projects and Activities	7-94
Table 7.10-3. Predicted Pollutant Increment from KSM Project at Brucejack Gold Mine Project Area ...	7-98
Table 7.10-4. Summary of Predicted Cumulative Changes on Air Quality.....	7-99
Table 7.11-1. Predicted Changes to Air Quality.....	7-101
Table 8.1-1. Common Noise Metrics.....	8-2
Table 8.2-1. Project Noise Impact Criteria	8-6
Table 8.3-1. 24-hour Noise Monitoring Data	8-10
Table 8.4-1. Interaction of Project Components and Physical Activities with Noise	8-12
Table 8.4-2. Noise Intermediate Components Included in the Application/EIS	8-16
Table 8.4-3. Ranking Potential Effects on Noise	8-18
Table 8.5-1. Summary of Sensitive Receptors.....	8-24

TABLE OF CONTENTS

Table 8.5-2. Construction Phase Noise Sources	8-26
Table 8.5-3. Aircraft Activity during Construction Phase	8-26
Table 8.5-4. Blasting Input Data	8-26
Table 8.5-5. Operation Phase Noise Sources	8-27
Table 8.5-6. Aircraft Activity during Operation Phase	8-27
Table 8.6-1. Predicted Construction Noise Levels at the Workers Accommodation Receptors.....	8-28
Table 8.6-2. Predicted Construction Noise Levels at Existing Off-site Human Receptors	8-28
Table 8.6-3. Predicted Operation Phase Noise Levels at the Workers Accommodation Receptors	8-38
Table 8.6-4. Predicted Operation Phase Noise Levels at Existing Off-site Human Receptors	8-38
Table 8.8-1. Summary of Predicted Changes after Mitigation for Noise	8-40
Table 8.10-1. Potential Cumulative Changes between the Brucejack Gold Mine Project Noise and Other Projects and Activities	8-44
Table 8.10-2. Summary of Predicted Cumulative Changes on Noise	8-45
Table 8.11-1. Predicted Changes to Noise	8-46
Table 9.2-1. Groundwater Legislation, Regulation, Standards, and Guidelines.....	9-2
Table 9.3-1. Summary of Exploration and Mining Activities within the Brucejack Watershed, 1935 to 2013.....	9-6
Table 9.3-2. Provincial Water Quality Guidelines for the Protection of Freshwater Aquatic Life and Drinking Water, and Federal Water Quality Guidelines for the Protection of Freshwater Aquatic Life	9-14
Table 9.3-3. Ammonia Concentration as a Function of pH and Temperature	9-17
Table 9.3-4. Description of Pretivm Main Geological Model Units	9-17
Table 9.3-5. Calibrated Hydraulic Parameters Assigned to Hydrogeologic Units	9-34
Table 9.3-6. Calibrated Recharge Rates Applied to the Numerical Model	9-37
Table 9.3-7. Baseflow Calibration - Observed versus Simulated Baseflow at BJL-H1	9-40
Table 9.3-8. Sensitivity Scenarios for Mining Operation and Post-closure Simulations	9-47
Table 9.4-1. Interaction of Project Components and Physical Activities with Groundwater Quality and Groundwater Quantity	9-51
Table 9.4-2. Hydrogeology Intermediate Components Included in the Application/EIS	9-56
Table 9.4-3. Ranking Potential Effects on Hydrogeology.....	9-60
Table 9.5-1. Quarry Source Term Values for Base Case and Conservative Case Scenarios (as Dissolved Concentrations in mg/L)	9-71

Table 9.5-2. Plant Site Source Term Values for Operation and Post-closure Phases (as Dissolved Concentrations in mg/L)	9-71
Table 9.5-3. Underground Water Pre-lag Source Terms (in mg/L) for Seven Brucejack-designated Geological Model Units	9-73
Table 9.5-4. Underground Water Post-lag Source Terms (in mg/L) for Seven Brucejack-designated Geological Model Units	9-74
Table 9.5-5. Estimated Adit Water Source Terms (mg/L) for Elements Associated with Blasting during Operation	9-75
Table 9.6-1. Summary of Predicted Groundwater Discharge to Surface Water Receptors in the Local Study Area	9-82
Table 9.6-2. Comparison of Office P1 Groundwater Type and Quarry Source Term (in mg/L)	9-89
Table 9.6-3. Comparison of Volcanic Sedimentary Facies Groundwater Type and Plant Site Source Term (in mg/L)	9-92
Table 9.6-4. Comparison of Volcanic Sedimentary Facies Groundwater Type and Underground Mine Water Quality End-members (in mg/L)	9-96
Table 9.6-5. Comparison of Office P1 Groundwater Type and Underground Mine Water Quality End-Members	9-100
Table 9.8-1. Summary of Predicted Changes after Mitigation for Hydrogeology	9-105
Table 9.8-2. Definitions of Characterization Criteria for Predicted Changes on Hydrogeology	9-105
Table 9.10-1. Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project for Hydrogeology	9-108
Table 9.11-1. Summary of Predicted Changes to Hydrogeology	9-111
Table 10.2-1. Surface Water Hydrology Legislation, Policy, Standards, and Guidelines	10-2
Table 10.3-1. Hydrometric Monitoring Stations in the Brucejack Gold Mine Project Study Area	10-9
Table 10.3-2. Drainage Area Scenarios for Brucejack Creek Watershed at Hydrometric Station BJL-H1	10-11
Table 10.3-3. Physiographic Characteristics of Watersheds within the Project Area	10-11
Table 10.3-4. Summary of Regional Hydrometric Stations	10-13
Table 10.3-5. Estimated Annual Runoff (mm) and Mean Annual Discharge (m^3/s) in the Project Area	10-14
Table 10.3-6. Estimates of Monthly Runoff Distribution for Watersheds within the Project Area ...	10-14
Table 10.3-7. Estimates of Peak Flows (m^3/s) at the Project Stations Based on Regional Quantile Regression Technique.....	10-15
Table 10.3-8. Estimated Annual Low Flow Indices for the Watersheds in the Project Area	10-15
Table 10.3-9. Estimated June to September Low Flow Indices for the Watersheds in the Project Area..	10-16

TABLE OF CONTENTS

Table 10.4-1. Sub-components and Indicators of Surface Water Hydrology as an Intermediate Component	10-23
Table 10.4-2. Interaction of Project Components and Physical Activities with Surface Water Hydrology	10-25
Table 10.4-3. Surface Water Hydrology Intermediate Components Included in the Application/EIS	10-30
Table 10.4-4. Ranking Potential Effects on Surface Water Hydrology	10-34
Table 10.6-1. Changes in Annual Flows in Brucejack Creek (BJL-H1) Compared to Baseline Conditions..	10-43
Table 10.6-2. Monthly Flows in Brucejack Creek (BJL-H1) for the Baseline Condition and during Construction	10-53
Table 10.6-3. Monthly Flows in Brucejack Creek (BJL-H1) for the Baseline Condition and during Operation	10-55
Table 10.6-4. Monthly Flows in Brucejack Creek (BJL-H1) for the Baseline Condition and during Closure.....	10-57
Table 10.6-5. Monthly Flows in Brucejack Creek (BJL-H1) for the Baseline Condition and at Post-closure	10-59
Table 10.6-6. Changes in March Flows in Brucejack Creek (BJL-H1) Compared to Baseline Conditions..	10-71
Table 10.6-7. Brucejack Access Road Summary, Classified by Watershed	10-72
Table 10.6-8. Preliminary Classification and Stability Scores for Bridge Reaches	10-72
Table 10.8-1. Summary of Predicted Changes after Mitigation for Surface Water Hydrology	10-82
Table 10.10-1. Potential Cumulative Effect Interactions for Surface Water Hydrology	10-86
Table 10.10-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Surface Water Hydrology and Other Projects and Activities.....	10-88
Table 10.10-3. Summary of Predicted Cumulative Changes on Surface Water Hydrology.....	10-92
Table 10.11-1. Predicted Changes to Surface Water Hydrology.....	10-93
Table 11.3-1. Slope Classes Used for Slope Gradient Maps within the Brucejack Local Study Area ...	11-9
Table 11.3-2. Surficial Material Summary by Sub-area within the Local Study Area	11-11
Table 11.3-3. Generalized Soil Climate Groups in the Brucejack Local Study Area	11-12
Table 11.3-4. Criteria for Evaluating Suitability of Soil for Use in Reclamation	11-13
Table 11.3-5. Generalized Soil Legend for the Brucejack Gold Mine Project	11-14
Table 11.3-6. Distribution of Slope Stability Classes within the Local Study Area by Sub-area	11-18
Table 11.3-7. Summary of Geohazard Risk to the Brucejack Gold Mine Project at Baseline	11-18
Table 11.4-1. Summary of Terrain and Soils Sub-components and Indicators	11-19
Table 11.4-2. Interaction of Project Components and Physical Activities with Terrain and Soils	11-20

Table 11.4-3. Terrain and Soils Intermediate Components Included in the Application/EIS.....	11-24
Table 11.6-1. Potential Loss of Soil Quantity due to Project Infrastructure.....	11-30
Table 11.6-2. Area of Potential Soil Quality Alteration and Degradation Outside of the Development Footprint.....	11-32
Table 11.6-3. Spatial Extent of Slope Stability Classes that Intersect with Project Infrastructure... 11-35	
Table 11.9-1. Key Pathways and Resultant Effects between Terrain and Soils and Relevant Receptor Valued Components	11-40
Table 11.10-1. Potential Cumulative Effect Interactions for Terrain and Soils Valued Components ...	11-43
Table 11.10-2. Projects Located within the Terrain and Soils Cumulative Effects Assessment Area	11-47
Table 11.10-3. Potential Cumulative Effects between the Brucejack Gold Mine Project Terrain and Soils and Other Projects and Activities	11-48
Table 11.10-4. Footprints of Projects Included in the Cumulative Effects Assessment.....	11-51
Table 11.10-5. Summary of Predicted Cumulative Changes on Terrain and Soils.....	11-53
Table 11.11-1. Predicted Changes to Soils	11-56
Table 12.2-1. Greenhouse Gas Emission Legislation and Initiatives	12-2
Table 12.3-1. Global Greenhouse Gas Emissions (2010; not counting LULUCF)	12-5
Table 12.3-2. National and Provincial Greenhouse Gas Emissions, including Mining Sector	12-7
Table 12.4-1. Interaction of Project Components and Physical Activities with Climate.....	12-9
Table 12.4-2. Climate Receptor Valued Components Included in the Application for an Environmental Assessment / Environmental Impact Statement	12-14
Table 12.5-1. Ranking Potential Effects on Climate	12-17
Table 12.5-2. Summary of Brucejack Gold Mine Project Greenhouse Gas Mitigation Strategies.....	12-23
Table 12.6-1. Summary of Residual Effects on Climate	12-24
Table 12.6-2. Brucejack Gold Mine Project Facility-level Greenhouse Gas Emissions	12-25
Table 12.6-3. Comparison of Brucejack Gold Mine Project to Provincial, National, and International Direct Facility-level Greenhouse Gas Emissions	12-26
Table 12.6-4. Brucejack Gold Mine Project and other British Columbia Metal Mining Project Greenhouse Gases	12-27
Table 12.7-1. Definitions of Characterization Criteria for Residual Effects on Climate	12-28
Table 12.7-2. Characterization of Residual Effects, Significance, Confidence, and Likelihood on Climate	12-30
Table 12.8-1. Summary of Residual Effects, Mitigation, and Significance on Climate	12-31
Table 12.10-1. Summary of Project Residual Effects, Mitigation, and Significance for Climate	12-32

TABLE OF CONTENTS

Table 13.2-1. Summary of Applicable Statutes and Regulations for Potential Surface Water Quality Effects, Brucejack Gold Mine Project.....	13-2
Table 13.3-1. Summary of Exploration and Mining Activities within the Brucejack Watershed, 1935 to 2013.....	13-8
Table 13.3-2. Provincial and Federal Water Quality Guidelines for the Protection of Freshwater Aquatic Life.....	13-13
Table 13.3-3. Baseline Water Quality of the Brucejack Watershed (Mine Site Area), Brucejack Gold Mine Project	13-17
Table 13.3-4. Baseline Water Quality of Sulphurets and Unuk Watersheds (Mid- and Far-field Receiving Environments), Brucejack Gold Mine Project.....	13-31
Table 13.3-5. Baseline Water Quality of Bowser River and Wildfire/Scott/Todedada Creek Watersheds (Off-site Areas), Brucejack Gold Mine Project.....	13-45
Table 13.4-1. Interaction of Project Components and Physical Activities with Surface Water Quality ..	13-57
Table 13.4-2. Surface Water Quality as a Receptor Valued Component Included in the Application/EIS	13-62
Table 13.5-1. Ranking of Potential Effects on Surface Water Quality	13-70
Table 13.5-2. Summary of ML/ARD Baseline Characterization Study along Brucejack Access Road and Bowser Aerodrome	13-83
Table 13.6-1. GoldSim™ Model Scenarios (Base Case and Sensitivity Cases) and Associated Assumptions	13-91
Table 13.6-2. Predicted Water Quality at Brucejack Lake Outlet (Base Case), Brucejack Gold Mine Project.....	13-95
Table 13.6-3. Predicted Water Quality (Base Case) of Brucejack Creek (BJ200m D/S), Brucejack Gold Mine Project	13-103
Table 13.6-4. Summary of Identified COPCs at Brucejack Lake Outlet, Modelled Cases 1 to 9	13-119
Table 13.6-5. Summary of Identified COPCs for Lower Brucejack Creek (BJ 200m D/S), Modelled Cases 1 to 9.....	13-120
Table 13.6-6. Summary of Dilution Factors for Discharge Flow Pathway, Brucejack Gold Mine Project	13-127
Table 13.6-7. Summary of Residual Effects on Surface Water Quality: Mine Site Area and Downstream Receiving Environment	13-129
Table 13.6-8. Summary of Residual Effects on Surface Water Quality: Off-site Areas.....	13-131
Table 13.7-1. Definitions of Characterization Criteria for Residual Effects on Surface Water Quality.....	13-133
Table 13.7-2. Characterization of Residual Effects, Significance, Confidence, and Likelihood on Surface Water Quality: Mine Site Area.	13-135

Table 13.7-3. Characterization of Residual Effects, Significance, Confidence, and Likelihood on Surface Water Quality: Off-site Areas	13-136
Table 13.8-1. Summary of Residual Effects, Mitigation, and Significance on Surface Water Quality...	13-142
Table 13.9-1. Potential Interaction of Projects and Activities with the Brucejack Gold Mine Project .	13-144
Table 13.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Surface Water Quality and Other Projects and Activities	13-149
Table 13.9-3. Summary of Cumulative Residual Effects on Surface Water Quality: Mine Site Area ...	13-152
Table 13.9-4. Significance Determination of Cumulative Residual Effects for Surface Water Quality - Future Case with the Project.....	13-154
Table 13.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Surface Water Quality.....	13-155
Table 14.2-1. Summary of Applicable Statutes and Regulations for Potential Aquatic Resources Effects, Brucejack Gold Mine Project.....	14-2
Table 14.3-1. Summary of Aquatic Resource Studies for the Brucejack Gold Mine Project.....	14-9
Table 14.3-2. Summary of Aquatic Biology and Sediment Quality Data for Study Streams for the Brucejack Gold Mine Project, 2008 to 2013	14-13
Table 14.3-3. Summary of Aquatic Biology and Sediment Quality Data for Study Lakes for the Brucejack Gold Mine Project, 2008 to 2013	14-14
Table 14.4-1. Interaction of Project Components and Physical Activities with Aquatic Resources...	14-27
Table 14.4-2. Aquatic Resources Receptor Valued Components Included in the Application/EIS	14-31
Table 14.4-3. Aquatic Resources Receptor Valued Components Excluded from the Application/EIS....	14-32
Table 14.5-1. Ranking Potential Project Effects on Aquatic Resources	14-42
Table 14.6-1. Summary of Metal Concentrations Greater than Thresholds for the Protection of Aquatic Life in Brucejack Creek from the Predictive Water Quality Modelling	14-65
Table 14.6-2. Summary of Predicted Nutrient Concentrations in Brucejack Creek	14-67
Table 14.6-3. Summary of Predicted Residual Effects on Aquatic Resources in the Mine Site Area..	14-71
Table 14.6-4. Summary of Predicted Residual Effects on Aquatic Resources in the Off-site Project Infrastructure Areas.....	14-73
Table 14.7-1. Definitions of Characterization Criteria for Residual Effects on Aquatic Resources ...	14-77
Table 14.7-2. Characterization of the Significance, Confidence, and Likelihood of Residual Effects on Aquatic Resources in the Mine Site Area.....	14-80
Table 14.7-3. Characterization of the Significance, Confidence, and Likelihood of Residual Effects on Aquatic Resources in the Off-site Project Infrastructure Areas	14-82
Table 14.8-1. Summary of Residual Effects, Mitigation, and Significance on Aquatic Resources	14-83

TABLE OF CONTENTS

Table 14.9-1. Potential Cumulative Effect Interactions for Aquatic Resources	14-87
Table 14.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Aquatic Resources and Other Projects and Activities	14-92
Table 14.9-3. Summary of Cumulative Residual Effects on Aquatic Resources	14-95
Table 14.9-4. Significance Determination of Cumulative Residual Effects for Aquatic Resources Future Case with the Project	14-96
Table 14.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Aquatic Resources in the Mine Site Area and Off-site Project Infrastructure Areas	14-99
Table 15.3-1. Fish Life History Periodicity for Species Identified within the Baseline Fish and Fish Habitat Study Area	15-5
Table 15.3-2. Baseline Fish and Fish Habitat Sampling Site Rationale.....	15-13
Table 15.3-3. Fish Species Present in the Fish and Fish Habitat Study Area Watersheds	15-16
Table 15.4-1. Interaction of Project Components and Physical Activities with Fish and Fish Habitat .	15-33
Table 15.4-2. Fish and Fish Habitat Receptor Valued Components Included in the Application for an Environmental Assessment Certificate/ Environmental Impact Statement	15-38
Table 15.5-1. Ranking Potential Effects on Fish	15-45
Table 15.5-2. Ranking Potential Effects on Fish Habitat	15-45
Table 15.5-3. Tissue Metal Concentrations of Dolly Varden in the Baseline Fish and Fish Habitat Study Area, 2008 to 2013	15-50
Table 15.6-1. Potential Residual Effects on Fish Valued Component due to Direct Mortality	15-61
Table 15.6-2. Potential Residual Effects on Fish Valued Component due to Erosion and Sedimentation.....	15-61
Table 15.6-3. Potential Residual Effects on Fish Habitat Valued Component due to Erosion and Sedimentation.....	15-62
Table 15.6-4. Potential Residual Effects on Fish Valued Component due to Change in Water Quality...	15-64
Table 15.6-5. Potential Residual Effects on Fish Habitat Valued Component due to Habitat Loss ...	15-69
Table 15.7-1. Definitions of Characterization Criteria for Residual Effects on Fish and Fish Habitat ...	15-69
Table 15.7-2. Characterization of Residual Effects, Significance, Likelihood and Confidence on Fish ...	15-71
Table 15.7-3. Characterization of Residual Effects, Significance, Likelihood and Confidence on Fish Habitat.....	15-73
Table 15.8-1. Summary of Residual Effects, Mitigation, and Significance on Fish and Fish Habitat	15-76
Table 15.9-1. Potential Cumulative Effect Interactions for Fish and Fish Habitat.....	15-78
Table 15.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Fish and Fish Habitat and Other Projects and Activities	15-83

Table 15.9-3. Summary of Cumulative Residual Effects on Fish and Fish Habitat	15-86
Table 15.9-4. Significance Determination of Cumulative Residual Effects for Fish - Future Case with the Project	15-89
Table 15.9-5. Significance Determination of Cumulative Residual Effects for Fish Habitat - Future Case with the Project.....	15-91
Table 15.10-1. Predicted Changes to Fish and Fish Habitat	15-93
Table 16.3-1. BEC Units in the Regional Study Area	16-14
Table 16.3-2. BEC Unit Summary within Sub-areas of the Terrestrial Ecosystems Local Study Area	16-20
Table 16.3-3. Surficial Material Summary within Sub-areas of the Terrestrial Ecosystems Local Study Area	16-27
Table 16.3-4. Listed Ecosystems Mapped or Predicted in the Study Areas.....	16-34
Table 16.3-5. Listed Ecosystems Mapped within Each Sub-area of the Local Study Area	16-35
Table 16.3-6. Distribution of Culturally/Economically Important Plant Species Habitat.....	16-36
Table 16.3-7. Rare Plant Habitat Types within the Local Study Area	16-48
Table 16.4-1. Interaction of Project Components and Physical Activities with Terrestrial Ecology Receptor Valued Components.....	16-50
Table 16.4-2. Terrestrial Ecology Receptor Valued Components Included in the Application/EIS....	16-55
Table 16.5-1a. Example of Probability Rating for Fugitive Dust Effects.....	16-68
Table 16.5-1b. Example of Consequence Rating for the Function of Ecologically Valuable Soils	16-75
Table 16.5-2a. Probability Ratings for Potential Project Effects	16-83
Table 16.5-2b. Consequence Ratings for Terrestrial Ecosystem Function.....	16-84
Table 16.5-3a. Risk to Alpine Ecosystems within the Brucejack Mine Site Sub-area	16-93
Table 16.5-3b. Risk to Alpine Ecosystems within the Brucejack Access Road Sub-area	16-93
Table 16.5-3c. Risk to Alpine Ecosystems within the Brucejack Transmission Line Sub-area.....	16-94
Table 16.5-4a. Risk to Parkland Ecosystems within the Brucejack Mine Site Sub-area	16-94
Table 16.5-4b. Risk to Parkland Ecosystems within the Brucejack Access Road Sub-area	16-95
Table 16.5-4c. Risk to Parkland Ecosystems within the Transmission Line Sub-area.....	16-95
Table 16.5-5a. Risk to Forested Ecosystems within the Brucejack Mine Site Sub-area	16-96
Table 16.5-5b. Risk to Forested Ecosystems within the Brucejack Access Road Site Sub-area.....	16-96
Table 16.5-5c. Risk to Forested Ecosystems within the Brucejack Transmission Line Sub-area.....	16-97
Table 16.5-6. Risk to Floodplain Ecosystems within the Brucejack Access Road Sub-area.....	16-98

TABLE OF CONTENTS

Table 16.5-7. Risk to Rare Ecosystems within the Brucejack Access Road Sub-area	16-98
Table 16.5-8. Loss of Culturally/Economically Important Plant Habitat within Each of the Sub-areas..	16-100
Table 16.5-9. Rare Plant or Lichen Species Potentially Altered by the Brucejack Gold Mine Project Activities by Sub-area	16-103
Table 16.5-10. Summary Results of Potential Phosphorous Deposition on Rare Plants and Lichens from the Brucejack Mine Site Sub-area	16-115
Table 16.5-11. Summary of Rare Plant or Lichen Species that May Be Affected by the Use of the Brucejack Access Road Sub-area.....	16-116
Table 16.5-12. Summary of Rare Plant or Lichen Species that May Be Affected by the Construction of the Brucejack Transmission Line	16-116
Table 16.5-13. Summary of Key Effects on Terrestrial Ecology VCs by Risk	16-117
Table 16.5-14. Rare Ecosystems Potentially Altered within the Brucejack Access Road Sub-area .	16-117
Table 16.5-15. Loss of Culturally/Economically Important Plant Habitat within each of the Sub-areas.	16-118
Table 16.5-16. List of Rare Plants and Lichens Associated with Potential Alteration of Habitat by the Brucejack Gold Mine Project	16-118
Table 16.6-1. Summary of Predicted Potential Residual Effects on Alpine Ecosystems	16-123
Table 16.6-2. Summary of Predicted Potential Residual Effects on Parkland Ecosystems	16-124
Table 16.6-3. Summary of Predicted Residual Effects on Forested Ecosystems	16-124
Table 16.6-4. Summary of Predicted Residual Effects on Floodplain Ecosystems	16-125
Table 16.6-5. Summary of Predicted Residual Effects on Culturally/Economically Important Plants ..	16-125
Table 16.6-6. Summary of Predicted Residual Effects on Rare Plants and Lichens.....	16-126
Table 16.7-1. Definitions of Characterization Criteria for Residual Effects on Terrestrial Ecology Receptor Valued Components	16-126
Table 16.7-2. Magnitude Threshold for Each Terrestrial Ecology Receptor Valued Component by Risk Category.....	16-127
Table 16.7-3. Magnitude Threshold for Rare Plants and Lichens	16-128
Table 16.8-1. Characterization of Residual Effects, Significance, Confidence, and Likelihood on Terrestrial Ecology Receptor Valued Components.....	16-130
Table 16.9-1. Summary of Residual Effects, Mitigation, and Significance on Terrestrial Ecology Receptor Valued Components	16-135
Table 16.10-1. Potential Cumulative Effect Interactions for Terrestrial Ecology Receptor Valued Components	16-137
Table 16.10-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Terrestrial Ecology Receptor Valued Component and Other Projects and Activities	16-143

Table 16.10-3a. Cumulative Loss of Alpine Ecosystems by Project within the Cumulative Effects Assessment Boundary	16-145
Table 16.10-3b. Cumulative Loss of Forested Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-148
Table 16.10-3c. Cumulative Loss of Floodplain Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-154
Table 16.10-3d. Cumulative Loss of Terrestrial Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-155
Table 16.10-4a. Cumulative Loss of Alpine Ecosystems by Project within the Cumulative Effects Assessment Boundary	16-156
Table 16.10-4b. Cumulative Loss of Forested Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-161
Table 16.10-4c. Cumulative Loss of Floodplain Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-171
Table 16.10-4d. Cumulative Loss of Terrestrial Ecosystems by Project within the Cumulative Effects Assessment Boundary.....	16-173
Table 16.10-5. Cumulative Loss of Rare Plants and Lichens within the Cumulative Effects Assessment Boundary	16-175
Table 16.10-6. Cumulative Alteration of Rare Plants and Lichens within the Cumulative Effects Assessment Boundary	16-176
Table 16.10-7. Summary of Cumulative Residual Effects on Terrestrial Ecology Receptor Valued Components	16-179
Table 16.10-8. Magnitude Threshold for each Terrestrial Ecology Receptor Valued Components ..	16-180
Table 16.10-9. Significance Determination of Cumulative Residual Effects for Terrestrial Ecology: Future Case with the Project	16-183
Table 16.11-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Terrestrial Ecology.....	16-187
Table 17.3-1. Wetland Function and Associated Fieldwork Component	17-8
Table 17.3-2. Area and Occurrence of Wetland Associations in the Wetlands Local Study Area.....	17-11
Table 17.3-3. Occurrence of Wetland Associations in the Wetlands Local Study Area.....	17-12
Table 17.3-4. Overview of General Wetland Functions.....	17-12
Table 17.3-5. Summary of Functions and Values by Wetland Classes	17-13
Table 17.4-1. Interaction of Project Components and Physical Activities with Wetland Receptor Valued Components	17-19
Table 17.4-2. Wetlands Receptor Valued Components included in the Application for an Environmental Assessment Certificate / Environmental Impact Statement	17-23

TABLE OF CONTENTS

Table 17.5-1. Ranking Potential Effects on Wetlands.....	17-36
Table 17.5-2. Wetland Buffer Guidelines	17-40
Table 17.6-1. Summary of Predicted Residual Effects on Wetland Function	17-41
Table 17.6-2. Probability Ratings for Wetlands for the Project.....	17-42
Table 17.6-3. Example of Probability Ratings for Project Sedimentation and Water Quality Effects ...	17-45
Table 17.6-4. Consequence Ratings for Wetlands for the Project	17-45
Table 17.6-5. Example of Consequence Ratings for Wetland Habitat Function	17-46
Table 17.6-6. Probability of Hydrological Connectivity Effects by Wetland Class	17-47
Table 17.6-7. Probability of Fragmentation Effects by Wetland Class.....	17-47
Table 17.6-8. Total Area of Low, Moderate and High Probable Effects Caused by Edge Effect by Wetland Class	17-48
Table 17.6-9. Probability of Dust Effects by Wetland Class.....	17-48
Table 17.6-10. Probability of Sedimentation Effects by Wetland Class.....	17-49
Table 17.6-11. Probability of Invasive Species Effects by Wetland Class.....	17-49
Table 17.6-12. Probability of Effects on Wetland Function.....	17-50
Table 17.6-13. Total Area of Wetlands with Identified Listed Species or Ecosystems by Wetland Class ..	17-50
Table 17.6-14. Total Area of Low, Moderate, and High Hydrologic Function by Wetland Class.....	17-53
Table 17.6-15. Total Area of Low, Moderate, and High Biochemical Function by Wetland Class.....	17-53
Table 17.6-16. Total Area of Low, Moderate, and High Functional Diversity by Wetland Class.....	17-54
Table 17.6-17. Total Area of Low, Moderate, and High Habitat Function by Wetland Class.....	17-54
Table 17.6-18. Consequence Rating of Wetland Functions by Wetland Class	17-57
Table 17.6-19. Wetland Risk Ratings Shown by Wetland Class	17-57
Table 17.7-1. Definitions of Characterization Criteria for Residual Effects on Wetlands	17-61
Table 17.7-2. Magnitude Threshold for Wetlands Grouped by Risk Category.....	17-63
Table 17.7-3. Characterization of Residual Effects, Significance, Confidence, and Likelihood on Wetlands	17-64
Table 17.9-1. Potential Cumulative Effect Interactions for Wetlands	17-67
Table 17.9-2. Potential Cumulative Effects between the Proposed Brucejack Gold Mine Project Wetlands and Other Projects and Activities	17-71
Table 17.9-3. Potential Cumulative Effects on Wetland Function and Extent from Past, Present, and Reasonably Foreseeable Future Projects	17-72

Table 17.9-4. Summary of Cumulative Residual Effects on Wetlands.....	17-73
Table 17.9-5. Significance Determination of Cumulative Residual Effects for Wetlands – Future Case with the Project.....	17-76
Table 17.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Wetlands.....	17-77
Table 18.2-1. Wildlife Objectives of the Cassiar Iskut-Stikine Land and Resource Management Plan and Nass South Sustainable Resource Management Plan.....	18-3
Table 18.3-1. Species of Conservation Concern Potentially Occurring within the Wildlife Local Study Area and Regional Study Area	18-12
Table 18.3-2. Wildlife Species or Groups of Regional Interest within the Wildlife RSA.....	18-14
Table 18.3-3. Baseline Study Objectives for Brucejack Gold Mine Project Wildlife Valued Components	18-18
Table 18.3-4. Data Sources Used to Supplement the Brucejack Gold Mine Project Wildlife Baseline Studies	18-20
Table 18.3-5. Summary of Wildlife Inventories within or near the Project Regional Study Area	18-20
Table 18.4-1. Interaction of Project Components and Physical Activities with All Wildlife	18-58
Table 18.4-2. Wildlife Valued Components Included in the Application/EIS.....	18-63
Table 18.4-3. Wildlife Valued Components Excluded from the Application/EIS	18-65
Table 18.4-4. Wildlife Effects Identified during Scoping	18-69
Table 18.5-1. Access Road Vehicle Traffic (One-way Trips) during Operation Phase	18-76
Table 18.5-2. Potential Effects that May Cause Direct Mortality to Wildlife Valued Components....	18-77
Table 18.5-3. Sources of Chemicals of Potential Concern Evaluated for Valued Components	18-82
Table 18.5-4. Wildlife Guidelines for Water Quality	18-85
Table 18.5-5. Predicted Water Concentrations of COPCs that Exceed Water Quality Guidelines for Wildlife and Baseline Conditions at Brucejack Lake and Brucejack Creek	18-87
Table 18.6-1. Ranking Potential Effects on Moose.....	18-94
Table 18.6-2. Moose Habitat Loss and Alteration due to the Project	18-95
Table 18.6-3. Ranking Potential Effects on Mountain Goats.....	18-110
Table 18.6-4. Mountain Goat Habitat Loss and Alteration due to the Project	18-112
Table 18.6-5. Ranking Potential Effects on Grizzly Bears.....	18-132
Table 18.6-6. Grizzly Bear Habitat Loss and Alteration due to the Project.....	18-135
Table 18.6-7. Ranking Potential Effects on American Marten	18-153
Table 18.6-8. Ranking Potential Effects on Hoary Marmots.....	18-162

TABLE OF CONTENTS

Table 18.6-9. Ranking Potential Effects on Bats	18-170
Table 18.6-10. Ranking Potential Effects on Raptors	18-182
Table 18.6-11. Raptor Nesting and Short-eared Owl Breeding Habitat Loss and Alteration due to the Project	18-184
Table 18.6-12. Ranking Potential Effects on Migratory Waterbirds	18-200
Table 18.6-13. Wetland Bird, Cavity-nesting Waterfowl, and Riverine Bird Habitat Loss and Alteration due to the Project	18-201
Table 18.6-14. Functional Loss of Suitable Wetland Bird, Cavity-nesting Waterfowl, and Riverine Bird Habitat due to Sensory Disturbance during Construction and Operation.....	18-215
Table 18.6-15. Ranking Potential Effects on Migratory Landbirds	18-229
Table 18.6-16. Landbird Habitat Loss and Alteration due to the Project Infrastructure	18-231
Table 18.6-17. Ranking Potential Effects on Western Toads	18-234
Table 18.7-1. Significance Determination Criteria of Residual Effects for Wildlife	18-247
Table 18.7-2. Summary of Residual Effects on Moose	18-249
Table 18.7-3. Summary of Residual Effects on Mountain Goats.....	18-252
Table 18.7-4. Summary of Residual Effects on Grizzly Bears	18-255
Table 18.7-5. Summary of Residual Effects on American Marten.....	18-260
Table 18.7-6. Summary of Residual Effect on Western Toads.....	18-262
Table 18.8-1. Summary of Residual Effects, Mitigation, and Significance on Wildlife	18-263
Table 18.9-1. Residual Effects Predicted from the Wildlife Application/EIS	18-266
Table 18.9-2. Potential Cumulative Effect Interactions for Wildlife	18-267
Table 18.9-3. CEA Area and Movement Area Rationale for Each Wildlife Valued Component.....	18-275
Table 18.9-4. Potential Cumulative Effects between the Brucejack Gold Mine Project Moose and Other Projects and Activities.....	18-278
Table 18.9-5. Spatially Linked Projects or Activities Scoped Out of the Moose Cumulative Effects Assessment	18-279
Table 18.9-6. Potential Cumulative Effects between the Brucejack Gold Mine Project Mountain Goats and Other Projects and Activities	18-279
Table 18.9-7. Spatially Linked Projects or Activities Scoped Out of the Mountain Goat Cumulative Effects Assessment	18-280
Table 18.9-8. Potential Cumulative Effects between the Brucejack Gold Mine Project Grizzly Bears and Other Projects and Activities.....	18-280

Table 18.9-9. Spatially Linked Projects or Activities Scoped Out of the Grizzly Bear Cumulative Effects Assessment	18-282
Table 18.9-10. Potential Cumulative Effect between the Brucejack Gold Mine Project American Marten and Other Projects and Activities.....	18-283
Table 18.9-11. Spatially Linked Projects and Activities Scoped Out of the American Marten Cumulative Effects Assessment	18-283
Table 18.9-12. Potential Cumulative Effect between the Brucejack Gold Mine Project Western Toad and Other Projects and Activities	18-284
Table 18.9-13. Projects Scoped Out from the Western Toad Cumulative Effects Assessment	18-284
Table 18.9-14. Traffic Data for Projects within the Brucejack Moose Cumulative Effects Assessment Boundaries	18-286
Table 18.9-15. Traffic Data for Projects within the Brucejack Gold Mine Project Grizzly Bear CEA Boundaries	18-290
Table 18.9-16. Summary of Cumulative Residual Effects on Wildlife	18-297
Table 18.9-17. Significance Determination of Cumulative Residual Effects for Moose - Future Case with the Project.....	18-299
Table 18.9-18. Significance Determination of Cumulative Residual Effects for Mountain Goats - Future Case with the Project	18-301
Table 18.9-19. Significance Determination of Cumulative Residual Effects for Grizzly Bears - Future Case with the Project	18-303
Table 18.9-20. Significance Determination of Cumulative Residual Effect for American Marten - Future Case with the Project	18-307
Table 18.9-21. Significance Determination of Cumulative Residual Effect for Western Toads - Future Case with the Project	18-309
Table 18.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Wildlife	18-310
Table 19.3-1. Regional Study Area Population (1996 to 2011)	19-3
Table 19.3-2. Labour Force by Industry, 2011.....	19-4
Table 19.3-3. Labour Force Status in the Regional Study Area, 2011	19-5
Table 19.3-4. Income in the Regional Study Area, 2011.....	19-6
Table 19.3-5. Timeline of Selected Past and Current Mines in the Vicinity of the Project	19-7
Table 19.3-6. Local Study Area Community Population Trends, 1996 to 2011	19-12
Table 19.3-7. Labour Force Status in the Local Study Area, 2011	19-15
Table 19.3-8. Income in the Local Study Area, 2011.....	19-16

TABLE OF CONTENTS

Table 19.4-1. Interaction of Project Components and Physical Activities with Economic Valued Components	19-20
Table 19.4-2. Economic Valued Components Included in the Application/EIS	19-21
Table 19.4-3. Economic Benefits of the Project within British Columbia	19-23
Table 19.5-1. Ranking Potential Effects on the Labour Market	19-26
Table 19.5-2. Average Project-related Wage Estimates.....	19-30
Table 19.5-3. British Columbia Industrial Comparison of Average Annual Earnings, 2012.....	19-30
Table 19.6-1. Summary of Residual Effects on Labour Market	19-33
Table 19.7-1. Characterization of Residual Economic Effects, Significance, Confidence, and Likelihood – Labour Market.....	19-36
Table 19.8-1. Summary of Residual Effects, Mitigation, and Significance on the Economy.....	19-39
Table 19.9-1. Potential Economic Cumulative Effect Interactions for Economic Environment.....	19-42
Table 19.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project and Other Projects and Activities	19-44
Table 19.10-1. Summary of Cumulative Residual Effects on the Economy.....	19-50
Table 19.11-1. Significance Determination of Cumulative Residual Effects on Labour Market - Future Case with the Project	19-51
Table 19.11-2. Summary of Project and Cumulative Residual Economic Effects, Mitigation, and Significance.....	19-53
Table 20.3-1. Timeline of Past and Current Mines in the Regional Study Area and Vicinity	20-4
Table 20.3-2. Secondary Information and Data Sources	20-7
Table 20.3-3. Regional Study Area Population (1996 to 2011)	20-10
Table 20.3-4. Population in the Project’s Regional and Local Economic Study Area.....	20-11
Table 20.4-1. Interaction of Project Components and Physical Activities with Social Environment....	20-26
Table 20.4-2. Identification and Rationale for Social Valued Component Selection	20-27
Table 20.6-1. Summary of Residual Effects on the Social Environment	20-50
Table 20.7-1. Definition of Characterization Criteria for Residual Effects on Social Environment ...	20-53
Table 20.7-2. Significance of Increased Demand for Educational Programs in the Local Study Area....	20-55
Table 20.7-3. Significance of Increased Demand for Infrastructure and Housing as a Result of Population In-migration	20-56
Table 20.7-4. Significance of Increased Demand on Health and Social Services	20-56
Table 20.7-5. Significance of Increase in Transient Workers Coming into the Local Study Area Communities	20-57

Table 20.7-6. Significance of Increased Levels of Stress and Anxiety on Families due to Rotational Work	20-58
Table 20.7-7. Significance of Increase in Poor Lifestyle Choices	20-58
Table 20.7-8. Characterization of Residual Effects, Significance, Confidence and Likelihood on Social Environment.....	20-61
Table 20.8-1. Summary of Residual Effects, Mitigation, and Significance on Social Environment....	20-63
Table 20.9-1. Potential Cumulative Effect Interactions for Social Environment.....	20-66
Table 20.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Social Environment and Other Projects and Activities	20-72
Table 20.9-3. Summary of Cumulative Residual Effects on Social Environment	20-78
Table 20.9-4. Significance of Cumulative Effect of Increased Demand for Educational Programs in the Local Study Area.....	20-80
Table 20.9-5. Significance of Cumulative Effect of Increased Demand for Infrastructure and Housing as a Result of Population In-migration	20-81
Table 20.9-6. Significance of Cumulative Effect of Increased Demand on Health and Social Services	20-82
Table 20.9-7. Significance of Cumulative Effect of Increase in Local Study Area Communities' Transient Workers	20-82
Table 20.9-8. Significance of Cumulative Effect of Increased Levels of Stress and Anxiety on Workers and Families due to Rotational Work	20-83
Table 20.9-9. Significance of Cumulative Effect of Increase in Poor Lifestyle Choices.....	20-83
Table 20.9-10. Significance Determination of Cumulative Residual Effects for Social Environment - Future Case with and without the Project	20-85
Table 20.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Social Environment	20-88
Table 21.2-1. Common Noise Metrics	21-3
Table 21.2-2. Federal and Provincial Ambient Air Quality Criteria.....	21-4
Table 21.2-3. Provincial and Federal Drinking Water Quality Guidelines	21-5
Table 21.3-1. Summary of Ambient Criteria Air Contaminant Concentrations from Other Sources ...	21-11
Table 21.3-2. Summary of Dustfall Deposition Rates from Other Sources	21-12
Table 21.3-3. Baseline Water Quality of Brucejack Lake, Brucejack Gold Mine Project	21-20
Table 21.3-4. Baseline Water Quality of Knipple Lake / Bowser River Watershed Sampling Sites, Brucejack Gold Mine Project	21-23
Table 21.3-5. Baseline Water Quality of Wildfire Creek/Scott/Todedada Watersheds Sampling Sites, Brucejack Gold Mine Project	21-27

TABLE OF CONTENTS

Table 21.3-6. Country Foods Selected for Evaluation.....	21-39
Table 21.3-7. Human Receptor Ingestion Rates.....	21-39
Table 21.3-8. Human Receptor Consumption Frequencies.....	21-40
Table 21.3-9. Recommended Maximum Weekly Intake and Number of Servings of Country Food ...	21-41
Table 21.3-10. Estimated Lifetime Daily Exposure and Incremental Lifetime Cancer Risk for Adult Human Receptors Exposed to Arsenic in Country Foods.....	21-42
Table 21.4-1. Interaction of Project Components and Physical Activities with Human Health.....	21-46
Table 21.4-2. Human Receptor Sub-components Included in the Application/EIS.....	21-50
Table 21.5-1. Ranking Potential Effects on Human Health by Sub-components	21-63
Table 21.5-2. Project Noise Guidelines.....	21-68
Table 21.5-3. Selected Noise Guidelines for Worker and Non-worker Receptor Locations.....	21-70
Table 21.6-1. Predicted Construction and Operation Noise Levels at the Worker Camp Receptor Locations.....	21-84
Table 21.6-2. Predicted Construction Phase Noise Levels for the Non-worker Receptor Locations ..	21-84
Table 21.6-3. Predicted Operation Phase Noise Levels for the Non-worker Receptor Locations	21-84
Table 21.6-4. Selection of Criteria Air Contaminants at Human Receptor Locations during the Construction Phase	21-85
Table 21.6-5. Selection of Criteria Air Contaminants at Human Receptor Locations during the Operation Phase	21-93
Table 21.6-6. Criteria Air Contaminants of Concern at Human Receptor Locations during Construction and Operation Phases of the Project	21-95
Table 21.6-7. Risk Characterization for Criteria Air Contaminants that Exceeded Guidelines at Human Receptor Locations during the Construction Phase	21-99
Table 21.6-8. Risk Characterization for Criteria Air Contaminants that Exceeded Guidelines at Human Receptor Locations during the Operation Phase	21-103
Table 21.6-9. Country Foods Selected for Evaluation.....	21-107
Table 21.6-10. Human Receptor Ingestion Rates	21-109
Table 21.6-11. Human Receptor Consumption Frequencies	21-109
Table 21.6-12. Selection of Contaminants of Potential Concern Based on Soil Quality during the Construction Phase for the Country Foods Effects Assessment	21-113
Table 21.6-13. Selection of Contaminants of Potential Concern based on Soil Quality during the Operation Phase for the Country Foods Effects Assessment	21-114
Table 21.6-14. Site-specific Selenium Biotransfer Factor for Soil-to-Vegetation in the Operation Phase	21-115

Table 21.6-15. Summary of Predicted Concentration of Selenium in Environmental Media during the Operation Phase	21-117
Table 21.6-16. Predicted Concentrations of Selenium in Country Foods during the Operation Phase Using Food Chain Modelling.....	21-117
Table 21.6-17. Estimated Daily Intake of Selenium by Human Receptors.....	21-118
Table 21.6-18. Human Exposure Ratios Based on Predicted Selenium Tissue Concentrations.....	21-119
Table 21.6-19. Summary of Residual Effects on Human Health	21-122
Table 21.7-1. Definitions of Characterization Criteria for Residual Effects on Human Health due to Noise	21-124
Table 21.7-2. Definitions of Characterization Criteria for Residual Effects on Human Health due to Air Quality and Drinking Water	21-125
Table 21.7-3. Characterization of Residual Effects, Significance, Confidence and Likelihood on Human Health.....	21-127
Table 21.8-1. Summary of Residual Effects, Mitigation, and Significance on Human Health due to Noise, Air Quality, and Drinking Water	21-134
Table 21.9-1. Potential Cumulative Effect Interactions for Human Health	21-138
Table 21.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Human Health and Other Projects and Activities	21-149
Table 21.9-3. Screening of Criteria Air Contaminants during the Operation Phase for Future Case without the Project at Human Receptor Locations at the Brucejack Gold Mine Project....	21-153
Table 21.9-4. Screening of Criteria Air Contaminants during the Operation Phase for Future Case with the Project at Human Receptor Locations at the Brucejack Gold Mine Project	21-155
Table 21.9-5. Risk Characterization for Future Case with the Project for Criteria Air Contaminants at Human Receptor Locations during the Operation Phase	21-157
Table 21.9-6. Summary of Cumulative Residual Effects on Human Health	21-158
Table 21.9-7. Significance Determination of Cumulative Residual Effects for Human Health - Future Case with the Project	21-159
Table 21.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Human Health	21-162
Table 22.2-1. Heritage Resources Legislation, Policy, Standards, and Guidelines	22-3
Table 22.3-1. Protected Archaeological Sites within the Regional Study Area	22-20
Table 22.4-1. Interaction of Project Components and Physical Activities with Heritage Resources....	22-27
Table 22.4-2. Heritage Resources Valued Sub-component Included in the Application for an Environmental Assessment Certificate / Environmental Impact Statement	22-31
Table 22.4-3. Heritage Resources Valued Components Excluded from the Application for an Environmental Assessment Certificate / Environmental Impact Statement	22-32

TABLE OF CONTENTS

Table 22.5-1. Ranking Potential Effects on Heritage Resources	22-35
Table 22.8-1. Summary of Assessment of Potential Environmental Effects for Heritage Resources.....	22-39
Table 23.2-1. Navigable Waters Legislation, Policy, Standards, and Guidelines.....	23-2
Table 23.3-1. Waterways Included in Brucejack Gold Mine Project Navigation Assessment.....	23-15
Table 23.3-2. Navigation Consultation Efforts and Feedback	23-17
Table 23.4-1. Interaction of Project Components and Physical Activities with Navigation	23-21
Table 23.4-2. Navigation Receptor Valued Components Included in the Application/EIS	23-25
Table 23.5-1. Ranking Potential Effects on Navigation	23-27
Table 23.5-2. Changes in Mean Annual Flows Compared to Baseline Conditions (% of Baseline Flows) ..	23-31
Table 23.6-1. Summary of Potential Effects, Mitigation, and Significance on Navigation.....	23-33
Table 24.2-1. Land Use Legislation and Policies	24-1
Table 24.3-1. Information Sources Reviewed.....	24-4
Table 24.3-2. Summary of Land Use in the LSA and RSA	24-6
Table 24.3-3. Guide Outfitting Licence Areas in the Land Use Study Areas	24-11
Table 24.3-4. Trapline Licence Areas within the Land Use Study Areas	24-13
Table 24.3-5. Summary of Commercial Recreation Licence Holders	24-16
Table 24.3-6. Summary of Forest Licence Holders in the Land Use Study Areas.....	24-18
Table 24.3-7. Water Licences in the Land Use Study Areas.....	24-19
Table 24.4-1. Interaction of Project Components and Physical Activities with Commercial and Non-commercial Land Use	24-25
Table 24.4-2. Land Use Receptor Valued Components Included in the Application/EIS	24-29
Table 24.7-1. Definitions of Residual Effects Criteria for Land Use	24-40
Table 24.7-2. Summary of Residual Effects on Commercial Land Use	24-40
Table 24.7-3. Characterization of Residual Effects, Confidence, Likelihood, and Significance for Commercial Land Uses.....	24-41
Table 24.8-1. Summary of Residual Effects, Mitigation, and Significance on Commercial Land Uses ...	24-43
Table 24.9-1. Potential Cumulative Effect Interactions for Land Use	24-45
Table 24.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project Land Use and Other Projects and Activities	24-49
Table 24.9-3. Summary of Cumulative Residual Effects on Commercial Land Use	24-51

Table 24.9-4. Significance Determination of Cumulative Residual Effects on Commercial Land Uses - Future Case with the Project	24-53
Table 24.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Land Use	24-53
Table 25.3-1. Fish Resources Harvested by Skii km Lax Ha, Nisga'a, Tahltan, and Métis	25-5
Table 25.3-2. Wildlife Species Harvested by Skii km Lax Ha, Nisga'a, Tahltan, and Métis	25-5
Table 25.3-3. Plant Species Harvested by Skii km Lax Ha, Nisga'a Nation, Tahltan, and Métis.....	25-6
Table 25.4-1. Valued Components and Indicators for Current Aboriginal Use.....	25-23
Table 25.4-2. Interaction of Project Components and Activities with Current Aboriginal Use	25-24
Table 25.4-3. Current Aboriginal Use: Receptor Valued Components Included in the Application/EIS ..	25-28
Table 25.4-4. Current Aboriginal Use: Receptor Valued Components Excluded from the Application/EIS	25-29
Table 25.6-1. Summary of Residual Effects related to Hunting and Trapping Opportunities and Practices	25-44
Table 25.7-1. Characterization of Residual Effects related to a Change in Distribution and Abundance of Wildlife	25-46
Table 25.7-2. Significance Rating for Effects of Change in the Abundance and Distribution of Resources on Skii km Lax Ha Hunting and Trapping Opportunities and Practices	25-47
Table 25.7-3. Characterization of Residual Effects, Significance, Confidence and Likelihood on Hunting and Trapping Opportunities and Practices	25-48
Table 25.8-1. Summary of Residual Effects, Mitigation, and Significance on Current Aboriginal Use ...	25-48
Table 25.9-1. Potential Cumulative Effect Interactions for Hunting and Trapping Opportunities and Practices.....	25-51
Table 25.9-2. Potential Cumulative Effects between the Brucejack Gold Mine Project and Other Projects and Activities on Hunting and Trapping Opportunities and Practices.....	25-57
Table 25.9-3. Key Design and Mitigation Actions to Reduce Potential Effects on Wildlife VCs.....	25-58
Table 25.9-4. Potential Effects Evaluated for Wildlife VCs and Residual Effects	25-59
Table 25.9-5. Summary of Cumulative Residual Effects on Current Aboriginal Use	25-62
Table 25.9-6. Significance Determination of Cumulative Residual Effects for Hunting and Trapping Opportunities and Practices – Future Case with the Project	25-64
Table 25.10-1. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Current Aboriginal Use	25-65
Table 26.1-1. Percentage of Overlap of Skii km Lax Ha and Tahltan Asserted Traditional Territories with Proposed Project Footprint	26-3

TABLE OF CONTENTS

Table 26.3-1. Issues Identified by Aboriginal Groups during Consultation Activities (excluding AIR comments)	26-16
Table 26.6-1. Links between Aboriginal Rights, VCs, Effects, Mitigation, and Significance Conclusions in the Application/EIS	26-29
Table 26.9-1. Summary of Potential Effects on Aboriginal Groups Rights and Accommodation Measures	26-42
Table 27.2-1. Nisga'a Nation Community Populations: March 2014	27-7
Table 27.2-2. Nisga'a Kinship Structure	27-7
Table 27.3-1. Issues identified by Nisga'a Lisims Government and Nisga'a Village Governments (until May 16, 2014).....	27-16
Table 27.7-1. Summary of Potential Effects on Nisga'a Nation Treaty Rights and Accommodation Measures	27-42
Table 29.2-1. Federal and Provincial Ambient Air Quality Criteria.....	29-4
Table 29.2-2. GHG Emission Legislation and Initiatives	29-5
Table 29.2-3. Monitoring Schedule	29-9
Table 29.7-1. Typical Dangerous Goods and Hazardous Materials on Site by Project Phase	29-39
Table 29.8-1. Protected Heritage Sites within the RSA.....	29-52
Table 29.10-1. Summary of Monitoring/Sampling Programs associated with Surface Material and Mine Waste	29-64
Table 29.10-2. Summary of Monitoring/Sampling Programs Associated with Mine-related Contact Water	29-66
Table 29.10-3. ML/ARD Prevention and Mitigation Measures for Waste Rock, Ore, and Underground Exposures	29-72
Table 29.10-4. ML/ARD Prevention and Mitigation Measures for Tailings and Paste	29-78
Table 29.10-5. ML/ARD Prevention and Mitigation Measures for Surface Materials	29-80
Table 29.10-6. ML/ARD Prevention and Mitigation Measures for Sludge	29-86
Table 29.14-1. Analysis of Risks per Selected Spill Type	29-114
Table 29.17-1. Typical Domestic, Industrial, Chemical and Hazardous Waste Generated at the Brucejack Gold Mine Project	29-135
Table 29.17-2. Waste Types, Treatment and Disposal	29-138
Table 29.19-1. Water Management Performance Objectives and Corresponding Management Measures	29-154
Table 29.19-2. Water Management Monitoring Variables, Frequency, and Expected Targets.....	29-166
Table 29.19-3. Water Management Reporting Requirements, Frequency, and Responsibilities.....	29-166

Table 29.20-1. Proposed Wetland Monitoring Sites	29-168
Table 29.20-2. Monitoring Schedule.....	29-171
Table 29.21-1. Wildlife Sensitive Periods Applicable to the Project	29-176
Table 29.21-2. Actions to Achieve Wildlife Management Targets during Operation.....	29-182
Table 29.21-3. Management Plans Describing Mitigation and Management Measures Applicable to Wildlife and Wildlife Habitat, and Associated Project Phases	29-192
Table 29.21-4. Frequency of Monitoring Activities for the Wildlife Effects Monitoring Program ...	29-192
Table 29.22-1. Statutory Reporting Requirements for the Project.....	29-194
Table 30.4-1. Potential Soil Salvage in the Brucejack Mine Site Footprint	30-15
Table 30.4-2. Potential Soil Salvage in the Bowser Aerodrome Facility	30-19
Table 30.4-3. Potential Soil Salvage along the Access Road	30-25
Table 30.5-1. Constructed Pads in the Brucejack Mine Site	30-38
Table 30.5-2. Disturbed Areas along the Brucejack Access Road	30-49
Table 30.10-1. Labour and Equipment Costs for Closure of Infrastructure	30-58
Table 30.10-2. Site Preparation, Reclamation, and Material Costs	30-59
Table 30.11-1. Monitoring Costs Estimated Over the Three Year Post-closure Period.....	30-61
Table 31.5-1. FMEA Workshop Participants	31-4
Table 31.5-2. FMEA Worksheet Column Heading Synopsis	31-5
Table 31.5-3. Criteria for Likelihood of Failure Modes	31-8
Table 31.5-4. Criteria for Severity of Failure Modes	31-9
Table 31.5-5. Criteria for Overall Risk Matrix	31-10
Table 31.6-1. Summary of Risk Ranks.....	31-10
Table 31.6-2. Risk Level by Impact Category.....	31-10
Table 31.6-3. Summary of Identified Environmental Risks.....	31-12
Table 31.6-4. Risk Register - Low Environmental Risks	31-13
Table 31.6-5. Risk Register - Medium Environmental Risks	31-17
Table 31.6-6. Description, Prevention, and Responses to Potential Medium Environmental Risk Failure Modes	31-21
Table 31.7-1. Interaction of Potential Project Failure Modes with Intermediate and Receptor Valued Component Subject Areas	31-27
Table 31.7-2. Characteristics and Descriptors for Environmental Assessment	31-28

TABLE OF CONTENTS

Table 31.7-3. Assessment of Intermediate Risks on Intermediate Receptor Valued Components	31-31
Table 32.2-1. Meteorological Service of Canada Weather Stations near the Project Area	32-3
Table 32.2-2. Precipitation-related Risks and Mitigation Measures	32-5
Table 32.2-3. Air Temperature-related Risks and Mitigation Measures	32-9
Table 32.3-1. Physiographic Characteristics of Monitored Watersheds within the Project Area.....	32-12
Table 32.3-2. Flow Conditions in the Project Area	32-13
Table 32.3-3. Estimates of Peak Flows (m ³ /s) at Project Area Hydrometric Stations Based on the Quantile Regression Technique	32-14
Table 32.3-4. Return Period Probabilities in a Single Year, and over the 22-year Proposed Mine Life ...	32-14
Table 32.3-5. Surface Water Flow-related Risks and Mitigation Measures	32-15
Table 32.3-6. Estimated June to September Low Flow Indices for the Watersheds in the Project Area ..	32-17
Table 32.3-7. Estimated Annual Low Flow Indices for the Watersheds in the Project Area	32-17
Table 32.5-1. Exceedance Probability, Risk, and Peak Ground Acceleration for Seismic Events at Brucejack Lake	32-23
Table 32.6-1. Fire Occurrences for Each Decade by Cause in the Project Area.....	32-26
Table 32.7-1. Potential Project Component Sensitivities Arising from Climate Change.....	32-35
Table 33-1. Summary of Federal Areas of Interest under the <i>Canadian Environmental Assessment Act, 2012</i>	33-1
Table 33.1-1. Summary of Residual Effects, Mitigation, and Significance on Fish and Fish Habitat..	33-14
Table 33.1-2. Functional Loss of Suitable Wetland Bird, Cavity-nesting Waterfowl, and Riverine Bird Habitat due to Sensory Disturbance during Construction and Operation	33-16
Table 33.3-1. Federal Decisions and Relevant Project Components and Activities Required for the Brucejack Gold Mine Project	33-25
Table 33.3-2. Summary of Potential Effects, Mitigation, and Significance on Navigation.....	33-28
Table 34.2-1. Past, Present and Reasonably Foreseeable Future Projects with the Potential to Interact with the Brucejack Gold Mine Project	34-7
Table 34.2-2. Past, Present and Reasonably Foreseeable Future Activities with the Potential to Interact with the Brucejack Gold Mine Project	34-12
Table 34.4-1. Potential Cumulative Effect Interactions for Intermediate and Receptor Valued Components	34-19
Table 34.4-2. Potential Cumulative Effects between the Proposed Brucejack Gold Mine Project and Other Projects and Activities	34-23
Table 34.4-3. Summary of Project-specific Predicted Changes after Mitigation for Air Quality	34-33

Table 34.4-4. Predicted Pollutant Increment from KSM Project at Brucejack Gold Mine Project Area ..	34-33
Table 34.4-5. Summary of Predicted Cumulative Changes on Air Quality.....	34-35
Table 34.4-6. Summary of Project-specific Predicted Changes after Mitigation for Noise	34-36
Table 34.4-7. Summary of Predicted Cumulative Changes on Noise	34-38
Table 34.4-8. Summary of Predicted Changes after Mitigation for Hydrogeology	34-39
Table 34.4-9. Summary of Project-specific Predicted Changes after Mitigation for Surface Water Hydrology	34-41
Table 34.4-10. Summary of Predicted Cumulative Changes on Surface Water Hydrology.....	34-46
Table 34.4-11. Footprints of Projects Included in the Cumulative Effects Assessment.....	34-49
Table 34.4-12. Summary of Predicted Cumulative Changes on Terrain and Soils.....	34-51
Table 34.5-1. Summary of Project-specific Residual Effects, Mitigation, and Significance on Climate ..	34-52
Table 34.5-2. Summary of Project-specific Residual Effects, Mitigation, and Significance on Surface Water Quality	34-53
Table 34.5-3. Summary of Cumulative Residual Effects on Surface Water Quality: Mine Site Area ..	34-57
Table 34.5-4. Summary of Residual Effects, Mitigation, and Significance on Aquatic Resources	34-59
Table 34.5-5. Summary of Cumulative Residual Effects on Aquatic Resources	34-64
Table 34.5-6. Summary of Project-specific Residual Effects, Mitigation, and Significance on Fish and Fish Habitat	34-65
Table 34.5-7. Summary of Cumulative Residual Effects on Fish and Fish Habitat	34-71
Table 34.5-8. Significance Determination of Cumulative Residual Effects for Fish	34-73
Table 34.5-9. Significance Determination of Cumulative Residual Effects for Fish Habitat	34-73
Table 34.5-10. Summary of Project-specific Residual Effects, Mitigation, and Significance on Terrestrial Ecology Receptor Valued Components.....	34-77
Table 34.5-11. Summary of Cumulative Residual Effects on Terrestrial Ecology Receptor Valued Components	34-79
Table 34.5-12. Magnitude Threshold for each Terrestrial Ecology Receptor Valued Components	34-80
Table 34.5-13. Significance Determination of Cumulative Residual Effects for Terrestrial Ecology ..	34-82
Table 34.5-14. Characterization of Project-specific Residual Effects, Significance, Confidence, and Likelihood on Wetlands	34-82
Table 34.5-15. Potential Cumulative Effects on Wetland Function and Extent from Past, Present, and Reasonably Foreseeable Future Projects	34-84
Table 34.5-16. Summary of Cumulative Residual Effects on Wetlands	34-87
Table 34.5-17. Significance Determination of Cumulative Residual Effects for Wetlands	34-88

TABLE OF CONTENTS

Table 34.5-18. Summary of Project-specific Residual Effects, Mitigation, and Significance on Wildlife	34-89
Table 34.5-19. Traffic Data for Projects within the Brucejack Gold Mine Project Moose Cumulative Effects Assessment Boundaries.....	34-97
Table 34.5-20. Traffic Data for Projects within the Brucejack Gold Mine Project Grizzly Bear Cumulative Effects Assessment Boundaries.....	34-101
Table 34.5-21. Summary of Cumulative Residual Effects on Wildlife	34-109
Table 34.5-22. Significance Determination of Cumulative Residual Effects for Moose	34-110
Table 34.5-23. Significance Determination of Cumulative Residual Effects for Mountain Goats....	34-110
Table 34.5-24. Significance Determination of Cumulative Residual Effects for Grizzly Bears.....	34-111
Table 34.5-25. Significance Determination of Cumulative Residual Effects for American Marten..	34-111
Table 34.5-26. Significance Determination of Cumulative Residual Effects for Western Toads.....	34-112
Table 34.5-27. Summary of Project-specific Residual Effects, Mitigation, and Significance on the Economy.....	34-112
Table 34.5-28. Summary of Cumulative Residual Effects on the Economy.....	34-118
Table 34.5-29. Significance Determination of Cumulative Residual Effects on Labour Market.....	34-118
Table 34.5-30. Summary of Project-specific Residual Effects, Mitigation, and Significance on Social Environment.....	34-119
Table 34.5-31. Aboriginal Governance in the Regional Study Area	34-123
Table 34.5-32. Summary of Cumulative Residual Effects on Social Environment	34-128
Table 34.5-33. Significance Determination of Cumulative Residual Effects for Social Environment	34-130
Table 34.5-34. Summary of Project-specific Residual Effects, Mitigation, and Significance on Human Health due to Noise, Air Quality, and Drinking Water.....	34-131
Table 34.5-35. Screening of Criteria Air Contaminants during the Operation Phase for Future Case without the Project at Human Receptor Locations at the Brucejack Gold Mine Project	34-143
Table 34.5-36. Screening of Criteria Air Contaminants during the Operation Phase for Future Case with the Project at Human Receptor Locations at the Brucejack Gold Mine Project .	34-145
Table 34.5-37. Risk Characterization for Future Case with the Project for Criteria Air Contaminants at Human Receptor Locations during the Operation Phase	34-147
Table 34.5-38. Summary of Cumulative Residual Effects on Human Health	34-148
Table 34.5-39. Significance Determination of Cumulative Residual Effects for Human Health	34-149
Table 34.5-40. Summary of Project-specific Residual Effects, Mitigation, and Significance on Commercial Land Use.....	34-150
Table 34.5-41. Summary of Cumulative Residual Effects on Commercial Land Use	34-154

Table 34.5-42. Significance Determination of Cumulative Residual Effects for Commercial Land Use Future Case with the Project	34-155
Table 34.5-43. Summary of Residual Effects, Mitigation, and Significance on Current Aboriginal Land and Resource Use	34-156
Table 34.5-44. Summary of Cumulative Residual Effects on Current Aboriginal Land and Resource Use	34-159
Table 34.5-45. Significance Determination of Cumulative Residual Effects for Hunting/Trapping Opportunities and Practices	34-161
Table 35.3-1. Summary of Impacts on Skii km Lax Ha Rights and Interests and Mitigation	35-3
Table 35.3-2. Summary of Impacts on Tahltan Rights and Interests and Mitigation.....	35-5
Table 35.3-3. Summary of Impacts on Nisga'a 8(e) Interests.....	35-8
Table 35.3-4. Summary of Impacts on Métis Rights and Interests and Mitigation.....	35-9
Table 35.4-1. Summary of Residual Project and Cumulative Effects and Mitigation Measures.....	35-11
Table 35.5-1. Follow-up Monitoring Requirements	35-32
Table 35.6-1. Table of Commitments	35-37

List of Plates

PLATE	PAGE
Plate 5.12-1. Schematic of the Proposed Water Treatment Process (Veolia)	5-143
Plate 5.12-2. Example of a turbidity curtain used for the construction of a jetty.	5-147
Plate 7.3-1. Brucejack Lake meteorological station, October 2012.....	7-8
Plate 7.3-2. Scott Creek meteorological station, March 2012.....	7-9
Plate 7.3-3. Wildfire Creek meteorological station, September 2012.....	7-9
Plate 7.3-4. Dustfall station DF4 (August 4, 2012).....	7-13
Plate 7.3-5. PASS2 attached to DF5 (August 7, 2012).	7-13
Plate 11.3-1. Brucejack Mine Site Sub-area.	11-9
Plate 11.6-1. Poor, thin soils are common at Brucejack Quarry (shown in the foreground) and Mine Site (in the background).	11-31
Plate 13.3-1. Streams and lakes within the mine site area (Brucejack Watershed) and downstream receiving environment: a) Brucejack Lake, b) Brucejack Creek, c) Sulphurets Lake, d) Sulphurets Creek, e) Unuk River.....	13-3

TABLE OF CONTENTS

Plate 13.3-2. Streams and lakes, from upstream to downstream, within the Bowser, Scott Creek, Todedada Creek, and Wildfire Creek Area, sampled as part of the 2008 to 2013 surface water quality baseline study for the Brucejack Gold Mine Project.	13-7
Plate 13.3-3. Photograph of adit area (2009, post-Newhawk reclamation activities)	13-9
Plate 16.3-1. General landscape mosaic of Alpine Group (fellfield ecosystems) near the proposed Brucejack Mine Site.	16-28
Plate 16.3-2. Mature forested ecosystem close to Highway 37, along the Brucejack Access Road...	16-29
Plate 16.3-3. Herbaceous fen located just east of Todedada Wetland near the maximum elevation of the Brucejack Access Road.	16-30
Plate 16.3-4. Zonal forests of the CWHwm subzone, along the south end of the Brucejack Transmission Line.	16-31
Plate 16.3-5. An example of the ecosystems within the MHmmp, at site BJ003, near the Salmon Glacier.....	16-32
Plate 16.3-6. Drummond's mountain-avens vegetation community 5 km south of Knipple Lake.	16-33
Plate 16.3-7. A variety of non-vegetated and early seral ecosystems exist along the Bowser River between Knipple Lake and Granduc. The white and dark layers of sediments indicate coarser and finer lacustrine material.....	16-33
Plate 17.3-1. Wb05 bog at site W044.	17-9
Plate 17.3-2. Wf01 fen at site W030.	17-9
Plate 17.3-3. Wm01 marsh at site W020.	17-10
Plate 17.3-4. Ws06 swamp at site W014.....	17-10
Plate 17.3-5. Yellow pond lily wetland (site W058) with pond lily species floating near shore area.	17-11
Plate 22.3-1. Tide Lake Flats. Left: View north toward Frank Mackie Glacier (note by red circle). Right: Deeply incised proglacial lake sediments at the northwestern end of the lake basin.....	22-7
Plate 22.3-2. Portion of a 1929 map of mineral claims in the Stewart and Salmon River area (Morkill 1929).	22-11
Plate 22.3-3. Shovel testing at HbTm-1. View north.....	22-21
Plate 22.3-4. Andesite flakes recovered from HbTm-1.	22-21
Plate 22.3-5. General layout of HbTm-2, view northwest.	22-22
Plate 22.3-6. Helicopter wreckage from the filming of The Thing (1982) at HbTm-2.	22-23
Plate 22.3-7. Location of artifact find on a surface exposure of decaying bedrock at HcTn-1.	22-24
Plate 22.3-8. A utilized obsidian flake recovered from HcTn-1.	22-24
Plate 22.3-9. Modifications observed on CMT1 at HcTk-1.	22-24

APPLICATION FOR AN ENVIRONMENTAL ASSESSMENT CERTIFICATE / ENVIRONMENTAL IMPACT STATEMENT

Plate 24.3-1a. Looking west towards the Salmon Glacier from a viewpoint to the east of the Salmon Glacier, September 23, 2012.	24-22
Plate 24.3-1b. Looking north from a viewpoint on the road to the east of the Salmon Glacier, September 21, 2012.....	24-22
Plate 24.3-1c. Location of photographs to the east of the Salmon Glacier.	24-23
Plate 30.3-1. Brucejack Mine Site area (2014).	30-5
Plate 30.3-2. Overview of Brucejack Exploration (Future) Mine Site area (2013).	30-6
Plate 30.3-3. View of Brucejack Mine Site area activity.	30-6
Plate 30.3-4. View of Brucejack Mine Site area activity showing exposed surface materials.	30-7
Plate 30.3-5. Mature forested ecosystems close to Highway 37, along the Access Road.	30-8
Plate 30.3-6. Willow and other shrubs characteristic of historic Bower Aerodrome area with the remnants of a former airstrip.	30-8
Plate 30.3-7. Forests along the south end of the Brucejack Transmission Line.	30-10
Plate 30.4-1. Brucejack Mine Site located on a gossan.	30-11
Plate 30.4-2. Stony soils in undisturbed area between rock outcrops at the Brucejack Mine Site. ..	30-12
Plate 30.4-3. Bowser Camp and Historic Newhawk Airstrip; Site of Proposed Aerodrome.	30-12
Plate 30.4-4. Vegetation common in the aerodrome area.	30-17
Plate 30.4-5. Gravelly soils in the Bowser Aerodrome area.	30-18
Plate 30.4-6. Gravelly soils and subsoils occurring in the Bowser Aerodrome site.	30-18
Plate 30.4-7. Tide Staging area (area outlined in red is the approximate tenure boundary).	30-22
Plate 30.4-8. Coarse, gravelly soils located in the Tide Staging area.	30-24
Plate 30.5-1. West Zone Portal developed by Newhawk Gold Mines and used by Pretivm for underground exploration.....	30-32
Plate 30.5-2. Bunkhouse and kitchen (large buildings in foreground) to be retained for the permanent camp.	30-33

List of Appendices**PART A: INTRODUCTION AND BACKGROUND**

- Appendix 3-A Notice of Open Houses and Invitation to Comment
- Appendix 3-B Project Information Booklet
- Appendix 3-C Project Posters and Maps Displayed at DAIR Open Houses (November 2013)
- Appendix 3-D Summary of Communications with Aboriginal Groups
- Appendix 3-E Aboriginal Issues Tracking Tables
- Appendix 3-F Notice of Open Houses (Pretivm)
- Appendix 3-G Summary of Communications with Government Agencies
- Appendix 3-H Government Agencies Issues Tracking Table
- Appendix 3-I Summary of Communications with the Public (until May 16, 2014)
- Appendix 3-J Public Issues Tracking Table
- Appendix 3-K Brucejack Gold Mine Project: Aboriginal Consultation Plan
- Appendix 3-L Pre-Application Aboriginal Consultation Report
- Appendix 3-M Brucejack Gold Mine Project: Public Consultation Plan
- Appendix 3-N Pre-Application Public Consultation Report
- Appendix 4-A Brucejack Underground Preliminary Assessment - Leach Tailings Facility Site Selection
- Appendix 4-B Brucejack Project - Tailings Alternatives Assessment
- Appendix 5-A Feasibility Study and Technical Report Update on the Brucejack Project, Stewart, BC
- Appendix 5-B Brucejack Environmental Assessment: ML/ARD Baseline Report
- Appendix 5-C Brucejack Project Environmental Assessment - Water Management Plan
- Appendix 5-D Brucejack Project: Geotechnical Stability Assessment of Waste Rock Deposition in Brucejack Lake
- Appendix 5-E Brucejack Gold Mine Project: Brucejack Lake Tailings System Design
- Appendix 5-F Brucejack Project: Geohazard and Risk Assessment
- Appendix 5-G Brucejack Access Road: Upgrade Prescription
- Appendix 5-H Brucejack Project: Preliminary Avalanche Hazard Management Plan for Mine Construction and Operations
- Appendix 5-I Brucejack Project Ground Control Management Plan - Outline
- Appendix 5-J Brucejack Lake Outlet Stability

PART B: PREDICTIVE STUDIES

- Appendix 7-A Brucejack Gold Mine Project: 2012 Meteorology Baseline Report
- Appendix 7-B Brucejack Gold Mine Project: 2012 Air Quality Baseline Report
- Appendix 7-C Brucejack Gold Mine Project: Conceptual Model Plan
- Appendix 8-A Brucejack Gold Mine Project: 2012 Noise Baseline Report
- Appendix 8-B Brucejack Gold Mine Project: Environmental Noise Modelling Study
- Appendix 9-A Brucejack Project Environmental Assessment - Hydrogeology Baseline Report
- Appendix 9-B Brucejack Project Environmental Assessment - Numerical Hydrogeologic Model
- Appendix 10-A Brucejack Gold Mine Project: 2012 Surface Water Hydrology Baseline Report
- Appendix 10-B Potential Interactions between the Brucejack Gold Mine Project and Channel Morphology: Preliminary Results
- Appendix 10-C Potential Interactions between the Glacier Section of Brucejack Access Road and Knipple Glacier Ablation
- Appendix 11-A Brucejack Project - Preliminary Identification of Geohazards for the Proposed Transmission Line
- Appendix 11-B Preliminary Assessment of Subsidence Potential for the Brucejack Project
- Appendix 11-C Brucejack Project Feasibility Study: Underground Rock Mechanics Assessment
- Appendix 11-D Brucejack Soil Mapping Units - Rationale for Ecological Function Ratings

PART C. ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS – BIOPHYSICAL ENVIRONMENT

- Appendix 13-A Brucejack Gold Mine Project: Cumulative Surface Water Quality Baseline Report
- Appendix 13-B Hydrodynamic Modelling of Brucejack Lake: Effect of Proposed Tailings Discharge
- Appendix 13-C Water Quality Predictions for Construction, Operation, and Post-closure Mine Phases
- Appendix 13-D Contaminants of Potential Concern (COPC) Screening Results for Brucejack Lake Outflow, Modelled Cases 1 to 9
- Appendix 13-E Contaminants of Potential Concern (COPC) Screening Results for Brucejack Creek (BJ 200m D/S), Modelled Cases 1 to 9
- Appendix 14-A Brucejack Gold Mine Project: Cumulative Aquatic Resources Baseline Report
- Appendix 15-A Brucejack Project: 2012 Fish and Fish Habitat Baseline Report
- Appendix 15-B Fish Tissue Metal Concentrations for Samples Collected at UR1 in 2013
- Appendix 16-A Brucejack Gold Mine Project: 2012-2013 Terrestrial Ecosystem Baseline Studies

Appendix 17-A	Brucejack Gold Mine Project: 2012 Wetland Baseline Report
Appendix 18-A	Brucejack Gold Mine Project: Wildlife Characterization Baseline Report
Appendix 18-B	Brucejack Gold Mine Project: Wildlife Habitat Suitability Report
Appendix 18-C	Summary of Potential Temporal Linkages between the Brucejack Gold Mine Project and Other Human Actions in Regards to Wildlife

PART D. ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS – HUMAN ENVIRONMENT

Appendix 19-A	Brucejack Gold Mine Project: Socio-economic Baseline Report
Appendix 19-B	BC Input-Output Model Report: Brucejack Mine
Appendix 20-A	Thresholds for Characterization Criteria
Appendix 20-B	Thresholds for Likelihood and Confidence Criteria
Appendix 21-A	Brucejack Gold Mine Project: Country Foods Baseline Assessment
Appendix 21-B	Predicted Metal Concentrations Associated with Fugitive Dust at the Human Health Country Foods LSA Sites during the Construction Phase of Brucejack Gold Mine Project
Appendix 21-C	Predicted Metal Concentrations Associated with Fugitive Dust at the Human Health Country Foods LSA Sites during the Operation Phase of Brucejack Gold Mine Project
Appendix 21-D	Baseline, Predicted Incremental Changes, and Predicted Soil Metal Concentrations for Construction Phase of Brucejack Gold Mine Project
Appendix 21-E	Construction Phase, Predicted Incremental Change, and Predicted Soil Metal Concentrations for Operation Phase of Brucejack Gold Mine Project
Appendix 21-F	Predicted Metal Concentrations in Vegetation due to Root Uptake of Metals from Soil and Direct Deposition of Metals in Dustfall for the Operation Phase of the Brucejack Gold Mine Project
Appendix 21-G	Predicted Metal Concentrations in Berries due to Root Uptake of Metals and Direct Deposition of Metals in Dustfall for the Operation Phase of the Brucejack Gold Mine Project
Appendix 22-A	2012 Archaeology Baseline Report
Appendix 22-B	2013 Paleontology Baseline Report
Appendix 23-A	Screening of Stream Crossings against the MWWO
Appendix 23-B	Transport Canada Permits and Responses to Applications for the Existing Exploration Road
Appendix 24-A	Brucejack Gold Mine Project: Non-traditional Land Use Baseline
Appendix 24-B	Brucejack Gold Mine Project: 2012 Visual Quality Baseline Report
Appendix 24-C	Resident and Non-resident Hunting in Wildlife Management Unit 6-16 (1999 to 2011)

APPLICATION FOR AN ENVIRONMENTAL ASSESSMENT CERTIFICATE / ENVIRONMENTAL IMPACT STATEMENT

- Appendix 24-D Resident and Non-resident Hunting in Wildlife Management Unit 6-21 (1999 to 2011)
- Appendix 25-A Ethnographic Overview Report
- Appendix 25-B Tsetsaut/Skii km Lax Ha Nation Traditional Knowledge and Traditional Use Report
- Appendix 25-C Métis Interests Desktop Study

PART E: ABORIGINAL GROUPS AND NISGA'A NATION

No appendices

PART F: ENVIRONMENTAL MANAGEMENT PLANS AND REPORTING

- Appendix 29-A Wetland Habitat Information Management (WHIM) Standard Operating Procedure (SOP)

PART G: OTHER REQUIREMENTS

No appendices

PART H: SUMMARY AND CONCLUSIONS

No appendices