



**PRODIGY**  
GOLD INCORPORATED

Magino Gold Project

---

# MAGINO GOLD PROJECT

Finan Township, Algoma District, Ontario

## ENVIRONMENTAL IMPACT STATEMENT SUMMARY

**Submitted to:**

Ontario Ministry of Natural Resources  
Wawa - District Office  
48 Mission Rd Hwy 101  
PO Box 1160  
Wawa ON P0S 1K0  
Tel: 705-856-2396

Canadian Environmental Assessment Agency  
Ontario Region  
55 St. Clair Avenue East, Room 907  
Toronto, Ontario M4T 1M2  
Telephone: 416-952-1576

CEAA Reference Number: 80044

**June, 2017**



## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Project Location .....	1
1.2	The Proponent .....	1
1.3	Land Ownership and Mineral Claims .....	2
1.4	Environmental Assessment Process .....	4
<b>2.0</b>	<b>PROJECT OVERVIEW .....</b>	<b>5</b>
2.1	Development Schedule .....	12
2.2	Description of the Undertaking .....	14
2.2.1	Open Pit Mining .....	14
2.2.2	Processing Facility .....	15
2.2.3	Tailings Management Facility (TMF) .....	15
2.2.4	Mine Rock Management Facility (MRMF) .....	16
2.2.5	Overburden and Topsoil Management .....	18
2.2.6	Other Project Infrastructure .....	18
2.2.7	Site Water Management .....	18
2.2.7.1	Processing Plant, Maintenance Facilities and Indoor Storage Facilities .....	18
2.2.7.2	Open Pit Dewatering .....	19
2.2.7.3	Surface Runoff .....	19
2.2.7.4	Diversions .....	19
2.2.7.5	TMF Water Management .....	20
2.2.7.6	TMF Seepage Water .....	20
2.2.7.7	Fresh Water Make-up from Goudreau Lake .....	20
2.3	Site Reclamation and Closure .....	20
2.3.1	Public Safety .....	21
2.3.2	Physical Stability of Structures .....	21
2.3.2.1	Mine Rock Management Facility .....	21
2.3.2.2	Tailings Management Facility .....	21
2.3.3	Chemical Stability of the Site .....	21
2.3.3.1	Groundwater Monitoring .....	21
2.3.3.2	Water Management at Closure and Post Closure .....	21
2.4	Post Closure Monitoring .....	22
<b>3.0</b>	<b>DESCRIPTION OF THE ENVIRONMENT .....</b>	<b>23</b>
3.1	Atmospheric Environment .....	23
3.2	Physical Environment .....	23

3.2.1	Geology .....	23
3.2.1.1	Surface Geology and Soils .....	23
3.2.1.2	Bedrock Geology .....	24
3.2.2	Geochemistry .....	26
3.2.3	Groundwater .....	26
3.2.4	Hydrology .....	27
3.2.5	Surface Water and Sediment Quality.....	28
3.3	Biophysical Environment.....	30
3.3.1	Fish and Fish Habitat.....	30
3.3.2	Terrestrial Vegetation and Wetlands.....	30
3.3.3	Significant Wildlife Habitat .....	31
3.3.4	Migratory Birds.....	32
3.3.5	Mammals .....	32
3.3.6	Species at Risk .....	32
3.4	Human Environment .....	32
3.4.1	Social Environment.....	32
3.4.2	Economic Environment.....	33
3.4.3	Aboriginal Interests .....	33
<b>4.0</b>	<b>ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT .....</b>	<b>35</b>
4.1	Alternatives to the Project .....	35
4.2	Mine Waste Disposal Alternatives Evaluation .....	35
4.3	Alternatives Means of Implementing the Project.....	35
<b>5.0</b>	<b>PUBLIC CONSULTATION.....</b>	<b>39</b>
5.1	Introduction .....	39
5.2	Identification of Parties Consulted .....	39
5.3	Public Consultation Approach.....	39
5.3.1	Consultation Techniques .....	39
5.3.2	Public Consultation Materials .....	40
5.4	Key Comments and Questions Raised During Public Engagement.....	41
<b>6.0</b>	<b>GOVERNMENT CONSULTATION .....</b>	<b>45</b>
6.1	Introduction .....	45
6.2	Identification of Government Agencies Consulted .....	45
6.3	Government Consultation Approach.....	45
<b>7.0</b>	<b>ABORIGINAL ENGAGEMENT .....</b>	<b>47</b>
7.1	Identification of Aboriginal Groups Engaged.....	47
7.2	Aboriginal Engagement Approach .....	47
7.2.1	Aboriginal Engagement Techniques .....	48

7.2.2	Traditional Knowledge Studies/Traditional Land Use Studies.....	48
7.2.3	Agreements with Aboriginal Groups .....	49
7.3	Key Comments and Questions Raised During Aboriginal Engagement .....	49
<b>8.0</b>	<b>MITIGATION MEASURES, ENVIRONMENTAL EFFECTS ASSESSMENT, AND SIGNIFICANCE EVALUATION .....</b>	<b>53</b>
8.1	Mitigation Measures.....	53
8.2	Identification of Valued Components for the Effects Assessment.....	64
8.3	Effects Assessment .....	68
8.3.1	Legislative Requirements and other Guidance .....	68
8.3.2	Key Indicators and Measurable Parameters.....	68
8.3.3	Effects Mechanisms.....	68
8.3.4	Assessment Methods .....	69
8.3.5	Assumptions and the Conservative Approach .....	69
8.3.6	Description of Effects on VCs and Indicators.....	69
8.4	Residual Effects and Significance.....	69
8.4.1	Residual Effects.....	69
8.4.2	Significance of Residual Effects .....	70
8.5	Summary of Magino Project Effects Assessment, Mitigation Measures and Residual Effects .....	71
8.5.1	Air Quality .....	71
8.5.1.1	Effects Assessment.....	71
8.5.1.2	Mitigation Measures .....	72
8.5.1.3	Residual Effects .....	72
8.5.2	Noise .....	78
8.5.2.1	Effects Assessment.....	78
8.5.2.2	Mitigation Measures .....	78
8.5.2.3	Residual Effects .....	78
8.5.3	Vibration .....	81
8.5.3.1	Effects Assessment.....	81
8.5.3.2	Mitigation Measures .....	81
8.5.3.3	Residual Effects .....	81
8.5.4	Light.....	84
8.5.4.1	Effects Assessment.....	84
8.5.4.2	Mitigation Measures .....	84
8.5.4.3	Residual Effects .....	84
8.5.5	Greenhouse Gases.....	87

	8.5.5.1	Effects Assessment.....	87
	8.5.5.2	Mitigation Measures .....	87
	8.5.5.3	Residual Effects .....	87
8.5.6		Terrain and Soils.....	89
	8.5.6.1	Effects Assessment.....	89
	8.5.6.2	Mitigation Measures .....	89
	8.5.6.3	Residual Effects .....	89
8.5.7		Groundwater.....	93
	8.5.7.1	Effects Assessment.....	93
	8.5.7.2	Mitigation Measures .....	94
	8.5.7.3	Residual Effects .....	94
8.5.8		Surface Water Hydrology.....	97
	8.5.8.1	Effects Assessment.....	97
	8.5.8.2	Mitigation Measures .....	97
	8.5.8.3	Residual Effects .....	97
8.5.9		Surface Water Quality.....	101
	8.5.9.1	Effects Assessment.....	101
	8.5.9.2	Mitigation Measures .....	101
	8.5.9.3	Residual Effects .....	102
8.5.10		Stream and Lake Sediments .....	107
	8.5.10.1	Effects Assessment.....	107
	8.5.10.2	Mitigation Measures .....	107
	8.5.10.3	Residual Effects .....	107
8.5.11		Visual Resources.....	111
	8.5.11.1	Effects Assessment.....	111
	8.5.11.2	Mitigation Measures .....	111
	8.5.11.3	Residual Effects .....	111
8.5.12		Fish and Fish Habitat.....	113
	8.5.12.1	Effects Assessment.....	113
	8.5.12.2	Mitigation Measures .....	113
	8.5.12.3	Residual Effects .....	113
8.5.13		Terrestrial Vegetation .....	117
	8.5.13.1	Effects Assessment.....	117
	8.5.13.2	Mitigation Measures .....	117
	8.5.13.3	Residual Effects on Terrestrial Vegetation .....	117
8.5.14		Wetlands.....	120

8.5.14.1	Effects Assessment.....	120
8.5.14.2	Mitigation Measures .....	120
8.5.14.3	Residual Effects on Wetlands .....	120
8.5.15	Significant Wildlife Habitat .....	123
8.5.15.1	Effects Assessment.....	123
8.5.15.2	Mitigation Measures .....	123
8.5.15.3	Residual Effects on Significant Wildlife Habitat.....	123
8.5.16	Migratory and Breeding Birds .....	126
8.5.16.1	Effects Assessment.....	126
8.5.16.2	Mitigation Measures .....	126
8.5.16.3	Residual Effects .....	126
8.5.17	Mammals .....	129
8.5.17.1	Effects Assessment.....	129
8.5.17.2	Mitigation Measures for Mammals.....	130
8.5.17.3	Residual Effects on Mammals .....	130
8.5.18	Species at Risk .....	134
8.5.18.1	Effects Assessment.....	134
8.5.18.1.1	Effect on Whip-poor-will ( <i>Caprimulgus vociferous</i> ) .....	134
8.5.18.1.2	Effect on Chimney Swift ( <i>Chaetura pelagic</i> ).....	134
8.5.18.1.3	Effect on Little Brown Bat ( <i>Myotis lucifugus</i> ) and Northern Long- eared Bat ( <i>Myotis septentrionalis</i> ).....	134
8.5.18.2	Mitigation Measures .....	135
8.5.18.3	Residual Effects .....	135
8.5.19	Population and Demographics.....	137
8.5.19.1	Effects Assessment.....	137
8.5.19.2	Mitigation Measures .....	137
8.5.19.3	Residual Effects .....	138
8.5.20	Community Vitality .....	138
8.5.20.1	Effects Assessment.....	138
8.5.20.1.1	Effect on Recreation and Leisure .....	138
8.5.20.1.2	Effect on Community Character .....	139
8.5.20.1.3	Effect on Community Facilities and Services .....	139
8.5.20.1.4	Effect on Health and Social Services .....	139

	8.5.20.1.5	Effect on Adult Education and Training .....	139
	8.5.20.1.6	Effect on Crime and Public Safety.....	139
	8.5.20.2	Mitigation Measures .....	139
	8.5.20.3	Residual Effects .....	140
8.5.21		Infrastructure and Services .....	144
	8.5.21.1	Effects Assessment.....	144
	8.5.21.1.1	Effect on Housing .....	144
	8.5.21.1.2	Effect on Emergency Services .....	144
	8.5.21.1.3	Effect on Utilities .....	144
	8.5.21.1.4	Effect on Road Transportation .....	144
	8.5.21.1.5	Effect on Communications .....	144
	8.5.21.1.6	Effect on Energy Supply.....	145
	8.5.21.2	Mitigation Measures .....	145
	8.5.21.3	Residual Effects .....	145
8.5.22		Land Use and Tourism .....	149
	8.5.22.1	Effects Assessment.....	149
	8.5.22.1.1	Effect on Land Ownership/ Tenure.....	149
	8.5.22.1.2	Effect on Mining .....	149
	8.5.22.1.3	Effect on Forestry .....	149
	8.5.22.1.4	Effect on Commercial Tourism and Recreation .....	149
	8.5.22.1.5	Effect on Commercial Trapping.....	150
	8.5.22.1.6	Effect on Other Land Uses.....	150
	8.5.22.2	Mitigation Measures .....	150
	8.5.22.3	Residual Effects .....	150
8.5.23		Employment and Business Opportunities .....	154
	8.5.23.1	Effects Assessment.....	154
	8.5.23.1.1	Effect on Employment and Wage Income .....	154
	8.5.23.1.2	Effect on Labour Supply .....	154
	8.5.23.1.3	Effect on Business Activity .....	154
	8.5.23.2	Mitigation Measures .....	154
	8.5.23.3	Residual Effects .....	155
8.5.24		Government Revenues.....	155
	8.5.24.1	Effects Assessment.....	155
	8.5.24.1.1	Effect on Municipal Revenues.....	155
	8.5.24.1.2	Effect on Provincial Revenues .....	155
	8.5.24.1.3	Effect on Federal Revenues.....	155

	8.5.24.2	Mitigation Measures .....	155
	8.5.24.3	Residual Effects .....	155
8.5.25		Aboriginal Employment and Business Opportunities .....	156
	8.5.25.1	Effects Assessment .....	156
		8.5.25.1.1 Effect on Aboriginal Employment and Wage Income .....	156
		8.5.25.1.2 Effect on Aboriginal Labour Supply .....	156
		8.5.25.1.3 Effect on Aboriginal Education and Training .....	156
		8.5.25.1.4 Effect on Aboriginal Business Activity .....	156
	8.5.25.2	Mitigation Measures .....	157
	8.5.25.3	Residual Effects .....	157
8.5.26		Traditional Use of Lands and Resources .....	157
	8.5.26.1	Effects Assessment .....	157
	8.5.26.2	Mitigation Measures .....	157
	8.5.26.3	Residual Effects .....	157
8.5.27		Aboriginal Cultural Activities and Special Places .....	161
	8.5.27.1	Effects Assessment .....	161
		8.5.27.1.1 Effect on Spiritual Sites .....	161
		8.5.27.1.2 Effect on Trails and Camps .....	161
		8.5.27.1.3 Effect on Cultural Activities .....	161
		8.5.27.1.4 Effect on Archaeological Sites .....	162
	8.5.27.2	Mitigation Measures .....	162
	8.5.27.3	Residual Effects .....	162
8.5.28		Public Health .....	165
	8.5.28.1	Effects Assessment .....	165
	8.5.28.2	Mitigation Measures .....	165
	8.5.28.3	Residual Effects .....	166
8.5.29		Worker Safety .....	166
	8.5.29.1	Effects Analysis .....	166
	8.5.29.2	Ontario Mining Industry Safety Record .....	167
	8.5.29.3	Effects Mitigation or Enhancement .....	167
	8.5.29.4	Residual Effects on Worker Safety .....	168
<b>9.0</b>		<b>ACCIDENTS AND MALFUNCTIONS .....</b>	<b>169</b>
	9.1	Hazard Identification .....	169
	9.2	Significance Assessment for Accidents and Malfunctions .....	170
<b>10.0</b>		<b>ENVIRONMENTAL MANAGEMENT SYSTEM .....</b>	<b>173</b>

<b>11.0</b>	<b>EFFECTS OF THE ENVIRONMENT ON THE PROJECT .....</b>	<b>176</b>
<b>12.0</b>	<b>CUMULATIVE EFFECTS.....</b>	<b>177</b>
<b>13.0</b>	<b>CONCLUSION OF THE ASSESSMENT.....</b>	<b>178</b>
<b>14.0</b>	<b>REFERENCES.....</b>	<b>179</b>

## TABLES

Table 2-1: Magino Project Key Facts Table .....	7
Table 3-1: Primary Bedrock Lithological Units Encountered in the PSA.....	25
Table 4-1: Alternative Means for Implementing the Project.....	36
Table 8-1: Mitigation Measures Incorporated into the Magino Project.....	54
Table 8-2: Listing of Proposed Valued Components and Indicators.....	65
Table 8-3: Project Interactions with Air Quality .....	73
Table 8-4: Significance of Effects on Air Quality.....	75
Table 8-5: Scope of Monitoring and Follow-Up Program for Air Quality .....	77
Table 8-6: Project Interactions with Noise .....	79
Table 8-7: Significance of Residual Effects on Noise .....	80
Table 8-8: Project Interactions with Vibration .....	82
Table 8-9: Significance of Residual Effects on Vibration .....	82
Table 8-10: Scope of the Monitoring Program for Residual Effects Caused by Vibration .....	83
Table 8-11: Project Interactions with Light.....	85
Table 8-12: Significance of Residual Effects on Light.....	86
Table 8-13: Project Interactions with Greenhouse Gases .....	88
Table 8-14: Project Interactions with Terrain and Soils .....	90
Table 8-15: Significance of Residual Effects on Terrain and Soils .....	92
Table 8-16: Project Interactions with Groundwater .....	95
Table 8-17: Residual Effects to Groundwater .....	96
Table 8-18: Scope of Monitoring and Follow-Up Program for Groundwater Quality.....	96
Table 8-19: Project Interactions with Hydrology (Surface Water Flow and Quantity) .....	98
Table 8-20: Significance of Residual Effects on Hydrology (Surface Water Quantity and Flow).....	100
Table 8-21: Project Interactions with Water Quality.....	103

Table 8-22: Significance of Residual Effects on Surface Water Quality .....	105
Table 8-23: Scope of the Monitoring and Follow-Up Program for Surface Water Quality and Lake Sediment .....	106
Table 8-24: Project Interactions with Stream and Lake Sediments .....	108
Table 8-25: Significance of Residual Effects on Stream and Lake Sediments .....	109
Table 8-26: Project Interactions with Visual Resources.....	112
Table 8-27: Significance of Residual Effects on Visual Resources .....	112
Table 8-28: Project Interactions with Fish and Fish Habitat.....	114
Table 8-29: Significance of Residual Effects on Lower Trophic Level, CRA Fish and Fish Habitat .....	115
Table 8-30: Scope of the Monitoring Program for Fish and Fish Habitat.....	116
Table 8-31: Project Interactions with Terrestrial Vegetation .....	118
Table 8-32: Significance of Residual Effects on Terrestrial Vegetation .....	119
Table 8-33: Scope of the Monitoring and Follow-Up Program for Terrestrial Vegetation .....	119
Table 8-34: Project Interactions with Wetlands.....	121
Table 8-35: Significance of Residual Effects on Wetlands .....	122
Table 8-36: Summary of Magino Project Effects on Significant Wildlife Habitat and Significance of Residual Effects .....	124
Table 8-37: Significance of Residual Effects on Significant Wildlife Habitat.....	125
Table 8-38: Scope of Monitoring and Follow-Up Program for Significant Wildlife Habitat.....	125
Table 8-39: Project Interactions with Migratory and Breeding Birds .....	127
Table 8-40: Significance of Residual Effects on Migratory and Breeding Birds.....	128
Table 8-41: Project Interactions with Mammals .....	131
Table 8-42: Significance of Residual Effects on Mammals.....	132
Table 8-43: Scope of the Monitoring and Follow-Up Program for Mammals .....	133
Table 8-44: Project Interactions with Species at Risk.....	136

Table 8-45: Significance of Residual Effects on Threatened and Endangered SAR .....	136
Table 8-46: Project Interactions with Community Vitality .....	141
Table 8-47: Significance of Residual Effects on Community Vitality .....	143
Table 8-48: Project Interactions with Infrastructure and Services .....	146
Table 8-49: Significance of Residual Effects on Infrastructure and Services .....	148
Table 8-50: Project Interactions with Land Use and Tourism .....	151
Table 8-51: Significance of Adverse Potential Residual Effects on Land Use and Tourism .....	153
Table 8-52: Project Interactions with Traditional Use of Lands and Resources .....	159
Table 8-53: Significance of Residual Effects on Traditional Use of Lands and Resources .....	160
Table 8-54: Project Interactions with Aboriginal Cultural Activities and Special Places .....	163
Table 8-55: Significance of Residual Effects on Aboriginal Cultural Activities and Special Places .....	164
Table 9-1: Summary of Accidents and Malfunctions by Project Phase .....	170
Table 9-2: Accidents and Malfunctions Rating Summary .....	172
Table 10-1: List of Environmental Management Plans (EMPs) for the Magino Project .....	174

## FIGURES

Figure 1-1: Regional Map .....	3
Figure 2-1: Magino Project Site Layout.....	6
Figure 2-2: Proposed Magino Gold Project Schedule.....	13
Figure 2-3: Cross-Section of the TMF Embankment .....	17
Figure 9-1: Risk Rating Matrix .....	171

## ACRONYMS

%	Percent
°C	Degrees Celsius
ABA	Acid Base Accounting
Agency	Canadian Environmental Assessment Agency
AMSL	Above Mean Sea Level
ANFO	Ammonium Nitrate/Fuel Oil
API	Algoma Power Inc.
ARD	Acidic Rock Drainage
Argonaut	Argonaut Gold Incorporated
ATV	All-Terrain Vehicle
Au	Gold
BFN	Batchewana First Nation
BMP	Best Management Practice(s)
CaCO <sub>3</sub>	Calcium Carbonate
CaO	Lime
CCGP	Chapleau Crown Game Preserve
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act
CEPP	Construction Environmental Protection Plan
CIC	Carbon-in-Column
CIP	Carbon in Pulp
Class EA	Class Environmental Assessment
DFO	Department of Fisheries & Oceans
EA	Environmental Assessment
EAA	Environmental Assessment Act
EC	Environment Canada
ECCC	Environment and Climate Change Canada
EHS	Environmental Health and Safety
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
ER	Emergency Response
ERP	Emergency Response Plan
ERSPC	Emergency Response Spill Prevention/Contingency Plan
FAQs	Frequently Asked Questions
ft	Feet
g	Grams
GHG	Greenhouse Gas(es)

g/t	Grams per tonne
GRFN	Garden River First Nation
H:V	Horizontal:Vertical
ha	Hectare
JDS	JDS Energy & Mining Inc.
kg	Kilogram
Kg/day	Kilogram per day
Kg/t	Kilogram per tonne
km	Kilometre
km/hr	Kilometre per hour
km <sup>2</sup>	Square kilometre
Koz	Kilo ounces
kt	Kilotonnes
kV	Kilovolt
Kw	Kilowatts
L	Litre
LSA	Local Study Area
LOM	Life of Mine
m	Metres
M	Million
m/s	Metres per second
m <sup>2</sup>	Square metre
m <sup>3</sup>	Cubic Metres
m <sup>3</sup> /day	Cubic metres per day
m <sup>3</sup> /hr	Cubic metres per hour
MAC	Mining Association of Canada
Masl	Metres above sea level
MCFN	Missanabie Cree First Nation
MEND	Mine Environment Neutral Drainage
MFN	Michipicoten First Nation
ML	Metal Leaching
MI	Million Litres
MMER	Metal Mining Effluent Regulations
MNDM	Ministry of Northern Development and Mines
MNO	Métis Nation of Ontario
MNR	Ontario Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
MOE	Ontario Ministry of the Environment
MOECC	Ministry of Environment and Climate Change
MOU	Memorandum of Understanding
Moz.	Million Ounces
MPA	Maximum Potential Acidity

MRMF	Mine Rock Management Facility
Mt	Million Tonnes
MW	Megawatts
NAD	North American Datum
NAG	Non-acid Generating
NP	Neutralization Potential
NPR	Neutralization Potential Ratio
O. Reg.	Ontario Regulation
ODWS	Ontario Drinking Water Quality Standards
OMA	Ontario Mining Association
oz.	Ounces
PAG	Potentially Acid Generating
PDR	Federal Project Description Report
PFS	Preliminary Feasibility Study
pH	Potential of Hydrogen
PMFN	Pic Mobert First Nation
Prodigy	Prodigy Gold Incorporated
Project	Magino Gold Project
PSA	Project Study Area
PTTW	Permit to Take Water
PWQO	Provincial Water Quality Objectives
Richmont	Richmont Mines Incorporated
RSA	Regional Study Area
RSFD	Resource Stewardship and Facility Development Projects
RSMIN	Red Sky Métis Independent Nation
s	Second
SAG	Semi-Autogenous Grinding
SAR	Species at Risk
SARA	Species at Risk Act
SARO	Species at Risk in Ontario
SSC	Species of Special Concern
SWH	Significant Wildlife Habitat
t	Tonnes
t/d	Tonnes per day
t/y	Tonnes per year
TDG	Transportation of Dangerous Goods
TK	Traditional Knowledge
TKS	Traditional Knowledge Studies
TLU	Traditional Land Use
TMF	Tailings Management Facility
TSD	Technical Support Document
UTM	Universal Transverse Mercator (coordinate system)

VC	Valued Component
WQ	Water Quality
WQCP	Water Quality Control Pond
y	Year

## GLOSSARY

Acid Rock Drainage	When rock surfaces containing sulphides (sulfur compounds) are exposed to air and rain/snow a reaction can occur with the elements in the rock resulting in acidification of the water run-off, which in turn causes metals and various salts to dissolve in the water, potentially causing environmental harm.
Assessment Framework	A description of a process that organizes actions and ideas, usually in a step-by-step fashion. Frameworks help to guide practitioners in carrying out an assessment.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.
Benthic Invertebrates	Organisms without backbones that live in or on the bottom sediments of rivers, streams, and lakes.
Bog	Peat-covered areas or peat-filled depressions with a high water table and a surface carpet of mosses, chiefly sphagnum. The water table is at or near the surface in the spring, and slightly below during the remainder of the year. Bogs are generally highly acidic and low in biodiversity.
Boreal	Relating to the forest areas of the Northern Temperate Zone that are dominated by coniferous trees such as spruce, fir and pine.
Brownfield	Abandoned or underused industrial and commercial facilities available for re-use.
Carbon in Column	Process for the carbon adsorption recovery of gold from solution in a series of columns. With carbon-in-column (CIC) operation, solution flows through a series of fluidized bed columns in an upflow direction.
Carbon in Pulp	The carbon adsorbs the gold from the slurry solution and is removed from the slurry by coarse screening. In practice, this is accomplished by a series of five or six agitated tanks where carbon and ore slurry are contacted in a staged countercurrent manner. This greatly increases the possible gold loading onto the carbon while maintaining a high recovery percentage.
Climate	Represents the expected values for meteorological parameters. The climate of an area is described using climate normals.
Dewater	Remove water from sediment or waste materials.
Ecodistrict	Areas of land and water contained within an ecoregion that are defined by characteristic physical features, including bedrock and/or surficial geological features and topography. These physical features significantly influence successional pathways, patterns of species associations and habitats. Local climate patterns, such as lake effect snowfall area, characterize ecodistricts.
Ecoregion	Unique areas of land and water that are defined by a characteristic

	climate range and pattern, including temperature, precipitation and humidity. The climate within and ecoregion has an influence on the vegetation types, soil formations and other ecosystem processes and associated species that live there.
Effect	Any response by an environmental or social component to an action's impact as defined by <i>Canadian Environmental Assessment Act</i> .
Electrowinning	Electrowinning involves passing an electric current through the pregnant (gold bearing) solution; the current causes the gold ions (ion solution) to plate out on steel wool cathodes as a recoverable solid.
Felsic	A term used to describe light-coloured igneous rocks with low magnesium and iron content and which are enriched by lighter elements such as silicon, oxygen, aluminium, sodium, and potassium. The most common felsic rock is granite.
Fen	Carbon accumulating wetlands (either peat or marl), or wetlands on carbonate substrates, with a persistent groundwater supply and characterized by indicator plant and moss species with low tree cover.
Frequency	Rate at which the effect occurs.
Geographic Extent	Spatial scale of the effect.
Glaciofluvial	Glaciofluvial deposits consist of material that has been transported, sorted and deposited by melt water from a glacier or inland ice sheet.
Igneous Rock	Igneous (volcanic) rock is formed through the cooling and solidification of magma or lava. Igneous rock may form with or without crystallization, either below the surface as intrusive (plutonic) rocks or on the surface as extrusive (volcanic) rocks.
Indicators	Specific characteristics of the environment that can be measured qualified or determined in some way.
Leaching	The extraction of certain materials from a carrier into a liquid.
Low-grade ore	The portion of mined ore with a lower gold content.
Mafic	A term used to describe dense, dark-colored minerals rich in magnesium and iron.
Metavolcanic	A type of metamorphic rock formed by a volcano, either as lava or tephra. Then, the rock was buried underneath subsequent rock and was subjected to high pressures and temperatures, causing the rock to recrystallize.
Meteorological	Relating to the study of the atmosphere or weather.
Moraine	Accumulation of rock debris of any size carried by a glacier and deposited upon melting, often in ridges.
Ore	A natural combination of minerals, from which a metal or metals can be profitably extracted.

Organic Deposits	Soils formed from decaying plant matter in environments where accumulation exceeds decomposition; peat.
Process Plant	Facilities including buildings, grinding mills, pipes, tanks, chemical feed, and electrical and control systems used to extract the gold from the ore.
Project (the)	The activities associated with the preparation for development, production and closure of the Magino Gold Mines, Ltd. (Magino) gold mine as described in the project description.
Region	Any area in which it is suspected or known that effects due to the action under review may interact with effects from other actions. This area typically extends beyond the local study area; however, as to how far will vary greatly depending on the nature of the cause-effect relationships involved.
Semi-autogenous Grinding	Autogenous mills operate without grinding bodies; instead, the coarser part of the ore simply grinds itself and the smaller fractions. Semi-autogenous mills, 5 to 10 percent grinding bodies (usually metal spheres) are added.
Slurry	A fluid mixture of a pulverized solid with a liquid. Slurries behave in some ways like thick fluids, flowing under gravity and capable of being pumped.
Tailings	The materials left over after the extraction and separation of valuable material from non-valuable material of an ore/rock.
Threshold	A limit of tolerance of a VEC to an effect, that if exceeded, results in an adverse response by that VEC.
Trophic Level	A group of organisms that occupy the same position in a food chain.
Wetlands	A land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.

## 1.0 INTRODUCTION

Prodigy Gold Incorporated (Prodigy) proposes to develop the Magino Gold Project (the Project), which is situated on a brownfield site that contains a past-producing underground gold mine, associated infrastructure, landfill, tailings facility and polishing pond. The past-producing mine is considered “temporarily suspended” under the Ontario Mining Act, Regulation 240/00 and the associated Mine Rehabilitation Code of Ontario. In 2013, Prodigy submitted notification of intent to enter a stage of redevelopment to the Ministry of Northern Development and Mines (MNDM).

### 1.1 Project Location

The Project is located in Finan Township, approximately 10 kilometres (km) southeast of the Town of Dubreuilville and 40 km northeast of Wawa, Ontario. The site is within the Wawa geological Subprovince of the Canadian Shield. It is centered at Universal Transverse Mercator (UTM) 689049E 5351422N (North American Datum [NAD] 83 Zone 16U). The Project location is shown on Figure 1-1

The Town of Dubreuilville, with a population of over 600, is the closest community. Dubreuilville is located on Highway 519, approximately 30 km east of the junction of the Trans-Canada Highway and Highway 519. Mining and ore processing are currently being carried out in the vicinity of the Project. The Island Gold Mine (operated by Richmond Mines Inc.) is approximately 2 km east of the property, the former Edwards Mine (Strike Minerals) approximately 8 km to the east, and the Eagle River Mine (Wesdome Gold Mines) is 80 km to the west. The Hemlo Operation (Barrick Gold Corp) is located approximately 150 km to the northwest.

### 1.2 The Proponent

The Project proponent is Prodigy Gold Inc., a wholly-owned subsidiary of Argonaut Gold Inc. (Argonaut). Argonaut is a publicly-traded Canadian gold mining company engaged in exploration, mine development, and gold production. In addition to the Magino Gold Project, Argonaut currently operates two gold mines in Mexico and multiple exploration projects. The Company has an experienced management team with wide-ranging expertise in mining operations.

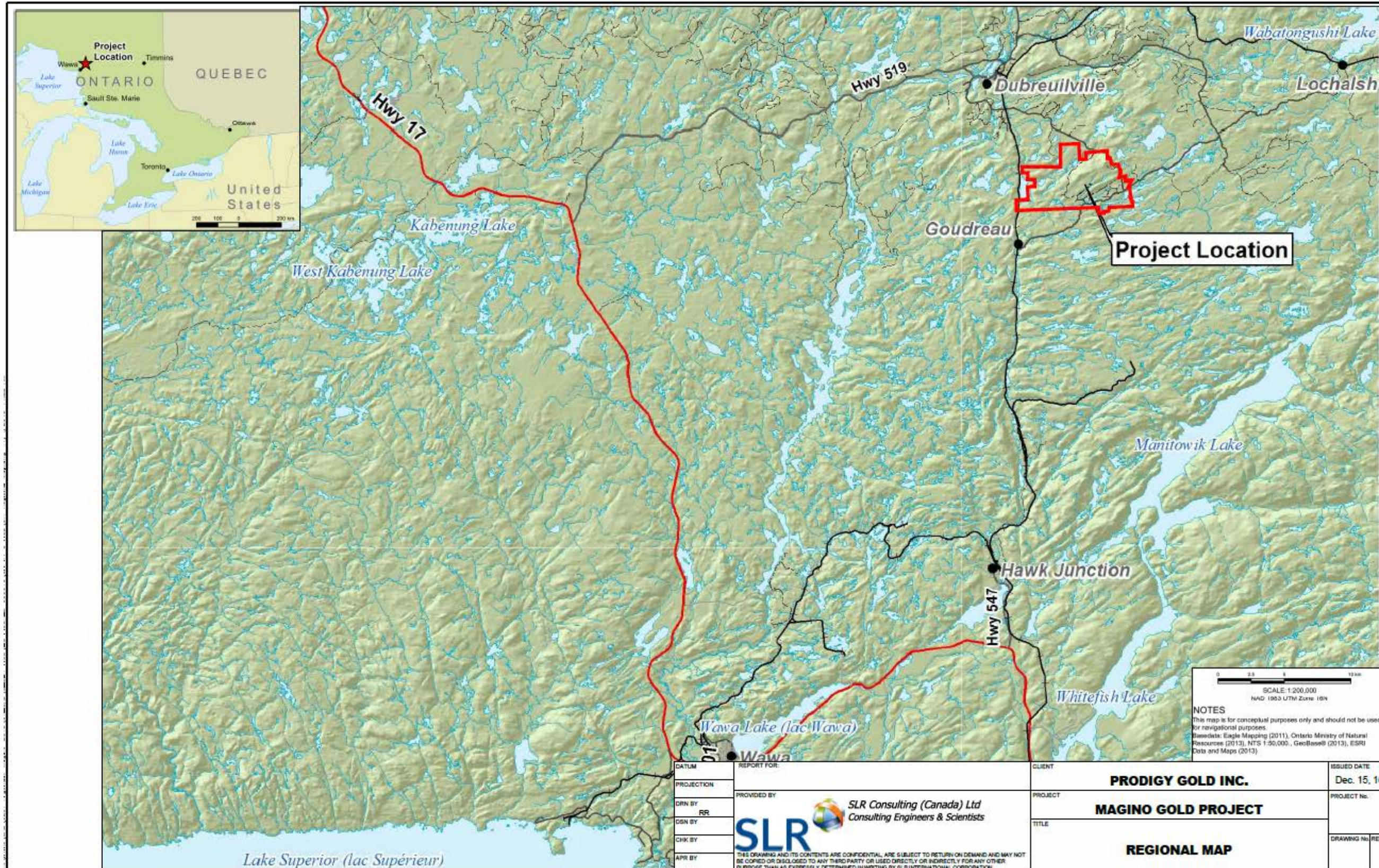
#### Proponent Contacts Information

<b>Location</b>	<b>Head Office</b>	<b>Site</b>
Address	9600 Prototype Court Reno, NV 89521	Box 209, 3 Dree Road Dubreuilville, Ontario P0S 1B0
Contact	W.A. Napier	
Position	Vice President	
Telephone	(775) 284 4422	
Email	info@argonautgold.com	

### **1.3 Land Ownership and Mineral Claims**

The land is owned by the provincial Crown which holds both surface and subsurface rights. As of January 9, 2016, Prodigy's wholly owned (i.e., 100% Registered Ownership) land holdings forming the Magino property comprise 18 patented mining claims (mining and surface rights), 62 leased mining claims, and 17 unpatented mining claims with a combined area of 2,261 ha.

Figure 1-1: Regional Map



DATUM REPORT FOR:		CLIENT	ISSUED DATE
PROJECTION PROVIDED BY:		<b>PRODIGY GOLD INC.</b>	Dec. 15, 16
DRN BY: RR DSN BY: CHK BY: APP BY:	<b>SLR</b> SLR Consulting (Canada) Ltd Consulting Engineers & Scientists	PROJECT	PROJECT No.:
THIS DRAWING AND ITS CONTENTS ARE CONFIDENTIAL, ARE SUBJECT TO RETURN ON DEMAND AND MAY NOT BE COPIED OR DISCLOSED TO ANY THIRD PARTY OR USED DIRECTLY OR INDIRECTLY FOR ANY OTHER PURPOSE THAN AS EXPRESSLY DETERMINED IN WRITING BY SLR INTERNATIONAL CORPORATION.		<b>MAGINO GOLD PROJECT</b>	
		TITLE	DRAWING No. / REV
		<b>REGIONAL MAP</b>	

## 1.4 Environmental Assessment Process

On July 8<sup>th</sup>, 2013, Prodigy Gold submitted a Project Description Report to the Canadian Environmental Assessment Agency (CEAA) for review to determine if the Magino Project would be subject to an environmental assessment under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). On August 30<sup>th</sup>, 2013, CEAA issued its determination that a Federal environmental assessment was required.

In September, 2013, the Agency issued draft Guidelines for consultation. Following receipt of comments on the draft Guidelines, the Agency issued its final “Guidelines for the Preparation of an Environmental Impact Statement” dated November 2013. These final Guidelines defined the scope of the project and the factors to be considered in the environmental assessment (EA). This included the factors listed in subsection 19(1) of CEAA 2012, and the scope of those factors.

The MNRF Class EA for Resource Stewardship and Facility Development Projects (RSFD) applies to components of the Magino Project because it requires an application to the Ministry of Natural Resources and Forestry (MNRF) for the disposition of Crown resources. In April 2014, Prodigy submitted a project description to the Ontario Ministry of Natural Resources and Forestry to allow a screening of the proposed Project and to identify which category the project should be placed in.

In November 2014, Prodigy prepared a draft Environmental Impact Statement (EIS). This document was submitted to certain government agencies and Aboriginal communities for a preliminary review. Comments received on the Draft EIS report were addressed and incorporated into the Final EIS submission. MNRF did not provide a screening decision for the RSFD Class EA in 2014. However in January, 2015, Prodigy announced it was undertaking a revised PFS, thus putting the Project on hold except for the continuation of Aboriginal community consultation.

On May 3, 2016, Prodigy announced it was proceeding with the environmental assessment review and would undertake a Feasibility Study. On November 2, 2016 an updated project description was submitted to MNRF in order to inform the RSFD Class EA screening decision.

With the Project being subject to both a Provincial Class EA and a Federal EA, Prodigy will submit a single EIS designed to meet both Provincial and Federal requirements under the *Canada-Ontario Agreement on Environmental Assessment Cooperation (2004)*. The Federal and Provincial government authorities have agreed that a single EA report will be used for the coordinated EA process. This EIS provides Federal and Provincial authorities the required information needed to complete their respective environmental assessment processes. The document will support a decision by the Federal Minister of the Environment under CEAA 2012 and the MNRF Statement of Completion approving the project under the *Ontario Environmental Assessment Act*.

## 2.0 PROJECT OVERVIEW

The Magino Gold Project consists of mining the deposit using conventional open pit mining methods and a carbon-in-pulp (CIP) mineral processing facility.

Approximately 105 to 150 million tonnes (Mt) of ore and 405 to 445 Mt of mine rock will be mined over a ten year period. The open pit overlays the site of the past-producing underground mine. The milling rate is designed at a throughput of 35,000 tpd.

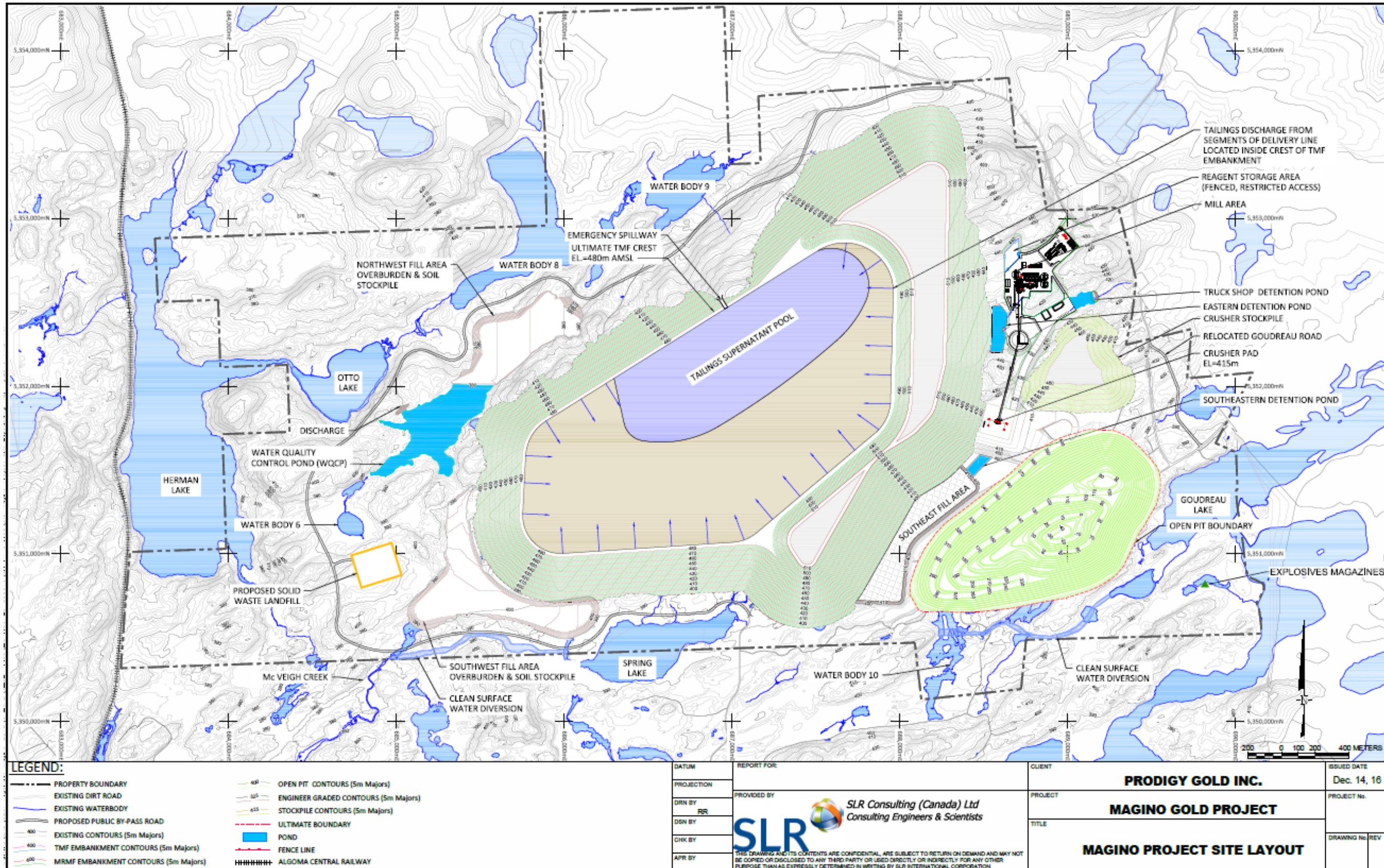
The Project will involve:

- Open pit mining;
- Construction, operation, and decommissioning (as appropriate) and/or closure of a rock crushing and ore processing plant, various plant area facilities; crushed rock and low-grade ore stockpiles; overburden stockpiles, chemical, fuel and hazardous materials management and storage facilities; an explosives magazine; and non-mining waste management facilities;
- Construction, operation, and closure of components of a mine waste management area, which include a Tailings Management Facility (TMF) and Mine Rock Management Facility (MRMF);
- Construction, operation and decommissioning (as appropriate) of enabling infrastructure for the Project, including: camp accommodation for workers, a landfill, Project roads (including a public bypass road), electrical transmission lines and a substation, power generation equipment, potable water supply system, sewage treatment system, and site security features; and
- Construction, operation and decommissioning (as appropriate) of environmental management infrastructure on-site, including: a variety of surface water and ground water controls designed to minimize the effects on the environment to the maximum extent practicable.

While most of the old mine infrastructure has been removed, additional closure measures are required. These additional measures include decommissioning and closure of the existing tailings facilities and other actions to deal with the existing industrial sewage works, the landfill, power lines, refuse, and remaining buildings. The closure objectives for the existing infrastructure will be met concurrently with the development of the Magino Project.

Figure 2-1 presents the site layout for the Project while Table 2-1 provides a succinct description of the key project components.

Figure 2-1: Magino Project Site Layout



**Table 2-1: Magino Project Key Facts Table**

<b>Key Project Facts</b>	
<b>Mining Claims</b>	The Magino property comprise 18 patented mining claims (mining and surface rights), 62 leased mining claims, and 17 unpatented mining claims with a combined area of 2,261 ha.
<b>Project Location</b>	The Project is located 195 km north of Sault Sainte Marie, Ontario, Canada. It is in Finan Township, approximately 40 km northeast of Wawa, Ontario and 10 km southeast of Dubreuilville, Ontario.
<b>Site Existing Conditions</b>	Brown-fields site that contains an historic underground gold mine, landfill and tailings facility.
<b>Site Access</b>	Via Goudreau Road for transport of crew, supplies, and other transport to and from the Project site. Public Bypass Road to surround the entire site.
<b>Deposit Mineral Reserve Estimate (Probable)</b>	Diluted tonnage: 105 Mt; Cut-off grade: 0.34 g/t Au; Diluted grade: 0.89 g/t Au Contained gold: 3,000 koz
<b>Project Purpose</b>	Mine the gold deposit using conventional open pit mining methods and extract gold from the ore using a 35,000 t/d carbon-in-pulp (CIP) mineral processing facility.
<b>Project Life</b>	18 years Life of Project (Construction – Operation – Closure) <ul style="list-style-type: none"> <li>• Site preparation/ Construction – 3 years</li> <li>• Operation: mining 10 - years; milling – 12 - 15 years</li> <li>• Closure – 3 years</li> </ul> Post Closure Monitoring <ul style="list-style-type: none"> <li>• Site wide – 10 years</li> <li>• Pit Lake filling – up to 50 years</li> </ul>
<b>Open Pit</b>	Total material hauled from the pit –up to 550 Mt over 11 years (including one year of pre-stripping) <ul style="list-style-type: none"> <li>- mine rock plus low grade ore range from 400 Mt to 430 Mt</li> <li>- ore 120 to 150 Mt</li> <li>- LOM average strip ratio: 3.8</li> <li>- Lower cut-off grade: &lt; 0.27 g/t Au</li> </ul> Ultimate pit opening: approximately 105 ha; Ultimate pit depth: 430 m Characteristics of the open pit: Bench height: 10 m (single, working); 20 m (double, final pit); Face angle: 55° to 76° (double bench, final pit); Berm width: 8.5 m; Ramp width: Upper bench - 31 m double lane; Lower bench – 23 m single lane; gradient of 10% Material haulage: 150,000 t/d to 176,000 t/d Haul truck size: 220 t Haul trucks trips: 690 to 800 trips per day Mining time frame: 10 years (plus 1 year of pre-production stripping) Rock face ARD potential: < 1% (over 99% NAG) Pit inflows pumped to Mill for make-up water and/or TMF

<b>Key Project Facts</b>	
<b>Explosives</b>	<p>Explosives (100% emulsion) delivered to site by Explosives Contractor. As Project evolves, ANFO/emulsion mixture ratio will be adjusted to remain in compliance with Air Quality criteria at Project boundaries.</p> <p>Explosives magazine on site for up to 24 tonnes of product; cap magazine up to 3.6 tonnes of product</p> <p>Explosives use: 0.2 kg/t of rock</p>
<b>Topsoil Stockpile and Overburden Stockpiles</b>	<p>Top soil up to 1,500,000 m<sup>3</sup>; Overburden up to 16,000,000 m<sup>3</sup>.</p> <p>Overburden used screened and used for construction. Excess overburden stockpiled in three areas within boundaries of perimeter bypass road (northwest, west and southwest of the MRMF). Total surface area of stockpiles – 60 ha.</p> <p>Top soil used for reclamation purposes.</p>
<b>Mine Rock Management Facility (MRMF)</b>	<p>Stockpile of mine rock up to 430 Mt (including mine rock used for TMF construction)</p> <p>ARD potential of mine rock less than 1%</p> <p>Used for construction of TMF embankment, road, and infrastructure pads.</p> <p>Stockpile area north and east of TMF – up to 400 ha (including ore stockpile).</p> <p>Elevation of MRMF up to 510 m.</p>
<b>Ore Stockpiles</b>	<p>Stockpile up to 15 Mt by year 3 of mining</p> <p>Crushed ore: 20,000 tonnes</p> <p>Stockpile up to 45 Mt (40 ha stockpile area) east of MRMF</p>
<b>Primary Crushing</b>	<p>Input top size: 850 mm; Product: 80% passing 150 mm</p> <p>Gyratory crushers 1,250 x 1,625 – 373 kW; Crushing rate: 1,667 t/hr (75% utilization factor).</p> <p>Crushed ore stockpile live capacity: 20,000 t</p>
<b>Grinding Circuit</b>	<p>SAG Mill (11 m diameter x 6.4 m long; 17 MW installed power); feed rate: 1,360 t/hr; final product size (P<sub>80</sub>): 75 micron</p> <p>Pebble crusher: 450 MW installed power</p> <p>Ball Mill: 8.2 m x 12.8 m long; 17 MW installed power</p>
<b>Processing Plant</b>	<p>Processing Rate: 25,000 to 35,000 t/day; 12,775,000 t/year; 365 day/year operation.</p> <p>Process includes: Leach Circuit, CIP (carbon-in-pulp) Circuit, Thickeners, Carbon Acid wash, Elution, Regeneration, CIC Circuit, Electrowinning and Refinery, Carbon Stripping, Carbon Reactivation, Tailings wash thickeners, Cyanide detoxification (SO<sub>2</sub>-Air), and, Tailing Handling and Reclaim; Au recovery of 93.5%.</p> <p>Mill water requirements: Circulating water load of 1,300 m<sup>3</sup>/hr; Plant start-up water requirement: up to 500,000 m<sup>3</sup>; Freshwater make-up requirement approximately 70 to 80 m<sup>3</sup>/hr; 70 m<sup>3</sup>/hr at end of pit life.</p>

Key Project Facts			
<b>Reagents Consumption and Storage</b>	Reagent	Consumption tonnes/year	Storage Capacity Method
	Lime (CaO)	2555	100 tonnes (2 weeks supply) Stored in 100 tonnes silo.
	Sodium Cyanide (NaCN)	9580	200 tonnes (one week supply) Stored in 10 seacan containers on site (20 t capacity per container). Bags/wooden box transferred to mill as required.
	Caustic Soda (30% strength)	255	40 m <sup>3</sup> Up to two iso-containers on site stored on laydown area close to the mill.
	Hydrochloric Acid (36 - 38% strength)	130	40 m <sup>3</sup> Up to two iso-containers on site stored on laydown area close to the mill.
	Activated Carbon	640	60 tonnes (one month supply) Three 20 ft. seacan container stored on laydown area next to mill. Bag transferred to mill by forklift as required.
	Sodium Metabisulphate	4800	400 tonnes (one month supply) Twenty 20 ft. seacan container stored on laydown area close to the mill. Bag transferred to mill by forklift as required.
	Copper Sulphate (CuSO <sub>4</sub> .4H <sub>2</sub> O)	1625	140 tonnes (one month supply) Seven 20 ft. seacan container stored on laydown area close to the mill. Bag transferred to mill by forklift as required.
	Magnafloc 155	255	20 tonnes (one month supply) One 20 ft. seacan container stored on laydown area close to the mill. Transferred to mill as required.
	Anti-scalant	385	30 tonnes (one month supply) Two 20 ft. seacan container stored on laydown area close to the mill. Transferred to mill as required.
	Other minor reagents may include antiscalants, Leachaid and standard industry fluxes, typically consisting of borax, silica and nitre for use in the induction furnace		
<b>Tailings Management Facility (TMF)</b>	<p>Disposal of up to 150 Mt; Construction of TMF completed in stages. Surface area – 390 ha (outside toe of embankment). Tailings surface area – 260 ha Crest elevation of embankment - 480 m (maximum tailings deposition thickness ranging up to 80 m). Three (or more) stage construction for impoundment with spillway constructed for each stage. Tailing slurry is 55% solids by weight (thickened tailing). Reclaim water system incorporated in TMF facility. Seepage control is incorporated; seepage monitored and discharges to Water Quality Control Pond; or is returned to TMF (depending on seepage water quality).</p>		

Key Project Facts																																	
<b>Air Supply</b>	Five 18,000 Nm <sup>3</sup> /hr @ 550 kPag air compressor supply low pressure air for cyanide detoxification.																																
<b>Water Supply</b>	Reclaimed water from TMF is main source of process water. Runoff collected in Water Quality Control Pond is the secondary source of process water. Fresh water make-up for mill and reagent preparation taken from Goudreau Lake: 1,680 m <sup>3</sup> /day; estimated annual requirements at 620,000 m <sup>3</sup> . Potable water requirement of 120 m <sup>3</sup> /day from Goudreau Lake.																																
<b>Sewage Treatment Plant</b>	Package treatment plant; Capacity of up to 120 m <sup>3</sup> /day. Treated sewage effluent pumped to TMF.																																
<b>Heavy Industrial Facilities</b>	Processing Plant; Mine Equipment Maintenance Shops.																																
<b>Light Industrial Facilities and Buildings</b>	Warehouses, maintenance facilities, Administration building, Temporary Camp, Mine Dry Temporary camp capacity of 400 people on site.																																
<b>Power Supply and On-site Generation</b>	Supplied by local utility company API; 44 kV line from Hawk Junction; Total connected load of 50 MW; Operating demand of 37 to 40 MW. Main substation contains two transformers rated at 44 kV – 25 kV and on-site power distributed to the plant at 25 kV. Back-up power provided by 3 x 1 MW gen sets.																																
<b>Site Water Management</b>	<p>Diversion of natural runoff around disturbed areas (from Water Body 10 and upper reaches of McVeigh Creek).</p> <p>Interception ditches located around mine facilities and disturbed areas. All mine contact water channelled to Water Quality Control Pond (Water Body 7) constructed to capture runoff from disturbed areas, MRMF ore stockpiles, and plant and ancillary areas.</p> <p>Open pit dewatering pumped to process plant or TMF.</p> <p>TMF water collected and recycled to the process plant.</p> <p>All mine contact water collected in Water Quality Control Pond is discharged or pumped to TMF or process plant if water quality unsuitable for discharge to receiving environment. WQCP water is pumped to TMF as make-up and the excess is treated as necessary before discharge to the environment</p> <p>TMF effluent discharges to Water Quality Control Pond. Adaptive management consist of treatment of TMF and/or Water Quality Control Pond water, if required.</p> <p>Discharge from Water Quality Control Pond to Otto Lake via an outfall.</p>																																
<b>Fuels</b>	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Consumption Litres/year</th> <th colspan="3">Transportation to Site</th> <th rowspan="2">On-site Storage Tank Capacity</th> </tr> <tr> <th>Amount per trip</th> <th>trips/year</th> <th>Tanker truck trips/day</th> </tr> </thead> <tbody> <tr> <td>Diesel</td> <td>49,000,000</td> <td>40,000 Litres/trip</td> <td>1225</td> <td>Three to four</td> <td>2000 m<sup>3</sup></td> </tr> <tr> <td>Gasoline</td> <td>165,000</td> <td>20,000 Litres/trip</td> <td>8</td> <td>One tanker every 6 weeks</td> <td>10 m<sup>3</sup></td> </tr> <tr> <td>Fuel Oil</td> <td>250,000</td> <td>20,000 Litres/trip</td> <td>12</td> <td>One tanker per month</td> <td>10 m<sup>3</sup></td> </tr> </tbody> </table>						Type	Consumption Litres/year	Transportation to Site			On-site Storage Tank Capacity	Amount per trip	trips/year	Tanker truck trips/day	Diesel	49,000,000	40,000 Litres/trip	1225	Three to four	2000 m <sup>3</sup>	Gasoline	165,000	20,000 Litres/trip	8	One tanker every 6 weeks	10 m <sup>3</sup>	Fuel Oil	250,000	20,000 Litres/trip	12	One tanker per month	10 m <sup>3</sup>
Type	Consumption Litres/year	Transportation to Site			On-site Storage Tank Capacity																												
		Amount per trip	trips/year	Tanker truck trips/day																													
Diesel	49,000,000	40,000 Litres/trip	1225	Three to four	2000 m <sup>3</sup>																												
Gasoline	165,000	20,000 Litres/trip	8	One tanker every 6 weeks	10 m <sup>3</sup>																												
Fuel Oil	250,000	20,000 Litres/trip	12	One tanker per month	10 m <sup>3</sup>																												

<b>Solid Waste Management</b>	<p>Sorting and recycling program implemented on site. Metal scrap and recyclable wastes shipped off site for recycling.</p> <p>Burn pile for wood/paper and other non-plastic combustible wastes.</p> <p>Organic and camp waste landfilled on site or shipped to municipal landfill in Dubreuilville (preferred alternative).</p> <p>Estimated volume of solid waste - 300 to 500 kg/day.</p> <p>Hazardous wastes ship off site to accredited hazardous waste treatment facility.</p>
<b>On-site Accommodation</b>	<p>Construction Phase - Temporary camp on site for up to 400 persons. Remainder of construction crews housed in Dubreuilville.</p> <p>Operation Phase – Accommodation located at Dubreuilville</p>
<b>Estimated Work Force</b>	<p>Site development – 50 persons.</p> <p>Peak construction workforce – 500 to 600 persons of which 400 will be lodged on site.</p> <p>Operations (mining and milling) – up to 375 persons.</p>
<b>Environmental Assessment</b>	
<b>Temporal Boundaries</b>	Site Preparation / Construction: 3 years.
	Operation: 10 to 15 years.
	Closure: 3 years.
	Post closure monitoring until closure objectives are achieved.
<b>Spatial Boundaries</b>	Regional Study Area (RSA) – 11,120 ha (110 km <sup>2</sup> ).
	Local Study Area (LSA) – 3,623 ha (36 km <sup>2</sup> ) – varies with each VECs.
	Project Study Area (PSA) - 1,802 ha (18 km <sup>2</sup> ). Facilities footprint inside of perimeter road - 1,070 Ha.
<b>Valued Ecosystem and Socio Economic Components</b>	<p>Five (5) VCs relevant to the atmospheric environment:</p> <ul style="list-style-type: none"> <li>• Air quality; Noise, Vibrations; Light; Greenhouse Gases/Climate Change.</li> </ul> <p>Six (6) VCs relevant to the physical environment;</p> <ul style="list-style-type: none"> <li>• Terrains and soils; Groundwater; Surface water hydrology; Surface water quality; Stream and lake sediments; Visual resources.</li> <li>• LSA – 3,623 ha – includes sub-watersheds associated with Herman-Otto, Spring-Lovell and Webb-Goudreau drainage.</li> </ul> <p>Seven (7) VCs relevant to the biological environment:</p> <ul style="list-style-type: none"> <li>• Fish and fish habitat; Terrestrial vegetation; Wetlands; Significant wildlife habitat; Migratory and breeding birds; Mammals; Species at risk (aquatic and terrestrial).</li> <li>• LSA – 3,623 ha – includes sub-watersheds associated with Herman-Otto, Spring-Lovell and Webb-Goudreau drainage.</li> </ul> <p>Four (3) VCs relevant to the social environment:</p> <ul style="list-style-type: none"> <li>• Population and demographics; Community vitality; Infrastructure and Services.</li> </ul> <p>Three (3) VCs relevant to the economic environment:</p> <ul style="list-style-type: none"> <li>• Land use and tourism; Employment and business opportunities; Government revenues.</li> </ul> <p>Three (3) VCs relevant to Aboriginal interests:</p> <ul style="list-style-type: none"> <li>• Aboriginal employment and business opportunities; Traditional use of lands and resources; Aboriginal cultural activities and special places.</li> </ul> <p>Two (2) VCs relevant to health:</p> <ul style="list-style-type: none"> <li>• Public health; Worker safety.</li> </ul>

<b>Project Economics</b>	
Capital Costs-initial	\$540 M (US \$)
Capital Costs Sustaining	\$195 M (US \$)

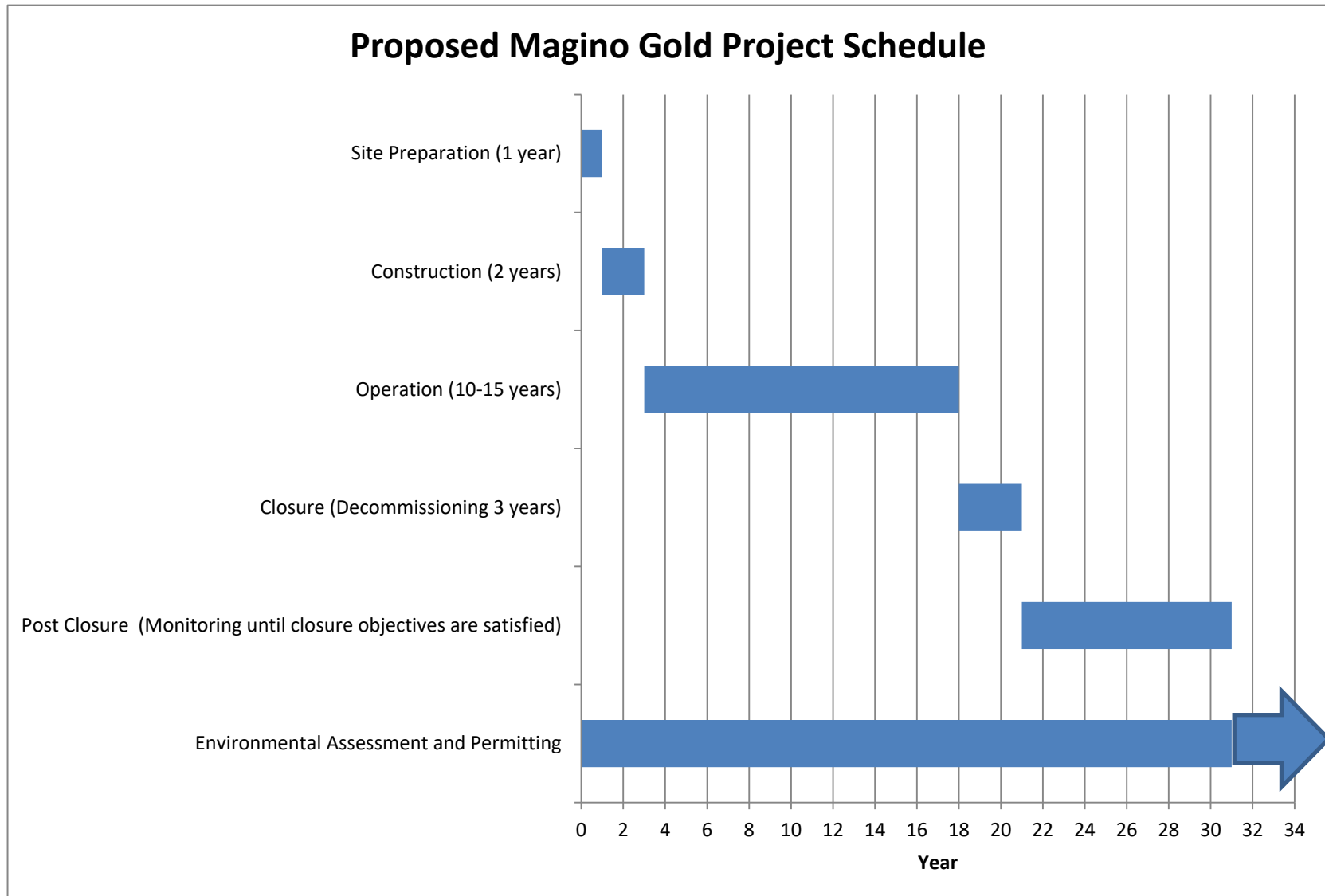
## 2.1 Development Schedule

The Project development schedule has been divided into five (5) distinct phases:

- Phase 1: Environmental Assessment and Permitting (Current Phase)
- Phase 2: Site Preparation;
- Phase 3: Construction;
- Phase 4: Operations - Mining and Processing; and
- Phase 5: Closure and Rehabilitation.

Following the completion of Phase 1 (i.e., on receipt of the applicable EA approval(s) and other regulatory authorizations and permits), the Project is expected to extend over a period of approximately 18-year period, as seen in Figure 2.2.

Figure 2-2: Proposed Magino Gold Project Schedule



Together, the Site Preparation (Phase 2) and Construction Phase (Phase 3) are expected to take approximately 3 years. Site preparation will involve site clearing, grubbing and pre-stripping. During the site preparation phase, items with potentially lengthy lead times will be procured, detailed engineering plans will be finalized, and sourcing of personnel will begin.

Construction activities will involve the following works and activities:

- Closure of existing mine facilities;
- Topsoil and overburden stripping and stockpiling;
- Stream diversions, draining, and backfilling of on-site waterbodies; and
- Construction of:
  - Enabling infrastructure (i.e., construction camp accommodations, landfill, public bypass road, mine haul roads and service roads, electrical transmission lines and substation, potable and process water infrastructure, sewage treatment system and non-mining waste management facilities);
  - Plant area components;
  - Facilities for reagents, fuel and hazardous materials management;
  - Mining waste management area components (i.e., Mine Rock Management; Facility, Tailings Management Facility); and
  - Environmental Management Infrastructure.

Operations will commence following the construction phase. Activities will include mining from the open pit, ore stockpiling, processing of the ore, removal and placement of overburden and mine rock, maintenance of equipment and facilities, various administrative activities and environmental monitoring. Mining is expected to be completed during the first 10 years of the operational phase. During this period 105 to 150 Mt of ore and 400 to 445 Mt of mine rock will be mined. Approximately 45 Mt of the ore will be stockpiled for processing during periods of pit expansion and when the process plant is not operating.

Progressive rehabilitation will start as soon as feasible. Decommissioning and closure activities will begin during the final year of construction of the TMF and continue through to the end of the operations phase. The first stage of Closure and Rehabilitation Phase (Phase 5) is expected to be approximately 3 years in duration as dismantling and preparing the remaining facility components for closure occurs. Shortly after, monitoring is undertaken to assess the performance of the closure activities.

## **2.2 Description of the Undertaking**

The specific characteristics of the Project components are described in Table 2-1. The following section expands on the description of key features of the Project.

### **2.2.1 Open Pit Mining**

Pre-stripping of the open pit area will begin during the construction phase. Mining will occur at a rate of 150,000 to 176,000 tpd of ore production over a 10 year period. The ultimate dimension of the open pit will be approximately 105 hectares (ha) in area, with a depth of approximately 430 m. Ore will be stockpiled near the processing plant while mine rock will be hauled directly to the MRMF.

### 2.2.2 Processing Facility

The nominal capacity of the Processing Plant is 35,000 tpd with an operating time frame of up to 15 years.

The initial stage of processing consists of crushing and grinding of the gold bearing ore in a SAG mill and ball mill. Cyanide and other reagents are added to initiate the leaching process. The SAG mill discharge is combined with the ball mill discharge and the tailings from the gravity concentrator to become the feed to the classification cyclones. The concentrate obtained from the gravity concentrators is sent to the gold refinery, and the tailings are returned to the mill for further processing.

The leaching and refining operations include fine grinding and a gravity recovery circuit, followed by cyanide leaching and gold recovery circuits. This will extract approximately 95% of the available gold from the ore.

Prior to the leaching, the slurry is thickened. The thickener overflow is directed to a Carbon-in-Column (CIC) circuit for the recovery of gold and silver present in the solution. The thickener underflow will enter the leach circuit, and then flow into the Carbon-in-Pulp (CIP) circuit to recover gold and any silver from the leached slurry.

The gold is recovered by electrowinning from a “pregnant solution”. Gold is electroplated onto stainless steel wool cathodes. Smelting of the plated gold to produce gold doré occurs twice weekly. Barren electrolyte solution exiting the electrolytic cells is returned to the barren/strip circuit for recovery. The doré gold bar product will then be securely transported off site by road. Typically, for a project of this size, the final product is shipped off site by truck once per week.

The cyanide treatment plant is operated on a continuous basis. Air agitation, sodium metabisulphate and anhydrous copper sulphate act as catalysts for cyanide destruction. Additional detoxification of cyanide occurs in the TMF through natural processes such as hydrolysis, dissociation, volatilization, photo oxidation, chemical and bacteriological oxidation, and precipitation-dissolution.

### 2.2.3 Tailings Management Facility (TMF)

From the cyanide detoxification process, the tailings are pumped to the TMF for disposal.

Up to 150 Mt of tailings will be produced over the life of the Project. There is approximately 1.85 Mt of a banded sulphide bearing mine rock type that is acid generating labelled Unit 5e (see TSD 2). This material will be placed in the TMF and encapsulated with tailings. Figure 2-3 presents the cross section of the TMF embankment. The TMF is sized to accommodate this volume of tailings and mine rock:

- Containment of tailings in the TMF is provided by:
  - Underlying bedrock. The quality in the TMF area is high, with bulk permeability on the order of  $5E^{-7}$  m/s (based on secondary permeability; i.e., fracture flow).
  - Geomembrane liner system on the upstream slope of the embankment to limit seepage through embankment.
  - The interface between the liner and the bedrock will be cemented. Any loose or broken bedrock will first be removed with dozers and rippers.

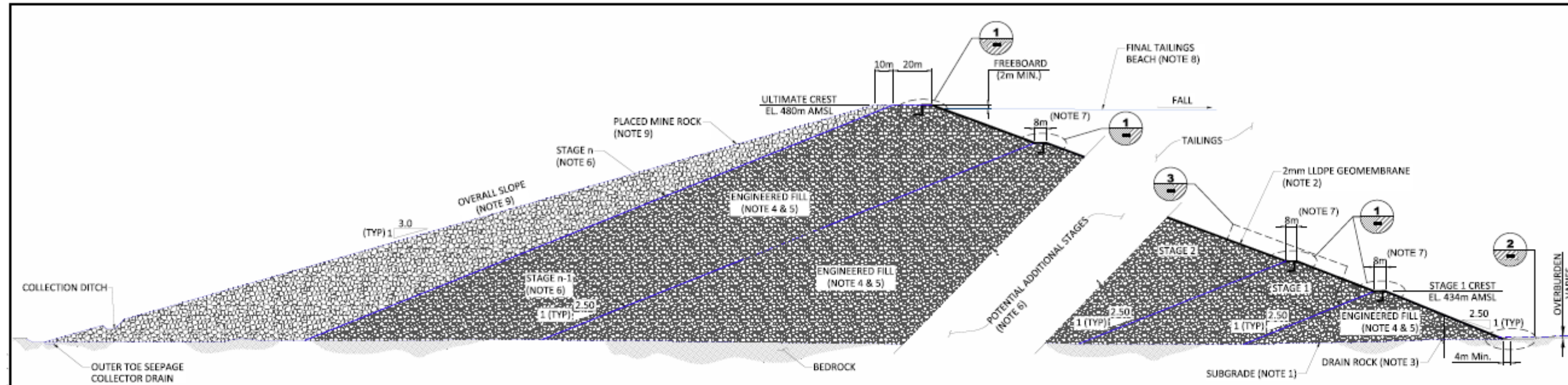
- Seepage that does occur will be collected and managed:
  - Rock drains will capture seepage which is going to occur through the liner and emerge from bedrock under the embankment. This seepage will be conveyed to Water Quality Control Pond 7 for management (refer to Figure 2-1).
  - Contingency downstream pump-back wells are used to capture seepage.
- A secure rock fill embankment will be constructed:
  - Overburden will be removed beneath the embankment (i.e., the embankment will be founded on bedrock).
  - The embankment will be constructed in layers that are compacted.
  - The embankment material will be designed to prevent water pressure buildup by using a combination of coarse material and engineering design specifications.
  - Tailings will be spigoted from embankments to keep the tailings pond water away from embankment.
- The potential for any surface spillages from the TMF will be minimized.
  - The TMF will be sized to accommodate the normal operating maximum pond elevation plus the 100-year wet year (exceeds the Canadian Dam Association (CDA) standards) to prevent overflow.
  - Each stage of the TMF embankment will include a spillway capable of handling the Probable Maximum Flood (PMF). Pond 7 will have a spillway to handle the 100-year flood as per CDA.
  - Water volume in the pool will be minimized.
  - Minimum freeboard of 2m will be provided.

#### **2.2.4 Mine Rock Management Facility (MRMF)**

For the mine rock, the static Acid-Base Accounting (ABA) work completed to-date includes 543 mine rock samples. In addition, nine (9) humidity tests and eight (8) on-going field cell tests have been performed on representative composite samples of each lithologic unit. The results indicate an overall Neutralizing Potential to Maximum Potential Acidity (NP/MPA) Ratio of 13.4. The results of the test work indicate that co-disposal of the different types of mine rock in a single facility is not anticipated to produce acid leachate. Field cell testing will continue, and runoff and leachate from the mine rock will be monitored during mine operations.


An estimated 225 Mt of rock will be required for the construction of the TMF embankment. The mine rock will be used for this purpose thus eliminating the need for quarries. The remaining mine rock will be stockpiled at the MRMF. The MRMF will cover an area of approximately 400 ha and provides a total of between 250 to 300 million tonnes of disposal capacity (refer to Figure 2-1). At a crest elevation of 510 metres above sea level (masl), the MRMF will have an average height of approximately 85 m above existing grades and a maximum height of up to 100 m. Final side slopes MRMF will range between 2:1 to 3:1 (horizontal:vertical), depending on stability and closure and post-closure grading considerations. Intermediate slopes may be as steep as 1.5:1 (H:V). The conceptual design of the MRMF is presented in TSD 6.

Figure 2-3: Cross-Section of the TMF Embankment



**A TYPICAL TMF EMBANKMENT SECTION**  
NTS

- NOTES:
1. STRIP ORGANICS AND UNSUITABLE FOUNDATION MATERIALS PRIOR TO PLACEMENT OF EMBANKMENT FILL.
  2. GEOMEMBRANE ON UPSTREAM SLOPES OF EMBANKMENTS ONLY, EXTENDING NOMINALLY UPSTREAM FOR ANCHORAGE.
  3. DRAIN ROCK WHERE PRESENT SHALL CONSIST OF FREE DRAINING MATERIAL THAT IS FILTER COMPATIBLE WITH ADJACENT MATERIALS.
  4. ALL EMBANKMENT MATERIALS SHALL BE PLACED AND COMPACTED IN LIFTS PER THE TECHNICAL SPECIFICATIONS.
  5. ENGINEERED FILL WILL CONSIST OF SELECT GLACIOFLUVIAL DEPOSITS OR SELECT MINE ROCK MATERIAL, AS APPROVED BY ENGINEER. ENGINEERED FILL TO BE KEYED INTO ABUTMENTS AND FOUNDATION USING KEY BENCHES.
  6. TMF EMBANKMENT WILL BE CONSTRUCTED IN STAGES. THE NUMBER AND HEIGHT OF EMBANKMENT RAISES MAY VARY DEPENDING ON THE MINE PRODUCTION SCHEDULE.
  7. INTERMEDIATE EMBANKMENT CREST WIDTHS DEPENDENT ON EQUIPMENT SAFETY AND STABILITY CONSIDERATIONS, AS WELL AS ACCESS REQUIREMENTS.
  8. TAILINGS MATERIAL SHALL BE SPIGOTTED FROM THE PERIMETER EMBANKMENT TO DEVELOP THE SUPERNATANT POOL DISTANT FROM THE EMBANKMENT FOR ENHANCED STABILITY, AS WELL AS EASE OF ACCESS TO THE DECANT POOL.
  9. OUTSIDE OF THE ENGINEERED FILL ZONE, MINE ROCK MAY BE PLACED BY END DUMPING OF MATERIAL IN 10 TO 20 M VERTICAL LIFTS AT ANGLE OF REPOSE WITH SET-BACK BENCHES TO ACHIEVE THE OVERALL DESIGN SLOPE.
  10. SANDY AND GRAVEL FILTER ZONES NOT SHOWN.

DATUM	REPORT FOR:	CLIENT	ISSUED DATE
PROJECTION	PROVIDED BY	<b>PRODIGY GOLD INC.</b>	Dec. 15, 18
DRN BY RR	 <b>SLR Consulting (Canada) Ltd</b> Consulting Engineers & Scientists <small>global environmental solutions</small>	PROJECT	PROJECT No.
DSN BY		<b>MAGINO GOLD PROJECT</b>	
CHK BY		TITLE	DRAWING No. REV
APR BY		<b>TMF CONCEPTUAL DESIGN - PROFILE AND SECTIONS</b>	
<small>THIS DRAWING AND ITS CONTENTS ARE CONFIDENTIAL. ARE SUBJECT TO RETURN ON DEMAND AND MAY NOT BE COPIED OR DISCLOSED TO ANY THIRD PARTY OR USED DIRECTLY OR INDIRECTLY FOR ANY OTHER PURPOSE THAN AS EXPRESSLY DETERMINED IN WRITING BY SLR INTERNATIONAL CORPORATION.</small>			

## **2.2.5 Overburden and Topsoil Management**

Topsoil (approximately 1.5 Mm<sup>3</sup>) and overburden (approximately 16 Mm<sup>3</sup>) will be removed from the open pit and TMF.

Topsoil and overburden will be removed and stockpiled for use during the mine reclamation phase. Overburden is of good granular quality and will also be used for backfill, road construction and other suitable use of aggregate for construction.

The overburden stockpiles locations are shown on Figure 2-1 and cover approximately 60 ha. These stockpiles will be placed at a minimum of 30 m from any waterbody in a stable configuration and compacted with the placement equipment. They will be vegetated to prevent erosion. Perimeter ditches will be located to preclude release of overburden (sediment) and separate contact water from non-contact water.

## **2.2.6 Other Project Infrastructure**

Other components of the Project infrastructure are described in Table 2-1. These include the maintenance facility, a temporary accommodation complex for the construction phase, sewage treatment facility, reagent storage, fuel storage, waste management facilities, a laboratory, and, site security.

Motive power will be supplied by Algoma Power Inc. The expected power demand is approximately 37-40 MW with a connect load of 50 MW.

Storage of diesel fuel (2 million litres) and reagents on site will be sufficient for sustaining the mining operation from 2 to 4 weeks. Reagents and fuel will be delivered by trucks via the Goudreau Road.

A temporary accommodation complex will be constructed on site. It will house up to 400 persons at peak of construction. Kitchen and sewage treatment facilities will be constructed to support the accommodation and administrative complex. Potable water will be supplied from Goudreau Lake with peak demand estimated at 120 m<sup>3</sup>/day. For the mine operating period, a 150 person accommodation complex will be located in Dubreuilville.

Prodigy proposes to build a landfill to the west of the TMF. In Ontario, landfills are subject to distinct authorization. A permit application will be submitted for this landfill once the approval of the Project is obtained.

## **2.2.7 Site Water Management**

### **2.2.7.1 Processing Plant, Maintenance Facilities and Indoor Storage Facilities**

Water used inside buildings will be contained within these buildings. The design of these facilities will include adequate sumps and storage to contain spill and enable pumping of these spills back into the milling process. Wash water used to clean equipment in the maintenance shops will be contained in a sump, treated in an oil/water separator and reused in the shop. Excess water will be pumped to the milling/TMF circuit. The oily water residues will be collected and shipped off-site to a licenced facility for treatment/disposal. Liquid storage tanks will be constructed within suitable secondary containments to prevent spillage.

### **2.2.7.2 Open Pit Dewatering**

Groundwater inflow into the open pit will be minimized with:

- 1) the construction of a slurry wall around a portion of the open pit perimeter to reduce groundwater flowing from Goudreau Lake into the pit;
- 2) dewatering wells will be installed strategically around the perimeter of the pit; and
- 3) construction of a diversion channel north of Waterbody 10 will be used to improve drainage of the area and minimize hydrostatic groundwater pressure on the open pit.

As the mine pit expands, it is expected that groundwater inflow into the open pit will increase over time. A pumping system will be installed in the pit to dewater and keep the working areas of the pit dry. The pit water will be pumped directly to the mill or TMF and be used as process water in the mill. The groundwater modelling study indicates expected drawdown on Goudreau Lake will be minimal (TSD 4 – Groundwater Modelling).

### **2.2.7.3 Surface Runoff**

The site has been designed to use the natural topography for the location of the mine rock and tailings storage, as well as to aid in the collection and containment of runoff from the operation.

Two perimeter collection ditches will be constructed downslope of the project infrastructure components (plant area, MRMF, ore stockpiles, TMF). Drainage works (ditches/trenches) from the MRMF, overburden stockpiles, process plant pads, ore stockpiles and other areas will be graded so that they drain towards the perimeter ditches. Certain areas of the site will require backfilling to prevent unwanted pooling of water. The water quality control pond (WQCP) will be constructed on the west side of the TMF (Figure 2-1). The two perimeter ditches, one on the north side of the TMF/MRMF and one on the south side of the TMF/MRMF, will direct runoff by gravity to the WQCP. Runoff collected in this pond will be pumped back to the TMF for re-use as mill process water. For the construction and operation phases, the Project has been designed to have a single discharge point for mine contact water to the receiving environment. Excess water from the WQCP will be pumped to Otto Lake via a diffuser. Discharge is expected to commence during the second year of operation and continue during the operational phase. The water quality of the pond will be monitored in accordance with MISA regulation (O. Reg 561/94) and the Metal Mining Effluent Regulations.

The WQCP will have capacity to contain precipitation from the 100 year return storm event. The design parameters for the surface water management systems are provided in TSD 6.

### **2.2.7.4 Diversions**

On the south side of the property, two diversions will be constructed to prevent runoff/drainage from non-project areas from flowing into the Project area. A drainage channel will be constructed north of Waterbody 10 to enhance flow and drainage from this area.

Another diversion channel will be constructed to connect the outflow of Spring Lake to the lower reach of McVeigh Creek, south of the bypass road.

### **2.2.7.5 TMF Water Management**

The design parameters of the TMF are summarized in TSD 6. The TMF is designed to store the mill process water. The TMF supernatant will be the main source of water used in the milling operation. The TMF pumping/water reclaim systems will be mounted on a floating barge. Access to the barge will be provided by a floating ramp. The pumps will connect to a fixed pipeline installed along the TMF embankment.

TSD 7 presents the water balance for the Magino Project on an annual and monthly basis. It is expected that no process water will be discharged from the TMF reservoir to the receiving environment during the operations phase of the project.

### **2.2.7.6 TMF Seepage Water**

The design of this facility will incorporate seepage collection structures under the embankment to ensure stability of the structure. The preliminary design of the TMF provides a description of the seepage collection network (TSD 6). Each proposed seepage trench will daylight above the perimeter ditches and will flow by gravity to these perimeter ditches, and to the Water Quality Control Pond.

### **2.2.7.7 Fresh Water Make-up from Goudreau Lake**

Fresh water will be required for potable water and process circuits such as pump gland water. Minimal volume of freshwater will be required for make-up process water at the processing plant (TSD 7). The expected fresh water quantity required from Goudreau Lake will range from 70 to 120 m<sup>3</sup>/hr.

## **2.3 Site Reclamation and Closure**

The objectives of Site Reclamation and Closure will be to ensure:

- 1) Public safety by maintaining awareness of the open pit in the surrounding communities and reducing access to the pit by wildlife;
- 2) The physical stability of all earthwork structures left at the site, mainly the TMF embankment and the MRMF; and
- 3) The chemical stability of the site by monitoring of groundwater and surface runoff discharging from the Water Quality Control Pond.

Progressive reclamation activities will begin once the mining activities are terminated. The pit dewatering system will be removed and the open pit will gradually fill with runoff and groundwater inflow.

Closure activities include the dismantling, removal and transport off-site of Project infrastructure, which include reagents, fuel and hazardous materials, and the demolition or removal of any buildings or structures, and fuel storage tanks. All hazardous materials will be disposed of at licensed facilities.

At closure, the plant area and other ancillary facilities will be recontoured to reflect the natural topography and the surfaces will be scarified and revegetated. The identification of remaining infrastructure will be based upon consultation with government agencies, local residents and aboriginal communities.

### **2.3.1 Public Safety**

The open pit will be filled with water. The pit filling time is estimated to take up to 50 years. At closure, the haul road from the pit will be blocked and where necessary to prevent inadvertent access, additional berms will be placed around the perimeter of the pit. Signage will be posted warning trespassers of the pit location.

### **2.3.2 Physical Stability of Structures**

During closure the MRMF overburden stockpile and TMF embankment slopes will be stabilized. During the operation phase, Prodigy will establish an inspection program for these structures. An independent geotechnical engineer will be retained to carry out this inspection program.

#### **2.3.2.1 Mine Rock Management Facility**

The areas of the MRMF that were not closed and rehabilitated during the operations phase, will be rehabilitated. The rehabilitation that is undertaken in these areas will be similar to that conducted over the MRMF during progressive rehabilitation. The slopes will be flattened and the site will be contoured. Overburden and soil cover will be used to promote vegetative growth in selective areas.

#### **2.3.2.2 Tailings Management Facility**

Closure will include the removal of the system piping and associated facilities used for tailings discharge and water return. Water stored in the TMF will be discharged to the open pit. The TMF embankment will be breached to allow free drainage of runoff from the TMF surface to the WQCP. The tailings surface will be contoured, drainage channels constructed and the surface revegetated if necessary. Wildlife access ramps are designed as part of the Project. These ramps will be graded into the mine rock to allow wildlife access to the surface of the TMF. Wildlife access will also be possible along the more gently sloping eastern edge of the TMF and via the spillway at closure of the TMF.

### **2.3.3 Chemical Stability of the Site**

ARD/ML test work completed to date indicates that the mine rock and the tailings are potentially non-acid generating (TSD 2). These properties will be further monitored and demonstrated during the operating years of the Project. During operations and closure, tailings, tailings pore water, tailings seepage, mine rock and overburden samples will be analysed to access their chemical properties and confirm that these materials are non-acid generating.

#### **2.3.3.1 Groundwater Monitoring**

Groundwater monitoring downstream of the TMF will continue until Prodigy can demonstrate that closure objectives of chemical stability have been achieved.

#### **2.3.3.2 Water Management at Closure and Post Closure**

In the upper reaches of the site (south east corner) the ponds will be breached and the surface water will drain to the open pit. The remainder of the site will continue to drain to the Water Quality Control Pond. Monitoring of this discharge will continue until closure objectives for site water quality are achieved.

## **2.4 Post Closure Monitoring**

Activities for the post closure period consist mainly of follow up monitoring.

## **3.0 DESCRIPTION OF THE ENVIRONMENT**

Baseline studies to characterize the physical, biological and human environments were undertaken from 2012 to 2016. Baseline information is documented within Technical Support Documents (TSDs) 1-18.

### **3.1 Atmospheric Environment**

The existing conditions relevant to the atmospheric environment are presented in detail in Chapter 4, Section 4.1. The Magino property is located within the “humid continental” climatic region. This region is typified by large seasonal temperature differences, with warm to hot (and often humid) summers and cold (sometimes severely cold) winters. The average annual temperature is 1.7°C with average annual minimum and maximum temperatures of -14.8°C and 14.9°C recorded in January and August, respectively.

Average total annual precipitation is 850 millimetres, of which approximately 70% falls as rain and 30% as snow (converted to snow water equivalents). On average, rainfall occurs on 105 days each year and snowfall on 80 days. Nearly half of the annual snowfall occurs in December and January while maximum rainfall occurs from June to October. Snow is usually present on the ground from November to April.

Air quality in the vicinity of the Magino property falls within normal values compared to national averages. Noise levels are generally dominated by sounds of nature and human activity typical of a rural setting. Transportation corridors, such as Highway 519, secondary roads, logging roads and rail lines, traverse the area. Air quality and noise conditions are affected by the local network of roads and in the immediate vicinity of the Magino property are influenced by operations at the nearby Island Gold Mine operation.

### **3.2 Physical Environment**

The existing conditions relevant to the physical environment are presented in detail in Chapter 4, Section 4.2. The Magino Project is a brownfield site that includes an historic underground gold mine. The mine and surrounding area has been categorized as slightly impacted by previous mining and sintering operations located in Wawa, Ontario, and iron mining located to the south of Magino mine.

The Magino property is located within the drainage basin of the Michipicoten River which is located to the west of the property. This river flows south, joining with the Magpie River to empty into Michipicoten Bay on Lake Superior. The Property is set within four watersheds that contain numerous lakes, streams, and wetlands of various sizes:

- Dreany watershed, including Dreany Lake and Tavis Lake;
- Herman-Otto watershed, including Mountain Lake, Herman Lake and Otto Lake;
- Spring-Lovell watershed, including Spring Lake, Lovell Lake and McVeigh Creek; and
- Webb-Goudreau watershed, including Webb Lake and Goudreau Lake.

#### **3.2.1 Geology**

##### **3.2.1.1 Surface Geology and Soils**

The glacial deposits in the RSA date to the last, or Late Wisconsinan, glaciation and were formed by the Laurentide Ice Sheet. Former ice flow directions ranged from southward to

westward and bedrock was carved by ice flow in some areas. Deposits formed by glaciers in the Pleistocene Epoch include till, glaciofluvial sediments, and glaciolacustrine sediments, while fluvial and organic deposits developed in the last 9,000 years. A number of recessional moraines consisting of till and glaciofluvial ice-contact material are found in the Maskinonge, Miller, and Mountain lakes area (Morris 2001a and b).

Till deposits were formed by ice flow during glaciation and deglaciation. Meltwater rivers draining the melting ice sheet during deglaciation formed large meltwater channels and eskers where glaciofluvial sediments were deposited. The compact, massive till in the region has a sand to sandy silt matrix and podzolic soil is generally developed on its surface (Morris, 2001a).

The glaciofluvial sediments are mainly found within former meltwater channels and may locally form kame and kettle (pitted) topography. Southwest-trending outwash deposits and eskers consisting of sand or sand and gravel cover large areas between Dog Lake and Goudreau Lake (McQuay, 1980). Spring and Lovell lakes within the PSA are also found within this outwash system. Large eskers are also common on the northern sides of Goudreau and Pine lakes (Morris 2001b). The eskers in this region are either flanked by outwash deposits or partly buried by glaciolacustrine sand and may contain boulders (Morris, 2001a).

Organic deposits of muck and peat are present locally within low-lying and poorly drained areas and fluvial sediments consisting of sand, gravel and minor silt flank some of the local rivers (Morris 2001a and b).

The surficial (overburden) deposits within the PSA consist predominantly of till and glaciofluvial sediments, while fluvial and organic deposits exist in poorly drained areas. Depth to bedrock in the till-dominated portions of the site varies between 0 and 6 m below existing grade. The till varies from very poorly sorted silty sand with boulders to poorly graded fine to very coarse sand. Glaciofluvial units form undulating to hummocky terrain, terraces, flat-lying planar units, esker ridges and blankets or veneers. These glaciofluvial deposit thicknesses range from 6 to 16 m thick. The thicker deposits (on the order of 12 to 16 m) generally occur locally with the undulating terrain, and in particular towards the south and eastern end of the PSA.

### **3.2.1.2 Bedrock Geology**

The RSA and LSA are located within the Michipicoten greenstone belt of the Wawa subprovince in the Archean Superior Province. For the most part, the Superior Province of the Canadian Shield is considered tectonically stable for the last 2.5 billion years (Percival and Easton, 2007). Hayek et al. (2009) have indicated that the Superior Province has experienced a number of low magnitude shallow seismic events. Since 1985, there have been 11 of such low magnitude, shallow seismic events within 100 km of the Magino Property. Most of these events have occurred in the Chapleau and Hornepayne area, ranging in magnitude from 2.0 to 3.9. Earthquakes below 3.5 magnitude can be recorded on local seismographs, but are generally not felt. Earthquakes in the order of 3.9 can be felt but rarely cause any damage (Natural Resources Canada, 2014).

The Michipicoten greenstone belt is a structurally and stratigraphically complex assemblage of volcanic, sedimentary, and intrusive rocks that were metamorphosed to greenschist and amphibolite facies. Early structures include major recumbent folds, thrusts and associated cleavages (Card and Poulsen, 1998). Later superimposed upright folds are accompanied by steep cleavages. The latest structures include northeast-trending shear zones and northerly-

trending sinistral faults. A northeast-southwest trend of this shear zone is evident. Several suites of plutonic rocks ranging in composition from gabbro to monzogranite and syenite occur in and around the Michipicoten greenstone belt.

The bedrock in and around the proposed mine consists of felsic to intermediate pyroclastic metavolcanic rocks grading into mafic metavolcanic rocks. Gold mineralization is hosted by the Webb Lake Stock (granodiorite/trondhjemite) which is exposed in a localized area in the southern portion of the PSA. The granodiorite contains 5% to 10% veins of carbonate, quartz, tourmaline, and pyrite in various orientations. Approximately 5% of the igneous rock contains healed faults and fractures, generally filled with chlorite and carbonate.

Within the Webb Lake Stock, gold bearing veins are usually 2 to 4.5 m wide and have a strike length of 25 to 70 m. The bedrock is folded in places, producing mineable widths of up to 10 m. The zones dip at about the same angle as the foliation, have a vertical plunge, and are aligned in an east-north-east direction. Weak bleaching and silica flooding are the distinguishing features of the zones. Silica flooding consists of incipient pale grey quartz replacing the foliated granodiorite. Gold content is directly related to the amount of silica flooding. Gold values are distributed inconsistently within the veins. The veins are folded in places, with gold concentrated in the fold noses.

The bedrock units encountered in the PSA have been subdivided into 11 lithological units. Each lithological unit has been divided into sub-groupings. The sub-groupings are based on compositional and textural variations. Lithology units are summarized, along with the dominant rock type (sub-group), in Table 3-1. Unit 6 is the dominant ore host rock. In terms of mining operations, all other units are considered to be mine rock.

**Table 3-1: Primary Bedrock Lithological Units Encountered in the PSA**

<b>LITHOLOGY TYPE</b>	<b>LITHOLOGY UNIT</b>	<b>DOMINANT ROCK TYPES</b>
Mafic Metavolcanics	Unit 1	Unsubdivided (Unit 1A)
Intermediate Metavolcanics	Unit 2	Lapilli –tuff (Unit 2F) and Crystal Tuff (2H)
Felsic Metavolcanics	Unit 3	Crystal Tuff (Unit 3I)
Clastic Metasediments	Unit 4	Volcaniclastic – Epiclastic (Unit 4G)
Chemical Metasediments	Unit 5	Banded Sulphides (Unit 5E) and Banded Carbonates (Unit 5C)
Synvolcanic Felsic to Intermediate Intrusives	Unit 6	Granodiorite-Monzodiorite (Unit 6C) and Quartz Feldspar Porphyry (Unit 6G)
Mafic Intrusives	Unit 7	Gabbro (Unit 7C)
Ultramafic Intrusives	Unit 8	Amphibolite (Unit 8E)
Felsic to Intermediate Intrusives	Unit 9	Felsite – Aplite dykes/sills (Unit 9G)
Lamprophyre	Unit 10	Porphyritic Lamprophyre (Unit 10A,B)
Diabase	Unit 11	Diabase dykes (Unit 11B)

### 3.2.2 Geochemistry

Four types of tests were undertaken to characterize the geochemical properties of the bedrock in the PSA: Static ABA; whole rock metals analyses; metal leaching potential analyses; and humidity cell testing. The results of these tests are described in TSD 2.

Static ABA analyses were completed on a total of 543 samples in accordance with the Mine Environment Neutral Drainage (MEND) protocol. This included representative samples from each of the seven dominant lithological units likely to be encountered in the southern portions of the PSA in the vicinity of the proposed open pit. The neutralization potential ratio (NPR) values reported are based on Sobek Neutralization Potential (NP) and Maximum Potential Acidity (MPA) values. The acid generation potential was interpreted according to the ratios of NP to AP, referred to as the Neutralization Potential Ratio (NPR). The samples were then classified as either Potentially Acid Generating (PAG) or Non Acid Generating (NAG) based on the minimum and maximum NPR values and the classifications regime presented in the MEND (2009) guidelines and by Price (1997).

Mine rock units tested as part of the geochemical analysis comprised Units 1, 2, 5c, 5e, 6, 7, 9 and 11. For the mine rock, the static ABA work completed to date includes 543 mine rock samples. In addition, nine humidity tests and eight ongoing field cell tests have been performed on representative composite samples of each lithologic unit. The results indicate an overall NP/MPA Ratio of 13.4 (neutralization potential/maximum potential acidity). The overall NNP and NP/MPA ratios are well above the MEND criteria for defining PAG rock (i.e., 20 and 2, respectively).

The lithologic units included in the ARD testing program that characterize the ore are Units 1, 2, and 6. Since the tailings are milled and processed ore, these units also characterize the tailings. No acid leachate is expected to be generated by ore or tailings piles based on the results of ARD testing.

As with the mine rock, metals in ore and tailings leachate are not anticipated to be a significant environmental issue during operations or post-closure.

### 3.2.3 Groundwater

The Project is located in the Boreal Shield physiographic region of Canada. It is free of permafrost and was last glaciated 9,000 years ago. The topography in the vicinity of the Magino property is similar to most areas of the Canadian Shield within northeastern Ontario. It is characterized by low ridges and hills up to 50 m high, flanked by generally flat areas of glacial outwash. Groundwater levels are typically near surface, varying to up to 5 m deep. In some low-lying areas, groundwater levels occur at the surface.

Groundwater quality was monitored in 23 groundwater wells located in the PSA. These wells provided groundwater quality data for the overburden, shallow bedrock, and bedrock, and were chosen because of the sub-watershed where they are located. They were also chosen for their potential use in future monitoring of Project-related effects given their locations relative to the proposed mine infrastructure.

Overall, groundwater quality sampling results indicate that the groundwater in the PSA is of good quality. In general and as expected, the groundwater quality improves with depth. The following points summarize the overall groundwater quality findings:

- Throughout the PSA and at the depths sampled, pH values were all within the regulatory pH range of 6.5 to 8.5 with one anomalous reading above 10.0. The pH values were generally lowest in the shallow overburden with an average pH of 7.0 and with several readings in the slightly acidic (6.5 to 6.9) range. The average pH increased with depth in the shallow bedrock zone averaging 7.2 and the bedrock zone averaging 7.8 with several readings above 8. Two follow-up pH readings at the one anomalous well where the pH was initially above 10 were both below 8.0. The anomaly is attributed to the presence of residue from well construction associated with humic acid formation caused by presence of the organic matter in the overburden.
- The groundwater in the area can be classified as “hard” with 120 to 180 mg/L of CaCO<sub>3</sub> on average, but with many readings in the “moderately hard” range of 60 to 120 mg/L.
- The average total dissolved solids values are relatively constant in the overburden, shallow and deep bedrock; increasing slowly with depth from approximately 160 mg/L to 170 mg/L.
- Both dissolved organic carbon and total organic carbon values are low, but slightly above the ODWS standard of 5 mg/L for dissolved organic carbon in each of the overburden, shallow and deep bedrock samples. The dissolved carbon values averaged 4.6 mg/L to 5.7 mg/L and average total organic carbon values decreased from 7.3 mg/L in the overburden to 4.7 mg/L in the bedrock.
- Three wells exhibited slightly elevated sulphate (SO<sub>4</sub>) values along with higher than average hardness and TDS values. One well is located in an area of past operations by Webb Lake (MW09-02) and two wells are located in the area of Spring Lake (HYD-05A and 05B). HYD-05A is located in bedrock and HYD-05B in shallow bedrock by Spring Lake. The elevated sulphate is considered to be the result of mineralization of the rock in the area. MW09-02 is located in the area of previous mining activities by Webb Lake with exposed bedrock and residual ore. It should be noted that although the groundwater in these areas shows the highest SO<sub>4</sub> levels, these are still relatively low at 99 mg/L for MW09 and 138 mg/L for HYD 05B. There is no water quality standard assigned by ODWS for SO<sub>4</sub>.

### 3.2.4 Hydrology

The Magino property is located within the Magpie - Michipicoten River Basin, a large drainage system consisting of numerous streams, lakes, wetland complexes and connecting watercourses. It is situated east of Lake Superior in northern Ontario. The Magpie - Michipicoten Basin divide is located north of the Magino property. Surface flows draining north of the divide drain to the Magpie River catchment, and surface flows draining south of the divide drain to the Michipicoten River catchment. Both catchments ultimately drain to Lake Superior. McVeigh Creek and Goudreau Lake are the largest watercourses and waterbodies, respectively, located adjacent to the Magino property.

Four subwatersheds constitute the delineated area of the RSA and extend upstream and beyond the potential downstream influence of the mine operations. These subwatersheds are:

- Dreany Lake subwatershed;
- Herman-Otto subwatershed;
- Webb-Goudreau subwatershed; and

- Spring-Lovell subwatershed.

The characterization of baseline stream flows was carried out for watercourses within the RSA, LSA, and PSA. The assessment focused on watercourses in the PSA directly affected by the development of the mine and associated infrastructure, and watercourses in the LSA potentially directly affected through water takings, discharges, drainage area modifications, and stream realignments or potentially indirectly affected (loss of groundwater discharge) by Project activities.

Overall, for watercourses in the RSA, LSA, and PSA the baseline flow regime was characterized by:

- Typically higher flows in the spring in response to freshet, accounting for approximately 50% of the annual runoff;
- Lowest runoff occurring in winter as baseflows decreased, with February and March exhibiting the lowest runoff; and
- Bimodal distribution of annual flow with a secondary peak occurring in late fall (October/November) in response to late fall rainfall events prior to freeze-up.

Lake level measurements were recorded from June 2013 to November 2013 at staff gauges established at a number of lakes and lake outflows in the RSA, LSA, and PSA. Overall, for lakes in the RSA, LSA, and PSA the baseline lake levels were characterized by:

- Highest water levels in May to June in response to spring snow melt;
- Lowest water levels in late summer (August and September) and winter (February and March) when precipitation inputs were seasonally low;
- Increasing water levels in late fall (October and November) in response to fall rainfall events;
- Lowest runoff occurring in winter as baseflows decreased, with February and March exhibiting the lowest runoff; and
- Bimodal distribution of annual flow with a secondary peak in late fall (October/November) in response to late fall rainfall events prior to freeze-up.

### **3.2.5 Surface Water and Sediment Quality**

Five reference lake water quality monitoring stations were established in the RSA to represent background water quality, and to track changes in water quality independent of project activities. Stations were established in Dreany Lake, located in the Dreany Lake subwatershed, and in Mountain Lake, the headwaters of the Herman-Otto subwatershed. Forty-five water quality monitoring stations were established in lakes and streams in the LSA and PSA to describe baseline water quality in water bodies that were potentially affected by historic mining activities, in sufficient detail to predict impacts, and to serve as sites for monitoring during construction, operations, and closure phases.

The following points summarize the overall surface water quality findings:

- Larger lakes within the study areas undergo thermal stratification that results in a decrease in bottom oxygen levels. Anoxic conditions were recorded in the hypolimnion of lakes within the Herman-Otto and Webb-Goudreau Lakes subwatersheds. Dissolved oxygen concentrations were mainly below the PWQO for warm and cold water biota in lakes. Smaller lakes and wetlands/ponds did not stratify and were generally well oxygenated.

- Both lakes and watercourses in the study areas generally had circumneutral pH, were typically soft and well buffered, with low conductivity and nutrient concentrations. Conditions in the Spring-Lovell subwatershed differed from this regional pattern in that levels of hardness, alkalinity and conductivity were substantially higher in the Tailings and Polishing Pond, and were moderately higher than average concentrations downstream in Spring Lake and McVeigh Creek. This is due to the influence of historical mining activity in the subwatershed. Hardness, alkalinity and conductivity were also slightly higher in the Webb-Goudreau subwatershed as compared with the Herman-Otto and Dreany Lake subwatersheds. This suggests that geologic conditions may differ in their influence on water quality on either side of the Magpie-Michipicoten watershed divide.
- Wetland water quality in the study areas varied moderately, and was generally reflective of the watershed in which the wetlands were located. On average, compared to lakes and streams, wetland water quality was softer, somewhat more sensitive to acidic inputs and had lower levels of conductivity. Wetland influence was evident on Dreany Lake, Spring Lake, Lovell Lake, Herman Creek, McVeigh Creek and in Goudreau Creek. Mountain Lake, Webb Lake, Goudreau Lake and all lakes in the Herman-Otto subwatershed showed little influence of wetlands on water quality.
- Metals concentrations in lakes, watercourses and wetlands were generally low. Metals that exceeded the CWQG and PWQO on occasion were aluminum, cadmium, cobalt, copper, iron, total mercury, methyl mercury, tungsten, silver and zinc. Among all metals measured, concentrations of iron exceeded guidelines and objectives most frequently and by greater orders of magnitude than other metals. Wetland influence on water quality was associated with iron exceedances and is likely a source of naturally high concentrations of iron in the Project Area. On average, iron concentrations in all PSA wetlands (excluding Water Body 10) were at or exceeded the CWQG and PWQO criteria value of 0.03 mg/L. Historical mining activities may also contribute to iron enrichment of McVeigh Creek.
- Concentrations of WAD cyanide in the Polishing Pond were above the PWQO/CWQG guidelines on two occasions, likely due to historical mining activities.
- Indicators of sustained acidic drainage at the monitoring locations downstream of areas of historical mining activity were not observed.

The following points summarize the overall findings for the stream and lake sediment quality:

- Nutrient enrichment was observed in the sediments of the Dreany and Mountain Lakes and in the McVeigh and Herman Creek RSA sites. In the LSA and PSA, nutrient enrichment was observed in the water bodies and watercourse sites of the Herman-Otto, Spring-Lovell and Webb-Goudreau subwatersheds. Low nutrient concentrations were observed at RSA site GC1 in Goudreau Creek.
- TKN and TOC were above their PSQG SEL values of 4,800 mg/kg and 100,000 mg/kg (or 10% TOC) in 70% and 58% of all the samples respectively. This is characteristic of the organic bottom sediments in lakes located on the Precambrian Shield and generally indicates poor habitat quality for bottom dwelling organisms (benthic invertebrates) and is not an indication of sediment toxicity.
- Arsenic, iron and manganese were above the guideline values in 29%, 22%, and 30% of the samples collected, respectively. Elevated concentrations of these parameters were observed throughout most of the entire study area, with the highest percentages at the RSA creek stations, and in Webb-Goudreau subwatershed. The elevated arsenic, iron, and manganese concentrations in the RSA creek stations and Webb-Goudreau

subwatershed were found only in the McVeigh Creek (McV0 and McV7) and Goudreau and Webb Lake stations. The catchments for all of these sites contain historical and/or current mining activity, and the higher metal concentrations at these sites are likely a reflection of anthropogenic activities in the catchments, rather than natural background levels.

- Other metals where more than 10% of the samples collected were above guideline values were lead in the reference catchments (13%); zinc (33%), and nickel (33%) at the RSA creek sites; and copper (16%) in Spring-Lovell subwatershed in the LSA/PSA.
- At selected sites in the local and project study area, PAH compounds were assessed in sediments. The method detection limit was above one or both of the MOECC and Canadian Council of Ministers of the Environment (CCME) guideline values. For all sites, PAH values were below their respective detection limits.

### **3.3 Biophysical Environment**

The existing conditions relevant to the biological environment are presented in detail in Chapter 4, Section 4.3. Within a 50 km radius of the Magino property there are ten provincial parks, game preserves/reserves or nature reserves, each with unique features. However, there are no such recognized ecological areas nor provincially designated areas of interest in or adjacent to the Magino property. There are no rare vegetation community types that have been identified on or in the vicinity of the Magino property.

#### **3.3.1 Fish and Fish Habitat**

As described earlier, the RSA includes four watersheds. These are:

- Dreany watershed;
- Hermann-Otto watershed;
- Spring-Lovell watershed; and
- Webb-Goudreau watershed.

Of the four watersheds within the RSA, Dreany and Herman-Otto flow into the Magpie River basin and Spring-Lovell and Webb-Goudreau watersheds flow into the Michipicoten River basin. Both the Magpie and Michipicoten Rivers flow to Lake Superior.

Collectively the waterbodies and watercourses within the RSA support diverse fish species with cold and cool water preferences. Multiple trophic levels and feeding guilds are present, as is a forage base that supports sport fish normally sought in recreational fisheries. The RSA is outside the distribution for warm water species such as Smallmouth and Largemouth Bass. Although small-bodied and early-maturing fish such as Fathead Minnow which prefer warm water do occur in the RSA, water temperatures are too cold to support large-bodied later maturing warm water species such as Smallmouth and Largemouth Bass. No aquatic SAR are known to occur in any of the water bodies in the RSA. A description of the baseline conditions for fish and fish habitat for each waterbody within the PSA and the LSA is presented in Chapter 4, Section 4.3.4.

#### **3.3.2 Terrestrial Vegetation and Wetlands**

The Magino property is located within Ecoregion 3E: Lake Abitibi and is generally characterized as boreal forest underlain generally by granitic or gneissic bedrock (Crins *et al.*, 2009). Over the entire Ecoregion, mixed forest and coniferous forest each comprise approximately 30% of the

land area, while sparse forest comprises 11% and deciduous forest comprises 7%. Approximately 8% of the Ecoregion has been cut over, and 7% is comprised of lakes and watercourses (Crins *et al.*, 2009). More specifically, the Magino property is located in the Foleyet Ecodistrict (3E-5). Over half of the Ecodistrict is comprised of mixed forest, dominated by Trembling Aspen, White Birch, Balsam Fir, Black Spruce, and White Spruce.

The RSA is located within a boreal forest and is dominated by Upland Forest which accounts for 70% of the total vegetation. The most abundant forest types in the RSA are dominated by early successional White Birch and Trembling Aspen with variable moisture regimes. These deciduous stands compose approximately two-thirds of the upland forest within the RSA. Conifer stands are comprised of variable percentages of Black or White Spruce and Jack Pine, depending on moisture regimes. Large lakes are present throughout the RSA (12% of the cover) and are often fringed with organic fen. Coniferous swamps with organic substrates compose almost 15% of the vegetation and are aligned in roughly a north east to south west direction in the hollows between sculptured bedrock hills with only thin soil cover. Lichen-covered rock barrens are exposed infrequently (less than 1% cover). Without the influence of recent logging operations that have opened up the canopy to mimic a more open forest, possibly on drier soils, the canopy would be largely closed.

Wetlands including bogs, fens, and marshes are often found within boreal forests. Within the RSA, wetlands are the next most dominant vegetation covering approximately 14% of the RSA. Within the Wetland Community, Organic Intermediate Conifer Swamp is the most dominant wetland vegetation covering 5% or 553 ha of the RSA yet is accounts for 36% of the RSA wetland vegetation. Shrub Shore Fen and Sparse Treed Fen are also common in the RSA wetlands covering 472 ha combined or 4% of the RSA or 31% of the RSA's wetland vegetation. Within the RSA there are 1509 ha of wetlands, 320ha of which are found within the PSA representing 12% of the PSA natural cover. Many of the wetlands within the PSA have been crossed by mineral exploration roads, and to a lesser extent, by forest service roads. They are located along the drainage systems that flow roughly northeast to southwest in the three watersheds that form the LSA.

### **3.3.3 Significant Wildlife Habitat**

The RSA is located within Ecoregion 3E: Lake Abitibi. Significant wildlife habitat (SWH) identified within the local and project study area comprised of:

- moose late winter cover habitats,
- moose aquatic feeding areas,
- moose aquatic feeding habitat, and
- wetland amphibian breeding habitats.

SWH varies within watersheds and can be found throughout the RSA. The PSA is approximately 1802 ha and represents 50% of the LSA. Significant Wildlife Habitat in the PSA represents 11% of the LSA and 50% of the total Significant Wildlife Habitat available in the LSA. Of all four Significant Wildlife Habitat types, the PSA contains virtually all of the moose calving and amphibian breeding habitat available in the LSA.

The RSA is located with the Ontario Ministry of Natural Resources Wildlife Management Unit (WMU) 32. WMU 32 is dominated by conifer species such as spruce, jack pine, balsam fir, and tamarack, and deciduous species such as white birch and poplar. The unit consists of two

discrete portions: the western portion where licensed hunting is allowed and the eastern portion of Chapleau Crown Game Preserve (CCGP) where licensed hunting is not allowed.

### **3.3.4 Migratory Birds**

Birds are a diverse group, and some species are expected to occupy all habitat types within the RSA for nesting, feeding, and or staging. The majority of birds expected within RSA are summer residents, which migrate into the area for the purposes of breeding. As with breeding territories, the routes of travel between wintering and breeding grounds are traditional and are used each year. Bird surveys identified 188 species of birds within the RSA.

### **3.3.5 Mammals**

The upland forests, wetlands, and waterbodies in the RSA provides suitable habitat for a potential of 48 mammal species. As a group, mammals within the RSA are diverse and require a variety of habitat types for their life requirements. All potentially occurring mammal species are year-round residents to the RSA. Of the 48 mammal species potentially occurring in the RSA, a total of 10 were detected during the field programs, including visual sightings and other signs. Beaver was the most commonly observed or detected mammal species, followed by Moose, Black Bear, and Red Squirrel. Marten, Fox, Wolf, Lynx, and Star-nosed Mole were the least detected mammals, typically through auditory signs or tracks. Notably though, a large number of Snowshoe Hares were observed incidentally along the roads and trails. Other species known to be hunted in the RSA but not observed during field studies include mink, muskrat, otter, and fisher.

### **3.3.6 Species at Risk**

Species at Risk (SAR) are those species that are extirpated, endangered, threatened or categorized as a species of special concern. The purpose of the federal and provincial legislation with respect to SAR is to help prevent wildlife species from becoming extinct. Species of special concern are afforded habitat protection in the context of the Provincial Policy Statement in the context of Significant Wildlife Habitat that has been assessed separately. Eight SAR were observed, heard or recorded in the PSA. An effects assessment of SAR is presented in detail in Chapter 7, Section 7.4.7.

## **3.4 Human Environment**

The existing conditions relevant to the biological environment are presented in detail in Chapter 4, Sections 4.4-4.6.

### **3.4.1 Social Environment**

The closest communities to the Project include Dubreuilville (approximately 14 km to the north by road); Wawa (approximately 40 km straight-line distance/ 80 km by road to the southwest); and White River (approximately 70 km straight line distance/ 90 km by road to northwest). Sault Ste. Marie is located approximately 310 km to the south and is the closest large community to the Magino property. Smaller settlements in the project area include Hawk Junction, Goudreau, Lochalsh, and Missanabie.

The communities of Dubreuilville, Wawa and White River - like many other northern Ontario communities - have experienced declines in their populations over the past two decades. In

recent years population decline, combined with an aging population has resulted in lower local school enrolments, and reduced school staffing and programming. Basic healthcare services are available at the Dubreuilville Health Center and in White River. A higher level of healthcare for local area residents is available in Wawa, including at the Lady Dunn Health Centre. However, specialty healthcare services require travel to facilities outside of the local communities. Local area residents do have access to a variety of social services and organizations. In general, it is expected the Project will stimulate interest in education and training and generate more local employment opportunities which, in turn, will help to retain local residents and attract new ones

### **3.4.2 Economic Environment**

The Magino property is located within the Unorganized Area of Finan Township which does not have municipal zoning designations. The Project site is located within Ontario Regulation #102/89, Zoning Order for the Territorial District of Algoma. Under Section 9(d) of the Order, mining, including pits, quarries, and wayside pits or quarries, is considered a permitted use. Since the Project is located on provincial Crown land, the development is governed by the Ontario provincial land use policy. This policy proposes that development occur mainly within the Wawa, Chapleau, Nipigon, and Sault Ste. Marie Districts General Use Area (G2694) to benefit from Integrated Multiple Resources Management

Mining remains the area's largest employment sector. There are currently three active gold mines operating in the Wawa, Dubreuilville and White River areas: the Island Gold Mine, Eagle River Mine (Pace, 2012) and the Hemlo mines. The Island Gold Mine facility is adjacent and east of the Project and has produced more than 100,000 oz. of gold since 2007 (Richmont Mines, 2012). The Eagle River Mine, owned and operated by Wesdome Gold Mines, is located 50 km west of Wawa (Wesdome Gold, 2012a). The company also owns two other mining properties north of Wawa (Mishi and Magnacon) and has been operating since 1995 (Pace, 2012). In 2010, Wesdome Gold Mines was the second major employer in the Municipality of Wawa, employing 180 residents (Economic Development Corporation of Wawa, 2010; Wesdome Gold, 2012b). Barrick Gold Corporation's Hemlo property consists of the David Bell Mine (underground) and the Williams mine (underground and open pit). The property is accessible via the TransCanada Highway 17 approximately 60 km west of White River. The mines shared milling, processing, and tailings facilities (InfoMine Inc., 2013). However, the David Bell Mine closed in spring 2014, resulting in a loss of approximately 100 jobs.

Overall, these communities share a desire to diversify the local and regional economies. They are working to retain and attract residents and businesses to the area by actively promoting the use of existing community assets such as housing, community infrastructure and available land. These communities are also keenly aware that the natural environment provides a wealth of recreational and tourism opportunities, largely associated with fishing and hunting. A number of recreational fishing species such as pike, muskie, walleye, bass, and trout populate the inland lakes, rivers, and streams of the area. Popular hunted species include moose, bear, deer, and waterfowl.

### **3.4.3 Aboriginal Interests**

As introduced in Chapter 2, Prodigy has engaged the following Aboriginal groups – First Nations and Métis organizations - in the Environmental Assessment (EA) process:

- Michipicoten First Nation (MFN);

- Missanabie Cree First Nation (MCFN);
- Batchewana First Nation (BFN);
- Métis Nation of Ontario (MNO);
- Red Sky Métis Independent Nation (RSMIN);
- Pic Moberg First Nation (PMFN); and
- Garden River First Nation (GRFN).

Traditional Knowledge Land Use Studies and reports have been prepared by five of the seven Aboriginal Groups: MFN, MCFN, BFN, MNO and RSMIN. Data from these studies has been incorporated into the EIS. Pic Moberg First Nation has declined the invitation to participate in the Magino EA process. Garden River First Nation has been identified by the province as a community that may have interest in the project.

In general, the interests expressed by these First Nations and Métis organizations have related to:

- The need for all parties to respect Aboriginal and Treaty Rights;
- The need to protect the natural environment;
- The ability to continue with traditional land use and harvesting activities,
- Preservation of archaeological and spiritual sites;
- Maintaining Aboriginal culture and way of life;
- Respect for Aboriginal Traditional Knowledge;
- Ensuring healthy, vibrant and prosperous communities; and
- The future status of the lands disturbed by the Project (via the closure plan and subsequent monitoring). This includes, a strong desire that the lands be restored to their natural state (or as close to natural as possible) and be available for future generations to use and enjoy.

## **4.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT**

As directed by the Magino Project (EIS) Guidelines, and in compliance with the requirements of the Canadian Environmental Assessment Act (CEAA) and the Ontario Environmental Assessment Act (EAA), Prodigy evaluated the alternatives to the Project, and alternative means of implementing the Project.

### **4.1 Alternatives to the Project**

The purpose of the Project is to extract gold from an identified ore body and to sell the recovered gold on global markets. This can only be accomplished through mining and processing the identified ore body. Due to the ore body being in a fixed location, there is no feasible alternate location. Similarly, there is no other alternative to the Project except for a “No Project” Alternative. A “No Project” Alternative would leave the ore body in place. The mine would not be developed, and the beneficial aspects of the Project would not be realized. Certain alternative means of implementing various components of the Project are discussed below.

### **4.2 Mine Waste Disposal Alternatives Evaluation**

Under Canadian federal law and regulations, it is expected that natural water bodies frequented by fish be avoided to the extent practicable in the long-term disposal of mine waste. Similarly, mine waste shall be managed to ensure the long-term protection of Canada’s terrestrial and aquatic environments. Using a natural water body frequented by fish for mine waste disposal requires an amendment to the Metal Mining Effluent Regulations (MMER). Schedule 2 of the MMER lists water bodies designated as Tailings Impoundment Areas (TIAs)/Tailing Management Facility (TMF). A water body can be added to the MMER Schedule 2 through a regulatory amendment.

Since the proposed layout of the Magino Project overlays water bodies frequented by fish, an amendment to MMER Schedule 2 will be required. In order to support its application for an amendment to Schedule 2, Prodigy undertook a comprehensive evaluation of feasible mine waste disposal alternatives for the Magino Project. The evaluation of alternatives was carried out in accordance with Environment Canada’s guidance document on multiple account analysis.

The Mine Waste Disposal Alternatives evaluation report is presented in TSD 5. Six different tailings disposal methods were considered, along with ten potential candidate sites for the location of the TMF. This assessment concluded that the optimal disposal method for the Project is the disposal of thickened tailings. The preferred site for disposition of the tailings and the mine rock is on the Prodigy property as shown on Figure 2-1.

### **4.3 Alternatives Means of Implementing the Project**

A summary of the alternative means of implementing various components of the Project is presented in Table 4-1. The table lists the alternatives considered and the rationale for the selection of the preferred alternative.

**Table 4-1: Alternative Means for Implementing the Project**

<b>COMPONENT</b>	<b>ALTERNATIVE</b>	<b>RATIONALE</b>
Mine Waste Disposal Alternatives	<ol style="list-style-type: none"> <li>1. Six disposal technologies</li> <li>2. Ten candidate sites for TMF location</li> </ol>	Multiple account analysis concluded that disposal of thickened tailings at Site G located on the Magino Property is optimal.
Mine Development	1. Underground mining	The Magino ore body is well-suited for open pit mining, because gold is present at low concentrations (approximately 1.0 grams per tonne) and is disseminated over an area that is estimated to be at least 300 m wide. Open pit mining is both technically and economically feasible.
	2. Open pit mining	
Ore Processing	1. Heap leaching on a lined pad	Alternative 4 (processing by milling and cyanide leaching) is preferred. This alternative reduces the amount of chemicals that have to be used by taking advantage of and enhancing the potential for natural attenuation that would occur in the TMF. It also makes operations of the cyanide destruction circuit more efficient.
	2. Non-cyanide processing methods	
	3. Processing by milling and cyanide leaching including a cyanide destruction circuit	
	4. Processing by milling and cyanide leaching using a cyanide destruction circuit and natural cyanide destruction	
Ore Processing Location	1. On-site processing	On-site ore processing is both technically and economically feasible because it is within Prodigy's ability to implement and is consistent with Prodigy's core competency as a mine owner and operator. It provides a reasonable rate of return to Prodigy in comparison to off-site processing alternatives.
	2. Off-site processing	
Power Supply	1. On-site power generation using renewable power sources	Alternative 3 is preferred. Off-site power generation and transmission via the existing API electric transmission line from Hawk Junction to the Project can provide the Project's power requirements. It is consistent with Prodigy's core competency as a mine owner and operator as it does not require the construction and operation of a new major power generation facility (i.e. 50 MW facility). It also maximizes the use of existing off-site power generation facilities and existing transmission infrastructure, thereby reducing capital and operating costs.
	2. On-site power generation using diesel power sources	
	3. Off-site power generation and transmission to the mine site by Algoma Power Incorporated (API) and on-site power generation.	
Transmission Line Re-routing through the Site	1. North Route	Alternative 1 is preferred because of the technical performance and opportunities, the lower effects on physical, biological and economic environment, as well best meeting aboriginal interests.
	2. Central Route	
	3. South Route	

COMPONENT	ALTERNATIVE	RATIONALE
Process Water Supply	1. Use of water from the mine pit and recycling of water	<p>Alternative 2 is preferred. The development of a new water supply from Goudreau Lake is both technically and economically feasible because:</p> <ul style="list-style-type: none"> <li>• Sufficient water is available from the lake to support the Project needs; and</li> <li>• It involves limited additional infrastructure, given the proximity of the source lake to the mine infrastructure.</li> </ul> <p>The use of water from the mine pit and recycling of water to minimize the amount of water supply needed is considered best industry practice. It is also consistent with Prodigy's core competency as a mine owner and operator.</p>
	2. New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water	
	3. New supply from Herman and Goudreau Lakes, including the use of water from the mine pit and recycling of water	
	4. New supply from Magpie River, including the use of water from the mine pit and recycling of water	
	5. New supply from groundwater wells, including the use of water from the mine pit and recycling of water	
PAG Material Disposal	1. Separate potentially acid-generating (PAG) cell	<p>Less than 1% of the mine rock is PAG. Co-disposal of PAG material within the MRMF (Alternative 2) is preferred because it provides greater technical performance and opportunities and because it has lower financial costs and risks. It lowers the potential for adverse effects on terrain and soils, and on surface water quantity. Lower effects on the physical environment are preferred from an Aboriginal interest perspective.</p>
	2. Disposal within the non-acid generating (NAG) MRMF	
Non-hazardous, non-mining Solid Waste Disposal	1. On-site landfill	<p>Alternative 1 is preferred because it provides the most flexibility and reliability during operation of the mine and has the lowest project costs. It is also preferred as it does not require off-site transportation of wastes, thereby minimizing effects on air quality, and avoiding potential traffic accidents on public roads. An on-site landfill does not take up available capacity in a planned or existing landfill used by others.</p>
	2. Off-site landfill near Dubreuilville	
	3. Export to a more remote landfill	
Access Roads to the Magino Property	1. Goudreau Road for all Project traffic	<p>Alternative 1 is preferred because as it provides greater technical performance and opportunities, lower financial costs and risks, and present fewer adverse atmospheric, physical, biological, human health, social and economic environmental effects than the other Alternatives. Alternative 1 is likely to result in lesser effects on the physical and biological environmental that support traditional activities.</p>
	2. Goudreau Road and the Northern Bypass for heavy loads	
	3. New road from Hawk Junction	
	4. Service road from CN rail line to Mill site	

COMPONENT	ALTERNATIVE	RATIONALE
On-site Relocation of Goudreau Road	1. Relocation of Goudreau Road to the west of the TMF & MRMF Area	Alternative 1 is preferred. It is within Prodigy's ability to implement and there are sufficient land and construction materials on the Magino property to construct a 12 km road around the site. The opportunity to co-locate the transmission line along the road right-of-way reduces Project costs. A ring road supports efficient and cost-effective mine operations by diverting public traffic away from mining infrastructure and areas of intensive mining activity.
	2. Relocation of Goudreau Road to the west of the open pit	
Accommodations for the Operation Phase	1. All accommodations to be provided by the local communities	An off-site accommodation complex within Dubreuilville (Alternative 3) is retained as the preferred alternative because it is strongly supported by local residents (refer to record of public consultation).
	2. On-site accommodation complex supplemented by off-site accommodation in the local communities	
	3. Accommodations to be provided in the local communities and an off-site staff accommodation complex located in Dubreuilville	
Mine Pit Closure	1. Pit lake filling from local surface runoff and groundwater inflow	Alternative 1 is preferred as it relies solely on natural processes and because there are no physical constraints or limitations that would prevent the pit from filling up over time.
	2. Pit lake filling from local surface runoff and groundwater inflow plus in-pit disposal of mine rock and/or tailings.	
	3. Pit lake filling from local surface runoff and groundwater inflow plus operations water supply	
Closure of TMF	1. Closure with soil cover and revegetated surface of the TMF deck	Alternative 1 is preferred. The soil and overburden placed on top of the tailings provide an improved base for revegetation. It minimizes residual seepage from the TMF and is durable, thereby reducing long-term effects and liabilities. It can be constructed using available on-site materials, thereby reducing Project costs.
	2. Closure by creating a wetland and/or waterbody on the TMF deck	

## **5.0 PUBLIC CONSULTATION**

### **5.1 Introduction**

Since 2012, Prodigy Gold has been conducting information, engagement and consultation process with local communities, individuals and groups as part of the public participation process. The public participation process included updates on the project description, of plans for the proposed Project. Public consultation activities have been undertaken to better understand local communities, make note of questions and key comments, and develop strong, long-term working relationships. Input received through public consultation will help shape Project design, mitigation, and implementation.

This chapter summary identifies the communities and other parties consulted, the public consultation approach, techniques used, and key comments and questions raised during public engagement. Chapter 13 and Appendix 6 of the EIS provide additional detail on public consultation, materials and records of communications.

### **5.2 Identification of Parties Consulted**

Prodigy Gold's public consultation activities have focused on the leadership and residents in three communities in the District of Algoma which have the greatest potential to be affected by the proposed Project: the Township of Dubreuilville, the Municipality of Wawa, and the Township of White River. Prodigy Gold scoped these three communities into their public consultation program given their close geographic proximity to the proposed Project site and to each other, as well as existing socio-economic and transportation linkages. Other individuals and organizations were also been identified (e.g., those with interests in economic development, training, resource development, land those who are tenure holders, trappers and baitfish license holders). All were invited to participate in consultation activities.

Prodigy Gold has documented all public consultation activities and comments received to ensure that relevant information is both recorded and responded to (e.g., in consultation materials and events or incorporated into the Project design and mitigation).

### **5.3 Public Consultation Approach**

Prior to the October 2014 submission of the Draft EIS, Prodigy Gold carried out public consultation between 2012 and 2014. During that time, Prodigy Gold specifically undertook scoping exercises that explained the proposed Project, sought public comment and questions, described VCs and the EA process and methodology. Post November 2014, Prodigy Gold focussed its public consultation process on providing local communities, likely to be most affected by the proposed Project (i.e., Dubreuilville, Wawa, and White River), with Project updates, information regarding tailings management facilities and alternatives, accommodation, fisheries offset, and VCs. Comments were reviewed and incorporated in to the EIS.

#### **5.3.1 Consultation Techniques**

The following public consultation techniques were used:

- Community Open Houses;
- Meetings and Presentations (including verbal and written presentations or handouts on specific project topics); and

- Project webpage (which serves to inform and provide updates on the Project).

### **Community Open Houses**

A total of 10 open houses were organized and held with the Municipalities of Dubreuilville, Wawa and White River between 2012 and 2016. Prodigy Gold hosted 4 open houses in both Dubreuilville and Wawa and 2 open houses in White River. The open houses were held after business hours in the early evening to encourage the greatest number of participants. The number of participants at the open houses held since 2012 ranged from 15 – 80, for an approximate total of 450 participants. The community open houses followed an informal format with an open floor for comments and questions, and opportunities for one-on-one discussion with Prodigy Gold representatives and consultants. Project storyboards (display panels) were set up at each open house and maps of the Project site, tailings management facility (alternative locations) and the surrounding region were available for reference. A Project overview presentation was given at each open house to provide information on matters including Federal and Provincial EA processes, Project phases, the proposed tailings management facility, tailings site alternatives, fisheries offsets, timelines and updates, and Project components. A question and answer period followed each presentation.

### **Meetings and Presentations**

Since 2012, meetings have been held and presentations have been provided to community leadership (i.e., Mayor and Council members), community members, as well as community and regional groups and organizations. Meetings have included presentations on specific project topics and/or agendas for discussion (e.g., Federal and Provincial EA processes, Project phases, timelines and updates, Project components, mine employment requirements and alternatives (e.g., tailings, accommodation complex)).

Communications with land tenure holders (e.g., trappers, cabin owners, bait-fish and bear management area licences holders with tenure on-site or within the Project area) which began as early as 2012 are ongoing. Prodigy Gold has held meetings with land tenure holders advising them of the proposed Project, consultation opportunities, and the scheduling of meetings and open houses.

### **Project Webpage**

A project webpage has been developed that serves to inform and provide updates on the Project's progress. Links to the webpage are posted on local community and group websites. The Project webpage includes background information on the Project and links to key documents (e.g., the Federal PDR).

#### **5.3.2 Public Consultation Materials**

Prodigy Gold developed an array of information materials for its public consultation program. These consultation materials included:

- Frequently asked questions (FAQs);
- Project storyboard panels at community open houses;
- Written information about the project in Brochure or pamphlet format;

- Participant comment sheets (made available at public events and at the Project office in Dubreuilville);
- 3-D physical scale model of the proposed project; and
- Virtual information about the Project scope.

## **Notifications**

Prodigy Gold has also used a variety of notification techniques to advertise its public consultation events (including announcements on local radio, posters in key community locations, advertisements in local print media, e-mails and letters to community leadership and interested parties, as well as postings on community website pages or Facebook).

## **5.4 Key Comments and Questions Raised During Public Engagement**

This section briefly summarizes the results of engagement activities conducted to date and outlines key comments and questions raised at regional and local levels. Engagement is currently ongoing. Prodigy Gold has considered the comments raised during public consultation as it assessed potential effects and identified mitigation measures for the Project.

Key topic areas during public consultations are organized into the following:

- Environmental Assessment Process;
- Community Economic Development;
- Employment and Training;
- Socio-economic Effects;
- Accommodation Needs;
- Community Involvement;
- Construction, Operations and Closure;
- Transportation; and
- Environmental Effects.

The following is a summary of some of the key comments and questions received from the public about the proposed Project and Prodigy Gold's responses to them.

### **Environmental Assessment Process**

Members of the public asked questions pertaining to the EA and permitting processes (particularly the steps involved). In response, Prodigy Gold stated it plans to submit the EIS to the CEAA in early 2017. The company noted that once submitted, the CEAA will prepare a draft EA report, which will be available for public comment. Following receipt of comments through public and Aboriginal review, the CEAA will finalize the EA Report and the Minister of Environment will make a decision on the significance of the environmental effects. Prodigy Gold has informed the public that the total EA and permitting process will take approximately two years.

### **Community Economic Development**

Some members of the public asked questions about contracts for goods and services during construction and operation phases of the Project, and expressed interest in encouraging local hiring and provision of incentives for families to locate to Dubreuilville/Wawa/White River during

construction and operation phases. Prodigy Gold responded that it will work with local communities to encourage workers to reside in local communities and is committed to implementing local hiring practices.

### **Employment and Training**

A number of public comments and questions focussed on a) the types and number of jobs that will be available at the proposed Project site; b) how community members can take advantage of employment opportunities, and how they can work with Prodigy Gold to identify and develop the skills (i.e., levels of formal education, skills, and trades training) required for new jobs at the Mine. Prodigy Gold responded by saying it is expected that during Mine construction, there will be approximately 500-600 jobs; and that during the operation of the Mine there will be up to approximately 375 jobs. Prodigy Gold committed to updating communities on its project timelines, job opportunities and training requirements. Prodigy Gold reiterated that it will work with regional and local educational institutions in order to coordinate and maximize training and employment opportunities for local residents.

### **Socio-economic Effects**

Questions and comments regarding the socio-economic effects of the Project focussed on Prodigy Gold's approach to training and addressing social service's needs. This included potential needs and impacts that the proposed Project will have on community services (i.e., the need to plan for eventual job losses associated with mine closure and the "boom and bust" cycle of economic development). Prodigy Gold said it is committed to being a good "neighbour" to the local communities and committed to working with communities as appropriate to help them plan for the transition and eventual closure of the proposed Magino Mine.

### **Accommodation Needs**

Some members of the public expressed their opinions regarding the availability of vacant homes and lots in Dubreuilville and Wawa which they believe are capable of accommodating population growth. Others were of the opinion that there is not enough housing or services available in the communities. Some community members asked what types of community infrastructure will be needed (e.g., housing, landfill, health and education) to support the Mine and mine workers/families. Prodigy Gold responded by saying it is committed to working with communities to understand their needs related to the Project. It also noted its intent to draw as many workers from the local communities as possible.

### **Community Involvement**

Comments and questions pertaining to community involvement related to the following: a) keeping people informed on the progress of the EA and permitting processes, as well as Project plans; and, b) how Aboriginal groups and local communities could be involved in the EA process. Prodigy Gold responded that it is committed to keeping the communities, Aboriginal groups, and local municipalities informed on the progress of the Project; and, that they are meeting with communities, municipalities and Aboriginal groups throughout the EA and permitting process, and will continue to do so throughout the development and implementation of the Project.

## **Construction, Operations and Closure**

There were a number of comments and questions from the public pertaining to the construction, operations and closure phases of the Mine which related to the following: a) the schedule/timing of construction and operations; b) whether the life of the mine (LOM) could be extended (i.e., is Prodigy Gold continuing exploration in the area); and, c) Mine site closure and reclamation.

In response, Prodigy Gold stated that construction and operations will not commence until EA processes have been completed and applicable permits have been obtained (approximately 2 years). Prodigy Gold noted that site preparation and construction will take 2 to 3 years; open pit mining and process plant operation will take 10 to 15 years; and, site closure and reclamation will last approximately 2 to 3 years and post-closure monitoring and maintenance will be based upon site performance objectives.

Prodigy Gold stated the proposed Project will extract the resource as discussed within the documentation but also noted that mining companies are continuously looking for new opportunities and exploring for more resources.

Regarding the Mine site closure and reclamation, Prodigy Gold responded to questions by saying it plans to allow the open pit to form a lake. The mine site, including the tailings management facility and mine rock management facility, will be revegetated as per a certified closure plan. Prodigy Gold noted that details on the closure plan will be developed in concert with the public, government agencies and Aboriginal groups.

## **Transportation**

Questions about transportation focused on: a) what Mine access routes are being considered (e.g., Goudreau Road); and, b) whether additional traffic volumes will affect road safety. In response to this, Prodigy Gold stated that Goudreau Road will serve as the Mine access route (no major improvements will be required). Prodigy Gold also noted there will be an increase of traffic on roads during construction and operation of the Mine but that the increased traffic is not expected to affect the safety of the roads.

## **Environmental Effects**

There were a number of comments and questions from the public pertaining to environmental effects of the Mine. These related to the following: a) the protection of the environment (i.e., the mine must be constructed and operated using sound environmental practices); b) potential effects on wildlife and proposed mitigation and monitoring measures; c) maintaining or recreating fish habitat; and, d) how water from the Project will be treated, used and recycled.

In response to these questions, Prodigy Gold stated that the Federal and Provincial approval and permitting processes will be followed before mine construction can be initiated, and that approvals and permits will ensure the environment will be protected. Prodigy Gold also noted it has developed an environmental management system to ensure the use of sound environmental practices, and to implement the principle of continuous improvement. Prodigy Gold noted that no significant adverse effects on wildlife are expected.

Prodigy Gold also stated that under the Fisheries Act, it will be required to provide offsets for the loss of fish habitat. Specific plans will be developed in consultation with the public and Aboriginal groups, MNRF, CEAA and DFO.

In response to questions about water from the Project, Prodigy Gold stated the water used in the mining process (i.e., tailings processing) will come from Goudreau Lake. The Project will use approximately 1700 m<sup>3</sup> per day. It also noted that all contact water from the mineral processing area and mine rock storage areas will be collected and directed to the TMF; and the contact water and supernatant will be recycled back to the mill.

## **6.0 GOVERNMENT CONSULTATION**

### **6.1 Introduction**

Since 2012, Prodigy Gold has been in communication with Federal and Provincial government agencies. The following summary identifies the government agencies which have been consulted, both at the Federal and Provincial levels. Appendix 4 of the EIS provides additional detail on the communications to date with government agencies, including the comments and requests raised by government officials and the proponent's responses.

### **6.2 Identification of Government Agencies Consulted**

Prodigy Gold's government consultation activities, listed by Federal and Provincial agencies, have included the following:

Federal:

- Canadian Environmental Assessment Agency;
- Department of Fisheries and Oceans;
- Environment and Climate Change Canada;
- Natural Resources Canada;
- Transport Canada; and
- Health Canada.

Provincial:

- Ministry of Natural Resources and Forestry;
- Ministry of Northern Development and Mines;
- Ministry of the Environment and Climate Change;
- Ministry of Labour;
- Ministry of Tourism, Culture and Sport;
- Ministry of Municipal Affairs and Housing; and
- Ministry of Community and Social Services.

Prodigy Gold has documented all government consultation activities and comments to ensure that relevant information is recorded and responses are provided. Consultation methods have included meetings and teleconferences with government agencies; letters and information requests to government agencies; and the sharing of information regarding the Project through such means as reports, technical studies, presentations and engagement summaries, updates and materials. Prodigy Gold's consultation activities with the agencies are ongoing.

### **6.3 Government Consultation Approach**

Consultation activities with Federal and Provincial agencies have included:

- The submission and review of key Project documentation for the EIS (e.g., PFS, PDR);
- Guidance with respect to the identification of Aboriginal groups, municipalities and stakeholders as well as consultation and engagement with these groups;
- Direction on EA processes including the EIS submission, Class EA and closure planning processes;

- Identification of and guidance on legislative and permitting requirements and expectations (e.g., Fisheries Act, Species at Risk Act; Metal Mining Effluent Regulations);
- Review of Project technical studies (e.g., baseline studies and reports);
- Presentations to inform government of Project updates and timelines, as well as consultation and engagement activities with Aboriginal groups, municipalities and other Project stakeholders; and
- Key correspondence related to topics and the mandates or interests of each government agency.

In addition to these communications with both Federal and Provincial agencies, Prodigy Gold received comments on the draft 2014 EIS submission which have been incorporated into this updated EIS.

Prodigy Gold will continue to work closely with government agencies.

## 7.0 ABORIGINAL ENGAGEMENT

Since 2011, Prodigy Gold has actively engaged with Aboriginal groups on the proposed Magino Mine Project. Aboriginal engagement activities have focused on sharing information and helping to provide greater understanding about the Project; responding to questions, comments, and concerns; and developing positive relationships. Engagement activities will be ongoing throughout the Environmental Assessment (EA) process and beyond, as Prodigy Gold continues to develop strong, long-term working relationships.

### 7.1 Identification of Aboriginal Groups Engaged

The Agency and the Province (MNDM and MNRF) have identified a combined total of seven Aboriginal groups (First Nation and Métis) that may have interests in, or potentially be affected by, the proposed Project. These are:

- Michipicoten First Nation (MFN);
- Missanabie Cree First Nation (MCFN);
- Métis Nation of Ontario (MNO);
- Batchewana First Nation (BFN);
- Red Sky Métis Independent Nation (RSMIN);
- Garden River First Nation (GRFN); and
- Pic Moberg First Nation (PMFN).

MFN, MCFN, PMFN, MNO and RSMIN were identified by CEAA for engagement early in the EA process (2013). In June 2014, the Agency identified the BFN as an additional Aboriginal group for Prodigy Gold to engage. In July 2016, MNRF identified GRFN as another Aboriginal group for Prodigy Gold to engage in the Provincial EA process.

### 7.2 Aboriginal Engagement Approach

Prodigy Gold recognizes the importance of meaningful and ongoing engagement throughout the life of the Project, and in particular, before and during the EA and permitting phases. Aboriginal engagement processes have followed the respective protocols of each Aboriginal group. Guided by these protocols, engagement activities have been tailored to the communicated needs and priorities of each specific Aboriginal group.

Prodigy Gold has had discussions with Aboriginal groups on how each would like to be engaged in the Project. The company has requested and followed direction from each respective First Nation and Métis group in terms of how they would like the company to engage with both Chief and Council/Leadership and general membership. For example, some Aboriginal groups have asked Prodigy Gold to attend membership meetings as the majority of their members do not reside within the specific community/reserve. Prodigy Gold has also been asked by some Aboriginal groups to specifically meet with their consultation committees. Other groups have asked Prodigy Gold to attend their annual general membership gatherings as they do not have a physical community or reserve.

Prodigy has engaged with Aboriginal groups identified by the federal and provincial agencies. However, the PMFN has to date declined participation in Prodigy Gold's Magino Mine EA process. Prodigy Gold has taken the approach as agreed to with PMFN (and CEAA) of keeping the First Nation informed of key project updates and milestones.

Aboriginal engagement to date has focused upon the approach to participation in the EA process, the conduct of Traditional Knowledge and Land Use Studies, technical and socio-economic components being assessed, baseline studies, potential Project effects and mitigation, VCs, Project updates, Project alternatives (including tailings alternatives) and fisheries offsets, as well as economic opportunities and benefits. In presenting information to Aboriginal groups, Prodigy Gold has ensured sufficient opportunities for Leadership and membership to review and provide feedback on key EA processes and Project components.

### **7.2.1 Aboriginal Engagement Techniques**

Prodigy Gold has used a variety of engagement techniques with Aboriginal groups<sup>1</sup> including:

- meetings with Chief and Council/Leadership and providing presentations on specific Project topics or means of engagement in the EA process;
- guided site tours of the Project site with Aboriginal Leadership, staff, technical experts, and membership to provide feedback on the Project;
- annual gatherings, community open houses and general membership meetings to present Project information to and gather feedback from membership; and
- interviews with Aboriginal Leadership, staff and membership to define and refine VCs of social, economic and Aboriginal interest in relation to the Project and the Aboriginal group's needs and priorities.

Prodigy Gold has used a variety of notification techniques to advertise open houses with Aboriginal groups. These sessions were planned in accordance with the group's scheduling needs, and were advertised at least one week in advance of the event<sup>2</sup>.

Prodigy Gold has developed an array of information materials for its engagement program. Project presentations, fact sheets and informative brochures, which use plain language to convey what are sometimes complex technical matters, have been developed to convey key Project information. These materials have been used at open house events, annual gatherings, and meetings. Key Project information (e.g., PFS, Project Description) has also been uploaded to the Magino Project webpage within the Argonaut Gold website.

A detailed summary of Prodigy Gold's Aboriginal engagement on the Project can be found in Chapter 12 of the EIS and a comprehensive chronology of Aboriginal engagement activities to-date is provided in Appendix 5. The latter also includes copies of Aboriginal engagement materials.

### **7.2.2 Traditional Knowledge Studies/Traditional Land Use Studies**

Traditional Knowledge Studies/Traditional Land Use Studies (TKS/TLUS) provide an important source of information gained through Aboriginal engagement. This information has assisted Prodigy Gold in predicting potential Project effects. At the time of writing, final TKS/TKLUS

---

<sup>1</sup> As noted above, PMFN has declined participation in the EA process for the Magino Project; communication has been limited to correspondence and telephone calls.

<sup>2</sup> Notifications included posters, newsprint and newsletter advertisements, radio advertisements, web site and social media posts, as well as letters and e-mails to Aboriginal groups

studies and other reports have been provided by five of the seven Aboriginal groups: MFN<sup>3</sup>, MCFN<sup>4</sup>, MNO<sup>5</sup>, BFN<sup>6</sup>, and the RSMIN<sup>7</sup>.

All TKS/TLUS received have been reviewed by Prodigy Gold and consultants and discussed with respective First Nations and Métis groups. The findings from these studies have been integrated into the baseline and effects assessment findings of this EIS. These findings and discussions with various Aboriginal groups have also assisted with the selection of the tailings site alternative.

### 7.2.3 Agreements with Aboriginal Groups

Prodigy Gold developed MoUs and participation agreements with each Aboriginal group identified by the Agency (with the exception of PMFN as the First Nation declined participation). MOUs were developed collaboratively with Aboriginal groups prior to the initiation of EA studies to ensure consistency with Aboriginal consultation protocols. In addition, Prodigy Gold is discussing and developing various types of bilateral agreements with First Nation and Métis groups.

## 7.3 Key Comments and Questions Raised During Aboriginal Engagement

Prodigy Gold has considered the comments raised by Aboriginal groups as it assessed potential effects and identified mitigation measures for the Project. Key comments/questions raised during Aboriginal engagement activities, and Prodigy's responses, are organized below in the following topic areas:

- Engagement, Agreements and Protocols;
- Aboriginal and Treaty Rights;
- Employment and Economic Benefits;
- Cultural Activities and Special Places;
- Construction, Operations and Closure; and
- Environmental Effects.

Prodigy is continuing engagement activities and will work with potentially affected Aboriginal groups to address comments and questions throughout the Environmental Assessment process as well as during the construction, operation and closure of the Project.

The text that follows provides an overview of the key comments and questions on the Magino Project received to date from Aboriginal Groups, and how Prodigy Gold has worked to address them.

---

<sup>3</sup> Hamilton Archaeological Consulting. (2014, October 31). *Traditional Land Use and Occupancy Study for Michipicoten First Nation regarding Magino Mine Site*. Thunder Bay, Ontario.

<sup>4</sup> Mushkegowuk Environmental Research Centre (MERC). (2014, July 31). *Missanabie Cree First Nation Traditional Ecological Knowledge Preliminary Study – Magino Gold Project EIS*. Timmins, Ontario.

<sup>5</sup> Shared Value Solutions. (2014, October 20). *Final Report on the Métis Nation of Ontario's Traditional Knowledge & Land Use Study and High Level Impact Assessment for the Magino Gold Project*. Guelph, Ontario.

<sup>6</sup> Hensel Design Group Inc. (2015, November 15). *Traditional Knowledge Assessment Related to the Magino Gold Project. Prepared for: Batchewana First Nation*. Collingwood, Ontario.

<sup>7</sup> Red Sky Métis Independent Nation. (2013, December). *Red Sky Métis Independent Nation Report for Prodigy Gold Incorporated – Magino Gold Project*. Thunder Bay, Ontario.

## **Engagement, Agreements and Protocols**

Aboriginal groups (with the exception of Pic Mobert First Nation) have expressed a desire to participate in the Environmental Assessment process. Through ongoing engagement, Prodigy Gold has provided details on how and when Aboriginal groups would be involved during the EA and permitting processes. Prodigy Gold has also responded to Aboriginal groups through the development of agreements to facilitate Aboriginal participation in the EA process. MoUs and Protocol agreements were established in collaboration with several Aboriginal groups prior to the initiation of EA studies. These agreements have guided engagement throughout the EA process.

Aboriginal groups wanted to understand how EA and permitting processes would be carried out, and the associated timelines and milestones. Both prior to and during the Environmental Assessment process, Prodigy Gold has provided information to Aboriginal groups on the steps in the EA and permitting processes, key timelines/milestones, and the Project's current status within these processes. The company has communicated this information to Aboriginal groups primarily through letters, Project overview and update presentations, and display panels. Aboriginal groups have been given the opportunity to review and comment on EA technical studies and the Draft 2014 EIS submission.

## **Aboriginal and Treaty Rights**

Aboriginal groups wanted to understand how potential effects of the Project may affect traditional use of lands and resources in the Project area (e.g., hunting, fishing, trapping, gathering, and cultural or spiritual practices on or near the site) and consumption of country food. First Nations and Métis groups expressed the need to ensure that there would be no impacts to their Aboriginal and Treaty Rights through the Project and that these rights would be respected. Prodigy Gold has considered these potential effects in the EA and engaged with Aboriginal groups for their input on how traditional lands are used. Prodigy Gold has also addressed questions about potential effects of the proposed Project.

Traditional Knowledge and Land Use Studies have been completed by five Aboriginal groups. Prodigy Gold has reviewed and discussed these studies with the respective Aboriginal groups and these findings – together with archaeological, terrestrial and aquatic studies undertaken by Prodigy – have been used in the Environmental Assessment for the evaluation of potential effects.

## **Employment and Economic Benefits**

First Nations and Métis groups wanted information regarding the types of opportunities and resourcing available for participation in the Project, including employment, training, and business opportunities (e.g., contracting and joint ventures/business partnerships). Prodigy Gold has communicated to Aboriginal groups that its goal is to maximize Aboriginal participation throughout all phases of the Project's implementation including: site preparation, construction, open pit mining and process plant operations, as well as closure and reclamation.

Prodigy Gold has discussed training, employment, contracts, and business opportunities with Aboriginal groups throughout the EA process. Opportunities for training, employment and economic benefits are also being discussed with regional/local educational institutions to assist in maximizing training and employment opportunities for Aboriginal peoples.

## **Cultural Activities and Special Places**

Aboriginal groups raised questions regarding traditional activities and practices, spiritual and cultural heritage and archaeology. First Nations and Métis groups wanted to ensure that any sites of cultural significance and their cultural activities would not be adversely affected by the Project. Prodigy Gold has engaged with Aboriginal groups to understand how traditional lands are used and how concerns about potential effects to cultural sites and activities have been considered as part of the EA. Traditional Knowledge and Land Use Studies have been undertaken by Aboriginal groups and incorporated into the EA. Prodigy Gold has gathered information from Aboriginal groups related to cultural sites and activities through its engagement of Aboriginal Leadership, membership and consultants in site tours and through participation in and review of Project archaeology studies.

## **Construction, Operations and Closure**

Aboriginal Groups proposed general questions about the schedule and timelines for Project construction, operations, and closure. Throughout the EA process, Prodigy Gold has provided Aboriginal groups with up-to-date information on Project timelines, and on the ongoing Aboriginal engagement throughout phases of the Project. Prodigy Gold has communicated to Aboriginal groups that construction and operations will not commence until EA and permitting processes are completed. Up-to-date information on the scheduling of the Project phases and timelines has been provided to Aboriginal groups through presentations, letters and display panels.

Aboriginal groups have raised questions concerning Project elements and components during construction, operations and closure. Prodigy Gold has provided Aboriginal groups with regular updates to Project planning elements and components across all phases. This includes the presentation of information, including display panels and maps, on the alternatives being assessed, such as tailings and transportation routes. Site tours have also been arranged with Aboriginal Leaders and members to provide a visual representation of the proposed locations of mine site components.

Aboriginal groups have also expressed interest in Prodigy Gold's plans for Project closure and expressed the need to participate in closure planning. Prodigy has informed groups that the company is working to further assess options for closure, including the pumping of water from Goudreau Lake. The proponent has committed to work with, and solicit input from, Aboriginal groups during Closure Plan development and design.

## **Environmental Effects**

Questions regarding potential effects on the physical and biological environment were raised by First Nations and Métis groups with respect to water, fish, wildlife and plants. Aboriginal groups wanted to ensure that Project design components and mitigation measures will be in place to avoid adverse environmental effects. Through ongoing engagement, Prodigy Gold has notified Aboriginal groups of completed terrestrial and aquatic baseline studies to understand potential effects from the Project. These environmental studies have been reviewed by and discussed with Aboriginal groups. The company has communicated to Aboriginal groups that no significant impacts have been identified. Prodigy Gold has also made commitments to Aboriginal groups to monitor environmental effects. The proponent will comply with the Metal Mine Effluent Regulation standard, monitoring requirements and the environmental effects program to assess

potential impact on the receiving environment. Prodigy will establish an environmental monitoring committee which will include Aboriginal groups. The Environmental Committee will provide oversight on the Project's environmental performance and activities.

Aboriginal groups have raised both general and specific questions around effects to water quality and quantity and which water bodies will be affected. Prodigy Gold has provided Aboriginal groups with up-to-date information on effects to local water bodies and associated wetlands and the assessment of potential adverse effects to water through the EA. Prodigy Gold has informed First Nations and Métis groups of which water bodies will be affected and how, noting that the water used in the mining process (i.e., tailings processing) will come from Goudreau Lake. The proponent has advised groups that water quality and quantity effects will be managed through adherence to the requirements of the Provincial and Federal Environmental Assessment and monitoring.

Questions were raised with respect to mine operations such as tailings generation and mine rock stockpiling, with respect to effects on the environment (e.g., fish and fish habitat) and human health (e.g., drinking water). Prodigy Gold has informed Aboriginal groups of the Human Health Risk Assessment undertaken as part of this EIS and noted that some of the human health assessment work specifically looks at potential effects on Aboriginal peoples. In addition, Prodigy Gold has notified Aboriginal groups of the Project requirement under the Fisheries Act to compensate for the loss of Fish Habitat. Prodigy Gold has been engaging with Aboriginal groups on potential fisheries offsets.

Prodigy Gold has provided Aboriginal groups with information on both the tailings management facility design as well as tailings alternatives. Through these discussions, questions were raised related to the design of the tailings management facility and potential effects to the physical and biological environment (e.g., birds and other wildlife). Prodigy Gold informed Aboriginal groups that the upstream shell of the tailings berm will be lined. First Nations and Métis groups were advised by Prodigy Gold that a combination of nets, cannons, bangers and fences will be used if necessary to deter birds and other wildlife.

## 8.0 MITIGATION MEASURES, ENVIRONMENTAL EFFECTS ASSESSMENT, AND SIGNIFICANCE EVALUATION

### 8.1 Mitigation Measures

Multiple mitigation measures are incorporated into the Project design to help ensure that potentially adverse effects on these Valued Components (VCs) are either avoided, eliminated, or reduced. There are three main types of mitigations:

- 1) A commitment to compliance with all applicable regulations, and to current Canadian design standard for all major structures.
- 2) Mitigations by design which focusses on point source of emissions or specific environmental concerns and tailors the design to eliminate, reduce or mitigate potential adverse effects. For key Project components such as the MRMF, the TMF, and the site water management structures, these mitigation by design are outline in the conceptual design (refer to TSD 6).
- 3) Management Plans which outline corporate policies and procedures that will be implemented to ensure compliance with authorizations and environmental standards (refer to TSD 20 for a description of Prodigy's Environmental Management Framework and its suite of Management Plans).

These mitigation measures meet or exceed the expectations of the *Code of practice for Metal Mines (EC, 2009)*.

The implementation of the Project (construction, operation and closure) will have effects on the receiving environment. These effects may occur during site preparation, construction, operation or closure phases. Potential adverse effects of the Project will be caused by:

- Clearing of vegetation, earthwork activities, land disturbances and construction of drainage works associated with the physical footprint of the Project components;
- Infringement on water bodies by Project components;
- Physical construction of project components;
- Atmospheric emissions, effluent discharges, runoff management and seepage into groundwater;
- Noise, vibration and visual impacts of Project activities; and,
- Increase human presence on the Magino site.

For each project component, Prodigy has identified and will implement mitigation measures that will contribute to avoidance, elimination or reduction of potential adverse effects of the Project on the identified VCs. Prodigy recognizes that construction of some of the Project components will result in permanent changes to the natural topography of the site and thus bring changes to the physical and biological VCs overlaid by the Project footprint. To the extent practicable, such impact will be mitigated by compensation of loss aquatic habitat.

Table 8-1 summarizes the proven and effective mitigation measures applicable for each Project components, the objective of the mitigation measure, the expected phase of the Project where effects are anticipated, and the VCs targeted with the mitigation measure. Prodigy is confident that the implementation of these mitigations measures will result in no significant Project residual effects on the VCs identified.

**Table 8-1: Mitigation Measures Incorporated into the Magino Project**

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health	
Site layout	Reduce overall impact on all VECs.	X					1 Comprehensive mine waste disposal alternative analysis to identify most suitable tailing disposal technology and most suitable tailings disposal site.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Design the Project with site closure objectives considerations.	X					2 Compact footprint for Project infrastructure by using natural topography. Total disturbed area of 1,135 ha. The compact footprint reduces the loss of terrestrial habitat, wetlands, fish and fish habitat.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Fish Habitat Compensation	X	X	X			4 Quantify loss fish habitat and develop a <b>Fish Habitat Compensation Plan</b> in accordance with the Fisheries Act												X									
		X	X	X	X	X	5 <b>Compliance</b> with all relevant Federal and Provincial Acts and Regulations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project Development Principles	Reduce overall impact on all VECs	X	X	X	X	X	6 <b>Environmental Management System (EMS – TSD 20)</b> will be used to manage environmental issues throughout the life of the project and contain a number of operation and environmental management plans to ensure: i) Mine Material Management Plan emphasizing the use of non-ARD/ML materials for construction ii) enforcement / monitoring of regulatory compliance iii) concerns related to occupational health and safety, and, environmental protection are addressed during all phases of the Project development	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Climate change	X	X	X	X		7 Investigate alternative solutions for reduction in fossil fuel emissions and implement energy efficient programs over the life of the Project.					X																
	Implement BMPs during site preparation and construction. Minimize spills and accidents. Prevent erosion and high sediment load in waterbodies. Minimize impact						8 <b>Construction Environmental Protection Plan (CEPP refer to TSD 20)</b> for the site preparation phase and construction phase outline best management practices (BMPs) for surface water management for activities adjacent to water bodies. The CEPP contain a series of Standard Operating Procedures (SOPs) such as: i) Earthworks near streams and water bodies; ii) Clearing and grubbing procedures to minimize footprint of activity - restrict grubbing to work areas; iii) Erosion control measures for cleared areas and temporary soil/overburden stockpiles; iv) Minimize the extent and width of construction and maintenance access roads and trails outside of the public bypass road;	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	
			X	X										X	X	X	X	X	X									
														X	X	X	X	X	X									

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health
	on receiving environment.						v) Temporary fuel storage and refueling procedures.									X	X		X	X	X	X	X	X	X		
							vi) Protect wetland areas bordering working areas with sediment fencing. Equipment, storage of materials, and other construction activities will not be permitted in these areas.									X	X				X						
							vii) Procedures for use of explosives for construction and blasting near water bodies.												X								
							viii) Prodigy will take into account Environment and Climate Change Canada's Avoidance Guidelines. Prodigy's actions in applying the Avoidance Guidelines shall be in compliance with the Migratory Birds Convention Act, 1994 and with the Species at Risk Act.																X		X		
	Compliance with emission standards. Minimize air emission and noise.	X	X	X	X	X	<b>Procurement practices</b> will incorporate emission standards in equipment vendor contracts and for general contractors' use of equipment and machinery on site. Air emission and noise standards will be based on Ontario or Canadian regulatory guidelines, or best available technologies.			X															X		
							i) Vehicles Emissions – meet Tier 4 emission requirements for off-road diesel vehicles.	X																			
							ii) Noise – specification for noise level in procurement contracts.		X																		
	Compliance with regulations. Worker safety. Reduce/control dust emissions. Minimize noise emissions. Control of discharges to receiving environment.	X	X	X	X		<b>Mitigation by design</b> focuses on point sources of emission and design parameters. The point source are the target of specific design and construction consideration/methods with the objective of reducing, controlling, and/or eliminating emissions at the source (atmospheric emissions, noise, vibration, effluent, or wastes products) at the source. These include:	X	X							X			X			X	X	X	X	X	X
							i) On-site roads will be constructed and maintained using granular material that contains metals at concentrations below the Ontario Typical Range (MOE, 1993) concentration for most metals.	X														X	X	X	X		
							ii) Mobile equipment equipped with mufflers.		X																		
	Minimize/control emissions of dust or other potential sources of air contaminants.		X	X	X	X	Use of <b>best management practices</b> (BMPs)																		X		
			X	X	X		i) Standard Operating procedures (SOPs) developed for activities susceptible to generate excessive dust emissions.	X																			
			X	X	X		ii) Reduce/limit vehicle speed and enforce speed limits on site roads.	X														X	X	X	X	X	X
			X	X			iii) Use of coarse granular material for construction of haul roads and site roads.	X																			

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health	
				X	X		iv) Use of water for dust suppression or other MOECC approved dust suppressant on roads and stockpiles.	X							X	X			X	X		X	X	X	X			
				X	X		v) Develop tailing deposition strategy to minimize exposed beach.	X																				
				X	X		vii) Site equipment operated to comply with NPC-300 operational noise limits		X																			
				X	X		viii) Where possible, maintain 1 km setback for Project blasting activities from off-site receptors.		X	X																		
				X	X		ix) Follow manufacturer's recommended guidelines regarding water infiltration and time of explosives usage to minimize emissions of NOx.										X	X										
			X	X	X		12 Operator <b>training and awareness</b> to ensure they are aware of potential emission sources and adhere to SOPs when operating equipment/machinery.	X									X	X		X						X	X	
				X	X		13 Scheduled <b>preventive maintenance</b> program that ensure equipment is functioning as intended to ensure that emissions are in line with emission criteria and vendor's specifications.	X																			X	
				X	X		14 Install air quality <b>monitoring equipment</b> to track equipment and operation performance.	X																			X	X
			X	X	X		15 <b>Open air burning</b> – waste segregated to ensure only wood waste and non-plastic combustible waste is burnt.	X																				
Accidents and malfunctions  Workers safety  Public health	Prevention of accidents and malfunctions. Workers health and safety. Avoidance of potential effects on the receiving environment due to spills which can impact groundwater, surface water, and, biological VECs and public health.		X	X	X	X	16 At all times, workplace conditions will be compliant with OHSA standards for workplace ambient air quality and noise. When and where necessary, employees will be provided with personal protective equipment. Health and safety procedures and standards will be strictly enforced throughout the life of the Project (TSD 20 – Health & Safety Plan).	X	X				X			X	X		X				X	X	X	X	X	
		X	X	X	X		17 Environmental Management System includes Hazard and Risk Evaluation, Health and Safety Management Plan, and, operator training (refer to TSD 20 EMS Framework).																			X		
			X	X	X	X	18 Emergency Response and Spill Prevention/Contingency Plan to deal with spills resulting from accidents and malfunctions (refer to TSD 20 for ERSPC).		X								X	X		X						X		
			X	X	X		19 Hazardous Material Management Plan for transportation, handling, storage, use and disposal of hazardous substances on the site ensure compliance with TDG Act and regulations (refer to TSD 20 for HazMP).	X									X	X								X		
			X	X	X		20 Waste Management Plan (TSD 20 – Waste MP) practices include:																					
			X	X	X		i) Sorting and segregation by types of waste	X						X			X	X					X	X	X	X	X	
	X	X	X		ii) Temporary storage of water on impermeable surface and spill containment structures.								X															

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health	
			X	X	X	X	iii) Compliance with O.Reg. 437, O.Reg. 302/14 and TDGA for waste handling, storage and transportation.																					
Open pit	Workers safety. Stability of the pit wall. Reduce groundwater inflows into the pit. Prevent excessive groundwater inflows from Goudreau Lake (draw down of the lake) and Water Body 10. Prevent access to the pit by non-employee and wildlife.	X	X	X	X		21 Pit slope design angles in overburden range between 2H:1V to 3H:1V.									X	X							X	X			
		X	X	X	X		22 Use of rock fill berms and buttresses may be used to allow overburden slopes to be steepened.								X	X								X	X			
			X	X	X		23 Dewatering/depressurization wells for the development of the pit.							X												X		
			X	X	X		24 Piezometers installed to measure water pressure which assist with slope stability monitoring.								X													
			X	X	X		25 Diversion channel constructed north of waterbody 10 to intercept and divert flows from that area to Goudreau Lake.								X	X	X	X		X		X						
				X	X		26 Overall slopes (inter-ramp angles) bench heights, bench face angle and bench widths have been determined in accordance with recommended geotechnical and rock-slope stability evaluations, incorporating engineering controls.																			X		
				X	X		27 Ramp grades in adjacent overburden will be 10 % or less. Catch and control berms and additional geotechnical berms may be provided should they be deemed necessary.										X									X		
				X	X		28 Overburden slope angles will depend on thickness of overburden encountered in the field and the groundwater controls installed. Overburden slopes will be designed to minimize the potential for failure and impact to the surrounding environment										X	X	X								X	
					X	X		29 Geotechnical monitoring of the stability of the pit wall will take place continuously during the excavation of the pit by licensed geotechnical engineers who will be responsible for evaluating the excavation and making changes as required.																		X		
			X	X		30 Monitoring will include survey points to detect movement (up, down, or sideways) of the surface of the pit wall, and instruments installed deep into the rock called inclinometers, that measure any deformations that may occur in the deeper rock.										X	X		X						X			
Use of Explosives	Workers safety. Pit water quality by preventing spills of emulsion during blasting.		X	X	X		31 Contract explosives manufacture and delivery to a Licence Explosives supplier.																		X			
				X	X		32 Adjust blast size so that objectives of O.Reg. NPC-119 are achieved for noise and vibration.	X	X	X															X	X		
				X	X		33 Minimal storage of explosives supplies on site (blasting accessories to be stored on site in a magazines provided by explosives suppliers).																		X			
		X	X	X		34 Only certified personnel handle explosives.																						

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT		Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health
Tailings Management Facility (TMF)	Ensure long term stability of all the components of the TMF which impact worker safety, public health, and, all biophysical VECs.	X					35	Embankment design to Canadian Dam Association, Dam Safety Guidelines						X		X	X	X								X		
				X	X		36	Operational and maintenance requirements to withstand the probable maximum flood and the maximum credible earthquake.								X	X	X								X	X	
		X		X	X		37	Embankment designed to hold the environmental design flood over the maximum operating water level.								X	X	X								X		
		X		X	X		38	Emergency spillway capable of passing any flows in excess of the environmental design flood incorporated into design								X	X	X								X		
				X	X		39	Extensive quality control and quality assurance plan will be developed for the construction of the embankment.							X	X	X	X										
				X	X	X	40	On-going inspection of the embankment during the operation and closure period.							X	X	X	X	X	X	X	X	X	X	X	X	X	
					X	X	X	41	Development and implementation of a site-specific Operation, Supervision and Maintenance (OSM) Manual that establishes clear TMF performance standards in accordance with principles in the Mining Association of Canada (MAC) Guide to the Management of Tailings Facilities; Canadian Dam Association (CDA) Dam Safety Guidelines, applicable international guidelines and standards. The OSM includes provisions for:							X	X	X	X	X	X	X	X	X	X	X	X	X
				X	X	X	i) Ensuring that construction of all embankments and critical infrastructure is overseen by qualified professionals and all materials and construction methods are tested to ensure they meet the required technical specification of the design;									X	X	X	X								X	
				X	X	X	ii) Providing for regular independent audit and assessment of the TMF critical infrastructure;									X	X	X	X								X	
				X	X	X	iii) Providing for visual inspections of the TMF dam daily/each 12-hour shift with respect to maintaining a safe operating pool, not exceeding operational freeboard restrictions and other visual inspection points of reference to be outlined in the OSM Manual;									X	X	X	X								X	
		X	X	X	iv) Implementing financial and operational controls (assign responsibility and budgetary authority) to establish an ongoing program of review and continual improvement to manage risks (health, safety and environmental) as well as change over the life-cycle of the TMF;									X	X	X	X								X			
		X	X	X	v) Establishing safe operating objectives and ensuring staff responsible for implementation of the OSM Manual, have appropriate knowledge and skills (awareness, training and competence) to implement;								X	X	X	X								X				

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health
				X	X	X	vi) Integrating technical, managerial, and financial aspects (i.e., operational and financial controls) of TMF operation, including providing employee training and engaging competent professionals to ensure consistent application of awareness, communication, sound engineering practice and corrective actions, as needed, within an effective management framework for the facility.						X		X	X	X									X	
			X	X	X	X	42 Seepage collection drains installed downstream of TMF to monitor groundwater quality							X													
		X		X			43 Monitoring wells installed on perimeter of TMF and MRMF allow pumping of groundwater should treatment required.							X													
						X	44 No discharge of TMF pond water during the Operation Phase.									X	X										
Mine rock management facility (MRMF)	Ensure long term stability of all the components of the MRMF which impact worker safety, and, all biophysical VECs. Minimize erosion potential.	X		X	X		45 Design factor of safety of 1.5. Final side slopes MRMF would range between 2:1 to 3:1 (horizontal / vertical), depending on stability and closure and post-closure grading considerations						X									X		X	X	X	
		X		X	X		46 Safety berms and perimeter ditches located to preclude release of mine rock beyond the defined perimeter limits in critical areas.						X		X	X										X	
		X		X	X		47 Mine's infrastructure buildings and other facilities located at safe distance from the toe of the MRMF.																			X	
Top soil and Overburden Stockpiles	Ensure long term stability of stockpiles. Prevent erosion and potential effects to freshwater VECs.	X		X	X		48 Stockpiles placed at a minimum of 30 m from a waterbody in a stable configuration and compacted with the placement equipment.								X	X											
					X	X	49 Vegetated to prevent erosion.						X		X	X	X	X	X								
				X	X		50 As necessary, perimeter ditches will be located to preclude release of overburden (sediment) release beyond the defined perimeter limits and to separate contact water and non-contact water.						X		X	X											
Tailings pipelines	Failure of pipeline can create erosion and slope stability problems along	X		X	X		51 Pipeline will be designed to handle the high pressure and tailings properties during the transfer from the mill to the TMF.						X		X	X									X		
					X		52 Redundant transfer line may be installed to allow for mill operation to continue in the event of a line failure. The pipes will be:						X		X	X									X		
		X			X		i) Sized to minimize the flow velocity while maintaining sufficient velocity to prevent freezing of the line and keep the slurry from settling;						X		X	X											

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health		
	the routing of pipeline (MRMF and TMF). Ensure that failure will cause minimal erosion and will not impact stability of structures.	X			X		ii) Equipped with pressure transducers and flow meters which will alert the mine operator of a potential leak or line failure due to an unexpected pressure drop or increase in flow rate; and						X			X	X												
					X		iii) Inspected at least once every 8 hours.						X			X	X												
		X			X		53	Catchment area located at low point near the mill to allow for gravity drainage of the line should it be necessary during repair to prevent tailings slurry.						X			X	X									X		
		X					54	Pipe will be located on the inside of the TMF embankment crest. In the event of a line failure, tailings slurry will drain into the TMF.						X			X	X									X		
Process Plant	Worker safety. Contain all process spills within the process plant. Minimize air emissions from the plant.	X			X		55	Process plant is enclosed and ventilated. Point source of dust and fume emission fitted with ventilation hoods and vented to dust collection equipment.	X							X	X												
		X			X		56	Process equipment (milling, leaching circuit and gold recovery) constructed on concrete pad and tanks placed within with secondary containment to contain spills.								X	X												
		X			X		57	Crusher and screening equipment enclosed and vented to baghouse system.	X	X																X			
		X			X		58	Point source of dust emission to be fitted with ventilation hoods and vented to dust collection equipment.	X																		X		
		X			X		59	Cyanide destruction tanks are covered and vented to a scrubber to capture emissions.									X	X									X		
					X		60	Cyanide destruction unit installed with monitoring control equipment to ensure effective removal of residual cyanide from tailings water prior to pumping to the TMF.																					
		X			X		61	Particulate outlet loading concentrations for dust collectors less than 5 mg/m <sup>3</sup> .	X																		X		
		X			X		62	Dust collection system for dry material (reagents) storage and handling areas. (Lime silo and lime slaking system vented to a baghouse; dedicated ventilation equipment for cyanide destruction and gold recovery room).	X																		X		
Fuel storage	Implement BMPs. Workers safety. Prevention of spills and contamination of soil, groundwater and surface	X			X		63	Storage tank constructed within secondary containment.	X							X	X									X	X		
		X		X	X		64	Unloading and Refueling station on an impermeable surface drained to collection sump.								X	X												
				X	X	X	65	Use of Iso-tanks for temporary fuel storage on site.								X	X												
				X	X		66	Standard Operating Procedures developed as part of CEPP and operational EMPs for refuel of equipment and use of temporary storage.								X	X												
			X	X	X	X	67	Emergency Response Spill Prevention Contingency Plan (TSD 20 - ERSPC).								X	X												

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health
	water.																										
Reagents transportation, handling, storage, and use	Worker safety. Spill prevention and control. Minimize waste generation. Effective destruction of residual cyanide after extraction process.				X		68	Reagents shipped by licensed transportation companies. Drivers are trained in spill management and trucks equipped with appropriate spill control equipment and supplies. Shipments will comply with the TDG regulations.								X	X									X	
		X			X		69	Tanks in the mill containing hazardous chemicals equipped with secondary containment sufficient to contain the volume of the full contents of the tank.								X	X									X	
		X			X		70	Tanks equipped with a high-level to prevent an overflow.								X	X									X	
		X			X		71	HazOp evaluations to minimize risk of an operational upset.																		X	
					X		72	WHMIS training for all employees.																		X	
		X			X		73	Special safety precautions will be designed in the cyanide circuit to be certain conditions are maintained at a pH greater than 9.	X								X									X	
		X			X		74	Operations in the cyanide destruction circuit will be closely monitored to ensure that the cyanide is reduced to a level that will not cause a danger to wildlife that may come in contact with the TMF pond water.	X								X									X	
		X	X	X	X	75	Emergency Response Spill Prevention Contingency Plan (TSD 20 - ERSPC).	X							X				X						X	X	
Site surface water management  Mine contact water	Capture and contain all mine contact water. Achieve an effective and passive surface runoff water management approach for the site. Ensure single discharge point to the receiving environment for all mine contact water. Monitor and		X	X	X	X	76	Comprehensive <b>water management plan</b> for all phases of the Project (TSD 20 – Water MP).							X	X	X		X								
		X	X	X	X		77	On-going <b>assessment of ARD/ML</b> potential of mine rock (field test cells).								X	X		X								
			X	X	X	X	78	<b>Diversion</b> of non-contact surface runoff from Project area								X	X		X								
		X	X	X	X	i) Diversion channel to intercept surface runoff from waterbody 10 (minimize flows into open pit).									X	X	X		X							X	
		X	X	X	X	ii) Diversion channel for the upper reach of McVeigh Creek.									X	X	X		X							X	
		X	X	X	X	X		iii) Diversion of surface flows to waterbody 6.								X	X	X		X							
X	X	X	X	X	79	<b>"Bounding of Project footprint"</b> with the construction of the Goudreau bypass road with the capture, collection and channeling of this runoff to a single Water Quality Control Pond.	X	X	X				X		X	X	X		X	X	X	X	X	X	X		
X	X	X	X	X		i) A <b>perimeter ditch</b> is constructed at the base of the MRMF and TMF to intercept and channel runoff and seepage from these areas and direct the runoff to the water Quality Control Pond. The ditch is sized for the 100-year precipitation return event.									X	X	X		X								

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT	Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health	
control discharge of mine water to the receiving environment (quality and quantity).		X	X	X	X	X	ii) <b>Passive water management</b> – the natural topography of the site is used for the alignment/routing of the collection ditch and the Water Quality Control Pond is located at the lowest elevation on the Project site.									X	X											
		X	X	X	X	X	iii) Perimeter ditch slope is minimal to prevent erosion.						X			X	X											
		X	X	X	X	X	80 Use of <b>collection ponds</b> where topography does not lend itself to gravity flow for runoff collection. Three such collection ponds are required (refer to Figure 2.1). Runoff collected from these ponds is either pumped to the process plant for use as process water or pumped to the perimeter ditch.						X			X	X											
		X	X	X	X	X	81 The site <b>Water Quality Control Pond</b> constructed in a natural depression in the topography of the site and is sized to accommodate the 100-year storm event.										X	X		X								
							82 Use of a diffuser to reduce mixing zone and achieve rapid dispersion of the effluent in Otto Lake.										X	X										
			X	X	X		83 Use of water collected in site runoff ponds for dust suppression on roads.	X																				
Pit water, process plant, and TMF water management	Minimize freshwater requirement by maximizing recycling of process water. Water management plan to ensure this objective is met.			X	X		84 Open pit water (seepage and precipitation) is pumped to the process plant and used as process water in the mill.								X	X	X		X									
				X	X		85 Recycling and reuse of TMF water as mill process water in the mill which minimizes requirements for freshwater.								X	X			X									
				X	X		86 TMF is sized to contain extreme rainfall event. No discharge of TMF water during the operational period.								X	X	X											
				X	X		87 Use of freshwater limited to use for potable water, reagent preparation and gland seal water.									X				X								
				X	X		88 <b>Single discharge to the receiving environment</b> for all mine contact water (MMER discharge). The discharge is to Otto Lake from the Water Quality Control Pond via a diffuser.									X	X			X								
Site closure	Avoid legacy issues and achieve "walk away" closure for the site.	X				X	89 Open pit left to fill naturally with precipitation and runoff.								X													
		X				X	90 Berms constructed around perimeter of pit.								X								X		X			
		X				X	91 Site water management structures left in place to facilitate monitoring of runoff quality from Water Quality Control Pond.								X													
						X	92 TMF drained and embankment breached to allow drainage.								X											X		
						X	93 Plant structures and equipment removed and salvaged.												X		X					X		
						X	94 Contaminated surfaces remediated or removed and transported to a licenced facility for treatment.								X													

COMPONENTS	PURPOSE / OBJECTIVE OF MITIGATION	Mitigation by Design	Site Preparation	Construction	Operation	Closure	MITIGATIONS INTEGRATED INTO THE PROJECT		Air quality	Noise	Vibration	Greenhouse gases	Climate change	Terrain and soil	Groundwater	Hydrology	Surface water quality	Stream and lake sediments	Visual resources	Fish and fish habitat	Terrestrial vegetation	Wetlands	Significant wildlife habitat	Migratory birds	Mammals	Species at risk	Worker safety	Public health
						X	95	Hard surfaces scoured and reprofiled for drainage. Top soil placed over to facilitate/promote regrowth of vegetation.													X							
						X	96	MRMF and TMF embankment inspected for slope stability. Remedial action taken where necessary.						X													X	
		X				X	97	Surface water monitoring and groundwater monitoring well left in place for post-closure monitoring.							X	X	X											

## 8.2 Identification of Valued Components for the Effects Assessment

Chapter 4 provided a description of existing environmental conditions at the Magino property and within various study areas (i.e., RSA, LSA and PSA). These existing conditions are the basis for the identification of VCs.

VCs refer to those features of the environment that may be affected by the Project and that have been identified to be of concern by Prodigy, government agencies, Aboriginal groups or the public. The value of a component relates to its role in the ecosystem and its scientific, social, cultural, economic, historical, archaeological or aesthetic importance. Indicators represent more specific items that reflect the key characteristics of the VC that serve as the focus of the assessment.

Prodigy has identified a number of VCs and indicators for the purposes of conducting the effects assessment. They were selected to be:

- representative of the overall environment;
- subject to and appropriately sensitive to the stressors likely to be associated with the Project; and
- measurable in terms of quantifiable and qualitative parameters of change and effect in the components of the environment for which they have been chosen to represent.

VCs were identified individually for each environmental component with consideration given to:

- The VCs identified in Section 6.2 of the EIS Guidelines as specified by Section 5 of CEAA 2012, as well as species at risk and their critical habitat as per the requirement outlined in Section 79 of the *Species at Risk Act*;
- the topics to be addressed in the Ministry of Natural Resources and Forestry Class EA process;
- Abundance (i.e., representation) in the relevant study areas;
- Ecological importance (i.e., in a context of accepted scientific principles);
- Data availability (i.e., sufficient information must be available to allow an appropriate evaluation of effects);
- Native species (i.e., those that have been well established in the area over a long time period);
- Degree of exposure and sensitivity (i.e., the extent to which a VC may be exposed to “stressors” associated with the Project);
- Human health (i.e., the extent to which human health may be affected);
- Socio-economic importance (i.e., value as a commercial, recreational or subsistence resource; or inherent aesthetic value);
- Conservation status (i.e., the extent to which a VC may be specifically protected by law, designated as rare, threatened, or endangered);
- Traditional and current importance to Aboriginal Peoples (as identified in available Traditional Knowledge studies); and
- Cultural and heritage importance to society.

The VCs and indicators are listed in Table 8-2. The table identifies the overall VC framework for this assessment. They reflect the knowledge acquired on the environment through the secondary source information gathered and scientific studies conducted in the Regional, Local and Project study areas and reported in Chapter 4. They also reflect the direct and indirect input

on VCs received to date in the EA process from Aboriginal groups, the public, and government agencies.

**Table 8-2: Listing of Proposed Valued Components and Indicators**

<b>ENVIRONMENTAL COMPONENT</b>	<b>VALUED COMPONENT</b>	<b>INDICATORS</b>
Atmospheric Environment	Air Quality	Particulate Matter
		Nitrogen Dioxide
		Sulphur Dioxide
		Carbon Monoxide
	Noise	Night-time Noise
	Vibration	Air Vibration
		Ground Vibration
	Light	Light Trespass
		Sky glow
Greenhouse Gases	Annual GHG Emissions	
Physical Environment	Terrain and Soils	Terrain and Topography
		Soil Quality
	Groundwater	Groundwater Levels and Quantity
		Groundwater Quality
	Surface Water Hydrology	Surface Water Quantity and Flows
	Surface Water Quality	Surface Water Quality in Receiving Waters
	Stream and Lake Sediments	Sediment Quality
	Visual Resources	Visibility
Biological Environment	Fish and Fish Habitat	Lower Trophic Level Community
		Aboriginal and Sport Fisheries Species
		Forage Fish Species
	Terrestrial Vegetation	Upland Forests
		Rock Barren Vegetation
	Wetlands	Organic /Peat Accumulating Wetlands
		Mineral Wetlands

ENVIRONMENTAL COMPONENT	VALUED COMPONENT	INDICATORS
Biological Environment (continued)	Significant Wildlife Habitat	Moose Calving and Feeding Areas
		Amphibian Breeding Areas
		Species of Special Concern Habitat
	Migratory and Breeding Birds	Passerines
		Marsh Birds
		Waterfowl
		Raptors
	Mammals	Furbearers
		Moose
		Carnivores (e.g., Bear, Wolves)
	Species at Risk (Aquatic and Terrestrial)	Whip-poor-will
		Chimney Swift
		Little Brown Bat
Northern Long-eared Bat		
Social Environment	Population and Demographics	Population Levels and Mobility
		Population Demographics
	Community Vitality	Recreation and Leisure
		Community Facilities and Services
		Health and Social Services
		Adult Education and Training
		Crime and Public Safety
		Individual and Family Well-Being
		Community Character
	Infrastructure and Services	Housing
		Emergency Services (i.e., police, fire, EMS)
		Utilities (i.e., water, waste water, waste management)
		Road Transportation
		Communications

<b>ENVIRONMENTAL COMPONENT</b>	<b>VALUED COMPONENT</b>	<b>INDICATORS</b>
		Energy Supply
Economic Environment	Land Use and Tourism	Land Ownership / Tenure
		Mining
		Forestry
		Commercial Tourism and Recreation
		Commercial Trapping
		Parks and Protected Areas
		Other Land Uses
	Employment and Business Opportunities	Employment (i.e., jobs) and Wage Income
		Labour Supply
		Business Activity
	Government Revenues	Municipal Revenues
		Provincial Revenues
Federal Revenues		
Aboriginal Interests	Aboriginal Employment and Business Opportunities	Aboriginal Employment (i.e., jobs) and Wage Income
		Aboriginal Labour Supply
		Aboriginal Education and Training
		Aboriginal Business Activity (including commercial use of lands and resources)
	Traditional Use of Lands and Resources	Hunting
		Fishing
		Trapping
		Gathering (e.g., berries, medicinal plants)
	Aboriginal Cultural Activities and Special Places	Archaeological Sites
		Spiritual Sites
		Trails and Camps
		Cultural Activities
	Human Health	Public Health

ENVIRONMENTAL COMPONENT	VALUED COMPONENT	INDICATORS
	Worker Safety	Workplace Hazards

### 8.3 Effects Assessment

The effects assessment identifies the potential interactions of the Project with the receiving environment. Mitigation and other management measures discussed in section 8.1 have been identified to avoid, reduce or minimize adverse effects of the Project. The effects assessment makes a determination regarding the significance of residual effects using a set of criteria specific to the VC under consideration. A description of the effects assessment for each VC is presented in Section 8.5 below.

#### 8.3.1 Legislative Requirements and other Guidance

The effects assessment is grounded in legislative requirements as set out by the Government of Canada and the Province of Ontario. Applicable legislation or regulations, standards or objectives and other relevant guidance documents were considered in the effects assessment. These include items that the assessment will need to demonstrate compliance with (i.e., legislation, regulation, standards); or that inform the assessment in terms of a potential threshold or limit beyond which an environmental effect might be considered significant. Consideration has been given to both federal and provincial regulatory requirements, standards, objectives, and guidelines applicable to each VC.

#### 8.3.2 Key Indicators and Measurable Parameters

The effects assessment is undertaken using a set of measures. For each indicator one or more “measures” are identified. Measures are the specific items or analytical parameters that have been used to describe the magnitude of the effect on the VC. Where they are quantifiable the specific measure and units of measure are identified (i.e., area of habitat removed (ha), or concentrations of Contaminants of Concern (mg/l)). Where qualitative analysis was used extensively, the selected measures represent the key considerations that were used to determine the magnitude of the effect (e.g., presence or absence of a feature; likelihood of a measurable effects on a VC; or a change in another measure/parameter such as noise, visibility etc.).

#### 8.3.3 Effects Mechanisms

Chapter 6 provided a detailed description of the Project works and activities which are the sources of potential effects. These Project works and activities will interact with the existing environmental and socio-economic conditions (the pathways) in the study areas as described in Chapter 4. The Project-environment interactions identify potential environmental effects on specified receptors (VCs). The Project works and activities were reviewed to identify those works and activities that may result in a measurable or noticeable change in a VC. The likely effects associated with these works and activities were then analyzed or evaluated by Project phase.

### **8.3.4 Assessment Methods**

The methods used in the assessment of effects are described for each VC are described in Chapter 7. This includes a description of any modeling or special analysis undertaken. Where a specific receptor is used, it is identified and described (e.g., location).

### **8.3.5 Assumptions and the Conservative Approach**

Any assessment will have its uncertainties. The key assumptions used in the analysis are identified. To address uncertainty, this assessment has taken a precautionary approach that reduces the chances for a mistaken determination that an effect is not significant. The assessment is based on conservative assumptions that err on over-stating a potential effect.

In some instance a “bounding” approach has been taken. This is when a credible “worst case” scenario is described and assessed, with the understanding that all other scenarios would have lesser effects. Scientific uncertainty concerning the extent of potential effects is largely compensated through the use of bounding conditions that typically reflect the outer range of possible conditions causing effects.

The degree of uncertainty concerning the prediction of effects has been further reduced through the use of best practices by experienced professionals; incorporation of actual measurement data where available and applicable; and use of recognized models with a history of application. Specific details with respect to model uncertainties associated with the prediction of environmental effects are included in discussion of the applicable TSDs.

### **8.3.6 Description of Effects on VCs and Indicators**

With an understanding of the project-environment interactions (i.e., the plausible effects mechanisms), the various assessment methods are applied in order to identify and describe (i.e., quantitatively or qualitatively) the likely effects on each VC. This is accomplished either individually by indicator or collectively for all indicators together. In most cases, the effects are described by Project phase. However, in those instances where a “bounding” approach was undertaken, the assessment is focused on a discrete scenario that could occur during any one phase of the Project.

Each likely environmental effect is identified and described as either adverse or beneficial. Where the likely adverse effect was determined to be measurable, but so small that it was clearly not of concern, no further assessment was conducted. A rationale was provided in each case where further assessment was not conducted. All other likely adverse environmental effects were carried forward for consideration of mitigation measures.

## **8.4 Residual Effects and Significance**

### **8.4.1 Residual Effects**

Residual effects are those effects of the Project remaining after the implementation of mitigation measures, and, therefore are the expected consequences of the Project for the VCs. These residual effects may be adverse or beneficial. Residual adverse effects are the focus of the significance assessment. A description of the residual effects for each VC is presented in Section 8.5 below.

### 8.4.2 Significance of Residual Effects

The significance of each residual adverse effect of the Project on the VCs was established within a framework of significance criteria and effect levels. The significance criteria as they were applied to the Project include:

Magnitude	The size or degree of the effect compared against baseline conditions or thresholds, and other applicable measurement parameters (i.e., standards, guidelines, objectives).
Geographic Extent	The area over or throughout which the effects will be measurable.
Timing and Duration	The time period over which the effect will last.
Frequency	The rate of recurrence of the effect (or conditions causing the effect).
Reversibility	The degree to which the effect can or will be reversed (typically measured by the time it will take to restore the environmental attribute or feature).
Ecological Context	The abundance or current status of the VC (e.g., quality), its importance to people, and ecosystem health and/or function.
Social Context	The abundance or current status of the VC, its value to people and/or its role in maintaining community well-being.

Effect levels were defined for each criterion as applicable to the VC under consideration. These effect levels allowed for the rating of effects as either low, medium or high. Existing regulatory and industry standards and guidelines were used as points of reference; however, professional expertise and judgement were also important in the definition of effect levels. As such, the definitions for the effects level within each criterion vary by environmental component and/or VC to recognize that the units and range of measurement are distinct for each.

Based on the application of these criteria and effect levels, one of the following two overall significance levels was assigned to each residual adverse effect:

- Not Significant: The residual adverse effect is minor and not significant; no further or more effective mitigation is considered necessary; and
- Significant: The residual adverse effect is significant; further or more effective mitigation is not considered feasible.

The overall level of significance was determined through professional judgement using a reasoned argument approach, rather than a generic formula. As such, emphasis was placed on one or more of the significance criteria depending upon the VC under consideration. The assessment of significance of any adverse residual effects for each VC is presented in Section 8.5 below.

Tables 8-3 to 8-55 present a summary of the Magino Project effects assessment, mitigation measures, and significance of the residual effects for each VC.<sup>8</sup> For each grouping of VCs, Table 8.1 identifies:

- 1) The Project Phase during which the effect is anticipated;
- 2) The relevant project activities that are susceptible to generate an effect;
- 3) The potential effect;
- 4) The key mitigation measure implemented to avoid, reduce, eliminate or mitigate potential adverse effects;
- 5) The expected adverse residual effect after mitigation have been implemented;
- 6) The assessment of the residual effect in terms of magnitude, geographic extent, duration, frequency, reversibility, ecological and social context; and,
- 7) The assessment of the residual effect in terms of overall significance on the VC under consideration.

## **8.5 Summary of Magino Project Effects Assessment, Mitigation Measures and Residual Effects**

This section presents a narrative description of the potential environmental effects for each VC, along with a summary of the mitigation measures for those environmental effects and the significance of any residual effects. Reference is also made to the applicable effects summary table for each VC.

### **8.5.1 Air Quality**

Both gaseous and particulate emissions can result in air contaminants such as Total Suspended Particulate (TSP), particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), sulphur dioxide SO<sub>2</sub>, nitrogen dioxide (NO<sub>2</sub>), and carbon monoxide (CO). Ambient air concentrations are assessed based on three sizes of dust particulates: (i) Total Suspended Particulates (TSP) is the fraction of airborne dust that ranges from particle diameters <50-100 µm and can be deposited in the nasal cavity. (ii) Particulate matter with a diameter of less than 10 µm (PM<sub>10</sub>) can bypass the nose and enter the thorax and (iii) Particulate matter with a diameter of less than 2.5 µm (PM<sub>2.5</sub>) can enter the lungs. TSP can potentially accumulate in terrestrial and aquatic systems. The effects of particulate deposition can range from being a nuisance or aesthetically displeasing to an environmental or human health concern. Regulatory standards have been developed by both the federal and provincial governments and are referenced in the EIS, see TSD 9 Table 3.7-1: Ontario Regulation 419/05 Schedule 3 Standards Applicable to the Project.

#### **8.5.1.1 Effects Assessment**

The potential effects of the Project and its activities are the release of particulates (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>) and gaseous emissions (SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>) resulting in adverse effects on ambient air quality, excessive dust fall out on vegetation and surrounding waterbodies. Project activities leading to particulate generation include site clearing, grubbing, stripping, excavating, road construction, blasting in mine open pit, haulage of mine rock and ore, stockpiling, and, vehicle movement on unpaved surfaces. The release of gaseous emissions is caused by combustion of fuel for mobile equipment and machinery. Minor aerosol emissions may occur resulting from the

---

<sup>8</sup> Tables have not been created for VCs which have no predicted adverse residual effects.

remediation of fuel spills or other hazardous substances. Relevant activities by Project phases contributing to particulate and gaseous emissions are listed in Table 8-3.

#### **8.5.1.2 Mitigation Measures**

Mitigations implemented to avoid, reduce or eliminate particulate and gaseous emissions and minimized effects on air quality are listed in Table 8-1 while key mitigation measures for ensuring no significant residual effects on air quality are listed in Table 8-3.

Prodigy's Air and Noise Abatement Management Plan provides guidance on management of air emissions and noise from construction and operation activities. The plan includes action to control airborne particulates and noise hazards. It also defines action to mitigate, prevent, or avoid to the extent practical noise nuisance to site personnel and nearby populations. The plan addresses greenhouse gas emissions and includes an assessment of emissions from the lifecycle of the Project, aimed at improving management of energy and greenhouse gas emissions, and building emissions abatement and energy saving considerations into the business decision-making processes.

#### **8.5.1.3 Residual Effects**

Taking into consideration the design of the Project, the residual effects on air quality that were assessed are the increased ambient air concentrations of TSP, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, and CO. As indicated in Table 8-3, residual effects on air quality are expected for the Operation phase of the Project. The significance of these residual effects was assessed in accordance with the methodology described in Section 8.3. Where available, existing environmental standards, guidelines, or objectives have been used to define the effects level definitions. The anticipated residual effects and their significance are listed in Table 8-4.

A follow-up program will be implemented to verify the accuracy of the effects assessment and to determine the effectiveness of the mitigation measures used. The goal of a monitoring program is to ensure that proper measures and controls are in place to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety. The proposed follow-up program for each air quality is summarized in Table 8-5.

Table 8-3: Project Interactions with Air Quality

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of Project activities on the release of air borne contaminants (mainly SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>) and particulate (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>) to the atmosphere. General mitigation measures identified in Table 6-22 for Project development principles and site layout (mitigations 1 to 20) targeted at air quality apply. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> <li>Compliance with all regulatory standards for air quality</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>Site Clearing, Grubbing, and Pre-stripping.</li> </ul>	<p><b>Particulate release</b></p> <ul style="list-style-type: none"> <li>Release of particulate during transportation of material and vehicle movement (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> </ul>		No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Closure of existing mine facilities;</li> <li>Topsoil and overburden stripping and stockpiling;</li> <li>Stream diversions, draining, and backfilling of on-site waterbodies; and</li> <li>Construction of: <ul style="list-style-type: none"> <li>Enabling infrastructure (i.e., camp accommodations, landfill, public bypass road, mine haul roads and service roads, electrical transmission lines and substation, potable and process water infrastructure, sewage treatment system and non-mining waste management facilities);</li> <li>Plant area components;</li> <li>Chemical, fuel and hazardous materials management facilities;</li> <li>Mining waste management area components (i.e., Mine Rock Management Facility, Tailings Management Facility); and</li> <li>Environmental Management Infrastructure.</li> </ul> </li> </ul>	<p><b>Particulate release</b></p> <ul style="list-style-type: none"> <li>Release of particulate during transportation of material and vehicle movement (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> <li>Fugitive emissions and dust/particulate during earthwork/construction activities, vehicles movement on roads, (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> <li>Release of dust during crushing and material sizing/handling (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> </ul> <p><b>Gaseous emissions</b></p> <ul style="list-style-type: none"> <li>Release of greenhouse gases.</li> <li>Combustion emissions from mobile equipment fleet (air quality contaminant SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>).</li> <li>Fugitive emissions resulting from spills of fuel or other hazardous substances</li> </ul>	<p><b>Particulate release</b></p> <ul style="list-style-type: none"> <li>Development of a Fugitive Dust Best Management Practices (BMP) Plan to control fugitive particulate emissions from on-site roadways and material handling will be implemented including: <ul style="list-style-type: none"> <li>Utilise Tier 3 or Tier 4 equipment emission standards in Canada.</li> <li>Use of low sulphur diesel fuel (less than 15 ppm of sulphur)</li> </ul> </li> </ul> <p><b>Gaseous emissions</b></p>	No residual effects
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>active mining from the open pit;</li> <li>ore stockpiling;</li> <li>processing of the ore;</li> <li>removal and placement of overburden and mine rock;</li> <li>equipment and facilities maintenance; and</li> <li>various administrative activities and environmental monitoring.</li> </ul>	<p><b>Particulate release</b></p> <ul style="list-style-type: none"> <li>Release of particulate during transportation of material and vehicle movement (TSP, DPM, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> <li>Fugitive emissions and dust/particulate during mining activities, stockpiling of mine rock (MRMF), construction of TMF, vehicles movement on roads, (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> </ul>	<p><b>Particulate release</b></p> <ul style="list-style-type: none"> <li>Adjust blast size so that objectives of O.Reg. NPC-119 are met</li> <li>Baghouses will have an outlet loading less than 5 mg/m<sup>3</sup></li> </ul> <p><b>Gaseous emissions</b></p> <ul style="list-style-type: none"> <li>Preventative maintenance program will be implemented to keep equipment operating to the design specifications.</li> <li>Prevent the release of cyanide gas in the environment by maintaining a pH greater than 9.</li> </ul>	<p>Potential adverse residual effects identified.</p> <p>Occasional exceedances of regulatory limits for ambient concentrations air of contaminants:</p> <ul style="list-style-type: none"> <li>24-hourly limits for TSP, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>;</li> <li>1-hour limit for NO<sub>2</sub>, SO<sub>2</sub>;</li> </ul>

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
			<p><b>Gaseous emissions</b></p> <ul style="list-style-type: none"> <li>• Combustion emissions from mobile equipment fleet (air quality contaminant SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>).</li> <li>• Fugitive emissions resulting from spills of fuel or other hazardous substances.</li> <li>• Release of dust during crushing and material sizing/handling (TSP, PM<sub>10</sub>, PM<sub>2.5</sub>).</li> <li>• Fugitive emissions from process plant (steam, cyanide off-gases from cyanide destruction unit and leach tanks).</li> </ul>		<ul style="list-style-type: none"> <li>• Annual limit for TSP, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>.</li> </ul>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Closure and dismantling of Project facilities and infrastructure.</li> <li>• Closure of Ore Processing Plant and Plant Area Facilities.</li> <li>• Final site rehabilitation.</li> <li>• Ongoing Operation and Maintenance of Environmental Management Infrastructure (i.e., surface water and groundwater controls, ongoing environmental monitoring).</li> <li>• Closure and Rehabilitation Phase Materials and Personnel Transportation.</li> </ul>	As outlined for Site preparation and Construction Phases of the Project		No residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>• No potentials interactions with air quality.</li> </ul>	No effects on air quality as activities are limited to routine post-closure monitoring.		No residual effects

**Table 8-4: Significance of Effects on Air Quality**

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	REVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Increased ambient air concentrations of TSP (24-hour).	<b>High</b>	<b>Low</b>	n/a <sup>(a)</sup>	<b>Low<sup>(b)</sup></b>	—	n/a <sup>(c)</sup>	n/a <sup>(c)</sup>	<b>Not Significant</b>
	Maximum predicted concentration including background is above the corresponding criteria.	Effect extends into the LSA excluding area within the PSA.		Conditions or phenomena causing the effect to occur infrequently (i.e., less than 5% of the time).				
Increased ambient air concentrations of TSP (Annual).	<b>Medium</b>	— <sup>(d)</sup>	n/a	—	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is between 50% and 100% of the corresponding criteria.							
Increased ambient air concentrations of PM <sub>10</sub> (24-hour).	<b>High</b>	<b>Low</b>	n/a	<b>Medium<sup>(e)</sup></b>	—	n/a	n/a	<b>Not Significant (monitor to confirm)</b>
	Maximum predicted concentration including background is above the corresponding criteria.	Effect extends into the LSA excluding area within the PSA.		Conditions or phenomena causing the effect to occur at regular, although infrequent intervals (i.e., between 5% and 25% of the time).				
Increased ambient air concentrations of PM <sub>2.5</sub> (24-hour).	<b>High</b>	<b>Low</b>	n/a	<b>Low<sup>(f)</sup></b>	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is above the corresponding criteria.	Effect extends into the LSA excluding area within the PSA.		Conditions or phenomena causing the effect to occur infrequently (i.e., less than 5% of the time).				
Increased ambient air concentrations of PM <sub>2.5</sub> (Annual).	<b>Medium</b>	—	n/a	—	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is between 50% and 100% of the corresponding criteria.							
Increased ambient air concentrations of NO <sub>2</sub> (1-hour).	<b>High</b>	<b>Low</b>	n/a	<b>Low<sup>(g)</sup></b>	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is above the corresponding criteria.	Effect extends into the LSA excluding area within the PSA.		Conditions or phenomena causing the effect to occur infrequently (i.e., less than 5% of the time).				
Increased ambient air concentrations of NO <sub>2</sub> (24-hour).	<b>Medium</b>	—	n/a	—	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is between 50% and 100% of the corresponding criteria.							
Increased ambient air concentrations of NO <sub>2</sub> (Annual).	<b>Medium</b>	—	n/a	—	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is between 50% and 100% of the corresponding criteria.							
Increased ambient air concentrations of SO <sub>2</sub> (1-hour).	<b>Low</b>	—	n/a	—	—	n/a	n/a	<b>Not Significant</b>
	Maximum predicted concentration including background is less than 50% of the corresponding criteria.							

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	REVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Increased ambient air concentrations of SO <sub>2</sub> (24-hour).	<b>Low</b> Maximum predicted concentration including background is less than 50% of the corresponding criteria.	—	n/a	—	—	n/a	n/a	Not Significant
Increased ambient air concentrations of SO <sub>2</sub> (Annual).	<b>Low</b> Maximum predicted concentration including background is less than 50% of the corresponding criteria.	—	n/a	—	—	n/a	n/a	Not Significant
Increased ambient air concentrations of CO (1-hour).	<b>Low</b> Maximum predicted concentration including background is less than 50% of the corresponding criteria.	—	n/a	—	—	n/a	n/a	Not Significant
Increased ambient air concentrations of CO (8-hour).	<b>Low</b> Maximum predicted concentration including background is less than 50% of the corresponding criteria.	—	n/a	—	—	n/a	n/a	Not Significant

Notes:

- (a) The duration is not specified since the air quality scenario assessed is assumed to continue throughout all project phases.
- (b) Of the 1,827 days of 24-hour predictions, 3.4% of the days were predicted to have high magnitudes for this indicator.
- (c) Not applicable to air quality.
- (d) “—” = effects criteria not required to determine significance.
- (e) Of the 1,827 days of 24-hour predictions, 22.7% of the days were predicted to have high magnitudes for this indicator.
- (f) Of the 1,827 days of 24-hour predictions, 1.6% of the days were predicted to have high magnitudes for this indicator.
- (g) Of the 43,800 hours of 1-hr predictions, 0.2% of the hours were predicted to have high magnitudes for this indicator.
- (h) To assess residual environmental effects, conservative operational values were used to model airborne concentrations at the receptor (i.e. A maximum ore processing rate of 35,000 t/d for the process plant, Maximum ore extraction rate of 45,200 t/d (based on Year 3 of the Mine Plan); Maximum mine rock extraction rate of 141,370 t/d (based on Year 5 of the Mine Plan); Emissions from open pit extraction operations were calculated assuming that the pit is in its final year of operation. This scenario corresponds to the longest in-pit haul roads which has the greatest potential to generate fugitive dust emissions;

**Table 8-5: Scope of Monitoring and Follow-Up Program for Air Quality**

<b>RESIDUAL EFFECT</b>	<b>LOCATION(S) TO BE MONITORED</b>	<b>PARAMETERS TO BE MONITORED</b>	<b>METHODS</b>	<b>DURATION AND FREQUENCY</b>
<b>Air Quality Concentrations</b>	Existing on-site tower.	Meteorology.	Regular observations at the on-site meteorological tower.	Throughout the mining and processing phase.
	On-site roadways.	Fugitive dust from roadways.	Periodic sampling or roadway silt loadings and metals composition.	Annually during the summer months of the mining and processing phase until consistent silt loading and metals concentrations are established.
	Processing Plant Stacks.	Process chemicals.	Source testing to confirm the emission rates used in the dispersion modelling assessment.	One time source testing campaign once the processing plant is operational.
	Re-establishment of the existing on-site station.	Ambient particulate matter.	Re-establishment of periodic SPM sampling unit.	Samples will be collected on the 6 day National Air Pollutant Surveillance (NAPS) Cycle for the mining and processing phase of the Project.  The focused sampling can be discontinued once the data are available and consistent.

## **8.5.2 Noise**

Noise is regulated by the Provincial government. The noise effects assessment was carried out in accordance with the Ministry of the Environment and Climate Change guidelines.

### **8.5.2.1 Effects Assessment**

Operations are 24 hours per day, 7 days per week with all process/equipment operating continuously. The night time equivalent noise level ( $L_{eq, night}$ ) is used in this noise assessment as there is no difference between daytime, evening and night time operations. The night time is typically the most sensitive period during the day as the background noise levels are expected to be the lowest. The selected indicator for noise is the change in night time equivalent noise levels resulting from project activities. Noise levels are predicted for five offsite receptors adjacent to the Magino site (see Table 7-17 of Chapter 7: Effects for Noise).

Noise will be generated during all phases of the Project. Vehicles movement, construction activities, blasting in the mine pit, haulage mine rock and ore, and crushing of ore will be major sources of noise.

### **8.5.2.2 Mitigation Measures**

Mitigations implemented to avoid, reduce or eliminate noise emissions and minimized effects on receptors adjacent to the site are listed in Table 8-1 while key mitigation measures for ensuring no significant residual effects on air quality are listed in Table 8-6.

Prodigy's Air and Noise Abatement Management Plan provides guidance on management of air emissions and noise from construction and operation activities. The plan includes action to control airborne particulates and noise hazards. It also defines action to mitigate, prevent, or avoid to the extent practical noise nuisance to site personnel and nearby populations.

### **8.5.2.3 Residual Effects**

An increase in night time noise is expected. The frequency of noise will be high during operations and the increase in noise will cause a low to medium at the receptor locations. None of the noise levels exceed MOECC noise level limits. The residual effects of noise at the receptors were determined to be "not significant" (see Table 8-7). No follow up is proposed for noise.

Table 8-6: Project Interactions with Noise

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of noise generated by Project activities at identified Point of Reception (POR) immediately outside the PDA and within the LSA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>Site Clearing, Grubbing, and Pre-stripping.</li> </ul>	Excessive noise levels at off-site receptors.	<p><b>Noise Attenuation Measures</b></p> <ul style="list-style-type: none"> <li>Schedule/routine maintenance of mobile equipment and stationary equipment</li> <li>Use of noise attenuation (mufflers) for mobile equipment and stationary equipment (generators)</li> </ul>	No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Construction activities for all project components.</li> <li>Transportation of construction material, supplies and personnel.</li> <li>Blasting as it relates to site levelling activities and open pit excavation.</li> <li>Crushing and sizing of aggregate for construction materials.</li> <li>Noise associated with the operation of mobile equipment and machinery on site.</li> </ul>	Excessive noise levels at off-site receptors.	<p><b>Noise Attenuation Measures</b></p> <ul style="list-style-type: none"> <li>Schedule/routine maintenance of mobile equipment and stationary equipment</li> <li>Use of noise attenuation (mufflers) for mobile equipment and stationary equipment (generators)</li> </ul>	No residual effects
Mining and Processing Phase	<p>Open Pit: 10 Years</p> <p>Processing Plant: 12 – 15 Years</p>	<ul style="list-style-type: none"> <li>Blasting as it relates to mining activities within the open pit excavation.</li> <li>Transportation of mine rock and ore.</li> <li>Crushing and sizing of aggregate for construction of TMF embankment.</li> <li>Crushing plant noise, maintenance facilities noise, and pumping stations noise.</li> <li>Noise associated with the operation of mobile equipment and machinery on site</li> <li>Vehicles noise (transportation of personnel and reagents, etc.)</li> </ul>	Excessive night time noise at identified receptors.	<p><b>Noise Attenuation Measures</b></p> <ul style="list-style-type: none"> <li>Mobile equipment equipped with mufflers.</li> <li>Schedule/routine maintenance of mobile equipment and stationary equipment to maintain in good operating condition.</li> <li>Use of noise attenuation (mufflers) for mobile equipment and stationary equipment</li> </ul> <p><b>At Process Plant (Grinding and Ore Concentrator Operations)</b></p> <ul style="list-style-type: none"> <li>Ore crushing equipment enclosed within building.</li> <li>Process equipment enclosed with processing building</li> </ul>	<p>Increased nighttime noise (<math>L_{eq}</math>) by:</p> <ul style="list-style-type: none"> <li>5.7 dB at POR1</li> <li>5.2 dB at POR5</li> </ul> <p>Increase in nighttime noise (<math>L_{eq}</math>) by:</p> <ul style="list-style-type: none"> <li>9.5 dB at POR2</li> <li>8.0 dB at POR3</li> <li>7.9 dB at POR4</li> </ul>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Noise associated with the dismantling of Project facilities and infrastructure.</li> <li>Noise associated with vehicles and transportation of material and personnel.</li> <li>Noise associated with pumping stations.</li> </ul>	Excessive noise levels at off-site receptors.	<p><b>Noise Attenuation Measures</b></p> <ul style="list-style-type: none"> <li>Schedule/routine maintenance of mobile equipment and stationary equipment</li> <li>Use of noise attenuation (mufflers) for mobile equipment and stationary equipment (generators)</li> </ul>	No residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>No plausible interaction as this activity does not generate noise.</li> </ul>	No effects		No residual effects

**Table 8-7: Significance of Residual Effects on Noise**

<b>RESIDUAL EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increased nighttime noise ( $L_{eq}$ ) by: <ul style="list-style-type: none"> <li>• 5.7 dB at POR1</li> <li>• 5.2 dB at POR5</li> </ul>	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Not Significant</b>
	<ul style="list-style-type: none"> <li>• Project related change in nighttime average noise level is &gt;3 dB and ≤6 dB; and</li> <li>• Project related noise levels do not exceed MOECC noise level limit</li> </ul>	Effect extends into the Project's Local Study Area	Conditions causing the medium-term effect are evident in the mining and processing phases	Conditions or phenomena causing the effect to occur at regular and frequent intervals (i.e., daily or continuously)	Immediately reversible			
Increase in nighttime noise ( $L_{eq}$ ) by: <ul style="list-style-type: none"> <li>• 9.5 dB at POR2</li> <li>• 8.0 dB at POR3</li> <li>• 7.9 dB at POR4</li> </ul>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Not Significant</b>
	<ul style="list-style-type: none"> <li>• Project related change in nighttime average noise level is &gt;6 dB and &lt;10 dB; and</li> <li>• Project related noise levels do not exceed MOECC noise level limit</li> </ul>	Effect extends into the Project's Local Study Area	Conditions causing the medium-term effect are evident in the mining and processing phases	Conditions or phenomena causing the effect to occur at regular and frequent intervals (i.e., daily or continuously)	Immediately reversible			

### **8.5.3 Vibration**

Project activities such as blasting could cause vibration to occur in the air and ground. Vibration levels are regulated in the Province of Ontario. The Federal Department of Fisheries and Oceans (DFO) Guidelines provides guidelines for the maximum allowable predicted ground vibration and underwater overpressure levels at aquatic receptors.

#### **8.5.3.1 Effects Assessment**

Open pit mining requires frequent blasting which will be the main source of vibration associated with the Project. Modelling suggests that blast-induced air and ground vibration levels will be well below the NPC 119 limits (128 dBL and 12.5 mm/s respectively) at the closest identified receptor external to the Magino site.

For potential effects on fish and fish habitat, DFO guidelines state that: “No explosive may be used that produces or is likely to produce, a peak particle velocity (PPV) greater than 13 mm/s in a spawning bed during egg incubation.” The Goudreau Lake shoreline is the nearest location to the mine blasting operations for both the active spawning beds and fisheries.

#### **8.5.3.2 Mitigation Measures**

Mitigations implemented to avoid, reduce or eliminate noise emissions and minimized effects on receptors adjacent to the site are listed in Table 8-1, while key mitigation measures for ensuring no significant residual effects on air quality are listed in Table 8-8.

Blasting induced air and ground vibration levels are predicted to be well within the NPC 119 guidelines. At distances less than 399 m from Goudreau Lake, estimated blast-induced PPV may exceed the DFO limit for ground vibration, for design blast conditions. It is anticipated that a reduction in the maximum explosive weight detonated per delay period within the blast will be required to comply with the DFO limits. Prodigy will be developing a blast protocol to adhere to DFO guidelines for use of explosives near waterbodies.

#### **8.5.3.3 Residual Effects**

Although increased air vibration levels above 90 dbL in the site vicinity are anticipated for some of the receptors, no significant effects are predicted to occur because of increased vibration levels. Table 8-9 presents that summary of the residual effects assessment for vibrations. Prodigy’s proposed monitoring and follow up program for vibrations is outlined in Table 8-10.

**Table 8-8: Project Interactions with Vibration**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Site Preparation Phase	6 Months – 1 Year	Earthwork activities - Site Clearing, Grubbing, and Pre-stripping. No significant sources of vibration.	No significant source of vibration – hence no potential effect.		No residual effects
Construction Phase	1 – 2 Years	Earthwork and construction activities. This phase may involve blasting but much less active than the Mining and Processing Phase. Therefore, emissions are bounded by the mining and processing phase and are not assessed.	No significant source of vibration – hence no potential effect.		No residual effects
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	Open pit mining and processing activities <ul style="list-style-type: none"> <li>Open pit mining - use of explosive and blasting</li> <li>Operations of ore crushing facility</li> </ul>	Effect on Peak Air Pressure Level and Peak Particle Velocity  Effect on Ground Vibration and Instantaneous Underwater Overpressure	<p><b>Air and Ground Vibrations</b></p> <ul style="list-style-type: none"> <li>Blast-induced air and ground vibration levels are predicted to be well within the NPC 119 guidelines.</li> </ul> <p><b>Overpressure in Waterbodies</b></p> <ul style="list-style-type: none"> <li>Adherence to DFO guidelines for use of explosives near waterbodies.</li> </ul>	Increased air vibration levels above 90 dBL in the site vicinity at POR 1 – 5, 9 and 10. Increased ground vibration levels above 0.3 mm/s in the site vicinity at POR 2, 9 and 10.
Closure and Rehabilitation Phase	2 – 3 Years	Earthwork and decommissioning activities. No significant sources of vibration.	No significant source of vibration – hence no potential effect.		No residual effects
Post closure Phase	4 to 50 years (approximately)	Passive monitoring activities. No significant source of vibration.	No significant source of vibration – hence no potential effect.		No residual effects

**Table 8-9: Significance of Residual Effects on Vibration**

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Increased air vibration levels above 90 dBL in the site vicinity at POR 1 – 5, 9 and 10.	Low	Medium	Medium	High	Low	n/a	n/a	Not significant
	Project-related air vibration levels >90 dBL and ≤ 120 dBL.	Effect extends into the LSA.	Conditions causing the medium-term effect are evident in the mining and processing phase.	Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e., daily).	Effect is readily (i.e., immediately) reversible.			
Increased ground vibration levels above 0.3 mm/s in the site vicinity at POR 2, 9 and 10.	Low	Medium	Medium	High	Low	n/a	n/a	Not significant
	Project-related ground vibration levels >0.3 mm/s and ≤ 0.5 mm/s at POR 2.	Effect extends into the LSA.	Conditions causing the medium-term effect are evident in the mining and processing phase.	Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e., daily).	Effect is readily (i.e., immediately) reversible.			
	Medium	Medium	Medium	High	Low	n/a	n/a	Not significant
	Project-related ground vibration levels >0.5 mm/s and ≤ 12.5 mm/s at POR 9 and 10.	Effect extends into the LSA.	Conditions causing the medium-term effect are evident in the mining and processing phase.	Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e., daily).	Effect is readily (i.e., immediately) reversible.			

**Table 8-10: Scope of the Monitoring Program for Residual Effects Caused by Vibration**

<b>Vibration</b> levels above 90 dBL at PORs 1 through 5 and 7 through 11	300 m to 2,000 m from the blast	Air and ground vibration level monitoring from blasting operations to develop site-specific vibration attenuation	Establishing a series of seismographs at varying distances from blasts and keeping a detailed record of the loading parameters.	Monitoring campaign; from a minimum 12 blasts at 6 sites during each blast, set up at distances varying from about 300 m to 2,000 m from the blast.
	Nearest POR	Blast air and ground vibration at nearest POR.	Establishing instrumentation at nearest POR.	<ul style="list-style-type: none"> <li>• Instrumentation to record air and ground vibration intensities on a continuous basis.</li> <li>• Data will be compared to known blast times to assess peak air and ground vibration intensities produced.</li> </ul>
<b>Vibration</b> and water overpressure levels above DFO guidelines	Nearest fish habitat	Blast-induced water overpressure and ground vibration levels at nearest active fishery.	<p>Establishing instrumentation at nearest active fishery location.</p> <p>This will include a hydrophone, vibration transducer and data acquisition unit.</p>	<ul style="list-style-type: none"> <li>• Instrumentation to record water overpressure and ground vibration intensities during the initial blasts.</li> <li>• Based on the data recorded:             <ul style="list-style-type: none"> <li>○ develop site-specific attenuation parameters, and</li> <li>○ make a decision on subsequent monitoring.</li> </ul> </li> <li>• Periodic monitoring will be carried out as the blasts approach the nearest fishery.</li> </ul>

## **8.5.4 Light**

The Project is located in a remote area of Northern Ontario and the Project activities have the potential to affect existing light levels and create a night glow.

### **8.5.4.1 Effects Assessment**

The assessment of light effects involves determining the light emissions from the Project, and using models to predict light levels at several specific locations to predict light trespass and sky glow within the study areas. The operations phase (mining and processing) was determined to cause the largest amount of light due to general area lighting of haulage roads, plant site and open pit for night time operations. Headlights from the mining equipment fleet will generate light. These project activities will influence both light trespass and sky glow.

Light trespass considers the effects of light or illuminance that strays from the Project site and may be visible by people off the Magino property. The effect of light trespass was assessed by determining the change in illuminance (measured by lux). Sky glow considers the result of stray light being scattered in the atmosphere brightening the natural sky background light level and therefore may be noticeable by people off the Magino property. Sky glow is assessed by determining the change in sky quality (measured by mag/arcsec<sup>2</sup>) at a distance from the Magino site.

### **8.5.4.2 Mitigation Measures**

General mitigations implemented to avoid, reduce or minimized effects of light trespass and sky glow on receptors away from the Magino site are listed in Table 8-1. Design and operating considerations for controlling light will include: shielding lighting fixtures to minimize uplight to the atmosphere, where possible, on-site structures will be dark in colour in order to absorb most of the incident light; and use light fixtures with a specified limit of less than 5% on Upward Light Ratio (ULR – the percentage of light rising above 90° nadir). As lighting is necessary to ensure a safe operation, there are no additional mitigations proposed by Prodigy. The anticipated residual effects caused by light trespass and sky glow are listed in Table 8-11.

### **8.5.4.3 Residual Effects**

A residual effect is determined if the increase in lighting for light trespass or sky glow effects alters light zone as shown in Table 7.1.1-5: Environmental Lighting Zones, Recommended Light Trespass Limits and Suggested Delta-mag Limits. There are four environmental lighting zones: natural, rural (low brightness), suburban (medium brightness) and urban (high brightness). As a result of the Project there will be a minor increase in anthropogenic light but not enough to cause a significant effect. As indicated in Table 8-12, none of these effects have been determined to be significant.

Table 8-11: Project Interactions with Light

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				The objectives of mitigations are to avoid, reduce, minimize potential effects of light generated by Project activities at identified Point of Reception (POR) immediately outside the PDA and within the LSA. These include: <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Earthwork activities - Site Clearing, Grubbing, and Pre-stripping. <ul style="list-style-type: none"> <li>Area lighting for night time work areas</li> <li>Headlight of mobile equipment for night time work</li> </ul>	Light effects localised and not visible beyond Project Development Area – No effects		No residual effects
Construction Phase	1 – 2 Years	Earthwork and construction activities. <ul style="list-style-type: none"> <li>Area lighting for night time work areas</li> <li>Lights of mobile equipment for night time work</li> <li>Roads, yard and laydown area lighting</li> <li>Accommodation complex lighting</li> <li>Process plant and maintenance area lighting</li> </ul>	Light effects localised and not visible beyond Project Development Area – No effect.		No residual effects
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	Area lighting for: <ul style="list-style-type: none"> <li>TMF construction</li> <li>Site roads, laydown areas</li> </ul> Night time lighting for: <ul style="list-style-type: none"> <li>Open pit and haul road lighting for night time work</li> <li>Accommodation complex lighting</li> <li>Process plant, maintenance area, storage facility lighting</li> <li>Mining equipment fleet headlights</li> </ul>	Increase sky glow		Increased anthropogenic light and reduced sky quality due to increased light trespass (POR 1 – 5).  Increased anthropogenic light and reduced sky quality due to increased sky glow (POR 1 – 6).
Closure and Rehabilitation Phase	2 – 3 Years	Area lighting for: <ul style="list-style-type: none"> <li>Site roads, storage area.</li> </ul>	Light effects localised and not visible beyond Project Development Area – No effect.		No residual effects
Post closure Phase	4 to 50 years (approximately).	Passive monitoring activities. No significant source of light.	No significant source of light – hence no potential effect.		No residual effects

**Table 8-12: Significance of Residual Effects on Light**

<b>RESIDUAL EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increased anthropogenic light and reduced sky quality due to increased light trespass (POR 1 – 5)	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Not Significant</b>
	Project related illuminance $\leq 1$ lux	Effect extends into the local study area	Over the mining and processing phases of the Project	The effect occurs at regular and frequent intervals (i.e., daily or continuously)	Immediately Reversible	-	-	
Increased anthropogenic light and reduced sky quality due to increased sky glow (POR 1 – 6)	<b>Low - Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Not Significant</b>
	Delta-mag $\leq 0.7$ (POR 1 and 6) and Delta-mag $>0.7$ but $\leq 2$ (POR 2 – 5)	Effect extends into the local study area	Over the mining and processing phases of the Project	The effect occurs at regular and frequent intervals (i.e., daily or continuously)	Immediately Reversible	-	-	

## **8.5.5 Greenhouse Gases**

The Project will be a source of Greenhouse Gases (GHG). The potential future annual GHG emissions associated with the Project have been estimated in accordance with accepted practices and protocols, and then put in context by comparison to the annual GHG emitted provincially, nationally, and globally.

### **8.5.5.1 Effects Assessment**

The direct annual GHG from the process sources, mobile fleet, and stationary combustion sources associated with the Project are presented in Table 7-42 of the EIS. They are based on estimates and may significantly overestimate the actual emissions. In the maximum operating scenario, GHG emissions from the mobile fleet contribute the largest portion (64.8%) of total project emissions in comparison to all other Project activities. The process source activity of blasting ore and mine rock contributes the smallest portion of emissions (1.4%) to the Project GHG. The GHG emissions from direct sources represent 84.8% of the Project GHG emissions.

The indirect source of GHG emissions associated with purchased electricity was included in the effects analysis for the purpose of comparing Project emissions to global emissions.

### **8.5.5.2 Mitigation Measures**

Environment Canada's Environmental Code of Practice for Metal Mines (Environment Canada, 2009) identifies and recommends best practices in order to facilitate and encourage continual improvement in the environmental performance of mining facilities throughout the mine life cycle. It is Prodigy's intent to follow these recommended best practices during the Project's life cycle.

### **8.5.5.3 Residual Effects**

Expected GHG emissions were compared to provincial, national, and international totals. The assessment focused on the potential for the GHG emissions from the Project to affect climate change. The Project GHG emissions could be expected to contribute an increase of less than 0.0001°C in the annual temperature, a change that will not be measurable. Likewise, the Project GHG emissions could be expected to contribute towards a decrease of less than 0.004 mm in the annual precipitation, another change that will not be measurable. Therefore, the Project GHG emissions will not have a measurable effect on climate. This conclusion is consistent with the acknowledgement by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA) (2003) that "...unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured". Overall, Prodigy is committed to the principle of continuous improvement in its operations to help minimize its GHG emissions.

In terms of monitoring and follow up, Prodigy will comply with the GHG reporting responsibilities under relevant legislative GHG Reporting Programs which include:

- Ontario's GHG Emissions Reporting Regulation (O. Reg. 452/09);
- Ontario's Cap and Trade Regulation (O. Reg. 144/16); and
- Government of Canada GHG Reporting Program (the GHGRP), and
- Annual summary of GHG emission

**Table 8-13: Project Interactions with Greenhouse Gases**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	RESIDUAL EFFECTS
				<p>The objectives of mitigation are to minimize the release of greenhouse gases resulting from Project activities. These include:</p> <ul style="list-style-type: none"> <li>• Minimizing footprint, area of activities and travel distances</li> <li>• Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> <li>• Compliance with all regulatory standards for air quality.</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Use of mobile equipment for earthwork activities - Site Clearing, Grubbing, and Pre-stripping.	Release of greenhouse gases		Not significant
Construction Phase	1 – 2 Years	<p>Use of mobile equipment for earthwork and construction activities (all Project infrastructure components).</p> <p>Use of temporary power generators during construction.</p>	Release of greenhouse gases	<ul style="list-style-type: none"> <li>• Exhaust emissions from non-road vehicles will meet Canadian Tier 3 or Tier 4 off-road emission standards.</li> <li>• Scheduled maintenance of mobile equipment.</li> <li>• Use of low sulphur diesel fuel (less than 15 ppm of sulphur).</li> </ul>	Release of greenhouse gases
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<p>Use of mining equipment fleet for open pit mining, mine rock and ore haulage.</p> <p>Use of mobile equipment for ongoing construction activities of TMF embankment.</p> <p>Use of haulage truck fleet for haulage of mine rock and ore. Blasting in open pit.</p>	Release of greenhouse gases	<p>Commercial agreement with Algoma Power Inc for power supply to the processing facility thus minimizing the need for power generation on site.</p> <p>Exhaust emissions from non-road vehicles will meet Canadian Tier 3 or Tier 4 off-road emission standards.</p> <ul style="list-style-type: none"> <li>• Scheduled maintenance of mobile equipment fleet.</li> <li>• Use of low sulphur diesel fuel (less than 15 ppm of sulphur).</li> <li>• Investigate alternative solutions for reduction in fossil fuel emissions and implement energy efficient programs over the life of the Project</li> </ul>	Release of greenhouse gases
Closure and Rehabilitation Phase	2 – 3 Years	<p>Use of mobile equipment for earthwork and site closure activities (decommissioning of all Project infrastructure components).</p> <p>Use of temporary power generators during decommissioning.</p>	Release of greenhouse gases	<ul style="list-style-type: none"> <li>• Schedule maintenance for mobile equipment.</li> <li>• Use of low sulphur diesel fuel (less than 15 ppm of sulphur).</li> </ul>	Release of greenhouse gases
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Passive monitoring activities. No significant source of greenhouse gases.	No significant source of greenhouse gases – hence no potential effect.		No residual effects

## **8.5.6 Terrain and Soils**

The Project will introduce permanent changes to the topography of the Magino site, which will affect ground surface slopes (i.e., topographic highs and lows). The Project activities may also result in changes in physical and chemical quality for natural soils.

### **8.5.6.1 Effects Assessment**

The Project will cause permanent alterations to landforms on 1,070 ha of the Project Study Area. Clearing, grubbing and backfilling of topographic lows will be undertaken for road construction and infrastructure foundations. Overburden will be stripped from the footprint of the open pit and the footprint of the TMF embankment. Overburden and topsoils will be stockpiled for reuse in site reclamation. The mine pit will require the drainage of Webb Lake and Lovell Lake, as well as modified drainage works for the disturbed areas. The TMF embankment will have a footprint of 390 ha and will rise up to 480 metres above sea level (masl) (80 m elevation), while the MRMF will cover an area of 400 ha and rise up to 510 masl. Up to 550 Mt of mine rock and ore will be excavated from the open pit over an area of 105 ha and 430 m deep.

At closure, all buildings and mechanical infrastructure will be dismantled and removed from the site. Where feasible, surfaces will be scoured, reprofiled for drainage and vegetated. The depleted open pit will be left to fill naturally with precipitation and runoff. The slopes of the MRMF and the TMF will be inspected for stability.

### **8.5.6.2 Mitigation Measures**

The open pit, the TMF and the MRMF are three major project components that will permanently alter the Magino site. Several mitigation measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on terrains and soils and ensure slope stability. These mitigations are listed in Table 8-1. Specific mitigation measures to ensure slope stability and safety and ensure no significant residual effects on terrains and soils are listed in Table 8-14.

### **8.5.6.3 Residual Effects**

Taking into consideration the design of the Project, including the implementation of the Closure Plan, the residual effects on terrain and soils anticipated are listed in Table 8-8A. For the reasons explained in Table 8-15, these residual effects are deemed to be “not significant”.

In terms of follow-up and monitoring, Prodigy will carry out routine inspection of the MRMF and TMF slopes throughout the operation, closure and post closure phases to ensure ongoing slope stability of the MRMF and the TMF. Repairs will be undertaken if and when required.

Table 8-14: Project Interactions with Terrain and Soils

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on terrains and soils within the PSA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> <li>Compliance with regulatory standards where applicable</li> <li>Adherence to construction codes and recognized construction methodologies.</li> <li>Design the Project with Closure objectives of chemical stability, physical stability and public safety for an abandoned site.</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	<p>Clearing, grubbing, stripping, grading, drilling and blasting, excavation, and pre-stripping and fills for the following:</p> <ul style="list-style-type: none"> <li>Stream Diversions/draining and backfilling of on-site water bodies;</li> <li>Surface water controls;</li> <li>TMF area and embankment foundation preparation;</li> <li>Pond/Lake Takings and backfilling;</li> <li>Pit overburden stripping;</li> <li>Construction of stockpile locations; and</li> <li>Earthworks for removal of existing industrial sewage works.</li> </ul>	Moderate to high increase in erosion potential of remaining soils.		<p>Altered Ground Surface Slopes and Topography</p> <p>Increased Potential for Slope Failures and Erosion of Natural Soils</p> <p>Reduced Soil Quality</p>
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Closure of existing mine facilities.</li> <li>Soil and overburden stripping and stockpiling.</li> <li>Stream diversion, draining, and backfilling of on-site water bodies.</li> <li>Construction of all Project components: <ul style="list-style-type: none"> <li>enabling infrastructure,</li> <li>plant area components,</li> <li>chemical, fuel, and hazardous materials management facilities</li> <li>mining waste management components (MRMF and TMF).</li> <li>environmental management infrastructure.</li> </ul> </li> <li>Transportation, storage and handling of fuel and reagents</li> </ul>	<p>Changes in ground surface slope affecting stability.</p> <p>Changes in topographic high and lows</p> <p>Potential for slope failure of natural material</p> <p>Erosion potential of natural material</p> <p>Change in quality of soil due to spills and deposition of mine material.</p> <p>Change in quantity of soil due to use in construction of infrastructure.</p>	<p><b>Temporary Construction Activity</b></p> <ul style="list-style-type: none"> <li>Minimize size of temporary laydown and work areas.</li> </ul> <p><b>Construction of TMF, MRMF and Permanent Project Infrastructure</b></p> <ul style="list-style-type: none"> <li>Design of embankment to ensure stability of slopes.</li> <li>TMF designed according to the Canadian Dam Association (CDA) Dam Safety Guidelines</li> <li>Construction of major earthwork supervised by a competent geotechnical/civil engineer.</li> <li>Develop and implement QA/QC program for the construction of the TMF embankment and the MRMF.</li> </ul>	<p>Altered Ground Surface Slopes and Topography</p> <p>Increased Potential for Slope Failures and Erosion of Natural Soils</p> <p>Reduced Soil Quality</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Open pit mining (including ore stockpiling, soil and overburden stockpiling, explosives handling and use, on-site materials haulage).</li> <li>Mining waste management (i.e., operations of MRMF, TMF, slurry pumping, contact water recycling and PAG rock).</li> <li>Transportation, storage and handling of fuel and reagents.</li> <li>Progressive rehabilitation activities</li> </ul>	<p>Changes in ground surface slope affecting stability.</p> <p>Changes in topographic high and lows.</p> <p>Potential for slope failure of natural material.</p> <p>Change in quality of soil due to spills and deposition of mine material.</p>	<p><b>Ongoing Development of TMF and MRMF</b></p> <ul style="list-style-type: none"> <li>Design of embankment to ensure stability of slopes.</li> <li>Construction of major earthwork supervised by a competent geotechnical/civil engineer.</li> <li>Develop and implement QA/QC program for the construction of the TMF embankment and the MRMF.</li> <li>Develop and implement the Operation, Supervision and Maintenance (OSM) Manual for the TMF.</li> </ul>	<p>Altered Ground Surface Slopes and Topography</p> <p>Increased Potential for Slope Failures and Erosion of Natural Soils</p> <p>Reduced Soil Quality</p>

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
			Erosion potential of natural material.		
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Closure and dismantling of Project facilities and infrastructure.</li> <li>• Rehabilitation and grading of surfaces.</li> <li>• Transportation, storage and handling of fuel and reagents.</li> </ul>	<p>Changes in ground surface slope affecting stability.</p> <p>Changes in topographic high and lows.</p> <p>Potential for slope failure of natural material.</p> <p>Erosion potential of natural material.</p> <p>Change in quality of soil due to spills and deposition of mine material.</p>	<ul style="list-style-type: none"> <li>• Inspection of TMF embankment in accordance with OSM Manual by a qualified geotechnical engineer.</li> <li>• Inspection of MRMF for stability.</li> </ul>	<p>Altered Ground Surface Slopes and Topography</p> <p>Increased Potential for Slope Failures and Erosion of Natural Soils</p> <p>Reduced Soil Quality</p>
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Passive monitoring of site – maintenance and repairs of eroded surfaces as required.	No effects	Periodic inspection of TMF embankment and MRMF slope stability.	No residual effects

**Table 8-15: Significance of Residual Effects on Terrain and Soils**

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Altered Ground Surface Slopes and Topography	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Not Applicable</b>	<b>Medium</b>	<b>Not Applicable</b>	<b>Not Applicable</b>	<b>Not Significant</b>
	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect could result in an impact to resource within the study area, but generally stable level in the PSA and LSA during project life and after Project closure and into foreseeable future.	<b>Not Applicable.</b>	Potential effect could result in an impact to resource within the study area, but generally stable level in the PSA and LSA during project life and after Project closure and into foreseeable future.	<b>Not Applicable.</b>	<b>Not Applicable.</b>	
Increased Potential for Slope Failures and Erosion of Natural Soils	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Minimal/Medium</b>	<b>Low</b>	<b>Not Applicable</b>	<b>Not Applicable</b>	<b>Not Significant</b>
	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	<b>Not Applicable.</b>	<b>Not Applicable.</b>	
Reduced Soil Quality	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Applicable</b>	<b>Not Applicable</b>	<b>Not Significant</b>
	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect may result in a slight impact resource within the Project Study Area in the study area during life of the Project.	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	Potential effect may result in a slight decline in resource in the study area during construction, operation and closure, but the resource should return to baseline levels.	<b>Not Applicable.</b>	<b>Not Applicable.</b>	

## 8.5.7 Groundwater

Groundwater is a potential source of drinking water for people, supports growth of vegetation, and, if it surfaces from the ground, is a source of surface water (lakes, rivers, creeks, and wetlands) which is important to aquatic life and wildlife. Groundwater quantity (flows and levels) as well as quality are important.

There are both existing Federal and Provincial guidelines and objectives for assessing project effects on water quality, including groundwater quality. The CCME guidelines are typically used when water quality guidelines do not exist for select parameters under Provincial Water Quality Objectives (PWQO). If groundwater at the site is to be used for potable drinking water then the Ontario Drinking Water Quality Standards (ODWS) also apply. These guidelines are governed provincially by the MOECC. Large water takings, such as those of more than 50,000 L/day, require a Permit to Take Water (PTTW) which is governed provincially by the MOECC under the Water Resources Act and Ontario Regulation O. Reg. 387/04. Such large water takings require a detailed hydrogeological study in support of the Permit Application.

### 8.5.7.1 Effects Assessment

The project development will impact groundwater flows around the open pit, the MRMF and the TMF. As the open pit will reach a depth of 430 m, the potential exists for a significant draw down of the water table adjacent to the pit, as well as excessive inflows from Goudreau Lake. Groundwater levels could be drawn down as much as 1 m up to a distance of 1300 m from the rim of the pit, and by as much as 0.1 m up to a distance of 2000 m from the rim of the pit. This drawdown will reduce the amount of water that discharges to surface water bodies, and may also cause the surface water bodies within the zone of influence to release some of their water to groundwater.

After excavation of the pit is completed, the pit will be allowed to fill with water. Water balance projections indicate that the period of filling will be about 50 years. Once the pit is full, the groundwater levels and flows will be similar to baseline conditions.

The mass of saturated tailings contained within the TMF (elevation 480 masl) and the mass of mine rock contained within the MRMF (elevation 510 masl) will cause the groundwater table to rise, below these structures. In the TMF, the mass of tailings will grow during the operations phase, but the amount of water in the pool will be kept relatively constant by recycling the water through the mineral processing circuit. During the closure and reclamation phase, the pool of water will be removed and the tailings surface will be covered and revegetated. The TMF will be large open grassland during the post-closure period.

Precipitation onto the tailings area will cause ongoing seepage of infiltrated rain water to the groundwater. Much of the seepage will rise to the surface to be intercepted in a surface seepage collection system and the water will be managed with runoff in the Water Quality Control Pond. During the post-closure period, the seepage rate will decrease. In this condition, the tailings mass will become part of the post-closure hydrogeologic system and there will be groundwater within the tailings due to normal recharge through the reclaimed surface of the TMF. It is anticipated that the final levels of groundwater in the TMF area will be higher than those in the baseline condition.

Construction of the MRMF will begin during the operations phase and be completed after 10 years when mining the open pit is completed. As the MRMF is constructed, groundwater recharge within the footprint of the MRMF will be reduced. The mine rock is relatively dry and much of the precipitation

that infiltrates into the rock will initially be absorbed. Once the mine rock reaches equilibrium moisture content, which is expected to occur at the end of the operations phase or shortly after the closure and reclamation phase, groundwater recharge will return to baseline conditions for this area of the PSA. As with the TMF, it is anticipated that the mine rock in the MRMF will become part of the hydrogeologic system and final groundwater levels will be somewhat elevated in this area relative to baseline. However, the function of groundwater in the local environment of the area will not be altered in the long term by construction of the MRMF.

The potential effects to groundwater quality will be the result of seepage from the TMF and MRMF, and possibly from slow migration of pit lake water into groundwater when the pit becomes full. The groundwater under the TMF and MRMF and the groundwater in the area between the pit and TMF/MRMF are expected to have the same general chemistry as the TMF water and MRMF leachate. The pit will be a groundwater sink until about 50 years after cessation of mining as it is filling; after it is full, it will likely remain a minor sink of groundwater with the excess water in the pit lake flowing to Goudreau Lake via a surface channel. As groundwater migrates, concentrations will attenuate through geochemical reactions and mixing with native groundwater, and eventually, with distance, the effects will not be measurable.

The effects from the TMF and MRMF will occur during the operations phase, and will continue into the post-closure period. The pit lake water will not have an effect on groundwater quality except to the extent that it causes water from under the TMF/MRMF to migrate toward the pit.

#### **8.5.7.2 Mitigation Measures**

Several mitigation measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on groundwater flows and groundwater quality. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on groundwater flows and groundwater quality are listed in Table 8-16.

In terms of mitigation for potential effects to groundwater flows, the design includes groundwater flow barriers along the perimeter of the pit to reduce the inflow of groundwater. With respect to groundwater quality, the tailings are treated to remove cyanide prior to being discharged into the TMF. The cyanide treatment also facilitates natural attenuation of metals and other constituents within the TMF pool. Further, the design includes seepage control systems for the TMF and MRMF which collect seepage, with the collected water being discharged into the WQCP where it is recycled or discharged under regulation to the environment.

#### **8.5.7.3 Residual Effects**

Taking into consideration the design of the project and the mitigation measures listed in Table 8-1 and 8-16, the anticipated adverse residual effects on groundwater are listed in Table 8-16. As illustrated in Table 8-17, none of these effects have been determined to be significant. The scope of the monitoring and follow-up program for groundwater quality is presented in Table 8-18.

Table 8-16: Project Interactions with Groundwater

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on groundwater within the PSA. These include</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	No relevant activities impacting on groundwater.	No potential effect.		No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Spills associated with transportation, storage and use of fuel for mobile equipment.</li> <li>Development of the open pit and associated draw down of groundwater table around the pit.</li> <li>Construction of the TMF and associated drainage works.</li> </ul>	Effect on groundwater flow direction		<p>Reduced groundwater quality to the east of the pit lake.</p> <p>Reduction of the flow of groundwater due to dewatering of the open pit</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Spills associated with transportation, storage and use of fuel for mobile equipment.</li> <li>Development of the open pit and associated draw down of groundwater table around the pit.</li> <li>Gradual filling of the TMF and associated seepage to groundwater.</li> <li>Gradual expansion of the MRMF with associated drainage and effect on groundwater table.</li> <li>Spills associated with transportation, storage and use of reagents and dangerous substances.</li> </ul>	<p>Effects on groundwater flow.</p> <p>Potential effects on groundwater quality.</p>	<p><b>Groundwater Quality</b></p> <ul style="list-style-type: none"> <li>Ongoing investigation of ARD properties of mine rock.</li> <li>Design includes groundwater flow barriers along the perimeter of the pit to reduce the inflow of groundwater from the east end of the pit.</li> <li>Treatment of tailings for cyanide destruction at process plant.</li> <li>Seepage control systems for the TMF and MRMF which collection of seepage for reuse as process water or discharge to the WQCP.</li> <li>Groundwater quality monitoring.</li> </ul>	<p>Lowering of groundwater levels in the vicinity of the open pit</p> <p>Increased groundwater levels in the vicinity of the TMF and MRMF</p> <p>Reduction of the flow of groundwater due to dewatering of the open pit</p> <p>Reduced groundwater quality under the TMF, MRMF and to the east of the pit lake.</p>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Final Rehabilitation of Mining Waste Management Area (i.e., ongoing TMF/MRMF seepage).</li> <li>Spills associated with transportation, storage and use of fuel for mobile equipment</li> </ul>	<p>Effects on groundwater flow.</p> <p>Potential effects on groundwater quality.</p>	<p><b>Groundwater Quality</b></p> <ul style="list-style-type: none"> <li>Seepage control systems for the TMF and MRMF remains in place for groundwater quality monitoring.</li> <li>Adaptive management plan consists of pump back and treatment of groundwater if required.</li> </ul>	<p>Lowering of groundwater levels in the vicinity of the open pit</p> <p>Increased groundwater levels in the vicinity of the TMF and MRMF</p> <p>Reduced groundwater quality under the TMF, MRMF and to the east of the pit lake.</p>
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling Seepage from TMF and MRMF	<p>Effects on groundwater flow.</p> <p>Potential effects on groundwater quality.</p>	<p><b>Groundwater Quality</b></p> <ul style="list-style-type: none"> <li>Seepage control systems for the TMF and MRMF left in place for groundwater quality monitoring.</li> <li>Adaptive management plan consists of pump back and treatment of groundwater if required.</li> </ul>	<p>Increased groundwater levels in the vicinity of the TMF and MRMF</p> <p>Reduced groundwater quality under the TMF, MRMF and to the east of the pit lake.</p>

**Table 8-17: Residual Effects to Groundwater**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Lowering of groundwater levels in the vicinity of the open pit	Not Applicable	Low	Not Applicable	Not Applicable	Low	Low	Low	Not Significant
	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	The effect is largely restricted to the PSA	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	Over time, the effect is completely reversible (post closure, once the pit is filled).	The ecological function of groundwater within the project area will not be affected.	There is no existing drinking water use of groundwater and future use is unlikely.	
Increased groundwater levels in the vicinity of the TMF and MRMF	Not Applicable	Low	High	Not Applicable	High	Low	Low	Not Significant
	This effect results in indirect effects on surface water and the Biological Environment which are assessed their respective VC assessments.	The effect is restricted to the PSA	This effect would commence during operations and will be permanent.		The effect is not reversible.	The ecological function of groundwater within the project area will not be affected.	There is no existing drinking water use of groundwater and future use is unlikely.	
Reduction of the flow of groundwater due to dewatering of the open pit	Not Applicable	Low	Not Applicable	Not Applicable	Low	Low	Not Applicable	Not Significant
	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	The effect is largely restricted to the PSA	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	This effect results in indirect effects on surface water and the Biological Environment which are assessed in their respective VC assessments.	Over time, the effect is completely reversible (post closure, once the pit is filled).	The ecological function of groundwater within the project area will not be affected.		
Reduced groundwater quality under the TMF, MRMF and to the east of the pit lake.	Not Applicable	Low	Low	Not Applicable	Low	Low	Low	Not Significant
	This effect results in indirect effects on surface which are assessed their respective VC assessments. The applicable water quality standards are for drinking water.	Under areas or around areas (the pit and waste management units) that are not likely to have future beneficial uses of groundwater.	While the changes to groundwater quality will last for several decades, the potential future beneficial uses are not affected.		The effect is completely reversible.	The ecological function of groundwater within the project area will not be affected.	There is no existing drinking water use of groundwater and future use is unlikely.	

**Table 8-18: Scope of Monitoring and Follow-Up Program for Groundwater Quality**

<b>Groundwater Changes in Water Levels</b>	Groundwater wells and piezometers throughout the project area.	Water levels and piezometric head.	<ul style="list-style-type: none"> <li>Water level gauge</li> <li>Pressure transducer</li> <li>Vibrating wire</li> </ul>	Throughout project life and into post-closure period. Semi-annual or quarterly.
<b>Groundwater Changes in Quality</b>	Groundwater wells throughout the project area with particular focus on areas downgradient of seepage control systems and waste management units.	<p><b>Physical parameters:</b> pH, conductivity, dissolved oxygen.</p> <p><b>Major ions:</b> TDS, calcium, magnesium, potassium, sodium, sulphate, chloride, alkalinity, and fluoride.</p> <p><b>Nutrients:</b> nitrate, nitrite, ammonia, and phosphate.</p> <p><b>Metals:</b> dissolved metals (including low level cadmium and mercury).</p> <p><b>Cyanide:</b> total and WAD.</p>	<ul style="list-style-type: none"> <li>Calibrated field instruments for physical parameters</li> <li>Purge and bail to collect samples for laboratory analysis</li> <li>Data analysis include trends, comparison with baseline and applicable regulatory standards</li> </ul>	Throughout project life and into post-closure period. Semi-annual or quarterly.

## **8.5.8 Surface Water Hydrology**

Surface water quantity and flow are critical components in the maintenance of healthy aquatic ecosystems. It is crucial to the functioning and maintenance of other biological VCs and linkages with other biological, social, and aboriginal VCs. Assessment of surface water quantity and flow provides a basis for determining whether water quantity, including flows and water levels, is sufficient for the protection of aquatic habitat, and for use by downstream water users. Primary pathways to water quantity include potential Project effects from removal of waterbodies and watercourses, alteration of surface runoff characteristics and drainage patterns, increased water flows in response to site discharges, and changes in lake water levels due to water withdrawal for project needs.

### **8.5.8.1 Effects Assessment**

Within the Project Study Area, the potential effects of the project on surface water quantity include changes in stream flow quantity and distribution due to direct loss of fishery resources, contributing catchment areas, site discharges, and water withdrawal for Project related use. Within the disturbed areas (1,070 ha), the removal of vegetation and topsoil will alter surface runoff as the site is being developed. During construction, stream flows will be altered as site drainage is developed and surface controls are constructed. The water patterns will be altered in the Project footprint area. Surface water from the processing plant, TMF and MRMF will be diverted from the Spring Lake / McVeigh sub watershed to the Otto-Herman sub watershed. There will be a reduction in water levels and flows to Spring Lake and Goudreau Lake. The loss of water could affect fishery resources and affect the downstream hydrogeological characteristics.

### **8.5.8.2 Mitigation Measures**

Several mitigation measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on surface water flows and surface water quantity external to the direct project footprint. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on surface water flows external to the footprint of the Project facilities are listed in Table 8-10A. The project components are located within one watershed. The separation of mine contact and non-contact runoff water prevents additional water from being transferred from one sub watershed to another. While the design of a single discharge location requires the diversion of water from the Spring Lake / McVeigh sub watershed to the Otto Herman sub-watershed, there is an incremental environmental benefit. Throughout the Operation phase, water recycling and reuse will be maximized to reduce freshwater make-up requirements. New watercourse crossings will be designed and constructed using best management practices such as appropriately sized structures (e.g., temporary bridges, embedded culverts) to maintain hydraulic capacity and connectivity. In addition, all water conveyance and retention structures, including diversions, ditches, culverts and water quality control ponds, will be appropriately sized, designed, and constructed using best management practices and to accommodate large storm events. Natural channel design will be incorporated into linkages between waterbodies and in diversion channels. Fish habitat compensation is proposed to offset fish and fish habitat losses that cannot be mitigated by other means.

### **8.5.8.3 Residual Effects**

Taking into consideration the mitigation by design measures and the additional mitigation measure identified above, including the rerouting of the affected creeks and providing fish habitat compensation through No Net Loss Plans, the anticipated adverse residual effects on surface water flows are listed in Table 8-19. As illustrated in Table 8-20, these residual effects are assessed as “not significant”.

**Table 8-19: Project Interactions with Hydrology (Surface Water Flow and Quantity)**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE EFFECTS	RESIDUAL EFFECTS	
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on the hydrology within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>• Minimizing footprint, area of activities and travel distances;</li> <li>• Bounding of Project activities within PDA which include capture of surface flows within Project footprint and diversion of non-contact surface water away from Project footprint;</li> <li>• Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP);</li> <li>• Compliance with regulatory requirements where applicable;</li> <li>• Implementation of Best Management Practices as outlined in the “Code of Practice for Metal Mines”</li> <li>• Compensation plan for water bodies overprinted by Project infrastructure in accordance with Fisheries Act.</li> </ul>			<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	<p>Clearing, grubbing, stripping, grading, drilling and blasting, excavation, and pre-stripping and fills for the following:</p> <ul style="list-style-type: none"> <li>○ Stream Diversions/draining and backfilling of on-site water bodies;</li> <li>○ Surface water controls;</li> <li>○ TMF area and embankment foundation preparation;</li> <li>○ Pond/Lake Takings and backfilling;</li> <li>○ Pit overburden stripping;</li> <li>○ Construction of stockpile locations; and</li> <li>○ Earthworks for removal of existing industrial sewage works.</li> </ul>	Removal of vegetation and topsoil will alter surface runoff characteristics from cleared areas.			The effects of these activities are expected to be small.	
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>• Closure of existing mine facilities.</li> <li>• Soil and overburden stripping and stockpiling.</li> <li>• Stream diversion, draining, and backfilling of on-site water bodies.</li> <li>• Construction of TMF and MRMF.</li> <li>• Construction Project enabling infrastructure, plant area components, chemical, fuel, and hazardous materials management facilities, and environmental management infrastructure.</li> <li>• Transportation, storage and usage of fuel by mobile equipment.</li> </ul>	Permanent changes to the hydrology of the Project area (surface water flow direction, quantities)	<p><b>Loss Fish Habitat Compensation</b></p> <ul style="list-style-type: none"> <li>• In accordance with the Fisheries Act, the loss fish habitat has been quantified and a Fish Habitat Compensation Plan will be developed.</li> </ul> <p><b>Hydrology and Surface Flows</b></p> <ul style="list-style-type: none"> <li>• Construction of surface water management structures (diversions) and drainage works at the onset of construction activities.</li> <li>• Construction of infrastructure incorporates mitigation by design to ensure stability of slopes for TMF and MRMF and other stockpiles.</li> <li>• Development and implementation of a site-specific Operation, Supervision and Maintenance (OSM) Manual the ensure stability of the structure.</li> </ul>	<p><b>Increased water levels and flows in Spring Lake and McVeigh associated with Lovell Lake dewatering during construction.</b></p> <p><b>Increased water levels and flows in Goudreau Lake and Goudreau Lake outflow associated with Webb Lake dewatering during construction</b></p>		

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>• Operation and maintenance of site water management infrastructure.</li> <li>• Open Pit Mining.</li> <li>• Operation of Ore Processing Plant and TMF (water recirculation).</li> <li>• Mine rock and overburden management.</li> <li>• Progressive Rehabilitation.</li> <li>• Transportation, storage and usage of fuel by mobile equipment.</li> <li>• Transportation, storage and usage of reagents and dangerous goods associated with the Project.</li> </ul>	<p>Permanent changes to the hydrology of the Project area (surface water flow direction, quantities) Loss of Webb Lake, Lovell Lake and upper tributaries of McVeigh Creek.</p> <p>Reduction in water levels and flows to Spring Lake and Goudreau Lake, and outflows of Goudreau Lake</p>	<p><b>Hydrology and Surface Flows</b></p> <ul style="list-style-type: none"> <li>• Containment of mine contact water within this “bounded area” for reuse as process water.</li> <li>• Diversion of non-contact water runoff away from Project activities.</li> <li>• Pit inflows and tailings water are used as process water thus minimizing the need for make-up water from Goudreau Lake.</li> <li>• Site runoff is directed to a Water Quality Control Pond and is also used as make-up process water.</li> <li>• Single discharge point to Otto Lake for excess water captured/contained within the Project Area</li> </ul>	<p>Reduction in water levels and flows in Spring Lake due to changes in upstream catchment area during operations, closure and post closure</p> <p>Reduction in water levels of Goudreau Lake and Goudreau Lake outflows resulting from surface water takings and pit dewatering</p>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Final Rehabilitation of MRMF and TMF (i.e., ongoing TMF/MRMF seepage).</li> <li>• Final rehabilitation of the site, reprofiling and grading for drainage.</li> <li>• Spills associated with transportation, storage and use of fuel for mobile equipment.</li> </ul>	Reduction in water levels and flows to Spring Lake and Goudreau Lake, and outflows of Goudreau Lake will persist until the pit lake is filled	<p><b>Hydrology and Surface Flows</b></p> <ul style="list-style-type: none"> <li>• Site runoff management structures are left in place.</li> <li>• TMF embankment is breached and allow to drain to WQCP.</li> <li>• Process plant area is recontoured for gravity drainage to mine pit.</li> <li>• Mine pit left to fill.</li> </ul>	Reduction in water levels of Goudreau Lake and Goudreau Lake outflows resulting from pit filling
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>• Pit Lake Filling.</li> <li>• Performance monitoring.</li> </ul>	Reduction in water levels and flows to Spring Lake and Goudreau Lake, and outflows of Goudreau Lake will persist until the pit lake is filled		Reduction in water levels of Goudreau Lake and Goudreau Lake outflows resulting from pit filling

**Table 8-20: Significance of Residual Effects on Hydrology (Surface Water Quantity and Flow)**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>		
Increased water levels and flows in Spring Lake and McVeigh associated with Lovell Lake dewatering during construction.	Residual effects (increased water levels and flows) are outside the range of historical monthly values for the duration of the 2 month dewatering of Lovell Lake.	Residual effects are expected to extend into LSA (Spring Lake and upper McVeigh Creek).	Lovell Lake dewatering will occur over 2 month period during construction.	Lovell Lake dewatering is a one-time event.	When dewatering ceases, water levels and flows should return to pre-Project ranges.	The residual effect is not expected to affect the ecological integrity of the RSA.	N/A	Not Significant
	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>		
Increased water levels and flows in Goudreau Lake and Goudreau Lake outflow associated with Webb Lake dewatering during construction	Residual effects (increased water levels and flows) within the range of historical monthly values for the duration of the 2 month dewatering of Webb Lake.	Residual effects are not expected to extend into LSA (Goudreau Lake and Goudreau Creek).	Webb Lake dewatering will occur over 2 month period during construction.	Webb Lake dewatering is a one-time event.	When dewatering ceases, water levels and flows should return to pre-Project ranges.	The residual effect is not expected to affect the ecological integrity of the RSA.	N/A	Not Significant
	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>		
Reduction in water levels and flows in Spring Lake due to changes in upstream catchment area during operations, closure and post closure	Residual effects (decreased water levels and flows) occur in the LSA outside the historical minimum monthly values. Both do not affect lake levels or flows in the downstream lake catchment.	Residual effects are expected to extend into LSA (Spring Lake and upper McVeigh Creek).	The reduction in the upstream catchment area is permanent which results in a permanent reduction of lake water levels and outflows within the LSA.	The reduction in the upstream catchment area is a one-time event.	The reduction in the upstream catchment area is permanent.	The residual effect is not expected to affect the ecological integrity of the RSA, and the residual effect on fish and fish habitat is not significant.	N/A	Not Significant
	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>		
Reduction in water levels of Goudreau Lake and <b>Goudreau Lake outflows</b> resulting from surface water takings and pit dewatering	The residual effects (reduced water level and lake outflows) of water taking and pit dewatering during operations are below historical minimum values during drought conditions during the winter low flow period (February and March).	Residual effects are not expected to extend into LSA (Goudreau Lake and Goudreau Creek).	The 100-Year drought event is a short duration event – 12 year in duration	The 100-Year drought occurs infrequently and taking into consideration duration of the project is effectively a one-time event.	When the drought conditions cease, water levels and flows should return to pre-Project ranges.	The residual effect is not expected to affect the ecological integrity of the RSA.	N/A	Not Significant

## **8.5.9 Surface Water Quality**

Surface water quality is a critical component in the maintenance of healthy aquatic ecosystems. It is a valued component (VC) and is important to the functioning and maintenance of other biological VCs such as fish, fish habitat, and linkages with other biological, social and aboriginal VCs. The indicator is a potential change in water quality.

### **8.5.9.1 Effects Assessment**

During site clearing, preparation and construction, waterbodies will be filled, surface water controls will be installed, open pit stripping will commence and the sites for ancillary facilities will be prepared. Some water bodies as shown in EIS Table 7-90: "On-site Waterbodies Directly Affected by Mine Infrastructure" will be overprinted during construction. Additional siltation and sediment loadings could affect adjacent water bodies. The alignment of the bypass road is located within an area to be disturbed by mining operations but avoids major wetlands and waterbodies. There will be effects as certain waterbodies are dewatered during construction (within Project footprint), built up with native fill, and culverts installed at the creek crossings.

During the Operation phase, water from the TMF will be recycled and reused in the mill process circuit. All mine contact water within the Project footprint, including open pit dewatering, will be contained and directed to the TMF. TMF seepage, storm water, and mine contact water will all report to a constructed water quality management pond. Water from the water quality control pond (WQCP) will be discharged seasonally to Otto Lake via a submerged diffuser to promote effluent mixing. This discharge represents the only discharge to surface water during operations. Changes in water quality will occur because of Project discharges of runoff from the mine rock storage facility, TMF downstream slopes, processing plant and ancillary facilities. Seepage from the mine rock and ore stockpiles will be directed to Otto Lake. The measured parameters which are used to indicate water quality impairment include the physical properties (e.g., temperature, turbidity/total suspended solids), major ions and nutrients, metals, and Cyanide.

During closure water from the site will be directed to the open pit and upon filling the open pit will discharge to Goudreau Lake. During operations, the potential effects on water quality are limited to Otto Lake and the downstream receiving environment. During closure potential effects on water quality are limited to Goudreau Lake and its downstream receiving environment.

During operations, sources of dust may include blasting activities, process activities (crushing and grinding), gravel roads, and wind erosion of the stockpiles, TMF and MRMF. Fugitive dust can enter surface water receivers and may increase concentrations of particulates, nitrates and ammonia (from blasting residue). Dust will be managed by watering and the progressive re-vegetation of stockpiles, TMF and MRMF.

### **8.5.9.2 Mitigation Measures**

Several mitigations measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on surface water quality. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on surface quality external to the footprint of the Project facilities are listed in Table 8-21.

### **8.5.9.3 Residual Effects**

Taking into consideration the mitigation by design measures listed in Table 8-1, and the key mitigation measure listed in Table 8-21, the anticipated adverse residual effects on surface quality are listed in Table 8-21. As illustrated in Table 8-22, these residual effects are assessed as “not significant”. The proposed monitoring and follow-up program for surface water quality is presented in Table 8-23.

**Table 8-21: Project Interactions with Water Quality**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on the water quality within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>• Minimizing footprint, area of activities and travel distances;</li> <li>• Bounding of Project activities within PDA which include capture of surface flows within Project footprint and diversion of non-contact surface water away from Project footprint;</li> <li>• Capture, storage and reuse of surface flows and pit inflows within the project footprint for reuse as process water;</li> <li>• Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP);</li> <li>• Implementation of Best Management Practices as outlined in the “Code of Practice for Metal Mines”</li> <li>• Compliance with regulatory requirements where applicable.</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	<p>Clearing, grubbing, stripping, grading, drilling and blasting, excavation, and pre-stripping and fills for the following:</p> <ul style="list-style-type: none"> <li>○ Stream Diversions/draining and backfilling of on-site water bodies;</li> <li>○ Surface water controls;</li> <li>○ TMF area and embankment foundation preparation;</li> <li>○ Pond/Lake Takings and backfilling;</li> <li>○ Pit overburden stripping;</li> <li>○ Construction of stockpile locations; and</li> <li>○ Earthworks for removal of existing industrial sewage works.</li> </ul>	Potential effect on receiving water quality in waterbodies adjacent to construction zones.	<p><b>General design principle and site layout</b></p> <ul style="list-style-type: none"> <li>• Single point of discharge to Otto Lake for all surface runoff from Project impacted areas.</li> </ul> <p><b>Development and Implementation of management plan:</b></p> <ul style="list-style-type: none"> <li>• Site Water Management Plan</li> <li>• Hazardous Material Management Plan</li> <li>• Waste Management Plan</li> </ul>	No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>• Closure of existing mine facilities.</li> <li>• Soil and overburden stripping and stockpiling.</li> <li>• Stream diversion, draining, and backfilling of on-site water bodies.</li> <li>• Construction of TMF and MRMF.</li> <li>• Construction Project enabling infrastructure, plant area components, chemical, fuel, and hazardous materials management facilities, and environmental management infrastructure.</li> <li>• Transportation, storage and usage of fuel by mobile equipment.</li> </ul>	Potential effect on receiving water quality in waterbodies adjacent to construction zones.	<p><b>Specific Mitigations for Water Quality - Construction</b></p> <ul style="list-style-type: none"> <li>• Mine Material Management Plan emphasizing the use of non-ARD/ML materials for construction</li> </ul>	No residual effects

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Operations and Maintenance of Enabling Infrastructure</li> <li>Open pit mining</li> <li>Operation of Ore Processing Plant and Plant Area Facilities</li> <li>Chemical, Fuel and Hazardous Materials Management</li> <li>Mining Waste Management</li> <li>Progressive Rehabilitation of Mining Waste Management Facilities</li> <li>Operation and Maintenance of Environmental Management Infrastructure</li> </ul>	Potential effects on receiving water quality in Otto Lake.	<p><b>TMF and MRMF Design Features, Construction and Operation</b></p> <ul style="list-style-type: none"> <li>TMF emergency spillway capable of passing any flows in excess of the environmental design flood incorporated into design</li> <li>No discharge of TMF pond water during the Operation Phase.</li> </ul> <p><b>Transportation, storage and handling of hazardous and contaminated substances</b></p> <ul style="list-style-type: none"> <li>Tanks containing hazardous substances placed within with secondary containment to contain spills.</li> <li>Unloading and refueling station on an impermeable surface drained to collection sump.</li> <li>Reagents shipped by licensed transportation companies. Drivers are trained in spill management and trucks equipped with appropriate spill control equipment and supplies.</li> </ul> <p><b>Water Management Plan for all phases of the Project (TSD 20 – Water MP).</b></p> <ul style="list-style-type: none"> <li>Diversion of non-contact surface runoff from Project area</li> <li>Containment and collect of site runoff, pit inflows, and, TMF water for reuse as mill process water.</li> <li>TMF is sized to contain extreme rainfall event. No discharge of TMF water during the operational period.</li> <li>The site Water Quality Control Pond constructed to accommodate the 100-year storm event.</li> <li>Single discharge to the receiving environment for all mine contact water (MMER discharge).</li> <li>Use of a diffuser to reduce mixing zone and achieve rapid dispersion of the effluent in Otto Lake.</li> </ul>	<p>Increased Total Phosphorus above water quality guideline within the mixing zone but achieves guideline within 165 m of the point of discharge.</p> <p>Increased copper above water quality guideline within the mixing zone but achieves guideline within 70 m of the point of discharge.</p> <p>Maximum mercury above water quality guideline within the mixing zone but achieves guideline within 40 m of the point of discharge.</p> <p>Increased silver above water quality guideline within the mixing zone but achieves guideline within 70 m of the point of discharge.</p>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Final Rehabilitation of MRMF and TMF (i.e., ongoing TMF/MRMF seepage).</li> <li>Final rehabilitation of the site, reprofiling and grading for drainage.</li> <li>Spills associated with transportation, storage and use of fuel for mobile equipment.</li> </ul>	No potential effects as water management structures remain in place.	No additional mitigation measures	<b>No residual effects</b>
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>Pit Lake Filling.</li> <li>Performance monitoring and management of pit water quality</li> </ul>	None	<p><b>Specific Mitigations for Water Quality – Post-Closure</b></p> <ul style="list-style-type: none"> <li>Monitoring of pit water quality</li> <li>Monitoring of WQCP discharge water quality</li> <li>Adaptive Management – provide treatment if water quality exceeds permitted levels.</li> </ul>	<b>No residual effects</b>

**Table 8-22: Significance of Residual Effects on Surface Water Quality**

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION (OF CONDITIONS CAUSING THE EFFECT)	FREQUENCY (OF CONDITIONS CAUSING THE EFFECT)	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Increased Total Phosphorus above water quality guideline within the mixing zone but achieves guideline within 165 m of the point of discharge.	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Total phosphorus concentration exceeds the water quality guideline but is less than acute toxicity thresholds within the mixing zone.	A measurable or noticeable effect is likely limited to within the PSA.	Conditions causing the effect are evident in the short term (i.e., during the site preparation, construction, operations or closure and rehabilitation phases).	Conditions occur seasonally during the discharge periods.	Concentrations will return to background discharge from the WQCP ceases at the end of operations.	Increased total phosphorus within the mixing zone expected to achieve water quality guidelines within 165 m of the point of discharge: it is not expected to affect the aquatic community in the LSA.	No changes are associated with total phosphorus that would be expected to affect a resource used by a few individuals.	
Increased copper above water quality guideline within the mixing zone but achieves guideline within 70 m of the point of discharge.	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Copper concentration exceeds the water quality guideline but is less than acute toxicity thresholds within the mixing zone.	A measurable or noticeable effect is likely limited to within the PSA.	Conditions causing the effect are evident in the short term (i.e., during the site preparation, construction, operations or closure and rehabilitation phases).	Conditions occur seasonally during the discharge periods.	Concentrations will return to background discharge from the WQCP ceases at the end of operations.	Increased copper concentrations will be below toxicity thresholds within the mixing zone thus any change is not expected to alter the aquatic community in the LSA beyond regional norms.	No changes are associated with copper that would be expected to affect a resource used by a few individuals.	
Maximum mercury above water quality guideline within the mixing zone but achieves guideline within 40 m of the point of discharge.	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not significant</b>
	Mercury concentration exceeds the water quality guideline but is less than acute toxicity thresholds within the mixing zone.	A measurable or noticeable effect is likely limited to within the PSA.	Conditions causing the effect are evident in the short term (i.e., during the site preparation, construction, operations or closure and rehabilitation phases).	Concentrations above guidelines will occur infrequently during operations.	Concentrations will return to background discharge from the WQCP ceases at the end of operations.	Maximum mercury concentrations will exceed water quality guidelines but will be below toxicity thresholds within the mixing zone thus any change are not expected to alter the aquatic community in the LSA beyond regional norms.	No changes are associated with mercury that would be expected to affect a resource used by a few individuals.	
Increased silver above water quality guideline within the mixing zone but achieves guideline within 70 m of the point of discharge.	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not significant</b>
	Silver concentration exceeds the water quality guideline but is less than acute toxicity thresholds within the mixing zone	A measurable or noticeable effect is likely limited to within the PSA.	Conditions causing the effect are evident in the short term (i.e., during the site preparation, construction, operations or closure and rehabilitation phases).	Conditions occur seasonally during the discharge periods.	Concentrations will return to background discharge from the WQCP ceases at the end of operations.	Increased silver concentrations will be below toxicity thresholds within the mixing zone thus any change are not expected to alter the aquatic community in the LSA beyond regional norms	No changes are associated with silver that would be expect to affect a resource used by a few individuals	

**Table 8-23: Scope of the Monitoring and Follow-Up Program for Surface Water Quality and Lake Sediment**

RESIDUAL EFFECT	LOCATION(S) TO BE MONITORED	PARAMETERS TO BE MONITORED	METHODS	DURATION AND FREQUENCY
Surface Water Changes in Surface Water Quality	<p>Lakes:</p> <ul style="list-style-type: none"> <li>• Otto</li> <li>• Herman</li> <li>• Water Body 8</li> <li>• Water Body 9</li> <li>• Goudreau</li> <li>• Spring</li> <li>• Dreany</li> <li>• Mountain</li> </ul> <p>Watercourses:</p> <ul style="list-style-type: none"> <li>• Herman Creek</li> <li>• Goudreau Creek</li> <li>• McVeigh Creek</li> </ul>	<p><b>Physical parameters:</b> pH, alkalinity, conductivity, dissolved oxygen, total dissolved solids and total suspended solids, total organic carbon (TOC) and dissolved organic carbon (DOC).</p> <p><b>Major ions:</b> calcium, magnesium, potassium, sodium, sulphate, chloride, and fluoride.</p> <p><b>Nutrients:</b> nitrate, nitrite, total ammonia, total Kjeldahl nitrogen, total phosphorus, Chlorophyll a (Otto, Herman, Dreany, and Mountain Lakes).</p> <p><b>Metals:</b> total and dissolved (including mercury).</p> <p><b>Cyanide:</b> total and WAD.</p> <p><b>Organics:</b> oil and grease, phenols (at selected locations during selected phases).</p>	<ul style="list-style-type: none"> <li>• Field chemistry (DO, temp, pH, Cond)</li> <li>• Temperature and dissolved oxygen profiles (lakes)</li> <li>• Water samples</li> </ul>	<p>Pre-Construction, Construction and Operations - weekly to quarterly</p> <p>Operations (Years 3 to 7) – weekly to monthly during ice-free conditions and annually under ice at Closure and Rehabilitation – Annual – more frequent at select sites</p> <p>Post-Closure - Annual</p>
Sediment Reduced overall sediment quality	<p>Lakes:</p> <ul style="list-style-type: none"> <li>• Otto</li> <li>• Herman</li> <li>• Goudreau</li> <li>• Dreany</li> <li>• Mountain</li> </ul> <p>Watercourses:</p> <ul style="list-style-type: none"> <li>• Herman Creek</li> <li>• McVeigh Creek</li> <li>• Goudreau Creek</li> </ul>	<p><b>Physical parameters:</b> Moisture (%), pH, grain size.</p> <p><b>Major ions and nutrients:</b> Calcium, magnesium, phosphorus, potassium, sodium, ammonia, conductivity, TOC content, TKN, nitrite, nitrate, nitrate+nitrite.</p> <p><b>Metals:</b> total (including mercury).</p> <p><b>Cyanide:</b> total and free.</p> <p><b>Organics:</b> oil and grease (at selected locations during selected phases).</p>	<ul style="list-style-type: none"> <li>• Core samples sectioning off the top 10 cm into 1-cm intervals for analysis.</li> <li>• Visual inspection of accumulation in streams as part of construction monitoring program</li> </ul>	<p>Sediment quality will be measured every three years to confirm that concentrations are not increasing above threshold levels.</p> <p>Monitoring at select stations will occur concurrently with the EEM sampling</p>

### **8.5.10 Stream and Lake Sediments**

Stream and lake sediments are a critical component in the maintenance of healthy aquatic ecosystems, particularly surface water quality, fish and fish habitat, and wetlands. Project pathways affecting sediment quality include potential Project effects from site runoff, the release of mine wastewater, site contact water, spills, and deposition of dust and metals from air emissions (addressed with the air quality assessment). The scope of the assessment for sediment quality focuses on the physical and chemical characteristics of sediment as they relate to water quality and healthy ecosystems and therefore addresses the potential for effects from the quality and quantity of sediments deposited into surface waters.

#### **8.5.10.1 Effects Assessment**

Site clearing, grubbing and/or pre-stripping and general construction activities related to the construction of roads, drainage works diversion channels, stockpiles, laydown areas, and other major project components will be the major source of sediment entrained in runoff. Removal of protective vegetation and topsoil will result in erosion of overburden and the potential for increased runoff and sediment loading to surface water receivers. This will increase during periods of high precipitation and snow melt. Increase in the sediment load to surface water receivers has the potential to change sediment quality due to a change in the physical characteristics (particle size) of the sediment. The extent of any effects, will be limited to the project study area during site preparation and construction. The specific Project activities likely to generate dust are listed in Table 8-24. Accidents and malfunctions causing spills are most likely to impact sediment quality.

During the Operation phase, all contact water with Project activities will be contained and directed to the Water Quality Control Pond. Since water quality has the potential to impact sediment quality, the water quality of the pond will be monitored. Discharges to Otto Lake from this pond will be seasonal.

#### **8.5.10.2 Mitigation Measures**

Several mitigation measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on stream and lake sediments. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on stream and lake sediments external to the footprint of the Project facilities are listed in Table 8-24. The focus of these mitigation measures is the development and implementation of a Construction Environmental Protection Plan which will provide guidance on for the use of best management practices during site preparation, construction and closure.

#### **8.5.10.3 Residual Effects**

Taking into consideration the mitigation by design measures listed in Table 8-1, and the key mitigation measure listed in Table 8-24, the anticipated adverse residual effects on surface quality are listed in Table 8-24. As illustrated in Table 8-25, these residual effects are assessed as “not significant”. No follow up or monitoring is proposed for sediment quality.

**Table 8-24: Project Interactions with Stream and Lake Sediments**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on streams and lake sediments within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>• Minimizing footprint, area of activities and travel distances;</li> <li>• Bounding of Project activities within PDA which include capture of surface flows within Project footprint and diversion of non-contact surface water away from Project footprint;</li> <li>• Capture, storage and reuse of surface flows and pit inflows within the project footprint for reuse as process water;</li> <li>• Comprehensive environmental management system (EMS – refer to TSD 20) which include a Construction Environmental Protection Plan (CEPP), and, Emergency Response and Spill Contingency Plan (ERSCP);</li> <li>• Compliance with regulatory requirements where applicable.</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	Site Clearing, Grubbing and Pre-stripping may mobilize sediments that could be deposited into surface water.	These activities may all mobilize sediments or generate dust that could be deposited into surface water.		No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>• Closure of Existing Mine Facility.</li> <li>• Topsoil and Overburden Stripping and Stockpiling.</li> <li>• Stream Diversions, Draining and Backfilling of On-site Water bodies.</li> <li>• Construction of Enabling Infrastructure and Plant Area Components.</li> <li>• Construction of Mining Waste Management Components (MRMF and TMF).</li> <li>• Construction of Environmental Management Infrastructure and Monitoring.</li> <li>• Spills associated with the transportation, storage and usage of fuel for mobile equipment.</li> </ul>	These activities may all mobilize sediments or generate dust that could be deposited into surface water.	<ul style="list-style-type: none"> <li>• Single point of discharge to Otto Lake for all surface runoff from Project impacted areas.</li> <li>• Hazardous Material Management Plan</li> <li>• Water Management Plan</li> <li>• Waste Management Plan</li> </ul>	No residual effects
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>• Operations and Maintenance of Enabling Infrastructure.</li> <li>• Open pit mining.</li> <li>• Operation of Ore Processing Plant and Plant Area Facilities.</li> <li>• Mining Waste Management (mine rock and tailings)</li> <li>• Progressive Rehabilitation of Mining Waste Management Facilities.</li> <li>• Operation and Maintenance of Environmental Management Infrastructure.</li> <li>• Spills associated with the transportation, storage and usage of fuel for mobile equipment.</li> <li>• Spills associated with the transportation, storage and usage of reagents and dangerous substances.</li> </ul>	These activities may all mobilize sediments or generate dust that could be deposited into surface water or release contaminants that may become associated with sediments in surface water	<p><b>TMF and MRMF Design Features, Construction and Operation</b></p> <ul style="list-style-type: none"> <li>• TMF emergency spillway capable of passing any flows in excess of the environmental design flood incorporated into design</li> <li>• No discharge of TMF pond water during the Operation Phase. Diversion of non-contact surface runoff from Project area</li> <li>• Containment and collect of site runoff, pit inflows, and, TMF water for reuse as mill process water.</li> <li>• TMF is sized to contain extreme rainfall event. No discharge of TMF water during the operational period.</li> <li>• The site Water Quality Control Pond constructed to accommodate the 100-year storm event.</li> <li>• Single discharge to the receiving environment for all mine contact water (MMER discharge).</li> <li>• Use of a diffuser to reduce mixing zone and achieve rapid dispersion of the effluent in Otto Lake.</li> </ul>	Potential increase in certain contaminant levels for lake sediments in Otto Lake and Herman Lake.

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Ongoing Operation and Maintenance of Environmental Management Infrastructure (i.e., surface water and groundwater controls, ongoing environmental monitoring).</li> <li>Spills associated with the transportation, storage and usage of fuel for mobile equipment.</li> </ul>	These activities may mobilize sediments or generate dust that could be deposited into surface water or release contaminants that may become associated with sediments in surface water.	<ul style="list-style-type: none"> <li>Single point of discharge to Otto Lake for all surface runoff from Project impacted areas.</li> <li>Hazardous Material Management</li> <li>Waste Management Plan</li> </ul>	No residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>Monitoring and Management of Pit Quality.</li> </ul>	Contaminants discharged from the pits at closure may become associated with sediments in surface water.	Monitoring of water quality and treatment if required.	No residual effects

**Table 8-25: Significance of Residual Effects on Stream and Lake Sediments**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION (OF CAUSING THE EFFECT)	FREQUENCY (OF CAUSING THE EFFECT)	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Concentrations of iron, lead, and nickel in Otto Lake predicted to be above background but less than LEL	Low	Medium	Medium	Medium	Medium	Low	Low	Not Significant
	Concentrations are predicted to increase but will remain below the LEL, as was observed in baseline.	Otto Lake is within the LSA so the measurable effect will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals	
Concentrations of arsenic and cadmium elevated in Otto Lake above LEL where baseline was also above LEL.	Low	Medium	Medium	Medium	Medium	Low	Low	Not Significant
	Concentrations are predicted to be greater than background concentrations but within existing guideline thresholds.	Otto Lake is within the LSA so the measurable effect will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION CONDITIONS (OF CAUSING THE EFFECT)</b>	<b>FREQUENCY CONDITIONS (OF CAUSING THE EFFECT)</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increase in mercury sediment concentrations in Otto Lake above LEL where baseline was below LEL	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Concentrations are predicted to increase above the MOECC LEL of 0.2 mg/kg but remain below the SEL of 2 mg/kg.	Otto Lake is within the LSA so the measurable effect will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake in time (approximately 5 -10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	
Increase in Phosphorus and copper above the SEL in Otto Lake where baseline was elevated above the LEL	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Concentrations of phosphorus and copper are predicted to increase above SEL from baseline concentrations which are above the LEL.	Otto Lake is within the LSA so the measurable effect will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	
Concentrations of iron, in Herman Lake predicted to be above background but less than LEL	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Concentrations are predicted to increase but will remain below the LEL as was observed in baseline.	Herman Lake is within the LSA so effects will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	
Concentrations of arsenic, cadmium and manganese predicted to be elevated in Herman Lake above LEL where baseline was below LEL.	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Concentrations are predicted to increase above the MOECC LEL but remain below the SEL.	Herman Lake is within the LSA so effects will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	
Increase in copper sediment concentrations above the SEL in Herman Lake where baseline was elevated above the LEL	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Concentration of copper is predicted to increase above MOECC's SEL from baseline concentrations which are above the LEL.	Herman Lake is within the LSA so effects will be limited to the LSA.	Sediment concentrations will increase in response to WQCP discharge and these effects will be realized by the end of operations and into the first 5 to 10 years of closure.	Sediment concentrations will increase in response to WQCP discharge. Discharge will occur seasonally.	Concentrations are predicted to return to background in Herman Lake and Otto Lake in time (approximately 5-10 years) after the discharge stops.	Minor changes in the benthic community composition within the LSA, but not expected to affect the ecological function of surface water within the RSA.	Changes in sediment chemistry are not expected to affect resource use by more than a few individuals.	

### **8.5.11 Visual Resources**

Visual resources include those physical features that define the visual and aesthetic character of an area. Project development can affect the visual landscape.

#### **8.5.11.1 Effects Assessment**

The construction of the Tailings Management Facility (TMF) and Mine Rock Management Facility (MRMF) are the two key structures that will detract from natural visual resources. Visual resources were assessed using models and a methodology developed by the United States Bureau of Land Management. For the assessment 38 vantage points on or off the Magino property were selected. Modeling was undertaken towards the end of the Operations phase when the TMF and MRMF are built to their maximum heights and before reclamation activities commence. The assessment evaluated if the visual resource class could be reduced. Photo renderings are used to illustrate the view from various vantage points. The Project will be visible from selected vantage points. A reduction of one Visual Class from baseline is likely at eight vantage points during the Operations phase and no reduction in Visual Class is anticipated in the Post Closure Phase. Photo renderings showing what people might expect to see from these vantage points are provided in EIS Figure 7-6.

#### **8.5.11.2 Mitigation Measures**

Taking into consideration the design of the Project and the results of the effects analysis, no further mitigation measures are identified. However, as described in Chapter 6 and the Closure Plan, the final site rehabilitation of the site and the mining waste management facilities will serve to mitigate adverse effects in the Post Closure phase (also see Table 8-26). For example, Project buildings and structures will be closed and removed as appropriate. The TMF and MRMF will be designed to Canadian Dam Association, Dam Safety Guidelines Operational and maintenance requirements to withstand the probable maximum flood and the maximum credible earthquake and will take into account the natural topography. In the Post-closure phase, TMF and MRMF will still be visible, but their rehabilitation as part of the Closure Plan are expected to largely alleviate the adverse effects during Operations.

#### **8.5.11.3 Residual Effects**

The Project will be visible from selected vantage points. A reduction of one Visual Class from baseline is likely at eight vantage points during the Operations phase and no reduction in Visual Class is anticipated in the Post Closure Phase. Landforms similar in scale to the TMF and MRMF are abundant and widely distributed within the RSA. As shown in Table 8-27, none of the effects were determined to be significant.

**Table 8-26: Project Interactions with Visual Resources**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
					<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Site Clearing, Grubbing and Pre-stripping.	No effects on visibility.		No residual effects
Construction Phase	1 – 2 Years	Construction of various Project components	No effects on visibility.		No residual effects
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	Construction of the MRMF and TMF embankment are expected to detract from natural visual resources.	Visibility of MRMF and TMF	<p><b>Slope Stability of TMF and MRMF</b></p> <ul style="list-style-type: none"> <li>TMF stability: <ul style="list-style-type: none"> <li>Embankment design to Canadian Dam Association, Dam Safety Guidelines Operational and maintenance requirements to withstand the probable maximum flood and the maximum credible earthquake.</li> <li>Embankment designed to hold the environmental design flood over the maximum operating water level.</li> <li>Emergency spillway capable of passing any flows in excess of the environmental design flood incorporated into design.</li> <li>Development and implementation of a site-specific Operation, Supervision and Maintenance (OSM) Manual.</li> </ul> </li> </ul>	The TMF and MRMF are the primary structures that represent the long term legacy of the Project on the landscape and have the greatest potential for effects on visual resources.  Residual effects on visibility as outlined in Appendix 7-1.
Closure Phase	2 – 3 Years	Final rehabilitation of MRMF and TMF slopes.	No effects		Residual effects on visibility as outlined in Appendix 7-1
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Post closure monitoring of stability of MRMF and TMF slopes.	No effects	<ul style="list-style-type: none"> <li>Routine inspection of TMF embankment. Maintenance/repairs if required.</li> </ul>	Residual effects on visibility as outlined in Appendix 7-1.

**Table 8-27: Significance of Residual Effects on Visual Resources**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Degradation of Visual Resources	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	The Project will be visible from selected vantage points. A reduction of one Visual Class from baseline is likely at eight vantage points during the Operations phase and no reduction in Visual Class is anticipated in the Post Closure Phase.	A majority of the studied vantage points fall into the background delineation zone (3 km to 13 km).  The Project is only visible from more than 13 km away at PT1 - Manitou Mountain.	A change in Visual Resource Class generally occurs towards the end of the Operations Phase but not throughout the Post- Closure phase.	The Project is likely to be seen by some residents or visitors when present at selected vantage points on occasion.	<b>Degradation to Visual Resources is largely reversible, with 100% of reduced Visual Classes being restored to their baseline values. This reversal is the goal of the Closure Plan.</b>	Landforms similar in scale to the TMF and MRMF are abundant and widely distributed within the RSA.	Social or cultural activities conducted at vantage points experiencing a change in Visual Resource Class may be important to a few individuals or visitors, but are not major contributors to community well-being.	

## **8.5.12 Fish and Fish Habitat**

Fish and fish habitat are valued for their ecological services as a renewable resource base, and for their economic, cultural, spiritual and ceremonial benefits.

### **8.5.12.1 Effects Assessment**

Potential effects on fish and fish habitat are associated with:

1. Reduced fish habitat due to removal of water bodies and watercourses;
2. Reduced fish habitat due to reduced drainage areas for local watercourses;
3. Reduced fish habitat and altered fish habitat function due to channel realignments resulting from location of mine infrastructure; and
4. Reduced fish habitat quality and function due to altered water and sediment quality associated with mine discharges and surface water runoff.

The Project activities leading to effects on Fish and Fish Habitat are listed in Table 8-28.

### **8.5.12.2 Mitigation Measures**

Several mitigations measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on fish and fish habitat. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on fish and fish habitat external to the footprint of the Project facilities are listed in Table 8-28. Of importance is avoiding effects of Project development of any high-value fish habitat in the RSA. The timing of fish relocations will be scheduled with respect to fish life history requirements (e.g., spawning periods) and conditions in the watershed (e.g., water temperature). Water within the TMF will be recycled and only TMF seepage and site contact water will be discharged to the receiving environment. Furthermore, effluent will only be discharged seasonally to Otto Lake via a submerged multiport diffuser. These measures will serve to minimize the volume of effluent discharged and to promote effluent mixing and lower concentrations of metals in the receiver. Prodigy will undertake an adaptive approach to the management of any effects from vibration of fish and fish habitat. An important element of the “mitigation by design” approach is the minimization of the long-term legacy of the Project. To compensate the loss of habitat associated with the Project development, a Fish Offset/Compensation Plan will be developed in support of a *Fisheries Act* Authorization and a MMR Schedule 2 Amendment.

### **8.5.12.3 Residual Effects**

Taking into consideration the mitigation by design measures and the additional mitigation measure identified above, including the rerouting of the affected creeks and providing fish habitat compensation through No Net Loss Plans, the anticipated adverse residual effects on fish and fish habitat are listed in Table 8-28. As illustrated in Table 8-29, these residual effects on lower trophic level, CRA fish and fish habitat are assessed as “not significant”. The proposed monitoring and follow-up program for fish and fish habitat is presented in Table 8-30.

**Table 8-28: Project Interactions with Fish and Fish Habitat**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on Fish and Fish Habitat within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>• Avoidance of high-value fish habitat in the PSA;</li> <li>• Minimizing footprint, area of activities and travel distances;</li> <li>• Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>• Construction Environmental Protection Plan (CEPP);</li> <li>• Emergency Response and Spill Contingency Plan (ERSCP);</li> <li>• Compliance with applicable regulations.</li> </ul>	<b>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</b>
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>• Site clearing, grubbing and pre-stripping; and</li> <li>• Site preparation phase workforce requirements and personnel management.</li> </ul>	No effects		No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>• Topsoil and overburden stripping and stockpiling.</li> <li>• Stream diversions (upper end of McVeigh to Spring Lake, and, Waterbody 10).</li> <li>• Draining of Webb Lake and Lovell Lake for open pit mining.</li> <li>• Backfilling of on-site water bodies for construction of Project infrastructure, TMF and MRMF.</li> <li>• General construction activities in proximity of streams and construction of site water management Infrastructure.</li> <li>• Construction of fish habitat compensation measures.</li> </ul>	<p>Effects on lower trophic community</p> <p>Effects on CRA fisheries</p> <p>Effects on fish habitat</p>	<p><b>Specific mitigation to minimize or avoid Fish Habitat:</b></p> <ul style="list-style-type: none"> <li>• Locating temporary overburden stockpiles, fuel or chemical storage facilities, and construction equipment a minimum of 30 m from any water body;</li> </ul> <p><b>Specific to protect fish:</b></p> <ul style="list-style-type: none"> <li>• Follow DFO’s Freshwater End-of-Pipe Guidelines for the design of water intakes and discharge structures.</li> </ul>	<p>Loss of CRA fish through relocation of fish from habitats to be lost due to the development of the Project.</p> <p>Loss of fish habitat due to removal of water bodies and watercourses</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>• Transportation, storage, handling and usage of fuel for mobile equipment and of other hazardous substances (reagents and wastes).</li> </ul>	<p>Effects on lower trophic community</p> <p>Effects on CRA fisheries</p> <p>Effects on fish habitat</p>	<p><b>Mitigation to protect fish:</b></p> <ul style="list-style-type: none"> <li>• Open pit blasting designs have been identified that can meet DFO guidelines for overpressure in waterbodies.</li> <li>• Adaptive management – modify blast protocol if DFO guidelines for protection of fish are not satisfied</li> </ul> <p><b>Mitigation to protect fish habitat:</b></p> <ul style="list-style-type: none"> <li>• Single discharge to the receiving environment for all mine contact water (MMER discharge).</li> <li>• Monitoring of discharge water quality</li> </ul>	<p>Changes in water and sediment quality that have the potential to effect lower trophic level species (plankton, benthic invertebrates, forage fish)</p> <p>Blasting from open pit effects CRA fish through vibration</p>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Closure and dismantling of Project facilities and infrastructure.</li> <li>• Final site rehabilitation.</li> <li>• Transportation, storage, handling and usage of fuel for mobile equipment.</li> </ul>	No additional effects	<p><b>Protection of Fish Habitat</b></p> <ul style="list-style-type: none"> <li>• Rehabilitation of the mine site to avoid erosion and elevated TSS in runoff.</li> </ul>	No residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>• Pit Lake filling; and</li> <li>• Stabilization of site rehabilitation, monitoring and maintenance</li> </ul>	No additional effects		No residual effects

**Table 8-29: Significance of Residual Effects on Lower Trophic Level, CRA Fish and Fish Habitat**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	REVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Changes in water and sediment quality that have the potential to effect lower trophic level species (plankton, benthic invertebrates, forage fish)	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Not Significant</b>
	Average concentrations of substances in water will be less than water quality guidelines for the protection of aquatic life in the receiver and maximum concentrations in the mixing zone will be less than acute toxicity thresholds. Concentrations of copper and phosphorus in sediment are predicted to exceed the SEL and may cause local effects to sediment dwelling organisms.	Concentrations of copper and phosphorus greater than the SEL are confined to the LSA.	Changes in sediment quality are associated with effluent discharge to Otto Lake which will only occur seasonally during operations.	Concentrations of copper and phosphorus in sediment may only be elevated during operations and will decrease with the cessation of discharge. Therefore, potential impairment to sediment dwelling organisms will only occur over the operating period.	Concentrations of copper and phosphorus in sediment will return to background following the cessation of discharge from the WQCP at the end of operations. It is expected that the benthic community will return to baseline (if any observable changes had occurred).	It is possible that the change in sediment chemistry may cause a shift in the fish community should benthic communities become impaired, but the overall fish population is not expected to be affected as extensive areas for foraging within other areas of the lake and in connecting habitats will remain.	The effect is not expected to affect the use of fisheries resources by the Aboriginal community or other community members. The fish species sought by the Aboriginal community will not be affected by a shift in the benthic community	Changes in predicted sediment chemistry are considered conservative as they do not consider the lower concentrations of substances in water that will be realized through a constant discharge rate and a submerged diffuser. Furthermore, effects to sediment will generally be confined to the depositional area of the downstream lakes which does not represent important forage habitat for the resident fish species.
Blasting from open pit effects CRA fish through vibration	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Blasting from the open pit has the potential to impair fish in the near-field area of the west bay of Goudreau Lake and to impair spawning within this area. It is expected that mitigation measures will be employed to eliminate/manage this potential effect.	The effect is confined to the LSA in the near-field area of the west bay of Goudreau Lake.	Any effects from blasting will be realized during construction and the early years of operations until the pit is sufficiently deep that effects no longer occur.	Any blasting effects that cannot be mitigated will occur during construction and the first years of operations (i.e., consistently for > 5 years).	Once blasting in the pit is no longer conducted (i.e., end of mine life) any potential effects to fish will stop.	Mitigation is expected to eliminate/manage effects from blasting but some individual fish may still be affected. Communities and populations will not be affected.	The effect is not expected to affect the use of fisheries resources by the Aboriginal community or other community members. The area affected within Goudreau Lake is very small and the effect of blasting can be mitigated.	Blasting from the pit has the potential impair fish in the near-field area of the west bay of Goudreau Lake however, it is expected that mitigation measures will be employed to eliminate/manage this potential effect. Furthermore, the area affected in Goudreau Lake is very small.
Loss of CRA fish through relocation of fish from habitats to be lost due to the development of the Project.	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Fish from habitats to be lost will be relocated to appropriate habitats (either newly created or existing) depending on the species. While measures will be taken to minimize the loss of and effects to CRA fish, individual fish will be lost.	Fish that will need to be relocated will come from habitats to be lost within the PSA.	Fish will be relocated during the construction phase of the Project and any effects will not extend beyond this phase.	Fish will be relocated within one season at each affected water body. Relocations will be timed to minimize effects on the fish and promote year class survival.	The fish communities and populations can accommodate the loss of individual fish during relocation and over time these individuals will be replaced through recruitment.	Relocation of fish has the potential to effect individuals but not communities or populations within the RSA.	The effect is not expected to affect the use of fisheries resources by the Aboriginal community or other community members.	While fish will need to be relocated from habitats to be lost, measures will be taken to minimize the impact and promote survival. It is expected that some individual fish will be lost but communities and populations will not be affected.
Loss of fish habitat due to removal of water bodies and watercourses	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	While an offsetting/compensation plan will be developed and approved by DFO and ECCC more than 10% but less than 35% of the area of fish habitat within the RSA will be affected which will disrupt the fish community until offsetting measures are fully established.	While habitat lost due to the development of the Project is largely confined to the PSA, reduction in flow within McVeigh Creek will result in some small loss of habitat within the LSA.	Habitat offsetting measures will be constructed prior to the loss of habitat and measures incorporated to reduce lag times should result in habitat functionality between 1 and 3 years.	The effect of habitat loss and offsetting is a one-time event.	Once the habitat offsetting measures are in place they will be permanent and any disruption to habitat will be reduced as the habitats develop.	The implementation of offsetting/compensation plans will require that there is no net loss of productive habitat for the resident species, thus impacts to the community or population are not expected.	The implementation of offsetting/compensation plans will require that there is no net loss of productive habitat for the resident species such that use of the resource by Aboriginal people is not expected to be affected.	While an offsetting/compensation plan will be developed and approved by DFO and ECCC more than 10% but less than 35% of the area of fish habitat within the RSA will be affected. This will disrupt the fish community until offsetting measures are fully established, but once established, these measures will provide for no net loss of productive habitat.

Table 8-30: Scope of the Monitoring Program for Fish and Fish Habitat

RESIDUAL EFFECT	LOCATION(S) TO BE MONITORED	PARAMETERS TO BE MONITORED	METHODS	DURATION AND FREQUENCY
<b>Fish and Fish Habitat</b>				
Loss of fish and fish habitat, due to the direct removal of water bodies and watercourses, which cannot be offset through physical habitat creation and enhancement.				No Monitoring Required.
Reduced connectivity or function of retained fish and fish habitat due to reduced drainage area and flow in sub-watershed.				No Monitoring Required.
Reduced quality of fish, and function of fish habitat, due to altered water quality associated with mine discharges and surface water runoff.	Otto Lake Goudreau Lake (MMER discharge points)	<b>Physical parameters:</b> pH, alkalinity, conductivity, dissolved oxygen, total dissolved solids, total suspended solids, total organic carbon (TOC), and dissolved organic carbon (DOC) <b>Major ions:</b> calcium, magnesium, potassium, sodium, sulphate, chloride, and fluoride <b>Nutrients:</b> nitrate, nitrite, ammonia, total phosphorus and phosphate <b>Organics:</b> oil and grease, phenols <b>Metals:</b> total and dissolved (including mercury) <b>Cyanide:</b> total and free <b>Biological parameters:</b> Fish tissue metals concentrations	Water column profile sampling and laboratory analysis.  Fish community sampling and tissue analysis.	Operations – Quarterly Closure and Rehabilitation – Annual Post-Closure – Annual
<b>Effectiveness of Mitigation Measures for Fish and Fish Habitat – Lower Trophic Level Community</b>				
Erosion and sediment control measures Construction access controls Stockpiled material containment Spill Prevention and Response Plan	Reference lakes Water bodies within 30 m of construction works within the study area	Benthic invertebrate Periphyton Zooplankton Phytoplankton	Sediment sampling Horizontal and vertical net tows	Operations - Quarterly Closure and Rehabilitation – Annual Post-Closure - Annual
<b>Effectiveness of Mitigation Measures for Fish and Fish Habitat – Forage Base Species and Recreational and Aboriginal Fisheries</b>				
Appropriate timing windows for least risk to fish and fish habitat Protection and isolation or salvage of fish DFO Guidelines for use of explosives near water	Reference Lakes Water bodies within 30 m of construction works within the study area	Nearshore and offshore fish community Fish Habitat inventories	Electrofishing and gillnetting Fish habitat mapping	Operations - Alternate years Closure and Rehabilitation – Annual Post-Closure - Annual
Fish and Fish Habitat Operational Blasting	Goudreau Lake	Blast intensities to calculate site specific Peak Particle Velocities Use of fish habitat	Vibrations in habitat substrates Use of fish habitat during sensitive life stages	Initial stages of pit development  Spawning periods
<b>Fish and Fish Habitat Offsets</b>				
Fish and Fish Habitat Offsets	Stocking Lakes  Habitat Creation and enhancement Riparian vegetation plantings	Fish recruitment success (fish community inventory, creel survey) Integrity of design and construction Rate of succession	Electrofishing and gillnetting	Operations – One-time event after implementation Closure and Rehabilitation – One-time event after implementation Post-Closure – Years 1 and 3 after closure
	Pit Lake development	<b>Physical parameters:</b> pH, alkalinity, conductivity, dissolved oxygen, total dissolved solids, total suspended solids, total organic carbon (TOC) and dissolved organic carbon (DOC) <b>Major ions:</b> calcium, magnesium, potassium, sodium, sulphate, chloride, and fluoride <b>Nutrients:</b> nitrate, nitrite, ammonia, total phosphorus and phosphate <b>Organics:</b> oil and grease, phenols <b>Metals:</b> total and dissolved (including mercury) <b>Cyanide:</b> total and free	Water column profile sampling and laboratory analysis	Operations – Quarterly Closure and Rehabilitation – Annual Post-Closure – Annual

### **8.5.13 Terrestrial Vegetation**

Terrestrial vegetation is valued for its ecological services and economic, social and cultural benefits. Soil, topography, moisture regime, and degree of disturbance dictate the associations of plants that provide these ecological services. Terrestrial vegetation supports a variety of resource uses, including sustainable forestry which continues to be important to the regional economy in the Algoma District. The indicators are potential reduction in Upland Forest and Barren Rock ecotypes. Upland forests were selected as an indicator of this VC because of its abundance and dominance in the LSA, PSA, and RSA. Rock barren vegetation was also selected as an indicator of this VC because it provides unique ecosystem functions related to food webs and wildlife habitat.

#### **8.5.13.1 Effects Assessment**

Adverse effects to terrestrial vegetation occurs mainly during site preparation and construction. During site clearing, grubbing, pre-stripping and construction, terrestrial habitat will be transformed reducing the size of certain ecotypes and dust effects on vegetation can occur. Land disturbance could also affect the existing vegetation causing dieback and changes in ground level flora. The spread of invasive species and spills could alter the existing vegetative species. As the mine proceeds to the processing phase, gradual expansion of the open pit will cause the removal of upland forests. Potential damage to adjacent natural vegetation from road maintenance activities, such as ice and dust controls, structure/culvert repairs, ditch cleanout, etc.; and spills which may reach forested areas can occur during the mining, processing and closure and rehabilitation phases. Two potential indirect effects are changes in groundwater levels and overland flow/infiltration rates and increased dustfall on vegetation. All of the ecotypes found in the PSA are well represented in the LSA ad RSA

#### **8.5.13.2 Mitigation Measures**

Several mitigations measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on terrestrial vegetation. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on terrestrial vegetation external to the footprint of the Project facilities are listed in Table 8-31. A key mitigation is the development and implementation of the Construction Environmental Protection Plan (CEPP) which will provide guidance on the use of best management practices (BMPs) to perform the various construction activities. These BMPs aim to avoid the removal of, or damage to, terrestrial vegetation due to clearing or other physical disturbances beyond defined construction working areas. Furthermore, Prodigy is engaging with Aboriginal groups to identify culturally important plants and provide mitigation measures in the CEPP. An Invasive Species Management Plan as part of the overall Environmental Management Plan.

#### **8.5.13.3 Residual Effects on Terrestrial Vegetation**

Taking into consideration the mitigation by design measures and the additional mitigation measure identified above, the anticipated adverse residual effects terrestrial vegetation are listed in Table 8-31. As illustrated in Table 8-32, these residual effects on terrestrial vegetation are assessed as “not significant”. The proposed follow-up and monitoring program for significant wildlife habitat in presented in Table 8-33.

**Table 8-31: Project Interactions with Terrestrial Vegetation**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on terrestrial vegetation within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>Construction Environmental Protection Plan (CEPP), and,</li> <li>Emergency Response and Spill Contingency Plan (ERSCP).</li> <li>Compliance with applicable regulations.</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.	<ul style="list-style-type: none"> <li>Dust effects on vegetation resulting from clearing and grubbing, exposing fine sandy soils vulnerable to desiccation and erosion;</li> <li>Edge effects where clearing crosses a forest, leaving existing vegetation exposed to increased light, wind, sun. These effects often lead to vegetation dieback, changes in the ground flora composition, wind throw, and/or spread of invasive species; and</li> <li>Forest clearing/damage beyond the working area due to machinery.</li> </ul>	<p><b>Protection of existing vegetation and fragmentation of pathways:</b></p> <ul style="list-style-type: none"> <li>Minimize footprint of the Project and travel distances.</li> <li>Protect vegetated areas bordering working areas with temporary fencing.</li> <li>Restrict tree grubbing and removal to the working areas.</li> <li>Fell trees into the construction zone to avoid damaging standing vegetation that is to be preserved, and away from any watercourse where it is safe to do so;</li> </ul>	
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Topsoil and overburden stripping and stockpiling</li> <li>Stream diversions and draining and backfilling of on-site waterbodies</li> <li>Gradual expansion of the mine pit.</li> <li>Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>Construction of environmental management infrastructure and monitoring systems</li> <li>Dust fall associated with construction activities.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<ul style="list-style-type: none"> <li>Removal of 919 ha of upland forests in the PSA.</li> <li>Introduction and/or spread of non-native, invasive plant species;</li> <li>Ongoing release of dust onto forested areas; and</li> <li>Spills of contaminants, fuels, and other materials that may reach forested areas.</li> <li>Forest fires</li> </ul>		<p>Removal of upland forest and associated rock barrens</p> <p>Fragmentation of pathways of connectivity</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Gradual expansion of the mine pit.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<ul style="list-style-type: none"> <li>Potential damage to adjacent natural vegetation from road maintenance activities, such as ice and dust controls, structure/culvert repairs, ditch cleanout, etc.; and</li> <li>Spills of fuels and other materials that may reach forested areas.</li> </ul>		No incremental adverse residual effects

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	<ul style="list-style-type: none"> <li>Potential damage to adjacent natural vegetation from road maintenance activities, such as ice and dust controls, structure/culvert repairs, ditch cleanout, etc.; and</li> <li>Spills of fuels and other materials that may reach forested areas.</li> </ul>		No adverse residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling Post monitoring activities	No effects		No adverse residual effects

**Table 8-32: Significance of Residual Effects on Terrestrial Vegetation**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Removal of upland forest and associated rock barrens	<b>Low</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	919 ha removed = 73% of forest in PSA (19% of area of PSA remaining as forest); 37% of forest in LSA (44% of area of LSA remaining as forest; 12% of RSA (62% of area of RSA remaining as forest).	Removals are confined to PSA.	Vegetation community functions are interrupted until final closure and rehabilitation is completed.	Removals occur concurrently, once, or may be alterations instead of removals.	The effect can be reversed by restoring forest.	All ecosites are well-represented in the RSA.	These forests likely provide resources that could be of value to Aboriginal groups.	
Fragmentation of pathways of connectivity	<b>Low</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	Restoration will mimic pre-construction connectivity.	Removals and additional fragmentation are confined to PSA.	Vegetation community functions are interrupted until final closure and rehabilitation is completed.	Removals occur once, concurrently, and alternate routes exist.	The effect can be reversed by restoring forest.	The mine is surrounded by forest offering alternate pathways.	Pathways are unlikely to provide resources that could be of value to Aboriginal groups.	

**Table 8-33: Scope of the Monitoring and Follow-Up Program for Terrestrial Vegetation**

RESIDUAL EFFECT	LOCATION(S) TO BE MONITORED	PARAMETERS TO BE MONITORED	METHODS	DURATION AND FREQUENCY
Verify that the forest is recovering as designed	PSA-wide, with focus on TMF and MRMF	<ul style="list-style-type: none"> <li>Area</li> <li>Soil quality</li> <li>Vegetation recovery: species richness and diversity</li> <li>Invasive Species</li> <li>Herbivory</li> </ul>	<ul style="list-style-type: none"> <li>Survey</li> <li>Soil samples</li> <li>Quadrats and documentation of plant species and percent cover</li> <li>Referenced photography</li> </ul>	Closure and Rehabilitation; and Post Closure Annual at same time of year (July recommended)
Invasive Species Control	PSA-wide, with focus on TMF and MRMF	Occurrence of and level of infestation by non-native invasive plant species	<ul style="list-style-type: none"> <li>Visual reconnaissance and estimation of size of infestation;</li> <li>Documentation with GPS</li> </ul>	Closure and Rehabilitation; and Post Closure Annual

### **8.5.14 Wetlands**

Wetlands are valued for their ecological services and economic, social, and cultural benefits. From a regulatory perspective, significant wetlands are protected under Section 2.1.4 of the Ontario Provincial Policy Statement (2005). Wetlands improve water quality by trapping sediments, filtering out pollutants, and absorbing nutrients that would otherwise result in poor water quality for downstream users. Wetlands in the LSA and RSA provide wildlife habitat for species such as amphibians, mammals, migratory and breeding birds, and fish, including SAR. Wetlands act as sinks for CO<sub>2</sub> and other GHGs. Wetlands are often of high cultural significance to Aboriginal people, who value their connection to the land and the biodiversity that wetlands support.

#### **8.5.14.1 Effects Assessment**

As per the terrestrial vegetation, the loss of wetlands will occur within the 1,070 ha of the Project footprint. The losses of 199 ha of wetland will occur at the initial phases of the Project as a result of the earthwork construction activities, changes to drainage patterns, dewatering and backfilling of low areas, and, water diversions. For the Project foot print these changes will be permanent. This represents 12% of the natural cover in the PSA, but these wetland ecosites are well represented within the LSA and the RSA.

Indirect effects may occur to remaining wetlands adjacent to the Project roads and infrastructure as a result of dust fall or changes to surface and groundwater quality and quantity that may result from the removal of vegetation and soil compaction. Dust effects and silting effects to wetland vegetation and water quality created by Project activities are listed in Table 8-34.

#### **8.5.14.2 Mitigation Measures**

Several mitigations measures have been identified and will be implemented to avoid, reduce, minimize or eliminate adverse residual effects on wetlands. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on remaining wetlands external to the footprint of the Project facilities are listed in Table 8-34. A key mitigation is the development and implementation of the Construction Environmental Protection Plan (CEPP) which will provide guidance on the use of best management practices (BMPs) to perform the various construction activities. These BMPs aim to avoid the removal of, or damage to, terrestrial vegetation and wetlands due to clearing or other physical disturbances beyond defined construction working areas (use of silt fences). Furthermore, Prodigy is engaging with Aboriginal groups to identify culturally important plants and provide mitigation measures in the CEPP. An Invasive Species Management Plan is part of the overall Environmental Management Plan.

#### **8.5.14.3 Residual Effects on Wetlands**

Taking into consideration the mitigation measures identified above, the anticipated adverse residual effects on wetlands are listed in Table 8-34. As illustrated in Table 8-35, these residual effects on wetlands are assessed as “not significant”.

Table 8-34: Project Interactions with Wetlands

TABLE 8-16A: PROJECT INTERACTIONS WITH WETLANDS					
PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on wetlands within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>Construction Environmental Protection Plan (CEPP), and,</li> <li>Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.			No effects on wetlands
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Topsoil and overburden stripping and stockpiling</li> <li>Stream diversions and draining and backfilling of on-site waterbodies</li> <li>Gradual expansion of the mine pit.</li> <li>Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>Construction of environmental management infrastructure and monitoring systems</li> <li>Dust fall associated with construction activities.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<p>Removal of 199 ha of organic/peat accumulating wetlands and 16 ha of mineral wetlands within the area of disturbance.</p> <p>The fen at the west end of Spring Lake will be largely removed to enable the restoration of a historical drainage pathway to McVeigh Creek.</p> <p>The duration of the impact of removals will be permanent.</p>	<ul style="list-style-type: none"> <li><b>Specific mitigations to protect wetlands:</b></li> <li>Minimizing footprint, area of activities and travel distances</li> <li>Minimize extent and width of construction and maintenance access roads and trails outside of the public bypass road;</li> <li>Protect wetland areas bordering working areas with sediment fencing.</li> <li>Implement Best Management Practices to control dust deposition</li> </ul>	<p>Removal of 199 ha of Organic/Peat Accumulating Wetlands</p> <p>Removal of 199 ha of Organic/Peat Accumulating Wetlands</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Gradual expansion of the mine pit.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	Potential effect of groundwater drawdown in vicinity of open pit (waterbody #10)	<ul style="list-style-type: none"> <li><b>Specific mitigations to protect wetlands:</b></li> <li>Implement Best Management Practices to control dust deposition</li> </ul>	<p>Reduced quality/function of the retained wetlands due to altered water quality and quantity</p> <p>Reduced quality/function of the retained wetlands due to indirect effects of dust, wind and sun exposure</p>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	No potential effects		No incremental adverse residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling	No potential effects		No incremental adverse residual effects

**Table 8-35: Significance of Residual Effects on Wetlands**

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Removal of 199 ha of Organic/Peat Accumulating Wetlands	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Percent of wetlands in watershed changed from 14% to 12% and percent change in wetlands is less than 20%.	Removals are confined to the PSA.	Effects extend until final closure, when rehabilitation is commenced.	Removals occur concurrently and once.	Effect is reversible but requires management by creating wetlands or restoring natural flows to retained wetlands.	All ecosites are well-represented in the RSA.	These wetlands likely provide resources that could be of value to Aboriginal groups and/or other community members.	
Removal of 199 ha of Organic/Peat Accumulating Wetlands	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Not Significant</b>
	This wetland type occurs at low levels (1%).	Removals are confined to the PSA.	Effects extend until final closure, when rehabilitation is commenced.	Removals occur concurrently.	The effect can be reversed through contouring around existing lakes, and recovery will be spontaneous.	This ecosite is well-represented in the RSA.	This wetland type (Mineral Thicket Fen) may provide resources that could be of value to Aboriginal groups and/or other community members	
Reduced quality/ function of the retained wetlands due to altered water quality and quantity	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Water quality is expected to meet water quality guidelines.	Effects are confined to the PSA.	Effects may extend until final closure, when rehabilitation is commenced.	The effect continues until closure.	Effect will reverse after closure.	All ecosites are well-represented in the RSA.	Wetlands could be of value to Aboriginal groups and/or other community members	
Reduced quality/ function of the retained wetlands due to indirect effects of dust, wind and sun exposure	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Effects can be managed within the PSA.	Effects will not be measurable beyond the PSA.	Effects may extend until final closure.	The effect continues until closure.	Effect will cease after closure.	There is an existing source of dust from Goudreau Road; therefore, local wetlands are already subject to some deposition	Wetlands could be of value to Aboriginal groups and/or other community members	

### **8.5.15 Significant Wildlife Habitat**

Significant wildlife habitat (SWH) are valued components because they are “areas where species concentrate at a vulnerable point in their annual lifecycle; and areas which are important to migration or non-migratory species” (MNR, 2000). From a regulatory perspective, SWH is protected under Section 2.1.4 of the Provincial Policy Statement (2014). Guidance for designation of SWH is provided under the Provincial Policy Statement (2014) through criteria developed by MNRF for Ecoregion 5E.

#### **8.5.15.1 Effects Assessment**

Effects on significant wildlife habitat are closely related to the loss of aquatic habitat, terrestrial vegetation and wetlands. These losses will occur during the initial phases of the Project, and will be limited to the physical footprint of the Project facilities. The Project activities that may contribute to the loss of significant wildlife habitat are listed in Table 8-36.

#### **8.5.15.2 Mitigation Measures**

Mitigation measures identified to avoid, reduce, minimize or eliminate adverse residual effects on wetlands, terrestrial vegetation, and, fish and fish habitat also apply for the protection of significant wildlife habitat. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on remaining significant wildlife habitat external to the footprint of the Project facilities are listed in Table 8-36. Additional mitigation measures to further avoid or reduce the severity of the adverse effects specific to Significant Wildlife Habitat include:

- Timing of removal of habitat to adhere to the requirements of the *Migratory Birds Convention Act*. Removal of active nests will be prohibited, and typically clearing should not occur between May 15 and July 31;
- Constructing the embankments of the TMF and the MRMF with multiple locations on the side slopes that are at an angle, and surfaced suitably for allow access by moose. This will effectively replace the height of land in the PSA that currently provides moose calving habitat; and
- Restoring forest at the mine site should include objectives for habitat elements that are important to species of special concern (SSC) such as mixed shelterwood woodlands and floating-leaved wetlands for moose; open woodlands with rock barren openings for Common Nighthawk; and sources of a water supply and shrubby understory for Canada Warbler.

#### **8.5.15.3 Residual Effects on Significant Wildlife Habitat**

Taking into consideration the mitigation measures identified above, the anticipated adverse residual effects significant wildlife habitat are listed in Table 8-36. As illustrated in Table 8-37, these residual effects on wetlands are assessed as “not significant”. The proposed follow-up and monitoring program for significant wildlife habitat in presented in Table 8-38.

**Table 8-36: Summary of Magino Project Effects on Significant Wildlife Habitat and Significance of Residual Effects**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on significant wildlife habitat within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>• Minimizing footprint, area of activities and travel distances</li> <li>• Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>• Construction Environmental Protection Plan (CEPP), and,</li> <li>• Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.			
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>• Topsoil and overburden stripping and stockpiling</li> <li>• Stream diversions and draining and backfilling of on-site waterbodies</li> <li>• Gradual expansion of the mine pit.</li> <li>• Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>• Construction of environmental management infrastructure and monitoring systems</li> <li>• Dust fall associated with construction activities.</li> <li>• Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<p>Removal of up to 123 ha of moose calving area on the high ridge between Spring-Lovell and Herman-Otto watershed.</p> <p>Removal of 17 ha of aquatic feeding area.</p> <p>Removal of 17 ha of amphibian breeding area.</p> <p>Removal of habitat for species of special concern (as quantified in Table 7.4.4-6: Effects on Species of Special Concern)</p> <p>Potential for dust fall on vegetation and feeding areas.</p> <p>Potential for degradation of water quality.</p> <p>Potential for degradation of vegetation due to dust fall</p>	<p><b><u>Mitigations aiming at minimizing removal and functionality of significant habitat:</u></b></p> <ul style="list-style-type: none"> <li>• Timing of removal of habitat to adhere to the requirements of the <i>Migratory Birds Convention Act</i>. Removal of active nests will be prohibited, and typically clearing should not occur between May 15 and July 31 (additional restrictions apply to Threatened and Endangered Species);</li> </ul>	<p>Removal of Moose Calving, Aquatic Feeding and Late Winter Cover Habitat</p> <p>Removal of Amphibian Breeding Habitat</p> <p>Removal of habitat for Species of Special Concern</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>• Gradual expansion of the mine pit.</li> <li>• Potential spills associated with the transportation, usage and storage of fuel.</li> <li>•</li> </ul>	<p>Potential for dust fall on vegetation and feeding areas.</p> <p>Potential for degradation of water quality.</p>		No incremental adverse residual effects.
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Closure and dismantling of Project facilities and infrastructure.</li> <li>• Final site rehabilitation.</li> <li>• Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	<p>Potential for dust fall on vegetation and feeding areas.</p> <p>Potential for degradation of water quality.</p>		No incremental adverse residual effects.
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling	No effects	No mitigation measures required	No adverse effects

**Table 8-37: Significance of Residual Effects on Significant Wildlife Habitat**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Removal of Moose Calving, Aquatic Feeding and Late Winter Cover Habitat	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	The moose calving area in the PSA and LSA will be removed and a third of the available late winter cover will be removed; potentially reducing these functions within the RSA.	Effects are confined to the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	The SWH functions occur within the LSA and RSA and within a forest to which substantial effects have occurred and upon recovery, provide habitat.	This effect may be important to the community.	
Removal of Amphibian Breeding Habitat	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Removal of a third of the habitat in the context of the LSA and RSA where it is common and well distributed will not create a measurable reduction in function in the RSA.	Effects are confined to the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	Amphibian breeding habitat is abundant in the RSA.	The amphibians may be important to the community in the context of their importance to the food supply for important species.	
Removal of habitat for Species of Special Concern	<b>Medium</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Not Significant</b>
	Common Nighthawk appears to be correlated with disturbed areas within the PSA. Removal of this habitat may result in removal of a disproportionate number of their feeding and breeding locations.	Effects are confined to the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	The removal of foraging opportunities for Bald Eagle, combined with removals of Olive-sided Flycatcher and Common Nighthawk locations are a combination less likely to occur in the RSA.	The removal of habitat for these birds may be important to the community.	

**Table 8-38: Scope of Monitoring and Follow-Up Program for Significant Wildlife Habitat**

RESIDUAL EFFECT	LOCATION(S) TO BE MONITORED	PARAMETERS TO BE MONITORED	METHODS	DURATION AND FREQUENCY
Verify the quality/ function of habitat created to replace winter cover for moose	As indicated in restoration plan (to be determined)	<ul style="list-style-type: none"> <li>Size.</li> <li>% Conifer composition.</li> </ul>	<ul style="list-style-type: none"> <li>Mapping, GPS delineation.</li> <li>Plant inventory.</li> </ul>	Post-Closure: Annual
Verify the occurrence of moose calving on the TMF and MRMF	TMF and MRMF	<ul style="list-style-type: none"> <li>Use of ramps to access plateau.</li> <li>Use of top of re-contoured TMF and MRMF.</li> </ul>	<ul style="list-style-type: none"> <li>Mapping, GPS delineation.</li> <li>Plant inventory.</li> <li>Game camera.</li> </ul>	Post-Closure: Annual
Verify the quality/ function of the Mixedwood and deciduous forest habitats created for Canada Warbler	As indicated in restoration plan (to be determined)	<ul style="list-style-type: none"> <li>Size.</li> <li>Biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>Mapping, GPS delineation.</li> <li>Plant inventory.</li> </ul>	Post-Closure: Annual
Verify the quality/ function of the coniferous or mixed forests created for Olive-sided Flycatcher and Bald Eagle	As indicated in restoration plan (to be determined)	<ul style="list-style-type: none"> <li>Size.</li> <li>Biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>Mapping, GPS delineation.</li> <li>Plant inventory.</li> </ul>	Post-Closure: Annual
Verify the quality/ function of the coniferous or mixed forests with a relatively open canopy with inclusions of bedrock openings created for Common Nighthawk	As indicated in restoration plan (to be determined)	<ul style="list-style-type: none"> <li>Size (target 74 ha of forest/barren complex).</li> <li>Biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>Mapping, GPS delineation.</li> <li>Plant inventory.</li> </ul>	Post-Closure: Annual

## **8.5.16 Migratory and Breeding Birds**

All bird species are valued for the important roles they play in maintaining healthy, functioning ecosystems. Examples of these roles include: seed dispersers, pollinators, insect control, scavengers, and as food for other animals including humans. They also support recreational activities and traditional Aboriginal activities. All bird species are valued for the biodiversity they support. Of principle importance, they are surrogates of ecosystem integrity and often the first warning signals that the ecosystem is changing. From a regulatory perspective, some birds are afforded protection under the federal *Migratory Birds Convention Act* (1994).

### **8.5.16.1 Effects Assessment**

Potential effects to migratory and breeding birds are closely related to the loss of aquatic habitat, terrestrial vegetation, wetlands, and, significant wildlife habitat. These losses will occur during the initial phases of the Project, and will be limited to the physical footprint of the Project facilities (1,070 ha). The Project activities that may contribute to effects on migratory and breeding birds are listed in Table 8-39. Within the area of disturbance, 919 ha of forest canopy is used by these species for nesting, foraging, and rearing young. This represents 73%, 27% and 12% of the resource in the PSA, LSA and RSA respectively. Given the size of the area of disturbance, the potential exists to reduce patch sizes below optimal. In this situation, area sensitive species might not remain within the watersheds of the LSA, but would likely move elsewhere and persist in the RSA and beyond.

Construction activities will also remove open water areas on which waterfowl were observed, resulting in a reduction of staging and foraging habitat. The removals will amount to 44%, 16% and 5% of the habitat available in the PSA, LSA and RSA respectively. Some waterfowl may be attracted to the tailings pond and water quality control pond. However, given the abundance of larger and more preferred habitat in the LSA and RSA, this is considered unlikely. The water in these ponds and wetlands may not meet guidelines, resulting in an increased exposure of waterfowl to contaminants. Adverse effects on waterfowl that might be exposed to altered water quality for only short periods of time are not likely to be measurable.

There are a wide variety of raptor species. Prey abundance and the availability of suitable nesting habitat largely govern species distribution and breeding success (Campbell *et al.*, 1990). The lack of nests would imply that the condition of the forest does not provide suitable nesting sites. Therefore, the key effect of the Project on raptors in the study areas is largely confined to foraging habitat. Aside from the loss of foraging habitat, raptors would likely avoid the area of disturbance.

### **8.5.16.2 Mitigation Measures**

Mitigation measures identified to avoid, reduce, minimize or eliminate adverse residual effects on wetlands, terrestrial vegetation, fish and fish habitat, and, significant wildlife habitat also apply for the protection of migratory and breeding birds. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on migratory and breeding birds external to the footprint of the Project facilities are listed in Table 8-39.

### **8.5.16.3 Residual Effects**

Taking into consideration the mitigation measures identified above, the anticipated adverse residual effects on migratory and breeding birds are listed in Table 8-39. As illustrated in Table 8-40, these residual effects on migratory and breeding birds are assessed as “not significant”.

Table 8-39: Project Interactions with Migratory and Breeding Birds

TABLE 8-18A - PROJECT INTERACTIONS WITH MIGRATORY AND BREEDING BIRDS					
PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of the Project activities on migratory and breeding birds within the PSA and LSA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>Construction Environmental Protection Plan (CEPP), and,</li> <li>Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.		<p><b>Mitigations aiming at minimizing removal and functionality of bird habitat:</b></p> <ul style="list-style-type: none"> <li>Timing of removal of habitat to adhere to the requirements of the <i>Migratory Birds Convention Act</i>. Removal of active nests will be prohibited, and typically clearing should not occur between May 15 and July 31 (additional restrictions apply to Threatened and Endangered Species);</li> </ul> <p><b>Protection of migratory birds:</b></p> <ul style="list-style-type: none"> <li>Activities with the potential to destroy migratory birds, including vegetation clearing, filling, and demolition/removal of structures used by cavity nesters, shall not take place in migratory bird habitat during the breeding season, generally defined (for different habitat types) as May 1 to July 31 for this region;</li> <li>Compliance with speed limits on the site roads will be strictly enforced to limit the potential for vehicle collisions with wildlife in the area.</li> </ul>	
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Topsoil and overburden stripping and stockpiling</li> <li>Stream diversions and draining and backfilling of on-site waterbodies</li> <li>Gradual expansion of the mine pit.</li> <li>Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>Construction of environmental management infrastructure and monitoring systems</li> <li>Dust fall associated with construction activities.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<p>Effects on Canopy Warbler habitat (removal of 919 ha of forest)</p> <p>Effects on waterfowl and waterfowl habitat (removal of 72 ha)</p> <p>Effects on foraging habitat for raptor species</p>		<p>Loss of mature forest canopy habitat for warblers</p> <p>Loss of foraging and staging habitat for waterfowl.</p> <p>Loss of foraging habitat for raptors</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Gradual expansion of the mine pit.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	No additional potential effects		No additional adverse residual effects
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	No additional potential effects		No additional adverse residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling	No potential effects		No residual effects

**Table 8-40: Significance of Residual Effects on Migratory and Breeding Birds**

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>DEGREE OF IRREVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Loss of mature forest canopy habitat for warblers	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Species and habitat types are well represented in the LSA and RSA.	No removals will occur outside of the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	The habitat is well represented in the RSA.	This effect may be important to the community.	
Loss of foraging and staging habitat for waterfowl.	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Species and habitat types are well represented in the LSA and RSA.	No removals will occur outside of the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	The habitat is well represented in the RSA.	This effect may be important to the community.	
Loss of foraging habitat for raptors	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>	<b>Low</b>	<b>Medium</b>	<b>Not Significant</b>
	Species and habitat types are well represented in the LSA and RSA.	No removals will occur outside of the PSA.	Effects occur during site preparation and progressive rehabilitation may be undertaken.	Effects occur simultaneously.	Effects can be reversed with active rehabilitation.	The habitat is well represented in the RSA.	This effect may be important to the community.	

### 8.5.17 Mammals

All mammal species are valued for the important roles they play in maintaining healthy, functioning ecosystems. Examples of these roles include: seed dispersers, scavengers, and food for other animals including humans. Mammals are consumers of herbivores (e.g., rabbits, mice) and play an essential role and a predator in the wood-web. Mammals are typically viewed as resources that have commercial value or as game to be hunted for sport. Mammals are often of high cultural significance to Aboriginal people, who value their connection to the land and the biodiversity that mammals support. The *Fish and Wildlife Conservation Act* list mammals in Ontario as furbearing mammals, game mammals or specially protected mammals. Mammals, including those listed as furbearers, that could be affected by the Project may correlate with the small and large mammals typically identified by Aboriginal groups as having traditional ecological value.

#### 8.5.17.1 Effects Assessment

Potential effects to mammals are closely related to the loss of their foraging habitat. These losses will occur during the initial phases of the Project, and will be limited to the physical footprint of the Project facilities (1,070 ha). The Project activities that will contribute to the loss of mammal foraging habitat are listed in Table 8-41.

Concerning bear berry foraging habitat and bears, an estimated 835 ha of this habitat will be removed, representing 75%, 46%, and 16% of the habitat available in the PSA, LSA, and RSA respectively. These ecosites are well represented in the LSA and RSA, and there are no unique or rare ecosites removed in the PSA that are not well represented beyond. Within the PSA the movement corridors for bears will likely be affected, however the forest is well connected in the LSA and RSA so the bears can avoid the disturbed area. Potential exists for them to be attracted to the project particularly if they perceive an opportunity to feed on putrescent waste, gain access to dining facilities, or to be fed by staff members. Dustfall in the project vicinity may contribute to the deterioration of foraging habitat, and, the increased human presence may also bring additional pressure on bears.

Within the area of disturbance, site clearing, grubbing and pre-stripping will remove 270 m of identified moose travel corridors. Within the PSA the movement corridors for moose will likely be affected, however the forest is well connected in the LSA and RSA so the moose can avoid the disturbed area. Moose will avoid noise and light within the PSA, but effects on moose behavior in the LSA are not likely detectable and will not occur in the RSA or beyond. The increase human presence for the Project duration may intensify potential effects on moose due to increased human activity including vehicular traffic that may result in Moose – vehicle collisions. Outright harassment of wildlife and/or hunting pressure may occur or increase with the presence of a large workforce.

Furbearing animals occupy many habitats and are not confined to a specific vegetation type. This assessment focuses on Beaver because they integrate both aquatic and terrestrial systems and they were documented by both the terrestrial and aquatic investigations. Within the area of disturbance in the PSA, the Project will remove 60 ha associated with 3 beaver dams and 72% of the upland and wetland vegetation on which these species depend. It is expected that the animals affected will move into the surrounding communities. Noise from may create an avoidance response in most species. Potential exists for some furbearers (e.g., Lynx, Red Fox, Red Squirrel) to be attracted to the PSA if they perceive an opportunity to feed on putrescent waste, gain access to dining facilities, or to be fed by staff members. Effects noted above may intensify due to increased human activity including vehicular traffic that may result in wildlife- vehicle collisions and/or outright harassment of wildlife may occur.

Installation of surface water controls may alter drainage patterns and affect downstream wetlands and lakes, including riparian habitat. This could, alter hydroperiod and water quality and quantity in wetlands and lakes used as habitat for furbearers. Groundwater controls will change surface water/groundwater interactions which may have similar effects.

#### **8.5.17.2 Mitigation Measures for Mammals**

Mitigation measures identified to avoid, reduce, minimize or eliminate adverse residual effects on wetlands, terrestrial vegetation, fish and fish habitat, and, significant wildlife habitat also apply for the protection of mammals. These mitigations are listed in Table 8-1. Key mitigation measures that will prevent adverse effects on migratory and breeding birds external to the footprint of the Project facilities are listed in Table 8-41.

#### **8.5.17.3 Residual Effects on Mammals**

Taking into consideration the mitigation measures identified above, the anticipated adverse residual effects on migratory and breeding birds are listed in Table 8-41. As illustrated in Table 8-42, these residual effects on wetlands are assessed as “not significant”. The proposed follow-up and monitoring program for significant wildlife habitat is presented in Table 8-43.

**Table 8-41: Project Interactions with Mammals**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential effects of Project footprint and activities on mammals within the PDA. These include:</p> <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>Construction Environmental Protection Plan (CEPP), and,</li> <li>Emergency Response and Spill Contingency Plan (ERSCP).</li> </ul>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.			No residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Topsoil and overburden stripping and stockpiling</li> <li>Stream diversions and draining and backfilling of on-site waterbodies</li> <li>Gradual expansion of the mine pit.</li> <li>Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>Construction of environmental management infrastructure and monitoring systems</li> <li>Dust fall associated with construction activities.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	<p>Effects on bear berry foraging habitat and bears</p> <p>Effects on fur bearers and fur bearer habitat</p> <p>Effects on moose and moose travel corridor</p>	<p><b>Mitigation of effects on bear berry foraging habitat:</b></p> <ul style="list-style-type: none"> <li>Minimize clearing of vegetation;</li> </ul> <p><b>Protection of fur bearers and their habitat</b></p> <ul style="list-style-type: none"> <li>Limited use of facility owned snowmobiles and ATV's.</li> <li>Prohibition of hunting, fishing, harassment or feeding of wildlife on the mine property.</li> <li>Speed limit for on-site vehicle.</li> <li>Implementation of Waste Management Plan to prevent attraction of mammals.</li> </ul> <p><b>Mitigation for moose and moose travel corridor:</b></p> <ul style="list-style-type: none"> <li>Speed limit for on-site vehicle</li> <li>No hunting policy</li> </ul>	<p>Removal of Black Bear Berry Foraging Habitat</p> <p>Changes in mammal behavior due to noise, vibration and light</p> <p>Attraction of bears and other mammals to kitchen waste disposal areas, dining facilities and human activity where food might be available</p> <p>Creation of barriers to landscape connectivity including removal of Moose Travel Corridors</p>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Gradual expansion of the mine pit.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	No additional effects	<p><b>Mammal-vehicular collision:</b></p> <ul style="list-style-type: none"> <li>Speed limit for on-site vehicle.</li> </ul> <p><b>Change in mammal behaviour:</b></p> <ul style="list-style-type: none"> <li>Implementation of Waste Management Plan to prevent attraction of mammals.</li> </ul>	<p>Increased mammal-vehicular collisions</p> <p>Changes in mammal behaviour due to noise, vibration and light</p> <p>Increased exposure of mammals to contaminants in water quality ponds, constructed treatment wetlands and from dustfall</p> <p>Creation of barriers to landscape connectivity including removal of Moose Travel Corridors</p>

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE EFFECTS	RESIDUAL
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	No additional effects	<p><b>Mammals and their habitat:</b></p> <ul style="list-style-type: none"> <li>Progressive and final rehabilitation of the site for use by mammals will incorporate relevant guidelines for habitat restoration and include creating pathways of connectivity for both aquatic and terrestrial species.</li> <li>No hunting policy on site.</li> <li>Speed limit for on-site vehicles.</li> <li>Implementation of Waste Management Plan to prevent attraction of mammals.</li> </ul>	No residual effects	
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling	No effects	No mitigation required.	No residual effects	

Table 8-42: Significance of Residual Effects on Mammals

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Removal of Black Bear Berry Foraging Habitat	Low	Low	Moderate	Low	Medium	Low	Medium	Not Significant
	Habitat is available elsewhere and no other critical habitat was identified.	Effects are confined to the PSA.	Progressive rehabilitation will initiate restoration before closure.	The effect occurs during clearing and construction.	The effect can be reversed by actively restoring forest.	All ecosites are well represented in the RSA.	The mammal species or the habitat affected may be used or may be important to the community.	
Changes in mammal behavior due to noise, vibration and light	Low	Low	Low	High	Low	Low	Low	Not Significant
	Mammals habituate to noise, vibration and light, or will move to adjacent areas to avoid disturbance.	Effects are confined to the PSA.	Once mammals are habituated during construction further effects are less likely.	Effects will be continuous. Vibration effects will be frequent.	Effects will cease with closure.	The habitat is well represented and already disturbed by commuting vehicles, operating mines and mine exploration.	The effect is likely not detectable to the community.	
Creation of barriers to landscape connectivity including removal of Moose Travel Corridors	Low	Low	Moderate	Low	Medium	Low	Medium	Not Significant
	The landscape is well connected surrounding the PSA.	Effects are confined to the PSA.	Progressive rehabilitation will initiate restoration before closure.	The effect occurs once during clearing and construction.	The effect can be reversed by actively restoring forest.	The habitat outside of the PSA is well represented and provides alternate corridors.	The corridors affected may be important to the community.	
Attraction of bears and other mammals to kitchen waste disposal areas, dining facilities and human activity where food might be available	Low	Low	Medium	Medium	Medium	Low	Low	Not Significant
	Effects associated with the mine are confined to the PSA.	Effects associated with the mine are confined to the PSA.	Potential effects will terminate with closure.	Effects could be continuous but controlled through mitigation and therefore effects should be reduced to occasional events.	Potential effects will terminate with closure.	The mammals affected are common in the RSA.	It is unlikely that this effect will be important to the community.	

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Removal of beaver lodges and furbearer habitat due to draining of wetlands and waterbodies	Low	Low	Moderate	Low	Medium	Low	Medium	Not Significant
	Beaver lodges and other furbearer habitat sites are common across the study areas.	Effects associated with the mine are confined to the PSA.	Progressive rehabilitation will initiate restoration before closure.	The effect occurs once during clearing and construction.	The effect can be reversed by actively restoring forest, wetlands and watercourses.	The mammals affected are common in the RSA.	The mammal species or the habitat affected may be used or may be important to the community.	
Increased mammal-vehicular collisions	Low	High	Medium	High	Low	Low	Medium	Not Significant
	Effects will not change the viability of the wildlife population, although the effect is likely to be most acute to young of the year.	Measurable effects beyond the LSA due to increased use of Goudreau Road and other transportation routes to the site.	Potential effects will return to existing levels with closure associated with the Magino Mine.	The effect is continuous for the duration of operations.	Effects will return to existing levels with closure.	Wildlife is acclimated to existing persistent traffic.	The mammal species or the habitat affected may be used or may be important to the community.	
Increased exposure of mammals to contaminants in water quality ponds, constructed treatment wetlands and from dustfall	Low	Low	Medium	High	Medium	Low	Medium	Not Significant
	Facilities with potentially available contaminants are confined to the PSA. High dustfall levels are largely confined to the PSA.	Effects are confined to the PSA	Features will be capped or isolated at closure	The effect continues until closure	Effects can be reversed through mitigation	The mammals affected are common in the RSA and mitigation measures should protect them.	The mammal species or the habitat affected may be used or may be important to the community.	

Table 8-43: Scope of the Monitoring and Follow-Up Program for Mammals

RESIDUAL EFFECT	LOCATION(S) TO BE MONITORED	PARAMETERS TO BE MONITORED	METHODS	DURATION AND FREQUENCY
Wildlife/human interactions that include wildlife use of water quality ponds, treatment wetlands and the pit; mortality due to vehicular collisions and use of the ecopassages	Selected water quality ponds, treatment wetlands The open pit during filling Goudreau Road, other access roads and internal haul roads Ecopassages	<ul style="list-style-type: none"> <li>Species using the location</li> <li>Time of use or collision,</li> <li>Proximity to water features and make-up of the adjacent vegetation community.</li> </ul>	<ul style="list-style-type: none"> <li>Surveys</li> <li>Incidental observations</li> </ul>	Ongoing incidental observations

### 8.5.18 Species at Risk

Species at Risk (SAR) are those species that are extirpated, endangered, threatened or considered a species of special concern (SSC). The purpose of the federal and provincial legislation with respect to SAR is to help prevent wildlife species from becoming extinct. SSC are afforded habitat protection through the Provincial Policy Statement in the context of Significant Wildlife Habitat.

Threatened and Endangered Species are considered Valued Components for the roles they play in the conservation of biodiversity. The programs that conserve their habitats also, help to maintain healthy, functioning ecosystems. Threatened and Endangered Species are afforded protection by the Province of Ontario under the Endangered Species Act (2007) and by the federal government under the Species at Risk Act (2002)

#### 8.5.18.1 Effects Assessment

Three species at risk were identified during the baseline studies.

##### 8.5.18.1.1 Effect on Whip-poor-will (*Caprimulgus vociferous*)

Although five singing males were detected in 2013, no Whip-poor-will were observed in subsequent survey years. Therefore, it is currently understood that this species does not use the site but could utilize other suitable habitat known to be present in the LSA and RSA, and likely beyond. No effects on Whip-poor-will are anticipated.

##### 8.5.18.1.2 Effect on Chimney Swift (*Chaetura pelagic*)

Effects are unlikely as there was only one occurrence of this species observed flying over the PSA. Breeding potential was not identified on the Project site. If present on-site, it is anticipated that this species would relocate to other suitable habitat outside the PSA.

##### 8.5.18.1.3 Effect on Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*)

These species are discussed together because they hibernate, swarm, and roost communally. The presence of the historic mine adit in its care and maintenance state provides an on-going source of the fungus that causes white-nose syndrome. This disease carries with it a high mortality rate for bats. Baseline studies have confirmed that these bats were using the historical mine adit as a winter hibernaculum and summer roost. Because the adit exists above the ore body to be mined, it will be removed early in the mine development. Baseline studies have also confirmed that the surrounding forest, lakes, and wetlands provide maternity roosting, roosting, and foraging opportunities for these species. Nevertheless, the Project will remove 1,070 ha of natural area that provides these life-cycle opportunities for bats.

During the Operations Phase, bats will likely be attracted to the PSA in search of insects attracted to the lighting fixture. However, given that the mine would be operating during the night time, noise and the physical activities at the mine site is more likely to create an aversion response (Schaub *et al.*, 2008). Final rehabilitation of the site provides opportunities for creation of hibernacula for bats. The open pit walls may provide niche habitat for some bat species until the pit is filled.

### **8.5.18.2 Mitigation Measures**

Taking into consideration the design of the Project and the results of the effects analysis, mitigation will consist of the provision of alternate artificial hibernacula and roost sites for bats prior to removal of the existing hibernacula (the adit) to allow acclimation to new site conditions.

### **8.5.18.3 Residual Effects**

The removal of bat hibernaculum from the RSA is the only residual effect anticipated and it is an unavoidable consequence of the Project and is **not significant**, as indicated in Table 8-45. With the exception of the Ecological Context, the ratings of effects levels for all criteria are Low or Medium. Alternate hibernation/roost sites are available in the vicinity. More importantly, the hibernaculum is infected with white-nose syndrome, and as a consequence, if left unaltered, is more likely to be a sink for this population than a source. Furthermore, Northern Long-eared Bats are not site tenacious and so it is likely bats that had not previously roosted at this adit may attempt roosting there subsequent winters, with lethal results.

**Table 8-44: Project Interactions with Species at Risk**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				The objectives of mitigations are to avoid, reduce, minimize potential effects of Project footprint and activities on species at risk within the PDA. These include: <ul style="list-style-type: none"> <li>Minimizing footprint, area of activities and travel distances</li> <li>Comprehensive Environmental Management System (EMS – refer to TSD 20)</li> <li>Construction Environmental Protection Plan (CEPP), and,</li> <li>Emergency Response and Spill Contingency Plan (ERSCP).</li> <li>Compliance with applicable regulations.</li> </ul>	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	Site clearing, grubbing and pre-stripping Dust fall associated with construction activities.	No effects	None	No adverse residual effects
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Topsoil and overburden stripping and stockpiling</li> <li>Stream diversions and draining and backfilling of on-site waterbodies</li> <li>Gradual expansion of the mine pit.</li> <li>Construction of Project infrastructure, plant area components, TMF and MRMF.</li> <li>Construction of environmental management infrastructure and monitoring systems</li> <li>Dust fall associated with construction activities.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	Removal of existing bat colony in abandoned mine audit		Removal of bat hibernaculum from the RSA.
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Gradual expansion of the mine pit.</li> <li>Potential spills associated with the transportation, usage and storage of fuel.</li> </ul>	No additional effect		No adverse residual effects
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and dismantling of Project facilities and infrastructure.</li> <li>Final site rehabilitation.</li> <li>Potential spills associated with the transportation, usage and storage of fuel</li> </ul>	No additional effects		No adverse residual effects
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	Pit lake filling	No additional effects		No adverse residual effects

**Table 8-45: Significance of Residual Effects on Threatened and Endangered SAR**

RESIDUAL ADVERSE EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	DEGREE OF IRREVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Removal of bat hibernaculum from the RSA	Medium	Medium	Low	Low	Medium	High	Medium	Not Significant
	Disturbance of habitat and removal of the hibernaculum will occur but SAR habitat functions are likely maintained elsewhere within the RSA.	Disturbance of habitat is likely to create a measurable effect beyond the LSA, but is likely confined to the RSA.	An artificial structure can be provided to replace the hibernation function.	Removal of the adit is effectively a one-time event.	Restoration of habitat is possible progressively or upon closure.	The anthropogenic habitat is all within the PSA and was not detected in the RSA.	The loss of SAR habitat may be important to the community.	

## **8.5.19 Population and Demographics**

Population and Demographics was identified as a Valued Component (VC), as each of the primary communities (Dubreuilville, Wawa and White River) noted during public consultation activities that they are experiencing declining populations. The communities want to maintain their size, if not grow, in order to enhance community well-being and better support community facilities, services, organizations, and to expand the tax base. There is also a desire to attract or retain younger individuals/families. It is anticipated that a portion of the Project workforce will reside in the primary communities.

### **8.5.19.1 Effects Assessment**

The Project will result in approximately 500-600 direct on-site jobs during the site preparation and construction phase. During the operations phase, the Project will result in up to 375 direct on-site jobs. Many of the workers in this phase will be long-term (i.e., for most or all of the 10-15-year operations phase). The 3-year closure phase will require a workforce of approximately 50 persons; some of these may have been employed during operations.

The temporary on-site construction accommodations complex will provide housing for up to 400 workers during the construction phase. The permanent accommodations complex in Dubreuilville will provide housing for up to 150 workers during the operations phase. However, some of the Project workforce will include individuals currently residing in the communities. By having a mixed workforce that is both resident in the local communities and housed at the Project's accommodation complexes, the economic benefits of the Project are distributed.

The extent to which the population may increase in Dubreuilville, Wawa or White River is expected to be moderate during the operations phase. The increase in population in the primary communities as a result of local employment or in-migration is a positive effect of the Project, particularly in the context of currently declining populations (as described in Section 4.4.4.2 of Chapter 4). With the transition from 375 operations jobs to a much-reduced closure phase workforce, the population in the primary communities may decline unless workers find other employment in the area, or choose to keep their home base while employed elsewhere.

A moderate increase in the population of these communities resulting from the return of former residents, or in-migration of new workers and their families would serve to offset the general aging trend and increase the number and proportion of children/youth and working age populations.

Dubreuilville is a Francophone community; this is unlikely to change significantly with a moderate increase in population as a result of the Project.

### **8.5.19.2 Mitigation Measures**

Taking into consideration the design of the Project and the results of the effects analysis, mitigation measures include the development of Human Resource and travel policies and incentives such as housing subsidies to encourage workers and families to live in nearby communities (Dubreuilville, but also Wawa and White River).

### 8.5.19.3 Residual Effects

Taking into consideration the design of the Project and mitigation measures identified above, there are no residual adverse effects on Population and Demographics; as such, their significance has not been determined nor presented in an effects assessment table.

Considering the recommended measures (above), the following residual positive effects on Population and Demographics are anticipated:

- Increase in the populations of Dubreuilville, Wawa and White River as a result of the Project during the operations phase in particular; and
- Offsetting of the general aging trend in the primary communities, and an increase in the number and proportion of children/youth and working-age populations.

### 8.5.20 Community Vitality

Community Vitality was identified as a VC to reflect the priorities and aspirations of the three primary communities (Dubreuilville, Wawa and White River) that may be affected by the Project, as identified during public consultation activities. These communities would like the Project to improve community well-being, and want assurance that any potential adverse effects on the indicators of community vitality will be mitigated or otherwise managed.

#### 8.5.20.1 Effects Assessment

##### 8.5.20.1.1 Effect on Recreation and Leisure

Access to cabins in the Former Township of Goudreau will be re-routed with the relocation of the on-site portion of Goudreau Road via the new Public Bypass road. Access using Goudreau Road to Island Gold mine/Goudreau Lake and beyond will be unaffected by the Project.

Depending on their location in the LSA, recreational users may experience adverse effects, However, recreational users are mobile and can readily travel to other sites in the Project vicinity or elsewhere for activities.

Potential effects to recreational land use include:

- Reduced access to on-site roads/trails, and public recreation and access points on Lovell and Goudreau Lakes.:
- Reduced access to recreational fisheries due to a removal of fish habitat and noise, light or vibration depending on proximity to the project;
- Reduced moose hunting opportunities due to moose migration; and
- The Human Health Risk Assessment has concluded that there is no significant risk to human health as a result of the Project, including consumption of fish, wildlife or plant materials (e.g., berries) that may be harvested in the LSA or RSA.
- No effects on navigation of lakes and streams are anticipated, as no barriers to boating are being created.

#### 8.5.20.1.2 Effect on Community Character

There will be social and economic changes such as moderate increase in population, employment, higher income levels, enhanced participation in community events/programs, increased school enrolments.

The presence of the in-town accommodations complex that will house employees during the operations phase will change the physical character of Dubreuilville. The physical character of Dubreuilville will likely be affected to some extent by traffic to and from the Project site itself, related to transportation of workers. Dubreuilville will experience a low level of sky glow effect and the Project will be visible as a subtle change on the horizon from the vantage point at the centre of Dubreuilville.

#### 8.5.20.1.3 Effect on Community Facilities and Services

Particularly in Dubreuilville, the Project will result in increased use of community recreation facilities and services (e.g., schools and daycare) by in-migrant families, and workers housed at the on-site and in-town accommodation complexes.

The extent to which the workers and/or their families would participate in community organizations and events is not known. It is also possible that existing residents who become employees at the Project may reduce their level of involvement in the community (e.g., due to shift rotations).

#### 8.5.20.1.4 Effect on Health and Social Services

The increase in population in the primary communities associated with the Project will result in a corresponding rise in demand for local health and social services associated with in-migration of workers to Dubreuilville, White River or Wawa. However, there is capacity to accommodate or absorb this increase.

#### 8.5.20.1.5 Effect on Adult Education and Training

There is a shortage of skilled mine labourers in the region; as a result, there will be increased demand for local/regional training programs to take advantage of Project employment opportunities. A number of post-secondary institutions are available in the region for residents interested in obtaining a degree/diploma or other training; some offer training focused on the skills needed for the mining sector.

#### 8.5.20.1.6 Effect on Crime and Public Safety

Increased levels of disposable income may lead to increased consumption of alcohol and drugs, which in turn may lead to increased levels of crime. The Project is unlikely to cause adverse effects on crime or safety in the primary communities that would require additional capacity by service providers.

### **8.5.20.2 Mitigation Measures**

The mitigation and enhancement, monitoring and follow-up measures proposed in the Atmospheric, Biological and Physical Environment VC assessments will contribute to managing potential off-site effects that in turn could influence the Community Vitality VC and indicators.

Taking into consideration the design of the Project and the results of the effects analysis, further mitigation measures have been identified to further avoid or reduce the severity of the adverse effects

on Infrastructure and Services due to increased population and demand. These are summarized in Table 8-46.

### **8.5.20.3 Residual Effects**

The anticipated adverse residual effects on community vitality are identified in Table 8-46. Many of these residual effects can be addressed through cooperative efforts with the communities. As indicated in Table 8-47, none of these residual effects are predicted to be significant.

The following residual positive effects on Community Vitality are anticipated:

- Enhancement of the social and economic aspects of community character in the primary communities;
- Increased use of community recreational facilities and programs in the primary communities;
- Stabilization or modest increased enrolments at schools in the primary communities;
- Increased volunteer base, and participation in community events, organizations and activities; and
- Enhanced well-being of individuals (and their families) employed/contracted at the Project.

**Table 8-46: Project Interactions with Community Vitality**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential adverse effects, or enhance positive effects of Project on community vitality. These include Life of Project mitigations such as:</p> <ul style="list-style-type: none"> <li>Continued liaison and dialogue with the primary communities and others throughout all Project phases, as part of a <i>Public and Stakeholder Engagement Plan</i></li> <li>Prodigy will cooperatively develop a process with the primary communities and others for confirming social and economic indicators, reporting and responding to monitoring results. Key indicators for the Project will be monitored by Prodigy.</li> </ul>	<p><b>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</b></p>
Site Preparation Phase	6 Months – 1 Year	<p>Indirectly:</p> <ul style="list-style-type: none"> <li>Access to Project site no longer available for recreational activities</li> <li>Site preparation activities creating off-site effects on atmospheric, physical and biological environments that are experienced by recreational users, influence community character.</li> </ul>	Small work force of approximately 50 individuals, mostly local contractors – limited potential effect		No adverse residual effects.
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Construction Phase Workforce Requirements and Personnel Management</li> </ul> <p>Indirectly:</p> <ul style="list-style-type: none"> <li>Construction activities creating off-site effects (e.g., noise, vibration, light, fugitive dust, visual, changes in the physical and biological environment, additional travel time to Goudreau settlement on Public Bypass) change recreational experience/community character in the Local Study Area (LSA).</li> </ul>	<p>Effects on recreation and leisure in LSA (Section 7.5.2.5.1).</p> <p>Effects on community character (Section 7.5.2.5.2).</p>	<p><b>Recreation and Leisure:</b></p> <ul style="list-style-type: none"> <li>The <i>Public and Stakeholder Engagement Plan</i></li> <li>Prodigy will continue to engage with recreational users and organizations to communicate the potential Project effects on users in the LSA, and identify potential impact management measures as appropriate</li> <li>Develop and implement a policy restricting Project employees and contractors from hunting, fishing or berry picking in the PSA/LSA while on the job at any time throughout the life of the Project;</li> </ul>	<p><b>Adverse Residual Effects</b></p> <ul style="list-style-type: none"> <li>Increased noise, vibration, light effects at nearby cabins, and increased travel time to some cabins at the Goudreau settlement for those who will have to use the new Public Bypass road.</li> <li>Less attractive experience for recreational users engaged in activities such as fishing, boating, hunting, snowmobiling, ATVing, hiking, cross-country skiing, snowshoeing, camping and berry picking</li> <li>Increased demand for local health and social services associated with a moderate increase in population in the primary communities and accommodations complexes.</li> <li>Increased demand for local/regional training programs to take advantage of Project employment opportunities.</li> </ul>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Operations Phase Workforce Requirements (including in-town accommodations complex during operations phase) and Personnel Management</li> <li>Operations Phase Payroll and Procurement</li> </ul> <p>Indirectly:</p> <ul style="list-style-type: none"> <li>Operational activities creating off-site effects (e.g., noise, vibration, light, fugitive dust, visual, changes in the physical and biological environment, additional travel time to Goudreau settlement on Public Bypass) change the recreational experience/community character in the LSA.</li> </ul>	<p>Effects on community facilities and services (Section 7.5.2.5.3)</p> <p>Effects on health and social services (Section 7.5.2.5.4).</p> <p>Effects on adult education and training (Section 7.5.2.5.5)</p> <p>Effects on crime and public safety (Section 7.5.2.5.6).</p> <p>Effects on individuals and community well-being (Section 7.5.2.5.7).</p>	<p><b>Health and Social Services</b></p> <ul style="list-style-type: none"> <li>Undertake liaison activities with local and regional service providers (e.g., health care, education and training, safety and emergency services) and economic development officials;</li> </ul> <p><b>Community Character</b></p> <ul style="list-style-type: none"> <li>Provide for daily transportation of community-based personnel from Dubreuilville;</li> <li>Establish an on-site temporary accommodation complex for workers during construction, and a permanent accommodation complex at Dubreuilville for the operations phase of the Project;</li> <li>Establish and enforce a code of conduct for workers housed in the Project's accommodation complexes, local motels, and other accommodations in the primary communities.</li> <li>Continue corporate sponsorship program in Dubreuilville, as well as Wawa and White River, to support community events, activities, facilities and purchases that contribute to community well-being;</li> <li>Encourage workers to participate in the community</li> </ul> <p><b>Education and Training:</b></p> <ul style="list-style-type: none"> <li>Provide a trained on-site Emergency Response Team that includes the necessary vehicles and equipment.</li> </ul>	<p><b>Positive residual effects:</b></p> <ul style="list-style-type: none"> <li>Enhancement of the social and economic aspects of community character in the primary communities;</li> <li>Increased use of community recreational facilities and programs in the primary communities;</li> <li>Stabilization or modest increased enrolments at schools in the primary</li> </ul>

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p><b>Community Facilities and Services:</b></p> <ul style="list-style-type: none"> <li>Utilize community recreational facilities in Dubreuilville to augment programs and services at on-site/in-town accommodations complexes, and for company events.</li> </ul>	<p>communities;</p> <ul style="list-style-type: none"> <li>Increased volunteer base, and participation in community events, organizations and activities; and</li> <li>Enhanced well-being of individuals (and their families) employed / contracted at the Project.</li> </ul>
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and Rehabilitation Phase Workforce Requirements and Personnel Management</li> <li>Closure and Rehabilitation Phase Payroll and Procurement</li> </ul> <p>Indirectly:</p> <ul style="list-style-type: none"> <li>Closure and Rehabilitation activities creating or reducing off-site effects (e.g., noise, vibration, light, fugitive dust, and changes in the physical and biological environment,)</li> <li>The additional travel time to Goudreau settlement on the transferred Public Bypass will continue post-closure.</li> <li>Following completion of mine closure, the Project's visibility will return to near baseline conditions</li> </ul>	<p>Loss of employment opportunities associated with the closure of the Project.</p> <p>Potential decline in local population.</p>		<p>Adverse effects associated with reduced employment levels due to closure of the facility.</p>
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>Ongoing use of transferred Public Bypass road.</li> </ul>	Loss of employment opportunities		No adverse residual effects.

**Table 8-47: Significance of Residual Effects on Community Vitality**

<b>RESIDUAL EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>REVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increased noise, vibration, light effects at nearby cabins, and increased travel time to some cabins at the Goudreau settlement for those who will have to use the new Public Bypass road	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>N/A</b>	<b>Medium</b>	<b>Not Significant</b>
	Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.	A measurable or noticeable effect is likely to extend into the LSA or the primary communities	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project		The effect is expected to diminish somewhat the overall community well-being in the LSA/primary communities.	
Less attractive experience for recreational users engaged in activities such as fishing, boating, hunting, snowmobiling, ATVing, hiking, cross-country skiing, snowshoeing, camping and berry picking	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Low</b>	<b>N/A</b>	<b>Low</b>	<b>Not Significant</b>
	Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.	A measurable or noticeable effect is likely to extend into the LSA or the primary communities	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project		The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	
Increased demand for local health and social services associated with a moderate increase in population in the primary communities and accommodations complexes	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>N/A</b>	<b>Low</b>	<b>Not Significant</b>
	Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.	A measurable or noticeable effect is likely to extend into the LSA or the primary communities	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular, although infrequent intervals (i.e., several times per month)	Effect is reversible with time following closure of Project		The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	
Increased demand for local/regional training programs to take advantage of Project employment opportunities	<b>Medium</b>	<b>Medium</b>	<b>Medium</b>	<b>High</b>	<b>Medium</b>	<b>N/A</b>	<b>Medium</b>	<b>Not Significant</b>
	Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.	A measurable or noticeable effect is likely to extend into the LSA or the primary communities	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is reversible with time following closure of Project		The effect is expected to diminish/enhance somewhat the overall community well-being in the LSA/primary communities.	

## **8.5.21 Infrastructure and Services**

Infrastructure and Services was identified as a Valued Component, as the Project itself has the potential to have effects on emergency services, utilities, transportation, communications and energy supply. In addition, it is anticipated that a portion of the Project workforce will reside in the primary communities, with the potential to have effects on infrastructure and services, including housing.

### **8.5.21.1 Effects Assessment**

#### **8.5.21.1.1 Effect on Housing**

The primary communities do not have sufficient housing capacity to accommodate the Project's full work force during the construction or operations phases. The Project will have a temporary on-site accommodation complex during the construction phase, and a permanent accommodation complex in Dubreuilville that will be used to house workers during the operations phase.

#### **8.5.21.1.2 Effect on Emergency Services**

During the construction and operations phases the Project will result in a slightly increased demand for emergency services in Dubreuilville and an incremental one in Wawa and White River. The Project will have its own trained on-site Emergency Response Team.

#### **8.5.21.1.3 Effect on Utilities**

There will be increased demand on utilities (landfill, water supply, wastewater management) in Dubreuilville resulting from the modest increase in population from returning or new residents. The accommodations complex that will house workers during the operations phase will utilize municipal utilities (landfill, water supply, waste water management).

Any future growth in Wawa and White River can be accommodated by the community's existing infrastructure. The Project itself will be self-sufficient in terms of landfill, water supply and wastewater management, and not dependent on municipal services. An on-site landfill for non-mining solid waste is proposed for the disposal of inert or municipal-type non-hazardous solid waste such as food waste, cardboard, plastics, metal tins, glass, scrap metal, wood, and paper.

#### **8.5.21.1.4 Effect on Road Transportation**

The Project will result in increased levels of traffic on Highway 519, but the increase will be relatively greater on the Goudreau Road. Most vehicles will bypass Dubreuilville, exiting to the Goudreau Road from Highway 519. During shift change, there will be some increase in vehicular traffic in Dubreuilville as resident workers travel to and from the Project. The permanent in-town accommodation complex may result in additional traffic in the community of Dubreuilville.

#### **8.5.21.1.5 Effect on Communications**

The Project itself will be self-sufficient / independent with respect to telephone, cellular and Internet communications; no effects on capacity in Dubreuilville are anticipated, other than those that may result from a modest increase in population. The increase in population in the primary communities (including the in-town accommodations complex in Dubreuilville) may result in providers enhancing services should the market demand exist.

#### 8.5.21.1.6 Effect on Energy Supply

There is sufficient capacity available to provide electrical power to the Project and to meet any additional needs associated with increased population. A temporary disruption of power supply may occur during the re-routing of the power line, with effects experienced at Goudreau settlement and possibly in Dubreuilville.

#### **8.5.21.2 Mitigation Measures**

Taking into consideration the design of the Project and the results of the effects analysis, further mitigation measures have been identified to further avoid or reduce the severity of the adverse effects on Infrastructure and Services due to increased population and demand. These are summarized in Table 8-48.

#### **8.5.21.3 Residual Effects**

Taking into consideration the mitigation measures proposed by Prodigy, the residual effects on infrastructure and services are identified in Table 8-48. As indicated in Table 8-49, none of these residual effects are predicted to be significant.

**Table 8-48: Project Interactions with Infrastructure and Services**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential adverse effects, or enhance positive effects of Project on community infrastructure and services. These include Life of Project mitigations such as:</p> <ul style="list-style-type: none"> <li>Continued liaison and dialogue with the primary communities and others throughout all Project phases, as part of a <i>Public and Stakeholder Engagement Plan</i></li> <li>Prodigy will cooperatively develop a process with the primary communities and others for confirming social and economic indicators, reporting and responding to monitoring results. Key indicators for the Project will be monitored by Prodigy.</li> </ul>	<p><b>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</b></p>
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>No plausible interactions</li> </ul>	Small work force of approximately 50 individuals, mostly local contractors – limited potential effect	No mitigations required	No adverse residual effects.
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Construction Phase Workforce Requirements and Personnel Management</li> <li>Construction Materials and Personnel Transportation</li> </ul> <p>Indirectly:</p> <ul style="list-style-type: none"> <li>On-site activities resulting in a modest potential increase in demand on emergency services</li> </ul>	<p>Effects on housing (Section 7.5.3.5.1).</p> <p>Effects on emergency services (Section 7.5.3.5.2).</p> <p>Effects on utilities (Section 7.5.3.5.3).</p> <p>Effects on road transportation (Section 7.5.3.5.4).</p> <p>Effects on communications (Section 7.5.3.5.5).</p> <p>Effects on energy supply (Section 7.5.3.5.6).</p>	<p><b>Effects on housing:</b></p> <ul style="list-style-type: none"> <li>An on-site worker accommodation complex will be constructed for use during the construction phase, and a permanent accommodations complex built in Dubreuilville for the operations phase.</li> </ul> <p><b>Emergency Services</b></p> <ul style="list-style-type: none"> <li>The Project will have a trained on-site Emergency Response Team including vehicles and equipment;</li> <li>An Emergency Response and Spill Contingency Plan will be established for the Project;</li> <li>Liaison and consultation with local and regional emergency service providers.</li> <li>The Prodigy Emergency Response Team will be made available for mutual aid.</li> </ul> <p><b>Road and Traffic Improvements</b></p> <ul style="list-style-type: none"> <li>Provide transportation for workers to the Project site.</li> <li>Public access to the site will be restricted by installation of a security gate.</li> </ul>	<ul style="list-style-type: none"> <li>Increased demand for housing (owned/rented) in the primary communities, with corresponding increase in prices</li> <li>Increased demand for emergency services in Dubreuilville, and to a lesser extent in Wawa and White River</li> <li>Increased demand on utilities (landfill, water supply, waste water management) related to moderate population increases in the primary communities and accommodations complex in Dubreuilville</li> <li>Increased travel time for those travelling to the Goudreau settlement via new Public Bypass Road</li> <li>Increased traffic levels on Highway 519 and Goudreau Road</li> <li>Increased vehicular traffic in the community of Dubreuilville</li> <li>Increased demand for telephone, cellular and Internet communications capacity by workers residing in the primary communities and accommodations complex in Dubreuilville.</li> <li>Possible disruption of power supply during re-routing of the power line</li> </ul>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Operations Phase Workforce Requirements and Personnel Management</li> <li>Operations Materials and Personnel Transportation</li> </ul> <p>Indirectly:</p> <ul style="list-style-type: none"> <li>On-site activities resulting in a modest potential increase in demand on emergency services</li> </ul>			

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>• Closure and Rehabilitation Phase Workforce Requirements and Personnel Management</li> <li>• Closure and Rehabilitation Phase Materials and Personnel Transportation</li> </ul> Indirectly: <ul style="list-style-type: none"> <li>• On-site activities resulting in a modest potential increase in demand on emergency services</li> </ul>	No effects		No adverse residual effects.
Post closure Phase	4 to 50 years (approx.) until closure objectives are met	<ul style="list-style-type: none"> <li>• No plausible interaction</li> </ul>	No effects		No adverse residual effects.

**Table 8-49: Significance of Residual Effects on Infrastructure and Services**

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>REVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increased demand for housing (owned/rented) in the primary communities, with corresponding increase in prices	<b>Medium</b> <i>Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>Medium</b> <i>Effect is reversible with time</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased demand for emergency services in Dubreuilville, and to a lesser extent in Wawa and White River	<b>Low</b> <i>Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>Low</b> <i>Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased demand on utilities (landfill, water supply, waste water management) related to moderate population increases in the primary communities and accommodations complex in Dubreuilville	<b>Medium</b> <i>Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased travel time for those travelling to the Goudreau settlement via new Public Bypass Road	<b>Low</b> <i>Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>High</b> <i>Conditions causing the effect extend for the long-term, into the Post-Closure.</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>High</b> <i>Effect is not reversible (i.e., permanent)</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased traffic levels on Highway 519 and Goudreau Road	<b>Medium</b> <i>Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased vehicular traffic in the community of Dubreuilville	<b>Medium</b> <i>Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions.</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Increased demand for telephone, cellular and Internet communications capacity by workers residing in the primary communities and accommodations complex in Dubreuilville	<b>Medium</b> <i>Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Medium</b> <i>Conditions causing the effect are evident during the operations phase, and possibly other phases</i>	<b>High</b> <i>Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>
Possible disruption of power supply during re-routing of the power line	<b>Low</b> <i>Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions</i>	<b>Medium</b> <i>A measurable or noticeable effect is likely to extend into the LSA or the primary communities</i>	<b>Low</b> <i>Conditions causing the effect are evident in the short term (i.e., only during the site preparation, construction or closure and rehabilitation phases)</i>	<b>Low</b> <i>Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.</i>	<b>Low</b> <i>Effect is readily (i.e., immediately) reversible</i>	<b>N/A</b>	<b>Low</b> <i>The effect is not expected to measurably affect overall community well-being in the primary communities.</i>	<b>Not Significant</b>

## **8.5.22 Land Use and Tourism**

Land Use and Tourism was identified as a VC to reflect the social and economic importance that a number of land use activities have in the Local Study Area (LSA) – these include forestry, mining, commercial tourism and recreation, trapping, and use of parks and protected areas.

### **8.5.22.1 Effects Assessment**

#### **8.5.22.1.1 Effect on Land Ownership/ Tenure**

The Project does not require the taking of private lands in Finan Township. The in-town accommodation complex that will house employees during the operations phase will require acquisition or use of lands within the municipal boundary. Much of the lands potentially available within the Township of Dubreuilville for the accommodation complex are owned by Dubreuil Lumber, or are Crown lands.

#### **8.5.22.1.2 Effect on Mining**

In the LSA, there is one operating gold mine (Richmont's Island Gold Mine). Both the Island Gold mine and the Magino Gold Project will use Goudreau Road for access. Much of the land in the LSA has been staked for mineral claims or pending dispositions. Given its industrial nature, the Island Gold mine will not be adversely affected by the noise, vibration, light, or visibility of the Project.

#### **8.5.22.1.3 Effect on Forestry**

Currently, the PSA is licenced for small public and commercial fuel wood operations. This resource will be lost with the development of the Project, beginning with the site preparation activities. No off-site effects on forest resources in the LSA (either the Magpie or Algoma Forests) are anticipated.

#### **8.5.22.1.4 Effect on Commercial Tourism and Recreation**

There is an outfitting camp in the settlement of Goudreau to the southwest of the Project. The Goudreau camp will experience a low but noticeable change in noise levels, vibration effects, and a low level of light trespass and sky glow. The Project will be visible from Goudreau and from Herman Lake. Travel time to the camp on the Goudreau Road will increase by approximately 6 minutes along the proposed public bypass road.

Generally, adverse effects related to visibility, noise, vibration and light from the Project at the camp and in the surrounding area may result in a less attractive experience for these users who typically seek out a wilderness experience.

Access to on-site roads/trails used by snowmobiles and ATVs will be lost when site preparation is initiated through to the post-closure phase. However, there is a network of trails in the LSA that will not be affected by the Project, which can continue to be used. As such, the Project does not create any substantial barrier or impediment to people's travel on the land.

The visual analysis indicates that later in the operations phase, the Project (the MRMF) may be partially visible on the horizon from the vantage point at the south end of Wabatongushi Lake. With closure of the Project, revegetation would further diminish any visual effect.

#### 8.5.22.1.5 Effect on Commercial Trapping

There are two trappers with trapline areas that include portions of the PSA. The portion of each trapline area lost due to the Project is estimated at 5 to 10%. Some level of disturbance to furbearing species can be expected in the western portion of the PSA where mining activities are not being undertaken.

There is a trapper's cabin located to the northwest of the site, just south of Goudreau Road near Dreany Lake. The cabin will experience a low but noticeable change in noise levels, vibration effects, a low level of light trespass and medium sky glow. The mine may be partially visible from the cabin vicinity, but the visual analysis did not take into account screening by vegetation (i.e. trees).

#### 8.5.22.1.6 Effect on Other Land Uses

Local outfitters have Bear Management Areas that include portions of the PSA as well as off-site areas in the LSA. Until wildlife is habituated to noise, the uncleared area in the Project vicinity may be less desirable to wildlife.

A single commercial operator has several baitfish licences that cover much of the PSA and the LSA; a second operator has a licence that includes the east end of Goudreau Lake. There are a few small lakes and wetlands that will be drained or overprinted by the Project that are considered potential baitfish sources. In addition, much of the PSA will no longer be accessible for baitfish purposes.

#### **8.5.22.2 Mitigation Measures**

The mitigation and enhancement, monitoring and follow-up measures proposed in the Atmospheric, Biological and Physical environment VC assessments will contribute to the management of potential off-site effects, which will in turn influence the Land Use and Tourism VC and indicators.

Taking into consideration the design of the Project and the results of the effects analysis, further mitigation measures have been identified to further avoid or reduce the severity of the adverse effects on Land Use and Tourism. These are summarized in Table 8-50 and below:

- Inform holders of commercial fuel wood licences of the Project schedule, to allow for the recovery of wood in advance of site preparation activities;
- Conduct ongoing engagement with the commercial outfitters, trappers, and individuals with bear management areas and baitfish licences that will have portions of their resources displaced, or otherwise affected by the Project.;
- Monitor progress on the Northeast Superior Enhanced Sustainable Forest Licence development process in terms of any implications for the Project;
- Conduct regular consultation with the Ministry of Natural Resources and Forestry.

#### **8.5.22.3 Residual Effects**

Taking into consideration the mitigation measures proposed by Prodigy, the residual effects on infrastructure and services are identified in Table 8-50. As indicated in Table 8-51, none of these residual effects are predicted to be significant.

**Table 8-50: Project Interactions with Land Use and Tourism**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
				<p>The objectives of mitigations are to avoid, reduce, minimize potential adverse effects, or enhance positive effects of Project on land use and tourism.</p> <p>The mitigation and enhancement, monitoring and follow-up measures proposed in the Atmospheric, Biological and Physical environment VC assessments will contribute to the management of potential off-site effects, which will in turn influence the Land Use and Tourism VC and indicators.</p>	<p><i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i></p>
Site Preparation Phase	6 Months – 1 Year	<p>Indirectly:</p> <ul style="list-style-type: none"> <li>Project activities that change access to the PSA for the purposes of trapping, baitfish, bear management, fuel wood activities.</li> <li>Site preparation activities that generate off-site effects on atmospheric, physical or biological environments that are experienced by commercial tourism and recreational users, or trappers</li> </ul>	No effect on land use and tourism		No adverse residual effects.
Construction Phase	1 – 2 Years	<p>Indirectly:</p> <ul style="list-style-type: none"> <li>Construction activities that generate off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment).</li> <li>Additional travel time to Goudreau settlement on proposed public bypass road.</li> </ul>	<p>Effects on land ownership/tenure (Section 7.6.1.5.1).</p> <p>Effects on mining (Section 7.6.1.5.2).</p> <p>Effects on forestry (Section 7.6.1.5.3).</p>	<p><b>Commercial Tourism and Recreation:</b></p> <ul style="list-style-type: none"> <li>Conduct ongoing engagement with the commercial outfitters, trappers, and individuals with bear management areas and baitfish licences that will have portions of their resources displaced, or otherwise affected by the Project.</li> <li><b>Mining:</b></li> <li>Conduct regular consultation with provincial ministries;</li> </ul>	<ul style="list-style-type: none"> <li>Increased traffic on Goudreau Road will be experienced by Richmond Mines and other users</li> <li>Loss of resource for public and commercial fuel wood operation in the PSA.</li> <li>Less attractive experience for users of the outfitting camp in Goudreau settlement as a result of noise, vibration, light, visual effects, and increased travel time.</li> <li>Loss of on-site trails and a small portion of trail along the Goudreau Road's western arm as a result of the proposed public bypass road.</li> <li>Loss of public access points at Lovell Lake and Goudreau Lake.</li> <li>Loss of portions of two trapline areas in the PSA and potential disturbance of furbearers elsewhere in the LSA by the Project.</li> <li>Loss of portions of bear management areas in the PSA and potential disturbance of bears in the LSA by the Project.</li> <li>Loss of access to baitfish resources in the PSA.</li> </ul>
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<p>Indirectly:</p> <ul style="list-style-type: none"> <li>Operations phase activities that generate off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment).</li> <li>Additional travel time to Goudreau settlement on proposed public bypass road)</li> </ul>	<p>Effects on commercial tourism and recreation (Section 7.6.1.5.4).</p> <p>Effects on commercial trapping (Section 7.6.1.5.5).</p> <p>Effects on parks and protected areas (Section 7.6.1.5.6).</p>		

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Closure and Rehabilitation Phase	2 – 3 Years	Indirectly: <ul style="list-style-type: none"> <li>• Closure and rehabilitation phase activities that generate off-site effects (e.g., noise, vibration, light, particulates, changes in the physical and biological environment).</li> <li>• Additional travel time to Goudreau settlement on the proposed public bypass road.</li> </ul>	No effects on land use and tourism		No adverse residual effects.
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>• Additional travel time to Goudreau settlement on the proposed public bypass road</li> <li>• Project's visibility</li> </ul>	No effects on land use and tourism		No adverse residual effects.

**Table 8-51: Significance of Adverse Potential Residual Effects on Land Use and Tourism**

<b>RESIDUAL ADVERSE EFFECT</b>	<b>MAGNITUDE</b>	<b>GEOGRAPHIC EXTENT</b>	<b>DURATION</b>	<b>FREQUENCY</b>	<b>REVERSIBILITY</b>	<b>ECOLOGICAL CONTEXT</b>	<b>SOCIAL CONTEXT</b>	<b>OVERALL ASSESSMENT OF SIGNIFICANCE</b>
Increased traffic on Goudreau Road will be experienced by Richmond Mines and other users	<b>Medium</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA or the primary communities	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of resource for public and commercial fuel wood operation in the PSA	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Low</b> A measurable or noticeable effect is likely limited to within the PSA	<b>Low</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.	<b>High</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Less attractive experience for users of the outfitting camp in Goudreau settlement as a result of noise, vibration, light, visual effects, and increased travel time	<b>Medium</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA or the primary communities	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of on-site trails and a small portion of trail along the Goudreau Road's western arm as a result of the proposed public bypass road	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA or the primary communities	<b>High</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>High</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of public access points at Lovell Lake and Goudreau Lake	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA or the primary communities	<b>High</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>High</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of portions of two trapline areas in the PSA and potential disturbance of furbearers elsewhere in the LSA by the Project	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Low</b> A measurable or noticeable effect is likely limited to within the PSA	<b>High</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Medium</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of portions of bear management areas in the PSA and potential disturbance of bears in the LSA by the Project	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Low</b> A measurable or noticeable effect is likely limited to within the PSA	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Medium</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>
Loss of access to baitfish resources in the PSA	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Low</b> A measurable or noticeable effect is likely limited to within the PSA	<b>High</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>High</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The effect is not expected to measurably affect overall community well-being in the LSA/primary communities.	<b>Not Significant</b>

### **8.5.23 Employment and Business Opportunities**

Employment and Business Opportunities was identified as a VC since the potential for direct jobs and contracting, and indirect benefits for local and regional businesses, was a priority identified during public consultation activities. The three primary communities and others in the RSA have resource-based economies focused primarily on forestry and mining, and are beginning to recover from recent economic downturns. Employment and business opportunities associated with the Project will result in retention of existing residents, attraction of new residents, and should facilitate the return of former residents to these communities.

#### **8.5.23.1 Effects Assessment**

##### **8.5.23.1.1 Effect on Employment and Wage Income**

The Project will result in direct, indirect, and induced jobs over the 20-year life of the Project (all phases) as follows:

- Approximately 500 to 600 direct on-site jobs annually during the construction phase and approximately 350 to 400 direct on-site jobs annually during the operations phase;
- Approximately 15,400 jobs across Canada, including an estimated 13,400 (direct, indirect and induced) in Ontario over the life of the Project; and
- Increased incomes in the local and regional areas.

The Project will result in growth to the local and provincial economies. The economic effects of the Project will accrue from the direct construction, operations, and closure expenditures as well as the indirect and induced spending that will occur as a result of the Project.

##### **8.5.23.1.2 Effect on Labour Supply**

The limited size of the mining labour supply that will be available regionally at the time of Project construction is difficult to predict; it will reflect the status of mining projects in the region and more broadly in Ontario/Canada, the success of current training initiatives, and the demands in competing sectors (e.g., forestry). Over the life of mine, the training and experience gained through employment at the Project will result in an incremental increase in the labour supply.

##### **8.5.23.1.3 Effect on Business Activity**

The Project is expected to positively affect the local, provincial, and national economies through expenditures on goods and services, which will help diversify the economic base. Businesses in neighbouring communities such as Dubreuilville, Wawa, and White River, as well as First Nations and Métis businesses will benefit given their proximity to the Project, although the extent of their success in capturing benefits will depend on their ability to supply the services needed by the project, as well as general economic conditions.

#### **8.5.23.2 Mitigation Measures**

Taking into consideration the design of the project and the results of the effects analysis, no specific mitigation measures are identified with respect to Employment and Business Opportunities, as there are no anticipated adverse effects.

### **8.5.23.3 Residual Effects**

No residual adverse effects on employment or business opportunities have been identified for any of the Project phases. As such, effects to Employment and Business Opportunities have not been presented in a table below nor has the significance of any effects to this VC been assessed.

### **8.5.24 Government Revenues**

Government Revenues was identified as a VC as there will be substantial measureable economic benefits of the Project for all three levels of government (Municipal, Provincial, and Federal).

#### **8.5.24.1 Effects Assessment**

##### **8.5.24.1.1 Effect on Municipal Revenues**

The Project itself is located within the Unorganized Finan Township on Crown Land; as such there are no property tax revenues accrued by a municipal government. However, the primary communities are expected to experience an increase in revenues related to property taxes; payment of water/sewer/waste management charges; and user fees for community/recreational facilities paid by employees residing in the communities. The in-town accommodation complex that will house workers during the operations phase will positively affect municipal revenues through payment of municipal taxes.

##### **8.5.24.1.2 Effect on Provincial Revenues**

The provincial government will receive approximately \$335.5 Million (USD) in total revenue over all phases of the Project. At the provincial level, personal income tax and corporate income tax are the main contributors at \$78.7 Million and \$73.2 Million (USD), respectively. The Workplace Safety contributions add \$49.6 Million to provincial revenue, and all indirect taxes amount to \$114.2 Million (USD).

##### **8.5.24.1.3 Effect on Federal Revenues**

Based on the estimated spending over the life of the mine (\$2.3 Billion), the federal government will collect revenues of approximately \$308.8 Million (USD) over all phases of the Project. This includes direct, indirect, and induced sources of revenue. About 51% (\$155.9 Million) of this comes from personal income tax, while corporate tax amounts to approximately 27% (\$82.7 Million). Employment Insurance contributions add another 9% (\$26.7 Million), while all indirect taxes amount to 13% (\$41.7 Million).

#### **8.5.24.2 Mitigation Measures**

Taking into consideration the design of the project and the results of the effects analysis, no additional mitigation or enhancement measures are identified with respect to effects on Government Revenues.

#### **8.5.24.3 Residual Effects**

There are no adverse residual effects on government revenue associated with the Project; as such, no effects have been summarized in a table below and the significance of any effects has not been assessed.

## **8.5.25 Aboriginal Employment and Business Opportunities**

Aboriginal Employment and Business Opportunities was identified as a Valued Component (VC) through ongoing engagement activities and discussions with Aboriginal group leadership and members. Aboriginal groups have stated their interest in participating in employment and business opportunities associated with the Project. There is also a desire that employment training opportunities be made available to Aboriginal people in advance of the construction and operation phases, and that these skills should be 'meaningful' and 'transferrable'. Prodigy is discussing and developing various types of bilateral agreements with First Nation and Métis groups.

### **8.5.25.1 Effects Assessment**

#### **8.5.25.1.1 Effect on Aboriginal Employment and Wage Income**

There is potential for the members of Aboriginal groups in the local/regional area to participate in employment during the mine life. The number of Aboriginal people employed by the Project cannot be predicted quantitatively or with certainty. However, Prodigy has been in discussions with Aboriginal groups to establish conditions that will maximize their participation in economic opportunities associated with the Project, including employment.

#### **8.5.25.1.2 Effect on Aboriginal Labour Supply**

There is potential for the Project to expand the Aboriginal labour supply within the local/regional area as people receive the necessary training to work on the Project. Aboriginal workers from farther afield may also return to the area to find employment, likewise increasing the current labour supply. Aboriginal groups may experience an increase in their overall skilled labour supply as a result of increased training, education and work experience gained.

There is potential for the Aboriginal unemployment rate to increase during the closure and post-closure phases of the Project if equivalent jobs are not available for those working at the Project. Aboriginal people working at the Project may also move elsewhere to find new employment in the post-closure phase.

#### **8.5.25.1.3 Effect on Aboriginal Education and Training**

Training for various types of mining jobs (including monitoring) will begin during the site preparation and construction phases and continue to closure. Prodigy is in discussions with Aboriginal groups about the specific training programs and supports required.

Overall, it is understood that there is a shortage of skilled Aboriginal mine labour force in the region; as a result, there will be increased demand for local/regional training programs to allow Aboriginal people to take advantage of Project employment opportunities.

#### **8.5.25.1.4 Effect on Aboriginal Business Activity**

The Project will create new opportunities for contractors and companies supplying goods and services, during the construction and operations phases in particular and Aboriginal groups/businesses/Joint Ventures/partnerships or other enterprises will have the opportunity to bid.

Currently, there are very few Aboriginal groups with business enterprises that have the capacity to carry out the spectrum of contracts across all Project phases. Prodigy continues to engage with Aboriginal groups to reach a mutual understanding of the opportunities that may be available.

#### **8.5.25.2 Mitigation Measures**

Taking into consideration the design of the Project and the results of the effects analysis, no specific mitigation measures are identified with respect to Aboriginal Employment and Business Opportunities, as there are no anticipated adverse effects.

#### **8.5.25.3 Residual Effects**

No residual adverse effects have been identified; as such, effects have not been presented in a table below and no assessment of significance has been conducted.

### **8.5.26 Traditional Use of Lands and Resources**

The Traditional Use of Lands VC includes activities such as hunting, fishing, trapping and gathering by Aboriginal peoples. Traditional Knowledge Studies/Traditional Land Use Studies (TKS/TLUS) and other reports provided an important source of information gained through Aboriginal engagement.

#### **8.5.26.1 Effects Assessment**

Depending on their location in the LSA, traditional uses may experience adverse effects similar to those described for PORs at various locations in the LSA. Potential effects will result in a less attractive experience in the LSA and RSA for traditional use activities such as fishing, hunting, and gathering. The effects of the Project are summarized in Table 8-52.

#### **8.5.26.2 Mitigation Measures**

Taking into consideration the design of the Project, the results of the effects analysis, and the mitigation measures that will be implemented for the Atmospheric Environment, Physical Environment, Biological Environment, Human Health Risk Assessment disciplines, the only specific mitigation measure identified with respect to Traditional Use of Lands and Resources is the formation of an Environmental Monitoring Committee. Aboriginal groups that have been involved in the Project's environmental assessment process will be invited to participate on this Committee, which will review mitigation and monitoring plans, and review monitoring results.

#### **8.5.26.3 Residual Effects**

Taking into consideration the design of the Project and the mitigation and enhancement measures recommended by other disciplines, the residual effects on Traditional Use of Lands and Resources anticipated are identified in Table 8-52. As indicated in Table 8-53, these anticipated residual effects on hunting, fishing, trapping, or gathering in the PSA, LSA or RSA are deemed "not significant".

it should be noted that the TKS/TLUS and other reports did not always distinguish between current and historical traditional uses. None of the TKS/TLUS and other reports indicated that the areas used in the PSA, LSA or RSA were of particularly high value, or were unique to the area used by an Aboriginal group for traditional activities. However, traditional users participating in hunting, fishing, and gathering can travel to other sites in the Project vicinity or elsewhere for activities.

The TKS/TLUS and other reports, and Prodigy's engagement activities with Aboriginal groups, have indicated that the potential effects of the Project on the relatively limited traditional activities identified need to be considered within the context of a larger geographic area that has many alternative (and in many cases preferred) locations for traditional uses.

Table 8-52: Project Interactions with Traditional Use of Lands and Resources

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>Access to Project site no longer available for use by Aboriginal people for possible current traditional uses.</li> <li>Site preparation activities creating off-site effects on atmospheric, physical and biological environments, additional traffic and site activity that are experienced for possible current traditional uses in the Local Study Area (LSA).</li> </ul>	<p>Users involved in traditional uses such as hunting, fishing and gathering may experience some noise, vibration, light (sky glow, light trespass), or visual effects. Generally, these will decrease with distance from the Project, but be influenced by topography.</p> <ul style="list-style-type: none"> <li><b>With respect to hunting:</b> <ul style="list-style-type: none"> <li>The Project will displace the potential for hunting in the PSA.</li> <li>Until wildlife (e.g., moose and bear) are habituated to noise, their behaviour and range patterns could be affected in the LSA.</li> <li>Diversion of moose away from the PSA may result in an increased density in the LSA, but no effects are anticipated on moose populations in the long-term. Animals will return to the site as it is re-vegetated in the post-closure phase.</li> <li>With respect to waterfowl, there is no significant habitat on-site. Waterfowl would avoid the area of disturbance and vicinity during the Site Preparation, Construction, Operations, and Closure Phases of the Project in response to increased noise, vibration, light, and dust. Post-closure the filled pit lake may be used by waterfowl.</li> </ul> </li> <li><b>With respect to fishing:</b> <ul style="list-style-type: none"> <li>The public recreation /access points at Goudreau Lake will be lost.</li> <li>The Project will have some adverse effects on fish/fish habitat or surface water quality or quantity at Otto, Herman, and Goudreau lakes.</li> <li>Fish habitat will be reduced on-site at the upper McVeigh Creek system, and at Webb and Lovell lakes (drained as part of the Project).</li> </ul> </li> <li><b>With respect to gathering:</b> <ul style="list-style-type: none"> <li>There will potentially be increased competition with bears for berries due to loss of habitat from the PSA. Those using the proposed public bypass road to access berry harvesting activities at Summit Lake would have approximately 6 minutes added to their travel time. There will be increased traffic on Goudreau Road as a result of the Project, potentially disrupting gathering activities identified on the shoulders of the road to the north of the PSA.</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>Displacement of potential hunting (wildlife, waterfowl) from the PSA.</li> <li>Reduced quality of hunting experience in the LSA until wildlife becomes habituated to noise.</li> <li>Loss of public access point at Goudreau Lake.</li> <li>Reduced quality of fishing experience at Otto, Herman, and Goudreau lakes.</li> <li>Reduced quality of berry harvest activity – Summit Lake area, and Goudreau Road north of the PSA.</li> </ul>
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Construction activities creating off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment, additional travel time to Goudreau settlement on proposed public bypass) resulting in change for possible current traditional uses in the LSA.</li> </ul>			
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Operational activities creating off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment, additional travel time to Goudreau settlement on proposed public bypass) resulting in change for possible current traditional uses in the LSA.</li> </ul>			
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and Rehabilitation activities creating or reducing off-site effects (e.g., noise, vibration, light, particulates, changes in the physical and biological environment).</li> <li>The additional travel time to Goudreau settlement on the proposed public bypass will continue post-closure.</li> <li>Following completion of mine closure, the Project's visibility will return to near baseline conditions.</li> </ul>			
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>Ongoing use of proposed public bypass road.</li> <li>Project visibility.</li> </ul>	No effects	No mitigation	Project site rehabilitated.

**Table 8-53: Significance of Residual Effects on Traditional Use of Lands and Resources**

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	REVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Displacement of potential hunting (wildlife, waterfowl) from the PSA	High	Low	Medium	High	Low	Low	Low	Not Significant
	Effect is substantial change from existing conditions	A measurable or noticeable effect is likely limited to within the PSA	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project	The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	The current traditional use of lands and resources at the location is valued but widely available elsewhere in the LSA/RSA	
Reduced quality of hunting experience in the LSA until wildlife becomes habituated to noise	Medium	Medium	Medium	High	Low	Low	Low	Not Significant
	A measurable or noticeable effect is likely to extend into the LSA	A measurable or noticeable effect is likely to extend into the LSA	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project	The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	The current traditional use of lands and resources at the location is valued but widely available elsewhere in the LSA/RSA	
Loss of public access point at Goudreau Lake	Low	Medium	High	High	High	Low	Low	Not Significant
	Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	A measurable or noticeable effect is likely to extend into the LSA	Conditions causing the effect extend for the long-term, into the post-closure phase	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is not reversible (i.e., permanent)	The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	The current traditional use of lands and resources at the location is valued but widely available elsewhere in the LSA/RSA	
Reduced quality of fishing experience at Otto, Herman, and Goudreau lakes	Medium	Medium	Medium	High	Low	Low	Low	Not Significant
	Project effects are likely to be noticeable and/or measurable, representing a moderate change relative to existing conditions	A measurable or noticeable effect is likely to extend into the LSA	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project	The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	The current traditional use of lands and resources at the location is valued but widely available elsewhere in the LSA/RSA	
Reduced quality of berry harvest activity – Summit Lake area, and Goudreau Road north of the PSA	Low	High	Medium	High	Low	Low	Low	Not Significant
	Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	A measurable or noticeable effect is likely to extend beyond the LSA	Conditions causing the effect are evident during the operations phase, and possibly other phases	Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	Effect is readily (i.e., immediately) reversible with closure of Project	The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	The current traditional use of lands and resources at the location is valued but widely available elsewhere in the LSA/RSA	

## **8.5.27 Aboriginal Cultural Activities and Special Places**

Cultural Activities and Special Places VC include Aboriginal Cultural Activities, Spiritual Sites, Trails and Camps, and Archaeological Sites. Traditional Knowledge Studies/Traditional Land Use Studies (TKS/TLUS) and other reports provided an important source of information gained through Aboriginal engagement.

### **8.5.27.1 Effects Assessment**

#### **8.5.27.1.1 Effect on Spiritual Sites**

Two Aboriginal groups (MCFN, MFN) identified Manitou Mountain (also known as Spirit Mountain), located approximately 15 km east of the Project and beyond the RSA, as an important spiritual area (see Chapter 4 Figure 4.5-6 for reference). Manitou Mountain is far removed beyond the noise, vibration or light effects associated with the Project. The MRMF will be nominally visible in winter (vegetation will totally obscure the view of the Project in other seasons) in the background from Manitou Mountain (southeast of the Conservation Reserve), due the Mountain's high elevation. With closure of the Project, revegetation would further diminish the visual effect.

The MFN Traditional Land Use and Occupancy Study (TLUOS) also notes that the cemetery near the former Goudreau settlement (south of the Project in the RSA, see Figure 7-9, POR 2 in Chapter 7). The cemetery location will experience a medium and clearly noticeable change in noise levels, vibration effects, a low level of light trespass and medium sky glow. The Project (e.g., the MRMF) will be visible from the area in the vicinity of the Goudreau cemetery. Travel time to the cemetery will increase by approximately 6 minutes along the proposed public bypass road.

#### **8.5.27.1.2 Effect on Trails and Camps**

The MFN TLUOS identified trails that go from Mountain Lake to Herman Lake (through the Magino Site), and from Goudreau Lake to Pine Lake (just south and east of the site in the LSA). The development of the Project would result in loss of a portion of this historically used trail.

The BFN TK report indicates a camp /cabin site between Goudreau Lake and Pine Lake at the border of the LSA/RSA (approximately 2 km east of the Magino property); however, the scale of the map makes it difficult to confirm the specific location, and it is not clear if this is an historical and/or current cabin/camp site. That general area is currently undergoing exploratory drilling by other companies.

The MNO's TK&LUS report identified a bush camp in the vicinity of Summit Lake west of the Goudreau settlement, that may experience effects related to noise, vibration, light, visual and increased travel time if accessed via Goudreau Road.

The MCFN's "Trappers, Tails and Trails Cultural Youth Camp" at Trout Lake (beyond the RSA) will not be affected by the Project, although the the visual analysis indicates that later in the operations phase, the Project (the MRMF) will be partially visible on the horizon from a boat vantage point on Trout Lake. With closure of the Project, revegetation would further diminish the visual effect.

#### **8.5.27.1.3 Effect on Cultural Activities**

The five Aboriginal groups that provided TKS/TLUS and other reports to Prodigy (MFN, MCFN, MNO, BFN, RSMIN) did not report specific current or historical cultural activities in the PSA, LSA or RSA.

#### 8.5.27.1.4 Effect on Archaeological Sites

Review of site files at the offices of the Archaeological Data Coordinator and the registered site database determined that there are no prehistoric sites or registered sites recorded or registered either in or near the Magino property.

The results of the Stage 1 archaeological assessment recommended that a Stage 2 assessment be undertaken. The Stage 2 assessment indicated that no archaeological material was found and no archaeological sites were identified.

#### **8.5.27.2 Mitigation Measures**

Taking into consideration the design of the Project the results of the effects analysis, and the mitigation measures described for the Atmospheric Environment and Physical Environment disciplines, the only mitigation measure identified with respect to Aboriginal Cultural Activities and Special Places is the formation of an Environmental Monitoring Committee.

#### **8.5.27.3 Residual Effects**

Taking into consideration the design of the Project and the mitigation/ enhancement measures recommended by other disciplines, the residual effects on Aboriginal Cultural Activities and Special Places anticipated are identified in Table 8-54. As indicated in Table 8-55, none of these residual effects are predicted to be significant.

**Table 8-54: Project Interactions with Aboriginal Cultural Activities and Special Places**

PROJECT PHASE	DURATION	RELEVANT PROJECT WORKS AND ACTIVITIES	POTENTIAL EFFECTS	MITIGATION MEASURES	ADVERSE RESIDUAL EFFECTS
		The Project-Environment interactions likely to measurably or noticeably change conditions with respect to Aboriginal Cultural Activities and Special Places are noted below:		The objectives of mitigations are to avoid, reduce, minimize potential adverse effects of Project on Aboriginal cultural activities and special places.	<i>Rows highlighted in BLUE indicate Project Phase during which residual effects will be generated.</i>
Site Preparation Phase	6 Months – 1 Year	<ul style="list-style-type: none"> <li>Initiation of site preparation in the PSA, with potential for disturbance of archaeological resources</li> <li>Access to Project site no longer available for use by Aboriginal people (or non-Aboriginal users) for possible cultural activities or sites</li> <li>Site preparation activities creating off-site effects on atmospheric, physical and biological environments, additional traffic and site activity that could possibly effect cultural activities or sites in the Local Study Area (LSA)</li> </ul>	<p>Effects of noise, vibration, light, visual, fugitive dust and travel time on:</p> <ul style="list-style-type: none"> <li>o Spiritual sites</li> <li>o Trails and camps</li> <li>o Cultural activities</li> <li>o Archaeological sites</li> </ul>	<p><b>Archaeological Sites:</b></p> <ul style="list-style-type: none"> <li>• Prodigy shall develop a protocol and provide its staff and/or contractors (where relevant) with orientation to allow for the quick identification of a potential archaeological resource that may be discovered in the course of conducting work on-site.</li> <li>• Prodigy shall ensure that any archaeological sites recommended for further archaeological fieldwork or protection are not altered, or have artifacts removed from them, except by a person holding an archaeological licence.</li> </ul>	<ul style="list-style-type: none"> <li>• Nominal visibility of the Project in the background from Manitou Mountain (winter only) and Trout Lake (boat vantage point, and possibly the MCFN cultural camp).</li> <li>• Reduced quality of experience for visitors to Goudreau cemetery.</li> <li>• Loss of a portion of trail from Mountain Lake to Herman Lake used historically by MFN.</li> <li>• Reduced quality of experience for users of camp/campsite identified by BFN at border of LSA/RSA.</li> <li>• Reduced quality of experience for users of bush camp identified by MNO near Summit Lake, west of Goudreau settlement.</li> <li>• Potential disturbance of undiscovered archaeological resources during site preparation and construction activities.</li> </ul>
Construction Phase	1 – 2 Years	<ul style="list-style-type: none"> <li>Construction activities creating off-site effects (e.g., noise, vibration, light, particulates, visual effects and changes in the physical and biological environment</li> <li>Additional travel time to Goudreau settlement on proposed public bypass) resulting in potential change in cultural activities or use of sites in the LSA</li> </ul>			
Mining and Processing Phase	Open Pit: 10 Years Processing Plant: 12 – 15 Years	<ul style="list-style-type: none"> <li>Operational activities creating off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment.</li> <li>Additional travel time to Goudreau settlement on proposed public bypass) resulting in potential change in cultural activities or use of sites in the LSA</li> </ul>			
Closure and Rehabilitation Phase	2 – 3 Years	<ul style="list-style-type: none"> <li>Closure and Rehabilitation activities creating or reducing off-site effects (e.g., noise, vibration, light, particulates, visual, changes in the physical and biological environment)</li> <li>Additional travel time to Goudreau settlement on the proposed public bypass will continue post-closure</li> <li>Following completion of mine closure, the Project's visibility will return to near baseline conditions</li> </ul>			
Post closure Phase	4 to 50 years (approximately), until closure objectives are met	<ul style="list-style-type: none"> <li>Ongoing use of proposed public bypass road</li> <li>Project visibility</li> </ul>	No effects		

**Table 8-55: Significance of Residual Effects on Aboriginal Cultural Activities and Special Places**

RESIDUAL EFFECT	MAGNITUDE	GEOGRAPHIC EXTENT	DURATION	FREQUENCY	REVERSIBILITY	ECOLOGICAL CONTEXT	SOCIAL CONTEXT	OVERALL ASSESSMENT OF SIGNIFICANCE
Nominal visibility of the Project in the background from Manitou Mountain (winter only) and Trout Lake (boat vantage point, and possibly the MCFN cultural camp)	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>High</b> A measurable or noticeable effect is likely to extend beyond the LSA	<b>Medium</b> <sup>9</sup> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>Low</b> <sup>10</sup> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events.	<b>Medium</b> Effect is reversible with time following closure of Project	<b>NA</b> NA	<b>High</b> The current cultural activity/spiritual sites at the location is highly valued and unique in the LSA/RSA	<b>Not Significant</b> <sup>11</sup>
Reduced quality of experience for visitors to Goudreau cemetery	<b>Medium</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events	<b>N/A</b> NA	<b>Low</b> The current cultural activity/spiritual sites at the location is valued but widely available elsewhere in the LSA/RSA	<b>Not Significant</b>
Loss of a portion of trail from Mountain Lake to Herman Lake used historically by MFN	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Medium</b> Effect is reversible with time following closure of Project	<b>NA</b> NA	<b>Low</b> The current cultural activity/spiritual sites at the location is valued but widely available elsewhere in the LSA/RSA	<b>Not Significant</b>
Reduced quality of experience for users of camp/campsite identified by BFN at border of LSA/RSA	<b>Medium</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events	<b>Low</b> The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	<b>Low</b> The current cultural activity/spiritual sites at the location is valued but widely available elsewhere in the LSA/RSA	<b>Not Significant</b>
Reduced quality of experience for users of bush camp identified by MNO near Summit Lake, west of Goudreau settlement	<b>Medium</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Medium</b> A measurable or noticeable effect is likely to extend into the LSA	<b>Medium</b> Conditions causing the effect are evident during the operations phase, and possibly other phases	<b>High</b> Conditions or phenomena causing the effects occur at regular or frequent intervals (i.e., daily or continuously)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events	<b>Low</b> The type of lands and resources used are relatively abundant elsewhere in the RSA or beyond	<b>Low</b> The current cultural activity/spiritual sites at the location is valued but widely available elsewhere in the LSA/RSA	<b>Not Significant</b>
Potential disturbance of undiscovered archaeological resources during site preparation and construction activities.	<b>Low</b> Project effects may be noticeable and/or measurable, but represent a small change relative to existing conditions	<b>Low</b> A measurable or noticeable effect is likely limited to within the PSA	<b>Low</b> Conditions causing the effect are evident in the short term (i.e., only during the site preparation, construction or closure and rehabilitation phases)	<b>Low</b> Conditions or phenomena causing the effects occur infrequently (i.e., a few times per year) or are effectively one-time events	<b>High</b> Effect is not reversible (i.e., permanent)	<b>N/A</b>	<b>Low</b> The current cultural activity/spiritual sites at the location is valued but widely available elsewhere in the LSA/RSA	<b>Not Significant</b>

<sup>9</sup> Visibility from Manitou Mountain occurs towards the end of the Operations Phase but not throughout the Post- Closure phase.

<sup>10</sup> Frequency refers to how often an individual or group would experience the visual effect at Manitou Mountain.

<sup>11</sup> The MRMF will be nominally visible in winter (vegetation will totally obscure the view of the Project in other seasons) in the background from Manitou Mountain. While at Manitou Mountain, an individual or group would likely be engaged in a number of activities, at various locations, and would not have a fixed view toward the Magino Project over an extended period. In any event, the Project – located approximately 15 km to the west, would constitute a subtle change in the horizon. With closure of the Project, revegetation would further diminish the visual effect.

## **8.5.28 Public Health**

Human health is selected as a VC as it has been identified as inherently important to both the public and regulators and because emissions from the Project activities have the potential to have an impact on human health. Human Health was identified in the EIS Guidelines as a VC.

### **8.5.28.1 Effects Assessment**

The HHRA was completed for three types of exposures: inhalation, multi-pathway, and noise. For the assessment of inhalation exposures, predicted changes to air quality during the operations phase of the Project were modeled by the air quality discipline for 1-hour, 24-hour and annual averaging periods. Comparison of the predicted air concentrations to health-based guidelines indicated that most chemicals met their respective guidelines and/or were associated with acceptable hazard quotients (HQs) or incremental lifetime cancer risks (ILCRs). The HHRA concluded that potential health effects due to inhalation are not expected from the Project.

For the multi-pathway assessment, predicted changes to soil quality (i.e., due to aerial deposition of dust) and water quality were modeled. Comparison of the predicted concentrations to health-based guidelines indicated that most chemicals met their respective guidelines and/or were associated with acceptable hazard quotients (HQs) or incremental lifetime cancer risks (ILCRs) with the exception of arsenic, cobalt and mercury in Otto Lake during the operations phase of the Project; and arsenic, cobalt, mercury and manganese in Goudreau Lake during the post-closure phase of the Project. The predicted health risks for these chemicals were largely due to the fish ingestion pathway, which relied upon conservative predictions of chemical uptake into fish tissue and assumptions related to the amount and frequency of fish consumed by people. Although health risks were predicted for these chemicals, considering the assumptions and conservative approach relied upon in the HHRA, exposure and by extension health risks were likely overpredicted and therefore potential health effects from the Project are not expected.

Predicted changes to noise levels as a result of the Project were also considered. The Project-related changes in noise levels were predicted to be within the target noise levels identified by federal regulatory agencies at the assessed receptor locations; therefore, potential health effects due to noise are not expected from the Project.

A thorough discussion of predicted health risks from air quality, water quality and noise is presented in TSD 14.

### **8.5.28.2 Mitigation Measures**

The predicted health risks were determined considering the mitigation measures incorporated into the design of the Project infrastructure, facilities and operation. These specific mitigation measures, as discussed in the TSD 9, TSD 11 and TSD 16, are considered to be typical and consistent with environmental best management practices, and were incorporated into the emission estimates and the resulting predicted air concentrations, noise levels and water concentrations. These in-design mitigation measures are listed in Chapter 6, Section 6.5 of the EIS Report. No additional mitigation measures, outside of those by design, are proposed or are required for human health.

### **8.5.28.3 Residual Effects**

Potential health risks were identified in the HHRA as a result of project-related changes to air quality and water quality; however, considering the assumptions and conservative approach relied upon in the HHRA, potential health effects from the Project are not expected.

Overall, there is no residual effect of project-related environmental exposures on human health; however, monitoring is recommended to confirm the predictions considered in the HHRA and verify if future air and water concentrations reflect predicted concentrations and therefore by extension predicted health risks.

### **8.5.29 Worker Safety**

The assessment of the effects on worker safety identifies and discusses the key types of workplace hazards that mine workers are likely to be exposed to. Virtually all of the Project works and activities could present hazards that may result in personnel injuries to workers. It is Prodigy's goal of having zero harm in the workplace and to be fully compliant with the Ontario *Occupational Health and Safety Act (OSHA)* and its associated regulations. Prodigy's Health and Safety Management Plan (TSD 20 - H&SMP) is based on the principle of continuous improvement, is consistent with the [Occupational Health and Safety Management System \(OHSAS\) 18001](#), and complies with all requirements of the Ontario Occupational Health and Safety Act (OHSA).

#### **8.5.29.1 Effects Analysis**

Mining operations are similar to many other industrial workplaces in that workers are exposed to a variety of physical hazards related to ergonomics and working at heights, in confined spaces, and, hazardous chemicals. At mine sites, vehicular traffic poses a major hazard due to the amount of traffic and types of vehicles used. Vehicular traffic including cars, small trucks, large trucks, dozers, loaders, crawler drills will be operating at the mine site continually during operations. Additionally, specialty vehicles such as forklifts, ATVs, snow mobiles, and boats will be used for site activities such as chemical delivery, monitoring activities, and sampling wells and lakes.

Large processing equipment such as crushers, mills, conveyors, and cyclones will also be operating virtually continuously during mining operations. Workers will be exposed to the physical hazards of operating equipment, including noise which is almost ubiquitous in mining. It is generated by drilling, blasting, cutting, materials handling, ventilation, crushing, conveying, and ore processing.

Workers will be exposed to a variety of chemical hazards. Mining activities require the use of several hazardous chemicals characterized as toxic (sodium cyanide), reactive (ammonium nitrate), corrosive (hydrochloric acid and caustic soda), flammable (fuel oil, gasoline), and explosive. Several of these chemicals are incompatible with each other and will need to be stored in separate specially designated areas in the warehouse and in explosives magazines. In some cases the chemicals used must be made up into solutions of a specific strength (hydrochloric acid, cyanide, caustic soda, lime) by adding them to water.

Blasting represents a workplace hazard for workers in the open pit. Proper and improper use of explosives could lead to dangerous situations such as exposure to fly-rock, explosive fumes poisoning, misfires, and premature blasts. There is always potential that some explosives or pyrotechnical products which remain in the ground could be triggered during other works or activities.

Seasonal elements such as insects and hot/cold weather may pose safety issues including heat exhaustion, dehydration, hypothermia, or frost bite. The site has uneven terrain and could, especially in winter, pose a high slip, trip and fall hazard for workers operating in the open.

#### **8.5.29.2 Ontario Mining Industry Safety Record**

According to the Ontario Mining Association (2013, August) Ontario is one of the safest mining jurisdictions. In 2012, approximately 18,700 employees at mine sites in Ontario worked a total of more than 38.3 million hours. For all of 2012, mining's lost time injury rate was 0.5 per 200,000 hours worked. This was an improvement of 0.1 from 2011. The industry's previous best lost time injury rate over a quarterly, or yearly, period was 0.4. Available statistics for the first 3 months of 2013 indicate that Ontario's mining sector had a lost time injury rate of 0.2 per 200,000 hours worked.

Ontario's mining industry has an excellent record of improving its safety performance. Since 1976, the sector's lost time injury rate has improved by 96%. The industry-wide lost time injury rate was 12 per 200,000 hours in 2002, and declined to the 0.4 to 0.2 range in 2012 and 2013.

#### **8.5.29.3 Effects Mitigation or Enhancement**

Prodigy is committed to providing its workers with a safe workplace. It will comply with all relevant Occupational Health and Safety Act and regulations, including Ministry of Labour enforcement activities. Prodigy shall provide information, instruction, and supervision to all its workers to protect their health and safety. More specifically, Prodigy shall:

- Comply with the practice of, arranging safety meetings and refresher training for returning workers at the beginning of season;
- Take every precaution reasonable in the circumstances for the protection of workers;
- Ensure workers meet minimum age requirements;
- Ensure equipment, materials and protective devices are well maintained and used as per manufacturer's instructions;
- Ensure workers are provided with appropriate supervision and personal protective equipment;
- Prepare and review, at least annually, a written occupational health and safety policy, and develop and maintain a program to implement that policy;
- Post a copy of the *Occupational Health and Safety Act* (OHSA), as well as the name and phone number of the MOL inspector for the district, prominently in the workplace;
- Advise contract truck drivers on traffic control procedures and policies at the workplace; and
- Ensure all workers receive appropriate training, including site orientation and core courses depending on their duties (Ministry of Labour, 2012).
- Become a signatory to the International Cyanide Management Code (ICMC or Cyanide Code) for the gold mining industry prior to the Project becoming operational. The Cyanide Code contains a far reaching and comprehensive set of principles and

standards of practice. The Code is intended to reduce the potential exposure of workers and communities to harmful concentrations of cyanide, to limit releases of cyanide to the environment, and to enhance response actions in the event of an exposure or release.

#### **8.5.29.4 Residual Effects on Worker Safety**

Workplace hazards will always remain at a mine site and some level of harm to workers is likely unavoidable. However, taking into consideration the mitigation by design incorporated into the Project, and the commitments to maintaining a safe workplace outlined in Prodigy's Health and Safety Management Plan, neither serious nor extensive harm to workers is anticipated.

## 9.0 ACCIDENTS AND MALFUNCTIONS

The assessment of the environmental effects resulting from accidents and malfunctions is a risk based assessment that involves three steps:

1. Identification of potential hazards associated with the Project works and activities to be undertaken both on-site and off-site. These are identified based on past experience with mines similar to the Project and with similar types of works and activities.
2. Identification of potential environmental effects or other anticipated consequences of the identified hazards; and
3. Completing a qualitative risk assessment aimed at providing some perspective on the hazards and consequences identified. This includes rating the likelihood of the adverse environmental effects actually occurring. This rating represents the overall assessment of significance for the potential adverse environmental effects of accidents and malfunctions.

On the basis of experience with similar mining operations in similar climatic conditions, accidents and malfunctions are considered if they have both a measurable environmental effect and a high probability of occurring during the life of the Project these are termed “credible” accidents and malfunctions, and the environmental effects which are identified represent a reasonable worst case outcome.

For the Magino Project, Prodigy’s Environmental Management System (EMS) includes a comprehensive Emergency Response and Spill Prevention and Contingency Plan (ERSPC Plan; TSD 20) that addresses accident prevention, training and effective response for the full range of accidents and malfunctions reasonably expected with the Magino Project.

### 9.1 Hazard Identification

Hazards presenting the greatest potential to result in environmental effects are:

- **Structural Failures:** These include open pit slope failure, TMF embankment failure, MRMF slope failure, overburden stockpile(s) slope failure; water quality (WQ) control pond failure; and creek diversion failure;
- **Accidents:** These include an explosives accident, tailings pipeline failure, water pipeline failure, transportation accident (e.g., vehicle collisions) with fuel or reagent shipments; and chemical spills within containment facilities; and
- **Other Malfunctions:** These include potential events such as unexpected effects on water quality, and project related fires.

Table 9-1 summarizes these hazards in terms of the Project phases during which they are most likely to occur.

**Table 9-1: Summary of Accidents and Malfunctions by Project Phase**

Risk Category	Project Works or Activities	Project Phases During which Accidents and Malfunctions Could Occur				
		Site Preparation	Construction	Operations	Closure	Post-Closure
Structural Failure	Open Pit	–	–	○	●	○
	TMF Embankment	–	–	●	○	○
	MRF	–	–	●	○	○
	Overburden Stockpiles	–	●	○	●	–
Accident	Explosives	–	○	●	–	–
	Tailings Pipeline	–	–	●	–	–
	Water Pipeline	–	–	●	○	–
	Fuel Transport, Transfer and Storage	○	○	●	○	–
	Reagent Transport	–	–	●	–	–
	Chemical Spill	–	–	●	–	–
Other	Unexpected Water Quality Effects	●	●	○	○	–
	Project related fires	●	●	○	○	–

Legend: ● Greatest potential for adverse environmental effects.  
○ Lesser potential for adverse environmental effects.

## 9.2 Significance Assessment for Accidents and Malfunctions

Significance was assessed by completing a qualitative risk assessment that rates the likelihood of the adverse environmental effects occurring. Each potential accident and malfunction discussed above was assessed according to the likelihood of the event occurring and was given a risk rating from “negligible” to “high”. Environmental effects are assigned a magnitude rating ranging from “low” to “extreme”. The combination of the likelihood of an event and the magnitude of its environmental effects is determined by plotting these ratings on the matrix shown on Figure 9-1. As shown in this matrix, increased risk is associated with accidents and malfunctions having a greater likelihood of occurrence and a greater magnitude of effects.

The risk ratings are defined as follows:

- **Negligible:** Not likely to occur (less than a 1 in 10,000 probability per year; i.e., - 1/10,000 events per year);

- **Very Low:** Unlikely to occur (less than a 1 in 1,000 probability per year);
- **Low:** Could possibly happen (less than a 1 in 100 probability per year);
- **Moderate:** May happen (less than a 1 in 10 or 10% probability per year); and
- **High:** Can happen over the life of the mine (greater than a 10% probability per year).

The magnitude ratings, consider not only the mitigation by design, operational safeguards and contingencies available to minimize environmental effects, but also consider the cost of remediation (as a measure of severity). The magnitude ratings are defined as follows:

- **Low:** No long-term effects expected, readily remediated with a cost in the \$10,000's;
- **Moderate:** Limited or no long-term effects expected, remediated for costs in the \$100,000's;
- **High:** Moderate long term effects expected, remediated for costs in the \$ millions;
- **Very high:** Significant long term effects expected, costly remediation in the \$10s millions; and
- **Extreme:** Highly significant long term effects likely, remediation cost in the \$100s millions.

**Figure 9-1: Risk Rating Matrix**

		<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>Extreme</b>						
<b>Very High</b>		<b>6</b>				
<b>High</b>		<b>7</b>				
<b>Moderate</b>		<b>8</b>				
<b>Low</b>		<b>9</b>				
		<b>Negligible</b>	<b>Very Low</b>	<b>Low</b>	<b>Moderate</b>	<b>High</b>
		<b>Risk Rating</b>				

Accidents and malfunctions with an overall combined rating of greater than or equal to 4 are not considered to be significant events or consequences. An overall combined rating of 3 requires

that the accident or malfunction be considered further in the detailed design phase. An overall combined rating of less than or equal to 2 are considered significant.

Results of this qualitative analysis are provided in Table 9-2. They indicate that all of the accidents and malfunctions considered for this project had a rating of either 6 or 7. These events and their environmental effects are therefore considered not significant.

**Table 9-2: Accidents and Malfunctions Rating Summary**

<b>MALFUNCTION/ACCIDENT</b>	<b>KEY ENVIRONMENTAL EFFECTS</b>	<b>RISK RATING</b>	<b>MAGNITUDE RATING</b>	<b>OVERALL RATING (1 = MAXIMUM 9 = MINIMUM)</b>
Open Pit Slope Failure	Effects on habitat, limited flooding of open pit, effects on lake levels	Low	Low	7
TMF Embankment Failure	Effects on terrestrial habitat, aquatic life	Negligible	Very High	6
MRMF Slope Failure	Effects on terrestrial habitat, possibly aquatic life	Moderate	Low	6
Overburden/Stockpile Slope Failure	Effects on terrestrial habitat, possibly aquatic life	Moderate	Low	6
Explosives Accident	Water quality impacts	Very Low	Moderate	7
Tailings Pipeline Failure	Effects on terrestrial habitat and aquatic life	Low	Moderate	6
Water Pipeline Failure	Effects on aquatic life	Low	Low	7
Reagent Transport	Effects on terrestrial habitat and possibly aquatic life	Very Low	High	6
Fuel Transport	Effects on aquatic life and possible terrestrial life	Very Low	High	6
Chemical Spill within Containment Areas	Effects on property and effects to human health and terrestrial and aquatic fauna	Negligible	High	7
Unexpected Water Quality Effects	Effects on aquatic life	Low	Moderate	6
Project-related Fires	Human health concerns and effects on fauna	Very Low	Moderate	7

## 10.0 ENVIRONMENTAL MANAGEMENT SYSTEM

Prodigy's EMS defines the sequence of "***Policy – Planning – Implementation and Operation – Checking and Corrective Actions – Management Review Process***" that must be in place to ensure that the Magino Project is executed in an environmentally and socially acceptable manner and in a spirit of **continuous improvement** that employs adaptive management principles. An overview of Prodigy's EMS is presented in TSD 20.

The Environmental Health and Safety (EHS) system and its associated management plans are "***Life of Project***" Management Plans. They apply from the onset of the site preparation phase, through the construction, operations and closure phases of the Project. Application of the principles of continuous improvement and adaptive management ensures that the environmental management plans are appropriate for the level of activities on site at all times. Adaptive management is the application of mitigation measures when review processes identify potential adverse effects. The application of adaptive management measures could require the approval of a regulatory authority.

The EMS and its management plans are tools used by Prodigy to ensure that the Company's objectives and environmental commitment are achieved. The Company acknowledges that the Management Plans will require updating on a regular basis to ensure that they capture/incorporate the requirements outlined in the terms and conditions of the Project authorization and permits, as well as other commitments made to Aboriginal and local communities.

Key elements of these plans are execution and line of accountability within the Company's organization to ensure that the objectives of the plan are met. As the Project advances through its various phases of development (construction, operation and closure), the on-site organizational structure of the site management team will change. However, the fundamental commitments made by the Company as embodied in the EMS and its management plans will remain. Furthermore, the process of continual improvement (review and adaptive management) may also occasionally introduce changes for some components of the management plans. The management plans are tools designed to manage change while ensuring that the Company's objectives and environmental commitments are achieved.

Each management plan will be updated regularly:

- At the time of each Project phase;
- Changes in regulations affecting the Project;
- Roles and Responsibilities - will adapt to the evolving organizational structure on-site and off-site;
- Monitoring requirements, objectives and thresholds will be adapted on the basis of annual review of monitoring information collected in the previous time period (adaptive management); and
- Changes in reporting requirements as directed by the licensing authority.

The EMS and its accompanying management plans presented in TSD 20 are listed in Table 10-1. The EMS and its accompanying plans apply to all phases of the Project.

**Table 10-1: List of Environmental Management Plans (EMPs) for the Magino Project**

<b>Document</b>	<b>Title</b>	<b>Description</b>
<b>General Management Plans</b>		
<b>TSD 20-1</b>	<b>Environmental Management System (EMS)</b>	<b>Describes the overarching framework for environmental, safety and health management</b>
<b>TSD 20-2</b>	<b>Health &amp; Safety Management Plan</b>	<b>Focusses on occupational health and safety and requirements of the Occupational Health and Safety Act, R.S.O. 1990, c.O.1- Ontario</b>
<b>TSD 20-3</b>	<b>Emergency Response and Spill Prevention and Contingency Plan (ERSPC)</b>	<b>Aligns with Ontario Regulation 224/07 for requirements of the management of spill prevention and contingency</b>
<b>TSD 20-4</b>	<b>Hazardous Substances Management Plan</b>	<b>Focusses on hazardous material and hazardous waste.</b>
<b>TSD 20-5</b>	<b>Waste Management Plan</b>	<b>Focusses on non-hazardous waste</b>
<b>TSD 20-6</b>	<b>Construction Environmental Protection Plan</b>	<b>Outlines environmental protection procedures implemented for the construction activities</b>
<b>TSD 20-8</b>	<b>Mine Material Management Plan</b>	<b>Outlines management of materials extracted from the mine pit</b>
<b>VECs - Biophysical Valued Ecological Components Management Plans</b>		
<b>TSD 20-11</b>	<b>Air Quality and Noise Abatement Plan</b>	<b>Targets VECs of air quality, noise, vibration, greenhouse gases and climate change</b>
<b>TSD 20-12</b>	<b>Water Management Plan</b>	<b>Targets management of all water sources/streams at the site (quantity and quality)</b>

<b>Document</b>	<b>Title</b>	<b>Description</b>
<b>TSD 20-13</b>	<b>Environmental Monitoring Plan</b>	<b>Regroups all environmental monitoring activities</b>
<b>TSD 20-14</b>	<b>Fish Habitat Compensation Plan</b>	<b>Satisfies requirements of the Fisheries Act</b>

## 11.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The natural environment has the potential to affect the Project through meteorological, climatological, and seismological events. These events could include flooding or drought, larger than anticipated temperature fluctuation (summer and winter), extreme storms events (rain, ice, snow, and wind storms), forest fires, and, earthquakes. These effects occur due to the variable nature of climate and the random nature of other events such as forest fires or earthquakes. Also, with the exception of earthquakes, the frequency or duration of these events are projected to change due to global climate change.

The effects of the environment on the Project assessment considers the potential effects on Project components caused by projected changes in climate and the future climate trends. These are described in Section 4 and in more detail in the Climate Change TSD (10). The latter provides the climate normal and climate trends and analysis.

All infrastructure will be built to the Canada Building Code. The TMF embankment will meet strict design (Canadian Dam Association, 2013), operational and maintenance requirements to withstand the probable maximum flood and the maximum credible earthquake. The mine pit will be designed to perform in a stable manner in the event of the design earthquake. Water management structures will be designed to contain a 100-year return events for precipitation. In addition, regular inspection and monitoring programs will ensure erosion and stability problems induced by the extreme climatic events are detected and promptly remediated. Given these prevention measures, the expectation is that potential effects of the environment on the Project will be mitigated.

## **12.0 CUMULATIVE EFFECTS**

There are several projects of varying scope and scale in the vicinity of the Magino Project. They relate to mining and exploration, forestry and, to a lesser degree, transportation, electricity and municipal development. The on-going operation of the Island Gold mine and the planned activities in the Magpie Forestry Management Unit are the only two actions identified that could have cumulative effects with the Project. No significant cumulative effects of these two activities on the Project's VCs have been identified. Though difficult to quantify, it is expected that the two projects combined will lead to population growth in the local communities in the vicinity of the Project. It may also lead to increase in tourism. These effects are considered to be positive and desirable.

## 13.0 CONCLUSION OF THE ASSESSMENT

Taking into consideration the design of the Project and additional mitigation measures identified throughout the assessment, no significant adverse residual effects were identified on the atmospheric, physical and biological VCs. The Magino Project is not anticipated to result in any significant adverse effects. This conclusion takes into consideration residual effects from past and current activities in the vicinity of the Magino site.

The EIS examined the potential for cumulative effects of the Project in combination with other past, existing and future projects and activities considered to be either certain or reasonably foreseeable. The assessment identified very few other projects that could overlap with those of the Project to result in adverse cumulative effects. The assessment concluded that there are no significant adverse cumulative effects on the Atmospheric, Biophysical, and Human Environments.

The Project is expected to result in several positive effects on the Social and Economic Environments and on Aboriginal Interests, largely in terms of its contributions to Aboriginal and non-Aboriginal community goals regarding population and economic growth.

The EIS examined the potential for the Project to result in environmental effects as well as personnel injuries to workers or members of the public as a result of a number of potential accidents and malfunctions, including:

- **Structural Failures:** These include open pit slope failure, TMF embankment failure, MRMF slope failure, overburden stockpile(s) slope failure; water quality control pond failure; and creek diversion failure;
- **Accidents:** These include an explosives accident, tailings pipeline failure, water pipeline failure, transportation accident (e.g., vehicle collision) with fuel or reagent shipment, and chemical spills within containment facilities; and
- **Other Malfunctions:** These include unexpected water quality effects, and project related fires.

Taking into consideration the design of the Project and various operational safeguards all of the potential accidents and malfunctions are considered to be unlikely and their environmental effects are considered to be not significant.

The EIS examines the potential effects of the environment on the Project, including the effects that might result from events such as flooding or drought; warmer temperatures; storms (ice, snow, and wind storms); forest fires; and earthquakes. These effects were considered to occur due to the variable nature of climate and the random nature of other events such as forest fires or earthquakes. With the exception of earthquakes, the frequency or duration of these events are projected to change due to global climate change. As such, the assessment of effects of the environment on the Project was undertaken in the context of climate change. Taking into consideration how the effects of these events would be mitigated through design and/or managed in an adaptive manner, the assessment concluded that there would be no significant adverse effects from the natural events examined. It also concluded that climate change trends have been adequately considered in the design and operations of the Project and do not change the conclusions of the environmental assessment.

## 14.0 REFERENCES

- Canadian Dam Association (CDA). (2013). Dam Safety Guidelines 2007, 2013 Edition.
- Card, K. D., and Poulsen, K. H. (1998). Geology and mineral deposits of the Superior Province of the Canadian Shield. In S. Lucas (co-ord.), Geology of the Precambrian Superior and Grenville Provinces and Precambrian Fossils in North America, No.7, pp 12-194.
- Crins, W.J., P.A. Gray, P.W.C. Uhlig, and M.C. Wester. (2009). The Ecosystems of Ontario, Part I: Ecozones and Ecoregions. Ontario Ministry of Natural Resources. Peterborough, Ontario. Inventory, Monitoring and Assessment, SIB TER IMA TR-01, 71pp.
- Economic Development Corporation of Wawa. (2010). Economic Development Corporation of Wawa, Ontario. Retrieved from the Economic Development Corporation of Wawa website: [http://edcwawa.ca/?option=com\\_content&view=article&id=53&Itemid=93](http://edcwawa.ca/?option=com_content&view=article&id=53&Itemid=93).
- Hayek, S., Drysdale, J.A., Peci, V., Halchuk, S., Adams, J. and Street, P. (2009). Seismic Activity in the Northern Ontario Portion of the Canadian Shield: Annual Progress Report for the Period of January 01 - December 31, 2008. Nuclear Waste Management Organization TR-2009-05.
- InfoMine Inc. (2013). Mine Sites – Hemlo. Retrieved from the InfoMine website: <http://www.infomine.com/minesite/minesite.asp?site=hemlo>.
- McQuay, D.F. (1980). Northern Ontario Engineering Geology Terrain Study. Ontario Geological Survey, Data. Base Map 5097, scale 1:100,000.
- Mine Environment Neutral Drainage (MEND). (2009). Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1.
- Morris, T.F. (2001a). Quaternary Geology of the Wawa Area, northeastern Ontario. Ontario Geological Survey, Open File Report 6055.
- Morris, T.F. (2001b). Quaternary Geology, Franz-Manitowik Lake-Kinniwabi Lake Area. Ontario Geological Survey, Map 2573, scale 1:50,000.
- Natural Resources Canada. (2014). National Earthquake Database. Retrieved from the Natural Resources Canada website: <http://www.earthquakescanada.nrcan.gc.ca/stndon/NEDB-BNDS/bull-eng.php>.
- Pace, A. (2012). Exploration Highlights in the Wawa District and Changes to the SSM and Wawa Boundary. Ontario Ministry of Northern Development and Mines, Ontario Geological Survey. Retrieved from the Economic Development Corporation of Wawa website: <http://www.edcwawa.ca/images/AGM/wawamines2012.pdf>.
- Percival, J.A. and Easton, R.M. (2007). Geology of the Canadian Shield in Ontario: an update. Ontario Geological Survey, Open File Report 6196, Geological Survey of Canada, Open File 5511, Ontario Power Generation, Report 06819-REP-01200-10158-R00.

- Price, W.A. (1997). Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine sites in British Columbia. Retrieved from the Mine Environment Neutral Drainage Program. (2013). Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Retrieved from the Mine Environment Neutral Drainage Program website: <http://mendnedem.org/wpcontent/uploads/2013/01/1.20.1-Ref.pdf>
- Richmont Mines Incorporated. (2012). Operations – Island Gold. Available at: Retrieved from the Richmont Mines website: [http://www.richmont-mines.com/op\\_operations\\_islandgold](http://www.richmont-mines.com/op_operations_islandgold).
- Wesdome Gold Mines Limited. (2012a). About Us. Retrieved from the Wesdome website: <http://www.wesdome.com/index.php?s=about&p=1>.
- Wesdome Gold Mines Limited. (2012b). Operations. Retrieved from the Wesdome website: <http://www.wesdome.com/index.php?s=operations&p=5>.