EAGLE GOLD MINE

ENVIRONMENTAL CHARACTERIZATION REPORT

MARCH 2022

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List of Acronyms and Abbreviations

%	percent
~	approximately
<	less than
>	greater than
AP	acid potential in kg $CaCO_3$/t equivalent
ARD	acid rock drainage
ARSA	Access Road Study Area
asl	above sea level
BC	British Columbia
BCWSQG	British Columbia Working Sediment Quality Guidelines
BGC	BGC Engineering Ltd.
CCME	Canadian Council of Ministers of the Environment
cm	centimeter
CSR	Contaminated Sites Regulations (Yukon)
EEM	Environmental Effects Monitoring
EMSAMP	Environmental Monitoring, Surveillance and Adaptive Management Plan
EQS	Effluent Quality Standard
FNNND	First Nation of Na-Cho Nyäk Dun
GMZ	Game Management Zone
ha	hectares
HCR	Haggart Creek Road
HLF	Heap Leach Facility
ISQG	Interim Sediment Quality Guidelines
km	kilometers
km^2	square kilometers
LAA	Local Assessment Area
LSA	Local Study Area
m	meters

m^3 .... cubic meters
masl .... meters above sea level
MDMER .... Metal and Diamond Mining Effluent Regulations
mg/L .... milligrams per liter
ML .... metal leaching
mm .... millimeter
m/s .... meters per second
N/A .... not applicable
Non-PAG .... Non-potentially acid generating
NP .... neutralization potential in kg $CaCO_3$/t equivalent
NP/AP .... neutralization potential to acid potential ratio
PAG .... Potential Acid Generation
pH .... potential of hydrogen (measure of acidity)
PEL .... Probable Effects Level
Project .... Eagle Gold Mine
RAA .... Regional Assessment Area
RCSA .... road corridor study area
RSA .... Regional Study Area
SARA .... Species at Risk Act
SRK .... SRK Consulting (Canada) Inc.
SWE .... Snow Water Equivalent
TEM .... Terrestrial Ecosystem Mapping
TOC .... total organic carbon
TSS .... total suspended solids
UTM .... Universal Transverse Mercator
VGC .... Victoria Gold Corp.
WKA .... Wildlife Key Area
WQO .... Water Quality Objective
WRSA .... Waste Rock Storage Area

WUL .... Water Use Licence QZ14-041-1

VWP .... Vibrating Wire Piezometer

yrs .... years

YT .... Yukon Territory

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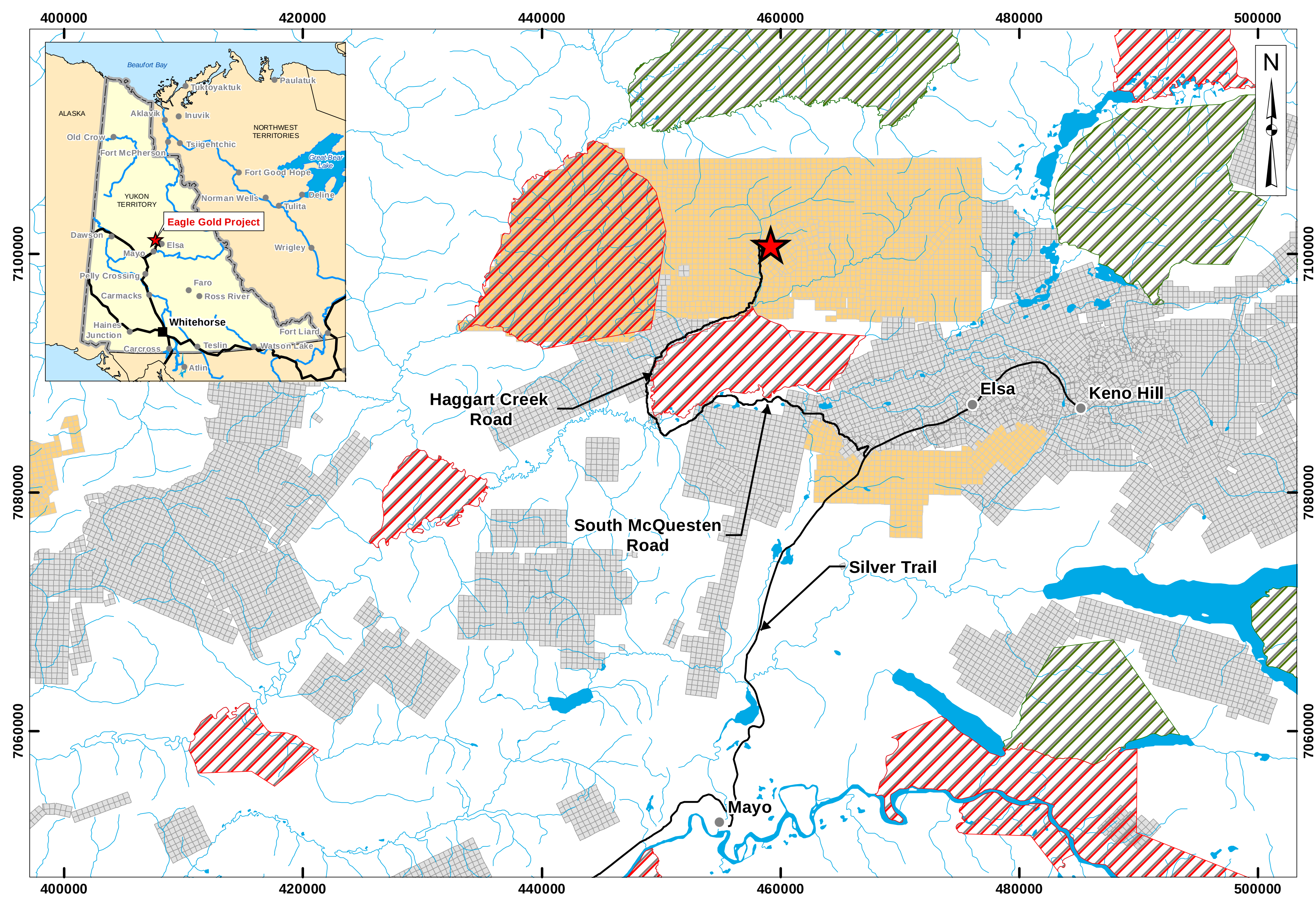
1 INTRODUCTION

The Eagle Gold Mine (the Project) is located in central Yukon, approximately 350 km north of Whitehorse and approximately 85 km north-northeast of the village of Mayo (Figure 1-1). The Project is accessible via the Silver Trail and the South McQuesten and Haggart Creek Roads. Victoria Gold (Yukon) Corp. (VGC) began construction of the Project in August 2017. During 2019, the construction of the Project was completed and the Project transitioned to the operations phase. The environmental monitoring programs are conducted in accordance with the Environmental Monitoring, Surveillance and Adaptive Management Plan (EMSAMP). Monitoring programs under the EMSAMP have shifted from baseline data collection to monitoring and evaluating changes related to the phases of, and activities required for, the Project. This report is an update to the 2020 version of the Environmental Characterization Report and includes additional environmental data collected since the finalization of the 2020 version of the report.

The Project is located within the Boreal Cordillera ecozone, which comprises much of the southern Yukon and a large portion of northern British Columbia, and more specifically within the Yukon Plateau-North ecoregion. The Boreal Cordillera ecozone is broadly characterized by the presence of several mountain ranges that trend in the northwesterly direction and include extensive plateau regions. The plateaus consist of flat or gently rolling upland terrain separated by broad valleys and lowlands. The climate is characterized by long, cold, dry winters and short, warm, wet summers, with conditions varying according to altitude and aspect.



Legend:

Eagle Gold Project	Town / Village	Category A Settlement Land
Victoria Gold Claims	Road	Category B Settlement Land
Other Claims	Watercourse	

VICTORIA GOLD CORP

0 3 6 12 Kilometres

Projection: NAD 83 Zone 8N	Drawn By: HC	EAGLE GOLD PROJECT YUKON TERRITORY
Date: 2020/06/01	Figure: 1-1	Project Location

2 METEOROLOGY AND AIR QUALITY

The Dublin Gulch area is characterized by a “continental” type climate with moderate annual precipitation and a large temperature range. Summers are short and can be hot, while winters are long and cold with moderate snowfall. Rainstorm events can occur frequently during the summer. Lower elevations are typically snow free by early May, whereas the higher elevations are typically snow free by mid-June. Frost action may occur at any time during the summer or fall.

2.1 CLIMATE STATIONS

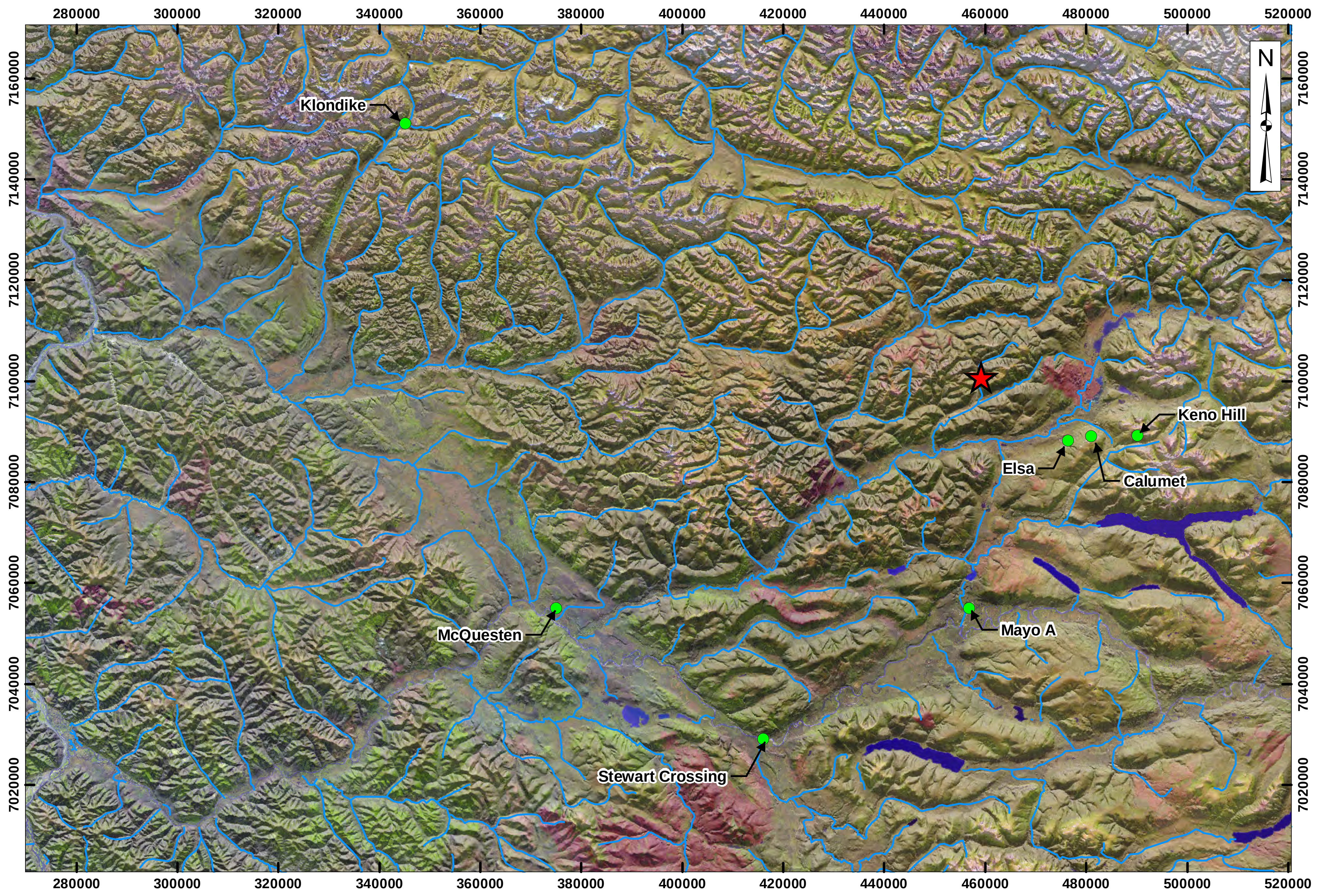
Regional climatic data are available from several stations in the area which provide a long-term database (Figure 2-1). Site specific climate data have been collected and analyzed from two climate stations that were established on the Project site from 1993 – 1996 and again in 2007 and 2009. One station was installed at Potato Hills (1,420 m asl) in August 2007, while a second station was installed near the camp (823 m asl) in August 2009. These sites were the same locations established by a prior operator in the Project area from 1993 – 1996. The lower Camp station was re-located to a nearby site (778 m asl) in September 2010 due to construction of new camp facilities. The stations characterize climatic conditions in the upper and lower elevations of the Project area which exhibits significant variability due to elevation and physiography (Figure 2-2).

The Project climate stations and snow survey locations, as well as regional climate station in proximity to the project area, are presented in Table 2-1.

Table 2-1: Regional and Project Climate Stations

Station	Elevation (m asl)	Latitude/ UTM E	Longitude/ UTM N	Record Period
Regional Climate Stations				
Keno Hill (Stations ID 2100677)	1473	N 63°56'	W 135°12'	1974-1982
Klondike (Stations ID 2100679)	973	N 64°27'14"	W 138°12'56"	1966-2010
Elsa (Station ID 2100500)	814	N 63°55'	W 135°29'	1948-1989
Mayo A (Station ID 2100700)	504	N 63°37'	W 135°52'	1925-Active
McQuesten (Station ID 2100719)	457	N 63°36'	W 137°31'	1986-2014
Stewart Crossing (Station ID 2101030)	480	N 63°22'48”	W 136°40'48”	1963-2008
Calumet (Snow Station ID 09DD-SC1)	1310	N 63°54'60"	W 135°24'00"	1975-Active
Project Site Climate Stations				
Camp Station	782	458,164	7,101,036	2009-present
Potato Hills Station	1420	463,544	7,100,833	2007-present
Project Site Snow Survey Locations				
Camp Snow Survey	782	458,164	7,101,036	2009-present
Ann Gulch Snow Survey	875	458,945	7,101,185	2012-2017
HLF Snow Survey	1078	459,859	7,102,319	2019-present
Potato Hills Snow Survey	1420	463,290	7,100,568	2009-present
HLF 3b (Bench and Slope)	1066	459,295	7,102,063	2021-present

Station	Elevation (m asl)	Latitude/ UTM E	Longitude/ UTM N	Record Period
HLF 4b (Bench and Slope)	1049	459,602	7,102,212	2021-present
HLF 5b (Bench and Slope)	1048	459,580	7,102,207	2021-present



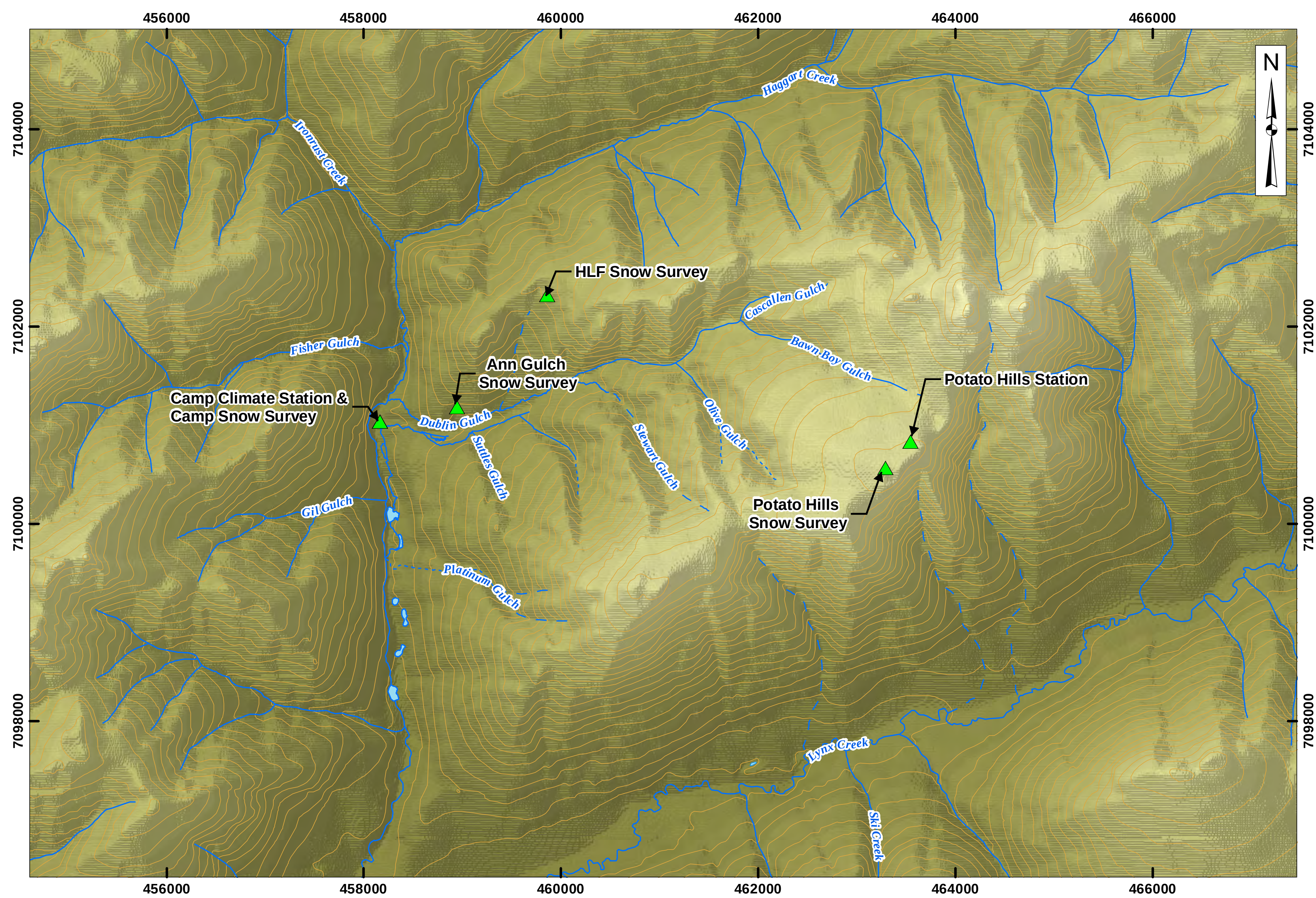
Legend:

- ★ Eagle Gold Project
- — Watercourse
- ● Climate Station

VICTORIA GOLD CORP

0 5 10 20
Kilometres

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date: 2020/06/01	Figure: 2-1	Regional Climate Station Locations



Legend:

Snow/Climate	Perennial
Contour (100ft)	Ephemeral
	Intermittent

VICTORIA GOLD CORP

0 0.25 0.5 1
Kilometres

Projection:	Drawn By:	
NAD 83 Zone 8N	HC	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2020/06/01	Figure: 2-2	**Project Climate Station Locations**

2.2 TEMPERATURE

2.2.1 Regional Temperature

Mean annual air temperature estimates range from -5.6°C to -1.9°C, with higher mean annual air temperature values occurring at stations showing lower elevation – and vice versa. Overall, regional data show that during the months of March to October inclusive, a standard lapse rate applies, with temperatures decreasing with rising elevation, and are cooler at the upper station, on average. However, during the winter months of November to February, temperature inversions are common in the region, with temperatures being cooler on average in the valley bottom than at the height of land (Lorax 2021).

Mean monthly temperature summaries for the regional stations are provided in Table 2-2. Spring thaws begin in April when daily maximum temperatures exceed 0°C, although daily mean temperatures may not rise above freezing until May. Temperatures begin to recede from summer highs during September. However, daily minimums may drop below freezing at night during August.

Table 2-2: Mean Monthly Temperatures at Regional Climate Stations

MSC Station Name	Elev (m asl)	Period of Record	Temperature (°C)												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Keno Hill	1473	1974-1982	-16.7	-14.2	-11.5	-4.8	2.1	7.8	10.4	9.1	2.9	-5.3	-11.0	-16.2	-4.0
Klondike	973	1966-2010	-22.6	-18.2	-14.4	-5.9	3.4	9.9	11.6	8.4	2.3	-6.7	-15.9	-18.9	-5.6
Elsa	814	1948-1989	-20.9	-18.0	-11.7	-2.6	6.1	12.5	14.6	11.3	4.8	-4.7	-14.2	-19.4	-4.1
Mayo A	504	1925-Active	-25.5	-19.0	-10.6	0.2	8.3	14.0	15.6	12.8	6.6	-2.3	-15.7	-22.2	-3.1
McQuesten	457	1986-2014	-22.8	-19.1	-12.8	0.1	8.5	13.7	15.0	12.4	6.4	-2.9	-16.4	-24.4	-2.9
Stewart Crossing	480	1963-2008	-21.9	-16.8	-11.5	0.0	8.3	14.0	15.6	12.6	6.4	-2.5	-14.7	-18.6	-1.9

NOTES:
1. Regional temperature data obtained from Environment Canada's national climate data and information archive and summarized in Lorax 2021.

2.2.2 Local Temperatures

Although mean monthly air temperatures measurably differ between the Camp station (782 m asl) and Potato Hills station (1,420 m asl), the mean annual air temperature at the project site for both sites are similar at -3.7°C at the Camp station and -3.6°C at the Potato Hills Station over their respective periods of record. At the Camp station, monthly average temperature ranges from -20.0°C in November to 13.4°C in July, and -15.1°C in December to 10.9°C in July at the Potato Hills station. The minimum (maximum) recorded daily average temperatures were -43.8°C (22.0°C) and -36.6°C (22.9°C) at the Camp and Potato Hills stations, respectively. The minimum (maximum) recorded 15-minute temperatures were -46.4°C (31.6°C) and -37.6°C (31.7°C) at the Camp and Potato Hills stations, respectively.

During the months of March to October inclusive, the standard lapse rate applies, with temperatures decreasing with rising elevation, and are approximately 3°C cooler at the upper station, on average. However, during the winter months of November to February, temperature inversions are common at the Project site, with temperatures approximately 2.5°C cooler on average in the valley bottom than at the height of land.

Table 2-3 summarizes the mean temperatures recorded at the Camp and Potato Hills climate stations.

Table 2-3: Project Site Mean Monthly Temperatures

Location	Year	Mean Temperature °C												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Potato Hills Station (1,420 m asl)	2007	-	-	-	-	-	-	-	-	1.0	-6.9	-12.0	-15.2	-
	2008	-17.7	-17.2	-11.3	-4.8	3.3	8.7	8.1	5.3	1.9	-7.7	-10.8	-18.6	-5.1
	2009	-19.3	-17.2	-16.7	-4.4	M	M	12.6	7.4	3.3	-5.3	-12.8	-11.9	-
	2010	-14.5	-9.7	-9.4	-1.8	5.2	8.8	10.5	9.7	2.3	-5.3	-11.7	-18.2	-2.9
	2011	-15.5	-18.3	-13.9	-5.6	4.8	8.8	10.3	7.0	4.1	-5.7	-18.0	-13.0	-4.6
	2012	-19.8	-11.1	-13.4	-1.9	3.1	11.3	10.9	M	M	-8.4	-18.8	-19.4	-
	2013	-17.6	-11.3	-14.2	*-10.4*	*2.8*	12.1	11.6	11.0	3.0	-2.9	-16.0	-19.5	-4.3
	2014	-10.0	-15.9	-11.5	-3.4	*5.6*	8.7	11.8	8.7	2.1	-5.6	-11.6	-11.4	-2.7
	2015	-14.4	-13.8	-9.6	*-2.3*	*8.6*	*8.6*	*9.5*	7.1	0.1	-3.7	-13.5	-13.6	-3.1
	2016	-9.2	-10.4	-6.2	M	7.2	12.0	12.2	9.3	2.8	-6.8	-10.1	-16.2	-
	2017	-13.0	-13.3	-16.7	-3.2	4.5	9.7	M	M	M	M	-17.4	-10.2	-
	2018	-14.4	-16.9	-12.0	-6.1	M	M	M	M	M	-3.3	-9.9	M	-
	2019	-16.0	M	-5.1	-3.5	M	11.1	13.6	8.9	M	M	-10.8	M	-
	2020	-17.4	-16.1	M	-6.0	M	8.3	8.9	8.6	2.8	-8.4	-14.9	-13.4	-
	2021	-10.2	M	-14.7	-7.6	2.5	11.0	12.2	8.4	1.3	-4.7	-14.9	-21.5	-4.4
	All Years	-14.9	-14.3	-11.7	-4.5	5.0	9.8	10.9	8.3	2.3	-5.8	-13.4	-15.1	-3.6
Camp Station (782 m asl)	2009	-	-	-	-	-	-	-	10.5	6.2	-2.6	-13.6	-17.3	-
	2010	-17.1	-10.8	-6.9	1.1	8.3	12.1	13.6	12.1	4.4	-3.4	-13.5	-24.1	-2.0
	2011	-22.9	-21.3	-15.9	-3.2	7.7	11.5	12.8	9.2	5.1	-2.8	-20.7	M	-
	2012	-25.2	-12.2	-13.4	0.4	5.9	13.3	12.6	10.5	5.0	M	-24.1	-25.9	-
	2013	-21.6	-13.3	-15.5	-8.6	5.0	14.2	14.0	11.9	5.5	-2.5	-18.7	-26.7	-4.7
	2014	-14.9	-23.4	-13.8	-1.8	7.0	11.0	13.4	10.6	3.7	-3.5	-15.8	-15.2	-3.6
	2015	-19.4	-18.1	-11.5	-0.1	10.1	11.2	12.2	9.0	2.9	-1.5	-15.1	-15.2	-3.0
	2016	-13.1	-13.5	-5.1	2.3	8.2	12.4	13.6	11.5	4.1	-8.3	-13.7	-21.9	-1.9

Location	Year	Mean Temperature °C												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	2017	-19.6	-18.8	-17.2	-1.4	7.3	M	M	11.8	6.3	-4.1	-22.9	-16.6	-
	2018	-19.4	-24.3	-11.9	-3.7	5.9	11.8	13.8	9.9	1.9	-3.8	-12.8	-16.0	-3.9
	2019	-20.4	-23.1	-6.2	-0.9	8.7	13.0	15.2	8.6	5.3	-4.6	-14.4	-18.7	-3.1
	2020	-26.8	-20.2	-15.7	-3.4	7.0	10.9	11.9	11.1	4.8	-7.9	-19.7	-16.8	-5.4
	2021	-15.5	-25.6	-14.6	-5.4	5.9	14.1	13.9	10.9	3.7	-1.8	-17.0	-25.6	-4.8
	All Years	-19.7	-18.7	-12.3	-2.1	7.3	12.3	13.4	10.6	4.5	-3.9	-17.1	-20.0	-3.6

NOTES:
1. Values are calculated from average daily temperatures.
2. Data is considered missing for a month when there are less than 25 days of data available for that month (beginning of data record until end of 2021).
3. Monthly values in italics for the Potato Hills station, for the period of 2013 through 2015 have been infilled using monthly regression relationships with temperature data from the Camp station.
4. Monthly values in gray for the period of June 2014 to March 2015, May through July 2016, November 2019 and January to February 2020 were recorded by a standalone HOBO temperature sensor.
5. 'M' denotes data missing due to a sensor/datalogger malfunction.
6. Source: Lorax 2022a.

2.3 RAINFALL

For regional climate stations surrounding the Project site, mean annual precipitation varies appreciably with elevation. For example, mean annual precipitation ranges from 324 mm at the Mayo A station (504 m; situated approximately 50 km to the south of the Project) to 572 mm at the Keno Hill station (1,473 m; ~30 km southeast of the Project). An inspection of available data from regional climate stations indicates both precipitation phases exhibit increases with elevation, with the regional gradients averaging 5%/100 m of elevation gain for rainfall, 11%/100 m for snowfall, and an average mean annual precipitation gradient of 7%/100 m (Lorax, 2021). On an annual basis, total precipitation in the region is comprised of roughly 60% rainfall and 40% snowfall, noting proportions vary to some degree from station to station, but notably by elevation (Lorax, 2021).

Historically, precipitation data was collected at the Project site using tipping bucket rain gauges, which were not been adapted to measure snowfall. Therefore, the precipitation data presented in Table 2-4 is for rainfall only, collected between the months of March and October, inclusive. The precipitation gauges were replaced with all-season instruments (Geonor weighing cell gauges) in 2020, and thus these data accurately represent total solid phase precipitation. Generally, precipitation falls as snow from November through March, with precipitation falling as a mix of rain and snow in April and October. Rainfall data for March is included in the table below, where the temperature record indicates that precipitation would have fallen as rain (i.e., daily average air temperature was above zero).

Table 2-4: Project Site Monthly Rainfall Data

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Apr-Sep
Camp Station (782 masl)	2009	-	-	-	-	-	-	-	-	35.0	*8.0*	S	S	-	
	2010	S	S	5.0	9.0	20.0	62.0	34.0	28.0	25.0	*12.0*	S	S	195.0	178.0
	2011	S	S	11.0	10.0	16.0	31.0	75.0	44.0	40.0	*9.0*	S	S	236.0	216.0
	2012	S	S	13.0	1.0	22.0	18.0	74.6	29.8	24.0	*4.8*	S	S	187.2	169.4
	2013	S	S	8.6	10.4	34.6	25.6	28.4	35.2	58.6	*25.2*	S	S	226.6	192.8
	2014	S	S	5.4	8.8	9.2	52.8	43.2	70.4	28.8	*23.2*	S	S	241.8	213.2
	2015	S	S	20.8	13.0	8.2	28.8	64.0	62.0	38.6	*13.4*	S	S	248.8	214.6
	2016	S	S	6.2	4.4	14.0	32.6	55.0	31.0	25.6	*2.6*	S	S	171.4	162.6
	2017	S	S	S	2.2	24.4	M	M	12.8	20.4	*6*	S	S	-	-
	2018	S	S	12.0	1.4	63.2	49.4	1.6	34.4	4.6	*12.4*	S	S	179	154.6
	2019	M	M	M	M	M	M	M	M	M	M	M	M	-	-
	2020	M	M	M	M	M	156.2	165.7	89.7	71	60.9	46.3	28.5	-	-
	2021	27.0	23.7	16.4	12.6	82.5	39.0	83.2	154.4	107.3	58.9	36.0	41.7	682.6	479.0
	All Years Mean	S	S	10.9	7.3	29.4	49.5	62.5	53.8	39.9	19.7	41.1	35.1	263.2	220.0
	All Years Maximum	S	S	20.8	13.0	82.5	156.2	165.7	154.4	107.3	60.9	46.3	41.7	682.6	479.0
	All Years Minimum	S	S	5.0	1.0	8.2	18.0	1.6	12.8	4.6	2.6	36.0	28.5	171.4	154.6
Potato Hills Station (1420 masl)	2007	S	S	S	-	-	-	-	24.0	100.8	*2*	S	S	-	-
	2008	S	S	3.4	4.8	58.4	52.0	201.2	130.0	11.2	*1.2*	S	S	462.2	457.6
	2009	S	S	S	3.0	M	50.8	12.6	75.4	44.4	*1.2*	S	S	-	-
	2010	S	S	1.0	6.2	16.4	77.2	45.8	39.4	4.2	*5.4*	S	S	195.6	189.2
	2011	S	S	0.2	7.2	21.2	38.0	92.8	83.8	34.4	*0.4*	S	S	278	277.4
	2012	S	S	S	0.6	9.6	24.2	64.8	37.8	21.0	*4.6*	S	S	162.6	158.0
	2013	S	S	2.2	0.2	29.6	33.2	18.0	18.2	63.8	*10.0*	S	S	175.2	163.0
	2014	S	S	S	M	M	M	M	M	M	*M*	S	S	-	-
	2015	S	S	S	M	M	M	M	48.5	27.1	*10.0*	S	S	-	-

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Apr-Sep
	2016	S	S	D	D	14.5	23.0	38.3	42.6	24.6	*0.6*	S	S	-	-
	2017	S	S	D	D	16.2	25.8	46.3	21.8	53.0	*6.1*	S	S	-	-
	2018	S	S	D	D	D	46.5	13.5	77.0	4.0	*3.8*	S	S	-	-
	2019	S	S	D	D	D	D	18.5	D	D	D	S	S	-	-
	2020	S	S	D	D	D	101.2	103.5	68.5	63.7	44.2	18.3	19	-	-
	2021	*14.2*	21.0	58.7	10.9	60.3	29.8	68.2	112.3	66.4	43.5	15.6	25.1	526.1	347.9
	All Years Mean	S	S	13.1	4.7	28.3	45.6	60.3	59.9	39.9	10.2	17.0	22.1	254.7	265.5
	All Years Maximum	S	S	58.7	10.9	60.3	101.2	201.2	130.0	100.8	44.2	18.3	25.1	462.2	457.6
	All Years Minimum	S	S	0.2	0.2	9.6	23.0	12.6	18.2	4.0	0.4	15.6	19.0	162.6	158

NOTES:

1. Winter precipitation data (October through April in many years) are unreliable due to the majority falling as snow. The months where no rainfall was recorded due to freezing conditions are denoted by an ‘S’. The exception is after October of 2020, following the installation of an all-season Geonor precipitation gauge at both climate stations.
2. Data for the month of October are in italics, as rainfall is not measured for the entire month.
3. M’ denotes when there are less than 25 days of data available for that month.
4. In August 2015, the primary rain gauge at the Potato Hills Station was replaced by a standalone tipping bucket rain gauge. The replacement gauge is deployed each spring (i.e., in April or May) then decommissioned in the autumn (October). Missing data at Potato Hills Station denoted by ‘D’ indicate time periods during which the standalone tipping bucket rain gauge was not functioning.
5. February 2021 precipitation value is estimated from the difference between the Feb. 1 and Mar. 1 Potato Hills snow water equivalent values.
6. Source: Lorax 2022a

2.4 SNOW DEPTH

Snow data has been collected at three snow courses at the Project site. The snowpack surveys were conducted near each climate station since 2009 and a third station (in the area of the HLF) was added to the program in 2013. Sampled information included snow depth, snow density and snow water equivalent (SWE).

At the Project site, the annual maximum SWE value generally occurs in late-March or early-April. Field measurements from site show that snow density is generally lower earlier in the season, corresponding to colder temperatures, but increases through winter as the snowpack deepens, consolidates and as snow melt progresses.

The Potato Hills snow survey was conducted in the immediate vicinity of the weather station from 2009 to 2011. However, due to the exposed location, snow redistribution resulted in variable measurements, and therefore the survey was moved to its current and more sheltered location in 2012, several hundred metres to the south-east. Note that high snowpacks did not allow access to the Potato Hills snow course in March 2012, and therefore the survey was conducted at Stewart Gulch that year. In 2013, an additional snow survey station was established on the south-facing slopes near Ann Gulch. Snow surveys conducted at the Heap Leach Facility (HLF) in 2019 through 2021 were primarily above or below the diversion ditch established above Phase 1 of the HLF.

Field methods followed the survey techniques according to Yukon Environment (2009) and Ministry of Environment of British Columbia (MOE, 1981). Snow survey data is summarized in Table 2-5.

Collection of SWE, snow depth and density data in additional areas of the area of the HLF were initiated in 2021 (Table 2-6).

Table 2-5: Snow Survey Data

Year	Camp Station (782 m asl)				Ann Gulch (Snow Survey #2; 995 m asl)				HLF Station (1,078 m asl)				Potato Hills Station (1,420 m asl)			
	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)
2009	2009-04-21	69	112	16%	-	-	-	-	-	-	-	-	2009-04-21	126	410	33%
2010	2010-03-31	50	99	20%	-	-	-	-	-	-	-	-	2010-03-31	103	278	27%
	2010-04-21	69	112	16%	-	-	-	-	-	-	-	-	2010-04-21	126	405	32%
2011	2011-03-28	55	93	17%	-	-	-	-	-	-	-	-	2011-03-28	105	251	24%
2012	2012-03-20	78	161	21%	-	-	-	-	-	-	-	-	2012-03-20	99	237	24%
	2012-04-20	56.4	79	14%	-	-	-	-	-	-	-	-	2012-04-22	117	262	22%
2013	-	-	-	-	2013-02-20	69.6	97	14%	-	-	-	-	2013-02-28	95.6	185	19%
	2013-03-02	60.9	108	18%	2013-03-02	66.9	115	17%	-	-	-	-	-	-	-	-
	2013-04-02	59.3	108	18%	2013-04-02	61.8	117	19%	-	-	-	-	2013-04-03	90	190	21%
	2013-05-05	57.6	106	18%	2013-04-16	62.2	85	14%	-	-	-	-	-	-	-	-
	-	-	-	-	2013-05-03	58	105	18%	-	-	-	-	2013-05-05	116.8	167	14%
2014	2014-03-12	56.8	126	22%	2014-03-12	51	94	18%	-	-	-	-	2014-03-11	97.5	276	28%
	2014-04-02	54.6	100	18%	2014-04-02	46	98	21%	-	-	-	-	2014-04-02	96.2	275	29%
	-	-	-	-	-	-	-	-	-	-	-	-	2014-05-08	69.6	258	37%
2016	2016-03-02	53	118	22%	2016-03-02	52.6	117	22%	-	-	-	-	2016-03-02	95.4	214	22%
	2016-04-09	38	140	37%	2016-04-09	22.2	115	52%	-	-	-	-	2016-04-10	107.4	257	24%
	-	-	-	-	-	-	-	-	-	-	-	-	2016-05-03	95.0	226	24%
2017	2017-03-17	50.9	89	17%	2017-03-17	50.3	100	20%	-	-	-	-	2017-03-17	84.0	206	25%
	2017-04-13	46	117	25%	2017-04-13	30.1	82	27%	-	-	-	-	2017-04-13	98.0	244	25%
	2017-05-04	7	28	40%	2017-05-04	0	0	NA	-	-	-	-	2017-05-03	89.0	236	27%
2018	2018-02-28	53	100	19%	-	-	-	-	-	-	-	-	2018-02-28	85.1	203	24%
	2018-04-04	53.9	109	20%	-	-	-	-	-	-	-	-	2018-04-04	90.5	219	24%
	2018-05-16	-	-	-	-	-	-	-	-	-	-	-	2018-05-16	80.7	226	28%
2019	2019-03-02	48.3	94	20%	-	-	-	-	2019-03-02	56.2	119	21%	2019-03-02	78.7	205	26%
	2019-04-01	25.3	72	31%	-	-	-	-	2019-04-02	37.2	93	25%	2019-04-01	79.3	171	22%
	2019-04-30	0.0	0	-	-	-	-	-	2019-04-30	31.7	71	18%	2019-04-30	91.0	200	22%
	2019-05-16	0.0	0	-	-	-	-	-	-	-	-	-	2019-05-16	48.3	111	23%
	2019-06-01	0.0	0	-	-	-	-	-	-	-	-	-	2019-06-01	0.0	0	-
2020	2020-03-07	89.8	157	18%	-	-	-	-	2020-03-07	108.7	229	21%	2020-03-13	188.5	431	23%
	2020-04-05	93.9	199	22%	-	-	-	-	2020-04-10	108.1	262	24%	2020-04-10	140.5	297	21%
	2020-05-02	40.1	142	35%	-	-	-	-	2020-05-02	50.3	176	35%	2020-05-02	130.3	384	29%
2021	2021-01-15	51.2	74	15%	-	-	-	-	-	-	-	-	-	-	-	-
	2021-01-30	50.3	77	15%	-	-	-	-	-	-	-	-	2021-02-03	92.6	216	23%
	2021-02-26	63.1	108	17%	-	-	-	-	2021-02-26	75.3	140	19%	2021-02-28	100.1	237	24%
	2021-03-30	62.3	113	18%	-	-	-	-	2021-03-30	78.1	116	15%	2021-03-29	108.9	168	15%
	2021-04-28	38.0	95	26%	-	-	-	-	-	-	-	-	2021-04-28	95.6	230	24%
	-	-	-	-	-	-	-	-	-	-	-	-	2021-06-01	16.4	70	32%

NOTES:
1. Snow survey data for Potato Hills collected on 2012-03-20 is from the Stewart Gulch survey (Snow Survey #2) at 995 m asl (see Figure 2-1).
2. No snow surveys were conducted at site in 2015.
3. Snow survey data for the HLF collected on 2019-04-02 from above and below the diversion ditch.
4. Snow survey data for the HLF collected on 2019-04-30 from above the diversion ditch.
5. The Potato Hills Station SWE value for 2020-03-13 was estimated from the average March snow density value (22%) and the measured snow depth on this date, to correct for an error in the SWE measurements.

Table 2-6: Snow Survey Data for Heap Leach Facility Snow Courses Initiated in 2021

Year	Elevation (m asl)	Latitude (°)	Longitude (°)	Snow Survey	Survey Date	Depth (cm)	SWE (mm)	Density (%)
2021	1,370	64.0172	-135.8064	1370 Bench	2021-04-01	22.3	46	21%
	1,066	64.0429	-135.8335	HLF 3b (Bench)	2021-01-16	21.5	42	14%
				HLF 3b (Slope)	2021-01-16	29	52	18%
				HLF 3b (Bench)	2021-02-27	29.4	80	19%
				HLF 3b (Bench)	2021-03-30	27.5	72	17%
	1,049	64.0443	-135.8273	HLF 4b (Bench)	2021-01-16	96.2	247	26%
				HLF 4b (Slope)	2021-01-16	33.6	60	18%
				HLF 4b (Bench)	2021-01-30	93.9	302	32%
				HLF 4b (Bench)	2021-02-27	100.2	266	27%
				HLF 4b (Bench)	2021-03-30	105.9	297	28%
	1,048	64.0442	-135.8277	HLF 5b (Bench)	2021-01-16	67.4	121	18%
				HLF 5b (Slope)	2021-01-16	59	89	15%
				HLF 5b (Bench)	2021-01-30	62.1	124	20%
				HLF 5b (Bench)	2021-02-27	71.1	161	23%
				HLF 5b (Bench)	2021-03-30	75.9	188	25%

Continuous snow depth data has also been collected at the Camp climate station since 2012, as shown in Figure 2-3. The evolution of the snowpack for the 2012 to 2021 time-period shows the pack depth accumulation through the months of November and December, typically reaching maximum depth by mid-March each year. These data then show snowpack depth remains deep and relatively stable to April.

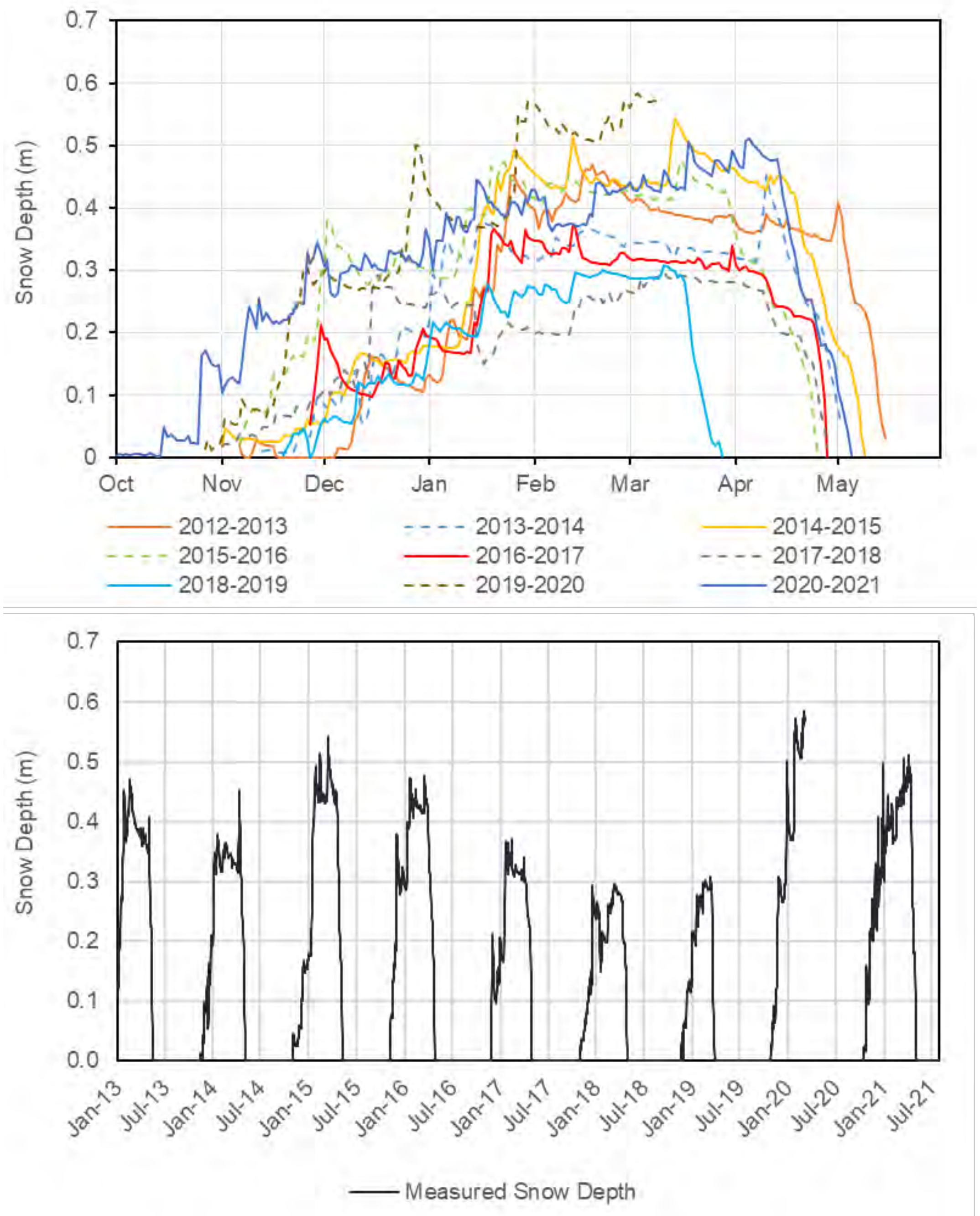


Figure 2-3: Summary of Continuous Snow Depth Data for the Camp Climate Station (2012-2021)

2.5 WIND SPEED AND DIRECTION

Wind speed and direction are measured on-site at the Potato Hills and Camp climate stations at 15-minute intervals and data are available for the period from August 2007 through December 2021 and August 2009 through December 2021, respectively. The Project site wind speed data are presented in Table 2-7.

The mean annual wind speed for Potato Hills and Camp is 2.5 m/s (9 km/hr) and 1.2 m/s (4.7 km/hr), respectively. The mean monthly wind speeds for both stations are higher in the spring, summer and autumn and lower in the winter. The maximum recorded gust speed at the Camp station was 23.5 m/s over a 15-minute interval (August 15, 2016). At the Potato Hills station, wind speeds averaged 23.5 m/s over a 1-hour period (November 3, 2010; 15-min maximum gust of 23.9 m/s). The predominant wind direction for Potato Hills and Camp is from the west-northwest and north to north-northwest, respectively.

Table 2-7: Project Site Monthly Average Wind Speed

Climate Station	Wind Speed (m/s)													
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station (782 masl)	2009	-	-	-	-	-	-	-	1.4	1.2	1.2	1.1	0.7	-
	2010	1.2	1.1	2.2	2.0	1.9	1.5	1.4	1.3	1.5	1.2	0.7	1.0	1.4
	2011	0.6	1.2	1.3	1.8	1.7	1.5	1.3	1.2	1.4	0.9	0.9	0.2	1.2
	2012	0.9	1.2	1.6	1.4	1.9	1.3	1.4	1.3	1.5	1.1	1.3	0.7	1.3
	2013	0.8	0.9	1.2	2.2	1.5	1.7	1.5	1.3	1.6	0.8	0.7	0.7	1.2
	2014	0.1	0.8	1.3	1.5	1.8	1.6	1.5	1.2	1.2	1.3	0.9	0.5	1.2
	2015	0.2	0.3	1.1	1.4	1.6	1.6	1.2	1.2	1.3	1.1	0.7	0.0	1.0
	2016	0.7	0.7	1.4	1.5	1.7	1.5	1.2	1.3	1.2	1.2	0.5	0.5	1.1
	2017	R	R	1.6	1.7	1.6	2.1	1.3	1.2	1.0	0.8	0.5	R	-
	2018	0.5	0.7	1.3	1.7	1.5	1.5	1.5	1.4	1.4	1.1	0.7	0.8	1.2
	2019	0.3	0.8	1.3	1.8	1.7	1.8	1.5	1.5	1.2	1.0	1.0	1.1	1.3
	2020	1.1	1.0	1.4	1.6	1.9	1.4	1.4	1.3	1.0	1.1	0.8	1.0	1.2
	2021	0.7	1.0	1.4	1.6	1.6	3.5	1.4	0.3	1.1	0.8	1.4	0.5	1.3
	Average	0.6	0.9	1.4	1.7	1.7	1.7	1.4	1.2	1.3	1.0	0.9	0.6	1.2
Potato Hills Station (1420 masl)	2007	-	-	-	-	-	-	-	2.3	2.3	3.0	3.0	0.8	-
	2008	2.8	3.7	3.6	3.6	3.6	3.1	3.1	2.8	1.7	1.3	2.6	3.1	2.9
	2009	3.2	2.5	3.2	3.0	3.1	2.7	2.9	2.0	2.0	3.4	2.3	2.1	2.7
	2010	2.1	2.1	3.9	3.6	2.7	2.0	2.6	2.7	3.0	2.8	1.5	1.0	2.5
	2011	2.0	3.2	3.4	3.2	3.4	2.0	1.8	2.3	1.2	0.4	2.0	1.4	2.2
	2012	0.0	0.2	1.4	2.0	2.9	1.8	1.9	2.0	2.9	2.5	2.6	0.7	1.7
	2013	1.7	0.7	2.9	4.8	2.6	2.3	2.5	1.8	2.9	2.2	2.1	2.2	2.4
	2014	1.6	2.6	2.5	3.0	2.7	M	M	M	M	M	M	M	-
	2015	M	M	M	M	M	M	0.9	1.8	2.5	1.4	0.0	0.0	-
	2016	1.3	2.7	2.8	M	M	M	M	2.1	2.1	1.6	1.3	0.6	-

Climate Station	Wind Speed (m/s)													
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	2017	2.2	2.8	2.5	3.1	2.6	2.5	M	M	M	M	1.6	1.0	-
	2018	2.8	2.7	2.7	3.2	M	M	M	M	M	2.5	0.7	M	-
	2019	0.7	M	3.0	3.1	M	2.8	2.0	M	M	M	M	M	-
	2020	M	M	M	2.7	M	2.3	2.5	2.4	2.6	2.2	2.5	2.7	-
	2021	2.3	M	2.6	3.1	2.7	2.9	2.1	2.4	2.0	2.9	3.9	2.6	2.9
	Average	1.9	2.6	2.9	3.2	2.9	2.4	2.2	2.2	2.3	2.2	2.0	1.5	2.5

Notes:

1. Zero value for January 2012 is likely due to icing of the wind sensor.
2. 'M' denotes data missing when there are less than 25 days per month due to a sensor malfunction and R an indicator the wind sensor affected by rime.
3. Source: Lorax 2022a

2.6 RELATIVE HUMIDITY

Relative humidity is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2021 and August 2009 through December 2021, respectively. The mean annual relative humidity for Potato Hills and Camp is 77% and 71%, respectively. The mean monthly relative humidity values for Potato Hills are lowest in the spring (62% to 67% in the months of March through May) and higher throughout the rest of the year (71% to 88% in the months of June through February). The mean monthly relative humidity values for Camp are lowest in the spring (56% to 65% in the months of March through May) and higher throughout the rest of the year (62% to 81% in the months of June through February). All monthly average relative humidity values from both climate stations are provided in Figure 2-4.

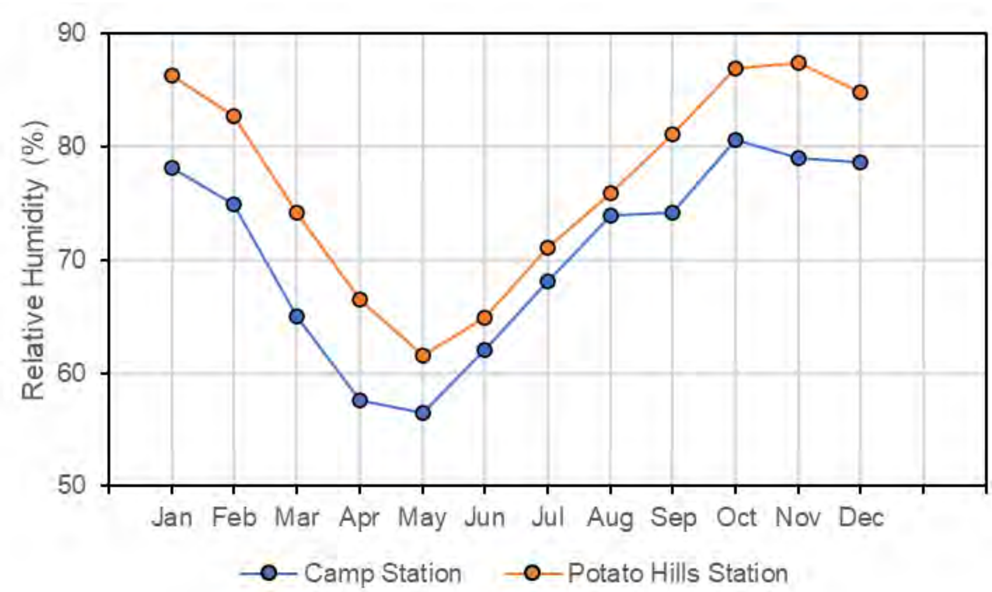


Figure 2-4: Average Monthly Relative Humidity for the Period of Record

2.7 BAROMETRIC PRESSURE

Barometric pressure is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2021 and August 2009 through December 2021, respectively. A standalone HOBO sensor measured barometric pressure at the Potato Hills station in January and February 2020, but malfunctioned thereafter, resulting in no further usable data collected in 2020 or 2021. Average barometric pressure data are collected on hourly increments at each of the project climate stations. Annual average barometric pressure is 84.9 kPa at the Potato Hills station, and 91.9 kPa at the Camp station. Barometric pressure tends to be highest in summer (May through August) with 85.6 kPa and 92.2 KPa recorded at the Potato Hills and Camp stations respectively and lowest during November, with 84.5 kPa and 91.6 kPa recorded at Potato Hills and Camp stations, respectively.

2.8 SOLAR RADIATION

Solar radiation is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2021 and August 2009 through December 2021, respectively. Given the high-latitude location of the Project site, day length, and therefore solar radiation, fluctuate greatly on a seasonal basis. The average annual minimum of 1 W/m^2 (Camp station) and 3 W/m^2 (Potato Hills station) occur in the month of December, while the average annual maximum of 227 W/m^2 and 218 W/m^2 occur in May and June at the Camp station and in May at the Potato Hills station, respectively. The Camp station location in the valley bottom results in slightly lower incident solar radiation, presumably due to the shading effect of the surrounding terrain.

2.9 POTENTIAL EVAPORATION

15-minute potential evaporation (PE) rates were computed for the Camp station using available climate and the Ref-ET calculator – a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record (January 2013 to December 2021), a 15-minute climate input file was prepared for the site (Lorax, 2022a). May to end-September PE for the Camp station is estimated to range from 367-448 mm with the Priestley-Taylor equation resulting in average PE estimates similar to values calculated using the Penman-Monteith equation. 2021 PE estimates using the Priestley-Taylor equation substantially exceeded the historical average, a similar result to that noted in the 2020 data following sensor servicing and calibration. A potential reason for this increase is the abnormally high solar radiation measured at Camp station during this period and the considerable influence exerted by solar radiation in the Priestley-Taylor equation. The highest monthly rates of PE are expected in May, June, July and August of each year.

2.10 AIR QUALITY

Ambient air quality is monitored at six locations across the Project which employ a variety of methods of collection at each site:

- Beta-Attenuation Particulate Monitors (EBAM) - collection of continuous active total suspended particulate matter (TSP), particulate matter less than 10 µm (PM_{10}), and particulate matter less than 2.5 µm ($PM_{2.5}$).
- Dustfall samplers - passive collection of dust for analysis of total particulates and metals.

- Passive air sampling systems (PASS) - collection of samples for analysis of nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), and ammonia (NH_3).
- Partisol monitoring for 6-day TSP and quarterly metals concentrations.

Air quality monitoring locations are described in Table 2-8 and shown in Figure 2-5.

Table 2-8: Air Quality Monitoring Station Locations

Monitoring Station	Dustfall Canister	Coordinates (Zone 8N)		Location	Parameter	Sampling Method	Sample Frequency
		UTM N	UTM E				
AQ1	D1	7,100,818	463,559	Exploration trail near Potato Hills weather station	Total Particulates, NO_2, SO_2, NH_3	Dustfall/ Passive	30 days
					Metals	Dustfall	91 days
AQ2B	D2B	7,100,976	458,254	Near the Camp Climate station and water quality station W27	TSP	Partisol	6 days
					Total Particulates, NO_2, SO_2, NH_3	Dustfall/ Passive	30 days
					Metals	Partisol/ Dustfall	91 days
AQ3	D3	7,099,088	460,583	Above Eagle Pit and PG WRSA	Total Particulates, NO_2, SO_2, NH_3	Dustfall/ Passive	30 days
					Metals	Dustfall	91 days
AQ4B	D4B	7,097,734	458,290	Rex Road near KM 42 and west side of HCR (previously labelled AQ5/D5 up to June 30, 2020)	Total Particulates, NO_2, SO_2, NH_3	Dustfall/ Passive	30 days
					Metals	Dustfall	91 days
AQ5B	D5B	7,095,942	457,864	Confluence of Lynx Creek and Haggart Creek (near W5) (established July 1, 2020)	Total Particulates, NO_2, SO_2, NH_3	Dustfall/ Passive	30 days
					Metals	Dustfall	91 days
EBAM	N/A	7,101,021	458,237	Near Camp station and south of Ditch C	TSP, PM_{10}, $PM_{2.5}$	EBAM	Hourly

NOTES:
1 - Dustfall samples have in some cases utilized the monitoring station identifier in Chain of Custody forms.
2 - Certain stations were relocated/renamed (denoted as a "B" station) as the monitoring program evolved. Station AQ4/D4 was decommissioned July 1, 2020. Station AQ5/D5 was renamed to AQ4B/D4B July 1, 2020. Station AQ5B/D5B was commissioned July 1, 2020.

2.10.1 Particulate Matter

Three EBAMs are installed west of the camp. The EBAM system includes real time data transmission that can be monitored remotely with daily summaries automatically generated by the associated software platform. In addition, site personnel complete routine checks and monthly maintenance. Routine measurements are taken on 15-minute intervals for TSPs, $PM_{2.5}$ and PM_{10}.

Recorded air quality results for particulate matter are summarized and compared to the Yukon Ambient Air Quality Standards (YAAQS) in Table 2-9. In 2019, there were two occurrences of TSP exceeding the 24hr standard, which occurred in May and June. $PM_{2.5}$ results exceeded the 24hr YAAQS 16 times, between the period of May to September. PM_{10} results exceeded the 24hr YAAQS 10 times, between the period of May to September. The surrounding Project area experienced a significant fire season in summer 2019 which may have contributed to the elevated concentrations measured. In 2020, no exceedances to the YAAQS were measured on the Project. In 2021, there were two exceedances of $PM_{2.5}$ in July and August and were attributed to summer forest fire smoke impacting the Project area.

Table 2-9: Particulate Matter Monitoring Results

Year	Parameter	Annual Ambient Air Quality Objectives (µg/m³)	Annual Results	24hr Ambient Air Quality Objectives (µg/m³)	24hr Results			No. of Exceedances
			Mean		Min	Max	Mean	
2019	TSP	60	5.0	120	-0.7	172.3	4.7	2
	PM_{10}	*	12.4	50	0.4	196.2	11.3	16
	$PM_{2.5}$	8.8	5.1	27	-0.7	172.3	4.6	10
2020	TSP	60	2.1	120	-0.6	17.6	1.7	0
	PM_{10}	*	6.1	50	-0.6	30.2	5.1	0
	$PM_{2.5}$	8.8	1.6	27	-0.6	17.0	1.3	0
2021	TSP	60	8.8	120	-2.0	77.9	8.7	0
	PM_{10}	*	5.2	50	-0.4	47.9	5.2	0
	$PM_{2.5}$	8.8	1.9	27	-0.7	43.9	1.9	2

NOTE:
*No Annual Ambient Air Quality Objectives outlined in the Yukon Standard.
All noted exceedances above are for 24hr standards only

2.10.2 Dustfall

Dustfall stations are located around the Project site adjacent to the five permanent vegetation plots (see Section 8.2). Measurements of dustfall commenced at the stations in January 2020. These dustfall stations utilize a passive collection method, whereby dust is allowed to settle in a container with a known surface area over a timed period. This simple method allows for the deployment of a greater number of cannisters over a broad area than may be feasible for active particulate monitors and may be used to identify relative hotspots around the site. Dustfall container samples are collected and submitted for total particulate laboratory analysis on a monthly basis. Dustfall monitoring results for 2020 and 2021 are presented in Table 2-10.

In 2020, all monitored dustfall stations met the 30-day standard with the exception of stations D3 and D4. Station D3 exceedances were noted for the months of March to May which contributed to the annual exceedance at the monitoring location. At the time these elevated dustfall rates were experienced, the 1,370 m asl elevation bench of the Platinum Gulch Waste Rock Storage Area was actively receiving waste rock and is directly adjacent to the dustfall station. Values returned to below standards following the end of active construction of the 1,370 bench. One exceedance at D4 also occurred in May and is believed to be attributed to the proximity of the station to the access road and typical spring road dust conditions; values returned to below the 30-day standard for the rest of the year. In 2021, only one exceedance of 30-day standard was recorded at station D4B in November.

Table 2-10: Dustfall Monitoring Results

Year	Month	Air Quality Permit Standard (g/m^2)	30-day Fixed Dustfall (g/m^2)[1]					
			D1	D2B	D3	D4	D5/D4B[2]	D5B
	January		0.30	0.72	0.45	1.17	1.35	Not commissioned
	February		N/A	0.69	1.65	1.17	0.90	
	March		0.30	0.99	**34.80**	2.04	2.13	
	April		0.42	0.33	**44.40**	1.17	1.29	
	May		0.30	1.98	**8.61**	**10.29**	4.38	
	June		0.33	0.99	2.07	1.23	0.42	
2020	July	7.0	0.30	0.90	2.52	Decommissioned	0.72	0.78
	August		0.30	0.63	0.75		0.30	0.60
	September		0.30	1.08	0.30		0.30	0.30
	October		0.30	1.47	1.44		1.77	1.44
	November		0.33	0.81	0.96		1.32	1.02
	December		0.30	0.72	0.30		4.83	2.43
	Annual	4.6	0.32	0.94	**8.19**		1.64	1.10
	January		0.30	0.48	0.45		0.87	0.84
	February		0.39	0.54	1.53		0.42	0.39
	March		0.33	0.87	4.11		2.04	1.95
	April		0.33	0.87	1.92		1.47	0.96
	May		0.30	1.38	1.23		1.41	1.05
	June		0.33	2.1	1.17		1.32	1.23
2021	July	7.0	2.73	0.84	2.88		0.9	0.66
	August		0.33	0.81	0.66		0.33	0.33
	September		0.3	0.66	0.42		0.36	0.33
	October		0.35	0.36	0.34		0.34	0.34
	November		0.34	0.71	0.53		**8.80**	4.59
	December		0.34	0.45	0.73		1.29	1.40
	Annual	4.6	0.53	0.84	1.33		1.63	1.17

NOTE:
1. Calculated 30-day and annual values assume the Method Detection Limit (MDL) value for results that were below MDL.
2. Station Renamed from D5 to D4B July 1, 2020
3. Values in bold indicate standard exceedance.
4. N/A indicates where sample was lost.

2.10.3 Metals

An active Partisol[TM] 2000i Air Sampler was installed adjacent to the EBAM air quality monitoring location and the metals analysis component of this monitoring method was initiated for the 2021 program with quarterly metals analysis. Metal analysis results for 2021 are presented in Table 2-11. All results were below the 24-hour standards, with only chromium measuring above method detection limits.

Table 2-11: Metals Monitoring Results

Year	Metal	24-hour Standard (µg/m³)	Concentration (µg/m³)			
			Q1	Q2	Q3	Q4
2021	Total Arsenic (As)	0.3	<0.0020	<0.0019	<0.0022	<0.0022
	Total Cadmium (Cd)	0.025	<0.0004	<0.0004	<0.0004	<0.0004
	Total Chromium (Cr)	0.5	0.0033	0.0031	0.0029	0.0066
	Total Copper (Cu)	50	<0.0012	<0.0011	<0.0013	<0.0013
	Total Lead (Pb)	2	<0.0012	<0.0011	<0.0013	<0.0013
	Acid Extractable Mercury (Hg)	0.2	<0.00001	<0.0001	<0.0001	<0.0001
	Total Nickel (Ni)	0.5	<0.0020	<0.0019	<0.0022	<0.0022
	Total Zinc (Zn)	120	<0.0201	<0.0192	<0.0219	<0.0219

2.10.4 Gaseous Constituents

A network of five Passive Air Sampling System (PASS) stations were launched on January 1, 2020. The PASS units monitor for trace levels of SO_2, NO_2 and NH_3 in ambient air based on a 30-day average. The results for 2020 and 2021 are provided below in Table 2-12. PASS results are reported in parts per billion (ppb) by the laboratory. The monthly values have been converted below to ug/m³. Results were either below instrument detection limits or well below the highest similar Yukon Ambient Air Quality Standards.

Table 2-12: SO_2, NO_2 and NH_3 Monitoring Results

Year	Month	Constituent	Concentration (µg/m³, 30-day)					
			AQ1	AQ2	AQ3	AQ4	AQ5 / AQ4B[1]	AQ5B
2020	January	NH_3 by Passive Sampler	0.28	0.21	0.63	0.28	<0.07	NA
		Calculated NO_2	<0.19	7.71	<0.19	6.77	4.32	
		Calculated SO_2	<0.26	<0.26	<0.26	<0.26	<0.26	
	February	NH_3 by Passive Sampler	<0.07	<0.07	<0.07	<0.07	0.14	
		Calculated NO_2	4.14	4.70	2.07	5.45	4.89	
		Calculated SO_2	<0.26	<0.26	<0.26	<0.26	<0.26	
	March	NH_3 by Passive Sampler	<0.07	<0.07	<0.07	<0.07	<0.07	
		Calculated NO_2	NR	0.94	6.39	0.75	1.13	
		Calculated SO_2	0.78	<0.26	0.52	<0.26	<0.26	
	April	NH_3 by Passive Sampler	0.21	0.14	0.35	0.28	0.56	
		Calculated NO_2	NR	<0.19	1.88	<0.19	<0.19	
		Calculated SO_2	<0.26	<0.26	<0.26	<0.26	<0.26	
	May	NH_3 by Passive Sampler	<0.07	<0.07	<0.07	<0.07	<0.07	
		Calculated NO_2	0.19	0.56	1.69	0.56	0.56	
		Calculated SO_2	<0.26	<0.26	<0.26	<0.26	<0.26	
	June	NH_3 by Passive Sampler	<0.07	<0.07	<0.07	<0.07	<0.07	
		Calculated NO_2	<0.19	<0.19	2.44	<0.19	<0.19	

Year	Month	Constituent	Concentration ($\mu g/m^3$, 30-day)					
			AQ1	AQ2	AQ3	AQ4	AQ5 / AQ4B[1]	AQ5B
		Calculated SO_2	<0.26	<0.26	<0.26	<0.26	<0.26	
	July	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	<0.07
		Calculated NO_2	0.38	0.19	3.20		0.38	<0.19
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	August	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	<0.07
		Calculated NO_2	<0.19	0.38	1.50		0.38	<0.19
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	September	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	<0.07
		Calculated NO_2	0.56	0.75	2.26		1.13	0.38
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	October	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	<0.07
		Calculated NO_2	0.56	3.01	2.07		2.82	2.63
		Calculated SO_2	0.26	<0.26	0.52		0.26	<0.26
	November	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	<0.07
		Calculated NO_2	NR	8.09	1.88		7.90	4.70
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	December	NH_3 by Passive Sampler	8.48	<0.07	1.39		<0.69	<0.69
		Calculated NO_2	0.56	8.09	1.13		6.39	6.02
		Calculated SO_2	0.26	0.52	0.26		<0.26	<0.26
2021	January	NH_3 by Passive Sampler	<0.069	<0.069	<0.069		<0.069	<0.069
		Calculated NO_2	0.75	7.90	1.69	NA	6.21	3.95
		Calculated SO_2	<0.262	<0.262	0.52		0.26	<0.262
	February	NH_3 by Passive Sampler	<0.069	<0.069	<0.069		<0.069	<0.069
		Calculated NO_2	0.75	7.90	2.82		6.21	2.45
		Calculated SO_2	0.26	<0.262	<0.262		<0.262	<0.262
	March	NH_3 by Passive Sampler	<0.069	<0.069	<0.069		<0.069	<0.069
		Calculated NO_2	<0.188	2.63	0.94		2.26	0.56
		Calculated SO_2	<0.262	0.26	<0.262		<0.262	<0.262
	April	NH_3 by Passive Sampler	0.76	0.56	0.63		0.35	0.28
		Calculated NO_2	<0.188	<0.188	0.19		<0.188	<0.188
		Calculated SO_2	<0.262	<0.262	<0.262		<0.262	<0.262
	May	NH_3 by Passive Sampler	<0.069	<0.069	<0.069		<0.069	<0.069
		Calculated NO_2	<0.188	1.50	1.13		1.13	<0.188
		Calculated SO_2	0.52	0.26	0.52		0.79	0.52
	June	NH_3 by Passive Sampler	<0.069	<0.069	<0.069		<0.069	<0.069
		Calculated NO_2	<0.188	0.94	0.94		0.75	<0.188
		Calculated SO_2	0.52	0.26	1.31		0.52	0.79
	July	NH_3 by Passive Sampler	0.42	0.21	<0.07		<0.07	0.21
		Calculated NO_2	0.38	0.56	1.32		0.38	<0.19
		Calculated SO_2	0.26	0.79	0.26		<0.26	<0.26

Year	Month	Constituent	Concentration ($\mu g/m^3$, 30-day)					
			AQ1	AQ2	AQ3	AQ4	AQ5 / AQ4B[1]	AQ5B
	August	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	0.14
		Calculated NO_2	0.38	0.75	1.88		1.13	0.38
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	September	NH_3 by Passive Sampler	0.56	0.56	<0.07		0.70	0.70
		Calculated NO_2	<0.19	0.94	0.56		1.32	0.19
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26
	October	NH_3 by Passive Sampler	<0.07	<0.07	<0.07		<0.07	0.07
		Calculated NO_2	1.69	2.26	0.38		2.26	0.75
		Calculated SO_2	<0.26	0.26	<0.26		0.79	0.79
	November	NH_3 by Passive Sampler	<0.07	0.28	0.21		0.35	0.28
		Calculated NO_2	<0.19	5.08	1.50		3.95	2.45
		Calculated SO_2	0.26	0.52	0.26		0.26	<0.26
	December	NH_3 by Passive Sampler	<0.07	<0.07	1.18		0.21	0.34
		Calculated NO_2	0.38	9.78	1.69		10.53	8.46
		Calculated SO_2	<0.26	<0.26	<0.26		<0.26	<0.26

NOTE:

1. Station Renamed from D5 to D4B July 1, 2020
2. NR – no result;
3. NA – Station either not yet commissioned or has been decommissioned

Legend:

- Active Air Quality Monitoring Station
- Deactivated Air Quality Monitoring Station
- Camp Climate Station
- Potato Hills Climate Station
- Major Facility
- Site Power
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 0.5 1
Kilometers

Projection: NAD 83 UTM Zone 8N	Drawn By: HC
Date: 2020/11/16	Figure: 2-5

EAGLE GOLD MINE YUKON TERRITORY

Air Quality Monitoring Locations

3 GEOLOGY AND SOILS

3.1 PHYSIOGRAPHY

The Project is situated within the Yukon Plateau North Ecoregion. Nearly all terrain in the ecoregion lays above 900 m asl, with the majority between 1,200 and 1,700 m asl. The majority of the Project site lies within the Dublin Gulch watershed which flows into Haggart Creek and eventually feeds into the McQuesten River. Elevations in the vicinity of the Project range from approximately 730 m asl near the confluence of 15 Pup and Haggart Creek, to about 1,525 m asl at the summit of the Potato Hills which forms the eastern boundary of the Dublin Gulch watershed. The Ecoregion is broken into tablelands by a network of deeply cut broad valleys. While some of these tablelands are remarkably level and non-dissected, with streams flowing at relatively gentle gradients in open valleys, the areas north of the McQuesten River, do not share these features. Instead the majority of the Project area was un-glaciated during the last glacial period (Bostock 1965), and has not been glaciated for more than 200,000 years (Figure 3-1). Much of the Project area displays physiographic characteristics of the unglaciated areas of the region, with narrow, V-shaped valleys and rounded upland surfaces. The valleys are deep and narrow to the head of streams, where they rise steeply and end abruptly.

Despite the extensive time since glaciations, evidence of glacial–ice action is still visible. This historic glaciation is responsible for the formation of the tributaries of Dublin Gulch with cirque-like headwaters, including from east to west, Cascallen, Bawn Boy, Olive, Ann, Stewart, Eagle, Suttles and Platinum Gulches (Figure 3-1). Within these gulches the post-glacial terrain has been modified by gravity, water, and freeze-thaw mechanics, as evidenced by many headscarps of ancient landslides, and observed rock and debris slides. While most of the mass wasting is historic, there are a few areas of ongoing rock fall that continue to modify the terrain, particularly in the Stewart, Bawn Boy, and Olive Gulches. These active areas of rock fall exist generally in the eastern portion of the Local Study Area and outside of the Project area.

3.2 SURFICIAL GEOLOGY AND SOILS

3.2.1 Surficial Geology

The surficial geology of the Project area has been substantially affected by historic glaciation over 200,000 years ago, including two major glaciation episodes in the Quaternary period; the pre-Reid (~2.5Ma-400ka BP) and the Reid (~200 ka BP) (Bond 1997; 1998a; b). Glacial limits are provided in Figure 3-1. In each case, ice likely originated from the Ogilvie and Wernecke Mountains, with glaciations being more extensive during the pre-Reid period.

Preservation of pre-Reid glacial deposits and landforms is rare. A few intact deposits and diorite erratics at high elevations are the only records left (Bond 1998a). Glacial deposits from the Reid glaciation are moderately preserved. Colluvium, alluvium, and small areas of shallow organics drape the Reid glacial sediments and the interglacial sediments throughout the area.

Dominant surficial materials within the Local Study Area (LSA) are weathered bedrock and colluvium. Competent bedrock outcrops are rare, as sufficient geologic time has passed to allow extensive weathering of exposed rock. In the larger RSA, the dominant material is colluvium, while along the McQuesten Road sections of the RSA, some of the surficial materials are largely coarse-textured fluvial deposits due to the proximity of the road to the river.

3.2.2 Soils

The largest influence on soil development in the area of the Project is climate, and the resulting permafrost which is discontinuous throughout the area. Despite over 200,000 years of soil development, pedogenic processes have been slow due to the cold climate and to the short growing season for vegetation, resulting in a predominance of ice-affected and relatively undeveloped soils (Cryosols and Brunisols).

Non-frozen soils encountered in the area of the Project include Brunisols, minor areas of Luvisols (on fine-textured till), and Gleysols (on poorly and imperfectly drained materials). The majority of the soil textures in the area are sandy-silt to silty-sand loam matrix with angular or tabular coarse fragments ranging from gravels to boulders.

Rooting depths are on average 50 cm, but can reach depths of over 120 cm. Baseline arsenic levels are naturally high in the soil as arsenic is often associated with gold bearing anomalies in the region reflecting the natural mineralization of the Project area. The naturally high arsenic concentrations in soils are not reflected as relatively high in the plant tissues and do not limit soil reclamation suitability. This incongruity may be related to the bioavailability associated with arsenic speciation (Laberge, 2020c).

Results from the recent soils monitoring programs indicate that, consistent with prior characterization programs, the soils at the Project are relatively nutrient poor. The soil samples were also analyzed for pH and a suite of 36 metals. The results of the 2020 soil monitoring program are presented in Table 3-1, including comparison with the most recent Canadian Council of Ministers of the Environment (CCME) guidelines, and the Yukon Contaminated Sites Regulations (CSR) for agriculture and parklands. Arsenic exceeded the recommended guidelines at all of the sites. Arsenic soil concentrations have also exceeded the CCME and CSR guidelines in the samples collected in 2018 (Laberge, 2018) and 2019 (Laberge, 2019), and as noted above, this is most likely attributed to the naturally high arsenic found in the mineralized zones throughout the region.

Chromium concentrations at D-3 exceeded the CSR guideline for agriculture but met the other guidelines. All of the recommended guidelines for chromium were exceeded in the soil collected from D-4B. The CSR and CCME agriculture guidelines for molybdenum was exceeded at D-4B. The CCME guideline for nickel was slightly exceeded at D-3 and D-4B. Soil samples have been collected on two occasions at all sites except for D-5.

Soil samples are collected in different locations of the 200 m^2 area of each site throughout the duration of the sample period (25 years). Changes in concentrations in the soil may not necessarily reflect effects from Project emissions as the differences could be attributable to localized mineralization at a particular place or other contributing factors. This seems to be the situation at D-4B where the concentrations of many of the parameters are very different between the two years. Several metals had much higher concentrations near the east plot, notably aluminum, antimony, arsenic, chromium, cobalt, iron, lead, lithium, mercury, molybdenum, vanadium and zinc. Conversely, concentrations of calcium, phosphorus, selenium, silver, sodium and strontium were higher near the north plot.

The remaining concentrations at all sites were well below the referenced guidelines.

Table 3-1: Results of 2020 Soil Monitoring Compared to CCME and Yukon CSR

Element	CCME (mg/kg)		Yukon CSR (mg/kg)		D-1	D2B	D-3	D4B	D-5
	Agriculture	Parkland	Agriculture	Parkland					
pH	-	-	-	-	5.28	5.07	4.59	5.71	6.6
Antimony (Sb)	20	20	20	20	9.57	3.01	5.13	7.41	16.4
Arsenic (As)	12	12	15	15	20.4	95.7	83.5	33.4	92.7
Barium (Ba)	750	500	750	500	180	156	153	139	71.7
Beryllium (Be)	4	4	4	4	0.57	0.38	0.41	0.28	0.23
Cadmium (Cd)	1.4	10	1.5	1.5	0.185	0.214	0.33	0.34	0.302
Chromium (Cr)	64	64	50	60	32.2	19.1	52.7	121	13.5
Cobalt (Co)	40	50	40	50	8.18	8.25	9.89	10.8	10.4
Copper (Cu)	63	63	90	90	27.5	19.7	28.2	22.1	23.9
Lead (Pb)	70	140	100	100	45.2	17.6	21.5	29.5	32.9
Mercury (Hg)	6.6	6.6	0.6	15	0.0403	0.0373	0.0287	0.0663	0.0229
Molybdenum (Mo)	5	10	5	10	1.41	0.85	1.92	7.51	0.59
Nickel (Ni)	45	45	150	150	25.6	20.3	46.4	68.5	22.6
Selenium (Se)	1	1	2	1	0.45	0.23	0.24	0.31	<0.20
Silver (Ag)	20	20	20	20	0.11	0.19	0.13	0.22	0.22
Thallium (Ti)	1	1	2	-	0.203	0.141	0.18	0.088	0.094
Tin (Sn)	5	50	5	50	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium (U)	23	23	-	-	1.34	0.966	0.877	0.955	0.926
Vanadium (V)	130	130	200	200	53.1	29.3	41.6	29.3	13.9
Zinc (Zn)	250	250	150	150	111	52.3	77.6	75	84.1

NOTES:

1. Exceedance of any guideline is shaded in grey.
2. Source Laberge 2020.

3.2.3 Permafrost

The project site is located in a region of widespread discontinuous permafrost (Brown, 1979). On the regional scale, permafrost distribution is typically controlled by mean annual temperature and precipitation, whereas on a local scale it is controlled by vegetation, surface sediments, soil moisture, slope aspect, and snow depth. Within the project area, frozen ground occurs typically on north- and east-facing slopes at higher elevations, and within poorly drained areas lower in the valleys. The distribution and thickness of frozen ground is highly variable across the site.

Frozen ground, when observed, is generally encountered immediately below the organic cover. Ground temperatures have been measured with thermistors installed on site in 1995-1996, and 2009-2012. The measured ground temperatures showed the frozen ground to be relatively warm when observed, typically between 0°C and -1°C.

Detailed investigations into the presence, distribution, thickness and temperature of permafrost across the project site and in specific areas where development could occur were conducted in 1995 (Knight Piesold 1996a and 1996b), 1996 (Sitka Corp, 1996), and from 2009 to 2013. Results of these more recent studies are described and summarized in BGC (2010, 2011, 2012a, 2012b, 2012c and 2012d). A total of thirteen thermistor strings were installed in test holes around the site between 2009 and 2019 and continue to be monitored as part of the EMSAMP.

3.3 BEDROCK GEOLOGY

3.3.1 Regional Geology

The Eagle Gold deposit is located within the Tintina Gold Province, an area of more than 150,000 km^2 covering parts of Alaska and the Yukon (Figure 3-2). The TGP is defined by more than 15 individual gold belts and districts traditionally mined for their placer resources and more recently recognized for their lode gold potential. Technological advances in heap leach mining have allowed for economically successful recovery of gold at sub-arctic operations such as Fort Knox and Brewery Creek (SRK 2014). The geology of the Eagle Gold Project is provided in a number of references including that of Brown et al. (2001), Goldfarb et al. (2007), Wardrop (2009).

The Project is underlain by Proterozoic to Lower Cambrian-age Hyland Group metasediments and the Cretaceous intrusive Dublin Gulch granodioritic stock. The granodiorite stock is elongate, measuring approximately 5 km in length and trends 070°. It has a maximum width of approximately 2 km. The long axis of the stock is coincident with the axis of the interpreted Dublin Gulch anticline. Sheet-like sills of granodiorite extend from the stock and cut the metasedimentary strata at low angles (Figure 3-3).

The stock has been dated at approximately 93 million years, and is therefore a member of the Tombstone Plutonic Suite. The Hyland Group is composed of interbedded quartzites and phyllitic metasedimentary rocks. The quartzites are variably gritty, micaceous, and massive. Phyllitic metasediments are composed of muscovite-sericite and chlorite. Limestone units are a relatively minor constituent of this stratigraphic sequence and are not significant in the contact zone around the Eagle deposit. The metasedimentary rocks dip at various angles, although all generally dip to the North. Hyland Group rocks take on a more easterly and steeper dipping orientation north of an as yet undefined structure, probably a fault, which runs along the course of Dublin Gulch. Some vein associated mineralisation is found in the Hyland Group but again not in significant amounts in the area local to the Eagle Zone.

The Dublin Gulch stock is comprised of four phases, the most significant of which is granodiorite. Quartz diorite, quartz monzonite, leucogranite and aplite comprise younger intrusive phases that occur predominantly as dikes and sills and cut both the granodiorite and surrounding country rocks. The stock has intruded the Hyland Group metasediments near their contact with the underlying Upper Schist.

Mineralisation in the Eagle Zone consists of sheeted quartz vein systems of differing densities which host gold. Additional to this, disseminated, lower grade gold is found throughout the intrusive body and is associated with arsenopyrite mineralisation, with minor pyrite/pyrrhotite. A model for the mineralisation style was published by Craig Hart in 1999 which describes a ‘Reduced Intrusion-Related Gold System (RIRGS) which also applies to the Fort Knox deposit in Alaska.

3.3.2 Deposit Geology

Geologically the deposit can be simplified and described as an intrusive suite, predominantly granodiorite in composition, emplaced within a metasediment package, predominantly phyllitic in nature. The granodiorite has been subdivided into three units, an oxidized unit, an altered unit, and an unaltered unit. Alteration tends to be dominated by albite, potassium feldspar, sericite, carbonate and chlorite and only occurs very locally around veining. While mineralization is associated with the intrusive stock, it is not spatially limited to the intrusive. Gold-bearing veins are found in all of the main geological units including the metasediments.

Gold occurs primarily as pure gold in association with very small amounts of metallic bismuth (Bi) and arsenopyrite (FeAsS). Other vein minerals include pyrite/marcasite (FeS_2) > pyrrhotite ($Fe_{1-x}S$) >>sphalerite ([Zn,Fe]S), chalcopyrite ($CuFeS_2$), galena (PbS), molybdenite (MoS_2) and iron oxides/hydoxides as well as metallic bismuth, Pb-Sb-(Cu,Zn) sulphosalts (e.g. bournonite ($PbCuSbS_3$) and boulangerite ($Pb_5Sb_4S_{11}$) and tetrahedrite ($Cu_{12}Sb_4S_{13}$).

3.3.3 Geochemical Characterization

3.3.3.1 Bedrock

Acid rock drainage and metal leaching (ARD/ML) evaluations to support the environmental assessment and water licensing processes were initiated by VGC in 2007 and are described and summarized by SRK (2013 and 2014). Previous to that, a comprehensive characterization program was conducted by New Millennium Mining Ltd to support a Feasibility Study in 1995/1996 (Lawrence 1997).

The objectives of the characterization program were to provide an assessment of the geochemical behaviour of proposed facilities (i.e., waste rock piles, pit walls, and heap leach facility) associated with the Project and to support engineering decisions and mitigation measures as required. Specifically, for each of these site components, the program focused on the quantification, description and assessment of:

- acid generation and neutralization potential,
- solids metal chemistry,
- mineralogy,
- metal leaching potential,
- rate of sulphide mineral oxidation,
- rate of depletion of neutralization potential,
- relative rate of depletion of neutralization potential compared to acid potential, and
- release rates of elements for input into water quality predictions.

Characterization of the metasediments and granodiorite indicated that carbonates, predominantly calcite, were generally well in excess of sulphides. Calcite content was generally 1 to 4% (from X-ray diffraction) whereas sulphur was most often less than 0.5% (from Leco S and ICP-S). Static testing showed a strong propensity towards non-acid generating conditions with the large majority of samples tested having a neutralization potential to acid potential ratio above 4. Acid rock drainage, or ARD, is therefore not anticipated for the Project.

Kinetic testing based on humidity cell testing and a field barrel program indicate that, although pH conditions are expected to be neutral, some metal leaching may still occur. This may include leaching of sulphate, arsenic, cadmium, manganese, antimony, selenium and uranium, and potentially fluoride, iron, lead, molybdenum, and zinc.

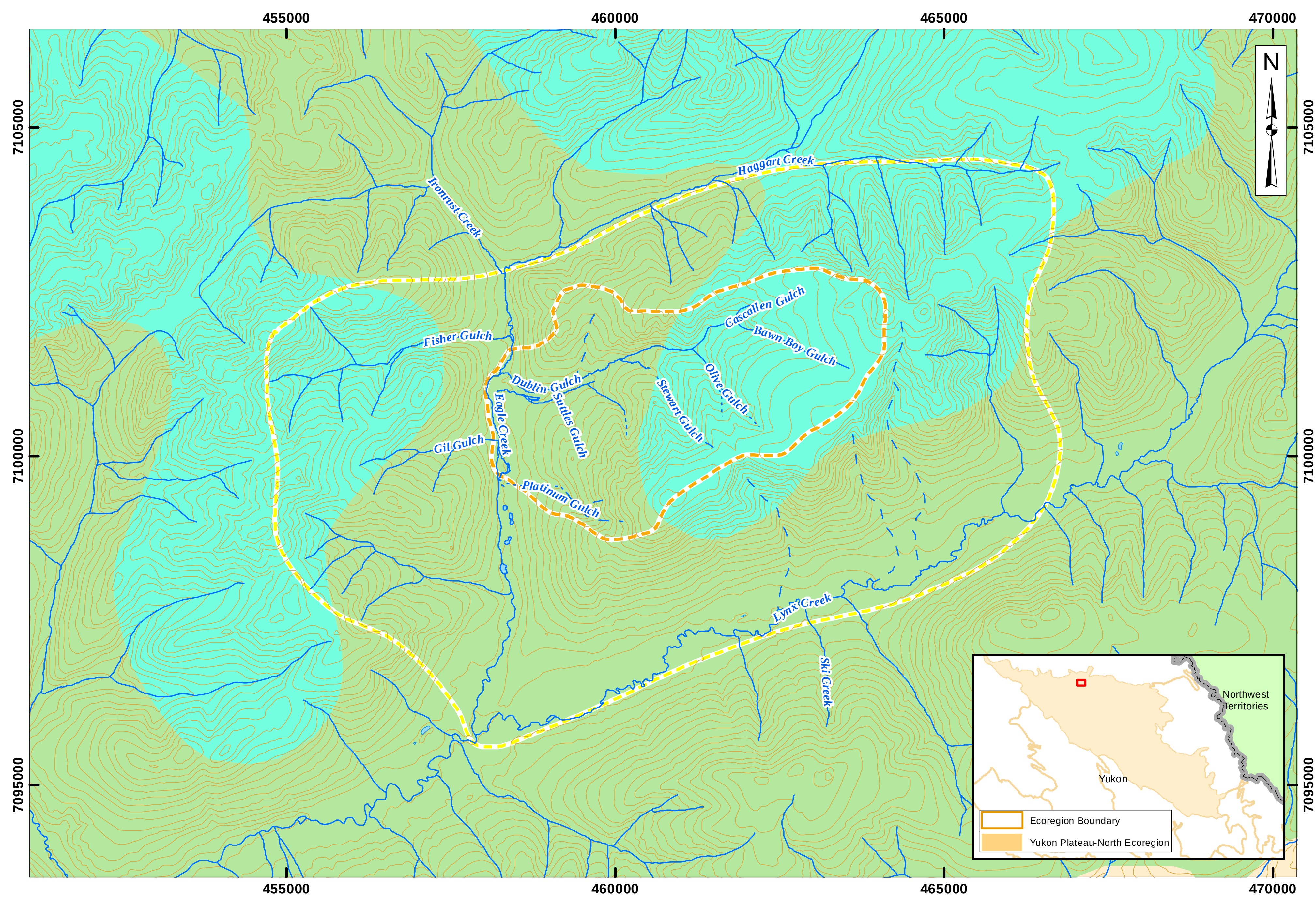
3.3.3.2 Construction Materials

Construction material sampling is undertaken with the purpose of characterizing the geochemistry of proposed excavation areas and borrow sources. A program conducted prior to the construction phase of the Project included 32 samples from the proposed site roads, 19 from placer tailings and alluvium borrow sources, and 19 from potential cut and fill (excavation) areas. Most of these samples (n=66) were from surficial materials, five were from metasedimentary bedrock, and one was from a granodiorite outcrop.

The paste pH for the samples ranged from 4.6 to 8.6 (median values of 6.6). The samples typically had low sulphur and low NP and TIC levels. This is in contrast to the characterization work from the deposit area that states NP in the form of carbonate minerals was present in modest amounts throughout the deposit area (SRK 2010). Based on having a sulphur content of <0.02%, 65% of samples were considered non-reactive. For the remaining samples, based on NP/AP or TIC/AP ratios, 7 to 14% were PAG, 11 to 14% had an uncertain potential for ARD, and 10 to 14% were non-PAG.

During construction activities in 2018 and 2019, 26 and 14 samples, respectively, were collected from various borrow locations to determine if the materials met the geochemical criteria established by the regulatory approvals for construction grade rock. All samples collected met the criteria required for construction or fill purposes, with a pH of at least 5.0, an NP:AP ratio of at least 3:1, and a total sulphide sulphur content of no greater than 0.3%. Samples ranged in pH from 6.6 to 9.2, with a median of 8.1 in 2018 samples and 8.4 in 2019 samples, with Sulphur content ranging from non-detect at < 0.01% to 22% in 2018 samples 0.04% in 2019 samples and a median of 0.02 in 2018 samples and 0.025 in 2019 samples.

During 2020, there were two construction projects that required borrow or fill material: the continuation of the PG Waste Rock Storage Area (WRSA) rock drain construction, and the placement of rip rap material in Ditch B. During 2021, there was one construction project, the EP WRSA rock drain. All samples were analyzed to determine suitability as construction grade material. Results from samples met the criteria required for construction or fill purposes In 2020, samples ranged in pH from 6.88 to 7.85, with a median of 7.41, with Sulphur content ranging from 0.02% to 0.1% and a median of 0.006, as well in all cases, the NP:AP ratio was greater than 3. In 2021, samples ranged in pH from 7.9 to 8.21, with a median of 8.01, and with Sulphur content ranging from <0.01% to 0.06% and a median of 0.033, as well in all cases, the NP:AP ratio was greater than 3.



Legend:

200 Thousand years ago (Reid Glaciation)

3 Million years ago (Pre-Reid Glaciation)

Soils and Vegetation Local Study Area

Soils and Vegetation Regional Study Area

Contour (100ft)

Perennial

Ephemeral

Intermittent

VICTORIA GOLD CORP

0 0.5 1 2 Kilometres

Projection: NAD 83 Zone 8N

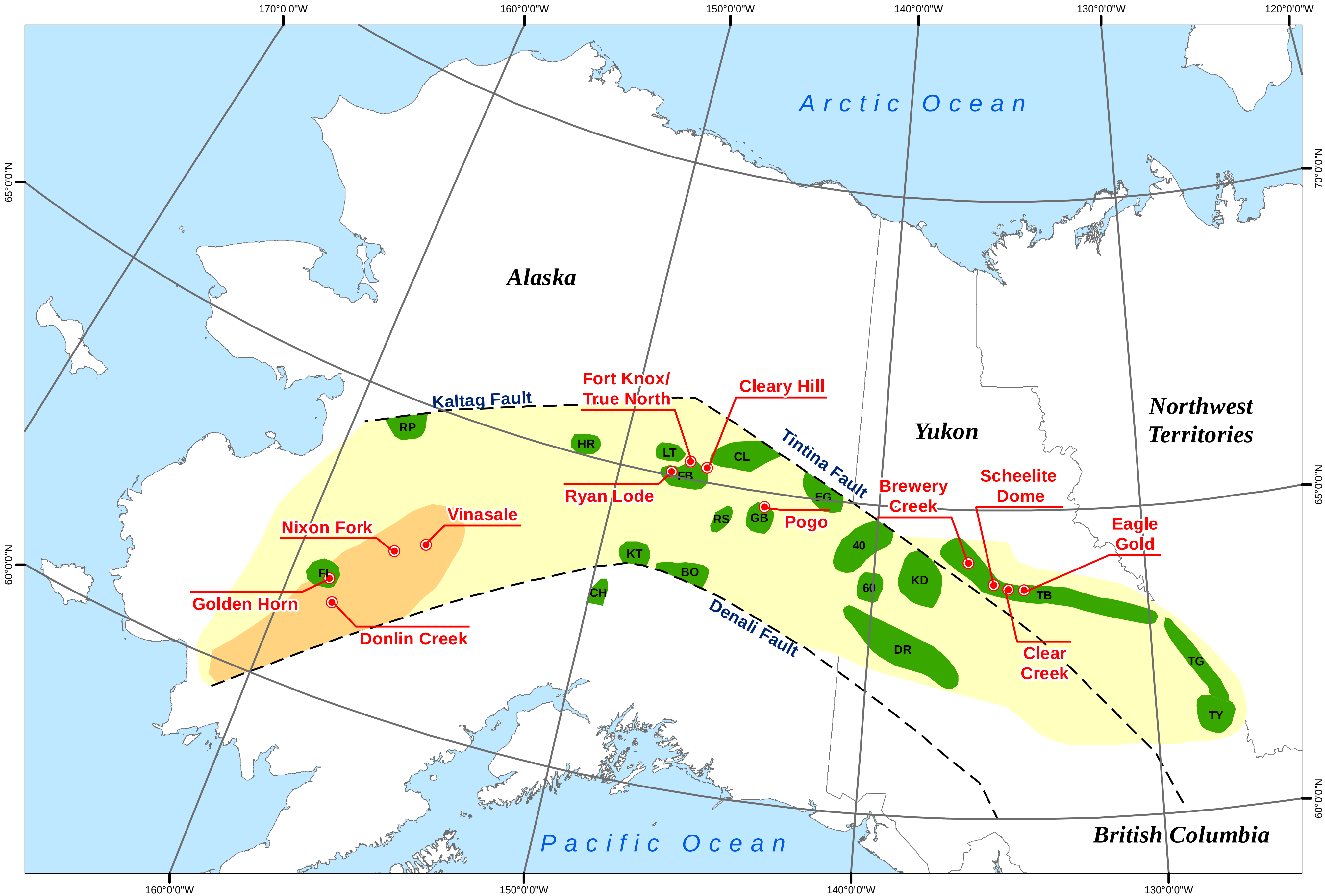
Drawn By: HC

Date: 2020/06/01

Figure: 3-1

EAGLE GOLD PROJECT YUKON TERRITORY

Regional and Local Study Areas with Glacial Limit Extents



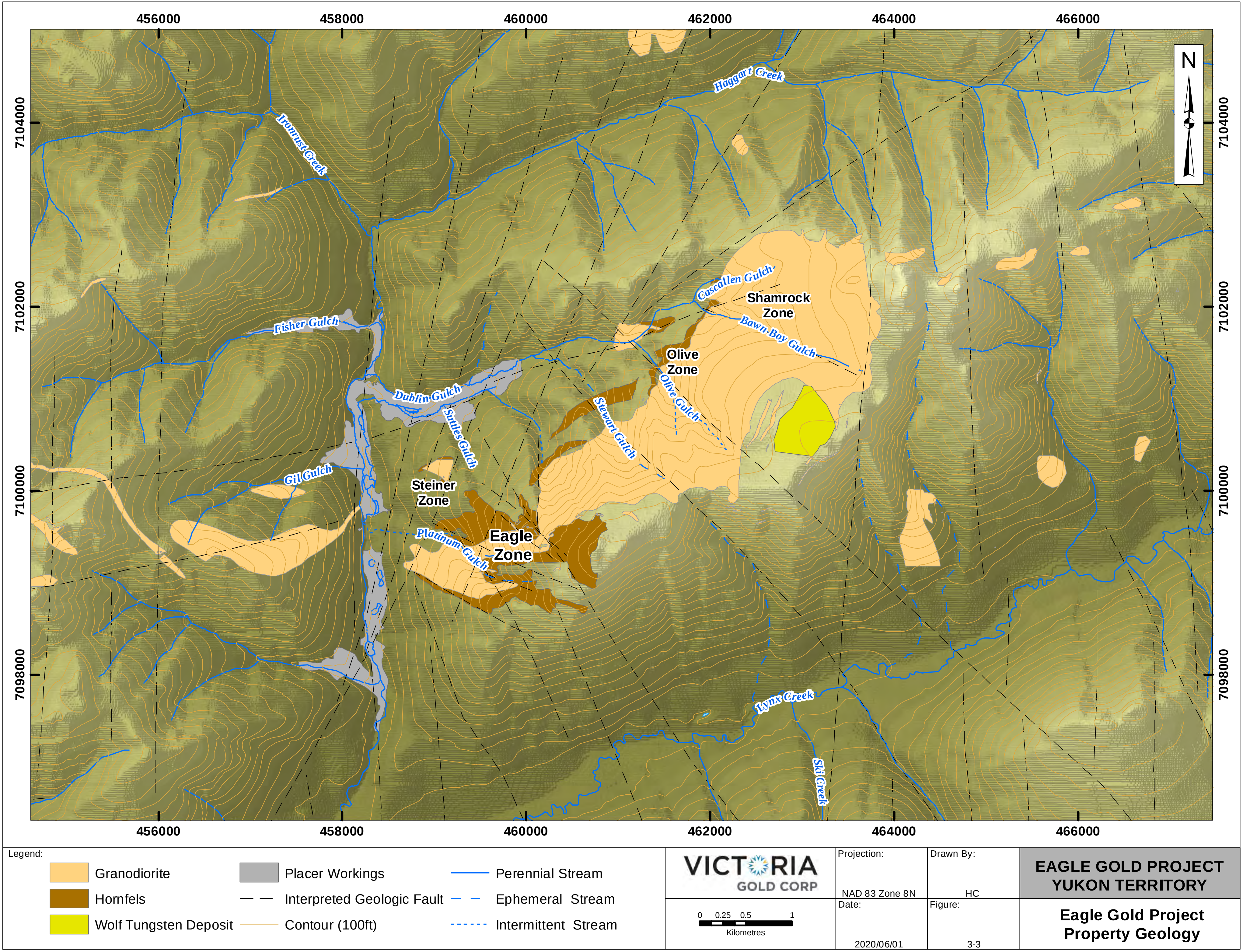
Legend:

- Major Mineral Deposit
- Kuskokwim Basin
- Major Geologic Fault System
- Tintina Gold Belt
- Mining or Placer District

VICTORIA GOLD CORP

0 50 100 200
Kilometers

Projection:	Drawn By: HC	EAGLE GOLD PROJECT YUKON TERRITORY
Date: 2020/06/01	Figure: 3-2	Main Gold Districts of the Tintina Gold Province


456000
458000
460000
462000
464000
466000
7104000
7102000
7100000
7098000
N
Haggart Creek
Ironrust Creek
Fisher Gulch
Cascallen Gulch
Shamrock Zone
Bawn-Boy Gulch
Olive Zone
Olive Gulch
Dublin Gulch
Stewart Gulch
Suttles Gulch
Gil Gulch
Steiner Zone
Eagle Zone
Platinum Gulch
Lynx Creek
Ski Creek
Legend:
Granodiorite
Hornfels
Wolf Tungsten Deposit
Placer Workings
Interpreted Geologic Fault
Contour (100ft)
Perennial Stream
Ephemeral Stream
Intermittent Stream
VICTORIA GOLD CORP
0 0.25 0.5 1
Kilometres
Projection:
NAD 83 Zone 8N
Drawn By:
HC
Date:
2020/06/01
Figure:
3-3
EAGLE GOLD PROJECT
YUKON TERRITORY
Eagle Gold Project
Property Geology

4 GROUNDWATER

Hydrogeologic baseline characterization studies conducted from 2009 to 2012 are described and summarized in Stantec (2011a and 2012c) and BGC (2013a). Previous hydrogeologic investigations conducted in 1995 and 1996 (GeoViro 1996 and Knight Piesold 1996a, 1996b, and 1996c) are also summarized in Stantec (2011a and 2012c) and BGC (2013a). Material property data available for the Project comprises results of packer tests, slug tests and pumping tests from drilled bore holes and wells at site. Hydraulic head data (instantaneous and continuous[1]) has been collected from 104 monitoring wells, standpipe piezometers, vibrating wire piezometers, and aquifer test wells located across eight different sub-basins that include Bawn Boy Gulch, Olive Gulch, Stewart Gulch, Eagle Pup, Suttles Gulch, Platinum Gulch, Dublin Gulch, and Ann Gulch. In addition, since 2009 water quality data has been collected on a regular basis from site monitoring wells in these same sub-basins. The groundwater level and groundwater quality data collection program that began in 2009 is still on-going.

The data obtained has been used to identify local groundwater recharge and discharge zones, groundwater flow patterns, characterize groundwater quality and to conduct an initial numerical hydrogeological model (BGC, 2014) that was updated in 2019 (BGC, 2019).

4.1 HYDROGEOLOGIC SETTING

There are two principal water-bearing units in the Project area: deeper relatively low permeability bedrock and the near-surface moderately permeable surficial deposits.

Surficial materials at the site comprise a thin layer of overburden (typically less than 10 m thick) that is generally composed of a thin veneer of colluvium in the uplands, while alluvium and reworked placer tailings dominate in the valley floors. Deposits along the lower Dublin Gulch valley generally wary from 0 to 30 m thick between Eagle Pup and Haggart Creek. Discontinuous, relatively warm (typically 0° to -10° celsius) permafrost is present on northeast to northwest facing slopes with a highly variable distribution in the overall area. Because of its discontinuous nature, permafrost is assumed to have limited influence on the groundwater flow system. The bedrock of the project area can be broadly divided into the Hyland Group metasediments and intrusive rocks of the Dublin Gulch stock.

Results from hydrogeologic tests conducted in the bedrock to date show that the hydaulic conductivity of the intrusive and metasediment units is generally similar and assoicated with fractures, although considerable variation in results is apparent for each unit at any given depth (i.e., 2 to 4 orders of magnitude). Meaured hydraulic conductivity ranges from $3x10^{-5}$ to $4x10^{-3}$ m/s in placer and fluvial overburden materials, and $4x10^{-7}$ to $3x10^{-5}$ m/s for colluvium. Within bedrock, hydraulic conductivity estimtes from site data range from $2x10^{-6}$ to $2x10^{-8}$ m/s and exhibit a decreasing trend with depth. Specific storage estimated from pumping tests ranged from $8x10^{-6}$ m^{-1} to $1x10^{-5}$ m^{-1} for bedrcok and from approximately $3x10^{-5}$ m^{-1} to $6x10^{-3}$ m^{-1} for overburden (BGC, 2019).

Further details of the spatial distribution and characteristics of these materials are found in Stantec (2010d) and BGC (2014, 2019).

[1] In addition to the four to five months in 2010, continuous hydraulic head has been collected from nine wells since May 2011

4.2 GROUNDWATER OCCURRENCE

Generally, groundwater has been observed deeper (approximately >6 m below ground) at higher elevations and shallow to artesian in lower elevations and in valley bottoms. Springs and seeps have been observed in a few locations where valley bottoms have narrowed. These are typically associated with the re-emergence of a stream from channel deposits (i.e., a gaining reach). In these instances (e.g., Eagle Pup, Stewart Gulch), thin alluvium overlying shallow bedrock is the likely cause of the emergence. Groundwater levels within the lower Dublin Gulch valley have been observed to have seasonally delayed trends due to higher groundwater levels during spring freshet and/or associated with rainstorms and lower groundwater levels during dry summer periods.

Groundwater elevation data exhibit common seasonal trends in all monitored locations, characterized by relatively high-water levels corresponding to spring freshet and fall precipitation events, and relatively low water levels related to dry summer and frozen winter conditions. Small but discernible responses to precipitation events were observed in all monitoring well records.

Hydraulic head observations were available from vibrating wire piezometers (VWP) and monitoring wells, pumping wells or standpipe piezometers installed between 1995 and 2019 (Figure 6.2-1). Data collection at a portion of these locations is still ongoing, both manually and with dataloggers.

Based on the available data, the water table is generally shallow (within 10 m of ground surface) at low elevations near the valley bottoms and along creeks and gulches. At ridge tops within the Project area the water table is typically deeper with measured water depths up to 40 m below ground surface. The interpreted piezometric surface appears to generally mimic the surface topography.

The measured values indicate that seasonal fluctuations in groundwater elevation range from less than 2 m near creeks (e.g., MW10-DG6, MW09-DG4, VWP nest BH-BHC11-68), gulches and at low elevations in the valleys, and up to 4 to 15 m in higher elevation ridges (e.g., MW96-9b, VWP nest BH-BGC11-73).

Continuous head data indicate that groundwater elevations decline through the winter and spring (i.e. November to April), and are highest during the summer and fall quarter (i.e. June to September). The seasonal variation in groundwater levels is consistent with the seasonal precipitation and temperature trends. The groundwater levels recorded in 2021 generally reflect similar trends to previous years. Greater amounts of precipitation were received in 2021 than is typical for the Project area, and groundwater elevations have recovered from the lower groundwater elevations observed in 2019. In some locations (e.g., MW96-9B), peak groundwater elevations were slightly higher than the historical range, likely in response to the high precipitation values observed in 2021.

4.3 GROUNDWATER FLOW

Groundwater flow in the bedrock occurs in fractures and fault zones, while preferentially flowing through more permeable (and porous) sediments within the surficial deposits. General orientation of groundwater flow contours mimic the topography of the site as groundwater flows from the highest areas to lowest. Throughout most of the Project area the groundwater divides of each sub-basin approximately coincide with the surface water divides (i.e., groundwater from the Eagle Pup and Suttles Gulch drain to Eagle Creek, while groundwater from Ann and Stewart Gulch Basins drain to Dublin Gulch). In the lower Dublin Gulch valley, the groundwater divide between the Eagle Creek and Dublin Gulch basins in the placer tailings is not clearly defined. Field observations suggest that at times the divide migrates across the valley so that groundwater from the Dublin Gulch basin may flow towards Eagle Creek. This shifting is seasonal and also due in part to the variability in the timing of the freshet and/or rainfall events across the entire watershed.

Groundwater recharge occurs at higher elevations throughout the Dublin Gulch-Eagle Creek drainage basin and ultimately discharges to surface water (in some cases as seeps and springs) at lower elevations in the valley or directly to surface streams, or ultimately into Haggart Creek. The main groundwater flow in conjunction with the highest groundwater elevations is expected to occur during the snowmelt in late spring (e.g., May to June) after thawing of the shallow sediment.

4.4 SURFACE WATER - GROUNDWATER CONNECTIVITY

Base flow values represent the groundwater contributions to streams. Groundwater contributes to stream flows where the groundwater table elevation intersects the ground surface, typically these intersections are located in stream channel inverts (e.g., Eagle Pup appears in mid-channel where the valley is well confined by bedrock); however, they also appear as seepage from slopes within the placer deposits of the lower Dublin Gulch valley. Groundwater from the lower Dublin Gulch valley likely contributes a measurable portion of the baseflow to Haggart Creek. The baseflow contributions to the streams maintain flow in the larger creeks during the drier months of the year (including winter flows).

4.5 GROUNDWATER FLOW PROPERTIES

The hydraulic conductivity of the colluvial, alluvial, and till deposits was generally higher than that of the placer material, and the variable hydraulic conductivity seen in the bedrock is typical of fractured crystalline rock, which showed decreasing hydraulic conductivity with depth. The test data did not demonstrate a measurable difference in the hydraulic conductivities of granodiorite and metasedimentary rock. This suggests that the flow properties of both rock types are similar.

The bedrock hydraulic conductivity dataset includes over 80 packer tests and slug tests conducted in over 50 boreholes and six pumping tests; two 24-hour duration tests carried out in the Open Pit area and in the upper reaches of Bawn Boy Gulch in 1996 (GeoViro, 1996), two pumping tests (a 7-day test in the lower Dublin Gulch valley and a 5-day test in the Open Pit area) carried out in 2011 (BGC, 2012e and 2012f), and a 10-day test in the lower Dublin Gulch valley in 2012 (BGC, 2013b). Results of the pumping tests are typically considered to be more representative of the larger scale (bulk) hydraulic conductivity of the rock mass. Results of the two GeoViro pumping tests at MW96-11 and MW96-19, conducted at depths less than 55 m yielded hydraulic conductivity values ranging from $3x10^{-7}$ m/s to $5x10^{-7}$ m/s. Mean results of the two pumping tests conducted in 2011 by BGC were $8x10^{-6}$ m/s in the lower valley (at PW-BGC11-01) and $9x10^{-8}$ m/s in the Open Pit area (at PW-BGC11-02) at depths up to 100 m and 140 m below ground, respectively. Results from the 2012 testing of PW-BGC12-04 in the lower Dublin Gulch valley bedrock aquifer are about an order of magnitude higher ($9.0x10^{-5}$ m/s) than results from 2011 testing; however, these results are specific to an 18 m thick zone targeted by the well, whereas the 2011 well was tested over a thicker (37 m) zone.

Generally, the hydraulic conductivity of the intrusive units and metasediments is similar and tends to decrease with depth, although considerable variation in results is apparent for each unit at any given depth. The general trend of decreasing hydraulic conductivity is common in bedrock settings as described by Rutqvist and Stephansson (2003).

4.6 GROUNDWATER QUALITY

The groundwater quality data suggests that the chemical composition of groundwater in the Project area depends on the local and up gradient rock-types. Groundwater quality data are collected in Eagle Pup, and Dublin, Suttles, Ann, Stewart, Olive, Bawn Boy and Platinum Gulches.

Groundwater quality data collected from 1995-2016 was characterized in 2017 prior to construction activities to represent baseline groundwater quality (Core Geoscience Services, 2017). In an effort to better characterize, and respond to potential changes to groundwater quality during the life of the mine, if necessary, VGC continues to build upon this report and work towards creating management triggers for groundwater quality. Groundwater quality trends from 2009/2010 to 2021 for Ann Gulch and Eagle Pup wells are discussed below.

Groundwater quality data for wells within the Ann Gulch drainage (which is the location) for the period of 2010 through 2020 is provided in Figure 4-1 and Figure 4-2. The wells monitored in Ann Gulch include MW10-AG6, MW10AG3A, MW10-DG6, MW19-DG6RB, MW19-DG6RA, and MW19-HLF1B. Due to construction activities, MW10-DG6 was decommissioned and replaced with MW19-DG6R A/B. MW10-AG3A was also decommissioned during 2020.

Parameter observations include the following:

- pH has remained neutral to slightly basic for the duration of the monitoring program.
- Aluminum generally fluctuates between 1 order of magnitude with the exception of MW19-HLF1B in April 2021.
- Arsenic levels were relatively stable from 2009-2019 (the period of continuous record at the wells established prior to decommissioning) with the exception of one outlier at MW10-DG6 which had a result 4 orders of magnitude lower than historical samples. New wells were established in 2019 and there is minor variability observed at MW19-HLF1B.
- Cadmium shows MW19-DG6RB as stable since sampling began in 2019 and MW18-DG6RA has a decreasing trend over time.
- Copper at all historic stations have a variability of approximately one order of magnitude over time. In 2021 MW19-DG6RB shows a slight increase and MW19-HLF1B has decreased and over 2 years.
- Lead values in wells that were drilled in 2019 (MW19-HLF1B and MW19-DG6RA&B show higher concentrations then decommissioned baseline wells, methodology for results has produced different Method Detection Limit. The quality in the new wells are close to or at MDL.
- Iron displays a large variability between stations but each station shows consistent ranges over 2009 to 2021.
- Selenium displayed results for MW19-DG6RB at detection limits in 2021. MW19-HLF1B shows a slight increase over the 3 years of monitoring.

Figure 4-1: **Ann Gulch Drainage Groundwater Quality Data**

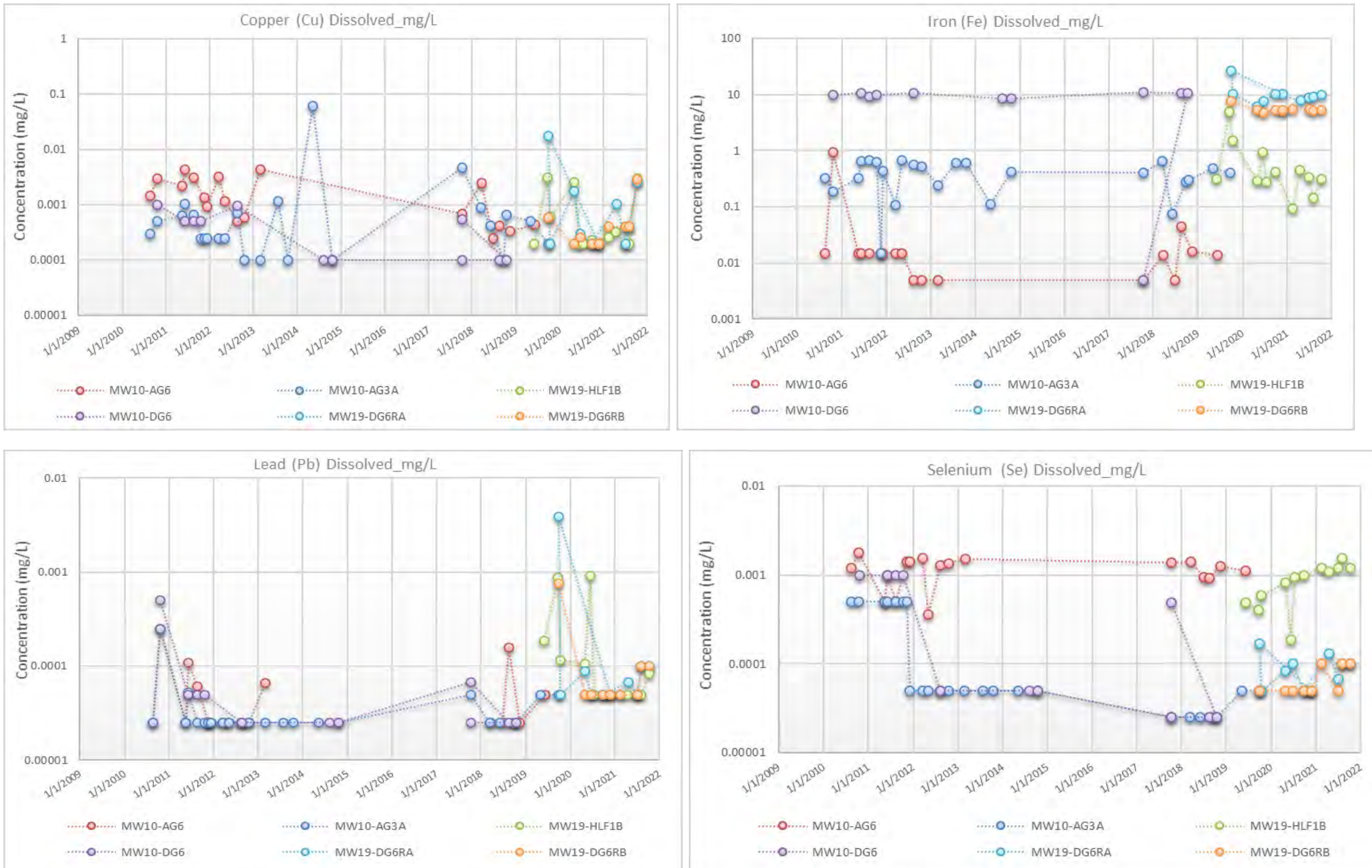


Figure 4-2: Ann Gulch Drainage Groundwater Quality Data

Well information has been gathered in the Eagle Pup drainage area at two locations since 2009 (MW96-13A, MW96-15) and an additional station was installed in 2019 (MW19-EPW1A), and is presented in Figure 4-3 and Figure 4-4. MW96-9B is located in the Bawn Boy drainage and is considered a background site that is discussed herein with the Eagle Pup sites and has been monitored since 2019:

- pH in the Eagle Pup drainage is neutral to slightly basic.
- Aluminum concentrations have remained relatively constant with MW96-13A showing a slight decrease in dissolved concentrations. While MW19-EPW1A shows a slight increase since the well was established in 2019.
- Arsenic concentrations at MW96-15 have displayed a stable range of 0.1 - 0.3 mg/L throughout the dataset. MW19-EPW1A had a stable to downward trend over 2 years.
- Cadmium concentrations for the majority of the samples are within one order of magnitude. MW96-13A has the highest variability over the dataset. Most samples taken in 2021 are close to or at MDL.
- Copper concentrations measured at MW96-9B shows a downward trend over time, MW96-13A is close to detection limit throughout 2021.
- Iron concentrations at MW96-13A have low variability over the four-year monitoring period and MW96-15 has a variability of one order of magnitude from 2009-present.
- Lead concentrations display a historic concentration range close to detection limits for MW96-15 and MW96-13A. MW19-EPW1A and MW96-9B show a decreasing trend in 2019 and are closer to detection limit in 2021.
- Selenium concentrations at station MW96-13A have been measured at or near to the detection limit of the time from 2009 to 2021. MW96-15 displayed selenium concentrations close to the detection limit from 2009 to 2014, and have generally remained within an order of magnitude. Concentrations remained near method detection limits for the MW96-9B station and MW19-EPW1A displays concentrations within an order of magnitude to the neighbor stations with a small range.

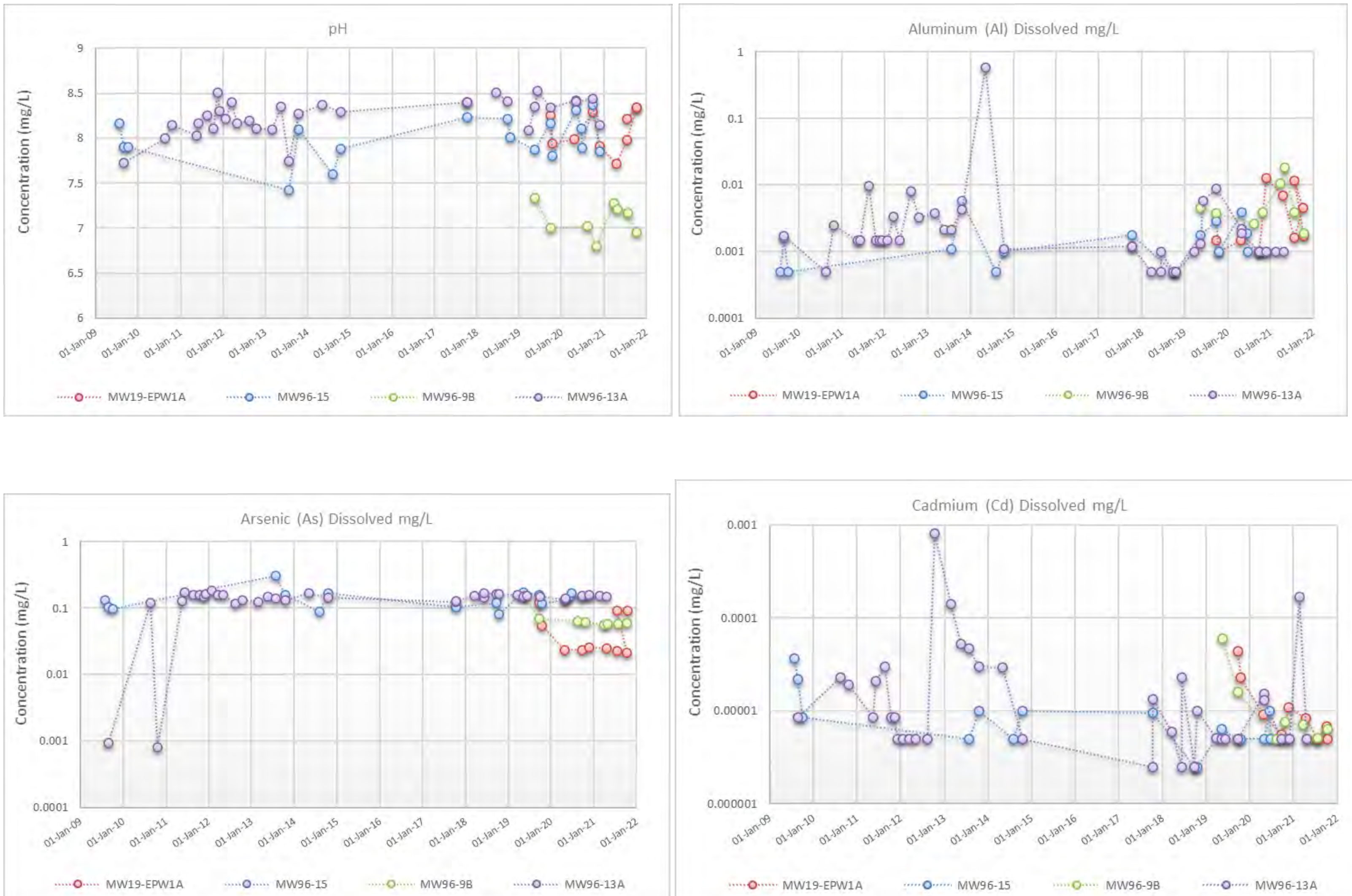


Figure 4-3: **Eagle Pup and Bawn Boy Drainage Groundwater Quality Data**

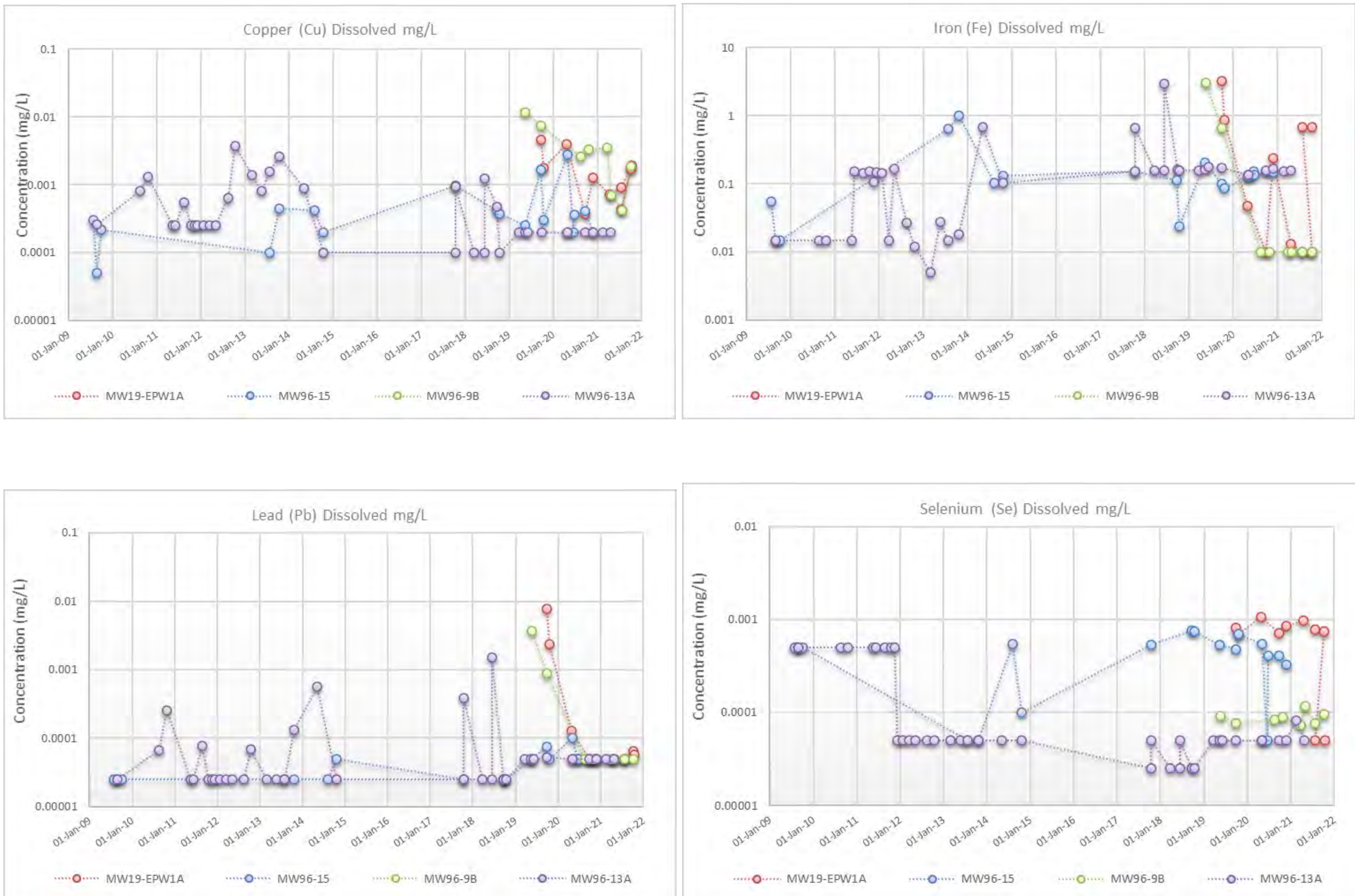
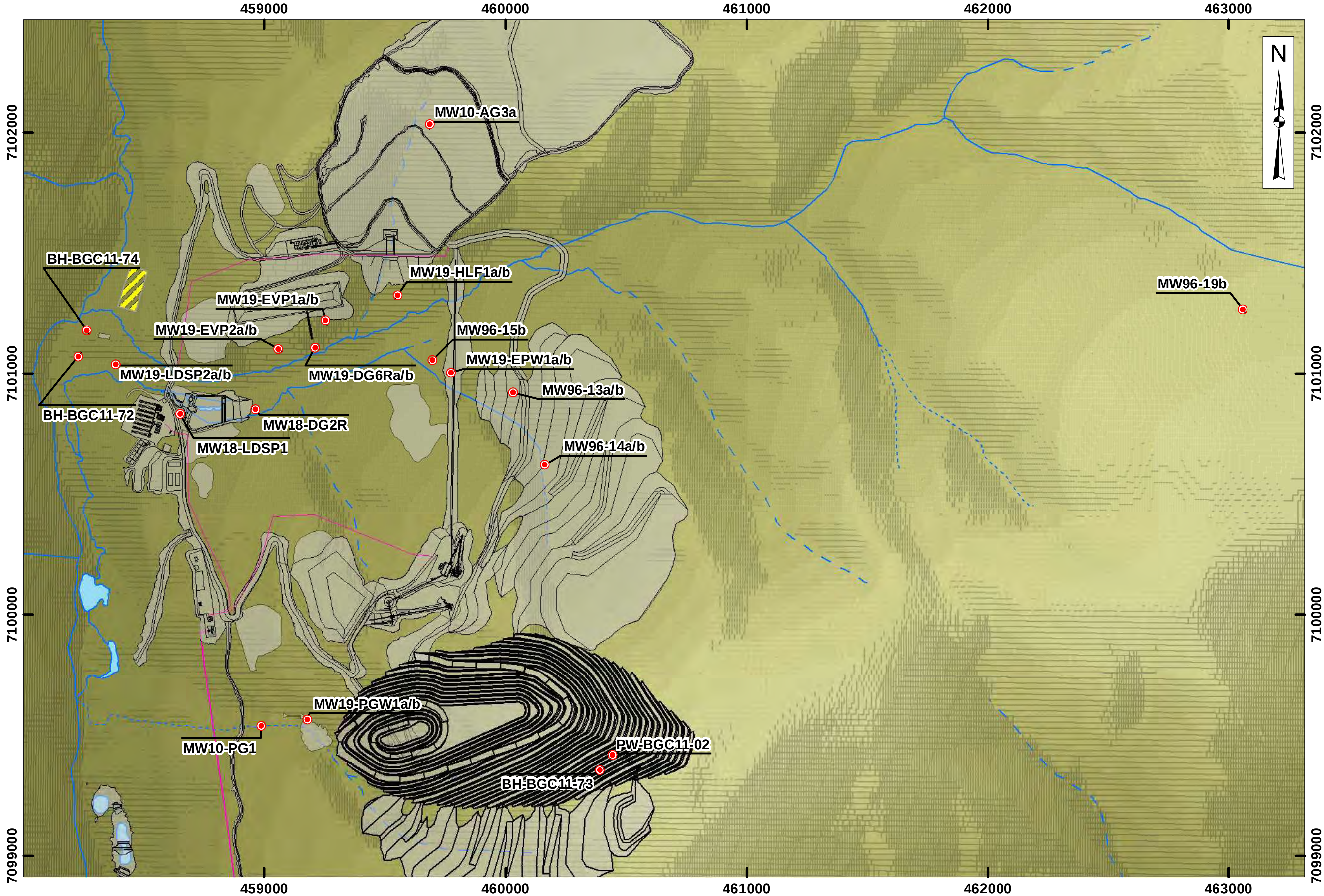


Figure 4-4: Eagle Pup and Bawn Boy Drainage Groundwater Quality Data



Legend:

- Groundwater Monitoring Location
- Major Facility
- Site Power
- Reserved Area
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 125 250 500
Meters

Projection: NAD 83 Zone 8N

Drawn By: HC

Date: 2022/03/27

Figure: 4-5

EAGLE GOLD PROJECT
YUKON TERRITORY

Site Plan with Groundwater Monitoring Locations

5 SURFACE WATER HYDROLOGY

The majority of the Project site lies within the Dublin Gulch watershed, a second order tributary to the larger Haggart Creek watershed, which is a major tributary of the South McQuesten River. The South McQuesten River joins the Stewart River, which flows west to its eventual confluence with the Yukon River.

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a lower summer flow regime reflective of groundwater primarily, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Base flows are lowest in the winter and flow sub-ice; in the smaller creeks, groundwater is depleted in the winter and no flow conditions under the ice are typical.

In larger tributaries, groundwater discharge maintains limited amounts of streamflow below the ice throughout the winter (i.e., November through end March). Aufeis (i.e., groundwater that seeps and freezes onto- and adjacent to local watercourses) is present in several places throughout streams at the Project site. As with shelf ice in the streams, aufeis melts during the freshet, but may in some cases persist into the early summer.

The current surface water baseline data collection program commenced in 2007 and has included up to 23 streamflow monitoring stations. The locations, and data collection and monitoring frequency of the program within the Project area has evolved somewhat since 2007 due primarily to changing program objectives associated with the requirements of environmental assessment and water licensing processes and the continuing development of the Project. Table 5-1 provides a summary of automated and manual streamflow monitoring stations, as well as the year or years in which streamflow data were collected.

Table 5-1: Summary of Streamflow Monitoring Stations

Drainage Basin	Monitoring Site	Type of Station	Year(s) of Record
Haggart Creek	W4 - DS Dublin Gulch	Automatic	2007 - ongoing
	W5 - US Lynx Creek	Automatic	2007 - ongoing
	W22 - US Dublin Gulch	Automatic	2007 - ongoing
	W23 - DS Lynx Creek	Manual	2007 – 2011, 2018 - ongoing
	W29 - DS Eagle Creek	Automatic Manual Automatic	2010 – 2015 2016 – 2019 2020 – ongoing
	W39 – US South McQuesten River	Manual	2017 - ongoing
	W99 – US 15 Pup	Automatic	2019 - ongoing
Eagle Creek	W27 – Midway, near camp	Automatic	2007 - ongoing
	W45 - US Haggart Creek	Manual Automatic	2012, 2013 2018 - ongoing
	W61 - US Suttles Gulch	Manual	2009 - 2011
	W62 - DS Suttles Gulch	Manual	2009 - 2011
	WECP - Eagle Creek Pond	Manual Automatic	2009, 2010 2011 - 2013
	W10 - Suttles Gulch	Manual	2010, 2011
Dublin Gulch	W1 - US Stewart Gulch	Automatic	2007-ongoing
	W21 - Dublin Gulch near mouth	Manual Automatic[2]	2007 – 2013, 2018 2019 - ongoing
	W32 - Ann Gulch	Manual	2010, 2011

Drainage Basin	Monitoring Site	Type of Station	Year(s) of Record
	W26 - Stewart Gulch at flume	Manual Automatic	2007 - 2011 2010, 2012-ongoing
	W36 - Stewart Gulch	Manual	2009
	W31 - Olive Gulch	Automatic	2009-2010
	W52 - Dublin US Olive	Manual	2009
	W51 - Dublin DS Cascallen	Manual	2009
	W20 - Bawn Boy Gulch	Manual Automatic Manual	2007, 2008 2009 2020 - ongoing
	W30 - Cascallen Gulch	Manual	2009
Lynx Creek	W6 - Lynx Creek US Haggart	Automatic	2007 - ongoing
	W13 - Lynx Creek midway	Automatic	2007
South McQuesten River	W49 – DS Haggart Creek	Manual	2017 - ongoing

Note: 1. Automated stations are not continuous through the winter
2. Water level sensor malfunctioned in 2019 and 2020, therefore no continuous water level data are available for these years

Stantec (2010b and 2012b) and Lorax (2022b) provide a comprehensive review of regional data and a baseline hydrology data summary for the project site through 2021.

5.1 MONITORING METHODS

The continuous streamflow monitoring stations noted in Table 5-1 consist of a permanent staff gauge, pressure transducer and datalogger that record water level continuously at 15 minute intervals. Discharge measurements were conducted during periodic station visits and related to the corresponding water level at time of measurement from which stage-discharge rating curves were developed. The continuous streamflow gauging stations are typically installed prior to the spring freshet and removed at the end of the open-water season in late October or early November to avoid damage from winter freeze.

5.2 WATERBODIES WATERCOURSES, AND DRAINAGE BASINS

The hydrology local study area includes the Dublin Gulch, Eagle Creek, and Haggart Creek (above the Lynx Creek confluence) drainage basins (Figure 5-1). The basin areas of these water bodies are 10.4 km^2, 4.7 km^2, and 98 km^2 respectively. The basins are characterized by high relief (750 to 800 m asl), steep gradients (mean gradient of 18%), and well-vegetated slopes.

Dublin Gulch, Eagle Creek, and Haggart Creek are all perennial streams. Several of the tributaries in the Project area are intermittent streams (i.e., the stream becomes dry at sections along the water course where flow goes subsurface) or ephemeral streams (i.e., the stream channel has little to no groundwater storage and flow is in response to snowmelt of heavy rains). With construction of the Mine, flows from Platinum Gulch, Suttles Gulch and Eagle Pup that previously reported to lower Eagle Creek (W45) are now being captured by the site water managed ditches and report to the Lower Dublin South Pond (LDSP).

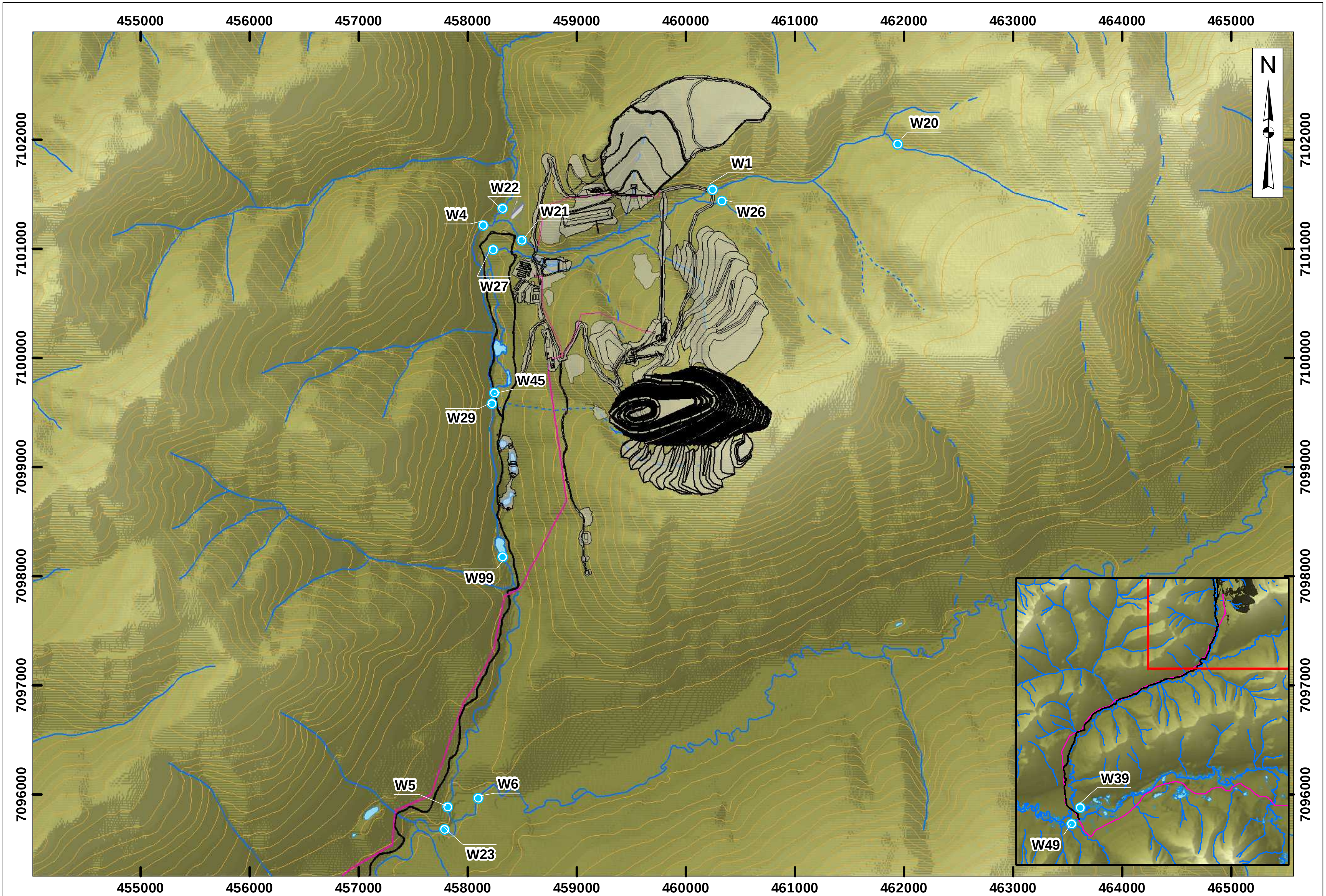
5.3 STREAM FLOWS

The open-water season pattern is characterized by freshet-generated peak flow in May to early June, followed by a relatively rapid recession to low base flow throughout July and August. Heavy rain events caused short-term increases in stream flow with storm-event recessions being generally rapid in the late summer and fall, both reflective of low groundwater storage capacity of the basins. Winter flows, though not continuously gauged, have been measured and observed by field personnel in Haggart Creek and lower Dublin Gulch and are the lowest flows of the year reflective of base flow contributions. These seasonal changes are represented in the hydrograph for Haggart Creek at station W4 (Figure 5-2). Monthly summaries and hydrographs for all the gauged streams are provided in Lorax (2022b). Summary of monthly average discharge, unit yield and runoff for Project site hydrometric stations is presented in Table 5-2.

Table 5-2: Summary of Monthly Average Discharge, Unit Yield and Runoff for Project Site Hydrometric Stations

Station (Discharge Area)	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/ Total
W1 (6.8 km²)	Average Discharge (m³/s)	--	--	--	0.024	0.255	0.110	0.091	0.088	0.089	0.099	0.069	--	0.103
	Average Yield (L/s/km²)	--	--	--	3.5	37.5	16.1	13.4	13.0	13.0	14.6	10.1	--	15.2
	Runoff (mm)	--	--	--	5	63	39	35	33	34	21	4	--	234
W4 (76.9 km²)	Average Discharge (m³/s)	--	--	--	0.780	2.281	1.176	0.858	0.903	0.917	0.829	--	--	1.106
	Average Yield (L/s/km²)	--	--	--	10.1	29.7	15.3	11.2	11.7	11.9	10.8	--	--	14.4
	Runoff (mm)	--	--	--	10	56	38	30	31	31	16	--	--	211
W5 (97.5 km²)	Average Discharge (m³/s)	--	--	--	--	3.088	1.450	1.060	1.041	1.049	1.106	--	--	1.466
	Average Yield (L/s/km²)	--	--	--	--	31.7	14.9	10.9	10.7	10.8	11.3	--	--	15.0
	Runoff (mm)	--	--	--	--	64	36	29	28	28	14	--	--	199
W6 (100.9 km²)	Average Discharge (m³/s)	--	--	--	--	3.653	1.158	0.933	1.127	1.203	1.061	0.574	--	1.387
	Average Yield (L/s/km²)	--	--	--	--	36.2	11.5	9.2	11.2	11.9	10.5	5.7	--	13.7
	Runoff (mm)	--	--	--	--	63	25	23	29	31	15	3	--	191
W21 (66.8 km²)	Average Discharge (m³/s)	--	--	--	--	0.280	0.123	0.067	0.118	0.074	0.055	--	--	0.120
	Average Yield (L/s/km²)	--	--	--	--	27.68	13.8	7.5	14.3	8.3	6.1	--	--	13.0
	Runoff (mm)	--	--	--	--	74.15	18	8	7	6	1	--	--	115
W22 (66.8 km²)	Average Discharge (m³/s)	--	--	--	0.531	2.211	1.009	0.713	0.832	0.794	0.764	0.937	--	0.974
	Average Yield (L/s/km²)	--	--	--	7.9	33.1	15.1	10.7	12.5	11.9	11.4	14.0	--	14.6
	Runoff (mm)	--	--	--	13	60	38	27	30	30	15	15	--	228
W26 (1.3 km²)	Average Discharge (m³/s)	--	--	--	--	0.029	0.016	0.011	0.014	0.011	0.007	--	--	0.015
	Average Yield (L/s/km²)	--	--	--	--	22.3	12.2	8.9	10.5	8.5	6.0	--	--	11.4
	Runoff (mm)	--	--	--	--	40	26	23	28	21	6	--	--	144
W27 (2.7 km²)	Average Discharge (m³/s)	--	--	--	0.007	0.054	0.027	0.024	0.021	0.019	0.023	--	--	0.025
	Average Yield (L/s/km²)	--	--	--	2.507	20.0	10.0	8.7	7.8	6.9	8.7	--	--	9.2
	Runoff (mm)	--	--	--	3.033	38	24	20	20	18	9	--	--	131

Station (Discharge Area)	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/ Total
W29 ($8\ km^2$)	Average Discharge (m^3/s)	--	--	--	--	2.886	1.163	1.099	1.170	1.081	0.968	--	--	1.395
	Average Yield ($L/s/km^2$)	--	--	--	--	33.5	13.5	12.8	13.6	12.6	11.2	--	--	16.2
	Runoff (mm)	--	--	--	--	43	28	34	35	33	18	--	--	191
W99 ($90.1\ km^2$)	Average Discharge (m^3/s)	--	--	--	1.503	2.657	1.595	0.915	0.990	0.936	1.077	--	--	1.382
	Average Yield ($L/s/km^2$)	--	--	--	17.0	30.1	18.1	10.4	11.2	10.6	12.2	--	--	15.7
	Runoff (mm)	--	--	--	19	81	45	27	30	27	11	--	--	240



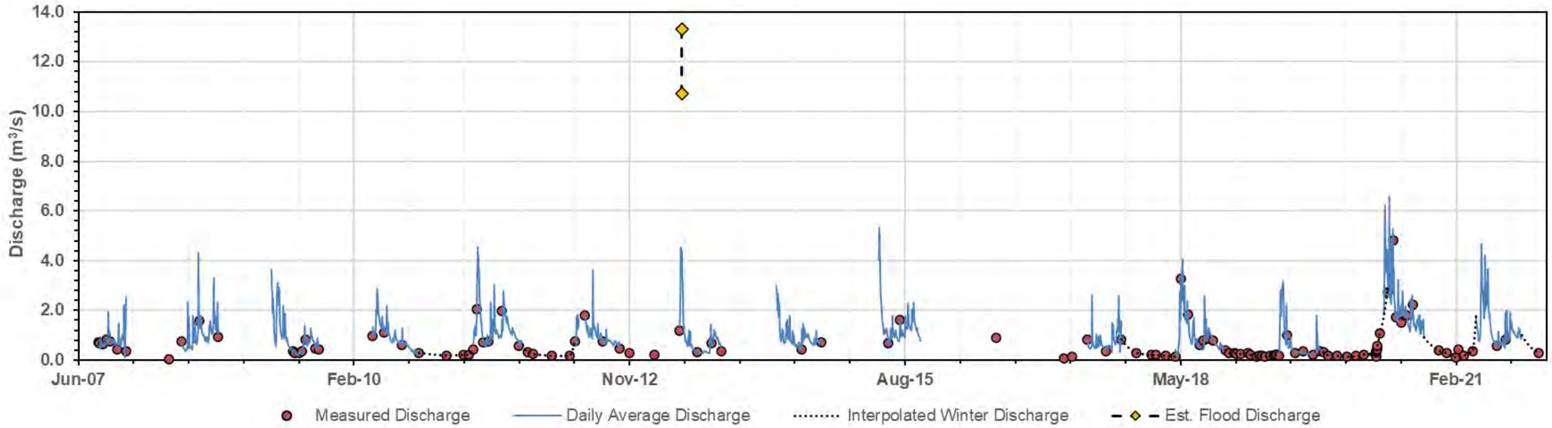
Legend:

- Hydrology Station
- Major Facility
- Site Power
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 250 500 1,000
Meters

Projection: NAD 83 Zone 8N	Drawn By: HC	EAGLE GOLD PROJECT YUKON TERRITORY
Date: 2022/03/27	Figure: 5-1	Location of Streamflow Monitoring Stations



Note: Values for May 29, 2013 are estimates based on high water marks and channel surveys at W29 extrapolated by drainage area to W4 (Laberge, 2013).

Figure 5-2: Haggart Creek (W4) Average Daily Discharge Record (2007 to 2021)

6 SURFACE WATER QUALITY AND AQUATIC BIOTA

The current water quality and aquatic biota baseline program began in 2007. Water quality characterization has occurred every year since 2007 and is ongoing. Historical data (1976/1977 for sediment only and 1993 – 1996 for surface water, sediment, and biota) are provided in Stantec (2010c).

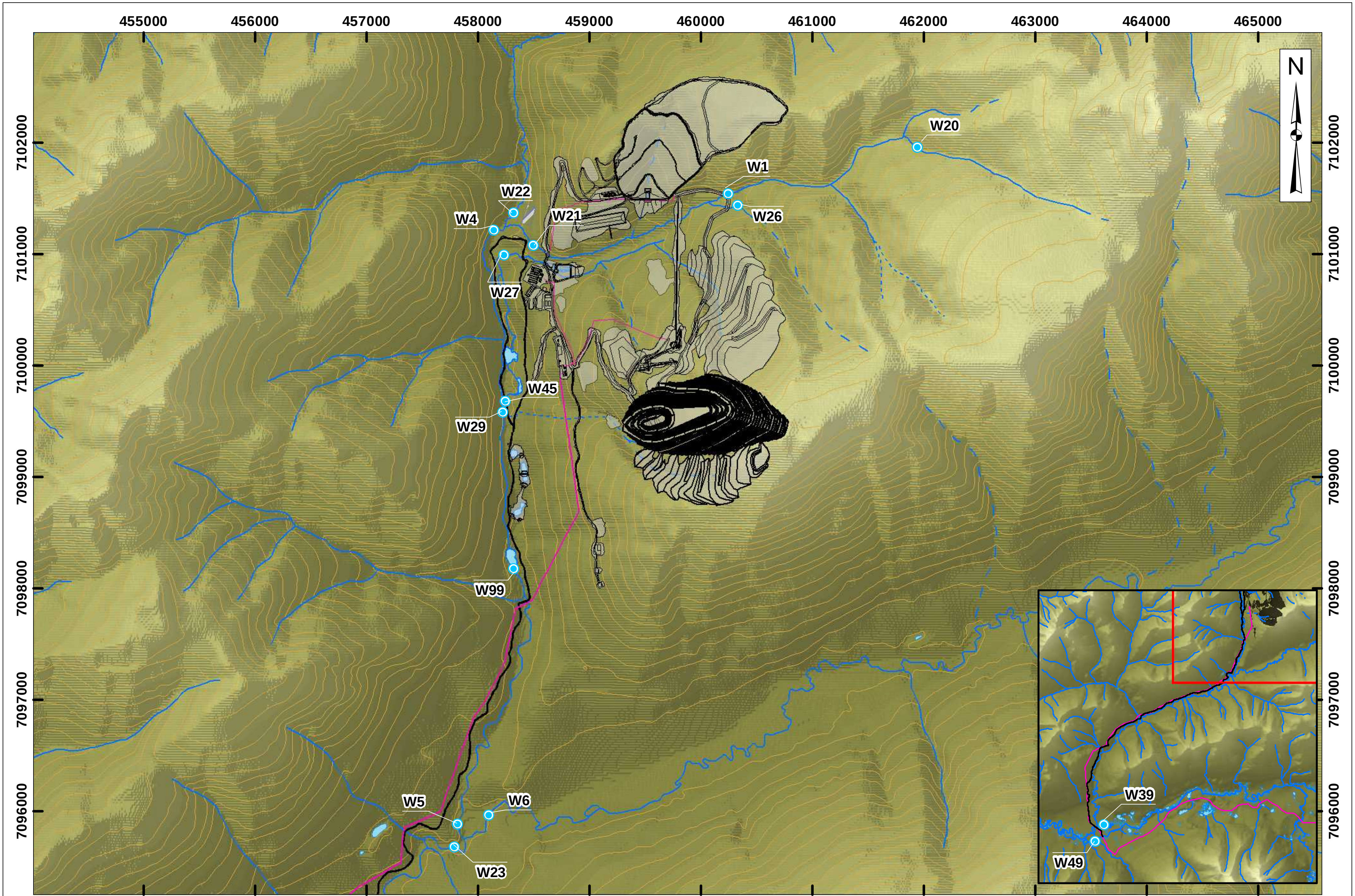
6.1 SURFACE WATER QUALITY

The current study area (Table 6-1 and Figure 6-1) includes the Haggart Creek, Dublin Gulch, Eagle Creek basins, which have been subject to placer mining in the past, and the Lynx Creek basin, which has not been subject to placer mining. Sites within the Haggart Creek, Dublin Gulch, and Eagle Creek drainage basins were selected upstream and downstream of the Project footprint, where possible. Lynx Creek drains a large catchment to the south of the Project area that will be unaffected by development activities.

Table 6-1: Water Quality Sampling Locations and Rationale by Drainage

Site	Location	Site Type	Rationale	Coordinates	
				North	East
Haggart Creek Drainage					
W22	Haggart above Dublin Gulch	Reference	Above Project influence	7,101,377	458,319
W4	Haggart below Dublin Gulch	Exposure	Below Project influence	7,101,223	458,144
W29	Haggart below Eagle Cr	Exposure	Below Project influence	7,099,583	458,225
W5	Haggart above Lynx Cr	Exposure	Below Project influence	7,095,887	457,815
W23	Haggart below Lynx Cr	Exposure	Below Project influence	7,095,682	457,790
W99	Haggart above 15 Pup	Exposure	Below Project Influence	7,098,180	458,322
W39	Haggart above S. McQuesten	Far Field	Below Project influence	7,086,504	449,780
Dublin Gulch Drainage					
W20	Bawn Boy Gulch	Reference	Above Project influence	7,101,961	461,945
W1	Dublin above Stewart Gulch	Reference	Above Project influence	7,101,545	460,249
W26	Stewart Gulch	Reference	Above Project influence	7,101,443	460,331
W21	Dublin above Haggart Cr	Exposure	Below Project influence	7,101,261	458,359
Eagle Creek Drainage					
W27	Eagle Creek midway	Exposure	Below Project influence	7,100,997	458,235
W45	Eagle above Haggart Cr	Exposure	Below Project influence	7,099,684	458,243
Lynx Creek Drainage					
W6	Lynx above Haggart Cr	Reference	No Project influence	7,095,964	458,099
South McQuesten River Drainage					
W49	S. McQuesten below Haggart	Far Field	Below Project influence	7,085,495	449,221

Procedures for collecting data and information on conditions in streams of the study area have used methods consistent with standards under Yukon and federal legislation. Water samples have been collected midstream following methods outlined in the BC Freshwater Biological Sampling Manual (BC Ministry of Water, Land Air Protection 2003). Grab samples were collected from just below the surface, facing upstream and using narrow mouth bottles. Samples requiring filtration and/or preservation were dealt with as soon as possible after returning to shore. All samples and blanks were kept in coolers with ice packs until arrival at the laboratory. In situ measurements were also taken on each sampling date for pH, temperature, conductivity and dissolved oxygen. Due to the timing of the reporting, only data to the end of 2020 is included in the discussion below. Additional water quality data is reported in monthly and annual Water Use Licence (WUL) reports under licence QZ14-041-01.



Legend:

- Hydrology Station
- Major Facility
- Site Power
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 250 500 1,000
Meters

Projection: NAD 83 Zone 8N

Drawn By: HC

Date: 2022/03/27

Figure: 6-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Surface Water Quality Monitoring Stations

6.1.1 Dublin Gulch Drainage

Water quality in Dublin Gulch is characterized using monitoring data from stations W1 and W21 (Figure 6-1). Upper Dublin Gulch (W1) drainage includes inputs from Bawn Boy Gulch (W20), Olive Gulch and Stewart Gulch (W26). These stations are all upstream of current mining operations. Data from station W20 in the upper reaches of Dublin Gulch in Bawn Boy Gulch is also considered as it strongly influences trace element concentrations in Dublin Gulch, in particular the arsenic signature throughout the stream. Station W26 in Stewart Gulch is also discussed as naturally elevated As concentrations exist and contribute to the overall As loading in Dublin Gulch.

The headwaters of Dublin Gulch originate in Bawn Boy Gulch and water quality is characterized by soft waters, with monthly median hardness values ranging from approximately 15 mg/L to 35 mg/L at station W20. Following inputs from Olive Gulch, and presumably influxes of groundwater, hardness values increase in Dublin Gulch at W1 during lower flow periods to values between roughly 50 mg/L to 70 mg/L. Values for conductivity and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June and an approximate two- to three-fold increase in concentration between freshet and other times of the year. Overall, such trends in stream salinity reflect varying proportions of snow-melt driven surface runoff (lower ionic strength) and groundwater inputs (higher ionic strength) as driven by the seasonal water balance.

Baseline concentrations for sulphate in Dublin Gulch exhibit very low concentrations in the headwaters of Bawn Boy Gulch (e.g., 3 mg/L to 8 mg/L) with gradually increasing concentrations downgradient through the catchment. Stewart Gulch contains higher concentrations of sulphate (6 mg/L to 44 mg/L) compared to that measured at W1 immediately upstream (5 mg/L to 20 mg/L) in Dublin Gulch. Unlike the dissolved ions, elevated TSS concentrations in Dublin Gulch generally coincide with the peak snowmelt month of April and May. At station W1 for the period of 2007 to 2020 the median and 95th percentile May TSS concentrations are roughly 30 mg/L and 240 mg/L, respectively. At most other flow periods of the year, TSS values in Dublin Gulch at W1 were generally at or below the analytical detection limit of 3.0 mg/L.

Nutrient values, as represented by NH_3-N, NO_3-N, NO_2-N and dissolved orthophosphate, are present at very low concentrations and well below water quality guidelines for the protection of aquatic life throughout Dublin Gulch.

Median monthly concentrations of total trace elements are low (e.g., Sb, Cu, Co, Cr, Pb, Ni, Hg, Se, U and Zn) and present at concentrations well below their respective water quality guideline. However, Dublin Gulch is characterized by elevated total and dissolved As concentrations throughout its reaches. Indeed, Dublin Gulch represents the most significant background contribution of As to the Haggart Creek system. One of the primary sources of As in Dublin Gulch occurs in its headwaters in Bawn Boy Gulch. Monthly median total and dissolved As at W20 for the monitoring period 2007 to 2020 ranged from 0.061 mg/L to 0.075 mg/L (total) and from 0.047 mg/L to 0.073 mg/L (dissolved). Arsenic in Bawn Boy Gulch is present primarily in the dissolved form. Olive Gulch and Stewart Gulch also provide significant As loadings to Dublin Gulch but at lower concentrations than in Bawn Boy, with total and dissolved As concentrations typically on the order of 0.022 mg/L to 0.030 mg/L for both drainages.

The baseline period for lower Dublin Gulch, as measured at monitoring station W21, spans the period of 2007 to 2017. Unlike upper Dublin Gulch, construction and mine operation activities have occurred upstream of W21 and have influenced water quality in lower Dublin Gulch since construction commenced in 2017. Accordingly, the existing conditions at W21 are characterized by data collected for the period 2018 to 2020. Values of hardness, conductivity and alkalinity in lower Dublin Gulch at W21 are typically higher than values at W1 in upper Dublin

Gulch; this likely reflects the contribution of higher conductivity, alkalinity and hardness waters from Stewart Gulch (W26) and possibly from the contribution from groundwater discharges at lower elevations in the catchment. Sulphate concentrations in lower Dublin Gulch as measured at W21 range from monthly median values of 9 mg/L to 60 mg/L for the baseline period of 2007 to 2017 and from 14 mg/L to 104 mg/L for the existing condition period of 2018 to 2020. These sulphate values at W21 are greater than measured upstream in Dublin Gulch at W1.

During the baseline period, monthly median TSS concentrations ranged from 3.0 mg/L to roughly 7.0 mg/L with a maximum observed TSS concentration of 31 mg/L in May 2014. Greater sampling frequency at W21 during the construction and operations period of 2018 to 2020 has indicated that higher TSS concentrations have occurred more frequently. Monthly median TSS values for 2018 to 2020 range from 3.0 mg/L to 384 mg/L with the highest median concentrations occurring in April and May. The corresponding 95th percentile measured TSS values for April and May over the same period at W21 are 2139 mg/L and 390 mg/L, respectively.

Monthly median total and dissolved As concentrations are similar during the baseline period of 2007 to 2017 and range from approximately 0.025 mg/L to 0.038 mg/L. Median total As concentrations at W21 since 2018 have increased relative to the baseline, particularly for the freshet months of April and May and while reflecting higher sampling frequency are also due to the high TSS contributions from snowmelt-generated sediment-laden runoff coming from the Dublin Gulch road upstream of W21 and downstream of W1. As with W1, total As concentrations at station W21 are directly correlated with elevated TSS.

Figure 6-2 illustrates the relationship between total As concentrations and elevated TSS levels during episodic higher flow events at stations W1 and W21 for the period 2007 to 2020.

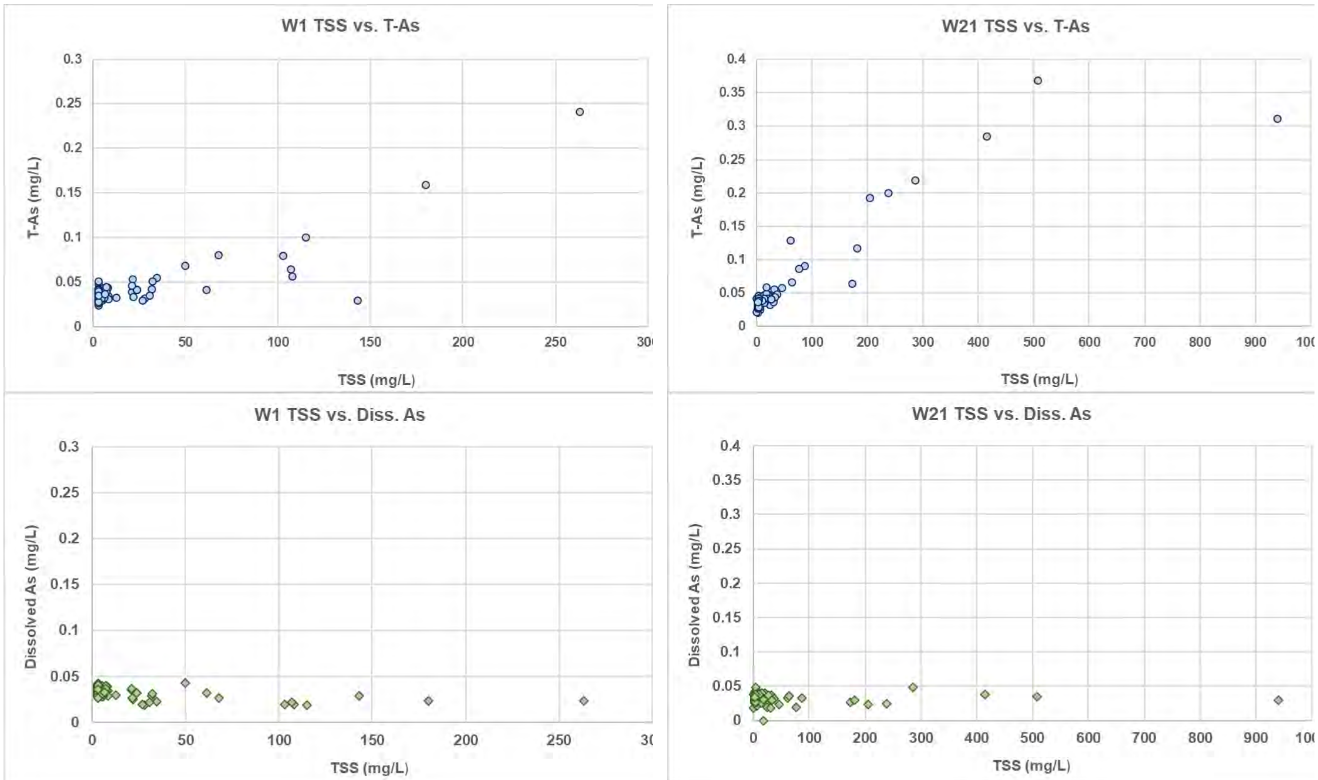


Figure 6-2: Relationship between TSS, Total and Dissolved Arsenic Concentrations at W1 and W21 (2007 to 2020)

6.1.2 Haggart Creek Drainage

Haggart Creek is the largest project affected stream and the primary receiving environment stream for the Project. The main monitoring stations on Haggart Creek are shown on Figure 6-1 and include stations W22 (upstream of project activities), W4 (immediately downstream of the confluence with Dublin Gulch), W29 (downstream of Dublin Gulch, Eagle Creek, Gil Gulch and Platinum Gulch confluences), W99 (upstream of 15 Pup), W5 and W23 (immediately upstream and downstream, respectively of the confluence with Lynx Creek).

Baseline and existing conditions in upper Haggart Creek (W22) are reflected in data collected from 2007 to 2020. The pH in upper Haggart Creek at station W22 is circumneutral throughout the year with values generally ranging between 7.5 and 8.0. Alkalinity values exhibit seasonal trends with the lowest monthly median concentrations occurring during the freshet period of May-June of approximately 40 mg/L to 60 mg/L (as $CaCO_3$) and higher monthly median concentrations during the remainder of the year. These higher median alkalinity values range from approximately 80 mg/L to 90 mg/L (as $CaCO_3$) during July-October and from 100 mg/L to 120 mg/L during the winter low flow months of November-April. Upper Haggart Creek is characterized by moderately hard to hard waters, with monthly median hardness values ranging from approximately 70 mg/L during freshet to over 180 mg/L during lower flow periods. Monthly median sulphate concentrations in upper Haggart Creek are higher during non-freshet flow conditions, ranging between ~60 mg/L to 95 mg/L as compared to peak snowmelt periods where sulphate values typically less than 30 mg/L are observed. Nutrient parameters, as represented by nitrogen species (NH_3, NO_3, NO_2) and dissolved orthophosphate in upper Haggart Creek are low throughout the year.

Median TSS concentrations in upper Haggart Creek are generally low for most of the year (e.g., ~3.0 mg/L), although higher concentrations are observed during freshet in May. Median TSS for May is approximately 17 mg/L and the 90th percentile is 65 mg/L and reflects elevated suspended solids during higher flow periods particularly during freshet.

Most trace metal parameters are present at concentrations at or below their respective analytical detection limit. In general, median monthly concentrations of total trace elements are low for all parameters monitored and below their respective generic water quality guideline provided by BC Ministry of Environment and Climate Change Strategy (BC) and/or Canadian Council of Ministers of Environment (CCME) with exception of total and dissolved Al observed during freshet. May monthly median dissolved Al concentrations (0.14 mg/L) naturally exceed the generic water quality objective of 0.05 mg/L. Monthly median total arsenic (As) concentrations are less than 0.001 mg/L for all flow periods with the exception of peak flows in May where median concentrations of total As approach 0.002 mg/L; however, these baseline values are below the water quality guideline of 0.005 mg/L. The 90th percentile total As concentrations at W22 range between 0.0014 mg/L to 0.0062 mg/L and these higher concentrations are all associated with higher TSS levels (e.g., 13 to 65 mg/L) occurring during freshet periods. Conversely, monthly median dissolved As concentrations are more consistent throughout the year and generally narrowly range between 0.0006 mg/L to 0.0008 mg/L.

The chemistry and water quality of Haggart Creek changes following the addition of Dublin Gulch waters that enter downstream of station W22 and immediately upstream of station W4. As noted above, baseline water quality in Dublin Gulch has been characterized as being soft to moderately hard water, nutrient poor and naturally elevated in arsenic. Other trace elements in Dublin Gulch are present at generally low concentrations. As such, water quality immediately downstream of the confluence with Dublin Gulch at W4 is generally similar to that observed at W22 with the notable exception of higher concentrations of total and dissolved arsenic derived from loadings from Dublin Gulch.

Monitoring stations below the Haggart Creek confluence with Dublin Gulch are considered receiving environment station and as such baseline period for these stations is defined as prior to 2019. Monthly water quality data collected for the Project is compared to each stations baseline water quality condition. For stations W4 and W23, the baseline water quality is represented by monitoring results for the period 2007 to 2018. For station W29, the baseline period spans 2009 to 2018 and for station W99, there does not exist a true baseline as water quality sampling was initiated at this station in April 2019 during early operations. In the case of W99, monthly data for 2020 is compared only to 2019. Haggart Creek exhibits strong flow-based variability and therefore data was compared among months between years as the most appropriate approach rather than assessing water quality changes observed over consecutive months.

Determination as to whether parameters measured in 2020 are exhibiting an increasing trend has been based on consideration of the natural variability in the baseline. Specifically, monthly mean 2020 observations for adaptive management (AMP) key parameters are compared to baseline monthly mean +1 and +2 standard deviations (e.g., 68th and 95th percentile). Monthly mean 2020 values within +1 standard deviation of baseline values are considered to be unchanged; values measured within +2 standard deviations are considered to be within the natural observed variability. Monthly mean 2020 values measured above +2 standard deviations of the baseline and above the Tier 3 water quality objective of (WQO) of the WUL are considered to be an increase over the baseline condition. In some instances, and for some parameters, monthly mean 2020 values were measured above the Tier 3 WQO but below +2 standard deviations of baseline conditions. In these instances, no specific action is considered currently necessary due to high background conditions.

Station W4 is located downstream of the confluence of both Dublin Gulch and where the discharge via Ditch C enters Haggart Creek. In 2020, discharge via Ditch C to Haggart Creek only occurred during the period of July 29 to August 18, September 14 to 20 and September 23 to 27. A trend analysis summary of W4 baseline water quality, for the period 2007 to 2018, compared to monthly mean 2020 water quality data for the open water period of April to October is presented in Table 6-2.

As illustrated, most parameters measured at W4 during 2020 were at concentrations very similar to baseline values (e.g., ≤ +2 std. dev. (95th percentile limits)); only TSS, total As and total Fe were measured at concentrations greater than the baseline variability and greater than the respective Tier 3 WQO (Table 6-2). In April, TSS, total As and total Fe were measured at elevated concentrations at W4. These elevated levels were a result of Dublin Gulch inflows containing elevated concentrations of these parameters. During the latter part of April, corresponding with the onset of initial snowpack melt, an increase in TSS and total As concentrations is observed between station W1 and W21 in Dublin Gulch (Figure 6-2).

Elevated total As concentrations above the AMP T3 WQO of 0.0085 mg/L were observed at station W4 during the July 29 to August 18 and the September 14 to September 27 discharge events. These results are not considered to be attributed to the Project given that all LDSP discharges during these events were compliant with all QZ14-041-1 effluent quality standards (EQS). Total As concentrations during the July/August and September discharges ranged between 0.027 mg/L and 0.033 mg/L, well below the (EQS) of 0.053 mg/L. The results prompted further investigation as per EMSAMP requirements and it was postulated that complete mixing of Dublin Gulch and Ditch C discharges with Haggart Creek may not occur by the time water reaches station W4. Exploratory transect sampling from the east bank to west bank at W4 and a visual dye test in Haggart Creek in September 2020 confirmed that Dublin Gulch and Ditch C discharges are poorly mixed at W4. Water quality sampling at W4 were erroneously biased upward owing to the incomplete mixing occurring at the W4 Haggart Creek monitoring station.

As such, all “elevated” total As concentrations, total Fe and TSS values measured at W4 must be viewed with caution and are not likely representative of fully mixed conditions and therefore biased upwards due to the sampling location. Potential impacts from the Project may also be more appropriately assessed based on consideration of Haggart Creek sites W29, W99 and W23.

Table 6-2: Summary Comparison of Key Water Quality Parameters at W4 for Baseline Period (2007 – 2018) to 2020 monthly Mean Values Relative to AMP Threshold Values

Parameter	T1	T2	T3	W4 - Haggart Creek																				
				April			May			June			July			August			September			October		
				Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean
TSS			***15***	6	7	453	70	102	30	31	48	18	4	5	23	9	13	8	4	4	8	4	4	3
SO_4	***231.8***	***262.7***	***309***	100	107	67	28	38	27	50	56	28	68	77	45	64	72	54	70	92	61	70	76	55
Cl	***112.5***	***127.5***	***150***	0.5	0.5	2.6	2.3	3.3	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.5	1.4	0.6	0.7	1.4	0.6	0.8	0.5
NO_3-N	***2.3***	***2.6***	***3***	0.144	0.156	0.183	0.046	0.065	0.041	0.794	1.253	0.059	0.058	0.067	0.067	0.061	0.071	0.074	0.102	0.126	0.110	0.169	0.204	0.097
NO_2-N	***0.015***	***0.017***	***0.02***	0.001	0.001	0.0014	0.0047	0.0067	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0013	0.0010	0.0010	0.0018	0.0099	0.0164	0.0010
NH_3-N	***0.848***	***0.961***	***1.13***	0.005	0.005	0.013	0.009	0.012	0.008	0.008	0.010	0.005	0.005	0.005	0.012	0.015	0.022	0.008	0.005	0.005	0.013	0.005	0.005	0.006
CN_{WAD}	***0.005***	***0.005***	***0.005***	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	-	0.005	0.005	-
Diss- Al	***0.075***	***0.085***	***0.1***	0.007	0.010	0.037	0.221	0.286	0.126	0.050	0.070	0.070	0.013	0.017	0.029	0.023	0.033	0.016	0.015	0.019	0.012	0.008	0.010	0.017
T-Sb	***0.015***	***0.017***	***0.02***	0.0006	0.0008	0.0023	0.0007	0.0009	0.0007	0.0009	0.0011	0.0006	0.0005	0.0005	0.0010	0.0005	0.0005	0.0019	0.0005	0.0005	0.0025	0.0005	0.0006	0.0013
T-As	***0.0064***	***0.0072***	***0.0085***	0.0093	0.0141	0.056	0.0255	0.0377	0.0138	0.0151	0.0228	0.0083	0.0059	0.0079	0.0156	0.0057	0.0070	0.0168	0.0072	0.0092	0.0203	0.0067	0.0084	0.0265
T-Cd	***0.00015***	***0.00017***	***0.0002***	0.00003	0.00004	0.00014	0.00010	0.00014	0.00007	0.0000	0.0000	0.00002	0.00002	0.00002	0.00003	0.00003	0.00004	0.00002	0.00003	0.00005	0.00002	0.00001	0.00002	0.00003
T-Co	***0.003***	***0.0034***	***0.004***	0.00047	0.00065	0.00302	0.00192	0.00275	0.00096	0.00064	0.00097	0.00035	0.00012	0.00013	0.00054	0.00022	0.00030	0.00028	0.00016	0.00018	0.00028	0.00015	0.00017	0.00084
T-Cu	***0.00375***	***0.00425***	***0.005***	0.00074	0.00096	0.00739	0.00511	0.00678	0.00359	0.00258	0.00378	0.00190	0.00065	0.00074	0.00198	0.00104	0.00140	0.00141	0.00073	0.00084	0.00140	0.00098	0.00131	0.00243
T-Fe	***0.75***	***0.85***	***1***	0.47	0.69	3.54	3.09	4.50	1.68	1.42	2.25	0.63	0.11	0.14	0.98	0.31	0.48	0.35	0.11	0.14	0.31	0.10	0.12	1.72
T-Pb	***0.00578***	***0.00655***	***0.0077***	0.00065	0.00099	0.00943	0.00275	0.00407	0.00185	0.00178	0.00286	0.00070	0.00006	0.00006	0.00168	0.00017	0.00025	0.00070	0.00010	0.00013	0.00061	0.00007	0.00008	0.00275
T-Mn	***0.878***	***0.995***	***1.17***	0.104	0.140	0.196	0.208	0.302	0.105	0.046	0.063	0.029	0.030	0.037	0.036	0.033	0.039	0.031	0.034	0.038	0.034	0.033	0.037	0.070
T-Hg	***0.000015***	***0.000017***	***0.00002***	0.000011	0.000013	0.000027	0.000032	0.000047	0.000008	0.000037	0.000055	0.000007	0.000011	0.000013	0.000007	0.000011	0.000013	0.000005	0.000011	0.000013	0.000005	0.000010	0.000013	0.000005
T-Mo	***0.0548***	***0.0621***	***0.073***	0.00018	0.00023	0.00038	0.00042	0.00062	0.00019	0.00080	0.00109	0.00028	0.00032	0.00041	0.00047	0.00031	0.00038	0.00077	0.00066	0.00092	0.00100	0.00061	0.00086	0.00049
T-Ni	***0.087***	***0.099***	***0.116***	0.0024	0.0030	0.0063	0.0057	0.0075	0.0038	0.0025	0.0035	0.0018	0.0010	0.0012	0.0021	0.0012	0.0015	0.0016	0.0010	0.0011	0.0016	0.0010	0.0011	0.0032
T-Se	***0.0015***	***0.0017***	***0.002***	0.00026	0.00031	0.00023	0.00021	0.00025	0.00011	0.00022	0.00025	0.00013	0.00020	0.00024	0.00019	0.00021	0.00025	0.00024	0.00021	0.00025	0.00030	0.00019	0.00022	0.00017
T-Ag	***0.00113***	***0.00128***	***0.0015***	0.000010	0.000010	0.000057	0.000033	0.000046	0.000021	0.000021	0.000028	0.000011	0.000010	0.000010	0.000020	0.000010	0.000010	0.000013	0.000010	0.000010	0.000012	0.000011	0.000012	0.000019
T-U	***0.0113***	***0.0128***	***0.015***	0.0016	0.0017	0.0016	0.0005	0.0006	0.0005	0.0007	0.0008	0.0005	0.0010	0.0011	0.0009	0.0009	0.0011	0.0015	0.0010	0.0011	0.0021	0.0012	0.0014	0.0012
T-Zn	***0.0285***	***0.0323***	***0.038***	0.0058	0.0072	0.0193	0.0148	0.0201	0.0103	0.0069	0.0098	0.0037	0.0034	0.0041	0.0053	0.0033	0.0041	0.0033	0.0034	0.0044	0.0032	0.0032	0.0033	0.0085

All units as mg/L
Baseline period for W4 2007 - 2018

Colour Coding Legend for Trend Assessment	
Monthly 2020 mean is ≤ any Tier and ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ any Tier but ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ Tier 2 < Tier 3 ≥ Baseline 2 stdev	monitor
Monthly 2020 mean is ≥ Tier 3 > Baseline 2 stdev	Upward trend
Monthly 2020 mean is ≥ Tier 3 < Baseline 2 stdev	high background

Water quality parameters at W29 in 2020 were present at concentrations very similar to the observed baseline values (e.g. ≤ +2 std. dev.) during the baseline period of 2009 to 2018 (Table 6-3). Minor exceptions to these observations occurred in June 2020, where elevated TSS, dissolved Al and total Fe were present in concentrations greater than AMP T3 and baseline values for the same period. No discharge was occurring from the Project in June and there were no identified Project influence point sources for the elevated water quality concentrations. In April, May and June 2020, mean monthly total As concentrations were higher than the AMP T3 WQO of 0.0085 mg/L; however, the monthly mean values were lower than the observed baseline values and therefore cannot be viewed as an upward trend at this time. Indeed, for most months, the mean monthly total As concentrations measured in 2020 were typically at or below the observed baseline +1 std. dev. value (Table 6-3).

Station W99 was added in 2019 and therefore does not have a true “baseline” record of measurements to which trend analysis is applicable. In 2020, April, June and September observed mean monthly total As concentrations were greater than the AMP T3 threshold of 0.0085 mg/L (Table 6-4). The elevated As concentrations measured in the aforementioned months appear to be associated with elevated TSS at W99 on those sampling occasions. Without historical baseline data it is not possible to determine whether these concentrations would have fallen within observed baseline values (e.g. ≤ +2 std. dev.). Elevated concentrations of total Cu and Fe were also observed in May 2020 (Table 6-4). Dissolved As concentrations at W99 in the open water period of 2020 (e.g., April to October) narrowly ranged between 0.004 mg/L and 0.006 mg/L, much lower than Total As concentrations. The low dissolved As concentrations contrast the corresponding total As measurements. Similarly, to W4 this supports the hypothesis that the majority of arsenic concentrations within the waters at W99 are associated with suspended sediment within the water column. Dublin Gulch is believed to be the primary source for the elevated concentrations of total As observed. The monitoring station W45 on Eagle Creek situated nearby central Project infrastructure and laydowns, which discharges into Haggart Creek just above W29, did not exhibit the similar elevated metal signatures when compared to W99.

Table 6-3: Summary Comparison of Key Water Quality Parameters at W29 for Baseline Period (2009 – 2018) to 2020 monthly Mean Values Relative to AMP Threshold Values

Parameter	T1	T2	T3	W29 - Haggart Creek																				
				April			May			June			July			August			September			October		
				Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean
TSS			15	96	157	225	135	192	100	11	15	22	3	3	16	12	19	6	4	5	3	5	7	3
SO_4	231.8	262.7	309	99	105	78	31	41	29	52	60	30	70	79	48	72	82	55	66	68	92	72	78	82
Cl	112.5	127.5	150	1.1	1.5	4.2	2.3	3.3	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.5	0.6	0.7	0.5
NO_3-N	2.3	2.6	3	0.135	0.144	0.176	0.039	0.052	0.040	0.079	0.089	0.061	0.061	0.071	0.065	0.068	0.085	0.072	0.098	0.115	0.060	0.122	0.133	0.118
NO_2-N	0.015	0.017	0.02	0.0012	0.0013	0.0023	0.0047	0.0067	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0012	0.0013	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
NH_3-N	0.848	0.961	1.13	0.0154	0.0224	0.0126	0.0117	0.0155	0.0089	0.0087	0.0108	0.0061	0.0050	0.0050	0.0334	0.0112	0.0155	0.0077	0.0131	0.0187	0.0201	0.0144	0.0205	0.0050
CN_{WAD}	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	-	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Diss- Al	0.075	0.085	0.1	0.006	0.009	0.022	0.420	0.627	0.123	0.057	0.082	0.102	0.012	0.015	0.033	0.023	0.035	0.016	0.009	0.011	0.004	0.007	0.009	0.006
T-Sb	0.015	0.017	0.02	0.0049	0.0078	0.0039	0.0018	0.0024	0.0012	0.0008	0.0009	0.0008	0.0007	0.0008	0.0006	0.0010	0.0013	0.0007	0.0007	0.0007	0.0006	0.0007	0.0008	0.0005
T-As	0.0064	0.0072	0.0085	0.123	0.2020	0.0839	0.0426	0.0615	0.0200	0.0109	0.0147	0.0111	0.0070	0.0087	0.0082	0.0081	0.0102	0.0078	0.0073	0.0086	0.0030	0.0071	0.0089	0.0029
T-Cd	0.00015	0.00017	0.0002	0.00017	0.00027	0.00014	0.00014	0.00019	0.00009	0.00003	0.00004	0.00006	0.00001	0.00002	0.00002	0.00002	0.00003	0.00002	0.00002	0.00002	0.00001	0.00004	0.00005	0.00001
T-Co	0.003	0.0034	0.004	0.00428	0.00700	0.00266	0.00254	0.00346	0.00109	0.00036	0.00051	0.00079	0.00011	0.00012	0.00037	0.00025	0.00035	0.00022	0.00012	0.00013	0.00011	0.00026	0.00038	0.00010
T-Cu	0.00375	0.00425	0.005	0.02130	0.03501	0.00880	0.00808	0.01037	0.00460	0.00216	0.00299	0.00314	0.00074	0.00087	0.00160	0.00125	0.00174	0.00092	0.00100	0.00121	0.00058	0.00087	0.00109	0.00063
T-Fe	0.75	0.85	1	9.42	15.51	4.32	4.78	6.56	1.77	0.71	1.07	1.31	0.12	0.15	0.62	0.44	0.69	0.21	0.10	0.12	0.04	0.45	0.72	0.05
T-Pb	0.00578	0.00655	0.0077	0.0179	0.0295	0.0123	0.0074	0.0106	0.0030	0.0013	0.0019	0.0024	0.0001	0.0002	0.0008	0.0006	0.0009	0.0003	0.0002	0.0003	0.0001	0.0005	0.0007	0.0001
T-Mn	0.878	0.995	1.17	0.268	0.412	0.155	0.219	0.302	0.106	0.035	0.046	0.066	0.038	0.047	0.035	0.037	0.043	0.039	0.039	0.043	0.067	0.050	0.061	0.056
T-Hg	0.000015	0.000017	0.00002	0.000032	0.000046	0.000017	0.000032	0.000047	0.000012	0.000042	0.000061	0.000011	0.000010	0.000013	0.000006	0.000011	0.000013	0.000005	0.000011	0.000013	0.000005	0.000011	0.000013	0.000005
T-Mo	0.0548	0.0621	0.073	0.00072	0.00107	0.00050	0.00026	0.00032	0.00020	0.00026	0.00027	0.00024	0.00036	0.00044	0.00033	0.00036	0.00042	0.00042	0.00051	0.00064	0.00029	0.00034	0.00041	0.00021
T-Ni	0.087	0.099	0.116	0.0109	0.0170	0.0063	0.0071	0.0090	0.0041	0.0020	0.0027	0.0029	0.0010	0.0012	0.0018	0.0014	0.0017	0.0015	0.0011	0.0011	0.0010	0.0012	0.0014	0.0010
T-Se	0.0015	0.0017	0.002	0.00041	0.00054	0.00027	0.00023	0.00029	0.00014	0.00025	0.00030	0.00013	0.00021	0.00024	0.00018	0.00024	0.00028	0.00022	0.00024	0.00027	0.00012	0.00024	0.00027	0.00020
T-Ag	0.00113	0.00128	0.0015	0.000124	0.000200	0.000087	0.000081	0.000114	0.000030	0.000012	0.000013	0.000020	0.000010	0.000010	0.000016	0.000010	0.000011	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011	0.000010
T-U	0.0113	0.0128	0.015	0.0023	0.0026	0.0019	0.0007	0.0008	0.0006	0.0008	0.0009	0.0005	0.0012	0.0013	0.0008	0.0013	0.0016	0.0011	0.0013	0.0014	0.0017	0.0014	0.0015	0.0014
T-Zn	0.0285	0.0323	0.038	0.036	0.057	0.023	0.020	0.027	0.012	0.005	0.007	0.008	0.004	0.006	0.005	0.004	0.005	0.003	0.003	0.004	0.003	0.004	0.003	0.003

All units as mg/L
Baseline period for W29 2009 - 2018

Colour Coding Legend for Trend Assessment	
Monthly 2020 mean is ≤ any Tier and ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ any Tier but ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ Tier 2 < Tier 3 ≥ Baseline 2 stdev	monitor
Monthly 2020 mean is ≥ Tier 3 > Baseline 2 stdev	Upward trend
Monthly 2020 mean is ≥ Tier 3 < Baseline 2 stdev	high background

Table 6-4: Summary Comparison of Key Water Quality Parameters at W99 for 2019 to 2020 monthly Mean Values Relative to AMP Threshold Values

Parameter	T1	T2	T3	W99 - Haggart Creek																				
				April			May			June			July			August			September			October		
				Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean
TSS			***15***	19	25	3	45	62	47	17	26	36	3	4	5	5	6	5	3	3	48	3	3	3
SO_4	***231.8***	***262.7***	***309***	98	102	108	58	82	31	72	90	29	82	83	53	86	86	54	92	92	48	82	82	61
Cl	***112.5***	***127.5***	***150***	3.4	4.3	0.7	0.7	0.8	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NO_3-N	***2.3***	***2.6***	***3***	0.104	0.113	0.168	0.204	0.312	0.025	0.068	0.075	0.056	0.063	0.066	0.076	0.058	0.058	0.067	0.060	0.060	0.077	0.118	0.118	0.106
NO_2-N	***0.015***	***0.017***	***0.02***	0.0011	0.0012	0.0010	0.0017	0.0021	0.0010	0.0016	0.0019	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
NH_3-N	***0.848***	***0.961***	***1.13***	0.0158	0.0209	0.0121	0.0067	0.0067	0.0072	0.0056	0.0056	0.0065	0.0122	0.0158	0.0050	0.0050	0.0050	0.0120	0.0201	0.0201	0.0053	0.0050	0.0050	0.0050
CN_{WAD}	***0.005***	***0.005***	***0.005***	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-	-	-	-	-	-	0.005	0.005	0.005	-	0.005	0.005	-
Diss- Al	***0.075***	***0.085***	***0.1***	0.013	0.015	0.002	0.191	0.269	0.160	0.066	0.095	0.074	0.008	0.010	0.021	0.004	0.004	0.015	0.004	0.004	0.032	0.006	0.006	0.018
T-Sb	***0.015***	***0.017***	***0.02***	0.0015	0.0018	0.0006	0.0010	0.0011	0.0017	0.0006	0.0007	0.0007	0.0007	0.0007	0.0005	0.0006	0.0006	0.0007	0.0006	0.0006	0.0015	0.0005	0.0005	0.0006
T-As	***0.0064***	***0.0072***	***0.0085***	0.0197	0.0231	0.0035	0.0178	0.0228	0.0327	0.0042	0.0045	0.0084	0.0038	0.0040	0.0067	0.0037	0.0037	0.0074	0.0030	0.0030	0.0235	0.0029	0.0029	0.0082
T-Cd	***0.00015***	***0.00017***	***0.0002***	0.00004	0.00005	0.00001	0.00006	0.00008	0.00010	0.00003	0.00004	0.00003	0.00001	0.00002	0.00001	0.00001	0.00001	0.00002	0.00001	0.00001	0.00005	0.00001	0.00001	0.00001
T-Co	***0.003***	***0.0034***	***0.004***	0.00065	0.00072	0.00015	0.00108	0.00140	0.00136	0.00038	0.00050	0.00046	0.00011	0.00012	0.00016	0.00013	0.00013	0.00019	0.00011	0.00011	0.00096	0.00010	0.00010	0.00025
T-Cu	***0.00375***	***0.00425***	***0.005***	0.00222	0.00260	0.00050	0.00373	0.00479	0.0071	0.00231	0.00310	0.00230	0.00063	0.00065	0.00089	0.00057	0.00057	0.00087	0.00058	0.00058	0.00307	0.00063	0.00063	0.00092
T-Fe	***0.75***	***0.85***	***1***	0.99	1.19	0.07	1.89	2.49	2.66	0.70	1.00	0.84	0.09	0.11	0.16	0.11	0.11	0.19	0.04	0.04	1.64	0.05	0.05	0.28
T-Pb	***0.00578***	***0.00655***	***0.0077***	0.0019	0.0024	0.0001	0.0023	0.0030	0.0040	0.0008	0.0011	0.0012	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0034	0.0001	0.0001	0.0004
T-Mn	***0.878***	***0.995***	***1.17***	0.132	0.148	0.073	0.108	0.132	0.097	0.053	0.058	0.045	0.049	0.049	0.031	0.063	0.063	0.035	0.067	0.067	0.070	0.056	0.056	0.056
T-Hg	***0.000015***	***0.000017***	***0.00002***	0.000005	0.000005	0.000005	0.000050	0.000068	0.000019	0.000007	0.000007	0.000008	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000006	0.000005	0.000005	0.000005
T-Mo	***0.0548***	***0.0621***	***0.073***	0.00034	0.00040	0.00017	0.00025	0.00030	0.00023	0.00019	0.00019	0.00025	0.00019	0.00019	0.00034	0.00019	0.00019	0.00044	0.00029	0.00029	0.00035	0.00021	0.00021	0.00038
T-Ni	***0.087***	***0.099***	***0.116***	0.0027	0.0029	0.0011	0.0039	0.0048	0.0058	0.0025	0.0032	0.0021	0.0010	0.0010	0.0013	0.0010	0.0010	0.0013	0.0010	0.0010	0.0030	0.0010	0.0010	0.0016
T-Se	***0.0015***	***0.0017***	***0.002***	0.00024	0.00026	0.00023	0.00018	0.00022	0.00013	0.00014	0.00015	0.00013	0.00015	0.00016	0.00018	0.00012	0.00012	0.00021	0.00012	0.00012	0.00018	0.00020	0.00020	0.00022
T-Ag	***0.00113***	***0.00128***	***0.0015***	0.000019	0.000023	0.000010	0.000033	0.000044	0.000047	0.000013	0.000015	0.000015	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000030	0.000010	0.000010	0.000010
T-U	***0.0113***	***0.0128***	***0.015***	0.0027	0.0031	0.0021	0.0011	0.0015	0.0006	0.0011	0.0014	0.0005	0.0013	0.0014	0.0009	0.0014	0.0014	0.0011	0.0017	0.0017	0.0010	0.0014	0.0014	0.0012
T-Zn	***0.0285***	***0.0323***	***0.038***	0.006	0.007	0.003	0.010	0.013	0.017	0.004	0.004	0.007	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.010	0.003	0.003	0.003

All units as mg/L
No baseline available for W99 - sampling commenced in April 2019

Colour Coding Legend for Trend Assessment	
Monthly 2020 mean is ≤ any Tier and ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ any Tier but ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ Tier 2 < Tier 3 ≥ Baseline 2 stdev	monitor
Monthly 2020 mean is ≥ Tier 3 > Baseline 2 stdev	investigate further
Monthly 2020 mean is ≥ Tier 3 < Baseline 2 stdev	high background

Water quality at W23 reflects loadings from Dublin Gulch and all mine related inputs as well as additional loadings from Lynx Creek. Water quality observed in 2020 at W23 relative to the baseline period of 2007 to 2018 indicated that most parameters measured in 2020 were at concentrations very similar to those observed during baseline monitoring. Most parameters were present at a concentration within 1 standard deviation of the baseline monthly mean concentration with the exception of As during freshet in May (Table 6-5). Concentrations of total As on May 5, 2020 at W23 (0.032 mg/L) were similar to total As concentrations measured at W99 on the same date (0.033 mg/L) and are a consequence of elevated TSS. This is supported by dissolved As concentrations at W23 in May 2020 of 0.005 mg/L. In addition, record snow pack and resultant increased flow within Haggart Creek throughout May as compared to baseline conditions contributed to TSS being more persistent within the water column, staying suspended for longer durations. Snow management, silt fencing, water diversion structures, check dams, jute and hay bales were all employed to mitigate potential sediment laden water souring from the Project entering Haggart creek. Efforts to improve sediment controls and upgrade water management structures on the Project are a key focus of ongoing water management improvements at the Project.

Table 6-5: Summary Comparison of Key Water Quality Parameters at W23 for Baseline Period (2007 – 2018) to 2020 monthly Mean Values Relative to AMP Threshold Values

Parameter	T1	T2	T3	W23 - Haggart Creek																				
				April			May			June			July			August			September			October		
				Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean	Baseline 1 stdev	Baseline 2 stdev	2020 mean
TSS			15	15	22	6	91	135	57	45	67	4	4	4	3	3	3	3	9	13	5	3	3	3
SO_4	231.8	262.7	309	89	89	98	24	30	34	53	60	36	74	82	55	72	79	60	68	75	49	74	82	60
Cl	112.5	127.5	150	0.5	0.5	3.4	1.5	2.2	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.5	0.6	0.7	0.5
NO_3-N	2.3	2.6	3	0.179	0.191	0.248	0.035	0.042	0.032	0.071	0.084	0.080	0.055	0.065	0.095	0.068	0.082	0.066	0.099	0.118	0.072	0.160	0.179	0.102
NO_2-N	0.015	0.017	0.02	0.0010	0.0010	0.0012	0.0030	0.0044	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0011	0.0010	0.0010	0.0010	0.0010
NH_3-N	0.848	0.961	1.13	0.0071	0.0083	0.0134	0.0100	0.0124	0.0094	0.0299	0.0427	0.0050	0.0050	0.0050	0.0272	0.0158	0.0225	0.0050	0.0118	0.0168	0.0148	0.0133	0.0187	0.0050
CN_{WAD}	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-	0.005	0.005	-
Diss- Al	0.075	0.085	0.1	0.006	0.008	0.003	0.167	0.215	0.099	0.038	0.052	0.033	0.019	0.027	0.016	0.010	0.013	0.014	0.017	0.022	0.032	0.008	0.010	0.015
T-Sb	0.015	0.017	0.02	0.0015	0.0021	0.0011	0.0010	0.0012	0.0015	0.0014	0.0019	0.0005	0.0006	0.0007	0.0005	0.0006	0.0006	0.0006	0.0007	0.0008	0.0006	0.0005	0.0006	0.0005
T-As	0.0064	0.0072	0.0085	0.0291	0.0436	0.0150	0.0178	0.0238	0.0321	0.0271	0.0398	0.0055	0.0055	0.0061	0.0063	0.0059	0.0063	0.0065	0.0072	0.0084	0.0061	0.0056	0.0061	0.0071
T-Cd	0.00015	0.00017	0.0002	0.00006	0.00008	0.00002	0.00011	0.00015	0.00008	0.00016	0.00024	0.00001	0.00003	0.00004	0.00001	0.00003	0.00004	0.00002	0.00003	0.00004	0.00002	0.00003	0.00004	0.00002
T-Co	0.003	0.0034	0.004	0.00086	0.00130	0.00037	0.00149	0.00213	0.00142	0.00267	0.00414	0.00014	0.00010	0.00010	0.00010	0.00010	0.00010	0.00011	0.00020	0.00026	0.00020	0.00019	0.00026	0.00015
T-Cu	0.00375	0.00425	0.005	0.00325	0.00492	0.00135	0.00554	0.00719	0.0056	0.00612	0.00882	0.00148	0.00087	0.00097	0.00100	0.00085	0.00096	0.00085	0.00172	0.00225	0.00140	0.00097	0.00114	0.00095
T-Fe	0.75	0.85	1	1.77	2.78	0.63	2.63	3.79	2.47	0.75	1.04	0.23	0.07	0.10	0.11	0.09	0.12	0.10	0.14	0.19	0.21	0.09	0.13	0.14
T-Pb	0.00578	0.00655	0.0077	0.0032	0.0051	0.0015	0.0037	0.0055	0.0042	0.0078	0.0123	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0005	0.0007	0.0002	0.0003	0.0004	0.0001
T-Mn	0.878	0.995	1.17	0.092	0.123	0.041	0.154	0.217	0.157	0.305	0.472	0.017	0.021	0.023	0.017	0.025	0.029	0.028	0.035	0.043	0.032	0.032	0.037	0.040
T-Hg	0.000015	0.000017	0.00002	0.000009	0.000009	0.000005	0.000042	0.000061	0.000014	0.000044	0.000061	0.000005	0.000042	0.000062	0.000005	0.000040	0.000059	0.000005	0.000038	0.000056	0.000005	0.000047	0.000068	0.000005
T-Mo	0.0548	0.0621	0.073	0.00050	0.00057	0.00052	0.00035	0.00041	0.00034	0.00089	0.00116	0.00046	0.00056	0.00058	0.00055	0.00060	0.00064	0.00057	0.00076	0.00093	0.00052	0.00077	0.00091	0.00070
T-Ni	0.087	0.099	0.116	0.0026	0.0039	0.0012	0.0047	0.0062	0.0044	0.0052	0.0076	0.0012	0.0007	0.0008	0.0012	0.0008	0.0009	0.0009	0.0011	0.0013	0.0015	0.0009	0.0011	0.0014
T-Se	0.0015	0.0017	0.002	0.00109	0.00138	0.00037	0.00094	0.00133	0.00022	0.00111	0.00147	0.00026	0.00100	0.00138	0.00032	0.00104	0.00141	0.00030	0.00104	0.00143	0.00033	0.00090	0.00124	0.00034
T-Ag	0.00113	0.00128	0.0015	0.000029	0.000039	0.000011	0.000049	0.000072	0.000041	0.000033	0.000046	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000015	0.000018	0.000010	0.000015	0.000018	0.000010
T-U	0.0113	0.0128	0.015	0.0017	0.0017	0.0020	0.0004	0.0005	0.0006	0.0011	0.0013	0.0005	0.0011	0.0011	0.0008	0.0010	0.0011	0.0009	0.0011	0.0012	0.0007	0.0013	0.0015	0.0011
T-Zn	0.0285	0.0323	0.038	0.011	0.016	0.003	0.014	0.019	0.014	0.023	0.035	0.003	0.003	0.004	0.003	0.003	0.004	0.003	0.005	0.006	0.003	0.004	0.005	0.003

All units as mg/L
Baseline period for W23 2007 - 2018

Colour Coding Legend for Trend Assessment	
Monthly 2020 mean is ≤ any Tier and ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ any Tier but ≤ Baseline 2 stdev	no action
Monthly 2020 mean is ≥ Tier 2 < Tier 3 ≥ Baseline 2 stdev	monitor
Monthly 2020 mean is ≥ Tier 3 > Baseline 2 stdev	Upward trend
Monthly 2020 mean is ≥ Tier 3 < Baseline 2 stdev	high background

6.1.3 Lynx Creek Drainage

Lynx Creek is an undisturbed catchment that drains into Haggart Creek downstream of the project area. Monitoring in Lynx Creek has occurred primarily at station W6, at the mouth of Lynx Creek and immediately prior to entering Haggart Creek (Figure 6-1).

Baseline water quality for Lynx Creek spans the monitoring record from 2007 to 2020. Lynx Creek at station W6 is characterized by moderately hard to hard waters, with monthly median hardness values ranging from approximately 70 mg/L during the snowmelt period to approximately 235 mg/L during winter baseflows. Similarly, monthly median values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May during peak periods of snowmelt-driven runoff. Nutrient levels as indicated by NH_3-N, NO_3-N, NO_2-N and orthophosphate are low throughout all flow periods. Nitrate-N values for the open water period vary narrowly between 0.04 mg/L and 0.08 mg/L and NH_3-N monthly mean values are typically around 0.005 mg/L and 0.006 mg/L. Baseline monthly median concentrations for sulphate in lower Lynx Creek are approximately 60 mg/L to 95 mg/L during non-freshet flow conditions as compared to peak snowmelt periods where values of between 20 mg/L and 40 mg/L sulphate are observed.

TSS concentrations in Lynx Creek show seasonal and flow patterns similar to the other catchments described previously. Peak TSS values occur during the snowmelt runoff period in May and June. Monthly median TSS values observed for the baseline period for May and June range between 9.0 mg/L and 13 mg/L. The 95^{th} percentile values for those same months are 57 mg/L and 62 mg/L, respectively. The maximum observed TSS concentration observed at W6 occurred in May and was 80 mg/L. During the remainder of the open water period and winter, median TSS values in Lynx Creek were generally below the analytical detection limit of 3.0 mg/L.

In general, monthly median concentrations of total and dissolved trace elements are low for all parameters with the exception of As. Monthly median total arsenic concentrations at W6 in lower Lynx Creek range from 0.0054 mg/L to 0.0076 and are consistently above the generic water quality guideline for As for the protection of aquatic life of 0.005 mg/L. The maximum measured total As concentration in Lynx Creek was 0.013 mg/L and coincided with the peak TSS concentration of 80 mg/L. Apart from short-duration elevated TSS conditions, most of the As in Lynx Creek is present as dissolved As. Monthly median dissolved As concentrations are similar to total values and range from 0.0055 mg/L to 0.0065 mg/L. Like upper Haggart Creek and Dublin Gulch, dissolved As concentrations in Lynx Creek are unaffected by elevated TSS values. Although no anthropogenic disturbances occur in the Lynx watershed, the presence of arsenic in drainage waters indicates that arsenic mineralization in the broader area is prevalent and not just limited to the Dublin Gulch catchment. This posit is supported by an extensive sampling of individual drainages in the upper Lynx watershed that occurred in August 2012. Some tributaries in upper Lynx Creek showed elevated dissolved As concentrations (values ranging from 0.0012 to 0.0086 mg/L) indicating that As mobility is not limited to the immediate project area or Dublin Gulch and its tributaries in particular.

6.2 AQUATIC BIOTA

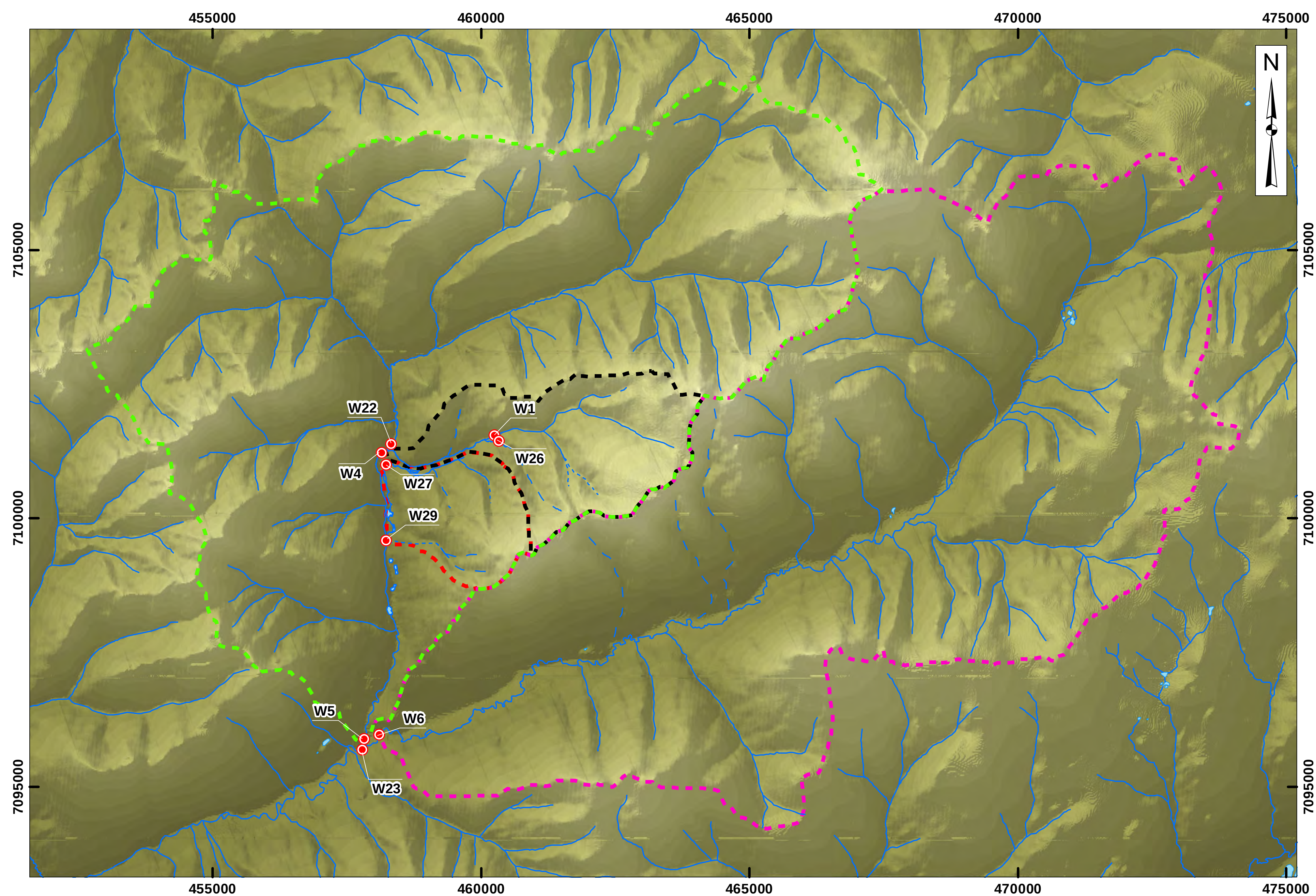
Sediment, periphyton, and benthic invertebrate characteristics of watercourses in the project area were studied during 1993-1996, 2007-2011, and ongoing from 2017. The objectives of the studies were to:

- obtain baseline data on water quality and sediment to assess potential Project impacts,

- identify parameters that may be present at elevated levels, and to use this information if needed to propose site-specific water quality objectives,
- provide baseline data that could be used to support biological monitoring programs,
- measure abundance and diversity of the periphyton and benthic invertebrate communities for comparison to future levels,
- evaluate changes related to the sequential phases of the Project.

Aquatic biota monitoring is currently undertaken in the four drainage basins in the Project area (Figure 6-3).

Going forward, the aquatic biota monitoring program for the Project will conform to the Environmental Effects Monitoring (EEM) study design as required under the *Metal and Diamond Mining Effluent Regulations* (MDMER) and the scope of the program under the EMSAMP is now considered to be the same as the EEM Study. The Phase 1 EEM Interpretive Report for program completed in 2021 is currently pending and will be reported on once available.



Legend:

- Aquatic Biota Monitoring Station
- Haggart Creek Watershed
- Lynx Creek Watershed
- Eagle Creek Watershed
- Dublin Gulch Watershed
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

0 0.5 1 2
Kilometers

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date: 2020/07/30	Figure: 6-3	Aquatic Biota Monitoring Stations

6.2.1 Sediment

Stream sediment samples have been collected in the general Project area in 1976, 1977, 1993, 1995, 2007, 2009 and 2010 (Stantec, 2011d), in 2017 (Laberge, 2017), in 2018 (Laberge, 2018), and in 2019 (Laberge, 2020a). The number of sites sampled, and the number of replicates collected varied in a given year. Data were examined from these surveys where the analysis was completed on the portion of the sediment that was less than 63 microns and for sites that were sampled in 2019.

High levels of arsenic were reported at all sites and on all occasions and exceeded the Probable Effects Level (PEL). Concentrations tended to fluctuate year to year at the sites.

Concentrations of nickel exceeded the lower British Columbia Working Sediment Quality Guidelines (BCWSQG) throughout the study area and study period with the exception in 2007 at Stewart Gulch (W26), and 2009 at Dublin Gulch (W1). There were periodic exceedances of guidelines of other metals in the earlier studies. This data has not been presented here but is available in a report prepared by Stantec (2011d).

The mean concentrations for arsenic and nickel over time have been tabulated (Table 6-6). Values that exceeded the PEL (or upper BCWSQG) are highlighted in grey. Where the Interim Sediment Quality Guidelines (ISQG) (or lower BCWSQG) is exceeded, the values are bolded.

While there are exceedances in certain metals throughout the study area at sites both upstream and downstream of project influence, the high metal concentrations generally reflect the natural geochemistry of the mineralized watersheds in the area.

Table 6-6: Mean Concentrations of Arsenic and Nickel in Stream Sediments, 1996 - 2019

Drainage	Site	Arsenic (mg/kg)							Nickel (mg/kg)						
		1995 n=5	2007 n=3	2009 n=3	2010 n=3	2017 n=3	2018 n=3	2019 n=3	1995 n=5	2007 n=3	2009 n=3	2010 n=3	2017 n=3	2018 n=3	2019 n=3
Haggart Creek	W22	**70.0**	**40.1**	**129.2**		**55.5**	**115.6**	**106**	**27.0**	**27.4**	**25.0**		**31.3**	**53.2**	**50.0**
	W4	**152.7**	**91.5**		**165.0**	**109.6**	**202.3**	**303**	**21.0**	**24.5**		**35.2**	**28.0**	**28.5**	**39.6**
	W29			**63.6**	**142.4**	**127.2**	**126.3**	**71**			**25.3**	**25.7**	**31.7**	**25.0**	**26.3**
	W5	**128.5**	**92.7**	**118.3**		**76.8**	**114.0**	**161**	**22.4**	**25.6**	**26.8**		**26.9**	**29.8**	**42.4**
	W23		**93.4**			**88.8**	**105.6**	**128**		**28.8**			**25.9**	**26.7**	**39.7**
Dublin Gulch	W1		**300.0**	**156.0**	**360.4**	**458.0**	**383.0**	**444**		**65.5**	13.3	**39.3**	**57.2**	**41.7**	**36.1**
	W26		**89.1**	**342.0**		**209.0**	**269.7**			15.7	**17.0**		**28.7**	**34.6**	
Eagle Creek	W27		**175.0**	**173.7**	**77.9**	**200.3**	**252.7**	**253**		**25.3**	**20.6**	**21.1**	**31.0**	**28.4**	**29.7**
Lynx Creek	W6		**65.9**			**85.8**	**79.5**	**96**		**23.6**			**27.5**	**29.7**	**39.6**
CEQG Guidelines	ISQG	5.9							16*						
	PEL	17							75*						

Notes:
* BCWSQG upper and lower guidelines used

6.2.2 Periphyton

Materials consulted to complete the baseline study of periphyton in the Project area include the 1995 study (Hallam Knight Piésold 1996a) and 2007 study (Jacques Whitford-AXYS 2008). The 1995 and 2007 sampling programs followed conventional guidance to sample riffle habitat in late summer, after peak flows have subsided and maximum development of the periphyton community had occurred (MWLAP 2003). In August 1995, periphyton samples were collected from 11 sites (Hallam Knight Piésold 1996a). In August 2007, periphyton samples were collected from 11 sites, some of which had been sampled in 1995. The sites were co-located with selected water, sediment, and benthic invertebrate sampling locations. Detailed descriptions of the field and laboratory methods, including QA/QC protocols, used to characterize periphyton are provided in Stantec (2010c).

Chlorophyll *a* levels suggest oligotrophic conditions in the streams, as indicated by nutrient chemistry. Taxonomic richness, diversity, and evenness indices were highest at sites in Haggart Creek, suggesting better conditions for growth there than in Dublin Gulch and Eagle Creek, or in Lynx Creek. This could be related to a number of factors, alone or in combination, including water quality, habitat conditions, and stream order (more opportunity for colonization from upstream communities than in smaller and headwater streams). Haggart Creek communities were dominated by diatoms and blue-green algae, whereas those in Dublin, Eagle and Lynx Creeks consisted mainly of blue-green algae.

6.2.3 Benthics

Materials consulted to complete the baseline study include data collected in 1995 (Hallam Knight Piésold (1996a), 2007 (Jacques Whitford AXYS 2008), 2009 and 2010 (Stantec 2010c), and 2017 to 2019 (Laberge, 2020b). Samples were collected during the late summer low flow period in 1995 (11 sites), 2007 (11 sites), 2009 (7 sites), 2010 (7 sites), 2017 – 2019 (9 sites). Samples were collected from riffle habitat to target the preferred habitat of the more sensitive benthic invertebrate species. Detailed descriptions of the field and laboratory methods, including QA/QC protocols, used to characterize benthic invertebrates are provided in Stantec (2010c) and Laberge (2020b).

Benthic invertebrate communities in all streams monitored had abundant pollution sensitive benthic invertebrate taxa that are common prey for fish. High abundance and numbers of taxa of Ephemeroptera, Plecoptera and Trichoptera (mayflies, stoneflies and caddisflies or EPT) is generally considered an indicator of good water quality and of food for fish.

In 2019, the highest densities of benthic invertebrates on record were documented in the Haggart Creek, Eagle Creek and Lynx Creek drainages. In fact, for Haggart Creek in particular, the densities were 2-3 times those of all previous years. Although densities were relatively high in 2019 for Dublin Gulch (W1), the highest density documented in the Dublin Gulch watershed occurred in 1995. Generally, except for Stewart Gulch (W26) in 1995, all sites had relatively high Simpson’s Diversity Index values over time, with the highest diversities for most sites occurring in 2018, and the lowest overall diversities occurring in 2010.

Fluctuation in numbers between monitoring events is related to many variables. Benthic community population numbers can be affected by climate (flooding, drought, rainfall events, unusually high or low temperatures), time of year sampled, sampling methods, disturbance to riparian zones, etc.

Although neither the same number of sites nor the same frequency of sampling is available per drainage, averages have been performed to give an overall idea of potential differences between watersheds. Based on the inclusion of 2019 data, these averages indicate that the most diverse communities are found in Haggart Creek, and in particular W4 and W23. The greatest populations of benthic communities have been in Dublin Gulch but they are less diverse. The greatest densities of organisms with moderately diverse communities have been documented in Lynx Creek. Overall, the limited data suggests stable benthic communities at all the sites sampled.

When comparing the most upstream site W22, Haggart Creek above Project influence, with all sample sites in Haggart Creek downstream of Project influence, the densities and diversities are very similar. This data suggests that there is little, if any, impact to Haggart Creek from construction activities at the Eagle Gold project site.

7 FISH AND FISH HABITAT

Baseline fish and fish habitat information was gathered from existing consultant reports, government databases, and the results of field studies conducted for the Project prior to VGC's claim ownership. Field studies were completed for watercourses located within the local Project area to obtain biophysical habitat data, determine fish presence and abundance, and characterize fish populations (i.e., size, age, and tissue metal concentrations). The fish and fish habitat study area includes:

- All watercourses in the Dublin Gulch watershed and lower Haggart Creek (below Dublin Gulch)
- Reference watercourses that would be uninfluenced by flows from the Dublin Gulch watershed (i.e., Ironrust Creek, Lynx Creek, and upper Haggart Creek [above Dublin Gulch])
- All watercourses that are crossed by or approach within 30 m of the site access road, which parallels Haggart Creek.

Although placer mining has occurred throughout the upper Haggart Creek watershed, including Dublin Gulch, it has not occurred in two of the selected reference watercourses: Ironrust and Lynx Creeks.

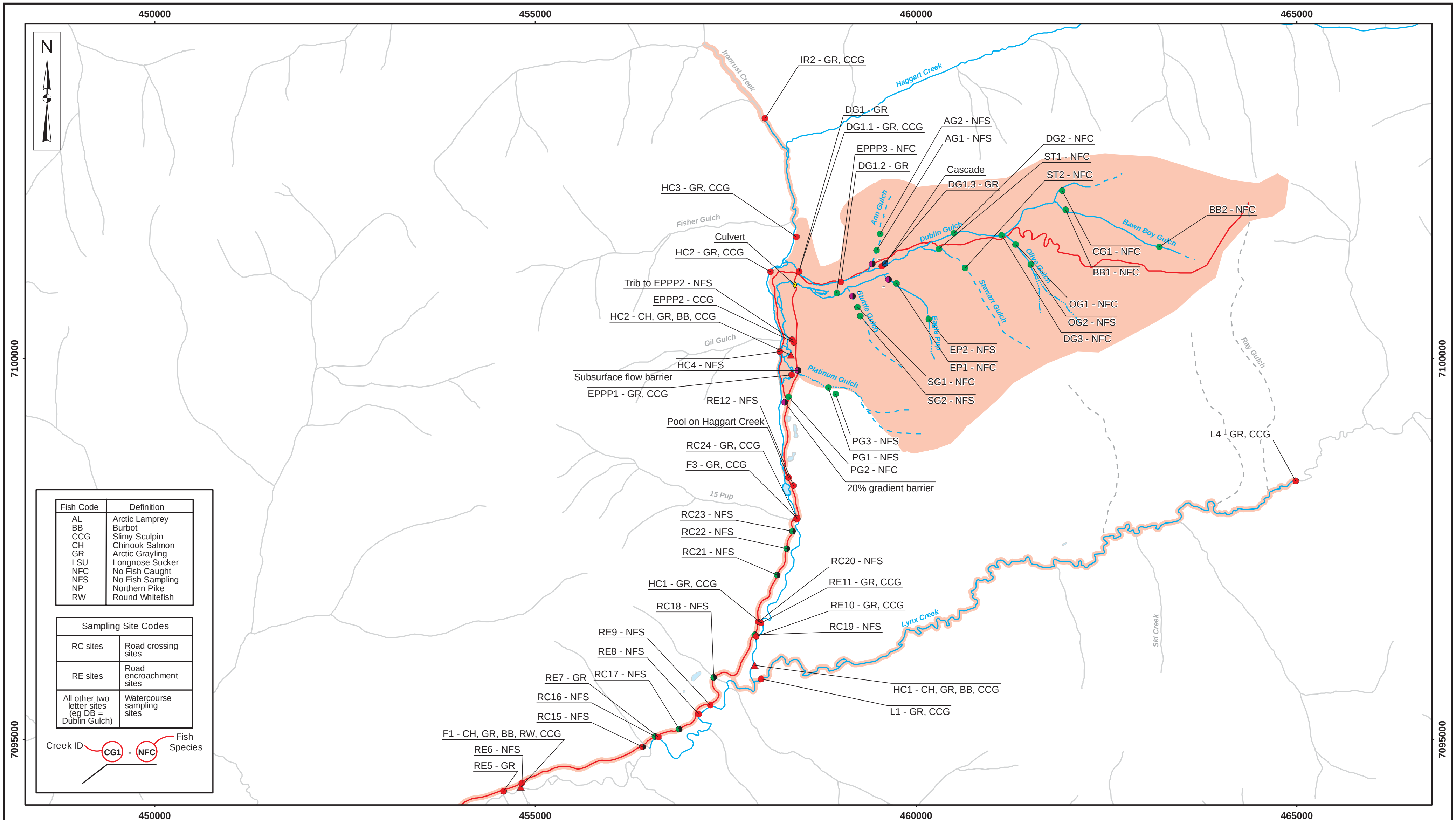
Field studies within the study area were completed over four sampling periods (August 2007, October 2007, April 2008, and July 2009) and included 59 sample sites, located on 28 mapped or field identified watercourses (Figure 7-1 to Figure 7-3). Results from the 2007-2009 Environmental Baseline Report: Fish and Fish Habitat are provided in Stantec (2010e). From 2017 to 2019, a total of 5 monitoring sites (HC1, HC2, HC3, IR2, and L1 Figure 7-4) were monitored in the Haggart, Ironrust and Lynx creeks as per the Project's Environmental Monitoring, Surveillance and Adaptive Management Plan (de Graff, 2020; de Graff 2019; de Graff 2017). The monitoring program focused on monitoring the potential effects of the Project on the fish and fish habitat, with these sampling locations consistent with reaches and locations sampled as part of the baseline surveys and include representative reaches that include all mesohabitat types present in the watercourse.

Sampled watercourses were characterized as fish-bearing unless:

- Fish were not captured, despite the application of appropriate capture methods, during at least two different sampling periods
- The watercourse had physical characteristics that could explain fish absence (i.e., gradient >20% or a permanent barrier to upstream fish passage where no perennial fish habitat exists upstream of the barrier).

Fish density per unit area was estimated for fish-bearing sites sampled in Dublin Gulch, Ironrust Creek, Lynx Creek, and a subset of sites in Haggart Creek, using electrofishing via multiple pass removal methods.

On April 20, 2019 the mine became subject to the MDMER and as a result required an EEM program was developed and submitted for approval under the MDMER. Going forward, the aquatic environment monitoring program for the Project will conform to the EEM study design and the scope of the program under the EMSAMP is now considered to be the same as the EEM Study.



LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)
- Cascade barrier
- Culvert barrier
- Gradient barrier

Watercourse
- Fish bearing (perennial)
- Non-fish bearing (perennial)
- Non-fish bearing (intermittent)
- Non-fish bearing (ephemeral)
- Unsampled (perennial)
- Unsampled (ephemeral)

- Fish and Fish Habitat Local Study Area
- Road - Gravel
- Waterbody

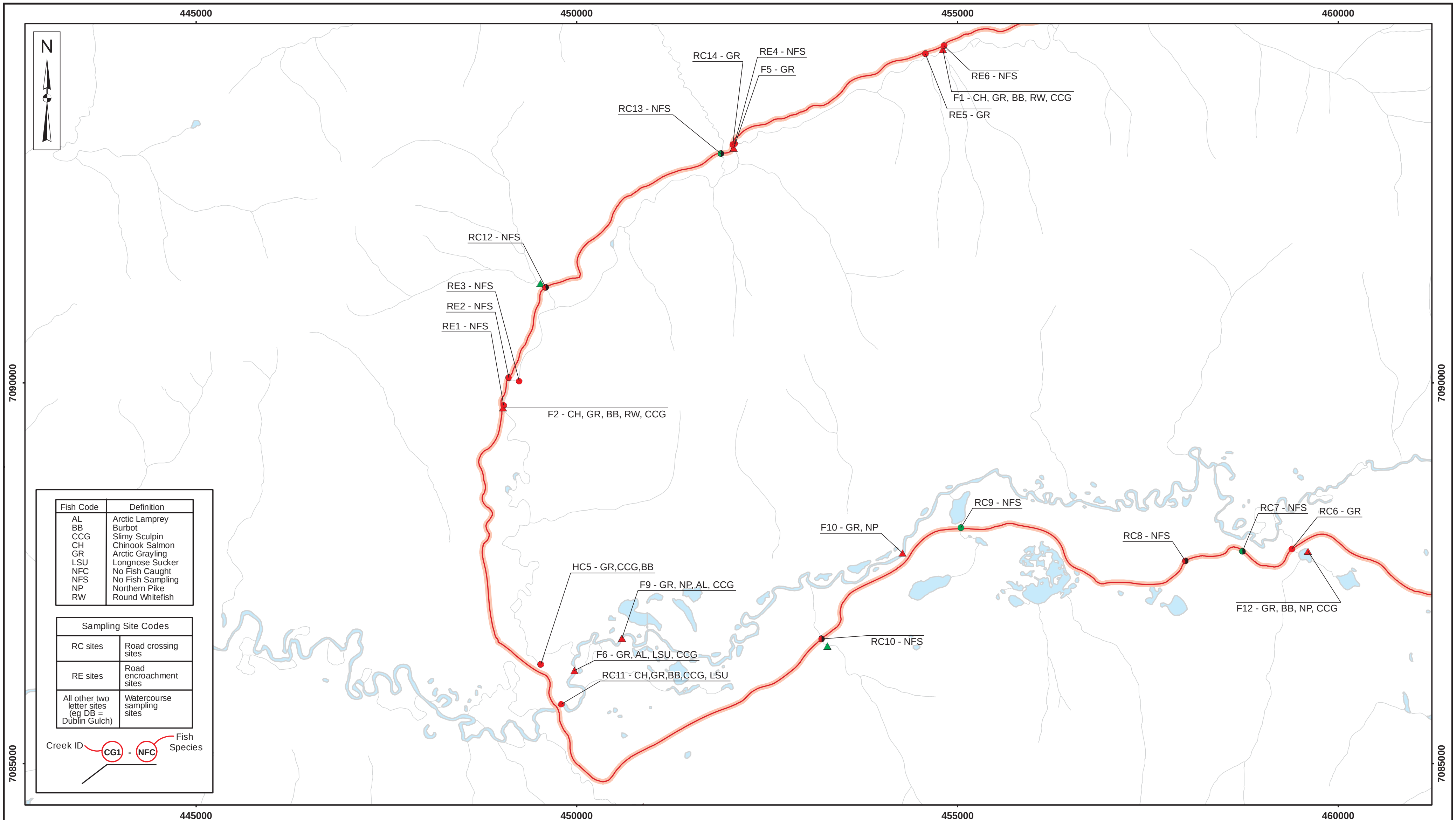
VICTORIA GOLD CORP

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY
NAD83 Zone 8N	
DATE	FIGURE
2014/03/26	7-1

EAGLE GOLD PROJECT
YUKON TERRITORY

FISH AND FISH HABITAT STUDY AREA
SHEET 1 OF 3



LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)

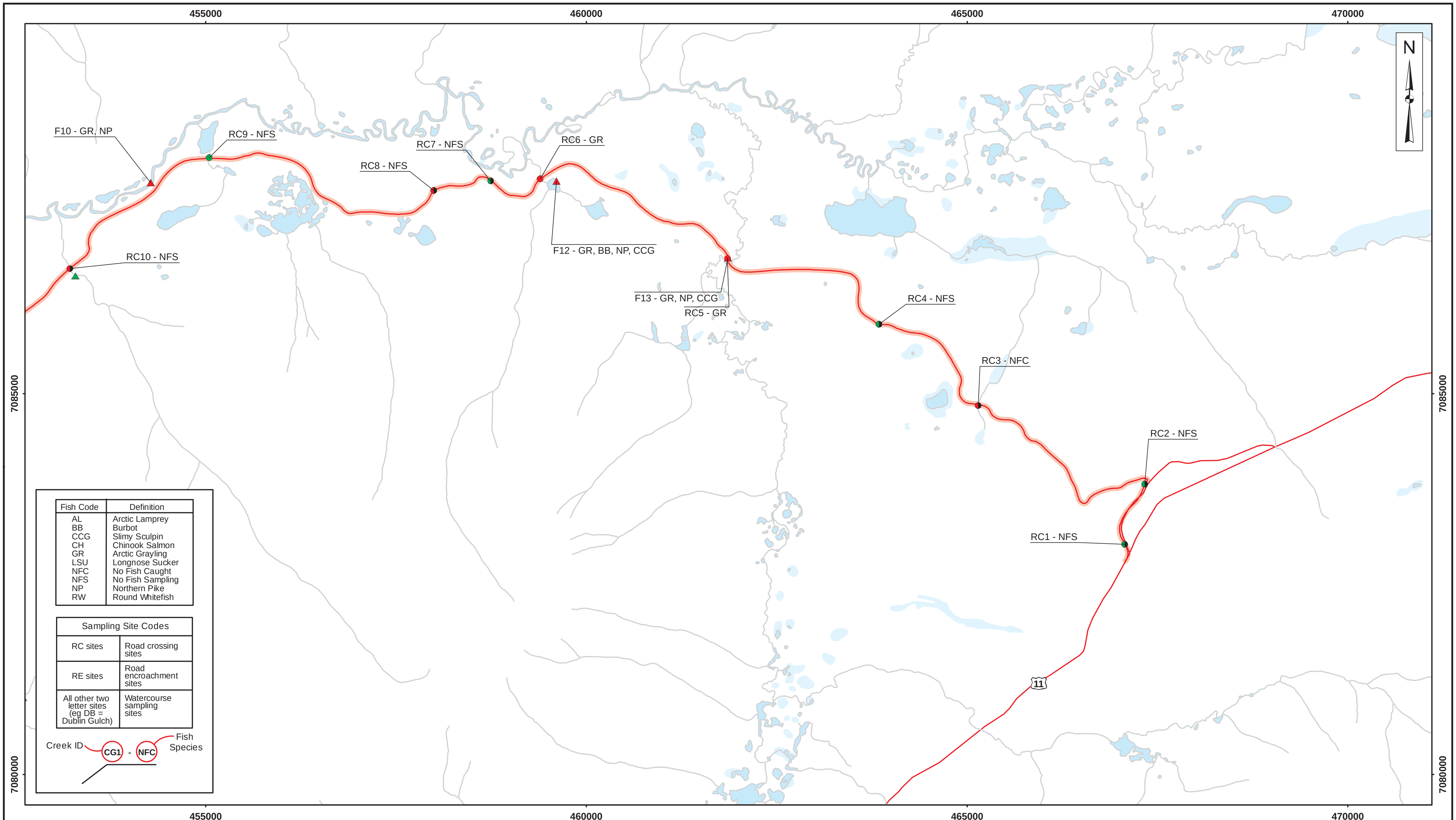
Watercourse
- Unsampled (perennial)

- Fish and Fish Habitat Local Study Area
- Road - Gravel
- Waterbody

VICTORIA GOLD CORP

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 Zone 8N		
DATE	FIGURE	FISH AND FISH HABITAT STUDY AREA SHEET 2 OF 3
2014/03/26	7-2	



LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)

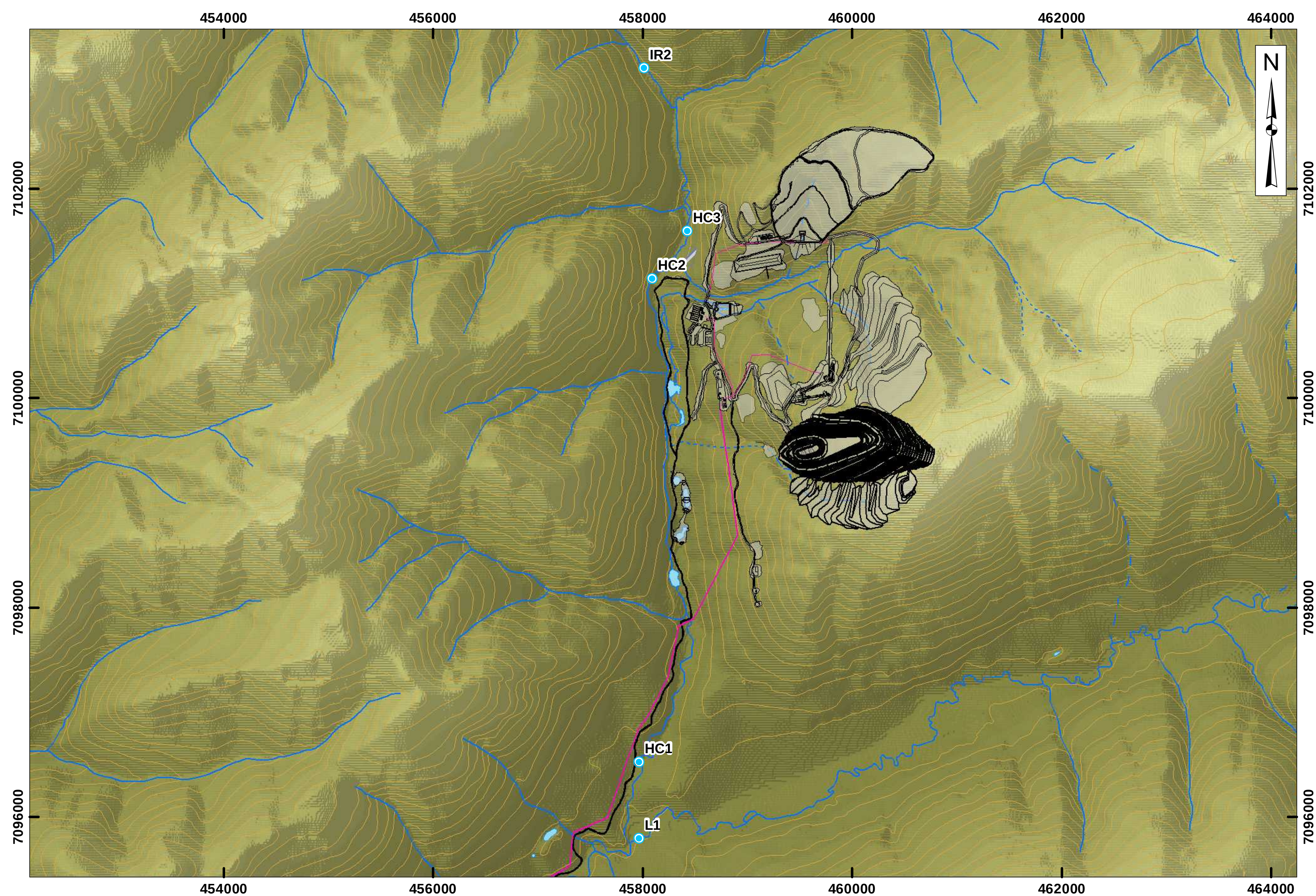
Watercourse
- Unsampled (perennial)

- Fish and Fish Habitat Local Study Area
- Road
- Waterbody
- Waterbody

VICTORIA GOLD CORP

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 Zone 8N		
DATE	FIGURE	FISH AND FISH HABITAT STUDY AREA SHEET 3 OF 3
2014/03/26	7-3	



Legend:

- Monitoring Location
- Major Facility
- Site Power
- Contour (100ft)
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 0.25 0.5 1 Kilometers

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date: 2022/03/27	Figure: 7-4	Current Fish and Fish Habitat Study Area

7.1 WATERCOURSE FISH-BEARING STATUS

Of the 26 watercourses sampled in the study area during the 2007-2009 field studies, 14 were identified as fish-bearing or potentially fish-bearing and 12 were as non-fish-bearing (Figure 7-1 to Figure 7-3). The 14 fish-bearing watercourses were:

- Haggart Creek, lower reaches of Dublin Gulch, and the lower reaches of Eagle Pup (including a pond created for historic placer mining operations and its tributary stream)
- Two watercourses sampled as reference watercourses—Lynx Creek and Ironrust Creek
- Nine additional watercourses crossed by the site access road including: North Star, Bighorn, Cadillac, and Secret creeks; the South McQuesten River, one unnamed tributary of Haggart Creek, and two unnamed tributaries of the South McQuesten River.

A summary of the data collected for all identified fish-bearing watercourses is presented in Stantec (2010e). The 12 watercourses identified as non-fish-bearing were as follows:

- Two watercourses with barriers to upstream fish passage—Upper Dublin Gulch (a gradient barrier located 1.5 km upstream of the confluence with Haggart Creek) and Upper Eagle Pup (a perched culvert located 1.9 km upstream of the confluence with Haggart Creek)
- Six tributaries to the non-fish-bearing upper reaches of Dublin Gulch and Eagle Pup—Suttles Gulch, Ann Gulch, Bawn Boy Gulch, Stewart Gulch, Olive Gulch, Cascallen Gulch
- Four watercourses with fish passage barriers that were located outside the Dublin Gulch and Eagle Pup watersheds: Platinum Gulch and three un-named watercourses crossed by the access road (sample site numbers RC1, RC13, and RC16).

7.2 FISH SPECIES DISTRIBUTION

At least 11 fish species are known to occur in the South McQuesten River watershed, including Chinook salmon (*Oncorhynchus tshawytscha*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), longnose sucker (*Catostomus catostomus*), Arctic lamprey (*Lampetra camtschatica*), burbot (*Lota lota*), slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), inconnu (*Stenodus leucichthys*), lake whitefish (*Coregonus clupeaformis*), and rainbow trout (*Oncorhynchus mykiss*) (DFO 2010). No freshwater fish species on Schedules 1 or 2 of the Federal *Species at Risk Act* (SARA) are present in the South McQuesten River watershed or the entire Yukon Territory (Government of Canada 2012). Haggart and Lynx creeks are both known to contain five fish species: Chinook salmon, Arctic grayling, round whitefish, burbot, and slimy sculpin (DFO 2010). Ironrust Creek, Dublin Gulch and Eagle Pup are known to be inhabited by Arctic grayling and slimy sculpin (Hallam Knight Piésold 1996b, DFO 2010).

The 2007 to 2009 baseline field program for this Project captured five fish species from ten different watercourses (Figure 7-1 to Figure 7-3). Arctic grayling were captured in nine watercourses and slimy sculpin were captured in seven. Burbot were captured in the South McQuesten River and lower Haggart Creek. Chinook salmon and longnose sucker were observed in the South McQuesten during the July 2009 snorkel survey.

Previous studies reported the presence of Chinook salmon (*Oncorhynchus tshawytscha*) in Haggart and Lynx creeks (Madrone 2006; Hallam Knight Piésold 1995, 1996b, 1996c; DFO 2010). In the 2007 to 2009 Dublin Gulch sampling programs, Chinook salmon were not captured at any of the Haggart and Lynx creek sites. Previous studies also reported the presence of Chinook salmon in the South McQuesten River, which was confirmed by the sighting of juvenile Chinook (est. age 1+) during a snorkel survey of the South McQuesten River at the access road crossing on July 23, 2009. No adult Chinook spawners or evidence of spawning were observed in the South McQuesten River during the July 2009 survey. However, Chinook spawners were observed in August 2009 adjacent to the South McQuesten River Bridge immediately downstream of the mouth of Haggart Creek by Stantec personnel (Gardner 2010, pers. comm.). During the 2019 survey, six Chinook salmon were captured at site HC1, three at site HC3 and one at site IR2 (de Graff, 2020). The presence of juvenile Chinook salmon at these locations represents their furthest upstream occurrence to date in the Haggart Creek watershed. Chinook salmon juveniles (age 0+) were not captured during the 2018 assessment and their absence is believed to be related to either a weaker brood year and/or cold environmental conditions at the time of sampling in mid-September influencing their distribution in the drainage.

The composition of captured fish in 2019 was represented by four species that included in decreasing frequency: slimy sculpin (35), Arctic grayling (24), Chinook, salmon (10) and burbot (1) (de Graff, 2020). Slimy sculpin dominated the overall catch in 2019 and were found at all five monitoring sites. Sites HC1 and HC3 in Haggart Creek were locations that had the highest frequency of capture. Only modest numbers (5 or less) were encountered at sites HC2, IR2 and L1. Sculpin total lengths ranged from 50 to 125 mm indicating the presence of both juvenile and adult life history stages. This size range was similar to those reported by Stantec (2010) in their baseline study. Based on captures, the implied densities of sculpin encountered at the Haggart Creek sites were generally greater than in 2018 and similar to 2017. It is believed that the cold-water temperatures and ice conditions during the 2018 assessment negatively influenced catch.

Arctic grayling were most frequently captured at site HC1 during 2019 survey, as was the case during the 2017 and 2018 assessments. Only a few were captured at the other sites (3 or less) with the exception of site IR2 where they were neither observed or caught. All captures during this assessment, with the exception of one large male that was angled at site L1, were believed to be young-of-the-year and ranged in fork length from 67 to 85 mm. Older age classes were noticeably absent in the catch. This artifact may have been a function of their distribution in the watershed during the September sampling window.

7.3 FISH RELATIVE ABUNDANCE

Arctic grayling and slimy sculpin were the only species caught during electrofishing depletion surveys, which were completed in Ironrust Creek, Haggart Creek, Lynx Creek, and in Dublin Gulch. Both species were present in low densities in these watercourses. There were no consistent differences in estimated Arctic grayling densities among the waterbodies sampled.

The results from the 2019 monitoring program were comparable to the 2017 and 2018 assessments as well as past baseline studies as indicated by the measured biophysical characteristics and fish species found inhabiting each of the five monitoring sites. While the absolute number of fish captures varied, the species composition continues to be consistent and indicative of a stable fish community (de Graff, 2020).

7.4 HABITAT USAGE

The majority of Arctic grayling in the Project area are thought to overwinter in the South McQuesten River and migrate into Haggart Creek and its tributaries to rear during summer (Pendray 1983). The summer migration into Lynx Creek has been observed to occur during June and early July (Pendray 1983). The timing of outmigration to overwintering areas has not been observed for the Project Area; however, baseline assessment for this Project demonstrated that densities of Arctic grayling in Dublin Gulch were similar during July, August, and October, even though anchor ice was beginning to form on the stream margins during the October sampling program. This suggests that significant outmigration may not occur from Dublin Gulch until after October.

The documented capture of juvenile Arctic grayling in Haggart Creek during May, at a location 19 km upstream from the South McQuesten River (Pendray 1983), suggests that some Arctic grayling may overwinter in the Haggart Creek watershed. The baseline assessment documented potential overwintering habitat (i.e., with residual pool depth ≥0.8 m) at sample sites in Lynx and Haggart creeks. Furthermore, a large number of Arctic grayling were captured from a large pool on Haggart Creek in April 2008 (i.e., after freeze up but before breakup). It is assumed that this unnaturally large pool (1 ha in area and over 10 m deep) was created by placer mining operations and was not present during fish studies conducted in the early 1980's (Pendray 1983) or 1996 (Hallam Knight Piésold 1996b, 1996c). This pool created by placer mining and the South McQuesten River likely represent important overwintering habitat for Arctic grayling in the study area. The quality of potential overwintering habitat in fish-bearing streams within the Project footprint (i.e., Dublin Gulch and Eagle Creek) is poor due to residual pool depths ≤0.3 m that most likely freeze to the bottom in winter.

Pendray (1983) observed that spawning by Arctic grayling in this region occurred predominantly in the South McQuesten River during the last two weeks of May. He also identified a small area at the mouth of Haggart Creek as a probable spawning site. Since spawning occurs in late May, immediately after ice breakup, Arctic grayling that winter in the Haggart Creek watershed might also spawn in the Haggart watershed. The baseline fisheries assessment for the Project identified areas of good to excellent quality potential spawning habitat for Arctic grayling—with modest currents (0.5 – 1.0 m/s), depths of 0.1 – 0.4 m, and 2 – 4 cm diameter gravel (McPhail 2007)—in Lynx, Haldane, Secret, and Haggart creeks. The quality of potential spawning habitat provided by Dublin Gulch and Eagle Creek within the mine site footprint was poor, primarily due to lack of suitable gravel.

As the majority of Arctic grayling in the study area are thought to overwinter and spawn in the South McQuesten River (Pendray 1983), Arctic grayling primarily use study area streams as summer rearing habitat. Good to excellent rearing habitat was present at sample sites in the South McQuesten River, Bighorn Creek, Haggart Creek, Haldane Creek, Lynx Creek, Ironrust Creek, and North Star Creek. The quality of potential rearing habitat provided by the fish-bearing streams Dublin Gulch and Eagle Creek was moderate, primarily due to lack of cover, high stream gradients, or insufficient channel depths.

7.5 ENVIRONMENTAL EFFECTS MONITORING

An EEM Study Design was submitted to Environment and Climate Change Canada (ECCC) on April 20, 2020 which was subsequently approved by ECCC on December 11, 2020. This program required a fisheries assessment in the second quarter (Q2) of 2021.

The Eagle Gold Project Phase 1 EEM biological study design included a benthic invertebrate community survey, a fish population survey, and supporting water quality assessments to assist with data interpretation. In accordance with MDMER requirements, the study design provided a description of, and the scientific rationale for, sampling areas, sample sizes, species selection (fish population survey only), and methods for field sample collection, laboratory analysis, and data analysis that will be used for the benthic invertebrate and fish population surveys, as well as a schedule for study completion. Notably, no fish tissue mercury or selenium studies are required for the Phase 1 EEM. Other EEM components routinely implemented by VGC, including effluent quality monitoring (i.e., effluent characterization, effluent sublethal toxicity testing) and receiving environment water quality monitoring, will be incorporated into the Eagle Gold Project Phase 1 EEM Interpretive Report. The Phase 1 EEM Study Design was devised through consideration of available site characterization information, as well as consideration of the methods and results of historical biological monitoring studies completed to satisfy territorial WUL conditions (e.g., Laberge 2018, 2019b, 2020; de Graff 2017, 2019, 2020).

The fish population survey for the Phase 1 EEM was implemented from May 20 to 24, 2021, resulting in a total of five days of sampling effort. In accordance with the Study Design, sampling for the EEM fish population was conducted at the near-field effluent-exposed area of Haggart Creek and the comparable reference area used at lower Lynx Creek. Fish sampling methods used for the survey primarily included backpack electrofishing and minnow trapping at each of the study areas, with a very limited amount of seine netting also applied (unsuccessfully) at the effluent-exposed area. The design approach and fish species targeted for the survey included a lethal survey using adult slimy sculpin (20 females/20 males from each study area) and non-lethal survey using arctic grayling (minimum of 100 from each study area).

Over the duration of the field study, the number of mature adult slimy sculpin collected at the effluent-exposed area totaled 11 females and 9 males, and at the reference area totaled 6 females and 14 males. Therefore, target numbers of female and male slimy sculpin were not achieved at either the effluent-exposed or reference study areas, constituting a deviation from the Phase 1 EEM study design. In addition, no arctic grayling were captured over the duration of the field study.

Historically during previous fish monitoring surveys, relatively low numbers of arctic grayling were captured at each study area. However, none of the previous studies were conducted in May, but were conducted in July, August, September and October. Most of the surveys were conducted during late summer (i.e., early September). Several factors were considered to have contributed to the inability to follow the study design (in terms of achieving the requisite number of adult slimy sculpin (20 of each sex) and arctic grayling (100, including all ages)) from each study area, including naturally low numbers of slimy sculpin and arctic grayling at each study area may reflect naturally low productivity of the watercourses used for the study (i.e., Haggart and Lynx creeks) and marked increases in water levels, water velocity, and turbidity in each watercourse beginning on May 21 following precipitation events on May 20 and 21.

Despite the inability to capture the target number of slimy sculpin at each study area, sufficient numbers of females and males were captured at each study area from which statistical comparisons can be completed, albeit understanding that caution will be warranted in the interpretation of these data given the small sample sizes. Within the Interpretive Report, the inability to achieve target samples sizes for slimy sculpin will be discussed and used as the basis for recommendations for modifying the EEM study. As a first step, additional fish sampling was conducted in late summer of 2021 using a non- lethal sampling approach to confirm the presence of arctic grayling within Haggart and Lynx Creeks. The results of this additional fish population sampling will be included in the Phase 1 EEM Interpretive Report, and will be used to develop recommendations regarding inclusion of arctic grayling sampling in future EEM studies. The Phase 1 EEM Interpretive Report is currently pending and will be provided at a later date.

8 VEGETATION

The information below summarizes Stantec (2011c) and Laberge (2021). Vegetation baseline study areas consist of a Local Study Area (LSA), a Regional Study Area (RSA), and a Road Corridor Study Area (RCSA). For the purposes of the vegetation assessment, the RSA and RCSA were combined to form the Regional Assessment Area (RAA), while the Local Assessment Area (LAA) includes the baseline LSA and a buffered area adjacent to the transmission line and access road.

The current vegetation monitoring program commenced in 2018 and has been designed to evaluate changes to metal deposition and uptake within vegetation during the construction and operational phases of the Project. Specifically, metal burden in and on plant tissues is measured annually during the growing season of each year to help identify whether any trends may be attributed to the Project.

8.1 LAND COVER (ECOSYSTEM MAPPING)

Terrestrial ecosystem mapping (TEM) was completed for an area of approximately 7,538 ha surrounding the Project. This included 1:10,000 scale mapping of the 1,606 ha LSA covering the area where Project disturbances were/are expected and the 7,538 ha RSA. The 1:20,000 RSA mapping is used to provide regional context. Ecosystem mapping (1:20,000) was also prepared for the one kilometre wide Road Corridor Study Area (RCSA) along the 44.8 km long access road (4,580 ha). A Project specific ecosystem classification system, based on field data collected in 2009 and literature review, was developed for the study areas. A completed description of the TEM methodology is provided in Stantec (2011c). The area occupied by each of the vegetated and non-vegetated ecosystem units summarized by ecological zone (i.e., Forested and Subalpine) for the study areas is provided in Table 8-1. The table also presents the area covered by disturbances such as main roads, exploration trails, seismic lines, and mining activity such as placer, trenching or drilling prior to construction of the Project. A total of 21 vegetated ecosystem units and nine non-vegetated units were mapped.

Two ecological zones were delineated in the baseline study areas: the Subalpine zone and the Forested (Boreal) zone. The majority of Project activities occur in the Forested zone. The Subalpine zone, which covers 1,502 ha in the RSA, occurs on the ridge tops and high plateaus above approximately 1,225 masl. Baseline condition tree cover was discontinuous or absent at this elevation, and the vegetation is dominated by dwarf birch, willows, ericaceous shrubs, herbs, mosses, and lichens. The highest points within the three study areas is 1,520 masl. These upper elevations are dominated by dwarf-shrub, heath and lichen communities.

The Forested zone (11,450 ha), which is part of the northern boreal forest (Boreal Cordillera Ecoregion), includes the valley bottoms, and the slopes of the mountains below the treeline. The elevation range of this zone in the three study areas is 600 masl up to the Subalpine zone, about 1,225 masl. Open canopy stands of black spruce are generally present on moist sites and on the lower portions of north facing slopes. However, coniferous dominated forests consisting of white and black spruce are found along creeks and rivers and on well drained sites. Ericaceous shrubs and feather mosses are most common in the understory of the coniferous forests. On the upper slopes, open subalpine fir stands are predominant with trees becoming smaller and more spread out with increasing elevation; the cover of willows, dwarf birch and ericaceous shrubs increase as the canopy opens. Mixed forests, consisting of white spruce, trembling aspen, and Alaska birch are also present on warm aspects or near-mesic sites that have been disturbed by forest fire. Small deciduous stands dominated by aspen (warm aspects) and Alaska birch are also occasionally present in the study area.

Table 8-1: Summary of Mapped Ecosystem Units

Ecological Zone	Map Code	Eagle Gold Ecosystem Name	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Forested	AK	Aspen – Kinnikinnick	13.7	63.0	47.7	124.4
Forested	AW	Alaska birch-White spruce-Willow	30.3	383.3	280.1	693.7
Forested	BL	Dwarf birch-Lichen	10.4	31.6	0.1	42.1
Forested	BS	Black spruce-Sphagnum	-	163.1	319.6	482.7
Forested	CL	Cliff	-	0.3	-	0.3
Forested	ES	Exposed Soil	2.7	0.3	-	3.0
Forested	FC	Subalpine fir-Cladina	353.6	1,363.7	59.7	1,777.0
Forested	FF	Subalpine fir-Feathermoss	95.9	729.8	41.5	867.2
Forested	FM	Subalpine Fir-Labrador tea	93.9	1,012.7	116.8	1,223.4
Forested	FP	Subalpine fir–Dwarf birch-Crowberry	61.6	128.7	0.4	190.7
Forested	GB	Gravel Bar	0.1	0.1	16.1	16.3
Forested	MA	Marsh	-	0.5	19.5	20.0
Forested	OW	Open Water	-	-	66.2	66.2
Forested	PD	Pond	-	-	1.9	1.9
Forested	PH	Balsam poplar-Horsetail	-	-	16.0	16.0
Forested	PM	Placer Mine	5.1	14.6	18.0	37.7
Forested	RI	River	0.1	30.2	75.4	105.7
Forested	RO	Rock Outcrop	3.1	23.2	0.4	26.7
Forested	SA	Dwarf birch-Northern rough fescue	35.3	93.4	-	128.7
Forested	SC	Black spruce-Cladina	-	18.0	401.5	419.5
Forested	SF	White spruce-Feathermoss	4.6	-	374.9	379.5
Forested	SH	White spruce-Horsetail	25.0	139.4	423.8	588.2
Forested	SL	Black spruce-Labrador Tea-Feathermoss	166.7	852.7	1,989.8	3,009.2
Forested	TA	Talus	4.4	5.6	-	10.0
Forested	WG	Willow-Groundsel	28.1	70.1	11.3	109.5
Forested	WH	Willow-Horsetail	10.5	-	35.8	46.3
Forested	WM	Willow-Mountain sagewort	-	67.3	-	67.3
Forested	WS herb stage	Willow-Sedge	0.4	8.3	15.1	23.8
Forested	WS shrub stage	Willow-Sedge	-	-	38.3	38.3
Subalpine	BL	Dwarf birch-Lichen	60.8	151.2	–	212.0
Subalpine	ES	Exposed Soil	0.1	0.4	–	0.5
Subalpine	FP	Subalpine fir–Dwarf birch-Crowberry	56.4	232.4	–	288.8
Subalpine	MM	Mountain heather meadow	4.0	33.8	–	37.8
Subalpine	MW	Mountain avens – Dwarf willow	7.3	32.6	–	39.9

Ecological Zone	Map Code	Eagle Gold Ecosystem Name	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Subalpine	RO	Rock Outcrop	–	11.1	–	11.1
Subalpine	SA	Dwarf birch-Northern rough fescue	249.2	176.7	–	425.9
Subalpine	TA	Talus	3.5	26.1	–	29.6
Subalpine	WG	Willow-Groundsel	11.8	–	–	11.8
Subalpine	WM	Willow-Mountain sagewort	25.9	0.3	–	26.2
Subtotals			**1,364.7**	**5,853.7**	**4.370.1**	**11,588.5**
Pre Project-Construction Disturbances			241.3	78.4	210.5	530.2
Totals			**1,606.0**	**5,932.1**	**4,580.5**	**12,118.6**

8.2 METALS IN VEGETATION

To characterize baseline levels of trace metal concentrations in vegetation, samples were collected and analyzed for a full suite of metals at nine locations in and around the LSA during the ecological mapping field survey. Samples consisting of leafy branches or stems and/or leaves were collected from willows species and graminoids at each site. All samples were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) at CANTEST in Richmond, BC. Mercury concentrations were determined using Cold Vapour Atomic Absorption Spectrophotometry or Cold Vapour Atomic Fluorescence Spectrophotometry.

Results of the analysis were compared to dietary tolerances of cattle based on thresholds outlined in Puls (1994). Tolerances of cattle were used since the dietary tolerance of wild ungulates is generally not known. All elements were below toxic levels for dietary intake by cattle for all sites and species sampled based on dietary guidelines. Barium concentration was high, but not toxic/excessive, in grasses at one site and willows at another. Phosphorus and potassium concentrations were deficient for all sites and all plant species.

Four sites were established as part of the EMSAMP, with samples collected annually since August 2018. The levels of metals found in the foliar samples collected in 2021 represent the fourth year of assessment for sites D-1(B) and D-3, third year for sites D-2B and D-4B and second year for D-5 (Laberge 2021). The data gives a general idea of the metal burden (uptake from soil in tissues as well as through dust deposition) in various species in different ecological zones. General observations of the data collected to date include:

- There was a slight increase in arsenic concentrations in the dwarf birch and willow leaves at D-1 but most of the other metals decreased in concentration in 2021 in all tissue types.
- There were some minor fluctuations throughout all tissue types at D-2B.
- Four consecutive years of data exist for D-3. There was an increase each year of all of the selected metals in the willow leaves, willow twigs and dwarf birch leaves up to 2020 with concentrations decreasing somewhat in 2021. The Platinum Gulch WRSA has encroached closer to D-3 over the time period. It is likely that dust generated from the off-loading of waste rock to the storage area has possibly lead to the increase in tissue concentrations observed in 2020. The July 2021 precipitation data from the Potato Hills and Camp Climate stations show that 23 mm and 37 mm of rain respectively, fell from July 15 to 24, and may have created a rinsing effect of the foliage prior to sampling, as no dust accumulations were observed on the vegetation during the collection process.

- Data were generally similar each year with some fluctuation over the three years at D-4B.
- Site D-5 now has two years of data. Arsenic and chromium increased in 2021 in all tissue types.

Arsenic is potentially a parameter of concern in the Project area. The soil samples collected to date indicate high naturally occurring levels of arsenic (see Section 3.2.2). Arsenic is associated with the gold bearing anomalies in the district and these initial concentrations reflect the natural mineralization of the Project area. Arsenic soil concentrations exceeded the CCME and CSR guidelines in the samples collected in 2018 (Laberge, 2018), 2019 (Laberge, 2019) and 2020 (Laberge 2020c). However, these relatively high soil concentrations are not overly reflected in the plant tissues. This incongruity may be related to the bioavailability associated with arsenic speciation.

It is a general consensus that arsenic is not essential for plants (Laberge 2021). The concentration of arsenic in plants is usually less than 1.0 mg/kg (Abbas, 2018). Arsenic concentrations ranged from 0.148 to 5.15 mg/kg in the 61 individual tissue samples analyzed in 2021. These concentrations are well below the maximum tolerable level of 30 mg/kg arsenic in a dietary source. There was no visible sign of stress in any of the vegetation in the plots. Therefore, the arsenic present in the soil may not be bioavailable to plants or the availability may be limited by the mycelium associated with the vegetation types, which effectively screen out toxins at the root hairs.

8.3 PLANT COMMUNITIES AND ASSEMBLAGES

The area occupied by ecosystem units was summarized by various land cover types (or patches) for the study areas (Table 8-2) during the baseline vegetation assessment completed in 2009 and 2010 for the Project (Stantec, 2011c). At the effective date of the assessment, coniferous dominated forest was the most common land cover type found in the LSA (45%), RSA (67%) and RCSA (65%). Dwarf birch dominated ecosystems are the next most common land cover type in the LSA and RSA. They occupied about 29 and 14% of these areas, respectively. These ecosystems dominate the ridge top and plateau found in the Subalpine zone. Disturbances, associated with exploration and previous mining activities cover about 15% of the LSA compared to about 1% of the RSA overall and 5% of the RCSA. Riparian areas (7%) and deciduous forest (3%) are the next most common land cover types in the LSA. Riparian areas are associated with Haggart Creek, Dublin Gulch and ephemeral streams found throughout the LSA. Wetlands are uncommon in both the local and regional study areas, however they are the second most abundant cover type in the RCSA. Non-vegetated units such as rock, talus and exposed soil and dwarf shrub land-cover types each occupy less than one percent of the LSA. The dwarf shrub ecosystem types are found in the Subalpine ecozone.

Table 8-2: Ecosystem Category Summaries

Ecosystem Category	Map Codes	LSA		RSA		RCSA	
		(ha)	(%)	(ha)	(%)	(ha)	(%)
Conifer forest	FC, FF, FM, SC, SF, SL	714.8	45	3,976.9	67	2,984.2	65
Dwarf birch dominated	BL, FP, SA	473.8	29	813.8	14	0.5	<1
Riparian areas*	GB, PH, RI, SH, WG, WM	120.6	7	399.2	7	664.4	15
Deciduous forest	AK, AW, PH	44.0	3	446.3	8	343.8	8
Wetlands	BS, MA, OW, PD, WH, WS	10.8	<1	161.5	3	495.5	11
Rivers	RI	0.1	<1	30.2	<1	75.4	2

Ecosystem Category	Map Codes	LSA		RSA		RCSA	
		(ha)	(%)	(ha)	(%)	(ha)	(%)
Rock/talus/exposed soil	CL, ES, RO, TA	13.8	<1	67.0	1	0.4	<1
Dwarf shrub	MM, MW	11.3	<1	66.4	1	0	0
Mining areas	PM	5.1	<1	14.6	<1	18.0	<1
Disturbances	Na	241.3	15	78.4	1	210.5	5

NOTE: Only riparian ecosystems are listed in the table, although other ecosystems and non-vegetated units are present within the riparian corridors.

Old forest patches occupy about 14% of the LSA. These consist of ecosystems dominated by white or black spruce at lower elevations and ecosystems dominated by subalpine at higher elevations.

Rare plant surveys were conducted in 2009 and 2010 within the local study area and along specific sections of the road in 2010. One rare plant species, island purslane (*Koenigia islandica* L.), was identified at a single location in the LSA. A relatively small patch of this plant, covering about 2 m x 2 m was found in Bawn Boy Gulch.

8.4 WETLANDS

Wetlands are uncommon in the LSA. These shrub and herb dominated wetlands cover about 10.8 ha (<1%) of the area.

Wetlands are more common in the RSA (3%). These wetlands are associated with the Lynx and Haggart Creek valley bottoms. The nearest major wetland complex identified by Smith, et al. (2004) is located at McQuesten Lake, approximately 25 to 30 km to the east-northeast of the Project. Wetlands are most common in the RCSA (11%) largely due to the fact the access road is located in valley bottoms.

9 WILDLIFE AND WILDLIFE HABITAT

Background information, methods, and results for the baseline wildlife studies conducted for the project are provided in Stantec (2011b). Ongoing monitoring for the Project, since the completion of baseline wildlife studies, includes the annual late winter moose survey, pre-clearing surveys, and completion of incidental wildlife observation records. With the exception of the discussion regarding moose distribution, the information presented for wildlife and wildlife habitat represents pre-construction conditions.

9.1 WILDLIFE STUDY AREAS

9.1.1 Local Study Area

The baseline Local Study Area (LSA) consisted of an approximately 18 km^2 area encompassing the Project site and a surrounding buffer ranging from 0.5 to 1 km as shown in Figure 9-1. The LSA was chosen to encompass the area in which direct effects on wildlife could occur.

9.1.2 Access Road Study Area

The Access Road Study Area (ARSA) was designed to assess the potential effects associated with the access road. The ARSA was created by buffering the South McQuesten Road and the Haggart Creek Access Road by 500 m on each side up to the Eagle Gold camp site. The ARSA is approximately 44.8 km in length and 45.8 km^2 (Figure 9-1). The access road study area was intended to provide a baseline for potential disturbance to wildlife resources that may occur due to realignment of the Project access road and use of the road during the Project.

9.1.3 Regional Study Area

The Regional Study Area (RSA) consisted of a 23 km by 21 km (483 km^2) area surrounding the Project site (Figure 9-1). This area was chosen because it is large enough to potentially encompass a grizzly bear home range, raptor nest sites (e.g., cliff habitat), and movement corridors (riparian drainages). It includes the Lynx Creek watershed to the south (which is relatively undisturbed when compared to the majority of the placer-mined drainages in the area), the McQuesten River watershed to the north, and the major habitat types present in the region

9.2 ABUNDANCE AND DISTRIBUTION OF HABITAT TYPES

The wildlife Regional Study Area (RSA) contains two ecological zones:

- The forested zone ranges from 600 m asl elevation to 1,225 m asl and includes the valley bottoms and the slopes of the mountains below the tree line. In the valley bottoms, forests are dominated by open canopy stands of black spruce (*Picea mariana*) with white spruce (*Picea glauca*) found along creeks and rivers. Lower forested habitats adjacent to riparian corridors are areas with high potential to support wildlife. In particular, both moose (*Alces alces*) and grizzly bear (*Ursus arctos*) are likely to use these areas seasonally at differing levels of intensity when forage opportunities are most abundant (e.g., seasonally ripe berries, newly emerged vegetation) or when shelter and insulation from winter weather is required. On the mid to lower slopes, continuous stands of subalpine fir (*Abies lasiocarpa*) occur along with minor components of white spruce, Alaska birch (*Betula neoalaskana*), trembling aspen (*Populus tremuloides*), and black spruce. On the upper slopes and up to tree line, open subalpine fir stands are predominant with trees becoming smaller and more spread out with increasing elevation.

- The subalpine zone occurs on the ridge tops and high plateaus above 1,225 m asl. Here tree cover is discontinuous or absent and the vegetation is dominated by scrub birch (Betula glandulosa), willows (Salix sp.), ericaceous shrubs, herbs, as well as mosses and lichens. The tree and shrub layers found in the subalpine zone are used by moose to support both feeding and cover from spring through fall. Elevations above 1,500 m asl are dominated by ecosystems containing a mixture of shrubs, graminoids, herbs, bryophytes, and lichens.

Terrestrial ecosystem mapping was completed for the LSA following standard methods (Resource Inventory Committee [RIC] 2002). A total of 21 vegetated ecosystem units and nine non-vegetated units were mapped in the LSA. A description of the site characteristics and dominant species for these ecosystems is provided in Stantec (2011c).

Coniferous forest habitat dominates the LSA, covering 66% of the area. It is composed of primarily subalpine fir, white spruce, and black spruce. Dwarf birch (*Betula nana*) dominated ecosystems cover a smaller portion of the LSA (11%). They are represented by dwarf birch, alpine herbs and lichens. Little deciduous forest habitat occurs, covering only seven percent of the LSA. It is dominated by trembling aspen, Alaska birch, and balsam poplar (*Populus balsamifera*). These patterns influence the distribution of wildlife species, as described in the following sections.

9.3 HABITATS OF SPECIAL INTEREST

The Yukon Government has identified Wildlife Key Areas (WKAs), which are used by wildlife for critical life functions (Environment Yukon 2009). The nearest WKA to the Project lies outside the RSA in the South McQuesten River and McQuesten Lake area. It includes summer nesting habitat for ducks in the wetlands upstream of McQuesten Lake; for Peregrine Falcon (*Falco peregrines anatum/tundrius*), Osprey (*Pandion haliaetus*), and Bald Eagle (*Haliaeetus leucocephalus*) on McQuesten Lake; and for Gyrfalcon (*Falco rusticolus*) and Golden Eagle (*Aquila chrysaetos*) immediately north of McQuesten Lake. Based upon local knowledge (Environment Yukon 2009), late-winter moose range is identified approximately 55 kilometres northwest of the Project site, outside of the RSA. No WKA is recorded in the RSA or LSA (Environment Yukon 2009). Information obtained via the Traditional Knowledge and Use Study (Stantec 2010f) indicated that FNNND Settlement Lands south of the Project site and adjacent to the access road and the area north of the Project site near the Potato Hills provide important moose habitat at various seasons.

A number of important habitat types are present within the LSA (Figure 9-2). They are considered important based upon their relative scarcity within the LSA and their importance for wildlife species that are specialized or considered habitat type obligates. These habitats include:

- Old growth Forest
- Wetlands
- Riparian corridors
- Areas previously disturbed by fire

Approximately 2,077 ha, or 18% of the LSA, is comprised of old growth coniferous forest. These forests consist of ecosystems dominated by white or black spruce at lower elevations and ecosystems dominated by subalpine fir at higher elevations. Old growth forest habitat is important for wildlife species such as American marten (*Martes americana*). Bears may use these areas for hibernation, with dens dug beneath the root wads of large trees. Moose may also seek out mature coniferous forest primarily for warmth in winter.

Wetlands are uncommon and account for approximately 6% of the LSA. They include sphagnum bogs, sedge fens, marshes, ponds, and areas of open water. The majority of wetlands in the LSA are adjacent to the access road, and are associated with the poorly drained valley bottoms along Lynx Creek, Haggart Creek, and portions of the South McQuesten River. While no wetlands have been identified as WKAs within the RSA or LSA, these ecosystems still play important roles for animals that frequent the RSA and LSA, such as preferred feeding habitat for moose and grizzly bear as well as other wildlife species such as Rusty Blackbird (*Euphagus carolinus*). The access road, particularly along the first approximately 20 km leading from the Silver Trail Highway, parallels the South McQuesten River and associated wetlands. This area is known locally as an important calving and rutting area for moose (O'Donoghue 2010a, pers. comm.).

Riparian corridors and drainages account for approximately 10% of the LSA. They are used as travel corridors for many species (including moose and grizzly bear) moving within and between habitat types. Riparian corridors are often attractive to these species as they provide food resources, protective cover, and relatively homogeneous topography, facilitating energy efficient movement. This is particularly true of riparian corridors found in the lower valley bottoms including Lynx Creek, Haggart Creek, and the South McQuesten River. Moose and grizzly bear may move between upper and lower elevation habitats seasonally as well as regular daily movements between forage resource areas and protective cover habitat. Helicopter-based wildlife surveys completed for the Project identified wildlife trails connecting forest habitat and distinct riparian and wetland habitats. Many of these appeared to have long term use, particularly by moose, and appeared to form connections between alpine or sub alpine habitats and lower elevation valley bottoms.

A relatively recent fire (<20 years) occurred on the south facing slope above Lynx Creek within the LSA. This area occupies 481 ha, or 4% of the LSA. Burned areas usually develop early successional vegetation (shrubs and herb species) preferred by grizzly bear and ungulates during early spring and summer. Other species, such as Olive-sided Flycatcher (*Contopus cooperi*), may use the abundance of dead snags for perching and foraging from and adjacent forest habitats for nesting.

9.4 WILDLIFE RESOURCES

The RSA provides habitat for a wide range of wildlife species that typically inhabit the central Yukon area. In addition to those mentioned above, species which have been documented in the RSA and LSA include mammals such as woodland caribou (*Rangifer tarandus caribou)*, black bear (*Ursus americanus*), grizzly bear, wolverine (*Gulo gulo*), grey wolf (*Canis lupus*), red fox (*Vulpes vulpes*), American marten, snowshoe hare (*Lepus americanus*), and red squirrel (*Tamiasciurus hudsonicus*). Game bird species include Spruce Grouse (*Canachites Canadensis*), Dusky Grouse (*Dendragapus Obscures*), Ruffed Grouse (*Bonasa Umbellus*), and three species of ptarmigan (*Lagopus* sp). Raptors present may include Golden Eagle, Red-tailed Hawk (*Buteo jamaicensis*), Northern Hawk Owl (*Surnia Ulula*), Great Gray Owl (*Strix Nebulosa*), and Gyrfalcon (*Falco Rusticolus*). A variety of passerine or songbird species are also present. They include Dark-eyed Junco (*Junco Hyemalis*), Gray Jay (*Perisoreus Canadensis*), Tree Swallow (*Tachycineta Bicolor*), and Townsend‘s Solitaire (*Myadestes Townsendi*).

Waterfowl species include Trumpeter Swan (*Cygnus Buccinators*), Mallard (*Anas Platyrhynchos*), and Canada Goose (*Branta Canadensis*).

9.5 SPECIES AT RISK

Species at risk that may occur in the RSA are listed in Table 9-1. In Canada, the status of each species is provided by the *Species at Risk Act* (SARA); Species at Risk Public Registry (Government of Canada 2010) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010).

Table 9-1: Species at Risk

Species	SARA*	COSEWIC
Mammals		
Grizzly bear *Ursus arctos*	No Status	Special Concern
Woodland caribou – northern mountain population *Rangifer tarandus caribou*	Special Concern	Special Concern
Wolverine *Gulo gulo*	No Status	Special Concern
Birds		
Canada Warbler *Wilsonia Canadensis*	Threatened	Threatened
Common Nighthawk *Chordeiles Minor*	Threatened	Threatened
Eskimo Curlew *Numenius Borealis*	Endangered	Endangered
Horned Grebe *Podiceps Auritus*	No Status	Special Concern
Olive-sided Flycatcher *Contopus Cooperi*	Threatened	Threatened
Peregrine Falcon *Falco Anatum* *Falco Tundrius*	Special Concern Special Concern	Threatened Special Concern
Red Knot Calidris Canatus Roseri type	Threatened	Threatened
Rusty Blackbird *Euphagus Carolinus*	Special Concern	Special Concern
Short-eared Owl *Asio Flammeus*	No Status	Special Concern

NOTES:

* SARA listed species are those considered on Schedule 1 of the Species at Risk Act.

The Yukon Wildlife Act lists species as ―specially protected‖, including cougar, Gyrfalcon, Peregrine Falcon and Trumpeter Swan (Yukon Government 2010b). These species are afforded protection under the *Yukon Wildlife Act* because they are considered particularly susceptible to hunting pressure.

While the ranges of species listed in Table 9-1 overlap the LSA, species specific habitat requirements may not be met within the LSA. For example, there is little or no cliff nesting-habitat for Peregrine Falcon or tall grass habitat for Short-eared Owl in the LSA.

9.6 ABUNDANCE AND DISTRIBUTION OF MAJOR WILDLIFE SPECIES

Baseline surveys confirmed the presence of 31 species of wildlife within the RSA. Information on species of management concern is summarized below.

9.6.1 Moose

While moose are not a species at risk, they are hunted and therefore important to both the FNNND and Environment Yukon.

Moose are recognized as an important species for harvest by local First Nations and are consistently reported within the LSA and portions of the RSA. Important calving and rutting areas within these areas have also been identified. Densities of moose in the Mayo area are close to 200 animals for every 1,000 km^2, which is above the Yukon average (Yukon Government 2003a). Farther north in the FNNND Traditional Territory, local knowledge acquired via the TKU Study and professional opinion suggest that moose densities are closer to 50 to 100 animals per 1,000 km^2 (Yukon Government 2003a). One participant in the TKU Study indicated that Haggart Creek and other creeks in the Project area provide food and shelter for moose in the springtime. While the surveys show that the population is about the same density as it was in the mid 1990s, there is an interest in the community to be proactive about harvest management before population levels decline further (Na-Cho Nyäk Dun Fish and Wildlife Planning Team, 2014).

Moose were the most commonly detected species during baseline surveys. Moose were detected across all surveys and in the widest range of habitat types indicating a relatively strong presence within the RSA. The majority of moose detections from late summer were in lower elevation forested habitat zones. Moose utilize low-elevation forested vegetation types in the RSA during much of the year, particularly in the winter. During the winter period (mid-December through late-April), moose requirements for suitable thermal and foraging habitat becomes increasingly important in order to survive harsh weather conditions. As such, winter thermal and winter feeding habitat life requisites are the focus for habitat modeling conducted for moose.

In winter, moose are more likely to migrate to low elevation forest habitats and riparian areas associated with valley bottoms for optimal thermal shelter, ease of movement via lower snow accumulations in these areas and associated feeding opportunities. Habitats with closed canopies and south-facing slopes accumulate less snow, providing favorable thermal conditions (Moose Management Team 1996). Riparian forests with tall shrub vegetation provide winter browse, including woody twigs of poplar, birch, alder and willow.

During spring through fall, moose are more widely distributed and can occur in any of the vegetation types found in the RSA. In general, ideal habitat conditions contain a mosaic of habitat types, providing a combination of shelter, forage, or reproduction opportunities (Moose Management Team 1996).

One Game Management Zone (GMZ 2, Subzone 2-62) overlaps the RSA. Harvest records between 1999 and 2008 for this subzone indicate a total reported average harvest of 2.1 moose annually within the management zone. Adjacent GMZ subzones report slightly higher harvest rates with an overall average of 3.65 moose per GMZ Subzone per year. No harvest data for the RSA were available from the FNNND.

Late winter aerial moose surveys have been conducted in 2018 and 2019 to document distribution and abundance of moose during construction phase of the Project, and built on the baseline/pre-construction studies conducted from 2011 to 2013.

During the 2020 survey, a total of 91 moose were observed of which 82 were observed within the study area boundary. Most moose were observed as individuals or pairs. The number of moose observed within the survey area in 2020 was similar to 2018 and 2019; however, the number of moose observed in 2018, 2019 and 2020 was considerably higher than in previous surveys. Potential factors for the variation in moose numbers typically include observer bias and seasonal variability in the regional distribution of moose. The latter can be influenced by annual and regional variations in snow characteristics such as depth and hardness. Variability could also be the result of high wolf activity preceding surveys within or near habitats seasonally important to moose.

The methodology utilized for previous Project related surveys was based on that proposed by Yukon Government Department of Environment staff. A revised methodology was trialed by Yukon Government in 2021. The appropriateness of the new methodology for general use remains under review to determine if it can be utilized for other project areas. Once a determination is made (expected to be completed by Yukon Government in 2022), it is anticipated that the Project related methodology will be revised and used in 2023.

9.6.2 Woodland Caribou

The northern mountain population of woodland caribou was listed as a species of special concern under Schedule 1 of SARA in 2002 (Government of Canada 2010); however, they are not included in the list of specially protected species by the Yukon Government.

All information suggests that the RSA receives low levels of caribou use and does not provide important habitat for this species. The closest woodland caribou herd to the Project is the Clear Creek Herd, followed by the Hart River and Bonnet Plume Herds (Environment Yukon 2009b). No WKAs for caribou occur within the RSA. Discussions with Yukon Environment staff familiar with the area noted that while woodland caribou are wide ranging, telemetry data indicate that the LSA is peripheral to the range of the Clear Creek herd (approximately 900 individuals) which is largely located on the opposite side of the North McQuesten River (O'Donoghue 2010, pers. comm.). Hunting records between 1999 and 2008 indicate there were no caribou harvests in GMZ Subzone 2-62, which overlaps with the RSA.

Field surveys support the conclusion that caribou are present at low densities within the LSA. Only three caribou detections were recorded when combining all past and present data. All detections occurred within subalpine habitat types within the RSA. One scat detection in the LSA was likely linked to a single individual moving beyond typical herd boundaries. The FNNND report overall declines in the presence of caribou since the 1950s, although they were previously abundant in the Proctor Lake area.

9.6.3 Grizzly Bear

While grizzly bears in Canada have no status under SARA or the Yukon Government (Government of Canada 2010), they have been listed special concern by COSEWIC (2010). A species of special concern is stable but vulnerable to decline from inherent conditions such as a low reproductive rate, and vulnerabilities to human activities such as attraction to non-natural food sources that can result in mortality.

Grizzly bears are a wide ranging species that seasonally use a variety of habitat types. The RSA provides a variety of potentially attractive habitats for grizzly, including forested riparian gullies, marsh habitats and subalpine areas. Grizzly bears are omnivorous and opportunistic feeders, using a variety of foods according to seasonal accessibility. Spring and fall feeding were selected as the critical life requisites used for grizzly bear habitat modeling as part of the assessment of Project effects.

Baseline data documented four detections of grizzly bear. Only one of these detections was in the LSA. The remaining three detections occurred in the larger RSA. The LSA at baseline does reflect a modest disturbance regime with exploration activities, drilling, and the creation and maintenance of a secondary road. Additionally, the LSA specifically was not found to contain a seasonally attractive magnet food resource, such as spawning salmon or highly productive berry patches that tend to attract grizzly bears.

Harvest records for Game Management Subzone 2-62 indicate no grizzly bears were reported harvested in the RSA between 1999 and 2008. For the overall region, grizzly bear is the least harvested wildlife species with an annual average rate of 0.1 bears per GMZ Subzone per year.

9.6.4 American Marten

The American marten is not listed as a species-at-risk by either Yukon Government or SARA (Government of Canada 2010). Although they are not a species of direct conservation concern, American marten provides significant economic and cultural value to local citizens, including the FNNND.

Marten in the northern boreal forest are closely associated with late successional coniferous stands, especially those dominated by spruce and fir, with complex structure near the ground (i.e., coarse woody debris) (Slough 1989; Buskirk and Powell 1994). Marten typically forage on small mammal species such as red-backed voles (*Clethrionomys rutilus*), birds and bird eggs, crowberries (*Empetrum nigrum*), and occasionally on grouse, ptarmigan, snowshoe hare and moose or caribou carrion when food becomes more scarce (Environment Yukon 2009b). Commonly reported refuge sites include ground burrows, rock piles and crevices, downed logs, stumps, snags, brush or slash piles and squirrel middens (Mech and Rogers 1977; Steventon and Major 1982; Buskirk and Powell 1994).

The FNNND identifies marten as present in, or in the vicinity of the RSA, concentrated in low elevational areas adjacent to riparian corridors. FNNND citizens report recent declines in the local marten population but suggest it might be part of a naturally fluctuating cycle for marten in the region (Stantec 2010f). There were no marten detections during 2009 baseline surveys, however past data (Hallam Knight Piésold Ltd. 1994; 1996a) provided a total of ten detections not linked to any specific habitat type or precise locations.

The LSA contains habitat typically associated with this species. Old growth coniferous forest accounts for approximately 2,077 ha, or 18% of the LSA.

9.6.5 Olive-sided Flycatcher

Olive-sided Flycatcher is listed as Threatened on Schedule 1 of SARA (Government of Canada 2010) because of a widespread and consistent population decline over the past 30 years (COSEWIC 2007b). The rate of decline for the Yukon population is estimated at -0.2% per year between 1998 and 2008, lower than the -3.1% estimated national decline for the same period (Environment Canada 2009a).

Olive-sided Flycatcher range within the Yukon extends north to include the Yukon Plateau-North ecoregion (Yukon Government 2010b). Across its range, the flycatcher typically occurs in coniferous and mixed-coniferous forest (Altman and Sallabanks 2000, COSEWIC 2007b, Kotliar 2007). Clear-cuts and other young (0 to 10 years old) forests are used if they contain snags or residual live trees for singing and foraging perches (Altman and Sallabanks 2000, COSEWIC 2007). Similarly, recent (0 to 30 years old) burns are considered important habitat (Boreal Avian Monitoring Project [BAMP] 2009), likely because of the creation of forest openings and edge habitat, as well as availability of snags and live trees (Altman and Sallabanks 2000; COSEWIC 2007b; Kotliar 2007). Deciduous forests are generally avoided.

A relatively recent fire (<15 years) occurred on the south facing slope above Lynx Creek. The area is approximately 481.5 ha in size and represents potential preferred habitat for this species within the LSA.

Breeding has been confirmed in the region, including four Olive-sided Flycatcher detections in the period 2006 – 2010 on the annual Mayo Landing breeding-bird survey route (US Geological Survey [USGS] 2010). No Olive-sided Flycatchers were detected within the RSA during baseline surveys completed in 2009. However, these surveys were completed outside the breeding-bird nesting period.

9.6.6 Rusty Blackbird

Rusty Blackbird is listed as a species of Special Concern on Schedule 1 of SARA (Government of Canada 2010) because of a significant long-term and severe population decline (Savignac 2006). The national rate of decline for Rusty Blackbird is estimated at -6.9% annually during 1988 through 2008. The species appears to be declining faster in Yukon with population declines estimated at -9.1% annually for the same period (Environment Canada 2009b).

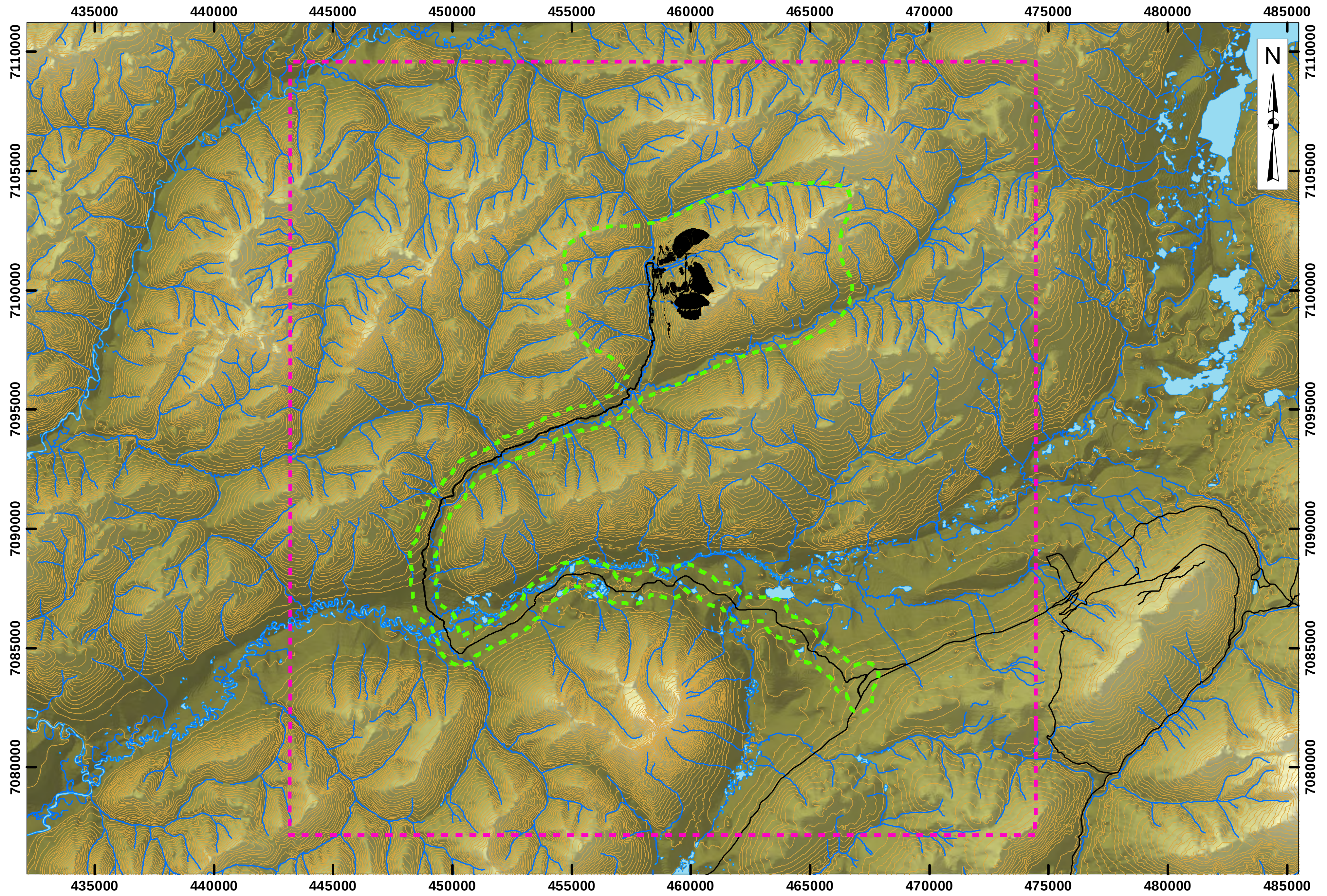
Rusty Blackbird is present in the Yukon primarily during the breeding season (early May through late August), although migrants and non-breeding birds may be present until late October and into winter (Semenchuk 1992; Federation of Alberta Naturalists [FAN] 2007). Its range extent includes the Yukon Plateau-North ecoregion, overlying both the LSA and RSA.

In Yukon, Rusty Blackbird nesting locations are closely associated with conifer forest wetlands, including bogs (with or without ponds), fens, muskegs, swamps and wet shrubby meadows (Yukon Government 2007, Avery 1995, Savignac 2006, Shaw 2006). It also uses shrubby riparian areas along the margins of lakes, beaver ponds, rivers, and creeks in coniferous and mixed wood forests (Semenchuk 1992, Avery 1995, Savignac 2006, FAN 2007). Wetlands and riparian areas combined account for approximately 15% of the LSA, or 1,818 ha of habitat potentially suitable for this species. Estimated Rusty Blackbird densities (Avery 1995) suggest this amount of potentially suitable habitat may support less than one Rusty Blackbird bird.

Two Rusty Blackbirds were observed most recently during the annual breeding-bird survey conducted at Mayo Landing in 2004 (USGS 2010). There were no recorded observations of Rusty Blackbirds during 2009 baseline surveys within the LSA or RSA, although as mentioned above, these surveys were completed after the nesting period.

9.6.6.1 2011 Breeding-bird Surveys

Breeding-bird point-count surveys were conducted June 16 – 22, 2011. A total of 605 individuals, consisting of 46 species, were recorded during the surveys. An additional three species were observed incidental to the point-count surveys, bringing the total number of species recorded to 49. Ten Olive-sided Flycatcher were observed within the LSA and along the access road. Three Rusty Blackbirds were observed adjacent to wetland areas along the access road. No other species at risk, raptors, or stick nests were observed.



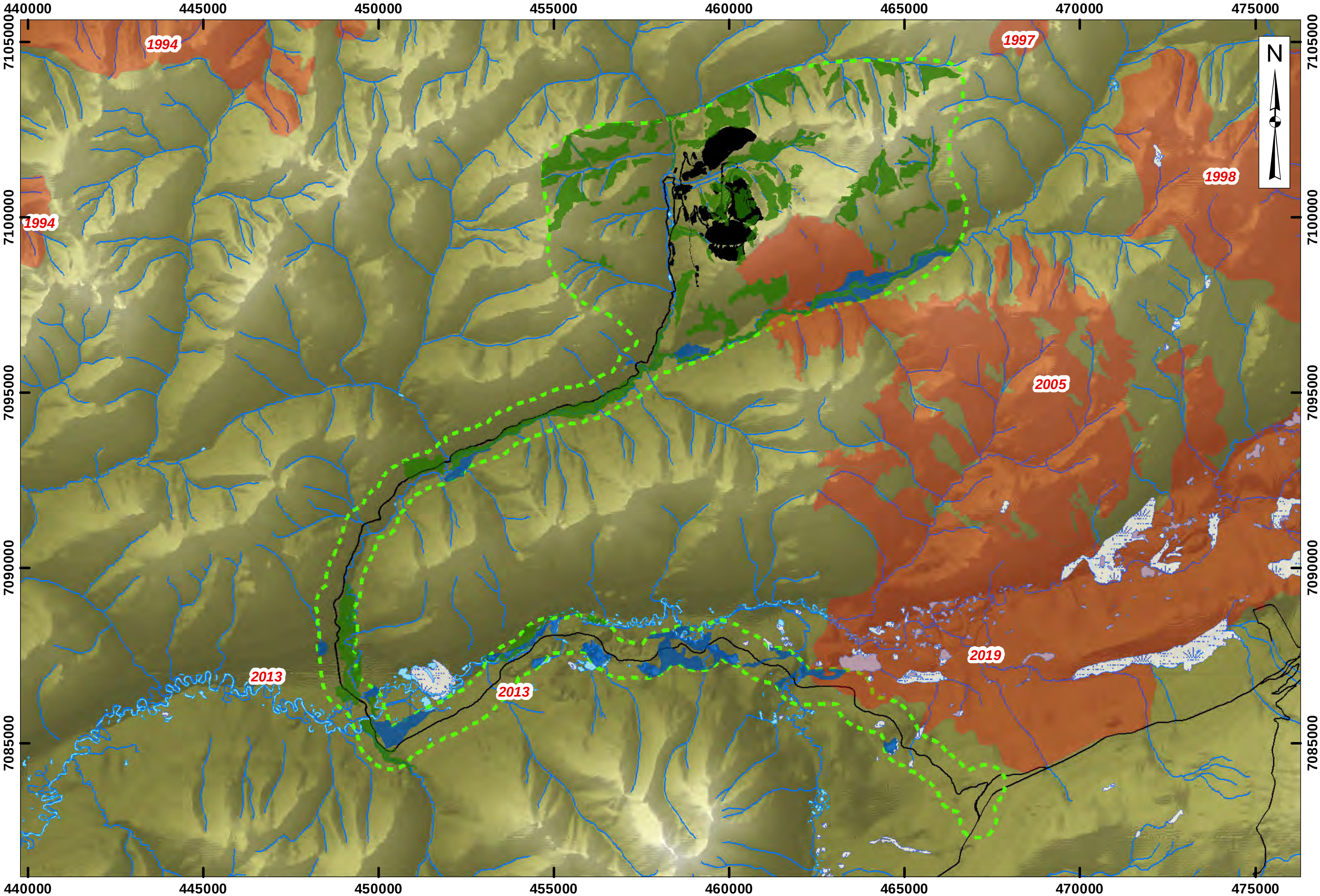
Legend:

- Wildlife Regional Assessment Area
- Wildlife Local Assessment Area
- Project Footprint
- Contour (100ft)
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 1 2 4
Kilometers

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date:	Figure:	Wildlife Local and Regional Study Areas
2020/07/30	9-1	



Legend:

- TEM Old Forest
- Wetland Ecosystem
- Wetland
- Fire-affected Areas
- Wildlife Local Assessment Area
- Project Footprint
- Perennial Watercourse
- Ephemeral Watercourse
- Intermittent Watercourse

VICTORIA GOLD CORP

0 1 2 4
Kilometers

Projection:	Drawn By:	
NAD 83 Zone 8N	HC	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2020/07/30	Figure: 9-2	**Wildlife Habitats of Special Intereset Within the Local Study Area**

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