PITEAU ASSOCIATES
Geotechnical and Water Management Consultants

MANH CHOH PROJECT

HYDROGEOLOGICAL CHARACTERIZATION AND GROUNDWATER MODELING SUMMARY

Prepared for

PEAK GOLD LLC

December 2021
PROJECT 4148

Piteau Associates USA Ltd.
9090 Double Diamond Parkway, Suite 1
Reno, NV 89521
+1.775.324.8880

EXECUTIVE SUMMARY

Baseline Conditions

The Manh Choh project is situated about 200 miles to the southeast of Fairbanks in a relatively dry region of Alaska. Mean annual precipitation at the site is 11.6 inches, which is significantly less than the Fort Knox and Pogo mines nearby to the northwest. The site lies close to the highest point in the Tetlin Hills and straddles a regional groundwater and surface water divide. Runoff from site flows both west to Tok River and east to Tetlin Lake.

Groundwater flow at the site is extremely low because of the dry conditions and limited recharge area. Any groundwater flow that does occur is localized and will percolate mostly through fractures, faults, and related small-scale structures. The limited overburden thickness and low bedrock hydraulic conductivity further reduces recharge; most precipitation runs off the site.

Although there is no active permafrost at the site, zones of discontinuous relict bedrock permafrost do occur, and act to further interrupt the movement of groundwater. The small amount of recharge that does occur is related to spring snowmelt. This causes seasonal increases in piezometric levels of 5 to 30 ft. The relatively large seasonal fluctuation of groundwater levels is indicative of a low storage groundwater system.

Seasonal intermittent stream flow occurs in the catchment headwaters on both sides of the drainage divide. Perennial stream segments start downgradient of the project area, at locations of year-round groundwater discharge which are delineated by ice buildup (aufeis) in winter.

Water quality in the headwater streams that drain the project area is mostly good. Constituent concentrations downgradient of the site are generally low, but higher concentrations are reported in samples taken from the Tok River and Tetlin Lake. Baseline iron, arsenic and manganese concentrations in Tors Creek exceed ADEC guideline values due to the proximity of the mineralized orebody. Baseline sulfate, metals, and total dissolved solids (TDS) concentrations are consistently higher in groundwater than surface water, particularly in the vicinity of the orebody. Downgradient of Manh Choh, water quality of streams reflects the mixing of the mineralized groundwater discharge with runoff from the stream headwaters.

Operational Water Management

The Manh Choh orebody will be mined with two pits: the North Pit and the South Pit. Waste rock will be stored on surface to the north and east of the North Pit, and south and east of the South Pit. Most of the geochemically reactive waste rock will eventually be used as pit backfill. Mineral processing will occur off site.

The principal component of the water management system is a perimeter collection trench that encircles the site area and is designed to intercept all contact water. The water in the trench will be directed to holding ponds at the crest of each pit. Groundwater inflow is predicted to be about 2 gpm for the North Pit and about 6 gpm for the South Pit once mining advances below the water table. Groundwater inflows and pit slope runoff will be pumped from in-pit sumps to the holding ponds. Month-by-month management of water has been assessed using a site-wide Goldsim water balance model which indicates that water will accumulate during and after the period of spring snowmelt and potentially for shorter periods following rainfall events in the summer and fall.

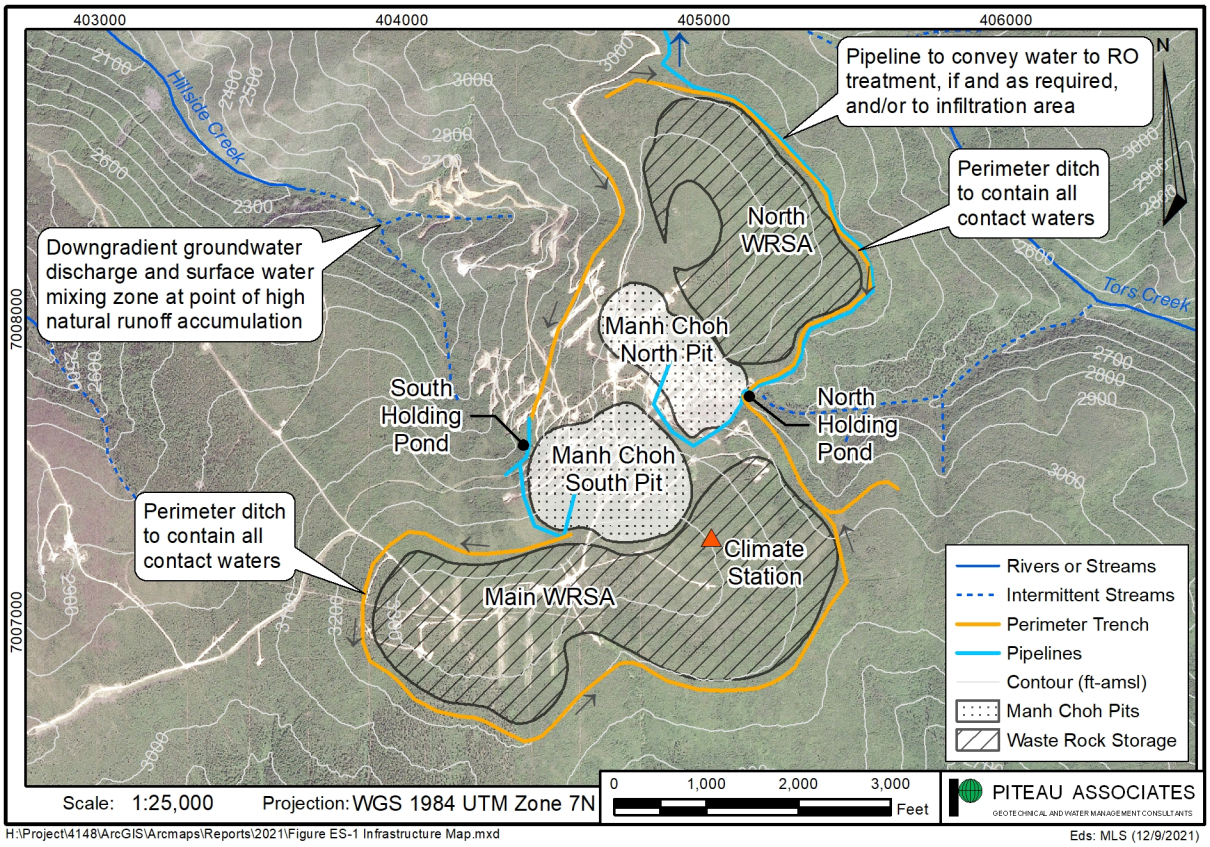


Figure FS-1. Layout of proposed Manh Choh facilities and water management infrastructure.

Infiltration testing in shallow test pits around Manh Choh has indicated that the shallow soils have low permeability and will form a good foundation for perimeter trenching to capture and convey water around site. The underlying weathered bedrock is seen to be permeable and would readily accept water from infiltration basins excavated to a deeper level, after removal of the fine-grained soil cover.

Accumulating water in the holding ponds will be used for dust suppression. Excess water will be infiltrated in designated rapid infiltration basins below the pits or may be treated by reverse osmosis (RO), depending on the quality. Water quality during the high flow periods is predicted to be good, particularly during the spring when a high proportion of the runoff will occur over frozen ground with limited contact. Sizing of the perimeter ditch and management of the contact water has used conservative assumptions to handle extreme precipitation events.

The low rates of groundwater inflow to the pits, low bedrock hydraulic conductivity and deep water table mean that drawdown is expected to be limited to the local areas of the pit walls The conceptual groundwater model is presented in Figure ES-2.

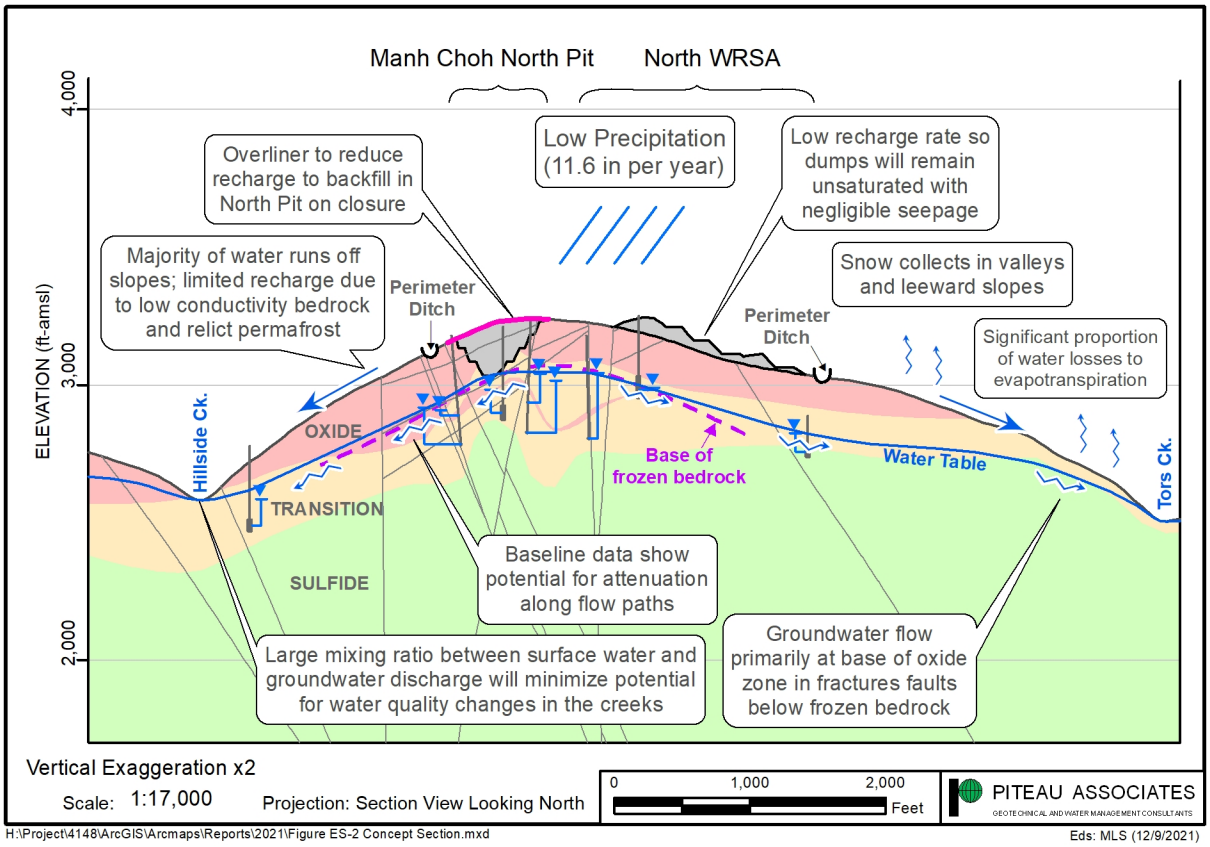


Figure FS-2. Diagrammatic cross section to illustrate conceptual Manh Choh hydrogeology model.

Water Management During Mine Closure

The perimeter collection trench constructed for operations will be retained during early closure. It will be progressively reclaimed as the waste rock is covered and the amount of contact water reduces. The natural pre-mining drainage pattern will be re-established with reclamation. Both pits will be backfilled with geochemically reactive waste rock to minimize mobilization of constituents and potential changes in downgradient water quality.

The goal for mine closure is to keep potentially metal leaching waste rock in North Pit dry and to keep potentially acid generating waste rock in South Pit submerged. Backfill in North Pit will be placed above the predicted post-closure water table. The current plan is to place an over-liner above the North Pit backfill such that post closure infiltration is negligible.

A groundwater and solute transport model has been constructed to help optimize the closure plan. The model predicts post-closure water elevations in North Pit can be maintained below about 2940 ft above mean sea level (ft-amsl), so most of the backfill material will remain above the water table, and any downgradient seepage will be negligible.

A program of enhanced filling with water is planned for the South Pit to minimize the time the backfill remains unsaturated. Water for the enhanced filling program will be derived from the on-going water management infrastructure, supplemented by pumping from the existing water supply wells, as required. The model predicts that post-closure water levels in South Pit can be maintained above 2965 ft-amsl, so the reclaimed backfill will remain submerged.

Mass transport model simulations indicate that dissolved constituents that could percolate from the South Pit backfill will undergo downgradient mixing with other groundwater local to the pit. Concentrations of non-conservative constituents such as arsenic will reduce along the groundwater flow paths due to sorption and other natural attenuation processes identified in baseline water quality data. The model indicates that virtually all parameters in the downgradient headwaters will be below the ADEC guideline values. Manganese could exceed its guideline value in the Hillside Creek headwaters after 180 years during dry months when creek flows are fed by minor groundwater discharge, but much of this is likely to be lost to evapotranspiration around the margins of the creek during the summer months. Since groundwater flows at the headwaters make up a very small proportion (2%) of annual stream flows, significant changes in water quality are unlikely to be detectable in streams, except possibly in late summer when less runoff is available for mixing.

Operational Monitoring Plan

During mine operations, bedrock groundwater levels will be monitored by an array of grouted-in vibrating wire piezometers and monitoring wells completed around the perimeter of the facility. Surface water monitoring will use the baseline stations, with roughly the same monitoring and sampling schedule. Monitoring objectives during operations are to assess: (i) downgradient water quality in the project area streams, (ii) whether groundwater drawdown remains local, as predicted, (iii) pore pressures for slope stability monitoring, (iv) the overall performance of the water management plan, including any water that is infiltrated, and (v) continued refinement of the conceptual hydrology and water quality models.

Sumps and holding ponds will be regularly sampled during all flow events to assess the quality of water that will need to be managed by dust control, infiltration, or treatment through the RO facility. The monitoring will include total suspended solids and constituent ions and metals outlined in an updated Sampling Analysis Plan for the site. Treatment or discharge will be applied based on triggers laid out in the detailed water management plan developed for operations.

Groundwater and surface water monitoring stations in Hillside Creek, Tors Creek, Tok River and Tetlin Lake will continue to be monitored for flow rates and sampled for water quality throughout the life of mine.

Monitoring Plan During Closure and Reclamation

The intent is to install vibrating wire piezometers as part of the backfill process in both pits to allow monitoring of water levels and comparison to model predictions, and to facilitate accelerated filling of South Pit. Additional groundwater monitoring wells will be installed at compliance points determined by the water management plan, close to the downgradient stream headwaters to assess groundwater chemistry and confirm groundwater model predictions.

Sumps and holding ponds will continue to be sampled to assess the improving quality of the runoff water as reclamation proceeds and to develop criteria for eventual release of runoff from the site. Monitoring of the stations in Hillside Creek, Tors Creek, Tok River and Tetlin Lake will be continued until confidence is achieved in the post-closure solute transport model predictions and the data confirm that long-term downgradient impacts will be as predicted.

CONTENTS

EXECUTIVE SUMMARY i
LIST OF TABLES ix
LIST OF FIGURES x
LIST OF APPENDICES xii
LIST OF ACRONYMS xiii
1. INTRODUCTION 1
1.1 Study Objectives 1
1.2 Background Information 1
1.3 Site Description 2
1.4 Proposed Mine Facilities and Infrastructure 2
1.5 Project History 2
1.6 Baseline Characterization Work 3
2. CLIMATE, SURFACE WATER HYDROLOGY AND WATER QUALITY 4
2.1 Topography, Surface Water Catchments and Surface Water Bodies 4
2.2 Surface Water Flow Monitoring 5
2.3 Surface Water Quality Guidelines and Compliance 5
2.3.1 Water Quality Guidelines 5
2.3.2 Laboratory Compliance and Certification 5
2.3.3 QA/QC 6
2.4 Climate and Precipitation 6
2.5 Baseline Surface Water Quality 7
2.5.1 Major Ions and Constituents of Concern 8
2.5.2 pH and Sulfate Concentration 8
3. GEOLOGY 9
3.1 Surficial Geology and Soils 9
3.2 Bedrock Geology 9
3.2.1 Lithology 9
3.2.2 Alteration and Mineralization 10
3.2.3 Structural Geology 10
4. HYDROGEOLOGY 11
4.1 Hydrogeologic Characterization 11
4.1.1 Piezometric Levels 11
4.1.2 Permafrost and Ground Temperatures 12
4.1.3 Interpreted Potentiometric Surface 13
4.1.4 Aufeis 13
4.2 Baseline Groundwater Quality 13
4.2.1 Water Quality Guidelines 14
4.2.2 QA/QC 14

4.2.3 Summary of Groundwater Water Quality 14
5. CONCEPTUAL GROUNDWATER MODEL 16
5.1 Groundwater Recharge 16
5.2 Groundwater Flow Regime 16
5.3 Water Quality 17
6. WATER BALANCE AND WATER QUALITY 18
6.1 Water Balance Model 18
6.1.1 Storm Water Flows 19
6.1.2 Seasonal Water Flows 19
6.2 Site Water Management 20
6.2.1 General 20
6.2.2 Runoff from the WRSA 20
6.2.3 Dust control 21
6.2.4 Infiltration 21
6.2.5 Operational Water Quality 21
6.3 Water Management During Closure 22
6.3.1 Post-Closure Water Quality 22
6.4 Climate Change 22
6.5 Monitoring Plan 23
6.5.1 Operational Monitoring 23
6.5.2 Monitoring During Closure and Reclamation 23
7. GROUNDWATER MODEL 25
7.1 Introduction 25
7.2 Numerical Model Construction 25
7.2.1 Code Selection and Model Domain 25
7.2.2 Hydrostratigraphy and Model Discretization 26
7.2.3 Stress Periods 26
7.2.4 External Boundary Conditions 27
7.2.5 Internal Boundary Conditions 27
7.3 Model Calibration 28
7.3.1 Steady-State Calibration 28
7.3.2 Water Balance 28
7.3.3 Calibrated Hydraulic Head and Hydraulic Conductivity 28
7.4 Dewatering and Recovery Simulations 29
7.4.1 Mining Simulation 29
7.4.2 Recovery Simulation 30
7.5 Constituent Transport 31
7.5.1 Introduction 31
7.5.2 Boundary Conditions and Background Concentrations 32

7.5.3 Transport Model Parameters 32
7.6 Constituent Transport Analysis 33
7.7 Predictive Uncertainty 34
7.7.1 Mining Sensitivity Simulations 34
7.7.2 Recovery Sensitivity Simulations 34
7.7.3 Transport Sensitivity Simulations 35
8. LIMITATIONS 36
9. REFERENCES 37

LIST OF TABLES

Table 2.1 Average Precipitation and Temperature Normals

Table 2.2 Surface Water Monitoring Stations

Table 2.3 Summary of Pre-mining Baseline Surface Water Flows at Monitoring Stations

Table 2.4 Annual Surface Water Samples Count

Table 2.5 Count of ADEC Guideline Value Exceedance for Pre-Mining Baseline Parameters at Surface Water Monitoring Stations

Table 4.1 Groundwater Monitoring Location

Table 4.2 Summary of Hydraulic Conductivity Testing and Analysis

Table 4.3 Summary of Frozen Bedrock Zones

Table 4.4 Annual Groundwater Samples Count

Table 4.5 Count of ADEC Guideline Value Exceedance for Pre-Mining Baseline Parameters in Groundwater Wells

Table 5.1 Baseline Concentrations, Source Terms and Distribution Coefficients for Water Quality at Manh Choh

Table 6.1 Return Period Storm Events

Table 6.2 Average Monthly Flow Rate Discharging to Site Retention Basins

Table 6.3 Predicted Water Quality of Retention Pond Water

Table 7.1 Observed and Simulated Stream Flows for the Manh Choh Area

Table 7.2 Observed and Calibrated Hydraulic Heads

Table 7.3 Transport Model Boundary Conditions and Background Concentrations

Table 7.4 Sensitivity Simulations

LIST OF FIGURES

Figure 1.1 Project Location, Cumulative Effects Study Area and NHD Defined Hydrographic Basins

Figure 2.1 Surface Water Monitoring, Sampling, and Stream Gauge Locations

Figure 2.2 Surface Water Piper Diagram

Figure 2.3 Average pH and Sulfate Concentrations in Surface Water Catchments

Figure 3.1 Cumulative Effects Study Area Geology and Distribution of Major Faults and Lineaments

Figure 3.2 Hydrogeological Section A-A' Along 7008062 m N (22992282 ft N)

Figure 3.3 Hydrogeological Section B-B' Along 404817 m E (1328138 ft E)

Figure 4.1 Groundwater Monitoring Locations and Potentiometric Surface

Figure 4.2 Preliminary Permafrost, Ground temperature Mapping and Aufeis Occurrences

Figure 4.3 Groundwater Piper Diagram

Figure 4.4 A Comparison of Arsenic and Sulfate Concentrations in Groundwater Versus Surface Water

Figure 6.1 Surface Water Catchments and Stormflows for Site Perimeter Trenches; Surface Water Catchments for Site Closure Configuration

Figure 6.2 Water Balance Flow Rates and Accumulated Flows

Figure 7.1 Numerical Groundwater Model Grid

Figure 7.2 Hydraulic Parameter Zones

Figure 7.3 Model Cross Section A1-A1'

Figure 7.4 Model Cross Section B1-B1'

Figure 7.5 Groundwater Model Boundary Conditions

Figure 7.6 Numerical Model Recharge Zones

Figure 7.7 Simulated Versus Observed Flows for Steady-State Calibration

Figure 7.8 Calibration Residuals and Observed Versus Simulated Water Levels

Figure 7.9 Simulated Water Levels and Pit Inflows Over Mining and Post-Closure

Figure 7.10 End of Mining Drawdown Contours

Figure 7.11 North Pit Simulated Post-Closure Water Balance

Figure 7.12 South Pit Simulated Post-Closure Water Balance

Figure 7.13 Highest Groundwater Discharge Locations in Hillside and Tors Catchments

Figure 7.14 Simulated Flows and Concentrations at Highest Groundwater Discharge Point on Hillside Creek

Figure 7.15 Simulated Flows and Concentrations at Highest Groundwater Discharge Point on Tors Creek

Figure 7.16 Simulated Monthly Flows and Concentrations at Highest Groundwater Discharge Point on Hillside Creek (300 Years Post-Closure)

LIST OF APPENDICES

Appendix A Stream Hydrographs

Appendix B Surface Water Quality

Appendix C Monitoring Well and Piezometer Logs

Appendix D Hydraulic Testing Data

Appendix E Groundwater Hydrographs

Appendix F Groundwater Quality

LIST OF ACRONYMS

ac-ft	acre-feet
ACZ	ACZ Laboratories
ADEC	Alaska Department of Environmental Conservation
ABR	ABR Inc.- Environmental Research & Services
ANCSA	Alaska Native Claims Settlement Act
ARS	ARS Aleut Analytical LLC
Asp	Bedrock fracture specific surface area
CESA	Cumulative effects study area
Contango	Contango ORE Company
ft-amsl	Feet above mean sea level
HEC-HMS	Hydrologic Engineering Center Hydrologic Modeling System
HSU	Hydrostratigraphic Units
Juneau	Juneau Exploration Inc.
Kd	Linear adsorption coefficient
Kinross	Kinross Gold Corporation
mi	Miles
mg/L	Milligrams per litre
ML	Oxide Metal Leaching
NAG	Non-Acid Generating
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
PAG	Potentially Acid Generating
Piteau	Piteau Associates Ltd.
QA/QC	Quality Assurance / Quality Control
QMS	Quartz Muscovite + Biotite Schist
RIB	Rapid Infiltration Basin
RMS	Root mean square
RO	Reverse Osmosis
SAP	Sampling and Analysis Plan (Piteau, 2019)
SGS	SGS Laboratories
SRK	SRK Consulting
Sy	Specific yield
TNC	Tetlin Native Corporation
USSCS	United States Soil Conservation Service
VWP	Vibrating wire piezometer
WRSA	Waste rock storage area

1. INTRODUCTION

This hydrogeological characterization and groundwater modeling report was prepared by Piteau Associates Ltd. (Piteau) to support project planning and design work for the proposed Manh Choh mine site (Manh Choh) in northeast Alaska. This report is a culmination of field and office hydrological assessments undertaken by Peak Gold LLC and builds on earlier hydrological studies presented in Piteau (2019). The following sections present the outcomes of that work including:

- Stream flow and baseline surface water quality sampling,
- Water level measurements and baseline groundwater quality sampling,
- Ground temperature measurements,
- Hydraulic testing and mapping,
- Development of a conceptual hydrology and hydrogeological model, and
- Numerical groundwater flow and transport modeling.

1.1 Study Objectives

The objectives of the study include:

- Defining the current groundwater and surface water conditions in and around Manh Choh, including surface flows, groundwater levels and water quality,
- Determining the key controls on surface water and groundwater flow at site,
- Assessing any impacts to groundwater levels and surface water baseflow rates during operations and closure,
- Assessing any impacts to groundwater and surface water quality at site,
- Presenting options for discharge of excess water associated with operations,
- Defining the maximum extent of drawdown during operations, and
- Assessing the potential cumulative effects on groundwater and surface water quantity and quality during proposed operations and closure between the Tok River and Tetlin Lake.

1.2 Background Information

The Cumulative Effects Study Area (CESA) defined for the Manh Choh project area encompasses three National Hydrography Dataset (NHD) hydrographic basins between Tok River and Tetlin Lake, in the area where the proposed mine facilities will be located (Figure 1.1):

- The portion of NHD 190803020705-Tok River south of Tok River, including Thunder Creek, Grayling Creek, Hillside Creek, south Day Creek and north Day Creek;
- Tetlin Lake Catchment NHD 190803020308, including north Black Creek and south Black Creek; and
- Tetlin Lake Catchment NHD 190803020310-Tetlin Lake, including Eagle Creek.

The CESA was defined to encompass all the areas that could potentially be affected by the proposed mine facilities (pits, waste rock storage areas (WRSAs) etc.) located within the surrounding natural hydrologic boundaries. The primary focus of the study is the Manh Choh site,

delineated by a planned perimeter ditch (Figure 1.1) that will surround the open pits and related infrastructure, and the headwaters of the catchments surrounding Manh Choh.

The following sections provide background on the CESA, including the site description, summary of proposed mine facilities, project history and description of baseline characterization work completed to date.

1.3 Site Description

Manh Choh is located in eastern interior Alaska, approximately 200 mi (miles) southeast of Fairbanks and approximately 10 mi south of the Village of Tok (Figure 1.1). Manh Choh is situated on the Native Village of Tetlin (Tetlin) lands, within the Tetlin Hills and Mentasta Mountains of eastern Interior Alaska. The Canadian border is approximately 62 mi east of Manh Choh. Within the CESA, the elevation ranges from 3350 ft-amsl to 1,650 ft-amsl near the shores of Tetlin Lake.

1.4 Proposed Mine Facilities and Infrastructure

The current proposed plan would be to mine the Manh Choh deposit in two open pits called the Manh Choh South Pit (South Pit) and the Manh Choh North Pit (North Pit) (Figure 1.1). Mine operations are proposed to begin in 2024 with a total mine life of about 4.5 years. The proposed pits are centered around the highest point of land in the study area at approximately 3,215 ft-amsl.

Waste rock from the open pits is currently categorized as either Potentially Acid Generating (PAG), Non-Acid Generating (NAG) or Oxide Metal Leaching (ML) material. The proposed WRSA is split between two areas. The larger is located south of South Pit and the second is northeast of North Pit (Figure 1.1). The proposed plan is to stockpile PAG in the WRSA during operations until the pits are completed. North Pit will be backfilled with ML material and South Pit will be backfilled with PAG; both pits will be capped with NAG material. The full WRSA footprint is outlined in Figure 1.1.

No mill or tailings facility is planned for Manh Choh. Ore will be stockpiled in limited volumes on site next to and overlapping with the WRSA footprint and subsequently trucked to the Fort Knox mine (located about 250 mi northwest) for processing.

1.5 Project History

In 1971, the Tetlin Native Corporation (TNC) was granted surface and subsurface title to 743,147 acres of land after the Alaska Native Claims Settlement Act (ANCSA) was passed. TNC transferred all lands south of the midline of the Tanana River, approximately 675,000 acres, to the Native Village of Tetlin. This acreage was leased to Juneau Exploration Inc. (Juneau) in 2008. Contango ORE Company (Contango) later acquired 100% of Juneau's interest, subject to a production royalty retained by Juneau, and subsequently Contango and Royal Gold entered into

a joint venture agreement to form Peak Gold, LLC in 2014. In 2020, Kinross became a 70% majority owner with Contango ORE holding 30% of the project. Peak Gold, LLC is the entity that owns the Manh Choh Project. KG Mining (Alaska) is the manager of Peak Gold, LLC.

Exploration activity at site has included: stream sediment and pan concentrate sampling in 2009, 2010, 2013, 2017 and 2019, geophysical surveys starting in 2010, and core drilling in 2011, 2012-2013, and 2015-2021. The Preliminary Economic Assessment was released in 2018 in compliance with the Canadian *National Instrument 43-101* (JDS, 2018) which ultimately led to Kinross purchasing a controlling interest in the project in 2020.

1.6 Baseline Characterization Work

Contango initiated a baseline surface water data collection program for the Project in 2012. Surface water quality sampling, surface water flow monitoring, stream habitat assessment, vegetation mapping, fish collection and macroinvertebrate surveys were completed in 2012. Additional surface water, vegetation and wetlands studies have been regularly conducted since. Groundwater and ground thermal monitoring programs were established in 2019. A preliminary baseline characterization of surface water and groundwater study for the Project was completed in 2019 (Piteau, 2020), and surface water and groundwater monitoring programs continued in 2020 and 2021 (Piteau, 2021).

2. CLIMATE, SURFACE WATER HYDROLOGY AND WATER QUALITY

2.1 Topography, Surface Water Catchments and Surface Water Bodies

Manh Choh is located at a hydrographic divide such that surface water flows away from the site in all directions, discharging into three defined national hydrographic basins (Figure 2.1), including:

- NHD 190803020705-Tok River south of Tok River, including Thunder Creek, Grayling Creek, Hillside Creek, South Day Creek and North Day Creek;
- Tetlin Lake Catchment NHD 190803020308, including N Black Creek and S Black Creek; and
- Tetlin Lake Catchment NHD 190803020310-Tetlin Lake, including Eagle Creek.

The Tok River converges with the Tanana River approximately 10 mi north of Manh Choh. The headwaters of the Tok River are located approximately 50 mi southwest of Manh Choh at the termini of several glaciers of the Alaska Range. The Tok River transitions from a high mountain braided river near its headwaters to a meandering river in the valley to the northwest of Manh Choh along the northwestern boundary of the CESA.

The headwaters of perennial portions of local streams flowing towards the Tok River start at approximately 2,500 ft amsl, below the proposed pits, and have an average stream gradient of 5% or greater. The gradient typically drops to between 1% to 2% towards the lower reaches of the catchment.

Tetlin Lake is located at the foot of the Tetlin Hills, southeast of Manh Choh. The lake is approximately 6 mi across (east to west) and drains into the Tanana River via the Tetlin River. While it has a surface area of about 16,550 acres, it is believed to be relatively shallow across its entire footprint. The area surrounding Tetlin Lake to the east is relatively flat and contains smaller lakes parallel to the shores (Figure 2.1).

The southeastern catchments draining to Tetlin Lake are larger in area than the drainages on the northwestern side of Manh Choh, although typical stream gradients in the headwaters of these sub-catchments are similar to the northwestern drainages. The valleys to the southeast typically broaden with low gradients at the mouth of the drainages near Tetlin Lake. Stream substrates are dominated by cobbles upstream which transition to a mix of cobbles, gravel, and sand midstream. Downstream, near Tetlin Lake, the stream substrate comprises fine sediment and wetland marshes.

One groundwater seep was mapped and sampled regularly at the interface between weathered bedrock and overlying thin regolith or organics at the top of the hill south of the proposed South Pit (Figure 2.1). This seep is at 3,295 ft amsl, whereas the highest measured groundwater elevation is 3,045 ft amsl (GT20-08), indicating it is not fed by groundwater below site but by

shallow water perched in the unsaturated zone. Perched seeps such as this appear to be feeding local wetlands at higher elevations in local catchments (Figure 2.1).

Groundwater discharge points can be observed in the field as perennial seeps at the head of stream alignments and are visible in satellite images as aufeis during winter/spring months (Section 4.1.4). The locations of the aufeis align with groundwater elevations and represent important sites of groundwater discharge.

2.2 Surface Water Flow Monitoring

Manual surface water flow monitoring data collected from 2012 to present are available from 14 sites within the three NHD hydrographic basins around Manh Choh (Tables 2.2 and 2.3). Three locations (HI01, HI02, and EA02) were equipped with continuous stream level monitoring equipment in October 2020. Preliminary stream hydrographs and calculated discharge from stream gauges indicate that measured stream flows are consistently higher downstream within the catchments above the Tok River and Tetlin Lake floodplains (Appendix A). Therefore, all streams are interpreted to be gaining streams in the steeper terrain below the Project Area.

Streamflows are typically higher during spring break-up than the wet early fall months. Most stream flows during the low-flow late fall and winter months are assumed to represent baseflows due to the limited runoff at Manh Choh during this period. Baseflows range between approximately 10 gallons per minute (gpm) and 100 gpm, depending on location within the catchment. Continuous stream measurements suggest that baseflows are sustained over the winter months at some locations.

2.3 Surface Water Quality Guidelines and Compliance

2.3.1 Water Quality Guidelines

The surface water quality results have been compared to the ADEC water quality guidelines based on the following documents:

- *ADEC 2008. Alaska water quality criteria manual for toxic and other deleterious organic and inorganic substances.*
- *ADEC 2018. 18 AAC 70 Water Quality Standards.*

ADEC follows Alaska Water Quality standards which are assigned based on criteria for designated use. A targeted list of parameters for baseline characterization is supplied by Mining Section Division of Water of ADEC along with the minimum level of quantification.

2.3.2 Laboratory Compliance and Certification

Water samples collected between 2012 and October 2020 were submitted to SGS in Anchorage, Alaska for analysis. Starting in November 2020, samples were analyzed at ACZ in Steamboat Springs, Colorado. Analysis methods and reported detection limits and method detection limits are summarized in Appendix B, along with the water quality results.

Duplicate water samples were analyzed at Test America Labs during 2012 and 2013; and additionally at ARS Aleut Analytical during 2015 and 2016. The lab duplicate analyses generally show comparable results but with some notable differences in low concentration analytes. Detailed results and lab comparison are discussed in ABR (2014, 2016 and 2018).

The water quality results are summarized in Appendix B and in the following sections. Individual laboratory certificates of analysis for each monitoring event are available upon request.

2.3.3 QA/QC

All surface water quality data collected between 2012 and 2019 have undergone quality assurance (QA) and quality control (QC) review by ABR as outlined in their water quality annual reports. A formal QA/QC plan was established for the monitoring program as part of the Sampling Analysis Plan (SAP; Piteau, 2019). Internal and external QA/QC protocols followed for surface water quality monitoring are provided in the SAP. Specifically, during each surface water monitoring event, at minimum, one duplicate sample was collected for every 10 samples. All QA/QC tables and the calculated percent difference are presented in Appendix B.

As part of the QA/QC plan, all laboratory analytical reports were reviewed, and results entered in a digital database. Laboratory QC samples were also reviewed to evaluate the performance of the analytical methods in addition to each lab's internal standard QA/QC practice.

2.4 Climate and Precipitation

Manh Choh is within the cold continental/subarctic climate zone, which is characterized by extremely cold winters and moderate summers (Table 2.1). Thermal inversions are common in the Tok River valley and Tanana River valley area below Manh Choh during winter, resulting in cooler temperatures and cloud cover in the valley bottom, and warmer clear conditions at the elevation of Manh Choh. Significant wildfires in the CESA in 1990 and 2015 are related to dry warmer conditions in summer.

Mean annual precipitation in Tok is low in comparison to Fort Knox and other regions of Alaska. Data from Tok-2 station, 11 mi north of site at 1,658 ft amsl; location shown in Figure 1.1, indicate average annual precipitation since 2012 is 11.3 in/yr, of which 40% fell as snow (Table 2.1). Between 1968 and 2016, Tok 1 station, located 11 mi northwest of site at 1,658 ft amsl; location shown on Figure 1.1, recorded an average of 9.88 in/yr. The wettest months are during late spring and summer in May, June, July, and August, when 58% of total annual precipitation occurs as rain. The driest months are late winter and early spring in February, March and April (8% of total annual precipitation).

The Tok 2 station was installed at an elevation of 1,685 ft amsl, whereas the elevation of Manh Choh is approximately 3,300 ft amsl. Mean Annual Precipitation at Manh Choh is estimated to be

6% higher based on a 0.4 in/yr per 1,000 ft correction to adjust for an assumed increase in precipitation with elevation[1].

Peak Gold LLC installed a robust meteorological (weather) station at site (Figure 1.1) and started collecting data in November 2020. The period of record is insufficient to base return period calculations on for site. However, it provides a basis for comparison between Tok 2 station data and actual site conditions over a one-year period. Boreal Environmental Services (pers. Comm. D Shallies, November 17, 2021) reported that the first year of precipitation data from the site station was within 10% of that reported at Tok 2. Recorded summer precipitation was higher at site, as expected, while winter precipitation was lower. Precipitation typically increases with elevation in comparable mountainous regions. Measured winter precipitation at Manh Choh is posited to be lower due to instrument error (ice rime, challenging collection conditions) and is not a reflection of true precipitation at site.

2.5 Baseline Surface Water Quality

Surface water quality samples were collected at 19 sites within the CESA from 2012 to 2021 (Tables 2.2 and 2.4). These include the 14 stream monitoring sites identified in Section 2.3 above, two sites in the Hillside and Thunder headwaters where a sample could be collected but the flow was too slow to measure, two sites along the shoreline of Tetlin Lake and one site on the Tok River. Sampling at many surface water locations started as early as 2012. Additional monitoring and sampling locations were added in 2019 to supplement the earlier stations and to advance baseline characterization studies.

Each surface water catchment has multiple designated collection and monitoring points along the stream course to characterize the spatial and temporal variability in water quality. Surface water samples are analyzed for major ions, cyanide, nitrates, and total metals. In addition, field measurements of pH, conductivity, temperature, and turbidity are also collected at each monitoring location. Samples are left unfiltered, preserved as necessary, and analyzed for total recoverable fractions and dissolved anions. Tabulated surface water quality results compared to guideline concentrations for each monitoring location presented in Appendix B. The number of ADEC guideline value exceedances of select parameters in the baseline water quality dataset is summarized in Table 2.5.

Total dissolved solids (TDS) values in the CESA are between 215 and 428 mg/L in Tok River, the highest in the project area. TDS values in streams around Manh Choh are below 250 mg/L, and

[1] Modelling and assessments for this report used an earlier estimate of mean annual precipitation at Tok 2 of approximately 10.9 in, which, when corrected to site elevation, translates to 11.6 in at Manh Choh.

more typically are below 100 mg/L. TDS values are noted to be lowest in all catchments during Spring and early Summer when stream flows are at their highest levels.

2.5.1 Major Ions and Constituents of Concern

All surface waters in the CESA can be described as 'calcium-bicarbonate' type, based on the piper diagram (Figure 2.2). This characterization of surface water is consistent across the catchments draining Manh Choh.

A scoping level assessment of the geochemistry of the proposed Manh Choh open pits and WRSA by SRK (2021) has identified several constituents of potential concern for water quality, including sulfate, antimony, arsenic, manganese, and selenium. Analyses of surface water from the CESA returned no exceedances of antimony, selenium or sulfate. The highest measured antimony concentration of 0.0017 mg/L was observed in Day Creek and the highest selenium concentration of 0.00033 mg/L was observed in Tok River.

Arsenic concentrations exceeding the 0.01 mg/L ADEC guideline value were measured at six sampling locations (Table 2.5). The highest arsenic concentration measured during the sampling program was 0.98 mg/L from Day Creek where average concentrations were 0.34 mg/L. The maximum measured concentrations in Hillside Creek and Tors Creek were 0.011 mg/L and 0.063 mg/L, respectively. Further downstream, maximum concentrations of 0.012 mg/L and 0.033 mg/L arsenic were measured in the Tok River and Tetlin Lake, respectively.

Maximum and average measured concentrations of manganese exceeded the guidelines in many of the creeks running off Manh Choh. As many as 70% of samples from Tetlin Lake exceeded the guideline, while 47% and 38% of samples exceeded the guideline in Hillside Creek and Tors Creek, respectively. The highest values of hardness (390 mg/L) and TDS (510 mg/L) measured at site were found in Tors Creek.

2.5.2 pH and Sulfate Concentration

Lowest pH values in the CESA are measured in catchments west of Manh Choh at values as low as 4.1 at HIT2-01. During wetter periods, of the year, pH rises to as high as 8.6 at HIT2-01. Exceeding the upper guideline limits of 8.5 is relatively rare in comparison to measuring below the lower limit, which occurs in about 10-50% of measurements in the western catchments. pH is rarely out of the guideline ranges in eastern catchments, except at BL01 in Black Creek (south of Manh Choh) where 6 of 17 samples had a pH of between 5.8 and 6.5. Measurements from the Tok River and Tetlin Lake are dominantly neutral to basic pH, ranging from 6.2 to 10.2.

Average sulfate concentrations and reported field pH values in surface water are shown on Figure 2.3. Average sulfate concentrations are higher in Hillside Creek and Day Creek catchments and are spatially correlated with lower average pH in comparison to other catchments surrounding Manh Choh. The presence of elevated constituents of concern, low pH and high

sulfate is consistent with the natural oxidation of sulfide-bearing rocks associated with the Manh Choh deposit below the headwaters of these catchments.

3. GEOLOGY

3.1 Surficial Geology and Soils

Soil development across the CESA varies from immature thin soil horizons and regolith at higher elevations to mature soil profiles and organic accumulations on the main valley floors. The most significant overburden unit in the CESA is in the Tok River Valley. Coarse granular sediments, channel fills of sand and sandy pebble gravels fill the valley. Deposits include colluvium, fan deposits, loess, ancient flood deposits and minor talus and rubble. Boulder-rich deposits in the valley fill reflect large scale outburst flood events which filled the Tok River valley during the past glaciation (Reger et. al., 2011). Ancient Tok River fan deposits are present where the Tok River enters the Tanana River valley nine miles east of the CESA. Recent meander avulsion has resulted in younger fan deposits towards the eastern margin of the Tok River valley. The water table below the Tanana River valley and similarly the Tok River valley is assumed to be shallow, based on extensive muskeg, clearwater springs, and ponds (Reger et al., 2011).

Bedrock is exposed at the higher elevations of the CESA, and is commonly covered only with moss, lichen or thin regolith. The soils at the base of drainages within the CESA are generally poorly developed and comprise colluvium overlying weathered angular regolith and underlying bedrock. The region was covered by a variable thickness of aeolian silt during the last glacial maximum.

A 150-300 ft deep oxidation zone below Manh Choh indicates the surface of the bedrock was exposed for an extensive period, suggesting there was minimal glacial cover during the last glaciation (Avalon Development Corp., 2013). In areas where erosion is higher than the rate of soil formation, or areas where the thin soil layer has failed on the bedrock surface, talus and felsenmeer is noted in the bottom of valleys. The locations of local talus zones appear to be correlated to the orientation of intersecting bedrock structures and slope aspect. Thin soils on the steeper slopes within drainages are typically held in place by vegetation.

3.2 Bedrock Geology

3.2.1 Lithology

Bedrock hosting the Manh Choh deposit comprises Early Paleozoic quartz muscovite ± biotite schist (QMS unit) with conformable layers of amphibolite schist/greenstone. The QMS unit comprises quartz, muscovite, biotite and local garnet, with minor actinolite and epidote. Calcareous units interbedded with QMS form the primary host for silicate skarn alteration (Figure 3.1). Lithology is consistent across the site with no identifiable primary porosity. Stratigraphy is

weakly defined by the presence of calcareous units. However, these do not appear to provide any control on the distribution of hydraulic head or hydraulic conductivity at Manh Choh.

3.2.2 Alteration and Mineralization

Gold-sulfide mineralization is preferentially hosted in the calcareous schist units which have been altered to amphibole–chlorite skarn (Avalon Development Corporation, 2013). Mineralization appears to be controlled by both macro structures such as faults and the fine-scale metamorphic rock fabric. The near surface rocks are heavily oxidized and transition into a primarily sulfide alteration at depth (Figure 3.2). Structures and rock fabric controlled the ancient hydrothermal mineralizing system and provided controls on development of the more recent oxidation profile. Oxidation is the weathering product of fresh oxidized groundwater moving through bedrock in a groundwater flow system which has been active since at least the Pleistocene period approximately 2.6 million years ago. This oxidation profile continues to provide control on the modern hydrogeologic environment including bedrock hydraulic conductivity and groundwater levels (see cross sections in Figure 3.2 and Figure 3.3).

3.2.3 Structural Geology

Linear stream drainages and low saddles within the Tetlin Hills are inferred to reflect the surface expression of faults and structure orientations. The two dominant structural orientations in the Project Area, both of which are manifested by high angle brittle faulting, are northwest-southeast and northeast-southwest. Faults are conjugate to the dominant regional stress regime in this part of Eastern Interior Alaska.

Regionally, the area has undergone at least three major deformation events (D_1, D_2 and D_3, in order of formation), based on recent structural geology analysis by SRK (2019a) (Figure 3.1). D_1 is characterized by thrust faults striking northwest-southeast and ductile to brittle-ductile folds verging predominantly towards the northeast. D_1 faults are poorly defined due to masking by subsequent D_2 and $D_{2\text{-}3}$ faults. D_2 is characterized by brittle-ductile folding and faulting. Faults and veins are northwest striking with a steep dip and are strongly associated with gold mineralization.

At larger scales, the northwest oriented D_2 fault zones below Hillside Creek and Tors Creek appear to provide localized higher conductivity pathways and comparatively higher storage for groundwater. They may be influencing the local distribution of pore pressure gradients below the Manh Choh Site. While hydraulic conductivity testing results are consistent with the presence of locally high fracture-controlled porosity in boreholes, drilling and testing were unable to resolve whether the D_2 faults are the only significant macro-scale structures controlling the bedrock flow regime. The orientations of D_1 and $D_{2\text{-}3}$ structures relative to the orientation of the proposed pit walls may locally compartmentalize groundwater or provide drainage within pit slopes as they are excavated below the incipient water table and may retard downgradient flow from recharge to the open pits after closure.

4. HYDROGEOLOGY

Groundwater levels, ground temperatures and bedrock hydraulic conductivity were assessed at site during drilling programs conducted between 2019 and 2021 to characterize the hydrogeology of the bedrock below Manh Choh. A total of 14 groundwater monitoring wells and were completed with standpipes to measure downhole water levels and ground temperature profiles. Prior to 2019, two water supply wells were installed to support the diamond hole drilling exploration programs. Multilevel grouted-in vibrating wire piezometers (VWPs) were installed to measure pore pressures in the proposed pit slopes. Well and piezometer locations are shown on Figure 4.1 and are provided in Table 4.1. As-built drawings of the final completions are provided in Appendix C.

4.1 Hydrogeologic Characterization

Hydraulic testing completed in boreholes at Manh Choh included:

- Airlift tests during drilling of monitoring wells (Appendix C),
- Five falling head tests and six rising head tests immediately after completion of monitoring wells (Appendix D),
- A 24-hour constant rate pumping test on Well 2 conducted by Knight Piesold (2018), and
- Twenty packer tests in the geotechnical boreholes which were later completed as VWP installations (Appendix D).

Estimated hydraulic conductivities range from 10^{-5} to 10^{-9} ft/s (Table 4.2). The bulk rock mass is interpreted to have a very low hydraulic conductivity due in part to low intergranular or intercrystalline porosity. Groundwater flow is interpreted to occur through fractures in the rock mass and the higher hydraulic conductivity values were associated with tests completed within or near fault zones. Systemic differences between hydraulic testing of screened well intervals versus packer test intervals in geotechnical boreholes obscured correlations between conductivity and rock mass characteristics, but it is evident that oxidized intervals tend to be higher conductivity. Higher average conductivity values from well tests are inferred to reflect the conductivity of shallow fractured and weathered bedrock zones, whereas packer testing results are inferred to reflect the low bulk conductivity of the deeper bedrock formations.

4.1.1 Piezometric Levels

Hydrographs for monitoring wells and VWPs are presented in Appendix E. Piezometric trends show a wide range of character due to differences in hydraulic connection with surface recharge sources, connection to fracture porosity in the borehole and permafrost conditions. The difference between seasonal high and low head levels ranges from 5 to 30 ft. Heads rise and fall gradually in slow seasonal cycles over periods of several months in up to 70% of the monitoring holes. In four monitoring well installations (PKG19-001, PKG19-006, GW21-02 and GW21-04) heads rise sharply within several weeks to a month after initiation of spring snowmelt, and subsequently decline through the remainder of the year. Levels in these piezometers also rise briefly by up to several feet following more intense (>1 in) rainfall events.

A sharp rise following snowmelt is only visible in hydrographs for monitoring wells. VWPs measure pore pressures in fractures in the immediate vicinity of the instrument relatively deep below surface, whereas filter packs in monitoring wells expose the well to between 30 to 140 ft of formation. Thus, monitoring wells have a higher probability of being exposed to discrete fractures or higher conductivity shallow oxide zones which efficiently transmit recharge from surface. Fracture flow environments are inherently complex on a local scale. However, the predominant character of piezometric response in bedrock to snowmelt and rainfall recharge at Manh Choh indicates that the regional water table varies by up to 30 ft seasonally and the response to that recharge is delayed by months. The elevation of the water table gradually rises during the seasonal recharge period following snowmelt and summer rainfall until late summer or fall, after which heads fall to seasonal lows during winter.

Some groundwater wells have developed an ice plug at the water table interface, whereby the water level is within or near the frozen bedrock zone and is characterized by a sharp increase in water level in the absence of other groundwater stress changes. Wells GW21-06, PKG19-004, PKG19-006 and PKG19-007 all have ground temperatures below freezing, frozen conditions during sampling, and erratic piezometric measurements which are assumed to not reflect the ambient pore pressure conditions.

Vertical hydraulic gradients are normally interpreted from multilevel piezometers. All multilevel piezometers installed at site are inclined such that VWPs do not line up vertically. Apparent hydraulic head differences between VWPs installed in the same hole range from 1 to 15 ft but are inconsistent with some upward and some downward gradients. This variability is assumed to result from VWPs being exposed to different fracture sets and hence compartmentalized pore pressures, so does not necessarily reflect true vertical gradients. One exception is GT20-01 in which piezometric heads show a greater than 120 ft vertical difference. By comparison to other nearby piezometer readings, the upper of the two VWPs in this hole is assumed to be measuring pore pressures related to short-circuiting of shallow perched water at the instrument, well above the ambient water table. Horizontal gradients are more pronounced, more regular, and provide a more reliable indication of groundwater flow through the bedrock.

4.1.2 Permafrost and Ground Temperatures

Observations during drilling and temperature measurements recorded after holes have thermally equilibrated indicate that extensive and thick areas of “warm” permafrost, or frozen bedrock, which is slightly below 32°F, exist at depth below Manh Choh. These frozen zones on average start at about 50 ft below ground surface (ft-bgs) and can extend to greater than 400 ft-bgs (Table 4.3; Figure 4.2). These depths are well below typical active thermal zone depths and thus are interpreted as fossil frozen zones from prior cold climatic periods (SRK, 2019b; SRK, 2021).

Temperatures of the frozen zones are at or just below 32°F. No seasonal effects were observed in deep frozen bedrock zones, however shallow bedrock (less than 50 ft) does show seasonal

temperature effects depending on aspect and the slope direction (i.e., north facing or south facing). Ice plugs have developed in some monitoring wells where the water table extends up into the frozen zone. Some monitoring wells did not produce water because of frozen conditions, indicating groundwater flow is impeded or prevented from flowing through some bedrock regions, in particular below the proposed South Pit.

The distribution of permafrost in the CESA is controlled by aspect, snow cover, vegetation, surface geology and past disturbance of the ground surface (i.e., wildfires). Inferred permafrost and preliminary deep frozen bedrock zones were interpreted by SRK within Manh Choh and west, as shown on Figure 4.2 (SRK, 2019b; SRK, 2021). The deep, frozen bedrock zone is interpreted to be absent in south facing slopes of Hillside Creek, Day Creek and near the headwaters of Eagle (Tors) Creek and Black Creek (Figure 4.2). Appendix D provides the borehole logs with ground temperatures in groundwater wells and geotechnical drillholes

4.1.3 Interpreted Potentiometric Surface

A potentiometric surface of the water table was generated using the water levels recorded at all available groundwater wells and VWPs in May 2021 and is presented in Figure 4.1. The May 2021 levels represent the seasonally high water levels for most wells. For wells which did not have a water level recorded during May 2021, earlier available water levels were used. Additionally, locations (and elevations) of mapped aufeis (Figure 4.2) in adjacent catchments are interpreted to be the surface expression of the water table and are included in the potentiometric surface mapping.

4.1.4 Aufeis

Aufeis, accumulations of layers of ice along stream beds which persist long after snow has melted, are visible during early summer in the field and in satellite imagery, in the upper reaches of local streams below Manh Choh (Figure 4.2). Aufeis is an easily identifiable indicator of the location of perennial groundwater discharge sites where the bedrock water table meets ground surface. Aufeis mapping by SRK (2021) provided important inputs to the conceptual groundwater model and groundwater flow simulations.

4.2 Baseline Groundwater Quality

Prior to 2019, only one water supply (Well 2) was sampled during 2016 and 2018. Regular groundwater quality monitoring initiated at Manh Choh in June 2019 through completion of 7 groundwater monitoring wells. In 2021, 7 additional groundwater wells were added to the monitoring program to support the baseline water quality characterization. In addition to the groundwater monitoring wells, one identified shallow groundwater seep was sampled in 2019 and 2020 for water quality (see Section 2.5). The annual count of groundwater quality samples taken at each well is summarized in Table 4.4.

4.2.1 Water Quality Guidelines

Groundwater discharge likely provides the main source of constituent loading to the local surface waters. Groundwater quality results have been compared to the ADEC surface water guidelines values for freshwater aquatic life (chronic), human health consumption, and drinking water, as discussed above (Section 2.4.1).

4.2.2 QA/QC

Similar to surface water samples, all groundwater quality samples have undergone QA/QC, as per the requirements outlined in the SAP (Piteau, 2019). A minimum of one duplicate sample of groundwater was collected during each field visit along with a field blank. Percent difference calculated between the primary sample and its duplicate are considered within acceptable limits for variation in natural samples. All groundwater quality data along with the QA/QC samples are presented in Appendix F.

4.2.3 Summary of Groundwater Water Quality

Both total metals and filtered metals are collected in groundwater. Filtered/dissolved concentrations of metals may be lower than total metals concentrations, indicating that a portion of the elevated concentrations of metals is attributed to suspended solids in the groundwater. The major ions concentration in groundwater for each sampled location are plotted in a piper diagram in Figure 4.3. Water quality of the groundwater seep sampled during the monitoring program is indicative of a magnesium-calcium-bicarbonate type water, similar to surface water. It also has lower TDS, hardness, and metal concentrations than other groundwater samples, indicating a shorter subsurface residence time and shallow groundwater flow path. GW21-04 has a similar chemical signature to the groundwater seep chemistry with notably low hardness (10 to 12 mg/L).

Average concentrations of arsenic and manganese, constituents of concern identified in Section 2.5.1 above, commonly exceed ADEC guideline values in groundwater wells at Manh Choh. Arsenic concentrations average 0.084 mg/L and have been recorded at concentrations up to 0.78 mg/L in wells. The average manganese concentration in groundwater samples was 0.03 mg/L and with a maximum of 0.22 mg/L. In addition to the identified constituents of concern, metals typically associated with hydrothermal deposits have maximum measured concentrations which exceed guidelines, including antimony, cadmium, copper, lead, and molybdenum (Table 4.5). Complete groundwater quality tables are presented in Appendix F.

Arsenic and sulphate are two key constituents of concern identified which have contrasting behaviour in water. Sulfate is conservative, i.e., is non-reactive and will tend to remain in solution, while arsenic is reactive and can naturally be removed from solution by sorption and precipitation processes. Based on this contrast, plotting arsenic versus sulphate could highlight the presence of these processes in the environment. Figure 4.4 plots arsenic versus sulfate for surface water and groundwater analyses for the project. Elevated arsenic is consistently associated with

elevated sulfate concentrations across the range of wells sampled at site. In contrast, arsenic is relatively depleted versus sulfate in most surface waters compared to groundwater. The discrepancy persists throughout the sampling period and is not affected by seasonal flows, despite the varying proportions of baseflow (groundwater discharge) and surface runoff mixing in the creek. The contrast between surface and groundwater is interpreted to reflect natural attenuation processes which deplete arsenic from groundwater as it moves downgradient of Manh Choh, prior to discharging as stream baseflows.

5. CONCEPTUAL GROUNDWATER MODEL

5.1 Groundwater Recharge

Most of the precipitation over the CESA falls as rain during the summer months, with winter snowpack accounting for less than 40% of the total precipitation. Groundwater recharge is controlled by available precipitation and snowmelt, in addition to surficial and bedrock hydraulic conditions. Groundwater recharge is assumed to be zero between November 1 and April 30 because snow cover and ground freezing prevent infiltration. Seasonally higher groundwater levels in groundwater wells at Manh Choh are correlated with the period of snowmelt, but not discrete rainfall events, indicating bedrock recharge is primarily driven by snowmelt. The presence of aufeis in mid to upper reaches of the catchments in addition to baseflows in surface water streams indicates groundwater discharges continuously from the bedrock throughout the year. Groundwater recharge is restricted in areas where the bedrock water table is at surface and where permafrost prevents infiltration.

5.2 Groundwater Flow Regime

Groundwater flow in the CESA occurs at very low rates. Most of the flow that does occur is within the upper weathered bedrock zone. Groundwater flow at deeper levels in the unweathered bedrock is limited by the very low hydraulic conductivity and the areas of relict permafrost.

Much of the flow in the upper weathered zone is discontinuous and can be classified as interflow. Packer testing of bedrock and infiltration testing in the upper weathered zone highlight the contrast between highly conductive weathered zone versus the tight deep bedrock. Flow occurs in fractures, faults, and other smaller-scale structures such as joints and local-scale contacts. Local scale groundwater flow paths are controlled by the presence, alignment, and interconnection of the fracture zones, which are in turn controlled by the trend of major geologic structures (fault zones and bedrock contacts).

Discontinuous zones of frozen bedrock have been measured from approximately 60 ft-bgs to greater than 200 ft-bgs beneath the site. The depth and relatively warm temperature (near 0 °C) of the frozen zones is consistent with inactive relict permafrost. However, the frozen zones have a localized effect on the groundwater flow paths and deeper percolation. The frozen bedrock zone is inferred to have effectively no conductivity, as evident from the inability to sample some wells (e.g. GW21-05, Well 1). Locally inverted pore pressure gradients suggest that frozen zones may confine groundwater flowing beneath or between frozen zones.

The contrast in hydraulic properties between the weathered zone and the deeper bedrock decouples the shallow interflow water from the main water table below the ridgetops. The shallow intermittent flows have limited residence time in the weathered bedrock zone above the water table and discharge to stream flows in the upper reaches. There are likely to be localized losses and gains between the groundwater interflow and streamflow which are too small to measure and are of limited consequence to deep groundwater flow.

Groundwater hydraulic gradients and water levels appear to mimic the topographic gradients below the project site (and are inferred to do the same across the CESA; Figure 4.1). The depth of the oxide zone is strongly correlated with the depth to the water table as well as the limit of the frozen bedrock zone (Figures 3.2 and 3.3). Development of the oxide zone is inherently linked to the natural flow of groundwater which, in turn, is linked to bedrock temperature, as relict frozen zones prevent groundwater flow through the rock.

Several wetland areas have been mapped in close proximity to both pits (Figure 2.1). Their presence is indicative of non-flowing water contained at surface and/or upward seepage with sufficient flow to sustain saturated organic materials. Notably, these wetland areas start at elevations greater than 3200 ft-amsl and follow drainages downslope until they reach local creeks. The wetlands are perched well above the elevation of the underlying bedrock water table and thus are interpreted to be disconnected from the bedrock groundwater flow regime.

In surrounding valleys at lower elevations, the bedrock water table is interpreted to be at surface based on upgradient aufeis locations. The near-surface groundwater elevation limits recharge and thus most groundwater and precipitation that does not evaporate will discharge as surface water flow.

5.3 Water Quality

Background groundwater and surface water quality for Hillside Creek and Tors Creek is summarized in Table 5.1. Monitoring wells PKG19-002, PKG19-003, GW21-01, GW21-06, GW21-07 and GW21-08 are inferred to be representative of the local groundwater water quality immediately surrounding the deposit area.

For post -mining assessment, groundwater quality is represented by median values for the entire groundwater dataset. Median values reflect less influence from the orebody, much of which will have been excavated by end of mining. Source terms presented in Table 5.1 reflect the 50th percentile predicted water quality for operational and closure mass loading in groundwater.

All constituents that have baseline or predicted concentrations above ADEC guideline values have been assessed for impacts to site water quality. Constituents noted with a distribution coefficient (log Kd) in Table 5.1 are non-conservative and therefore will undergo some attenuation as groundwater moves through the subsurface. Attenuation can potentially occur due to sorption in the mica-rich rock mass and/or organic soils, or by precipitation of minerals related to supergene weathering processes. Natural attenuation of arsenic has been identified through the baseline water quality data (Section 4.2.3).

6. WATER BALANCE AND WATER QUALITY

This section of the report outlines the development of a water balance to assess flows and water quality that will need to be managed during operations and closure. The water balance is presented in the context of water management strategies proposed for the project. Water management will include the following key components:

- Contact water runoff from the natural topography and waste rock areas will be collected in a ditch constructed around the periphery of the site.
- Water collected in the peripheral ditch, open pits and other local trenches will be routed to retention basins at the crest of each pit.
- Where possible, water collected in the retention basins will be used on roads to control dust.
- Excess water not used for roads will be infiltrated to ground or treated.
- Captured water requiring treatment may be passed through a portable reverse osmosis (RO) unit prior to infiltration, should water quality considerations warrant; brine from the RO system would be either be used in pit as a dust suppressant or transferred offsite for disposal.
- Closure plans are designed to minimize recharge to backfill waste rock in North Pit and maintain a minimum level of submergence of backfill in South Pit

6.1 Water Balance Model

The water balance in the project area is shown on Figure 6.1. The model assumes that any precipitation, snowmelt, runoff, and groundwater discharge that interacts with exposed waste rock, pit slopes or other disturbed ground will be contained as contact water, including:

- Runoff from the WRSA runoff during operations and active closure
- Water infiltrating to the waste rock
- Runoff from the pit slopes
- Pit dewatering drains and sumps
- Water used to backfill the pits following construction
- Pore water within the backfilled pits upon closure

Runoff is expected to occur primarily during the time of spring break up and during isolated summer rainfall events. There will be no surface water flow for much of the year due to the relatively limited precipitation in the summer and prolonged frozen conditions during winter. All contact water will be collected and managed by dust control, infiltration and potentially water treatment, depending on the seasonal volumes

The water balance model was constructed in GoldSim, a widely used and accepted dynamic simulation software for mine water balances (GTG, 2021). The GoldSim model incorporates results from more detailed runoff modeling completed in the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS), a computer program specifically designed for detailed

runoff analysis (UACE, 2018). The model includes all runoff sources together with seasonal flows to Hillside and Tors Creek.

For the retention ponds and pits, the water balance model includes:

- Seasonal snowmelt and runoff from the pit slopes.
- Bedrock groundwater as the pits are excavated below the interflow zones and the water table.
- Seasonal snowmelt and runoff from drainages up-slope of the open pits that may enter the perimeter ditch and retention ditches.
- Transfer between facilities such as pumping from in-pit sumps to retention ponds.
- Infiltration and recharge to the planned in-pit waste rock for closure.
- Changes in water storage over time as inputs change.

In the model, water is accumulated over catchments and allowed to flow over topography defined by the operational and closure configurations, as outlined on Figure 6.1.

6.1.1 Storm Water Flows

Figure 6.1 shows runoff United States Soil Conservation Service (USSCS) Curve Number (CN), runoff catchments and calculated storm flow rates. To apply a high level of conservatism for water management planning, modelled CNs were varied from 75 over exposed waste rock piles to 87 over road alignments. Evaporation and infiltration losses to ground along the perimeter ditches and in retention ponds were assumed to be zero based on data obtained from the infiltration tests. These tests confirmed that shallow soils have low permeability and will form a good ditch foundation for capturing, retaining, and conveying water around site.

In practice, runoff may be slowed or redirected based on the final design configuration of ramps and benches in waste rock slopes. The modelled CN values and flow volumes are therefore considered to be conservative.

A Type 1 USSCS storm distribution curve was used in model, as recommended for Alaska (USDA/NRCS, 1986). Storm events for Manh Choh were generated using the NOAA ATLAS 14 Point Precipitation Frequency Estimates (NOAA, 2020) and are presented in Table 6.1. Perimeter ditching has been sized to manage the 100-year return period, 24-hour storm event. Calculated accumulation rates used for the ditch design are shown on Figure 6.1. The size of the retention basins and water treatment facilities was based on the net flow for the 10-year, 24-hour storm event.

6.1.2 Seasonal Water Flows

The water balance model was run using a monthly time step to calculate average total flows that will report to sumps during operations and active closure. Stochastic representations of daily precipitation were developed to provide a realistic representation of precipitation. Evaporation in

the model was based on estimates from Fort Knox operations. Sublimation losses are estimated at 40% of the seasonal snowpack based on intermediate values assessed from a literature survey of typical alpine snowpack ablation. Losses due to sublimation are removed prior to snowmelt being accounted in the model. It is assumed that one third of the snowpack is lost in May. All snow that falls in May is assumed to melt and produce surface water.

Predictive simulations of the GoldSim water balance were first conducted for the operational period. The model simulates: (i) the planned pumping of sump flows from the South Pit to the North Pit sump, and (ii) the planned discharge of sump flows from North Pit through dust control, infiltration or, where necessary, water treatment.

Groundwater discharge to the developing open pits was estimated through progressive iterations of both the water balance and numerical groundwater flow models. Peak monthly flow rates are estimated at 207 gpm for North Pit and 24 gpm for South Pit (Table 6.2 and Figure 6.2). For mine closure simulations, stage-volume curves for the open pits were based on current mine planning layout.

6.2 Site Water Management

6.2.1 General

During operations, all contact water sources will be collected in the North Pit. The water will be collected via perimeter ditches surrounding the mine infrastructure and redirected to retention basins (Figure 6.1). Infiltration testing in shallow test pits around Manh Choh indicates the shallow soils have low permeability and will form a good foundation for perimeter trenching to capture and convey contact water around site. In contrast, the underlying weathered bedrock is very permeable and would readily accept infiltration of water after removal of the fine-grained soil cover (Piteau, 2021b).

6.2.2 Runoff from the WRSA

The WRSA will be designed and operated to encourage runoff and minimize infiltration of water. A variety of strategies can be implemented including: (i) strategic design of ramps and ditching to redirect runoff directly to collection sumps, (ii) grading of benches to direct runoff towards the collection sumps, and (iii) contouring to encourage leeward snowpack accumulation. With good operational management, infiltration rates into WRSAs at other operations in similar dry climates are low enough that saturation does not occur at a rate sufficient to generate external seepage.

During the period of active closure, all site runoff (including the WRSAs) will continue to be collected and used for enhanced filling and stabilization of the South Pit to its post mining recovery level. The site will practice a program of concurrent reclamation and all contact water will continue to be managed until sampling indicates it is of sufficient quality to be released as

non-contact runoff. All WRSAs will be recontoured and ditches remediated so that natural runoff patterns will re-establish post-closure.

6.2.3 Dust control

Dust control estimates for site and access road were developed based on usage data from Fort Knox and experience at other sites scaled to the relative footprint area of Manh Choh. These estimates were applied to the site water balance for the operational life of the mine. Commercial dust suppressant products should be assessed to reduce the frequency of water application on access roads during operations and conserve water at site. All dust control water used on haul ramps in the pit or on the waste dumps will be contained using ditches along the roadways and will be routed back into the contact water management system.

Table 6.2 presents the net monthly operating water balance and accounts for dust control demand. Based on a strict monthly schedule, May and June will have an excess of water to manage from snowmelt annually while the remaining summer and fall will be in deficit during the first three years of operations. Currently, it is assumed that any excess water not used for dust control will be infiltrated or treated, if necessary.

6.2.4 Infiltration

Excess water will either be infiltrated to ground in the Hillside Creek catchment, or treated with RO, if necessary. Treatment or discharge will be applied based on triggers laid out in a water management plan developed during permitting. Brine from the RO plant may either be stored for later use as in-pit dust suppressant or may be shipped off site, depending on constituents of concern concentrations and the volumes.

Infiltration testing was completed in a series of test pits at select locations at Manh Choh to assess infiltration potential of the subsurface (Piteau, 2021b). Results indicate the upper weathered bedrock is relatively permeable and available piezometric data indicate that a thick (>200 ft) unsaturated zone underlies the upper reaches of catchments downslope of the site facilities. Constant head test results from the test pits indicate a rapid infiltration basin dug into the weathered bedrock and unsaturated vadose zone would have sufficient capacity to infiltrate the estimated excess water from operations (Table 6.2).

6.2.5 Operational Water Quality

The operational water balance provides the basis for determining the proportion of runoff from the WRSAs and pit walls that mixes with the pit groundwater inflows. Source terms presented in Table 5.1 (including average water quality for groundwater and runoff components), were used to develop the monthly pond water quality estimates presented in Table 6.3. Periods of excess water that occur with snowmelt have lower constituent concentrations because much of the runoff will occur over frozen ground and will therefore have minimal contact with the underlying geochemically reactive materials. The model shows that all potential constituents of concern are below ADEC guideline values and are generally at or near background concentrations. If the water is routed to the infiltration basins, constituent concentrations are expected to drop further

due to attenuation that results from flow through the vadose zone inorganic rich shallow soils and/or weathered bedrock (Section 5.2).

6.3 Water Management During Closure

As for the operational period, no contact water runoff or discharge from waste rock will be allowed to enter the surrounding surface water system during the closure period. All WRSAs will be constructed to shed runoff and minimize infiltration of surface water. The planned waste rock placed in the North Pit will be covered with an impermeable HDPE over-liner to prevent infiltration. The planned waste rock placed in the South Pit will have a topsoil/overburden cover to minimize recharge and reduce the potential for subsequent groundwater outflow from the reclaimed pit. The groundwater model does predict a minor amount of outflow although discharge rates are expected to be very low because of the inherently low recharge rates at the site and the low hydraulic conductivity of the bedrock. The low natural recharge rate will be further reduced by the in-pit backfill covers.

6.3.1 Post-Closure Water Quality

The low rates of groundwater flow will mean that any movement and mass transport of the identified constituents of concern will also occur at very low rates. As is observed in the pre-mining dataset, some constituents such as arsenic will be attenuated by sorption or precipitation reactions because of the slow rate of transport and high residence time, which is likely to be on the order of multiple decades.

Transport and attenuation processes are inherently non-linear but their effects on water quality within the CESA can be estimated through the development of predictive numerical simulations which are presented in the following sections.

6.4 Climate Change

All planned conveyance ditches and sumps are designed to safely manage a 1 in 100-year storm event. This type of low probability, high impact storm event is predicted to become more frequent with climate change. By designing to low probability events, infrastructure will be inherently resilient to changes in precipitation patterns over the relatively short mine life.

All WRSAs and in-pit waste rock storage areas are designed to minimize recharge and to isolate PAG and metal leaching material, and therefore minimize any potential for external discharge from the waste rock over the long term. Any future changes to mean annual rates and seasonal patterns of precipitation and temperature are therefore not expected to change net infiltration or otherwise affect the environmental design intent of the waste rock facilities.

6.5 Monitoring Plan

6.5.1 Operational Monitoring

During operations bedrock water levels will be monitored by an array of grouted-in VWPs installed in pit slopes and monitoring wells completed around the perimeter of the facility. Surface water monitoring will use the baseline stations, with roughly the same monitoring and sampling schedule. Monitoring objectives during operations are to assess: (i) downgradient water quality in the project areas streams, (ii) whether groundwater drawdown remains local, as predicted, (iii) pore pressures for slope stability monitoring, (iv) the overall performance of the water management plan, including any water that is infiltrated, and (v) continued refinement of the conceptual hydrology and water quality models.

The current array of VWPs installed for baseline hydrogeological studies will need to be augmented with additional installations as existing ones get mined out. Additional monitoring wells may need to be installed at compliance points to provide sufficient water quality monitoring downgradient of facilities during mine development to satisfy the requirements of the water management plan.

Sumps and holding ponds will be regularly sampled during all flow events to assess the quality of water that will need to be managed by dust control, infiltration, or treatment through the RO facility. The monitoring will include total suspended solids and constituent ions and metals outlined in an updated Sampling Analysis Plan for the site. Treatment or discharge will be applied based on triggers laid out in a water management plan developed during permitting.

Groundwater and surface water monitoring stations in the headwaters of Hillside Creek and Tors Creek will continue to be monitored for flow rates and sampled for water quality throughout the life of mine.

6.5.2 Monitoring During Closure and Reclamation

A well string will be buried in the backfill of both pits to allow monitoring of water levels and comparison to model predictions. The backfill well in South Pit will provide a receptacle for injecting additional water to accelerate filling of the pit with water on closure. The well string should include a lower prepacked screened interval to filter out sediment. The well string can be laid down the completed slope and carefully buried with a backhoe as the pit is backfilled with waste rock, leaving the collar exposed at surface for access.

Water quality monitoring will be carried out according to best practices to be included in an update to the sampling analysis plan drafted by Piteau (2019) and development of a quality assurance project plan (QAPP). Monitoring wells will be sampled regularly to monitor background groundwater quality downgradient of the facility during operations and into closure.

Sumps and holding ponds will continue to be sampled during operations to assess the improving quality of water as reclamation proceeds, and to develop criteria for eventual release of runoff from the site. Monitoring of stations in Hillside Creek, Tors Creek, Tok River and Tetlin Lake will be continued until confidence is achieved in the post-closure solute transport model predictions and the data confirm that long-term downgradient impacts will be as predicted.

7. GROUNDWATER MODEL

7.1 Introduction

A numerical groundwater flow and transport model was used to evaluate the potential for water quantity and water quality impacts from the proposed project development. Operational dewatering, water-level recovery on closure, and the potential for post-mining constituent transport from the backfilled pits were simulated with the model.

The Manh Choh groundwater model was designed such to meet the ADEC standards for groundwater modeling. This includes ADEC's "Guidance of Developing Conceptual Site Models" and "Fate and Transport Modeling Guidance" (ADEC, 2017a and 2017b).

7.2 Numerical Model Construction

7.2.1 Code Selection and Model Domain

MODFLOW-USG and USG-Transport were selected for the Manh Choh model because the code meets all the technical requirements for the study, is widely used for mining applications and is agency-accepted. Model grid cells were assigned a cell spacing of between 50 ft and 500 ft, with a consistent level of grid refinement applied in the proposed pit area and headwaters of creeks adjacent to the pit. The final numerical grid arrangement is shown on Figure 7.1.

The model domain area extends from the Tok River to the northwest to Tetlin Lake to the southeast for a maximum width of about 11 mi (east to west) and a maximum length of about 9 mi (north to south) (Figure 7.1). These extents are based on the following considerations:

- The model domain extends to hydrogeologically significant boundaries such that simulated drawdowns and/or effects are not artificially constrained.
- The model domain encompasses all groundwater and surface water quality monitoring points and locations that could potentially be affected by development of the project.

The groundwater model domain includes the entirety of the following Tok River and Tetlin Lake Tributaries (Figure 7.1):

<u>Tok River Headwaters</u>

- Grayling Creek
- Thunder Creek
- Hillside (Pump) Creek
- South and North Day Creeks

<u>Tetlin Lake Headwaters</u>

- Tors (Eagle) Creek
- North and South Black Creeks

The land surface elevation represented in the groundwater model is consistent with the CESA elevation range. The 1200-ft thick model comprises 12 layers, ranging in thickness from 50 ft near the ground surface to 200 ft at depth.

7.2.2 Hydrostratigraphy and Model Discretization

Field data available for the Manh Choh and the surrounding CESA were compiled into a 3D geological model that included:

- 2021 site alteration model, which includes exploration and infill data/diamond drillholes completed to date. This model has three main zones: oxide, transition and sulfide;
- 2D induced polarization (IP) survey line (L87) in the Tok River Valley (Figure 3.1), completed by Quantec Geoscience Ltd. (2019) to define the base of overburden;
- Structural geology analysis, SRK Consulting Inc. (2019); and
- Detailed regional geological map completed by Peak Gold LLC (2019).

These data were synthesized and parameterized into 3D volumes to represent distinct hydrogeological units. The resulting model was used as the basis to define hydrostratigraphic units (HSUs) for the groundwater flow model.

The structural model was incorporated into the numerical model grid with distinct zones of higher hydraulic conductivity to reflect the presence of discrete fault structures or fault zones. For consistency with USGS guidance, fault zones were typically simulated with reduced hydraulic conductivity across strike and enhanced conductivity along strike. Ground IfSAR surface digital elevation model (DEM) available through the USGS as part of the Alaska Mapping Initiative was used to generate the upper topographic surface of the model. Figure 7.2 presents the hydrostratigraphic zones in plan, while Figure 7.3 and Figure 7.4 present west-east and south-north cross sections through the numerical model.

7.2.3 Stress Periods

Predictive scenarios for model simulations require definition of stress periods that reflect points in time where the groundwater flow regime is controlled by a unique arrangement of boundary conditions. One steady state period and three transient stress periods are defined for the model including:

1. Steady state representation of pre-mining (current) conditions.
2. Transient period of mining both pits concurrently.
3. Transient period of mining South Pit and backfilling North Pit.
4. Transient period of backfilling South Pit extending into post closure conditions.

Biannual stress periods were assigned for the transient simulations to simulate recharge in the summer and no recharge in the winter. The stress periods were further discretized to correspond with the proposed closure and filling for each pit. Within the transient stress periods, individual time steps were calculated by an automatic time-stepping function to maintain numerical stability. Timesteps were as short as 0.01 days, and up to 10 days for long term closure.

7.2.4 External Boundary Conditions

The external boundary conditions for the numerical model include steady-state constant head, river and no-flow boundaries.

Constant-Head Boundaries

Constant-head boundary cells (steady state) were placed along the southeastern boundary of the model along the shore of Tetlin Lake to reflect a constant elevation of water maintained in the lake (Figure 7.5).

River Boundaries

River boundary cells (steady state) were placed along the northwestern boundary of the model in the Tok River Valley to reflect water exchange between the Tok River and underlying alluvium (Figure 7.5).

No-flow Boundaries

No-flow boundary cells were assigned to the remaining perimeter of the numerical model to reflect minimal cross flow into or out of catchments surrounding the CESA. It is assumed that any crossflow is minor and would provide no measurable effect on the water balance for the model domain. No-flow boundaries in the model correspond to the NHD hydrographic basin boundaries.

7.2.5 Internal Boundary Conditions

The simulated internal boundary conditions include groundwater recharge, streams, and drain cells.

Model Recharge

Groundwater recharge from precipitation and snowmelt was applied to the highest active model layer as steady state recharge during model calibration, and time-variant recharge for the transient simulations.

The distribution of variable recharge rates was based on the site topography, geology and permafrost mapping by SRK and adjusted to match observed ground temperature data (Figure 7.6). Recharge rates ranged from 0.01 in/year (0.1% of mean annual precipitation) over regions with locally continuous permafrost to 1.3 in/year (11% of mean annual precipitation) in areas absent of permafrost where surface water is more likely to accumulate. Recharge values of 2.4 in/year (21% of mean annual precipitation) over the Tok River Valley include recharge from North and South Day Creek, which drain their respective catchments into the Tok River valley overburden (Figure 3.1). Recharge rates over the pits and WRSAs for mining and post-closure simulations are discussed in Section 7.5. The recharge distribution and assigned values for the steady state and predictive simulations are presented on Figure 7.6.

Surface Streams

Drain boundary cells were used to simulate groundwater discharge to surface water, including aufeis locations, and inferred and mapped streams. Steady-state, annual-average flow conditions were considered a reasonable surrogate for baseflow contributions from groundwater for calibration.

Pit Drains

Drain boundary cells were generated using the biannual pit shells from Q4 2023 to Q2 2027 to represent inflow to the developing pits. The final North Pit shell (Q4 2024) uses the design pit for the open pit geotechnical assessments (Piteau, 2021). The average pit shell elevation was calculated within each grid cell and that average value was assigned to the boundary condition representing the pit for that cell.

7.3 Model Calibration

7.3.1 Steady-State Calibration

The model was calibrated to a steady state numerical solution using head values from March to May 2021 to reflect peak seasonal water levels during the active recharge season. Although water levels are known to fluctuate seasonally, peak head and recharge conditions are assumed to approximate a steady-state condition. Calibration of the model was achieved by varying the distribution of recharge and hydraulic conductivity of the HSUs within ranges defined by a site water balance and conductivity measured in the field. The objective of steady-state calibration is to: (i) minimize the difference between simulated and observed heads, and (ii) achieve a close match to estimated groundwater balance for conditions prior to mining. The calibrated model formed the basis with which to develop predictive simulations to evaluate mining and closure scenarios.

7.3.2 Water Balance

The Goldsim water budget (Section 6) was developed to assess conditions in the project area and to define inputs to the numerical groundwater flow model. Since the proposed project area will straddle the hydrologic divide between the Tok River and Tetlin Lake basins, inflows are restricted to infiltration from precipitation and snowmelt. Outflows include deep groundwater discharge and intermediate groundwater flow that discharges to creeks downgradient of the planned site facilities. Figure 7.6 summarizes the recharge rates applied to discretized zones in the model. Table 7.1 and Figure 7.7 compare the observed streamflow and simulated groundwater discharge to creeks.

7.3.3 Calibrated Hydraulic Head and Hydraulic Conductivity

Simulated and observed heads for calibration targets are listed in Table 7.2. The model was calibrated to measured water levels at 33 locations. In addition, the water levels at 19 aufeis locations were evaluated to ensure the model was adequately predicting water levels in

drainages outside the mine area. The goal of calibration was to minimize the difference between the measured water levels and model-predicted water levels at the same locations.

Measured water levels in the project area reflect a relatively shallow horizontal hydraulic gradient below the pits. Outside the pits, hydraulic gradients steepen with topography. Simulated vertical gradients in nested piezometers are relatively low, consistent with observed heads.

Calibration statistics and residuals (difference between observed and simulated hydraulic head) are presented on Figure 7.8. The steady-state model calibration to pre-mining conditions achieves a scaled root mean square (RMS) of 7.8%. The RMS drops to 2.7% when aufeis locations are included (the aufeis locations cover a larger range of observed heads and tend to be well calibrated as they are close to fixed boundary conditions). The residual mean is -0.5 ft, indicating that negative and positive residuals are well balanced to the average head conditions.

The greatest deviation in the model from observed conditions is to the west and south of the pits where the model tends to overestimate hydraulic heads. These areas are known to have the thickest measured bedrock permafrost zone below site. Hydraulic head values may reflect extreme low permeability and recharge such that the local groundwater regime is either non-existent or is disconnected from regional groundwater flow regime controlling heads closer to the pits.

Absolute values and distribution of the calibrated hydrogeological parameters are presented in Figures 7.2 to 7.4. The contrast between oxide, transition and sulfide hydraulic conductivity is relatively low, whereas the calibrated hydraulic conductivities of the shallow weathered zone and Tok valley overburden sediments are several orders of magnitude higher. A local higher conductivity zone was required below the frozen zone in the model to reflect local under-drained conditions from flow along discrete zones associated with D2 faults which follow the northwest-oriented trend of Hillside and neighboring creeks (see Section 3.2.3 above).

7.4 Dewatering and Recovery Simulations

Transient predictive simulations were developed to assess impacts to groundwater levels, flow, and water quality during operations and closure. Semi-annual stress periods were established to reflect wet and dry seasons for all predictive scenarios, which were simulated by the seasonal application of recharge. Three transient flow models were developed to simulate three periods of mine development: dewatering of both open pits during operations, refilling of the backfilled North Pit while mining in the South Pit continues, and refilling of the South Pit and long-term closure.

7.4.1 Mining Simulation

Drains were specified in MODFLOW-USG to simulate development of the Manh Choh Pits through time. MODFLOW-USG drains are a type of model boundary condition that induce flow from surrounding model cells. Water flows into the drain boundary as a function of: (i) the

difference in head between the boundary and surrounding cell, and (ii) the drain conductance. The drain conductance was set with a hydraulic conductivity of 500 ft/d to ensure flow into the drains was controlled by the low-hydraulic conductivity rock mass, not by the drain conductance. Drain nodes were activated in the model according to the proposed mine plan, with the shallowest drains activated first during early mining, and the lower drains activated later in the simulation as mining moves deeper. Drain elevations were lowered from the existing ground surface to the final mining elevations of the South and North Pit, according to the biannual pit plans.

Other assumptions made for the dewatering simulations include:

- All annual recharge was applied to the model over the 6-month stress period from May to October.
- No recharge was applied over the pit area during the mining period as this recharge would report directly to the planned in-pit sumps.
- No recharge was applied to WRSAs during mining.
- Storage parameters were assigned to each hydrogeological unit (Figures 7.2 to 7.4).
- All other model assumptions, parameters, and boundary conditions were unchanged for simulated operations.

Drawdown from pit dewatering is limited to local areas of the pit walls due to the low hydraulic conductivity of the bedrock and low elevation of the pre-mining water table where it is exposed in the pit slopes. The depth of groundwater dewatering will not exceed the ultimate depth of the pit once mining is complete. Monthly groundwater seepage rates are not expected to exceed 3 gpm in North Pit and 9 gpm in South Pit, and average closer to 2 gpm and 6 gpm, respectively (Figure 7.9). The extent of the 10 ft drawdown contour predicted at end of mining for each pit is shown on Figure 7.10. Most dewatering flows derive from storage in the rock mass. Downgradient groundwater discharge to streams remains unaffected by pit dewatering.

7.4.2 Recovery Simulation

For the post-mining recovery period, the pit backfill was assigned a nominally high hydraulic conductivity relative to bedrock conductivity, and specific yield (Sy) of 25%. Because North Pit is so close to the natural drainage divide, the only water entering the final excavation was from precipitation recharge. The model provided a realistic simulation where water elevations were close to their expected long-term levels. For the South Pit, the model simulated the planned enhanced filling schedule over ten months using Modflow's CLN Well Package at a nominal rate of 200 gpm.

To be consistent with the pre-mining simulations, all annual recharge during closure was applied over the 6-month stress period from May to October. A recharge of 5% mean annual precipitation was assumed for North Pit in early closure when the South Pit was still being mined. This value was reduced to 2% when cover and regrading are completed. Recharge over South Pit was

assumed to be 7% of mean annual precipitation during the active filling period and into post-closure. All other recharge was unchanged from the pre-mining simulations.

Two additional recharge cases of 5 and 10% of mean annual precipitation were simulated for the South Pit to assess the sensitivity of long-term flow and transport downgradient from the backfilled pit (Section 7.8) to reflect probable bounding cases for long term post-closure recharge to account for uncertainty in the model.

For the North Pit, the model indicates that water levels will slowly rise to about 2938 ft-amsl, followed by a gradual decline to below 2930 ft-amsl after about 200 years. The model simulates a post-closure decline in water levels because of the storage and recharge attenuation of the waste rock backfill material above the water table (Figure 7.11). Long term seepage from the North Pit to the downgradient groundwater system was simulated to be less than 1 gpm.

For the South Pit, the closure plan includes redirecting all runoff flows and additional well flows to enhance recovery of water levels to a nominal elevation of 2970 ft-amsl to provide the necessary submergence of the planned backfill (Figure 7.12). The model predicts a long-term seepage rate from the South Pit of approximately 2 gpm to the downgradient groundwater system.

The Hillside Catchment represents the highest point that groundwater discharge will occur. The model predicts the maximum groundwater seepage elevation will be approximately 2900 ft northwest of South Pit, 950 ft above HI01, at the confluence of two inferred creeks (Figure 7.13). In the Tors Creek catchment, the highest simulated post-closure groundwater discharge point is approximately 1600 ft east of North Pit, and approximately 2000 ft east of EAT2-01. Simulated average annual groundwater discharge is less than 1 gpm for both sites.

7.5 Constituent Transport

7.5.1 Introduction

Simulations were completed in MODFLOW-USG (USGS, 2013) to assess the potential for constituent transport due to groundwater flow at the reclaimed Manh Choh Pits post-closure. The transport model simulation includes a 300-year period following closure and reclamation of the mine site, to allow long-term simulation of constituent concentrations that may discharge to the headwaters.

Constituents that exceed ADEC guideline values based on the 50th percentile predicted backfill concentrations provided in SRK (2021) include aluminum, arsenic, cadmium, copper, iron, manganese, mercury, nitrate, selenium, and sulfur (Table 5.1). These constituents were analyzed using transport analysis in Modflow to assess their fate and concentrations in groundwater and surface water over the long-term in closure. Of these, aluminum, iron, manganese, nitrate, and sulfur are considered conservative, and so will reduce in concentration downgradient of the pits as contact water mixes with the ambient clean groundwater. Arsenic, cadmium, copper, mercury and selenium are non-conservative, and will reduce in concentration both through mixing, and

additionally through natural attenuation from sorption and reaction processes which are demonstrated by baseline arsenic concentrations (Section 4.2.3).

MODFLOW-USG's Block Centered Transport (BCT) package (Panday et al., 2017) was used to simulate constituent migration downgradient from the reclaimed pits based on results of the predictive groundwater flow simulation. The BCT package utilizes an implicit Total Variation Diminishing (TVD) solution scheme to solve the advective-dispersion groundwater transport equation. The implicit TVD scheme is critical for minimizing numerical dispersion in sharp concentration fronts, like those anticipated close to the margins of the pits at the start of the simulation. Key model input parameters include effective porosity and dispersion coefficients (longitudinal and transverse). The groundwater model was also used to simulate constituent adsorption for those parameters that are predicted to exceed ADEC guideline values in the backfill pore water.

7.5.2 Boundary Conditions and Background Concentrations

Constituent concentrations in all South Pit and North Pit backfill were simulated with a steady-state constant concentration boundary, based on the preliminary 50th percentile concentrations for backfill porewater provided by SRK (SRK, 2021; Table 7.3).

Background concentrations were assumed to be constant over the entire model area and were assigned median groundwater concentrations measured in the pit area (Section 4.2.3 and Table 7.3). Enhanced pit fill water concentrations were assumed to be equivalent to background concentrations.

7.5.3 Transport Model Parameters

Dispersion, Diffusion, and Effective Porosity

The Manh Choh transport model dispersion coefficients were assumed as follows (Bear and Cheng, 2010):

- Longitudinal dispersivity: 10% of the longest model cell dimension in area of model where transport is occurring or 5 ft.
- Transverse dispersivity: 1% of the longest model cell dimension in relevant area of model or 0.5 ft.

Bedrock in the vicinity of the pits was assigned an effective porosity value of 1.5%. This is 150% the estimated specific yield values, which is considered a reasonable value for a fractured bedrock groundwater system with substantial isolated pore space. A list of the assumed effective porosities by model zone is provided on Figures 7.2 to 7.4.

Adsorption

Non-conservative constituents identified in Section 7.5.1 are naturally occurring and are present throughout the CESA. The site-specific sampling data indicate that attenuation of these parameters occurs in the groundwater system surrounding the pits (Section 4.2.3). Based on the empirical results, the simulated transport scenario for closure included sorption, as follows:

- The groundwater system sorption capacity was specified in the transport model with the linear adsorption coefficient, or Kd.
- Sorption coefficients based on literature values (Allison and Allison, 2005).
- The model Kd was scaled to account for the bedrock fracture specific surface area, Asp, being smaller than for unconsolidated sediments.
    - The average Asp for fractured limestone from the literature of 50 m²/Kg (Brooks and Purcell, 1952) was reduced to 0.1 m²/Kg after model simulations showed the results were only slightly sensitive to this parameter or conservative, warranting a low-end value.
    - Assuming 0.1 m²/Kg for Asp ensures a "lower end" sorption result in the transport model to account for the potential natural variability in fracture density in the formation.

Sensitivity sorption transport runs were also conducted to simulate non-conservative constituent concentrations without sorption and with higher sorption (Section 7.8.3).

7.6 Constituent Transport Analysis

The numerical transport simulations indicate that any changes to parameter concentrations above the ADEC guideline values are limited to the area directly surrounding the pits. Time-series plots for the highest discharge points in the Hillside and Tors catchments showing simulated average annual concentrations, flows, and concentrations after mixing with surface flows are shown on Figures 7.14 and 7.15.

Simulated constituent concentrations in groundwater discharging to the Hillside Creek headwaters are projected to remain below ADEC guideline values. Simulated manganese groundwater discharge is projected to rise above the 0.05 mg/L ADEC guideline value after 180 years post closure. However, as the average annual groundwater discharge to stream headwaters from the area of the pits is less than 2% of average annual stream flow at the upstream monitoring stations, the groundwater discharge has no significant effect on predicted manganese concentrations in the surface waters downgradient of the pits. All simulated average annual streamflow concentrations in Hillside Creek are projected to remain below the relevant ADEC guideline values (Figure 7.14). Similarly, all simulated groundwater concentrations discharging into the Tors Creek headwaters (location shown on Figure 7.13) are below ADEC guideline values and are not projected to affect existing chemistry in Tors Creek (Figure 7.15).

Mixing of simulated groundwater and runoff in streams in the Hillside Creek headwaters indicates that most monthly streamflow concentrations are expected to remain below ADEC guideline values (Figure 7.16) 300 years after closure. The only exception is manganese in September and October when runoff is less than 1 gpm and total stream flows are less than 2 gpm. Much of the near surface groundwater will likely be affected by evapotranspiration, reducing the groundwater discharge to the headwaters. Simulated groundwater flows over winter (<1 gpm) are expected to freeze upon discharge, before melting in the spring and mixing with the runoff during the high flow spring break up period.

7.7 Predictive Uncertainty

Sensitivity analyses were completed on the operational and closure simulations by running the predictive simulations through mining and closure using the parameter changes outlined in Table 7.4. Hydraulic conductivity and recharge were varied in tandem to maintain the head calibration within the pit area for the steady state model. The remaining parameters varied for the sensitivity analyses (storage, porosity, recharge to the South Pit in closure, and transport parameters) affect only the predictive scenarios. Key results are summarized in the following sections.

7.7.1 Mining Sensitivity Simulations

The sensitivity of simulated pit inflows during mining was assessed with the upper and lower bound hydraulic conductivity and recharge cases, and storage cases. Changing the hydraulic conductivity and recharge had the most significant effect, with a 25% increase in hydraulic conductivity and recharge resulting in a 20% increase in predicted pit inflows (Figure 7.9).

Simulated end of mining drawdown was not significantly affected by the four sensitivity scenarios. The low storage case had the largest drawdown footprint, and the low hydraulic conductivity and recharge case had the smallest drawdown footprint. In all cases, the extent of drawdown was confined to the area of the pits and WRSAs.

7.7.2 Recovery Sensitivity Simulations

For the closure simulations, the upper and lower bound recharge to the South Pit backfill was varied based on 10% and 5% of mean annual precipitation.

The simulated post-closure water elevation in South Pit is sensitive to the amount of recharge applied to the reclaimed backfill surface. South Pit water elevations at 100 years post-closure range from 2964 ft-amsl to 2998 ft-amsl for the two sensitivity recharge cases (Figure 7.12). Applying a recharge rate of 7% of mean annual precipitation to the model simulations will maintain a long-term water level above 2970 ft-amsl in South Pit.

Simulated water elevations in North Pit are most sensitive to the recharge rate to South Pit. Results indicate that, for the upper bound South Pit recharge case, water levels in North Pit would be maintained at about 2938 ft-amsl (Figure 7.11). The final closure plan and submergence requirements will be optimized once the hydraulic connection between the two pits is better assessed during mining.

The hydraulic conductivity and recharge sensitivity scenarios affected simulated water elevations in North Pit by less than 2 ft. The storage sensitivity simulations significantly affected simulated water elevations in South Pit during pit filling as the pit filling timing and rate was not adjusted for the change in storage. Water elevations at 100 years post-closure were approximately 6 ft above and below the closure design case for the low and high storage scenarios, respectively. At 100

years post-closure, water elevations for all sensitivity simulations were within the bounds of the two South Pit recharge cases shown on Figures 7.11 and 7.12.

Results of the sensitivity simulations (Table 7.4) indicate long-term water elevations in North Pit can be maintained below approximately 2940 ft-amsl and in South Pit above approximately 2965 ft-amsl. The model results provide guidance for how the actual closure plan may need to be adjusted to achieve the desired post-closure groundwater levels.

7.7.3 Transport Sensitivity Simulations

The closure model simulations indicate that all constituents will be below ADEC guideline values at groundwater discharge areas at 100 years post closure. Reducing the storage and porosity in the model generated the most significant effects to groundwater concentrations for sulfate, manganese, and selenium. The reduced storage generated an increased hydraulic gradient and greater transport velocities, resulting in greater mass transport. Despite the increased transport, the model shows that mixing will act to reduce concentrations in receiving streams to below the guideline values. Arsenic groundwater concentrations were most sensitive to the no-sorption case and remained well under the guideline values at the discharge point for all cases.

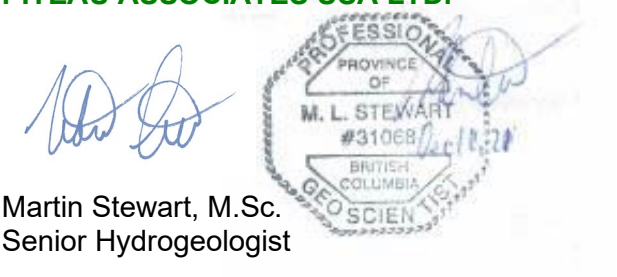
8. LIMITATIONS

Piteau Associates has exercised reasonable skill, care, and diligence in obtaining, reviewing, analyzing, and interpreting the information acquired during this study, but makes no guarantees or warranties, expressed or implied, as to the completeness of the information contained in this report. Conclusions and recommendations provided in this report are based on the information available at the time of this assessment.

In preparing the recommendations contained herein, Piteau Associates has relied on information and interpretations provided by others. Piteau Associates is not responsible for any errors or omissions in this information. This report is comprised of text, tables, and figures, and all components must be read and interpreted in the context of the whole report. The report has been prepared for the sole use of Kinross Gold Corporation and no representation of any kind is made to any other party.

Respectfully submitted,

PITEAU ASSOCIATES USA LTD.



Martin Stewart, M.Sc.
Senior Hydrogeologist

Reviewed by:



Geoff Beale
Principal Hydrogeologist

9. REFERENCES

ABR Inc., 2014. Tetlin Minerals Prospect Stream Water Quality and Biological Resource Surveys. Prepared for Avalon Development Corporation. February 2014.

ABR Inc., 2016. Tetlin Project Stream and Lake Water Quality. Prepared for Avalon Development Corporation. December 2016.

ABR Inc., 2018. Tetlin Project Stream and Lake Water Quality Surveys. Prepared for Avalon Development Corporation. December 2018.

ADEC, 2008. Alaska water quality criteria manual for toxic and other deleterious organic and inorganic substances. Amended December 12, 2008

ADEC, 2017a. State of Alaska Department of Environmental Conservation Division of Spill Prevention and Response Contaminated Sites Program Guidance on Developing Conceptual Site Models, January.

ADEC, 2017b. State of Alaska Department of Environmental Conservation Division of Spill Prevention and Response Contaminated Sites Program Fate and Transport Modeling Guidance, January.

ADEC, 2018. 18 AAC 70 Water Quality Standards. Amended as of March 5, 2020

Allison J.D, Allison, T. L. 2005. Partition Coefficients for Metals in Surface Water, Soil, and Waste. EPA Report 600/R-05/074

Avalon Development Corporation, 2013. Final Report for the Tetlin Project, Tanacross and Nabesna Quadrangles, Eastern Interior Alaska. Prepared for Contango Ore Inc.

Bear, J., A.H.-D. Cheng. 2010. Modeling Groundwater Flow and Contaminant Transport. Springer.

Brooks C.S., Purcell W.R., 1952. Surface Area Measurements on Sedimentary Rocks. Paper 222 G, American Institute of Mining and Metallurgical Engineers (AIME), Petroleum Branch Fall Meeting

ESI, 2020. Groundwater Vistas, Version 8, code documentation report. Herndon, VA: Environmental Simulations Inc.

GTG (GoldSim Technology Group), GoldSim Probabilistic Simulation Environment, <goldsim.com>, 2021.

JDS Energy & Mining Inc. [JDS], 2018. Preliminary Economic Assessment Technical Report Peak Gold Project Alaska, USA. Prepared for Peak Gold LLC. September 24.

Knight Piesold Consulting, 2018. Tetlin TET2 Pumping Well and Water Supply Evaluation. Prepared for Royal Gold Corporation. April 20, 2018.

Miller, John F., 1963. Probable maximum precipitation and rainfall frequency data for Alaska. Technical Paper No. 47, Weather Bureau,U.S. Department of Commerce, Washington, D.C., 69 pp.

Panday, Sorab, Langevin, C.D., Niswonger, R.G., Ibaraki, Motomu, and Hughes, J.D., 2017, MODFLOW-USG version 1.4.00: An unstructured grid version of MODFLOW for simulating groundwater flow and tightly coupled processes using a control volume finite-difference formulation: U.S. Geological Survey Software Release, 27 October

2017.Piteau Associates Engineering Ltd., 2020. Peak Gold Deposit Surface Water and Groundwater Characterization. Report prepared for Peak Gold LLC., April.

Perica, S. Martin, D., Pavlovic, S., Roy, I., St. Laurent, M., Trypaluk, C., Unruh, D., Yekta, M., and Bonnin, G., 2013. NOAA Atlas 14 Volume 8 Version 2, Precipitation-Frequency Atlas of the United States, Midwestern States. NOAA, National Weather Service, Silver Spring, MD.

Piteau Associates Engineering Ltd., 2019. Groundwater and Surface Water Sampling Analysis Plan. Draft Report prepared for Peak Gold LLC, September 2019, 4148-R01.

Piteau Associates Engineering Ltd., 2020. Peak Gold Deposit - Surface Water and Groundwater Characterization. Report prepared for Peak Gold LLC, April 2020, 4148-R02.

Piteau Associates Engineering Ltd., 2021a. Manh Choh Project 2020 Annual Surface Water and Groundwater Monitoring Efforts. Memo prepared for Kinross Gold Corporation, March 2021, 4148-M03.

Piteau Associates Engineering Ltd., 2021b. Manh Choh Infiltration Testing and Recommendations for Water Discharge Options. Draft Memo prepared for Kinross Gold Corporation, November 2021.

Quantec Geoscience, 2019. Preliminary sections prepared for Avalon Development Corp. Avalon Peak 2019 Project, Alaska, USA Induced Polarization Survey, May.

Reger, D.R., Hubbard, T.D., Carver, G.A., 2011. Surficial Geology of Alaska Highway

Corridor, Robertson River to Tetlin Junction, Alaska. State of Alaska- Department of Natural Resources. December 2011.

SRK Consulting, 2019a. Structural Geology Analysis for the Tetlin Project, Alaska. Prepared for Peak Gold JV, January.

SRK Consulting, 2019b. Peak Gold Project- Preliminary Permafrost Characterization. Prepared for Peak Gold LLC. October 2019.

SRK Consulting, 2021. Geochemical Characterization Report for the Manh Choh Project, Alaska – DRAFT. Prepared for Peak Gold LLC., September.

Stantec, 2021. Preliminary Jurisdictional Determination Report, Manh Choh Project. Prepared for Peak Gold LLC. December 15, 2021.

U.S. Army Corps of Engineers (USACE), 2018. Institute for Water Resources Hydrologic Engineering center Hydrologic Modeling System HEC-HMS, Version 4.3, September 2018.

U.S. Department of Agriculture / Natural Resources Conservation Service (USDA/NRCS), 1986. Urban Hydrology for Small Watersheds, TR-55.

U.S. Environmental Protection Agency (EPA) 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005. February 2000.

U.S. Geological Survey (USGS), 2013. MODFLOW-USG. An Unstructured Grid Version of MODFLOW for Simulating Groundwater Flow and Tightly Coupled Processes Using a Control Volume Finite-Difference Formulation. https://www.usgs.gov/software/modflow-usg-unstructured-grid-version-modflow-simulating-groundwater-flow-and-tightly.

TABLES

Table 2.1 Average Precipitation and Temperature Normals

Month	*Tok 1 (509313) (Active: 1954-2016)*			*Tok 2 (509314) (2012-2020)*		
	Average Daily Temperature (°F)		**Monthly Precipitation (in)**	**Average Daily Temperature (°F)**		**Monthly Precipitation (in)**
	Max	**Min**	**Average**	**Max**	**Min**	**Average**
January	-5.1	-22.5	0.61	-3	-18.3	0.65
February	7.5	-15.5	0.09	7.7	-14.5	0.15
March	25.2	-5.7	0.19	25.8	-3.4	0.31
April	44.9	16.8	0.38	45.5	16.8	0.38
May	60.9	29.9	0.58	61.8	31.9	0.81
June	70.8	40.1	1.93	70.2	42.6	1.41
July	72.7	44.2	1.87	72.7	46.9	2.08
August	67.6	39.1	1.42	66.7	41.3	1.07
September	54.4	29.6	0.97	55.6	31.8	0.86
October	31.8	13.1	1.06	34.3	17.3	0.7
November	8.1	-9.9	0.66	6.7	-8.1	0.85
December	-2.5	-19.8	0.36	-1.2	-15.5	0.57
Annual Average			**9.88**	**-**	-	**11.33**

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]2.1 Climate Normals

Note:

1. Historical years during which less than 300 days of precipitation was recorded are omitted from the annual precipitation average.

2. Tok 2(509314) is currently the active NOAA meteorological station

Table 2.2 Surface Water Monitoring Stations

Catchment (NHD Basin)	Waterbodies	Monitoring Location ID	Easting[1] (m)	Northing[1] (m)	Elevation (ft)
Tetlin Lake (NHD-190803020310)	Tors (Eagle) Creek	EAT1-01	405635	7008831	2,730
		EAT2-01	405453	7007668	2,835
		EA01[(2)]	407312	7007221	2,216
		EA02	409732	7005623	2,240
		EA03[(2)]	413019	7004039	1,685
	Tetlin Lake	TL01	410271	7000385	1,657
		TL02	413215	7003272	1,657
Tetlin Lake (NHD 190803020308)	Black Creek	BLT1-01	405756	7005463	2,149
		BL01	403865	7005502	2,367
		BL02	407285	7003518	1,804
		BL03	408937	7000385	1,660
Tok River (NHD 190803020705)	Hillside Creek	HIT2-01	404138	7008017	2,608
		HI01	403709	7008470	2,339
		HI02	402037	7010121	1,795
	Thunder Creek	THT1-01	403222	7007327	2,867
		TH01	402016	7008492	1,959
	Day Creek	DA01	403582	7009762	1,988
	Grayling Creek	GR01	401614	7010756	1,749
	Tok River	TK01	403857	7013127	1,725

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]2.2 SW Location

Notes:

1. Coordinate system is in NAD83 UTM Zone 7N
2. Not included in the active monitoring network; historical monitoring location

Table 2.3 Summary of Pre-mining Baseline Surface Water Flows at Monitoring Stations

Waterbody (NHD Basin)		Monitoring Location ID	n[1]	Min Flow (gpm)	Min Flow Date	Max Flow (gpm)	Max Flow Date	Geomean Flow (gpm)
Tors (Eagle) Creek (NHD 190803020310)		EA01	7	56	2016-09-05	988	2012-05-24	268
		EA02[5]	12	88	2016-07-01	1,341	2020-06-03	439
		EA03	10	93	2013-10-04	3,843	2018-05-29	794
		EAT1-01	7	30	2020-06-03	81	2020-08-07	46
		EAT2-01	3	3	2020-08-06	31	2021-06-21	12
Black Creek (NHD 190803020308)		BL01 (BLT2-01)	12	33	2015-09-24	695	2012-05-24	154
		BL02	11	194	2019-10-23	2,023	2020-09-21	796
		BL03	15	58	2019-10-23	10,719	2018-05-28	994
		BLT1-01	5	32	2019-09-10	279	2020-08-06	138
Day Creek	(NHD 19080302070S)	DA01	8	3	2018-05-29	479	2012-05-23	49
Hillside Creek		HI01[5]	13	28	2020-10-18	897	2021-07-23	91
		HI02[5]	16	37	2020-09-22	3,836	2012-05-23	201
		HIT2-01[6]	0	-	-	-	-	-
Thunder Creek		TH01	7	82	2020-10-17	494	2021-08-25	177
		THT1-01[6]	0	-	-	-	-	-
Grayling Creek		GR01	3	197	2015-09-24	735	2013-10-02	355

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]2.3 Surface Flows

Notes:

1. n = number of samples
2. gpm = US gallons per minute
3. Spot flow readings collected between 2012 and 2021
4. Total discharge (flow) in streams is measured using a current meter or an acoustic doppler velocimeter, as per the USGS streamflow collection method
5. Stations installed with continuous stream flow gauges since October 2020
6. No stream flow collected due to stagnant conditions

Table 2.4 Annual Surface Water Samples Count

Surface Water Body	Monitoring Location ID	2012	2013	2015	2016	2018	2019	2020	2021	Total
Black Creek	BL01	2	2	1	2	-	2	6	3	18
	BL02	-	2	1	2	-	2	6	3	16
	BL03	-	2	1	2	2	3	6	2	18
	BLT1-01	-	-	-	-	-	2	6	5	13
Tors (Eagle) Creek	EA01[1]	2	2	1	2	-	-	-	-	7
	EA02	-	2	1	2	-	2	6	5	18
	EA03[1]	-	2	1	2	2	1	-	-	8
	EAT1-01	-	-	-	-	-	2	6	5	13
	EAT2-01	-	-	-	-	-	2	4	4	10
Hillside Creek	HI01	2	2	-	2	2	3	5	6	22
	HI02	-	2	1	2	2	3	6	3	19
	HIT2-01	2	-	-	-	-	1	4	3	10
Thunder Creek	TH01	2	-	-	-	-	2	6	7	17
	THT1-01	-	-	-	-	-	1	4	4	9
Day Creek	DA01	2	1	-	-	2	2	5	2	14
Grayling Creek	GR01	-	2	1	2	2	3	6	5	21
Tok River	TK01	-	-	1	2	2	3	4	4	16
Tetlin Lake	TL01	-	-	1	2	2	3	6	6	20
	TL02	-	-	1	2	2	3	6	6	20

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]2.4 SW Annual Samples

Notes:

1. No longer an active sampling/monitoring location
2. Samples were not collected during 2014 or 2017
3. 2021 inclusive of samples until September 30, 2021

Table 2.5 Count of ADEC Guideline Value Exceedance for Pre-Mining Baseline Parameters at Surface Water Monitoring Stations

Basin	Catchment	Station	n	Years	pH	Alk.	Al	As	Cd	Cu	Fe	Pb	Mn	Hg	Ni	WAD-Cy[5]
Tetlin	Tors (Eagle) Creek	EAT1-01	13	2019-2021	1	-	9	-	-	-	9	-	13	-	-	1
		EAT2-01	10	2019-2021	1	2	9	7	3	2	3	8	3	-	-	1
		EA02	18	2013-2021	4	-	1	-	-	-	-	-	1	1	-	-
	Black Creek	BLT01-01	13	2019-2021	2	-	1	-	-	-	-	-	1	-	-	-
		BL01 (BLT02-01)	18	2012-2021	6	1	7	-	1	1	3	2	3	-	-	-
		BL02	16	2013-2021	4	-	3	-	-	-	1	-	14	-	-	-
		BL03	18	2013-2021	1	-	7	-	-	-	2	-	6	-	-	-
	Tetlin Lake	TL01	20	2015-2021	5	-	2	-	1	1	7	1	12	-	-	-
		TL02	20	2015-2021	4	-	4	2	2	3	6	3	14	2	2	-
Tok	Thunder Creek	THT1-01	9	2019-2021	3	3	9	-	1	9	4	4	2	-	-	2
		TH-01	17	2012-2021	4	4	10	-	-	4	1	1	4	-	-	1
	Hillside Creek	HIT2-01	10	2012-2021	4	8	1	-	1	1	1	-	2	-	-	1
		HI01	22	2012-2021	6	5	2	1	-	2	3	2	4	1	-	1
		HI02	19	2012-2021	6	-	2	3	-	-	12	-	19		-	1
	Day Creek	DA01	14	2012-2021	4	1	-	13	-	-	-	-	-	-	-	-
	Grayling Creek	GR01	21	2013-2021	6	-	-	-	-	-	7	-	15	1	-	-
	Tok River	TK01	16	2015-2021	1	-	6	1	1	1	9	1	6		-	-

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]2.5 SW Sample Exceedances

Notes:

1. n- number of samples
2. Alk.- Alkalinity; Al- aluminum; As- Arsenic; Cd-Cadmium; Cu Copper; Fe-Iron; Pb- Lead; Mn- Manganese; Hg- Mercury; Ni- Nickel; WAD- Cy-Cyanide
3. The metals are total extractable fractions. Alkalinity is a minimum requirement. pH is a range between 6.5 and 8.5 and is measured in the field.
4. ADEC guideline values for Cd, Cu, Pd, Ni, Ag and Zn are hardness dependant and vary between locations, based on average hardness
5. WAD-Cy was detected or reported above the ADEC guideline for some samples during October 2020 as a result of possible contamination or error with lab analysis

Table 4.1 Groundwater Wells

Well ID	Well Type	Coordinates		Collar Elev. (ft)	Azim	Dip	Location	Installation Details			
		Easting	Northing					Installation Date	Well or Borehole Depth (ft)	Solinst Logger or VWP Depth (ft)	Screened Interval (ft)
PKG19-001	2" Monitoring Well	404718	7007536	3,231	0	90	South Pit	15/06/2019	560	500	480-560
PKG19-002	2" Monitoring Well	405079	7008248	3,249	0	90	North WRSA	17/06/2019	298	297	218-298
PKG19-003	2" Monitoring Well	404779	7007958	3,212	0	90	North Pit	21/06/2019	338	300	288-338
PKG19-004	2" Monitoring Well	404185	7006986	3,336	0	90	South WRSA	21/06/2019	397	400	317-397
PKG19-005	2" Monitoring Well	404870	7007880	3,158	0	90	North Pit	21/06/2019	219	200	169-219
PKG19-006	2" Monitoring Well	404853	7007492	3,247	0	90	South Pit	22/06/2019	400	300	320-400
PKG19-007	2" Monitoring Well	404603	7007559	3,174	0	90	South Pit	23/06/2019	322	302	222-322
Well 1	6" Supply Well	404577	7007132	3,302	0	90	South WRSA	~2013	800 (?)	-	120-800 (?)
Well 2	6" Supply Well	405022	7009190	2,897	0	90	Tors Creek	10/15/2016	800	-	120-800
GW21-01	4" Monitoring Well	405455	7007765	2,887	0	90	Tors Creek	04/05/2021	148	110	118-148
GW21-02	4" Monitoring Well	405457	7008919	2,781	0	90	Tors Creek	04/01/2021	159	98	119-159
GW21-04	4" Monitoring Well	405476	7006947	3,079	0	90	East of South WRSA	04/15/2021	148	128	128-148
GW21-05	4" Monitoring Well	404130	7007433	3,119	0	90	West of South WRSA	04/09/2021	390	-	338-390
GW21-06	4" Monitoring Well	404647	7007395	3,254	0	90	South Pit	04/19/2021	458	298	398-458
GW21-07	4" Monitoring Well	404599	7007566	3,172	0	90	South Pit	04/22/2021	348	250	308-348
GW21-08	4" Monitoring Well	404216	7008175	2,777	0	90	Hillside Creek	04/12/2021	308	253	268-308
GT20-01	Geotech Grouted-in Borehole	404648	7007621	3,199	216	78	South Pit	09/09/2020	657	655; 495	-
GT20-02	Geotech Grouted-in Borehole	404840	7007603	3,201	123	81	South Pit	03/03/2020	492	475; 320	-
GT20-03	Geotech Grouted-in Borehole	404871	7007393	3,287	277	86	South Pit	05/05/2021	656	650; 480	-
GT20-04	Geotech Grouted-in Borehole	404638	7007345	3,267	342	72	South Pit	29/29/2020	657	655; 495	-
GT20-05	Geotech Grouted-in Borehole	404453	7007466	3,127	69	81	South Pit	10/10/2021	492	492; 300	-
GT20-06	Geotech Grouted-in Borehole	404663	7008002	3,178	38	74	North Pit	13/13/2021	410	410; 300	-
GT20-07	Geotech Grouted-in Borehole	404839	7008055	3,233	205	82	North Pit	16/16/2021	410	410; 300	-
GT20-08	Geotech Grouted-in Borehole	404963	7007957	3,179	149	85	North Pit	22/22/2021	377	375	-
GT20-09	Geotech Grouted-in Borehole	404980	7007649	3,130	356	76	North Pit	26/26/2021	328	325	-
GT20-10	Geotech Grouted-in Borehole	404900	7007750	3,139	116	86	North Pit	24/24/2021	328	325	-
GT20-11	Geotech Grouted-in Borehole	404778	7007854	3,213	67	74	North Pit	19/19/2021	380	375; 325	-

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]4.1 GW Location

Notes:

1. Coordinate system is in NAD83 UTM Zone 7N
2. WRSA- Waste Rock Storage Area
3. The groundwater wells are fitted with Solinst pressure transducers to record water level fluctuations; Geotech boreholes have been fitted with grouted-in vibrating wire piezomeetrs (VWPs)

Table 4.2 Summary of Hydraulic Conductivity Testing and Analysis

Well ID	Screen or Test Interval (ft)	Screen or Test Interval (ft-Elev.)	Lithology and Alteration	Type of Test	Analysis/Solution Method	Test Date	Hydraulic Conductivity (K) (ft/s)
GW21-01	118-148	2,769-2,739	MQS/QMS (Sulfide)	Rising Head	Bouwer & Rice (1976)	02-Jun-21	7.00E-06
GW21-02	119-159	2,662-2,622	CS (Oxide)	Rising Head	Bouwer & Rice (1976)	21-May-21	3.00E-05
GW21-04	128-148	2,951-2,931	MQS (Transition)	Rising Head	Bouwer & Rice (1976)	21-May-21	4.60E-06
GW21-06	398-458	2,856-2,796	MQS/QMS (Sulfide)	Rising Head	Bouwer & Rice (1976)	22-Apr-21	1.40E-06
GW21-07	308-348	2,865-2,825	QMS (Transition)	Rising Head	Bouwer & Rice (1976)	01-Jun-21	7.60E-07
GW21-08	268-308	2,509-2,469	CS/QMS (Sulfide)	Rising Head	Bouwer & Rice (1976)	22-Apr-21	6.40E-05
PKG19-001	480-560	2,751-2,671	QMS (Sulfide)	Falling Head	Bouwer & Rice (1976)	29-Jun-19	8.20E-06
PKG19-002	220-300	3,029-2,949	QMS (Oxide)	Falling Head	Bouwer & Rice (1976)	21-Jun-19	8.90E-09
PKG19-003	292-340	2,919-2,871	QMS (Sulfide)	Falling Head	Bouwer & Rice (1976)	29-Jun-19	5.10E-06
PKG19-005	170-220	2,988-2,938	QMS (Oxide)	Falling Head	Bouwer & Rice (1976)	26-Jun-19	7.50E-06
PKG19-007	220-300	2,954-2,874	QMS (Transition)	Falling Head	Bouwer & Rice (1976)	29-Jun-19	3.60E-08
Well 2	120-800	2,779-2,099	CS/QMS (Sulfide)	Pumping Test	Gringerten & Witherspoon (1972)	07-Apr-18	2.60E-07
GT20-01	561-657	2,650-2,556	MQS (Sulfide)	Lugeon Packer Test	Houlsby (1976)	09-Dec-21	4.6E-09 to 1.8E-09
GT20-02	384-492	2,842-2,716	QMS (Transition)	Lugeon Packer Test	Houlsby (1976)	03-Dec-21	1.20E-09
GT20-03	508-656	2,780-2,632	QMS (Sulfide)	Lugeon Packer Test	Houlsby (1976)	04-Mar-21	1.2E-07 to 7.3E-08
GT20-04	541-656	2,751-2,642	MQS/QMS (Sulfide)	Lugeon Packer Test	Houlsby (1976)	28-Nov-20	7.9E-08 to 6.0E-08
GT20-05	390-492	2,742-2,642	MQS (Sulfide)	Lugeon Packer Test	Houlsby (1976)	09-Mar-21	3.3E-07 to 1.1E-07
GT20-06	357-410	2,834-2,783	CS (Transition)	Lugeon Packer Test	Houlsby (1976)	12-Mar-21	2.20E-07
GT20-07	300-410	2,936-2,827	MQS/QMS (Transition)	Lugeon Packer Test	Houlsby (1976)	16-Mar-21	1.1E-07 to 7.1E-08
GT20-08	300-377	2,880-2,803	MQS (Transition)	Lugeon Packer Test	Houlsby (1976)	22-Mar-21	7.7E-08 to 5.6E-08
GT20-09	278-328	2,860-2,811	CS (Transition)	Lugeon Packer Test	Houlsby (1976)	26-Mar-21	1.80E-06
GT20-10	214-328	2,926-2,812	CS (Transition)	Lugeon Packer Test	Houlsby (1976)	24-Mar-21	7.3E-07 to 3.3E-07
GT20-11	300-380	2,924-2,847	MQS (Transition)	Lugeon Packer Test	Houlsby (1976)	19-Mar-21	1.5E-07 to 3.6E-08

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]4.2 GW Hydraulic Testing

Notes:

1. The detailed analysis and solution for each test is presented in Appendix D.

Table 4.3 Summary of Frozen Bedrock Zones

Well ID	Collar (ft-elev)	Frozen zones (Yes/No)	Frozen Thickness (ft)	Top of Zone (ft bgs)	Depth to Base (ft bgs)	Bottom Elevation (ft-elev)
PKG19-001	3,231	Yes	95	152	> 247	< 2984
PKG19-002	3,249	Yes	102	98	~ 200	~ 3049
PKG19-003	3,212	Yes	124	82	~ 206	~ 3006
PKG19-004	3,336	Yes	340	53	> 393	< 2943
PKG19-005	3,158	Yes	81	39	~ 120	~ 3038
PKG19-006	3,247	Yes	251	47	> 298	< 2949
PKG19-007	3,174	Yes	213	31	> 244	< 2930
GW21-01	2,887	No	-	-	-	-
GW21-04	3,079	Yes	Not stable	Not stable	Not stable	Not stable
GW21-05	3,120	Yes	Not stable	Not stable	Not stable	Not stable
GW21-08	2,777	Yes	120	80	~ 200	~ 2577
GT20-01	3,199	Yes	240	60	300	2880
GT20-02	3,201	Yes	310	10	320	2900
GT20-04	3,267	Yes	400	10	410	2850
GT20-05	3,127	Yes	340	10	350	2780
GT20-06	3,178	Yes	240	40	280	2910
GT20-08	3,179	No	-	-	-	-
GT20-09	3,130	Yes	200	10	213	2890

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]4.3 GW Temperature

Notes:

1. ft- feet
2. ft-bgs- feet below ground surface
3. ft-elev- elevation in feet above mean sea level

Table 4.4 Annual Groundwater Samples Count

Well ID	2016	2018	2019	2020	2021	Total
PKG19-002	-	-	3	5	-	**8**
PKG19-003	-	-	3	5	7	**15**
PKG19-005	-	-	3	6	-	**9**
GW Seep	-	-	2	4	-	**6**
Well 02	1	2	1	5	10	**19**
GW21-01	-	-	-	-	9	**9**
GW21-02	-	-	-	-	8	**8**
GW21-04	-	-	-	-	7	**7**
GW21-06	-	-	-	-	5	**5**
GW21-07	-	-	-	-	9	**9**
GW21-08	-	-	-	-	9	**9**

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]4.4 GW Annual Samples

Notes:

1. 2021 inclusive of samples until September 30, 2021

Table 4.5 Count of ADEC Guideline Exceedance for Select Parameters Recorded at Each Groundwater Well

Location ID	Area	n	Years Active	pH	TDS	Al	Sb	As	Cd	Cu	Fe	Pb	Mn	Ni	Ag	Zn	WAD-Cy
Seep[5]	Manh Choh South Pit	6	2019-2020	4	-	6	-	1	3	5	4	5	1	1	1	1	1
PKG19-002	North Waste Rock Storage Area	6	2019-2020	3	-	2	-	2	2	1	3	2	3	-	-	-	-
PKG19-003	Manh Choh North Pit	12	2019-2021	4	-	-	2	10	-	-	-	-	1	-	-	-	-
PKG19-005	Manh Choh North Pit	9	2019-2020	3	-	1	-	6	-	-	1	-	2	-	-	-	-
Well 02	Tors Creek	15	2016-2021	1	-	-	-	-	-	-	-	-	-	-	-	-	-
GW21-01	Tors Creek	9	2021	1	-	1	-	-	-	-	1	1	-	-	-	-	-
GW21-02	Tors Creek	8	2021	-	-	-	-	-	-	-	-	1	8	-	-	-	-
GW21-04	East of Main WRSA	7	2021	6	-	-	-	-	-	-	-	2	-	-	-	-	-
GW21-06	Manh Choh South Pit	5	2021	4	-	-	-	5	-	-	-	-	1	-	-	-	-
GW21-07	Manh Choh South Pit	9	2021	1	-	-	-	-	-	-	-	-	-	-	-	-	-
GW21-08	Hillside Creek	9	2021	-	1	-	-	-	-	-	-	1	5	-	-	-	-

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]4.5 GW Sample Exceedances

Notes:

1. n- number of samples
2. TDS- total dissolved solids; Al- Aluminum; Sb- Antimony; As- Arsenic; Cd-Cadmium; Cu Copper; Fe-Iron; Pb- Lead; Mn- Manganese; Ni- Nickel; Ag- Silver; Zn- Zinc; WAD- Cy-Cyanide
3. ADEC guideline values for Cd, Cu, Pd, Ni, Ag and Zn are hardness dependant and vary between locations, based on average hardness
4. Metals in groundwater water wells are dissolved (filtered) extractable fractions, expect for the groundwater seep, which is total metals
5. Seep is representative of local perched groundwater and not the primary bedrock groundwater flow system.

Table 5.1 Baseline Concentrations, Source Terms and Distribution Coefficients for Water Quality at Manh Choh

Parameter	ADEC guidelines	Average Baseline Concentrations			Calculated Source Term Concentrations from SRK (2021)[8]							
		Site Groundwater (mg/L)[2,3]	Hillside Creek (mg/L)[4,5]	Tors Creek (mg/L)[4,6]	Backfill Pore Water (mg/L)	Summer Waste Rock Ruonff (mg/L)	Snowmelt Waste Rock Runoff (mg/L)	Pit Wall Runoff (mg/L)	log Kd[9] (L/kg)	Backfill vs ADEC Guideline Values (%)	Backfill vs Groundwater (%)	Constituent Explicitly Modelled (?)
SO_4	250	78.03	62.03	29.39	1820	72.8006851	58.95263158	157.1570345		728%	2333%	yes
Nitrate-N	10	0.2	0.7	0.3	9.8	6.5	0.0	41.9		98%	5056%	SO4 as reference
Al	0.09	0.24	0.73	0.70	0.60	0.19	0.42	0.41		690%	246%	SO4 as reference
Sb	0.006	0.00308	0.00025	0.00031	0.00594	0.00183	0.00024	0.00396	2.4	99%	193%	
As	0.01	0.022	0.002	0.012	0.0414	0.0158	0.0071	0.0340	3.4	414%	188%	yes
Ba	2	0.019	0.018	0.027	0.06	0.00	0.02	0.01	2	3%	302%	
Be	0.004	<0.00008	<0.00008	<0.00008	0.00049	0.00003	0.00006	0.00007	3.1	12%		
B	0.75	0.0137	0.0041	0.0019	0.05	0.05	0	0.05		7%	365%	
Cd	0.00036996	0.00031	0.00014	0.00011	0.000753	0.000035	0.000070	0.000074	2.9	204%	245%	As as reference
Ca		51.0	25.3	33.7	942.2	45.3	43.6	97.7			1847%	
Cr	0.1	0.0012	0.0017	0.0017	0.0050	0.0003	0.0009	0.0007		5%	427%	
Co	0.05	0.0007	0.0007	0.0008	0.0058	0.0004	0.0006	0.0009	2.1	12%	884%	
Cu	0.015	0.0050	0.0062	0.0026	0.0223	0.0014	0.0046	0.0029	2.7	149%	444%	As as reference
Fe	1	2.1	1.0	1.4	1.23	0.06	1.41	0.13		123%	58%	SO4 as reference
Pb	0.005	0.003	0.001	0.002	0.00269	0.00017	0.00060	0.00037	4.2	54%	86%	
Li		0.0	0.0	0.0	0.018	0.001626629	0	0.003511453				
Mg		6.4	5.9	7.8	27.8	1.4	8.4	3.0			431%	
Mn	0.05	0.03	0.03	0.22	1.077	0.026	0.114	0.056		2155%	3419%	yes
Hg	0.00005	0.00004	0.00001	0.00000	0.00010	0.00003	0.00001	0.00007	3.8	200%	243%	As as reference
P		<0.1	0.06	0.07	0.154	0.010	0.063	0.022				
Mo	0.01	0.00489	0.00181	0.00022	0.008	0.002	0.001	0.005	1.1	80%	164%	
Ni	0.086	0.0021	0.0019	0.0018	0.015	0.001	0.002	0.002	3.1	17%	731%	
K		3.0	1.4	0.5	21.7	4.4	1.5	9.6			730%	
Se	0.0050	0.0012	0.0004	0.0004	0.0131	0.0007	0.0007	0.0015	1	262%	1103%	yes
Ag	0.00115	<0.0001	0.00008	0.00007	0.00026	0.00002	0.00014	0.00004	2.6	23%		
Na		8.7	5.4	2.6	6.41	0.50	5.86	1.08			74%	
Tl	0.0017	<0.0001	<0.0001	<0.0001	0.000441	0.000027	0.000000	0.000058		26%		
U		0.0	0.0	0.0	0.0364	0.0029	0.0000	0.0064				
Zn	0.194	0.03	0.01	0.01	0.0499	0.0033	0.0044	0.0072	3.1	26%	188%	
TDS	500	234	153	156	4729	209	198	452		946%	2018%	SO4 as reference

H:\Project\4148\Water Quality\[20211109_WQ summary updated.xlsx]Table 5.1 Chemistry Summary

Notes:

1. Only concentrations above detection limit are used to calculate averages; non-detects are not used
2. Metal constituents for groundwater are dissolved analysis, except Mercury (Hg). It is noted that early on in the sampling/monitoring program, only total metals were analysed for GW which are not included.
3. The groundwater concentrations are averages from PKG19-002, PKG19-003, GW21-01, GW21-06, GW21-07, and GW21-08
4. Metal constituents for surface water are total analysis.
5. The Hillside Creek concentrations are averages of samples from HIT2-01 and HI01, taken between May 2018 and August 2021
6. The Tors Creek concentrations are averages of samples from EAT2-01 and EAT1-01, taken between September 2019 and August 2021
7. The 50th percentile water quality source terms are reported, reflecting values used for base case water quality modelling scenarios at Manh Choh
8. Kd represents the distribution coefficient used to assess the effects of sorption in mass transport modelling

Value exceeds ADEC guideline values

Table 6.1 Return Period Storm Events

Recurrence Interval (years)	24-hr Storm Event (in)	Net 24-hr Storm Volume (acre-ft)
1	1.07	41.60
2	1.38	53.66
5	1.81	70.38
10	2.16	83.99
25	2.64	102.65
50	3.03	117.81
100	3.44	133.75
200	3.9	151.64
500	4.51	175.36
1000	4.97	193.24

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]6.1 24-hr Storm Svents

Table 6.2 Average Monthly Flow Rate (gpm) Discharging to Site Retention Basins

Date	South Sump	North Sump	Total Flow	Site Dust Control	Access Road Watering	Residual	Comments
Jan-24	-	0.7	0.7	-	-	-	Construction
Feb-24	-	0.6	0.6	-	-	-	
Mar-24	-	0.6	0.6	-	-	-	
Apr-24	-	0.5	0.5	15.7	8	-23.2	
May-24	3.3	105.8	109.1	47.0	8	54.0	
Jun-24	5.6	162.1	167.7	69.4	8	90.3	
Jul-24	3.0	37.9	40.8	69.4	8	-36.6	
Aug-24	2.8	13.3	16.1	17.8	8	-9.7	
Sep-24	2.3	7.3	9.6	11.2	8	-9.6	
Oct-24	0.9	2.4	3.2	2.4	8	-7.2	
Nov-24	-	2.0	2.0	-	-	-	
Dec-24	-	3.1	3.1	-	-	-	
Jan-25	-	2.7	2.7	-	-	-	
Feb-25	-	2.4	2.4	-	-	-	
Mar-25	-	2.2	2.2	-	-	-	
Apr-25	-	2.0	2.0	15.7	8	-21.7	
May-25	8.4	119.4	127.8	47.0	8	72.7	
Jun-25	13.4	181.9	195.3	69.4	8	117.9	
Jul-25	6.6	47.0	53.6	69.4	8	-23.8	End of mining north pit
Aug-25	5.7	14.9	20.6	17.8	8	-5.2	
Sep-25	4.6	6.6	11.2	11.2	8	-8.0	
Oct-25	1.7	2.0	3.7	2.4	8	-6.7	
Nov-25	-	0.8	0.8	-	-	-	
Dec-25	-	0.5	0.5	-	-	-	
Jan-26	-	0.5	0.5	-	-	-	
Feb-26	-	0.2	0.2	-	-	-	
Mar-26	-	0.3	0.3	-	-	-	
Apr-26	-	0.3	0.3	15.7	8	-23.4	
May-26	14.9	136.5	151.4	47.0	8	96.4	
Jun-26	23.5	207.1	230.6	69.4	8	153.2	
Jul-26	12.2	47.9	60.0	69.4	8	-17.4	
Aug-26	10.3	15.2	25.5	17.8	8	-0.3	
Sep-26	8.8	7.2	16.1	11.2	8	-3.1	
Oct-26	4.3	2.0	6.3	2.4	8	-4.1	
Nov-26	5.4	0.8	6.1	-	-	-	
Dec-26	8.1	0.5	8.6	-	-	-	
Jan-27	7.1	0.5	7.6	-	-	-	
Feb-27	6.6	0.2	6.8	-	-	-	
Mar-27	6.2	0.3	6.5	-	-	-	
Apr-27	6.0	0.3	6.3	15.7	8	-17.4	End of mining south pit

H:\Project\4148\Water Balance\[Infiltration and Water Balance 20211109.xlsx]Table 6.2

Notes:

1. Rates provided in gallons per minute (gpm)

Periods of Water Deficit

Periods of Excess Water

Table 6.3 Predicted Water Quality of Retention Pond Water

Date	Total Water (gpm)	SO4	NO3	Sb	As	Se	TDS
		(mg/L)					
ADEC Guideline Concentrations		250	10	0.006	0.01	0.005	500
Jan-24	0	78.0	0.2	0.003	0.022	0.001	234.3
Feb-24	0	78.0	0.2	0.003	0.022	0.001	234.3
Mar-24	0	78.0	0.2	0.003	0.022	0.001	234.3
Apr-24	-23.2	78.0	0.2	0.003	0.022	0.001	234.3
May-24	54.0	64.7	2.4	0.000	0.009	0.001	212.8
Jun-24	90.3	65.3	2.7	0.000	0.009	0.001	214.3
Jul-24	-36.6	86.1	12.0	0.002	0.019	0.001	247.9
Aug-24	-9.7	99.9	17.7	0.003	0.022	0.001	287.6
Sep-24	-9.6	108.6	21.3	0.003	0.024	0.001	312.9
Oct-24	-7.2	112.3	22.4	0.003	0.025	0.001	323.7
Nov-24	0	78.0	0.2	0.003	0.022	0.001	234.3
Dec-24	0	78.0	0.2	0.003	0.022	0.001	234.3
Jan-25	0	78.0	0.2	0.003	0.022	0.001	234.3
Feb-25	0	78.0	0.2	0.003	0.022	0.001	234.3
Mar-25	0	78.0	0.2	0.003	0.022	0.001	234.3
Apr-25	-21.7	78.0	0.2	0.003	0.022	0.001	234.3
May-25	72.7	70.8	5.0	0.001	0.010	0.001	228.5
Jun-25	117.9	71.2	5.2	0.001	0.010	0.001	229.5
Jul-25	-23.8	86.4	12.0	0.002	0.019	0.001	249.0
Aug-25	-5.2	100.5	18.1	0.003	0.022	0.001	289.2
Sep-25	-8.0	109.3	21.8	0.003	0.024	0.001	314.3
Oct-25	-6.7	115.0	24.2	0.003	0.025	0.001	330.8
Nov-25	0	0.0	0.0	0.000	0.000	0.000	0.0
Dec-25	0	0.0	0.0	0.000	0.000	0.000	0.0
Jan-26	0	0.0	0.0	0.000	0.000	0.000	0.0
Feb-26	0	0.0	0.0	0.000	0.000	0.000	0.0
Mar-26	0	0.0	0.0	0.000	0.000	0.000	0.0
Apr-26	-23.4	0.0	0.0	0.000	0.000	0.000	0.0
May-26	96.4	67.2	3.5	0.001	0.009	0.001	219.2
Jun-26	153.2	67.4	3.5	0.001	0.009	0.001	219.7
Jul-26	-17.4	88.3	12.7	0.002	0.019	0.001	254.4
Aug-26	-0.3	101.1	17.9	0.003	0.022	0.001	291.5
Sep-26	-3.1	107.2	20.3	0.003	0.024	0.001	309.1
Oct-26	-4.1	108.0	19.6	0.003	0.024	0.001	312.5
Nov-26	0.0	78.0	0.2	0.003	0.022	0.001	234.3
Dec-26	0.0	78.0	0.2	0.003	0.022	0.001	234.3
Jan-27	0.0	78.0	0.2	0.003	0.022	0.001	234.3
Feb-27	0.0	78.0	0.2	0.003	0.022	0.001	234.3
Mar-27	0.0	78.0	0.2	0.003	0.022	0.001	234.3
Apr-27	-17.4	78.0	0.2	0.003	0.022	0.001	234.3

H:\Project\4148\Water Quality\[20211109_WQ summary updated.xlsx]Table 6.3

Notes:

Periods of Water Deficit

Periods of Excess Water

Concentrations exceeding ADEC guideline values

Table 7.1 Observed and Simulated Stream Flows for the Manh Choh Area

			Observed Flows			Calibrated Model Baseflows				
Waterbody	**Location**	**Catchment Area (acres)**	**Min Flow (gpm)**	**Max Flow (gpm)**	**Unit Flow (gpm /acre)**	**Avg Annual (gpm)**	**Min Monthly (gpm)**	**Max Monthly (gpm)**	**Unit Flow (gpm /acre)**	**Unit Recharge (in/yr)**
Tors (Eagle) Creek	EA01	1,696	56	988	0.033	53	40	69	0.024	0.46
	EA02[5]	3,362	88	1,341	0.026	127	103	154	0.031	0.59
	EA03	6,479	93	3,843	0.014	228	191	274	0.029	0.57
	EAT1-01	283	30	81	0.106	6.4	3.9	9.4	0.014	0.26
	EAT2-01	171	3	31	0.018	0.5	0.3	1	0.002	0.03
Black Creek	BL01	604	33	695	0.055	22	20	26	0.033	0.64
	BL02	5,760	194	2,023	0.034	194	159	235	0.028	0.54
	BL03	5,776	58	10,719	0.01	275	245	356	0.042	0.82
	BLT1-01	809	32	279	0.04	30	25	39	0.031	0.61
Day Creek	DA01	303	3	479	0.01	3.2	2.1	4.6	0.007	0.13
Hillside Creek	HI01[5]	430	28	897	0.065	6.7	5.6	9	0.013	0.25
	HI02[5]	970	37	3,836	0.038	15	13	18	0.013	0.26
	HIT2-01	204	-	-	-	0	0	0	0	0
Thunder Creek	TH01	704	82	494	0.116	5.8	4.1	6	0.006	0.11
	THT1-01	69	-	-	-	0	0	0	0	0

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]7.1 Flows

Notes:

1. n- number of samples
2. gpm- US gallons per minute
3. Spot flow readings collected between 2012 and 2021
4. Total discharge (flow) in streams is measured using a current meter or an acoustic doppler velocimeter, as per the USGS streamflow collection method
5. stations with continuous stream flow measurements since October 2020
6. '-' no stream flow collected due to stagnant conditions

Table 7.2 Observed and Calibrated Hydraulic Heads

Name	Date	Description	Observed Head (ft)	Calibrated Head (ft)
Wells				
PKG19-001	16-Mar-21	Manual	2,976.3	2,959.0
PKG19-002	16-Mar-21	Manual	2,988.8	2,968.4
PKG19-003	16-Mar-21	Manual	2,983.3	2,968.7
PKG19-004	15-Mar-21	Datalogger	2,949.8	3,085.7
PKG19-005	16-Mar-21	Manual	3,023.7	3,024.9
PKG19-006	16-Mar-21	Manual	2,975.2	2,980.0
PKG19-007	21-May-21	Datalogger	2,940.4	2,937.7
Well_01	02-Jun-21	Manual	3,040.5	3,079.7
Well_02	25-Feb-21	Manual	2,820.0	2,750.9
GW21-01	19-May-21	Manual	2,823.9	2,826.5
GW21-02	19-May-21	Manual	2,763.6	2,768.8
GW21-08	21-May-21	Datalogger	2,549.4	2,652.9
GW21-04	19-May-21	Manual	3,031.1	3,025.2
GW21-06	19-May-21	Manual	2,971.5	2,989.4
GW21-07	19-May-21	Manual	2,939.6	2,935.4
GT20-01_P1	19-May-21	Manual	2,940.2	2,938.6
GT20-02_P1	21-May-21	Manual	2,999.1	2,973.8
GT20-02_P2	21-May-21	Manual	2,989.9	2,974.4
GT20-03_P1	21-May-21	Manual	2,979.3	2,994.5
GT20-03_P2	21-May-21	Manual	2,969.4	2,990.3
GT20-04_P1	18-May-21	Manual	2,969.8	2,983.3
GT20-04_P2	18-May-21	Manual	2,971.8	2,989.0
GT20-05_P2	15-Mar-21	Manual	2,945.2	2,938.8
GT20-06_P1	21-May-21	Manual	2,917.1	2,906.4
GT20-06_P2	21-May-21	Manual	2,908.5	2,905.5
GT20-07_P1	18-May-21	Manual	3,014.3	2,959.3
GT20-07_P2	18-May-21	Manual	3,030.4	2,969.4
GT20-08_P1	21-May-21	Manual	3,043.7	3,005.9
GT20-09_P1	21-May-21	Manual	2,991.8	2,979.7
GT20-10_P1	21-May-21	Manual	2,989.8	2,992.0
GT20-11_P1	21-May-21	Manual	3,002.7	2,990.8
GT20-11_P2	21-May-21	Manual	2,994.1	3,007.2
Aufeis Locations				
AUFGRY-01	-	Ground El	2,060.5	2,041.0
AUFBL-01	-	Ground El	2,631.4	2,635.1
AUFHI-01	-	Ground El	1,925.9	1,920.6
AUFBL-05	-	Ground El	2,532.9	2,542.0
AUFBL-06	-	Ground El	2,464.0	2,487.7
AUFBL-02	-	Ground El	2,628.1	2,682.4
AUFSDAY-01	-	Ground El	1,847.2	1,831.7
AUFBL-03	-	Ground El	2,231.1	2,238.0
AUFBL-07	-	Ground El	2,172.0	2,162.7
AUFBL-08	-	Ground El	2,234.4	2,261.2
AUFBL-10	-	Ground El	1,991.6	2,006.7
AUFNDAY-01	-	Ground El	1,922.7	1,908.3
AUFBL-09	-	Ground El	2,096.6	2,094.2
AUFEA-01	-	Ground El	2,769.2	2,755.9
AUF_UNK1	-	Ground El	2,726.5	2,722.7
AUFBL-04	-	Ground El	2,132.4	2,119.3
AUFNDAY-02	-	Ground El	1,873.4	1,868.8
AUFEA-02	-	Ground El	2,365.6	2,372.1
AUFBL-11	-	Ground El	1,847.2	1,859.6

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]7.2 CalibrationTargets

Table 7.3 Transport Model Boundary Conditions and Background Concentrations

Parameter		ADEC Guideline Value	Background Groundwater and Rapid Fill[1]	Backfill cell	Log Kd[2]
Sulfate	mg/L	250	71	1,820	N/A
Arsenic	mg/L	0.01	0.0083	0.041	3.4
Manganese	mg/L	0.05	0.01155	1.08	N/A
Selenium	mg/L	0.005	0.00124	0.013	1

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]7.3 Transport Model

Notes:

1. Background groundwater concentration assumed to be the median of local groundwater sampling results. Rapid fill concentration conservatively assumed to be equivalent to background concentration.
2. From Allison, 2015

Table 7.4 Sensitivity Simulations

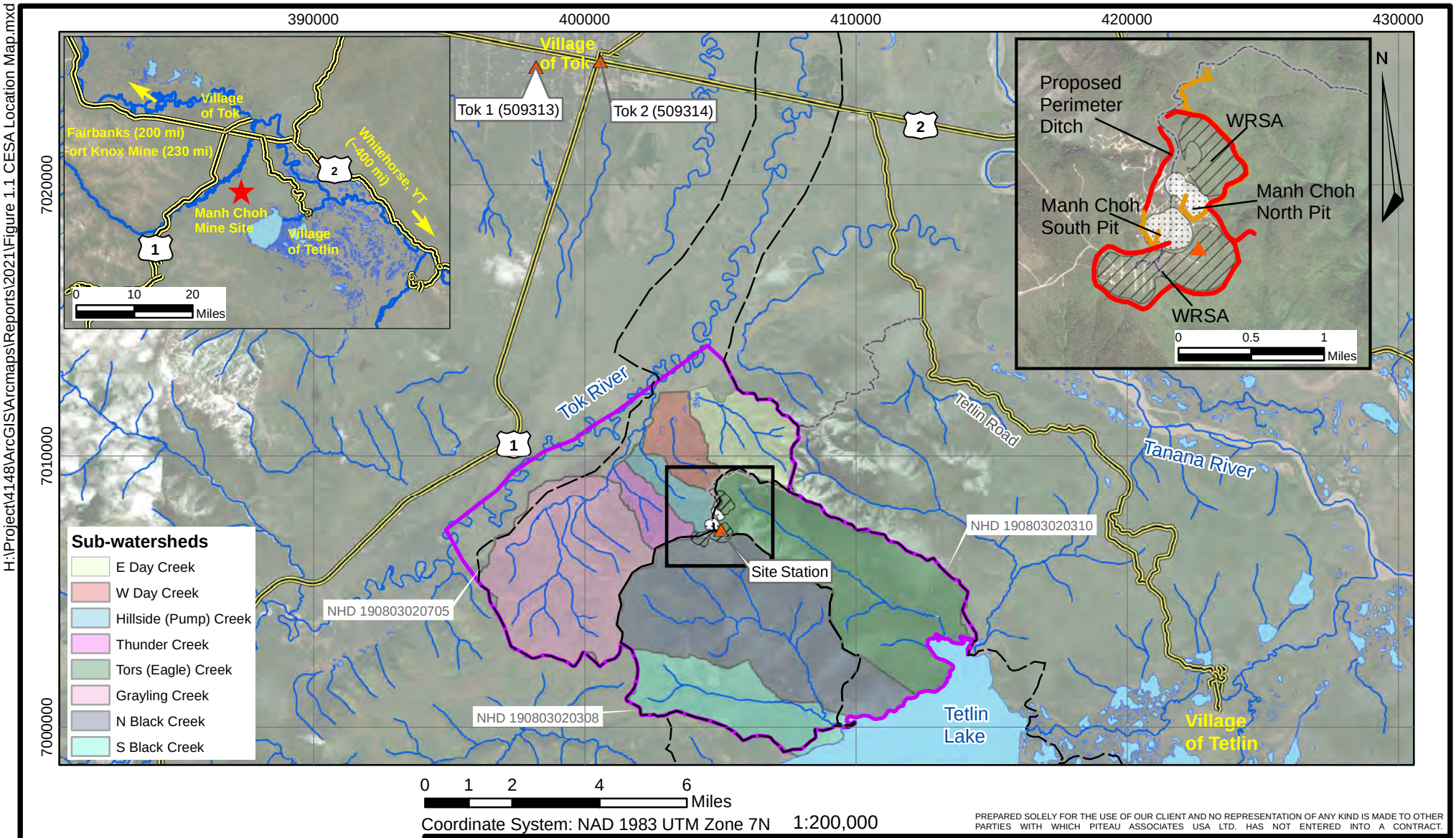
Parameter (s)	Zones Edited	Upper Bound	Lower Bound	Affected Results
Closure Recharge to South Pit	South Pit	143% (10% MAP)	71% (5% MAP)	Heads and flows in closure, all transport parameters
Hydraulic Conductivity and Recharge	All	125%	75%	Heads and flows through mining and closure, all transport parameters
Storage and Porosity	All	125%	75%	Heads and flows through mining and closure, all transport parameters
Dispersion	All	125%	75%	All transport parameters
Kd (Adsorption)	All	0 (No Kd)	1000%	Arsenic and selenium transport only

H:\Project\4148\Reports\7. Hydrogeology Assessment 2021\Tables\[Tables-formatted.xlsx]7.4 Sensitivity Scenarios

Note:

1. MAP is mean annual precipitation
2. Kd is linear adsorption coefficient

FIGURES



Coordinate System: NAD 1983 UTM Zone 7N 1:200,000

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

Legend

- Weather Stations
- Cumulative Effects Study Area
- NHD Hydrologic Basins
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas
- Waterbody
- River / Stream
- Site Access Road
- Road/Highway
- Perimeter Drainage Channel
- Continuous
- Water-ND

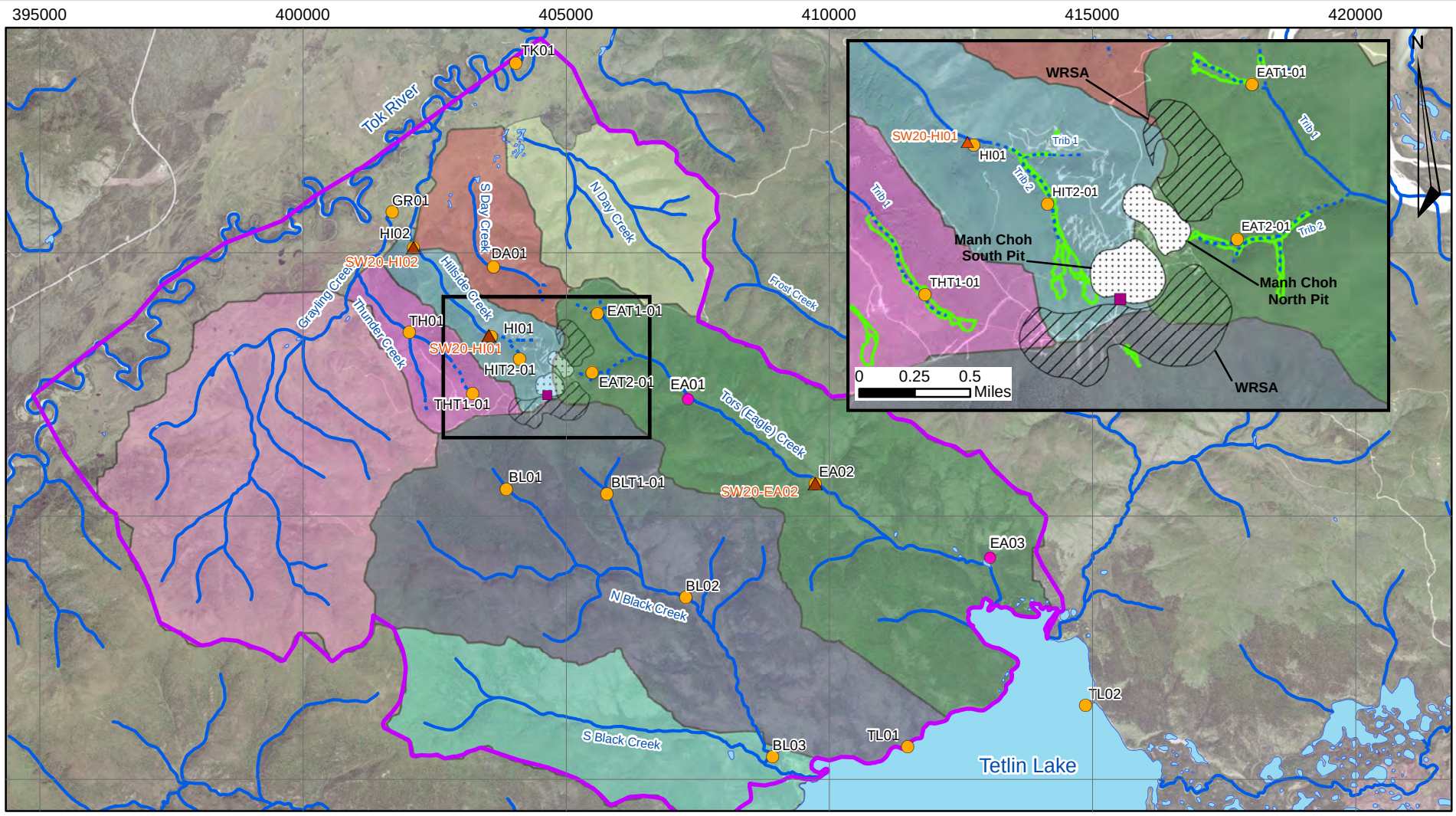
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PROJECT LOCATION, CUMULATIVE EFFECTS STUDY AREA AND NHD DEFINED HYDROGRAPHIC BASINS

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	1.1

H:\Project4148\ArcGIS\Arcmaps\Reports\2021\Figure 1.1 CESA Location Map.mxd



H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 2.1 SW Monitoring and Sampling Locn.mxd

Legend

- Stream Gauge Location
- Active Surface Water Monitoring Location
- Previous Sampling Locations 2012-2018
- Site Groundwater Seep
- Wetlands (SRK, 2021)
- Cumulative Effects Study Area
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas
- Lakes
- Rivers or Streams
- Inferred or Intermittent Streams

Coordinate System: NAD 1983 UTM Zone 7N 1:110,000

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

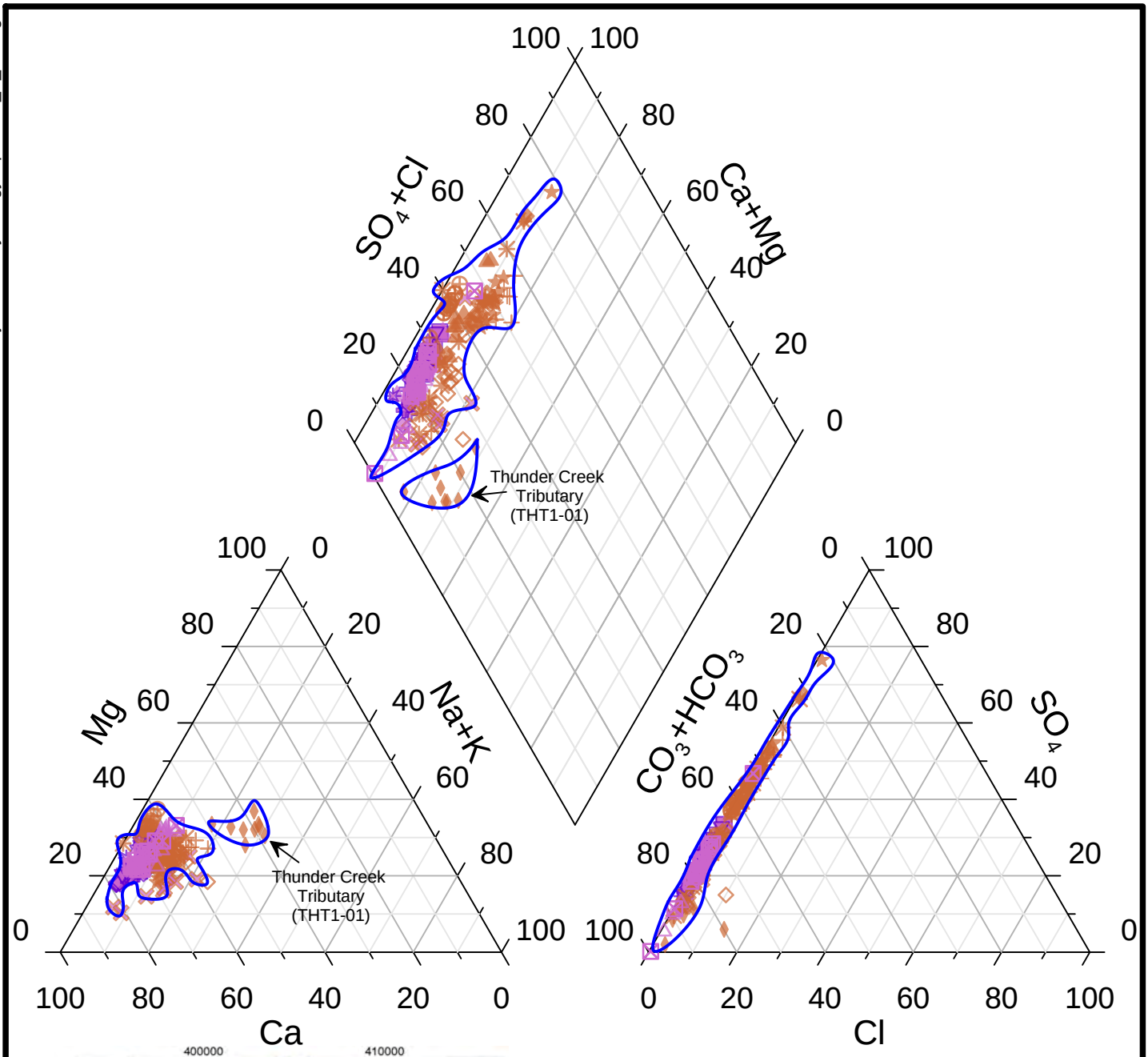
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

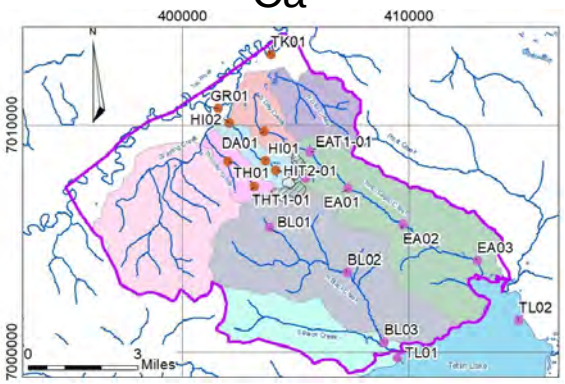
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER MONITORING, SAMPLING AND STREAM GAUGE LOCATIONS

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	2.1

H:\Project\4148\Hydrology\Piper Plot_w_Inset.grf





Legend

BL01 (BLT2-01)	DA01	EAT1-01	HI02	TK01
BLT1-01	EA01	EAT2-01	HIT2-01	TL01
BL02	EA02	GR01	TH01	TL02
BL03	EA03	HI01	THT1-01	

Approximate Range of SW Samples

Note:
The baseline chemistry data used to constuct these plots ranges from 2018 to 2021. Samples collected prior to 2018 did not include the required major ions for the construction of the piper plots.

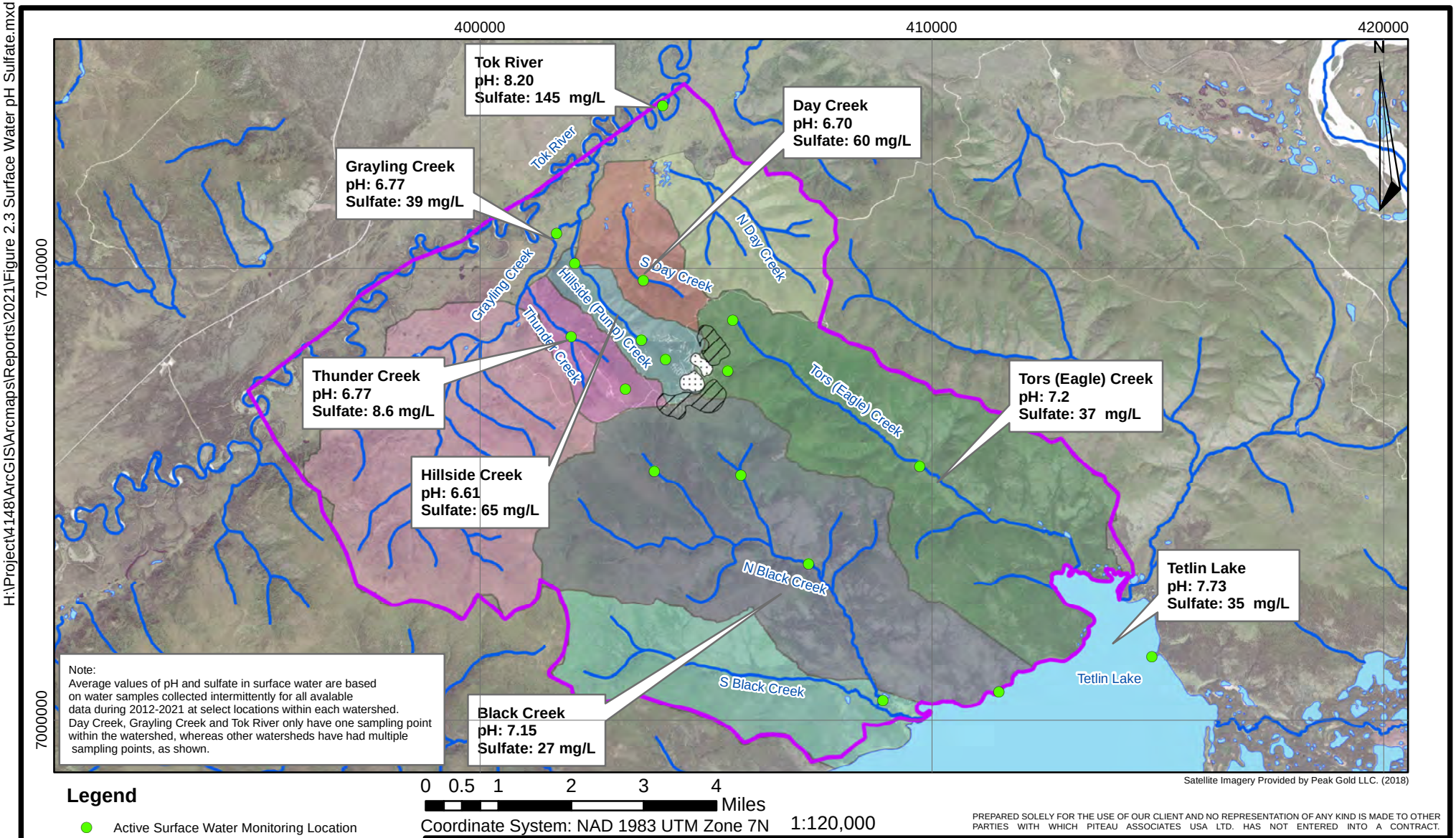
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER PIPER DIAGRAM

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	2.2



0 0.5 1 2 3 4 Miles

Coordinate System: NAD 1983 UTM Zone 7N 1:120,000

Legend

- Active Surface Water Monitoring Location
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas
- Cumulative Effects Study Area
- Waterbody
- Rivers and Streams

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

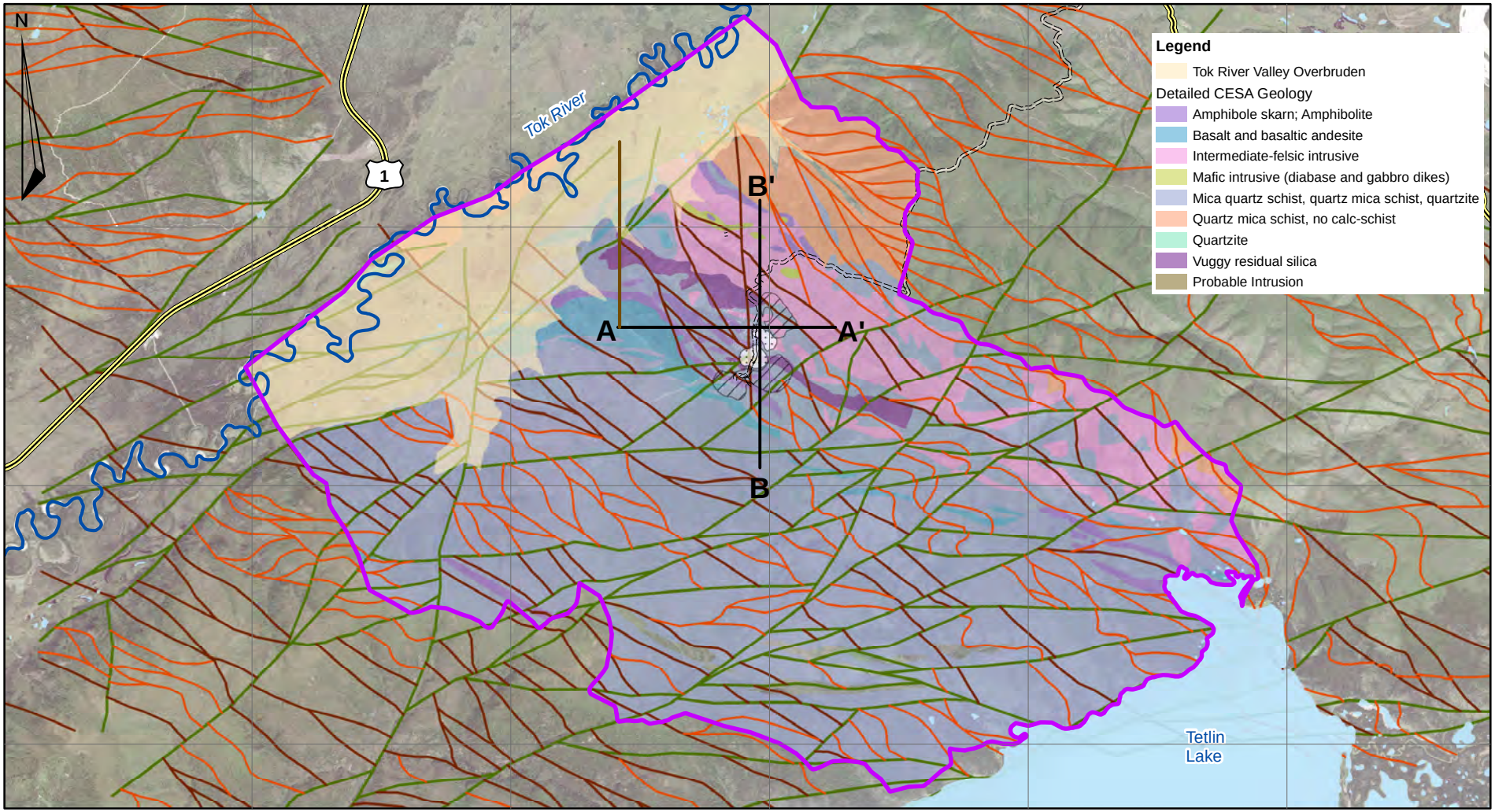
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

AVERAGE PH AND SULFATE CONCENTRATIONS IN SURFACE WATER CATCHMENTS

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	2.3

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 2.3 Surface Water pH Sulfate.mxd

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 3.1 Project Area Geology and Faults.mxd



Legend

- Geophysics IP Line (L87)
- Regional Cross Section Lines
- Site Access Road
- Road/Highway
- Cumulative Effects Study Area
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas

Structural Geology Analysis (SRK, 2019)

- D1 Faults
- D2 Faults
- D2-D3 Faults

0 1 2 4 Miles

Coordinate System: NAD 1983 UTM Zone 7N 1:115,000

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

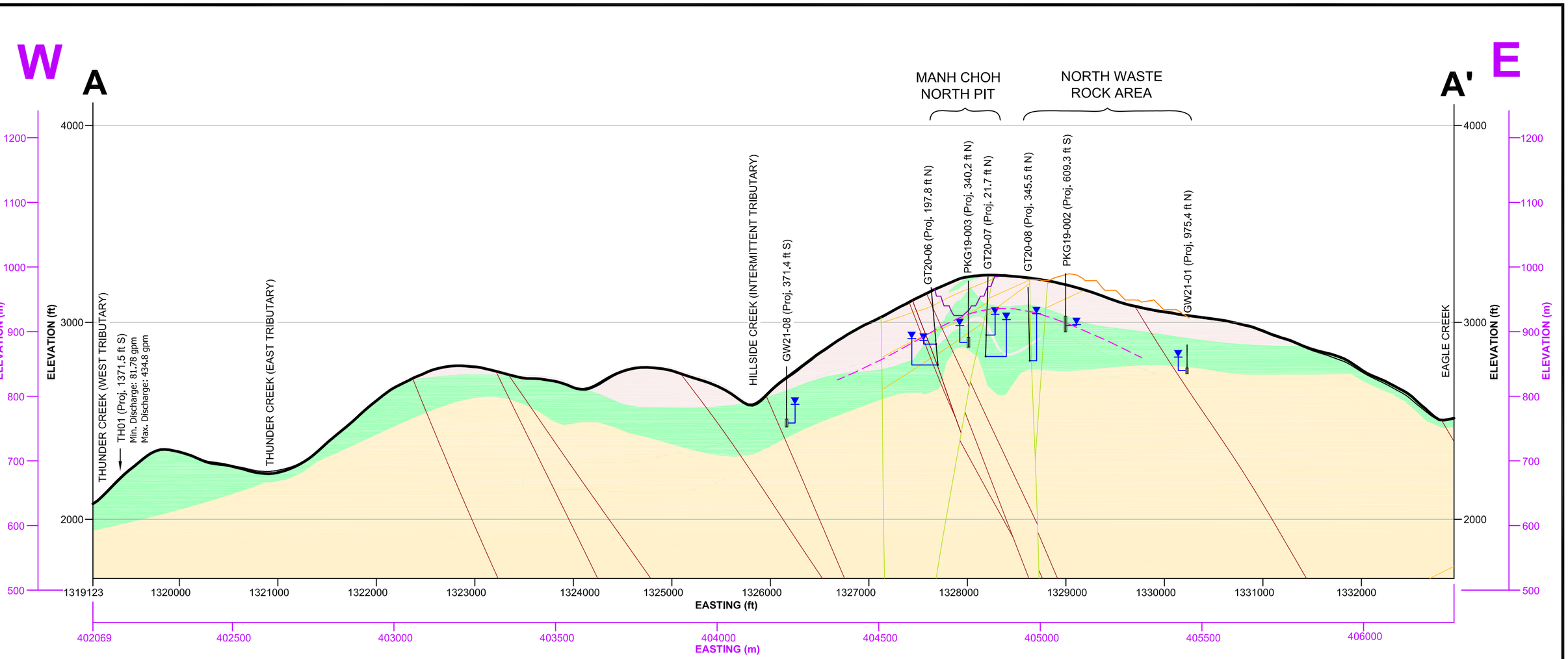
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

CUMULATIVE EFFECTS STUDY AREA GEOLOGY AND DISTRIBUTION OF MAJOR FAULTS AND LINEAMENTS

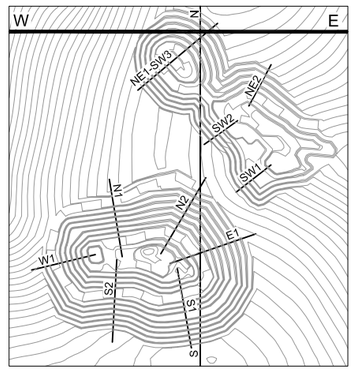
BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	3.1

DWG. NUMBER: K:\4148\Cadd\4148-005.dwg (Fig 3_2)



LEGEND

- OXIDE
- TRANSITION
- SULFIDE
- TOPOGRAPHY
- PROPOSED MANH CHOH PIT
- PROPOSED MANH CHOH WASTE ROCK STORAGE AREA
- FAULT STRUCTURAL GEOLOGY ANALYSIS (SRK, 2019a)
  - D1 FAULT
  - D2 FAULT
  - D2 - D3 FAULT
- WELL WITH VWP
- WELL WITH SCREEN
- 2020/2021 WATER LEVEL
- BOTTOM OF FROZEN BEDROCK ZONE



SCALE: 1" = 1000 ft

VERTICAL EXAGGERATION x 2

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

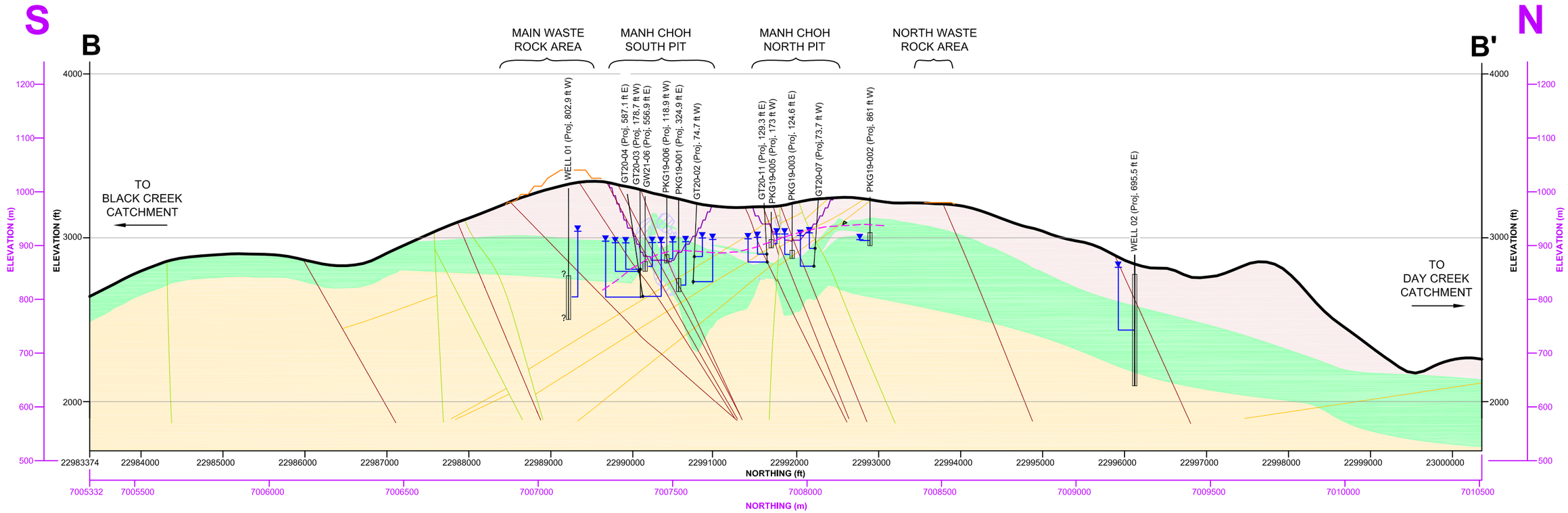
PEAK GOLD LLC
MANH CHOH PROJECT – TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL SECTION A - A'
ALONG 7008062 m N (22992282 ft N)

BY:	DATE:
SH/sl	NOV 21
APPROVED:	FIG:
MLS	3.2

DWG. NUMBER: K:\4148\Cadd\4148-004.dwg (Fig 3_3)

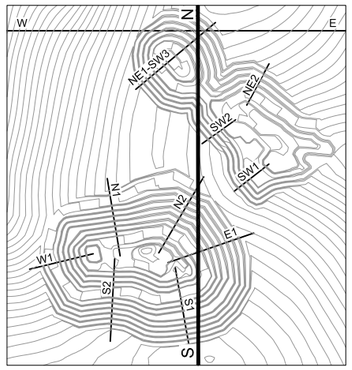


LEGEND

- OXIDE
- SKARN
- TRANSITION
- SULFIDE
- TOPOGRAPHY
- PROPOSED MANH CHOH PIT
- PROPOSED MANH CHOH WASTE ROCK STORAGE AREA

FAULT STRUCTURAL GEOLOGY ANALYSIS (SRK, 2019a)
- D1 FAULT
- D2 FAULT
- D2 - D3 FAULT

- WELL WITH VWP
- WELL WITH SCREEN
- 2020/2021 WATER LEVEL
- BOTTOM OF FROZEN BEDROCK ZONE



0 500 1000 1500 2000ft.

SCALE: 1" = 1250 ft.

VERTICAL EXAGGERATION x 2

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

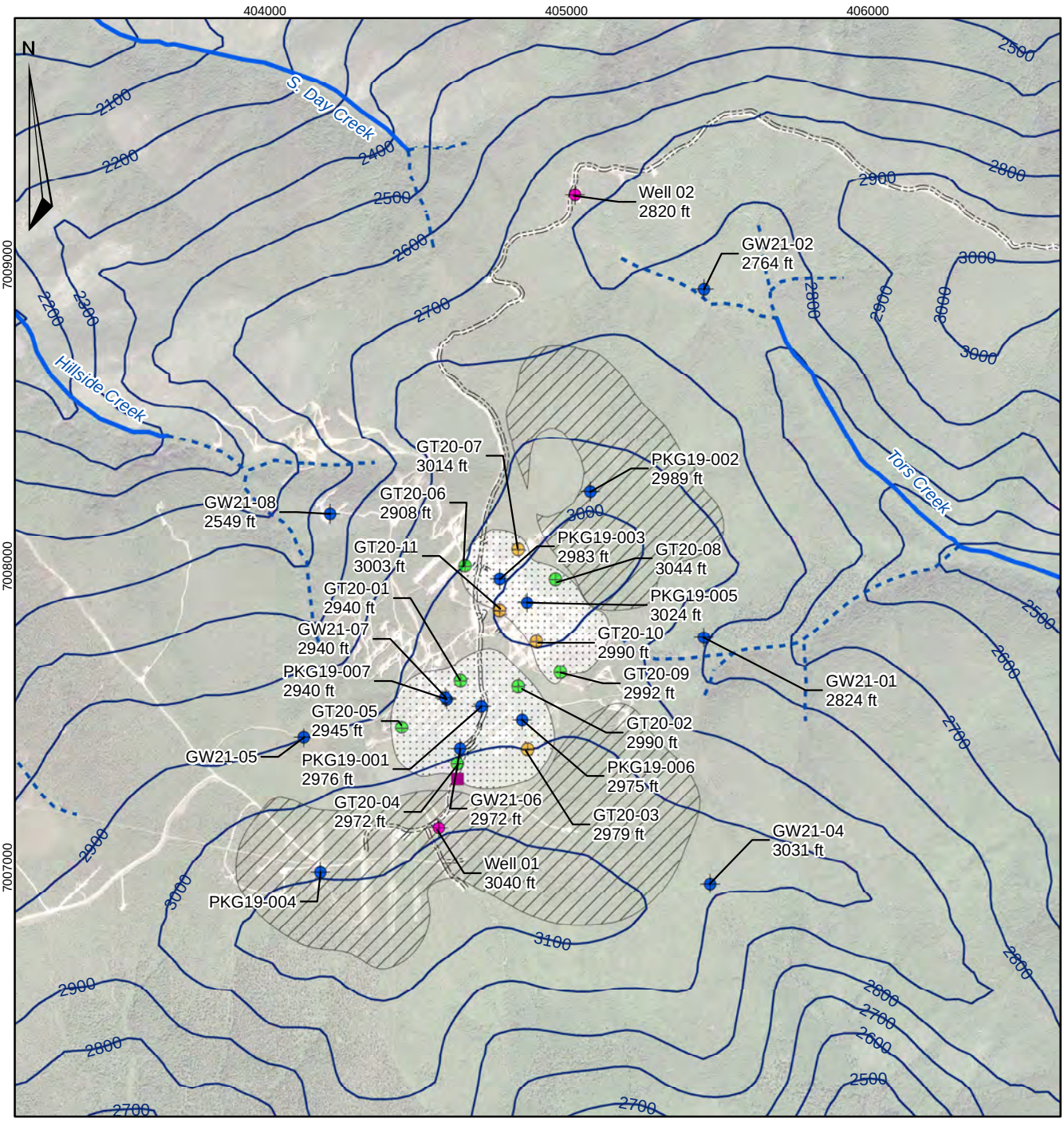
PEAK GOLD LLC
MANH CHOH PROJECT – TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL SECTION B - B' ALONG 404817 m E (1328138 ft E)

BY:	DATE:
SH/sl	NOV 21
APPROVED:	FIG:
MLS	3.3

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 4.1 Monitoring, Seeps, Potentiometric Surface v2.mxd



Legend

Geotech Holes
- VWP
- VWP and Thermistor

Groundwater Wells
- GW Monitoring Well
- Water Supply Well
- Groundwater Seep

- Water Table Contours (ft-amsl)
- Inferred or Intermittent Streams
- Stream
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas
- Site Road

0 500 1,000 2,000 3,000 ft

1:20,000

Coordinate System: NAD 1983 UTM Zone 7N

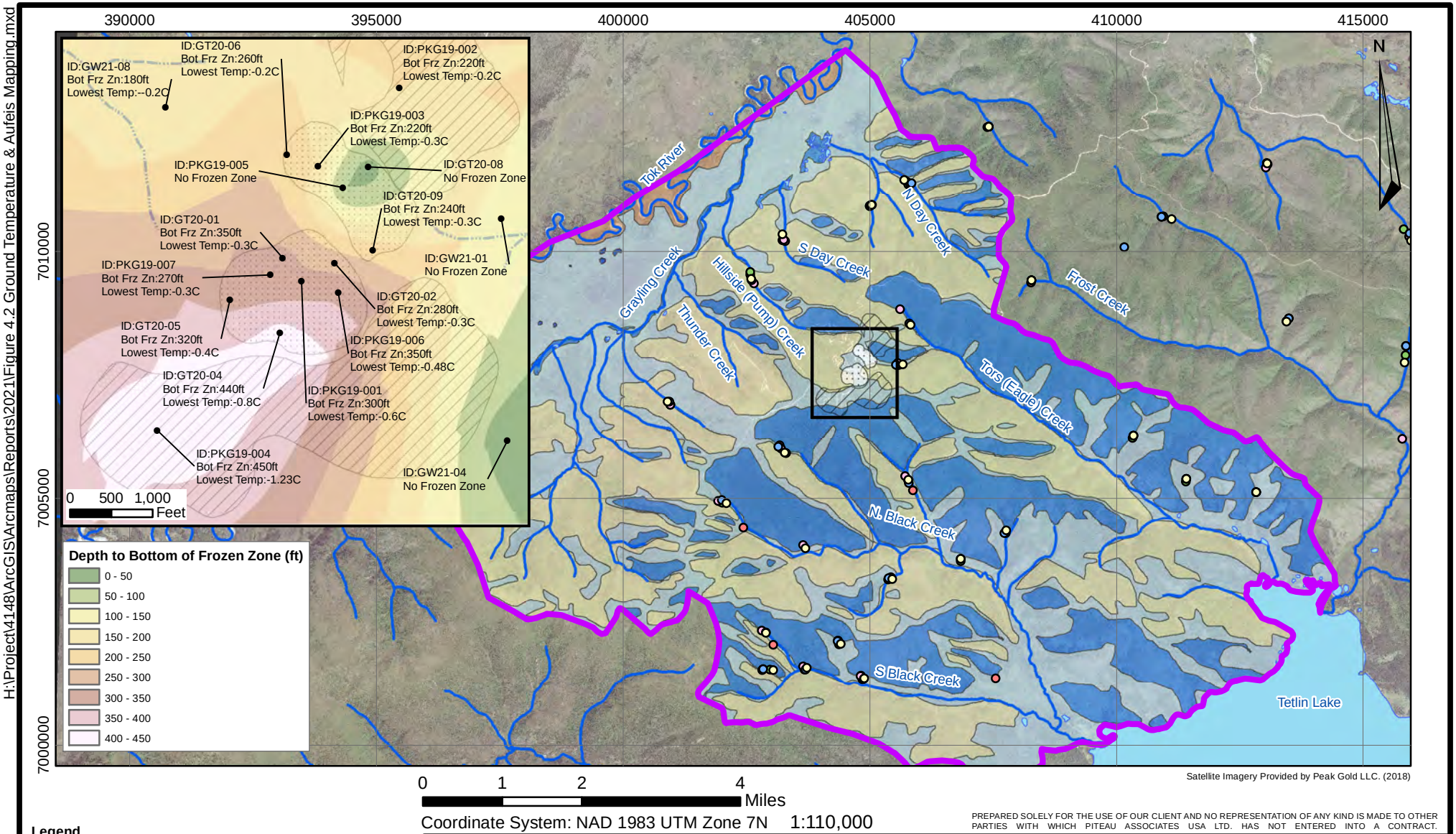
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GROUNDWATER MONITORING LOCATIONS AND POTENTIOMETRIC SURFACE

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	4.1



Satellite Imagery Provided by Peak Gold LLC. (2018)

Coordinate System: NAD 1983 UTM Zone 7N 1:110,000

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

Legend

- Cumulative Effects Study Area
- Proposed Manh Choh Pits
- Proposed Waste Rock Storage Areas
- Rivers and Streams
- Icings/Aufeis (2016)
- Icings/Aufeis (2017)
- Icings/Aufeis (2019)
- Icings/Aufeis (2020)
- Icings/Aufeis (2021)

Permafrost

- Absent
- Locally Discontinuous
- Locally Continuous (>90% permafrost)
- Open Talik

Note:
1) Aufeis mapping is based on Sentinel-2 satelite imagery, as interpreted by SRK (2021)

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

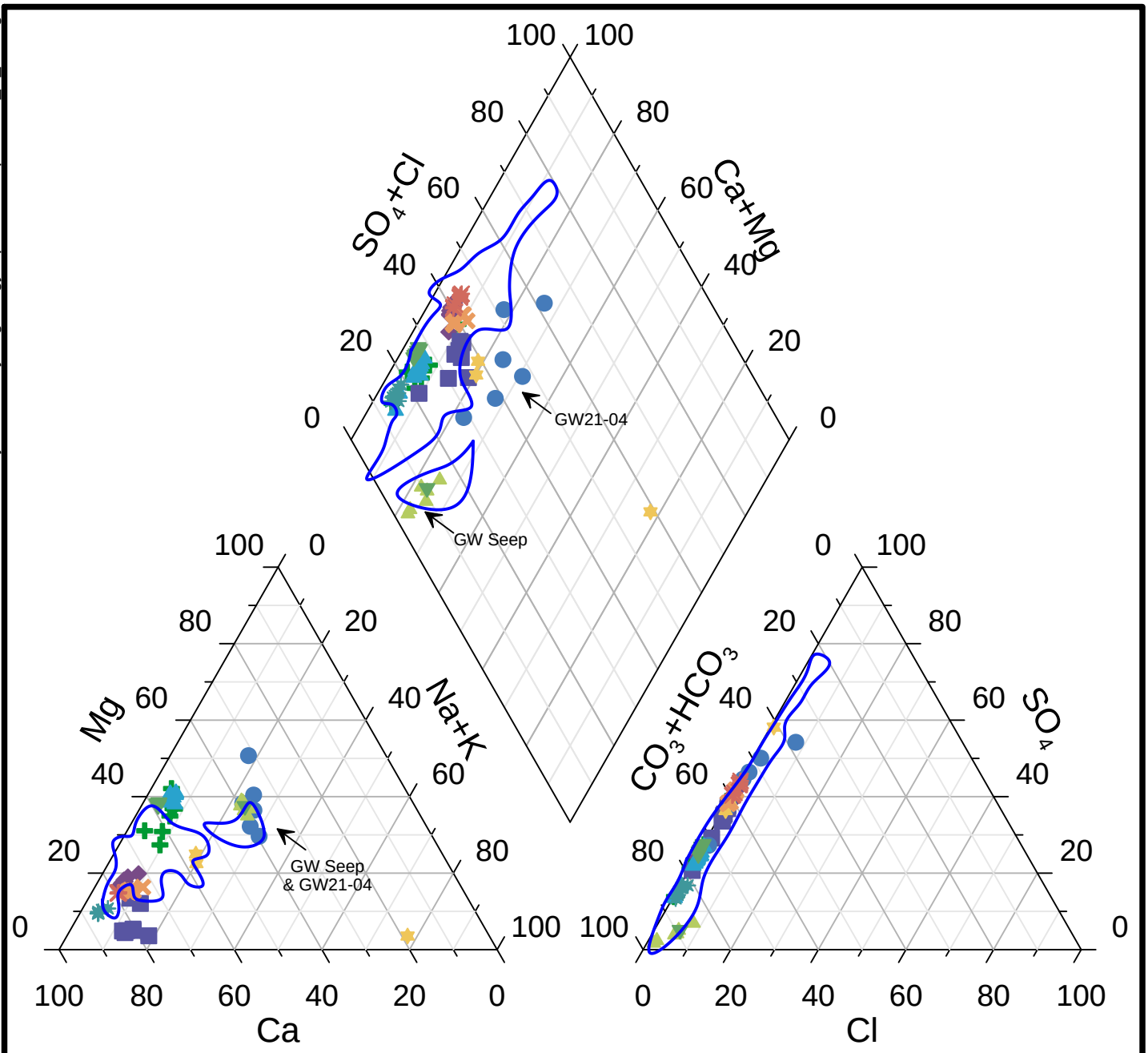
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

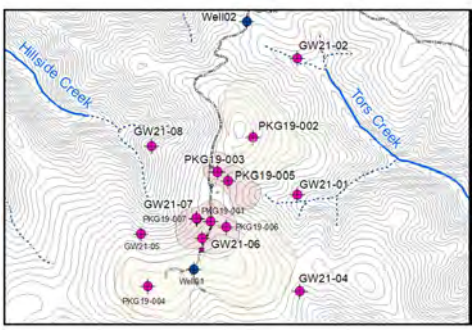
PRELIMINARY PERMAFROST, GROUND TEMPERATURE MAPPING AND AUFEIS OCCURRENCES

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
JM	4.2

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 4.2 Ground Temperature & Aufeis Mapping.mxd

H:\Project\4148\Hydrogeology\Piper Plots\Piper Plots_w_Inset.grf





Legend

- PKG19-002
- PKG19-003
- PKG19-005
- SEEP
- Well02
- GW21-01
- GW21-02
- GW21-04
- GW21-06
- GW21-07
- GW21-08
- Approximate Range of SW Samples

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

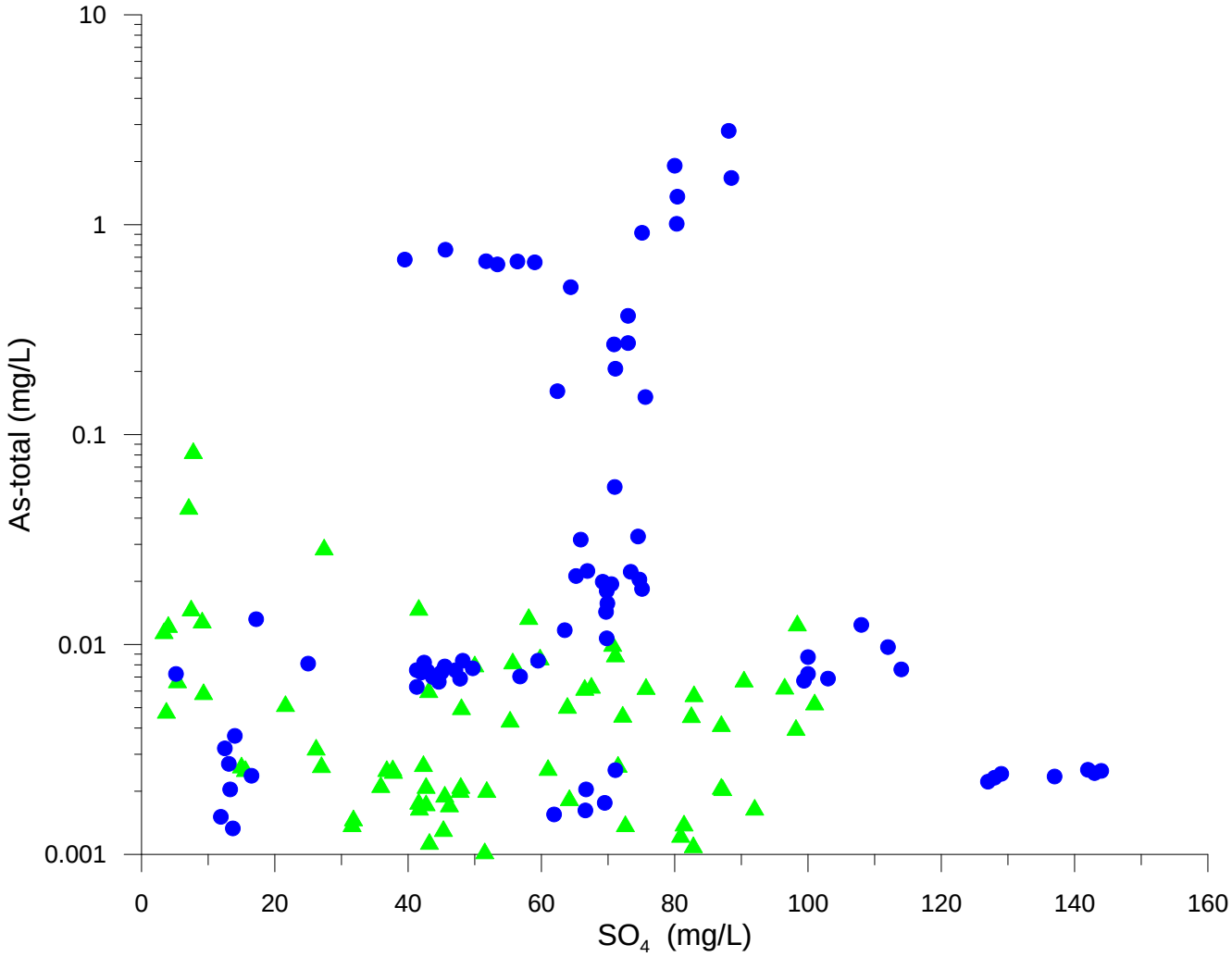
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

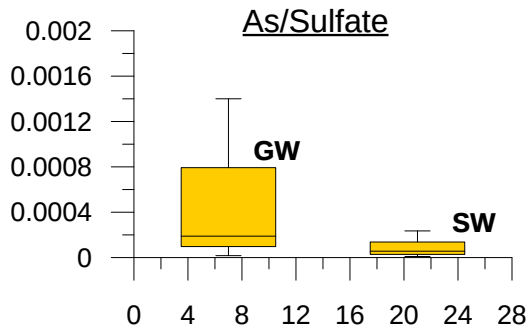
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

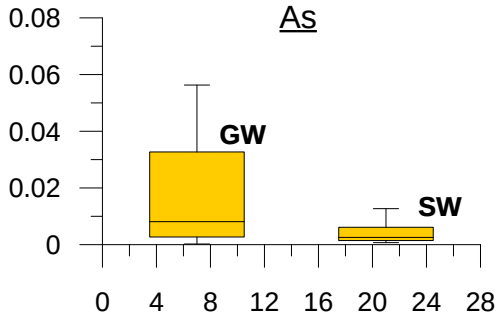
GROUNDWATER PIPER DIAGRAM

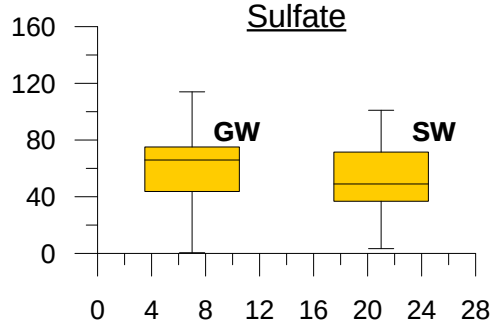
BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	4.3

H:\Project\4148\Water Chemistry Database\Tables\AsSO4 plot.grf









Legend

- Surface Water (SW)
- Groundwater (GW)

Note: Surface water quality samples from Hillside and Tors Creek; Groundwater quality samples from all wells at site.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

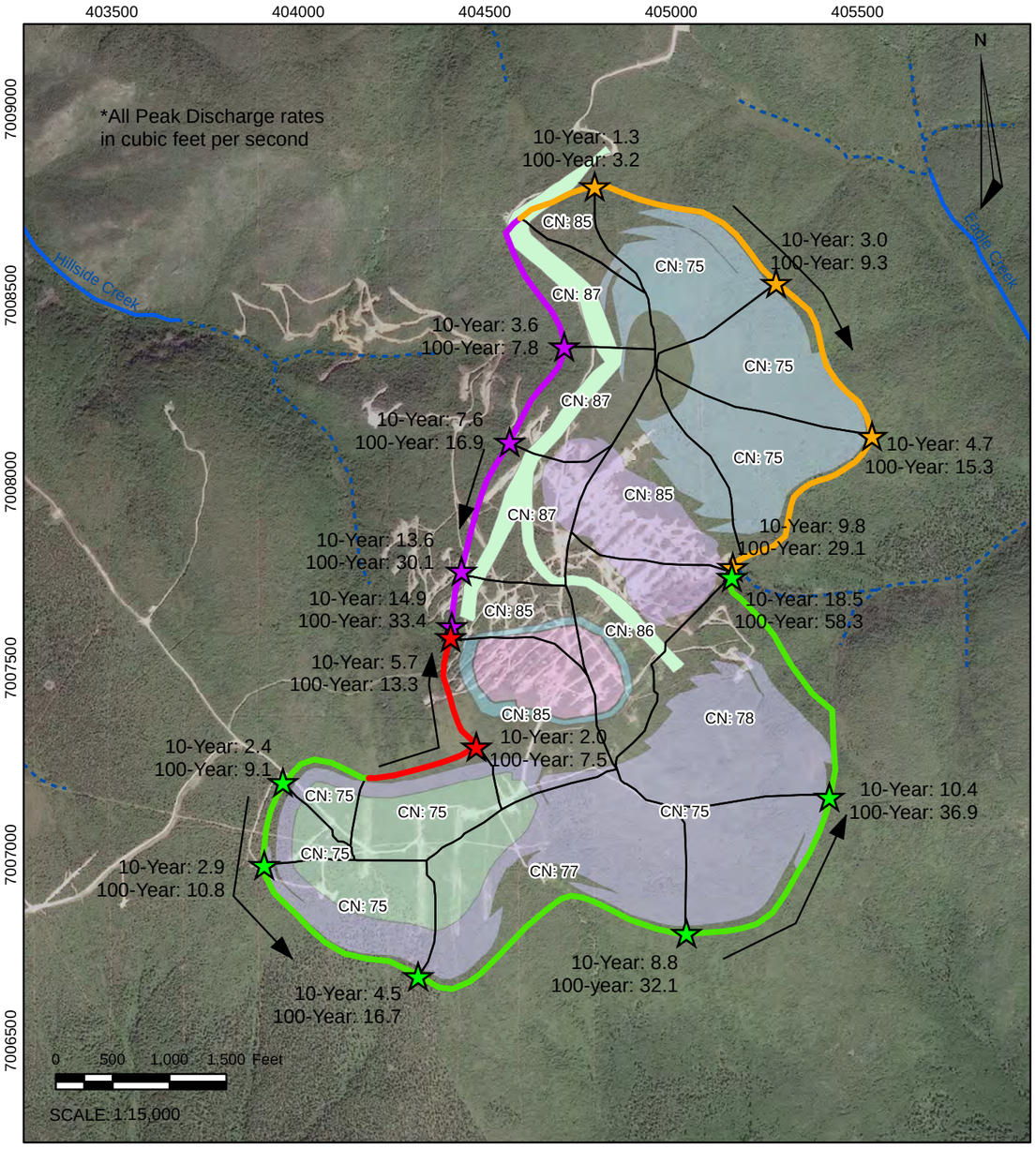
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

A COMPARISON OF ARSENIC AND SULFATE CONCENTRATIONS IN GROUNDWATER VERSUS SURFACE WATER

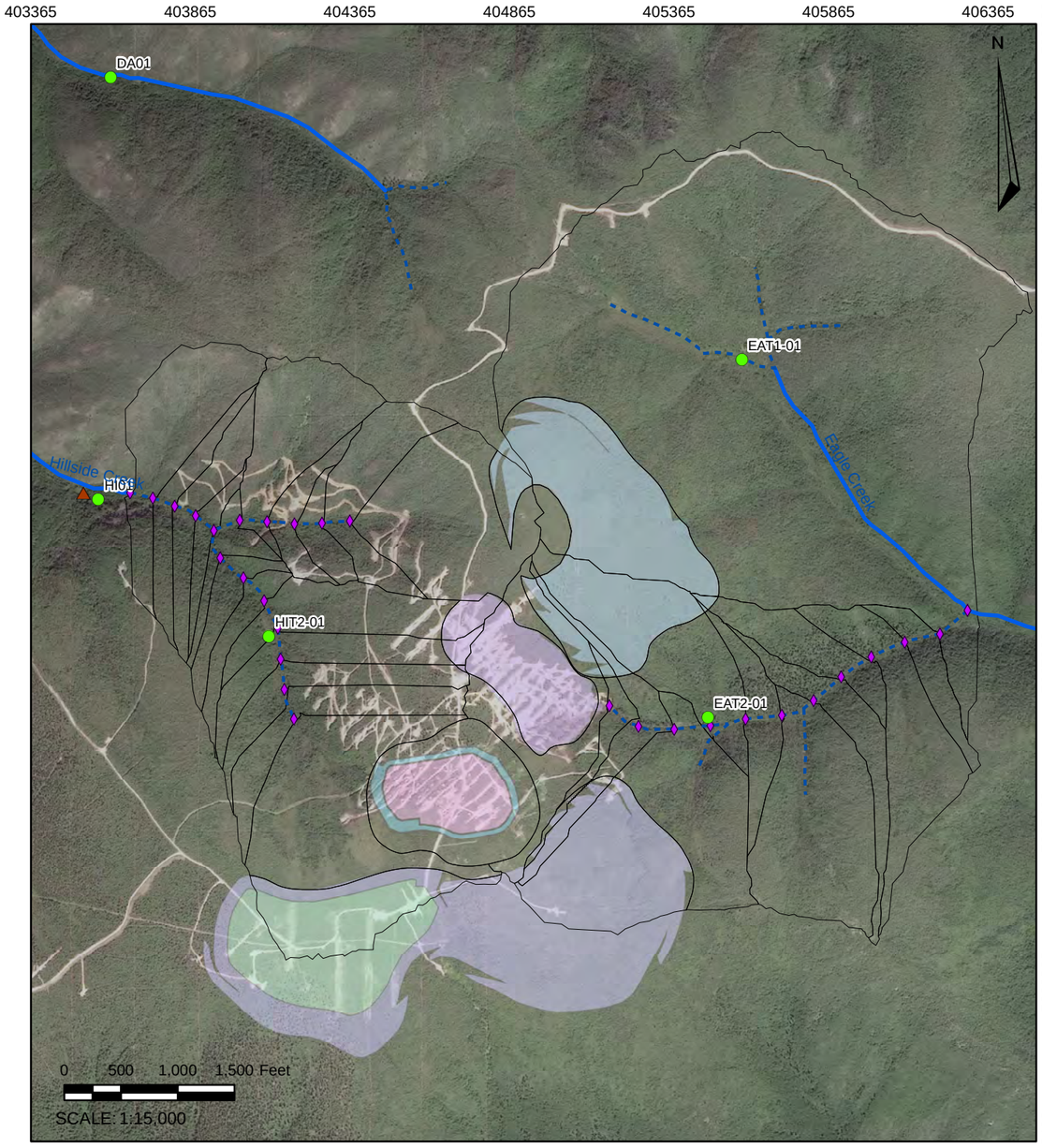
BY:	DATE:
JC	NOV 21
APPROVED:	FIG:
MLS	4.4

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 6.1 Catchments.mxd

OPERATIONAL SURFACE WATER MANAGEMENT CONFIGURATION



SURFACE WATER CATCHMENTS FOR POST-CLOSURE MODELLING



South Channel to Main Pit
South Channel to North Pit
North Channel to North Pit
North Channel to Main Pit
Basins
Mine Roads

MaxMainPitWallArea
MainPeakBackfillPolygon
MainNAGWRDlessPAG
MainPAGWRD
MainNAGWRD
NorthPeakBackfillArea

Stream
Inferred or Intermittent Streams
Active Surface Water Monitoring Location
Model Monitoring Points

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

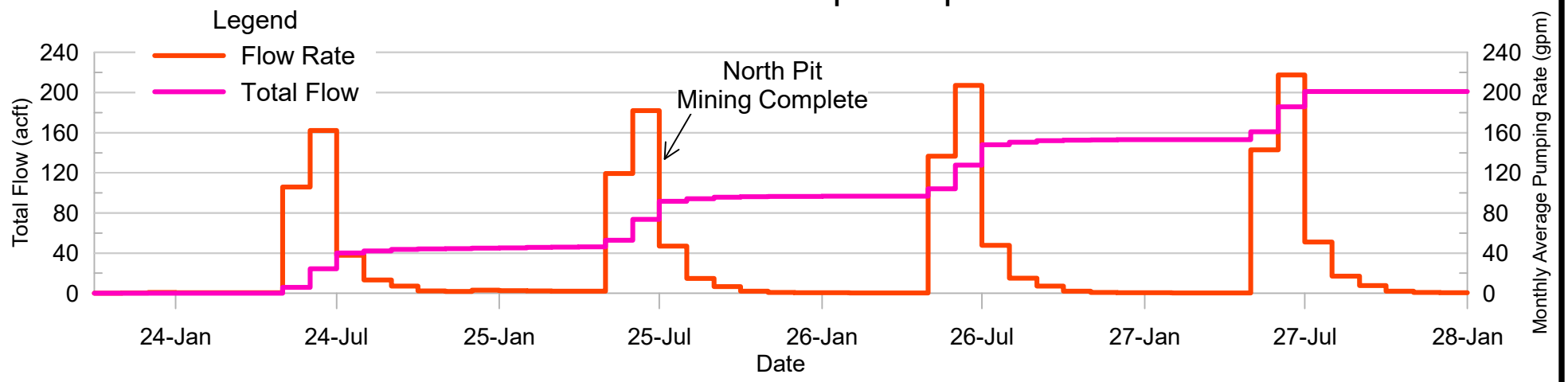
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

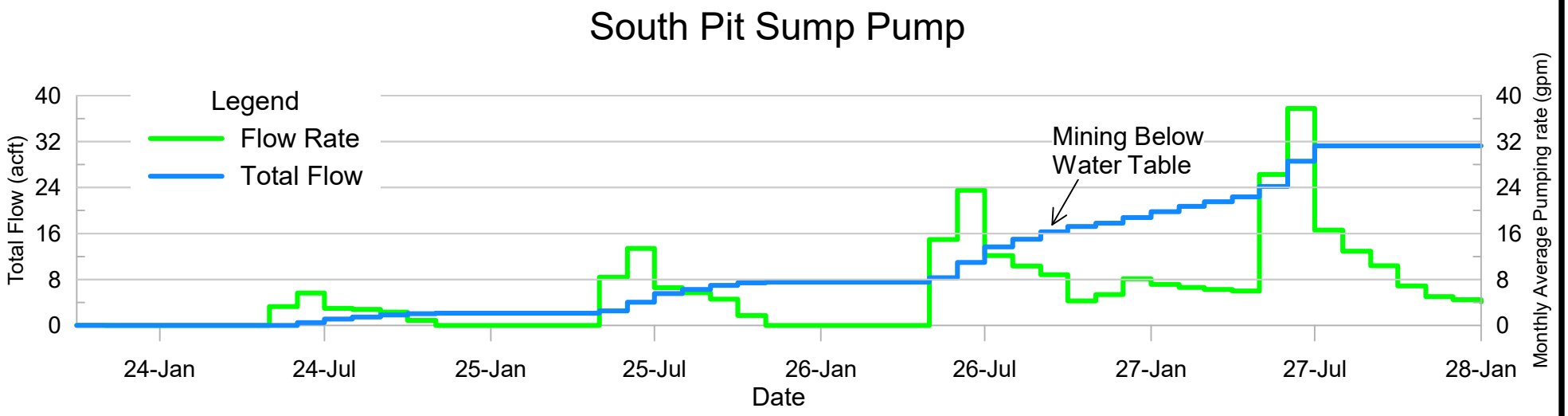
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER CATCHMENTS AND STORMFLOWS FOR SITE PERIMETER TRENCHES; SURFACE WATER CATCHMENTS FOR SITE CLOSURE CONFIGURATION

BY:	DATE:
MLS	NOV 21
APPROVED:	FIG:
MLS	6.1

H:\Project\4148\Water Balance\Figure 6.2 Monthly Sump Flows.grf





PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

Note: Flows to the pit sumps incorporates total runoff to the perimeter ditches, groundwater seepage and pit wall runoff to the open pits.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

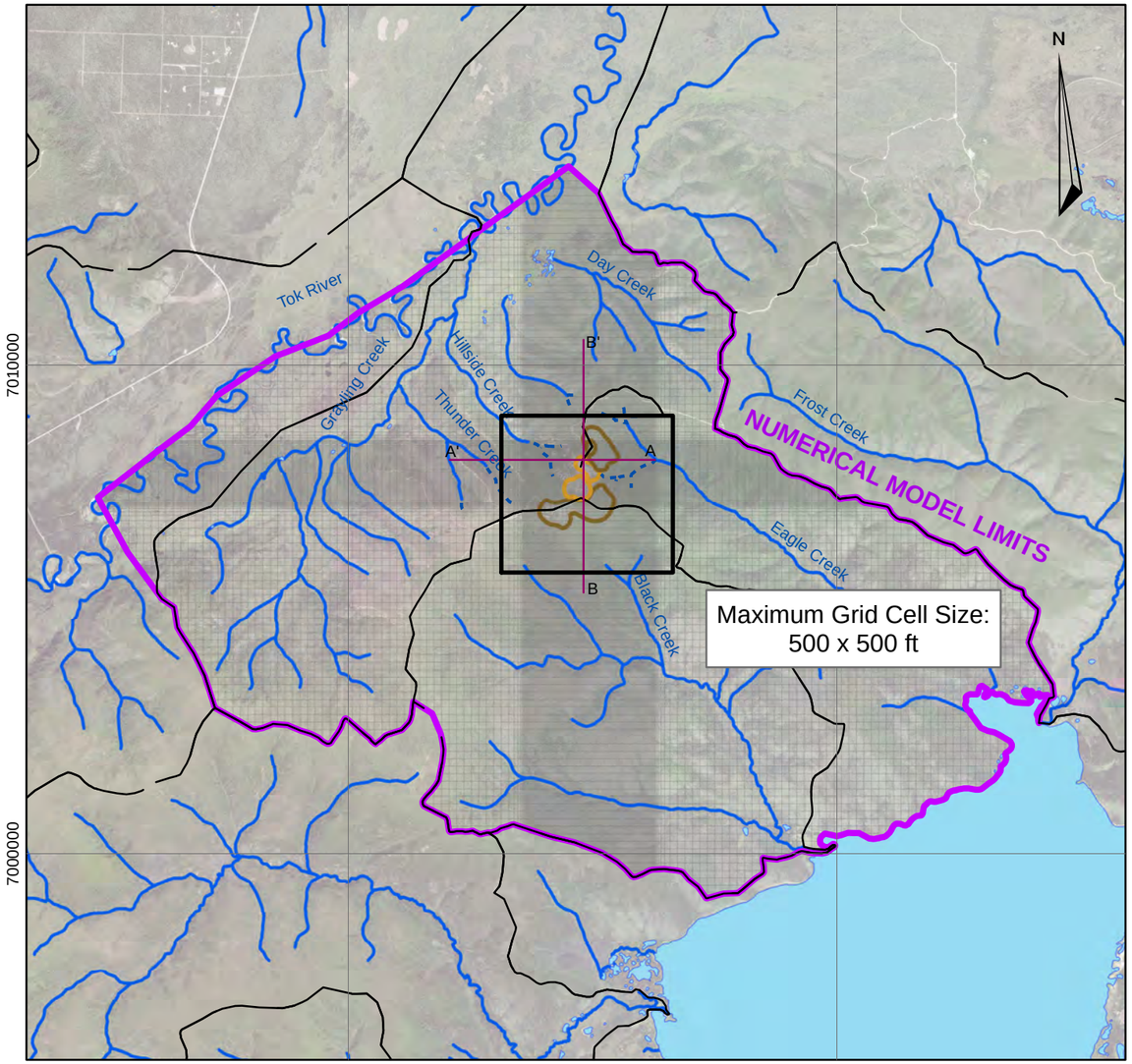
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

WATER BALANCE FLOW RATES AND ACCUMULATED FLOWS

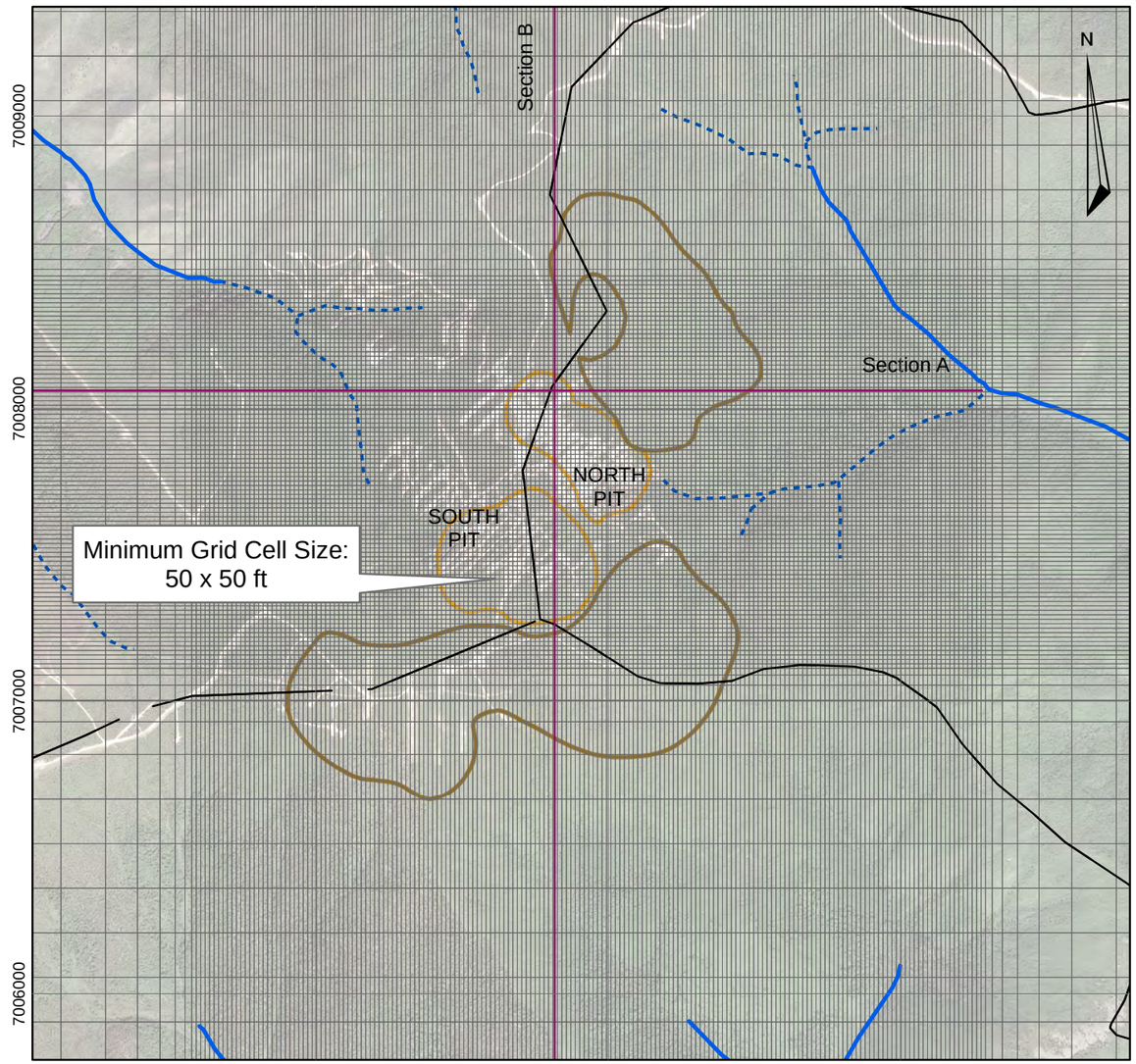
BY:	DATE:
JC	NOV 21
APPROVED:	FIG:
MLS	6.2

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure 7.1 Model Grid.mxd

Model Area



Detail of Site Area (inset map)



- Numerical Model Boundary
- Numerical Model Grid Cell
- Proposed Manh Choh Pit
- Proposed Waste Rock Area
- NHD Hydrographic Basin Boundary
- Mapped Stream
- Inferred/Intermittent Stream
- Tetlin Lake

Coordinate System: NAD 1983 UTM Zone 7N

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

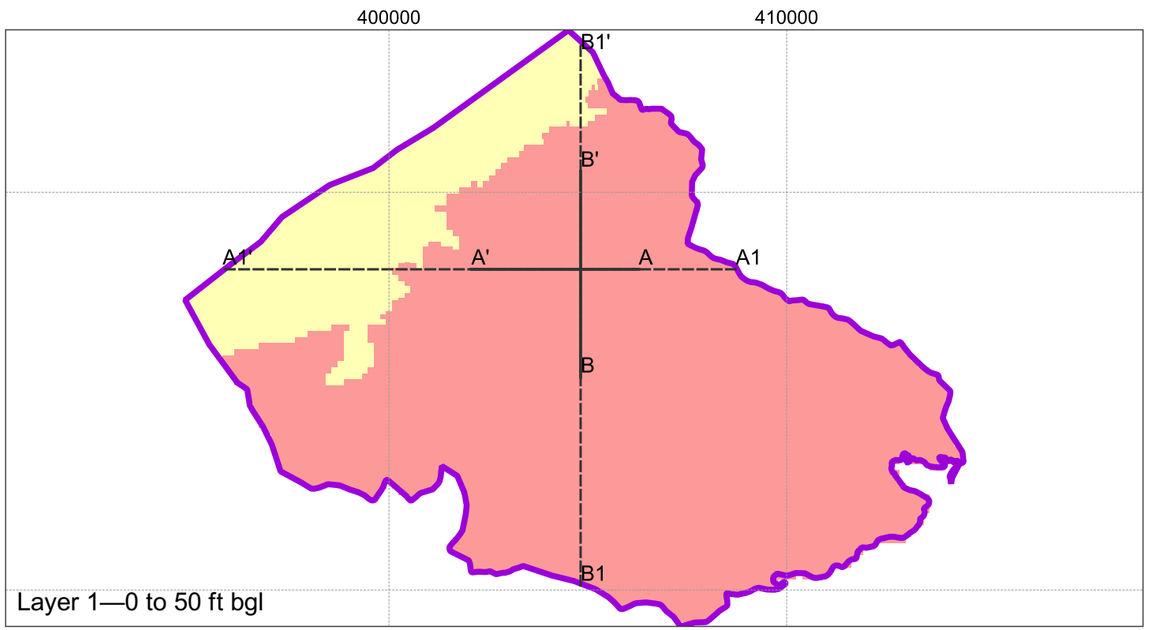
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

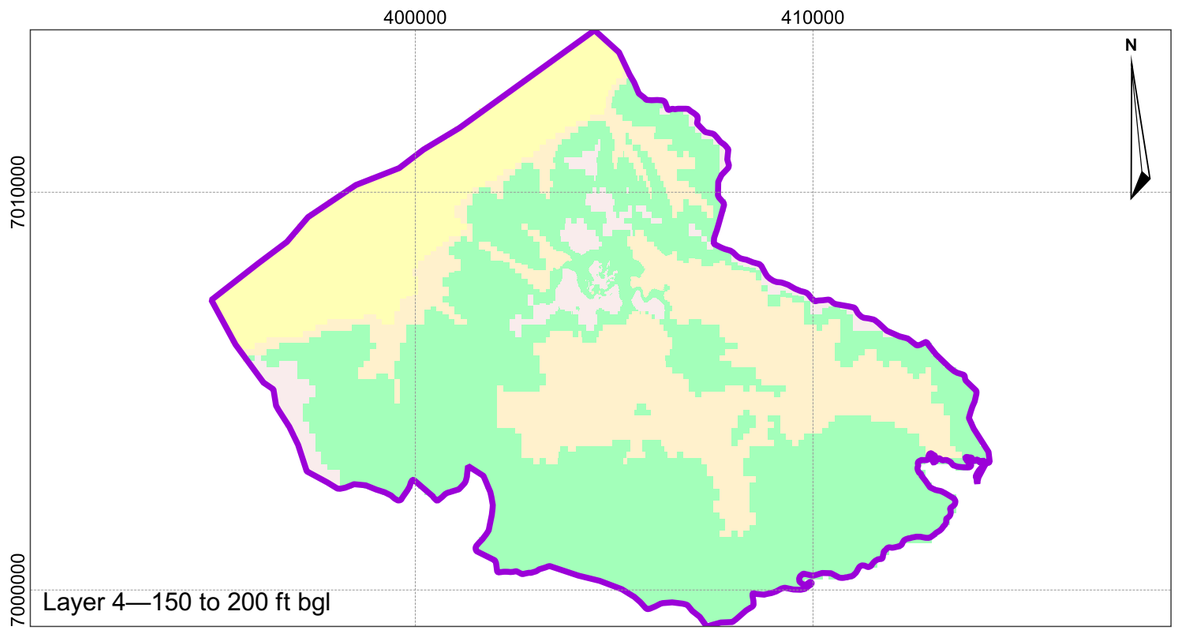
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

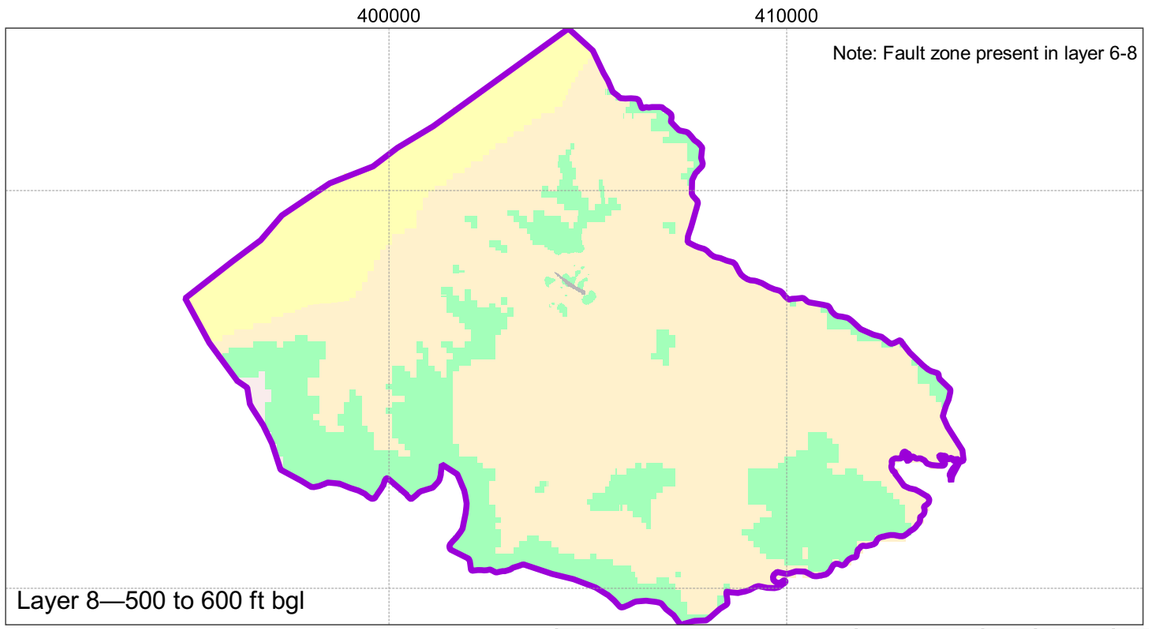
NUMERICAL GROUNDWATER MODEL GRID

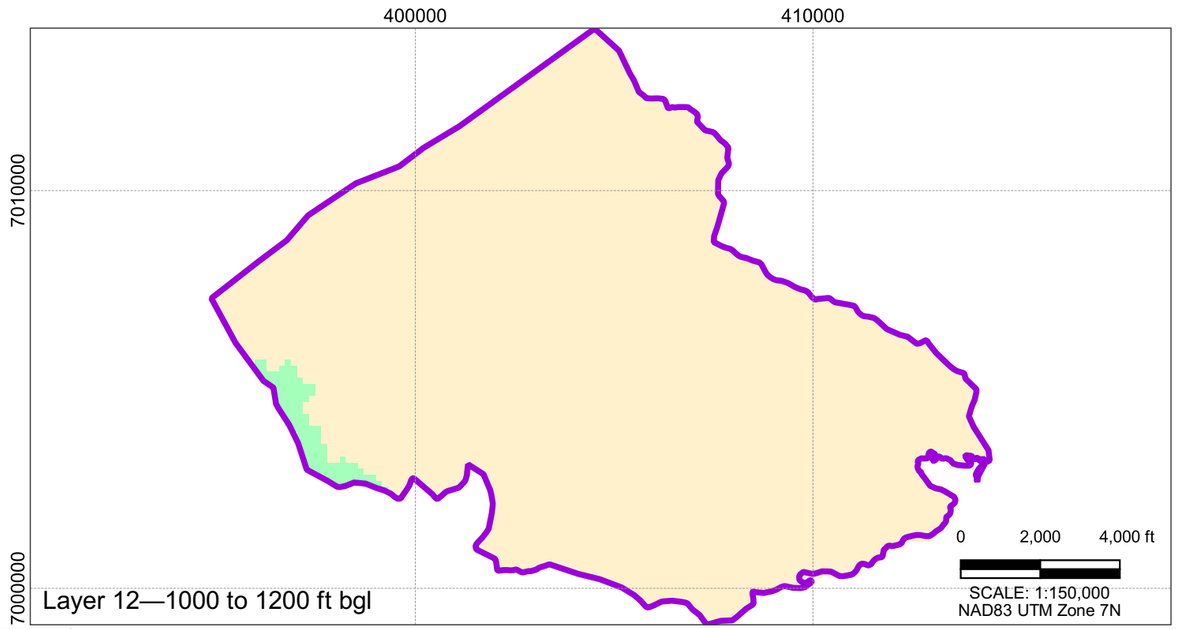
BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.1

H:\Projects\1449\ArcGIS\Arcmaps\Reports\2021\Hydrogeological Characterization\20211004_ModelFigures.mxd









Legend

- Numerical Groundwater Model Boundary
- Hydrogeological Section Lines
- Numerical Model Section Lines

Hydrostratigraphic Unit

- Tok Valley Overburden Sediments
- Fault Zone
- Weathered Oxide
- Oxide
- Transition
- Sulfide

Zone	Kh, Kz (ft/d)	Ss	Sy (%)	Porosity (%)
Tok Valley Overburden Sediments	2.83	5e-5	0.25	0.3
Fault Zone	0.015	2e-6	0.02	0.03
Weathered Bedrock at Surface	0.283	2e-6	0.02	0.03
Oxide	0.009	1e-6	0.01	0.015
Transition	0.001	1e-6	0.01	0.015
Sulfide	0.001	1e-6	0.01	0.015
Pit Backfill (Closure Only)	283	5e-5	0.25	0.3

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

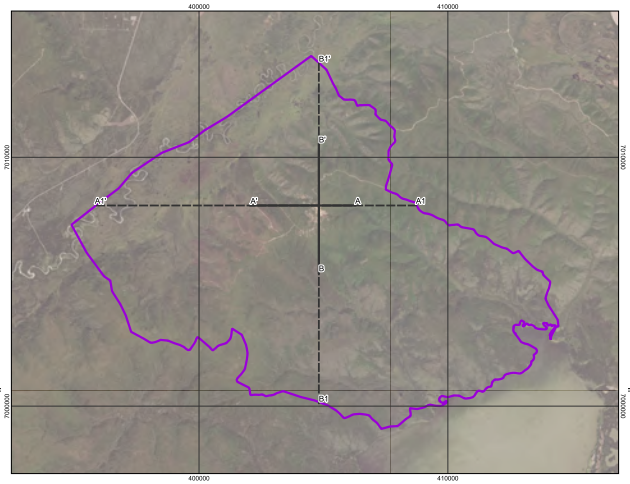
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

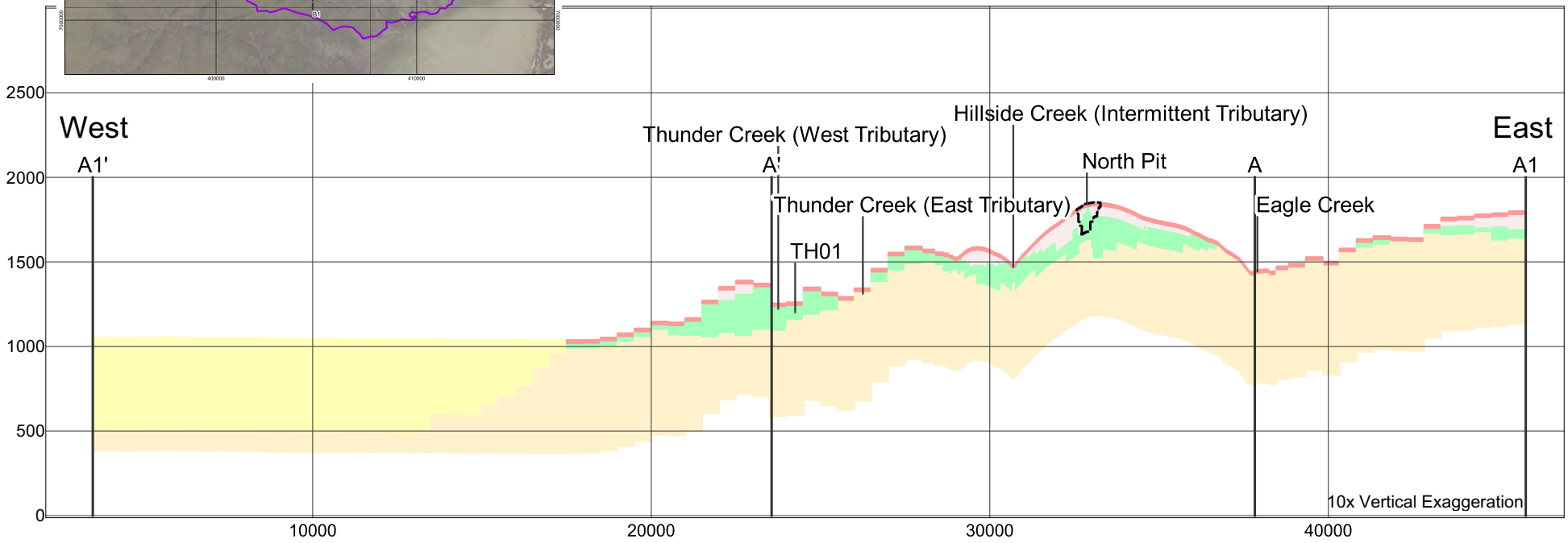
HYDRAULIC PARAMETER ZONES

BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.2

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Hydrogeological Characterization\20210929 ModelSections.aqz



Zone	Kh,Kz (ft/d)	Ss	Sy (%)	Porosity (%)
Tok Valley Overburden Sediments	2.83	5e-5	0.25	0.3
Fault Zone	0.015	2e-6	0.02	0.03
Weathered Bedrock at Surface	0.283	2e-6	0.02	0.03
Oxide	0.009	1e-6	0.01	0.015
Transition	0.001	1e-6	0.01	0.015
Sulfide	0.001	1e-6	0.01	0.015
Pit Backfill (Closure Only)	283	5e-5	0.25	0.3



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

Legend

- SectionA_pits
- Hydrostratigraphic Unit
  - Tok Valley Overburden Sediments
  - Weathered Oxide
  - Fault Zone
  - Oxide
  - Transition
  - Sulfide

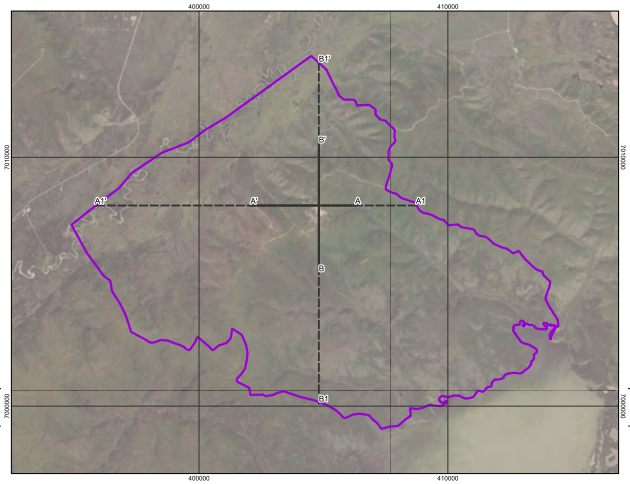
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

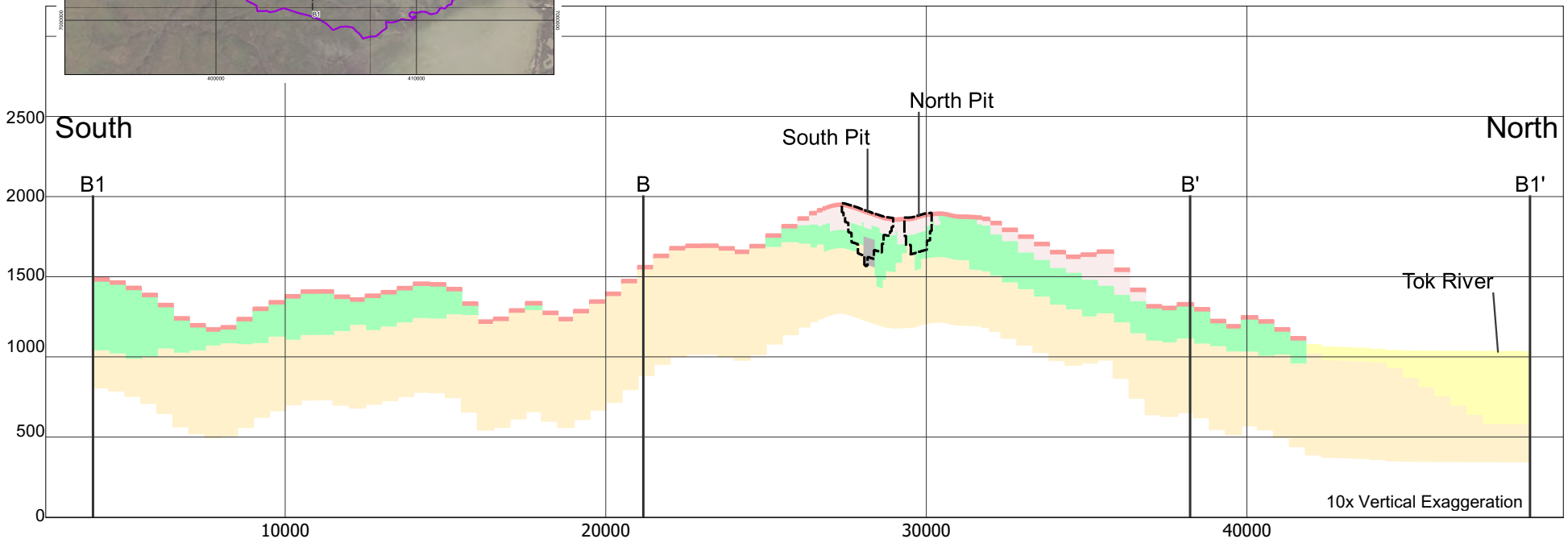
MODEL CROSS SECTION A1-A1'

BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.3

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Hydrogeological Characterization\20210929 ModelSections.aqz



Zone	k (ft/day)	Ss	Sy	Porosity
Tok River Valley Overburden	2.83	5e-05	0.25	0.3
Fault Zone	0.015	2e-06	0.02	0.03
Weathered Bedrock at Surface	0.283	2e-06	0.02	0.03
Oxide	0.009	1e-06	0.01	0.015
Transition	0.001	1e-06	0.01	0.015
Sulfide	0.001	1e-06	0.01	0.015
Pit Backfill (Closure Only)	283	5e-05	0.25	0.3



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

Legend

- SectionB_pits
- Hydrostratigraphic Unit
  - Tok Valley Overburden Sediments
  - Fault Zone
  - Weathered Oxide
  - Oxide
  - Transition
  - Sulfide

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

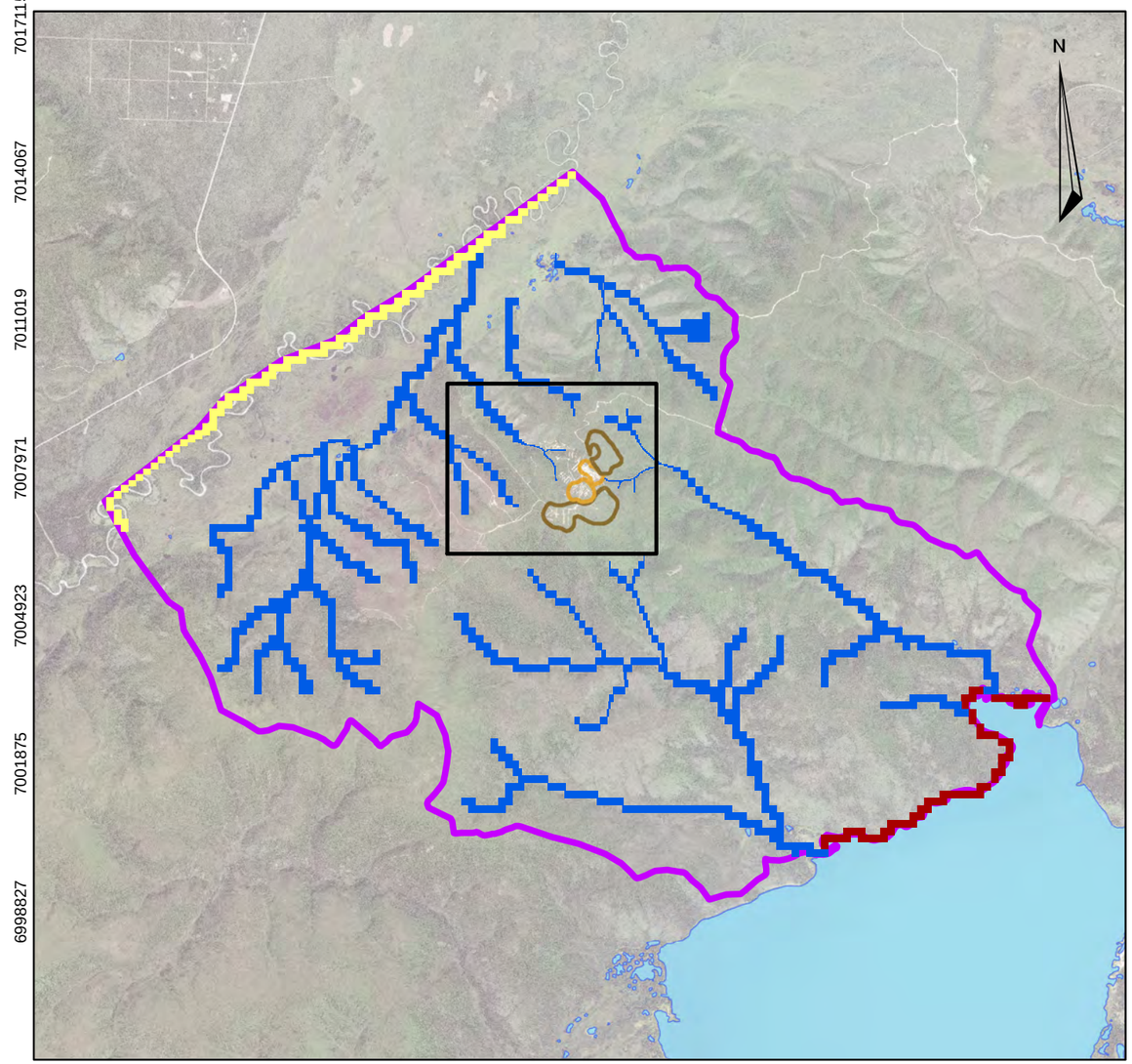
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

MODEL CROSS SECTION B1-B1'

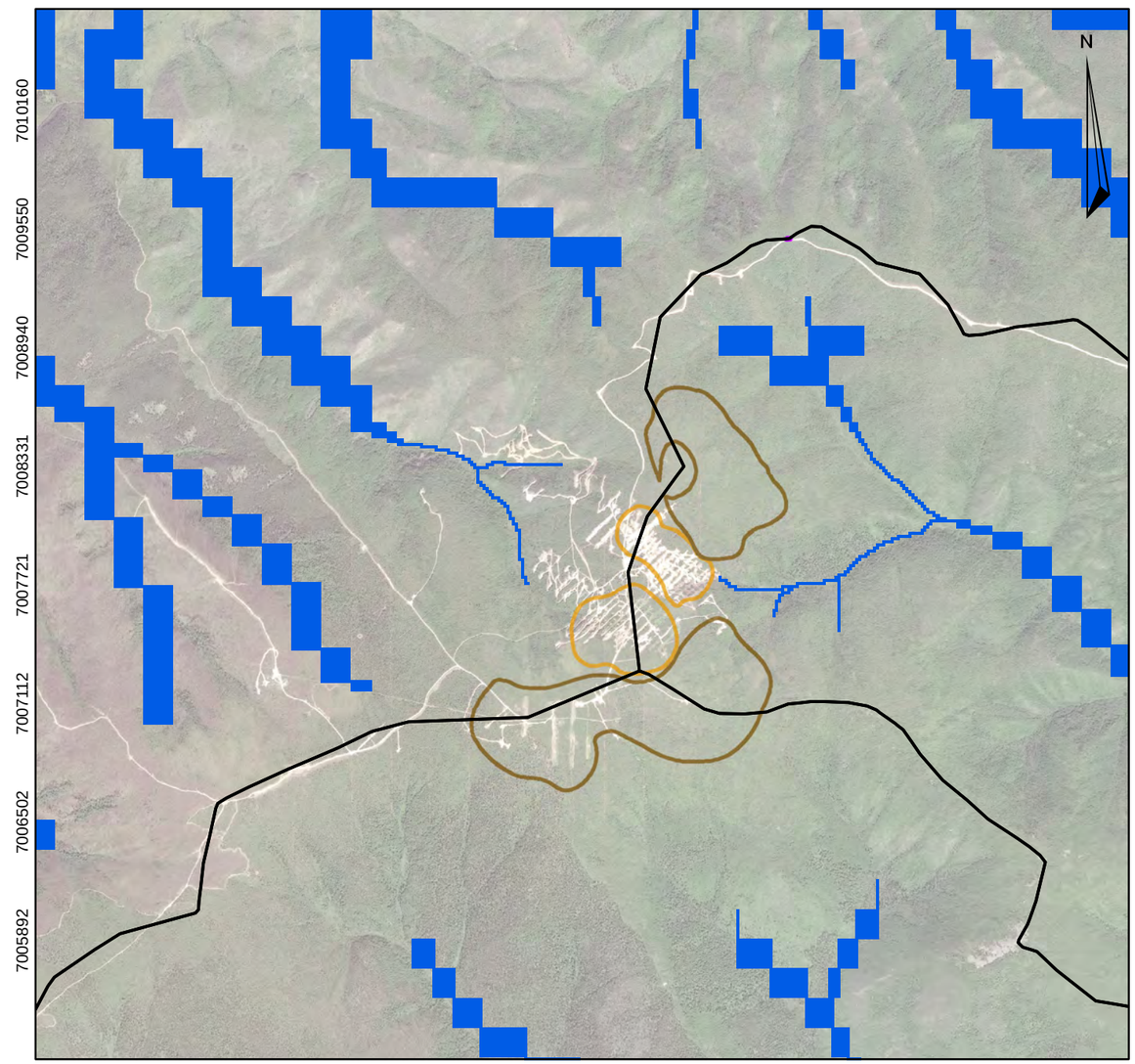
BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.4

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Figure7.5 Boundary Conditions.mxd

Model Area



Inset Map



- River Boundary (Tok River)
- Constant Head Boundary (Tetlin Lake)
- Drain Boundary (Stream)
- Numerical Model Boundary
- NHD Hydrographic Basin Boundary
- Proposed Manh Choh Pit
- Proposed Waste Rock Area
- Tetlin Lake

Coordinate System: NAD 1983 UTM Zone 7N

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

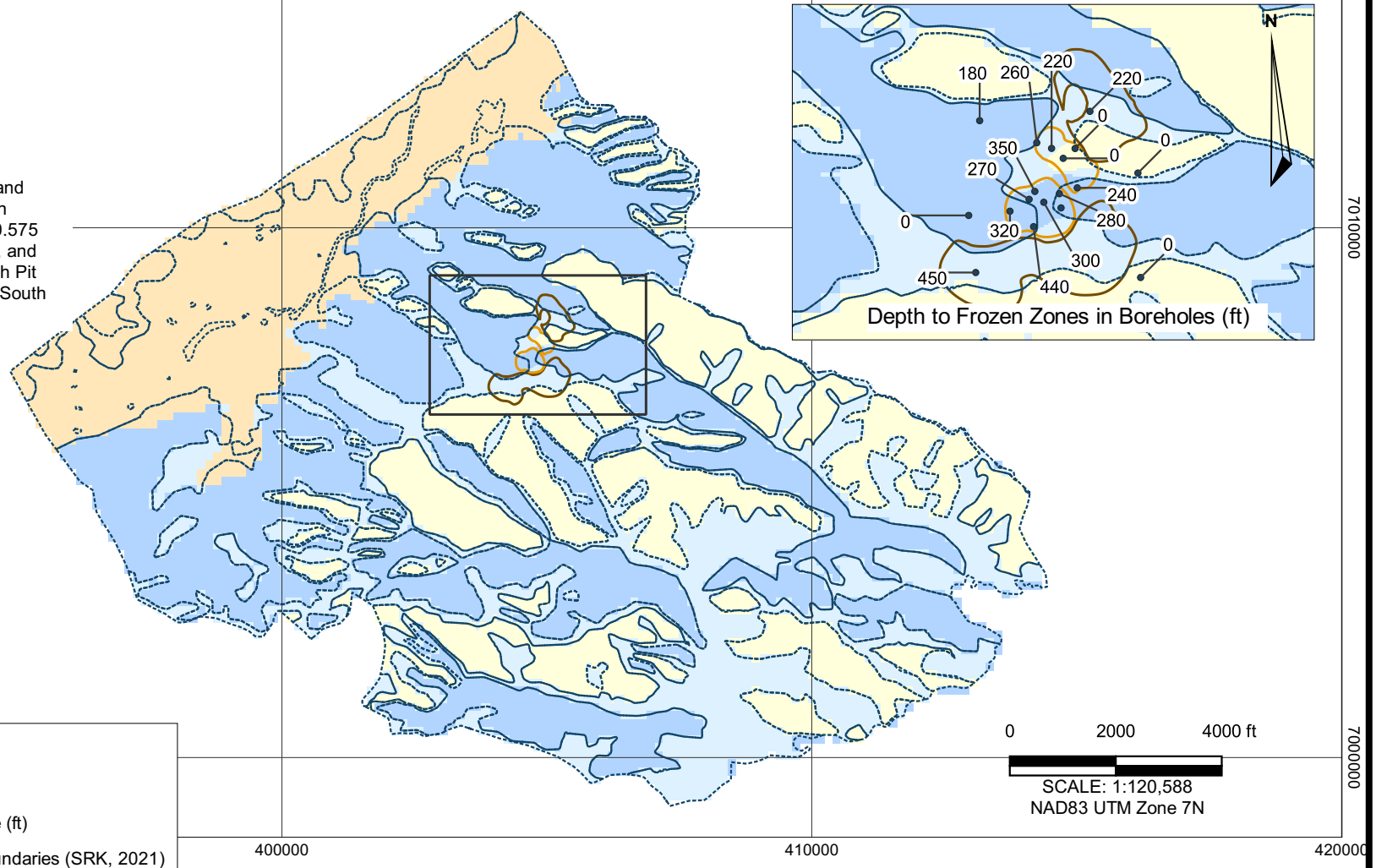
GROUNDWATER MODEL BOUNDARY CONDITIONS

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.5

H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Hydrogeological Characterization\20211004_ModelFigures.aqz

Zone	Recharge Rate (in/yr)
1	0.01
2	0.4
3	1.3
4	2.6

Note: Simulated recharge to pits and waste rock piles reduced to zero in mining. Recharge to North Pit is 0.575 in/year (5% MAP) in early closure, and 0.23 in/year (2% MAP) once South Pit is closed. Base Case recharge to South Pit in closure is 0.805 in/year (7%



Legend

Recharge
- Depth to Base of Frozen Zone (ft)
- Mapped Permafrost Zone Boundaries (SRK, 2021)
- Proposed Waste Rock Area
- Proposed Manh Choh Pit

Model Recharge Zones
- Zone 1—Locally continuous permafrost
- Zone 2—Locally discontinuous permafrost
- Zone 3—Permafrost absent
- Zone 4—Open talik along Tok River

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

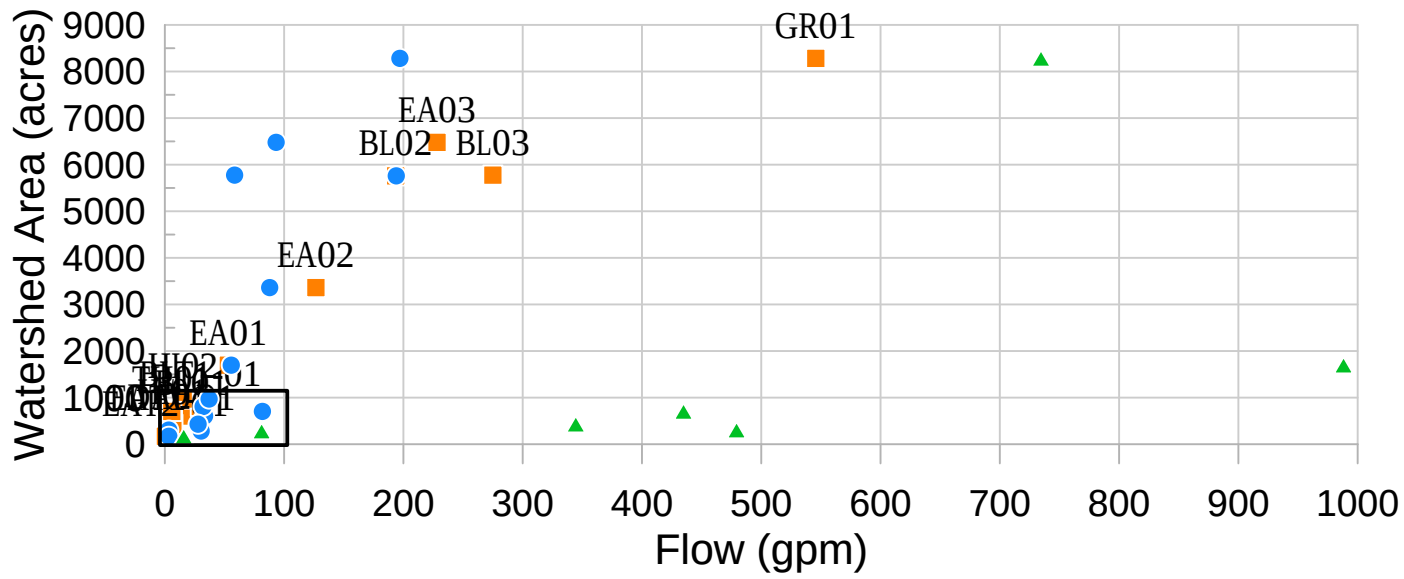
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

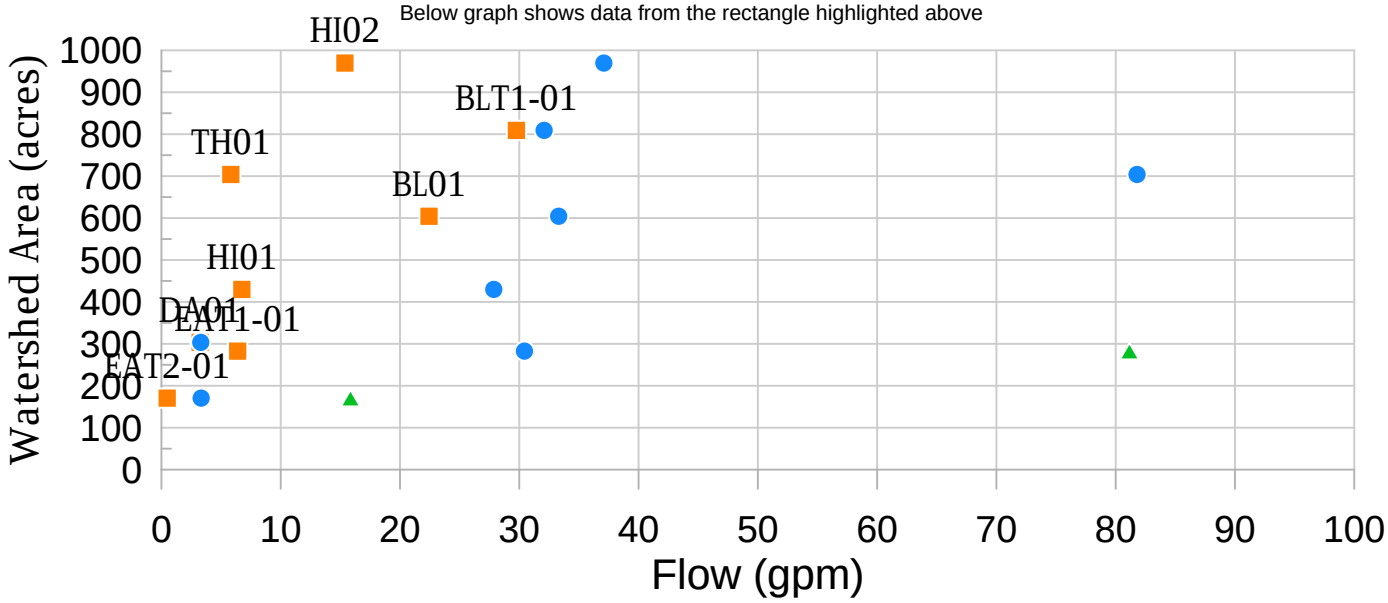
NUMERICAL MODEL RECHARGE ZONES

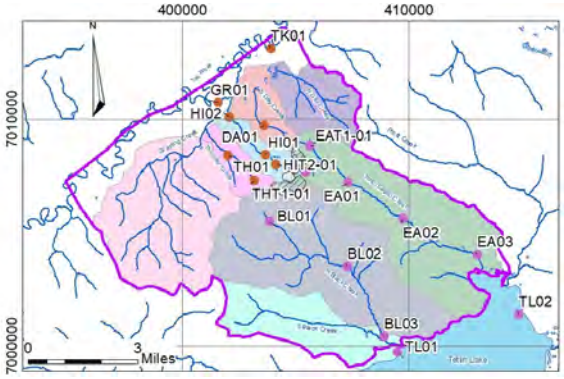
BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.6

H:\Project\4148\Modeling\Modflow\06_Targets\SS_Calibration_Flows.grf



Below graph shows data from the rectangle highlighted above





T56 Calibration: M:\4148\2021\SS-Cal\T56\Calibration_T56.xlsx

Legend

- Simulated Average Annual Flow
- Lowest Observed Flow
- Highest Observed Flow

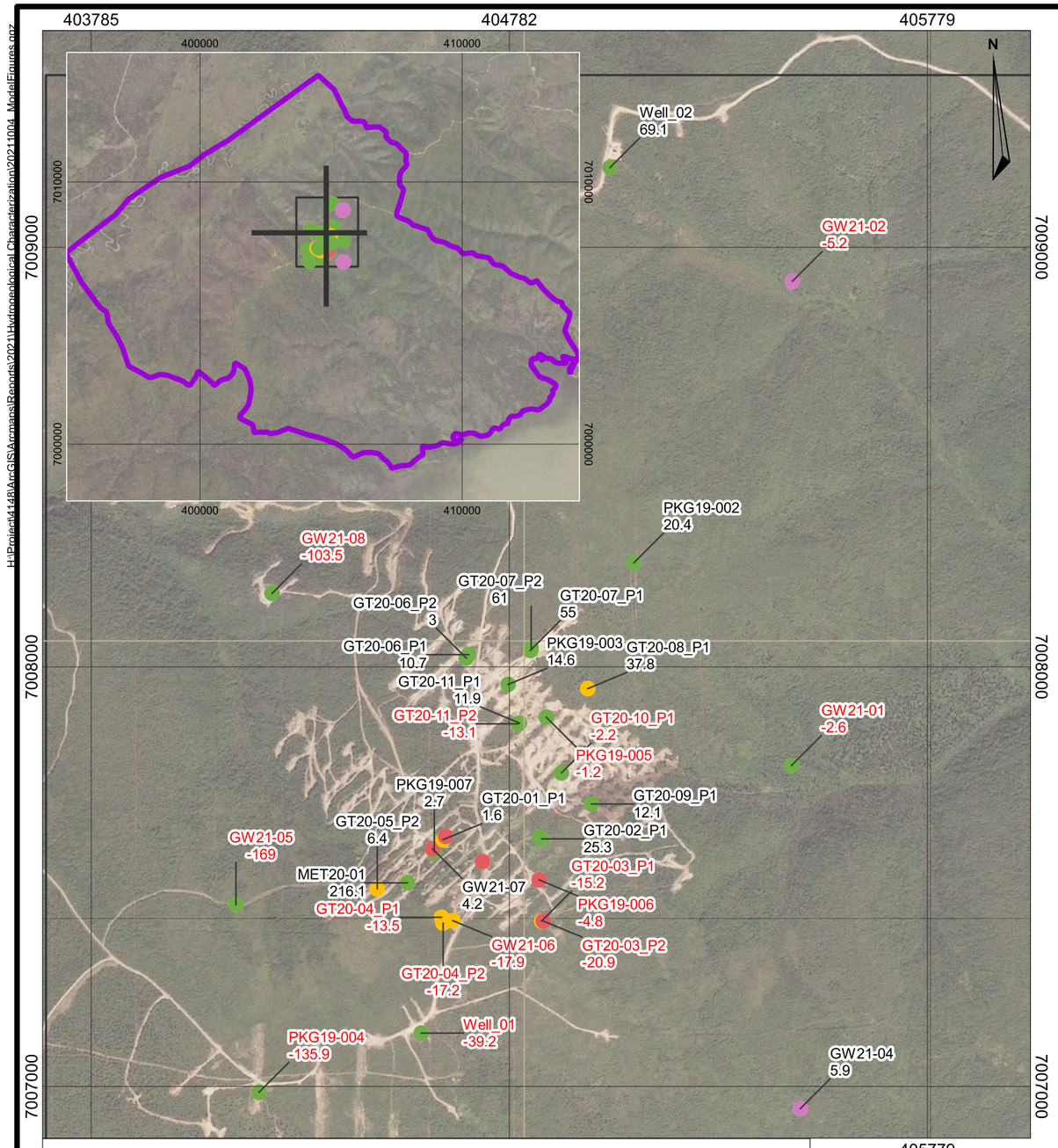
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SIMULATED VS OBSERVED STREAM FLOWS FOR STEADY-STATE CALIBRATION

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.7



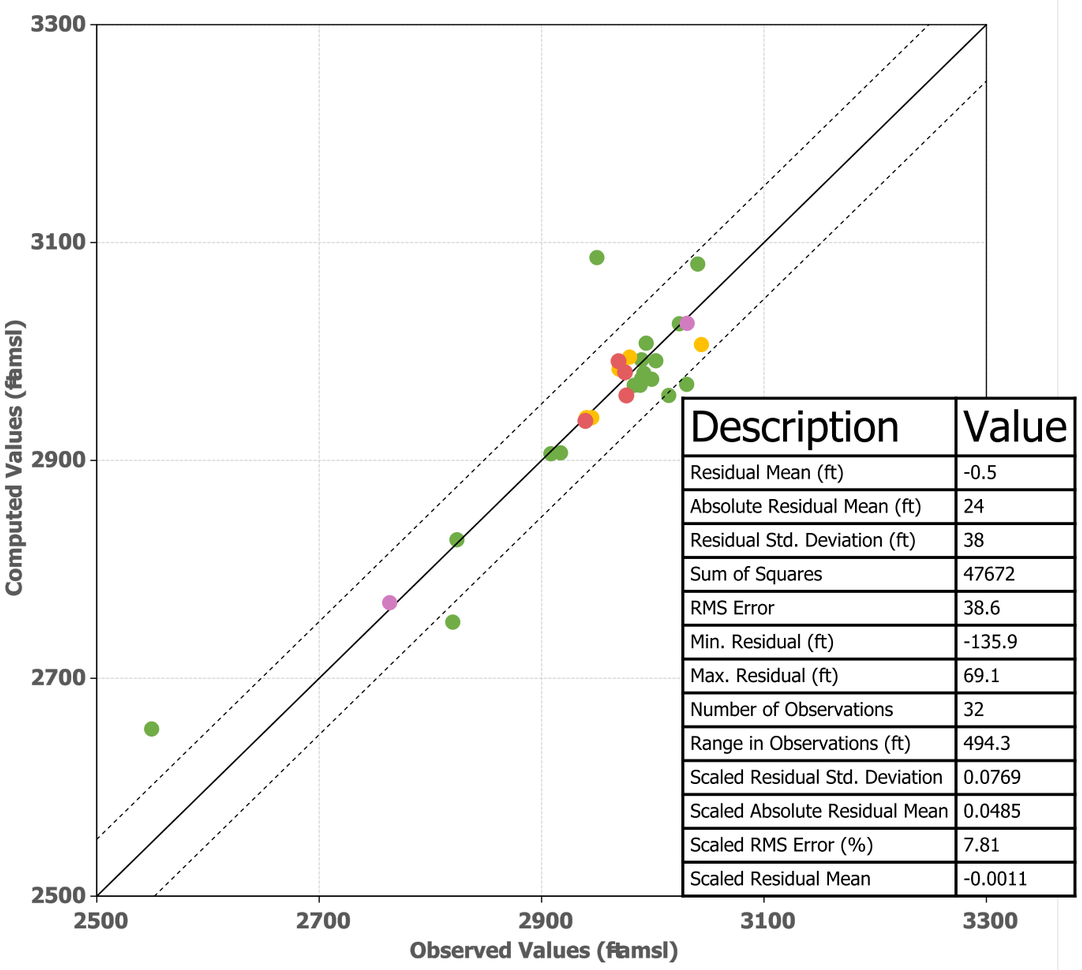
Legend

Calibration_T56 Wells with posted location and calibration residual in feet

- Zone 1 (Oxide)
- Zone 2 (Transition)
- Zone 3 (Sulfide)
- Zone 7 (Faullt zone)
- Numerical Groundwater Model Boundary

0 1,000 2,000 ft

SCALE: 1:12,500
NAD83 UTM Zone 7N



Description	Value
Residual Mean (ft)	-0.5
Absolute Residual Mean (ft)	24
Residual Std. Deviation (ft)	38
Sum of Squares	47672
RMS Error	38.6
Min. Residual (ft)	-135.9
Max. Residual (ft)	69.1
Number of Observations	32
Range in Observations (ft)	494.3
Scaled Residual Std. Deviation	0.0769
Scaled Absolute Residual Mean	0.0485
Scaled RMS Error (%)	7.81
Scaled Residual Mean	-0.0011

Model No: T56

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

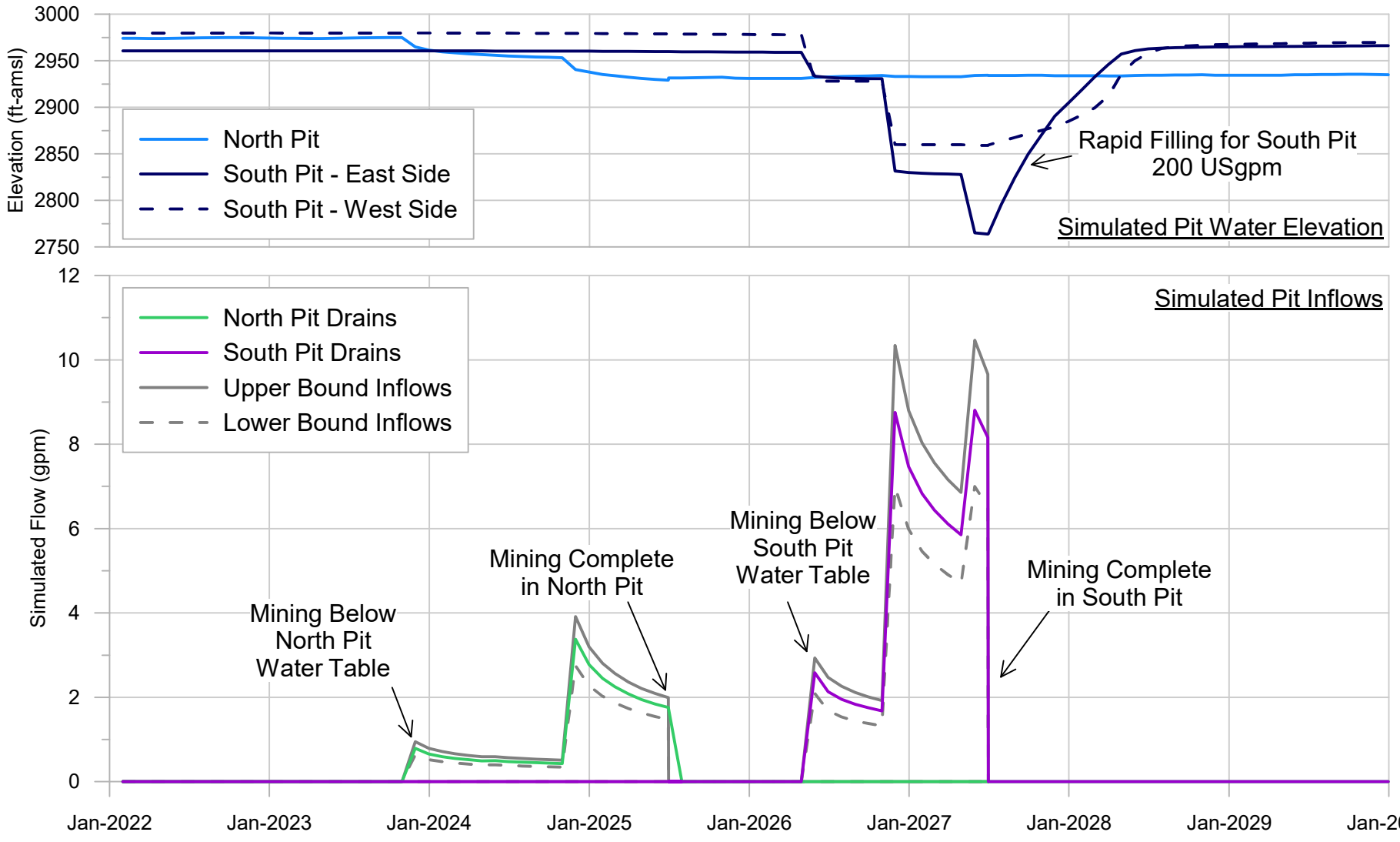
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

CALIBRATION RESIDUALS AND OBSERVED VS SIMULATED WATER LEVELS

BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.8

H:\Project\4148\Modeling\Modflow\14_Results\Flows_Heads_T56_P2a_P5b_P7c.grf



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

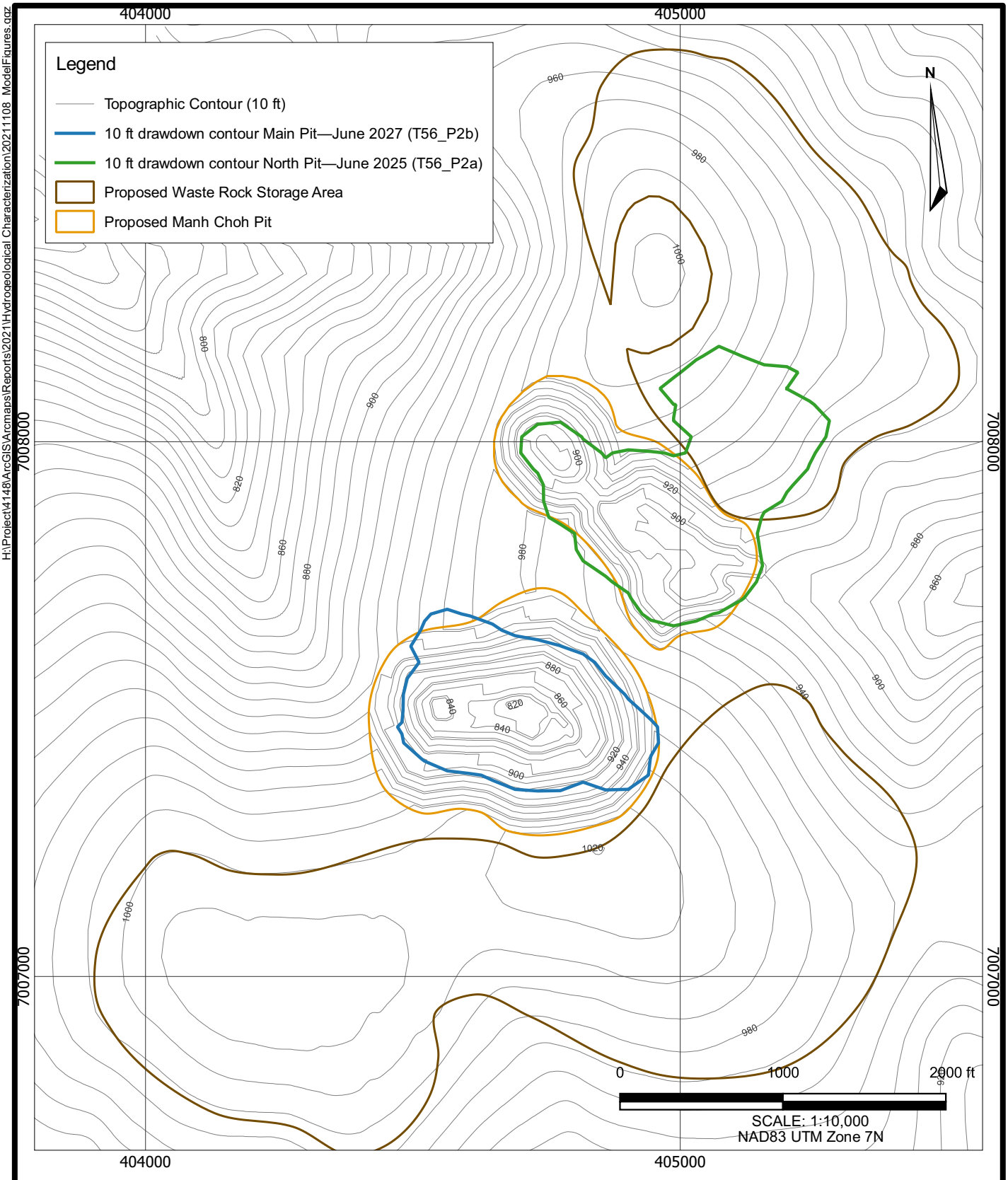
Note:
Groundwater inflow sensitivity analysis based on the high conductivity and recharge case for upper bound flows and low conductivity and recharge case for lower bound flows.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SIMULATED WATER LEVELS AND PIT INFLOWS OVER MINING AND POST-CLOSURE

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.9



H:\Project\4148\ArcGIS\Arcmaps\Reports\2021\Hydrogeological Characterization\20211108_ModelFigures.qgz

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

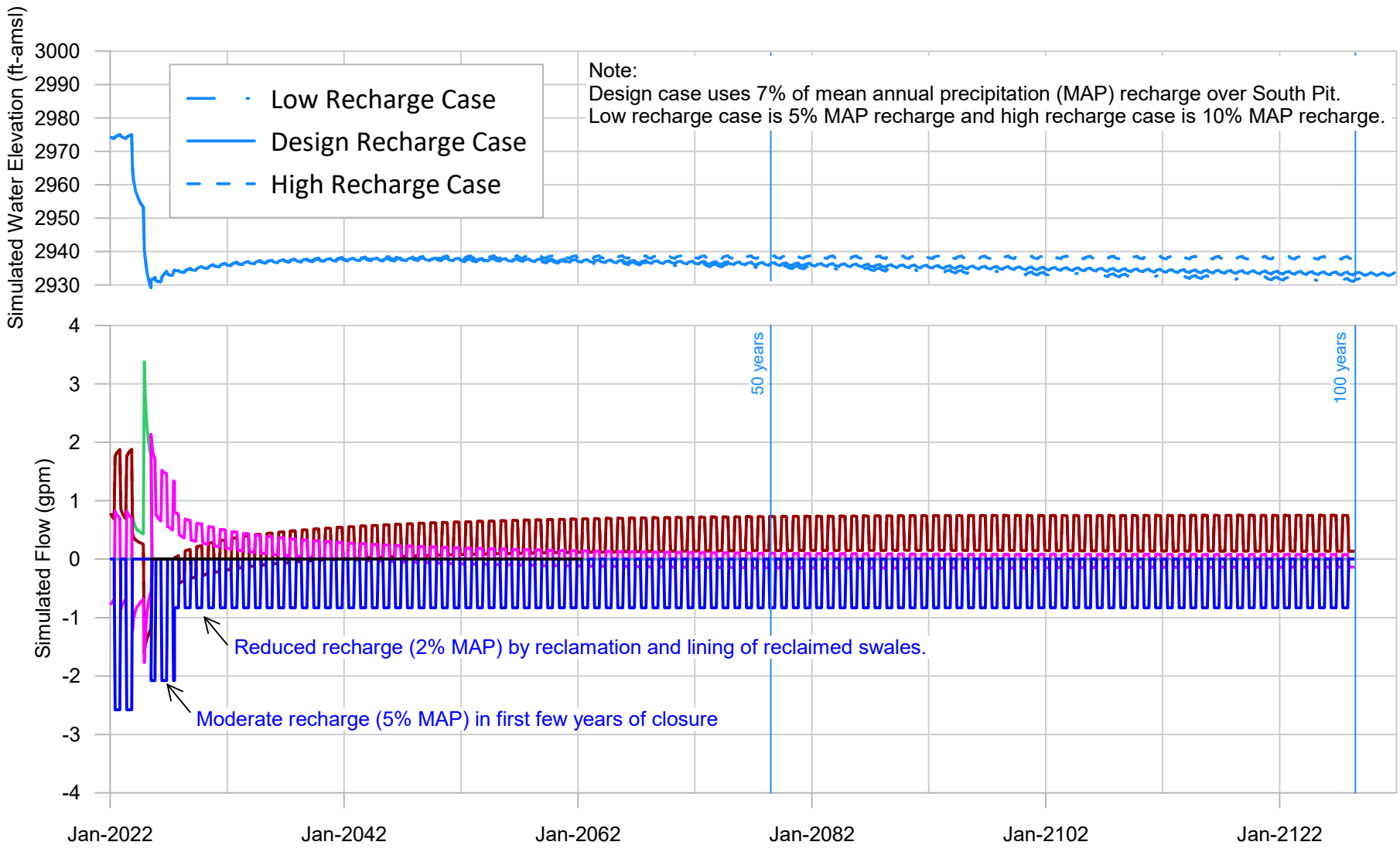
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

END OF MINING DRAWDOWN CONTOURS

BY:	DATE:
HHJM	NOV 21
APPROVED:	FIG:
MLS	7.10

H:\Project\4148\Modeling\Modflow\14_Results\TwoAxesLongTermNorthPitFlows_Heads_T56_P2a_P5b_P7c.grf



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

Drains
GW Flow
Storage
Recharge

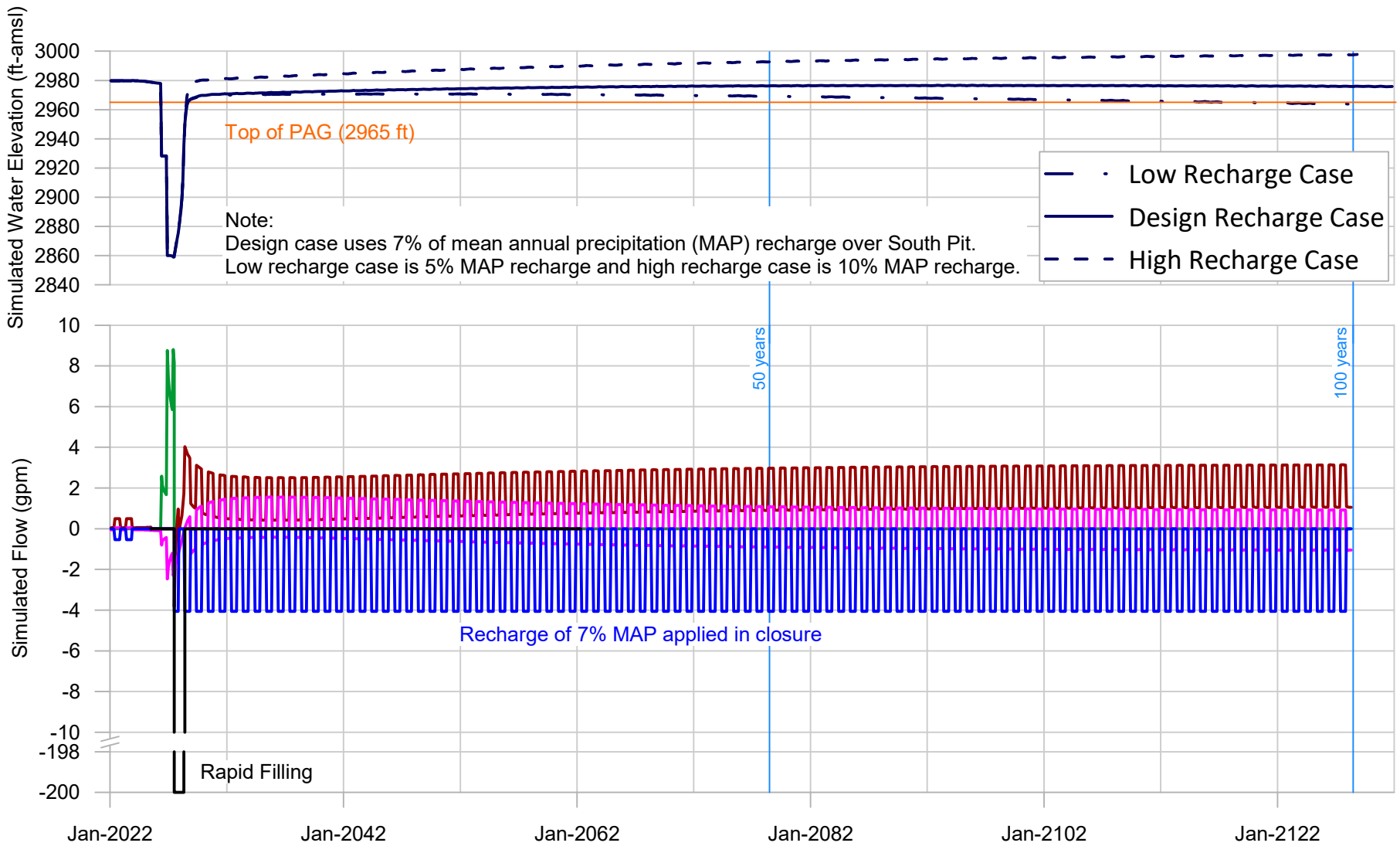
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

NORTH PIT SIMULATED POST-CLOSURE WATER BALANCE

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.11

H:\Project\4148\Modeling\Modflow\14_Results\LongTermSouthPitFlows_Heads_T56_P2a_P5b_P7c.grf



Drains
GW Flow
Storage
Recharge
Rapid Filling

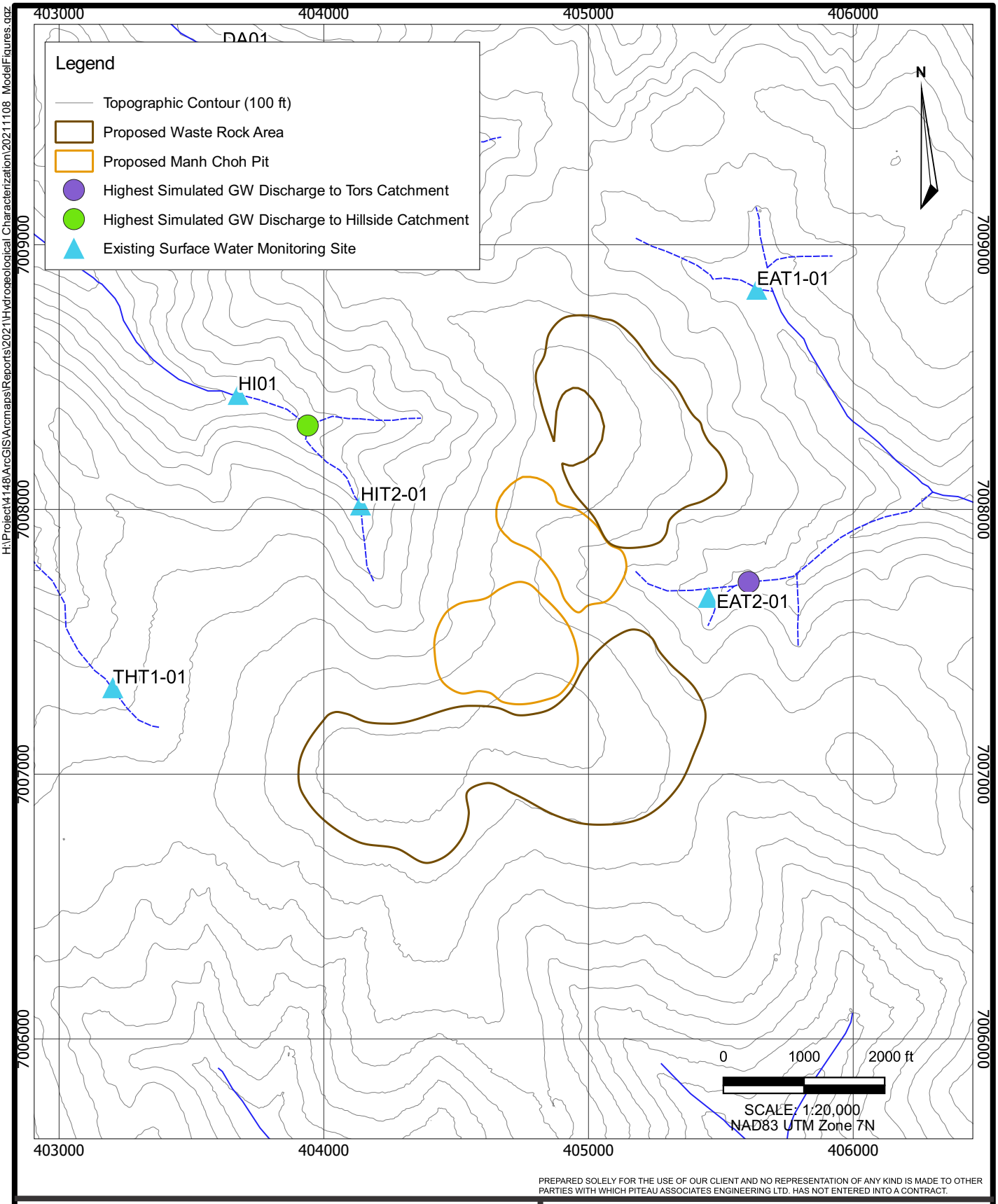
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SOUTH PIT SIMULATED POST-CLOSURE WATER BALANCE

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.12



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

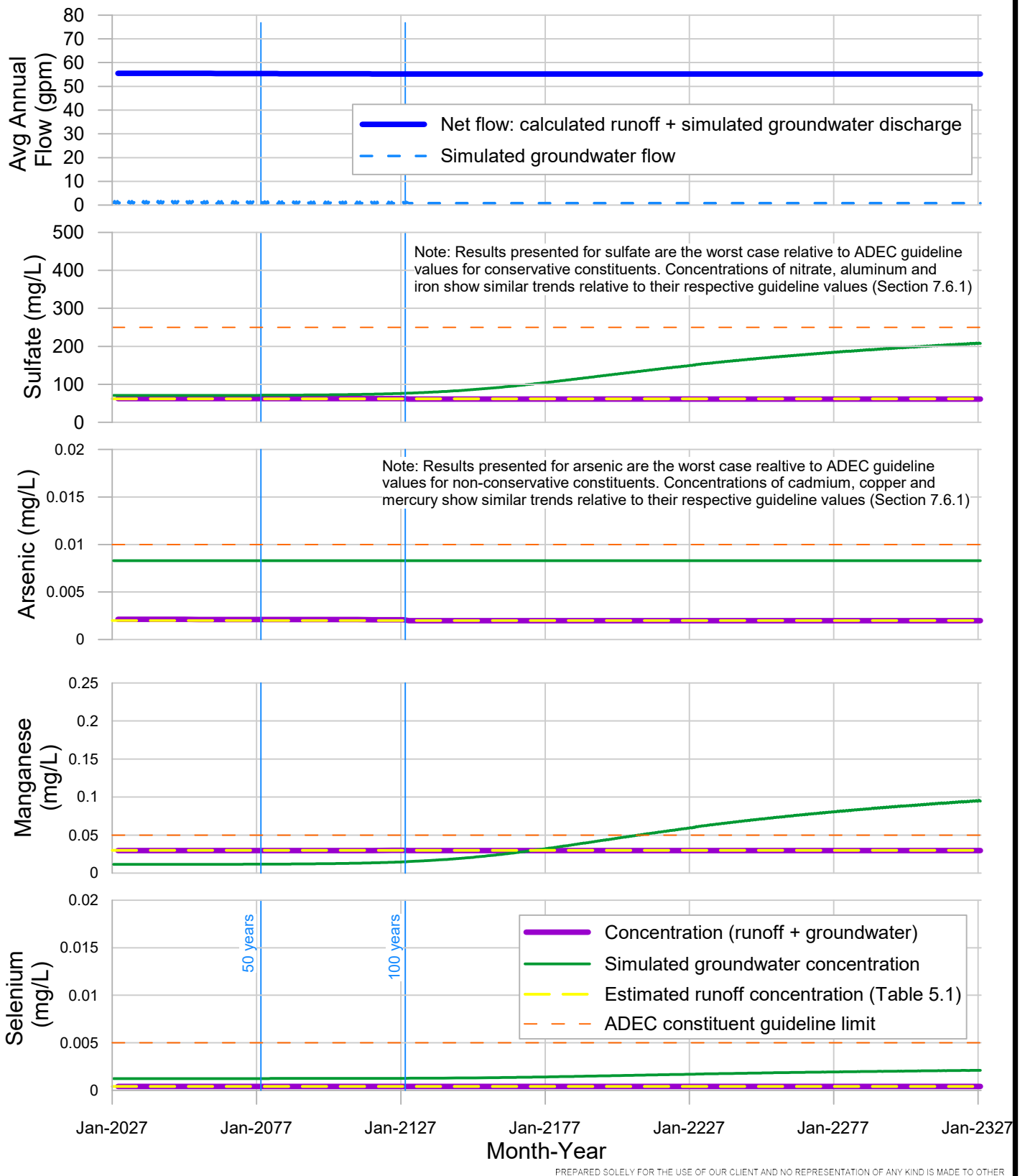
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HIGHEST GROUNDWATER DISCHARGE LOCATIONS IN HILLSIDE AND TORS CATCHMENTS

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.13

H:\Project\4148\Modeling\Modflow\15_Sensitivity\Mixing_Hillside.grf



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

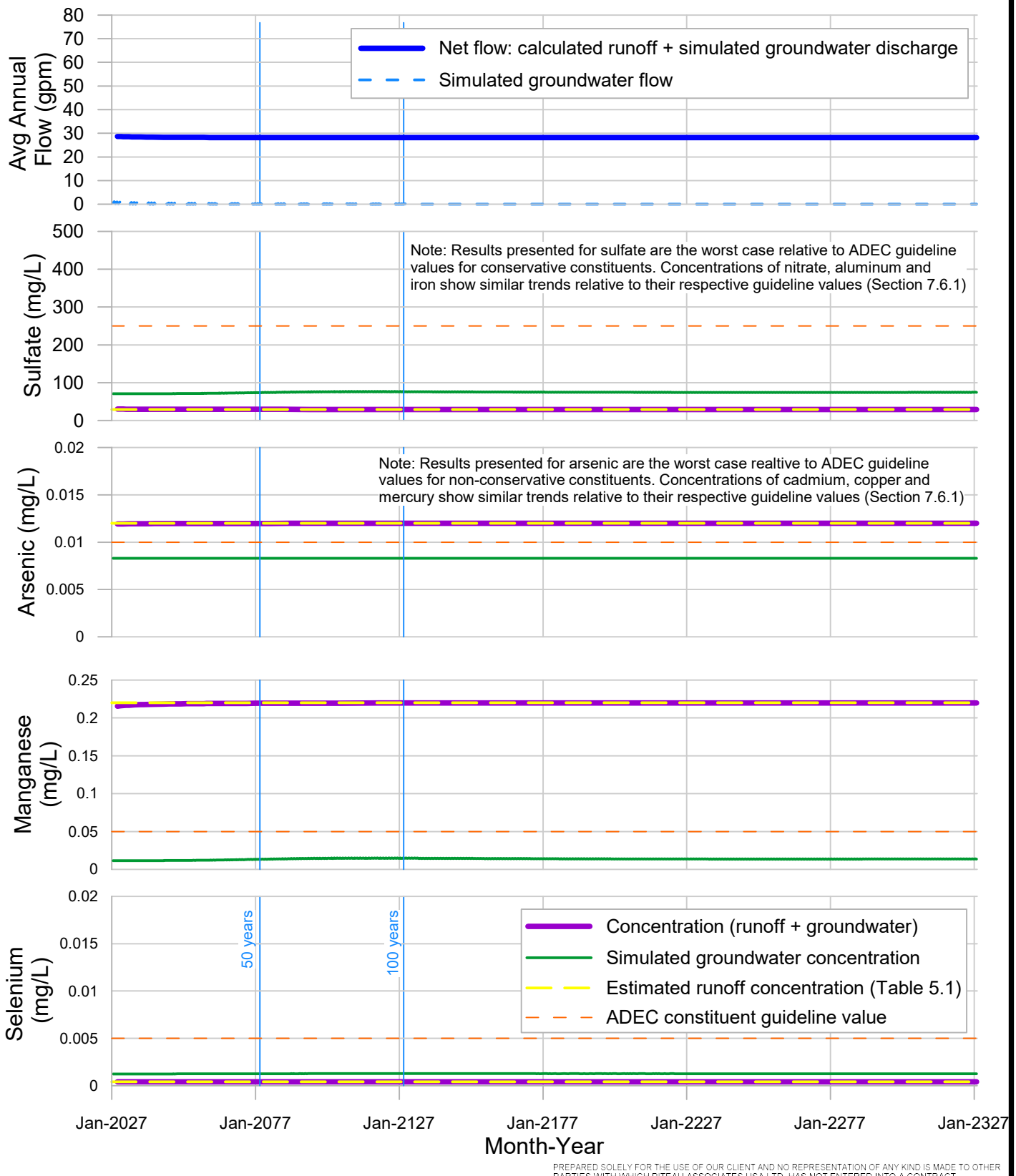
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SIMULATED FLOWS AND CONCENTRATIONS AT HIGHEST GROUNDWATER DISCHARGE POINT ON HILLSIDE CREEK

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.14

H:\Project\4148\Modeling\Modflow\15_Sensitivity\Mixing_Tors.grf



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

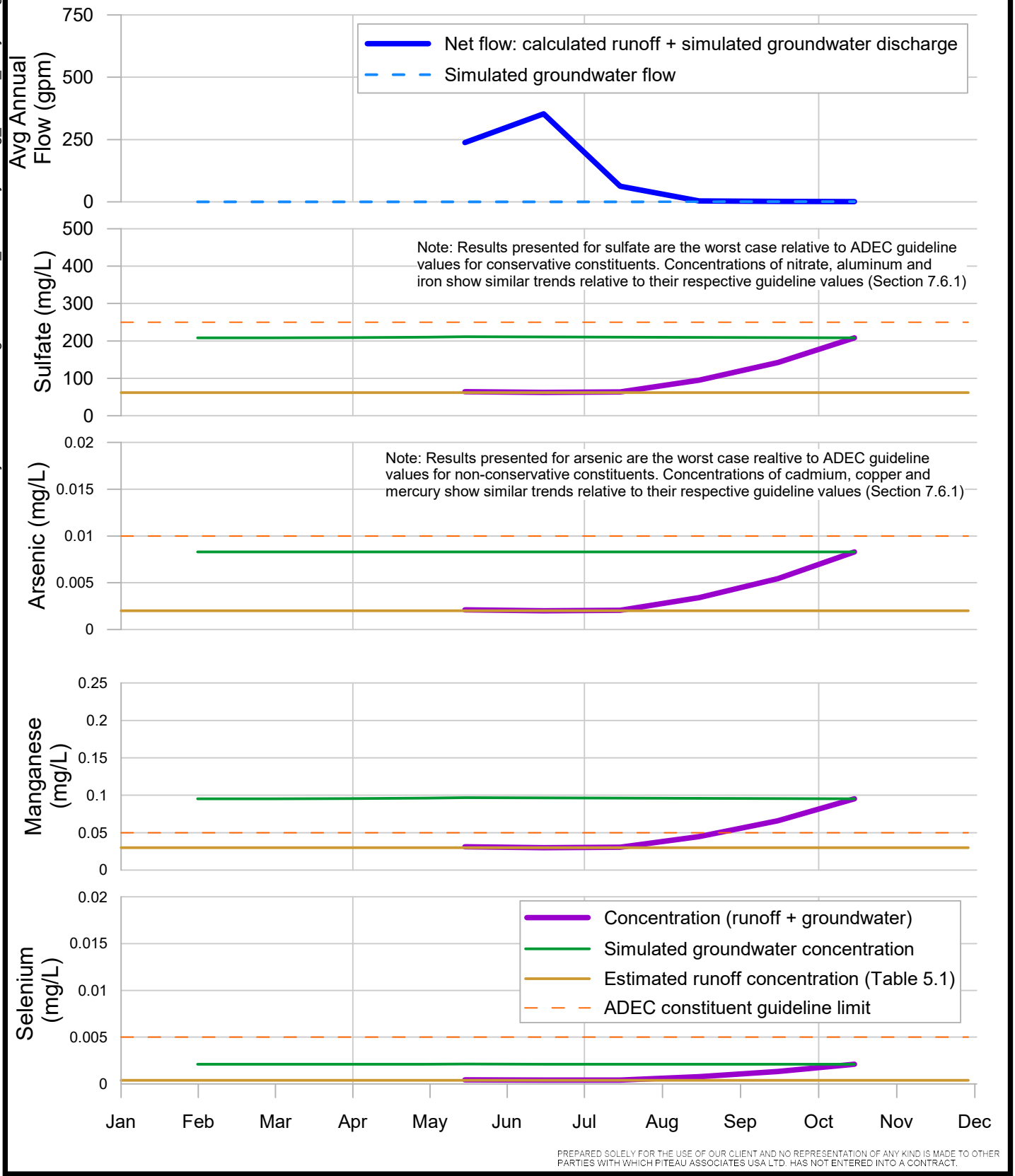
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SIMULATED FLOWS AND CONCENTRATIONS AT HIGHEST GROUNDWATER DISCHARGE POINT ON TORS CREEK

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.15

H:\Project\4148\Modeling\Modflow\15_Sensitivity\Mixing_Hillside_301years.grf



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

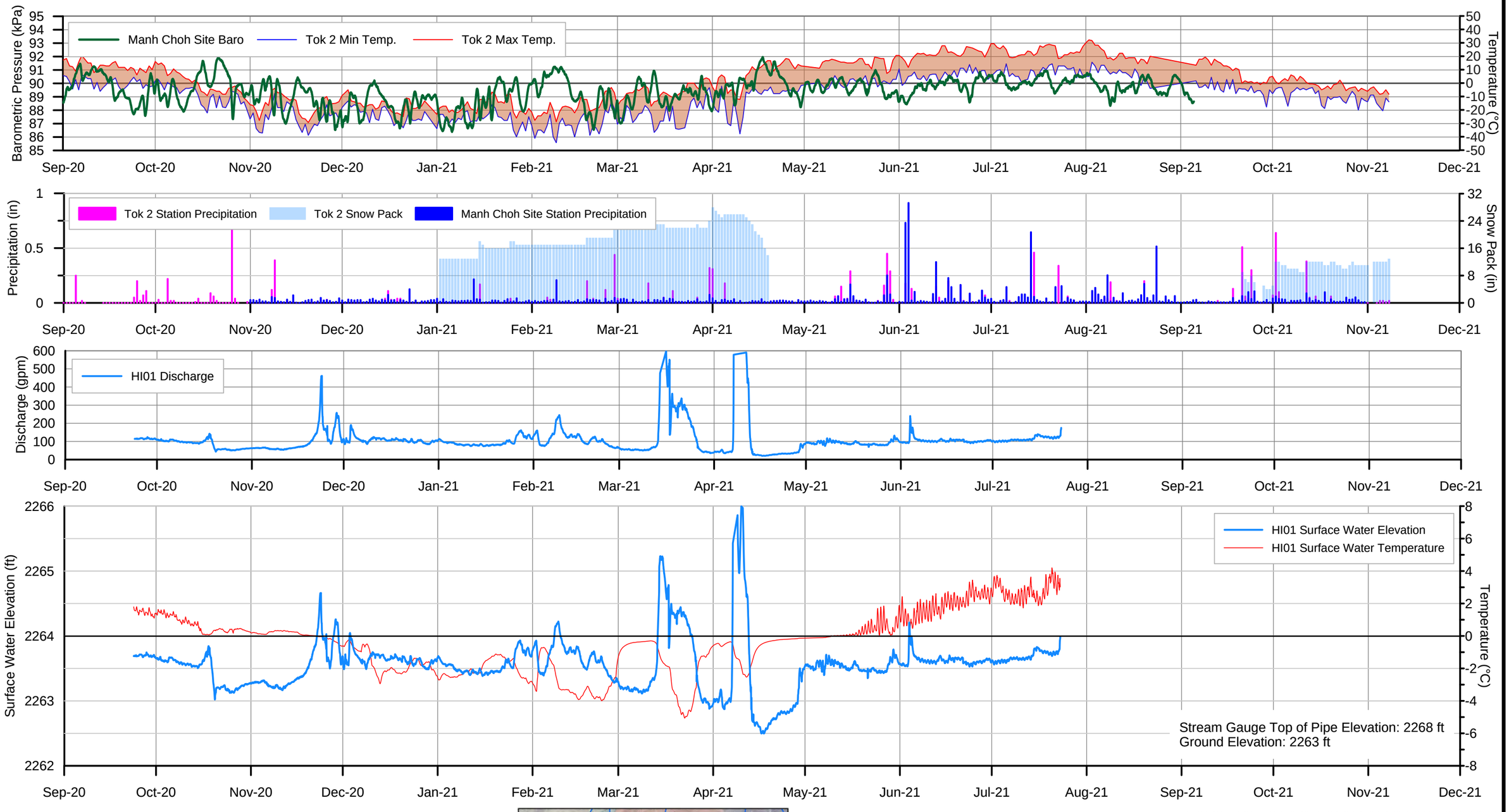
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SIMULATED MONTHLY FLOWS AND CONCENTRATIONS AT HIGHEST GROUNDWATER DISCHARGE POINT ON HILLSIDE CREEK (300 YEARS POST-CLOSURE)

BY:	DATE:
JM	NOV 21
APPROVED:	FIG:
MLS	7.16

APPENDIX A
STREAM HYDROGRAPHS

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-001



Note: Continuous stream discharge values calculated based on the stage-discharge curve method, as defined by the USGS



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

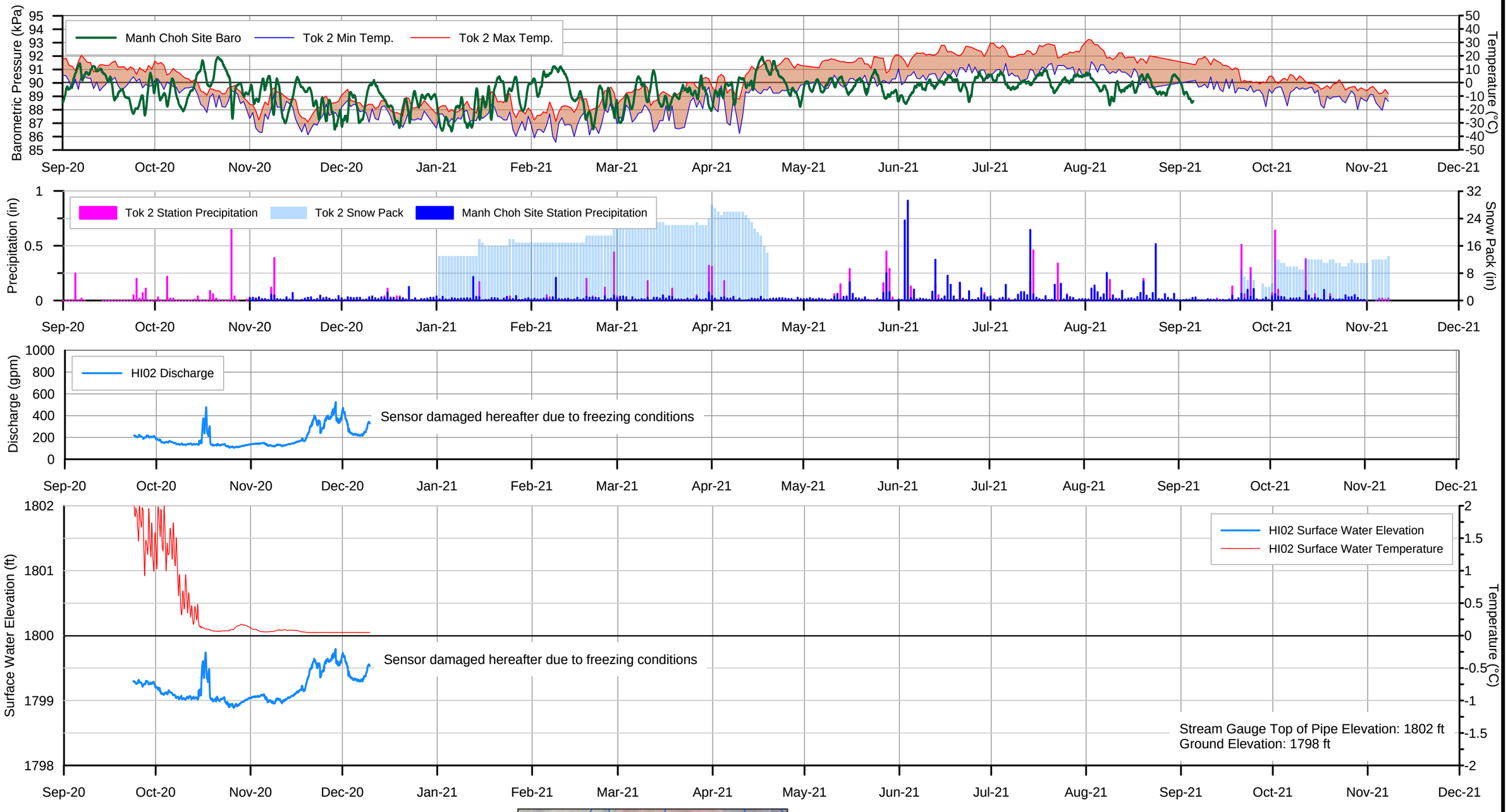
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER ELEVATION AND DISCHARGE IN SW20-HI01 STREAM GAUGE: SEPTEMBER 2020 TO AUGUST 2021

BY:	DATE:
CM	NOV 21
APPROVED:	FIG:
SH	A-1

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-001



Note: Continuous stream discharge values calculated based on the stage-discharge curve method, as defined by the USGS



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

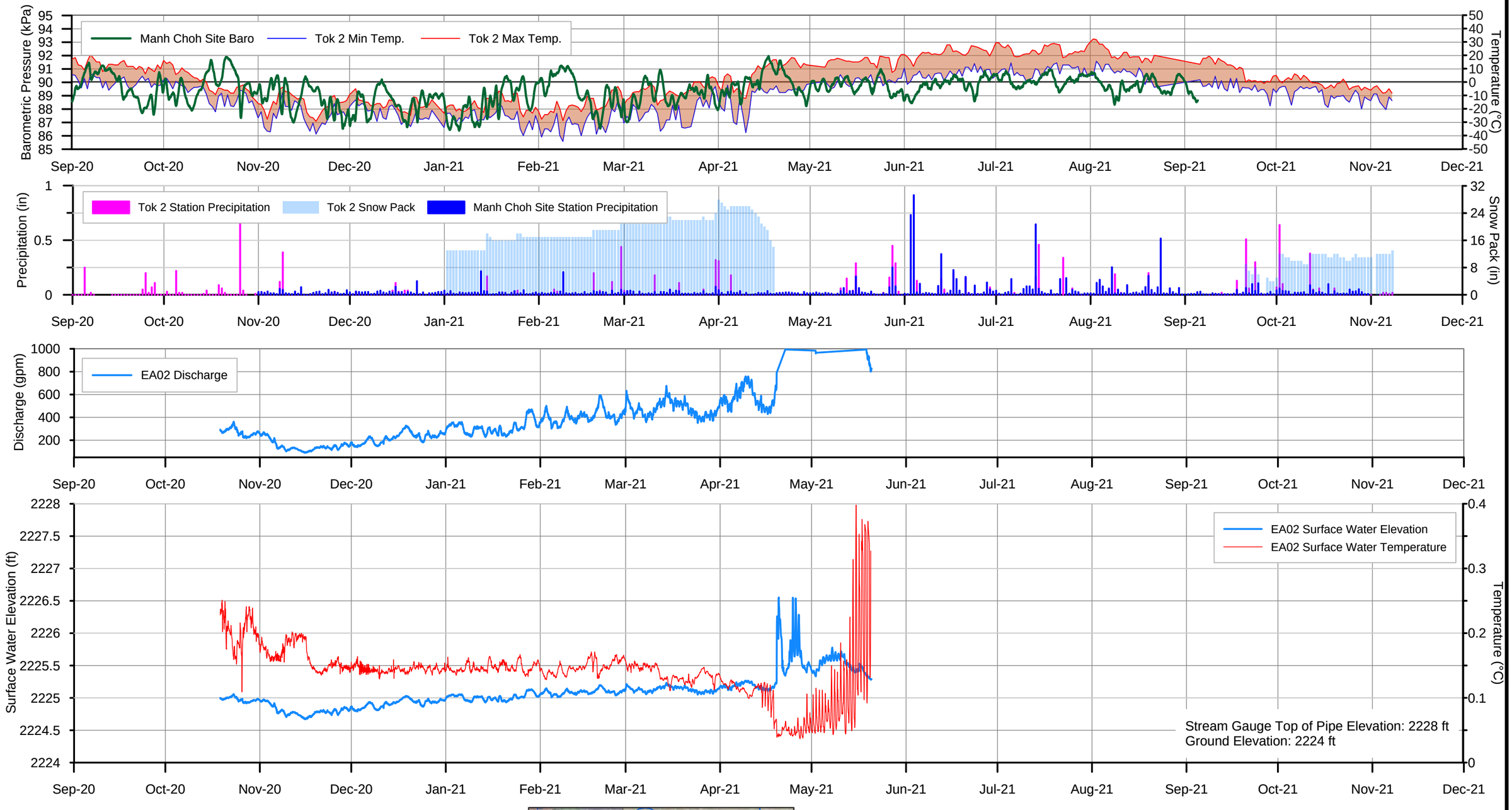
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER ELEVATION AND DISCHARGE IN SW20-HI02 STREAM GAUGE: SEPTEMBER 2020 TO DECEMBER 2020

BY:	DATE:
CM	NOV 21
APPROVED:	FIG:
SH	A-2

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-001



Note: Continuous stream discharge values calculated based on the stage-discharge curve method, as defined by the USGS



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
HYDROGEOLOGICAL CHARACTERIZATION

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SURFACE WATER ELEVATION AND DISCHARGE IN SW20-EA02 STREAM GAUGE: OCTOBER 2020 TO MAY 2021

BY:	DATE:
CM	NOV 21
APPROVED:	FIG:
SH	A-3

APPENDIX B
SURFACE WATER QUALITY

TABLE B-1

EAT1-01: TORS (EAGLE) CREEK TRIBUTARY 1

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01	EAT1-01
Sample Date									9-Sep-2019	22-Oct-2019	3-Jun-2020	7-Aug-2020	22-Sep-2020	18-Oct-2020	17-Nov-2020	12-Dec-2020	18-Mar-2021	17-May-2021	21-Jun-2021	20-Jul-2021	25-Aug-2021
Lab ID									1195369006	1199902002	1209326008	1209562011	1205287013	1205837007	L63022-14	L63345-06	L64885-03	L66044-04	L66741-01	L67326-05	L68129-02
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																					
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	-	-	7.16	7.21	7.15	4.97	7.06	7.25	7.2	7.71	7.39	7.59	7.27
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	208.7	-	175.9	213.6	199	199.1	199.8	206.2	374	158	323	342	333
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	367.3	377.2	302	358.6	361.4	302.3	384.1	399.1	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	2.4	-	3.3	3.8	1.5	0	0.1	0	12	2.1	4.2	9.5	6.7
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	9.07	-	10.47	9.45	10.46	7.66	10.49	10.3	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	1.23	41.1	2.2	1.5	1.5	2.5	17.0	4.3	Clear	Light Amber	Light Amber	Clear	Clear
Physical Tests																					
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	196	189	142	174	157	206	204	209	198	85	170	189	191
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	243	224	187	232	221	232	236	250	238	132	216	238	226
Total Suspended Solids	mg/L	1.01	20	0.313	5	SM21 2540D	SM2540D	-	36.8	471	29.6	3.09	5.78	36.4	61	6	9	14	15	40	65
Dissolved Anions [6]																					
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	-	-	114	141	140	146	163	156	153	63.3	147	142	140
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	163	156	153	63.3	147	142	140
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.291	0.249	0.22	0.204	0.245	0.282	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	55.3	55.7	37.7	43.2	46.6	47.9	50	51.8	43	47.8	45.5	42.3	43.1
Nutrients																					
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	<0.05	-	-	0.083	0.115	0.107	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.05	<0.05	0.0618	0.119	0.105	0.219	0.131	0.139	0.136	0.11	0.113	0.042	0.028
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	0.14	0.14	0.17	0.11	0.1	0.05	0.03
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	0.137	0.137	0.166	0.106	0.099	0.049	0.027
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0247	0.566	0.0342	<0.012	<0.012	0.0386	0.1	<0.01	0.032	0.028	<0.01	0.04	0.151
Cyanides																					
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0029	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	<0.0015	0.0076	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																					
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	1.0	4.7	0.4	0.0344	0.0455	0.415	2.92	0.083	0.05	0.39	0.187	0.668	2.05
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000185	0.000205	0.000141	0.000142	0.000152	0.000169	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00428	0.00811	0.00251	0.00112	0.000862	0.00207	0.00785	0.00198	0.00088	0.00198	0.00188	0.00263	0.00592
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0485	0.103	0.0312	0.0258	0.0238	0.0344	0.0621	0.026	0.0362	0.0218	0.0275	0.0358	0.0492
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	0.0000728	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	0.0000189	0.0000372	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.00227	0.0023	0.00225	0.00204	<0.0015	0.00205	0.0024	0.0018	0.0024	0.0019	0.0024	0.0022	0.0021
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0004	0.0000359	0.000126	0.000023	<0.000015	<0.000015	0.0000196	0.000097	<0.00005	0.000057	<0.00005	<0.00005	<0.00005	0.000083
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	52.5	51.8	38.4	49.4	45.3	55.9	56.7	58.5	59.4	23.8	48	54.9	54
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000537	0.0055	0.000844	<0.00015	<0.00015	0.00044	0.00413	<0.0005	<0.0005	0.00107	0.00054	0.0011	0.00302
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000894	0.00329	0.000563	0.000286	0.000257	0.000481	0.00195	0.000415	0.000676	0.000472	0.000444	0.000716	0.00135
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.015	0.00293	0.00749	0.00173	0.000571	0.000476	0.00098	0.00379	<0.0008	<0.0008	0.00222	<0.0008	0.00134	0.00386
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	1.89	7.05	1.39	0.457	0.431	1.27	6.35	1.09	0.449	1.11	0.857	2.18	4.58
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.00103	0.00442	0.000491	0.0000548	0.0000436	0.000387	0.00231	<0.0001	<0.0001	0.00028	0.00015	0.00067	0.0015
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	15.3	14.4	11.3	12.4	10.7	16.1	15.1	15.2	12	6.09	12.1	12.7	13.6
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.287	0.342	0.258	0.163	0.159	0.192	0.34	0.337	1.23	0.174	0.297	0.278	0.308
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	1.46	8.66	2.97	0.963	0.5	1.18	2.91	<0.3	2.97	3.8	0.68	<0.3	2.86
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000209	0.000198	0.000236	0.000306	0.000275	0.000235	0.00027	<0.0002	0.00031	0.00023	0.00031	0.00027	0.00025
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.086	0.00276	0.00773	0.00162	0.00149	0.0014	0.00177	0.00346	<0.0004	0.00075	0.00144	0.00063	0.00081	0.00261
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.727	0.762	0.65	0.427	0.461	0.599	0.82	0.52	0.62	0.81	0.48	0.43	0.55
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.00031	<0.00031	0.000456	0.000485	0.000359	0.000419	0.00055	0.0005	0.00064	0.00025	0.00054	0.00054	0.00045
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	9.11	12.7	7.88	7.69	6.27	8.94	10.6	7.77	7.34	4.72	6.7	8.37	8.81
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	0.0000399	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.34	3.24	2.85	2.97	2.53	3.52	3.18	3.11	3.03	1.78	2.77	3.01	3.2
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	0.224	0.252	0.273	0.285	0.247	0.11	0.221	0.247	0.256
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	0.00000714	0.0000233	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.0000714	0.000108	<0.000062	<0.000062	<0.000062	0.0000779	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0458	0.21	0.0178	0.00599	0.00363	0.0215	0.161	0.0109	0.012	0.0226	0.0145	0.0756	0.0983
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00394	0.0128	0.00144	0.000964	<0.00031	0.00123	0.00762	<0.0005	<0.0005	0.00165	0.0009	0.00202	0.00614
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.194	0.00629	0.0195	<0.0031	<0.0031	<0.0031	<0.0031	0.0096	<0.006	<0.006	<0.006	<0.006	<0.006	0.0066

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]EAT1-01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 180 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-2

EAT2-01: TORS (EAGLE) CREEK TRIBUTARY 2

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01	EAT2-01
Sample Date									11-Sep-2019	24-Oct-2019	3-Jun-2020	6-Aug-2020	22-Sep-2020	18-Oct-2020	19-May-2021	21-Jun-2021	20-Jul-2021	25-Aug-2021
Lab ID									1195369016	1199902015	1209326007	1209562009	1205287014	1205837008	L66043-05	L66741-02	L67326-02	L68129-06
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																		
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	-	-	6.57	7	6.9	4.46	8.25	7.79	7.45	7.74
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	53.1	-	30.8	59.4	74.8	59.4	42.5	58	62.4	67.5
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	95.5	166.8	54.8	102.4	138.8	113.2	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	1.8	-	2	3.1	0.8	0	3.7	1.9	4.3	6.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	9.8	-	12.04	10.31	9.63	7.22	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	8.8	0.5	0.9	0.8	2.7	0.23	Amber	Clear	Clear	Light Amber
Physical Tests																		
Hardness - as CaCO3	mg/L	1	0.2	1	5	SM21 2340B	SM2340B - Calculatio	-	35.9	73.9	20.2	44.1	51.3	35.4	21	26	31	31
Total Dissolved Solids	mg/L	10	20	3.1	40	SM21 2540C	SM2540C	500	74	105	57	85	93	71	68	58	68	58
Total Suspended Solids	mg/L	0.962	5	0.298	20	SM21 2540D	SM2540D	-	20.6	9.33	1.27	18.3	15.7	1.06	65	8	69	60
Dissolved Anions [6]																		
Alkalinity - Total - CaCO3	mg/L	10	2	2.5	20	SM21 2320B	SM2320B - Titration	20	-	-	13.1	37.2	49	27.4	10.2	25.5	24.6	26.5
Chloride	mg/L	0.2	0.4	0.05	2	EPA 300.0	M300.0 - Ion Chromat	230	0.147	0.277	0.216	0.158	0.159	0.408	<0.4	<0.4	<0.4	0.54
Sulphate	mg/L	2	0.4	0.5	2	EPA 300.0	M300.0 - Ion Chromat	250	7.45	27.4	7.09	9.1	9.31	7.77	4.02	5.39	3.38	3.73
Nutrients																		
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	0.557	-	-	0.526	0.837	<0.05	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.02	0.05	0.1	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.557	1.02	0.874	0.693	0.99	0.949	0.502	0.623	0.541	0.477
Total Phosphorous	mg/L	0.04	0.01	0.012	0.05	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.005	0.0143	0.0215	<0.012	0.0603	0.0277	0.065	0.024	0.086	0.038
Ortho Phosphorous	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanides																		
Total Cyanide	mg/L	-	0.003	-	0.01	-	D7511-09	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.003	0.0015	0.01	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	<0.0015	0.0021	<0.003	<0.003	<0.003	0.0114
Total Metals [5,7,8]																		
Aluminum	mg/L	0.002	0.005	0.00062	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.261	0.139	0.104	0.102	0.144	0.0358	1.61	0.345	1.68	1.35
Antimony	mg/L	0.00005	0.0004	0.000015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000939	0.000175	0.000518	0.000439	0.000126	0.00014	0.00047	<0.0004	0.00052	<0.0004
Arsenic	mg/L	0.0008	0.0002	0.0002	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.0145	0.0283	0.0442	0.0127	0.00579	0.0815	0.0121	0.00659	0.0113	0.00472
Barium	mg/L	0.00025	0.0005	0.00004	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0115	0.0113	0.0064	0.0111	0.0104	0.0069	0.0211	0.00883	0.0224	0.0181
Beryllium	mg/L	0.00005	0.00008	0.000025	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	0.000137	0.0000278	0.0000185	0.000031	0.0000504	<0.000015	-	-	-	-
Boron	mg/L	0.005	0.001	0.0015	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	<0.0015	0.00163	<0.0015	<0.0015	<0.0015	<0.0015	0.001	<0.001	0.0012	<0.001
Cadmium	mg/L	0.00005	0.00005	0.000015	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.0001	0.0000786	0.0000516	0.000047	0.0000608	0.000056	0.000155	0.000868	0.000051	0.000132	0.000078
Calcium	mg/L	0.05	0.1	0.015	0.5	EPA 200.8 Low Level	M200.7 ICP	-	11.6	25.9	6.11	14.7	18.2	9.91	6.65	8.19	9.57	9.39
Chromium	mg/L	0.0005	0.0005	0.00015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.00015	<0.00015	0.000824	<0.00015	<0.00015	0.000179	0.0019	0.00071	0.00216	0.00185
Cobalt	mg/L	0.000025	0.00005	0.00001	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000372	0.000227	0.000162	0.000201	0.000249	0.00136	0.00305	0.000354	0.00162	0.00124
Copper	mg/L	0.0005	0.0008	0.0002	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.00305	0.00136	0.0038	0.0021	0.00126	0.0036	0.00573	0.00233	0.0042	0.00266
Iron	mg/L	0.02	0.06	0.0062	0.15	EPA 200.8 Low Level	M200.7 ICP	1	0.271	0.148	0.0681	0.0943	0.186	0.0462	1.99	0.315	2.21	1.03
Lead	mg/L	0.0001	0.0001	0.000031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.001	0.00501	0.0014	0.000632	0.00172	0.00251	0.0000911	0.00652	0.00145	0.00946	0.00409
Magnesium	mg/L	0.02	0.2	0.0062	1	EPA 200.8 Low Level	M200.7 ICP	-	1.66	2.26	1.19	1.78	1.4	2.59	1.15	1.23	1.71	1.75
Manganese	mg/L	0.0001	0.0004	0.000031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0128	0.00587	0.00124	0.0107	0.00709	0.00645	0.168	0.0142	0.0922	0.0915
Mercury	ng/L	1	0.0000003	0.5	1	EPA 1631 E	M1631E, Atomic Fluor	50	1.19	1.21	<2.5	1.45	1.23	1.08	10.6	2.38	7.33	3.89
Molybdenum	mg/L	0.00005	0.0002	0.000015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.0000942	0.000288	0.0000609	0.0000662	0.0000542	0.0000757	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	0.00062	0.0004	0.00015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.024	0.00108	0.000891	0.000817	0.000791	0.000768	0.0016	0.00422	0.00093	0.00194	0.00183
Potassium	mg/L	0.05	0.2	0.015	1	EPA 200.8 Low Level	M200.7 ICP	-	0.524	0.56	0.414	0.392	0.37	0.522	0.71	0.26	0.32	0.24
Selenium	mg/L	0.001	0.0001	0.00031	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.00031	<0.00031	0.000336	<0.00031	<0.00031	<0.00031	0.00018	0.00014	<0.0001	<0.0001
Silicon	mg/L	0.1	0.1	0.031	0.5	EPA 200.8 Low Level	M200.7 ICP	-	8.16	6.49	7.52	7.33	6.02	10.3	6.16	6.95	8.24	6.54
Silver	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	0.000103	0.0000279	0.0000225	0.0000131	0.000024	0.0000287	0.00018	<0.0001	0.00019	0.00012
Sodium	mg/L	0.1	0.2	0.031	1	EPA 200.8 Low Level	M200.7 ICP	-	2.65	1.89	2.28	2.57	2.01	2.96	1.58	1.95	2.18	2.27
Strontium	mg/L	0.0025	0.009	0.00075	0.045	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	0.0742	0.0462	0.0316	0.0352	0.0431	0.0414
Thallium	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0008	0.000062	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.0000672	0.0000688	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.005	0.00015	0.025	EPA 200.8 Low Level	M200.7 ICP	-	0.00796	0.00567	0.00216	0.00355	0.00587	0.00188	0.0802	0.0146	0.0952	0.0453
Vanadium	mg/L	0.001	0.0005	0.00031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00688	<0.00031	<0.00031	<0.00031	<0.00031	0.000459	0.0032	0.00087	0.00385	0.0029
Zinc	mg/L	0.01	0.006	0.0031	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.054	0.00436	<0.0031	<0.0031	<0.0031	<0.0031	0.00846	0.0432	<0.006	0.0096	0.0082

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]EAT2-01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 40 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-3

EA02: TORS (EAGLE) CREEK

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02	EA02
Sample Date									19-Jun-2013	3-Oct-2013	24-Sep-2015	1-Jul-2016	5-Sep-2016	10-Sep-2019	23-Oct-2019	3-Jun-2020	7-Aug-2020	23-Sep-2020	18-Oct-2020	17-Nov-2020	12-Dec-2020	22-Feb-2021	17-Mar-2021	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1132583006	1135004005	1155647003	1168221008	1168541007	1195369014	1199902009	1209326006	1209562010	1205287012	1205837006	L63022-13	L63345-05	L64532-04	L64872-01	L66041-04	L68131-04	L68796-02
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																										
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	7.44	7.49	6.92	–	7.37	-	-	7.45	7.75	7.56	6.14	7.7	6.7	7.56	8.73	9.96	6.12	7.79
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	176.8	185.7	210.8	-	242.3	171.2	-	123	162.4	156.5	163.5	166.7	174	413	367	237	361	395
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	304	343	380	-	396	295.8	305.4	215.7	281.8	285	312.4	319	333.3	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	3.3	1.1	1.7	-	4.6	2.9	-	2.5	2.8	1.4	0	0	0	0.9	0	4.4	6.7	1.8
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	13.46	13.9	12.25	-	10.37	10.75	-	12.35	11.27	11.7	12.08	12.28	12.28	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	0.7	0.9	0.28	0.77	0.4	2.12	0.25	0.36	0.37	0.32	0.20	0.38	1.4	Lt/Med Amber	Clear	Light Amber	Clear	lt. amber
Physical Tests																										
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	187	97.7	176	142	142	103	140	125	145	157	170	191	-	125	189	193
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	200	206	233	251	241	189	187	140	181	188	194	194	206	226	-	182	236	234
Total Suspended Solids	mg/L	0.99	20	0.307	5	SM21 2540D	SM2540D	-	0.412	0.323	0.337	0.408	2.51	1.13	0.471	0.972	0.98	<0.313	0.396	<5	<5	<5	<5	6	<5	<5
Dissolved Anions [6]																										
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	116	137	122	139	149	-	-	77	102	103	112	114	122	133	-	86.2	137	141
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	114	122	133	-	86.2	137	133
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	-	<2	<2	7.9
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.339	0.338	0.498	-	-	0.257	0.27	0.209	0.238	0.264	0.314	<0.4	<0.4	<0.4	0.98	0.42	<0.4	0.52
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	46.4	48.5	51.9	-	-	41.7	45.3	27	36.8	37.8	41.6	42.7	46.2	56.9	59.4	31.8	50.2	53.8
Nutrients																										
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	0.189	-	-	0.233	0.292	0.364	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.142	0.167	0.24	0.0942	0.107	0.195	1.32	0.369	0.367	0.337	0.482	0.347	0.354	0.223	-	0.157	0.054	0.112
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	0.36	0.35	0.29	0.25	0.16	0.05	0.112
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	0.359	0.35	0.285	0.254	0.16	0.054	0.112
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	0.007	0.015	0.014	<0.005	<0.005	<0.012	<0.012	<0.012	<0.012	<0.01	<0.01	<0.01	-	0.015	<0.01	<0.01
Cyanides																										
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0035	<0.0015	0.0015	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	<0.0015	0.0021	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																										
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.015	<0.0062	0.00703	0.0121	0.0406	0.012	0.014	0.0488	0.0168	0.00982	0.0118	0.0134	0.014	0.0491	-	0.155	0.0136	0.007
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.0000727	0.0000955	0.0000642	0.000182	0.000169	0.000186	0.000181	0.00017	0.000151	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0015	<0.0015	0.00072	0.000765	0.000486	0.00163	0.00129	0.0026	0.00249	0.00244	0.00174	0.00171	0.00169	0.0009	-	0.00145	0.00085	0.00078
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0188	0.0201	0.0219	0.0254	0.0239	0.015	0.0148	0.012	0.0149	0.0145	0.0159	0.0147	0.0154	0.013	-	0.016	0.018	0.0188
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	-	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	<0.0015	0.00197	<0.0015	0.00178	<0.0015	0.00175	0.00183	<0.0015	0.00166	0.0014	0.0012	0.0017	-	0.0016	0.0018	0.0014
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	<0.00005	-	0.000149	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	48.2	55	58	30.9	55.7	45.4	45.2	31.8	43.1	39.6	44.9	49.6	54	60.7	-	39.4	59.3	61
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000711	<0.00062	0.000531	<0.00015	<0.00015	<0.00015	<0.00015	0.000501	<0.00015	<0.00015	<0.00015	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	0.000148	0.0001	0.000139	0.000117	0.000116	0.000145	0.00013	0.000126	0.000122	0.000157	0.000145	0.000199	-	0.000471	0.000152	0.000136
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.013	0.000955	0.000806	0.000715	0.000821	0.000941	0.000716	0.000736	0.00152	0.000773	0.000755	0.000723	<0.0008	<0.0008	<0.0008	-	0.00182	<0.0008	<0.0008
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	<0.078	<0.078	0.0398	0.0326	0.0955	0.0212	0.0465	0.0749	0.0278	0.0261	0.0292	<0.06	<0.06	<0.06	-	0.31	<0.06	<0.06
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000062	<0.000062	<0.000031	<0.000031	0.0000684	<0.000031	0.0000313	0.000052	<0.000031	0.000243	<0.000031	<0.0001	<0.0001	<0.0001	-	0.00012	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	9.18	9.85	10.3	5.02	8.83	6.88	7.03	5.61	7.78	6.33	7.99	8.05	8.52	9.59	-	6.57	9.92	10
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00709	0.00996	0.0133	0.00915	0.0157	0.0213	0.0259	0.0263	0.0219	0.0228	0.0236	0.03	0.0453	0.00519	-	0.0264	0.0229	0.0238
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	65.8	0.945	1.65	1.14	0.539	1.2	2.71	1.6	0.665	0.566	<0.3	0.34	0.6	<0.0002	2.96	0.69	<0.3
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.00041	0.000482	0.000366	0.000386	0.000372	0.000315	0.000368	0.000325	0.000363	0.00034	0.00034	0.0003	-	0.0003	0.00031	0.00032
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.073	0.00141	0.00205	0.0026	0.00141	0.00138	0.0012	0.00118	0.000964	0.00121	0.00121	0.00114	<0.0004	<0.0004	<0.0004	-	0.00116	0.00044	0.00054
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.66	1.69	1.84	2.27	1.93	1.38	1.23	1.1	1.19	1.2	1.32	1.24	1.26	1.45	-	1.62	1.76	1.75
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	0.000329	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.00013	0.00011	0.00012	-	<0.0001	<0.0001	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	5.47	5.39	5.65	2.47	5.12	4.68	4.78	5.66	5.84	4.74	5.58	5.15	5.34	5.59	-	4.63	5.17	4.42
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.08	3.3	3.43	4.06	3.27	2.61	2.53	2.52	2.82	2.36	2.81	2.58	2.78	2.89	-	2.25	3.28	3.41
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	0.173	0.201	0.2	0.223	0.242	-	0.16	0.24	0.24
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.000168	<0.0008	<0.0008	<0.0008	-	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	<0.0015	0.00151	0.00161	0.000866	0.00235	0.00132	0.00129	0.002	0.000852	0.00104	0.00147	0.0052	0.0064	<0.005	-	0.0113	0.007	0.0096
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.000404	<0.00031	<0.00031	0.0011	<0.00031	<0.00031	0.000916	<0.00031	<0.00031	<0.0005	<0.0005	<0.0005	-	0.00056	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.167	<0.0025	<0.0025	0.00134	0.000806	0.00161	<0.0031	0.00411	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	-	0.0063	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]EA02

Notes
1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 150 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.
Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-4

BLT1-01: BLACK CREEK TRIBUTARY 1

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01	BLT1-01
Sample Date									10-Sep-2019	23-Oct-2019	3-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	22-Feb-2021	17-Mar-2021	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1195369013	1199902008	1209326004	1209562005	1205287010	1205837004	L63022-11	L63345-04	L64532-03	L64872-04	L66047-01	L68130-05	L68797-04
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																					
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	-	-	7.74	7.31	6.89	5.75	7.53	7.34	7.57	7.52	7.37	5.97	7.59
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	89.4	-	88.4	142.8	148.3	74.9	153.4	158.7	428	320	66.6	259	293
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	313.6	294.1	161.6	257.4	270.6	142.2	292.7	303.9	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	1	-	1.3	1.7	1.3	0	0.1	0.1	0.5	0.5	4.4	1.9	1
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	12.67	-	13.94	12.68	12.99	13.26	12.81	12.48	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	0.33	0.32	0.22	0.42	0.86	0.26	0.63	0.47	Clear	Clear	Light Amber	Clear	clear
Physical Tests																					
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	161	141	77.1	126	119	64.2	142	156	173	-	39	130	150
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	208	186	107	170	158	87	170	188	198	-	88	168	174
Total Suspended Solids	mg/L	1.19	20	0.369	5	SM21 2540D	SM2540D	-	9.89	4.06	1.41	2.5	2.45	1.43	<5	<5	<5	<5	5	<5	<5
Dissolved Anions [6]																					
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	-	-	60.3	97.2	101	54.3	110	130	135	-	27.7	105	112
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	110	130	135	-	27.7	105	106
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	<2	<2	<2	-	<2	<2	6.4
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.232	0.23	0.193	0.202	0.23	0.194	<0.4	<0.4	<0.4	0.88	<0.4	<0.4	0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	33.9	34.9	15.9	27.3	30.5	10.3	31.8	35	37.1	39.4	4.15	26.4	29.3
Nutrients																					
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	0.569	-	-	0.617	0.693	0.35	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.569	0.931	0.97	0.876	0.819	0.469	0.752	0.733	0.546	-	0.158	0.544	0.587
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	1.37	0.75	0.69	0.65	0.16	0.62	0.533
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	1.37	0.746	0.693	0.652	0.157	0.615	0.533
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.005	<0.005	<0.012	<0.012	<0.012	<0.012	<0.01	<0.01	<0.01	-	0.015	<0.01	<0.01
Cyanides																					
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.002	<0.002	0.0029	<0.002	-	-	<0.003	<0.003	<0.003	-	0.004	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	<0.0015	0.0021	<0.003	<0.003	<0.003	<0.003	0.0031	<0.003	<0.003
Total Metals [5,7,8]																					
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.0146	0.0272	0.0492	0.0255	0.0193	0.0445	0.0512	0.0093	0.0761	-	0.237	0.0405	0.01
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.0000471	0.0000424	0.0000583	0.0000417	0.0000554	0.000106	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	0.00039	<0.0002	<0.0002
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0145	0.0139	0.00792	0.0126	0.0132	0.0089	0.0126	0.0125	0.0138	-	0.0079	0.013	0.0131
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	-	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.002	0.00162	0.00155	0.00233	0.00161	<0.0015	0.001	0.0015	0.0021	-	<0.001	0.0015	0.0016
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	51.9	46	24.4	39.7	38.7	19.5	45.9	50.9	56.2	-	12.2	42.2	48.9
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.00015	<0.00015	0.000546	<0.00015	<0.00015	0.000165	<0.0005	<0.0005	<0.0005	-	0.00059	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000128	0.000127	0.000135	0.000134	0.000127	0.000102	0.000161	0.000133	0.000223	-	0.000401	0.000148	0.000121
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.010	0.000679	0.000693	0.00154	0.000962	0.000865	0.00122	<0.0008	<0.0008	<0.0008	-	0.00214	<0.0008	<0.0008
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.0146	0.0354	0.0439	0.0221	0.0241	0.0706	<0.06	<0.06	0.112	-	0.413	<0.06	<0.06
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	<0.000031	0.0000377	<0.000031	<0.000031	<0.000031	0.0000367	<0.0001	<0.0001	<0.0001	-	0.00014	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	7.13	6.28	3.94	6.57	5.48	3.74	6.61	7.07	7.96	-	2.14	6.02	6.69
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00149	0.00122	0.000893	0.00113	0.000877	0.00933	0.00132	<0.0004	0.00274	-	0.0748	0.00082	0.00044
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<0.5	0.807	3.44	1.07	0.803	1.11	0.39	0.31	0.49	<0.0002	6.4	0.5	0.36
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000594	0.000561	0.000368	0.000522	0.000554	0.000315	0.00052	0.00052	0.00051	-	<0.0002	0.00054	0.00052
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.061	0.00125	0.00117	0.000881	0.00113	0.00115	0.000833	<0.0004	<0.0004	<0.0004	-	<0.00101	<0.0004	<0.0004
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.907	0.819	0.56	0.768	0.798	0.513	0.78	0.7	0.89	-	0.65	0.8	0.82
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.00023	0.00021	0.00032	-	<0.0001	0.00026	0.00017
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	5.23	4.83	6.39	6	4.93	6.71	5.24	5.51	5.78	-	4.19	5.34	5.57
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.44	2.09	1.92	2.34	2.03	2.09	2.22	2.38	2.44	-	1.32	2.26	2.39
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	0.18	0.0674	0.186	0.209	0.218	-	0.0407	0.168	0.177
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	-	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00159	0.00177	0.00186	0.00537	0.00162	0.00211	0.0067	0.0056	0.0064	-	0.0109	0.0082	0.0075
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00111	<0.00031	<0.00031	0.000781	<0.00031	<0.00031	<0.0005	<0.0005	<0.0005	-	0.00081	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.138	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	-	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]BLT1-01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 120 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-5

BL01 (BLT2-01): BLACK CREEK TRIBUTARY 2

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01	BL01
Sample Date									24-May-2012	2-Aug-2012	18-Jun-2013	4-Oct-2013	24-Sep-2015	30-Jun-2016	4-Sep-2016	9-Sep-2019	23-Oct-2019	3-Jun-2020	6-Aug-2020	22-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1121854010	1123514009	1132583003	1135004013	1155647006	1168221003	1168541003	1195369008	1199902010	1209326005	1209562007	1205287007	1205837001	L63022-08	L63345-01	L66047-03	L68131-02	L68797-03
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																										
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	6.72	6.9	6.1	6.01	6.27	6.34	7	7.27	7.7	6.59	7.75	7.17	6.51	7.69	5.82	7.4	5.96	7.55
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	99.5	102.4	100	97.7	97.5	83.7	79	69.6	60.7	45.6	73	66.2	146.7	50.4	84.7	183.2	114	140.1
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	36	99.8	100	113	118	135	137	120.8	116.9	81.7	123.6	124	285.5	97.5	164.3	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	0.8	3.9	0.9	BDL	0.4	3.3	2.8	2.7	0	1.8	3.6	0.6	0.3	0.1	0	4.1	3.6	0.4
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	13.1	-	14.16	14.31	14.06	11.17	10.39	12.91	13.03	13.61	11.86	13.41	13.19	9.26	11.7	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	25.8	40	12.8	0.97	0.33	0.55	0.41	0.46	0.28	0.31	0.70	0.83	0.32	0.44	2.84	Light Amber	Clear	clear
Physical Tests																										
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	-	-	51.3	68	57.2	61.6	54	35.5	58.4	53.5	139	70	76	99	57	66
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	31	66	81	75	89	100	88	91	83	81	86	83	166	88	112	144	92	88
Total Suspended Solids	mg/L	1	20	0.31	5	SM21 2540D	SM2540D	-	76.8	205	57.3	9.38	10.6	<0.317	0.529	1.56	0.519	1.25	1.48	<0.341	15.9	<5	<5	<5	7	<5
Dissolved Anions [6]																										
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	10.6	39.6	40.4	48.3	41.7	50.3	54	-	-	32.6	50.4	49.6	105	57.7	63.9	69.7	49	55
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.7	63.9	69.7	49	55
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.127	0.146	0.184	0.124	0.164	-	-	0.127	0.158	0.11	0.116	0.137	0.271	<0.4	<0.4	<0.4	<0.4	<0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	1.24	5.17	7.72	8.67	8.8	-	-	9.69	9.75	5.32	8.65	8.95	31.5	11.6	12.8	17.6	7.69	9.32
Nutrients																										
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	-	0.232	-	-	0.26	0.309	0.707	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.046	0.164	0.16	0.315	0.351	0.313	0.26	0.237	0.549	0.355	0.343	0.366	1	0.349	0.356	0.693	0.218	0.251
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	-	-	0.36	0.36	0.7	0.25	0.228
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	-	-	0.364	0.359	0.702	0.245	0.228
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0887	0.154	<0.062	<0.062	0.0204	0.0112	0.011	<0.005	<0.005	<0.012	<0.012	<0.012	<0.012	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanides																										
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	<0.0015	<0.0015	0.0022	0.0095	<0.0015	<0.0015	0.0024	0.0026	0.0029	<0.002	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0022	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																										
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	2.38	4.21	1.39	0.229	0.48	0.0213	0.0212	0.0402	0.0356	0.133	0.055	0.0374	0.079	0.0465	0.0159	0.0408	0.234	0.0391
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	<0.00031	<0.00031	0.000123	0.000159	0.000114	0.000145	0.000128	0.000108	0.000108	0.000108	0.0000609	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0015	0.00277	<0.0015	<0.0015	0.000321	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.00021
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0304	0.0607	0.0244	0.0108	0.0132	0.00981	0.00845	0.00871	0.0076	0.00609	0.00797	0.00744	0.0152	0.00998	0.00932	0.00898	0.00845	0.00754
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	0.000159	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	-	-	<0.0015	<0.0015	<0.0015	0.0015	<0.0015	<0.0015	0.00168	<0.0015	0.0019	<0.001	0.0015	<0.001	0.0013	<0.001
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0002	<0.00015	0.000195	<0.00015	<0.00015	0.0000319	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	6.87	16.5	14.9	16.7	15.6	21.2	18	19.2	16.7	10.9	17.9	16.7	44.7	22.2	24.2	32.3	17.8	21
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00331	0.00495	0.0026	0.000969	0.000796	<0.00015	<0.00015	<0.00015	<0.00015	0.000839	<0.00015	<0.00015	<0.00015	<0.0005	<0.0005	<0.0005	0.00061	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00191	0.003	<0.0012	<0.0012	0.000455	0.0000711	0.0000775	0.000103	0.0000922	0.000133	0.000115	0.000107	0.000173	0.000116	0.000075	0.000166	0.000189	0.000127
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.007	0.00606	0.0115	0.00335	0.00167	0.00222	0.00126	0.00129	0.00219	0.00138	0.00235	0.00144	0.00123	0.00111	0.00083	0.0011	0.00141	0.00143	0.00275
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	2.96	4.64	1.8	0.34	0.616	0.0267	0.0438	0.0466	0.0507	0.152	0.0699	0.0614	0.0875	0.063	<0.06	<0.06	0.295	0.064
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.002	0.00256	0.0054	0.00136	0.000301	0.000514	<0.000031	<0.000031	0.0000603	0.000045	0.0000568	0.0000406	<0.000031	0.000124	<0.0001	<0.0001	<0.0001	0.00017	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.83	3.65	3.16	3.17	2.99	3.67	2.97	3.3	2.98	2	3.32	2.86	6.75	3.59	3.86	4.53	2.95	3.32
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.134	0.21	0.102	0.0225	0.0415	0.00376	0.0127	0.0078	0.0072	0.00409	0.00852	0.00874	0.00361	0.00868	0.00787	0.00164	0.0125	0.00751
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<0.062	<0.062	-	<62	2.42	1.56	1.4	1.15	1.7	4.16	3.04	1.37	0.624	0.58	0.54	2.93	1.64	0.64
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	<0.0031	<0.0031	0.000279	0.000337	0.000299	0.000349	0.000284	0.000215	0.00031	0.000285	0.000542	0.00029	0.00028	0.00038	0.00024	0.00027
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.038	0.00398	0.00628	0.00255	0.00134	0.00162	0.000953	0.000738	0.000922	0.000866	0.00103	0.000861	0.000865	0.00111	<0.0004	<0.0004	0.0005	0.0007	<0.0004
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.531	0.639	0.69	0.465	0.435	0.562	0.449	0.506	0.404	0.34	0.465	0.433	0.855	0.47	0.41	0.75	0.4	0.44
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.00012	<0.0001	0.00019	<0.0001	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	6.35	10.5	6.62	5.95	6.18	5.71	5.31	6.35	6.01	5.11	6.73	5.66	5.98	5.67	5.89	5.46	6.23	5.86
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.05	1.85	1.78	1.87	1.72	2.15	1.71	1.94	1.69	1.36	1.87	1.63	2.47	1.84	2	1.92	1.73	1.81
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-	-	0.0597	0.184	0.0693	0.0773	0.132	0.0524	0.0565
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.000332	<0.00031	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	0.0000655	<0.000062	<0.000062	<0.000062	0.0000701	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0808	0.133	0.0478	0.00887	0.0154	0.000892	0.000959	0.00186	0.00154	0.00298	0.00312	0.00148	0.00366	<0.005	<0.005	<0.005	0.0091	<0.005
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	0.0116	<0.0062	<0.0062	0.0015	<0.00031	<0.00031	0.000956	<0.00031	<0.00031	0.000938	<0.00031	0.000467	<0.0005	<0.0005	<0.0005	0.00063	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.0123	0.0168	0.00854	0.00601	0.00228	0.00191	0.00109	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]BL01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 70 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020 and August 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-6

BL02: BLACK CREEK

Site ID									BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02	BL02
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	18-Jun-2013	3-Oct-2013	24-Sep-2015	30-Jun-2016	4-Sep-2016	9-Sep-2019	23-Oct-2019	3-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1132583004	1135004010	1155647004	1168221004	1168541004	1195369005	1199902007	1209326003	1209562006	1205287008	1205837002	L63022-09	L63345-02	L66041-02	L68131-03	L68797-05
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																								
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	6.88	7.56	5.99	7.15	7.52	-	-	7.48	-	6.99	6.19	7.49	6.71	10.85	6.13	7.76
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	106.1	101.3	94.2	87.7	81	97.4	-	81.8	159.7	127.4	135	162.5	166.9	128.3	266	270
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	221	258	270	333	328	267.8	256.9	150.6	254.2	228.6	269.6	290.6	321.2	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	0.2	0.5	0.8	6.3	3.9	2.1	-	1	5.5	1.8	0	0.1	0	0.6	5	0.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	15.36	14.6	13.45	10.82	10.63	13.4	-	13.78	11.19	12.92	12.88	13.39	12.49	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	12.2	1.43	0.45	0.4	0.87	0.25	0.50	1.52	0.51	0.57	0.37	1.3	2.33	Amber	Clear	It amber
Physical Tests																								
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	126	168	149	138	125	74.9	126	96.6	130	142	168	68	136	136
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	148	173	174	219	201	179	171	131	169	149	158	178	214	144	174	174
Total Suspended Solids	mg/L	1.04	20	0.323	5	SM21 2540D	SM2540D	-	59.3	1.04	0.449	<0.32	0.918	0.808	0.706	8.63	1.94	<0.304	<0.323	<5	<5	5	<5	<5
Dissolved Anions [6]																								
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	77.5	95.8	81.4	101	113	-	-	52	90.1	81	91	102	117	45	96	96.1
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	102	117	45	96	91.3
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	4.9
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.258	0.199	0.264	-	-	0.196	0.234	0.147	0.157	0.193	0.25	<0.4	<0.4	<0.4	0.49	<0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	33.4	40.9	39.1	-	-	45.1	43.7	19.6	35.8	31.5	35.2	40.2	46.6	16.6	38	36
Nutrients																								
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	<0.05	-	-	0.112	0.172	0.226	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.031	0.147	0.185	0.159	0.101	<0.05	0.957	0.287	0.17	0.177	0.288	0.189	0.15	0.053	0.096	0.594
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	0.21	0.15	0.05	0.1	0.113
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	0.208	0.15	0.051	0.102	0.113
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	0.004	0.0129	0.0124	<0.005	<0.005	0.0155	<0.012	<0.012	<0.012	<0.01	<0.01	0.021	<0.01	<0.01
Cyanides																								
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	0.0035	0.0052	<0.0015	<0.0015	0.0028	<0.002	0.0035	<0.002	-	-	<0.003	<0.003	0.005	<0.003	0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	<0.0015	0.0022	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																								
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	1.15	0.0299	0.0189	0.016	0.0132	0.0134	0.0252	0.25	0.0384	0.0149	0.021	0.0091	0.0073	0.183	0.0699	0.0268
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.0000873	0.00012	0.0000776	0.0000894	0.0000717	0.000105	0.0000676	0.0000661	0.0000752	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0015	<0.0015	0.000252	0.000238	<0.0002	<0.0002	0.000393	0.000223	<0.0002	0.000206	0.000243	0.00025	0.00023	0.00061	0.00037	0.00029
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0281	0.014	0.0125	0.0172	0.0161	0.0143	0.0135	0.0123	0.0133	0.0108	0.0146	0.013	0.0149	0.0115	0.0131	0.0123
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.0015	0.00192	<0.0015	0.00213	0.00169	0.00195	0.00232	0.00174	0.002	<0.001	0.0019	0.0013	0.002	0.0015
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	0.000155	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	31.8	35.4	34.9	46.7	42.2	39.2	35.5	20.8	35.3	27.8	35.2	40.6	47.7	19.9	38.9	39.2
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00204	0.00072	0.000185	<0.00015	<0.00015	<0.00015	<0.00015	0.00095	<0.00015	<0.00015	0.000163	0.00055	<0.0005	0.00056	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	0.000134	0.000103	0.000112	0.000125	0.000137	0.000372	0.00015	0.000127	0.000152	0.000141	0.00015	0.00064	0.000172	0.000144
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.010	0.00356	0.00142	0.00134	0.00124	0.00132	0.00153	0.00166	0.00372	0.00165	0.00148	0.00159	0.00092	0.00098	0.0048	0.00126	0.00123
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	1.95	0.219	0.112	0.0529	0.0682	0.0579	0.0986	0.531	0.11	0.107	0.107	<0.06	<0.06	0.444	0.2	0.123
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	0.000696	<0.000062	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	0.00016	<0.000031	<0.000031	<0.000031	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	8.46	9.29	9.37	12.4	10.6	9.8	8.85	5.59	9.18	6.6	10.1	9.97	11.8	4.55	9.4	9.24
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.268	0.065	0.0439	0.0349	0.0606	0.0514	0.073	0.0869	0.0534	0.055	0.0957	0.0643	0.0906	0.136	0.0526	0.0643
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	<62	1.51	1.41	1.36	0.801	4.83	6.04	1.32	1.23	0.963	0.5	0.46	5.62	3.62	0.55
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.000346	0.000464	0.000407	0.000397	0.00033	0.000317	0.000379	0.000297	0.000345	0.00032	0.00029	0.00021	0.00033	0.00028
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.061	0.00322	0.00207	0.002	0.0015	0.00143	0.00166	0.00155	0.0023	0.00178	0.00156	0.00172	0.00069	0.00065	0.00178	0.00079	0.00073
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.922	0.674	0.677	0.94	0.826	0.72	0.608	0.511	0.684	0.567	0.692	0.65	0.67	0.74	0.68	0.65
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.0001	<0.0001	<0.0001	0.00014	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	6.73	6.15	6.65	6.48	6.31	6.65	6.75	6.62	7.34	6.02	8.5	6.38	7.24	3.91	6.45	6.92
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.8	3.07	3.2	4.18	3.62	3.33	2.9	2.3	3.09	2.36	3.53	3.23	3.52	1.71	3.13	3.05
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	0.119	0.145	0.155	0.185	0.0756	0.141	0.132
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	0.0000925	<0.000062	<0.000062	<0.000062	0.0000675	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0514	0.00273	0.00194	0.00129	0.00131	0.00177	0.00189	0.00887	0.00696	0.00163	0.00198	<0.005	0.005	0.0082	0.0064	0.0063
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.000665	0.000334	<0.00031	0.00106	<0.00031	0.000894	0.00103	<0.00031	0.000311	<0.0005	<0.0005	0.00072	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.138	0.0107	0.00355	0.000847	0.00137	0.00115	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]BL02

Notes
1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 120 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, May 2021 and August 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-7

BL03: BLACK CREEK

Site ID								Comparative Guideline [1,2,4,5,6,7,8]	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03	BL03
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]			18-Jun-2013	3-Oct-2013	25-Sep-2015	30-Jun-2016	5-Sep-2016	28-May-2018	12-Sep-2018	5-Jun-2019	8-Sep-2019	23-Oct-2019	4-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	20-May-2021	24-Aug-2021
Lab ID									1132583011	1135004011	1155647016	1168221005	1168541005	1189336004	1189750009	1199394007	1195369004	1199902006	1209326011	1209562004	1205287009	1205837003	L63022-10	L63345-03	L66041-05	L68132-03
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																										
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	6.96	7.32	7.06	7.1	7.59	7.16	7.65	7.96	7.8	7.84	7.46	7.83	7.41	6.77	7.29	6.14	7.71	-
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	104	98.3	87.4	85.1	83.7	52.9	154.1	101.4	173.2	147.7	91.9	175.7	129.7	146.1	156.7	180.9	127.6	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	253	263	289	364	356	98	257	-	286.6	283.7	166.1	274.6	237.6	280.7	299.8	348	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	4.3	0.6	-0.1	8.9	4.2	1	4.1	1.4	4.3	0.1	1.8	6.1	1.2	0	0.1	0.1	5.9	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	13.61	14.1	12.71	9.81	10.88	12.85	10.89	9.99	12.44	11.34	13.14	9.72	12.96	12.58	13.4	9.82	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	3.2	0.93	0.73	0.72	0.77	39	1.33	4	0.58	0.96	2.75	0.48	0.55	0.43	0.38	28.23	Amber	-
Physical Tests																										
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	139	184	166	51.9	145	89.7	153	132	74.1	138	99	143	146	184	73	142
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	182	177	184	255	224	131	175	146	193	187	132	186	153	170	190	218	164	186
Total Suspended Solids	mg/L	1.05	20	0.326	5	SM21 2540D	SM2540D	-	3.81	3.75	<0.167	<0.31	0.6	103	4.17	7.08	0.722	4	13.3	0.505	<0.304	<0.326	<5	95	<5	<5
Dissolved Anions [6]																										
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	90.7	99.9	93	113	124	33.3	95.9	65.3	-	-	54.5	97.9	84.1	96.5	105	124	45.3	106
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	124	45.3	106
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.362	0.283	0.317	-	-	0.173	0.248	0.189	0.235	0.345	0.149	0.191	0.239	0.308	<0.4	<0.4	<0.4	<0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	37.6	39.4	43.1	-	-	10.2	39	30.4	50.5	48.3	22.6	38.9	32.1	41.4	43.5	49.6	16.5	37.7
Nutrients																										
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	-	-	<0.05	-	-	0.09	0.123	0.198	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.031	0.108	0.135	0.144	2.36	0.151	0.486	0.166	<0.05	0.2	0.17	0.13	0.22	0.254	0.181	0.175	0.025	0.041
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.17	0.03	0.05
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.167	0.027	0.045
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	0.0307	0.0206	0.0188	0.105	0.0084	0.0238	<0.005	<0.005	0.0229	<0.012	0.0305	<0.012	0.01	0.201	0.022	0.014
Cyanides																										
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	0.0033	<0.0015	<0.0015	<0.0015	<0.002	0.0042	<0.002	0.0038	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	0.006	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0023	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																										
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.0941	0.0584	0.0122	0.0158	0.00929	0.984	0.134	0.157	0.0136	0.0271	0.322	0.0149	0.0157	0.0212	0.0123	3.24	0.136	0.03
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.0000856	0.000132	0.0000731	0.000145	0.00012	0.000123	0.000104	0.000102	0.0001	0.0000717	0.0000651	0.0000936	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0015	<0.0015	0.000375	0.00049	0.00041	0.00146	0.000292	0.00061	<0.0002	0.000376	0.000248	<0.0002	<0.0002	0.000249	0.00034	0.00261	0.00055	0.00042
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.019	0.0162	0.0128	0.0205	0.0164	0.0287	0.0166	0.0117	0.0148	0.0138	0.0124	0.0132	0.00986	0.0144	0.0135	0.0479	0.0112	0.0125
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	0.0000714	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.000026	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.00157	0.0019	<0.0015	0.00185	0.00278	0.00194	0.00188	0.00189	0.00164	0.00245	0.00155	0.00195	0.0013	0.0023	0.0014	0.0026
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	<0.000015	<0.000015	<0.000015	0.0000468	0.0000213	<0.000015	<0.000015	0.0000158	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	0.000065	0.000107	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	34.8	34.7	36.7	49	44.2	13.8	38.5	23.2	40.4	35.2	19.3	37	27.1	37.5	40.5	50.8	19.8	38.4
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000899	0.000692	0.000254	<0.00015	<0.00015	0.00152	0.000361	0.000561	<0.00015	<0.00015	0.00111	<0.00015	<0.00015	0.000235	<0.0005	0.00419	0.00059	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	0.000137	0.000119	0.000115	0.00156	0.000278	0.000289	0.000125	0.00013	0.000367	0.000128	0.000102	0.000138	0.000147	0.00208	0.00046	0.000137
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.011	0.00187	0.00175	0.00137	0.00188	0.00124	0.00897	0.0024	0.00261	0.00175	0.00193	0.00347	0.00157	0.00148	0.00212	0.00113	0.00629	0.00267	0.0012
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.49	0.258	0.211	0.181	0.195	2.08	0.375	0.384	0.118	0.143	0.637	0.108	0.11	0.177	0.125	5.55	0.459	0.132
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	0.0000963	<0.000062	<0.000031	<0.000031	<0.000031	0.00174	0.000293	0.000107	<0.000031	0.0000801	0.000224	<0.000031	<0.000031	<0.000031	<0.0001	0.00162	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	10.8	11	11.4	15.1	13.4	4.25	11.9	7.73	12.5	10.7	6.27	11	7.64	12	10.9	14	5.8	11.2
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.113	0.0299	0.0294	0.0261	0.0358	0.201	0.0285	0.051	0.0174	0.0224	0.0577	0.0158	0.0123	0.0271	0.0302	0.228	0.0569	0.0184
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	<62	1.15	1.3	1.46	10.8	2.11	4.03	0.757	1.51	4.79	1.83	1.14	0.862	0.47	4.64	7.7	0.65
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.000349	0.000421	0.000374	0.000145	0.000384	0.000286	0.000369	0.000292	0.000247	0.000372	0.000259	0.000313	0.00029	0.00033	<0.0002	0.00031
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.065	0.00191	0.00213	0.00215	0.00161	0.0014	0.00487	0.00255	0.00205	0.00173	0.00161	0.00219	0.0017	0.00149	0.00176	0.00061	0.00475	0.0021	0.00079
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.901	0.678	0.684	0.951	0.832	0.631	0.842	0.51	0.754	0.619	0.483	0.726	0.547	0.711	0.69	1.03	0.76	0.68
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	0.000406	0.000396	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.0001	0.00014	<0.0001	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	5.65	6.31	7.05	6.73	6.34	5.57	8.27	5.31	7.24	6.8	5.98	7.25	6.19	8.5	6.76	12.6	4.48	6.16
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	0.00001	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.86	3.94	4	5.34	4.78	1.87	4.32	3.13	4.21	3.77	2.56	3.8	2.78	4.25	3.39	4.36	2.29	3.75
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-	-	-	0.128	0.158	0.163	0.214	0.0813	0.15
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.0000726	0.0000762	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00413	0.00393	0.00203	0.00123	0.00129	0.0186	0.00658	0.00715	0.00197	0.00209	0.0121	0.00869	0.00161	0.00231	<0.005	0.154	<0.005	0.0053
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.000611	0.000379	<0.00031	0.00437	0.000808	0.00137	0.000964	<0.00031	0.000683	0.00116	<0.00031	<0.00031	<0.0005	0.00763	0.00055	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.148	0.00672	0.00357	0.00126	0.0026	0.00161	0.00532	<0.0031	<0.0031	<0.0031	0.00397	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	0.0121	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]BL03

Notes
1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 130 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 and December 2020 are erroneous due to instrument malfunction.
Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-8a

TL01: TETLIN LAKE

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	TL01	TL01	TL01	TL01	TL01	TL01	TL01	TL01
Sample Date									25-Sep-2015	1-Jul-2016	5-Sep-2016	28-May-2018	12-Sep-2018	5-Jun-2019	8-Sep-2019	23-Oct-2019
Lab ID									1155647015	1168221015	1168541009	1189336001	1189750008	1199394008	1195369002	1199902005
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters [6,9]																
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.56	-	8.38	7.71	6.36	-	-	-
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	74.1	-	85.6	91.1	27.3	83.4	112.8	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	264	-	199	260	281	220	213.2	350.6
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	1.9	-	12.5	16.1	9.6	16	15.5	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	10.27	-	9.14	8.98	3.08	8.17	11.36	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	19.4	11.7	8.88	51.97	3.92	3.72	6.56	7.49
Physical Tests																
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	134	96.9	89.5	129	149	107	116	187
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	156	145	142	163	173	138	134	213
Total Suspended Solids	mg/L	1.22	20	0.378	5	SM21 2540D	SM2540D	-	60.7	16.7	14	42.5	6.6	5.92	13.7	8.43
Dissolved Anions																
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	80.7	66	70.9	95.6	140	91	-	-
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.252	-	-	0.48	0.244	0.373	0.153	0.282
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	36.2	-	-	32.7	13.7	29.5	31.4	46.6
Nutrients																
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	<0.05	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	<0.05	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.532	0.0614	0.114	1.12	<0.025	0.0964	<0.05	<0.05
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0552	0.119	0.076	0.177	0.159	0.0411	0.0391	0.02
Cyanides																
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0024	<0.0015	<0.0015	<0.002	0.0053	<0.002	0.0033	0.0028
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-
Total Metals [5,7,8]																
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.595	0.311	0.0921	0.67	0.0272	0.0428	0.0985	0.193
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000145	0.000175	0.000157	0.000246	0.000205	0.000118	0.000136	0.000194
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00082	0.00171	0.00212	0.00192	0.000956	0.000599	0.0013	0.000668
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0315	0.0207	0.0175	0.0327	0.0255	0.0168	0.0193	0.034
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.0000178	<0.000015	<0.000015
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0102	0.0158	0.00992	0.0142	0.0215	0.0119	0.00815	0.0119
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	0.0000165	0.0000226	<0.000015	0.0000385	0.000019	<0.000015	<0.000015	0.000017
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	38.9	26.7	23.3	37.8	44.5	31	32.6	57.9
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000846	0.000161	0.000214	0.000637	<0.00015	0.000216	<0.00015	<0.00015
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000492	0.000361	0.000215	0.000608	0.000194	0.000159	0.000204	0.000284
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.012	0.00211	0.00208	0.00132	0.00322	0.000536	0.000943	0.00121	0.00173
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	1.11	0.831	0.322	1.45	1.33	0.136	0.225	0.357
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.000495	0.000319	0.000231	0.00105	0.000109	0.0000638	0.000139	0.000343
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	8.86	7.32	7.63	8.34	9.33	7.16	8.47	10.3
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.089	0.0979	0.0664	0.112	0.104	0.0358	0.0576	0.0174
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	2.04	5.03	2.56	36.7	1.96	2.69	1.3	1.49
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000743	0.000646	0.000731	0.00066	0.000306	0.000462	0.00065	0.000863
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.065	0.00265	0.00165	0.00113	0.00227	0.0015	0.00122	0.00135	0.0022
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.26	1.08	0.956	1.75	1.13	1.18	1.18	1.46
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.000659	0.000494	<0.00031	0.000587	<0.00031	0.000439	0.000517	0.000668
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	1.94	1.35	0.963	1.68	2.69	0.609	1.01	1.8
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	0.0000117	<0.0000062	<0.0000062	<0.0000062	0.00000862
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.33	3.1	3.28	3.35	7.31	2.83	3.17	3.61
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.0000622	0.0000805
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0224	0.0087	0.00422	0.0174	0.00253	0.00159	0.00477	0.00696
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00293	0.00284	0.00196	0.00298	0.00055	0.00188	0.00223	0.000671
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.150	0.00291	0.00327	0.00153	0.00584	<0.0031	<0.0031	<0.0031	0.00416

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]TL01_a

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 130 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-8b

TL01: TETLIN LAKE

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	TL01	TL01	TL01	TL01	TL01	TL01	TL01	TL01	TL01	TL01	TL01
Sample Date									3-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	22-Feb-2021	17-Mar-2021	20-Apr-2021	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1209326002	1209562002	1205287019	1205837013	L63022-02	L63345-09	L64532-01	L64872-02	L65492-02	L66041-01	L68132-02	L68796-04
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																				
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	7.42	8.53	8.09	6.85	7.76	6.28	7.33	6.75	8.02	10.37	5.84	7.49
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	158.9	208	188.8	161.9	180.6	222.2	829	728	278	179.7	255	271
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	200.8	243.8	279.5	300.8	347.6	417.1	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	14.1	17.3	8	0.8	0.1	0.5	0.7	1.9	0.2	17.1	15.3	1.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	7.65	7.15	9.74	12.06	24	7.08	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	2.37	3.97	4.26	0.44	1.14	4.75	Light Amber w/ grey	Brown	Black	Light Amber	Amber	amber
Physical Tests																				
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	96.8	141	127	159	176	221	302	-	182	89	129	139
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	124	175	179	185	214	274	348	-	184	160	164	190
Total Suspended Solids	mg/L	1.22	20	0.378	5	SM21 2540D	SM2540D	-	6.4	7	9.8	2.2	<5	<5	84	313	203	7	<5	19
Dissolved Anions																				
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	76.9	90.2	102	111	143	165	232	-	120	63.4	126	135
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	143	165	232	-	120	63.4	126	132
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	<2	<2	<2	-	<2	<2	<2	2.5
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.224	0.195	0.177	0.23	<0.4	<0.4	0.63	1.72	0.79	<0.4	<0.4	0.61
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	21	31.3	39.4	42.9	43.8	51.2	69.7	83	22.4	22.1	6.54	10.2
Nutrients																				
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.05	<0.05	<0.05	0.16	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	0	<0.02	0.034
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	0	<0.02	0.034
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0429	0.0273	0.0413	0.0153	0.019	0.01	0.14	-	0.316	0.107	0.069	0.086
Cyanides																				
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.002	<0.002	-	-	<0.003	<0.003	0.4	-	<0.003	0.009	<0.003	0.015
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	0.0022	0.0023	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																				
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0793	0.0933	0.0561	0.0215	<0.005	<0.005	2.37	-	15.7	0.0478	0.0394	0.0221
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.0000887	0.000107	0.0000983	0.000105	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0002	0.00105	0.000721	0.000595	0.00066	0.00076	0.00156	-	0.0054	0.00092	0.00128	0.00118
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0163	0.0234	0.0234	0.0252	0.0229	0.0284	0.0694	-	0.129	0.0162	0.012	0.00893
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	-	<0.0016	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0101	0.0121	0.00717	0.00785	0.0074	0.0087	0.011	-	<0.02	0.0071	0.0079	0.0067
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0004	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	0.00012	-	0.000483	0.000051	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	29.6	41.5	38.9	46.7	53.4	66.9	87.3	-	46.8	25.1	36.2	39.9
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000586	<0.00015	<0.00015	0.000158	<0.0005	<0.0005	0.00329	-	0.0158	<0.0005	0.00057	0.0007
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000176	0.000229	0.000174	0.000176	0.000174	0.000224	0.00171	-	0.00866	0.00034	0.000271	0.00048
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.013	0.00156	0.00174	0.00112	0.00116	0.00083	0.00098	0.00618	-	0.0247	0.00104	<0.0008	<0.0008
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.274	0.22	0.173	0.0962	0.072	0.192	5.23	-	24.7	1.02	1.24	2.35
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.000591	0.000111	0.000279	0.0000587	<0.0001	<0.0001	0.00138	-	0.00572	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	5.55	9.06	7.34	10.3	10.4	13	20.3	-	15.7	6.28	9.46	9.65
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0426	0.0676	0.0398	0.0239	0.0336	0.0788	0.69	-	0.734	0.0552	0.0713	0.243
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	3.01	2.89	1.1	0.536	0.31	0.41	6.55	<0.0002	10.9	5.44	2.14	0.68
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000429	0.000593	0.000506	0.000518	0.00048	0.00049	<0.0002	-	0.00086	0.00029	<0.0002	<0.0002
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.074	0.00126	0.002	0.00157	0.0016	0.00058	0.00097	0.00375	-	0.015	0.00097	0.00097	0.00087
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.12	1.4	1.12	1.27	1.4	1.77	2.86	-	4.34	1.31	1.12	1.17
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.000435	0.000871	0.000661	0.000634	0.00059	0.00053	0.00052	-	0.00109	0.00015	0.00017	0.00011
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	0.967	1.12	1.55	1.67	1.65	2.34	12	-	17.2	2.02	0.64	4.85
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	0.00012	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.91	2.79	2.13	3.17	3.11	3.97	5.7	-	6.43	2.6	5.51	6.75
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	0.194	0.214	0.225	0.281	0.333	-	0.243	0.108	0.161	0.166
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.0000782	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	-	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00253	0.0119	0.00231	0.00151	<0.005	0.0062	0.178	-	0.89	<0.005	0.006	0.0065
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000986	0.00206	0.000903	0.000767	<0.0005	<0.0005	0.00728	-	0.0348	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.169	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	0.0098	-	0.0536	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_ll.xlsx]TL01_b ables_ll.xlsx]TL01_b

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 150 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020, May 2021 and August 2021 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-9a

TL02: TETLIN LAKE

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02
Sample Date									25-Sep-2015	1-Jul-2016	5-Sep-2016	28-May-2018	12-Sep-2018	4-Jun-2019	8-Sep-2019	23-Oct-2019
Lab ID									1155647001	1168221012	1168541012	1189336002	1189750007	1199394001	1195369003	1199902004
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters [6,9]																
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	7.77	8.18	8.39	7.03	7.07	-	-	-
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	99.3	85.6	95.6	105.6	74	74.8	113.3	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	274	234	246	231	238	-	245.2	312.5
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	2.4	21.2	13.8	14.2	11.3	15.8	15.8	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	13.18	7.6	9.87	10.76	8.11	8.1	11.25	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	189	5.72	15.4	57.47	3.74	7.92	4.69	5.91
Physical Tests																
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	177	112	107	120	143	103	133	157
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	165	182	142	138	146	152	154	188
Total Suspended Solids	mg/L	1.43	20	0.443	5	SM21 2540D	SM2540D	-	787	8.5	23.6	159	6.94	11.2	8.24	8.33
Dissolved Anions																
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	99.3	91.7	94.3	93.1	98.5	48.2	-	-
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.37	-	-	0.303	0.323	0.362	0.223	0.386
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	34.3	-	-	25.3	28.2	71.6	38.6	32.6
Nutrients																
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	<0.05	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	<0.05	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.136	0.0606	0.205	0.0734	0.0252	<0.05	<0.05	0.0878
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	1.54	0.046	0.0872	0.292	0.0345	0.064	0.0808	0.0234
Cyanides																
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0036	<0.0015	0.0046	<0.002	<0.002	<0.002	0.0035	0.0031
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-
Total Metals [5,7,8]																
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	11.6	0.114	0.266	3.17	0.165	0.147	0.195	0.165
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000114	0.000143	0.000142	0.000126	0.000217	0.000137	0.000125	0.000183
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00625	0.00189	0.002	0.00236	0.00136	0.00102	0.000869	0.00126
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.139	0.0221	0.0236	0.0498	0.0239	0.0164	0.0233	0.0303
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.000291	<0.000025	<0.000025	0.0000707	<0.000025	<0.000025	<0.000025	<0.000025
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	0.0000558	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0132	0.0128	0.011	0.0155	0.0103	0.0123	0.00967	0.0145
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	0.000278	<0.000015	0.000019	0.000065	0.0000334	<0.000015	<0.000015	<0.000015
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	48.5	32.4	30.8	35.3	40.6	29.9	38.2	47.4
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.0188	<0.00015	0.000501	0.00391	0.000276	0.000415	<0.00015	0.000571
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00848	0.000214	0.000306	0.00197	0.000283	0.000241	0.000242	0.000268
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.012	0.0373	0.00123	0.00161	0.00876	0.0018	0.00148	0.00182	0.00136
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	20.3	0.345	0.634	4.93	0.372	0.382	0.32	0.362
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.00584	0.000132	0.000379	0.00154	0.000202	0.000173	0.000136	0.000242
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	13.4	7.68	7.43	7.63	10.2	6.96	9.13	9.48
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.45	0.0738	0.0666	0.194	0.0284	0.0532	0.0304	0.0358
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	37.3	5.61	3.81	20.1	2.46	3.14	1.46	1.49
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000679	0.000655	0.00072	0.000523	0.000726	0.000567	0.000802	0.00117
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.065	0.0192	0.00146	0.00136	0.00454	0.00174	0.00137	0.00157	0.00174
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.77	1.52	1.31	1.6	1.56	1.32	1.52	1.64
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.00128	0.000416	<0.00031	0.000759	0.000675	0.00049	0.000627	0.000511
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	15.7	0.803	1.34	5.73	1.01	0.649	1.17	4.96
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	0.0000799	<0.0000062	<0.0000062	0.0000251	<0.0000062	0.0000108	<0.0000062	<0.0000062
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	4.42	3.55	2.92	2.85	3.96	3.01	3.35	4.43
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	0.000041	<0.0000062	<0.0000062	0.0000114	<0.0000062	<0.0000062	<0.0000062	<0.0000062
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.0000927	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.0000621	0.0000883
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.322	0.00359	0.00982	0.0811	0.00609	0.00535	0.0108	0.00681
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.0397	0.00145	0.00245	0.00824	0.00139	0.0022	0.00211	0.00109
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.150	0.0568	0.00505	0.00233	0.0118	0.00344	<0.0031	0.00571	0.00333

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]TL02_a

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 130 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-9b

TL02: TETLIN LAKE

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02	TL02
Sample Date									3-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	24-Feb-2021	17-Mar-2021	20-Apr-2021	20-May-2021	22-Jul-2021	24-Aug-2021	22-Sep-2021
Lab ID									1209326001	1209562003	1205287020	1205837014	L63022-03	L63345-10	L64533-01	L64872-03	L65492-01	L66041-03	L67403-01	L68132-01	L68796-03
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																					
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	7.7	8.35	7.66	7.61	6.89	6.69	7.18	6.63	8.55	10.23	8.88	6.22	7.95
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	181.8	219.5	196.8	168.1	201.8	233.1	608	488	404	174.5	216	376	395
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	233.9	256.2	293.8	321.2	364.7	424.8	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	13.3	17.6	7.7	0	1.4	1.5	1.1	1.8	0	16.2	22.3	8.3	0.3
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	8.19	7.13	9.03	13.38	7.3	2.45	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	10.02	10.57	12.07	2.97	1.51	2.47	Black w/ organics	Brown	Black	Amber	Light Amber	Light Amber	lt. amber
Physical Tests																					
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	117	137	132	165	187	177	484	-	517	89	118	198	210
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	141	173	185	196	226	220	356	-	284	156	-	250	256
Total Suspended Solids	mg/L	1.43	20	0.443	5	SM21 2540D	SM2540D	-	22	14.5	12.4	4.43	<5	<5	3030	602	2100	14	-	<5	<5
Dissolved Anions																					
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	91.3	93.5	108	116	142	150	328	-	159	67.1	-	151	155
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	142	150	328	-	159	67.1	-	151	147
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	<2	<2	<2	-	<2	<2	-	<2	7.8
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.238	0.231	0.198	0.324	<0.4	<0.4	1.06	1.72	0.91	<0.4	<0.4	<0.4	1.76
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	24.6	34	39.7	41.8	44.5	27	0.79	<1000	52.3	18	25.5	46.8	54.2
Nutrients																					
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.05	<0.05	<0.05	<0.05	<0.02	0.13	<0.02	-	<0.02	<0.02	<0.02	0.031	<0.02
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	0.02	0.11	<0.02	<0.02	<0.02	0	2.71	<0.02	<0.02
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	0.021	0.107	<0.02	<0.02	<0.02	0	2.71	<0.02	<0.02
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0696	0.0404	0.0393	0.0171	0.026	0.026	3.92	-	3.85	0.104	0.038	0.039	0.038
Cyanides																					
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0028	<0.002	-	-	<0.003	<0.003	-	-	0.006	0.006	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	0.0021	0.0022	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																					
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.492	0.199	0.323	0.084	0.0056	0.0055	49.7	-	92.4	0.0605	0.232	0.0399	0.0158
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.0000981	0.0000982	0.0000926	0.000095	<0.0004	<0.0004	0.00044	-	<0.002	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000833	0.00128	0.000419	0.000574	0.00083	0.00125	0.0327	-	0.0326	0.00167	0.00137	0.00199	0.0018
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0234	0.0234	0.0266	0.0236	0.0252	0.0278	0.554	-	0.767	0.0151	0.0177	0.022	0.0236
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.004	-	<0.016	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0132	0.0111	0.00852	0.00704	0.0088	0.015	0.0261	-	<0.2	0.0081	0.0083	0.0023	0.0017
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0004	0.0000161	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	0.00167	-	0.00239	0.000179	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	35.5	41	40.4	47.6	57.1	54.6	132	-	131	27.3	35.8	60.7	64.5
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00111	<0.00015	0.00038	0.000212	0.00069	0.00189	0.0652	-	0.0838	<0.0005	0.00061	0.00932	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00042	0.000344	0.000329	0.000187	0.000199	0.000181	0.0307	-	0.0492	0.000705	0.000473	0.000269	0.000313
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.015	0.00251	0.0022	0.00168	0.00127	0.00086	<0.0008	0.0735	-	0.145	0.00086	0.0021	0.00196	0.001
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	1.02	0.49	0.59	0.204	0.081	0.265	87.2	-	124	1.8	0.698	0.488	0.748
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.007	0.000262	0.000203	0.000201	0.000088	<0.0001	<0.0001	0.028	-	0.0354	<0.0001	0.0002	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	6.96	8.43	7.59	11.1	10.7	9.96	37.4	-	46.1	5.09	6.89	11.3	11.8
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0669	0.075	0.0401	0.0228	0.0571	0.248	1.64	-	1.54	0.0758	0.0591	0.0849	0.141
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	4.51	2.56	1.88	0.819	0.39	0.4	125	47.7	91.5	2.52	1.21	0.76	0.56
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000654	0.000568	0.000572	0.000533	0.00064	0.00103	0.0019	-	0.00313	0.00045	0.00038	0.00152	0.00042
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.086	0.00179	0.00209	0.00195	0.00162	0.00051	0.00055	0.073	-	0.0827	0.00111	0.00096	0.00091	0.00067
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.48	1.37	1.14	1.41	1.43	1.64	8.83	-	13.8	1.85	1.16	1.66	3.11
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.000632	0.000838	0.000819	0.000649	0.00066	0.00066	0.00229	-	0.00376	0.00017	0.00053	<0.0001	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	2.81	1.1	2.64	2.13	2.76	7.18	61.5	-	55.1	1.86	1.29	5.27	5.91
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	0.00049	-	0.00069	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.59	2.51	2.48	3.52	3.52	4.95	15.9	-	17.5	2.36	2.53	3.86	4.25
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	0.203	0.21	0.245	0.274	0.653	-	0.769	0.112	0.157	0.242	0.247
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	0.00021	-	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	-	<0.004	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0179	0.00786	0.017	0.00383	<0.005	0.0056	3.13	-	4.96	<0.005	0.0156	0.0095	0.0095
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00241	0.00286	0.00204	0.000706	<0.0005	0.00078	0.0805	-	0.163	0.00058	0.00163	0.00062	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.197	<0.0031	0.00463	<0.0031	<0.0031	<0.006	<0.006	<0.3	-	0.21	0.0086	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]TL02_b

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 180 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020, May 2021 and August 2021 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-10

HIT2-01: HILLSIDE (PUMP) CREEK TRIBUTARY 2

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01	HIT2-01
Sample Date									23-May-2012	4-Aug-2012	11-Sep-2019	3-Jun-2020	7-Aug-2020	21-Sep-2020	18-Oct-2020	19-May-2021	21-Jun-2021	25-Aug-2021
Lab ID									1121854001	1123514003	1195369017	1209326009	1209562012	1205287018	1205837012	L66043-04	L66741-06	L68129-05
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																		
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	-	-	-	6.15	6.54	6.04	4.12	8.55	7.54	7.12
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	-	-	94	53.5	115.3	112.7	122.2	89	171.2	210.7
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	-	-	179.3	100.4	205.1	210.1	232.1	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	-	-	1.2	0.5	2.1	0.7	0	4	1.5	1.6
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	-	-	13.3	14.01	11.93	13.13	12.2	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	-	-	5.97	0.53	0.41	0.86	3.72	Light Amber	Clear	Clear
Physical Tests																		
Hardness - as CaCO3	mg/L	1	0.2	1	5	SM21 2340B	SM2340B - Calculatio	-	-	-	364	35.5	76.4	69.8	81.7	38	69	85
Total Dissolved Solids	mg/L	10	20	3.1	40	SM21 2540C	SM2540C	500	62	109	146	101	161	156	148	112	144	162
Total Suspended Solids	mg/L	0.98	5	0.304	20	SM21 2540D	SM2540D	-	9	0.6	16.4	5.03	1.5	2.32	9.8	6	6	6
Dissolved Anions [6]																		
Alkalinity - Total - CaCO3	mg/L	10	2	2.5	20	SM21 2320B	SM2320B - Titration	20	4.62	17.8	-	4.47	9.6	11.4	10.6	6.9	13.7	23
Chloride	mg/L	0.2	0.4	0.05	2	EPA 300.0	M300.0 - Ion Chromat	230	0.223	0.303	2.12	0.985	2.6	2.53	2.66	1.15	2.29	2.21
Sulphate	mg/L	2	0.4	0.5	2	EPA 300.0	M300.0 - Ion Chromat	250	15.6	42.7	63.9	28.1	66.5	72.9	72.6	26.2	61	64.2
Nutrients																		
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	0.939	-	0.922	0.817	0.767	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	<0.05	-	<0.05	<0.05	<0.05	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.02	0.05	0.1	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.046	0.186	0.939	1.07	1.27	0.921	1.04	0.525	1.23	1.21
Total Phosphorous	mg/L	0.04	0.01	0.012	0.05	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	-	-	<0.005	<0.012	<0.012	<0.012	<0.012	0.023	<0.01	<0.01
Cyanides																		
Total Cyanide	mg/L	-	0.003	-	0.01	-	D7511-09	-	<0.0015	<0.0015	<0.002	<0.002	<0.002	-	-	0.004	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.003	0.0015	0.01	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	0.0021	0.0024	0.0182	<0.003	<0.003
Total Metals [5,7,8]																		
Aluminum	mg/L	0.002	0.005	0.00062	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.453	0.0479	1.72	0.318	0.211	0.0763	0.254	0.454	0.269	0.153
Antimony	mg/L	0.00005	0.0004	0.000015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.000801	0.000148	0.00012	0.000118	0.000155	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.0002	0.0002	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00249	0.00207	0.00498	0.000883	0.000878	0.000831	0.00136	0.00315	0.00252	0.00181
Barium	mg/L	0.00025	0.0005	0.00004	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.00764	0.00785	0.104	0.0116	0.0199	0.0178	0.0199	0.012	0.0124	0.00852
Beryllium	mg/L	0.00005	0.00008	0.000025	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	0.000135	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-
Boron	mg/L	0.005	0.001	0.0015	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.00995	<0.0015	0.00254	0.00163	0.00218	0.0014	0.002	0.0024
Cadmium	mg/L	0.00005	0.00005	0.000015	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	0.000124	0.0000296	0.000022	0.0000253	0.0000351	0.00125	<0.00005	<0.00005
Calcium	mg/L	0.05	0.1	0.015	0.5	EPA 200.8 Low Level	M200.7 ICP	-	6.09	16.6	98.2	9.41	20.7	19.6	21.3	10.8	19.7	24.4
Chromium	mg/L	0.0005	0.0005	0.00015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000838	<0.00062	<0.00015	0.000959	<0.00015	<0.00015	0.00045	0.00079	0.00076	0.00066
Cobalt	mg/L	0.000025	0.00005	0.00001	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	0.0022	0.000369	0.000338	0.000213	0.000405	0.00333	0.000317	0.000213
Copper	mg/L	0.0005	0.0008	0.0002	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.009	0.00573	0.00283	0.0219	0.00593	0.00368	0.00312	0.00369	0.00533	0.00403	0.00308
Iron	mg/L	0.02	0.06	0.0062	0.15	EPA 200.8 Low Level	M200.7 ICP	1	0.437	<0.078	1.55	0.238	0.195	0.0762	0.229	0.608	0.24	0.107
Lead	mg/L	0.0001	0.0001	0.000031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	0.000245	<0.000062	0.00154	0.000144	0.000184	0.0000665	0.000196	0.00026	0.00015	<0.0001
Magnesium	mg/L	0.02	0.2	0.0062	1	EPA 200.8 Low Level	M200.7 ICP	-	1.66	4.33	28.9	2.92	6.01	5.05	6.91	2.67	4.85	5.88
Manganese	mg/L	0.0001	0.0004	0.000031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0321	0.000733	0.0789	0.0118	0.0102	0.0167	0.0373	0.203	0.0078	0.00827
Mercury	ng/L	1	0.0000003	0.5	1	EPA 1631 E	M1631E, Atomic Fluor	50	<0.062	<0.062	1.95	7.87	2.51	1.89	1.77	6.65	2.43	0.87
Molybdenum	mg/L	0.00005	0.0002	0.000015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.000853	0.000124	0.000231	0.00025	0.000256	0.00045	0.00081	0.00138
Nickel	mg/L	0.00062	0.0004	0.00015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.052	0.00169	0.00087	0.00723	0.00142	0.00124	0.00107	0.00125	0.00466	0.00091	0.0006
Potassium	mg/L	0.05	0.2	0.015	1	EPA 200.8 Low Level	M200.7 ICP	-	1.25	0.948	3.63	0.617	0.819	0.716	0.818	0.97	0.88	1.11
Selenium	mg/L	0.001	0.0001	0.00031	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.00016	0.00029	0.00026
Silicon	mg/L	0.1	0.1	0.031	0.5	EPA 200.8 Low Level	M200.7 ICP	-	4.67	8.69	52.8	8.06	10.7	8.2	11	5.26	7.13	7.53
Silver	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	0.0000564	0.0000149	0.0000107	<0.0000062	0.0000115	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	0.2	0.031	1	EPA 200.8 Low Level	M200.7 ICP	-	1.95	3.94	29.6	3.69	5.92	5.01	6.7	2.74	4.5	4.87
Strontium	mg/L	0.0025	0.009	0.00075	0.045	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	0.116	0.111	0.0534	0.088	0.105
Thallium	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0008	0.000062	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	0.000333	<0.000062	<0.000062	<0.000062	0.000071	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.005	0.00015	0.025	EPA 200.8 Low Level	M200.7 ICP	-	0.0118	<0.0015	0.0587	0.00613	0.0146	0.00334	0.008	0.023	0.013	0.0085
Vanadium	mg/L	0.001	0.0005	0.00031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.00681	0.00039	0.000649	<0.00031	<0.00031	0.00089	0.00072	0.00056
Zinc	mg/L	0.01	0.006	0.0031	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.120	0.00955	<0.0025	0.0156	<0.0031	0.00356	<0.0031	<0.0031	0.0669	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]HIT2-01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 100 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 and May 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-11a

HI01: HILLSIDE (PUMP) CREEK

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01
Sample Date									23-May-2012	4-Aug-2012	18-Jun-2013	2-Oct-2013	30-Jun-2016	4-Sep-2016	29-May-2018	13-Sep-2018	5-Jun-2019	9-Sep-2019	22-Oct-2019
Lab ID									1121854002	1123514004	1132583002	1135004002	1168221002	1168541002	1189336009	1189750004	1199394009	1195369009	1199902001
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters [6,9]																			
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.43	7.4	5.84	5.81	–	5.84	6.82	7.25	-	7	7
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	100.8	95.4	104.8	114.4	75.1	18.3	94.2	86.4	71.2	77.5	77.5
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	54	155.2	178	228	262	342	113	217	-	271.2	277.9
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	0.5	2.9	1.3	0.3	2.6	4.8	1.1	2.6	1.3	2.1	2.1
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	13.35	-	14.8	12.49	10.24	2.33	13.32	11.88	10.04	10.88	10.88
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	5	3.5	1	12.3	0.68	0.39	0.96	2.65	0.38	0.74	0.61
Physical Tests																			
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	-	-	108	109	44.7	94.9	60.6	115	109
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	58	109	144	130	194	202	122	158	136	192	190
Total Suspended Solids	mg/L	0.98	20	0.304	5	SM21 2540D	SM2540D	-	11.8	1.46	0.316	24.1	1.56	0.67	0.556	0.833	<0.313	4.46	8.21
Dissolved Anions																			
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	4.51	17.4	20.1	23.5	24.6	28.6	11.4	22.4	20	-	-
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.204	0.331	0.393	0.438	-	-	0.817	1.39	0.657	0.929	0.97
Sulphate	mg/L	2	4	0.5	0.8	EPA 300.0	M300.0 - Ion Chromat	250	15	42.7	62.2	71.5	-	-	31.6	71.2	51.5	92	98.2
Nutrients																			
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	-	-	-	0.591	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	-	-	-	<0.05	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.039	0.15	0.299	0.91	0.674	0.508	0.528	1.13	0.758	0.591	1.01
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	<0.062	<0.062	0.0142	0.0257	0.016	<0.005	0.0057	0.0083	<0.005
Cyanides																			
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	<0.0015	<0.0015	0.0035	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	<0.002
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-	-
Total Metals [5,7,8]																			
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.534	0.108	0.0491	0.754	0.0515	0.0737	0.353	0.0394	0.131	0.031	0.0743
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	<0.00031	<0.00031	0.000201	0.000153	0.00019	0.000209	0.00017	0.000189	0.000201
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00259	<0.0015	<0.0015	0.00261	0.00099	0.00112	0.00136	0.000717	0.00101	0.00163	0.00391
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.00767	0.00793	0.00978	0.0187	0.0159	0.0229	0.00994	0.0152	0.00904	0.0114	0.00387
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	-	-	0.00377	0.00304	0.00244	0.00528	0.00308	0.00659	0.00786
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	<0.00015	<0.00015	<0.000015	0.0000444	0.0000178	<0.000015	<0.000015	0.0000328	0.000033
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	5.93	16.4	21.7	24.3	31.7	32	12.4	27.1	17.3	36	34.6
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000825	<0.00062	0.000816	0.00212	<0.00015	0.000151	0.000609	<0.00015	0.000617	<0.00015	<0.00015
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	<0.0012	<0.0012	0.000131	0.000531	0.000409	0.000162	0.000216	0.000142	0.000195
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.009	0.00525	0.00315	0.00303	0.00697	0.00265	0.00272	0.00767	0.00325	0.00553	0.00269	0.00265
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.474	<0.078	<0.078	0.788	0.0315	0.0878	0.221	0.0311	0.0909	0.022	0.0783
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	0.000244	<0.000062	0.0000938	0.000616	<0.000031	0.0000597	0.0000863	<0.000031	<0.000031	<0.000031	0.000108
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.69	4.25	5.39	6.86	7.1	7.06	3.32	6.6	4.19	6.17	5.56
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0342	0.00151	0.00196	0.0165	0.00169	0.105	0.00558	0.00334	0.000576	0.00362	0.00313
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<0.062	<0.062	-	96.8	1.67	2.21	9.55	2.38	6.53	1.12	1.52
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	<0.0031	<0.0031	0.00175	0.000401	0.00089	0.00224	0.00165	0.00411	0.00381
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.048	0.00146	0.000858	0.00132	0.00232	0.00102	0.00125	0.00153	0.00107	0.00136	0.00127	0.00129
Phosphorous	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.02	0.938	1.2	1.19	1.29	1.49	1	1.38	0.869	1.51	1.3
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.0015	<0.0015	<0.00031	<0.00031	0.000361	0.000508	0.000345	0.000481	0.000513
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	4.72	8.67	8.49	10.1	7.67	8.39	5.98	9.03	6.2	8.86	8.82
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	0.000027	<0.0000062	<0.0000062	<0.0000062	0.00000862
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.74	3.9	4.26	4.93	5.27	4.75	2.97	5.62	3.62	6.91	6.57
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062
Tin	mg/L	0.0002	0.003	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	0.000227	0.000127	0.0000704
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0141	0.00193	<0.0015	0.0295	0.00157	0.00268	0.00486	0.00204	0.00247	0.00255	0.00381
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	<0.0062	<0.0062	<0.00031	<0.00031	0.000537	<0.00031	0.00046	0.00103	0.000421
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.110	0.00619	0.00359	<0.0025	0.0111	0.0022	0.0145	0.00116	<0.0031	<0.0031	<0.0031	<0.0031

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]HI01_a

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 90 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-11b

HI01: HILLSIDE (PUMP) CREEK

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01	HI01
Sample Date									4-Jun-2020	7-Aug-2020	23-Sep-2020	18-Oct-2020	17-Nov-2020	20-Apr-2021	18-May-2021	21-Jun-2021	28-Jul-2021	25-Aug-2021	22-Sep-2021
Lab ID									1209326016	1209562013	1205287016	1205837010	L63022-16	L65492-06	L66048-01	L66741-04	L67404-01	L68129-03	L68797-01
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																			
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	7.17	7.22	5.45	4.55	7.71	7.16	8.29	7.94	7.68	8.26	7.76
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	72	141.2	149.1	227.8	126.5	111.1	115.3	218	210.1	249	317
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	133	240.4	259.1	437.6	241.3	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	1.1	3.4	1.7	0	0.1	0.5	2.1	2	6.3	4.3	0.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	14.09	11.17	10.08	7.76	7.69	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	0.73	0.32	0.39	1.32	2.7	Amber	Light Amber	Light Amber	Cloudy	Clear	lt. amber
Physical Tests																			
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	61	101	86.2	112	113	72	56	93	127	117	145
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	121	173	181	176	182	190	134	170	166	196	212
Total Suspended Solids	mg/L	0.98	20	0.304	5	SM21 2540D	SM2540D	-	0.842	0.851	0.99	3.73	<5	19	0	<5	529	<5	<5
Dissolved Anions																			
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	13.6	27.4	27.8	30	32.6	21.4	12	25.4	28.1	36.2	64.7
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.649	0.972	1.01	0.981	0.9	1.74	0.74	1.16	2.86	1.13	1.17
Sulphate	mg/L	2	4	0.5	0.8	EPA 300.0	M300.0 - Ion Chromat	250	47.3	73.8	82.8	87.2	87	41.6	35.9	80.9	66.5	81.4	78.9
Nutrients																			
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	0.615	0.611	<0.05	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.88	0.845	0.708	0.904	0.653	0.354	0.402	0.722	0.82	0.725	0.154
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	0.67	0.37	0.39	0.72	0.83	0.81	0.137
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	<0.01	<0.01	0	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	0.668	0.374	0.387	0.721	0.832	0.805	0.137
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.012	<0.012	<0.012	<0.012	0.012	0.142	0.021	<0.01	0.422	<0.01	0.019
Cyanides																			
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.002	<0.002	-	-	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	0.0073	0.0022	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																			
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.166	0.0453	0.0436	0.149	0.269	5.1	0.303	0.0615	9.74	0.0551	0.0148
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.00015	0.000167	0.000156	0.000195	<0.0004	0.00056	<0.0004	<0.0004	0.00047	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00081	0.000711	0.00108	0.00202	0.00205	0.0146	0.00209	0.00121	0.00607	0.00137	0.00644
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.00865	0.014	0.0115	0.0132	0.0207	0.0279	0.0089	0.0103	0.0938	0.0119	0.0149
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	0.0002	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.00289	0.005	0.00421	0.00605	0.0058	0.0056	0.0027	0.0036	0.0055	0.0048	0.0055
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.000015	<0.000015	0.000023	0.0000315	<0.00005	0.000177	<0.00005	<0.00005	0.000164	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	17.7	29	26.2	32.9	34.7	21.1	16.6	27.8	35.4	35.4	42.7
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000916	<0.00015	<0.00015	0.000336	0.0008	0.00512	0.00073	<0.0005	0.0122	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000235	0.000137	0.000134	0.000229	0.000279	0.00263	0.000627	0.000177	0.00611	0.000161	0.000432
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.009	0.00507	0.00291	0.0028	0.00448	0.00507	0.0163	0.00567	0.00292	0.0454	0.00212	0.00186
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.114	0.0262	0.0367	0.168	0.28	6.87	0.29	<0.06	11.9	<0.06	1.06
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.003	0.0000348	<0.000031	<0.000031	0.0000819	0.0007	0.00394	0.00011	<0.0001	0.00453	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	4.09	6.84	5.05	7.18	6.37	4.7	3.55	5.64	9.33	6.9	9.22
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00225	0.00126	0.00207	0.00567	0.00424	0.0593	0.0272	0.00114	0.162	0.00131	0.197
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<5	1.24	1.31	1.17	1.03	14.5	8.05	1.47	15.8	0.72	0.63
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00145	0.00279	0.00276	0.00351	0.00323	0.00187	0.00115	0.00217	0.00275	0.00342	0.00164
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.048	0.0011	0.00116	0.00111	0.00138	0.00089	0.00495	0.00122	0.00094	0.0128	0.00048	0.00077
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.995	1.28	1.18	1.41	1.3	3.91	1.34	1.21	2.42	1.42	1.75
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.000455	0.000458	0.000373	0.000378	0.00056	0.00044	0.00028	0.0005	0.00063	0.00048	0.00022
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	8.09	8.97	7.31	9.94	9.07	12	5.93	7.46	17	8.12	9.01
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	0.00025	<0.0001	<0.0001	0.00013	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.97	5.45	4.84	7.14	6.28	2.9	3.29	4.56	6.15	5.3	6.06
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	0.0919	0.108	0.099	0.0762	0.0615	0.0923	0.145	0.114	0.127
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.003	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00399	0.0106	0.00246	0.00817	0.0187	0.244	0.0075	<0.005	0.541	0.0071	0.0061
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.00031	0.000465	<0.00031	0.000638	<0.0005	0.00829	0.00081	<0.0005	0.0215	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.110	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	0.0112	<0.006	<0.006	0.0315	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]HI01_b

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 90 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in September 2020 and October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-12

HI02: HILLSIDE (PUMP) CREEK

Site ID		Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI02	HI01
Sample Date	Units								18-Jun-2013	2-Oct-2013	24-Sep-2015	30-Jun-2016	4-Sep-2016	29-May-2018	13-Sep-2018	5-Jun-2019	9-Sep-2019	24-Oct-2019	4-Jun-2020	7-Aug-2020	23-Sep-2020	18-Oct-2020	17-Nov-2020	9-Dec-2020	20-May-2021	24-Aug-2021	22-Sep-2021
Lab ID									1132583001	1135004003	1155647013	1168221001	1168541001	1189336008	1189750003	1199394010	1195369010	1199902011	1209326014	1209562016	1205287017	1205837011	L63022-01	L63345-08	L66046-05	L68130-03	L68797-01
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																											
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.34	6.42	6.54	6.3	6.47	7.12	7.14	-	-	-	7.17	7.31	6.52	6.55	6.91	6.08	7.05	5.94	7.76
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	99	91.1	84.6	73.4	75.5	78.9	83.1	60	87.7	-	120.3	166.9	168.8	169.5	139.1	180.9	204.3	279	317
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	252	284	298	294	295	151	279	-	302.5	311.3	218.7	273	295.6	325.8	268.3	347.2	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	5.4	0.1	0.7	2.7	3.2	-0.2	2.2	1.3	3.3	-	1.4	4.6	2.5	0	0.1	0	1	4.3	0.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	11.64	13.24	12.01	9.91	10.12	11.6	11.42	8.46	11.7	-	12.94	10.8	11.96	9.36	9.62	9.75	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	2.4	2.73	2.57	7.99	3.63	2.63	1.89	3.49	4.93	2.43	11.17	1.36	1.43	0.90	3.40	5.22	Amber	Light Amber	lt. amber
Physical Tests																											
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	126	130	117	70.5	124	116	135	130	92.2	116	114	140	143	153	102	124	145
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	191	182	201	205	192	153	191	190	216	205	160	192	211	221	212	244	174	196	212
Total Suspended Solids	mg/L	0.99	20	0.307	5	SM21 2540D	SM2540D	-	1.5	1.37	0.894	8.62	1.64	6.44	32	9.17	39.9	7.74	68.7	1.21	0.98	0.99	<5	8	48	<5	<5
Dissolved Anions																											
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	56	61.3	70.5	62.7	67	45.6	55.3	52.3	-	-	36.4	51.4	51.2	55.8	56.8	60.7	34.3	58.7	64.7
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.624	0.68	0.755	-	-	0.905	1.1	1.04	1.03	1.09	0.823	0.851	0.936	1.07	1	0.96	0.9	0.86	1.17
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	67.5	82.5	71.1	-	-	21.6	75.7	82.9	90.4	48	59.8	72.2	87	101	96.5	98.4	58.1	70.7	78.9
Nutrients																											
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	-	-	0.141	-	-	0.191	0.247	<0.05	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.153	0.201	0.141	0.156	0.184	0.0464	0.134	0.351	0.141	0.309	0.425	0.27	0.264	0.409	0.284	0.275	0.279	0.126	0.154
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.27	0.26	0.13	0.137
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.299	0.273	0.264	0.126	0.137
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	0.0222	0.0289	0.0306	0.0296	0.0402	0.0188	0.0123	0.0057	0.0579	<0.012	<0.012	<0.012	0.014	0.025	0.055	0.028	0.019
Cyanides																											
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0028	<0.0015	0.0061	<0.0015	<0.0015	0.0037	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-	-	-	0.0048	0.0023	<0.003	<0.003	0.0079	<0.003	<0.003
Total Metals [5,7,8]																											
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0331	0.409	0.00868	0.133	0.00992	0.163	0.625	0.177	0.278	0.166	1.18	0.0221	0.0163	0.0292	0.0098	0.333	0.956	0.0503	0.0148
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.000175	0.000266	0.00019	0.000307	0.000418	0.000322	0.000335	0.000288	0.000398	0.000267	0.000263	0.000253	<0.0004	<0.0004	0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00621	0.0045	0.00876	0.0109	0.00766	0.00508	0.00613	0.00566	0.00665	0.00491	0.00847	0.00452	0.00408	0.00517	0.00615	0.0123	0.0132	0.00983	0.00644
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.016	0.0153	0.0155	0.0197	0.0159	0.0112	0.0239	0.0187	0.0221	0.0201	0.0254	0.0152	0.0156	0.0187	0.0166	0.0217	0.0235	0.0157	0.0149
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	0.0000351	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.0000273	<0.000015	<0.000015	<0.000015	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.00635	0.00743	0.00573	0.0105	0.0083	0.0058	0.00517	0.00518	0.00494	0.00554	0.00461	0.00548	0.0053	0.0052	0.0045	0.0048	0.0055
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0003	<0.00015	<0.00015	<0.000015	0.0000161	<0.000015	0.0000195	0.0000214	0.0000154	<0.000015	<0.000015	0.00003	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	33.1	36.3	35.5	37.2	34.4	18.5	35.7	33.2	39.9	38.4	26.2	33.4	33.8	39.1	42	44.9	29.9	36.7	42.7
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000906	<0.00062	0.000272	0.000168	0.000211	0.000683	0.000777	0.000411	<0.00015	<0.00015	0.002	<0.00015	<0.00015	0.000234	<0.0005	0.00072	0.00197	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	0.000659	0.000683	0.000597	0.000852	0.000767	0.000731	0.000559	0.000444	0.00124	0.000384	0.000341	0.000468	0.000514	0.000995	0.00156	0.000465	0.000432
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.011	0.00293	0.00971	0.00174	0.00274	0.00194	0.00627	0.00445	0.003	0.00334	0.00276	0.00908	0.00282	0.00248	0.00237	0.00193	0.00281	0.00834	0.00236	0.00186
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	1.06	0.927	1.58	2.13	1.33	1	1.74	1.04	1.18	0.857	2.48	0.601	0.566	0.851	1	2.4	4.81	1.99	1.06
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.000132	0.00013	<0.000031	0.000202	<0.000031	0.000163	0.000385	0.000186	0.000407	0.000107	0.0011	<0.000031	<0.000031	<0.000031	<0.0001	0.00022	0.00114	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	8.14	9.02	9.09	9.04	7.67	5.92	8.53	8.11	8.68	8.34	6.49	7.93	7.23	10.3	9.3	9.93	6.65	7.96	9.22
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.263	0.206	0.312	0.31	0.277	0.298	0.194	0.247	0.192	0.161	0.149	0.164	0.129	0.196	0.223	0.388	0.318	0.177	0.197
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	<62	0.643	1.36	1.23	4.61	3.31	2.2	1.31	0.875	3.48	1.61	0.599	<0.5	0.32	0.74	5.93	0.56	0.63
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.00186	0.00181	0.00172	0.00133	0.00172	0.00177	0.00186	0.00138	0.00162	0.00198	0.00169	0.00158	0.0015	0.00161	0.00168	0.00173	0.00164
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.061	0.00185	0.0118	0.00219	0.0017	0.00138	0.00334	0.00243	0.00194	0.00195	0.00184	0.00342	0.00149	0.00148	0.00149	0.00076	0.0015	0.00266	0.00082	0.00077
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.55	1.55	1.68	1.64	1.63	1.18	1.72	1.68	1.83	1.59	1.5	1.63	1.66	1.78	1.67	1.75	1.87	1.7	1.75
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	0.000375	<0.00031	<0.00031	0.000648	<0.00031	0.000435	<0.00031	<0.00031	0.000449	<0.00031	0.000328	<0.00031	0.00026	0.00026	0.00037	0.00022	0.00022
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	8.69	8.72	9.88	9.87	8.55	6.25	10	8.43	9.13	8.56	10.3	9.73	7.95	10.1	7.82	10	9.05	8.43	9.01
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	0.00000728	<0.0000062	0.0000185	0.00000918	0.00000884	<0.0000062	<0.0000062	0.0000192	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	5.38	5.48	6.01	5.86	5.35	3.67	5.8	5.63	5.73	5.3	4.96	5.72	5.13	6.77	5.81	6.06	4.85	5.57	6.06
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-	-	-	0.121	0.141	0.141	0.154	0.101	0.12	0.127
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	0.00000872	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.0000754	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00205	0.00287	0.00262	0.00724	0.00173	0.0073	0.0229	0.00884	0.0145	0.00853	0.052	0.00832	0.00272	0.00288	<0.005	0.0208	0.0766	0.0082	0.0061
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.000719	0.00112	0.000358	0.00105	0.00216	0.00121	0.00171	0.000458	0.00373	0.00124	<0.00031	<0.00031	<0.0005	0.00104	0.0034	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.140	<0.0025	0.00289	0.00137	0.00148	0.00129	0.00148	<0.0031	<0.0031	<0.0031	<0.0031	0.00589	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]HI02 _Tables_II.xlsx]HI02

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 120 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020 and August 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-13

THT1-01: THUNDER CREEK TRIBUTARY 1

Site ID									THT1-01	THT1-01	THT1-01	THT1-01	THT1-01	THT1-01	THT1-01	THT1-01	THT1-01
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	11-Sep-2019	3-Jun-2020	6-Aug-2020	21-Sep-2020	17-Oct-2020	20-Apr-2021	18-May-2021	21-Jun-2021	25-Aug-2021
Lab ID									1195369018	1209326010	1209562008	1205287022	1205837016	L65492-03	L66049-01	L66741-05	L68129-04
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																	
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	-	6.01	6.81	6.17	4.98	7.6	7.22	7.17	7.31
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	89.6	21.1	32.2	31.4	49.9	42.14	29.7	51.2	57
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	50	35.5	49.3	53.4	92.3	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	3.6	3.6	6.8	3.2	0.1	0.1	3.9	5.5	10.6
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	11.3	10.39	9.94	10.85	8.26	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	11.3	2.79	3.56	3.98	-	Amber	Amber	Light Amber	Light Amber
Physical Tests																	
Hardness - as CaCO3	mg/L	1	0.2	1	5	SM21 2340B	SM2340B - Calculatio	-	19.7	13.3	19.8	19.1	27	18	20	24	22
Total Dissolved Solids	mg/L	10	20	3.1	40	SM21 2540C	SM2540C	500	64	62	74	74	48	114	108	70	62
Total Suspended Solids	mg/L	4	5	1.24	20	SM21 2540D	SM2540D	-	53.6	30.5	40.3	278	248	8	20	53	65
Dissolved Anions [6]																	
Alkalinity - Total - CaCO3	mg/L	10	2	2.5	20	SM21 2320B	SM2320B - Titration	20	-	10.5	21.9	23.5	24.9	4.1	4.3	24	20
Chloride	mg/L	0.2	0.4	0.05	2	EPA 300.0	M300.0 - Ion Chromat	230	0.086	<0.05	<0.05	0.123	0.202	1.85	<0.4	<0.4	<0.4
Sulphate	mg/L	2	0.4	0.5	2	EPA 300.0	M300.0 - Ion Chromat	250	2.25	1.45	1.75	2.2	2.02	1.06	<0.4	2.65	5.8
Nutrients																	
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	0.059	-	0.053	0.074	<0.05	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	<0.05	-	<0.05	<0.05	<0.05	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.02	0.05	0.1	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.059	<0.05	0.067	0.0762	0.165	1.03	0.03	0.062	0.037
Total Phosphorous	mg/L	0.04	0.01	0.012	0.05	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0142	0.016	0.0154	0.019	0.0591	0.251	0.061	0.061	0.022
Cyanides																	
Total Cyanide	mg/L	-	0.003	-	0.01	-	D7511-09	-	<0.002	<0.002	<0.002	-	-	0.009	0.012	0.006	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.003	0.0015	0.01	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	0.0053	0.0076	<0.003	0.0034	<0.003	<0.003
Total Metals [5,7,8]																	
Aluminum	mg/L	0.002	0.005	0.00062	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	0.693	0.431	0.315	0.659	1.93	2.39	1.79	2.44	0.762
Antimony	mg/L	0.00005	0.0004	0.000015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000062	0.0000626	0.000063	0.0000648	0.0000653	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.0002	0.0002	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000588	<0.0002	0.00025	0.00048	0.00102	0.00303	0.00161	0.0025	0.00107
Barium	mg/L	0.00025	0.0005	0.00004	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0104	0.00713	0.0086	0.0123	0.0262	0.0241	0.0212	0.0242	0.0125
Beryllium	mg/L	0.00005	0.00008	0.000025	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	0.000086	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	0.000019	<0.000015	<0.000015	0.0000163	0.0000282	-	-	-	-
Boron	mg/L	0.005	0.001	0.0015	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0026	<0.001	0.0011	<0.001
Cadmium	mg/L	0.00005	0.00005	0.000015	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.0001	<0.000015	<0.000015	<0.000015	<0.000015	0.000021	0.000114	0.00007	0.000056	<0.00005
Calcium	mg/L	0.05	0.1	0.015	0.5	EPA 200.8 Low Level	M200.7 ICP	-	4.25	2.97	4.23	4.35	5.45	4.38	5.06	5.58	4.8
Chromium	mg/L	0.0005	0.0005	0.00015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000293	0.00146	0.000377	0.000839	0.00237	0.00285	0.00276	0.00377	0.00135
Cobalt	mg/L	0.000025	0.00005	0.00001	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000396	0.000352	0.000323	0.000582	0.00123	0.00131	0.000858	0.00159	0.000484
Copper	mg/L	0.0005	0.0008	0.0002	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.002	0.00441	0.00537	0.00452	0.00463	0.00677	0.0118	0.0103	0.0104	0.0046
Iron	mg/L	0.02	0.06	0.0062	0.15	EPA 200.8 Low Level	M200.7 ICP	1	0.542	0.337	0.283	0.669	1.61	2.05	1.74	2.74	0.89
Lead	mg/L	0.0001	0.0001	0.000031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0004	0.000261	0.000125	0.000149	0.000381	0.000949	0.00092	0.00045	0.00115	0.00036
Magnesium	mg/L	0.02	0.2	0.0062	1	EPA 200.8 Low Level	M200.7 ICP	-	2.2	1.43	2.24	1.99	3.24	1.69	1.82	2.46	2.35
Manganese	mg/L	0.0001	0.0004	0.000031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0113	0.0125	0.0107	0.0209	0.043	0.0541	0.0253	0.0581	0.0166
Mercury	ng/L	1	0.0000003	0.5	1	EPA 1631 E	M1631E, Atomic Fluor	50	3	8.61	4.58	4.73	5.32	18.1	19.7	8.29	5.4
Molybdenum	mg/L	0.00005	0.0002	0.000015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.0000753	0.0000638	0.0000664	0.000073	0.0000895	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	0.00062	0.0004	0.00015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.013	0.00129	0.00122	0.00121	0.00134	0.00225	0.00303	0.00277	0.00319	0.00118
Potassium	mg/L	0.05	0.2	0.015	1	EPA 200.8 Low Level	M200.7 ICP	-	0.208	0.23	0.222	0.24	0.356	3.05	0.44	0.45	0.23
Selenium	mg/L	0.001	0.0001	0.00031	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.0001	0.00012	0.00014	0.00016
Silicon	mg/L	0.1	0.1	0.031	0.5	EPA 200.8 Low Level	M200.7 ICP	-	11	7.68	10.2	9.12	13.7	5.41	6.38	9.97	8.83
Silver	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	0.0000406	0.000026	0.00000914	0.0000407	0.0000831	0.00018	<0.0001	0.00014	<0.0001
Sodium	mg/L	0.1	0.2	0.031	1	EPA 200.8 Low Level	M200.7 ICP	-	3.53	2.63	3.44	2.85	4.02	1.39	1.79	2.91	3.73
Strontium	mg/L	0.0025	0.009	0.00075	0.045	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	0.0387	0.0464	0.0482	0.0416	0.0482	0.0464
Thallium	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	0.00000682	0.000015	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0008	0.000062	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	-	0.0000683	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.005	0.00015	0.025	EPA 200.8 Low Level	M200.7 ICP	-	0.0198	0.00848	0.00358	0.0202	0.0467	0.0828	0.0591	0.089	0.0267
Vanadium	mg/L	0.001	0.0005	0.00031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00143	<0.00031	0.000813	0.000817	0.00324	0.00414	0.00346	0.0056	0.00213
Zinc	mg/L	0.01	0.006	0.0031	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.030	<0.0031	<0.0031	<0.0031	<0.0031	0.00376	0.0083	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]THT1-01

Notes
1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 20 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-14

TH01: THUNDER CREEK

Site ID									TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01	TH01
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	23-May-2012	2-Aug-2012	9-Sep-2019	23-Oct-2019	4-Jun-2020	7-Aug-2020	22-Sep-2020	17-Oct-2020	16-Nov-2020	9-Dec-2020	24-Feb-2021	17-Mar-2021	26-Apr-2021	20-May-2021	22-Jul-2021	24-Aug-2021	22-Sep-2021
Lab ID									1121854004	1123514006	1195369007	1199902012	1209326017	1209562014	1205287021	1205837015	L63022-04	L63345-11	L64533-02	L64872-05	L65494-01	L66046-04	L67403-02	L68130-04	L68797-02
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																									
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	6.06	7.3	-	-	6.71	7.15	6.63	5.83	7.2	5.28	7.22	6.83	7.22	11.54	7.82	6.56	7.5
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	101.8	73.7	95.5	-	24	59.3	57.3	34.9	75.1	105.9	193.7	17.9	43.4	41	101.2	111.4	137.4
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	21	67.2	87.4	95.3	42.4	99.7	104.9	66.9	141.2	199	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	0.7	3.8	2.5	-	2.4	3.8	1.2	0	0.1	0	0.7	1.4	0.4	7.5	5.3	4.6	0.8
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	13.56	-	13.04	-	13.36	11.4	12.44	3.1	9.6	4.92	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	63.3	32.1	0.47	0.77	0.69	0.7	0.76	-	1.03	2.11	Light Amber	Light Amber	Amber	Light Amber	Clear	Light Amber	amber
Physical Tests																									
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	37.7	41.9	20.5	41.7	39	55.1	63	66	91	-	18	22	48	51	64
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	56	57	90	77	78	91	98	94	102	122	132	-	90	100	98	100	112
Total Suspended Solids	mg/L	1.01	20	0.313	5	SM21 2540D	SM2540D	-	192	0.606	1.21	0.814	8.54	1.44	0.612	1.92	<5	<5	25	<5	<5	<5	9	<5	<5
Dissolved Anions [6]																									
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	4.43	24.1	-	-	8.64	26.9	29.4	34.2	42.5	43.6	81.7	-	6.9	7	28.4	39.8	49.4
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	42.5	43.6	81.7	-	6.9	7	28.4	39.8	49.4
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	<2	<2	<2	-	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.125	0.126	0.645	0.734	0.268	0.647	0.661	0.739	0.76	0.74	0.67	1.29	1.4	<0.4	0.51	0.57	0.64
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	0.25	3.47	10.4	13.1	3.37	14.4	14.8	17	20.6	24.7	11.4	2	2.83	2.47	16.3	11.7	12.5
Nutrients																									
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	0.859	-	-	0.829	0.809	<0.05	-	-	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	-
Nitrate Nitrate as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.031	0.129	0.859	1.44	0.782	1.08	0.889	1.19	0.712	0.36	0.176	-	0.145	0.232	0.618	0.461	0.47
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	0.74	0.35	0.23	0.11	0.16	0.25	0.65	0.52	0.422
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	0.737	0.35	0.227	0.105	0.163	0.253	0.65	0.516	0.422
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.17	<0.062	<0.005	<0.005	0.015	<0.012	<0.012	<0.012	0.014	0.02	0.115	-	0.159	0.018	0.013	0.024	0.013
Cyanides																									
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	<0.0015	<0.002	0.0029	<0.002	<0.002	-	-	<0.003	<0.003	0.004	-	<0.003	0.004	0.003	<0.003	0.005
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	0.0082	0.0026	<0.003	<0.003	<0.003	<0.003	0.0045	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																									
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.087	7.27	0.127	0.0857	0.0778	0.435	0.118	0.0765	0.0907	0.053	0.0601	0.462	-	0.462	0.469	0.291	0.3	0.0376
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.000336	0.000341	0.000286	0.000308	0.000285	0.000335	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00571	<0.0015	0.00173	0.00212	0.0022	0.00187	0.00211	0.0019	0.0024	0.00145	0.00367	-	0.00307	0.00261	0.002	0.00315	0.00194
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0543	0.00573	0.00797	0.00863	0.00705	0.00875	0.00806	0.0109	0.0114	0.0142	0.0173	-	0.00725	0.00696	0.00958	0.0113	0.0103
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	0.000198	<0.00013	<0.000025	<0.000025	0.0000323	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	-	<0.00008	<0.00008	<0.00008	0.000107	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.00183	0.0018	<0.0015	0.00226	0.00152	0.00207	0.002	0.0025	0.0038	-	0.0053	0.001	0.002	0.0021	0.0026
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0002	<0.00015	<0.00015	0.0000181	0.0000153	0.0000341	0.0000187	0.0000201	0.0000226	<0.00005	<0.00005	0.000083	-	0.000124	0.000084	<0.00005	0.000108	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	6.08	7.62	10.9	12.2	5.9	11.9	11.4	15.3	18.1	19.2	26.3	-	5.55	6.68	14.5	14.7	18.6
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.0109	<0.00062	<0.00015	<0.00015	0.00151	<0.00015	<0.00015	0.000475	<0.0005	<0.0005	0.00096	-	0.00085	0.00096	0.00076	0.00165	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00361	<0.0012	0.00026	0.000252	0.000406	0.00032	0.000273	0.000292	0.000483	0.000571	0.000441	-	0.00062	0.000655	0.000351	0.000501	0.000298
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.0211	0.00362	0.00379	0.00394	0.00689	0.00424	0.00328	0.00397	0.00298	0.0025	0.00368	-	0.00533	0.00696	0.00409	0.00487	0.00445
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	6.35	0.118	0.0643	0.0809	0.449	0.0888	0.0731	0.0839	0.318	0.302	0.92	-	0.382	0.485	0.246	0.64	0.234
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.001	0.00301	0.000064	0.0000451	0.0000446	0.000317	0.0000714	0.0000444	0.0000711	<0.0001	<0.0001	0.00033	-	0.00014	0.00023	0.00019	0.00027	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.78	2.23	2.55	2.82	1.41	2.9	2.56	4.14	4.31	4.45	6.2	-	1.08	1.36	2.96	3.47	4.14
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.153	0.00302	0.00222	0.00224	0.00974	0.00401	0.00949	0.0075	0.0801	0.0672	0.0451	-	0.032	0.0486	0.00733	0.0363	0.0544
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<0.062	<0.062	2	5.95	7.11	4.05	2.8	2.03	1.46	1.4	2.82	<0.0002	13.8	12.1	2.31	2.64	1.49
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.00126	0.0014	0.000423	0.00123	0.00115	0.00139	0.00111	0.00085	0.00251	-	0.00059	0.00036	0.00124	0.00201	0.00201
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.029	0.00832	0.000839	0.00124	0.00125	0.00186	0.00136	0.00114	0.00144	0.00106	0.00139	0.00129	-	0.00148	0.00183	0.00108	0.00355	0.00097
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.968	0.401	0.758	0.753	0.603	0.821	0.695	0.92	0.82	1.23	1.56	-	2.69	0.92	0.88	0.81	0.89
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.0002	0.00013	0.00015	-	0.00011	0.00012	0.00021	0.00018	0.00019
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	11.7	8.05	7.45	7.89	5.76	8.1	6.68	9.06	7.66	8.49	10.5	-	4.01	4.34	7.15	7.96	8.34
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	<0.0000062	0.000015	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	0.00012	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.25	2.96	2.55	2.69	1.54	2.74	2.34	3.49	3.15	3.34	3.9	-	1.1	1.41	2.72	3.05	3.31
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	0.0449	0.0675	0.0737	0.081	0.096	-	0.0334	0.0292	0.0593	0.0598	0.0632
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	0.00000662	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	0.000068	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.244	0.00367	0.0026	0.00274	0.0135	0.0048	0.00275	0.00296	<0.005	<0.005	0.028	-	<0.01	0.0113	0.0106	0.0155	<0.005
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.0151	<0.0062	0.000576	<0.00031	0.00177	0.000659	<0.00031	<0.00031	<0.0005	<0.0005	0.00167	-	0.0008	0.00132	0.0009	0.00107	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.066	0.0206	0.00308	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.006	-	<0.006	<0.006	<0.012	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_I.xlsx]TH01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 50 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020 and May 2021 are erroneous due to instrument malfunction.
10. Sample collected in March 2021 was analyzed for an incomplete sample suite.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-15
DA01: DAY CREEK

Site ID									DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01	DA01
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	23-May-2012	3-Aug-2012	19-Jun-2013	29-May-2018	13-Sep-2018	11-Sep-2019	22-Oct-2019	4-Jun-2020	7-Aug-2020	22-Sep-2020	18-Oct-2020	17-Nov-2020	20-May-2021	22-Jul-2021
Lab ID									1121854006	1123514002	1132583005	1189336010	1189750002	1195369015	1199902003	1209326015	1209562015	1205287011	1205837005	L63022-12	L66046-03	L67403-04
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																						
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.4	6.88	-	7.07	6.69	-	-	6.74	7.14	6.27	6.22	6.91	8.6	7.01
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	35	-	68.7	107.4	202.5	230.9	-	123.5	187.4	180	183.4	187.2	206.6	471
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	61	267.7	127	188	369	421.2	407.4	223.9	328.5	324.9	341.6	355.9	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	2.6	2.4	1.1	2.5	1.4	1.3	-	1.5	2.5	1.7	0.7	0.1	1.5	11
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	12.77	-	15.05	12.37	5.14	7.63	-	10.52	9.52	9.71	9.63	8.94	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	2.36	25.1	5.4	0.61	-	0.43	1.18	0.38	0.33	0.88	0.14	4.99	Light Amber	Light Amber
Physical Tests																						
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	-	84.3	179	217	183	90.7	155	132	157	168	111	253
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	64	157	107	165	240	282	259	151	216	204	204	224	172	354
Total Suspended Solids	mg/L	0.971	20	0.301	5	SM21 2540D	SM2540D	-	1.96	13.5	1.35	<0.365	1.43	0.8	5.75	0.4	<0.313	0.68	<0.301	18	<5	<5
Dissolved Anions																						
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	15.4	71	37.3	50	96.6	-	-	60.5	78.8	81.5	84.9	87.8	62.7	162
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.202	0.352	0.207	0.852	0.448	0.546	0.509	0.383	0.346	0.417	0.444	1.07	0.56	2.37
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	8.98	54.2	23.3	31.5	85.4	101	93.3	41.4	75.4	74.3	80.3	82.9	37.2	88
Nutrients																						
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	0.941	-	-	0.552	0.547	0.559	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.12	0.303	0.627	0.983	0.88	0.941	1.44	1.07	0.736	0.645	0.747	0.585	0.854	<0.02
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-	-	0.62	0.83	<0.02
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-	-	<0.01	0	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-	-	0.616	0.827	<0.02
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	<0.062	0.0177	0.0199	0.008	0.0073	0.0149	0.0188	<0.012	<0.012	0.014	0.017	<0.01
Cyanides																						
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	<0.0015	<0.0015	<0.0015	<0.002	<0.002	0.003	<0.002	0.0022	0.016	-	-	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	<0.0015	0.0023	<0.003	<0.003	<0.003
Total Metals [5,7,8]																						
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.259	0.363	0.0504	0.148	0.03	0.0154	0.038	0.0666	0.019	0.0181	0.0165	0.164	0.0484	0.0221
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	0.000718	<0.00031	0.00068	0.000977	0.00082	0.00079	0.00064	0.000823	0.00079	0.000778	0.0007	0.00074	0.00058
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.013	0.0388	0.00386	0.0274	0.0406	0.0511	0.0458	0.0358	0.0443	0.0443	0.0504	0.0565	0.0345	0.00555
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.00965	0.0187	0.0123	0.0182	0.0248	0.0264	0.0254	0.0143	0.0209	0.0185	0.0197	0.0188	0.0141	0.0341
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	-	0.0024	0.00621	0.0021	0.0022	0.00196	0.00303	0.00227	0.00244	0.0021	0.002	0.0071
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0004	<0.00015	<0.00015	<0.00015	0.000015	0.0000271	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	8.26	34.4	19.2	22.8	49.4	60.8	52.5	24.8	42.5	37.7	42.5	47.6	31.6	72
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000823	<0.00062	0.00113	0.000404	<0.00015	<0.00015	<0.00015	0.000515	<0.00015	<0.00015	<0.00015	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	<0.0012	<0.0012	<0.0012	0.000233	0.000205	0.000158	0.000141	0.000152	0.000159	0.000146	0.000139	0.000243	0.000165	0.000285
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.014	0.00197	0.00294	0.00145	0.0045	0.00216	0.00142	0.00153	0.00303	0.00203	0.00172	0.0016	0.00168	0.0033	0.00133
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.227	0.432	<0.078	0.12	0.0352	0.00814	0.0064	0.0461	0.0108	0.0189	0.0179	0.184	0.334	0.072
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.000062	0.000199	0.000111	0.0000467	0.0000488	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	0.00012	<0.0001	<0.0001
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.52	9.17	3.08	6.63	13.5	14.8	12.6	6.98	11.8	9.09	12.4	11.9	7.75	17.7
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00787	0.0133	0.00189	0.00137	0.0043	0.000915	0.000716	0.000599	0.00104	0.000992	0.000731	0.00717	0.00162	0.0116
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	<0.062	<0.062	-	9.78	2.42	0.873	1.54	4.62	1.77	1.7	1.05	1.34	8.77	0.72
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	<0.0031	0.000458	0.000647	0.000773	0.000743	0.000513	0.000594	0.000591	0.000662	0.00061	0.00064	0.00031
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.078	0.00127	0.00146	0.00121	0.00178	0.00174	0.00174	0.00161	0.00126	0.00169	0.00144	0.0013	0.00061	0.0009	0.00102
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.67	2.59	0.669	3.22	3.49	3.46	3.3	2.42	3.15	2.91	3.11	2.98	3.04	2.82
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.0015	0.000426	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	0.00015	0.00011	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	2.89	5.21	5.29	4.52	5.19	4.79	4.59	4.42	5.57	4.34	5.17	4.82	4.54	6.5
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.00031	0.0000086	<0.0000062	<0.0000062	0.00000888	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.23	3.38	2.48	2.44	4.3	4.25	3.97	2.63	3.95	3.35	4.34	3.84	3.19	6.13
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	0.145	0.16	0.16	0.103	0.246
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.003	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.00031	<0.000062	<0.000062	0.0000722	0.0000943	<0.000062	<0.000062	<0.000062	0.0000754	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00476	0.0156	<0.0015	0.00296	0.00143	0.00125	0.000883	0.0017	0.0125	0.00138	0.00112	0.0117	<0.005	0.0105
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	<0.0062	0.000455	0.000354	0.00106	<0.00031	0.000374	0.00072	<0.00031	0.00044	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.178	0.00559	0.00257	0.00686	0.00108	<0.0031	0.00876	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	<0.006	<0.012

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]DA01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 160 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 and May 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-16a

GR01: GRAYLING CREEK

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01
Sample Date									20-Jun-2013	2-Oct-2013	24-Sep-2015	2-Jul-2016	6-Sep-2016	29-May-2018	13-Sep-2018	4-Jun-2019	9-Sep-2019	23-Oct-2019
Lab ID									1132583016	1135004001	1155647017	1168221018	1168541017	1189336011	1189750005	1199394005	1195369011	1199902013
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters [6,9]																		
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.54	6.26	6.57	6.4	6.36	6.6	7.06	8.45	6.79	-
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	74.2	85.5	81.7	61.1	65.4	76.9	75.6	55.5	72.8	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	157	136	139	150	150	69	174	100	192.5	212.1
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	15	1.7	2.7	15.8	8.9	10	6.5	13	8.7	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	7.49	11.9	11.09	6.14	7.48	8.68	9.34	5.9	8.49	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	25.8	10.5	2.49	6.63	2.67	2.85	2.97	66.6	2.1	1.57
Physical Tests																		
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	-	-	65.5	70.7	68	34.2	59.2	43.8	90.1	91.4
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	141	89	106	134	115	109	98	98	144	147
Total Suspended Solids	mg/L	0.99	20	0.307	5	SM21 2540D	SM2540D	-	38.3	27.5	0.809	17.5	1.81	1.75	4.56	0.874	4.75	1.59
Dissolved Anions																		
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	50	42	44	46	53.5	24.8	49.6	38.7	-	-
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.282	0.332	0.62	-	-	0.301	0.619	0.317	0.634	0.945
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	27.8	23.1	18.4	-	-	4.62	10.3	9.26	40.5	46.5
Nutrients																		
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	-	-	<0.05	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	-	-	<0.05	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.04	<0.031	<0.031	0.914	<0.03	0.0306	<0.025	0.0744	<0.05	0.834
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	-	-	-
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	-	-	-
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	-	-	-
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.062	<0.062	0.0111	0.0286	0.0199	0.0236	0.0185	0.027	<0.005	<0.005
Cyanides																		
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0028	0.0026	0.0016	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	<0.002
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-
Total Metals [5,7,8]																		
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.775	0.618	0.039	0.104	0.0322	0.145	0.0886	0.0345	0.0188	0.0237
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	<0.00031	<0.00031	0.000193	0.000249	0.000171	0.000153	0.00037	0.000158	0.000213	0.000211
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00581	0.00226	0.00207	0.00381	0.00186	0.00156	0.00166	0.00168	0.00176	0.00122
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.028	0.0149	0.0103	0.0123	0.0113	0.01	0.0118	0.00752	0.0138	0.013
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.0000387	<0.000015	<0.000015
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	-	-	0.00232	0.00337	0.00153	0.00287	0.00277	0.00201	0.00284	0.00318
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0002	<0.00015	<0.00015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.0000151
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	21.3	18.7	18	19.6	19.2	8.95	16	12	25.7	26.2
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00234	0.00115	0.000582	0.00069	0.000261	0.000516	0.000432	0.000436	<0.00015	<0.00015
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.00242	<0.0012	0.000312	0.000732	0.000352	0.000308	0.000521	0.000238	0.00023	0.000227
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.007	0.00581	0.00306	0.00282	0.00263	0.00216	0.00396	0.00229	0.00206	0.00198	0.00238
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	3.34	1.54	0.652	1.68	0.626	0.928	0.957	0.531	0.305	0.212
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.002	0.00159	0.000776	0.000157	0.000264	0.000133	0.000229	0.00023	0.0000968	0.0000539	0.000115
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	6.54	5.2	5.03	5.28	4.88	2.87	4.68	3.35	6.27	6.32
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.395	0.12	0.0485	0.133	0.0549	0.017	0.0656	0.0245	0.0399	0.052
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	105	1.81	2.97	2.25	5.49	4.54	2.77	1.01	1.18
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	<0.0031	<0.0031	0.00105	0.00102	0.000848	0.000321	0.00071	0.000386	0.00107	0.000816
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.039	0.0071	0.00382	0.00268	0.00254	0.00232	0.00414	0.00277	0.00206	0.00181	0.00182
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.67	1.29	1.05	0.616	0.91	1.42	1.09	0.828	1.17	1.24
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	0.000454	<0.00031	<0.00031	<0.00031	<0.00031
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	5.94	5.97	6.18	4.98	5.37	3.22	4.46	2.91	5.39	7.86
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	0.000013	<0.0000062	<0.0000062	<0.0000062	<0.0000062
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	2.9	3.18	3.61	3.3	3.13	1.62	2.96	2.19	4.13	4.05
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0000062
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	0.0000655	<0.000062	0.0000678
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.0216	0.0105	0.00238	0.00518	0.00185	0.00325	0.00452	0.0017	0.00216	0.00178
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	<0.0062	<0.0062	0.000865	0.000819	0.000495	0.000473	0.000545	0.00111	0.000927	<0.00031
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.089	0.0107	0.00543	0.00242	0.00392	0.00148	0.00324	<0.0031	<0.0031	<0.0031	0.00341

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]GR01_a

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 70 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-16b

GR01: GRAYLING CREEK

Site ID	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01	GR01
Sample Date									4-Jun-2020	7-Aug-2020	22-Sep-2020	17-Oct-2020	17-Nov-2020	9-Dec-2020	26-Apr-2021	20-May-2021	22-Jul-2021	24-Aug-2021	22-Sep-2021
Lab ID									1209326013	1209562017	1205287015	1205837009	L63022-15	L63345-07	L65494-02	L66046-02	L67403-03	L68130-02	L68796-05
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																			
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	6.57	6.74	6.68	6.94	6.34	6.09	8.36	7.96	7.12	5.64	7.74
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	61.2	156.2	163.9	159.8	164	172.8	162.5	77.5	190.8	143.9	146.5
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	87.4	199	291.9	307.9	315.5	330.4	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	9.3	13.7	2.1	0	0.1	0	1.2	9.1	18	11.7	1.9
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	7.83	6.87	12.78	8.22	9.71	6.2	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	1.92	2.75	3.50	1.75	3.83	15.30	Amber	Amber	Amber	Light Amber	lt. amber
Physical Tests																			
Hardness - as CaCO3	mg/L	1	5	1	0.2	SM21 2340B	SM2340B - Calculatio	-	40.7	96	108	140	130	156	67	43	97	66	71
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	98	148	191	225	204	242	136	116	158	112	110
Total Suspended Solids	mg/L	0.99	20	0.307	5	SM21 2540D	SM2540D	-	2.11	1.12	10	32.9	<5	6	<5	<5	<5	5	13
Dissolved Anions																			
Alkalinity - Total - CaCO3	mg/L	10	20	2.5	2	SM21 2320B	SM2320B - Titration	20	29.9	57.5	52	57.9	63.6	62.3	24.5	25.8	64.3	62.1	59.5
Bicarbonate - HCO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	63.6	62.3	24.5	25.8	64.3	62.1	59.5
Carbonate - CO3	mg/L	-	20	-	2	-	SM2320B - Titration	-	-	-	-	-	<2	<2	<2	<2	<2	<2	<2
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	0.15	0.464	0.896	1.12	0.99	1.23	1.09	<0.4	0.58	<0.4	1.36
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	9.28	32.7	79.5	97.2	73.3	99.5	43	7.1	31.4	5.55	12.6
Nutrients																			
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	0.059	0.223	<0.05	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.1	0.05	0.02	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	<0.05	0.0786	0.261	0.344	0.222	0.267	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	0.24	0.27	<0.02	0	<0.02	<0.02	<0.02
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	0.238	0.268	<0.02	0	<0.02	<0.02	<0.02
Total Phosphorous	mg/L	0.04	0.05	0.012	0.01	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	<0.012	<0.012	<0.012	0.0148	0.028	0.014	0.078	0.02	0.016	0.016	0.026
Cyanides																			
Total Cyanide	mg/L	-	0.01	-	0.003	-	D7511-09	-	0.0025	<0.002	-	-	<0.003	<0.003	<0.003	0.006	0.005	<0.003	0.009
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	<0.0015	0.0023	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																			
Aluminum	mg/L	0.002	0.015	0.00062	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.104	0.0368	0.183	0.317	0.0263	0.24	0.131	0.124	0.0342	0.0775	0.158
Antimony	mg/L	0.00005	0.002	0.000015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000141	0.000217	0.000264	0.000262	<0.0004	0.00044	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.001	0.0002	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.00113	0.00285	0.00291	0.00419	0.0017	0.00252	0.00154	0.00171	0.00381	0.00193	0.0018
Barium	mg/L	0.00025	0.0025	0.00004	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.00927	0.0137	0.0185	0.023	0.0153	0.022	0.0136	0.01	0.0124	0.00951	0.0104
Beryllium	mg/L	0.00005	0.00025	0.000025	0.00008	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	<0.000015	<0.000015	<0.000015	-	-	-	-	-	-	-
Boron	mg/L	0.005	0.005	0.0015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.00235	0.00385	0.00428	0.0053	0.0041	0.0053	0.0045	0.0021	0.0032	0.0016	0.0015
Cadmium	mg/L	0.00005	0.00025	0.000015	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0002	<0.000015	<0.000015	<0.000015	0.0000222	<0.00005	<0.00005	0.000091	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.5	0.015	0.1	EPA 200.8 Low Level	M200.7 ICP	-	11.1	26.8	31.8	39.1	37.7	45.6	18.6	12.1	28	18.5	20.1
Chromium	mg/L	0.0005	0.002	0.00015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.00064	<0.00015	<0.00015	0.000661	<0.0005	0.00174	<0.0005	0.00063	0.00051	0.00052	0.00063
Cobalt	mg/L	0.000025	0.00025	0.00001	0.00005	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000263	0.000512	0.000511	0.000721	0.000484	0.000936	0.00162	0.00031	0.000633	0.000904	0.000709
Copper	mg/L	0.0005	0.002	0.0002	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	0.008	0.00334	0.00214	0.00332	0.00388	0.00206	0.00307	0.00266	0.00398	0.00145	0.00131	0.00161
Iron	mg/L	0.02	0.15	0.0062	0.06	EPA 200.8 Low Level	M200.7 ICP	1	0.574	0.716	0.65	0.832	0.462	1.05	0.434	0.937	1.46	1.08	1.08
Lead	mg/L	0.0001	0.0005	0.000031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.002	0.000127	0.000136	0.000193	0.000363	<0.0001	0.00063	0.00021	0.00015	<0.0001	0.00018	0.00029
Magnesium	mg/L	0.02	1	0.0062	0.2	EPA 200.8 Low Level	M200.7 ICP	-	3.16	7.1	7.08	10.3	8.7	10.2	4.92	3.02	6.53	4.82	5.04
Manganese	mg/L	0.0001	0.002	0.000031	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0218	0.115	0.126	0.175	0.17	0.248	0.332	0.0297	0.161	0.171	0.0998
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	3.67	2.28	1.54	1.52	0.62	1.58	4.27	5.6	1.6	0.86	2.02
Molybdenum	mg/L	0.00005	0.0005	0.000015	0.0002	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000408	0.0012	0.00161	0.00142	0.0011	0.0013	0.00052	0.00041	0.00091	0.00071	0.00071
Nickel	mg/L	0.00062	0.001	0.00015	0.0004	EPA 200.8 Low Level	M200.8 ICP-MS	0.043	0.00322	0.00211	0.002	0.00214	0.00121	0.00225	0.00194	0.00326	0.00167	0.00148	0.00139
Potassium	mg/L	0.05	1	0.015	0.2	EPA 200.8 Low Level	M200.7 ICP	-	0.725	1.02	1.58	1.84	1.55	2.03	3.95	1.19	0.84	0.67	1.2
Selenium	mg/L	0.001	0.00025	0.00031	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	<0.00031	<0.00031	<0.00031	<0.00031	0.00023	0.00023	0.00016	0.00011	0.00014	<0.0001	<0.0001
Silicon	mg/L	0.1	0.5	0.031	0.1	EPA 200.8 Low Level	M200.7 ICP	-	3.97	6.02	7.91	10.4	8.75	9.94	2.93	3.33	5.05	3.96	4.5
Silver	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	1	0.031	0.2	EPA 200.8 Low Level	M200.7 ICP	-	1.91	4.45	5	6.86	5.13	6.29	2.75	1.72	3.89	2.83	3.44
Strontium	mg/L	0.0025	0.045	0.00075	0.009	EPA 200.8 Low Level	M200.7 ICP	-	-	-	0.123	0.142	0.13	0.157	0.0676	0.0472	0.106	0.0745	0.0712
Thallium	mg/L	0.00002	0.0005	0.0000062	0.0001	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0025	0.000062	0.0008	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	<0.000062	<0.000062	<0.000062	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.025	0.00015	0.005	EPA 200.8 Low Level	M200.7 ICP	-	0.00328	0.0091	0.0112	0.0167	<0.005	0.016	<0.005	<0.005	0.0051	0.0066	0.0068
Vanadium	mg/L	0.001	0.002	0.00031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000787	0.0011	0.000933	0.00102	<0.0005	0.00062	<0.0005	0.00098	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.0031	0.006	EPA 200.8 Low Level	M200.8 ICP-MS	0.099	<0.0031	<0.0031	<0.0031	<0.0031	<0.006	0.0067	0.0096	<0.006	<0.006	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]GR01_b ables_II.xlsx]GR01_b

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 80 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020, December 2020 and Ausgut 2021 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-17
TK01: TOK RIVER

Site ID									TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01	TK01
Sample Date	Units	Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,8]	24-Sep-2015	30-Jun-2016	5-Sep-2016	28-May-2018	13-Sep-2018	4-Jun-2019	9-Sep-2019	23-Oct-2019	4-Jun-2020	7-Aug-2020	22-Sep-2020	17-Oct-2020	20-May-2021	22-Jul-2021	24-Aug-2021	22-Sep-2021
Lab ID									1155647010	1168221007	1168541016	1189336003	1189750006	1199394006	1195369012	1199902014	1209326012	1209562018	1205287023	1205837017	L66046-01	L67403-05	L68130-01	L68796-06
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [6,9]																								
pH	pH units	-	-	-	-	Field YSI Pro Plus /Hach HQ		6.5 < pH < 8.5	8.05	-	8.01	7.7	8.22	-	-	-	8.13	8.49	8.1	8.18	8.93	8.27	8.42	8.4
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	-	6.6	-	-	-	142.5	142.5	-	315.4	385	344	257.2	501	550	561	585
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus /Hach HQ		-	577	-	577	316	534	500	560	619	489	542.4	576.9	495.9	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus /Hach HQ		20	1.3	1	1.9	6.1	5.6	3.3	3.3	-	6.5	9.9	3.9	0	9.5	15.7	9.5	1.9
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus /Hach HQ		3	-	11.8	-	-	-	12.45	12.45	-	12.19	10.56	12.71	5.46	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	4.75	91.1	21.1	611.67	23.3	3.8	8.62	3.58	42.97	15.33	6.87	4.97	Light Amber	Cloudy	Clear	clear
Physical Tests																								
Hardness - as CaCO3	mg/L	1	0.2	1	5	SM21 2340B	SM2340B - Calculatio	-	291	268	268	212	282	253	312	305	252	285	258	342	291	320	300	334
Total Dissolved Solids	mg/L	10	20	3.1	40	SM21 2540C	SM2540C	500	384	351	385	215	368	352	391	413	318	366	399	416	350	428	388	398
Total Suspended Solids	mg/L	1.06	5	0.33	20	SM21 2540D	SM2540D	-	6.41	129	44.7	238	71.1	107	15.3	5.58	360	85.2	22.8	47.4	42	37	19	15
Dissolved Anions																								
Alkalinity - Total - CaCO3	mg/L	10	2	2.5	20	SM21 2320B	SM2320B - Titration	20	145	120	115	83.7	145	133	-	-	117	134	146	161	129	146	142	154
Chloride	mg/L	0.2	0.8	0.05	4	EPA 300.0	M300.0 - Ion Chromat	230	0.432	-	-	0.307	0.385	0.346	0.387	1.12	0.277	0.302	0.386	0.534	<0.4	<0.8	<0.8	<0.8
Sulphate	mg/L	2	0.8	0.5	4	EPA 300.0	M300.0 - Ion Chromat	250	156	-	-	73.9	144	145	153	175	131	148	163	168	135	149	152	162
Nutrients																								
Total Nitrate as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	10	-	-	-	-	-	-	0.179	-	-	0.208	0.273	<0.05	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	<0.05	-	-	-	-
Nitrate Nitrogen as N	mg/L	0.2	0.02	0.05	0.1	SM21 4500NO3-F	M353.2 - H2SO4 prese	10	0.297	0.241	4.59	0.234	0.298	0.287	0.179	0.405	0.324	0.26	0.291	0.463	0.222	0.192	0.185	0.24
Total Phosphorous	mg/L	0.04	0.01	0.012	0.05	SM21 4500P-B,E	M365.1 - Auto Ascorb	-	0.0114	0.14	0.0569	1.09	0.0739	0.109	<0.005	<0.005	0.366	0.0724	0.0127	0.0239	0.033	0.027	0.021	0.018
Cyanides																								
Total Cyanide	mg/L	-	0.003	-	0.01	-	D7511-09	-	0.0055	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	<0.003	<0.003	<0.003	<0.003
Weak Acid Dissociable Cyanide	mg/L	0.005	0.003	0.0015	0.01	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0027	<0.003	<0.003	<0.003	<0.003
Total Metals [5,7,8]																								
Aluminum	mg/L	0.002	0.005	0.00062	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.104	2.65	0.307	7.51	0.732	1.88	0.233	0.0697	3.46	1.27	0.195	0.183	0.0349	1.11	0.573	0.243
Antimony	mg/L	0.00005	0.0004	0.000015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.006	0.000215	0.000461	0.000272	0.000744	0.000261	0.000452	0.000218	0.000183	0.000575	0.000299	0.000165	0.000176	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.0008	0.0002	0.0002	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000695	0.00361	0.00124	0.0125	0.00168	0.00455	0.000825	0.00055	0.00854	0.00232	0.000675	0.00147	0.00092	0.00181	0.00125	0.00105
Barium	mg/L	0.00025	0.0005	0.00004	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	2	0.0437	0.0925	0.0498	0.165	0.0513	0.0671	0.0497	0.0492	0.087	0.0574	0.0433	0.0529	0.0373	0.0605	0.0505	0.0446
Beryllium	mg/L	0.00005	0.00008	0.000025	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.004	<0.000025	0.0000825	<0.000025	0.000258	<0.000025	0.0000474	<0.000025	<0.000025	0.000112	0.0000335	<0.000025	<0.000025	<0.00008	<0.00008	<0.00008	<0.00008
Bismuth	mg/L	0.00005	-	0.000015	-	EPA 200.8 Low Level	-	-	<0.000015	0.0000397	<0.000015	0.000201	<0.000015	0.0000552	<0.000015	<0.000015	0.000106	0.0000196	<0.000015	<0.000015	-	-	-	-
Boron	mg/L	0.005	0.001	0.0015	0.005	EPA 200.8 Low Level	M200.8 ICP-MS	0.75	0.0292	0.018	0.028	0.0141	0.0347	0.0176	0.0284	0.0335	0.019	0.0306	0.025	0.0359	0.0226	0.0262	0.0292	0.0341
Cadmium	mg/L	0.00005	0.00005	0.000015	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.0006	0.0000241	0.000154	0.0000632	0.000919	0.0000694	0.000127	0.0000264	0.0000161	0.00026	0.0000789	0.0000286	0.0000276	<0.00005	<0.00005	0.000051	<0.00005
Calcium	mg/L	0.05	0.1	0.015	0.5	EPA 200.8 Low Level	M200.7 ICP	-	75.5	70	72.2	52	73.6	64	83.2	83	66.8	75.1	70.8	89.8	77.8	85.4	79.6	89.6
Chromium	mg/L	0.0005	0.0005	0.00015	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000389	0.00561	0.000682	0.0171	0.00159	0.00473	<0.00015	<0.00015	0.00832	0.00178	<0.00015	0.000517	<0.0005	0.00233	0.0016	0.00084
Cobalt	mg/L	0.000025	0.00005	0.00001	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.000287	0.00302	0.000906	0.0165	0.0014	0.00352	0.00051	0.000273	0.00633	0.00162	0.000489	0.000462	0.000206	0.0011	0.000773	0.000448
Copper	mg/L	0.0005	0.0008	0.0002	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.022	0.000778	0.00812	0.003	0.0455	0.00385	0.00996	0.00162	0.00111	0.0204	0.00552	0.00147	0.00148	0.00103	0.00259	0.00175	0.00107
Iron	mg/L	0.02	0.06	0.0062	0.15	EPA 200.8 Low Level	M200.7 ICP	1	0.289	5.97	1.14	23.1	2.37	6.95	0.623	0.223	11.7	2.74	0.594	0.544	<0.12	1.98	1.05	0.525
Lead	mg/L	0.0001	0.0001	0.000031	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.012	0.000193	0.00343	0.001	0.023	0.00155	0.00458	0.000425	0.000177	0.00918	0.00199	0.000481	0.000465	<0.0001	0.00113	0.00139	0.00039
Magnesium	mg/L	0.02	0.2	0.0062	1	EPA 200.8 Low Level	M200.7 ICP	-	25.3	22.6	21.2	19.9	23.9	22.7	25.5	23.7	20.8	23.7	19.7	28.5	23.4	26	24.7	26.7
Manganese	mg/L	0.0001	0.0004	0.000031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.05	0.0103	0.136	0.0439	0.832	0.0675	0.165	0.0197	0.00721	0.345	0.0852	0.0229	0.0187	0.00825	0.0384	0.0292	0.0176
Mercury	ng/L	1	0.0000003	0.5	1	EPA 1631 E	M1631E, Atomic Fluor	50	1.95	24.2	12.4	13.5	11	11.1	3.05	1.72	34.6	12.9	3.31	2.55	5.16	6.63	3.83	2.25
Molybdenum	mg/L	0.00005	0.0002	0.000015	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.01	0.000518	0.000828	0.000443	0.000921	0.000534	0.000638	0.000616	0.000531	0.000775	0.000585	0.000444	0.000546	0.00048	0.00055	0.00134	0.00051
Nickel	mg/L	0.00062	0.0004	0.00015	0.001	EPA 200.8 Low Level	M200.8 ICP-MS	0.100	0.00309	0.00791	0.00336	0.036	0.00467	0.00935	0.00309	0.00253	0.0159	0.00557	0.00286	0.00271	0.00085	0.00248	0.00168	0.00094
Potassium	mg/L	0.05	0.2	0.015	1	EPA 200.8 Low Level	M200.7 ICP	-	1.79	2.52	1.68	2.36	1.73	1.88	1.83	1.74	1.92	1.8	1.51	1.85	1.89	2.09	1.78	1.69
Selenium	mg/L	0.001	0.0001	0.00031	0.00025	EPA 200.8 Low Level	M200.8 ICP-MS	0.005	0.00106	0.00105	0.00101	0.00149	0.00164	0.0013	0.00171	0.00157	0.0022	0.00203	0.00147	0.00185	0.00128	0.00154	0.00133	0.00158
Silicon	mg/L	0.1	0.1	0.031	0.5	EPA 200.8 Low Level	M200.7 ICP	-	4.06	6.68	3.72	11.3	5.17	5.8	4.33	4.69	9.22	6.2	3.75	5.85	4.09	5.64	4.74	4.04
Silver	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.00115	<0.0000062	0.0000384	0.0000219	0.000146	0.0000128	0.0000242	<0.0000062	<0.0000062	0.0000614	0.0000176	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.1	0.2	0.031	1	EPA 200.8 Low Level	M200.7 ICP	-	3.71	2.79	3.11	1.97	3.69	2.88	3.74	3.71	2.74	3.74	2.93	4.55	3.4	3.67	3.56	3.82
Strontium	mg/L	0.0025	0.009	0.00075	0.045	EPA 200.8 Low Level	M200.7 ICP	-	-	-	-	-	-	-	-	-	-	-	0.373	0.442	0.35	0.395	0.381	0.385
Thallium	mg/L	0.00002	0.0001	0.0000062	0.0005	EPA 200.8 Low Level	M200.8 ICP-MS	0.0017	<0.0000062	0.0000476	0.00000714	0.0000915	0.0000109	0.0000243	<0.0000062	<0.0000062	0.0000458	0.0000141	<0.0000062	<0.0000062	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0002	0.0008	0.000062	0.0025	EPA 200.8 Low Level	M200.8 ICP-MS	-	<0.000062	0.0000816	<0.000062	<0.000062	<0.000062	<0.000062	0.0000629	0.000077	0.0000654	<0.000062	<0.000062	0.0000641	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.0005	0.005	0.00015	0.025	EPA 200.8 Low Level	M200.7 ICP	-	0.00585	0.174	0.0182	0.223	0.0397	0.107	0.014	0.0046	0.186	0.0801	0.0144	0.01	<0.01	0.0687	0.0419	0.0239
Vanadium	mg/L	0.001	0.0005	0.00031	0.002	EPA 200.8 Low Level	M200.8 ICP-MS	0.1	0.000569	0.0109	0.00124	0.0208	0.00269	0.00675	0.00195	<0.00031	0.0124	0.00408	0.00108	0.000821	0.00053	0.0034	0.00161	0.00058
Zinc	mg/L	0.01	0.006	0.0031	0.015	EPA 200.8 Low Level	M200.8 ICP-MS	0.287	0.00223	0.0248	0.00677	0.0973	0.00783	0.0221	0.00434	<0.0031	0.0397	0.0107	0.00321	<0.0031	<0.006	0.0083	<0.006	<0.006

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_II.xlsx]TK01 '_Tables_II.xlsx]TK01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 280 mg/L CaCO3 shown.
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
9. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

Hardness	280

TABLE B-18

EA01: TORS (EAGLE) CREEK- INACTIVE STATION

Site ID	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7,8]	EA01	EA01	EA01	EA01	EA01	EA01	EA01
Sample Date						24-May-2012	2-Aug-2012	20-Jun-2013	2-Oct-2013	24-Sep-2015	30-Jun-2016	5-Sep-2016
Lab ID						1121854009	1123514010	1132583015	1135004004	1155647007	1168221006	1168541006
Lab		SGS	SGS	SGS		SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters												
pH	pH units	-	-	Field YSI Pro Plus	6.5 < pH < 8.5	6.86	7.3	7.34	6.24	5.14	7.01	7.28
Conductivity (EC)	µS/cm	-	-	Field YSI Pro Plus	-	56.4	-	142.5	116.9	156.6	193.3	173.1
Specific Conductance	µS/cm	-	-	Field YSI Pro Plus	-	102	117.4	244	220	288	317	302
Temperature	°C	-	-	Field YSI Pro Plus	20	1.6	1.9	3.3	0.6	1.1	4.6	2.7
Dissolved Oxygen (DO)	mg/L	-	-	Field YSI Pro Plus	3	12.83	-	12.45	13.11	12.02	8.57	9.32
Turbidity	NTU	-	-	2020e Turbidimeter	-	4.9	10.9	2.28	4.37	0.21	1.26	0.51
Physical Tests												
Hardness - as CaCO3	mg/L	1	1	SM2340B	-	-	-	-	-	127	74.9	129
Total Dissolved Solids	mg/L	5	3.1	SM2540C	500	55	123	175	138	190	201	181
Total Suspended Solids	mg/L	0.58	0.36	SM2540D	-	14.7	3.09	0.725	11.5	1.02	8.8	2.56
Dissolved Anions												
Alkalinity - Total - CaCO3	mg/L	5	3.1	SM2320B	20	38.9	78.6	83.9	35.1	99.5	114	112
Chloride - Cl	mg/L	-	-	-	230	0.195	0.169	0.295	0.447	0.298	-	-
Fluoride - F	mg/L	-	-	-	4	0.103	0.095	0.089	0.179	0.136	-	-
Sulphate - SO4	mg/L	-	-	-	250	8.49	19.1	28	72.5	34.2	-	-
Nutrients												
Nitrate Nitrogen as N	mg/L	0.05	0.03	SM4500-NO3 F	10	0.279	0.41	0.33	0.564	0.226	0.2	0.734
Total Phosphorous	mg/L	0.005	0.0031	SM4500-P B,E	-	<0.062	<0.062	<0.062	<0.062	0.0048	0.0142	0.0707
Ortho Phosphorous	mg/L	-	-	-	-	<0.031	<0.031	-	-	-	-	-
Cyanides												
Total Cyanide	mg/L	0.0025	0.0015	SM4500-CN C,E	-	<0.0015	<0.0015	<0.0015	0.0018	0.0056	<0.0015	0.0016
Total Metals												
Aluminum	mg/L	0.001	0.00062	EPA 200.8 Low Level	0.75	0.443	0.0478	0.0181	1.02	0.0228	0.252	0.0147
Antimony	mg/L	0.000025	0.000015	EPA 200.8 Low Level	0.006	<0.00031	<0.00031	<0.00031	<0.00031	0.000125	0.000171	0.000123
Arsenic	mg/L	0.0004	0.0002	EPA 200.8 Low Level	0.01	<0.0015	<0.0015	0.00359	0.0077	0.00222	0.0047	0.00209
Barium	mg/L	0.000125	0.00004	EPA 200.8 Low Level	2	0.00957	0.00993	0.0144	0.00856	0.0123	0.0201	0.0137
Beryllium	mg/L	0.000025	0.000025	EPA 200.8 Low Level	0.004	<0.00013	<0.00013	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025
Bismuth	mg/L	0.000025	0.000015	EPA 200.8 Low Level	-	-	-	-	-	<0.000015	<0.000015	<0.000015
Boron	mg/L	0.0025	0.0015	EPA 200.8 Low Level	0.75	-	-	-	-	<0.0015	<0.0015	<0.0015
Cadmium	mg/L	0.000025	0.000015	EPA 200.8 Low Level	0.00029	<0.00015	<0.00015	<0.00015	<0.00015	<0.000015	0.00002	<0.000015
Calcium	mg/L	0.025	0.015	EPA 200.8 Low Level	-	17.1	32.1	38.6	29.3	40.3	24.2	41.4
Chromium	mg/L	0.00025	0.00015	EPA 200.8 Low Level	0.1	0.000692	<0.00062	0.000662	0.00178	0.000155	<0.00015	<0.00015
Cobalt	mg/L	0.00001	0.00001	EPA 200.8 Low Level	0.05	<0.0012	<0.0012	<0.0012	<0.0012	0.000122	0.00035	0.000104
Copper	mg/L	0.00025	0.0002	EPA 200.8 Low Level	0.0101	0.0023	0.0011	0.0008	0.0114	0.0006	0.0016	0.0007
Iron	mg/L	0.01	0.0062	EPA 200.8 Low Level	1	0.421	<0.078	<0.078	1.01	0.0621	0.513	0.0597
Lead	mg/L	0.00005	0.000031	EPA 200.8 Low Level	0.0036	0.0003	0.0001	<0.000062	0.0007	<0.000031	0.0005	<0.000031
Magnesium	mg/L	0.01	0.0062	EPA 200.8 Low Level	-	2.77	5.06	6.7	4.99	6.53	3.53	6.12
Manganese	mg/L	0.00005	0.000031	EPA 200.8 Low Level	0.05	0.0133	0.00201	0.0181	0.026	0.0305	0.231	0.039
Mercury	ng/L	0.5	0.5	EPA 1631 E	50	<0.062	<0.062	-	114	1	1.47	1.5
Molybdenum	mg/L	0.000025	0.000015	EPA 200.8 Low Level	0.01	<0.0031	<0.0031	<0.0031	0.00455	0.000332	0.000371	0.000322
Nickel	mg/L	0.00031	0.000062	EPA 200.8 Low Level	0.057	0.001	0.001	0.001	0.004	0.002	0.001	0.001
Potassium	mg/L	0.025	0.015	EPA 200.8 Low Level	-	0.49	0.588	1.16	1.42	1.24	1.45	1.24
Selenium	mg/L	0.0005	0.00031	EPA 200.8 Low Level	0.005	<0.0015	<0.0015	<0.0015	<0.0015	0.000475	<0.00031	<0.00031
Silicon	mg/L	0.05	0.031	EPA 200.8 Low Level	-	6.0400	5.7700	5.3500	10.8000	5.0400	2.3900	4.5100
Silver	mg/L	0.00001	0.0000062	EPA 200.8 Low Level	0.00115	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062
Sodium	mg/L	0.05	0.031	EPA 200.8 Low Level	-	1.61	2.09	2.51	6.49	2.48	2.97	2.34
Thallium	mg/L	0.00001	0.0000062	EPA 200.8 Low Level	0.0017	<0.00031	<0.00031	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062
Tin	mg/L	0.0001	0.000062	EPA 200.8 Low Level	-	<0.00031	<0.00031	<0.00031	<0.00031	<0.000062	0.0000671	<0.000062
Titanium	mg/L	0.00025	0.00015	EPA 200.8 Low Level	-	0.0153	<0.0015	<0.0015	0.035	0.00134	0.0111	0.00103
Vanadium	mg/L	0.0005	0.00031	EPA 200.8 Low Level	0.1	<0.0062	<0.0062	<0.0062	<0.0062	0.000605	0.000667	<0.00031
Zinc	mg/L	0.00155	0.0004	EPA 200.8 Low Level	0.129893777	0.00523	0.00505	<0.0025	0.00564	0.000732	0.00319	0.00109

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_inactive.xlsx]EA01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified lab for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an av
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE B-19

EA03: TORS (EAGLE) CREEK- INACTIVE STATION

Site ID	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7,8]	EA03	EA03	EA03	EA03	EA03	EA03	EA03	EA03
Sample Date						19-Jun-2013	4-Oct-2013	25-Sep-2015	1-Jul-2016	5-Sep-2016	29-May-2018	12-Sep-2018	4-Jun-2019
Lab ID						1132583007	1135004012	1155647008	1168221009	1168541008	1189336007	1189750010	1199394002
Lab		SGS	SGS	SGS		SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
Field Measured Parameters													
pH	pH units	-	-	Field YSI Pro Plus	6.5 < pH < 8.5	7.36	6.85	6.38	7.62	7.64	7.69	7.93	-
Conductivity (EC)	µS/cm	-	-	Field YSI Pro Plus	-	179.9	191	206.4	270.6	242.9	115.3	219.7	176.6
Specific Conductance	µS/cm	-	-	Field YSI Pro Plus	-	300	361	396	409	409	218	359	290
Temperature	°C	-	-	Field YSI Pro Plus	20	4	0.4	-0.1	7.3	3.7	0.3	4.8	4.2
Dissolved Oxygen (DO)	mg/L	-	-	Field YSI Pro Plus	3	13.22	14.09	12.98	10.3	11.14	12.58	11.26	8.24
Turbidity	NTU	-	-	2020e Turbidimeter	-	2	0.13	0.7	1.0	0.6	6.1	0.5	2.0
Physical Tests													
Hardness - as CaCO3	mg/L	1	1	EPA 200.8 Low Level	-	-	-	180	99	186	113	182	153
Total Dissolved Solids	mg/L	10	3.1	SM2540C	500	207	230	260	261	262	167	226	204
Total Suspended Solids	mg/L	1.03	0.32	SM2540D	-	5.41	<0.156	5.63	5.2	1.24	163	0.808	13.4
Dissolved Anions													
Alkalinity - Total - CaCO3	mg/L	10	2.5	SM2320B	20	122	146	149	150	157	79.7	142	115
Chloride - Cl	mg/L	0.2	0.05	EPA 300.0	230	0.386	0.403	0.543	-	-	0.392	0.456	0.468
Fluoride - F	mg/L	0.2	0.05	EPA 300.0	4	0.127	0.102	0.173	-	-	0.13	0.141	0.143
Sulphate - SO4	mg/L	1	0.25	EPA 300.0	250	37.7	49.7	52.8	-	-	26.1	50.7	45.1
Nutrients													
Nitrate Nitrogen as N	mg/L	0.2	0.05	SM4500-NO3 F	10	0.0385	0.118	0.0575	0.119	0.24	0.127	0.046	0.0966
Total Phosphorous	mg/L	0.02	0.005	SM4500-P B,E	-	<0.062	<0.062	0.0166	0.0299	0.0225	0.15	0.0097	0.0269
Cyanides													
Total Cyanide	mg/L	0.005	0.002	SM4500-CN C,E	-	<0.0015	0.0016	0.0056	<0.0015	<0.0015	<0.002	0.0046	<0.002
Total Metals													
Aluminum	mg/L	0.002	0.00062	EPA 200.8 Low Level	0.75	0.0918	0.0117	0.0696	0.104	0.0127	2.57	0.0237	0.187
Antimony	mg/L	0.00005	0.000015	EPA 200.8 Low Level	0.006	<0.00031	<0.00031	0.0000744	0.000114	0.0000652	0.000189	0.0000773	0.000111
Arsenic	mg/L	0.0008	0.0002	EPA 200.8 Low Level	0.01	<0.0015	0.00171	0.00143	0.00197	0.00133	0.00376	0.00111	0.00141
Barium	mg/L	0.00025	0.00004	EPA 200.8 Low Level	2	0.0233	0.0226	0.0216	0.0275	0.0234	0.0448	0.024	0.0206
Beryllium	mg/L	0.00005	0.000025	EPA 200.8 Low Level	0.004	<0.00013	<0.00013	<0.000025	<0.000025	<0.000025	0.0000644	<0.000025	<0.000025
Bismuth	mg/L	0.00005	0.000015	EPA 200.8 Low Level	-	-	-	<0.000015	<0.000015	<0.000015	0.0000217	<0.000015	0.0000589
Boron	mg/L	0.005	0.0015	EPA 200.8 Low Level	0.75	-	-	<0.0015	0.00161	<0.0015	0.00245	0.00247	0.0025
Cadmium	mg/L	0.00005	0.000015	EPA 200.8 Low Level	0.00037	<0.00015	<0.00015	<0.000015	<0.000015	<0.000015	0.00005	<0.000015	<0.000015
Calcium	mg/L	0.05	0.015	EPA 200.8 Low Level	-	47.9	55.6	54.2	30.4	57.8	32.9	54.4	46
Chromium	mg/L	0.0005	0.00015	EPA 200.8 Low Level	0.1	0.000889	0.000704	0.000259	<0.00015	<0.00015	0.00291	<0.00015	0.000376
Cobalt	mg/L	0.000025	0.00001	EPA 200.8 Low Level	0.05	<0.0012	<0.0012	0.00021	0.000198	0.000123	0.00218	0.000179	0.000289
Copper	mg/L	0.0005	0.0002	EPA 200.8 Low Level	0.0132	0.0025	0.0011	0.0010	0.0013	0.0010	0.0074	0.0011	0.0019
Iron	mg/L	0.02	0.0062	EPA 200.8 Low Level	1	0.302	0.185	0.291	0.335	0.197	3.86	0.174	0.393
Lead	mg/L	0.0001	0.000031	EPA 200.8 Low Level	0.0053	0.0007	<0.000062	0.0000	0.0001	<0.000031	0.0019	<0.000031	0.0001
Magnesium	mg/L	0.02	0.0062	EPA 200.8 Low Level	-	9.93	11.6	10.9	5.6	10	7.5	11.3	9.35
Manganese	mg/L	0.0001	0.000031	EPA 200.8 Low Level	0.05	0.0448	0.0342	0.045	0.0282	0.033	0.223	0.0291	0.0341
Mercury	ng/L	1	0.5	EPA 1631 E	50	-	<62	0.988	1.36	0.934	8.88	1.52	2.53
Molybdenum	mg/L	0.00005	0.000015	EPA 200.8 Low Level	0.01	<0.0031	<0.0031	0.000413	0.000508	0.000456	0.000357	0.000426	0.000426
Nickel	mg/L	0.00062	0.000062	EPA 200.8 Low Level	0.074	0.002	0.002	0.003	0.002	0.002	0.006	0.002	0.002
Potassium	mg/L	0.05	0.015	EPA 200.8 Low Level	-	1.79	1.68	1.7	2.12	1.86	1.55	2.07	1.58
Selenium	mg/L	0.001	0.00031	EPA 200.8 Low Level	0.005	<0.0015	<0.0015	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
Silicon	mg/L	0.1	0.031	EPA 200.8 Low Level	-	5.79	5.65	5.9	2.69	5.29	8.29	6.11	5.25
Silver	mg/L	0.00002	0.0000062	EPA 200.8 Low Level	0.0012	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	0.0000	<0.0000062	<0.0000062
Sodium	mg/L	0.1	0.031	EPA 200.8 Low Level	-	3.5	3.92	3.83	4.53	3.87	2.8	4.31	3.5
Thallium	mg/L	0.00002	0.0000062	EPA 200.8 Low Level	0.0017	<0.00031	<0.00031	<0.0000062	<0.0000062	<0.0000062	0.0000102	<0.0000062	<0.0000062
Tin	mg/L	0.0002	0.000062	EPA 200.8 Low Level	-	<0.00031	<0.00031	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062	<0.000062
Titanium	mg/L	0.0005	0.00015	EPA 200.8 Low Level	-	0.00411	0.00165	0.00468	0.00565	0.0012	0.0935	0.00232	0.00975
Vanadium	mg/L	0.001	0.00031	EPA 200.8 Low Level	0.1	<0.0062	<0.0062	0.000736	0.000926	<0.00031	0.00635	0.000417	0.00174
Zinc	mg/L	0.01	0.0031	EPA 200.8 Low Level	0.1689	0.0043	0.0035	0.0011	0.0021	0.0013	0.0091	<0.0031	<0.0031

H:\Project\4148\Water Chemistry Database\Tables\[SW_Tables_inactive.xlsx]EA01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified lab for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. Aluminum standard is dependent on hardness and pH. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-spec
6. Alkalinity and Dissolved Oxygen standards shown are the minimum concentrations required.
7. Silver standard shown is for acute exposure. Chronic standard unavailable.
8. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

APPENDIX C
MONITORING WELL AND PIEZOMETER LOGS

H:\Project\4148\Drilling\2021 Well Completion Logs\Well_01\Well_01.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION	AIR LIFT YIELD (gpm)	WELL / PIEZOMETER CONSTRUCTION N: 7007127 E: 404572 AZIMUTH: N/A DIP: 90° GROUND ELEVATION: 3303.00 ft (1006.75 m)
			0 50	6" Steel Casing Stick-up = ~2.5 ft
3300	0	Lithology unknown		
3250	50			
3200	100			
3150	150			
3100	200			
3050	250			
3000	300			
2950	350			
2900	400			
2850	450			
2800	500			
2750	550			
2700	600			
2650	650			
2600	700			
2550	750			
	800	End of hole @ 800 ft-BGL.	35 Apr-2021	800.0 ft

Notes:
No formal drilling log available. The well was drilled in ~2013, based on personal communication, but exact drilling date is unknown. Original data on yield or air lift testing not available.

The well had been frozen with significant ice development and had not been operational since 2014.

Well rehabilitation and develppment was completed on April 25th, 2021. Significant ice development was noted between 233 ft and 428 ft. The pump assembly including heat trace was pulled from the well. New pump, drop pipe and heat trace to be installed in well.

6" Steel Casing (Unperforated to unknown depth)

Water Level: 3040.5 ft-ELEV (02-Jun-2021)

6" Steel Casing (Likely perforated to end of hole)

Note:
Pump assembly to be installed in well.

LEGEND

- OVB
- QMS/MQS
- CS
- QTZ
- QTZE

- Oxide Zone
- Transition Zone
- Sulphide Zone

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Forest Drilling (?)
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	~ 2013
DRILLING END DATE:	~ 2013
DATE PUMP INSTALLED:	N/A
HYDROGEOLOGIST:	N/A

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: WELL 01

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-1

H:\Project\4148\Drilling\2021 Well Completion Logs\Well_02\Well_02.gpj

WELL 02 LOG OBTAINED FROM ARCTIC DRILLING INC.
WELL IS ADOPTED AS A MONITORING WELL BUT CONTINUES TO ACT AS A TEMPORARY WATER SUPPLY WELL

ARCTIC DRILLING, INC.
P.O. BOX 58317
FAIRBANKS, ALASKA 99711
Phone: (907) 451-8706 Fax: (907) 452-4465

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND & WATER
WATER WELL RECORD

Drilling Started: 10 / 3 / 16, Completed: 10 / 15 / 16

Legal Description:		BLOCK	LOT	Property Owner Name & Address:
City/Borough:	Subdivision:			Avalon Development Well location Tetlin Hills
Tetlin				

Meridian _____ Township _____ Range _____ Section _____, _____ ¼ of _____ ¼ of _____ ¼ of _____ ¼

BOREHOLE DATA: (from ground surface) Material: Type, Color & wetness	Depth From	Depth To
frozen dirt/rock	0	5
soft rock	5	20
medium soft rock	20	110
seep, 3 gpm	110	
rock, fractures, 25 gpm by 160 ft	110	160
rock, fractures 100 gpm by 200 ft	160	200
rock, fractures, 400 gpm est by 360 ft	200	360
swelling clay, stuck at 360, case hole	360	
soft rock, fractures, over 500 gpm est	360	600
rock and clay layers, difficult drilling	600	800

Drilling method: ☒ Air rotary, ☐ Cable tool ☐ Other _____
Well use: ☐ Public supply, ☒ Domestic, ☐ Other _____

Depth of hole: 800 ft, Casing stickup: 2 ft
Casing type: STEEL Thickness .250 inches
Casing diameter: 8 inches Casing depth 360 ft
Liner type: Steel Diameter: 6 inches Depth: 800 ft

Static water (from top of casing): 105 ft on 10 / 16 / 16
Pumping level & yield: 112 feet after 20 hours at 40 gpm
Recovery rate: 100 gpm, Method of testing: AIR LIFT
Development method: AIR SURGE Duration: 2.5 HOURS

Well intake opening type: ☐ Open end ☐ Open hole
☐ Screened; Start: N/A ft, Stopped _____ ft
Screen type: _____ Slot/mesh size _____
☐ Perforated; Start: 120 ft, Stopped 800 ft
Start: _____ ft, Stopped _____ ft
Note: perforated evry 10 feet

Grout type: Bentonite Volume 4 cf
Depth; from 0 ft, to 20 ft

Pump intake depth: 210 ft
Pump size 33GS30 460v hp Brand name Goulds

Was well disinfected upon completion? ☐ Yes ☒ No
Method of disinfection: _____

Driller comments/ disclaimers:
well makes est over 500 gpm, hard to tell actual potential, could be up to 1,000 gpm

Well driller name: Dan Brotherton
Company name: ARCTIC DRILLING, INC.
Mailing address: P.O. BOX 58317
City: FAIRBANKS State: AK Zip 99711
Phone number : (907) 451 - 8706
Drillers signature: _____
Date: 10 / 16 / 16

State law requires that a copy of this well log be submitted to the state of Alaska within 45 days. **CITY OF ANCHORAGE ONLY**

(Alaska statutes: 38.05.020, 38.05.035, 41.08.020, 46.15.020 and regulations 11 AAC 93.140.)

DNR/DIVISION OF MINING, LAND & WATER
550 West 7th Ave., Suite 900A
ANCHORAGE AK 99501-3577

Phone (907)269-8503, Fax (907) 269-8947

The City of Anchorage requires that a copy of this log be sent to the city within 60 days and a copy of this log be sent to the owner of the property on which the well is located within 30 days.

REQUIRED BY THE CITY OF ANCHORAGE ONLY:
Permit Number: _____
Date of Issue: ____/____/____
Parcel Identification Number: _____-_____-_____
Is well located at approved permit location? ☐ Yes ☐ No

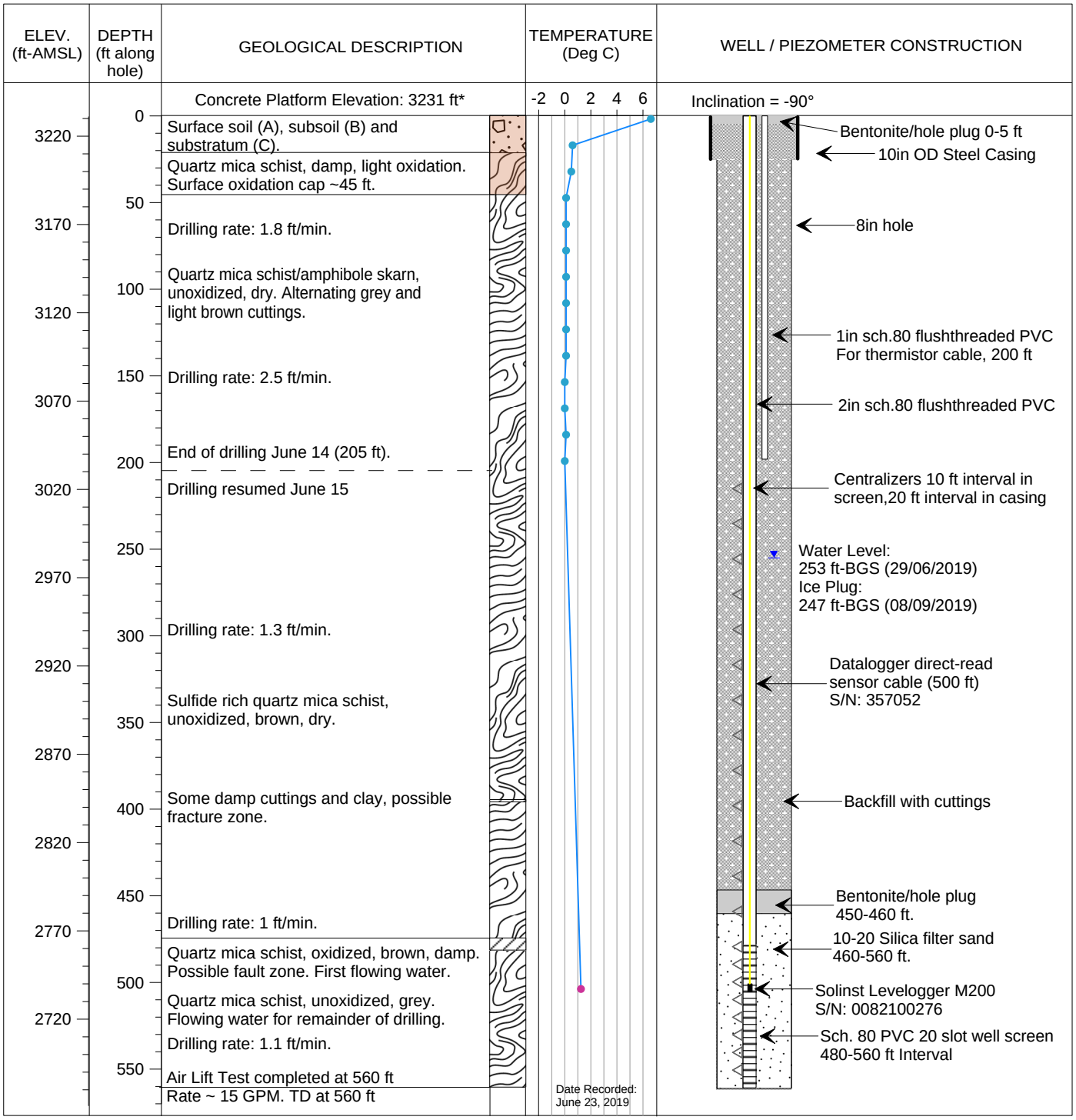
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: WELL 02

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-2

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-001\PKG19-001.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 36" above surface
2" PVC stick up: 27.5" above surface

*Elevation survey completed in April 2021

Solinst Levelogger Reading
Geokon Thermistor Reading

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 14, 2019
END DATE: June 15, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7007536
EASTING: 404718
WELL PAD ID: GW-02

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

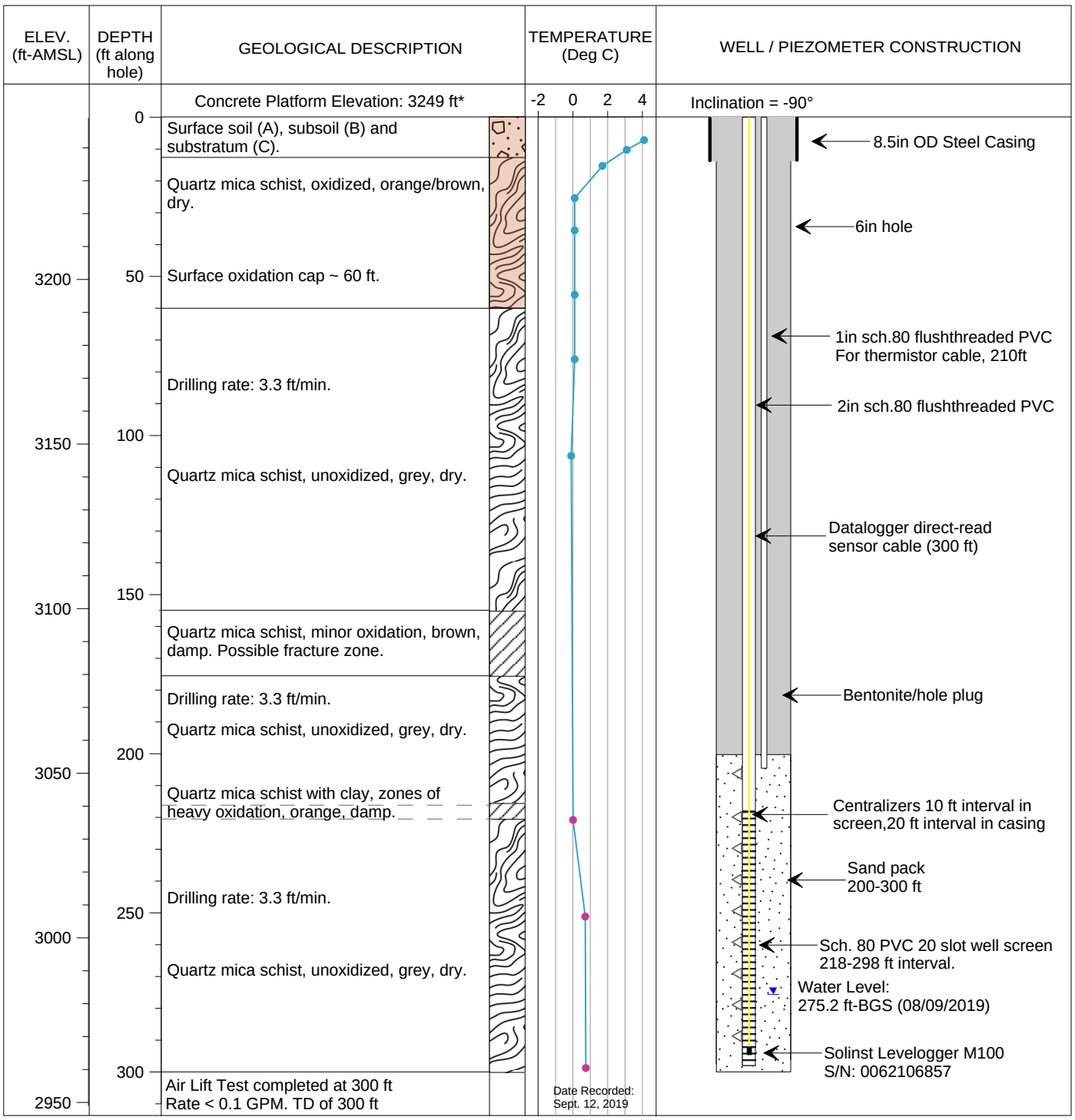
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: PKG19-001

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-3

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-002\PKG19-002 Drill Log.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 38" above surface
2" PVC stick up: 26" above surface

*Elevation survey completed in April 2021

Solinst Levelogger Reading
Geokon Thermistor Reading

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 16, 2019
END DATE: June 17, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7008248
EASTING: 405079
WELL PAD ID: GW-06

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

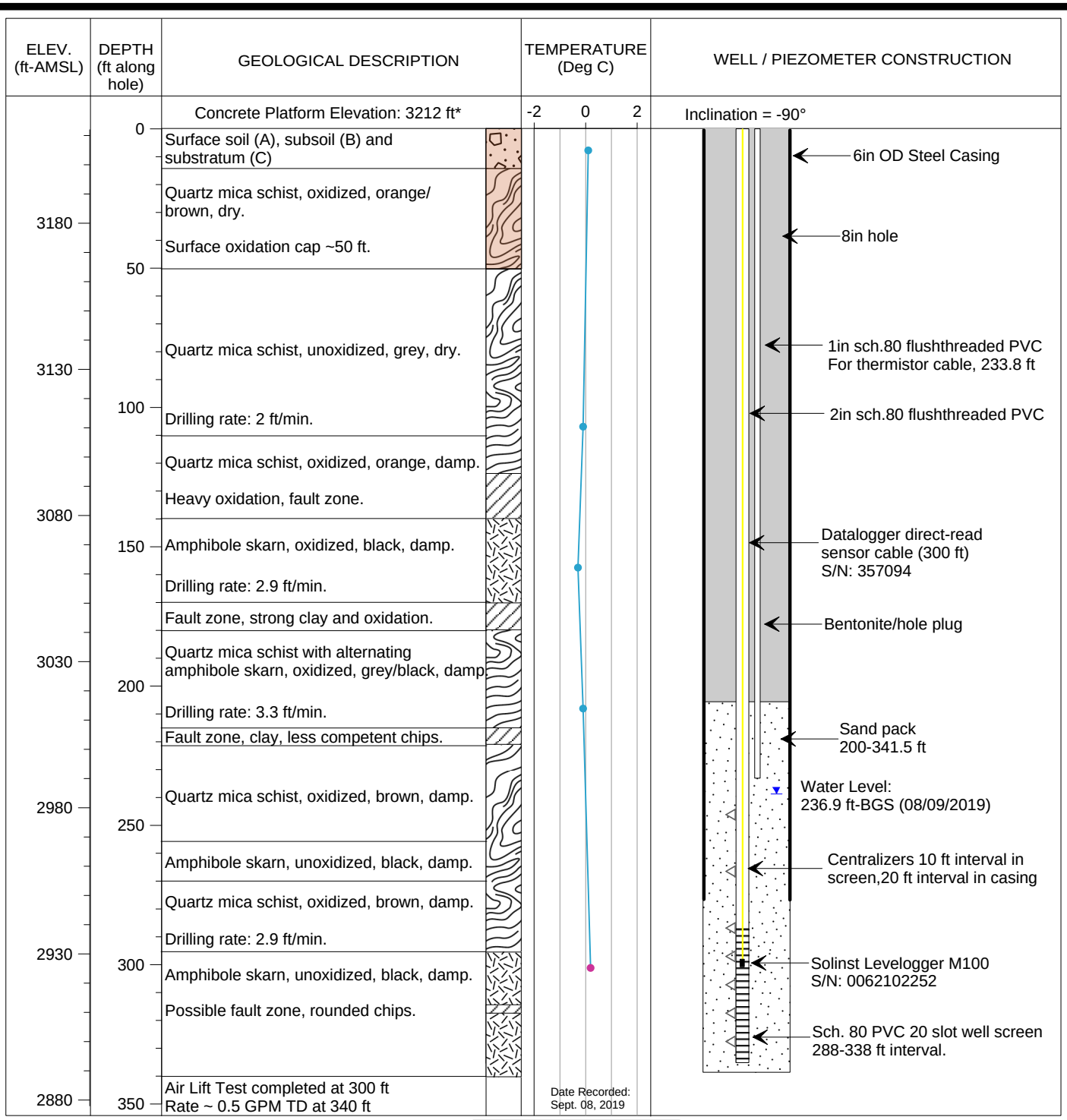
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: PKG19-002

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-4

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-003\PKG19-003 Drill Log.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 42" above surface
2" PVC stick up: 28" above surface

*Elevation survey completed in April 2021

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 17, 2019
END DATE: June 21, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7007958
EASTING: 404779
WELL PAD ID: GW-09

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

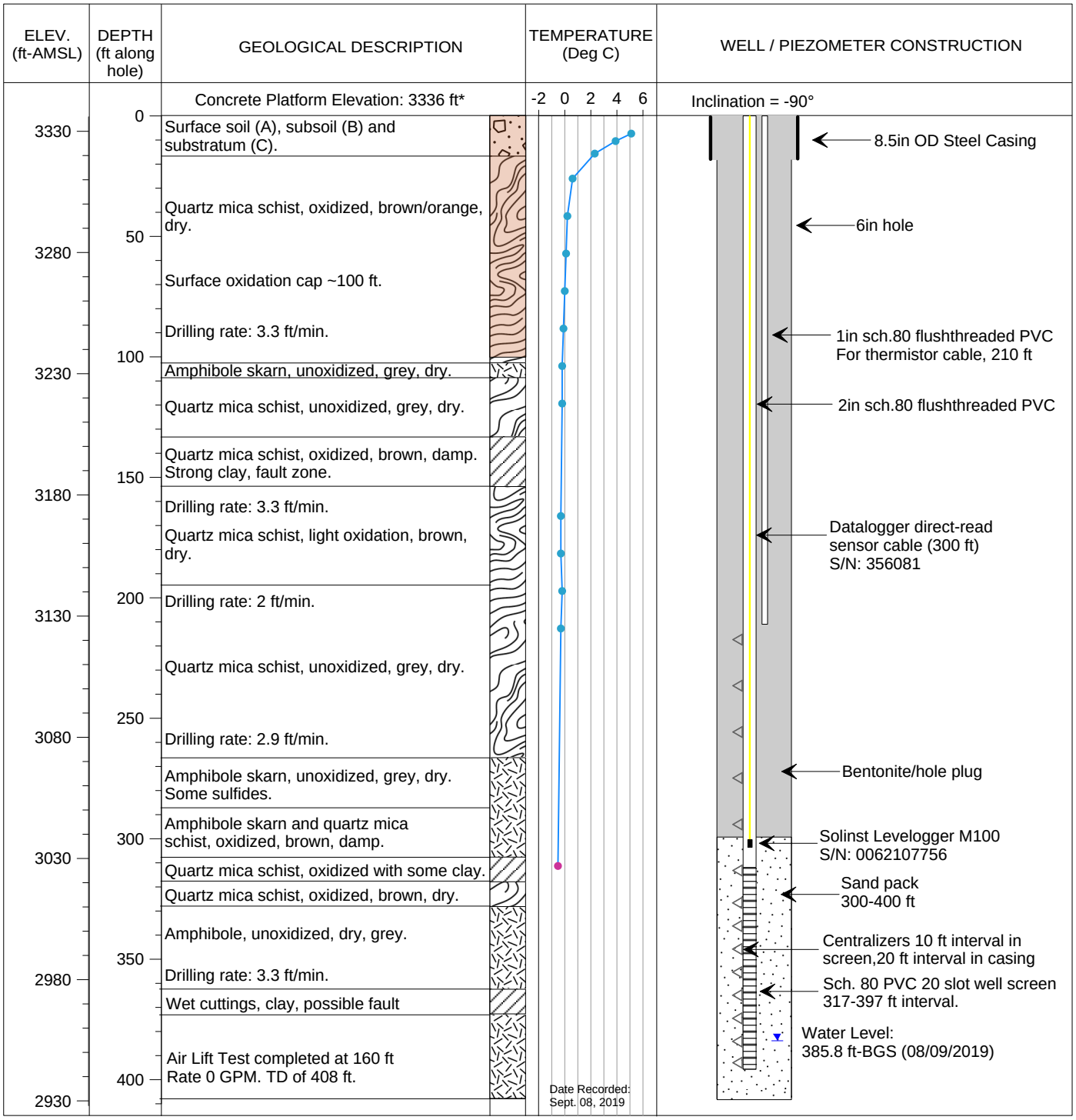
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: PKG19-003

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-5

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-004\PKG19-004 Drill Log.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 38" above surface
2" PVC stick up: 28" above surface

*Elevation survey completed in April 2021

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 18, 2019
END DATE: June 21, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7006986
EASTING: 404185
WELL PAD ID: GW-10

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

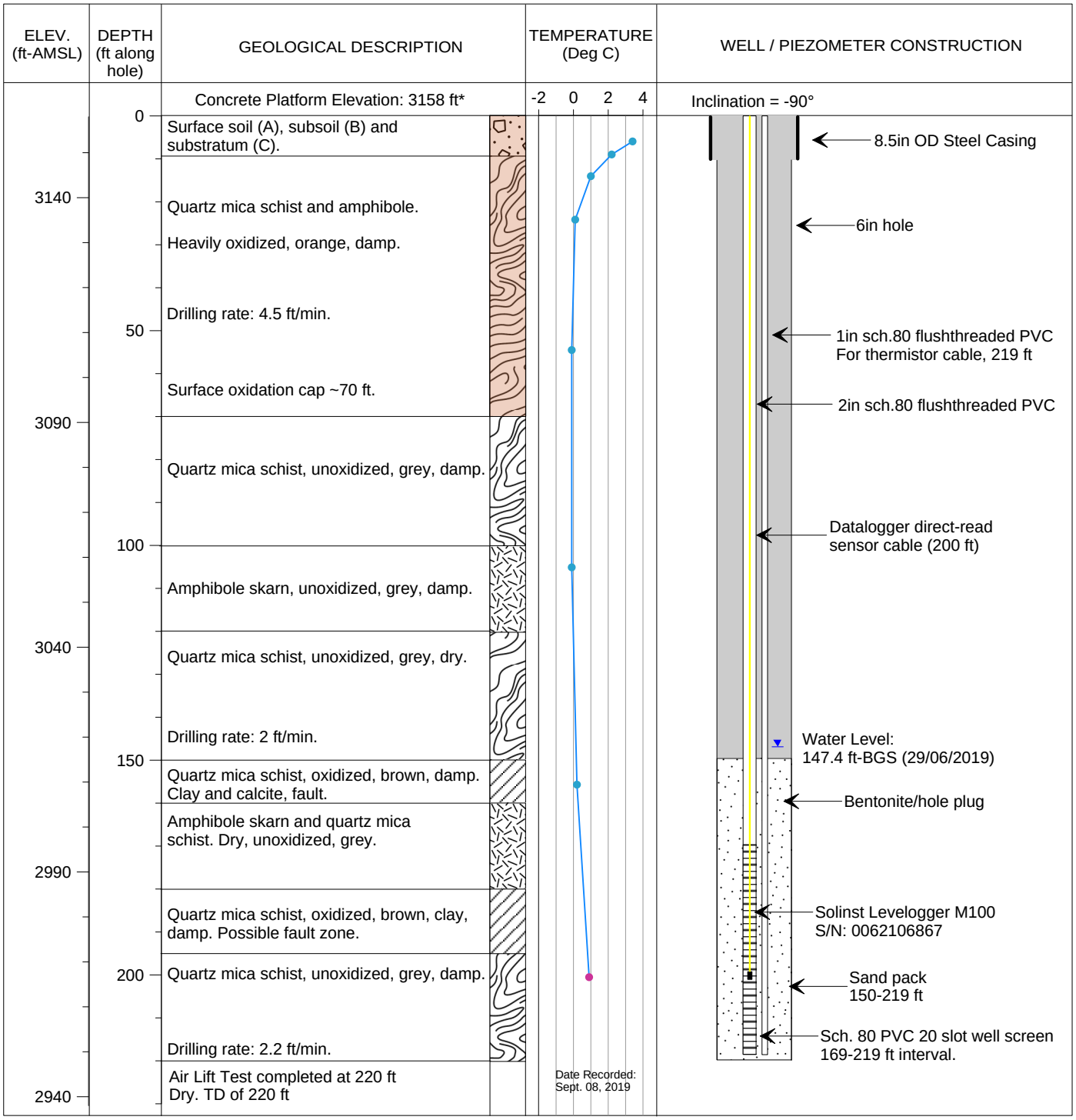
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: PKG19-004

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-6

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-005\PKG19-005 Drill Log.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 39" above surface
2" PVC stick up: 24.5" above surface

*Elevation survey completed in April 2021

Solinst Levelogger Reading
Geokon Thermistor Reading

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 21, 2019
END DATE: June 21, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7007880
EASTING: 404870
WELL PAD ID: GW-05

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

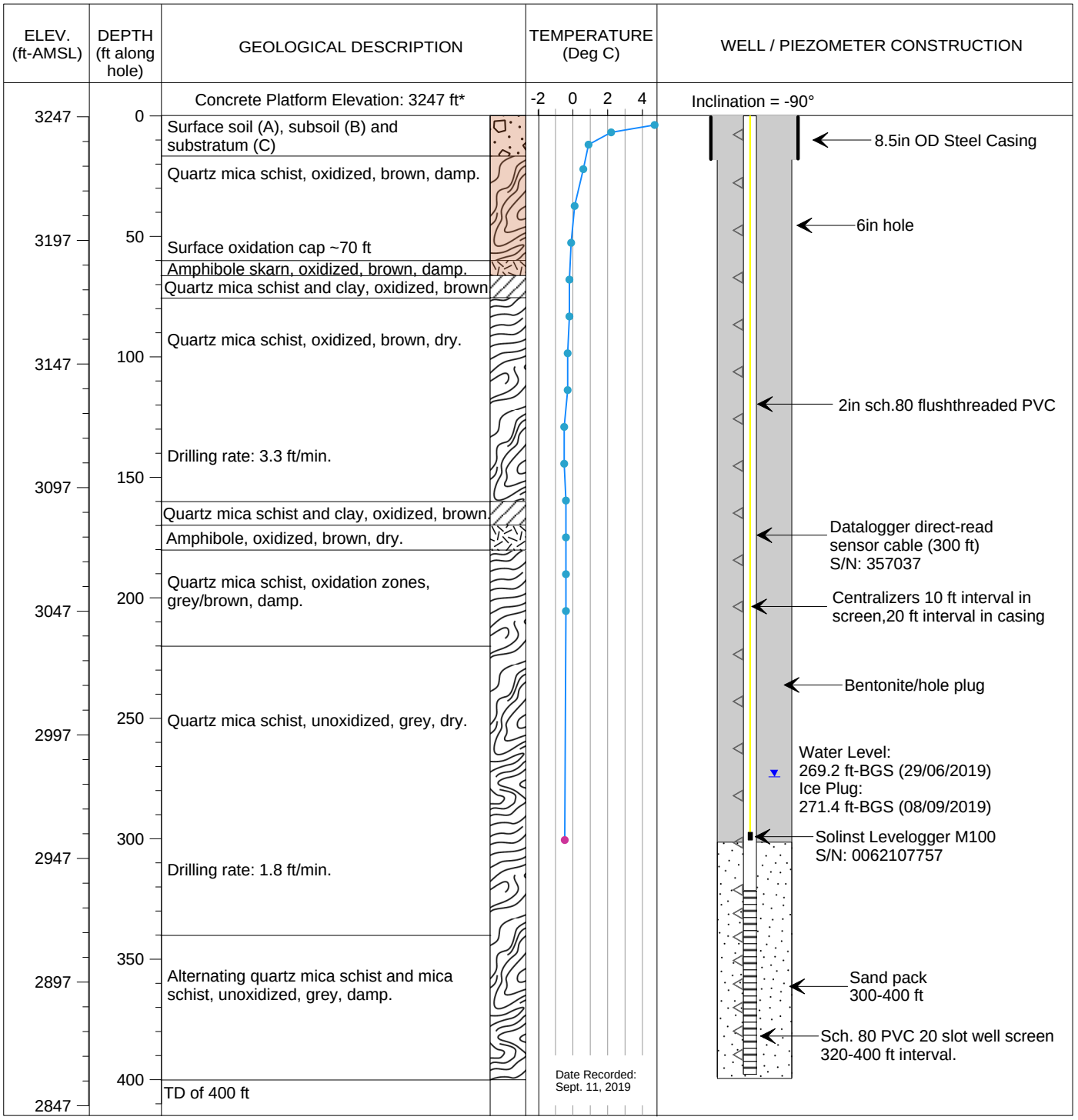
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: PKG19-005

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-7

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-006\PKG19-006 Drill Log.grf



Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 36.5" above surface
2" PVC stick up: 24.5" above surface

*Elevation survey completed in April 2021

Solinst Levelogger Reading
Geokon Thermistor Reading

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 22, 2019
END DATE: June 22, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7007492
EASTING: 404853
WELL PAD ID: GW-04

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

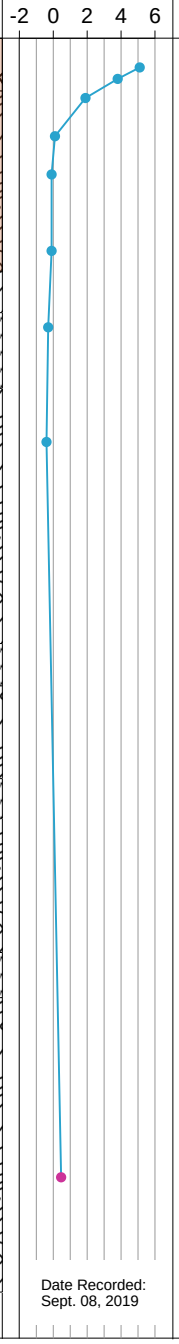
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

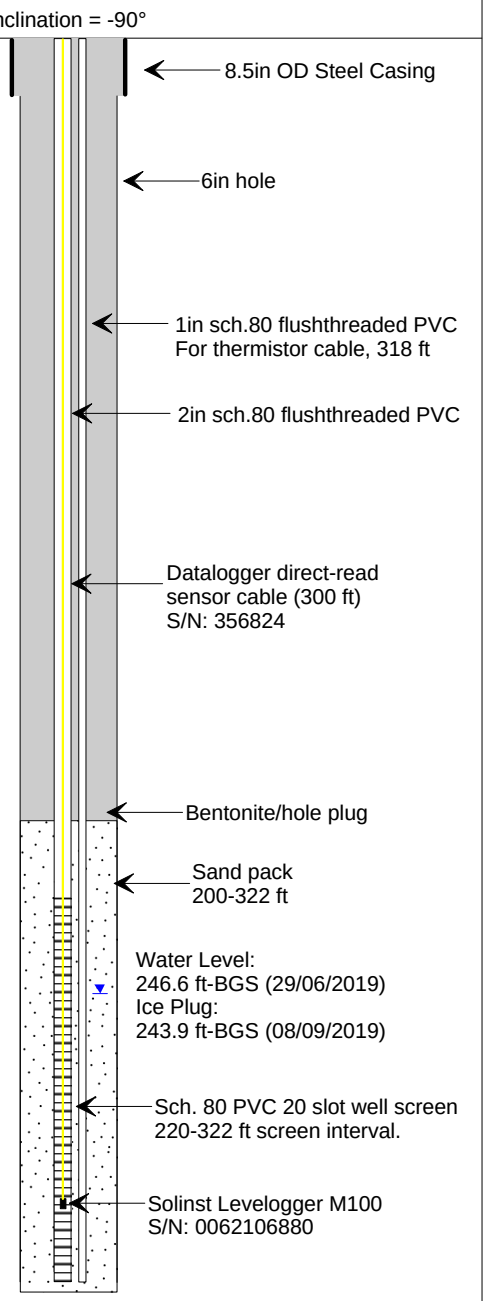
HYDROGEOLOGICAL LOG: PKG19-006

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-8

H:\Project\4148\Field Work\6. Field Data\Well Data\PKG19-007\PKG19-007 Drill Log.grf

ELEV. (ft-AMSL)	DEPTH (ft along hole)	GEOLOGICAL DESCRIPTION
		Concrete Platform Elevation: 3174 ft*
3160	0	Surface soil (A), subsoil (B) and substratum (C)
		Quartz mica schist, oxidized, brown, damp.
		Drilling rate: 4 ft/min.
	50	Surface oxidation cap ~60 ft.
3110		Quartz mica schist, unoxidized, grey, dry.
		Quartz mica schist, minor oxidation, brown, damp. Fracture zone.
	100	Quartz mica schist and amphibole skarn, unoxidized, grey, dry.
3060		Drilling rate: 2.9 ft/min.
	150	Quartz mica schist, unoxidized, grey, dry.
		Quartz mica schist, oxidized, orange, dry.
3010		Quartz mica schist, unoxidized, grey, dry.
		Drilling rate: 2.5 ft/min.
	200	Quartz mica schist and clay, oxidized, brown.
		Quartz mica schist, dry, unoxidized.
2960		Drilling rate: 3.3 ft/min.
		Quartz mica schist and clay, oxidized, brown
	250	Quartz mica schist, unoxidized, grey, dry.
2910		Drilling rate: 1.5 ft/min.
	300	Quartz mica schist and amphibole, unoxidized, grey, dry.
2860		Air Lift Test completed at 250 ft Rate 0 GPM. TD of 322 ft.





Solinst Levelogger Reading
Geokon Thermistor Reading

Surface completion:
3' x 3' concrete pad and a lockable 10" protective casing
Protective casing (10"): 38" above surface
2" PVC stick up: 25" above surface

*Elevation survey completed in April 2021

DRILLING CONTRACTOR: Arctic Drilling
DRILLING METHOD: Air Rotary
START DATE: June 23, 2019
END DATE: June 23, 2019
GEOLOGIST: Sadeed Hassan
NORTHING: 7007559
EASTING: 404603
WELL PAD ID: GW-01

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

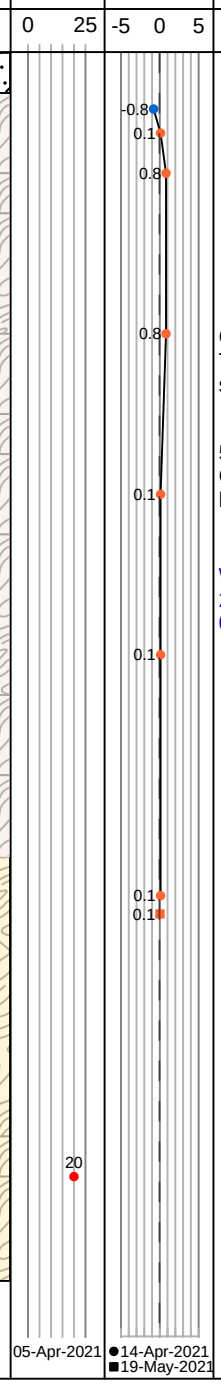
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

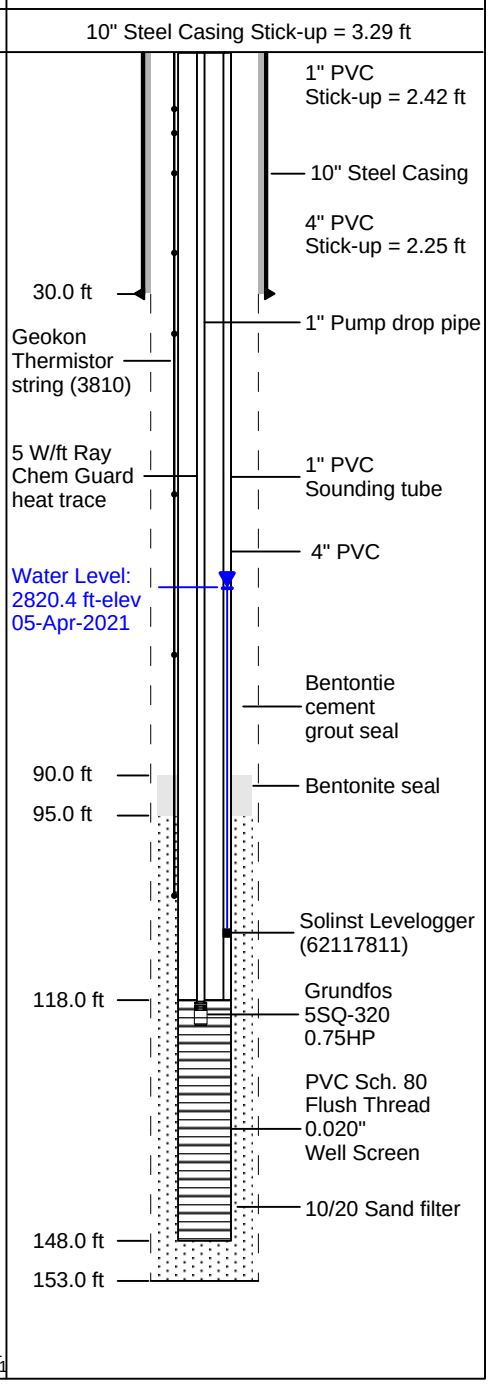
HYDROGEOLOGICAL LOG: PKG19-007

BY:	DATE:
SH/NP	SEP 19/ MAY 21
APPROVED:	FIG:
MLS	C-9

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-01\GW21-01.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
2885	0	Overburden.
2875	10	Quartz Mica Schist. Abundant to pervasive oxidation from 5 ft-bgl to 15 ft-bgl.
2865	20	Mica Quartz Schist.
2855	30	Quartz Mica Schist. Abundant to pervasive oxidation from 20 ft-bgl to 35 ft-bgl.
2845	40	Mica Quartz Schist.
2835	50	Quartz Mica Schist.
2825	60	Mica Quartz Schist. Abundant oxidation from 50 ft-bgl to 55 ft-bgl.
2815	70	Quartz Mica Schist. Abundant oxidation from 65 ft-bgl to 70 ft-bgl and 75 ft-bgl to 80 ft-bgl.
2805	80	Mica Quartz Schist. Hematite on fracture surfaces from 85 ft-bgl to 90 ft-bgl.
2795	90	Quartz Mica Schist. Abundant oxidation from 90 ft-bgl to 100 ft-bgl. Surface coating of hematite from 120 ft-bgl to 125 ft-bgl.
2785	100	
2775	110	
2765	120	
2755	130	
2745	140	Mica Quartz Schist. Quartz Mica Schist.
2735	150	End of hole @153 ft-bgl.
	160	Geological description based on chip logging provided by Kinross (May 2021)





LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	03-Apr-2021
DRILLING END DATE:	04-Apr-2021
DATE PUMP INSTALLED:	05-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

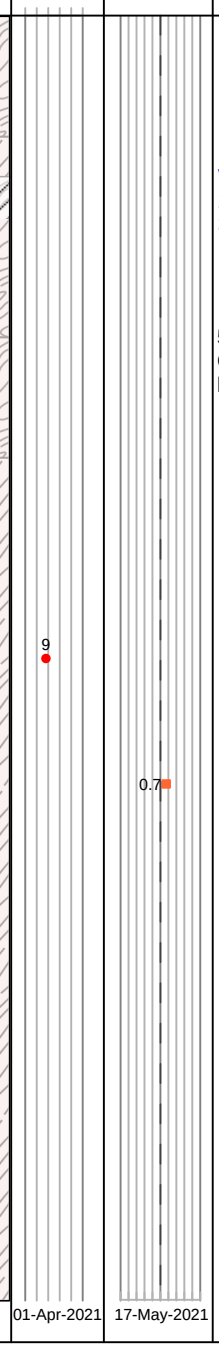
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

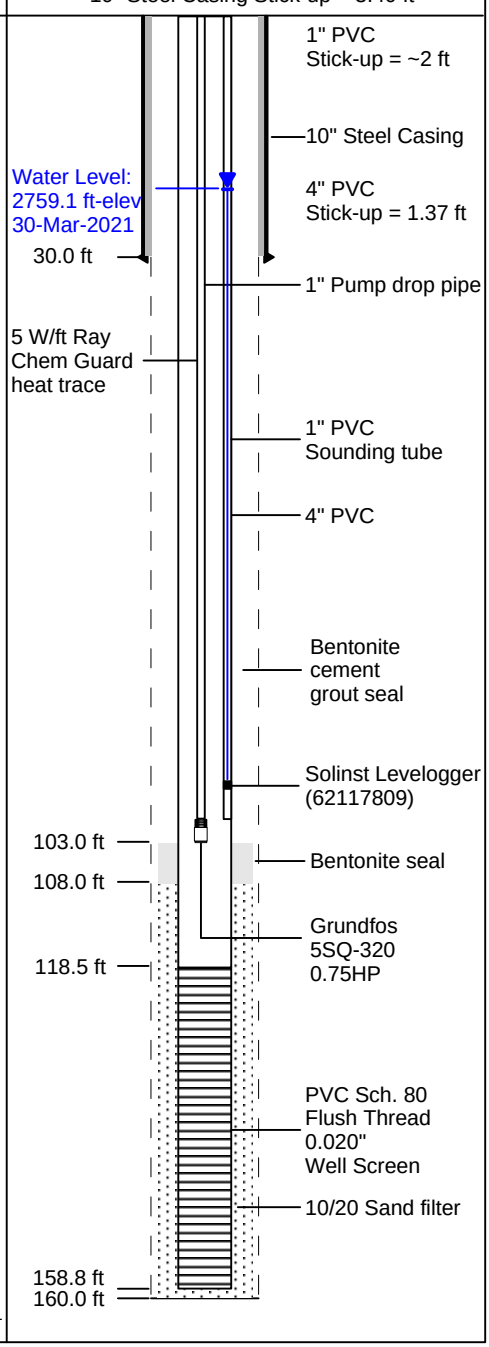
HYDROGEOLOGICAL LOG: GW21-01 (TET21-490)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-10

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-02\GW21-02.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
2780	0	Mica Quartz Schist.
2770	10	
2760	20	Calcareous Schist. Mica Quartz Schist. Heavy gouge zone (fault?) from 20 ft-bgl to 25 ft-bgl.
2750	30	
2740	40	Quartz Mica Schist.
2730	50	
2720	60	Calcareous Schist. Abundant to pervasive oxidation from 55 ft-bgl to 85 ft-bgl and 90 ft-bgl to 160 ft-bgl.
2710	70	
2700	80	
2690	90	
2680	100	
2670	110	
2660	120	
2650	130	
2640	140	
2630	150	
	160	Geological description based on chip logging provided by Kinross (May 2021) End of hole @160 ft-bgl.





LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	27-Mar-2021
DRILLING END DATE:	01-Apr-2021
DATE PUMP INSTALLED:	01-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

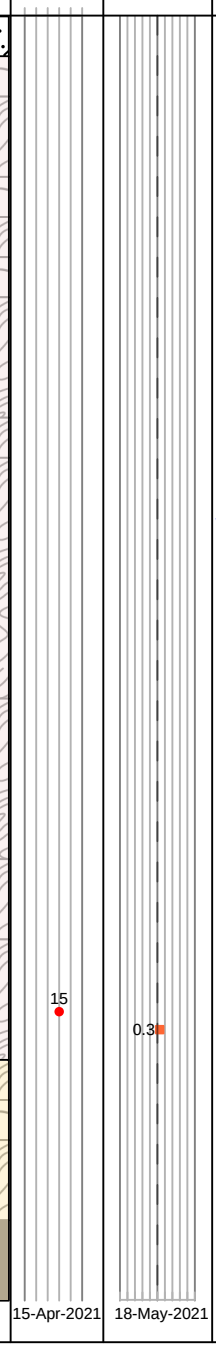
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

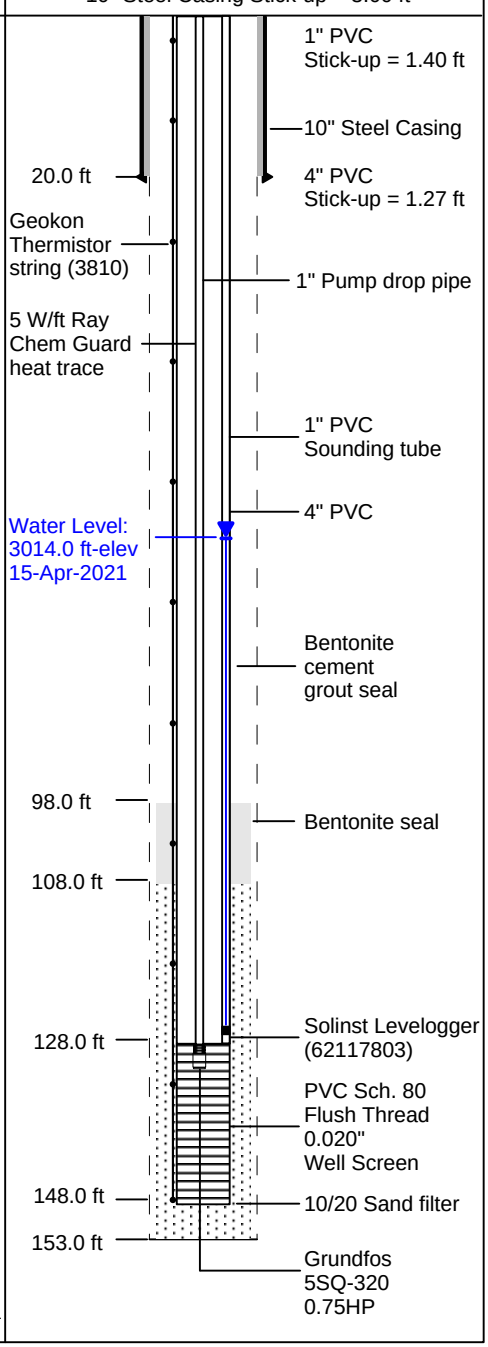
HYDROGEOLOGICAL LOG: GW21-02 (TET21-484)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-11

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-04\GW21-04.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3070	0	Overburden.
	10	Quartz.
		Quartz Mica Schist.
3060	20	Quartz.
		Quartz Mica Schist.
3050	30	Quartz.
		Mica Quartz Schist.
3040	40	
3030	50	Quartz Mica Schist.
		Mica Quartz Schist.
3020	60	
3010	70	
3000	80	
2990	90	Quartz Mica Schist. Abundant oxidation from 100 ft-bgl to 105 ft-bgl.
2980	100	
2970	110	Mica Quartz Schist.
2960	120	Quartz Mica Schist (QMS). Abundant oxidation from 115 ft-bgl to 130 ft-bgl.
2950	130	Mica Quartz Schist.
2940	140	Quartz. Mica Quartz Schist.
2930	150	Missing sample.
2920	160	Geological description based on chip logging provided by Kinross (May 2021) End of hole @153 ft-BGL.





LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	13-Apr-2021
DRILLING END DATE:	15-Apr-2021
DATE PUMP INSTALLED:	15-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

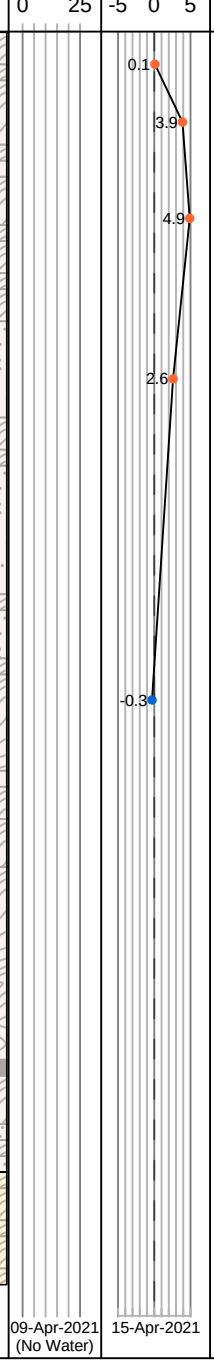
HYDROGEOLOGICAL LOG: GW21-04 (TET21-506)

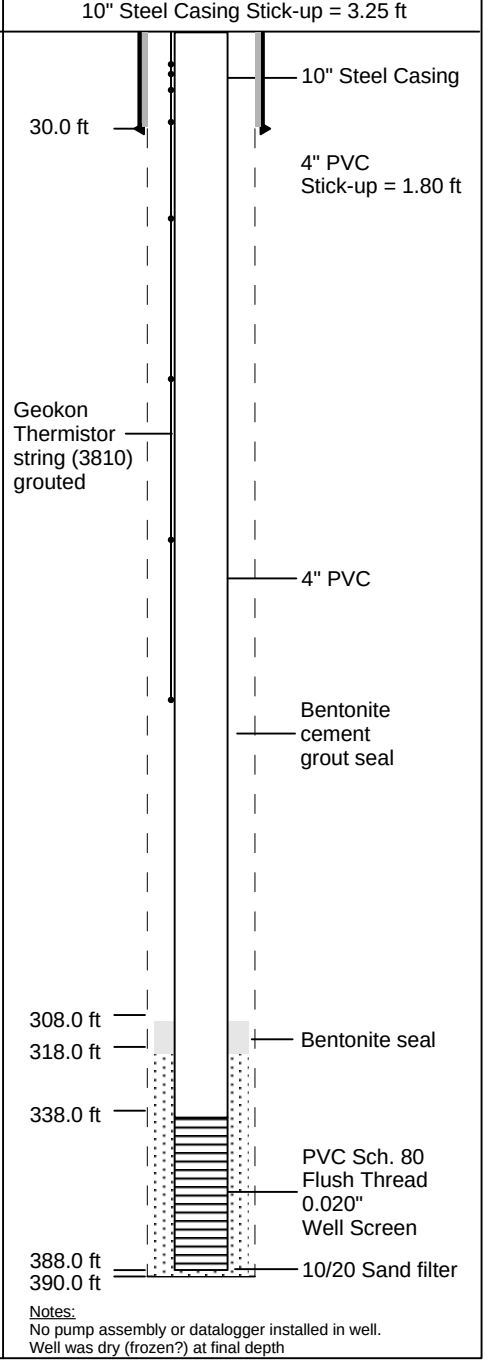
BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-12

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-05\GW21-05.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
	0	Quartz Mica Schist.
		Mica Quartz Schist.
3100	20	Quartz Mica Schist.
3080	40	Mica Quartz Schist.
		Calcareous Schist.
		Quartz Mica Schist.
3060	60	Mica Quartz Schist.
		Quartz Mica Schist.
3040	80	Mica Quartz Schist.
		Quartz Mica Schist.
3020	100	Quartzite.
3000	120	Quartz Mica Schist.
		Mica Quartz Schist.
2980	140	Quartzite.
2960	160	
2940	180	Quartz Mica Schist.
		Quartzite.
2920	200	Quartz Mica Schist.
		Mica Quartz Schist.
2900	220	
		Calcareous Schist.
2880	240	Mica Quartz Schist.
		Quartz Mica Schist.
2860	260	Mica Quartz Schist.
2840	280	Abundant oxidation from 300 ft-bgl to 305 ft-bgl.
2820	300	
2800	320	Missing Sample.
		Mica Quartz Schist. Pervasive oxidation from 325 ft-bgl to 335 ft-bgl.
2780	340	Quartzite.
		Mica Quartz Schist.
		Quartzite. Abundant oxidation.
2760	360	Quartz Mica Schist.
		Mica Quartz Schist.
		Quartz Mica Schist.
2740	380	Mica Quartz Schist.
		Quartz Mica Schist.
2720	400	End of hole @ 390 ft-bgl.

Geological description based on chip logging provided by Kinross (May 2021)





Notes:
No pump assembly or datalogger installed in well.
Well was dry (frozen?) at final depth

LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	06-Apr-2021
DRILLING END DATE:	09-Apr-2021
DATE PUMP INSTALLED:	N/A
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GW21-05 (TET21-494)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-13

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-06\GW21-06.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3250	0	Mica Quartz Schist.
3230	25	Quartz Mica Schist.
3210	50	Mica Quartz Schist. Abundant - pervasive oxidation.
3190	75	Quartz Mica Schist. Abundant - pervasive oxidation from 65 ft-bgl to 75 ft-bgl. Quartz.
3170		Quartz Mica Schist/Mica Quartz Schist.
3150	100	
3130	125	
3110	150	
3090	175	
3070		
3050	200	
3030	225	
3010	250	
2990		Mica Quartz Schist. Abundant oxidation.
2970	275	Quartz. Pervasive oxidation. Mica Quartz Schist.
2950	300	Pervasive oxidation from 275 ft-bgl to 285 ft-bgl.
2930	325	Abundant oxidation from 300 ft-bgl to 310 ft-bgl. Calcareous Schist.
2910		Quartz Mica Schist. Mica Quartz Schist.
2890	350	Calcareous Schist.
2870	375	Mica Quartz Schist.
2850	400	Calcareous Schist. Mica Quartz Schist.
2830	425	Calcareous Schist. Quartzite. Mica Quartz Schist.
2810	450	
2790		End of hole @ 460 ft-bgl.
2770	475	
	500	

Geological description based on chip logging provided by Kinross (May 2021)

AIR LIFT YIELD (gpm): 0 25

19-Apr-2021 (No Water)

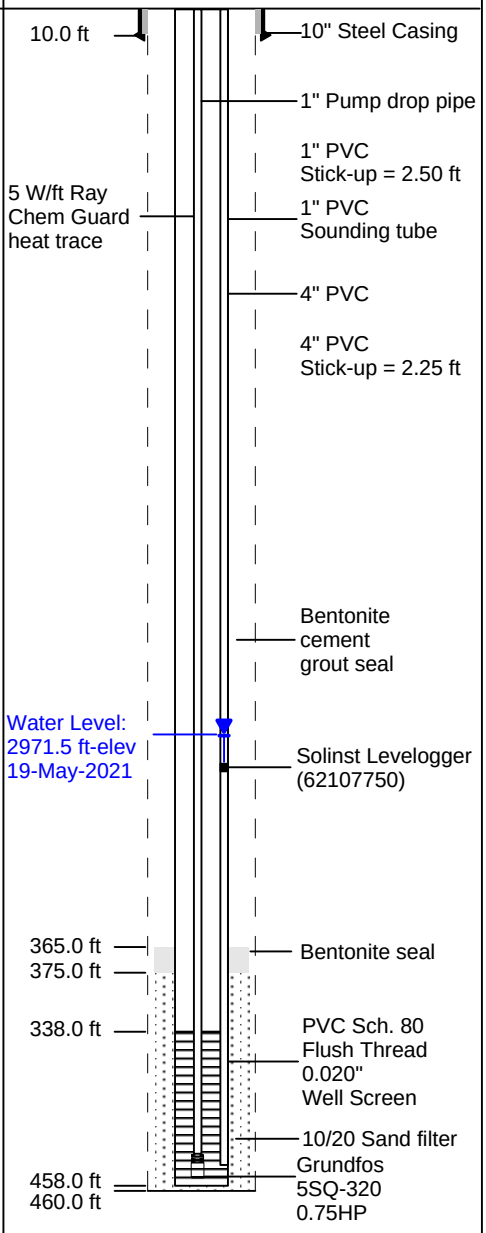
TEMP. (°C): -5 0 5

-0.5

19-May-2021

WELL / PIEZOMETER CONSTRUCTION
N: 7007395 E: 404647 AZIMUTH: N/A DIP: 90°
GROUND ELEVATION: 3253.70 ft (991.73 m)

10" Steel Casing Stick-up = 3.00 ft



LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	16-Apr-2021
DRILLING END DATE:	19-Apr-2021
DATE PUMP INSTALLED:	19-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

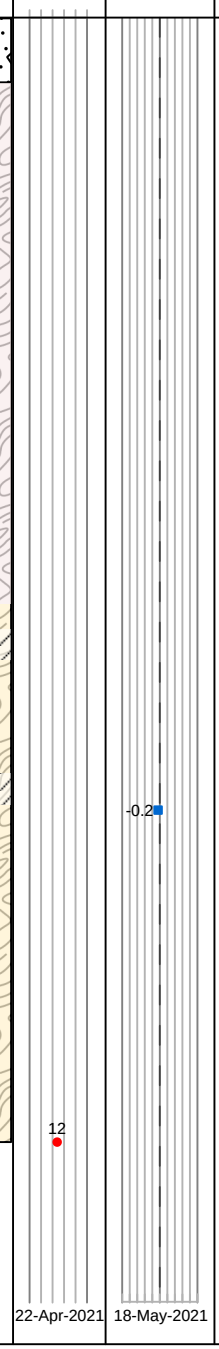
HYDROGEOLOGICAL LOG: GW21-06 (TET21-509)

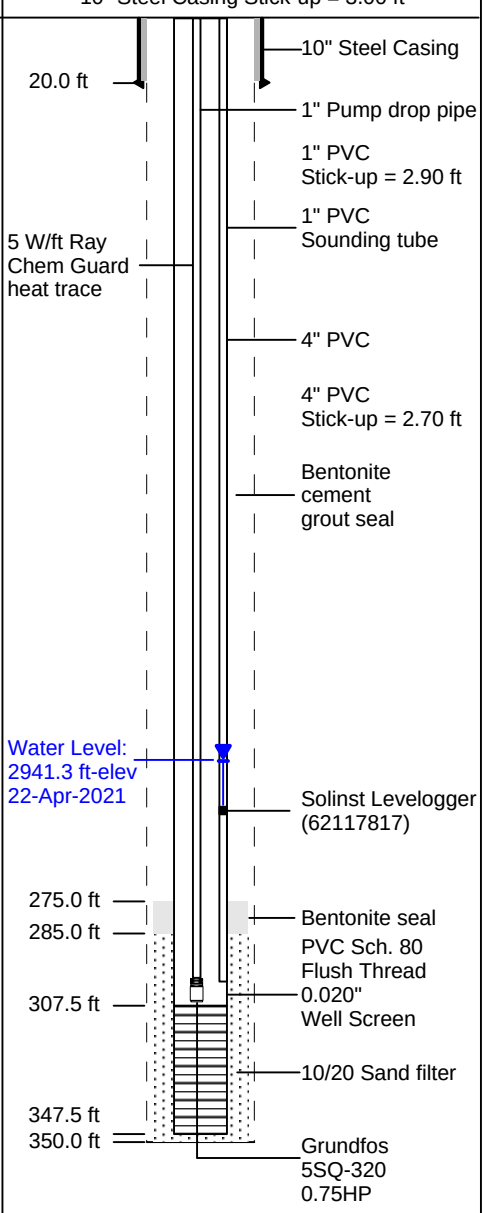
BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-14

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-07\GW21-07.gpj

ELEV. (ft-ELEV)	DEPTH (ft-BGL)	GEOLOGICAL DESCRIPTION
	0	Overburden.
3150	20	Quartz Mica Schist.
3130	40	Light oxidation from 70 ft-bgl to 90 ft-bgl.
3110	60	Moderate oxidation from 100 ft-bgl to 110 ft-bgl and 140 ft-bgl to 145 ft-bgl and 190 ft-bgl to 200 ft-bgl and 235 ft-bgl and 245 ft-bgl.
3090	80	
3070	100	
3050	120	
3030	140	
3010	160	Heavy oxidation from 155 ft-bgl to 165 ft-bgl.
2990	180	
2970	200	
2950	220	
2930	240	Possible fault zone from 190 ft-bgl to 200 ft-bgl and 235 ft-bgl to 245 ft-bgl.
2910	260	
2890	280	
2870	300	
2850	320	
2830	340	
2810	360	End of hole @ 350 ft-BGL.
2790	380	
	400	

Note:
Geological information sourced from adjacent PKG19-007 log.





LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	20-Apr-2021
DRILLING END DATE:	22-Apr-2021
DATE PUMP INSTALLED:	22-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GW21-07 (TET21-510)

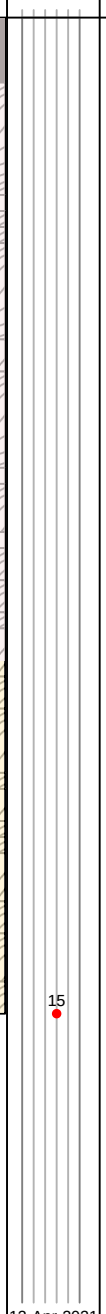
BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-15

H:\Project\4148\Drilling\2021 Well Completion Logs\GW21-08\GW21-08.gpj

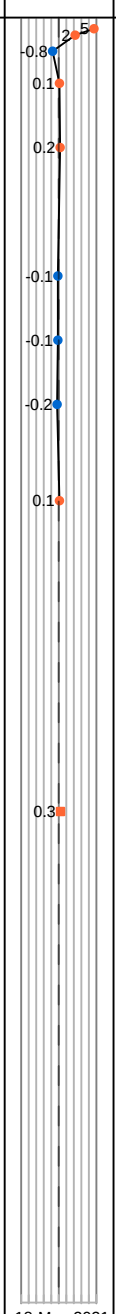
ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
2775	0	Missing Sample.
2755	20	Quartz Mica Schist.
2735	40	
2715	60	Calcareous Schist. Pervasive oxidation. Quartz Mica Schist. Abundant oxidation. Mica Quartz Schist.
2695	80	Quartz Mica Schist. Abundant - pervasive oxidation from 70 ft-bgl to 75 ft-bgl and 90 ft-bgl to 100 ft-bgl.
2675	100	Calcareous Schist. Abundant - pervasive oxidation.
2655	120	Quartz Mica Schist. Abundant - pervasive oxidation from 115 ft-bgl to 125 ft-bgl and 130 ft-bgl to 135 ft-bgl.
2635	140	Calcareous Schist.
2615	160	Quartz Mica Schist. Abundant oxidation from 155 ft-bgl to 160 ft-bgl. Calcareous Schist. Abundant oxidation.
2595	180	Quartz Mica Schist. Abundant oxidation. Mica Quartz Schist. Quartz Mica Schist.
2575	200	Calcareous Schist. Abundant oxidation from 190 ft-bgl to 200 ft-bgl.
2555	220	Mica Quartz Schist. Quartz Mica Schist.
2535	240	Mica Quartz Schist. Calcareous Schist.
2515	260	Quartz Mica Schist. Mica Quartz Schist. Calcareous Schist.
2495	280	Mica Quartz Schist. Calcareous Schist.
2475	300	Mica Quartz Schist.
2455	320	End of hole @ 310 ft-bgl.
2435	340	
2415	360	
2395	380	
	400	

Geological description based on chip logging provided by Kinross (May 2021)

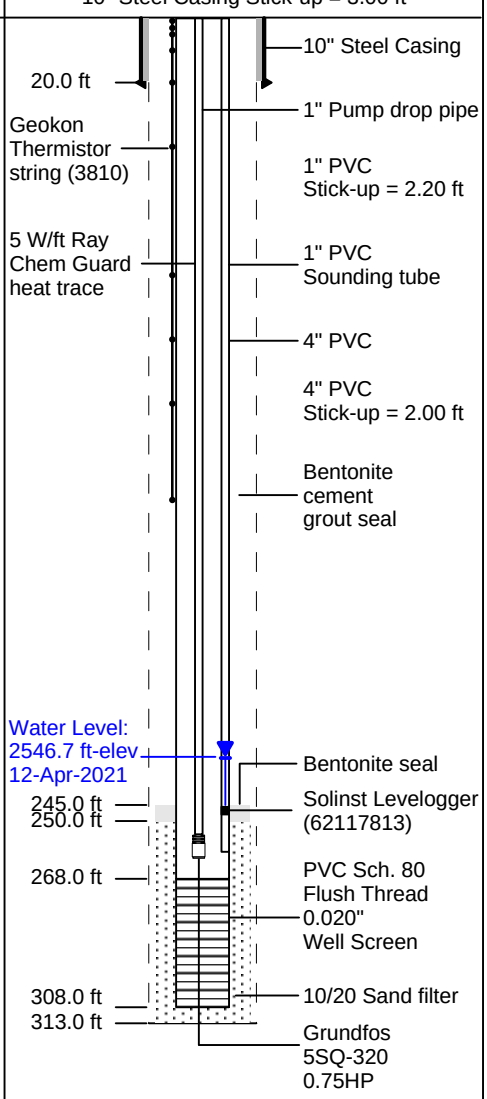
AIR LIFT YIELD (gpm)



TEMP. (°C)



WELL / PIEZOMETER CONSTRUCTION
N: 7008175 E: 404216 AZIMUTH: N/A DIP: 90°
GROUND ELEVATION: 2776.7 ft (846.3 m)



LEGEND

OVB
QMS/MQS
CS
QTZ
QTZE

Oxide Zone
Transition Zone
Sulphide Zone

Thermistor Data (>0°)
Thermistor Data (≤0°)
Levelogger Data (>0°)
Levelogger Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	T&J Enterprises Inc.
DRILLING METHOD:	Air Rotary
DRILLING START DATE:	10-Apr-2021
DRILLING END DATE:	12-Apr-2021
DATE PUMP INSTALLED:	12-Apr-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

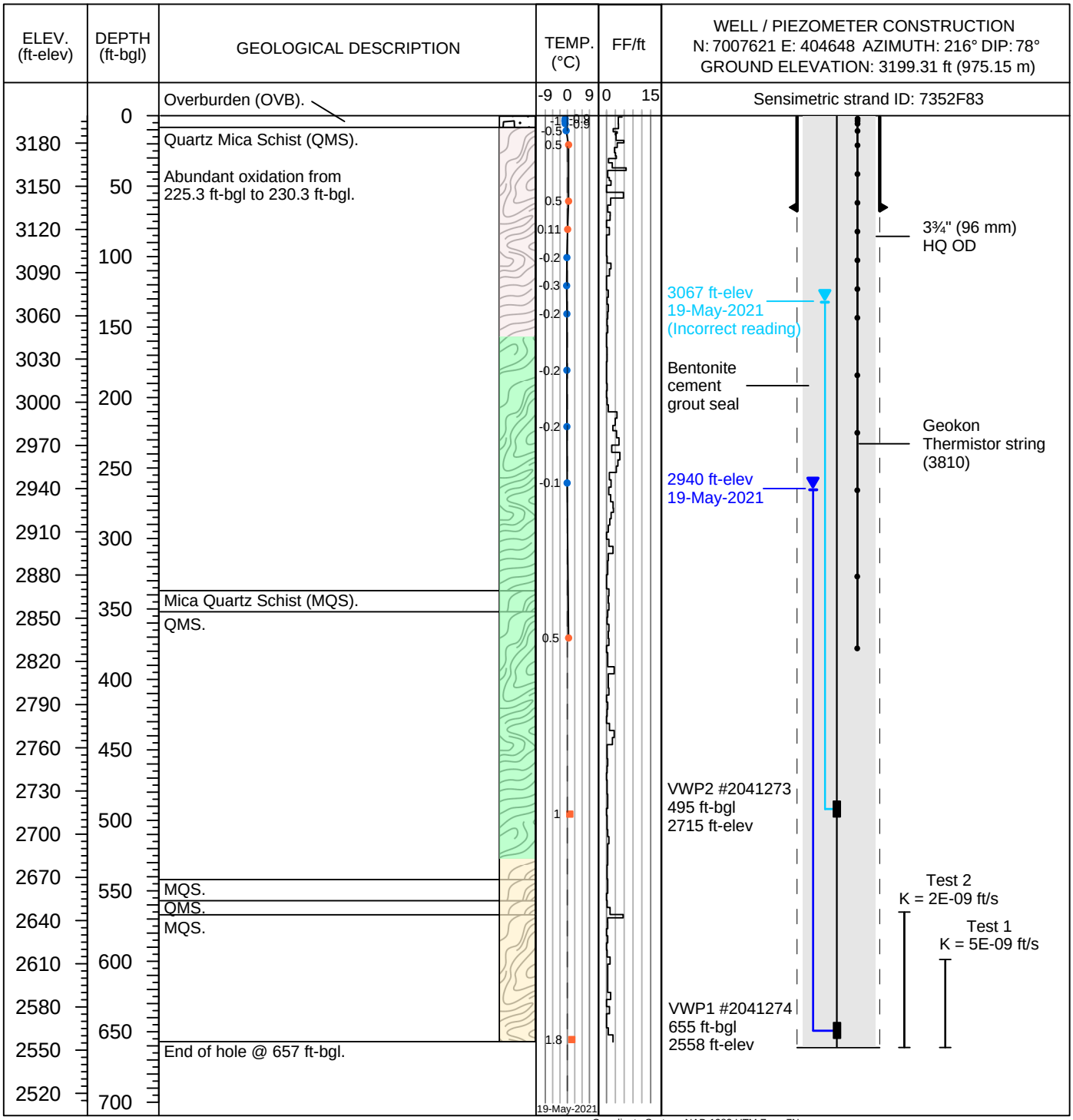
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GW21-08 (TET21-510)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH	C-16

H:\Project\4148\Drilling\2021 VWP Logs\GT20-01GT20-01.gpj



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Boart Longyear
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	04-Dec-2020
DRILLING END DATE:	09-Dec-2020
HYDROGEOLOGIST:	S. Hassan / M. Smith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

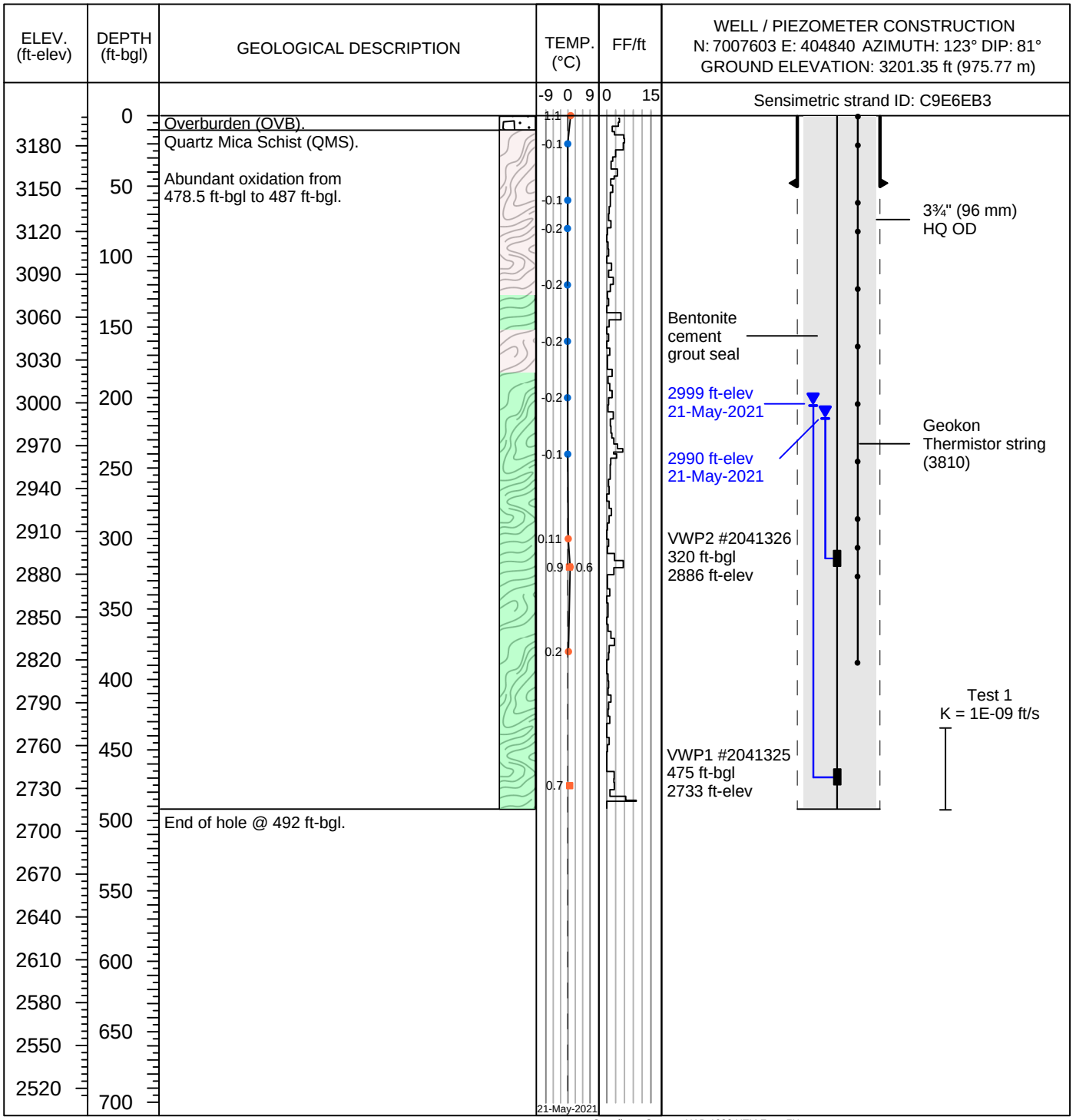
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-01 (TET20-456)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-17

H:\Project\4148\Drilling\2021 VWP Logs\GT20-02\GT20-02.gpj



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Boart Longyear
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	30-Nov-2020
DRILLING END DATE:	02-Dec-2020
HYDROGEOLOGIST:	S. Hassan / M. Smith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

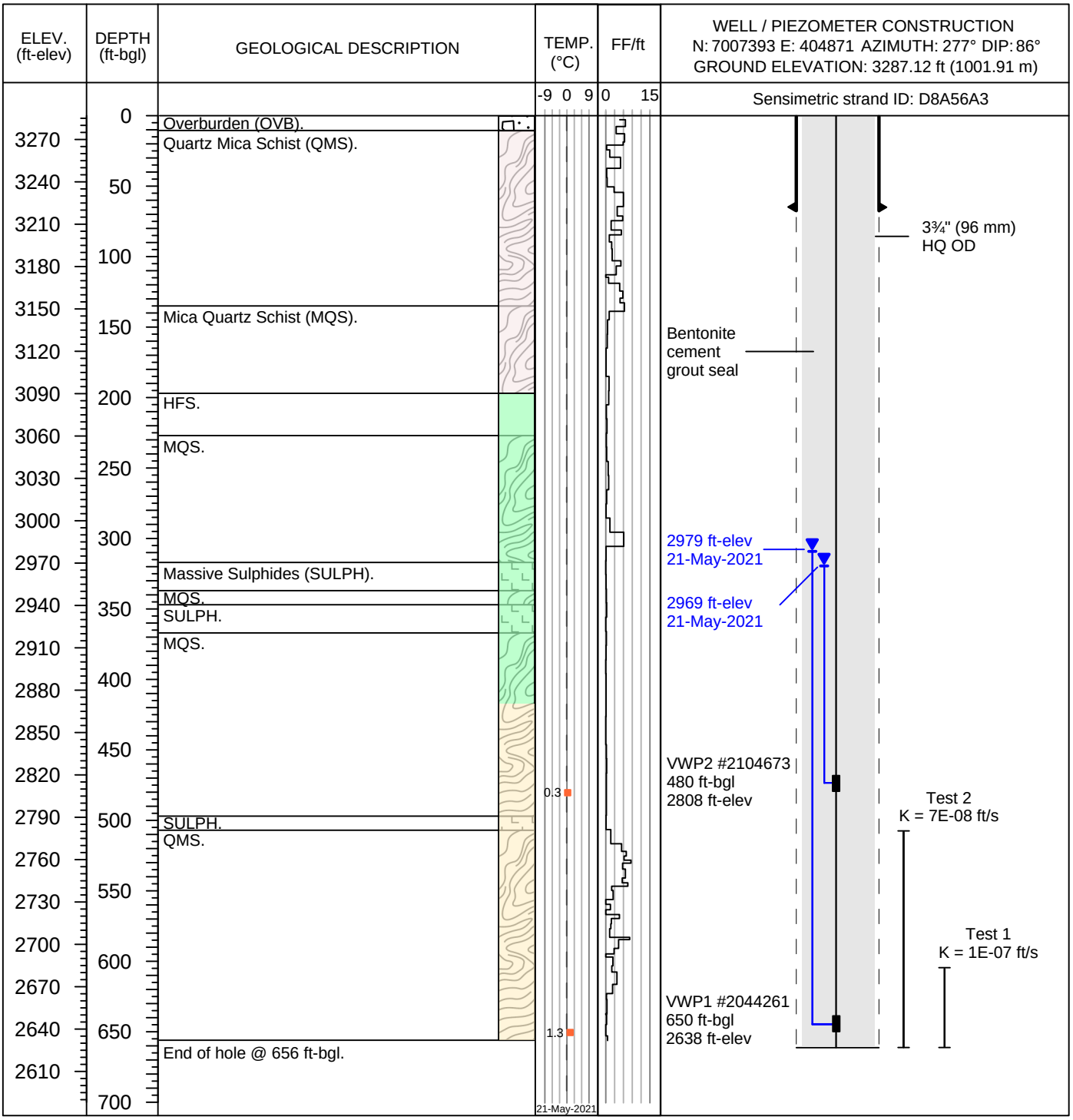
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-02 (TET20-454)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-18

H:\Project\4148\Drilling\2021 VWP Logs\GT20-03\GT20-03.gpj



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	27-Feb-2021
DRILLING END DATE:	02-Mar-2021
HYDROGEOLOGIST:	T. Roschinski

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-03 (TET20-463)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-19

H:\Project\4148\Drilling\2021 VWP Logs\GT20-04\GT20-04.gpj

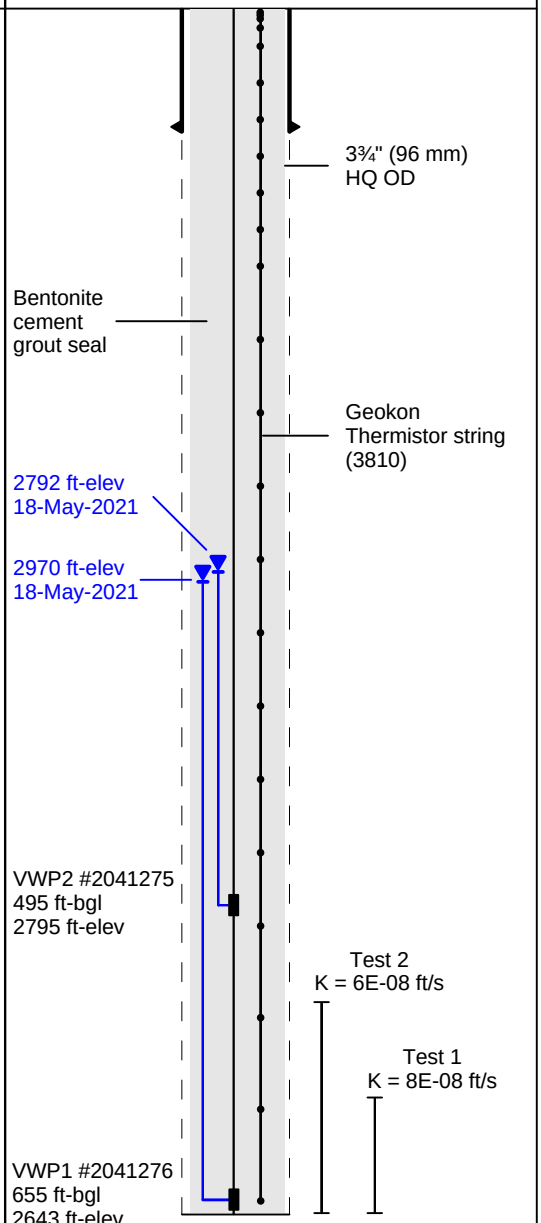
ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3240	0	Overburden (OVB).
		Quartz Mica Schist (QMS).
3210	50	
3180	100	
3150	150	
3120	150	
3090	200	
3060		Mica Quartz Schist (MQS).
3030	250	QMS.
3000		MQS.
2970	300	
2940	350	
2910		
2880	400	QMS.
2850	450	
2820		
2790	500	MQS.
2760		QMS.
2730	550	MQS.
		QMS.
2700	600	MQS.
2670		QMS.
2640	650	MQS.
		End of hole @ 657 ft-bgl.
2610	700	

TEMP. (°C) -9 0 9

FF/ft 0 15

WELL / PIEZOMETER CONSTRUCTION
N: 7007345 E: 404638 AZIMUTH: 342° DIP: 72°
GROUND ELEVATION: 3267.28 ft (995.87 m)

Sensimetric strand ID: E794423



18-May-2021

LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone

Packer Testing Interval

FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Boart Longyear
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	24-Nov-2020
DRILLING END DATE:	28-Nov-2020
HYDROGEOLOGIST:	S. Hassan / M. Smith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

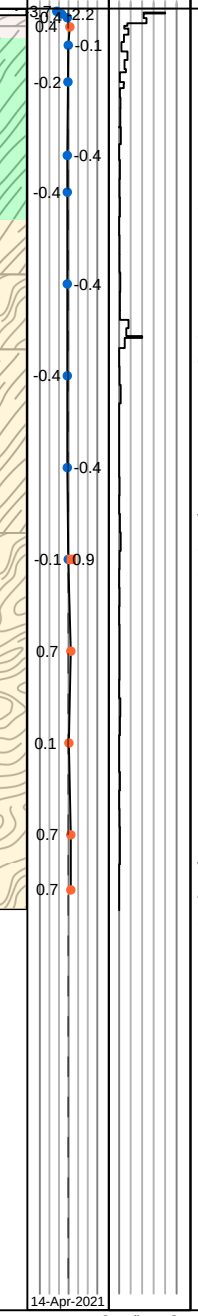
HYDROGEOLOGICAL LOG: GT20-04 (TET20-451)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-20

H:\Project\4148\Drilling\2021 VWP Logs\GT20-05\GT20-05.gpj

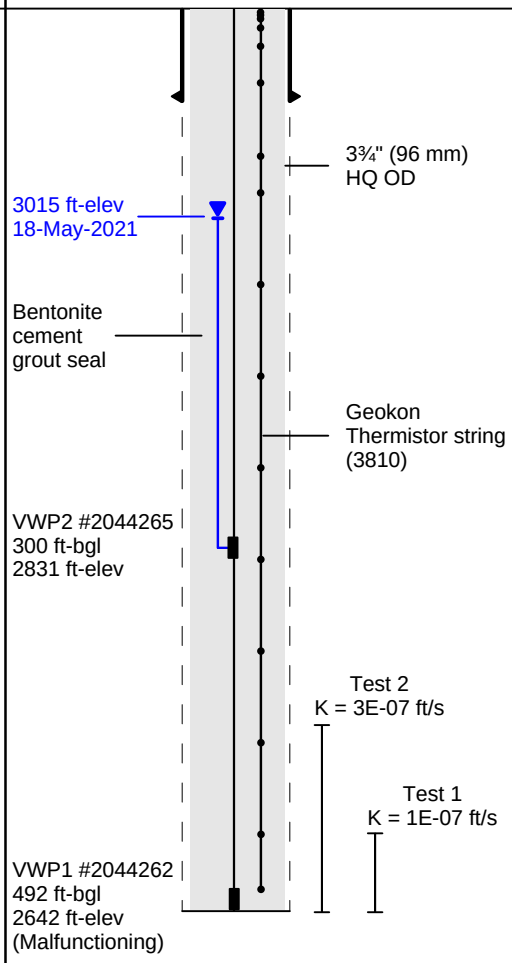
ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3120	0	Overburden (OVB).
3090	50	Quartz Mica Schist (QMS). Calcareous Schist (CS). Abundant oxide intensity from 10.8 ft-BGL to 17 ft-BGL.
3060		
3030	100	
3000		
2970	150	Mica Quartz Schist (MQS).
2940		
2910	200	CS.
2880	250	
2850		
2820	300	MQS.
2790	350	
2760		
2730	400	
2700		
2670	450	
2640		
2610	500	End of hole @ 492 ft-bgl.
2580	550	
2550		
2520	600	
2490	650	
2460	700	

TEMP. (°C) -9 0 9 | FF/ft 0 15



WELL / PIEZOMETER CONSTRUCTION
N: 7007466 E: 404453 AZIMUTH: 69° DIP: 81°
GROUND ELEVATION: 3127.07 ft (953.13 m)

Sensimetric strand ID: 69F39233



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

FF/ft: Fracture frequency per foot

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	07-Mar-2021
DRILLING END DATE:	08-Mar-2021
HYDROGEOLOGIST:	T. Roschinski

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

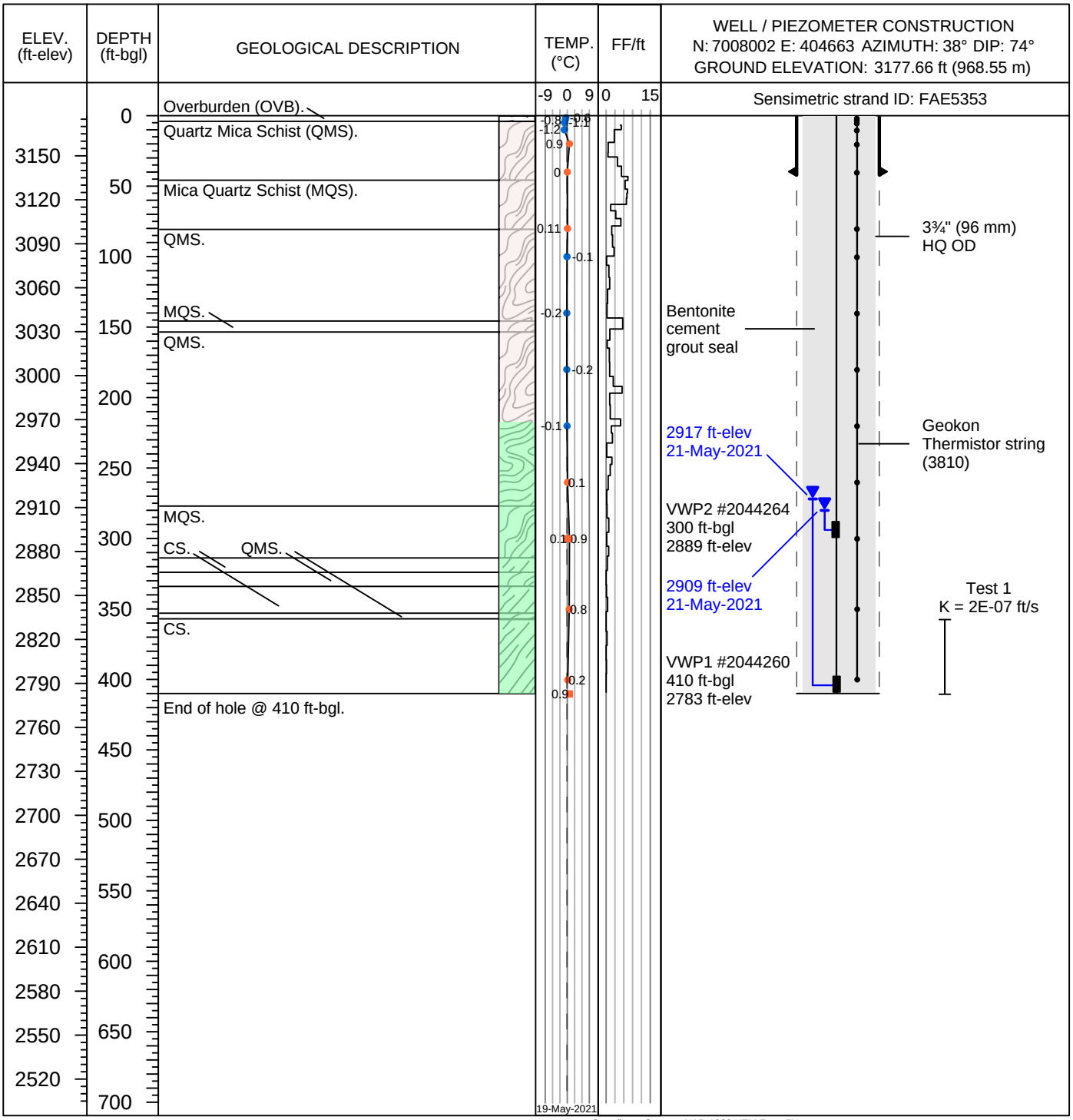
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-05 (TET20-465)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-21

H:\Project\4148\Drilling\2021 VWP Logs\GT20-06\GT20-06.gpj



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

Coordinate System: NAD 1983 UTM Zone 7N
Vertical Datum: NAVD88

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	10-Mar-2021
DRILLING END DATE:	12-Mar-2021
HYDROGEOLOGIST:	T. Roschinski

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-06 (TET20-469)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-22

H:\Project\4148\Drilling\2021 VWP Logs\GT20-07\GT20-07.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3210	0	Quartz Mica Schist (QMS). Abundant oxidation from 5.5 ft-BGL to 41.5 ft-BGL.
3180	50	Mica Quartz Schist (MQS).
3150		Calcareous Schist (CS). Pervasive oxidation.
		MQS.
3120	100	CS. Abundant to pervasive oxidation.
3090	150	
3060		
3030	200	MQS.
3000		QMS.
		CS. Abundant oxidation.
2970	250	Quartzite (QTZE).
2940	300	
2910		QMS.
2880	350	MQS.
2850		
2820	400	End of hole @ 410 ft-bgl.
2790	450	
2760		
2730	500	
2700		
2670	550	
2640	600	
2610		
2580	650	
2550	700	

TEMP. (°C): -9 0 9 | FF/ft: 0 15

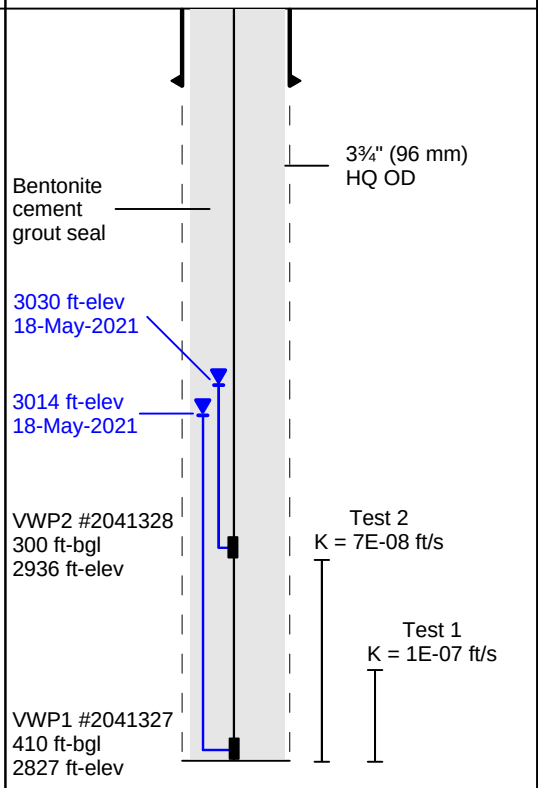
0.2

0

18-05-2021

WELL / PIEZOMETER CONSTRUCTION
N: 7008055 E: 404839 AZIMUTH: 205° DIP: 82°
GROUND ELEVATION: 3232.63 ft (985.31 m)

Sensimetric strand ID: D5B0383



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone

Packer Testing Interval

FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	14-03-2021
DRILLING END DATE:	15-03-2021
HYDROGEOLOGIST:	T. Roschinski / B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-07 (TET20-473)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-23

H:\Project\4148\Drilling\2021 VWP Logs\GT20-08\GT20-08.gpj

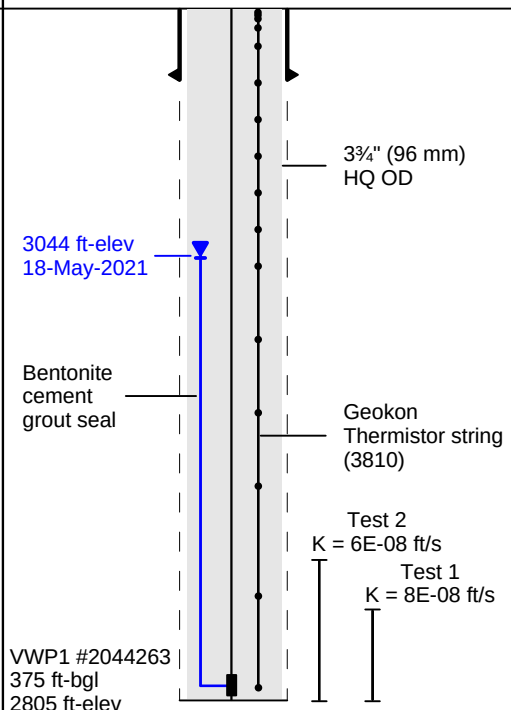
ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3150	0	Overburden (OVB).
3120	50	Quartz Mica Schist (QMS).
3090	100	Pervasive oxidation from 141 ft-bgl to 156.2 ft-bgl.
3060	150	Mica Quartz Schist (MQS).
3030	200	
3000	250	
2970	300	
2940	350	
2910	400	End of hole @ 377 ft-bgl.
2880	450	
2850	500	
2820	550	
2790	600	
2760	650	
2730	700	
2700		
2670		
2640		
2610		
2580		
2550		
2520		
2490		

TEMP. (°C) -9 0 9 | FF/ft 0 15

19-05-2021

WELL / PIEZOMETER CONSTRUCTION
N: 7007957 E: 404963 AZIMUTH: 149° DIP: 85°
GROUND ELEVATION: 3178.84 ft (968.91 m)

Sensimetric strand ID: 989DC83



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	20-03-2021
DRILLING END DATE:	21-03-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

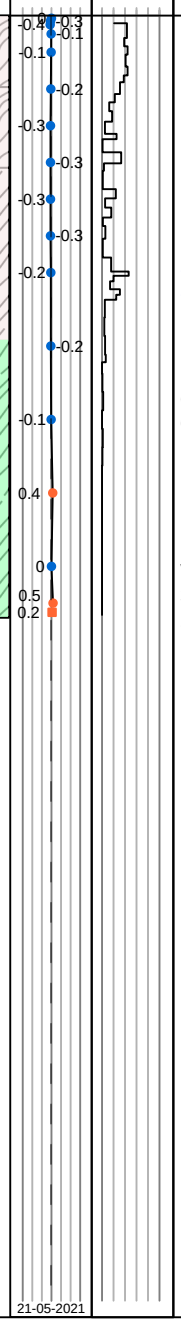
HYDROGEOLOGICAL LOG: GT20-08 (TET20-478)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-24

H:\Project\4148\Drilling\2021 VWP Logs\GT20-09\GT20-09.gpj

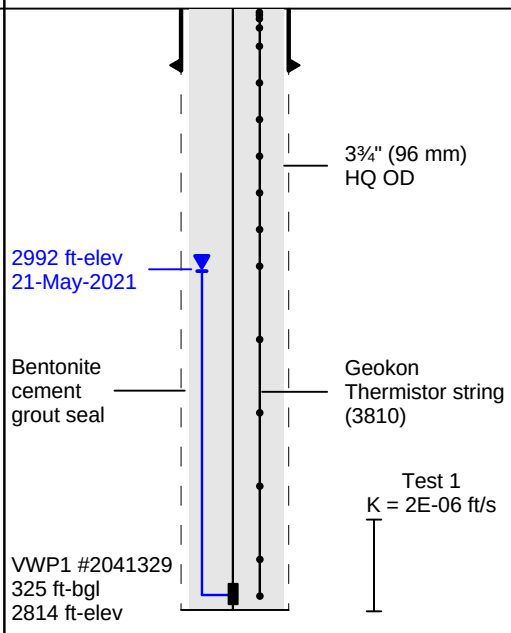
ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3120	0	Quartz Mica Schist (QMS). Abundant oxidation from 24 ft-bgl to 49.9 ft-bgl.
3090	50	Mica Quartz Schist (MQS).
3060		
3030	100	Calcareous Schist (CS). Abundant oxidation from 134.1 ft-bgl to 151.3 ft-bgl.
3000	150	
2970		
2940	200	
2910		
2880	250	
2850		
2820	300	
2790	350	End of hole @ 328 ft-bgl.
2760		
2730	400	
2700	450	
2670		
2640	500	
2610	550	
2580		
2550	600	
2520		
2490	650	
2460	700	

TEMP. (°C) -9 0 9 | FF/ft 0 15



WELL / PIEZOMETER CONSTRUCTION
N: 7007649 E: 404980 AZIMUTH: 356° DIP: 76°
GROUND ELEVATION: 3129.92 ft (954.00 m)

Sensimetric strand ID: 67FED78



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone
Packer Testing Interval
FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	25-03-2021
DRILLING END DATE:	25-03-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-09 (TET20-482)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-25

H:\Project\4148\Drilling\2021 VWP Logs\GT20-10GT20-10.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3120	0	Mica Quartz Schist (MQS).
3090	50	Calcareous Schist (CS). Abundant to pervasive oxidation from 33 ft-bgl to 78.7 ft-bgl and abundant oxidation from 92.7 ft-bgl to 121.3 ft-bgl.
3060		
3030	100	
3000	150	
2970		Quartz Mica Schist (QMS). Abundant oxidation from 212.7 ft-bgl to 283 ft-bgl.
2940	200	
2910		
2880	250	
2850		CS.
2820	300	
2790	350	End of hole @ 328 ft-bgl.
2760		
2730	400	
2700	450	
2670		
2640	500	
2610		
2580	550	
2550		
2520	600	
2490	650	
2460	700	

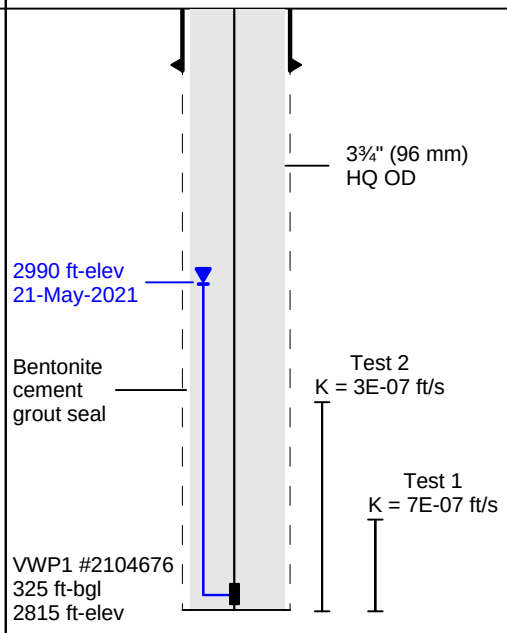
TEMP. (°C): -9 0 9 | FF/ft: 0 15

0.2

21-05-2021

WELL / PIEZOMETER CONSTRUCTION
N: 7007750 E: 404900 AZIMUTH: 116° DIP: 86°
GROUND ELEVATION: 3139.32 ft (956.86 m)

Sensimetric strand ID: 331A823



LEGEND

- OVB
- QMS/MQS
- CS
- QTZE
- SULPH
- HFS

- Oxide Zone
- Transition Zone
- Sulphide Zone
- Packer Testing Interval

FF/ft: Fracture frequency per foot

- Thermistor Data (>0°)
- Thermistor Data (≤0°)
- VWP Data (>0°)
- VWP Data (≤0°)

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	23-03-2021
DRILLING END DATE:	23-03-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-10 (TET20-480)

BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-26

H:\Project\4148\Drilling\2021 VWP Logs\GT20-11\GT20-11.gpj

ELEV. (ft-elev)	DEPTH (ft-bgl)	GEOLOGICAL DESCRIPTION
3210	0	Quartz Mica Schist (QMS).
		Abundant oxidation from 0 ft-BGL to 33.5 ft-BGL.
3180	50	
3150		
3120	100	Mica Quartz Schist (MQS).
		Abundant oxidation from 257 ft-BGL to 267 ft-BGL.
3090	150	
3060		
3030	200	
3000		
2970	250	
2940		
2910	300	
2880		
2850	350	Calcareous Schist (CS).
		End of hole @ 380 ft-bgl.
2820	400	
2790		
2760	450	
2730		
2700	500	
2670		
2640	550	
2610		
2580	600	
2550		
	650	
	700	

TEMP. (°C): -9 0 9 | FF/ft: 0 15

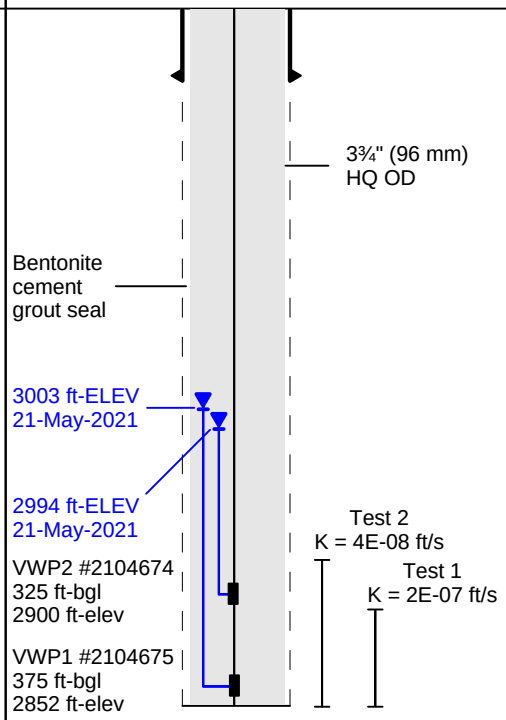
0.3

0.8

21-05-2021

WELL / PIEZOMETER CONSTRUCTION
N: 7007854 E: 404778 AZIMUTH: 67° DIP: 74°
GROUND ELEVATION: 3212.80 ft (979.26 m)

Sensimetric strand ID: 5F8CFD3



LEGEND

OVB
QMS/MQS
CS
QTZE
SULPH
HFS

Oxide Zone
Transition Zone
Sulphide Zone

Packer Testing Interval

FF/ft: Fracture frequency per foot

Thermistor Data (>0°)
Thermistor Data (≤0°)
VWP Data (>0°)
VWP Data (≤0°)

DRILLING CONTRACTOR:	Ruen Drilling Inc.
DRILLING METHOD:	HQ Diamond Drilling
DRILLING START DATE:	17-03-2021
DRILLING END DATE:	18-03-2021
HYDROGEOLOGIST:	B. Goldsmith

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

HYDROGEOLOGICAL LOG: GT20-11 (TET21-476)

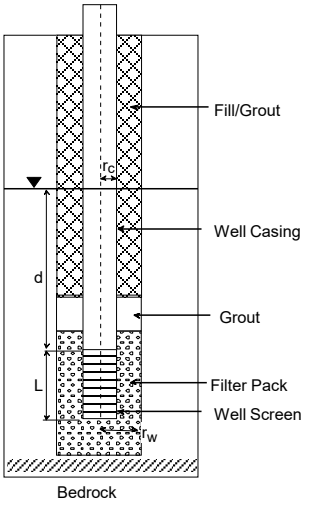
BY:	DATE:
KFM	MAY 21
APPROVED:	FIG:
SH/MLS	C-27

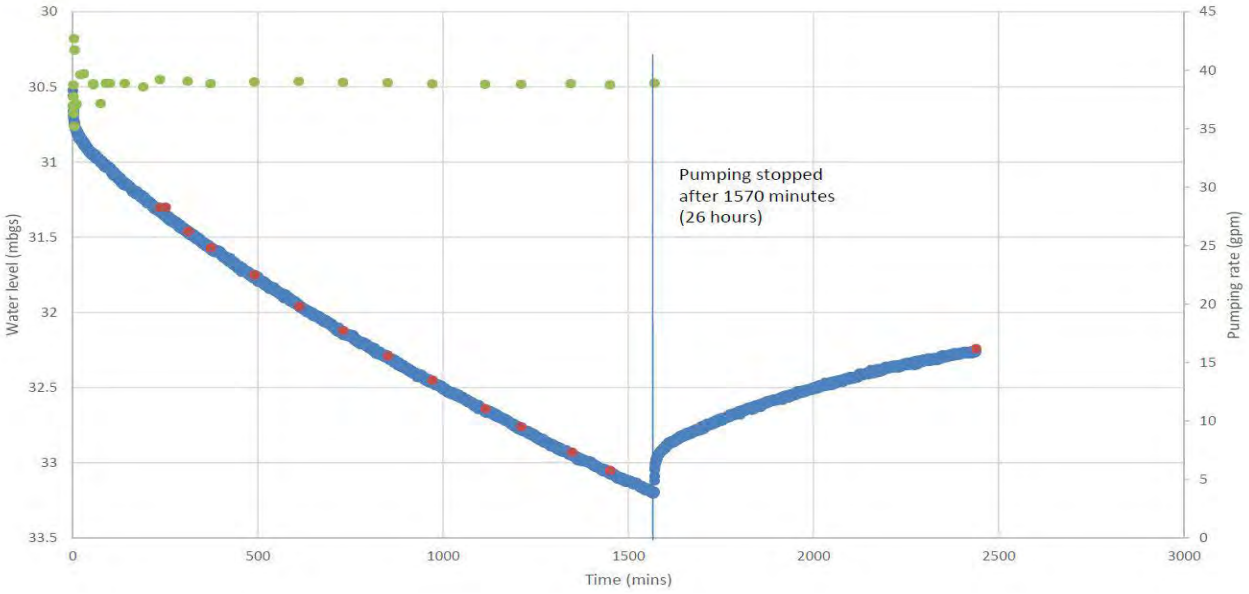
APPENDIX D
HYDRAULIC TESTING DATA

PUMPING TEST ANALYSIS: WELL 02

Well ID	WELL 02
Well Location (UTM)	405035.8; 7009224.4
Test Start Date and Time	2018-04-05 15:50
Test End Date and Time	2018-04-07 18:00
Pumping Test Analysis	Gringarten-Witherspoon

Depth to top of screen (d)	120.00	ft	**Site location/Description**
Screen length (L)	680.00	ft	Near Tok, Alaska. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000		
Radius of well casing (rc)	0.25	ft	
Radius of screen (rw)	0.25	ft	
Initial Water Level	103.35	ft	**Site Geology**
			Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.





WELL TEST ANALYSIS

Data Set: C:\...\TET2_20180404_Gringarten.agt
Date: 04/18/18 Time: 14:15:06

AQUIFER DATA

Saturated Thickness: 300. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
TET2	0	0	▫ TET2	0	0

SOLUTION

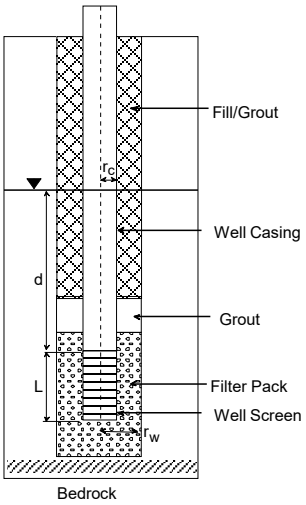
Aquifer Model: Fractured Solution Method: Gringarten (Vertical)
Kx = 1.783E-7 m/sec Ss = 0.0009245 m^{-1}
Ky/Kx = 0.6961 Lf = 50. m

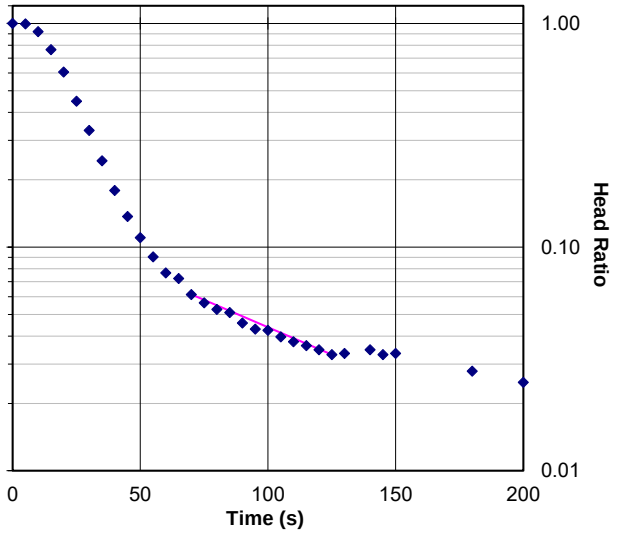
Analysis and Pumping Test Data Reference:
Knight Piesold Consulting (2018) Tetlin TET2
Pumping Well and Water Supply Evaluation.
Prepared for Royal Gold Operations. April 2018.

PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS	
	PUMPING TEST ANALYSIS: WELL 02	Analysis: KP CON.	15-Jul-2019
		Review: SH/MLS	Project: 4148

FALLING HEAD TEST ANALYSIS: PKG19-001

Well ID	PKG19-001		
Well Location (UTM)	404718 E, 7007536 N		
Test Start Date and Time	2019-06-29 9:19		
Test End Date and Time	2019-06-29 9:23		
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)		
Depth to top of screen (d)	224.63 ft	**Site location/Description**	
Screen length (L)	80.00 ft	Near Tok, Alaska. Bedrock permafrost. For this analysis the fractured bedrock is treated as a porous media.	
Anisotropy ratio, Kz/Kr	1.000		
Radius of well casing (rc)	0.083 ft		
Radius of screen (rw)	0.333 ft		
Initial Water Level	304.63 ft	**Site Geology**	
Initial Displacement (H0)	9.0 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.	
Rice & Bouwer Factor A	6.486		
Rice & Bouwer Factor B	1.316		
Effective Screen Radius (rw*)	0.333 ft		
Effective Well Radius Ratio	16.852		
Basic Time Lag (T_0)	88.68 s		





i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	313.7	1.000
2	5.0	313.6	0.997
3	10.0	312.9	0.920
4	15.0	311.5	0.764
5	20.0	310.1	0.606
6	25.0	308.7	0.449
7	30.0	307.6	0.333
8	35.0	306.8	0.243
9	40.0	306.2	0.179
10	45.0	305.9	0.137
11	50.0	305.6	0.110
12	55.0	305.4	0.090
13	60.0	305.3	0.077
14	65.0	305.3	0.072
15	70.0	305.2	0.061
16	75.0	305.1	0.056
17	80.0	305.1	0.053
18	85.0	305.1	0.051
19	90.0	305.0	0.046
20	95.0	305.0	0.043
21	100.0	305.0	0.042
22	105.0	305.0	0.040
23	110.0	305.0	0.038
24	115.0	305.0	0.036
25	120.0	304.9	0.035
26	125.0	304.9	0.033
27	130.0	304.9	0.033
28	140.0	304.9	0.035
29	145.0	304.9	0.033
30	150.0	304.9	0.033
31	180.0	304.9	0.028
32	200.0	304.9	0.025
33			
34			
35			

***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	15	70.0	0.06
End	26	125.0	0.03
K_r =	**8.2E-06**	**ft/sec**	
K_r =	**2.5E-06**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

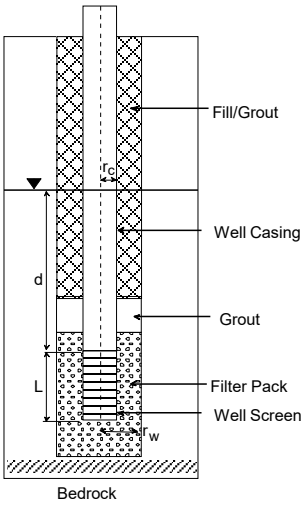
Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

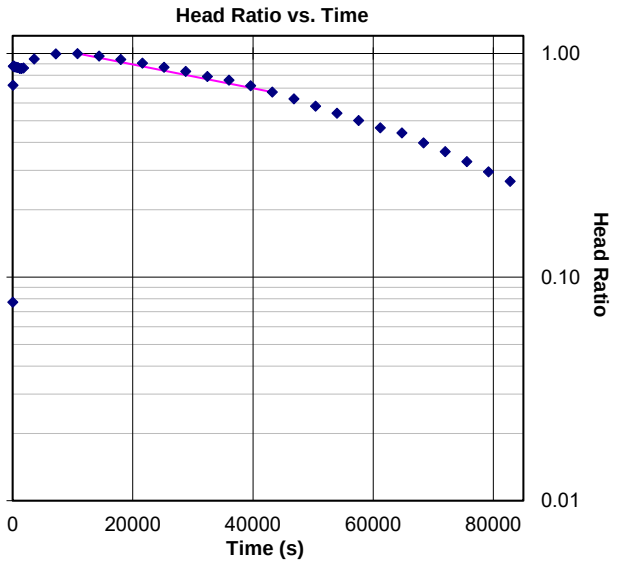
PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS	
	HYDRAULIC RESPONSE TEST: PKG19-001	Analysis: NP	15-Jul-2019
		Review: SH/MLS	Project: 4148

FALLING HEAD TEST ANALYSIS: PKG19-002

Well ID	PKG19-002	
Well Location (UTM)	405079 E, 7008247 N	
Test Start Date and Time	2019-06-20 15:42	
Test End Date and Time	2019-06-21 18:59	
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)	
Depth to top of screen (d)	-51.31 ft	**Site location/Description**
Screen length (L)	80.00 ft	Near Tok, Alaska. Bedrock permafrost. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.083 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	28.69 ft	**Site Geology**
Initial Displacement (H0)	5.2 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	6.486	
Rice & Bouwer Factor B	1.316	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	16.937	
Basic Time Lag (T_0)	81529.03 s	



Note: Well is not developed and has abundant sand/silt in the well. Test is not representative.



***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	15	10800.0	1.0
End	24	43200.0	0.7
K_r =	**8.9E-09**	**ft/sec**	
Kr =	**2.7E-09**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

i = 1, 2, 3, ...n

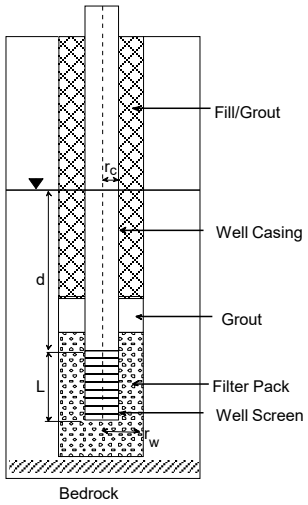
i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	28.7	0.00
2	30.0	29.1	0.08
3	60.0	32.5	0.72
4	120.0	33.3	0.88
5	180.0	33.3	0.88
6	240.0	33.3	0.88
7	300.0	33.2	0.87
8	600.0	33.2	0.87
9	900.0	33.2	0.87
10	1200.0	33.2	0.86
11	1500.0	33.2	0.86
12	1800.0	33.2	0.86
13	3600.0	33.6	0.94
14	7200.0	33.9	1.00
15	10800	33.9	1.00
16	14400	33.8	0.97
17	18000	33.6	0.94
18	21600	33.4	0.91
19	25200	33.2	0.87
20	28800	33.0	0.83
21	32400	32.8	0.79
22	36000	32.7	0.76
23	39600	32.4	0.72
24	43200	32.2	0.67
25	46800	32.0	0.63
26	50400	31.7	0.58
27	54000	31.5	0.54
28	57600	31.3	0.50
29	61200	31.1	0.46
30	64800	31.0	0.44
31	68400	30.8	0.40
32	72000	30.6	0.36
33	75600	30.4	0.33
34	79200	30.2	0.30
35	82800	30.1	0.27

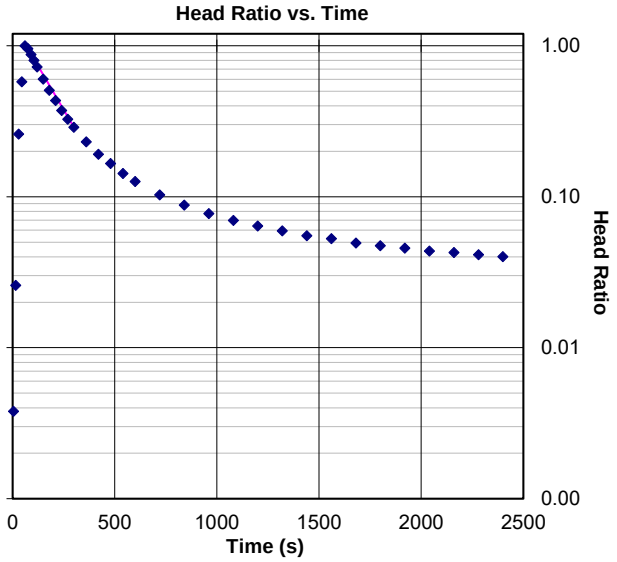
PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS	
	HYDRAULIC RESPONSE TEST: PKG19-002	Analysis: NP	15-Jul-2019
		Review: SH/MLS	Project: 4148

FALLING HEAD TEST ANALYSIS: PKG19-003

Well ID	PKG19-003
Well Location (UTM)	404779 E, 7007959 N
Test Start Date and Time	2019-06-29 11:33
Test End Date and Time	2019-06-29 12:17
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)

Depth to top of screen (d)	53.38 ft	**Site location/Description**
Screen length (L)	50.00 ft	Near Tok, Alaska. Bedrock permafrost. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.083 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	103.38 ft	**Site Geology**
Initial Displacement (H0)	22.9 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	5.260	
Rice & Bouwer Factor B	0.949	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	13.890	
Basic Time Lag (T_0)	187.58 s	





i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	5.0	103.5	0.00
2	15.0	104.0	0.03
3	30.0	109.3	0.26
4	45.0	116.6	0.58
5	60.0	126.3	1.00
6	75.0	125.3	0.96
7	90.0	123.4	0.88
8	105.0	121.7	0.80
9	120.0	120.0	0.73
10	150.0	117.2	0.60
11	180.0	115.0	0.51
12	210.0	113.3	0.43
13	240.0	111.9	0.37
14	270.0	110.9	0.33
15	300.0	110.0	0.29
16	360.0	108.7	0.23
17	420.0	107.8	0.19
18	480.0	107.2	0.17
19	540.0	106.6	0.14
20	600.0	106.3	0.13
21	720.0	105.7	0.10
22	840.0	105.4	0.09
23	960.0	105.2	0.08
24	1080.0	105.0	0.07
25	1200.0	104.8	0.06
26	1320.0	104.7	0.06
27	1440.0	104.6	0.06
28	1560.0	104.6	0.05
29	1680.0	104.5	0.05
30	1800.0	104.5	0.05
31	1920.0	104.4	0.05
32	2040.0	104.4	0.04
33	2160.0	104.4	0.04
34	2280.0	104.3	0.04
35	2400.0	104.3	0.04

***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	6	75.0	1.0
End	15	300.0	0.3
K_r =	**5.1E-06**	**ft/sec**	
Kr =	**1.6E-06**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

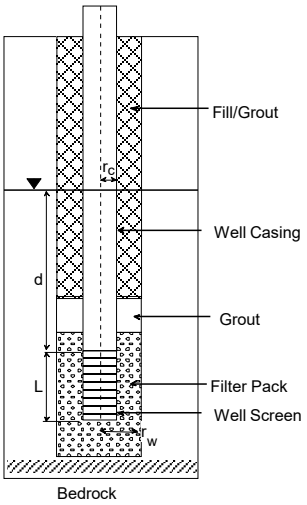
Reference

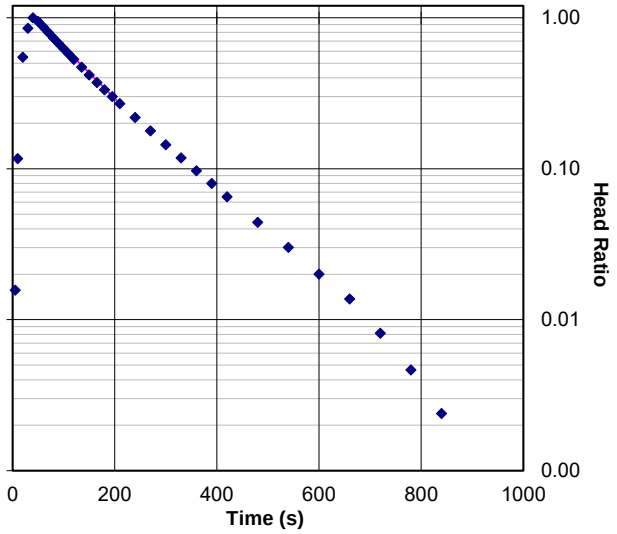
Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS PEAK GOLD LLC., TOK ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS
	HYDRAULIC RESPONSE TEST: PKG19-003	Analysis: NP | 15-Jul-2019 Review: SH/MLS | Project: 4148

FALLING HEAD TEST ANALYSIS: PKG19-005

Well ID	PKG19-005	
Well Location (UTM)	404870 E, 7007880 N	
Test Start Date and Time	2019-06-26 9:54	
Test End Date and Time	2019-06-26 10:09	
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)	
Depth to top of screen (d)	21.03 ft	**Site location/Description**
Screen length (L)	50.00 ft	Near Tok, Alaska. Bedrock permafrost. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.083 ft	
Radius of screen (rw)	0.083 ft	
Initial Water Level	71.03 ft	**Site Geology**
Initial Displacement (H0)	22.9 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	5.260	
Rice & Bouwer Factor B	0.949	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	13.903	
Basic Time Lag (T_0)	127.62 s	





i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	5.0	71.4	0.02
2	10.0	73.7	0.12
3	20.0	83.6	0.55
4	30.0	90.6	0.85
5	40.0	93.9	1.00
6	50.0	92.7	0.94
7	60.0	91.0	0.87
8	70.0	89.4	0.80
9	80.0	87.9	0.74
10	90.0	86.5	0.68
11	100.0	85.3	0.62
12	110.0	84.2	0.57
13	120.0	83.2	0.53
14	135.0	81.8	0.47
15	150.0	80.6	0.42
16	165.0	79.6	0.37
17	180.0	78.7	0.33
18	195.0	77.9	0.30
19	210.0	77.2	0.27
20	240.0	76.0	0.22
21	270.0	75.1	0.18
22	300.0	74.3	0.14
23	330.0	73.7	0.12
24	360.0	73.2	0.10
25	390.0	72.9	0.08
26	420.0	72.5	0.07
27	480.0	72.0	0.04
28	540.0	71.7	0.03
29	600.0	71.5	0.02
30	660.0	71.3	0.01
31	720.0	71.2	0.01
32	780.0	71.1	0.00
33	840.0	71.1	0.00
34	920.0	71.0	0.00
35	2400.0	104.3	1.45

***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	6	50.0	0.9
End	19	210.0	0.3
K_r =	**7.5E-06**	**ft/sec**	
Kr =	**2.3E-06**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

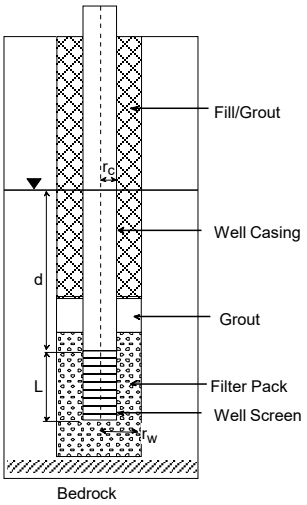
Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

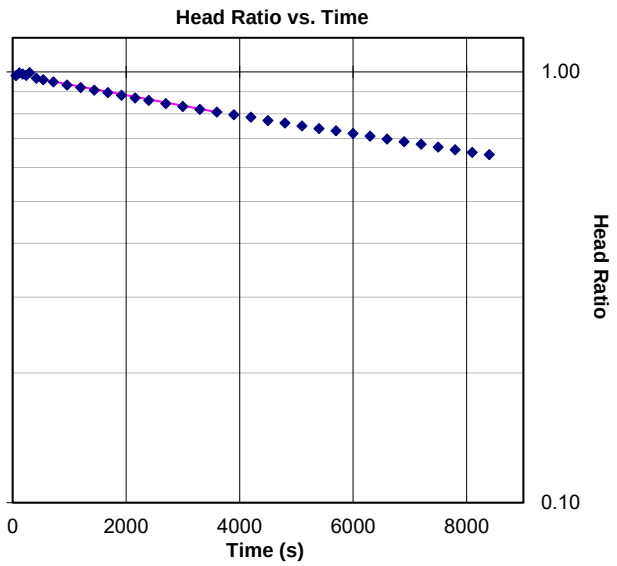
PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS
	HYDRAULIC RESPONSE TEST: PKG19-005	Analysis: NP | 15-Jul-2019 Review: SH/MLS | Project: 4148

FALLING HEAD TEST ANALYSIS: PKG19-007

Well ID	PKG19-007		
Well Location (UTM)	404603 E, 7007559 N		
Test Start Date and Time	2019-06-29 10:33		
Test End Date and Time	2019-06-29 12:55		
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)		
Depth to top of screen (d)	-21.08 ft	**Site location/Description**	
Screen length (L)	100.00 ft	Near Tok, Alaska. Bedrock permafrost. For this analysis the fractured bedrock is treated as a porous media.	
Anisotropy ratio, Kz/Kr	1.000		
Radius of well casing (rc)	0.083 ft		
Radius of screen (rw)	0.083 ft		
Initial Water Level	78.92 ft	**Site Geology**	
Initial Displacement (H0)	7.3 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.	
Rice & Bouwer Factor A	7.039		
Rice & Bouwer Factor B	1.536		
Effective Screen Radius (rw*)	0.333 ft		
Effective Well Radius Ratio	18.662		
Basic Time Lag (T_0)	17676.02 s		



Note: Well screen is partially above water table. Frozen conditions. Test may not be representative.



***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	7	540.0	1.0
End	19	3600.0	0.8
K_r =	**3.6E-08**	**ft/sec**	
Kr =	**1.1E-08**	**m/sec**	

i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	60.0	86.1	0.98
2	120.0	86.2	0.99
3	180.0	86.1	0.99
4	240.0	86.1	0.98
5	300.0	86.2	1.00
6	420.0	86.0	0.97
7	540.0	85.9	0.96
8	720.0	85.8	0.95
9	960.0	85.7	0.93
10	1200.0	85.6	0.92
11	1440.0	85.5	0.91
12	1680.0	85.4	0.89
13	1920.0	85.4	0.88
14	2160.0	85.3	0.87
15	2400.0	85.2	0.86
16	2700.0	85.1	0.84
17	3000.0	85.0	0.83
18	3300.0	84.9	0.82
19	3600.0	84.8	0.81
20	3900.0	84.7	0.80
21	4200.0	84.6	0.78
22	4500.0	84.5	0.77
23	4800.0	84.5	0.76
24	5100.0	84.4	0.75
25	5400.0	84.3	0.74
26	5700.0	84.2	0.73
27	6000.0	84.2	0.72
28	6300.0	84.1	0.71
29	6600.0	84.0	0.70
30	6900.0	83.9	0.69
31	7200.0	83.9	0.68
32	7500.0	83.8	0.67
33	7800.0	83.7	0.66
34	8100.0	83.7	0.65
35	8400.0	83.6	0.64

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

Reference

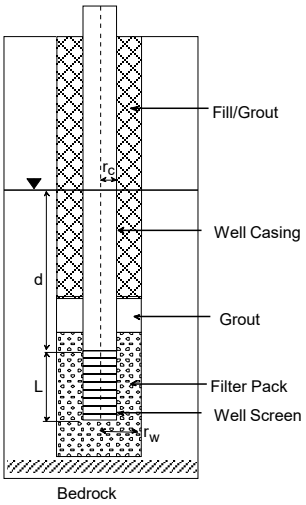
Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS
	HYDRAULIC RESPONSE TEST: PKG19-007	Analysis: NP | 15-Jul-2019 Review: SH/MLS | Project: 4148

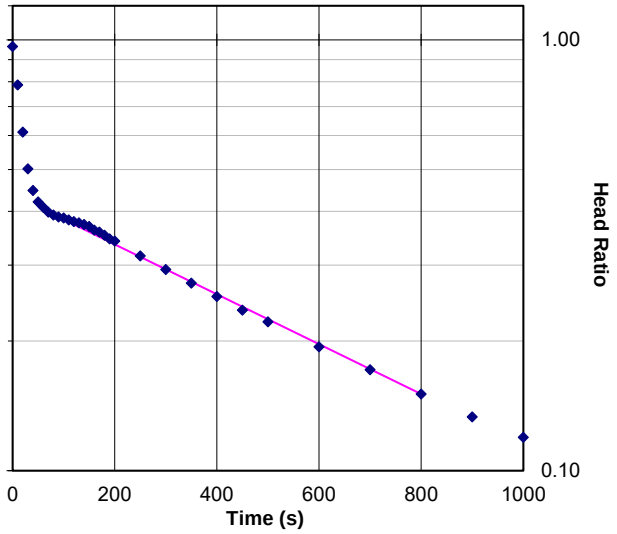
RISING HEAD TEST ANALYSIS: GW21-01

Well ID	GW21-01
Well Location (UTM)	405455.28 E, 700764.69 N
Test Start Date and Time	2021-06-02 10:10
Test End Date and Time	2021-06-02 11:30
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)

Depth to top of screen (d)	57.16 ft	**Site location/Description**
Screen length (L)	30.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.167 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	87.16 ft	**Site Geology**
Initial Displacement (H0)	6.2 ft	Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	4.068	
Rice & Bouwer Factor B	0.679	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	11.260	
Basic Time Lag (T_0)	749.78 s	



Head Ratio vs. Time



***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	8	70.0	0.40
End	30	800.0	0.15
K_r =	**7.0E-06**	**ft/sec**	
K_r =	**2.1E-06**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

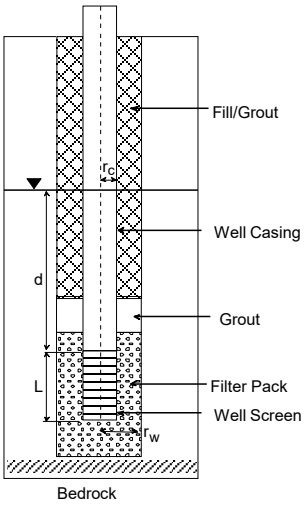
i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	80.99	0.966
2	10.0	82.13	0.786
3	20.0	83.26	0.611
4	30.0	83.95	0.502
5	40.0	84.30	0.447
6	50.0	84.47	0.421
7	60.0	84.55	0.409
8	70.0	84.61	0.399
9	80.0	84.65	0.392
10	90.0	84.68	0.388
11	100.0	84.69	0.386
12	110.0	84.72	0.382
13	120.0	84.74	0.379
14	130.0	84.76	0.376
15	140.0	84.78	0.373
16	150.0	84.80	0.369
17	160.0	84.85	0.362
18	170.0	84.87	0.358
19	180.0	84.91	0.352
20	190.0	84.96	0.345
21	200.0	84.98	0.341
22	250.00	85.15	0.315
23	300.0	85.29	0.293
24	350.0	85.42	0.272
25	400.0	85.54	0.254
26	450.0	85.66	0.236
27	500.0	85.75	0.222
28	600.0	85.92	0.194
29	700.0	86.07	0.171
30	800.0	86.2	0.151
31	900.0	86.3	0.133
32	1000.0	86.4	0.120
33			
34			
35			

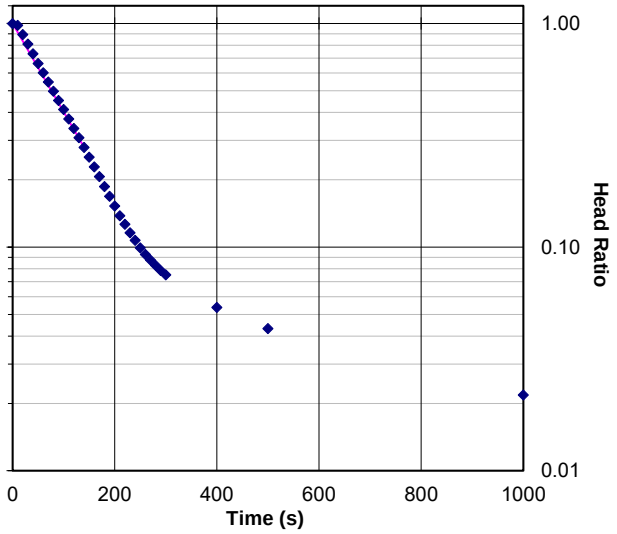
RISING HEAD TEST ANALYSIS: GW21-02

Well ID	GW21-02
Well Location (UTM)	405456.28 E, 7008919.07 N
Test Start Date and Time	2021-05-21 11:40
Test End Date and Time	2021-05-21 12:20
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)

Depth to top of screen (d)	100.18 ft	**Site location/Description**
Screen length (L)	40.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.167 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	140.18 ft	**Site Geology**
Initial Displacement (H0)	28.0 ft	Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	3.324	
Rice & Bouwer Factor B	0.537	
Effective Screen Radius (rw*)	0.666 ft	
Effective Well Radius Ratio	9.382	
Basic Time Lag (T_0)	109.76 s	



Head Ratio vs. Time



***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	1	0.0	1.00
End	15	140.0	0.28
K_r =	**3.0E-05**	**ft/sec**	
K_r =	**9.1E-06**	**m/sec**	

i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	112.18	1.000
2	10.0	112.74	0.981
3	20.0	115.36	0.893
4	30.0	117.85	0.809
5	40.0	120.15	0.732
6	50.0	122.18	0.663
7	60.0	124.00	0.602
8	70.0	125.62	0.547
9	80.0	127.10	0.498
10	90.0	128.44	0.452
11	100.0	129.64	0.412
12	110.0	130.76	0.374
13	120.0	131.79	0.340
14	130.0	132.71	0.309
15	140.0	133.58	0.279
16	150.0	134.37	0.253
17	160.0	135.08	0.229
18	170.0	135.73	0.207
19	180.0	136.33	0.187
20	190.0	136.87	0.169
21	200.0	137.34	0.153
22	210.0	137.77	0.138
23	220.0	138.12	0.126
24	230.0	138.43	0.116
25	240.0	138.69	0.107
26	250.0	138.93	0.099
27	260.0	139.12	0.093
28	270.0	139.27	0.088
29	280.0	139.41	0.083
30	290.0	139.5	0.079
31	300.0	139.6	0.075
32	400.0	140.3	0.054
33	500.0	140.6	0.043
34	1000.0	141.2	0.022
35	1500.0	141.5	0.014

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

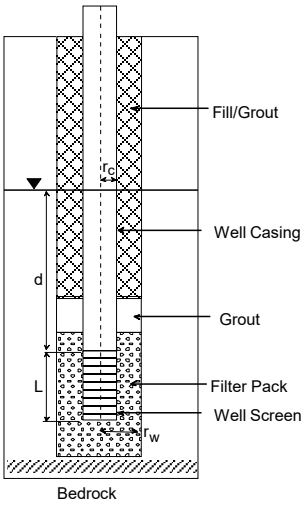
Reference

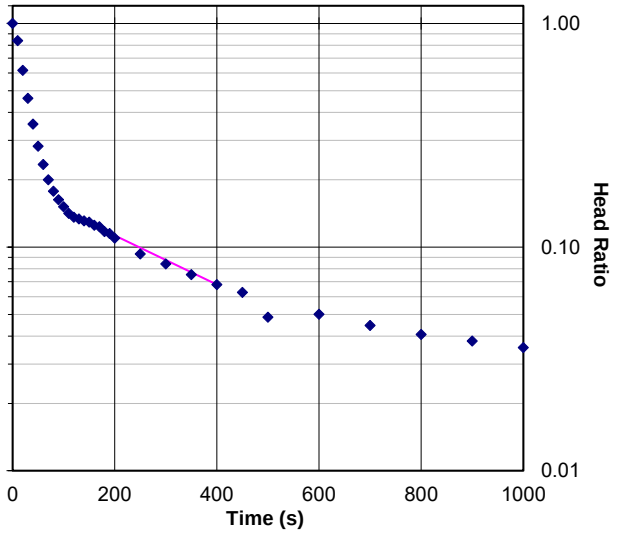
Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS
	HYDRAULIC RESPONSE TEST: GW21-02	Analysis: KFM 4-Jun-2021 Review: SH/MLS Project: 4148

RISING HEAD TEST ANALYSIS: GW21-04

Well ID	GW21-04	
Well Location (UTM)	405476.2 E, 7006947.2 N	
Test Start Date and Time	2021-06-02 13:51	
Test End Date and Time	2021-06-02 14:11	
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)	
Depth to top of screen (d)	87.69 ft	**Site location/Description**
Screen length (L)	20.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.167 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	99.98 ft	**Site Geology**
Initial Displacement (H0)	8.8 ft	Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	3.324	
Rice & Bouwer Factor B	0.537	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	9.367	
Basic Time Lag (T_0)	395.30 s	





***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	12	110.0	0.14
End	25	400.0	0.07
K_r =	**1.7E-05**	**ft/sec**	
K_r =	**5.0E-06**	**m/sec**	

i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	91.23	1.000
2	10.0	92.64	0.839
3	20.0	94.58	0.617
4	30.0	95.92	0.463
5	40.0	96.87	0.355
6	50.0	97.51	0.283
7	60.0	97.93	0.234
8	70.0	98.23	0.200
9	80.0	98.42	0.178
10	90.0	98.55	0.163
11	100.0	98.65	0.152
12	110.0	98.74	0.141
13	120.0	98.79	0.136
14	130.0	98.81	0.134
15	140.0	98.83	0.131
16	150.0	98.85	0.129
17	160.0	98.88	0.125
18	170.0	98.90	0.123
19	180.0	98.95	0.117
20	190.0	98.97	0.115
21	200.0	99.02	0.110
22	250.0	99.16	0.093
23	300.0	99.24	0.084
24	350.0	99.32	0.075
25	400.0	99.38	0.068
26	450.0	99.43	0.063
27	500.0	99.55	0.049
28	600.0	99.54	0.050
29	700.0	99.59	0.045
30	800.0	99.6	0.041
31	900.0	99.6	0.038
32	1000.0	99.7	0.036
33			
34			
35			

Assumptions

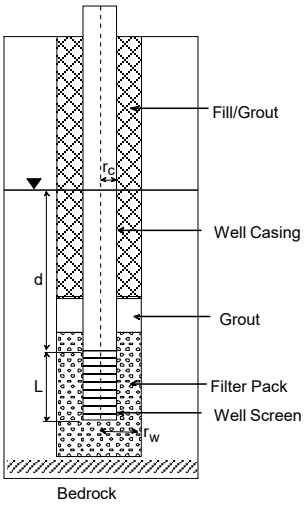
1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

Reference

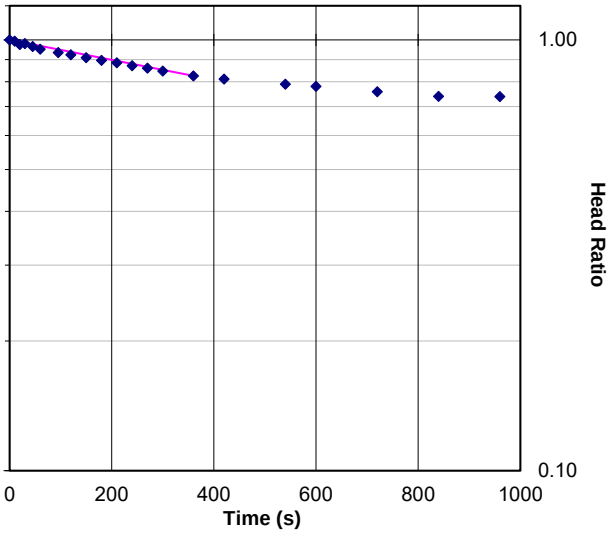
Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

RISING HEAD TEST ANALYSIS: GW21-06

Well ID	GW21-06		
Well Location (UTM)	404647.26 E, 7007394.76 N		
Test Start Date and Time	2021-04-22 13:00		
Test End Date and Time	2021-04-22 14:00		
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)		
Depth to top of screen (d)	112.65 ft	**Site location/Description**	
Screen length (L)	60.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.	
Anisotropy ratio, Kz/Kr	1.000		
Radius of well casing (rc)	0.167 ft		
Radius of screen (rw)	0.333 ft		
Initial Water Level	172.65 ft	**Site Geology**	
Initial Displacement (H0)	164.7 ft	Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.	
Rice & Bouwer Factor A	4.068		
Rice & Bouwer Factor B	0.679		
Effective Screen Radius (rw*)	0.666 ft		
Effective Well Radius Ratio	11.260		
Basic Time Lag (T_0)	1873.18 s		



Head Ratio vs. Time



i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	8.00	1.000
2	10.0	9.00	0.994
3	20.0	12.00	0.976
4	30.0	11.25	0.980
5	45.0	13.60	0.966
6	60.0	15.90	0.952
7	95.0	18.70	0.935
8	120.0	20.52	0.924
9	150.0	22.90	0.910
10	180.0	25.05	0.896
11	210.0	27.00	0.885
12	240.0	29.11	0.872
13	270.0	31.00	0.860
14	300.0	33.32	0.846
15	360.0	36.78	0.825
16	420.0	39.10	0.811
17	540.0	42.65	0.790
18	600.0	44.22	0.780
19	720.0	47.80	0.758
20	840.0	50.90	0.739
21	960.0	51.05	0.739
22	1080.0	56.80	0.704
23	1200.0	60.20	0.683
24	1500.0	69.40	0.627
25	1800.0	77.10	0.580
26	2100.0	130.68	0.255
27	2400.0	93.55	0.480
28	2700.0	101.70	0.431
29	3600.0	123.90	0.296
30			
31			
32			
33			
34			
35			

***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	1	0.0	1.00
End	15	360.0	0.83
K_r =	**1.4E-06**	**ft/sec**	
K_r =	**4.3E-07**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

Reference

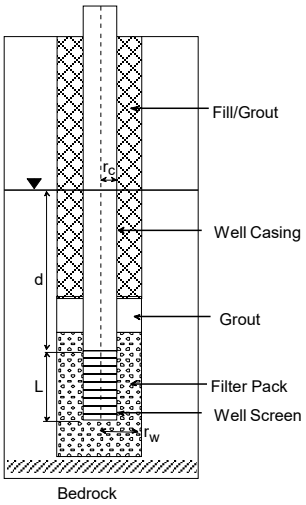
Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* , 12(3) p 423.

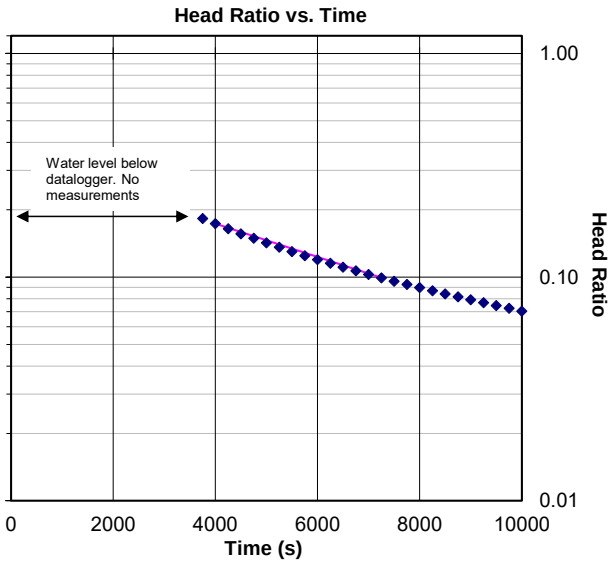
PEAK GOLD LLC	WATER MANAGEMENT ASSESSMENTS MANH CHOH PROJECT - TOK, ALASKA	PITEAU ASSOCIATES GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS	
	HYDRAULIC RESPONSE TEST: GW21-06	Analysis: KFM	12-May-2021
		Review: SH/MLS	Project: 4148

RISING HEAD TEST ANALYSIS: GW21-07

Well ID	GW21-07
Well Location (UTM)	404598.7 E, 7007566.4 N
Test Start Date and Time	2021-06-01 9:35
Test End Date and Time	2021-06-01 15:00
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)

Depth to top of screen (d)	73.22 ft	**Site location/Description**
Screen length (L)	40.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.167 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	113.22 ft	**Site Geology**
Initial Displacement (H0)	68.2 ft	Fractured quartz mica schist. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	4.710	
Rice & Bouwer Factor B	0.817	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	12.688	
Basic Time Lag (T_0)	5836.13 s	





Note: Well was frozen and had to be thawed out prior to the pump operation/response test

i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	3750.0	100.75	0.183
2	4000.0	101.39	0.173
3	4250.0	102.00	0.165
4	4500.0	102.56	0.156
5	4750.0	103.05	0.149
6	5000.0	103.52	0.142
7	5250.0	103.94	0.136
8	5500.0	104.34	0.130
9	5750.0	104.72	0.125
10	6000.0	105.05	0.120
11	6250.0	105.36	0.115
12	6500.0	105.66	0.111
13	6750.0	105.94	0.107
14	7000.0	106.21	0.103
15	7250.0	106.44	0.099
16	7500.0	106.68	0.096
17	7750.0	106.90	0.093
18	8000.0	107.10	0.090
19	8250.0	107.29	0.087
20	8500.0	107.48	0.084
21	8750.0	107.65	0.082
22	9000.0	107.82	0.079
23	9250.0	107.98	0.077
24	9500.0	108.13	0.075
25	9750.0	108.28	0.072
26	10000.0	108.42	0.070
27			
28			
29			
30			
31			
32			
33			
34			
35			

***Calculation of Hydraulic Conductivity,* K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity*:**

		Time	Head
Start	2	4000.0	0.17
End	15	7250.0	0.10
K_r =	**7.6E-07**	**ft/sec**	
K_r =	**2.3E-07**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

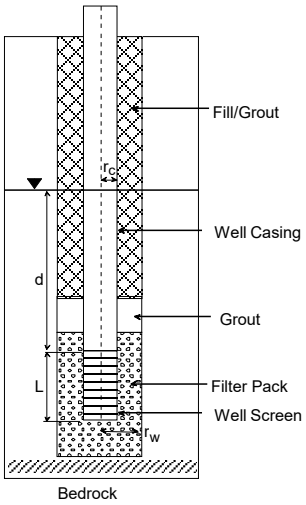
Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research*, 12(3) p 423.

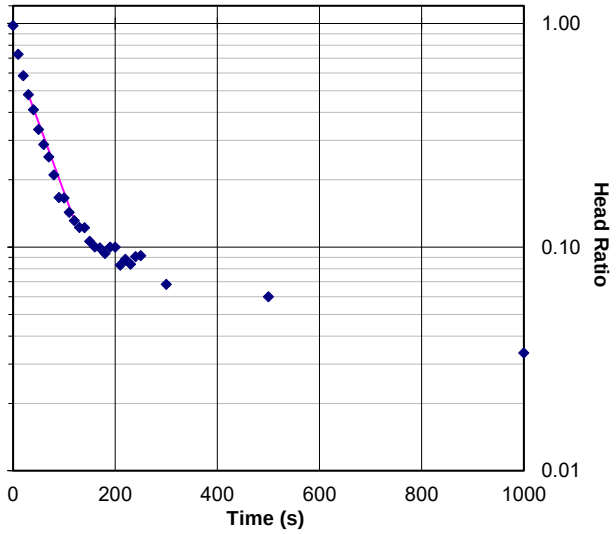
RISING HEAD TEST ANALYSIS: GW21-08

Well ID	GW21-08
Well Location (UTM)	404216.17 E, 7008175.18 N
Test Start Date and Time	2021-04-22 10:24
Test End Date and Time	2021-04-22 10:45
Slug Test Analysis	Bouwer & Rice (1976) (partially penetrating)

Depth to top of screen (d)	37.87 ft	**Site location/Description**
Screen length (L)	40.00 ft	Near Tok, Alaska. Bedrock. For this analysis the fractured bedrock is treated as a porous media.
Anisotropy ratio, Kz/Kr	1.000	
Radius of well casing (rc)	0.167 ft	
Radius of screen (rw)	0.333 ft	
Initial Water Level	77.87 ft	**Site Geology**
Initial Displacement (H0)	0.8 ft	Fractured quartz mica schist/ amphibole skarn. Well is entirely drilled and screened in bedrock.
Rice & Bouwer Factor A	4.710	
Rice & Bouwer Factor B	0.817	
Effective Screen Radius (rw*)	0.333 ft	
Effective Well Radius Ratio	12.701	
Basic Time Lag (T_0)	69.39 s	



Head Ratio vs. Time



i = 1, 2, 3, ...n

i	Time t (s)	Water Level h (ft)	Normalized Head H
1	0.0	77.06	0.980
2	10.0	77.27	0.729
3	20.0	77.39	0.584
4	30.0	77.47	0.480
5	40.0	77.53	0.412
6	50.0	77.59	0.336
7	60.0	77.63	0.288
8	70.0	77.66	0.253
9	80.0	77.70	0.210
10	90.0	77.73	0.167
11	100.0	77.73	0.166
12	110.0	77.75	0.143
13	120.0	77.76	0.131
14	130.0	77.77	0.122
15	140.0	77.77	0.122
16	150.0	77.78	0.106
17	160.0	77.79	0.100
18	170.0	77.79	0.099
19	180.0	77.79	0.094
20	190.0	77.79	0.100
21	200.0	77.79	0.100
22	210.0	77.80	0.083
23	220.0	77.80	0.088
24	230.0	77.80	0.084
25	240.0	77.80	0.091
26	250.0	77.79	0.092
27	300.0	77.81	0.068
28	500.0	77.82	0.060
29	1000.0	77.8	0.034
30			
31			
32			
33			
34			
35			

***Calculation of Hydraulic Conductivity*, K :**

$$K_r = \frac{r_c^2 \left[\frac{1.1}{\ln\left(\frac{d+L}{r_w^*}\right)} + \frac{A + B\left(\ln\left(\frac{b-(d+L)}{r_w^*}\right)\right)}{\frac{L}{r_w^*}} \right]^{-1}}{2LT_0}$$

***Best Fit Line Hydraulic Conductivity* :**

		Time	Head
Start	4	30.0	0.48
End	13	120.0	0.13
K_r =	**6.4E-05**	**ft/sec**	
K_r =	**1.9E-05**	**m/sec**	

Assumptions

1) Aquifer is UNCONFINED
2) Well is PARTIALLY PENETRATING
3) Well is screened BELOW WATER TABLE
4) Aquifer is ISOTROPIC
5) Negligible WELL SKIN effects
6) Neglect aquifer STORATIVITY

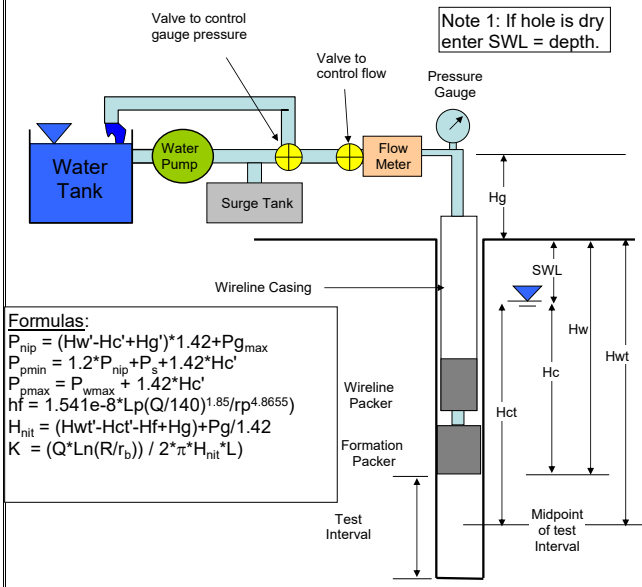
Reference

Bouwer, H. and Rice, R.C. (1976) A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research*, 12(3) p 423.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-01 Packer Test 1

Project:	4148- Manh Choh	**Depth of Test (m):**	181.00	to	200.00	**Hole Nº:**	GT20-01
Area:	South Pit	**Date:**	09-Dec-20	**Start:**	14:26	**Test Nº:**	1
Elevation (m):	975	**Height of "T" (m):**	1.5	**End:**	15:16	**Total Depth (m):**	200
Coordinates:	404648, 7007621	**Lithology:**	Mica Quartz Schist/ Sulphide			**Engineer:**	SH



Note 1: If hole is dry enter SWL = depth.

Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

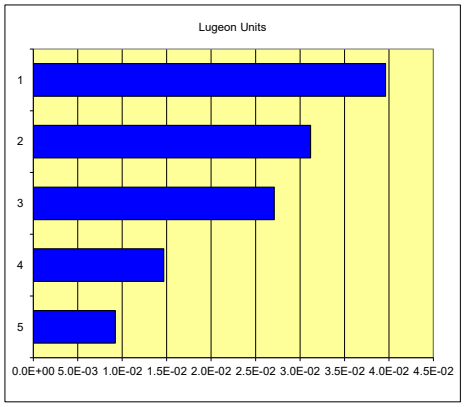
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

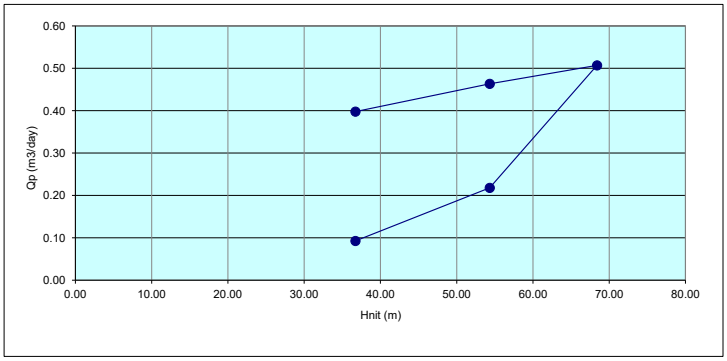
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	181.0	m
Hwt	Water column over test midpoint	190.5	m
SWL	Static water level (see note 1)	0.0	m
Hc	Hydrostatic head on packer	181.0	m
Hct	Hydrostatic head on test midpoint	190.5	m
Hw'	Water column over packer (corrected)	177.2	m
Hwt'	Water column over test midpoint (corrected)	186.5	m
SWL'	Static water level (corrected)	0.0	m
Hc'	Hydrostatic head on packer (corrected)	177.2	m
Hct'	Hydrostatic head on test midpoint (corrected)	186.5	m
ß	Inclination from horizontal	78	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	100	psi
Pnip	Net injection pressure at packer	102	psi
Ppmin	**Minimum packer inflation pressure**	**424**	psi
Ppmax	**Maximum packer inflation pressure**	**552**	psi
rb	Borehole radius	0.048	m
L	Length of test section	19.00	m
Lp	Length of discharge pipe	182.50	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	550	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	50	75	95	75	50
1	**0.303**	**0.303**	**0.454**	**0.303**	**0.076**
2	**0.303**	**0.265**	**0.341**	**0.227**	**0.038**
3	**0.341**	**0.341**	**0.303**	**0.227**	**0.038**
4	**0.303**	**0.303**	**0.341**	**0.114**	**0.076**
5	**0.265**	**0.341**	**0.341**	**0.076**	**0.076**
6	**0.265**	**0.265**	**0.341**	**0.151**	**0.076**
7	**0.265**	**0.379**	**0.341**	**0.114**	**0.076**
8	**0.265**	**0.341**	**0.341**	**0.076**	**0.076**
9	**0.227**	**0.303**	**0.379**	**0.114**	**0.038**
10	**0.227**	**0.379**	**0.341**	**0.114**	**0.076**
Q_P (lit/min)	0.28	0.32	0.35	0.15	0.06
Q_P (m^3/day)	0.40	0.46	0.51	0.2	0.1
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	36.71	54.31	68.40	54.32	36.71
K (m/day)	5.2E-04	4.1E-04	3.6E-04	1.9E-04	1.2E-04
K (m/sec)	6.0E-09	4.8E-09	4.1E-09	2.2E-09	**1.4E-09**
UL	0.0396	0.0312	0.0271	0.0147	0.0092
Sensitivity of K:		1.01E-05 (m/day)		1.17E-10 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth to water in GT20-01 was not pre-measured before the packer test. The borehole was observed to hold water during televiewer testing. The depth of water in the hole was estimated to be near ground surface. Extremely low flows during testing, likley some leaks in system. Possibly, not a representative test.

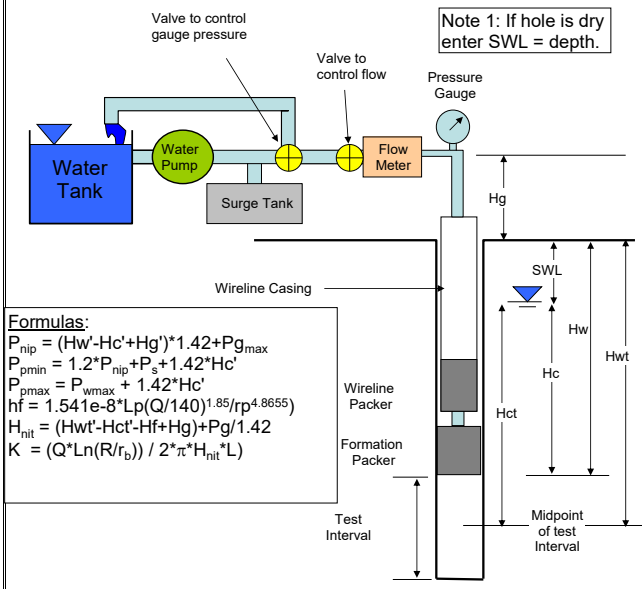
Interpreted Results

The Lugeon units pattern of GT20-01 Test 1 most closely resembles the Houlsby (1976) void filling type graph, where Lugeon units decrease as the test proceeds. Therefore, the final Lugeon unit value was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-01 Packer Test 2

Project:	4148- Manh Choh	**Depth of Test (m):**	171.00	to	200.00	**Hole Nº:**	GT20-01
Area:	South Pit	**Date:**	09-Dec-20	**Start:**	13:00	**Test Nº:**	2
Elevation (m):	975	**Height of "T" (m):**	1.5	**End:**	13:50	**Total Depth (m):**	200
Coordinates:	404648, 7007621	**Lithology:**	Mica Quartz Schist/ Sulphide			**Engineer:**	SH

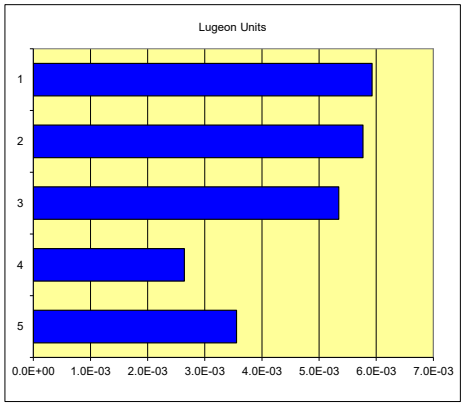


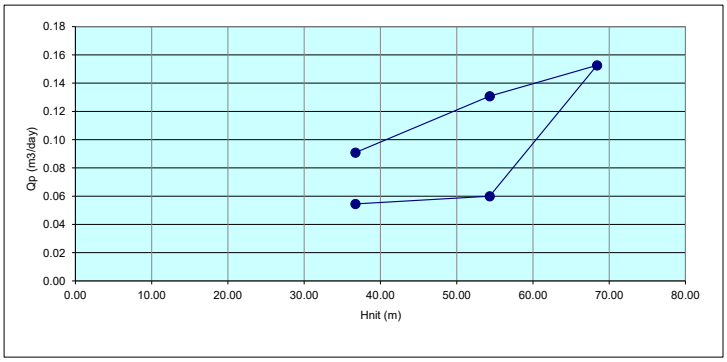
Formulas:
$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$
$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$
$P_{pmax} = P_{wmax} + 1.42*Hc'$
$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	171.0	m
Hwt	Water column over test midpoint	185.5	m
SWL	Static water level (see note 1)	0.0	m
Hc	Hydrostatic head on packer	171.0	m
Hct	Hydrostatic head on test midpoint	185.5	m
Hw'	Water column over packer (corrected)	167.4	m
Hwt'	Water column over test midpoint (corrected)	181.6	m
SWL'	Static water level (corrected)	0.0	m
Hc'	Hydrostatic head on packer (corrected)	167.4	m
Hct'	Hydrostatic head on test midpoint (corrected)	181.6	m
ß	Inclination from horizontal	78	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	100	psi
Pnip	Net injection pressure at packer	102	psi
Ppmin	**Minimum packer inflation pressure**	**410**	psi
Ppmax	**Maximum packer inflation pressure**	**538**	psi
rb	Borehole radius	0.048	m
L	Length of test section	29.00	m
Lp	Length of discharge pipe	172.50	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	500	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	50	75	95	75	50
1	**0.114**	**0.189**	**0.189**	**0.038**	**0.038**
2	**0.076**	**0.114**	**0.114**	**0.038**	**0.000**
3	**0.076**	**0.000**	**0.076**	**0.038**	**0.038**
4	**0.076**	**0.114**	**0.114**	**0.076**	**0.000**
5	**0.000**	**0.076**	**0.114**	**0.038**	**0.076**
6	**0.114**	**0.076**	**0.076**	**0.038**	**0.076**
7	**0.076**	**0.076**	**0.114**	**0.038**	**0.000**
8	**0.076**	**0.114**	**0.076**	**0.038**	**0.076**
9	**0.038**	**0.076**	**0.076**	**0.038**	**0.000**
10	**0.038**	**0.076**	**0.114**	**0.038**	**0.076**
Q_P (lit/min)	0.06	0.09	0.11	0.04	0.04
Q_P (m^3/day)	0.09	0.13	0.15	0.1	0.1
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	36.71	54.32	68.40	54.32	36.71
K (m/day)	7.8E-05	7.6E-05	7.0E-05	3.5E-05	4.7E-05
K (m/sec)	9.0E-10	8.8E-10	8.1E-10	4.0E-10	**5.4E-10**
UL	0.0059	0.0058	0.0053	0.0026	0.0036
Sensitivity of K:		6.64E-06 (m/day)		7.68E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm^2 = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth to water in GT20-01 was not pre-measured before the packer test. The borehole was observed to hold water during televiewer testing. The depth of water in the hole was estimated to be near ground surface. Extremely low flows during testing, likley some leaks in system. Possibly, not a representative test.

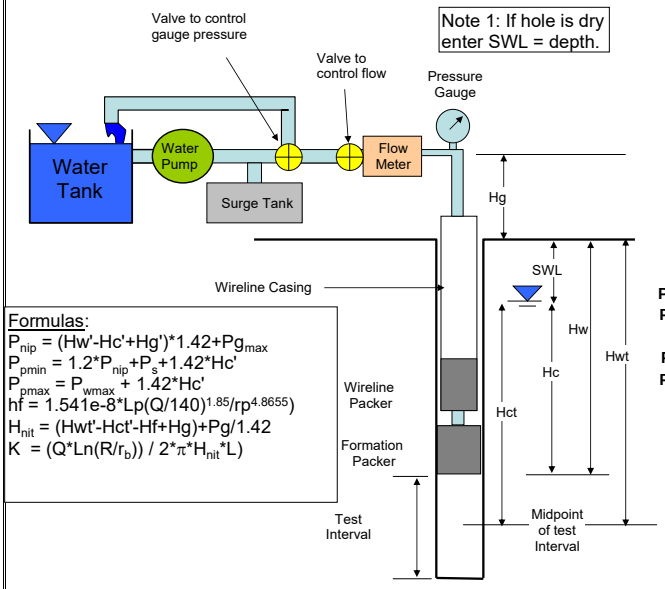
Interpreted Results

The Lugeon units pattern of GT20-01 Test 2 most closely resembles the Houlsby (1976) void filling type graph with some possible turbulent flows. Therefore, the final Lugeon unit value was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-02 Packer Test 1

Project:	4148- Manh Choh	**Depth of Test (m):**	133.00	to	150.00	**Hole Nº:**	GT20-02
Area:	South Pit	**Date:**	03-Dec-20	**Start:**	16:23	**Test Nº:**	1
Elevation (m):	976	**Height of "T" (m):**	1.5	**End:**	17:13	**Total Depth (m):**	150
Coordinates:	404840, 7007603	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	SH



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

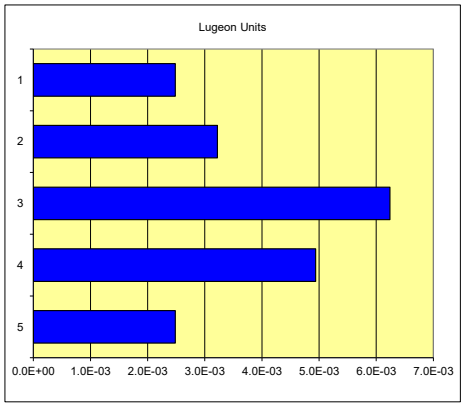
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

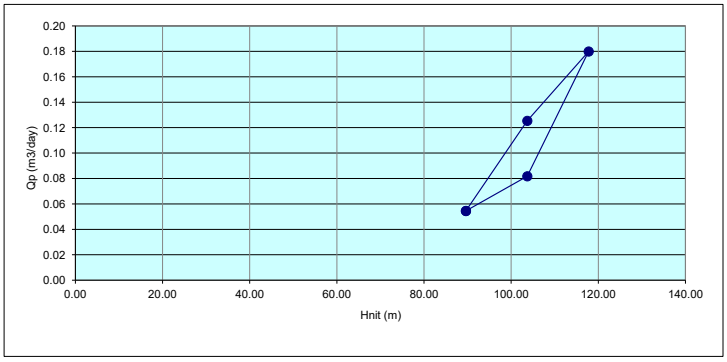
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	133.0	m
Hwt	Water column over test midpoint	141.5	m
SWL	Static water level (see note 1)	75.0	m
Hc	Hydrostatic head on packer	58.0	m
Hct	Hydrostatic head on test midpoint	66.5	m
Hw'	Water column over packer (corrected)	131.3	m
Hwt'	Water column over test midpoint (corrected)	139.6	m
SWL'	Static water level (corrected)	74.0	m
Hc'	Hydrostatic head on packer (corrected)	57.2	m
Hct'	Hydrostatic head on test midpoint (corrected)	65.6	m
ß	Inclination from horizontal	81	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	100	psi
Pnip	Net injection pressure at packer	207	psi
Ppmin	**Minimum packer inflation pressure**	**380**	psi
Ppmax	**Maximum packer inflation pressure**	**381**	psi
rb	Borehole radius	0.048	m
L	Length of test section	17.00	m
Lp	Length of discharge pipe	134.50	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	400	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	20	40	60	40	20
1	**0.000**	**0.114**	**0.151**	**0.151**	**0.038**
2	**0.000**	**0.038**	**0.114**	**0.076**	**0.038**
3	**0.000**	**0.038**	**0.000**	**0.114**	**0.038**
4	**0.000**	**0.038**	**0.114**	**0.076**	**0.038**
5	**0.038**	**0.038**	**0.151**	**0.114**	**0.038**
6	**0.000**	**0.076**	**0.114**	**0.076**	**0.038**
7	**0.000**	**0.038**	**0.189**	**0.076**	**0.038**
8	**0.000**	**0.076**	**0.076**	**0.114**	**0.038**
9	**0.000**	**0.076**	**0.227**	**0.076**	**0.038**
10	**0.038**	**0.038**	**0.114**	**0.000**	**0.038**
Q_P (lit/min)	0.04	0.06	0.12	0.09	0.04
Q_P (m^3/day)	0.05	0.08	0.18	0.1	0.1
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	89.60	103.69	117.77	103.69	89.60
K (m/day)	3.3E-05	4.2E-05	8.2E-05	6.5E-05	3.3E-05
K (m/sec)	**3.8E-10**	4.9E-10	9.5E-10	7.5E-10	**3.8E-10**
UL	0.0025	0.0032	0.0062	0.0049	0.0025
Sensitivity of K:		6.58E-06 (m/day)		7.61E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-02 was not pre-measured before the packer test. The driller reported the borehole had no return. The depth of water estimated based on televiewer survey.

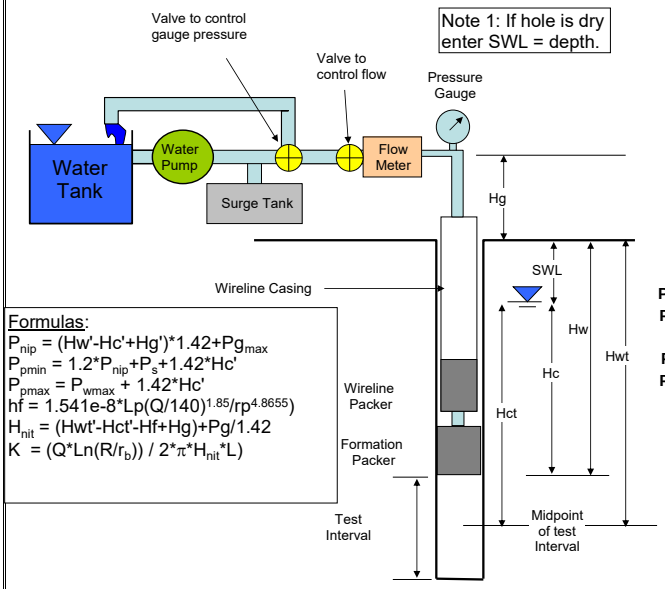
Interpreted Results

The Lugeon units pattern of GT20-02 Test 1 most closely resembles the Houlsby (1976) dilation flow type graph. Therefore, the lowest Lugeon unit value was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-02 Packer Test 2

Project:	4148- Manh Choh	**Depth of Test (m):**	111.00	to	150.00	**Hole Nº:**	GT20-02
Area:	South Pit	**Date:**	03-Dec-20	**Start:**	19:39	**Test Nº:**	2
Elevation (m):	976	**Height of "T" (m):**	1.5	**End:**	20:16	**Total Depth (m):**	150
Coordinates:	404840, 7007603	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	SH



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

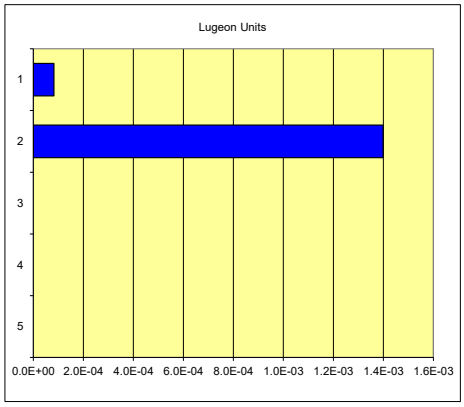
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

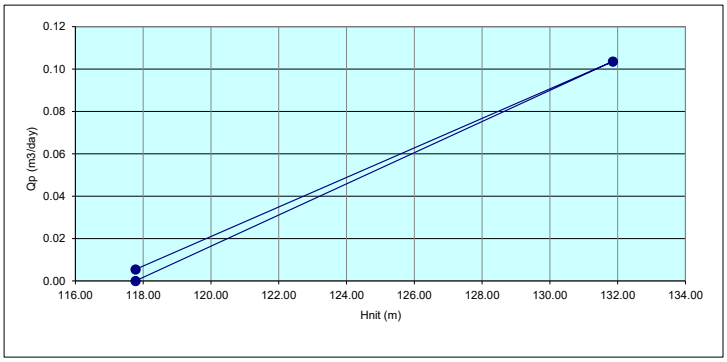
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	111.0	m
Hwt	Water column over test midpoint	130.5	m
SWL	Static water level (see note 1)	75.0	m
Hc	Hydrostatic head on packer	36.0	m
Hct	Hydrostatic head on test midpoint	55.5	m
Hw'	Water column over packer (corrected)	109.5	m
Hwt'	Water column over test midpoint (corrected)	128.8	m
SWL'	Static water level (corrected)	74.0	m
Hc'	Hydrostatic head on packer (corrected)	35.5	m
Hct'	Hydrostatic head on test midpoint (corrected)	54.8	m
ß	Inclination from horizontal	81	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	100	psi
Pnip	Net injection pressure at packer	207	psi
Ppmin	**Minimum packer inflation pressure**	**349**	psi
Ppmax	**Maximum packer inflation pressure**	**350**	psi
rb	Borehole radius	0.048	m
L	Length of test section	39.00	m
Lp	Length of discharge pipe	112.50	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	400	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	60	80	60	0	0
1	**0.000**	**0.303**	**0.000**		
2	**0.000**	**0.114**	**0.000**		
3	**0.000**	**0.114**	**0.000**		
4	**0.000**	**0.114**	**0.000**		
5	**0.000**	**0.076**	**0.000**		
6	**0.000**	**0.000**	**0.000**		
7	**0.000**	**0.000**	**0.000**		
8	**0.000**	**0.000**	**0.000**		
9	**0.000**	**0.000**	**0.000**		
10	**0.038**	**0.000**	**0.000**		
Q_P (lit/min)	0.00	0.07	0.00		
Q_P (m^3/day)	0.01	0.10	0.00		
Hf (m)	0.00	0.00	0.00		
Hnit (m)	117.77	131.85	117.77		
K (m/day)	1.1E-06	1.8E-05	0.0E+00		
K (m/sec)	1.3E-11	2.1E-10	0.0E+00		
UL	0.0001	0.0014	0.0000		
Sensitivity of K:			(m/day)		(m/sec)

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm^2 = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

Water leaking from the stuffing box after the drill rods were filled with water. The stuffing box/head assembly was then tightened up to halt leakage. The driller did not have the capacity increase pressure above 20 psi, leakage could not be fixed. Test abandoned.

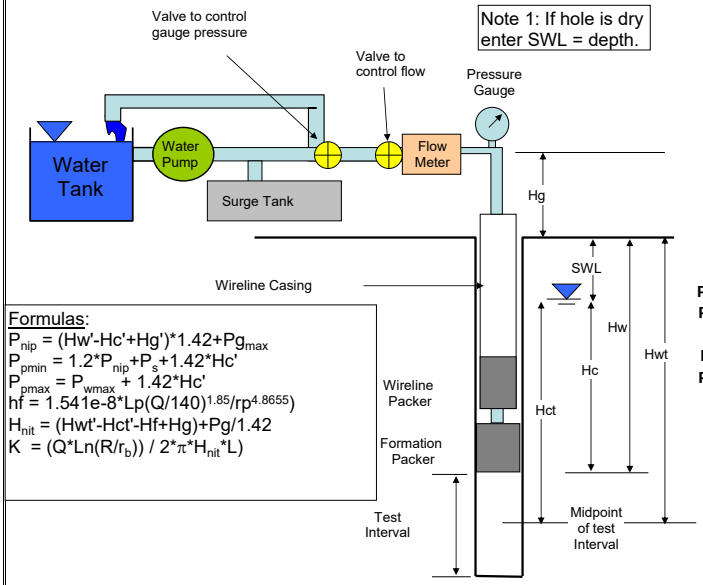
Interpreted Results

Leakage in system. Test could not be run for multiple intervals. Test abandoned.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-03 Packer Test 1

Project:	4148- Manh Choh	**Depth of Test (m):**	184.00	to	200.00	**Hole Nº:**	GT20-03
Area:	South Pit	**Date:**	04-Mar-21	**Start:**	21:36	**Test Nº:**	1
Elevation (m):	1,002	**Height of "T" (m):**	1.4	**End:**	22:26	**Total Depth (m):**	200
Coordinates:	404871, 7007393	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	TR



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

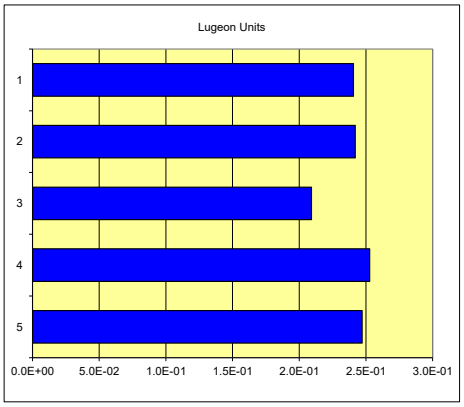
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

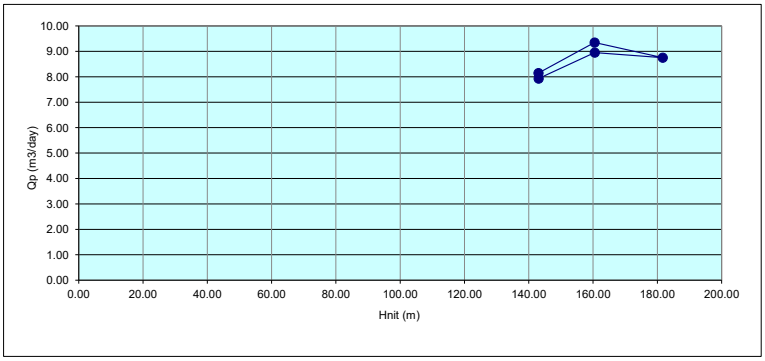
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.4	m
Hw	Water column over packer	184.0	m
Hwt	Water column over test midpoint	192.0	m
SWL	Static water level (see note 1)	100.0	m
Hc	Hydrostatic head on packer	84.0	m
Hct	Hydrostatic head on test midpoint	92.0	m
Hw'	Water column over packer (corrected)	183.7	m
Hwt'	Water column over test midpoint (corrected)	191.6	m
SWL'	Static water level (corrected)	99.8	m
Hc'	Hydrostatic head on packer (corrected)	83.8	m
Hct'	Hydrostatic head on test midpoint (corrected)	91.8	m
ß	Inclination from horizontal	86	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	115	psi
Pnip	Net injection pressure at packer	259	psi
Ppmin	**Minimum packer inflation pressure**	**480**	psi
Ppmax	**Maximum packer inflation pressure**	**419**	psi
rb	Borehole radius	0.048	m
L	Length of test section	16.00	m
Lp	Length of discharge pipe	185.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	450	psi

Time (min)	Q (lit/min)				
	P_g (psi) Low	P_g (psi) Medium	P_g (psi) High	P_g (psi) Medium	P_g (psi) Low
	60	85	115	85	60
1	**4.542**	**6.624**	**5.678**	**6.322**	**5.489**
2	**5.186**	**6.170**	**6.738**	**6.397**	**5.905**
3	**5.489**	**6.322**	**5.565**	**6.587**	**5.375**
4	**6.132**	**6.284**	**5.830**	**6.814**	**5.792**
5	**5.300**	**5.905**	**5.981**	**6.094**	**5.830**
6	**5.830**	**6.132**	**6.246**	**6.359**	**5.754**
7	**6.814**	**5.905**	**6.549**	**7.154**	**5.565**
8	**4.997**	**6.511**	**6.435**	**6.473**	**5.640**
9	**5.905**	**6.132**	**6.094**	**5.905**	**5.224**
10	**4.883**	**6.170**	**5.678**	**6.814**	**5.981**
Q_P (lit/min)	5.51	6.22	6.08	6.49	5.66
Q_P (m^3/day)	7.93	8.95	8.75	9.3	8.1
Hf (m)	0.45	0.56	0.54	0.61	0.47
Hnit (m)	143.02	160.51	181.66	160.46	142.99
K (m/day)	3.2E-03	3.2E-03	2.8E-03	3.3E-03	3.3E-03
K (m/sec)	**3.7E-08**	**3.7E-08**	**3.2E-08**	**3.9E-08**	**3.8E-08**
UL	0.2407	0.2420	0.2092	0.2529	0.2472
Sensitivity of K:		4.53E-06 (m/day)		5.24E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm^2 = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-03 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

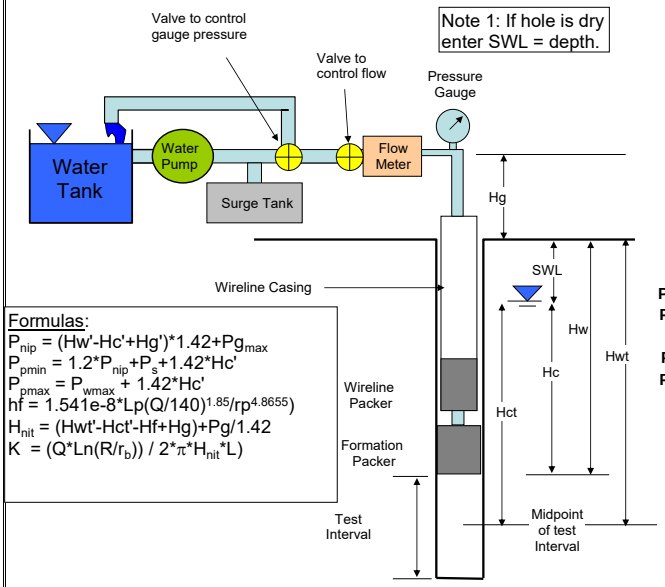
Interpreted Results

The Lugeon units pattern and flow vs. pressure pattern of GT20-03 Test 1 most closely resembles the Houlsby (1976) laminar flow where all Lugeon values are about equal. Therefore, the average of the five Lugeon units was used to estimate a representative hydraulic conductivity (K) of 3.6E-8 m/sec.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-03 Packer Test 2

Project:	4148- Manh Choh	**Depth of Test (m):**	155.00	to	200.00	**Hole Nº:**	GT20-03
Area:	South Pit	**Date:**	05-Mar-21	**Start:**	9:26	**Test Nº:**	2
Elevation (m):	1,002	**Height of "T" (m):**	1.4	**End:**	10:16	**Total Depth (m):**	200
Coordinates:	404871, 7007393	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	TR



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

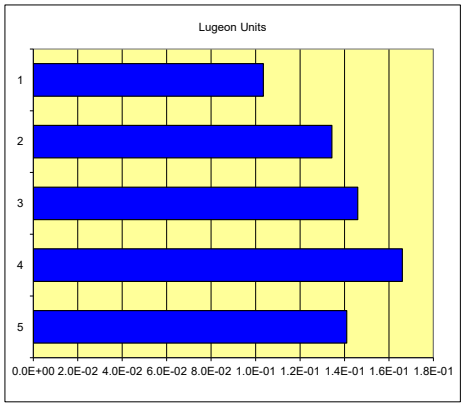
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

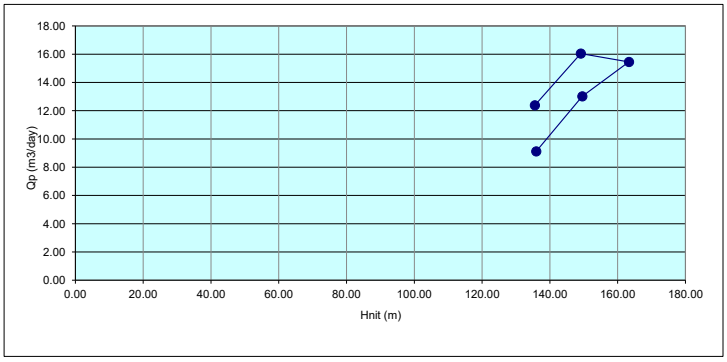
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.4	m
Hw	Water column over packer	155.0	m
Hwt	Water column over test midpoint	177.5	m
SWL	Static water level (see note 1)	100.0	m
Hc	Hydrostatic head on packer	55.0	m
Hct	Hydrostatic head on test midpoint	77.5	m
Hw'	Water column over packer (corrected)	154.7	m
Hwt'	Water column over test midpoint (corrected)	177.2	m
SWL'	Static water level (corrected)	99.8	m
Hc'	Hydrostatic head on packer (corrected)	54.9	m
Hct'	Hydrostatic head on test midpoint (corrected)	77.4	m
ß	Inclination from horizontal	86	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	90	psi
Pnip	Net injection pressure at packer	234	psi
Ppmin	**Minimum packer inflation pressure**	**408**	psi
Ppmax	**Maximum packer inflation pressure**	**378**	psi
rb	Borehole radius	0.048	m
L	Length of test section	45.00	m
Lp	Length of discharge pipe	156.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	400	psi

Time (min)	Q (lit/min)				
	P_g (psi) Low	P_g (psi) Medium	P_g (psi) High	P_g (psi) Medium	P_g (psi) Low
	50	70	90	70	50
1	~~49.702~~	**7.836**	**9.577**	**11.356**	**9.388**
2	~~45.614~~	**7.684**	**11.205**	**10.978**	**7.457**
3	~~44.592~~	**7.079**	**10.864**	**10.788**	**8.971**
4	~~41.677~~	**8.820**	**10.410**	**10.864**	**9.009**
5	~~46.333~~	**10.296**	**10.334**	**10.637**	**9.312**
6	~~28.201~~	**8.706**	**10.902**	**11.583**	**8.366**
7	**5.830**	**10.637**	**10.713**	**11.318**	**8.025**
8	**6.776**	**8.971**	**11.205**	**11.659**	**8.858**
9	**6.738**	**9.691**	**10.713**	**12.000**	**8.744**
10	**5.981**	**10.675**	**11.356**	**10.221**	**7.874**
Q_P (lit/min)	6.33	9.04	10.73	11.14	8.60
Q_P (m^3/day)	9.12	13.02	15.45	16.0	12.4
Hf (m)	0.49	0.94	1.30	1.39	0.86
Hnit (m)	135.93	149.56	163.29	149.12	135.56
K (m/day)	1.4E-03	1.8E-03	1.9E-03	2.2E-03	1.9E-03
K (m/sec)	1.6E-08	2.0E-08	**2.2E-08**	2.5E-08	2.1E-08
UL	0.1035	0.1343	0.1460	0.1660	0.1410
Sensitivity of K:		1.79E-06 (m/day)		2.07E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

Insuficient inflation pressure likely caused packer bypass during the initial part of the 50 psi test. Hence, the early time data was ignored. The depth of water estimated based on televiewer survey.

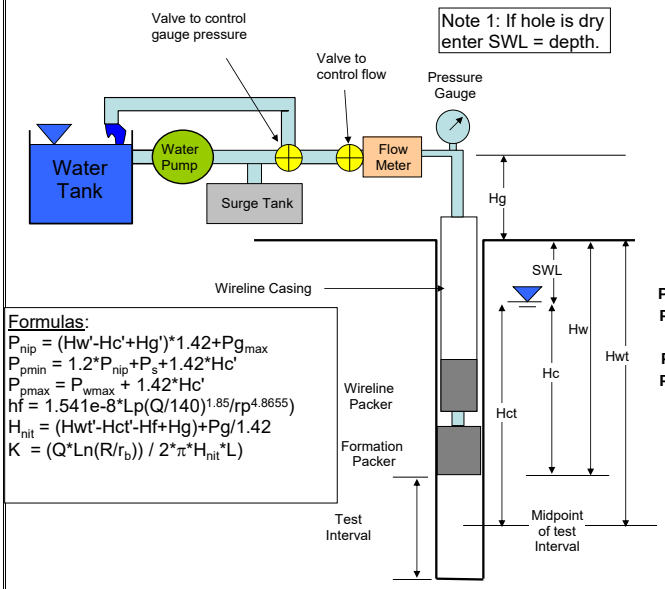
Interpreted Results

The Lugeon units pattern of GT20-03 Test 2 most closely resembles the Houlsby (1976) turbulent flow type graph where the lowest Lugeon value occurs at the highest pressure/flow. Therefore, the lowest Lugeon units was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-04 Packer Test 1

Project:	4148- Manh Choh	**Depth of Test (m):**	180.73	to	200.00	**Hole Nº:**	GT20-04
Area:	South Pit	**Date:**	28-Nov-20	**Start:**	5:24	**Test Nº:**	1
Elevation (m):	996	**Height of "T" (m):**	1.5	**End:**	6:15	**Total Depth (m):**	200
Coordinates:	404638, 7007345	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	SH



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

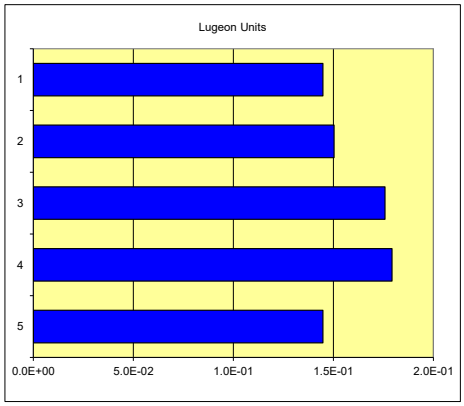
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

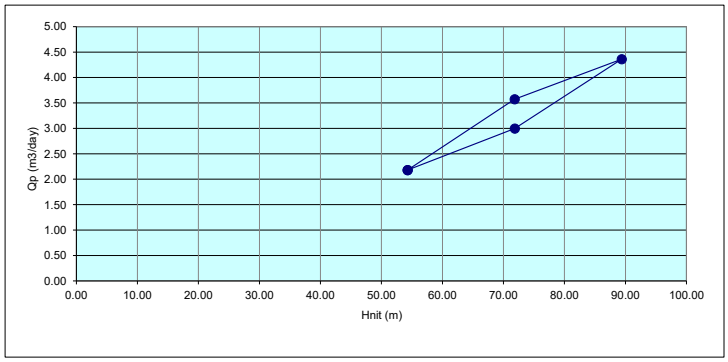
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	180.7	m
Hwt	Water column over test midpoint	190.4	m
SWL	Static water level (see note 1)	0.0	m
Hc	Hydrostatic head on packer	180.7	m
Hct	Hydrostatic head on test midpoint	190.4	m
Hw'	Water column over packer (corrected)	172.3	m
Hwt'	Water column over test midpoint (corrected)	181.5	m
SWL'	Static water level (corrected)	0.0	m
Hc'	Hydrostatic head on packer (corrected)	172.3	m
Hct'	Hydrostatic head on test midpoint (corrected)	181.5	m
ß	Inclination from horizontal	72	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	100	psi
Pnip	Net injection pressure at packer	102	psi
Ppmin	**Minimum packer inflation pressure**	**417**	psi
Ppmax	**Maximum packer inflation pressure**	**545**	psi
rb	Borehole radius	0.048	m
L	Length of test section	19.27	m
Lp	Length of discharge pipe	182.23	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	500	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	75	100	125	100	75
1		**1.893**	**2.650**	**3.028**	**1.514**
2	**1.136**	**1.136**	**2.271**	**2.271**	**1.893**
3	**1.514**	**1.893**	**2.650**	**2.650**	**1.514**
4	**1.893**	**1.514**	**2.271**	**2.650**	**1.514**
5	**1.893**	**2.650**	**2.271**	**2.650**	**1.893**
6	**1.136**	**2.650**	**3.407**	**1.893**	**1.136**
7	**1.514**	**2.271**	**4.164**	**3.028**	**1.514**
8	**1.514**	**2.650**	**3.407**	**2.271**	**1.514**
9	**1.514**	**1.893**	**3.785**	**3.028**	**1.136**
10	**1.514**	**2.271**	**3.407**	**1.893**	**1.514**
Q_P (lit/min)	1.51	2.08	3.03	2.48	1.51
Q_P (m^3/day)	2.18	3.00	4.36	3.6	2.2
Hf (m)	0.04	0.07	0.15	0.10	0.04
Hnit (m)	54.28	71.85	89.38	71.82	54.28
K (m/day)	1.9E-03	2.0E-03	2.3E-03	2.4E-03	1.9E-03
K (m/sec)	**2.2E-08**	**2.3E-08**	**2.7E-08**	**2.7E-08**	**2.2E-08**
UL	0.14	0.15	0.18	0.18	0.14
Sensitivity of K:		7.64E-06 (m/day)		8.85E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The depth of water in GT20-04 was not pre-measured before the packer test. The borehole was observed to hold water during televiewer testing.

The depth of water was assumed to be near ground surface. The last 50-100 ft during drilling had some loss

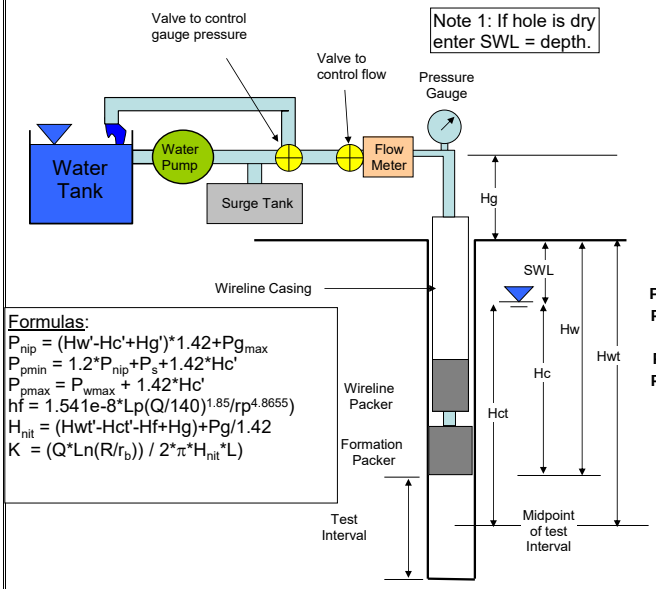
Interpreted Results

The Lugeon units pattern of GT20-04 Test 1 most closely resembles the Houlsby (1976) laminar type graph where all Lugeon unit are roughly equal. Therefore, the average Lugeon unit was used to estimate a representative hydraulic conductivity (K) of 2.4E-8 m/sec.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-04 Packer Test 2

Project:	4148- Manh Choh	**Depth of Test (m):**	165.49	to	200.00	**Hole Nº:**	GT20-04
Area:	South Pit	**Date:**	28-Nov-20	**Start:**	8:07	**Test Nº:**	2
Elevation (m):	996	**Height of "T" (m):**	1.5	**End:**	8:37	**Total Depth (m):**	200
Coordinates:	404638, 7007345	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	SH



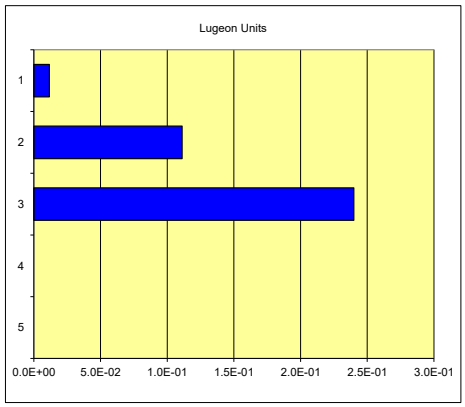
Note 1: If hole is dry enter SWL = depth.

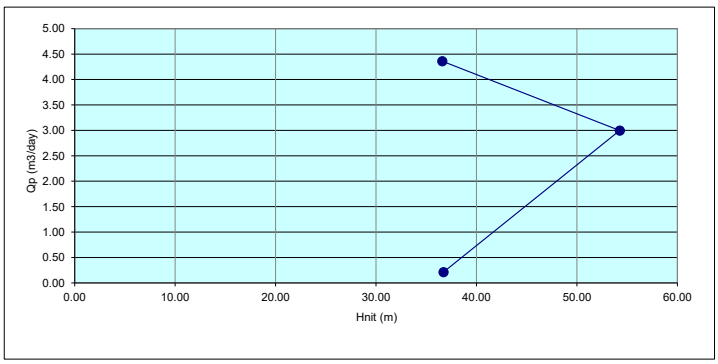
Formulas:
$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$
$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$
$P_{pmax} = P_{wmax} + 1.42*Hc'$
$hf = 1.541e-8*Lp(Q/140)^{1.85}/rp^{4.8655})$
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.5	m
Hw	Water column over packer	165.5	m
Hwt	Water column over test midpoint	182.7	m
SWL	Static water level (see note 1)	0.0	m
Hc	Hydrostatic head on packer	165.5	m
Hct	Hydrostatic head on test midpoint	182.7	m
Hw'	Water column over packer (corrected)	157.8	m
Hwt'	Water column over test midpoint (corrected)	174.3	m
SWL'	Static water level (corrected)	0.0	m
Hc'	Hydrostatic head on packer (corrected)	157.8	m
Hct'	Hydrostatic head on test midpoint (corrected)	174.3	m
ß	Inclination from horizontal	72	º
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	60	psi
Pnip	Net injection pressure at packer	62	psi
Ppmin	**Minimum packer inflation pressure**	**349**	psi
Ppmax	**Maximum packer inflation pressure**	**524**	psi
rb	Borehole radius	0.048	m
L	Length of test section	34.51	m
Lp	Length of discharge pipe	166.99	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	500	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) High**	**P_g (psi) Low**	**P_g (psi)**	**P_g (psi)**
	50	75	50	0	0
1	**0.151**	**1.893**	**2.650**		
2	**0.114**	**1.136**	**2.271**		
3	**0.189**	**1.893**	**2.650**		
4	**0.151**	**1.514**	**2.271**		
5	**0.151**	**2.650**	**2.271**		
6	**0.151**	**2.650**	**3.407**		
7	**0.114**	**2.271**	**4.164**		
8	**0.265**	**2.650**	**3.407**		
9	**0.038**	**1.893**	**3.785**		
10	**0.151**	**2.271**	**3.407**		
Q_P (lit/min)	0.15	2.08	3.03		
Q_P (m^3/day)	0.21	3.00	4.36		
Hf (m)	0.00	0.07	0.13		
Hnit (m)	36.71	54.25	36.58		
K (m/day)	1.5E-04	1.5E-03	3.2E-03		
K (m/sec)	**1.8E-09**	**1.7E-08**	**3.7E-08**		
UL	0.01	0.11	0.24		
Sensitivity of K:		7.03E-06 (m/day)		8.14E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm^2 = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-04 was not pre-measured before the packer test. The borehole was observed to hold water during televiewer testing. The depth of water was assumed to be at the ground surface. A leak occured in the packer system which resulted in the packer not holding inflation pressure and the tank ran out of nitrogen. Therefore, the packer test ended early.

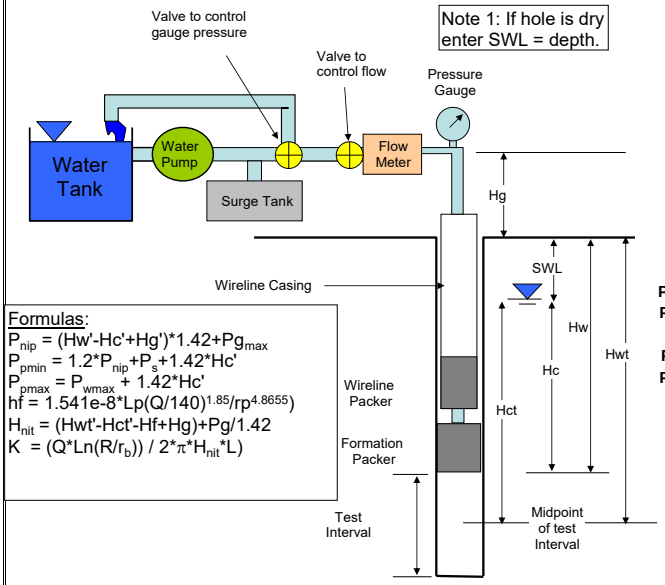
Interpreted Results

It is difficult to establish the Lugeon units pattern of GT20-04 Test 2 given the Houlsby (1976) type graphs and a partial test. Therefore, the average Lugeon unit was used to estimate a representative hydraulic conductivity (K) of 1.8E-08 m/sec

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-05 Packer Test 1

Project:	4148	**Depth of Test (m):**	137.00	to	150.00	**Hole Nº:**	GT20-05
Area:	South Pit	**Date:**	09-Mar-21	**Start:**	16:38	**Test Nº:**	1
Elevation (m):	953.13	**Height of "T" (m):**	1.4	**End:**	17:28	**Total Depth (m):**	150
Coordinates:	404453, 7007466	**Lithology:**	Mica Quartz Schist/Sulphide			**Engineer:**	TR



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

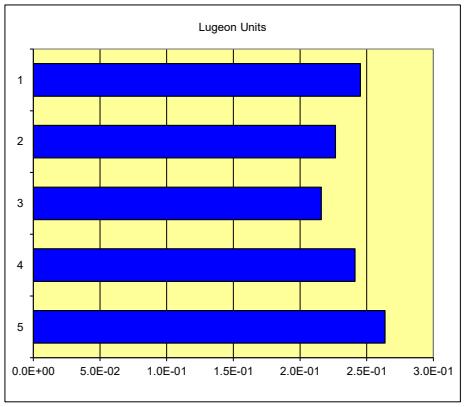
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

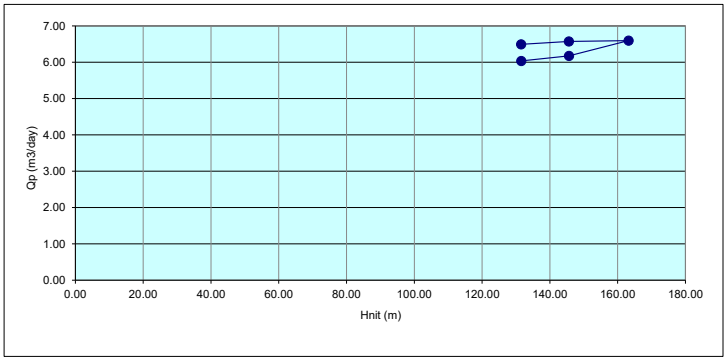
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.4	m
Hw	Water column over packer	137.0	m
Hwt	Water column over test midpoint	143.5	m
SWL	Static water level (see note 1)	100.0	m
Hc	Hydrostatic head on packer	37.0	m
Hct	Hydrostatic head on test midpoint	43.5	m
Hw'	Water column over packer (corrected)	135.1	m
Hwt'	Water column over test midpoint (corrected)	141.5	m
SWL'	Static water level (corrected)	98.6	m
Hc'	Hydrostatic head on packer (corrected)	36.5	m
Hct'	Hydrostatic head on test midpoint (corrected)	42.9	m
ß	Inclination from horizontal	81	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	90	psi
Pnip	Net injection pressure at packer	232	psi
Ppmin	**Minimum packer inflation pressure**	**380**	psi
Ppmax	**Maximum packer inflation pressure**	**352**	psi
rb	Borehole radius	0.048	m
L	Length of test section	13.00	m
Lp	Length of discharge pipe	138.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	400	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	45	65	90	65	45
1	~~10.031~~	**3.899**	**4.505**	**4.353**	**4.580**
2	~~10.258~~	**4.088**	**4.088**	**4.202**	**4.353**
3	~~10.107~~	**4.240**	**4.656**	**4.656**	**4.353**
4	~~9.199~~	**4.391**	**4.694**	**3.975**	**4.580**
5	~~8.366~~	**4.278**	**4.126**	**4.694**	**4.391**
6	~~5.224~~	**4.467**	**4.353**	**4.732**	**4.505**
7	**4.618**	**4.278**	**4.467**	**5.072**	**4.618**
8	**4.202**	**4.315**	**4.618**	**4.656**	**4.429**
9	**3.710**	**4.164**	**5.224**	**4.391**	**4.542**
10	**4.240**	**4.770**	**5.072**	**4.921**	**4.732**
Q_P (lit/min)	4.19	4.29	4.58	4.57	4.51
Q_P (m^3/day)	6.04	6.18	6.60	6.6	6.5
Hf (m)	0.20	0.21	0.24	0.24	0.23
Hnit (m)	131.52	145.60	163.17	145.57	131.49
K (m/day)	3.2E-03	3.0E-03	2.8E-03	3.2E-03	3.5E-03
K (m/sec)	3.7E-08	3.5E-08	**3.3E-08**	3.7E-08	4.0E-08
UL	0.245	0.227	0.216	0.241	0.264
Sensitivity of K:		6.21E-06 (m/day)		7.18E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

Insuficient inflation pressure likely caused packer bypass during the initial part of the 50 psi test. Hence, the early time data was ignored. The depth of water estimated based on televiewer survey.

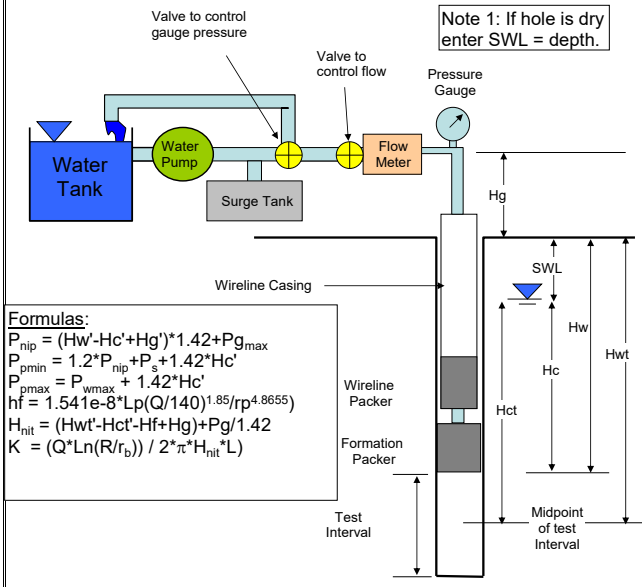
Interpreted Results

The Lugeon units pattern of GT20-05 Test 1 most closely resembles the turbulent flow type graph where the lowest Lugeon value occurs at the highest pressure. Therefore, the lowestLugeon unit was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-05 Packer Test 2

Project:	4148	**Depth of Test (m):**	119.00	to	150.00	**Hole Nº:**	GT20-05
Area:	South Pit	**Date:**	09-Mar-21	**Start:**	19:52	**Test Nº:**	2
Elevation (m):	953.13	**Height of "T" (m):**	1.4	**End:**	20:42	**Total Depth (m):**	150
Coordinates:	404453, 7007466	**Lithology:**	Mica Quartz Schist/Sulphide			**Engineer:**	TR



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

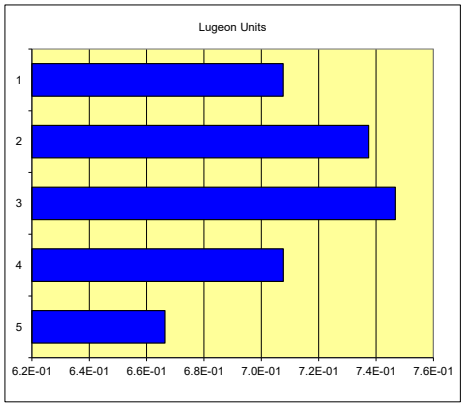
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

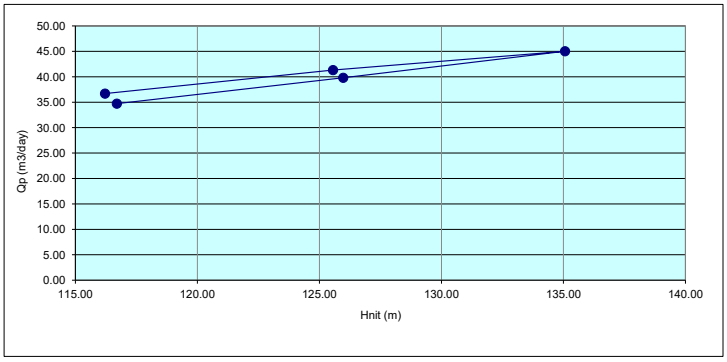
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.4	m
Hw	Water column over packer	119.0	m
Hwt	Water column over test midpoint	134.5	m
SWL	Static water level (see note 1)	100.0	m
Hc	Hydrostatic head on packer	19.0	m
Hct	Hydrostatic head on test midpoint	34.5	m
Hw'	Water column over packer (corrected)	117.4	m
Hwt'	Water column over test midpoint (corrected)	132.7	m
SWL'	Static water level (corrected)	98.6	m
Hc'	Hydrostatic head on packer (corrected)	18.7	m
Hct'	Hydrostatic head on test midpoint (corrected)	34.0	m
ß	Inclination from horizontal	81	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	90	psi
Pnip	Net injection pressure at packer	232	psi
Ppmin	**Minimum packer inflation pressure**	**355**	psi
Ppmax	**Maximum packer inflation pressure**	**327**	psi
rb	Borehole radius	0.048	m
L	Length of test section	31.00	m
Lp	Length of discharge pipe	120.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	400	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	30	45	60	45	30
1	**23.390**	~~33.838~~	**33.497**	**27.758**	**22.190**
2	**27.278**	**28.754**	**31.638**	**28.224**	**25.090**
3	**25.616**	**28.727**	**29.602**	**27.554**	**24.253**
4	**25.786**	**29.159**	**32.838**	**27.493**	**24.806**
5	**26.104**	**29.678**	**30.775**	**27.974**	**23.178**
6	**26.524**	**28.148**	**30.499**	**27.103**	**24.302**
7	**24.673**	**27.054**	**31.237**	**27.781**	**25.347**
8	**25.286**	**29.802**	**30.696**	**29.424**	**23.015**
9	**25.245**	**28.296**	**30.033**	**26.176**	**24.450**
10	**25.014**	**28.697**	**31.820**	**26.873**	**24.439**
Q_P (lit/min)	25.49	28.70	31.26	27.64	24.11
Q_P (m^3/day)	36.71	41.33	45.02	39.8	34.7
Hf (m)	4.95	6.17	7.22	5.75	4.47
Hnit (m)	116.21	125.55	135.06	125.97	116.69
K (m/day)	9.3E-03	9.7E-03	9.8E-03	9.3E-03	8.8E-03
K (m/sec)	1.1E-07	1.1E-07	1.1E-07	1.1E-07	**1.0E-07**
UL	0.708	0.737	0.747	0.708	0.666
Sensitivity of K:		3.14E-06 (m/day)		3.64E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The depth of water in GT20-05 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

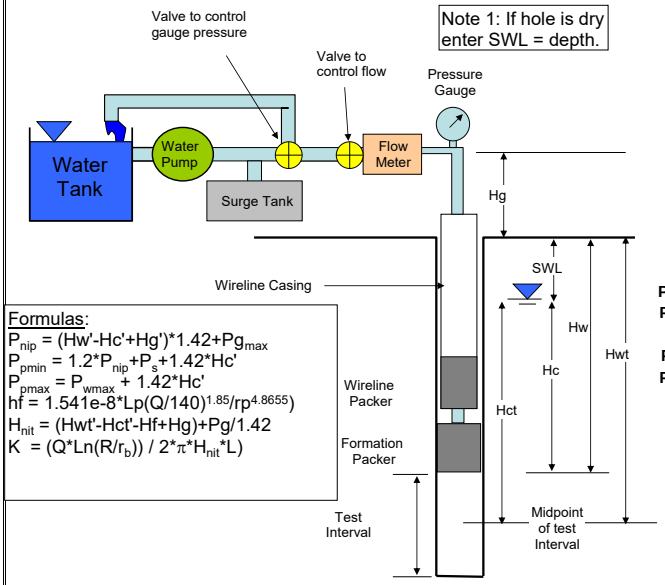
Interpreted Results

The Lugeon units pattern of GT20-05 Test 2 most closely resembles the dilation type graph where the highest Lugeon unit value occurs at the highest test pressure. Therefore, the lowest Lugeon unit was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-06 Packer Test 1

Project:	4148	**Depth of Test (m):**	109.00	to	125.00	**Hole Nº:**	GT20-06
Area:	North Pit	**Date:**	12-Mar-21	**Start:**	23:48	**Test Nº:**	1
Elevation (m):	968.55	**Height of "T" (m):**	1.40	**End:**	0:38	**Total Depth (m):**	125
Coordinates:	404663.4, 7008002	**Lithology:**	Calcareous Schist/Sulphide			**Engineer:**	TR



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

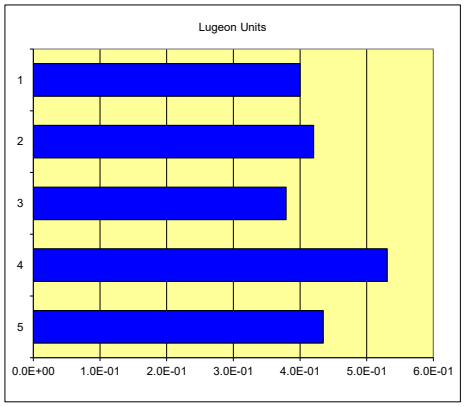
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

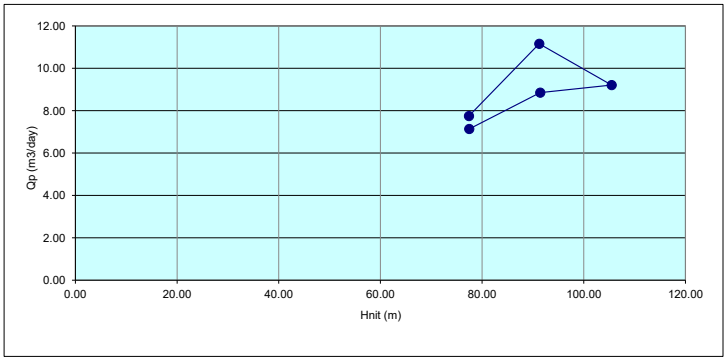
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.4	m
Hw	Water column over packer	109.0	m
Hwt	Water column over test midpoint	117.0	m
SWL	Static water level (see note 1)	50.0	m
Hc	Hydrostatic head on packer	59.0	m
Hct	Hydrostatic head on test midpoint	67.0	m
Hw'	Water column over packer (corrected)	104.8	m
Hwt'	Water column over test midpoint (corrected)	112.5	m
SWL'	Static water level (corrected)	48.1	m
Hc'	Hydrostatic head on packer (corrected)	56.7	m
Hct'	Hydrostatic head on test midpoint (corrected)	64.4	m
ß	Inclination from horizontal	74	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	150	psi
Ppmin	**Minimum packer inflation pressure**	**311**	psi
Ppmax	**Maximum packer inflation pressure**	**381**	psi
rb	Borehole radius	0.048	m
L	Length of test section	16.00	m
Lp	Length of discharge pipe	110.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	350	psi

Time (min)	Q (lit/min)				
	P_g (psi) Low	P_g (psi) Medium	P_g (psi) High	P_g (psi) Medium	P_g (psi) Low
	40	60	80	60	40
1	**3.710**	**6.889**	**5.640**	**7.684**	**5.754**
2	**4.240**	**5.527**	**5.148**	**7.911**	**5.716**
3	**5.110**	**5.451**	**6.132**	**7.722**	**5.489**
4	**5.110**	**5.792**	**6.662**	**7.949**	**5.413**
5	**4.845**	**6.208**	**6.246**	**7.798**	**5.300**
6	**4.883**	**6.208**	**6.700**	**7.874**	**5.413**
7	**5.072**	**6.322**	**6.624**	**7.836**	**5.224**
8	**5.224**	**6.170**	**6.549**	**7.571**	**5.375**
9	**5.640**	**6.322**	**6.587**	**7.419**	**5.072**
10	**5.716**	**6.587**	**7.684**	**7.722**	**5.072**
Q_P (lit/min)	4.96	6.15	6.40	7.75	5.38
Q_P (m^3/day)	7.14	8.85	9.21	11.2	7.8
Hf (m)	0.22	0.33	0.35	0.50	0.26
Hnit (m)	77.44	91.41	105.47	91.24	77.40
K (m/day)	5.3E-03	5.5E-03	5.0E-03	7.0E-03	5.7E-03
K (m/sec)	**6.1E-08**	**6.4E-08**	**5.8E-08**	**8.1E-08**	**6.6E-08**
UL	0.40	0.42	0.38	0.53	0.43
Sensitivity of K:		7.80E-06 (m/day)		9.03E-11 (cm/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The driller estimated water at ~50 m downhole. Test is completed with no issues. Second interval of packer testing was not completed due to flow bypassing the packers after extensive troubleshooting.

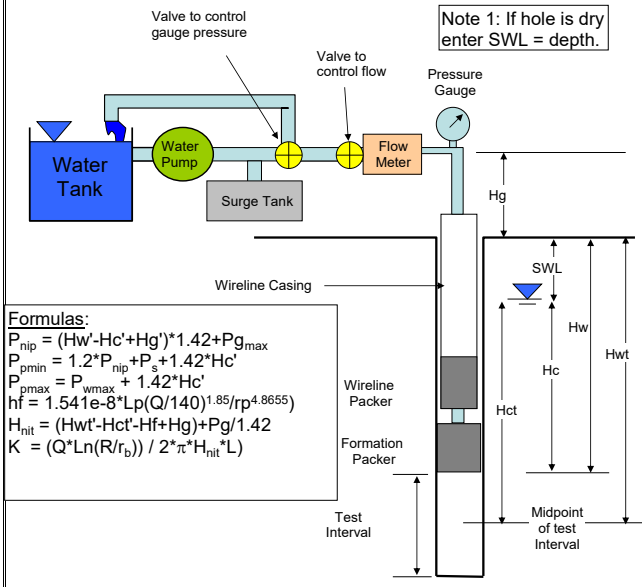
Interpreted Results

The Lugeon units pattern of GT20-06 Test 1 most closely resembles the Houlsby (1976) laminar flow (Group A) type graph where the Lugeon unit values are relatively consistent. Therefore, the average Lugeon unit was used to estimate a representative hydraulic conductivity (K) of 6.6E-8 m/sec.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-07 Packer Test 1

Project:	4148	**Depth of Test (m):**	99.00	to	124.97	**Hole Nº:**	GT20-07
Area:	North Pit	**Date:**	16-Mar-21	**Start:**	13:35	**Test Nº:**	1
Elevation (m):	985.31	**Height of "T" (m):**	1.7	**End:**	14:25	**Total Depth (m):**	124.97
Coordinates:	404839, 7008055	**Lithology:**	Mica Quartz Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

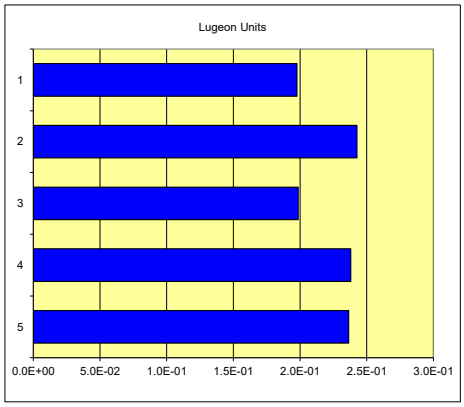
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

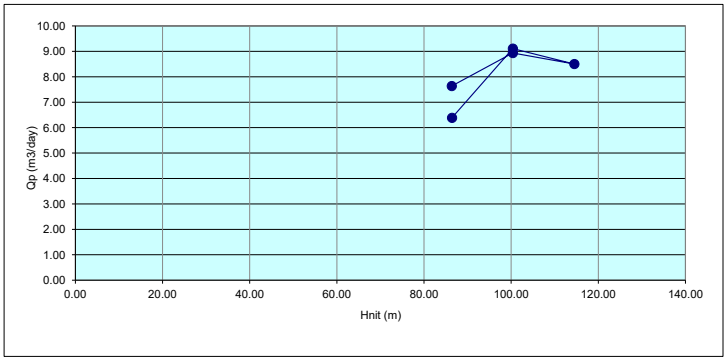
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.7	m
Hw	Water column over packer	99.0	m
Hwt	Water column over test midpoint	112.0	m
SWL	Static water level (see note 1)	57.3	m
Hc	Hydrostatic head on packer	41.7	m
Hct	Hydrostatic head on test midpoint	54.7	m
Hw'	Water column over packer (corrected)	98.0	m
Hwt'	Water column over test midpoint (corrected)	110.9	m
SWL'	Static water level (corrected)	56.7	m
Hc'	Hydrostatic head on packer (corrected)	41.3	m
Hct'	Hydrostatic head on test midpoint (corrected)	54.1	m
ß	Inclination from horizontal	82	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	163	psi
Ppmin	**Minimum packer inflation pressure**	**304**	psi
Ppmax	**Maximum packer inflation pressure**	**359**	psi
rb	Borehole radius	0.048	m
L	Length of test section	25.97	m
Lp	Length of discharge pipe	100.72	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	335	psi

Time (min)	Q (lit/min)				
	P_g (psi) Low	P_g (psi) Medium	P_g (psi) High	P_g (psi) Medium	P_g (psi) Low
	40	60	80	60	40
1	**1.211**	**7.911**	**7.457**	**6.927**	**6.852**
2	**2.461**	**5.640**	**4.429**	**6.246**	**3.407**
3	**3.899**	**5.867**	**4.732**	**6.662**	**5.830**
4	**4.013**	**4.618**	**5.867**	**6.057**	**5.148**
5	**4.505**	**6.738**	**5.489**	**2.915**	**5.640**
6	**4.542**	**5.943**	**5.830**	**6.435**	**6.019**
7	**3.823**	**7.230**	**7.003**	**8.290**	**5.716**
8	**5.375**	**5.905**	**5.300**	**6.094**	**5.072**
9	**3.672**	**6.473**	**6.587**	**4.883**	**4.088**
10	**4.770**	**6.927**	**6.359**	**7.533**	**5.262**
Q_P (lit/min)	4.44	6.33	5.91	6.20	5.30
Q_P (m^3/day)	6.39	9.11	8.50	8.9	7.6
Hf (m)	0.16	0.31	0.28	0.30	0.23
Hnit (m)	86.43	100.36	114.48	100.37	86.36
K (m/day)	2.6E-03	3.2E-03	2.6E-03	3.1E-03	3.1E-03
K (m/sec)	**3.0E-08**	**3.7E-08**	**3.0E-08**	**3.6E-08**	**3.6E-08**
UL	0.20	0.24	0.20	0.24	0.24
Sensitivity of K:		4.43E-06 (m/day)		5.13E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The depth of water in GT20-07 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

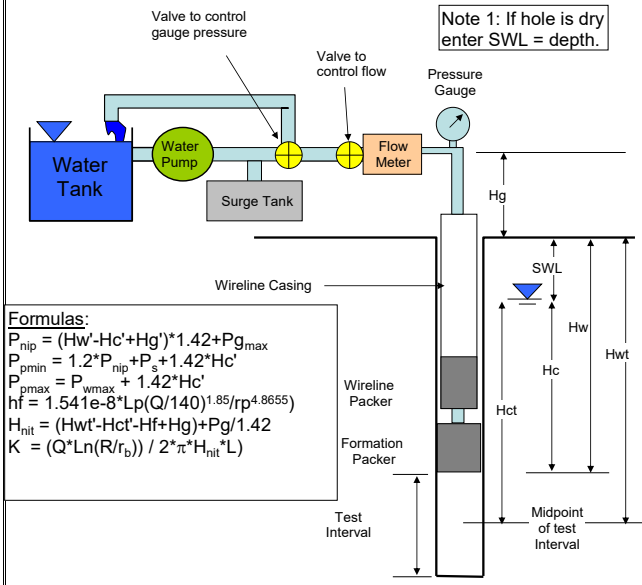
Interpreted Results

The Lugeon units pattern of GT20-07 Test 1 most closely resembles the Houlsby (1976) laminar flow type graph where all the Lugeon units are about equal. Therefore, the average of the five Lugeon units was used to estimate a representative hydraulic conductivity (K) of 3.4E-8 m/sec.

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-07 Packer Test 2

Project:	4148	**Depth of Test (m):**	91.44	to	124.97	**Hole Nº:**	GT20-07
Area:	North Pit	**Date:**	16-Mar-21	**Start:**	15:18	**Test Nº:**	2
Elevation (m):	985.31	**Height of "T" (m):**	1.7	**End:**	16:07	**Total Depth (m):**	124.97
Coordinates:	404839, 7008055	**Lithology:**	Quartzite-Mica Quartz Schist/Sulphi			**Engineer:**	BG



Note 1: If hole is dry enter SWL = depth.

Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

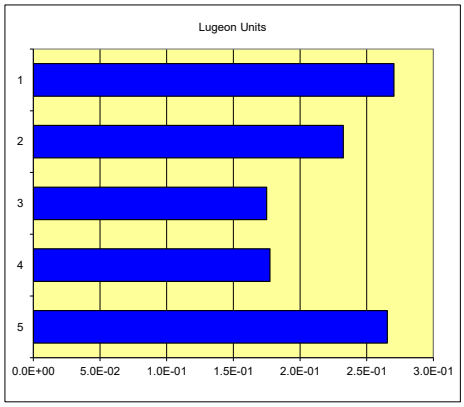
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

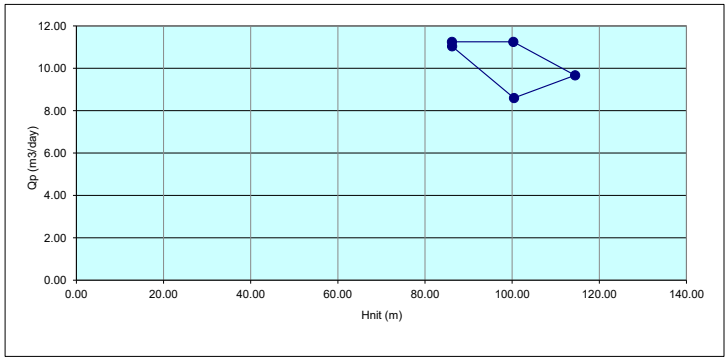
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.7	m
Hw	Water column over packer	91.4	m
Hwt	Water column over test midpoint	108.2	m
SWL	Static water level (see note 1)	57.3	m
Hc	Hydrostatic head on packer	34.1	m
Hct	Hydrostatic head on test midpoint	50.9	m
Hw'	Water column over packer (corrected)	90.5	m
Hwt'	Water column over test midpoint (corrected)	107.1	m
SWL'	Static water level (corrected)	56.7	m
Hc'	Hydrostatic head on packer (corrected)	33.8	m
Hct'	Hydrostatic head on test midpoint (corrected)	50.4	m
ß	Inclination from horizontal	82	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	163	psi
Ppmin	**Minimum packer inflation pressure**	**294**	psi
Ppmax	**Maximum packer inflation pressure**	**348**	psi
rb	Borehole radius	0.048	m
L	Length of test section	33.53	m
Lp	Length of discharge pipe	93.16	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	5	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**8.328**	**12.908**	**9.085**	**5.337**	**6.359**
2	**6.624**	**4.505**	**6.700**	**7.117**	**7.192**
3	**7.722**	**8.176**	**7.268**	**6.284**	**7.798**
4	**7.268**	**11.356**	**6.662**	**5.640**	**8.252**
5	**8.214**	**3.861**	**7.154**	**5.451**	**6.776**
6	**5.602**	**6.624**	**5.262**	**6.094**	**8.669**
7	**8.820**	**6.473**	**5.981**	**6.208**	**8.139**
8	**7.874**	**4.429**	**6.397**	**5.943**	**8.517**
9	**9.539**	**12.757**	**6.587**	**5.792**	**7.571**
10	**8.139**	**7.041**	**6.057**	**5.867**	**7.419**
Q_P (lit/min)	7.81	7.81	6.72	5.97	7.67
Q_P (m^3/day)	11.25	11.25	9.67	8.6	11.0
Hf (m)	0.43	0.43	0.32	0.26	0.42
Hnit (m)	86.16	100.24	114.43	100.41	86.17
K (m/day)	2.9E-03	2.5E-03	1.9E-03	1.9E-03	2.8E-03
K (m/sec)	3.3E-08	2.9E-08	**2.2E-08**	2.2E-08	3.3E-08
UL	0.27	0.23	0.18	0.18	0.27
Sensitivity of K:		2.78E-06 (m/day)		3.21E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-07 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

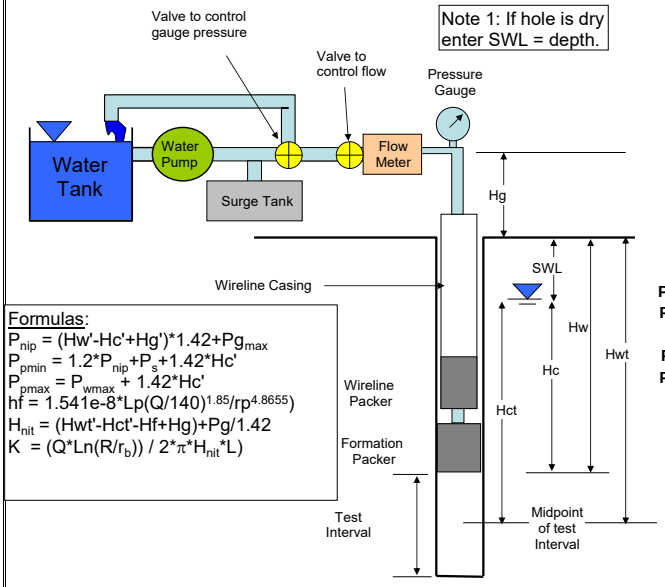
Interpreted Results

The Lugeon units pattern of GT20-07 Test 2 most closely resembles the Houlsby (1976) turbulent flow type graph where the lowest Lugeon unit value occurs at the highest pressure. Therefore, the Lugeon unit occuring at the highest pressure was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-08 Packer Test 1

Project:	4148	**Depth of Test (m):**	100.00	to	115.00	**Hole Nº:**	GT20-08
Area:	North Pit	**Date:**	22-Mar-21	**Start:**	1:52	**Test Nº:**	1
Elevation (m):	968.91	**Height of "T" (m):**	2.1	**End:**	2:40	**Total Depth (m):**	115
Coordinates:	404963, 7007957	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	BG



Note 1: If hole is dry enter SWL = depth.

Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

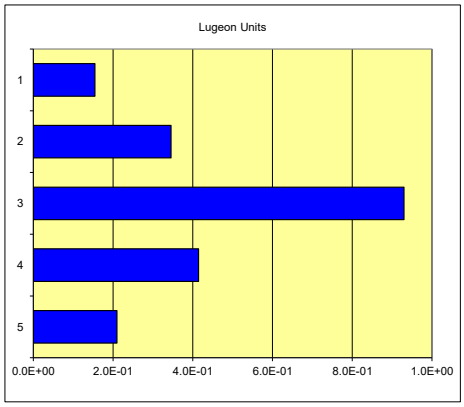
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

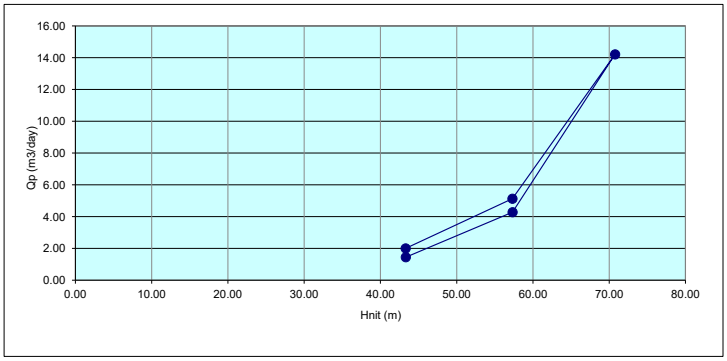
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	2.1	m
Hw	Water column over packer	100.0	m
Hwt	Water column over test midpoint	107.5	m
SWL	Static water level (see note 1)	13.1	m
Hc	Hydrostatic head on packer	86.9	m
Hct	Hydrostatic head on test midpoint	94.4	m
Hw'	Water column over packer (corrected)	99.6	m
Hwt'	Water column over test midpoint (corrected)	107.1	m
SWL'	Static water level (corrected)	13.1	m
Hc'	Hydrostatic head on packer (corrected)	86.6	m
Hct'	Hydrostatic head on test midpoint (corrected)	94.0	m
ß	Inclination from horizontal	85	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	101	psi
Ppmin	**Minimum packer inflation pressure**	**295**	psi
Ppmax	**Maximum packer inflation pressure**	**423**	psi
rb	Borehole radius	0.048	m
L	Length of test section	15.00	m
Lp	Length of discharge pipe	102.08	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**1.173**	**3.483**	**8.479**	**4.921**	**1.476**
2	**0.871**	**2.839**	**10.069**	**4.088**	**1.779**
3	**1.476**	**2.725**	**11.016**	**3.596**	**1.173**
4	**0.492**	**2.725**	**9.464**	**2.953**	**0.379**
5	**0.416**	**3.104**	**10.372**	**3.634**	**1.666**
6	**1.060**	**3.369**	**10.031**	**2.801**	**0.946**
7	**0.984**	**2.915**	**10.486**	**4.240**	**1.666**
8	**1.590**	**2.574**	**8.593**	**2.763**	**1.779**
9	**1.249**	**2.990**	**10.107**	**3.672**	**1.438**
10	**0.719**	**2.990**	**10.069**	**2.953**	**1.325**
Q_P (lit/min)	1.00	2.97	9.87	3.56	1.36
Q_P (m^3/day)	1.44	4.28	14.21	5.1	2.0
Hf (m)	0.01	0.08	0.73	0.11	0.02
Hnit (m)	43.31	57.32	70.76	57.29	43.30
K (m/day)	2.0E-03	4.5E-03	1.2E-02	5.5E-03	2.8E-03
K (m/sec)	**2.4E-08**	5.3E-08	1.4E-07	6.3E-08	3.3E-08
UL	0.15	0.35	0.93	0.41	0.21
Sensitivity of K:		1.24E-05 (m/day)		1.44E-10 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-08 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

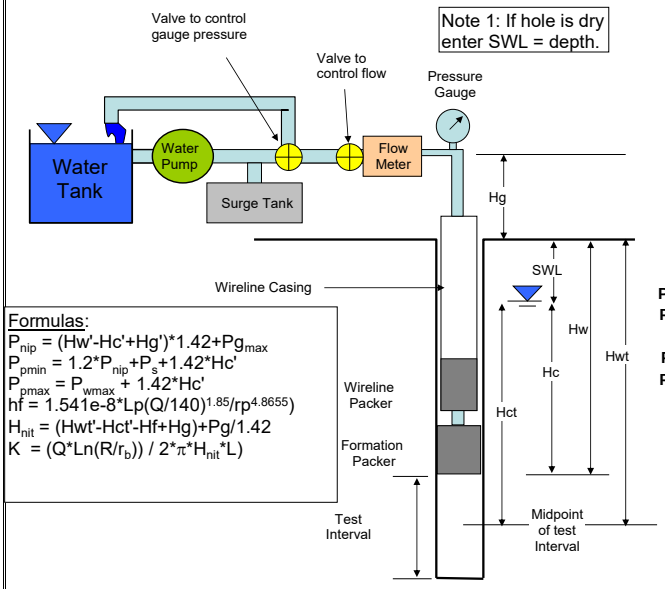
Interpreted Results

The Lugeon units pattern of GT20-08 Test 1 most closely resembles the Houlsby (1976) dilation type graph where the highest Lugeon unit occurs at the highest pressure. Therefore, the lowest Lugeon unit value was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-08 Packer Test 2

Project:	4148	**Depth of Test (m):**	91.44	to	115.00	**Hole Nº:**	GT20-08
Area:	North Pit	**Date:**	22-Mar-21	**Start:**	6:46	**Test Nº:**	2
Elevation (m):	968.91	**Height of "T" (m):**	1.7	**End:**	7:35	**Total Depth (m):**	115
Coordinates:	404963, 7007957	**Lithology:**	Quartz Mica Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

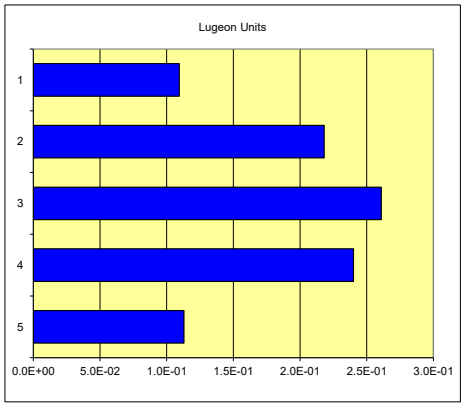
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

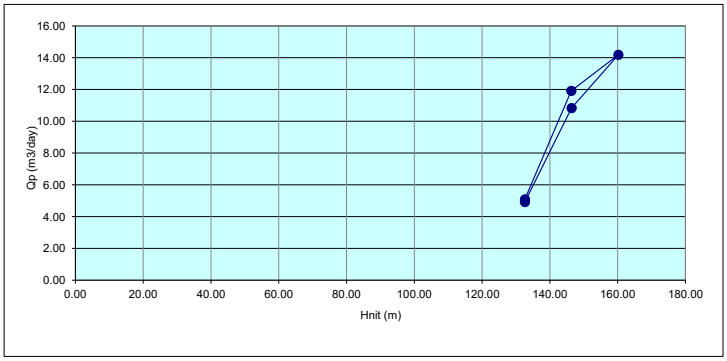
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.7	m
Hw	Water column over packer	91.4	m
Hwt	Water column over test midpoint	103.2	m
SWL	Static water level (see note 1)	131.0	m
Hc	Hydrostatic head on packer	0.0	m
Hct	Hydrostatic head on test midpoint	0.0	m
Hw'	Water column over packer (corrected)	91.1	m
Hwt'	Water column over test midpoint (corrected)	102.8	m
SWL'	Static water level (corrected)	130.5	m
Hc'	Hydrostatic head on packer (corrected)	0.0	m
Hct'	Hydrostatic head on test midpoint (corrected)	0.0	m
ß	Inclination from horizontal	85	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	212	psi
Ppmin	**Minimum packer inflation pressure**	**304**	psi
Ppmax	**Maximum packer inflation pressure**	**300**	psi
rb	Borehole radius	0.048	m
L	Length of test section	23.56	m
Lp	Length of discharge pipe	93.14	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	330	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**2.915**	**8.328**	**12.870**	**7.874**	**5.148**
2	**3.218**	**6.170**	**12.681**	**7.798**	**3.823**
3	**3.672**	**7.836**	**13.173**	**7.798**	**3.520**
4	**3.975**	**6.776**	**11.280**	**8.631**	**3.255**
5	**4.013**	**6.965**	**7.836**	**7.609**	**2.801**
6	**3.558**	**7.154**	**8.139**	**8.517**	**3.710**
7	**2.536**	**8.139**	**8.479**	**8.782**	**3.445**
8	**3.899**	**7.457**	**7.949**	**8.479**	**2.498**
9	**3.180**	**8.631**	**8.441**	**8.744**	**3.634**
10	**3.218**	**7.760**	**7.647**	**8.517**	**3.445**
Q_P (lit/min)	3.42	7.52	9.85	8.27	3.53
Q_P (m^3/day)	4.92	10.83	14.18	11.9	5.1
Hf (m)	0.09	0.40	0.66	0.48	0.10
Hnit (m)	132.60	146.38	160.21	146.30	132.60
K (m/day)	1.4E-03	2.9E-03	3.4E-03	3.2E-03	1.5E-03
K (cm/sec)	1.7E-08	3.3E-08	4.0E-08	3.7E-08	**1.7E-08**
UL	0.11	0.22	0.26	0.24	0.11
Sensitivity of K:		3.49E-06 (m/day)		4.04E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The depth of water in GT20-08 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

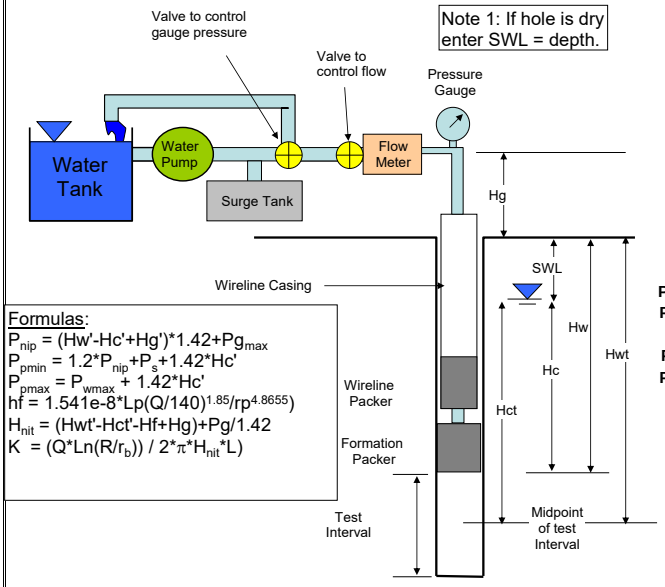
Interpreted Results

The Lugeon units pattern of GT20-08 Test 2 most closely resembles the Houlsby (1976) dilation type graph where the highest Lugeon unit occurs at the highest pressure. Therefore, the lowest Lugeon unit value was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-09 Packer Test 1

Project:	4148	**Depth of Test (m):**	84.70	to	100.00	**Hole Nº:**	GT20-09
Area:	North Pit	**Date:**	26-Mar-21	**Start:**	16:44	**Test Nº:**	1
Elevation (m):	953.81	**Height of "T" (m):**	2.4	**End:**	17:33	**Total Depth (m):**	100
Coordinates:	404980, 7007649	**Lithology:**	Calcareous Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

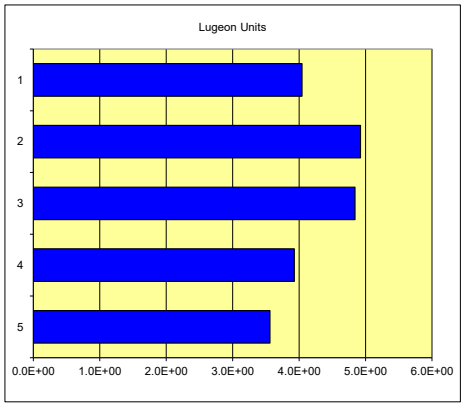
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

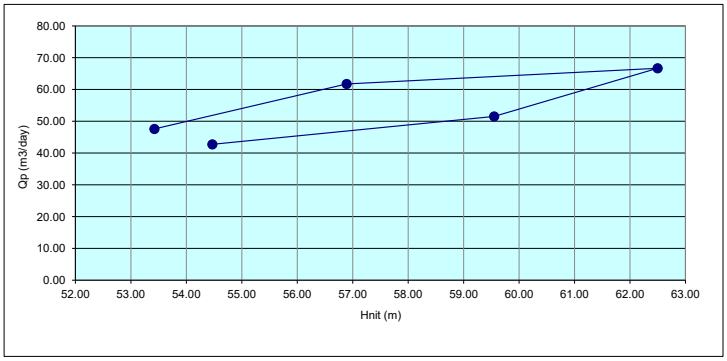
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	2.4	m
Hw	Water column over packer	84.7	m
Hwt	Water column over test midpoint	92.4	m
SWL	Static water level (see note 1)	44.0	m
Hc	Hydrostatic head on packer	40.7	m
Hct	Hydrostatic head on test midpoint	48.4	m
Hw'	Water column over packer (corrected)	82.3	m
Hwt'	Water column over test midpoint (corrected)	89.7	m
SWL'	Static water level (corrected)	42.7	m
Hc'	Hydrostatic head on packer (corrected)	39.5	m
Hct'	Hydrostatic head on test midpoint (corrected)	47.0	m
ß	Inclination from horizontal	76	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	144	psi
Ppmin	**Minimum packer inflation pressure**	**279**	psi
Ppmax	**Maximum packer inflation pressure**	**356**	psi
rb	Borehole radius	0.048	m
L	Length of test section	15.30	m
Lp	Length of discharge pipe	87.10	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	20	30	40	30	20
1	**40.69**	**49.48**	**58.07**	**25.06**	**15.48**
2	**36.04**	**53.49**	**46.18**	**42.06**	**31.31**
3	**30.40**	**37.40**	**46.30**	**38.04**	**31.08**
4	**32.78**	**39.94**	**46.11**	**35.81**	**31.34**
5	**32.93**	**41.00**	**45.08**	**36.11**	**30.89**
6	**32.33**	**41.75**	**45.77**	**36.38**	**31.76**
7	**33.31**	**41.34**	**42.55**	**36.23**	**30.81**
8	**32.93**	**40.73**	**43.23**	**36.83**	**31.42**
9	**33.27**	**41.64**	**45.01**	**35.20**	**31.46**
10	**33.43**	**41.90**	**44.71**	**36.15**	**31.34**
Q_P (lit/min)	33.05	42.87	46.30	35.79	29.69
Q_P (m^3/day)	47.60	61.73	66.67	51.5	42.8
Hf (m)	5.79	9.37	10.80	6.71	4.75
Hnit (m)	53.42	56.89	62.50	59.55	54.47
K (m/day)	5.3E-02	6.5E-02	6.4E-02	5.2E-02	4.7E-02
K (m/sec)	6.2E-07	7.5E-07	7.4E-07	6.0E-07	**5.4E-07**
UL	4.04	4.92	4.84	3.93	3.56
Sensitivity of K:		1.38E-05 (m/day)		1.59E-10 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-09 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

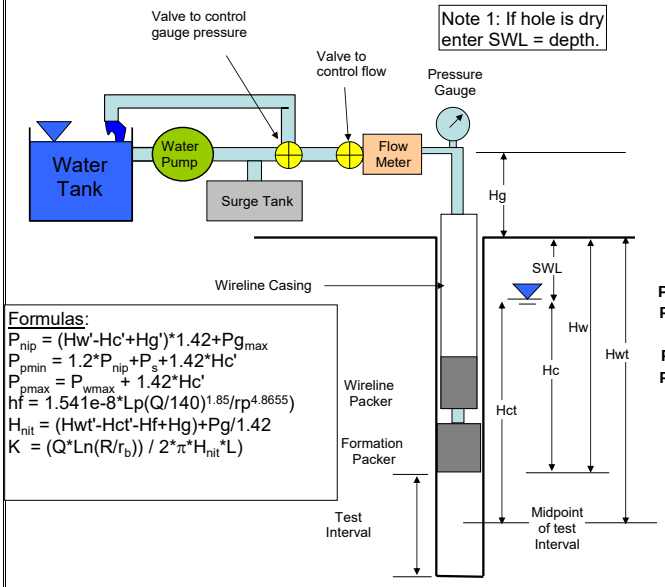
Interpreted Results

The Lugeon units pattern of GT20-09 Test 1 most closely resembles the Houlsby (1976) void filling flow type graph where the Lugeon are generally decreasing as test proceeds. Therefore, the final Lugeon units was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-10 Packer Test 1

Project:	4148	**Depth of Test (m):**	84.70	to	100.00	**Hole Nº:**	GT20-10
Area:	North Pit	**Date:**	24-Mar-21	**Start:**	11:50	**Test Nº:**	1
Elevation (m):	956.86	**Height of "T" (m):**	1.7	**End:**	12:41	**Total Depth (m):**	100
Coordinates:	404900, 7007750	**Lithology:**	Calcareous Schist/Sulphide			**Engineer:**	BG



Note 1: If hole is dry enter SWL = depth.

Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

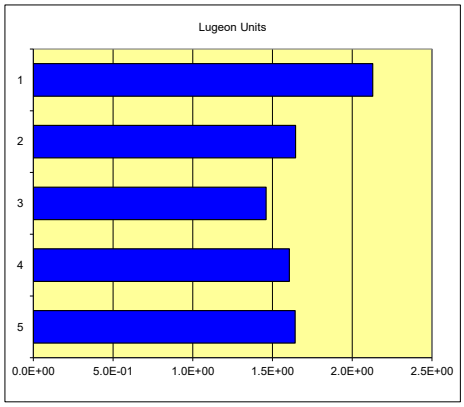
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

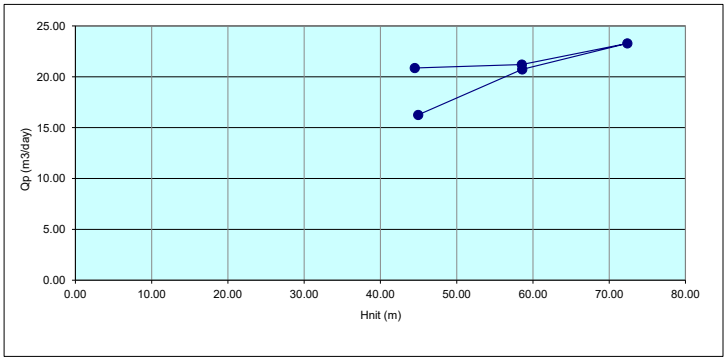
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.7	m
Hw	Water column over packer	84.7	m
Hwt	Water column over test midpoint	92.4	m
SWL	Static water level (see note 1)	15.9	m
Hc	Hydrostatic head on packer	68.8	m
Hct	Hydrostatic head on test midpoint	76.5	m
Hw'	Water column over packer (corrected)	84.5	m
Hwt'	Water column over test midpoint (corrected)	92.1	m
SWL'	Static water level (corrected)	15.9	m
Hc'	Hydrostatic head on packer (corrected)	68.6	m
Hct'	Hydrostatic head on test midpoint (corrected)	76.3	m
ß	Inclination from horizontal	86	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	105	psi
Ppmin	**Minimum packer inflation pressure**	**273**	psi
Ppmax	**Maximum packer inflation pressure**	**397**	psi
rb	Borehole radius	0.048	m
L	Length of test section	15.30	m
Lp	Length of discharge pipe	86.40	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**16.959**	**15.255**	**16.769**	**13.022**	**12.643**
2	**15.104**	**15.785**	**16.807**	**14.044**	**11.356**
3	**14.347**	**16.012**	**17.451**	**13.665**	**9.653**
4	**14.195**	**15.558**	**17.148**	**14.460**	**10.940**
5	**15.142**	**15.179**	**15.104**	**14.574**	**11.205**
6	**15.596**	**14.347**	**15.596**	**14.649**	**11.016**
7	**14.157**	**14.006**	**15.066**	**14.536**	**11.280**
8	**14.536**	**13.855**	**15.785**	**14.498**	**11.962**
9	**13.741**	**14.044**	**15.861**	**15.672**	**11.318**
10	**13.552**	**13.211**	**16.088**	**14.801**	**11.508**
Q_P (lit/min)	14.49	14.73	16.17	14.39	11.29
Q_P (m^3/day)	20.86	21.20	23.28	20.7	16.3
Hf (m)	1.25	1.29	1.53	1.23	0.79
Hnit (m)	44.48	58.53	72.37	58.58	44.94
K (m/day)	2.8E-02	2.2E-02	1.9E-02	2.1E-02	2.2E-02
K (m/sec)	3.2E-07	2.5E-07	**2.2E-07**	2.4E-07	2.5E-07
UL	2.128	1.644	1.460	1.606	1.642
Sensitivity of K:		1.19E-05 (m/day)		1.38E-10 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-10 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

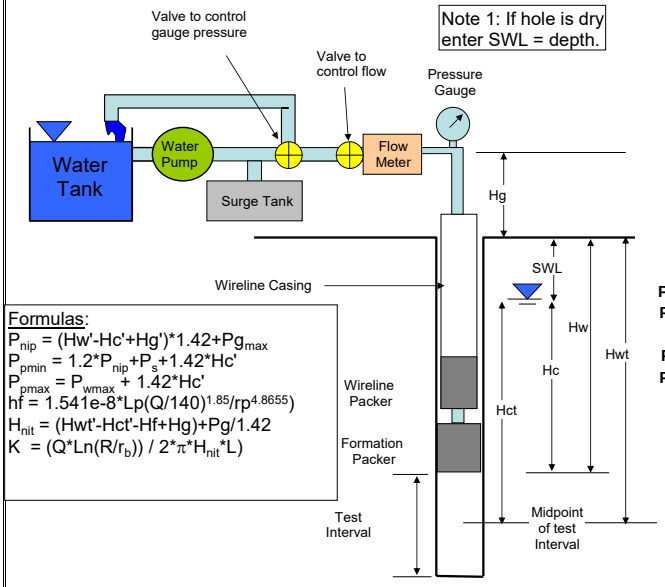
Interpreted Results

The Lugeon units pattern of GT20-10Test 1 most closely resembles the Houlsby (1976) turbulent flow type graph where the lowest Lugeon unit value occurs at the highest pressure. Therefore, the Lugeon unit for the highest pressure was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-10 Packer Test 2

Project:	4148	**Depth of Test (m):**	65.20	to	100.00	**Hole Nº:**	GT20-10
Area:	North Pit	**Date:**	24-Mar-21	**Start:**	13:55	**Test Nº:**	2
Elevation (m):	956.86	**Height of "T" (m):**	1.7	**End:**	14:44	**Total Depth (m):**	100
Coordinates:	404900, 7007750	**Lithology:**	Calcareous Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

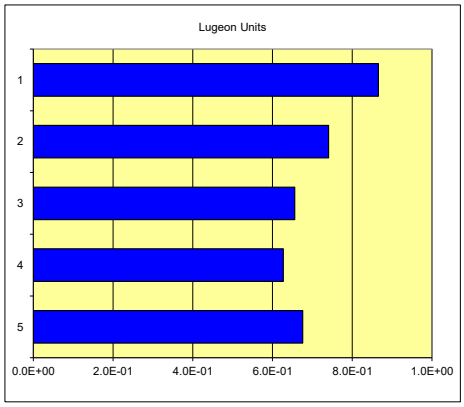
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

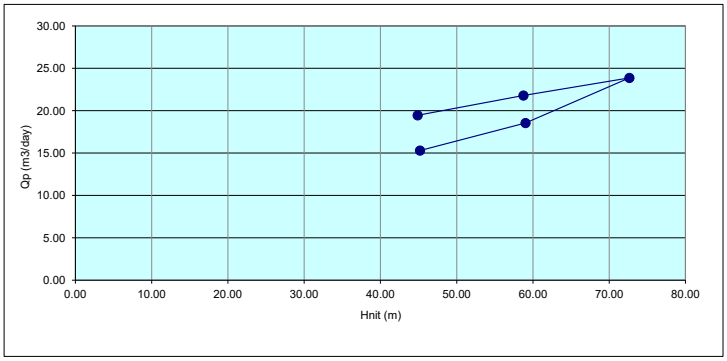
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.7	m
Hw	Water column over packer	65.2	m
Hwt	Water column over test midpoint	82.6	m
SWL	Static water level (see note 1)	15.9	m
Hc	Hydrostatic head on packer	49.3	m
Hct	Hydrostatic head on test midpoint	66.7	m
Hw'	Water column over packer (corrected)	65.0	m
Hwt'	Water column over test midpoint (corrected)	82.3	m
SWL'	Static water level (corrected)	15.8	m
Hc'	Hydrostatic head on packer (corrected)	49.1	m
Hct'	Hydrostatic head on test midpoint (corrected)	66.4	m
ß	Inclination from horizontal	85	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	105	psi
Ppmin	**Minimum packer inflation pressure**	**246**	psi
Ppmax	**Maximum packer inflation pressure**	**370**	psi
rb	Borehole radius	0.048	m
L	Length of test section	34.80	m
Lp	Length of discharge pipe	66.90	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**14.422**	**18.548**	**19.419**	**11.394**	**9.804**
2	**13.703**	**16.429**	**16.845**	**12.530**	**10.410**
3	**14.157**	**15.558**	**17.110**	**12.530**	**10.751**
4	**14.347**	**15.293**	**16.845**	**12.984**	**9.577**
5	**13.855**	**13.590**	**16.618**	**13.211**	**11.356**
6	**12.719**	**14.649**	**16.277**	**13.135**	**10.751**
7	**12.492**	**14.914**	**15.937**	**13.703**	**10.788**
8	**12.189**	**14.233**	**15.407**	**12.984**	**11.773**
9	**12.908**	**14.460**	**15.709**	**13.627**	**10.107**
10	**14.309**	**13.703**	**15.596**	**12.719**	**10.902**
Q_P (lit/min)	13.51	15.14	16.58	12.88	10.62
Q_P (m^3/day)	19.45	21.80	23.87	18.5	15.3
Hf (m)	0.85	1.05	1.24	0.78	0.54
Hnit (m)	44.86	58.74	72.64	59.01	45.16
K (m/day)	1.1E-02	9.7E-03	8.6E-03	8.3E-03	8.9E-03
K (m/sec)	1.3E-07	1.1E-07	**1.0E-07**	9.6E-08	1.0E-07
UL	0.87	0.74	0.66	0.63	0.68
Sensitivity of K:		5.21E-06 (m/day)		6.03E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m³/day = 60 l/min





Field Observations

The depth of water in GT20-10 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

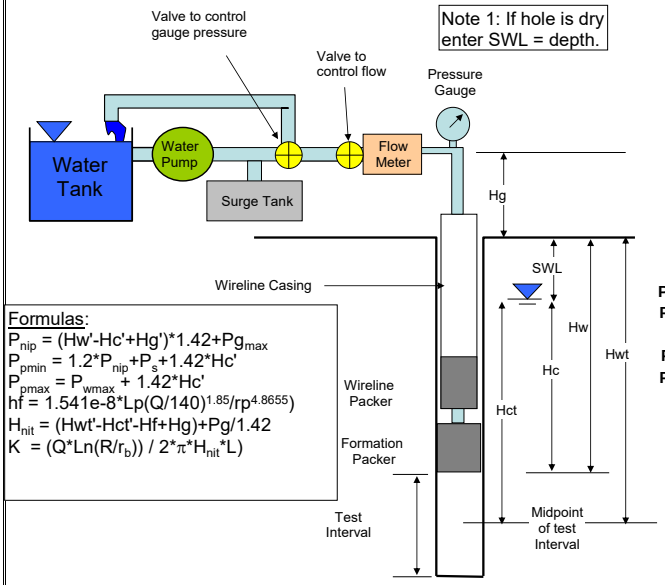
Interpreted Results

The Lugeon units pattern of GT20-10 Test 2 most closely resembles the Houlsby (1976) turbulent flow type graph where the lowest Lugeon value occurs at highest pressue. Therefore, the Lugeon unit for the highest pressure was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-11 Packer Test 1

Project:	4148	**Depth of Test (m):**	99.67	to	115.80	**Hole Nº:**	GT20-11
Area:	North Pit	**Date:**	19-Mar-21	**Start:**	16:25	**Test Nº:**	1
Elevation (m):	979.26	**Height of "T" (m):**	2.7	**End:**	17:15	**Total Depth (m):**	115.8
Coordinates:	404778, 7007854	**Lithology:**	Mica Quartz Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

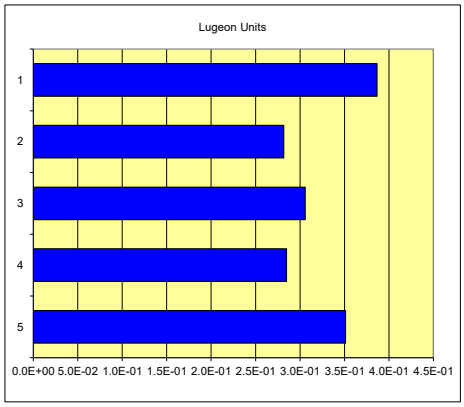
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

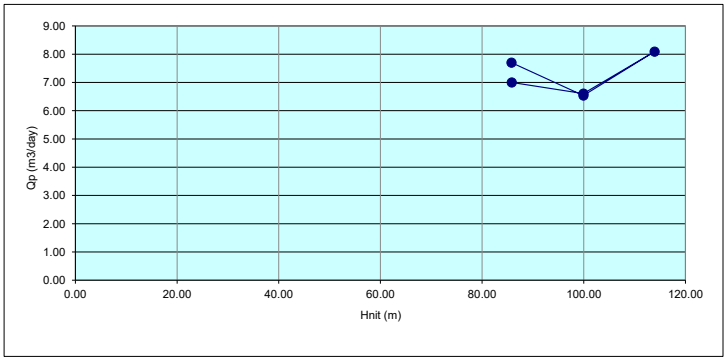
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	2.7	m
Hw	Water column over packer	99.7	m
Hwt	Water column over test midpoint	107.7	m
SWL	Static water level (see note 1)	57.3	m
Hc	Hydrostatic head on packer	42.4	m
Hct	Hydrostatic head on test midpoint	50.4	m
Hw'	Water column over packer (corrected)	95.9	m
Hwt'	Water column over test midpoint (corrected)	103.7	m
SWL'	Static water level (corrected)	55.1	m
Hc'	Hydrostatic head on packer (corrected)	40.8	m
Hct'	Hydrostatic head on test midpoint (corrected)	48.5	m
ß	Inclination from horizontal	74	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	162	psi
Ppmin	**Minimum packer inflation pressure**	**303**	psi
Ppmax	**Maximum packer inflation pressure**	**358**	psi
rb	Borehole radius	0.048	m
L	Length of test section	16.13	m
Lp	Length of discharge pipe	102.41	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	**5.867**	**4.278**	**~~7.003~~**	**4.429**	**4.997**
2	**5.262**	**3.785**	**6.132**	**4.959**	**4.240**
3	**5.716**	**4.770**	**5.489**	**3.975**	**4.883**
4	**4.997**	**4.505**	**5.754**	**4.429**	**4.542**
5	**5.186**	**5.527**	**5.981**	**4.845**	**4.656**
6	**5.072**	**3.899**	**5.792**	**4.732**	**5.035**
7	**5.224**	**4.618**	**4.883**	**4.088**	**4.959**
8	**5.678**	**4.050**	**4.959**	**4.845**	**5.300**
9	**5.072**	**5.072**	**5.678**	**4.845**	**5.640**
10	**5.413**	**4.883**	**5.905**	**4.732**	**4.353**
Q_P (lit/min)	5.35	4.54	5.62	4.59	4.86
Q_P (m^3/day)	7.70	6.54	8.09	6.6	7.0
Hf (m)	0.23	0.17	0.26	0.18	0.20
Hnit (m)	85.77	99.92	113.92	99.91	85.81
K (m/day)	5.1E-03	3.7E-03	4.0E-03	3.7E-03	4.6E-03
K (m/sec)	5.9E-08	4.3E-08	**4.7E-08**	4.3E-08	5.4E-08
UL	0.39	0.28	0.31	0.28	0.35
Sensitivity of K:		7.16E-06 (m/day)		8.29E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

The depth of water in GT20-11 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

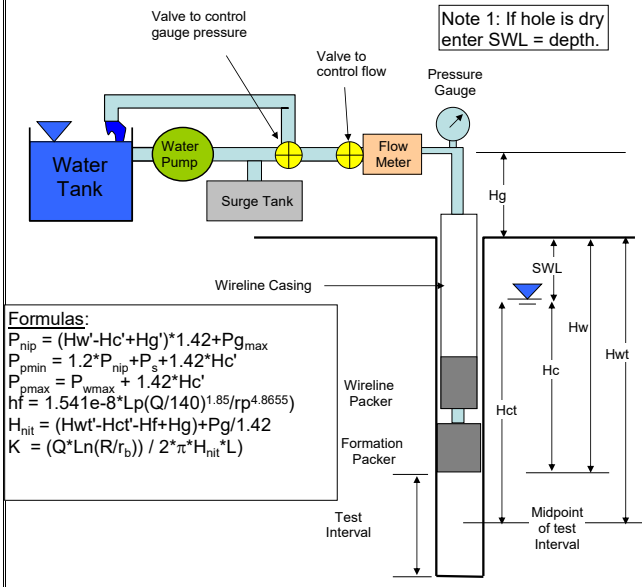
Interpreted Results

The Lugeon units pattern of GT20-11 Test 1 most closely resembles the Houlsby (1976) turbulent flow (Group B) type graph where the lowest Lugeon unit value occurs at the highest pressure. Therefore, the Lugeon unit for the highest pressure was used to estimate a representative hydraulic conductivity (K).

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

GT20-11 Packer Test 2

Project:	4148	**Depth of Test (m):**	91.44	to	115.80	**Hole Nº:**	GT20-11
Area:	North Pit	**Date:**	19-Mar-21	**Start:**	8:09	**Test Nº:**	2
Elevation (m):	979.26	**Height of "T" (m):**	1.8	**End:**	16:07	**Total Depth (m):**	115.8
Coordinates:	404778, 7007854	**Lithology:**	Mica Quartz Schist/Sulphide			**Engineer:**	BG



Formulas:

$P_{nip} = (Hw'-Hc'+Hg')*1.42+Pg_{max}$

$P_{pmin} = 1.2*P_{nip}+P_s+1.42*Hc'$

$P_{pmax} = P_{wmax} + 1.42*Hc'$

$hf = 1.541e\text{-}8*Lp(Q/140)^{1.85}/rp^{4.8655})$

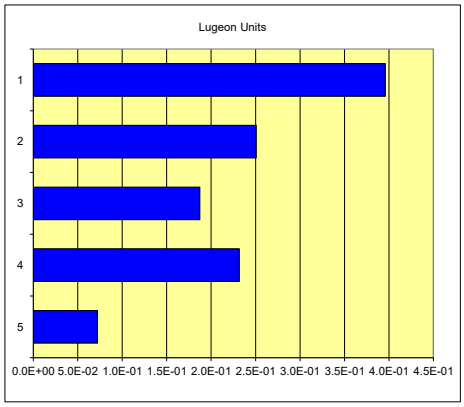
$H_{nit} = (Hwt'-Hct'-Hf+Hg)+Pg/1.42$

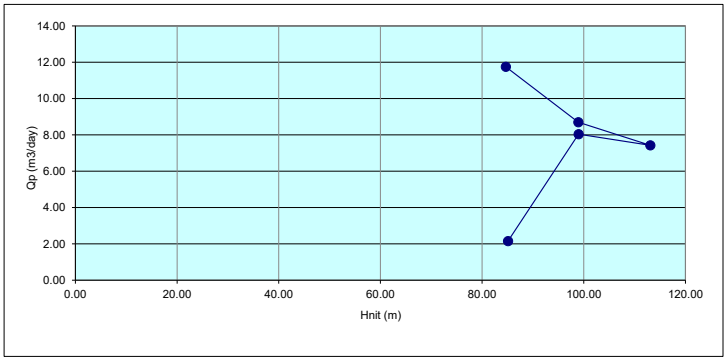
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Hg	Gauge height	1.8	m
Hw	Water column over packer	91.4	m
Hwt	Water column over test midpoint	103.6	m
SWL	Static water level (see note 1)	57.3	m
Hc	Hydrostatic head on packer	34.1	m
Hct	Hydrostatic head on test midpoint	46.3	m
Hw'	Water column over packer (corrected)	88.0	m
Hwt'	Water column over test midpoint (corrected)	99.7	m
SWL'	Static water level (corrected)	55.1	m
Hc'	Hydrostatic head on packer (corrected)	32.9	m
Hct'	Hydrostatic head on test midpoint (corrected)	44.6	m
ß	Inclination from horizontal	74	°
Ps	Packer stretch pressure	50	psi
Pwmax	Maximum packer working pressure	300	psi
Pgmax	Maximum anticipated gauge pressure	80	psi
Pnip	Net injection pressure at packer	161	psi
Ppmin	**Minimum packer inflation pressure**	**290**	psi
Ppmax	**Maximum packer inflation pressure**	**347**	psi
rb	Borehole radius	0.048	m
L	Length of test section	24.36	m
Lp	Length of discharge pipe	93.24	m
rp	Radius of discharge pipe	0.025	m
R	Radius of influence	15	m
	Packer Inflation Pressure Set	325	psi

Time (min)	**Q (lit/min)**				
	P_g (psi) Low	**P_g (psi) Medium**	**P_g (psi) High**	**P_g (psi) Medium**	**P_g (psi) Low**
	40	60	80	60	40
1	~~**9.956**~~	~~**9.956**~~	**6.435**	**5.300**	~~**6.359**~~
2	~~**9.161**~~	**5.186**	**5.110**	**5.300**	**2.120**
3	~~**8.404**~~	**5.678**	**5.300**	**5.640**	**2.006**
4	**7.722**	**5.527**	**5.565**	**5.716**	**0.908**
5	**7.874**	**5.262**	**4.770**	**5.981**	**1.893**
6	**7.647**	**6.057**	**4.202**	**5.413**	**1.779**
7	**7.987**	**6.776**	**4.997**	**5.640**	**0.454**
8	**7.722**	**5.035**	**5.186**	**5.413**	**0.606**
9	**8.252**	**5.375**	**4.770**	**5.640**	**0.984**
10	**6.889**	**5.565**	**5.262**	**5.792**	**2.688**
Q_P (lit/min)	8.16	6.04	5.16	5.58	1.49
Q_P (m^3/day)	11.75	8.70	7.43	8.0	2.2
Hf (m)	0.47	0.27	0.20	0.23	0.02
Hnit (m)	84.64	98.92	113.08	98.96	85.09
K (m/day)	5.2E-03	3.3E-03	2.5E-03	3.0E-03	9.5E-04
K (m/sec)	6.0E-08	3.8E-08	2.9E-08	3.5E-08	**1.1E-08**
UL	0.40	0.25	0.19	0.23	0.07
Sensitivity of K:		4.78E-06 (m/day)		5.53E-11 (m/sec)	

Conversion Factors:
10.2 m of water = 1 bar = 1kg/cm² = 14.5 psi
1 m = 3.281 ft = 39.37 inches
1 liter/sec = 15.85 gpm =86.38 m^3/day = 60 l/min





Field Observations

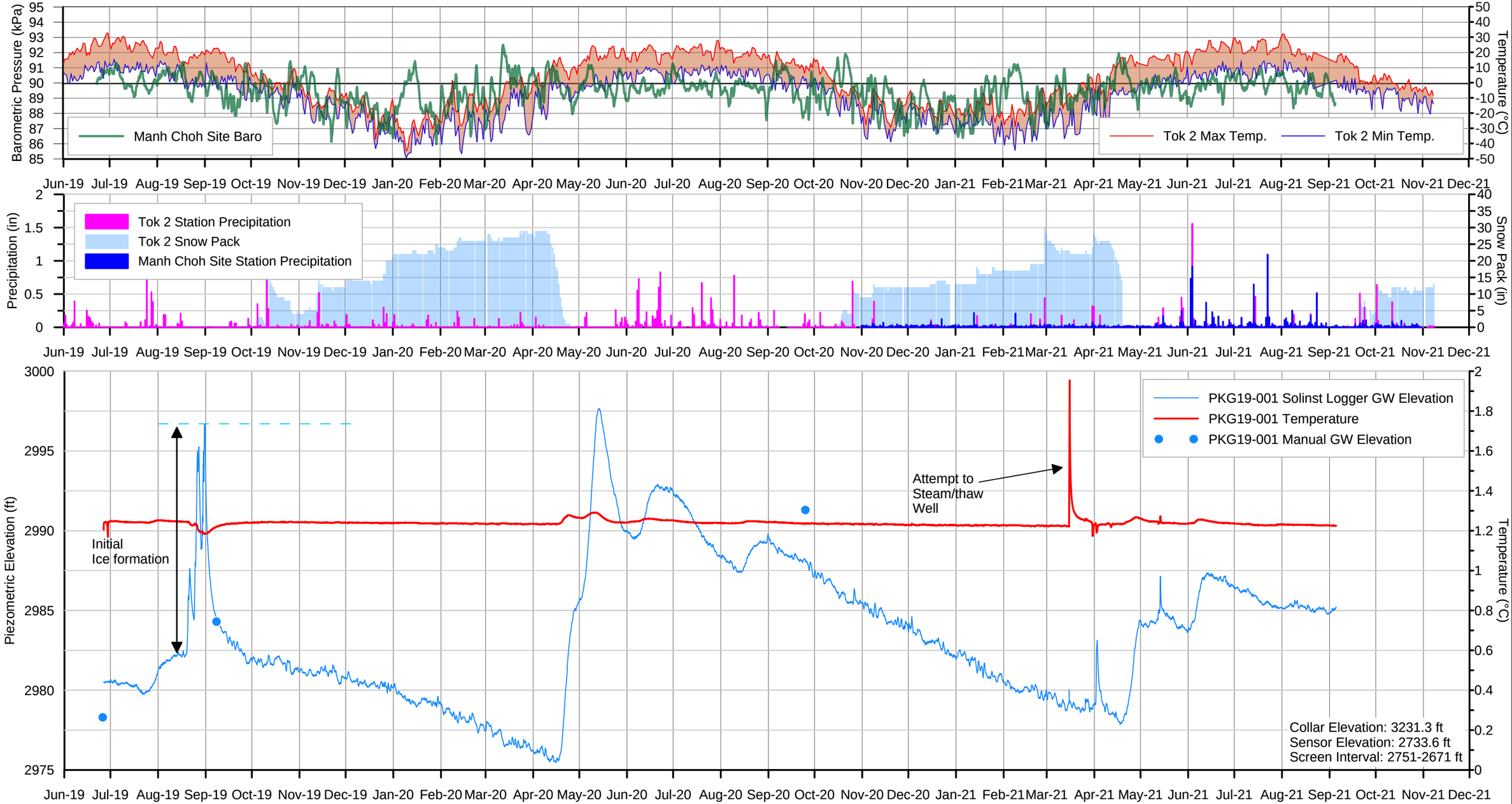
The depth of water in GT20-11 was not pre-measured before the packer test due to being unable to drop water sensor downhole because of friction with the drill rods. The depth of water estimated based on televiewer survey.

Interpreted Results

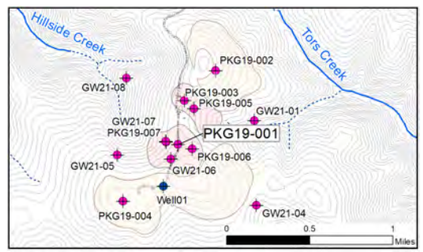
The Lugeon units pattern of GT20-11 Test 2 most closely resembles the Houlsby (1976) void filling (Group E) type graph where Lugeon units decrease as the test proceeds. Therefore, the final Lugeon value was used to estimate a representative hydraulic conductivity (K).

APPENDIX E
GROUNDWATER HYDROGRAPHS

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-001



Note:
-Ice exerts a higher pressure on the sensor as compared to water, therefore, the sharp increase in elevation during August is not an increase in water levels, instead an indication of ice formation at the top of the water column.
-Well developed an ice plug in September 2019



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-001: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-1

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-002

Barometric Pressure (kPa)

Temperature (°C)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Precipitation (in)

Snow Pack (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Piezometric Elevation (ft)

Temperature (°C)

PKG19-002 Solinst Logger GW Elevation

PKG19-002 Temperature

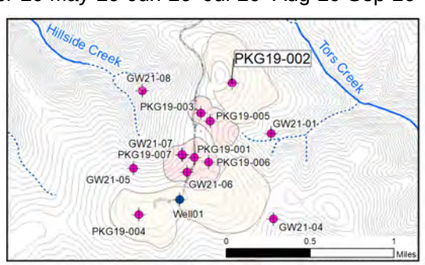
PKG19-002 Manual GW Elevation

Groundwater Sampling

Logger Removed
From Well

Groundwater Sampling

Collar Elevation: 3249.3 ft
Sensor Elevation: 2954.5 ft
Screen Interval: 3031 - 2951 ft



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-002: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-2

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-003

Barometric Pressure (kPa)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Snow Pack (in)

Piezometric Elevation (ft)

PKG19-003 Solinst Logger GW Elevation

PKG19-003 Temperature

PKG19-003 Manual GW Elevation

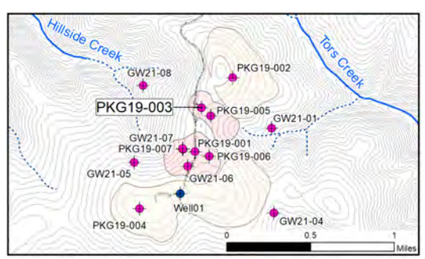
Temperature (°C)

Groundwater Sampling

Groundwater Sampling

Groundwater Sampling

Collar Elevation: 3211.6 ft
Sensor Elevation: 2914 ft
Screen Interval: 2923.6-2873.6 ft



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-003: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-3

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-004

Barometric Pressure (kPa)

Temperature (°C)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Precipitation (in)

Snow Pack (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Piezometric Elevation (ft)

Temperature (°C)

PKG19-004 Solint Logger GW Elevation

PKG19-004 Temperature

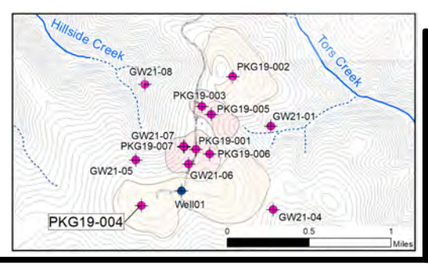
Manual Water Level

Attempts to thaw well to retrieve heat trace cable

Collar Elevation: 3336.2 ft
Sensor Elevation: 3038.5 ft
Screen Interval: 3019-2939 ft

Jun-19 Jul-19 Aug-19 Sep-19 Oct-19 Nov-19 Dec-19 Jan-20 Feb-20 Mar-20 Apr-20 May-20 Jun-20 Jul-20 Aug-20 Sep-20 Oct-20 Nov-20 Dec-20 Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Note:
-Well had no water during or immediately after drilling
-Residual melting of immediate relict permafrost as a result of drilling infiltrated water in the well; temperature is continuously below zero



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-004: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-4

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-005

Barometric Pressure (kPa)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Snow Pack (in)

Piezometric Elevation (ft)

PKG19-005 Solinst Logger GW Elevation

PKG19-005 Temperature

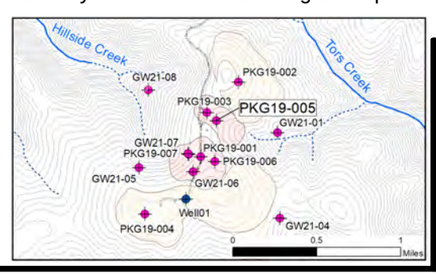
PKG19-005 Manual GW Elevation

Temperature (°C)

Groundwater Sampling

Groundwater Sampling

Collar Elevation: 3157.8 ft
Sensor Elevation: 2959.8 ft
Screen Interval: 2988.8-2938.8 ft



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-005: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-5

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-006

Barometric Pressure (kPa)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Snow Pack (in)

Piezometric Elevation (ft)

PKG19-006 Solinst Logger GW Elevation

PKG19-006 Temperature

PKG19-006 Manual GW Elevation

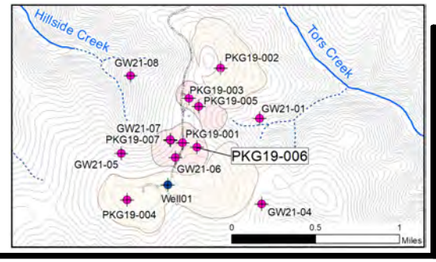
Collar Elevation: 3247 ft
Sensor Elevation: 2949 ft
Screen Interval: 2927-2847 ft

Initial
Ice
formation

Datalogger
damaged and
removed from well

Jun-19 Jul-19 Aug-19 Sep-19 Oct-19 Nov-19 Dec-19 Jan-20 Feb-20 Mar-20 Apr-20 May-20 Jun-20 Jul-20 Aug-20 Sep-20 Oct-20 Nov-20 Dec-20 Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Note:
-Well froze shortly after drilling
-Ice exerts a higher pressure on the sensor as compared to water, therefore, the sharp increase in elevation s not an increase in water levels, instead an indication of ice formation at the top of the water column.
-Solinst datalogger damaged during well thawing attempt



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-006: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-6

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Manh Choh Site Baro

Tok 2 Max Temp.

Tok 2 Min Temp.

Temperature (°C)

Jun-19 Jul-19 Aug-19 Sep-19 Oct-19 Nov-19 Dec-19 Jan-20 Feb-20 Mar-20 Apr-20 May-20 Jun-20 Jul-20 Aug-20 Sep-20 Oct-20 Nov-20 Dec-20 Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Precipitation (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

Manh Choh Site Station Precipitation

Snow Pack (in)

Piezometric Elevation (ft)

PKG19-007 Solinst Logger GW Elevation

PKG19-007 Temperature

PKG19-007 Manual GW Elevation

Attempts to thaw well

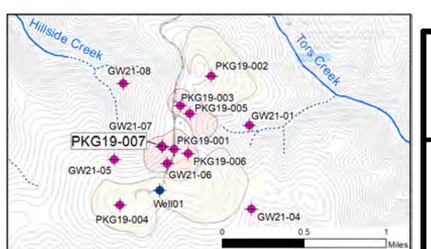
Steam/
thaw well

Sampling adjacent
well GW21-07

Collar Elevation: 3174 ft
Sensor Elevation: 2875 ft
Screen Interval: 2952-2852 ft

Temperature (°C)

Note:
-Well froze shortly after drilling
-Ice exerts a higher pressure on the sensor as compared to water, therefore, the sharp increase in elevation is not an increase in water levels, instead an indication of ice formation at the top of the water column
-Well was steamed to thaw ice cap (March 2021); manual measurement (2977 ft) is anomalously high



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

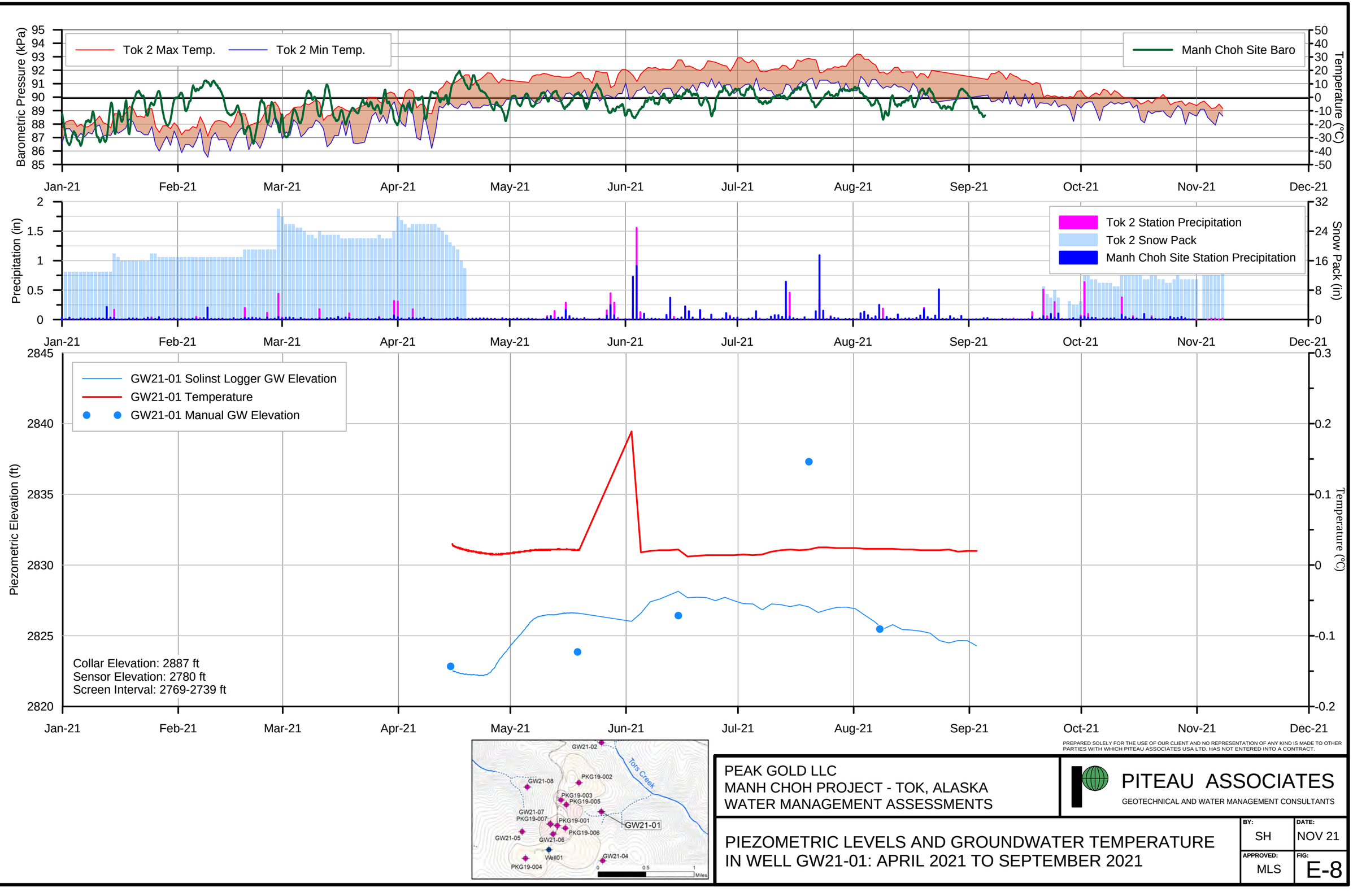
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL PKG19-007: JUNE 2019 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-7

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-01: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-8

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.
Tok 2 Min Temp.
Manh Choh Site Baro

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Precipitation (in)

Tok 2 Station Precipitation
Tok 2 Snow Pack
Manh Choh Site Station Precipitation

Snow Pack (in)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Piezometric Elevation (ft)

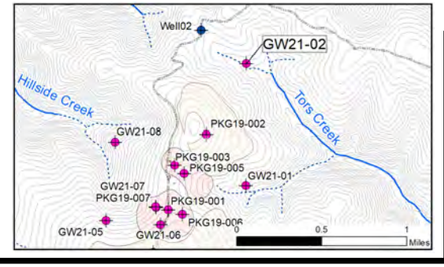
GW21-02 Solinst Logger GW Elevation
GW21-02 Temperature
GW21-02 Manual GW Elevation

Collar Elevation: 2780.5 ft
Sensor Elevation: 2684.4 ft
Screen Interval: 2662 - 2622 ft

Groundwater Sampling

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

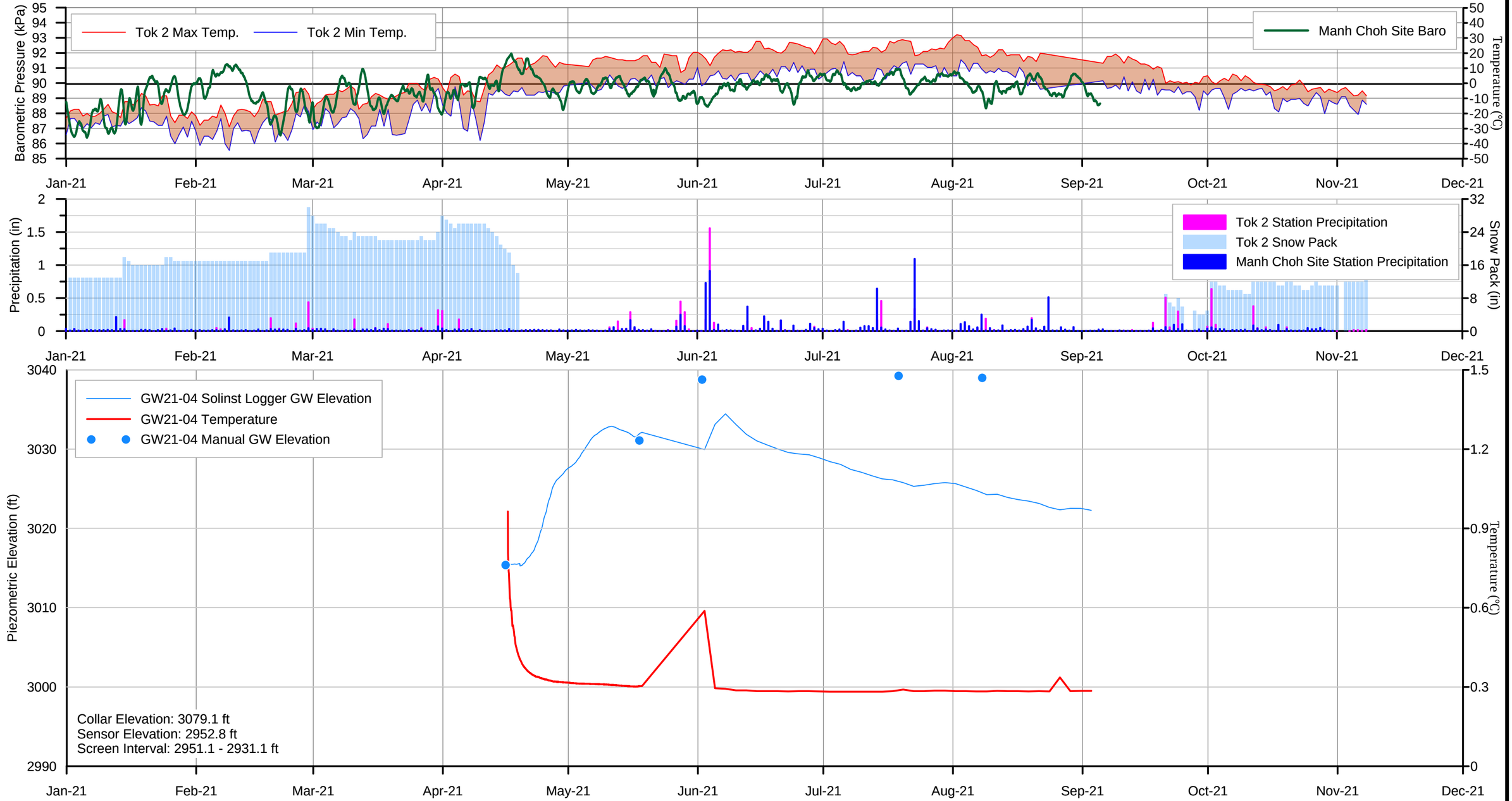
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

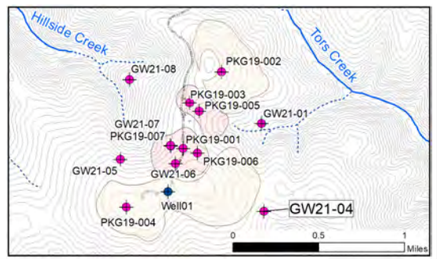
PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-02: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-9

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007





PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

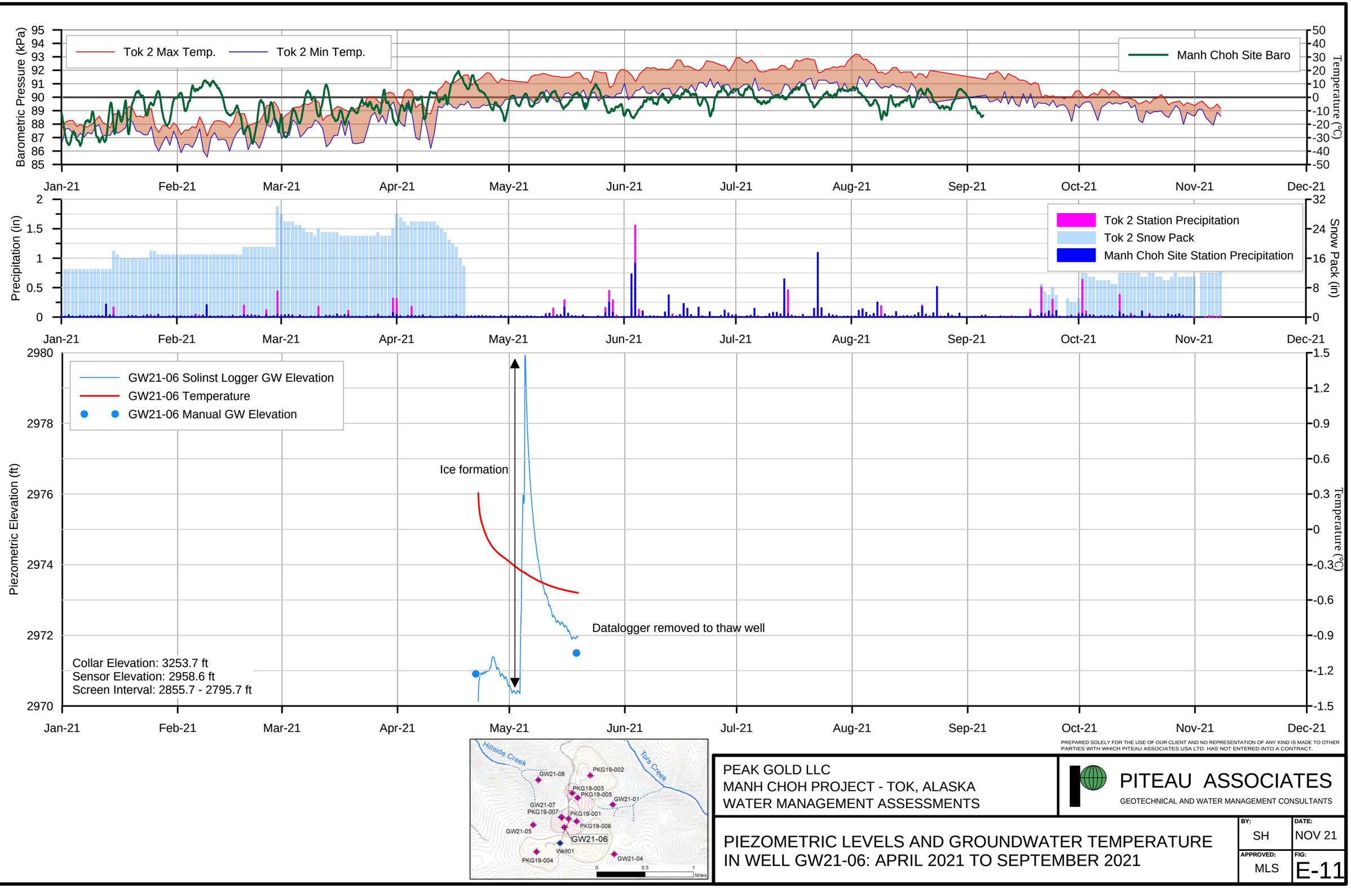
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-04: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-10

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

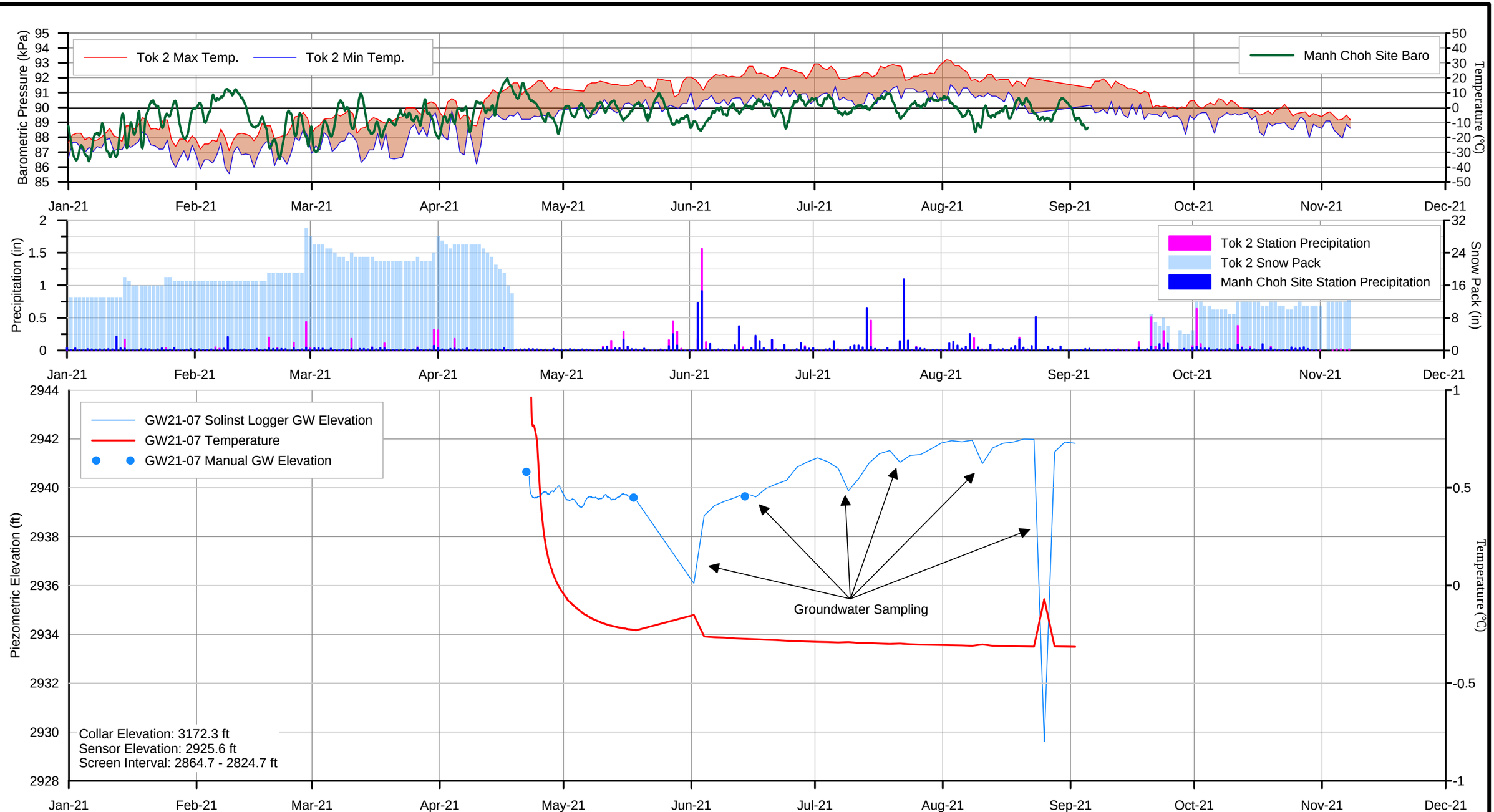
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

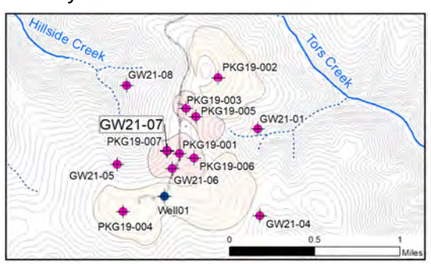
PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-06: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-11

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007



Notes:
- Manual measurements could not be obtained from well (since June 2021) due to some obstruction in the well at 50 ft



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

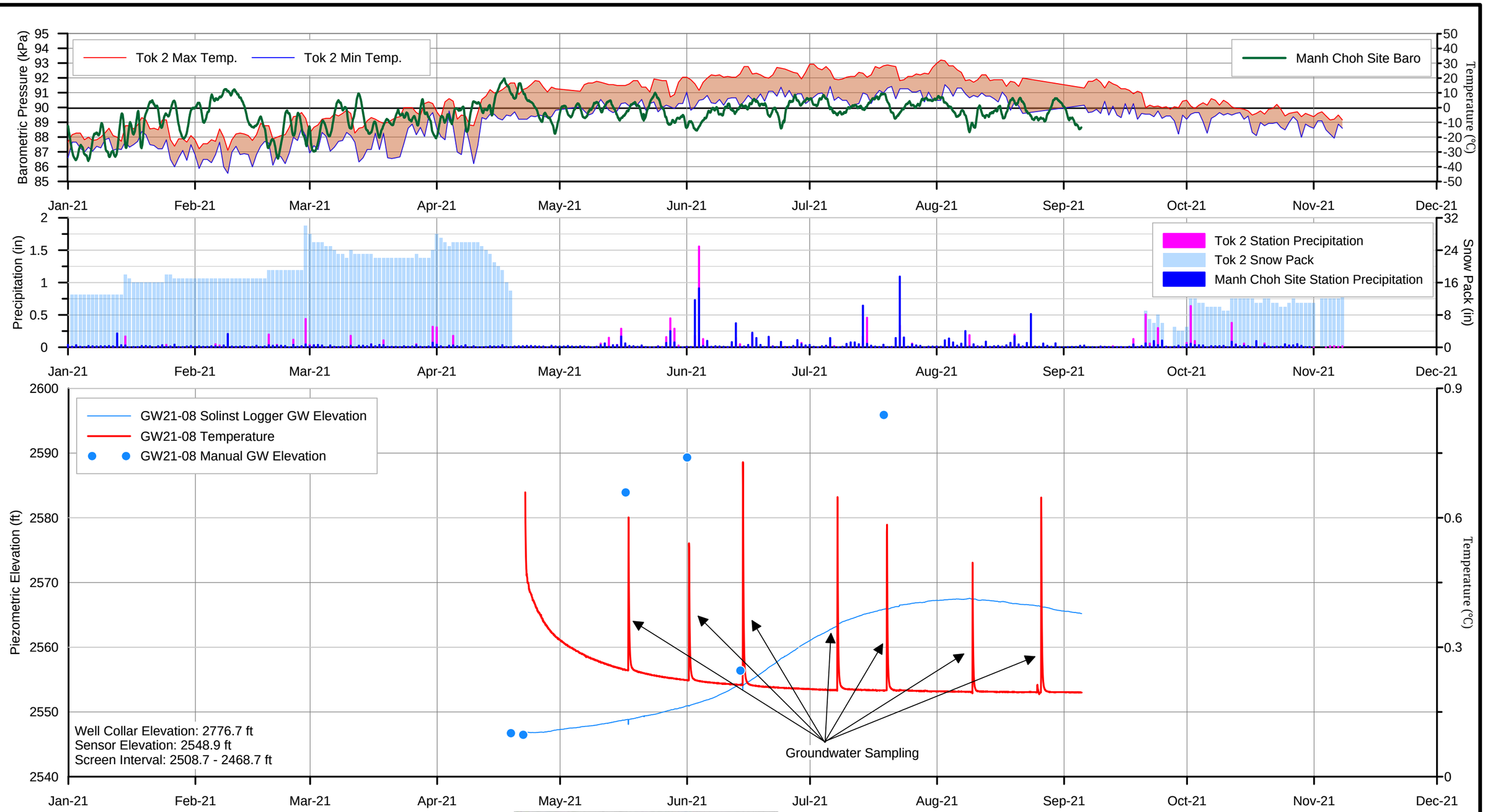
PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

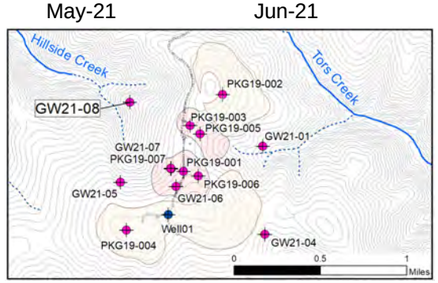
PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-07: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-12

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007



Note:
Some manual readings collected are anomalously high and are attributed to a malfunction of the water level tape/sounder.



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN WELL GW21-08: APRIL 2021 TO SEPTEMBER 2021

BY:	DATE:
SH	NOV 21
APPROVED:	FIG:
MLS	E-13

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Tok 2 Snow Pack

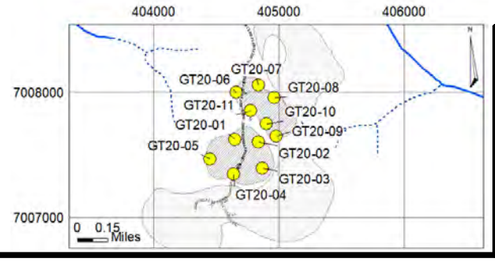
Manh Choh Site Station Precipitation

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3199 ft
GT20-01-1 Sensor Elevation: 2558 ft
GT20-01-2 Sensor Elevation: 2715 ft

GT20-01-1 GW Elevation
GT20-01-2 GW Elevation
GT20-01-1 Spot GW Elevation
GT20-01-2 Spot GW Elevation
GT20-01-1 Temperature
GT20-01-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-01: JANUARY 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-14

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

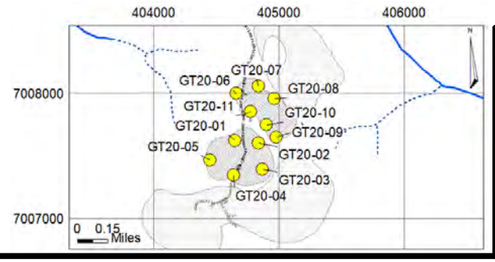
Snow Pack (in)

Piezometric Elevation (ft)

Temperature (°C)

Collar Elevation: 3201 ft
GT20-01-1 Sensor Elevation: 2733 ft
GT20-01-2 Sensor Elevation: 2886 ft

GT20-02-1 GW Elevation
GT20-02-2 GW Elevation
GT20-02-1 Spot GW Elevation
GT20-02-2 Spot GW Elevation
GT20-02-1 Temperature
GT20-02-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-02: JANUARY 2021 TO OCTOBER 2021

BY: KFM
DATE: NOV 21
APPROVED: MLS
FIG: E-15

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

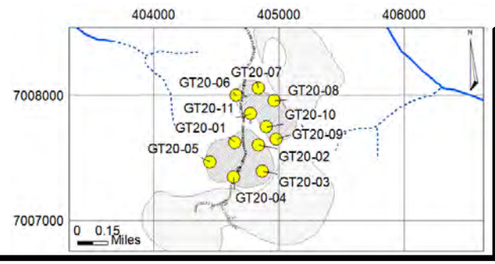
Piezometric Elevation (ft)

Collar Elevation: 3287 ft
GT20-03-1 Sensor Elevation: 2638 ft
GT20-03-2 Sensor Elevation: 2808 ft

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

GT20-03-1 GW Elevation
GT20-03-2 GW Elevation
GT20-03-1 Spot GW Elevation
GT20-03-2 Spot GW Elevation
GT20-03-1 Temperature
GT20-03-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-03: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-16

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

VWP malfunction (?)

Temperature (°C)

Collar Elevation: 3267 ft
GT20-04-1 Sensor Elevation: 2643 ft
GT20-04-2 Sensor Elevation: 2795 ft

GT20-04-1 GW Elevation

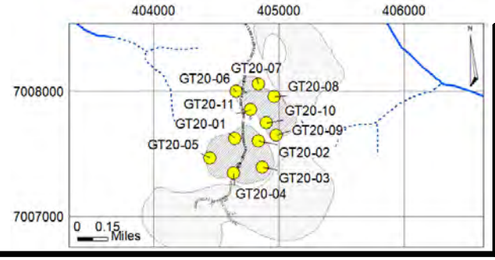
GT20-04-2 GW Elevation

GT20-04-1 Spot GW Elevation

GT20-04-2 Spot GW Elevation

GT20-04-1 Temperature

GT20-04-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-04: JANUARY 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-17

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.
Tok 2 Min Temp.
Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation
Manh Choh Site Station Precipitation
Tok 2 Snow Pack

Snow Pack (in)

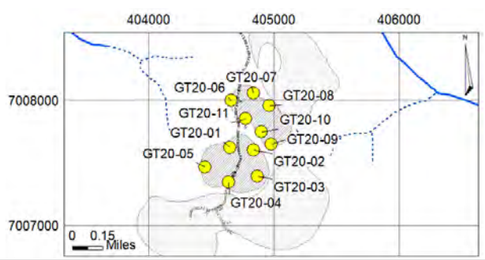
Piezometric Elevation (ft)

Collar Elevation: 3127 ft
GT20-05-1 Sensor Elevation: 2642 ft (Malfunctioning)
GT20-05-2 Sensor Elevation: 2831 ft

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

GT20-05-2 GW Elevation
GT20-05-2 Spot GW Elevation
GT20-05-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-05: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-18

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3178 ft
GT20-06-1 Sensor Elevation: 2783 ft
GT20-06-2 Sensor Elevation: 2889 ft

Temperature (°C)

GT20-06-1 GW Elevation

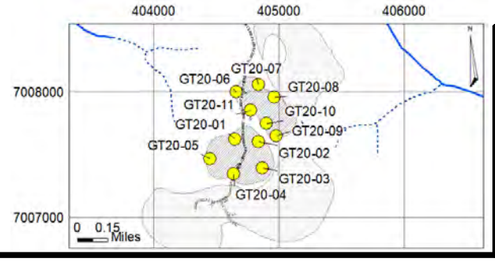
GT20-06-2 GW Elevation

GT20-06-1 Spot GW Elevation

GT20-06-2 Spot GW Elevation

GT20-06-1 Temperature

GT20-06-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-06: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-19

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3233 ft
GT20-07-1 Sensor Elevation: 2827 ft
GT20-07-2 Sensor Elevation: 2936 ft

Temperature (°C)

GT20-07-1 GW Elevation

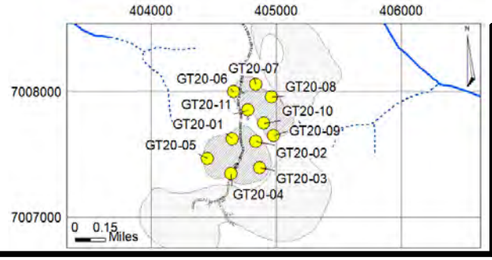
GT20-07-2 GW Elevation

GT20-07-1 Spot GW Elevation

GT20-07-2 Spot GW Elevation

GT20-07-1 Temperature

GT20-07-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-07: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-20

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3179 ft

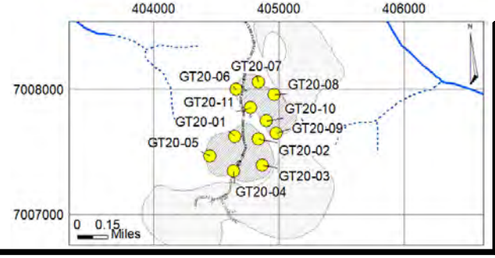
GT20-08-1 Sensor Elevation: 2805 ft

Temperature (°C)

GT20-08-1 GW Elevation

GT20-08-1 Spot GW Elevation

GT20-08-1 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-08: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-21

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3130 ft

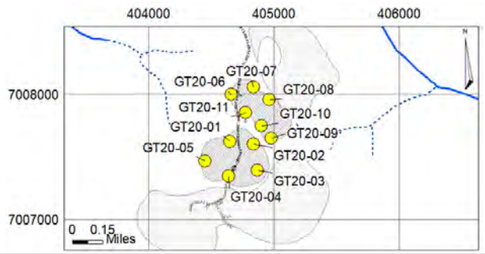
GT20-09-1 Sensor Elevation: 2814 ft

Temperature (°C)

GT20-09-1 GW Elevation

GT20-09-1 Spot GW Elevation

GT20-09-1 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-09: APRIL 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-22

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 2815 ft

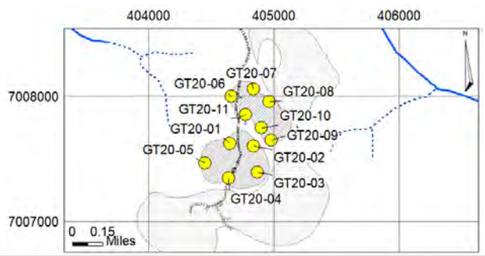
GT20-10-1 Sensor Elevation: 3139 ft

Temperature (°C)

GT20-10-1 GW Elevation

GT20-10-1 Spot GW Elevation

GT20-10-1 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-10: APRIL 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-23

H:\Project\4148\Hydrogeology\Groundwater Hydrographs\PKG19-007

Barometric Pressure (kPa)

Tok 2 Max Temp.

Tok 2 Min Temp.

Manh Choh Site Baro

Temperature (°C)

Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21

Precipitation (in)

Tok 2 Station Precipitation

Manh Choh Site Station Precipitation

Tok 2 Snow Pack

Snow Pack (in)

Piezometric Elevation (ft)

Collar Elevation: 3213 ft
GT20-11-1 Sensor Elevation: 2852 ft
GT20-11-2 Sensor Elevation: 2900 ft

Temperature (°C)

GT20-11-1 GW Elevation

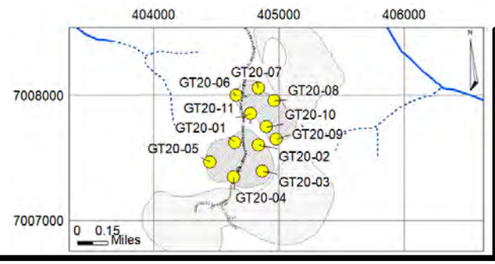
GT20-11-2 GW Elevation

GT20-11-1 Spot GW Elevation

GT20-11-2 Spot GW Elevation

GT20-11-1 Temperature

GT20-11-2 Temperature



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES USA LTD. HAS NOT ENTERED INTO A CONTRACT.

PEAK GOLD LLC
MANH CHOH PROJECT - TOK, ALASKA
WATER MANAGEMENT ASSESSMENTS

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

PIEZOMETRIC LEVELS AND GROUNDWATER TEMPERATURE IN VWP GT20-11: MARCH 2021 TO OCTOBER 2021

BY:	DATE:
KFM	NOV 21
APPROVED:	FIG:
MLS	E-24

APPENDIX F
GROUNDWATER QUALITY

TABLE F-1
WELL02

Site ID		Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,9]	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02	Well02
Sample Date									2-Jul-2016	29-May-2018	12-Sep-2018	9-Sep-2019	4-Jun-2020	6-Aug-2020	24-Sep-2020	17-Oct-2020	10-Dec-2020	18-Mar-2021	21-Apr-2021	17-May-2021	1-Jun-2021	14-Jun-2021	7-Jul-2021	20-Jul-2021	8-Aug-2021	25-Aug-2021	8-Sep-2021	28-Sep-2021
Lab ID	Units								1168221017	1189336016	1189750001	1199769002	1209327001	1209561001	1205287001	L62412-01	L63346-01	L64885-01	L65493-02	L66044-01	L66315-04	L66644-01	L67036-01	L67326-03	L67792-01	L68129-01	L68409-02	L68941-03
Lab ID (Dissolved metals) [8]												1199769008	1209327007															
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [9,10]																												
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	-	7.03	7.07	7.65	7.24	6.9	6.13	7.42	6.94	7.82	8.47	8.02	7.75	7.79	7.85	8.03	7.83	7.77	7.71	-
Conductivity (EC)	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	-	151.3	237.4	325	206.6	-	-	-	-	341	348	333	340	357	326	327	339	334	361	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	NULL	254	390	-	-	225	403	357	315	-	-	-	-	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	-	3.5	4.6	2.5	3.9	1.8	1.33	0	0.2	12.2	5.3	3.8	4.5	4.1	5.8	4.2	3.4	5.3	4	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	-	8.2	6.84	16.43	5.33	5.45	9.68	7.88	68.3	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	-	2.31	0.4	5.19	1.39	1.22	1.27	0.75	1.92	Clear	Clear	Clear	Clear	Clear	clear	Clear	Clear	Clear	-	-
Physical Tests																												
Hardness as CaCO3	mg/L	-	-	-	-	SM21 2340B	-	-	126	185	199	157	183	181	174	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Hardness as CaCO3	mg/L	-	5	-	0.2	-	SM2340B - Calculatio	-	-	-	-	-	-	-	-	181	151	174	174	172	176	194	168	179	178	178	155	187
Total Dissolved Solids	mg/L	-	40	-	20	SM21 2540C	SM2540C	500	188	218	228	214	196	218	221	218	190	214	220	220	208	236	232	230	226	220	170	210
Dissolved Anions																												
Chloride	mg/L	-	2	-	0.4	EPA 300.0	M300.0 - Ion Chromat	230	-	0.254	0.257	0.242	0.232	0.234	0.241	<0.4	<0.4	<0.4	<0.4	<0.8	<0.8	<0.4	<0.4	<0.4	<0.4	<0.4	1.21	<0.4
Sulphate	mg/L	-	2	-	0.4	EPA 300.0	M300.0 - Ion Chromat	250	-	48.2	59.5	41.3	42	43.7	44.6	45	25	41.3	42.9	45.5	47.1	56.8	42.4	49.7	47.8	44.5	25	46.7
Nutrients																												
Total Nitrate as N	mg/L	0.2	-	0.1	-	EPA 300.0	-	10	-	-	-	0.319	0.347	0.337	0.333	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	-	-	0.1	-	EPA 300.0	-	1	-	-	-	<0.100	<0.100	<0.100	<0.100	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate Nitrite as N	mg/L	-	0.1	-	0.02	-	M353.2 - H2SO4 prese	10	0.0582	0.405	0.401	-	-	-	-	0.317	0.332	0.3	0.306	0.303	0.285	0.302	0.25	0.295	0.304	0.29	-	0.316
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	-	0.32	0.33	0.33	0.31	0.3	0.31	0.3	0.32	0.3	0.32	0.33	0.328	0.31
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	-	0.323	0.334	0.332	0.31	0.302	0.308	0.298	0.315	0.298	0.315	0.326	0.328	0.31
Cyanides																												
Weak Acid Dissociable Cyanide	mg/L	-	0.01	0.0025	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	-	-	0.005	0.0019	<0.0025	<0.0025	<0.003	<0.003	<0.003	<0.003	<0.003	0.0034	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,6,7]																												
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8	M200.8 ICP-MS	0.75	0.00483	0.000948	<0.00062	<0.01	<0.01	<0.01	<0.01	<0.005	0.0053	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.006	0.0000878	0.0000687	0.000129	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8	M200.8 ICP-MS	0.01	0.00781	0.00837	0.00837	0.00628	0.00736	0.007	0.00664	0.00737	0.00811	0.00755	0.00745	0.00786	0.00754	0.00704	0.0082	0.0077	0.00687	0.00715	-	0.00727
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8	M200.8 ICP-MS	2	0.00123	0.00052	0.000556	<0.0015	<0.0015	<0.0015	<0.0015	0.00063	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00062	<0.0005	0.00052	<0.0005	0.00058	-	0.0006
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8	M200.8 ICP-MS	0.004	<0.000025	<0.000025	<0.000025	<0.0002	<0.0002	<0.0002	<0.0002	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	-	<0.00008
Boron	mg/L	-	0.005	-	0.001	-	M200.8 ICP-MS	0.75	0.0388	0.00305	0.0193	-	-	-	-	0.0026	0.0015	0.0021	0.0021	0.0021	0.002	0.0022	0.0025	0.0023	0.0025	0.0023	-	0.0027
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8	M200.8 ICP-MS	0.0004	<0.000015	<0.000015	0.0000153	<0.00025	<0.00025	<0.00025	<0.00025	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8	M200.7 ICP	-	33.2	41.6	46.6	35.5	40.9	41.5	40.4	40.5	36	42.2	41.6	43.8	41.7	44.4	42.7	43.5	43.1	43.5	-	45
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8	M200.8 ICP-MS	0.1	<0.00015	<0.00015	<0.00015	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8	M200.8 ICP-MS	0.05	0.000107	0.0000967	0.000156	<0.002	<0.002	<0.002	<0.002	0.000147	0.000084	0.000202	0.00013	0.000107	0.000167	0.000227	0.00011	0.000151	0.000114	0.000114	-	0.000126
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8	M200.8 ICP-MS	0.014	0.00135	<0.0002	0.000277	<0.0005	<0.0005	<0.0005	<0.0005	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0016	<0.0008	<0.0008	<0.0008	<0.0008	-	<0.0008
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8	M200.7 ICP	1	0.106	0.125	0.112	0.129	0.415	0.412	0.224	0.207	0.075	<0.06	<0.06	<0.06	<0.06	0.136	<0.06	0.136	0.236	0.251	-	0.281
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8	M200.8 ICP-MS	0.004	0.000158	0.0000693	0.000057	<0.0001	0.0000895	<0.0001	0.000079	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8	M200.7 ICP	-	10.4	19.8	20.1	16.7	19.6	18.9	17.8	18.3	16.7	18.6	18.4	18.8	18.2	19.8	17.8	18.6	18.7	19.1	-	19.6
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.05	0.0236	0.00677	0.00502	0.00956	0.0213	0.0103	0.00733	0.00769	0.0052	0.00232	0.00111	0.00206	0.0021	0.01	0.00191	0.00527	0.0112	0.0104	-	0.0105
Mercury	ng/L	-	1	-	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	0.623	0.777	1.01	<0.1	<0.5	-	<0.500	<0.3	<0.3	<0.3	<0.3	0.63	<0.3	<0.3	<0.3	<0.3	<0.3	0.97	-	<0.3
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8	M200.8 ICP-MS	0.01	0.00187	0.000183	0.00022	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00044	<0.0002	-	<0.0002
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8	M200.8 ICP-MS	0.081	0.000732	0.000736	0.00103	<0.001	0.000829	0.00101	0.00111	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8	M200.7 ICP	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	0.884	1.89	2.08	1.72	1.76	1.89	1.81	1.75	1.18	1.72	1.66	1.85	1.74	2.03	1.78	1.77	1.74	1.84	-	1.96
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8	M200.8 ICP-MS	0.005	<0.00031	<0.00031	0.000347	<0.0025	<0.0025	<0.0025	<0.0025	0.00011	0.00011	0.00012	0.00011	0.00013	0.00011	<0.0001	0.00012	0.00011	<0.0001	0.00016	-	0.00011
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8	M200.7 ICP	-	5.02	7.6	7.4	6.26	6.7	6.87	6.61	6.16	7.46	6.12	6.62	7.09	6.23	5.52	5.64	6.86	6.34	6.62	-	7.06
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.008	<0.0000062	<0.0000062	<0.0000062	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	6.07	4.29	4.43	3.66	4.24	4.08	3.78	3.86	2.93	4.01	3.75	4.14	3.88	4.05	4.06	3.98	4.08	4.12	-	4.37
Strontium	mg/L	-	0.045	-	0.009	-	M200.7 ICP	-	-	-	-	0.247	0.233	0.286	-	0.253	0.258	0.258	0.255	0.271	0.257	0.277	0.252	0.261	0.268	0.273	-	0.275
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.0017	<0.0000062	<0.0000062	0.0000384	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8	M200.8 ICP-MS	-	0.00026	<0.000062	<0.000062	<0.0005	<0.0005	<0.0005	<0.0005	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	-	<0.0008
Titanium	mg/L	0.025	0.025	0.0125	0.005	EP200.8	M200.7 ICP	-	0.000711	0.00114	0.00132	<0.0125	<0.0125	<0.0125	<0.0125	<0.005	<0.005	0.0067	<0.005	<0.005	0.0053	<0.005	0.0068	0.0075	0.0053	0.008	-	0.0057
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8	M200.8 ICP-MS	0.1	<0.00031	<0.00031	<0.00031	<0.01	<0.01	<0.01	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8	M200.8 ICP-MS	0.185	0.335	0.029	0.017	0.0309	0.127	0.0316	0.0228	0.0242	0.128	0.0174	0.0181	0.0191	0.0203	0.0123	0.0262	0.0205	0.0284	0.029	-	0.0224
Dissolved Metals [5,6,7]																												
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8 Diss	M200.8 ICP-MS	0.75	-	-	-	0.00924	<0.01	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.006	-	-	-	<0.0005	<0.0005	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	-	-	0.00674	0.00404	-	-	0.00294	0.00762	0.00714	0.00772	0.00666	0.00753	0.00416	0.00739	0.00502	0.00767	0.00364	0.00866	0.00212
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8 Diss	M200.8 ICP-MS	2	-	-	-	<0.0015	<0.0015	-	-	0.00079	<0.0005	0.00056	0.00104	0.00058	<0.001	0.0006	<0.0005	0.00058	0.00065	0.00145	<0.007	0.00074
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8 Diss	M200.8 ICP-MS	0.004	-	-	-	<0.0002	<0.0002	-	-	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00016	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	-	<0.00008
Boron	mg/L	-	0.005	-	0.001	-	M200.8 ICP-MS	0.75	-	-	-	-	-	-	-	0.00253	0.00152	0.00274	0.00201	0.002	<0.002	0.00328	0.00375	0.00235	0.00294	0.0029	-	0.0022
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.0004	-	-	-	<0.00025	<0.00025	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8 Diss	M200.7 ICP	-	-	-	-	36.9	42.5	-	-	41.4	34.5	40.5	40.3	40.1	41.1	44.5	39.4	41.8	41.3	41.4	35	43.5
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	-	-	<0.001	<0.001	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.02	<0.0005
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.05	-	-	-	<0.002	<0.002	-	-	0.000114	0.000112	0.000095	0.000112	0.000089	<0.0001	0.000149	0.000113	0.000116	0.000138	0.000112	-	0.000107
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	0.014	-	-	-	<0.0005	<0.0005	-	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0016	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.01	<0.0008
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8 Diss	M200.7 ICP	1	-	-	-	<0.125	0.221	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.077	<0.06	<0.06	0.226	<0.06	0.212	<0.06
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.004	-	-	-	<0.0001	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00016	<0.0001
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8 Diss	M200.7 ICP	-	-	-	-	16.9	19.6	-	-	18.8	15.8	17.7	17.7	17.5	17.8	20.2	17	18.1	18.1	18.2	16.4	19
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.05	-	-	-	0.00972	0.0196	-	-	0.00655	0.00414	0.00231	0.00091	0.00186	0.00193	0.00522	0.00178	0.00457	0.0121	0.01	<0.01	0.00833
Mercury	ng/L	-	-	0.1	-	EP200.8 Diss	-	50	-	-	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	-	-	<0.001	<0.001	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004	0.00026	<0.0002	<0.0002	0.00068	<0.0002	-	<0.0002
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.081	-	-	-	0.000645	0.000978	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.008	<0.0004
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8 Diss	M200.7 ICP	-	-	-	-	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	-	-	1.79	1.83	-	-	1.69	1.41	1.81	1.67	1.71	1.75	1.96	3.64	1.88	1.8	1.77	1.58	1.82
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.005	-	-	-	<0.0025	<0.0025	-	-	0.0001	0.00014	0.0001	0.00011	<0.0001	<0.0002	0.00013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8 Diss	M200.7 ICP	-	-	-	-	6.58	6.7	-	-	7.04	7.25	7.26	6.99	6.81	6.83	6.9	6.78	6.94	7.07	6.99	7.55	7.28
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.008	-	-	-	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	-	-	3.78	4.26	-	-	4	3.47	3.72	3.8	3.92	3.79	4.33	3.81	4.05	4.13	4.07	3.31	4.12
Strontium	mg/L	-	0.045	0.05	0.009	EP200.8 Diss	M200.7 ICP	-	-	-	-	0.249	0.238	-	-	0.262	0.242	0.257	0.242	0.248	0.256	0.285	0.239	0.258	0.27	0.243	-	0.264
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.0017	-	-	-	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	-	-	-	-	<0.0005	<0.0005	-	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0016	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	-	<0.0008
Titanium	mg/L	0.00625	0.025	0.003125	0.005	EP200.8 Diss	M200.7 ICP	-	-	-	-	<0.00313	<0.00313	-	-	<0.005	0.0072	<0.005	<0.005	0.0055	<0.005	<0.005	0.0058	0.0061	0.0077	0.0065	-	<0.005
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	-	-	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8 Diss	M200.8 ICP-MS	0.185	-	-	-	0.032	0.115	-	-	0.0188	0.0576	0.0246	0.0185	0.0191	0.0235	0.0098	0.0242	0.0139	0.0318	0.0253	0.07	0.0176

H:\Projects\414\8\Water Chemistry Database\Tables\[GW_Tables.xlsx]Well02

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 170 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
8. Dissolved metals were analyzed under a separate lab ID in June 2020.
9. Dissolved Oxygen standard shown is the minimum concentration required.
10. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-2
PKG19-002

Site ID		Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,9]	PKG19-002	PKG19-002	PKG19-002	PKG19-002	PKG19-002	PKG19-002	PKG19-002	PKG19-002
Sample Date	Units								28-Jun-2019	10-Sep-2019	26-Oct-2019	5-Jun-2020	25-Sep-2020	20-Oct-2020	19-Nov-2020	11-Dec-2020
Lab ID									1199471002	1199769003	1199903004	1209327002	1205287004	L62412-04	L63021-01	L63346-03
Lab ID (Dissolved metals) [8]										1199769009	1199903009	1209327008				
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ
Field Measured Parameters [9,10]																
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	7.67	7.64	6.24	7.17	7.26	6.4	7.27	6.43
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	-	-	-	347	329	328	307	354
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	3.67	2	0.68	4.18	0.69	1.2	-	0.5
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	10.34	11.47	13.5	5.93	10.25	10.1	-	8.71
Turbidity	NTU	-	-	-	-	2020e Turbidimeter		-	-	>2,000	-	-	-	-	633.4	1036
Physical Tests																
Hardness as CaCO3	mg/L	25	-	25	-	SM21 2340B	-	-	528	536	357	269	380	-	-	-
Dissolved Hardness as CaCO3	mg/L	-	5	-	0.2	-	SM2340B - Calculatio	-	-	-	-	-	-	150	149	142
Total Dissolved Solids	mg/L	40	40	12.4	20	SM21 2540C	SM2540C	500	-	244	239	217	236	240	204	204
Dissolved Anions																
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	-	0.98	0.55	0.395	0.296	0.4	<0.4	<0.4
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	-	88.1	88.5	80.3	80.4	80	73	73
Nutrients																
Total Nitrate as N	mg/L	0.2	-	0.1	-	EPA 300.0	-	10	-	0.1	0.096	0.151	0.112	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.100	<0.100	<0.100	<0.100	-	-	-
Nitrate Nitrite as N	mg/L	-	0.1	-	0.02	-	M353.2 - H2SO4 prese	10	-	-	-	-	-	0.084	0.089	0.099
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	0.09	0.14	0.1
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	0.093	0.144	0.098
Cyanides																
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	0.004	<0.0025	0.0025	<0.0025	<0.003	<0.003	<0.003
Total Metals [5,6,7]																
Aluminum	mg/L	0.02	0.375	0.01	0.125	EP200.8	M200.8 ICP-MS	0.75	124	164	97.2	54.6	74	149	24.7	27.1
Antimony	mg/L	0.001	0.05	0.0005	0.01	EP200.8	M200.8 ICP-MS	0.006	0.0128	0.0148	0.0495	0.0362	0.0583	0.0531	0.0089	0.0109
Arsenic	mg/L	0.005	0.025	0.0025	0.005	EP200.8	M200.8 ICP-MS	0.01	2.42	2.8	1.67	1.01	1.36	1.91	0.273	0.368
Barium	mg/L	0.003	0.0625	0.0015	0.0125	EP200.8	M200.8 ICP-MS	2	0.672	0.935	0.63	0.402	0.882	1.09	0.257	0.254
Beryllium	mg/L	0.0004	0.00625	0.0002	0.002	EP200.8	M200.8 ICP-MS	0.004	0.00717	0.00991	0.00673	0.00072	0.00485	0.00749	0.00121	<0.002
Boron	mg/L	-	0.125	-	0.025		M200.8 ICP-MS	0.75	-	-	-	-	-	<0.1	<0.05	<0.025
Cadmium	mg/L	0.0005	0.00625	0.00025	0.00125	EP200.8	M200.8 ICP-MS	0.0004	0.0782	0.119	0.0487	0.0195	0.0446	0.0521	0.00902	0.00795
Calcium	mg/L	0.5	2.5	0.25	0.5	EP200.8	M200.7 ICP	-	123	120	85.8	71.6	94.3	83.2	60.3	60.2
Chromium	mg/L	0.002	0.05	0.001	0.0125	EP200.8	M200.8 ICP-MS	0.1	0.158	0.219	0.102	0.0687	0.114	0.168	0.0318	0.0362
Cobalt	mg/L	0.004	0.00625	0.002	0.00125	EP200.8	M200.8 ICP-MS	0.05	0.525	0.797	0.315	0.144	0.286	0.343	0.0688	0.0803
Copper	mg/L	0.001	0.05	0.0005	0.02	EP200.8	M200.8 ICP-MS	0.018	1.19	1.7	0.922	0.541	0.739	0.949	0.148	0.189
Iron	mg/L	0.25	0.75	0.125	0.3	EP200.8	M200.7 ICP	1	416	552	306	178	290	274	82.5	92.2
Lead	mg/L	0.0002	0.0125	0.0001	0.0025	EP200.8	M200.8 ICP-MS	0.006	0.859	0.895	0.634	0.408	0.621	0.791	0.12	0.154
Magnesium	mg/L	0.05	5	0.025	1	EP200.8	M200.7 ICP	-	53.8	57.5	34.6	22	34.9	33.5	16.9	15.8
Manganese	mg/L	0.001	0.05	0.0005	0.01	EP200.8	M200.8 ICP-MS	0.05	18.4	27.4	11.5	5.07	11.2	14.9	3.21	3.22
Mercury	ng/L	4	20	2	6	EPA 1631 E	M1631E, Atomic Fluor	50	-	<0.5	<2.5	<5	277	454	60.5	123
Molybdenum	mg/L	0.002	0.0125	0.001	0.005	EP200.8	M200.8 ICP-MS	0.01	0.0187	0.0113	0.0101	0.00603	0.0101	0.0174	0.00326	<0.005
Nickel	mg/L	0.002	0.025	0.001	0.01	EP200.8	M200.8 ICP-MS	0.101	0.562	0.782	0.407	0.214	0.38	0.48	0.0977	0.114
Phosphorous	mg/L	0.2	2.5	0.1	0.5	EP200.8	M200.7 ICP	-	6.89	9.05	5.54	3.2	4.47	4.21	1.34	1.31
Potassium	mg/L	0.5	5	0.25	1	EP200.8	M200.7 ICP	-	13.6	13.4	18	12.3	18	16.3	10.6	11.3
Selenium	mg/L	0.005	0.00625	0.0025	0.0025	EP200.8	M200.8 ICP-MS	0.005	0.00987	0.0076	<0.0125	<0.0125	<0.0125	0.00465	0.00174	<0.0025
Silicon	mg/L	1	2.5	0.5	0.5	EP200.8	M200.7 ICP	-	50	112	194	121	169	62.5	55.3	85.8
Silver	mg/L	0.001	0.0125	0.0005	0.0025	EP200.8	M200.8 ICP-MS	0.012	0.0122	0.0164	0.0116	0.00418	0.00882	0.00968	0.00158	<0.0025
Sodium	mg/L	0.5	5	0.25	1	EP200.8	M200.7 ICP	-	6.27	4.01	3.61	3.73	4.21	3.4	3.48	3.55
Strontium	mg/L	-	0.225	-	0.045	-	M200.7 ICP	-	0.522	0.554	0.315	0.221	-	0.261	0.191	0.208
Thallium	mg/L	0.001	0.0125	0.0005	0.0025	EP200.8	M200.8 ICP-MS	0.0017	0.00317	0.00342	0.00275	0.00172	0.00287	0.00368	0.00074	<0.0025
Tin	mg/L	0.001	0.0625	0.0005	0.02	EP200.8	M200.8 ICP-MS	-	0.00816	0.00549	0.00645	0.00389	0.0137	0.0161	0.00426	<0.02
Titanium	mg/L	0.025	0.125	0.0125	0.025	EP200.8	M200.7 ICP	-	0.17	0.121	0.243	0.245	0.493	0.258	0.606	0.638
Vanadium	mg/L	0.02	0.05	0.01	0.0125	EP200.8	M200.8 ICP-MS	0.1	0.0887	0.111	0.0614	0.0557	0.0835	0.108	0.0226	0.0173
Zinc	mg/L	0.01	0.375	0.005	0.15	EP200.8	M200.8 ICP-MS	0.230	4.5	6.25	3.56	1.69	2.58	3.06	0.472	0.661
Dissolved Metals [5,6,7]																
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8 Diss	M200.8 ICP-MS	0.75	-	0.332	1.56	2.78	-	0.0141	0.0095	0.0078
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.006	-	0.0021	0.0022	0.00356	-	0.00171	0.00081	0.00122
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.00883	0.0346	0.0507	-	0.00259	0.00162	0.00154
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8 Diss	M200.8 ICP-MS	2	-	0.0119	0.0214	0.0346	-	0.0201	0.0226	0.0179
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8 Diss	M200.8 ICP-MS	0.004	-	<0.0002	<0.0002	<0.0002	-	<0.00008	<0.00008	<0.00008
Boron	mg/L	-	0.005	-	0.001		M200.8 ICP-MS	0.75	-	-	-	-	-	0.00294	0.00357	0.00246
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.0004	-	0.000384	0.000586	0.000882	-	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8 Diss	M200.7 ICP	-	-	46.8	51.7	56	-	49.4	49.1	46.2
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.001	<0.001	0.00289	-	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.05	-	0.00123	0.00247	0.00636	-	0.000143	0.000195	0.000163
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	0.018	-	0.00476	0.0146	0.0241	-	<0.0008	0.00175	<0.0008
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8 Diss	M200.7 ICP	1	-	1.22	5.27	8.4	-	<0.06	<0.06	<0.06
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.006	-	0.00364	0.0179	0.0193	-	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8 Diss	M200.7 ICP	-	-	9.89	9.11	8.48	-	6.54	6.52	6.38
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.05	-	0.143	0.109	0.224	-	0.0017	0.00328	0.00201
Mercury	ng/L	-	-	0.1	-	EP200.8 Diss	-	50	-	<0.1	<0.1	0.11	-	-	-	-
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.0021	0.00186	0.00134	-	0.00071	0.00041	0.00048
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.100	-	0.00538	0.00856	0.0112	-	0.0006	0.00073	0.00082
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8 Diss	M200.7 ICP	-	-	<0.1	0.123	0.193	-	<0.1	<0.1	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	2.01	1.94	2.05	-	1.13	0.92	0.99
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.005	-	0.00205	<0.0025	<0.0025	-	0.00147	0.00139	0.00134
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8 Diss	M200.7 ICP	-	-	4.9	7.75	10.9	-	6.36	6.32	5.9
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.012	-	<0.0005	<0.0005	<0.0005	-	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	2.97	2.65	2.9	-	2.61	2.63	2.72
Strontium	mg/L	-	0.045	0.05	0.009	EP200.8 Diss	M200.7 ICP	-	-	0.16	0.145	0.131	-	0.118	0.117	0.121
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.0017	-	<0.0005	<0.0005	<0.0005	-	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	-	-	<0.0005	<0.0005	<0.0005	-	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.00625	0.025	0.003125	0.005	EP200.8 Diss	M200.7 ICP	-	-	0.0034	0.0106	0.0201	-	<0.005	<0.005	0.0084
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.01	<0.01	<0.01	-	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8 Diss	M200.8 ICP-MS	0.230	-	0.012	0.0462	0.0814	-	<0.006	0.177	<0.006

H:\Project\41148\Water Chemistry Database\Tables\[GW_Tables.xlsx]PKG19-002

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 220 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
8. Dissolved metals were analyzed under a separate lab ID in June 2020.
9. Dissolved Oxygen standard shown is the minimum concentration required.
10. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-3
PKG19-003

Site ID									PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003	PKG19-003
Sample Date		Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,9]	28-Jun-2019	9-Sep-2019	26-Oct-2019	5-Jun-2020	8-Aug-2020	24-Sep-2020	20-Oct-2020	11-Dec-2020	16-Mar-2021	21-Apr-2021	19-May-2021	14-Jun-2021	21-Jul-2021	9-Aug-2021	26-Aug-2021
Lab ID	Units								1199471003	1199769001	1199903003	1209327004	1209561002	1205287005	L62412-05	L63346-04	L64886-01	L65493-01	L66043-03	L66644-03	L67373-01	L67761-04	L68133-06
Lab ID (Dissolved metals) [8]										1199769007	1199903008	1209327010											
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters [9,10]																							
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	7.55	7.57	6	7.81	7.35	6	6.03	5.72	7.32	8.44	8.34	7.82	7.87	7.84	-
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	-	-	-	348	318	354	317	318	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	2.4	9.1	0.64	3.8	4.3	1.38	2.06	0.3	2.8	4.8	3.8	8.8	6.2	3.2	-
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	3.57	1.44	6.07	8.39	19.32	4.15	5.38	1.81	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	2020e Turbidimeter/Visual		-	-	2.15	18.3	133.3	15.3	3.41	20.8	10.91	Clear	Clear	Cloudy	Clear	Clear	Clear	-
Physical Tests																							
Hardness as CaCO3	mg/L	5	-	5	-	SM21 2340B	-	-	149	125	131	164	141	144	-	-	-	-	-	-	-	-	-
Dissolved Hardness as CaCO3	mg/L	-	5	-	0.2	-	SM2340B - Calculatio	-		-	-	-	-	-	138	133	135	130	142	133	134	134	134
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	-	198	191	192	187	208	194	200	184	196	198	202	184	200	180
Dissolved Anions																							
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	-	0.535	0.73	2.03	0.712	0.546	0.96	<0.4	0.88	0.59	0.57	0.51	0.78	1.11	0.55
Sulphate	mg/L	2	2	0.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	-	63.5	74.5	71	69.2	75.1	74.7	69.8	69.9	69.7	70.5	73.4	65.9	66.9	65.2
Nutrients																							
Total Nitrate as N	mg/L	0.2	-	0.1	-	EPA 300.0	-	10	-	0.078	0.093	0.0576	0.062	0.077	-	-	-	-	-	-	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.100	<0.100	<0.100	<0.100	<0.100	-	-	-	-	-	-	-	-	-
Nitrate Nitrite as N	mg/L	-	0.1	-	0.02	-	M353.2 - H2SO4 prese	10	-	-	-	-	-	-	0.04	0.044	0.045	0.068	0.037	0.051	0.047	0.053	0.047
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	0.05	0.04	0.05	0.09	0.05	0.05	0.06	0.05	0.04
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	0.053	0.037	0.051	0.085	0.045	0.045	0.062	0.053	0.038
Cyanides																							
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	0.0039	<0.0025	<0.0025	0.0018	<0.0025	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,6,7]																							
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8	M200.8 ICP-MS	0.75	3.94	0.108	0.446	4.1	0.4	0.0969	1.1	0.691	0.436	0.217	0.484	0.777	1.75	0.989	0.67
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.006	0.00326	0.000471	0.00285	0.0478	0.00361	<0.0005	0.0252	0.025	0.0463	0.0187	0.00902	0.0115	0.0175	0.0115	0.00597
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8	M200.8 ICP-MS	0.01	0.0455	0.0117	0.0327	0.0563	0.0199	0.0184	0.0204	0.018	0.0157	0.0143	0.0194	0.0222	0.0316	0.0224	0.0212
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8	M200.8 ICP-MS	2	0.0607	0.0174	0.0165	0.0593	0.0104	0.00711	0.0243	0.0149	0.0136	0.00882	0.00778	0.00959	0.016	0.0125	0.00891
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8	M200.8 ICP-MS	0.004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	0.0001	<0.00008	<0.00008
Boron	mg/L	-	0.005	-	0.001	-	M200.8 ICP-MS	0.75	-	-	-	-	-	-	0.0047	0.0028	0.0036	0.003	0.0024	0.0027	0.0032	0.0028	0.0028
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8	M200.8 ICP-MS	0.0003	<0.00025	<0.00025	<0.00025	0.000779	<0.00025	<0.00025	0.000229	0.000092	0.000121	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8	M200.7 ICP	-	47.6	39.9	42.3	51.4	45.7	47.4	45.6	45.2	46.1	44.4	44.5	43.9	47.9	44.5	45.6
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8	M200.8 ICP-MS	0.1	0.00582	<0.001	<0.001	0.0336	<0.001	<0.001	0.0108	0.00625	0.0121	0.00389	0.0027	0.00341	0.00591	0.00356	0.00199
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8	M200.8 ICP-MS	0.05	0.00728	<0.002	0.00197	0.0134	0.00167	<0.002	0.00385	0.00239	0.00131	0.000657	0.00146	0.00202	0.00419	0.00341	0.00184
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8	M200.8 ICP-MS	0.012	0.016	0.000776	0.00533	0.0499	0.00613	0.00105	0.0214	0.00721	0.018	0.0124	0.00462	0.00747	0.0143	0.0152	0.00514
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8	M200.7 ICP	1	6.16	0.191	1.01	7.5	0.923	0.277	2.4	1.33	0.835	0.436	0.95	1.17	3.17	1.78	1.28
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8	M200.8 ICP-MS	0.050	0.00226	0.0000853	0.000481	0.00601	0.000477	0.00578	0.00233	0.0017	0.00146	0.00059	0.00054	0.00073	0.00127	0.0008	0.00056
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8	M200.7 ICP	-	7.4	6.16	6.14	8.61	6.5	6.17	6.5	6.1	6.33	6.08	6.2	6.11	6.75	6.18	6.23
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.05	0.101	0.0528	0.0234	0.123	0.0197	0.00536	0.0515	0.0339	0.0168	0.00777	0.0142	0.018	0.0349	0.0217	0.0139
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	<0.5	<0.5	<0.5	-	0.796	1.33	1.57	12.8	7.57	15.6	5.42	19.5	12.3	7.66
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8	M200.8 ICP-MS	0.01	0.0102	0.00843	0.00911	0.00722	0.00795	0.00745	0.0096	0.00972	0.0106	0.00962	0.0101	0.00994	0.00981	0.0101	0.00942
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8	M200.8 ICP-MS	0.069	0.00777	0.00127	0.00215	0.0113	0.00247	0.00171	0.00424	0.002	0.00267	0.00113	0.00105	0.00123	0.00214	0.00147	0.00088
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8	M200.7 ICP	-	0.0708	<0.1	<0.1	0.102	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.037
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	2.35	1.06	1.14	2.45	1.22	1.08	1.4	1.01	1.19	1	1.01	1.24	1.41	1.13	1.16
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8	M200.8 ICP-MS	0.005	<0.0025	0.00238	0.0025	<0.0025	0.00158	<0.0025	0.00197	0.00181	0.00191	0.00168	0.00202	0.00185	0.00202	0.00194	0.0019
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8	M200.7 ICP	-	12.5	7.36	7.97	15.2	8.03	7.03	8.08	8.89	7.31	7.32	7.72	6.74	9.8	8.29	8.61
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.006	<0.0005	<0.0005	0.000548	0.00563	0.000587	<0.0005	0.0013	0.00058	0.00046	0.00014	0.00016	<0.0001	0.00012	<0.0001	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	5.96	3.17	2.96	5.29	3.54	3.17	3.33	3.13	3.5	3.15	3.03	3.13	3.43	3.16	3.3
Strontium	mg/L	-	0.045	-	0.009	-	M200.7 ICP	-	0.114	0.0722	0.068	0.088	0.0711	-	0.0628	0.071	0.0739	0.07	0.065	0.0663	0.0673	0.0665	0.0667
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.0017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8	M200.8 ICP-MS	-	0.0212	0.000441	0.000835	0.0105	0.000618	<0.0005	0.00488	0.00159	0.00174	0.00107	<0.0008	<0.0008	0.00169	0.00151	<0.0008
Titanium	mg/L	0.025	0.025	0.0125	0.005	EP200.8	M200.7 ICP	-	0.171	<0.0125	0.00983	0.13	0.012	<0.0125	0.0386	0.0245	0.0211	0.0089	0.028	0.0331	0.0849	0.0488	0.0408
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8	M200.8 ICP-MS	0.1	0.00676	<0.01	<0.01	<0.01	<0.01	<0.01	0.00239	0.00066	0.00086	<0.0005	0.00088	0.00118	0.00261	0.00135	0.00107
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8	M200.8 ICP-MS	0.157	0.0397	<0.005	0.00469	0.0568	0.00602	<0.005	0.0291	0.0142	0.0271	0.0116	<0.006	0.0081	0.014	0.0143	0.0068
Dissolved Metals [5,6,7]																							
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8 Diss	M200.8 ICP-MS	0.75	-	0.0476	0.0178	0.0363	-	-	0.0301	0.0078	0.0237	0.0059	0.193	0.0063	0.417	0.0297	0.056
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.006	-	<0.0005	0.000785	0.00254	-	-	0.00651	0.00345	0.00906	0.00269	0.00414	0.00197	0.00471	0.00221	0.00336
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.011	0.0219	0.0193	-	-	0.00714	0.00888	0.0117	0.0122	0.0159	0.0153	0.0223	0.0135	0.0144
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8 Diss	M200.8 ICP-MS	2	-	0.0173	0.0125	0.00938	-	-	0.0124	0.00557	0.00778	0.00503	0.00609	0.0041	0.0067	0.0049	0.00565
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8 Diss	M200.8 ICP-MS	0.004	-	<0.0002	<0.0002	<0.0002	-	-	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	-	0.005	-	0.001	-	M200.8 ICP-MS	0.75	-	-	-	-	-	-	0.00411	0.00207	0.00353	0.00266	0.00272	0.00271	0.00259	0.00224	0.00265
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.0003	-	<0.00025	<0.00025	<0.00025	-	-	0.000078	<0.00005	0.000086	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8 Diss	M200.7 ICP	-	-	40.8	43.7	50.4	-	-	45.4	43.4	43.9	42.6	46.4	43.3	43.9	43.9	44
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.001	<0.001	0.000946	-	-	0.00057	<0.0005	0.00082	<0.0005	0.00093	<0.0005	0.00123	<0.0005	<0.0005
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.05	-	<0.002	<0.002	<0.002	-	-	0.000358	0.000221	0.00036	0.000216	0.00116	0.000173	0.00251	0.000299	0.000344
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	0.012	-	0.000447	0.000976	0.00331	-	-	0.00473	<0.0008	0.00644	0.00352	0.01	<0.0008	0.00985	0.00297	0.00244
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8 Diss	M200.7 ICP	1	-	<0.125	<0.125	0.0969	-	-	<0.06	<0.06	<0.06	<0.06	0.293	<0.06	0.538	<0.06	<0.06
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.004	-	<0.0001	<0.0001	0.0000833	-	-	0.00017	<0.0001	0.00025	<0.0001	0.00043	<0.0001	0.00058	<0.0001	0.00013
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8 Diss	M200.7 ICP	-	-	6.01	6.25	7.14	-	-	5.96	5.91	6.05	5.82	6.34	5.96	6.01	6.02	5.95
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.05	-	0.0531	0.00155	0.00434	-	-	0.00731	0.00235	0.00465	0.00156	0.0186	0.00069	0.0179	0.00224	0.00218
Mercury	ng/L	-	-	0.1	-	EP200.8 Diss	-	50	-	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.00909	0.00964	0.00805	-	-	0.00917	0.00887	0.00977	0.00982	0.0089	0.00903	0.00628	0.0098	0.00948
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.069	-	0.00131	0.00142	0.00257	-	-	0.0017	0.00041	0.00128	0.00052	0.00076	<0.0004	0.00109	<0.0004	<0.0004
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8 Diss	M200.7 ICP	-	-	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	1.08	1.11	1.16	-	-	0.99	1.03	1.2	0.95	1.23	1.03	1.08	1.04	0.97
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.005	-	0.00192	0.0028	<0.0025	-	-	0.00193	0.00197	0.00186	0.00177	0.00173	0.0021	0.00174	0.00186	0.00179
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8 Diss	M200.7 ICP	-	-	7.27	7.12	7.46	-	-	7.76	7.52	7.79	7.38	7.51	7.49	8.29	8.04	7.84
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.006	-	<0.0005	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	3.14	3.29	4.62	-	-	3.47	3.27	3.28	3.17	3.62	3.1	3.32	3.07	3.16
Strontium	mg/L	-	0.045	0.05	0.009	EP200.8 Diss	M200.7 ICP	-	-	0.0751	0.068	0.0809	-	-	0.0659	0.0701	0.071	0.0616	0.069	0.0666	0.0621	0.0649	0.0592
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.0017	-	<0.0005	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	-	-	<0.0005	<0.0005	<0.0005	-	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.00625	0.025	0.003125	0.005	EP200.8 Diss	M200.7 ICP	-	-	<0.00313	<0.00313	<0.00313	-	-	<0.005	0.0076	<0.005	<0.005	0.0146	<0.005	0.0104	0.008	0.0085
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00062	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8 Diss	M200.8 ICP-MS	0.157	-	<0.005	0.00641	0.00634	-	-	0.0094	<0.006	0.0152	0.0076	0.0114	<0.006	0.0077	<0.006	0.0061

H:\Project\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]PKG19-003

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 140 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
8. Dissolved metals were analyzed under a separate lab ID in June 2020.
9. Dissolved Oxygen standard shown is the minimum concentration required.
10. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-4
PKG19-005

Site ID									PKG19-005	PKG19-005	PKG19-005	PKG19-005	PKG19-005	PKG19-005	PKG19-005	PKG19-005	PKG19-005
Sample Date		Reported Detection Limit		Method Detection Limit		Analysis Method [3]		Comparative Guideline [1,2,4,5,6,7,9]	25-Jun-2019	10-Sep-2019	25-Oct-2019	5-Jun-2020	9-Aug-2020	25-Sep-2020	19-Oct-2020	19-Nov-2020	11-Dec-2020
Lab ID	Units								1199470001	1199769004	1199903001	1209327005	1209561005	1205287006	L62412-06	L63021-02	L63346-05
Lab ID (Dissolved metals) [8]										1199769010	1199903006	1209327011					
Lab		SGS	ACZ	SGS	ACZ	SGS	ACZ		SGS	SGS	SGS	SGS	SGS	SGS	ACZ	ACZ	ACZ
Field Measured Parameters [9,10]																	
pH	pH units	-	-	-	-	Field YSI Pro Plus/Hach HQ		6.5 < pH < 8.5	8.05	7.24	6.37	6.86	6.72	6.69	6.28	-	10.81
Specific Conductance	µS/cm	-	-	-	-	Field YSI Pro Plus/Hach HQ		-	-	-	360	307	289	305	288	-	315
Temperature	°C	-	-	-	-	Field YSI Pro Plus/Hach HQ		20	7.49	1.8	0.13	1.98	3.23	1.18	1.43	-	2.12
Dissolved Oxygen (DO)	mg/L	-	-	-	-	Field YSI Pro Plus/Hach HQ		3	7.56	5.92	6.34	5.53	4.02	7.87	7.51	-	6.38
Turbidity	NTU	-	-	-	-	2020e Turbidimeter		-	-	155	429	10.13	6.27	16.1	7.1	-	9.5
Physical Tests																	
Hardness as CaCO3	mg/L	5	-	5	-	SM21 2340B	-	-	240	163	185	120	120	122	-	-	-
Dissolved Hardness as CaCO3	mg/L	-	5	-	0.2	-	SM2340B - Calculatio	-	-	-	-	-	-	-	121	112	123
Total Dissolved Solids	mg/L	10	40	3.1	20	SM21 2540C	SM2540C	500	-	222	246	172	183	214	188	188	202
Dissolved Anions																	
Chloride	mg/L	0.2	2	0.05	0.4	EPA 300.0	M300.0 - Ion Chromat	230	-	1.97	2.06	1.04	0.876	0.902	0.98	1.22	0.63
Sulphate	mg/L	1	2	0.2.5	0.4	EPA 300.0	M300.0 - Ion Chromat	250	-	64.4	75.1	39.5	51.7	53.4	56.4	45.6	59
Nutrients																	
Total Nitrate as N	mg/L	0.2	-	0.1	-	EPA 300.0	-	10	-	0.415	0.111	0.425	0.335	0.35	-	-	-
Total Nitrite as N	mg/L	0.2	-	0.05	-	EPA 300.0	-	1	-	<0.100	<0.100	<0.100	<0.100	<0.100	-	-	-
Nitrate Nitrite as N	mg/L	-	0.1	-	0.02	-	M353.2 - H2SO4 prese	10	-	-	-	-	-	-	0.31	0.57	0.303
Nitrate as N, dissolved	mg/L	-	0.1	-	0.02	-	Calculation: NO3NO2	10	-	-	-	-	-	-	0.31	0.5	0.3
Nitrite as N, dissolved	mg/L	-	0.05	-	0.01	-	M353.2 - Automated C	1	-	-	-	-	-	-	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	-	0.1	-	0.02	-	M353.2 - Automated C	10	-	-	-	-	-	-	0.305	0.501	0.296
Cyanides																	
Weak Acid Dissociable Cyanide	mg/L	0.005	0.01	0.0015	0.003	SM21 4500-CN I	SM4500-CN I,E-Colori	0.0052	-	0.0035	<0.0025	<0.0025	0.0039	<0.0025	<0.003	<0.003	<0.003
Total Metals [5,6,7]																	
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8	M200.8 ICP-MS	0.75	18.2	5.19	13.4	0.46	0.152	0.576	0.117	0.223	0.375
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.006	0.000812	0.0235	0.00275	0.000465	<0.0005	0.00108	0.00219	0.00561	0.00163
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8	M200.8 ICP-MS	0.01	1.69	0.504	0.915	0.682	0.67	0.647	0.668	0.76	0.662
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8	M200.8 ICP-MS	2	0.139	0.0477	0.0849	0.0133	0.0105	0.0126	0.00988	0.0118	0.0113
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8	M200.8 ICP-MS	0.004	<0.0002	0.000137	0.000537	<0.0002	<0.0002	<0.0002	<0.00008	<0.00008	<0.00008
Boron	mg/L	-	0.005	-	0.001		M200.8 ICP-MS	0.75	-	-	-	-	-	-	0.0038	0.0039	0.0036
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8	M200.8 ICP-MS	0.0003	0.000157	0.00142	0.00018	<0.00025	<0.00025	<0.00025	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8	M200.7 ICP	-	81.1	55.5	63.9	45.2	45.3	46.1	45.8	43.2	49.4
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8	M200.8 ICP-MS	0.1	0.0206	0.0125	0.0129	<0.001	<0.001	<0.001	<0.0005	0.00104	0.00062
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8	M200.8 ICP-MS	0.05	0.13	0.0308	0.0613	0.00158	<0.002	0.00235	0.000783	0.00109	0.00245
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8	M200.8 ICP-MS	0.013	0.0546	0.0581	0.0468	0.0015	0.000884	0.00179	0.00105	0.00534	0.00132
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8	M200.7 ICP	1	55.1	17.2	33.3	0.54	0.348	0.819	0.246	0.394	0.982
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8	M200.8 ICP-MS	0.004	0.00724	0.0195	0.00669	0.000447	0.000134	0.000436	0.00013	0.00034	0.00026
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8	M200.7 ICP	-	9.1	5.87	6.21	1.83	1.71	1.7	1.63	1.22	1.61
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8	M200.8 ICP-MS	0.05	0.656	0.407	0.404	0.0147	0.00979	0.03	0.00758	0.0122	0.025
Mercury	ng/L	1	1	0.5	0.3	EPA 1631 E	M1631E, Atomic Fluor	50	-	<0.5	<0.5	<0.5	-	0.87	<0.3	0.35	<0.3
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8	M200.8 ICP-MS	0.01	0.00756	0.00616	0.0105	0.00794	0.00641	0.00563	0.00561	0.00756	0.00578
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8	M200.8 ICP-MS	0.073	0.0258	0.0194	0.0152	0.00133	0.00187	0.00181	<0.0004	0.00067	0.00047
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8	M200.7 ICP	-	0.272	0.218	0.186	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	6.44	3.66	4.34	1.31	1.35	1.31	1.22	1.2	1.18
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8	M200.8 ICP-MS	0.005	<0.0025	<0.0025	0.00155	0.00159	0.00156	0.00178	0.00165	0.00245	0.00151
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8	M200.7 ICP	-	33.3	18	26.2	7.6	7.07	7.71	6.12	6.25	8.07
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.006	<0.0005	0.00112	0.000312	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8	M200.7 ICP	-	4.85	5.65	9.62	8.38	8.51	7.57	6.89	11.2	8.09
Strontium	mg/L	-	0.045	-	0.009	-	M200.7 ICP	-	0.106	0.109	0.0822	0.0419	0.0401	-	0.033	0.039	0.0452
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8	M200.8 ICP-MS	0.0017	0.000549	<0.0005	0.000349	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8	M200.8 ICP-MS	-	0.00896	0.00667	0.0028	<0.0005	<0.0005	0.000462	<0.0008	0.00132	<0.0008
Titanium	mg/L	0.025	0.025	0.0125	0.005	EP200.8	M200.7 ICP	-	0.66	0.0864	0.287	0.00916	<0.0125	0.0128	0.0084	0.0102	0.019
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8	M200.8 ICP-MS	0.1	0.0189	<0.01	0.00971	<0.01	<0.01	<0.01	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8	M200.8 ICP-MS	0.167	0.0604	0.131	0.0463	<0.005	<0.005	0.00345	<0.006	0.0072	<0.006
Dissolved Metals [5,6,7]																	
Aluminum	mg/L	0.02	0.015	0.01	0.005	EP200.8 Diss	M200.8 ICP-MS	0.75	-	0.266	0.963	0.197	-	-	<0.005	0.0124	<0.005
Antimony	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.006	-	0.00497	0.000747	<0.0005	-	-	0.00103	0.00362	0.00088
Arsenic	mg/L	0.005	0.001	0.0025	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.276	0.306	0.661	-	-	0.635	0.781	0.64
Barium	mg/L	0.003	0.0025	0.0015	0.0005	EP200.8 Diss	M200.8 ICP-MS	2	-	0.0138	0.021	0.0114	-	-	0.00886	0.0101	0.00834
Beryllium	mg/L	0.0004	0.00025	0.0002	0.00008	EP200.8 Diss	M200.8 ICP-MS	0.004	-	<0.0002	<0.0002	<0.0002	-	-	<0.00008	<0.00008	<0.00008
Boron	mg/L	-	0.005	-	0.001		M200.8 ICP-MS	0.75	-	-	-	-	-	-	0.00352	0.00391	0.00319
Cadmium	mg/L	0.0005	0.00025	0.00025	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.0003	-	0.000236	<0.00025	<0.00025	-	-	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.5	0.25	0.1	EP200.8 Diss	M200.7 ICP	-	-	51.6	50.8	43.7	-	-	46.2	42.9	46.7
Chromium	mg/L	0.002	0.002	0.001	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.001	<0.001	<0.001	-	-	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.004	0.00025	0.002	0.00005	EP200.8 Diss	M200.8 ICP-MS	0.05	-	0.0018	0.00366	<0.002	-	-	0.000151	0.000214	0.000203
Copper	mg/L	0.001	0.002	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	0.013	-	0.00731	0.00374	0.000938	-	-	<0.0008	0.00369	<0.0008
Iron	mg/L	0.25	0.15	0.125	0.06	EP200.8 Diss	M200.7 ICP	1	-	0.731	1.66	0.15	-	-	<0.06	<0.06	<0.06
Lead	mg/L	0.0002	0.0005	0.0001	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.004	-	0.0018	0.000608	0.000161	-	-	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	0.05	1	0.025	0.2	EP200.8 Diss	M200.7 ICP	-	-	4.35	3.25	1.78	-	-	1.39	1.21	1.6
Manganese	mg/L	0.001	0.002	0.0005	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.05	-	0.0664	0.0572	0.00411	-	-	0.00133	0.00203	0.00085
Mercury	ng/L	-	-	0.1	-	EP200.8 Diss	-	50	-	<0.1	0.11	<0.1	-	-	-	-	-
Molybdenum	mg/L	0.002	0.0005	0.001	0.0002	EP200.8 Diss	M200.8 ICP-MS	0.01	-	0.00555	0.0106	0.00772	-	-	0.00547	0.00731	0.0053
Nickel	mg/L	0.002	0.001	0.001	0.0004	EP200.8 Diss	M200.8 ICP-MS	0.073	-	0.00451	0.00316	0.00116	-	-	<0.0004	<0.0004	<0.0004
Phosphorous	mg/L	0.2	0.5	0.1	0.1	EP200.8 Diss	M200.7 ICP	-	-	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	<0.1
Potassium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	2.52	2.49	1.26	-	-	1.11	1.14	1.23
Selenium	mg/L	0.005	0.00025	0.0025	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.005	-	<0.0025	<0.0025	<0.0025	-	-	0.00156	0.00236	0.00168
Silicon	mg/L	1	0.5	0.5	0.1	EP200.8 Diss	M200.7 ICP	-	-	7.04	7.72	7.18	-	-	6.87	7.55	6.76
Silver	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.006	-	<0.0005	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001
Sodium	mg/L	0.5	1	0.25	0.2	EP200.8 Diss	M200.7 ICP	-	-	5.41	9.31	8.39	-	-	7.4	10.3	8.12
Strontium	mg/L	-	0.045	0.05	0.009	EP200.8 Diss	M200.7 ICP	-	-	0.0965	0.0642	0.0401	-	-	0.0383	0.0356	0.0456
Thallium	mg/L	0.001	0.0005	0.0005	0.0001	EP200.8 Diss	M200.8 ICP-MS	0.0017	-	<0.0005	<0.0005	<0.0005	-	-	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.001	0.0025	0.0005	0.0008	EP200.8 Diss	M200.8 ICP-MS	-	-	0.00158	0.000951	<0.0005	-	-	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.00625	0.025	0.003125	0.005	EP200.8 Diss	M200.7 ICP	-	-	0.00534	0.0205	0.0041	-	-	<0.005	<0.005	0.0081
Vanadium	mg/L	0.02	0.002	0.01	0.0005	EP200.8 Diss	M200.8 ICP-MS	0.1	-	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.01	0.015	0.005	0.006	EP200.8 Diss	M200.8 ICP-MS	0.167	-	0.0203	0.00577	0.00589	-	-	<0.006	0.0121	<0.006

H:\Projects\41488\Water Chemistry Database\Tables\[GW_Tables.xlsx]PKG19-005

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 150 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.
8. Dissolved metals were analyzed under a separate lab ID in June 2020.
9. Dissolved Oxygen standard shown is the minimum concentration required.
10. pH measurements in October 2020 are erroneous due to instrument malfunction.

Highlighted cells indicate exceedance of Comparative Guideline.
"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-5
GW21-01

Site ID	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	GW21-01	GW21-01	GW21-01	GW21-01	GW21-01	GW21-01	GW21-01	GW21-01	GW21-01
Sample Date						19-May-2021	1-Jun-2021	15-Jun-2021	7-Jul-2021	20-Jul-2021	9-Aug-2021	25-Aug-2021	8-Sep-2021	28-Sep-2021
Lab ID						L66043-02	L66281-03	L66645-03	L67035-03	L67326-01	L67761-05	L68133-02	L68460-03	L68941-02
Lab ID (Dissolved metals)														
Lab		ACZ	ACZ	ACZ		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters														
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	8.82	8.11	8.14	8.01	8.1	7.86	8.08	8.05	7.01
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	2.5	3.7	4.1	2.7	3.3	1.7	2.8	2	1
Turbidity	-	-	-	Visual	-	Light Amber	Light Amber	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Physical Tests														
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	92	86	82	86	85	80	81	81	103
Total Dissolved Solids	mg/L	40	20	SM2540C	500	116	118	108	112	118	114	100	100	100
Dissolved Anions														
Chloride	mg/L	2	0.4	M300.0 - Ion Chromatography	230	<0.4	<0.4	1.04	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Sulphate	mg/L	2	0.4	M300.0 - Ion Chromatography	250	12.5	13.1	13.3	13.7	11.9	10.6	9.93	10.3	11.2
Nutrients														
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	0.543	0.586	0.61	0.567	0.642	0.663	0.631	0.637	0.636
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	0.55	0.58	0.61	0.63	0.64	0.64	0.68	0.658	0.63
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	0.546	0.578	0.606	0.628	0.643	0.644	0.681	0.658	0.63
Cyanides														
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	<0.003	<0.003	<0.003	<0.003	0.0038	<0.003	<0.003	<0.003
Total Metals [5,6,7]														
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	1.74	1.26	0.589	0.54	0.651	0.177	0.292	0.17	0.326
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00091	0.00072	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.0032	0.0027	0.00204	0.00133	0.00151	0.00062	0.0008	0.00067	0.00113
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0127	0.00888	0.0054	0.00422	0.0048	0.00181	0.00227	0.00136	0.00279
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	0.000105	<0.00008	<0.00008	<0.00008	0.00012	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0021	0.0026	0.002	0.0026	0.0019	0.0013	0.0014	0.0016	0.0016
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0002	0.000068	0.000065	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	1	0.2	M200.7 ICP	-	32	32.2	30.9	31.9	31.4	30.9	30.9	30.8	32
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00193	0.00156	0.00081	0.0007	0.0009	<0.0005	<0.0005	<0.0005	0.00061
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00181	0.000911	0.000467	0.000388	0.000466	0.000173	0.00023	0.000184	0.000286
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.007	0.00511	0.00253	0.00135	0.00108	0.00114	<0.0008	<0.0008	<0.0008	<0.0008
Iron	mg/L	0.3	0.12	M200.7 ICP	1	4.5	2.59	1.11	1.03	1.22	0.256	0.493	0.304	0.345
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	0.0134	0.00953	0.00469	0.00323	0.00351	0.00094	0.0013	0.0007	0.00152
Magnesium	mg/L	2	0.4	M200.7 ICP	-	2.5	2.39	2.02	2.14	2.1	2.04	2.07	1.98	2.01
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0439	0.0176	0.00772	0.00705	0.00629	0.00112	0.00268	0.00179	0.00351
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	1.44	2.46	2.14	<0.3	<0.3	<0.3	5.56	<0.3	<0.3
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00077	0.00082	0.00079	0.00075	0.00081	0.00075	0.0007	0.00076	0.00081
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.043	0.00473	0.00246	0.00122	0.00102	0.0013	<0.0004	0.00051	<0.0004	0.00063
Phosphorous	mg/L	1	0.2	M200.7 ICP	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1
Potassium	mg/L	2	0.4	M200.7 ICP	-	1.93	1.05	0.89	0.64	0.71	0.44	0.51	0.51	0.5
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00036	0.00034	0.00036	0.00033	0.00033	0.00033	0.00028	0.0003	0.00032
Silicon	mg/L	1	0.2	M200.7 ICP	-	11.3	7.39	5.2	5.47	5.26	4.93	5.52	5.32	5.24
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	2	0.4	M200.7 ICP	-	1.4	1.37	1.3	1.36	1.35	1.37	1.39	1.4	1.4
Strontium	mg/L	0.09	0.018	M200.7 ICP	-	0.112	0.105	0.104	0.105	0.106	0.105	0.104	0.105	0.106
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.05	0.01	M200.7 ICP	-	0.039	0.0075	0.0054	0.0088	0.0096	<0.005	0.0067	<0.005	<0.005
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00166	0.00121	0.00074	0.00053	0.00057	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.098	0.0246	0.0177	0.0072	0.0066	0.0064	<0.006	<0.006	<0.006	<0.006
Dissolved Metals [5,6,7]														
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	1.19	0.0487	0.0124	<0.005	0.0182	<0.005	<0.005	0.0273	0.022
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00128	0.00038	0.00039	0.00036	0.00039	0.00035	0.00037	0.00037	0.0004
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.00766	0.00252	0.00107	0.00054	<0.0005	<0.0005	<0.0005	<0.0005	0.00596
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.00152	0.00339	0.00176	0.00133	0.00153	0.00107	0.00152	0.00124	0.00179
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	32.8	31.1	29.6	30.9	30.8	28.9	29.1	29.1	37.7
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00144	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00118	0.000184	0.000125	0.000097	0.000109	0.000107	0.000081	0.000056	0.000231
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.007	0.00279	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.00233
Iron	mg/L	0.15	0.06	M200.7 ICP	1	1.02	0.066	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.002	0.00716	0.00071	0.00016	<0.0001	0.00019	<0.0001	<0.0001	0.00015	0.00028
Magnesium	mg/L	1	0.2	M200.7 ICP	-	2.4	2	1.96	2.06	2.06	2.01	1.93	2.02	2.14
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0311	0.00189	0.00051	<0.0004	0.00054	<0.0004	<0.0004	0.00135	0.00804
Mercury	ng/L	-	-	-	50	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00042	0.00052	0.00076	0.00075	0.00064	0.00082	0.00073	0.00066	0.00076
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.043	0.00232	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	0.89	0.25	0.47	0.54	0.52	0.52	0.38	0.38	0.47
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00031	0.00036	0.00034	0.00033	0.00028	0.00029	0.00027	0.00027	0.00027
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6	5.31	5.15	5.26	5.39	5.34	5.36	5.54	5.52
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	1.55	1.17	1.37	1.41	1.43	1.24	1.38	1.34	1.41
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.115	0.107	0.104	0.106	0.105	0.1	0.0908	0.0975	0.102
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0184	<0.005	<0.005	0.0054	<0.005	0.006	<0.005	<0.005	<0.005
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00103	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.098	0.0139	0.0067	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.622

H:\Projects\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-01

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 80 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-6
GW21-02

Site ID						GW21-02	GW21-02	GW21-02	GW21-02	GW21-02	GW21-02	GW21-02	GW21-02
Sample Date	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	17-May-2021	1-Jun-2021	14-Jun-2021	7-Jul-2021	20-Jul-2021	8-Aug-2021	8-Sep-2021	28-Sep-2021
Lab ID						L66044-03	L66281-04	L66644-02	L67036-02	L67326-04	L67792-02	L68409-01	L68942-01
Lab ID (Dissolved metals)													
Lab		ACZ	ACZ	ACZ		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters													
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	7.71	7.77	7.83	7.69	7.57	7.66	7.64	7.74
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	2.6	5.4	5.4	3.4	2.8	4.1	2.9	1.7
Turbidity	-	-	-	Visual	-	Light Amber	Clean, Little Cloudy	Clear	Clear	Clear	Clear	Clear	Clear
Physical Tests													
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	239	245	237	243	246	246	263	253
Total Dissolved Solids	mg/L	40	20	SM2540C	500	312	284	290	272	318	298	338	290
Dissolved Anions													
Chloride	mg/L	2	0.4	M300.0 - Ion Chromatography	230	0.4	<0.4	<0.4	<0.8	0.43	0.5	1.32	0.49
Sulphate	mg/L	2	0.4	M300.0 - Ion Chromatography	250	69.8	71.1	66.7	61.9	69.5	66.6	70.7	66.6
Nutrients													
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	0.156	0.11	0.108	0.098	0.054	0.079	-	0.133
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	0.15	0.17	0.14	0.14	0.18	0.21	0.198	0.131
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	0.153	0.165	0.138	0.141	0.18	0.207	0.198	0.131
Cyanides													
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,6,7]													
Aluminum	mg/L	0.03	0.01	M200.8 ICP-MS	0.75	1.43	0.154	0.0682	0.0296	0.0109	0.0226	-	0.0082
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00645	0.00126	0.00119	0.00048	0.00059	0.00072	-	0.0005
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.0107	0.00252	0.00204	0.00155	0.00176	0.00162	-	0.0017
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0257	0.0109	0.00953	0.00798	0.00822	0.00948	-	0.00785
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	0.000118	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	-	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0044	0.0079	0.0032	0.0032	0.003	0.0045	-	0.0033
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0005	0.000106	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	66.4	62.1	58.5	60.5	61.8	61.1	-	64.3
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00132	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00115	0.000405	0.000279	0.000216	0.000244	0.000223	-	0.000192
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.019	0.00534	0.00096	0.00137	<0.0008	<0.0008	0.00219	-	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	3.69	0.479	0.114	0.105	<0.06	<0.06	-	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	0.00348	0.00052	0.00241	0.00011	0.00016	0.00092	-	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	25.5	24.1	22.4	22.9	23.7	23.7	-	24.5
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.16	0.102	0.121	0.118	0.132	0.123	-	0.138
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	11.4	1.29	<0.3	1.29	<0.3	0.36	-	<0.3
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00033	<0.0002	<0.0002	<0.0002	<0.0002	0.00032	-	<0.0002
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.109	0.00203	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.017	<0.01
Potassium	mg/L	1	0.2	M200.7 ICP	-	1.48	1.1	1.21	1.06	1.07	0.96	-	1.06
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00028	0.00019	0.00011	0.00015	0.00013	<0.0001	-	0.00013
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	9.74	7.18	5.66	5.88	6.66	6.5	-	6.62
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.015	0.00017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	4.4	3.86	3.6	3.87	3.74	3.79	-	4.04
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.319	0.289	0.273	0.287	0.29	0.292	-	0.301
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	-	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0253	0.0063	0.0052	0.0095	0.0097	0.0078	-	0.0081
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00215	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.248	0.0224	<0.006	<0.006	<0.006	<0.006	<0.006	-	<0.006
Dissolved Metals [5,6,7]													
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	<0.005	0.0099	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00297	0.00058	0.00072	<0.0004	0.00061	0.00046	0.00065	0.00053
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00096	0.00118	0.00146	0.00129	0.00168	0.00153	0.00168	0.00148
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0107	0.0119	0.0094	0.00731	0.00748	0.0117	<0.007	0.00943
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	-	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.00283	0.0126	0.00453	0.00304	0.00303	0.00525	-	0.00295
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	58.6	59.8	57.6	58.9	60.3	60.1	63	62.6
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.02	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000193	0.000269	0.000248	0.000186	0.000198	0.00024	-	0.000216
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.019	<0.0008	0.00126	0.00123	<0.0008	<0.0008	<0.0008	<0.01	0.00084
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.006	<0.0001	0.00222	0.0167	0.00029	0.0001	0.00058	<0.0001	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	22.5	23.3	22.7	23.2	23.1	23.2	25.6	23.5
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0738	0.092	0.109	0.113	0.12	0.127	0.142	0.133
Mercury	ng/L	-	-	-	50	-	-	-	-	-	-	<0.0002	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00026	<0.0002	0.0002	<0.0002	<0.0002	0.00033	-	<0.0002
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.100	<0.0004	<0.0004	0.00101	<0.0004	<0.0004	<0.0004	<0.008	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	1.01	0.86	1.12	1.13	1.26	1.1	1.3	1.08
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00022	0.00017	0.00015	0.00011	<0.0001	<0.0001	0.00015	<0.0001
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.74	6.93	6.81	6.95	7.14	7.13	7.51	7.01
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.015	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	3.91	3.61	3.71	3.77	3.94	3.88	4.12	3.84
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.282	0.286	0.281	0.286	0.291	0.29	-	0.286
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	-	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0069	<0.005	<0.005	0.0087	0.0094	0.0099	-	0.011
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.248	<0.006	<0.006	0.0353	<0.006	<0.006	<0.006	<0.02	0.201

H:\Project\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-02

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 240 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-7
GW21-04

Site ID						GW21-04	GW21-04	GW21-04	GW21-04	GW21-04	GW21-04	GW21-04
Sample Date	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	18-May-2021	1-Jun-2021	15-Jun-2021	7-Jul-2021	19-Jul-2021	9-Aug-2021	26-Aug-2021
Lab ID						L66049-02	L66315-03	L66645-02	L67035-04	L67372-01	L67761-01	L68133-05
Lab ID (Dissolved metals)												
Lab		ACZ	ACZ	ACZ		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters												
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	6.55	6.09	5.91	5.94	5.96	5.89	6.1
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	4.1	1.7	3.3	3.8	3.1	2.8	2.4
Turbidity	-	-	-	Visual	-	Cloudy	Cloudy	Clear	Cloudy	Clear	Clear	Clear
Physical Tests												
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	11	11	10	11	12	11	10
Total Dissolved Solids	mg/L	40	20	SM2540C	500	42	34	36	38	36	40	34
Dissolved Anions												
Chloride	mg/L	2	0.4	M300.0 - Ion Chromatography	230	<0.4	<0.4	0.55	<0.4	<0.4	<0.4	<0.4
Sulphate	mg/L	2	0.4	M300.0 - Ion Chromatography	250	0.58	0.67	0.64	0.49	<0.4	<0.4	<0.4
Nutrients												
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	0.606	0.59	0.632	0.595	0.602	0.55	0.5
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	0.59	0.64	0.64	0.67	0.6	0.55	0.56
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	0.592	0.639	0.642	0.669	0.597	0.547	0.558
Cyanides												
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	<0.003	0.005	<0.003	<0.003	0.0033	<0.003
Total Metals [5,6,7]												
Aluminum	mg/L	0.03	0.01	M200.8 ICP-MS	0.087	1.08	0.429	0.194	0.254	0.162	0.167	0.122
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00041	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00058	0.00038	0.00032	0.00023	<0.0002	<0.0002	<0.0002
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.00984	0.00565	0.00493	0.00487	0.00261	0.00268	0.00215
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0011	0.0012	0.0035	0.0018	0.0012	<0.001	<0.001
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0000	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	2.91	2.55	2.42	2.37	2.3	2.17	2.2
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00194	0.00093	0.00061	0.00065	0.00055	0.00058	0.00055
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000904	0.000318	0.00016	0.000172	0.000135	0.000135	0.000108
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.001	0.00277	0.00117	0.00146	0.00109	0.00099	<0.0008	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	2.09	0.6	0.191	0.314	0.162	0.225	0.214
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	0.00109	0.00047	0.00097	0.00053	0.0004	0.00089	0.00018
Magnesium	mg/L	1	0.2	M200.7 ICP	-	1.76	1.46	1.29	1.39	1.28	1.31	1.31
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0551	0.0152	0.00698	0.00761	0.00466	0.00801	0.00378
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	3.35	2.03	10.4	1.4	1.04	1.33	0.98
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.007	0.00308	0.00162	0.0014	0.00141	0.00115	0.00104	0.00116
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	0.62	0.34	0.39	0.21	<0.2	<0.2	<0.2
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	9.37	7.58	6.1	6.99	6.15	5.55	6.92
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.000	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	1.59	1.46	1.48	1.43	1.43	1.34	1.36
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.0266	0.03	0.0242	0.0225	0.0134	0.0208	0.0208
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.014	0.0098	<0.005	0.0053	<0.005	<0.005	<0.005
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00136	<0.0005	<0.0005	0.00051	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.017	0.0061	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Dissolved Metals [5,6,7]												
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.087	0.0085	0.017	0.0209	0.0146	0.0122	0.0076	0.0088
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	<0.0002	<0.0002	0.00021	0.00021	<0.0002	<0.0002	<0.0002
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.00083	0.00201	0.00236	0.0011	0.00097	0.00104	0.00057
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	<0.001	<0.001	0.00372	<0.001	<0.001	0.00106	<0.001
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0000	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	2.42	2.26	2.2	2.28	2.33	2.13	2.13
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000119	0.000082	0.000084	0.00007	0.00007	0.000116	0.000056
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.001	<0.0008	<0.0008	0.00085	<0.0008	<0.0008	<0.0008	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	0.063	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.000	<0.0001	0.00015	0.00287	<0.0001	<0.0001	0.00034	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	1.16	1.27	1.18	1.27	1.37	1.29	1.22
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.00516	0.00186	0.00179	0.00124	0.00096	0.00348	0.00103
Mercury	ng/L	-	-	-	50	-	-	-	-	-	-	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00033	<0.0002
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.007	0.00116	0.00119	0.00122	0.0013	0.00109	0.00105	0.00097
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	<0.2	0.22	0.25	0.27	0.31	0.26	<0.2
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.97	7.01	6.99	7.25	7.42	7.33	7.35
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.000	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	1.43	1.4	1.48	1.43	1.59	1.24	1.38
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.0255	0.0221	0.0243	0.0208	0.0213	0.0203	0.0212
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.017	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006

H:\Projects\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-04

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 10 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-8
GW21-06

Site ID	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	GW21-06	GW21-06	GW21-06	GW21-06	GW21-06
Sample Date						19-May-2021	1-Jun-2021	15-Jun-2021	11-Aug-2021	28-Sep-2021
Lab ID						L66043-01	L66315-01	L66645-01	L67861-01	L68941-01
Lab ID (Dissolved metals)										
Lab		ACZ	ACZ	ACZ		ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters										
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	8.9	9.26	11.85	11	8.22
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	4.5	3.3	3.7	5.7	2.5
Turbidity	-	-	-	Visual	-	Clear	Clear	Clear	Clear	Clear
Physical Tests										
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	156	151	59	56	188
Total Dissolved Solids	mg/L	80	40	SM2540C	500	244	232	408	-	224
Dissolved Anions										
Chloride	mg/L	2	0.4	M300.0 - Ion Chromatography	230	0.92	0.84	<0.4	0.58	1.44
Sulphate	mg/L	2	0.4	M300.0 - Ion Chromatography	250	70.9	75.6	71.1	62.4	50.9
Nutrients										
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	<0.02	<0.02	<0.02	0.038	<0.02
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	<0.02	<0.02	<0.02	0.03	0.253
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	<0.02	<0.02	<0.02	0.028	0.253
Cyanides										
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,6,7]										
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	0.0278	0.037	0.0118	0.184	0.0769
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00071	0.00127	0.00058	0.00164	0.00051
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.269	0.151	0.206	0.161	0.0271
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0132	0.0256	0.339	0.0278	0.0368
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0126	0.0158	0.0116	0.0148	0.0253
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	42.5	45.7	23.6	18.6	59.7
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00064	0.0012	0.00158	0.00169	0.00124
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00188	0.00105	0.00156	0.000312	0.000284
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.010	0.00141	0.00187	0.00283	0.0179	0.00155
Iron	mg/L	0.15	0.06	M200.7 ICP	1	0.09	0.145	<0.06	0.171	0.27
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	<0.0001	0.0001	0.00181	0.0003	0.00067
Magnesium	mg/L	1	0.2	M200.7 ICP	-	10.1	12.3	4.94	2.08	11.1
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0626	0.0248	0.04	0.00422	0.00704
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	0.36	<0.3	<0.3	2.03	0.68
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00303	0.00349	0.00294	0.00311	0.00132
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.056	0.00195	0.00135	0.00106	0.00062	0.0006
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	0.1	<0.1	0.11	0.07
Potassium	mg/L	1	0.2	M200.7 ICP	-	4.54	4.67	48.1	21.8	5.13
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00029	0.00021	0.00015	0.00035	0.00091
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.87	7.21	4.46	6.6	6.78
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	14.4	14.7	111	86.9	11.5
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.153	0.179	1.55	0.171	0.342
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	<0.005	0.0078	<0.005	0.0051	0.0106
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.0015	0.0028	0.00075	0.00818	0.00136
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.128	0.0179	<0.006	<0.006	0.0245	0.054
Dissolved Metals [5,6,7]										
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	0.0251	0.0052	<0.01	0.122	0.0138
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.00066	0.00152	0.00049	0.00148	0.00063
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.256	0.144	0.172	0.159	0.0241
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0121	0.0175	0.327	0.0223	0.0344
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0108	0.0294	0.016	0.0139	0.0237
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	44.7	42.3	19.7	18.7	56.8
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00051	0.00057	0.00144	0.0013	0.00059
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00174	0.000656	0.0007	0.000219	0.000219
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.010	0.00119	<0.0008	0.00148	0.00191	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.003	<0.0001	<0.0001	0.00084	<0.0001	0.00024
Magnesium	mg/L	1	0.2	M200.7 ICP	-	10.7	11	2.27	2.16	11.1
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0581	0.0163	0.00569	0.00132	0.00277
Mercury	ng/L	-	-	-	50	-	-	-	-	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00279	0.00386	0.00303	0.00296	0.00126
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.056	0.00185	0.00145	0.00066	0.00046	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	4.98	4.7	48.1	18.8	5.17
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00022	0.00018	0.00018	0.00028	0.00081
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	7.25	6.82	5.36	7.1	7.7
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	15.4	13.1	113	78.4	10.6
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.164	0.153	1.51	0.207	0.319
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0087	<0.005	<0.005	<0.005	0.0056
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.0009	0.00196	0.00065	0.00939	0.00076
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.128	0.0169	<0.006	<0.012	<0.006	0.0441

H:\Project\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-06

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 110 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-9
GW21-07

Site ID						GW21-07	GW21-07	GW21-07	GW21-07	GW21-07	GW21-07	GW21-07	GW21-07	GW21-07
Sample Date						18-May-2021	31-May-2021	14-Jun-2021	7-Jul-2021	19-Jul-2021	9-Aug-2021	25-Aug-2021	8-Sep-2021	28-Sep-2021
Lab ID						L66049-03	L66281-01	L66644-06	L67036-03	L67372-02	L67761-02	L68133-01	L68460-02	L68942-03
Lab ID (Dissolved metals)														
Lab	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters														
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	8.83	8.06	8.23	7.96	8.01	8.01	7.85	8.03	8.3
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	4	4.5	3.2	3.4	6.4	3.9	3.2	2.6	1.7
Turbidity	-	-	-	Visual	-	Cloudy	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Physical Tests														
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	191	202	201	203	210	199	205	208	240
Total Dissolved Solids	mg/L	40	20	SM2540C	500	294	288	284	290	286	292	282	282	274
Dissolved Anions														
Chloride	mg/L	2	0.4	M300.0 - Ion Chromatography	230	0.68	0.97	0.46	<0.8	0.4	1.24	0.57	<0.8	0.56
Sulphate	mg/L	4	0.8	M300.0 - Ion Chromatography	250	108	112	114	100	103	99.4	100	98.7	100
Nutrients														
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	0.045	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	0.027	0.025	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanides														
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	<0.003	<0.003	<0.003	<0.003	0.0038	<0.003	<0.003	<0.003
Total Metals [5,6,7]														
Aluminum	mg/L	0.075	0.025	M200.8 ICP-MS	0.75	2.34	0.634	0.353	0.318	0.156	0.069	0.104	0.0448	0.0634
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.0124	0.00972	0.00761	0.00871	0.00688	0.00672	0.00724	0.00673	0.00681
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0454	0.0192	0.0161	0.0113	0.00988	0.0102	0.00725	0.00632	0.00729
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	0.00017	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0118	0.0125	0.0114	0.0097	0.0112	0.0127	0.0112	0.0108	0.0118
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0004	0.00007	0.000076	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	75.6	74.6	67.6	70.3	72.5	68.5	70.4	72.3	73.6
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00175	0.00097	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.00103	0.000645	0.000387	0.00043	0.000296	0.000314	0.000243	0.000205	0.000209
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.016	0.00802	0.00401	0.00354	0.0022	0.0105	0.00116	0.00419	<0.0008	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	2.02	0.656	0.216	0.338	0.082	0.072	0.146	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	0.00145	0.00053	0.00085	0.00026	0.00056	0.00115	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	10.3	9.12	8.68	8.31	8.57	8.16	8.41	8.47	8.42
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0394	0.0262	0.0277	0.0227	0.0226	0.0199	0.0144	0.0112	0.0114
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	0.82	<0.3	<0.3	<0.3	<0.3	0.78	0.59	<0.3	<0.3
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00218	0.0019	0.00206	0.00158	0.00187	0.00177	0.00156	0.00155	0.00169
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.093	0.00148	0.00068	0.00043	0.00042	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Potassium	mg/L	1	0.2	M200.7 ICP	-	2.66	1.95	2.09	1.79	1.77	1.65	1.65	1.75	1.76
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00124	0.0012	0.00072	0.00132	0.00095	0.00086	0.00104	0.00086	0.0007
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	8.93	7.13	5.54	7.58	5.87	5.47	5.77	5.59	5.82
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	11.5	9.1	8.61	7.66	7.94	7.39	7.33	7.56	7.57
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.189	0.164	0.158	0.149	0.144	0.145	0.146	0.151	0.15
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0639	0.0257	0.0159	0.021	0.0099	0.0115	0.0117	0.0062	0.0106
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	0.00198	0.00075	<0.0005	0.00054	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.213	0.0172	0.0075	<0.006	<0.006	0.0087	<0.006	<0.006	<0.006	<0.006
Dissolved Metals [5,6,7]														
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	<0.005	0.0298	<0.005	0.0233	0.0058	<0.005	0.0135	0.0169	0.0154
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00834	0.00805	0.0074	0.00776	0.00659	0.00712	0.00681	0.00724	0.00621
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.0224	0.0742	0.0117	0.0074	0.00848	0.00884	0.00646	0.00632	0.0152
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0102	0.233	0.0138	0.0102	0.0101	0.0104	0.0114	0.012	0.011
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0004	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	62.8	67	66.7	67.5	70.2	66.6	68.7	69.8	82.3
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00053
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000204	0.000383	0.000324	0.000268	0.000269	0.000318	0.000229	0.000155	0.000371
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.016	<0.0008	0.0032	0.001	<0.0008	<0.0008	0.00082	0.00541	<0.0008	0.00405
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.005	<0.0001	0.00085	0.00026	<0.0001	<0.0001	0.00049	<0.0001	<0.0001	0.00022
Magnesium	mg/L	1	0.2	M200.7 ICP	-	8.42	8.45	8.25	8.39	8.32	8.05	8.23	8.27	8.43
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0168	0.0282	0.0231	0.0183	0.0223	0.0221	0.0127	0.0133	0.0164
Mercury	ng/L	-	-	-	50	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00196	0.00176	0.00206	0.00147	0.00198	0.002	0.00157	0.00161	0.00158
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.093	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.00042
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	2.13	1.66	2.01	1.83	1.92	1.82	1.69	1.69	1.8
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00108	0.00118	0.0011	0.00137	0.00089	0.00087	0.00107	0.00101	0.00062
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.16	6.25	6.02	6.3	6.34	6.25	6.36	6.38	6.18
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	10	9.03	8.26	7.49	7.82	7.03	7.26	7.46	7.44
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.156	0.151	0.153	0.144	0.15	0.141	0.131	0.145	0.155
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0069	<0.005	0.0051	0.0103	0.0109	0.0113	0.0104	<0.005	0.0128
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.213	<0.006	0.0621	0.0085	<0.006	<0.006	<0.006	0.0093	<0.006	1.02

H:\Projects\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-07

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 200 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-10
GW21-08

Site ID	Units	Reported Detection Limit	Method Detection Limit	Analysis Method [3]	Comparative Guideline [1,2,4,5,6,7]	GW21-08	GW21-08	GW21-08	GW21-08	GW21-08	GW21-08	GW21-08	GW21-08	GW21-08
Sample Date						17-May-2021	1-Jun-2021	14-Jun-2021	7-Jul-2021	19-Jul-2021	9-Aug-2021	26-Aug-2021	8-Sep-2021	28-Sep-2021
Lab ID						L66044-02	L66281-02	L66644-04	L67035-01	L67372-04	L67761-03	L68133-04	L68460-01	L68942-04
Lab ID (Dissolved metals)														
Lab		ACZ	ACZ	ACZ		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Field Measured Parameters														
pH	pH units	-	-	Field YSI Pro Plus/Hach HQ	6.5 < pH < 8.5	7.86	7.99	7.93	7.8	7.78	7.73	7.89	7.79	8.05
Temperature	°C	-	-	Field YSI Pro Plus/Hach HQ	20	1.8	3.3	3.9	4.7	2.7	29	2.7	2.1	2.1
Turbidity	-	-	-	Visual	-	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Physical Tests														
Dissolved Hardness as CaCO3	mg/L	5	0.2	SM2340B - Calculation	-	229	234	231	236	242	231	238	239	231
Total Dissolved Solids	mg/L	40	20	SM2540C	500	328	324	332	660	328	334	322	324	336
Dissolved Anions														
Chloride	mg/L	4	0.8	M300.0 - Ion Chromatography	230	<0.8	<0.8	0.47	1.23	0.47	<0.8	0.57	<0.8	0.6
Sulphate	mg/L	4	0.8	M300.0 - Ion Chromatography	250	137	143	144	142	129	127	128	128	126
Nutrients														
Nitrate Nitrite as N	mg/L	0.1	0.02	M353.2 - H2SO4 preserved	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate as N, dissolved	mg/L	0.1	0.02	Calculation: NO3NO2 minus NO2	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite as N, dissolved	mg/L	0.05	0.01	M353.2 - Automated Cadmium Reduction	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate Nitrite as N, dissolved	mg/L	0.1	0.02	M353.2 - Automated Cadmium Reduction	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanides														
Weak Acid Dissociable Cyanide	mg/L	0.01	0.003	SM4500-CN I,E-Colorimetric w/ distillation	0.0052	<0.003	0.0037	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Metals [5,6,7]														
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	0.0081	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00235	0.00244	0.0025	0.00253	0.00242	0.00222	0.00232	0.00238	0.0023
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.00244	0.0014	0.00164	0.00082	0.00068	0.00161	0.00063	0.00053	0.0007
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.0086	0.0099	0.0095	0.0085	0.009	0.0085	0.0095	0.009	0.0096
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0004	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000053	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	86.4	81.7	79.4	81.9	82.6	80.8	82.6	83.8	87
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000591	0.000668	0.000537	0.000451	0.000354	0.000365	0.000265	0.00027	0.000281
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.018	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00054	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	9.74	9.37	8.91	9.24	9.16	9.08	9.27	9.23	9.53
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.103	0.0904	0.0842	0.0668	0.051	0.0296	0.0325	0.0311	0.0332
Mercury	ng/L	1	0.3	M1631E, Atomic Fluorescence	50	1.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.0101	0.00981	0.00979	0.00856	0.00811	0.00772	0.0072	0.00722	0.00712
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.105	0.00046	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Potassium	mg/L	1	0.2	M200.7 ICP	-	2.54	2.38	2.46	2.34	2.31	2.25	2.26	2.37	2.38
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00104	0.00112	0.00116	0.00121	0.00115	0.00101	0.0009	0.00074	0.00054
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.31	6.42	4.99	5.19	5.9	5.92	5.87	4.95	6.12
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	6.32	5.76	5.58	5.72	5.84	5.84	5.91	6	6.19
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.17	0.154	0.153	0.155	0.149	0.159	0.161	0.164	0.165
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	<0.005	<0.005	<0.005	0.0116	0.0081	0.0101	0.0109	0.0062	0.0104
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.239	0.0095	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Dissolved Metals [5,6,7]														
Aluminum	mg/L	0.015	0.005	M200.8 ICP-MS	0.75	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Antimony	mg/L	0.002	0.0004	M200.8 ICP-MS	0.006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Arsenic	mg/L	0.001	0.0002	M200.8 ICP-MS	0.01	0.00225	0.00229	0.00246	0.00248	0.00242	0.00233	0.00236	0.00241	0.00215
Barium	mg/L	0.0025	0.0005	M200.8 ICP-MS	2	0.00132	0.0182	0.00252	0.00079	0.00072	0.00174	0.00074	0.00077	0.0007
Beryllium	mg/L	0.00025	0.00008	M200.8 ICP-MS	0.004	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Boron	mg/L	0.005	0.001	M200.8 ICP-MS	0.75	0.00828	0.00625	0.0107	0.00894	0.00825	0.0083	0.00967	0.0102	0.00901
Cadmium	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.0004	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000051	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.5	0.1	M200.7 ICP	-	77	78.8	77.9	79.6	81.6	78	80.5	81.1	78.2
Chromium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L	0.00025	0.00005	M200.8 ICP-MS	0.05	0.000548	0.000658	0.000547	0.000425	0.000361	0.000361	0.000178	0.000224	0.000178
Copper	mg/L	0.002	0.0008	M200.8 ICP-MS	0.018	<0.0008	0.00654	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Iron	mg/L	0.15	0.06	M200.7 ICP	1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.006	<0.0001	0.0117	<0.0001	0.00018	<0.0001	0.00042	<0.0001	<0.0001	<0.0001
Magnesium	mg/L	1	0.2	M200.7 ICP	-	8.8	9.11	8.98	9.1	9.19	8.82	9.05	8.94	8.63
Manganese	mg/L	0.002	0.0004	M200.8 ICP-MS	0.05	0.0964	0.0883	0.0781	0.0645	0.0518	0.0242	0.0104	0.0322	0.00103
Mercury	ng/L	-	-	-	50	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	0.0005	0.0002	M200.8 ICP-MS	0.01	0.00954	0.00922	0.00917	0.00819	0.00812	0.00792	0.00728	0.00752	0.00688
Nickel	mg/L	0.001	0.0004	M200.8 ICP-MS	0.100	0.00045	0.00137	0.00048	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Phosphorous	mg/L	0.5	0.1	M200.7 ICP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	mg/L	1	0.2	M200.7 ICP	-	2.27	2.16	2.46	2.37	2.4	2.31	2.25	2.31	2.17
Selenium	mg/L	0.00025	0.0001	M200.8 ICP-MS	0.005	0.00098	0.00116	0.00126	0.00124	0.00109	0.00091	0.00077	0.00083	0.00052
Silicon	mg/L	0.5	0.1	M200.7 ICP	-	6.16	6.31	6.2	6.43	6.64	6.48	6.59	6.59	6.18
Silver	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	mg/L	1	0.2	M200.7 ICP	-	5.66	5.73	5.54	5.72	5.85	5.44	5.77	5.94	5.62
Strontium	mg/L	0.045	0.009	M200.7 ICP	-	0.154	0.155	0.154	0.156	0.157	0.152	0.145	0.159	0.153
Thallium	mg/L	0.0005	0.0001	M200.8 ICP-MS	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	0.0025	0.0008	M200.8 ICP-MS	-	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Titanium	mg/L	0.025	0.005	M200.7 ICP	-	0.0087	<0.005	0.0056	0.0111	0.0119	0.0125	0.0116	<0.005	0.0118
Vanadium	mg/L	0.002	0.0005	M200.8 ICP-MS	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.015	0.006	M200.8 ICP-MS	0.239	0.0088	0.029	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006

H:\Projects\4148\Water Chemistry Database\Tables\[GW_Tables.xlsx]GW21-08

Notes

1. State of Alaska Department of Environmental Conservation (ADEC) - Alaska Water Quality (AWQ) Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Amended December 12, 2008.
2. Department of Environmental Conservation Water Quality Standards 18AAC 70, Amended April 6, 2018
3. These methods are standardized as defined by US EPA or other regulatory body. SGS and ACZ labs are certified for these methods.
4. The Comparative Guideline shown is the lowest of available standards for Aquatic Life Fresh Water Chronic, Human Health Consumption: Water + Aquatic Organisms, or drinking water, irrigation water, or stock water standards. See notes 1 and 2.
5. Aluminum, cadmium, copper, lead, nickel, silver, and zinc have a hardness dependent standard. The calculated standards of these parameters reflect the Alaska Water Quality Standards (WQS) with an average site-specific hardness of 230 mg/L CaCO3 shown.
6. Silver standard shown is for acute exposure. Chronic standard unavailable.
7. AWQ Aquatic Life Fresh Water Chronic standards (not shown) for nitrate, sulphate, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc are for dissolved parameters.

Highlighted cells indicate exceedance of Comparative Guideline.

"-" indicates data, standard, or detection limit not available, or no analysis method applicable.

TABLE F-11a

PRIMARY AND DUPLICATE GROUNDWATER SAMPLE QAQC

		Well02			Well02			PKG19-001			Well02			PKG19-003			SEEP			PKG19-002		
Sample Date	UNITS	29-May-2018	29-May-2018	RPD	12-Sep-2018	12-Sep-2018	RPD	28-Jun-2019	28-Jun-2019	RPD	24-Sep-2020	24-Sep-2020	RPD	24-Sep-2020	24-Sep-2020	RPD	24-Sep-2020	24-Sep-2020	RPD	25-Sep-2020	25-Sep-2020	RPD
Sample Type		PR	DUP_Lab		PR	DUP_Lab		PR	DUP		PR	DUP_LAB		PR	DUP_Lab		PR	DUP_LAB		PR	DUP_Lab	
Lab ID		1189336016	F1815171-01		1189750001	F1819167-01A		1199471001	1199471005		1205287001	L61834-01		1205287005	L61834-05		1205287002	L61834-02		1205287004	L61834-04	
Lab		SGS	ARS Aleut Analytical		SGS	ARS Aleut Analytical		SGS	SGS		SGS	ACZ		SGS	ACZ		SGS	ACZ		SGS	ACZ	
Physical Tests																						
Hardness - as CaCO3	mg/L	185	170	8	199	190	5	207	211	2	174	-	-	144	-	-	24.7	-	-	380	-	-
Total Dissolved Solids	mg/L	218	215	1	228	241	6	-	-	-	221	222	0	208	212	2	88	74	17	236	234	1
Dissolved Anions																						
Chloride	mg/L	0.254	<3	>169	0.257	<3	>168	-	-	-	0.241	2.41	164	0.546	0.67	20	0.167	2.75	177	0.296	0.42	35
Sulphate	mg/L	48.2	51	6	59.5	65	9	-	-	-	44.6	44.8	0	75.1	72.7	3	14	13.7	2	80.4	77.2	4
Nutrients																						
Total Nitrate as N	mg/L	-	-	-	-	-	-	-	-	-	0.333	-	-	0.077	-	-	0.129	-	-	0.112	-	-
Total Nitrite as N	mg/L	-	-	-	-	-	-	-	-	-	<0.100	-	-	<0.100	-	-	<0.100	-	-	<0.100	-	-
Nitrate Nitrite as N	mg/L	0.405	0.376	7	0.401	0.296	30	-	-	-	-	0.331	-	-	0.05	-	-	0.105	-	-	0.078	-
Nitrate as N, dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	0.35	-	-	0.05	-	-	0.12	-	-	0.1	-
Nitrite as N, dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-
Nitrate Nitrite as N, dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	0.345	-	-	0.054	-	-	0.12	-	-	0.098	-
Total Phosphorus	mg/L	0.0093	<0.05	>137	<0.005	<0.05	-	-	-	-	-	<0.01	-	-	0.011	-	-	0.044	-	-	11.6	-
Cyanides																						
Weak Acid Dissociable Cyanide	mg/L	-	-	-	-	-	-	-	-	-	<0.0025	<0.003	-	<0.0025	<0.003	-	<0.0025	<0.003	-	<0.0025	<0.003	-
Total Metals																						
Aluminum	mg/L	0.000948	<0.1	>196	<0.00062	<0.1	-	8.09	8.04	1	<0.01	<0.005	-	0.0969	0.0612	45	3.03	2.24	30	74	154	70
Antimony	mg/L	0.0000687	<0.002	>187	0.000129	<0.002	>176	0.0102	0.0108	6	<0.0005	<0.0004	-	<0.0005	<0.0004	-	<0.0005	<0.0004	-	0.0583	<0.04	>37
Arsenic	mg/L	0.00837	0.0075	11	0.00837	0.0074	12	0.0282	0.0263	7	0.00664	0.00634	5	0.0184	0.0168	9	0.00367	0.00288	24	1.36	2.47	58
Barium	mg/L	0.00052	<0.001	>63	0.000556	<0.001	>57	0.0728	0.0726	0	<0.0015	0.00067	>76	0.00711	0.00621	14	0.0245	0.018	31	0.882	1.12	24
Beryllium	mg/L	<0.000025	<0.001	-	<0.000025	<0.001	-	<0.0002	<0.0002	-	<0.0002	<0.00008	-	<0.0002	<0.00008	-	<0.0002	<0.00008	-	0.00485	0.00657	30
Cadmium	mg/L	<0.000015	<0.001	-	0.0000153	<0.004	>198	0.00034	0.000322	5	<0.00025	<0.00005	-	<0.00025	<0.00005	-	0.000435	0.000368	17	0.0446	0.057	24
Calcium	mg/L	41.6	40	4	46.6	45	3	64.1	65.7	2	40.4	43.7	8	47.4	48.8	3	4.91	4.95	1	94.3	108	14
Chromium	mg/L	<0.00015	<0.003	-	<0.00015	<0.003	-	0.0175	0.0157	11	<0.001	<0.0005	-	<0.001	<0.0005	-	0.00304	0.00306	1	0.114	0.224	65
Cobalt	mg/L	0.0000967	<0.001	>165	0.000156	<0.001	>146	0.00925	0.00901	3	<0.002	0.00012	>177	<0.002	0.000354	>140	0.00166	0.00106	44	0.286	0.534	60
Copper	mg/L	<0.0002	<0.002	-	0.000277	<0.002	>151	0.0488	0.0477	2	<0.0005	<0.0008	-	0.00105	<0.0008	>27	0.00916	0.00642	35	0.739	1.34	58
Iron	mg/L	0.125	0.12	4	0.112	0.11	2	12.6	11.9	6	0.224	0.247	10	0.277	0.266	4	3.99	3.38	17	290	585	67
Lead	mg/L	0.0000693	<0.001	>174	0.000057	<0.001	>178	0.0104	0.0102	2	0.000079	<0.0001	>23	0.00578	<0.0001	>193	0.00258	0.00162	46	0.621	0.999	47
Magnesium	mg/L	19.8	17	15	20.1	20	0	11.4	11.4	0	17.8	19.2	8	6.17	6.4	4	3.02	2.82	7	34.9	56.5	47
Manganese	mg/L	0.00677	0.0053	24	0.00502	0.0044	13	0.289	0.285	1	0.00733	0.00708	3	0.00536	0.00427	23	0.0241	0.0168	36	11.2	20.6	59
Mercury	ng/L	0.777	<1	>25	1.01	<1	>1	-	-	-	<0.500	<0.3	-	0.796	0.64	22	6.74	3.51	63	277	460	50
Molybdenum	mg/L	0.000183	<0.002	>166	0.00022	<0.002	>160	0.00519	0.00542	4	<0.001	<0.0002	-	0.00745	0.00787	5	<0.001	<0.0002	-	0.0101	<0.02	>66
Nickel	mg/L	0.000736	<0.002	>92	0.00103	<0.002	>64	0.0202	0.0192	5	0.00111	<0.0004	>94	0.00171	<0.0004	>124	0.00655	0.00453	36	0.38	0.685	57
Phosphorous	mg/L	-	-	-	-	-	-	0.178	0.157	13	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	4.47	8.79	65
Potassium	mg/L	1.89	<3	>45	2.08	<3	>36	6.69	6.78	1	1.81	1.92	6	1.08	1.11	3	0.937	0.91	3	18	23.6	27
Selenium	mg/L	<0.00031	<0.005	-	0.000347	<0.005	>174	<0.0025	<0.0025	-	<0.0025	<0.0001	-	<0.0025	0.00138	>58	<0.0025	<0.0001	-	<0.0125	<0.01	-
Silicon	mg/L	7.6	6.8	11	7.4	6.7	10	19.7	20.5	4	6.61	7.42	12	7.03	7.64	8	14	13.5	4	169	109	43
Silver	mg/L	<0.0000062	<0.001	-	<0.0000062	<0.001	-	<0.0005	<0.0005	-	<0.0005	<0.0001	-	<0.0005	<0.0001	-	<0.0005	<0.0001	-	0.00882	0.0106	18
Sodium	mg/L	4.29	<5	>15	4.43	<5	>12	11.2	11.4	2	3.78	4.27	12	3.17	3.12	2	3.26	3.62	10	4.21	4.28	2
Strontium	mg/L	-	-	-	-	-	-	0.158	0.158	0	-	0.279	-	-	0.0751	-	-	0.0542	-	-	0.393	-
Thallium	mg/L	<0.0000062	<0.001	-	0.0000384	<0.001	>185	<0.0005	<0.0005	-	<0.0005	<0.0001	-	<0.0005	<0.0001	-	<0.0005	<0.0001	-	0.00287	0.00344	18
Tin	mg/L	<0.000062	<0.01	-	<0.000062	<0.01	-	0.0168	0.0174	4	<0.0005	<0.0008	-	<0.0005	<0.0008	-	<0.0005	<0.0008	-	0.0137	<0.08	>142
Titanium	mg/L	0.00114	<0.01	>159	0.00132	<0.01	>153	0.283	0.277	2	<0.0125	<0.005	-	<0.0125	<0.005	-	0.109	0.086	24	0.493	0.506	3
Vanadium	mg/L	<0.00031	<0.005	-	<0.00031	<0.005	-	0.0131	0.0128	2	<0.01	<0.0005	-	<0.01	<0.0005	-	<0.01	0.00319	>103	0.0835	0.0838	0
Zinc	mg/L	0.029	0.024	19	0.017	0.017	0	0.074	0.0678	9	0.0228	0.0215	6	<0.005	<0.006	-	0.0158	0.015	5	2.58	4.45	53
Dissolved Metals																						
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	<0.005	-	-	0.104	-	-	0.0126	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	<0.0004	-	-	<0.0004	-	-	0.00133	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	0.00288	-	-	0.0174	-	-	0.00044	-	-	0.00237	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	0.00079	-	-	0.0056	-	-	0.00635	-	-	0.0197	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00008	-	-	<0.00008	-	-	<0.00008	-	-	<0.00008	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	0.00221	-	-	0.00266	-	-	0.00217	-	-	0.00315	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00005	-	-	<0.00005	-	-	0.000284	-	-	<0.00005	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	42.5	-	-	47.2	-	-	4.5	-	-	51	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	0.000147	-	-	0.00016	-	-	0.000324	-	-	0.000211	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0008	-	-	<0.0008	-	-	0.00202	-	-	<0.0008	-
Iron	mg/L	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	<0.06	-	-	0.088	-	-	<0.06	-
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	<0.0001	-	-	0.0002	-	-	<0.0001	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	19.2	-	-	6.21	-	-	2.07	-	-	6.83	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	0.00697	-	-	<0.0004	-	-	0.00678	-	-	0.00242	-
Mercury	ng/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	0.00752	-	-	<0.0002	-	-	0.00061	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	<0.0004	-	-	0.00223	-	-	0.00064	-
Phosphorous	mg/L	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	<0.1	-	-	<0.1	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	1.76	-	-	0.96	-	-	0.38	-	-	1.16	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	0.00147	-	-	0.00014	-	-	0.00143	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	7.58	-	-	7.5	-	-	9.01	-	-	6.71	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	<0.0001	-	-	<0.0001	-	-	<0.0001	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	4.07	-	-	2.99	-	-	3.45	-	-	2.59	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	0.268	-	-	0.0702	-	-	0.0468	-	-	0.121	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	<0.0001	-	-	<0.0001	-	-	<0.0001	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0008	-	-	<0.0008	-	-	<0.0008	-	-	<0.0008	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	0.0053	-	-	0.0052	-	-	<0.005	-	-	0.0056	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	0.0183	-	-	<0.006	-	-	0.0605	-	-	<0.006	-

H:\Project\4148\Water Chemistry Database\QAQC\[GW_QAQC.xlsm]GW_QAQC_a

Notes:

PR = Primary sample

DUP_LAB = Duplicate sample analyzed at a different lab

DUP = duplicate sample analyzed at the same lab

RPD = Relative Percent Difference

"-" denotes the parameter was not analyzed or that both the PR and DUP have values below the detection limit, and no RPD has been calculated.

highlighted cells indicate RPD > 65

highlighted cells indicate high RPD likely due to significant difference between lab detection limits

">" denotes that one of the samples had a value below the detection limit. The RPD shown is a conservative value based on the detection limit.

TABLE F-11b

PRIMARY AND DUPLICATE GROUNDWATER SAMPLE QAQC

		PKG19-005			Well02			GW21-06			GW21-08			GW21-08			GW21-07			GW21-01		
Sample Date	UNITS	25-Sep-2020	25-Sep-2020	RPD	18-Mar-2021	18-Mar-2021	RPD	1-Jun-2021	1-Jun-2021	RPD	14-Jun-2021	14-Jun-2021	RPD	7-Jul-2021	7-Jul-2021	RPD	19-Jul-2021	19-Jul-2021	RPD	8-Sep-2021	8-Sep-2021	RPD
Sample Type		PR	DUP_LAB		PR	DUP		PR	DUP		PR	DUP		PR	DUP		PR	DUP		PR	DUP	
Lab ID		1205287006	L61834-06		L64885-01	L64885-02		L66315-01	L66315-02		L66644-04	L66644-05		L67035-01	L67035-02		L67372-02	L67372-03		L68460-03	L68460-04	
Lab		SGS	ACZ		ACZ	ACZ		ACZ	ACZ		ACZ	ACZ		ACZ	ACZ		ACZ	ACZ		ACZ	ACZ	
Physical Tests																						
Hardness - as CaCO3	mg/L	-	123		174	175		151	153		231	230	-	236	236	0	210	212	1	81	85	5
Total Dissolved Solids	mg/L	214	212	1	214	214	0	232	260	11	332	330	1	660	324	68	286	123	80	100	102	2
Dissolved Anions																						
Chloride	mg/L	0.902	1.02	12	<0.4	<0.4	-	0.84	0.89	6	0.47	0.45	4	1.23	<2	>48	0.4	0.43	7	<0.4	<0.4	-
Sulphate	mg/L	53.4	51.7	3	41.3	42.1	2	75.6	75.1	1	144	143	1	142	139	2	103	102	1	10.3	10.3	0
Nutrients																						
Nitrate Nitrite as N	mg/L	-	0.341	-	0.3	0.303	1	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.637	0.636	0
Nitrate as N, dissolved	mg/L	-	0.37	-	0.33	0.35	6	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.658	0.674	2
Nitrite as N, dissolved	mg/L	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Nitrate Nitrite as N, dissolved	mg/L	-	0.372	-	0.332	0.347	4	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.658	0.674	2
Total Phosphorus	mg/L	-	0.054	-	<0.01	<0.01	-	0.06	0.064	6	0.03	0.031	3	<0.01	<0.01	-	<0.01	<0.01	-	-	-	-
Cyanides																						
Weak Acid Dissociable Cyanide	mg/L	<0.0025	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	-
Total Metals																						
Aluminum	mg/L	0.576	0.273	71	<0.005	<0.005	-	0.037	0.041	10	<0.005	<0.005	-	<0.005	<0.005	-	0.156	0.153	2	0.17	0.165	3
Antimony	mg/L	0.00108	0.00096	12	<0.0004	<0.0004	-	0.00127	0.0012	6	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-
Arsenic	mg/L	0.647	0.586	10	0.00755	0.00752	0	0.151	0.146	3	0.0025	0.00245	2	0.00253	0.00252	0	0.00688	0.00675	2	0.00067	0.00064	5
Barium	mg/L	0.0126	0.0111	13	<0.0005	<0.0005	-	0.0256	0.0271	6	0.00164	0.00159	3	0.00082	0.00078	5	0.00988	0.00972	2	0.00136	0.0014	3
Beryllium	mg/L	<0.0002	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-
Cadmium	mg/L	<0.00025	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Calcium	mg/L	46.1	47.2	2	42.2	43.2	2	45.7	45.8	0	79.4	77.6	2	81.9	82.5	1	72.5	70.4	3	30.8	31.1	1
Chromium	mg/L	<0.001	0.00052	>63	<0.0005	<0.0005	-	0.0012	0.00108	11	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Cobalt	mg/L	0.00235	0.00202	15	0.000202	0.000129	44	0.00105	0.00104	1	0.000537	0.000539	0	0.000451	0.000448	1	0.000296	0.000294	1	0.000184	0.000183	1
Copper	mg/L	0.00179	0.00101	56	<0.0008	0.00243	>101	0.00187	0.00195	4	<0.0008	<0.0008	-	<0.0008	<0.0008	-	0.0105	0.00748	34	<0.0008	<0.0008	-
Iron	mg/L	0.819	0.917	11	<0.06	<0.12	-	0.145	0.161	10	<0.06	<0.06	-	<0.06	<0.06	-	0.082	0.079	4	0.304	0.308	1
Lead	mg/L	0.000436	0.0003	37	<0.0001	<0.0001	-	0.0001	0.00011	10	<0.0001	<0.0001	-	<0.0001	<0.0001	-	0.00056	0.00054	4	0.0007	0.00068	3
Magnesium	mg/L	1.7	1.64	4	18.6	19	2	12.3	12.3	0	8.91	8.95	0	9.24	9.28	0	8.57	8.26	4	1.98	2.02	2
Manganese	mg/L	0.03	0.0238	23	0.00232	0.00302	26	0.0248	0.0248	0	0.0842	0.0841	0	0.0668	0.0675	1	0.0226	0.0227	0	0.00179	0.00178	1
Mercury	ng/L	0.87	0.48	58	<0.3	<0.3	-	<0.3	0.34	>13	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	-
Molybdenum	mg/L	0.00563	0.0061	8	<0.0002	<0.0002	-	0.00349	0.00338	3	0.00979	0.00955	2	0.00856	0.00865	1	0.00187	0.00189	1	0.00076	0.00073	4
Nickel	mg/L	0.00181	<0.0004	>128	<0.0004	<0.0004	-	0.00135	0.00132	2	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-
Phosphorous	mg/L	<0.1	<0.1	-	<0.1	<0.2	-	0.1	0.12	18	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.01	<0.1	-
Potassium	mg/L	1.31	1.34	2	1.72	1.66	4	4.67	4.67	0	2.46	2.45	0	2.34	2.34	0	1.77	1.74	2	0.51	0.51	0
Selenium	mg/L	0.00178	0.00148	18	0.00012	<0.0001	>18	0.00021	0.00018	15	0.00116	0.00111	4	0.00121	0.0012	1	0.00095	0.00093	2	0.0003	0.0003	0
Silicon	mg/L	7.71	7.93	3	6.12	6.93	12	7.21	7.19	0	4.99	5.45	9	5.19	6.18	17	5.87	6.11	4	5.32	5.21	2
Silver	mg/L	<0.0005	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Sodium	mg/L	7.57	7.59	0	4.01	4.03	0	14.7	14.6	1	5.58	5.6	0	5.72	5.76	1	7.94	7.72	3	1.4	1.42	1
Strontium	mg/L	-	0.0402		0.258	0.268	4	0.179	0.182	2	0.153	0.154	1	0.155	0.156	1	0.144	0.141	2	0.105	0.106	1
Thallium	mg/L	<0.0005	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Tin	mg/L	0.000462	<0.0008	>54	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-
Titanium	mg/L	0.0128	0.0142	10	0.0067	<0.01	>40	0.0078	0.0076	3	<0.005	0.005	-	0.0116	0.0115	1	0.0099	0.0109	10	<0.005	<0.005	-
Vanadium	mg/L	<0.01	<0.0005	-	<0.0005	<0.0005	-	0.0028	0.00265	6	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Zinc	mg/L	0.00345	<0.006	>54	0.0174	0.0164	6	<0.006	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	-	0.0087	0.0069	23	<0.006	<0.006	-
Dissolved Metals																						
Aluminum	mg/L	-	<0.005	-	<0.005	<0.005	-	0.0052	<0.005	>4	<0.005	<0.005	-	<0.005	<0.005	-	0.0058	0.0054	7	0.0273	0.0562	69
Antimony	mg/L	-	0.0005	-	<0.0004	<0.0004	-	0.00152	0.00143	6	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-
Arsenic	mg/L	-	0.646	-	0.00714	0.00698	2	0.144	0.147	2	0.00246	0.00243	1	0.00248	0.00241	3	0.00659	0.00669	2	0.00037	0.00048	26
Barium	mg/L	-	0.00885	-	0.00056	<0.0005	>11	0.0175	0.0167	5	0.00252	0.00178	34	0.00079	0.00081	2	0.00848	0.00834	2	<0.0005	<0.0005	-
Beryllium	mg/L	-	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-	<0.00008	<0.00008	-
Boron	mg/L	-	0.00383	-	0.00274	0.00221	21	0.0294	0.016	59	0.0107	0.0101	6	0.00894	0.00907	1	0.0101	0.00984	3	0.00124	0.00121	2
Cadmium	mg/L	-	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Calcium	mg/L	-	46.8	-	40.5	40.8	1	42.3	42.8	1	77.9	77.3	1	79.6	79.4	0	70.2	70.9	1	29.1	30.6	5
Chromium	mg/L	-	<0.0005	-	<0.0005	<0.0005	-	0.00057	<0.0005	>13	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Cobalt	mg/L	-	0.000208	-	0.000095	0.000095	0	0.000656	0.000636	3	0.000547	0.000558	2	0.000425	0.000425	0	0.000269	0.000254	6	0.000056	0.000079	34
Copper	mg/L	-	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-
Iron	mg/L	-	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-
Lead	mg/L	-	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	0.00018	<0.0001	>57	<0.0001	<0.0001	-	0.00015	0.00031	70
Magnesium	mg/L	-	1.5	-	17.7	17.8	1	11	11.3	3	8.98	8.97	0	9.1	9.15	1	8.32	8.43	1	2.02	1.98	2
Manganese	mg/L	-	0.00084	-	0.00231	0.00218	6	0.0163	0.0168	3	0.0781	0.0781	0	0.0645	0.0652	1	0.0223	0.0214	4	0.00135	0.00133	1
Mercury	ng/L	-	-	-	-	-		-	-		-	-		-	-		-	-		-	-	
Molybdenum	mg/L	-	0.00589	-	<0.0002	<0.0002	-	0.00386	0.00374	3	0.00917	0.00909	1	0.00819	0.00818	0	0.00198	0.00192	3	0.00066	0.00056	16
Nickel	mg/L	-	<0.0004	-	<0.0004	<0.0004	-	0.00145	0.00107	30	0.00048	<0.0004	>18	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	-
Phosphorous	mg/L	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Potassium	mg/L	-	1.17	-	1.81	1.81	0	4.7	4.77	1	2.46	2.39	3	2.37	2.49	5	1.92	1.94	1	0.38	0.41	8
Selenium	mg/L	-	0.00164	-	0.0001	<0.0001	-	0.00018	0.00016	12	0.00126	0.00131	4	0.00124	0.00117	6	0.00089	0.00088	1	0.00027	0.00026	4
Silicon	mg/L	-	7.34	-	7.26	7.25	0	6.82	6.93	2	6.2	6.19	0	6.43	6.44	0	6.34	6.43	1	5.54	5.58	1
Silver	mg/L	-	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Sodium	mg/L	-	7.51	-	3.72	3.72	0	13.1	13.4	2	5.54	5.52	0	5.72	5.86	2	7.82	7.92	1	1.34	1.4	4
Strontium	mg/L	-	0.0395	-	0.257	0.258	0	0.153	0.162	6	0.154	0.153	1	0.156	0.156	0	0.15	0.151	1	0.0975	0.103	5
Thallium	mg/L	-	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Tin	mg/L	-	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-	<0.0008	<0.0008	-
Titanium	mg/L	-	0.0053	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0056	0.0053	6	0.0111	0.0137	21	0.0109	0.011	1	<0.005	<0.005	-
Vanadium	mg/L	-	<0.0005	-	<0.0005	<0.0005	-	0.00196	0.00199	-	<0.0005	<0.0005	6	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Zinc	mg/L	-	<0.006	-	0.0246	0.0179	32	<0.006	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	-

H:\Project\4148\Water Chemistry Database\QAQC\[GW_QAQC.xlsm]GW_QAQC_b

Notes:
PR = Primary sample
DUP_LAB = Duplicate sample analyzed at a different lab
DUP = duplicate sample analyzed at the same lab
RPD = Relative Percent Difference
"-" denotes the parameter was not analyzed or that both the PR and DUP have values below the detection limit, and no RPD has been calculated.
highlighted cells indicate RPD > 65
highlighted cells indicate high RPD likely due to significant difference between lab detection limits
">" denotes that one of the samples had a value below the detection limit. The RPD shown is a conservative value based on the detection limit.

TABLE F-12
TRIP AND FIELD BLANKS

		TRIP BLANK	FIELD BLANK GW	HG TRIP BLANK 3	FIELD BLANK GW	HG TRIP BLANK 3	HG TRIP BLANK 3	FIELD BLANK GW	HG TRIP BLANK 3	TRIP BLANK
Sample Date	UNITS	29-May-2018	24-Sep-2020	24-Sep-2020	20-Oct-2020	20-Oct-2020	19-Nov-2020	11-Dec-2020	12-Dec-2020	18-Mar-2021
Sample Type		TB	FB	TB	FB	TB	TB	FB	TB	TB
Lab ID		F1815171-02	L61834-03	L61834-07	L62412-03	L62412-07	L63021-03	L63346-02	L63346-06	L64885-04
Lab		ARS Aleut Analytical	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Physical Tests										
Total Dissolved Solids	mg/L	-	<20	-	<20	-	-	<20	-	-
Dissolved Anions										
Chloride	mg/L	-	<0.4	-	<0.4	-	-	<0.4	-	-
Sulphate	mg/L	-	<0.4	-	<0.4	-	-	<0.4	-	-
Nutrients										
Nitrate Nitrite as N	mg/L	-	<0.02	-	<0.02	-	-	<0.02	-	-
Nitrate as N, dissolved	mg/L	-	<0.02	-	<0.02	-	-	<0.02	-	-
Nitrite as N, dissolved	mg/L	-	<0.01	-	<0.01	-	-	<0.01	-	-
Nitrate Nitrite as N, dissolved	mg/L	-	<0.02	-	<0.02	-	-	<0.02	-	-
Cyanides										
Weak Acid Dissociable Cyanide	mg/L	-	<0.003	-	<0.003	-	-	<0.003	-	-
Total Metals										
Aluminum	mg/L	-	<0.005	-	<0.005	-	-	<0.005	-	-
Antimony	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Arsenic	mg/L	-	<0.0002	-	<0.0002	-	-	<0.0002	-	-
Barium	mg/L	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-
Beryllium	mg/L	-	<0.00008	-	<0.00008	-	-	<0.00008	-	-
Boron	mg/L	-	<0.001	-	<0.001	-	-	<0.001	-	-
Cadmium	mg/L	-	<0.00005	-	<0.00005	-	-	<0.00005	-	-
Calcium	mg/L	-	<0.1	-	<0.1	-	-	<0.1	-	-
Chromium	mg/L	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-
Cobalt	mg/L	-	<0.00005	-	<0.00005	-	-	<0.00005	-	-
Copper	mg/L	-	<0.0008	-	<0.0008	-	-	<0.0008	-	-
Iron	mg/L	-	<0.06	-	<0.06	-	-	<0.06	-	-
Lead	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Magnesium	mg/L	-	<0.2	-	<0.2	-	-	<0.2	-	-
Manganese	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Mercury	ng/L	1.11	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.96	<0.3
Molybdenum	mg/L	-	<0.0002	-	<0.0002	-	-	<0.0002	-	-
Nickel	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Phosphorous	mg/L	-	<0.1	-	<0.1	-	-	<0.1	-	-
Potassium	mg/L	-	<0.2	-	<0.2	-	-	<0.2	-	-
Selenium	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Silicon	mg/L	-	<0.1	-	<0.1	-	-	<0.1	-	-
Silver	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Sodium	mg/L	-	<0.2	-	<0.2	-	-	<0.2	-	-
Strontium	mg/L	-	<0.009	-	<0.009	-	-	<0.009	-	-
Thallium	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Tin	mg/L	-	<0.0008	-	<0.0008	-	-	<0.0008	-	-
Titanium	mg/L	-	<0.005	-	<0.005	-	-	<0.005	-	-
Vanadium	mg/L	-	<0.0005	-	0.00153	-	-	<0.0005	-	-
Zinc	mg/L	-	<0.006	-	<0.006	-	-	<0.006	-	-
Dissolved Metals										
Aluminum	mg/L	-	<0.005	-	<0.005	-	-	<0.005	-	-
Antimony	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Arsenic	mg/L	-	<0.0002	-	<0.0002	-	-	<0.0002	-	-
Barium	mg/L	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-
Beryllium	mg/L	-	<0.00008	-	<0.00008	-	-	<0.00008	-	-
Boron	mg/L	-	<0.001	-	<0.001	-	-	<0.001	-	-
Cadmium	mg/L	-	<0.00005	-	<0.00005	-	-	<0.00005	-	-
Calcium	mg/L	-	<0.1	-	<0.1	-	-	0.31	-	-
Chromium	mg/L	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-
Cobalt	mg/L	-	<0.00005	-	<0.00005	-	-	<0.00005	-	-
Copper	mg/L	-	<0.0008	-	<0.0008	-	-	<0.0008	-	-
Iron	mg/L	-	<0.06	-	<0.06	-	-	<0.06	-	-
Lead	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Magnesium	mg/L	-	<0.2	-	<0.2	-	-	<0.2	-	-
Manganese	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Mercury	ng/L	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	<0.0002	-	<0.0002	-	-	<0.0002	-	-
Nickel	mg/L	-	<0.0004	-	<0.0004	-	-	<0.0004	-	-
Phosphorous	mg/L	-	<0.1	-	<0.1	-	-	<0.1	-	-
Potassium	mg/L	-	<0.2	-	<0.2	-	-	0.44	-	-
Selenium	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Silicon	mg/L	-	<0.1	-	<0.1	-	-	<0.1	-	-
Silver	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Sodium	mg/L	-	<0.2	-	<0.2	-	-	0.59	-	-
Strontium	mg/L	-	<0.009	-	<0.009	-	-	0.01	-	-
Thallium	mg/L	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-
Tin	mg/L	-	<0.0008	-	<0.0008	-	-	<0.0008	-	-
Titanium	mg/L	-	<0.005	-	<0.005	-	-	0.007	-	-
Vanadium	mg/L	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-
Zinc	mg/L	-	<0.006	-	<0.006	-	-	<0.006	-	-

H:\Project\4148\Water Chemistry Database\QAQC\[GW_QAQC.xlsm]GW_QAQC (TB+FB)

Notes:
TB = Trip Blank
FB = Field Blank
highlighted cells indicate value detected
"-" denotes the parameter was not analyzed