Alaska Gold Company

A NovaGold Subsidiary

ROCK CREEK MINE
PLAN OF OPERATIONS
VOLUME 4
RECLAMATION PLAN
May, 2006

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Placer mining on the Rock Creek deposit, 1902

NovaGold

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DEFINITIONS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
ADOT	Alaska Department of Transportation
Alaska Gold	Alaska Gold Company
AS	Alaska Statute
asl	above sea level
ATV	all-terrain vehicle
cm	centimeter
COE	U.S. Army Corps of Engineers
cy	cubic yard
km	kilometers
m^3	cubic meter
Mt	metric ton
NEPA	National Environmental Policy Act
Project	Rock Creek Gold Mine Project
Reclamation Plan	Rock Creek Gold Mine Project Reclamation Plan
TSF	Tailings Storage Facility
USGS	U.S. Geological Survey

1.0 INTRODUCTION

1.1 INTRODUCTION

The Rock Creek Gold Mine Project (Project) is located on the Seward Peninsula along the west coast of Alaska, There are two project components: the Rock Creek Mine/Mill Complex and the Big Hurrah Mine. Due to proposed excavation and fill activities within wetlands under the jurisdiction of the U.S. Army Corps of Engineers (COE), Alaska Gold Company (Alaska Gold) is required to secure COE 404 permits for the Project, subjecting the proposed Project to the authority and review of the National Environmental Policy Act (NEPA) process. All other federal permits anticipated to be required for the Project do not require NEPA review.

The Alaska Department of Natural Resources (ADNR) Large Project Permitting Team is coordinating the state permitting process, as well as working cooperatively with the COE to ensure the Project is properly permitted and in compliance with all relevant environmental regulations.

This Rock Creek Gold Mine Project Reclamation Plan (Reclamation Plan) has been prepared to meet ADNR reclamation requirements pursuant to Alaska Statutes Chapter 27.19 (AS 27.19) and the Alaska Administrative Code (11 AAC 97) as applicable to private land, and to provide internal guidance in keeping with the Alaska Gold Company Environmental Policy.

1.2 PROJECT LOCATION AND LAND STATUS

The Project is located on the Seward Peninsula along the west coast of Alaska, north of Norton Sound. There are two project components:

- The Rock Creek Mine/Mill Complex located about 6.2 miles (10 kilometers [km]) north of Nome in the Snake River watershed; and
- The Big Hurrah Mine located about 42 miles (68 km) east of Nome in the Solomon River watershed.

1.2.1 Rock Creek Mine/Mill Complex

The Rock Creek Mine/Mill Complex Project site is located within Sections 14, 15, 22, 23, 24, 25, and 26, Township 10 South, Range 34 West, Kateel River Meridian, within the Cape Nome Mining District (refer to U.S. Geologic Survey [USGS] Quad Map Nome C-1).

The Rock Creek Mine/Mill Complex occurs partly on patented mining claims owned 100 percent by Alaska Gold, a wholly owned subsidiary of NovaGold Resources Inc., and partly on land controlled by the Bering Straits Native Corporation (BSNC). BSNC also owns local mineral rights, with surface rights owned by Sitnasuak (the Nome Native village corporation). The mining operation does not involve the use of any state or federal lands.

The Rock Creek Mine/Mill Complex is anticipated to operate with adequate to excess water availability. During times of water surplus, groundwater interception and reinjection wells within the

Rock Creek aquifer will be developed. Electric power will be supplied from the Nome Joint Utility System.

The nearest area to the Rock Creek prospect that is closed to mineral entry is the Bering Land Bridge National Preserve, which is more than 60 miles (96 km) northeast of the Rock Creek Mine/Mill Complex at its closest point. There currently are no unusual social, political, or environmental encumbrances to exploration, development, or production on the prospect.

The Rock Creek Mine/Mill Complex is locally road accessible via the Glacier Creek Road and the state maintained Teller-Nome Highway, an all-weather paved and gravel road.

The City of Nome (population 4,000) is situated on the Bering Sea coast and serves as the logistical and administrative center for this portion of western Alaska. Nome has daily commercial jet service from Anchorage and large container barge service from June through October. Nome is not connected to the interior Alaskan road system.

1.2.2 Big Hurrah Mine

The Big Hurrah Mine is located within Sections 2,3,4,5,10 and 11, Township 10 South, Range 28 West, Kateel River Meridian (refer to USGS Quad Map Solomon C-5). The Big Hurrah Mine site occurs on patented mine claims owned 100 percent by Alaska Gold. Adjacent land owners are BSNC and Solomon Native Corporation. The mining operation does not involve the use of any state or federal lands.

The Big Hurrah Mine will be an open pit gold mine. Mine drainage water, will be intercepted and discharged through permitted Class V injection wells. Power will be supplied by a small diesel generator. The ore will be transported by truck to the Rock Creek Mine/Mill Complex.

The nearest area to the Big Hurrah prospect that is closed to mineral entry is the Bering Land Bridge National Preserve, which is more than 50 miles (80 km) north of the Big Hurrah Mine at its closest point. There currently are no unusual social, political, or environmental encumbrances to exploration, development, or production on the prospect.

The Big Hurrah Mine is locally road accessible via an Alaska Department of Transportation (ADOT) right-of-way up Big Hurrah Creek, and the state maintained Council-Nome Highway, an all-weather paved and gravel road. The ADOT right-of-way will require significant road improvement to accommodate regular traffic of heavy equipment. The road construction is being cooperatively designed between the ADNR Office of Habitat Management and Permitting, ADOT and Alaska Gold.

The City of Nome (population 4,000) is situated on the Bering Sea coast and serves as the logistical and administrative center for this portion of western Alaska. Nome has daily commercial jet service from Anchorage and large container barge service from June through October. Nome is not connected to the interior Alaskan road system

1.3 ENVIRONMENTAL SETTING

1.3.1 Rock Creek Mine/Mill Complex Site

The Rock Creek Mine/Mill Complex is bounded on the north and east by Mount Brynteson, to the west by the Snake River, and on the south by Glacier Creek. Elevation varies from 100 feet (30 meters [m]) above sea level (asl) to 650 feet (200 m) asl. The property is located within the Bering Straits Resource Area Coastal Management District. The Rock Creek area has been placer mined extensively in the past 100 years. Much of the area shows visible disturbance, and there are placer tailings piles located throughout the region.

1.3.2 Big Hurrah Mine Site

The Big Hurrah Mine site is bounded on the south by the Uncle Sam Mountains, on the north by Big Hurrah Creek, to the west by Linda Vista Creek, and by a small unnamed intermittent creek to the east, informally referred to as Charlotte's Creek. The elevations on the property vary from 150 feet (45 m) asl to 500 feet (150 m) asl. The property is located within the Bering Straits Resource Area Coastal Management District. The Big Hurrah area has been extensively placer and hard rock mined in the past 100 years. There is an abandoned adit and a 20 stamp mill still in existence at the site.

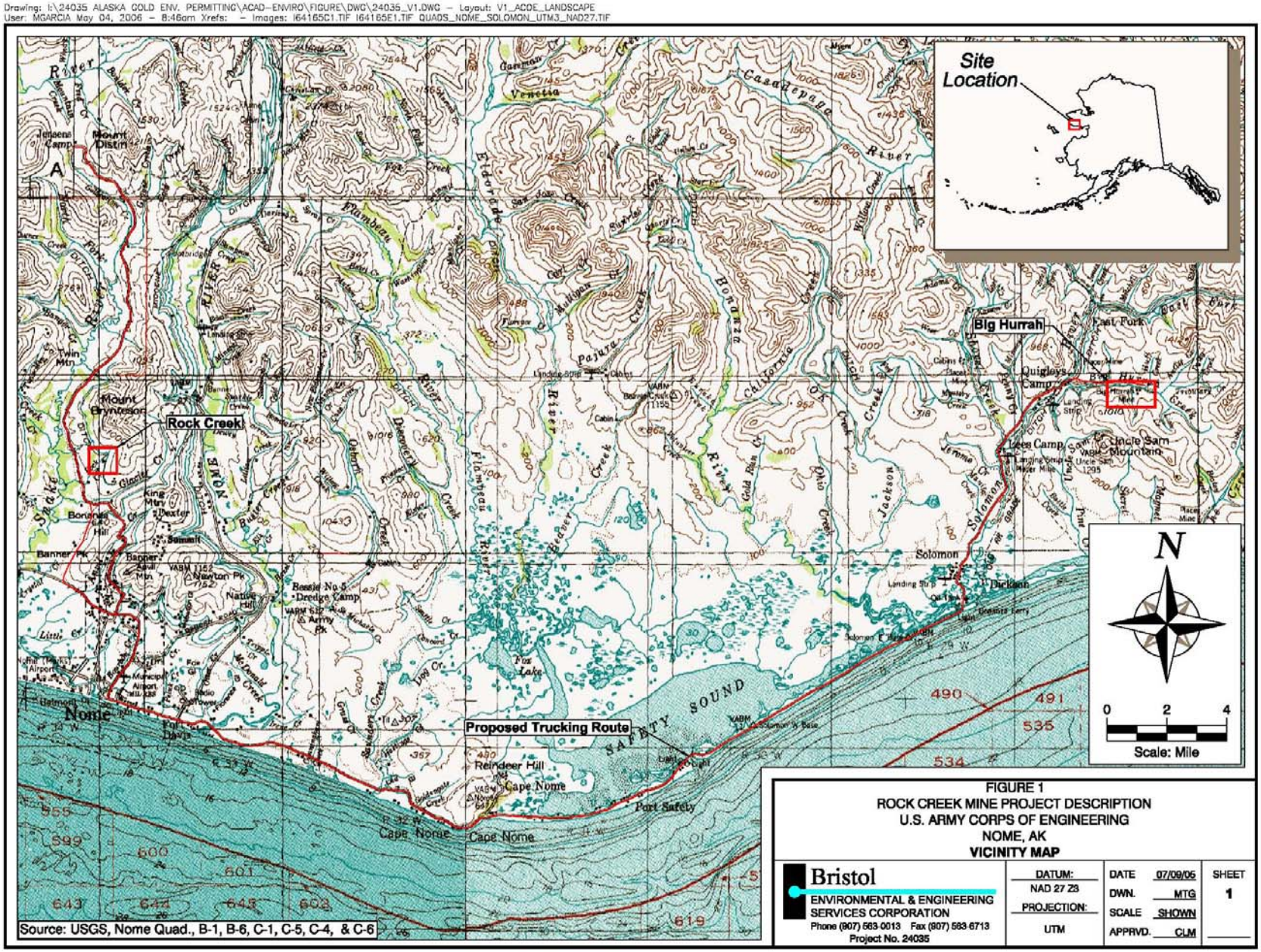
1.3.3 Project Regional Characteristics

According to the U.S. Department of Agriculture Forest Service classification system, both project sites are located within the Seward Peninsula Tundra – Meadow ecological sub region. The terrain is fairly hilly with broad and narrow valleys. Forested areas and trees are generally non-existent at either site, although closed willow thickets exist in wetland areas at the Rock Creek Mine/Mill Complex site. Soils generally are poorly-drained and shallow. On hill slopes and ridges, soils are formed in gravelly regolith material over weathered bedrock. Vegetation in the area consists mostly of tundra mat, sedges, shrubs, mosses, lichens, willows, and in some places, cottonwoods. The Seward Peninsula is home to more than 170 species of birds, and small mammals including Arctic foxes, Alaskan hares, land otters, lynxes, and ground squirrels.

The Project sites are characterized by cool summers and cold winters. Summer temperatures range from +68 to +59 degrees Fahrenheit [°F] (+20 to +15 degrees Celsius (°C)) and winter temperatures average around +5 to -4°F (-15 to -20ºC). Annual precipitation averages about 25 inches (635 mm) at the sites with the majority of precipitation falling as rain in summer. Annual snowfall totals approximately 56 inches (1422 mm) on average.

Wetlands have been identified across the Rock Creek Mine/Mill Complex, although they predominantly lie within the northwestern portion. The Big Hurrah Mine access route occurs within the Big Hurrah Creek floodplain. There are no wetlands within the Project footprint at the Big Hurrah Mine site.

Figure 1.1


Drawing: I:\24035 ALASKA GOLD ENV. PERMITTING\ACAD-ENVIRO\FIGURE\DWG\24035_V1.DWG - Layout: V1_ACOE_LANDSCAPE
User: MGARCIA May 04, 2006 - 8:46am Xrefs: - Images: I64165C1.TIF I64165E1.TIF QUADS_NOME_SOLOMON_UTM3_NAD27.TIF
Site Location
Rock Creek
Big Hurrah
Proposed Trucking Route
Nome
Solomon
Cape Nome
Port Safety
SAFETY SOUND
Reindeer Hill
Fox Lake
Mount Distin
Mount Bryntesson
Quigleys Camp
Lees Camp
Uncle Sam Mountain
East Fork
Bessie No. 5 Dredge Camp
Dickson
N
0 2 4
Scale: Mile
Source: USGS, Nome Quad., B-1, B-6, C-1, C-5, C-4, & C-6
FIGURE 1
ROCK CREEK MINE PROJECT DESCRIPTION
U.S. ARMY CORPS OF ENGINEERING
NOME, AK
VICINITY MAP
Bristol
ENVIRONMENTAL & ENGINEERING SERVICES CORPORATION
Phone (907) 563-0013 Fax (907) 563-6713
Project No. 24035
DATUM: NAD 27 Z3
PROJECTION: UTM
DATE 07/09/06
DWN. MTG
SCALE SHOWN
APPRVD. CLM
SHEET 1

2.0 RECLAMATION PLAN REQUIREMENTS SUMMARY

2.1 OVERVIEW

This Reclamation Plan is prepared to meet ADNR reclamation requirements pursuant to AS 27.19 and 11 AAC 97 as applicable to private land, and to provide internal guidance in keeping with the Alaska Gold Company Environmental Policy.

Although miners on private land are not required by AS to provide a mining plan, Alaska Gold will file all permitting documents as a series of volume under the title Plan of Operations. These volumes will include an Introduction, General Project Description, Environmental Information Document, All Permits and Permit Applications, Waste Management Plan, Rock Creek Project Operation and Closure Monitoring Plan, and this Reclamation Plan. Other volumes may be added if needed.

The Reclamation Plan requirements apply to areas disturbed by the proposed mining operations, including any mining disturbance occurring on previously mined areas.

2.2 RECLAMATION PLAN REQUIREMENTS

The Project is a mining project located on private lands. As such, it is required that the mining company comply with the reclamation standards set out in the Alaska mining laws and regulations, as contained in AS, and which require that a Reclamation Plan meet criteria that include:

- AS 27.19, Reclamation Section, 27.19.050 Reclamation Standard: A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition.

  Definitions:

  - Unnecessary and undue degradation is defined to mean: Surface disturbance greater than would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and considering site specific conditions. It also includes: The failure to initiate and complete reasonable reclamation under the reclamation standard (above) or an approved reclamation plan under AS 27.19.030 (a).
  - Stable condition is defined to mean*: The rehabilitation, where feasible, of the physical environment of the site to a condition that allows for the re-establishment of renewable resources on the site within a reasonable period of time by natural processes.*

Project reclamation plans are subject to the following under the 11 AAC 97.200. Land Reclamation Standards require:

- A miner shall reclaim areas disturbed by a mining operation so that any surface that will not have a stream flowing over it is left in a stable condition.

- Stable condition for the purposes of the Alaska State Statute definition listed above and for the purposes of 11 AAC 97.200 means a condition that can reasonably be expected to return waterborne soil erosion to pre-mining levels within one year after the reclamation is completed, and that can be reasonably expected to achieve revegetation, where feasible, within 5 years without the need of fertilizers or reseeding.
- If not feasible due to low natural fertility of the mined site soils, or if the site lacks a natural seed source, the department recommends the miner fertilize and re-seed or replant the site with native vegetation to protect against soil erosion – but this is not required by statute.
- Rehabilitation is not required if incompatible with the post- mining land use intended by the private land owner, but miner should inform DNR of the intended post-mining land use.
- If topsoil disturbed is not promptly redistributed it should be segregated, protected from erosion and from contamination and preserved in a condition suitable for later use.
- If the natural composition, texture or porosity of the surface materials is not conducive to natural revegetation a miner should take measures to promote revegetation including redistribution of topsoil. If topsoil is not available then a miner shall apply fines or other suitable growing medium – but do not apply to surfaces likely to be exposed to annual flooding, unless the action is authorized in an approved reclamation plan and will not result in an unlawful point, or non-point-source discharge of pollutants.
- Re-contouring shall be done in a manner conducive to natural revegetation or with the landowners intended post-mining land use by backfilling, contouring and/or grading – miner need not restore original contours.
- Shall re-stabilize the site to a condition that will retain sufficient moisture for natural revegetation or for the landowners intended post-mining land use.
- Pit walls, subsidence features or quarry walls exempt if the steepness makes them impracticable to accomplish. Miner shall leave wall in a condition that it will not collapse nor allow loose rock that presents a safety hazard to fall from it.

- If a mining operation diverts a stream channel to the extent that the stream channel is no longer stable, a miner shall re-establish that stream channel in a stable location. A miner may not place a settling basin in the way of a re-established channel unless the fines will be removed and protected from erosion.
- Regulations regarding the removal of buildings and infrastructure are applicable only to state lands.
- Acid Rock Drainage – A miner shall reclaim a mined area that has the potential to generate acid rock drainage in a manner that prevents the generation of, or prevents the offsite discharge of, acid rock drainage.
- Material Sites – Continuous and intermittent use of material sites shall be reclaimed as contemporaneously as practicable with mining. Cell by cell development with contemporaneous

reclamation is encouraged. However, if site conditions require that the entire material site be mined continuously, layer by layer, a miner shall reclaim the site as soon as possible after mining is completed. Reclamation may be postponed at the discretion of the Commissioner, and with additional reclamation plan and bonding requirements, if reclamation is impracticable and/or to allow for future intermittent mining of the material site. If the primary use of the extracted materials is to assist another mining operation, the miner must include the reclamation plan for the material site as part of the reclamation plan for the primary mine.

- River Gravel Extraction – Re-establish a stable bed and bank profile as contemporaneously as possible in a manner that will not alter river currents, or change erosion and deposition patterns downstream.
- Stockpiles, located at mining sites, are to be located where they will not erode into a water body.
- Reclamation Plan Submittal – A reclamation plan must be submitted 45 days before the proposed start of the mine. The Commissioner will approve or disprove within 30 days after determination of completeness.
- Alternate Post-Mine Planning Use – The commissioner may not propose an alternate post-mining land use if the land is on privately owned lands. The landowner may propose an alternate post-mining land use, but must include a description of the proposed alternate use in the Reclamation Plan.
    - Posting – Must keep a copy of the approved reclamation plan on site until completion of the mining operation.

3.0 APPLICANT INFORMATION

3.1 CORPORATION OFFICER COMPLETING APPLICATION

Name: Doug Nicholson
Title: Vice President and General Manager
Telephone: (907) 443-5272
Email: doug.nicholson@novagold.net

3.2 AGENT AND DESIGNATED CONTACT PERSON

Name: Charlotte MacCay
Title: Environmental Management, Project Manager
Telephone: (907) 743-9366
Email: cmaccay@beesc.com

3.3 CORPORATE INFORMATION

Business Name: Alaska Gold Company
Address: P.O. Box 640 Nome, AK 99762
Telephone: (907) 443-5272
President and Chief Executive Officer: Rick Van Nieuwenhuyse
Vice President: Doug Nicholson

3.4 ADDITIONAL LAND OWNER INFORMATION

Business Name: Bering Strait Native Corporation
Address: P.O. Box 1008 Nome AK 99762-1008
Telephone: (907) 443-5252

Business Name: Sitnasuak Native Corporation
Address: P.O. Box 905, Nome AK 99762 - 0905
Telephone: (907) 443-2632

3.5 INDIVIDUALS TO RECEIVE NOTICES

Name: Doug Nicholson
Title: Vice President and General Manager
Telephone: (907) 443-5272
Email: doug.nicholson@novagold.net

Name: Charlotte MacCay
Title: Environmental Management, Project Manager
Telephone: (907) 743-9366
Email: cmaccay@beesc.com

4.0 PROJECT DESCRIPTION

4.1 GENERAL

4.1.1 Rock Creek Mine/Mill Complex

The Rock Creek Mine/Mill Complex is located on the Seward Peninsula along the west coast of Alaska, north of Norton Sound. The project area lies about 6.2 miles (10 km) north of Nome, and is accessible by state roads.

Gold mineralization at Rock Creek is confined to quartz veining in two ore types: Tension veins and Albion shear veins. Ore will be processed on site with the use of a gravity circuit, supplemented with a flotation circuit and cyanide leach and carbon in pulp recovery process.

Ore and waste will be loaded with a 16 cubic yards (cy) (12 cubic meters [m^3])-front end loader and hydraulic shovel and hauled by a truck fleet of four to five 100 ton trucks, with support from other equipment including dozers, graders, a rock drill, blasting truck, and various service vehicles. Operations will run on two 12-hour shifts, 365 days/year and will employ about 135 people. Ore will be mined and milled at a rate of approximately 2.75 million tons (Mt) (2.5 million tonnes) per year (or 7,700 tons per day [tpd] [7,000 tonnes per day]), with development rock stripping quantities varying from 4.4 to 5.5 Mt (4 to 5 million tonnes) per year. The overall mine strip ratio is around 2:1, waste to ore.

The two main waste products generated through operations will be development rock and paste tailings. Development rock at will be primarily stored in development rock stockpiles. Laboratory tests have demonstrated that the development rock is not likely to be acid generating or metal leaching. Tailings will be produced as a paste with a high solids content. A tailings storage area will be prepared by removing the organic material and laying down a layer of engineered fill constructed of development rock with a downstream rockfill embankment. Laboratory test indicate the tailings may be metals leaching and will therefore be capped with development rock at closure. Process water will be supplied from the tailings facility, while electric power will be supplied by the local electrical utility.

Figure 4.1.1 illustrates the general layout of the Rock Creek Mine/Mill Complex, including pit, development rock stockpiles, tailings facility and mine infrastructure, as well as lease and property boundaries.

4.1.2 Big Hurrah Mine

The Big Hurrah Mine is located on the Seward Peninsula along the west coast of Alaska, north of Norton Sound. The project area lies about 31 miles (50 km) east of Nome, and is accessible by state roads.

Gold mineralization at Big Hurrah is hosted in quartz veins contained within fault veins and varying in thickness from less than 3 feet (1 meter) to greater than 33 feet (10 meters). The gold in these mineralized zones is contained primarily in sub-parallel quartz veins containing carbon on the vein

margins, or as thin films within the veins giving them a ribbon texture. Stockwork quartz veins that vary in thickness from fractions of an inch to 2 inches (a few millimeters to 5 cm) are also present.

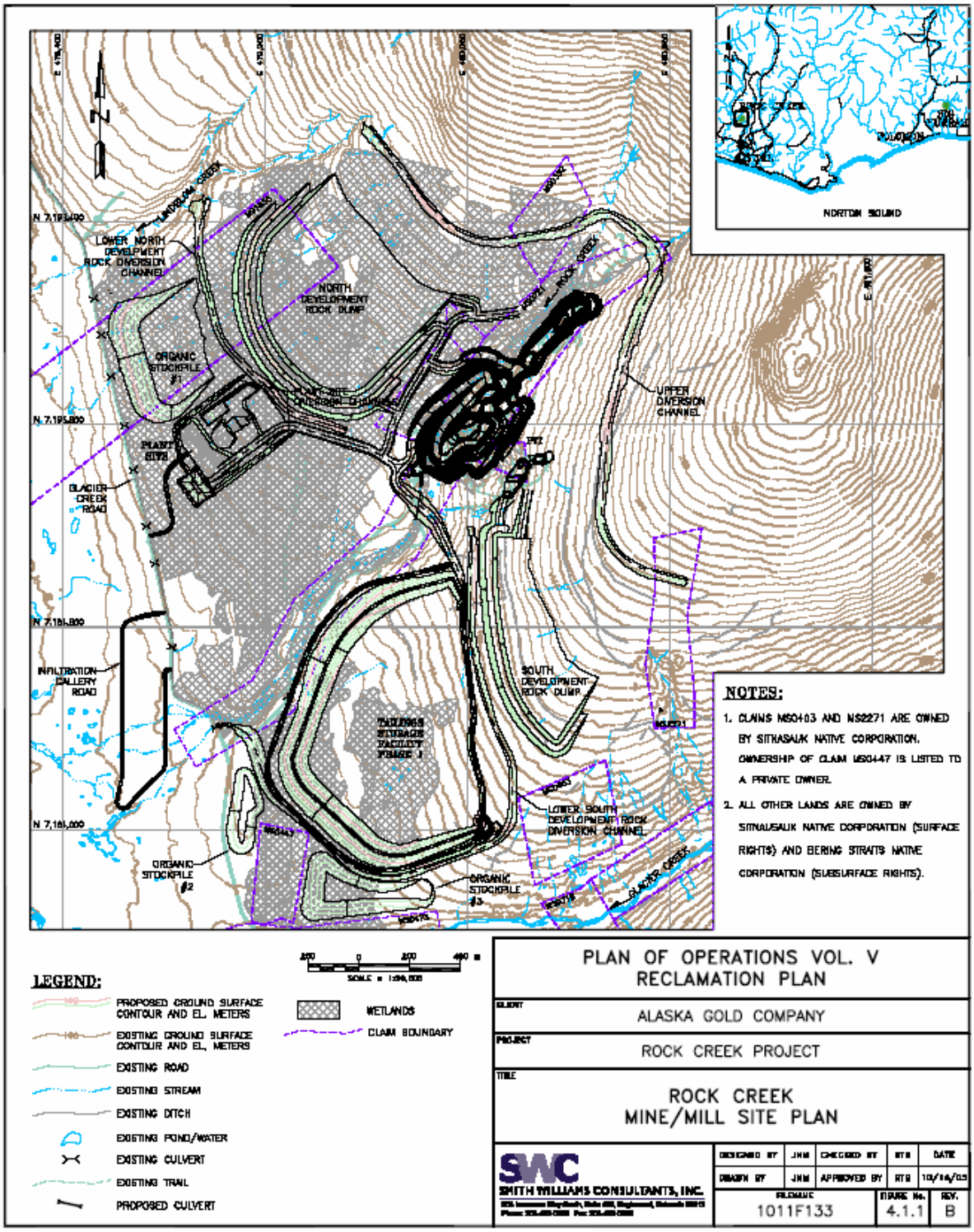
Development rock at Big Hurrah will be tested and segregated during operations as laboratory testing indicated that portions of the rock may have the potential to be acid generating. Potentially acid generating development rock (PAG) up to a volume of 1,305,000 cubic yards (988,000 cubic meters) will be backfilled into the main pit at the Big Hurrah site at closure and inundated reducing exposure and oxidation. The backfilled PAG material will be placed in the pit during the first month of the first spring runoff. Inflowing ground and surface water will inundate the pit, limiting exposure of the PAG material. The pit will fill during the first spring after mine closure.

Once the pit is full, surface water drainage will be diverted using pre-existing diversion structures during the summer months. This will allow the suspended solids in the pit lake to settle out. If water quality testing indicates the pit lake water meets all applicable water quality standards, drainage will be re-directed towards the pit again in the fall, which will flush the upper most layer of the pit lake. If the pit lake water does not meet all applicable water quality standards, the water will be treated to appropriate standards and discharged into groundwater injection wells until the pit lake water quality meets the applicable standards.

The remaining PAG will be blended with non-acid generating development rock and be stockpiled on site in a non-acid generating stockpile.

Big Hurrah Mine ore will transported by truck to the Rock Creek site and be processed in the Rock Creek mill with the use of a gravity circuit, supplemented with a flotation circuit and cyanide leach and carbon in pulp recovery process.

Figure 4.1.1 Rock Creek Mine/Mill Complex Site Layout

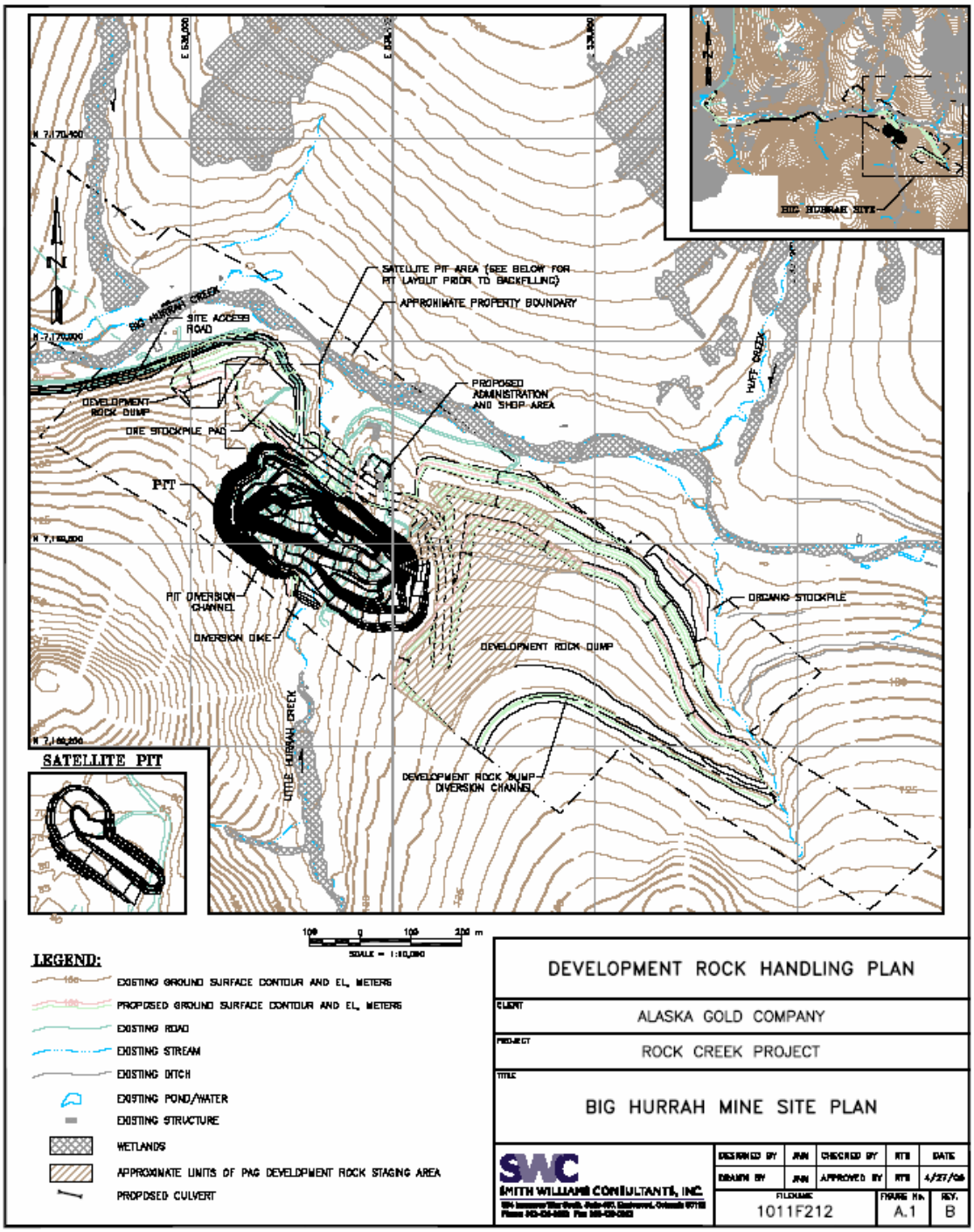


Ore and waste will be loaded with a 16 cy (12 m^3)-front end loader and hydraulic shovel and hauled by a truck fleet of approximately two 100 ton trucks, with support from other equipment including dozers, graders, a rock drill, blasting truck, and various service vehicles. Operations will run on two 12-hour shifts, with mining occurring for approximately 3 months out of the year and trucking conducted on a year round basis. Big Hurrah will employ about 50 people, who may be transferred from work at the Rock Creek Mine/Mill Complex. Ore will be mined at a rate of approximately 300,000 tons (270,000 tonnes) per year (1,600 tons [1,500 tonnes] per day on a seasonal basis), with development rock stripping quantities varying from 5,500 tons (5,000 tonnes) per day. Ore will be stockpiled and delivered to the Rock Creek Mine/Mill Complex at an average rate of 1,100 tons (1,000 tonnes) per day.

The main waste product generated through Big Hurrah Mine operations will be development rock. Development rock will be stored in development rock stockpile. Electric power will be supplied by a small diesel generator.

Figure 4.1.2 illustrates the general layout of the Big Hurrah Mine site including pit, stockpiles, and mine infrastructure.

Figure 4.1.2 Big Hurrah Mine Site Layout



4.2 MINING DISTURBANCES

4.2.1 Current and Pre-Existing Mining Disturbances

Both Project sites have been extensively mined in the past. Activity at the Rock Creek site was limited to placer mining, while both placer and hard rock mining has occurred at the Big Hurrah site. The access route into Big Hurrah Mine was extensively dredged. Some portion of the Project sites show visible disturbance including pits, ditches, abandoned infrastructure, and tailings piles. This is primarily a result of ground disturbance and tailings disposal associated with previous mine operations and current exploration drilling development (pads and roads).

4.2.2 Proposed Mining Disturbances

Surface disturbances anticipated during the Project are summarized below in Tables 4-1 through 4-10.

Table 4-1 Rock Creek Mine Development Rock Stockpile Design Basis

Stockpile	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Storage (million tonnes)	Crest Elevation (feet)	Wetland Disturbance (acres)	Footprint Area (acres)
North Stockpile	4,230,000 (3,233,000 m^3)	4,230,000 (3,233,000 m^3)	5.98	404 (123 m)	119 (48 hectares)	131 (53 hectares)
South Stockpile	0	720,000 (550,000 m^3)	1.01	453 (138 m)	0	62 (25 hectares)
Total	**4,230,000 (3,233,000 m^3)**	**4,950,000 (3,783,000 m^3)**	**6.99**		**119 (48 hectares)**	**193 (78 hectacres)**

Table 4-2 Big Hurrah Mine Development Rock Stockpile Design Basis

Stockpile	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Storage (million tonnes)	Crest Elevation (feet)	Wetlands Disturbance (acres)	Footprint Area (acres)
#1 East of Pit – Operations w/ Temporary PAG Stockpile	0	3,921,000 (2,998,000 m^3)	5.5	414 (126 m)	0	59 (24 hectares)
#1 East of Pit at Closure	0	2,616,000 (2,000,000 m^3)	3.7	414 (126 m)	0	42 (17 hectares)
#2 West of Satellite Pit	0	65,400 (50,000 m^3)	0.1	278 (84 m)	0	4 (1.5 hectares)
Backfill in Satellite	0	78,500 (60,000 m^3)	0.1	230 (70 m)	----	----
Backfill of PAG in Main Pit at Closure	0	1,305,000 (820,000 m^3)	1.8	192 (58.5 m)	---	-----
Total	**0**	**4,064,900 (3,108,000 m^3)**	**5.7**	_____	**0**	**63 (25.5 hectares)**

Table 4-3 Maximum Rock Creek Soil Stockpile Dimensions

Soil Stockpile	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Average Height (feet)	Wetlands Disturbance (acres)	Footprint Area (acres)
1	1,602,240 (1,225,000 m^3)	1,602,240 (1,225,000 m^3)	26 (8 m)	41 (16.5 hectares)	41 (16.5 hectares)
2	15,695 (12,000 m^3)	241,971 (185,000 m^3)	20 (6 m)	1.5 (0.5 hectares)	10 (4 hectares)
3	660,515 (505,000 m^3)	837,089 (640,000 m^3)	26 (8 m)	15 (6 hectares)	22 (9 hectares)
Total	**2,278,450 (1,742,000 m^3)**	**2,681,300 (2,050,000 m^3)**	_____	**57.5 (23 hectares)**	**73 (29.5 hectares)**

Table 4-4 Maximum Big Hurrah Soil Stockpile Dimensions

Soil Stockpile	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Average Height (feet)	Wetlands Disturbance (acres)	Footprint Area (acres)
1	0	26,159 (20,000 m^3)	13 (4 m)	0	2.5 (1 hectare)
Total	**0**	**26,159 (20,000 m^3)**	_____	**0**	**2.5 (1 hectare)**

Table 4-5 Rock Creek Water Management Systems

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
Stormwater Diversion Channels	131,449 (100,500 m^3)	209,272 (160,000 m^3)	23 (9 hectares)	69 (28 hectares)
Class V Injection System - wells	32,700 (25,000 m^3)	32,700 (25,000 m^3)	7.5 (3 hectares)	7.5 (3 hectare)
Class V Injection System - Gallery	60,000 (45,900 m^3)	60,000 (45,900 m^3)	8.5 (3.5 hectare)	8.5 (3.5 hectare)
Total	**224,149 (171,400m^3)**	**301,972 (230,900 m^3)**	**39 (15.5 hectare)**	**85.0 (34.5 hectare)**

Table 4-6 Big Hurrah Water Management Systems

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
Stormwater Diversion Channels	0	3,270 (2,500 m^3)	0	5 (2 hectares)
Class V Injection System - wells	0	2,616 (2,000 m^3)	0	2.5 (1 hectare)
Total	**0**	**5,886 (4,500 m^3)**	**0**	**7.5 (3 hectares)**

Table 4-7 Rock Creek Tailings Storage Facility Fill Quantities

	Wetland Fill Volume (cubic yards)	Volume (cubic yards)	Maximum Elevation (feet)	Wetlands Disturbance (acres)	Footprint Area (acres)
TSF Embankment	6,212,765 (4,750,000 m^3)	3,858,454 (2,950,000 m^3)	328 (100 m)	94 (38 hectares)	173 (70 hectares)
Tailings		9,351,847 (7,150,000 m^3)	322 (98 m)		
Cap on Tailings		738,992 (565,000 m^3)			
Total	**6,212,765 (4,750,000 m^3)**	**13,949,293 (10,665,000 m^3)**		**94 (38 hectares)**	**173 (70 hectares)**

Table 4-8 Rock Creek Mine/Mill Complex Roads

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
Access road and on-site haul roads	510,101 (390,000 m^3)	850,168 (650,000 m^3)	49.5 (20 hectares)	73 (29.5 hectares)
Infiltration Zone access roads	45,778 (35,000 m^3)	45,778 (35,000 m^3)	6 (2.5 hectares)	6 (2.5 hectares)
Plant area general fill	117,716 (90,000 m^3)	117,716 (90,000 m^3)	44.5 (18 hectares)	44.5 (18 hectares)
Total	**673,595 (515,000 m^3)**	**1,013,662 (775,000 m^3)**	**100 (40.5 hectares)**	**123.5 (50 hectares)**

Table 4-9a Big Hurrah On-site Mine Roads

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
On-site access road and on-site haul roads	78,477 (60,000 m^3)	240,663 (184,000 m^3)	5 (2 hectares)	31 (12.5 hectares)
Plant area general fill	0	6,540 (5,000 m^3)	0	1.5 (1.5 acres)
Total	**78,477 (60,000 m^3)**	**247,203 (189,000 m^3)**	**5 (2 hectares)**	**32.5 (13 hectares)**

Table 4-9b Big Hurrah Access Road

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
Big Hurrah Access Road	0	103,000 (79,000 m^3)	0	16 acres (6.5 hectares)
Total	**0**	**103,000 (79,000 m^3)**	**0**	**16 acres (6.5 hectares)**

Table 4-10 Total Project Fill Quantities

	Wetland Fill Volume (cubic yards)	Rockfill Quantity (cubic yards)	Wetlands Disturbance (acres)	Footprint Area (acres)
Rock Creek Site Total	13,618,959 (10,412,441m^3)	22,896,227 (17 505 421m^3)	409.5 (163.5 hectares)	601.5 (240.5 hectares)
Big Hurrah Site Total	78,477 (60,000 m^3)	4,447,148 (3,400,089 m^3)	5 (2 hectares)	154.5 (62 hectares)
Total Project	**13,697,436** **(10,472,441m^3)**	**27,343,375** **(20,905,510 m^3)**	**414.5** **(165.5 hectares)**	**756** **(303.5 hectares)**

5.0 RECLAMATION PLAN

5.1 GENERAL

The overall objective of permanent closure and reclamation is to return the Project area to a safe, stable condition and to treat, remove, or otherwise mitigate sources of potential degradation to local lands and waters. Alaska Gold intends to accomplish this in accordance with their obligations to the BSNC, Sitnasuak Native Corporation, all state requirements, and their corporate environmental policy. Best management practices will be followed.

In general, effective reclamation will be achieved through control of waterborne erosion and downstream water quality through effective drainage control as delineated below;

- Stabilization and protection of organic soil material from wind and water erosion;
- Stabilization of steep slopes through contouring or leveling;
- Laboratory testing has demonstrated that acid rock drainage and metal leaching are not likely to occur in the development rock at Rock Creek , but will be monitored for in accordance with the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan ,
- Acid rock drainage is recognized as a potential issue for the development rock at Big Hurrah. Development rock types will be segregated during the mining process. Potentially acid generating material (PAG) will be temporarily segregated and stored in the Development Rock Stockpile at a location graded to drain towards the main pit. At mine closure the PAG will be placed in the main pit and inundated as the pit lake fills reducing exposure and mineral oxidation. The remaining waste rock will be monitored in accordance with the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan,

- Potential for acid rock drainage and/or metal leaching from the tailings will be managed through the use of paste tails and the installation of development rock as a cover or cap after the TSF is drained and breached after mine closure, and
- Establishment of long-term, self-sustaining vegetation communities through the promotion of natural invasion and succession.

Reclamation and closure practices will be inherent to the Project operations. The major phases of reclamation efforts are as follows:

- Development rock stockpiles, final pit walls, and organic soil stockpiles will be stabilized during, and directly after, construction.
- Where practicable, active reclamation of areas disturbed both previous to, and during the Project, will be performed contemporaneously to stripping and mining operations. This will include re-grading of final development rock or organic soil stockpiles, facility sites, and final pit walls, as well as any seed bed preparation. Re-grading and active reclamation will be completed within 5 years.
- Water quality monitoring will continue after mine closure for a period of 30 years according to the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan.

5.2 PROJECT SITE LAND USES

5.2.1 Prior Land Use

Mining began in the Nome area in 1865; a gold strike on Anvil Creek in 1898 started the Nome Gold Rush and tens of thousands of miners came to the region. The discovery led to the construction of the Nome-Anvil railroad in 1900 which paralleled a portion of what is now the Glacier Creek Road. Claims were extensively staked along the Glacier Creek Road, with known mining activity in the proximity of Glacier Creek, Rock Creek, and Lindblom Creek. Mining also occurred along the Solomon River to the east in the early 1900s and led to development of the mining towns of Solomon and Council. There was extensive dredging of Big Hurrah Creek and surrounding areas, as well as the establishment of an underground mine and stamp mill at the Big Hurrah Mine site. Additional mining also occurred throughout the Seward Peninsula at this time. Historical artifacts of this turn-of-the-century mining activity still exist at both sites. Cultural Resource Surveys have been conducted and reviewed by SHPO for both sites. There are no affected sites at Rock Creek. Some of the historically eligible sites at Big Hurrah will be affected and a mitigation plan will be imposed as agreed upon by SHPO and the Army Corps of Engineers through a Memorandum of Agreement.

Continuous intermittent mining has existed along the Glacier Creek Highway, the Nome-Council Highway, and the Seward Peninsula over the last 100 years. Currently, there are four active placer-mining operations along Glacier Creek Road, and one active placer miner operation along the Nome-Council Highway. Independent and corporate miners show interest in continuing mining throughout these areas.

The Snake River Valley, which is accessed by the Glacier Creek Road and a sled dog/snow-machine /all terrain vehicles (ATV) trail, has a long-standing prior use as a subsistence hunting area. The area is particularly important for moose, but is also utilized for bear, caribou, and bird hunting. Musk oxen are also present in the area, and may be hunted although this is not a popular sport or subsistence activity at this time. Reindeer herding occurs on the Seward Peninsula and the herd at times grazes within the Snake River Valley. Fishing and berries are additional subsistence resources utilized by the local population.

Bird watching is a growing tourist activity in Nome. The Glacier Creek Road provides access to birding areas along the Snake River Valley. Additional recreational activities within the area include dog-mushing, snow-machining, and cross-country travel opportunities for ATVs.

There are approximately 10 to 15 recreational/hunting cabins located along the Glacier Creek Road. There is one year-round resident located at the confluence of the Snake River and Glacier Creek. There are remains of historic cabin sites within the Rock Creek Mine/Mill Complex footprint, but no active cabin sites presently exist on the property.

The Solomon River Valley is accessed by the Nome-Council Highway. Subsistence uses such as fishing, hunting, berry picking, and greens picking, as well as recreational travel, occur along the Nome-Council Highway. There is minimal off-highway travel in this area, and minimal travel along the Big Hurrah River. There are two recreational cabins located within the Big Hurrah floodplain that host limited recreational use of this area. One placer mining operation is located along the Solomon River at Shovel Creek, downstream of the confluence with Big Hurrah Creek. Mine support buildings are located on the Big Hurrah Mine property, along with the historic remains of a house and mill. The house is no longer occupied.

The majority of the lands within the Project footprint are private lands owned by Alaska Gold; public use of those lands is discouraged for liability reasons. The peripheral lands that are owned by BSNC and Sitnasuak Native Corporation are open for shareholder use for recreational and subsistence purposes. During operations, public access to the Project site will be limited and carefully controlled, due to the hazards inherent to surface mining operations.

5.2.2 Alternate Post-Mining Land Use

The designated post-mining land use on Alaska Gold lands would be for ongoing use as a storage site for material source sales, including the potential sale of stockpiled placer tailings removed from surrounding streams. The BSNC and Sitnasuak Native Corporation lands would have post-mining land use designations that included wildlife habitat, subsistence, and recreation.

Alaska Gold will determine its continued use for the site infrastructure, or its plans for removal, at the close of the mines. As a private land owner, there are no post-mining requirements for infrastructure removal.

5.3 RECLAMATION SCHEDULING AND SEQUENCE

5.3.1 Pre-Mining Reclamation

Prior to mining operations at Rock Creek and Big Hurrah, some disturbance of lands will be required for exploration, facility construction, commencement of mining pits, and preparation of stockpile sites. Land will be disturbed in accordance with all regulations and guidelines described in this Reclamation Plan. Land will be cleared by the following methods, as applicable:

- There is little wooded vegetation on the project site so timber salvage will not be required.
- Organic soils are thin to non-existent over much of the project site. Where practicable, in areas requiring excavation, the organic soils will be stripped prior to mining operations and stockpiled for later use. Areas that will be stripped include the tailings storage facility (TSF), and mill facility site.

As described earlier, any areas disturbed prior to, or immediately after, commencement of mining operations, and that will not be required during mining operations, will be reclaimed as soon as practicable. These areas may include exploratory drill hole pads, test pits, material borrow pits, laydown pads, and temporary access roads.

5.3.2 Concurrent Reclamation

Organic soils and development rock, as it is stripped throughout the Project's life, will be placed into stockpiles. Stockpile locations are shown in Figures 4.1.1 and 4.1.2.

As portions of development rock stockpiles are considered 'final', they will be stabilized and reclaimed as contemporaneously as practicable.

5.3.3 Final Reclamation

Upon cessation of mining operations, final reclamation activities will commence on any areas that were not previously reclaimed. Notification of the date on which final reclamation activities will begin will be submitted to ADNR, the COE, BSNC, and Sitnasuak Native Corporation within 90 days of the cessation of mining operations.

Final development rock and organic soil stockpiles, as well as final pits, will be stabilized so as to minimize safety hazards and/or allow the reestablishment of natural vegetation. Mine infrastructure, including buildings, access roads and other facilities, will either be left intact, or removed at the owner's discretion, in accordance with proposed post-mining land use.

5.3.4 Temporary Closure Reclamation

Temporary closure means the cessation of the mining operations for a period of not more than three years. If conditions require temporary closure to extend beyond three-years, final reclamation will begin with a final closure notice submitted to ADNR. An extension accompanied by full justification may be requested by the company and approved by ADNR.

Temporary closure scenarios that require modifications to the plan of operation or this Reclamation Plan will be coordinated with appropriate Federal and State agencies and with BSNC and SNC for approval. Temporary closure may include planned and unplanned cessation of the mining and/or milling operations.

Temporary Closure will comply with the following reclamation guidelines:

1. Maintain the site;
2. Maintain all site monitoring, reporting, and reclamation work already completed;
3. Increase bond amounts for any additional disturbed acreage; and
4. Identify areas of reclamation affected by closure and how they will be influenced.

5.3.5 Reclamation of Pre-Existing Mining Disturbances

The Rock Creek and Big Hurrah sites have been extensively mined in the past. Some portions of the Project site show visible disturbance, primarily as a result of ground disturbance and tailings piles associated with previous operations and exploration drilling development (pads and roads).

In most cases, the ground disturbance and tailings piles associated with Rock Creek and Big Hurrah lie within the proposed disturbance area, and so will be eliminated and reclaimed through the natural course of reclamation efforts.

Portions of the placer tailings piles within Glacier Creek may be utilized for borrow material sites or laydown pads for the Project, and will thereby be covered by the general terms and conditions within this Reclamation Plan. Additional reclamation standards may be developed for Glacier Creek as mitigation measures within the COE 404 Wetlands Fill permit. Placer tailings piles within Glacier Creek that are not utilized as a mine site material source will not be subject to the terms and conditions of this Reclamation Plan.

Exploration pads and roads within the Project footprint, or resulting from the exploration activities conducted by Alaska Gold in and around Rock Creek and Big Hurrah, will be reclaimed under the terms and conditions of this Reclamation Plan.

In some cases, the infrastructure has been deemed to be eligible for the National Register of Historic Places. This infrastructure will, where practical, be left undisturbed. In instances where disturbance is necessary, mitigation measures will be covered under a Memorandum of Agreement between the Army Corps of Engineers and SHPO.

Historic mining ditches transect the Rock Creek site. There are no features eligible for the National Register of Historic Places along the ditches within the Project area; however, disturbance to these ditches will be as minimal as practicable. Those portions of the ditches which lie within the proposed disturbance area will be eliminated and reclaimed through the natural course of reclamation efforts.

The historic remains of a cabin and associated support building are located outside of the Rock Creek Mine/Mill Complex Project footprint and will be left intact.

The historic remains of a stamp mill at Big Hurrah Mine will remain intact. The remains of a historic house at Big Hurrah will be removed in order to access the mineral deposit. Historic workings of the original mine may also be disturbed by renewed mining operations.

5.3.6 Proposed Reclamation Schedule

Table 5-1 presents the proposed Project reclamation schedule.

Table 5-1 Reclamation Schedule

Task	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Organice Material I Stripping		X	X												
Reclaim open pits						X					X				
Reclaim development stockpiles							X		X	X	X	X			
Reclaim tailings area												X			
Re-establish drainage system							X					X			

5.4 POST-MINING TOPOGRAPHY

Post-mining topography at the Rock Creek and Big Hurrah sites will consist of rolling hills and small creek valleys centered on a small lake created by the abandoned pit at each site. Post-mining topography around Glacier Creek, by nature of the removal of any existing tailings piles for borrow material, will be returned to a topography that more closely resembles the natural floodplain. Post road construction topography in the Big Hurrah floodplain will be returned to a topography that more closely resembles the original floodplain prior to the mining activities that have occurred over the past century. Some placer tailings piles will be removed to full bank level, the stream channel will be deepened and better defined, additional in-stream pits may be established to provide over-wintering and spawning habitat for fish.

The Project sites will be left in a condition that is conducive to natural re-establishment of vegetation. This will be accomplished, in part, by establishing safe and stable grades on stockpile slopes when they are constructed, re-establishing disturbed drainages, and allowing suitable drainage – while returning hydrological soil erosion to pre-mining levels. Best management practices and available technology will be used. The conceptual post-mining project sites are presented in Figures 5.4.1 and 5.4.2 for Rock Creek and Big Hurrah, respectively.

Figure 5.4.1 Reclaimed Rock Creek Mine/Mill Site Plan

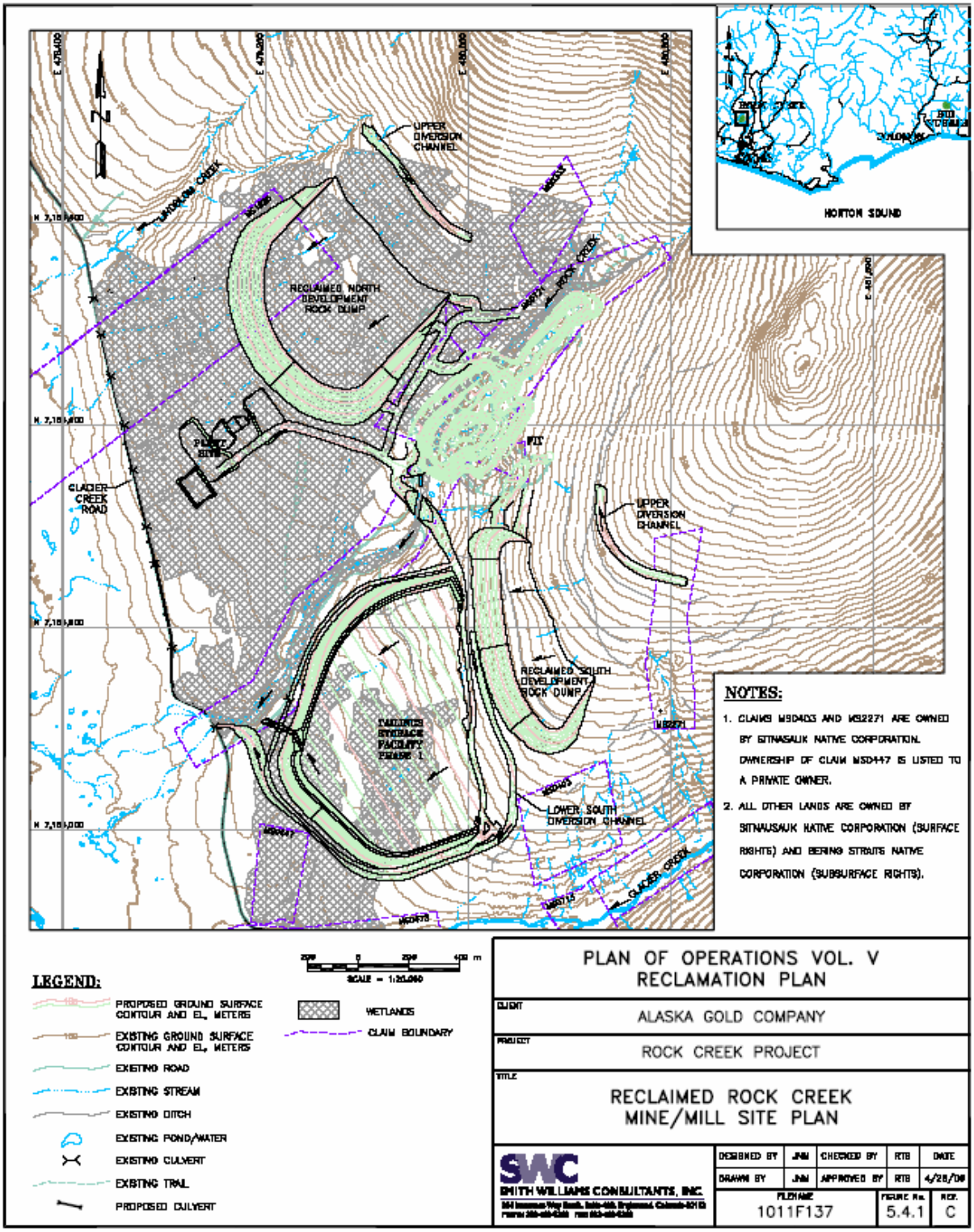
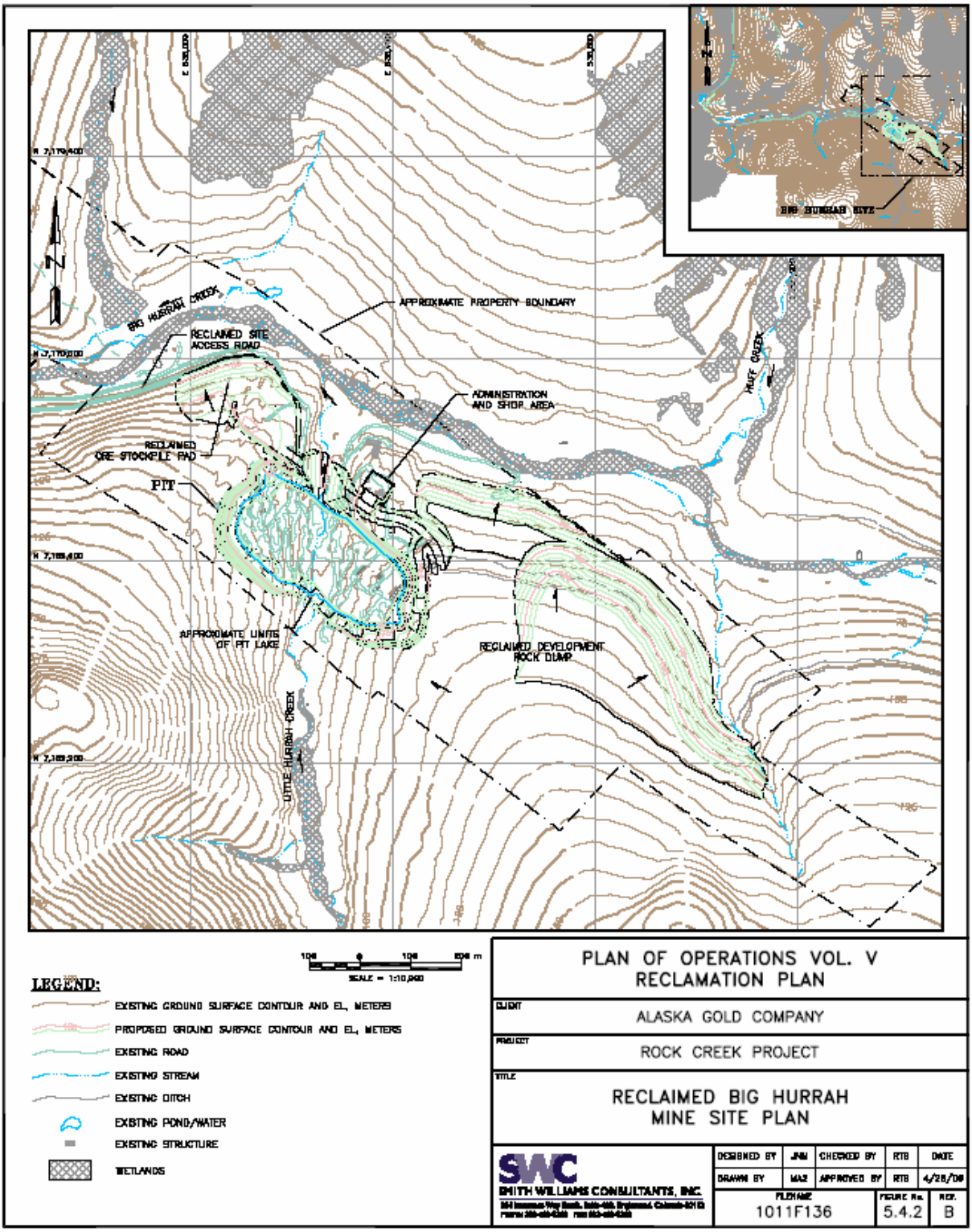


Figure 5.4.2 Reclaimed Big Hurrah Mine Site Plan



5.4.1 Final Grade of Development Rock Stockpiles

Upon cessation of mining operations at Rock Creek and Big Hurrah, it is expected that there will be approximately 16.3 million cy (12.5 million m^3) of out-of-pit waste development rock distributed across the sites (see Table 5-2 for a summary of development rock by location).

Some of the development rock will have been used to construct site roads and the tailings storage facility.

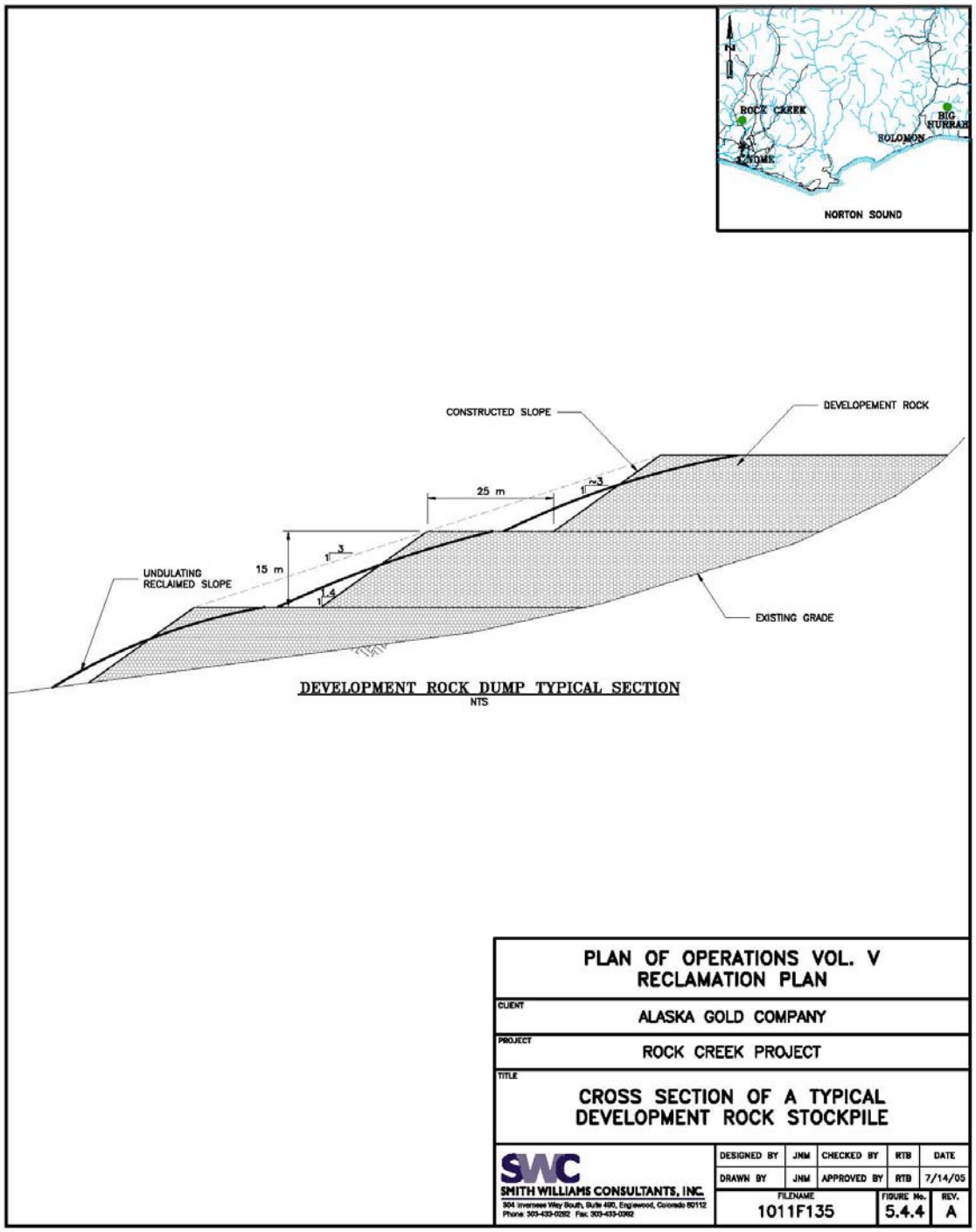
Table 5-2 Summary of Development Rock Volumes

Stockpile	Volume (cubic yards)
Rock Creek Development Rock Stockpiles	4,950,000 (3,783,000 m^3)
Big Hurrah Development Rock Stockpiles	4,064,900 (3,108,000 m^3)
Tailings Storage facility dam	3,858,454 (2,950,000 m^3)
Cap on Tailings Storage Facility	738,992 (565,000 m^3)
Rock Creek site roads and pads	1,013,662 (775,000 m^3)
Big Hurrah site roads and pads	247,203 (189,000 m^3)
Total Development Rock	14,873,211 (11,370.000 m^3)

Development rock dumps will be constructed by dumping in 50 feet (15 m)-high lifts at angle of repose (1.4:1 H:V). By allowing a bench on every lift, the overall slope angle from toe to ultimate crest will be 3:1.

The individual lifts will be re-contoured or ‘rounded off’ to ensure stabilization and minimize waterborne erosion, as shown in Figure 5.4.4. Bench crests will be pushed onto the lower levels to create an undulating overall slope of around 3:1.

Figure 5.4.4 Rock Stockpile Re-contouring



The development rock at the Rock Creek and Big Hurrah sites have been sampled and laboratory tested for acid rock drainage potential (ARD) and neutral drainage metals leaching (NDML) potential. Lab results have demonstrated that the development rock the Rock Creek site to be non-ARD and non-NDML. Therefore, no special rock segregation techniques are required. In addition, a low permeability infiltration cover will not be required.

Some of the development rock at Big Hurrah has demonstrated potential for ARD. Segregation of development rock at Big Hurrah will take place in accordance with the Big Hurrah Development Rock Management Plan contained within the Rock Creek Project Waste Management Plan. Potentially acid generating material (PAG) up to a volume of 1,305,000 cubic yards (998,000 cubic meters) will be backfilled into the Big Hurrah main pit and inundated with water at closure reducing exposure and mineral oxidation. The remaining PAG will be blended with the non-acid generating development rock to create a non-acid generating development rock stockpile that does not demonstrate ARD or NDML potential and will be stockpiled without any necessary cover.

The backfill PAG material will be placed in the pit during the first month of the first spring runoff. Inflowing ground and surface water will inundate the pit, limiting exposure of the PAG material. The pit will fill during the first spring after mine closure.

Once the pit is full, surface water drainage will be diverted using pre-existing diversion structures during the summer months. This will allow the suspended solids in the pit lake to settle out. If water quality testing indicates the pit lake water meets all applicable water quality standards, drainage will be re-directed towards the pit again in the fall, which will flush the upper most layer of the pit lake. If the pit lake water does not meet all applicable water quality standards, the water will be treated to appropriate standards and discharged into groundwater injection wells until the pit lake water quality meets the applicable standards.

Both sites will be monitored according to the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan. If ARD or NDML should occur, an alternate closure plan will be developed and a low permeability cover may be required.

5.4.2 Re-Grading of the Open Pit Mine

The mine plan and pit development sequence does not provide an opportunity to backfill the main pit at the Rock Creek site during operations. At Big Hurrah, development rock with potential for acid generation will be backfilled into the main pit, and the small satellite pit at Big Hurrah may be partially backfilled with development rock during operations.

Over time, the open pits, including the partially backfilled pits at Big Hurrah, will fill with groundwater, precipitation, and surface runoff. The pit lakes will drain into the re-established ditch/creek systems.

It is expected that final pit slopes will remain stable at the designed slope angles (ranging from 38 degrees (º) to 52º). However, bench walls will be cleared and scaled for loose material to minimize hazards.

Upon cessation of mining operations, pit benches will be scaled to reduce hazards, but no flattening or grading of pit slopes will be undertaken.

Pit lake water quality is expected to meet applicable water quality standards for all water quality uses except the drinking water criterion for arsenic at Rock Creek. A reclassification petition has been filed with ADEC to remove the drinking water use from Rock Creek and Lindblom Creek based on naturally occurring pollutant concentrations and natural, ephemeral, intermittent, or low-flow conditions that prevent attainment of the drinking water use. Water quality will be monitored in accordance with the conditions set out in the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan.

Pit lake water quality is expected to meet all applicable water quality standards at Big Hurrah with the possible exception of the first season when the backfill material is placed in the pit .

In the event that pit lake water quality exceeds the applicable water quality standards, Alaska Gold will address the issue through drainage management, and/or water treatment as necessary.

Note: Natural background levels will be determined by the mean or highest 5th percentile baseline data for the Project site, depending on the applicable regulations at the time of closure, for the project site. Data utilized in the analysis will be pre-mining data collected in accordance with the State-of Alaska approved Surface Water Quality Monitoring Plan for Alaska Gold Projects. At the Rock Creek Site, data will be used from Stations ROCK, RCK1, and RCK2. At the Big Hurrah site, data will be used from Stations LHRL and LHRU.

5.4.3 Re-Grading of Tailings Area and Tailings Dams

The milling process will produce paste tailings which will be deposited in a Tailings Storage Facility (TSF). The TSF will consist of a rockfill embankment with an upstream high-density polyethylene (HDPE) geomembrane liner that extends from the face of the dam into the bedrock and a seepage collection system. The tailings will be deposed along the upstream limits of the TSF basin, with process solution and precipitation being collected and recycled into the milling process. The tailings are anticipated to be deposited at a stable slope of 6 percent from the basin limits down to the embankment.

Water accumulation that still remains in the TSF at mine closure will be treated to applicable water quality standards using the ferric chloride system in place for groundwater treatment and discharged into the groundwater injection system. The tailings surface will then be capped with a minimum 3.3 foot (1 m)-layer of development rock. This cap will significantly minimize infiltration of precipitation into the tailings. In some areas, additional development rock may be applied in order to support the equipment spreading the capping material. Stockpiled organic material will be spread on the capped tailings deposit in a layer about 12 inches (30 cm) thick and re-seeded with native grasses. Only minor regrading of the tailings surface is anticipated to be required to promote drainage off the TSF. It is anticipated that a spillway will be constructed at the low point of the

tailings surface to allow surface water run-off to flow into re-establish pre-mining drainages. The rockfill embankments will not require regrading upon completion of operations.

Without infiltration of precipitation into tailings, seepage out of the tailings is expected to cease approximately two to three years after closure. Drainage and/or seepage from the reclaimed TSF during this period will be caught in the seepage collection system and monitored to determine if it meets applicable water quality standards. If the drainage and/or seepage does not meet applicable water quality standards, then the water will be treated and discharged through the groundwater injection system. When monitoring indicates that no further treatment is required, then drainage will flow unimpeded down the natural flow path of the Rock Creek watershed.

5.4.4 Reclamation of Settling Ponds and Diversion Ditches

Diversion channels will be used to control surface runoff around the project site during operations. Once mining operations cease, the Lower North diversion channel located below the North Development Rock Stockpile and the Plant diversion channel which wraps around the plant facility will be reclaimed, allowing surface runoff to return to current conditions. The reclamation will consist of backfilling the channels and grading the surface to blend into the surrounding topography.

At the Rock Creek site, a portion of the Upper diversion channel is expected to be partially reclaimed and reconfigured to direct surface flow into the pit lake. The reconfigured ditch will direct drainage away from the development rock stockpiles. This will minimize erosion of the stockpile slopes and seepage into the development rock. Additionally, the Lower South diversion channel will remain in place to route stormwater flow around the tailings facility. This will minimize the potential for seepage into the tailings from stormwater runoff. A new channel will be constructed to provide an outfall for the lake which will develop in the mine pit. This new channel will discharge back into the natural drainage.

At the Big Hurrah site, all of the constructed channels will be reclaimed. The removal of the culvert in the pit diversion channel will provide an outlet for the lake that will form in the mine pit.

5.4.5 Reclamation of Mine Infrastructure

Mine buildings and other infrastructure located on Native Corporation lands will be removed to the landowner's satisfaction, all other building and infrastructure will be left in place, in accordance with the proposed land use. Non-hazardous and non-toxic material will be burned or buried within the pit.

Hazardous and toxic materials will be disposed of at the appropriate facilities off site.

5.4.6 Reclamation of Mine Roads

The on-site roads will be left intact or removed at the owner's discretion. If any roads are built on native corporation land, they will be removed at the owner's request.

Gravel roads will not be removed in their entirety if there is a high probability of thaw subsidence that could lead to establishment of new drainage channels along their alignments.

5.4.7 Reclamation of Gravel Pits and Gravel Pads

In areas where gravel pads are not being retained for future use, and to the extent practicable, the following will apply to gravel pad reclamation:

- Gravel pad fills overlying lightly-compressed organic mats will be removed to within 3.9 inches (10 cm) or less of the underlying layer to expose in situ hydric soils and initiate a natural process of thaw subsidence and wetlands creation.
- Gravel fills overlying highly compressed or non-existent (bladed) organic mats will be removed to a depth appropriate to allow natural re-vegetation of the site. Complete removal of gravel to the natural grade is not necessary to reestablish wetland habitat.
    - Gravel removal below the natural grade will be avoided, as it will potentially pond waters and accelerate thaw subsidence, providing an inadequate surface for seedling reestablishment.

Adequately re-vegetated surfaces will gradually subside from thaw consolidation of permafrost soils and acquire the wetlands hydrology of the surrounding area.

5.5 GENERAL RECLAMATION PRACTICES

5.5.1 General

Once regarded as necessary, best management practices will be used to ensure successful stabilization of disturbed lands. Runoff and erosion control will be managed as described in the Storm Water Discharge Pollution Prevention Plan, a provision of the National Pollution Discharge Elimination System.

5.5.2 Equipment Requirements

Earthworks during reclamation operations at Rock Creek and Big Hurrah will include minor re-grading of material that is already in-place to round off the Development Rock Stockpiles and minor re-grading required as described above for the TSF. The Project's two dozers are well suited to this kind of work. To a lesser extent, the front end loaders, possibly in conjunction with mine trucks, will be used to tram bulkier material over longer distances. The motor grader will be necessary to maintain access roads and for detailed re-contouring and smoothing of final surfaces. The road watering truck will be needed in order to prepare working surfaces and maintain access roads. Additional equipment may be contracted for use at the site, if needed.

5.5.3 Revegetation

The Project sites will be left in a condition conducive to natural re-establishment of vegetation through methods such as re-grading and construction of stockpiles at an angle-of-repose as discussed in the sections above.

Due to the fine nature of the tailings in the impoundment, reseeding will be conducted in this area. The general seed mix for the TSF will be developed in consultation with the Alaskan Plant Center and approved by ADNR. Reseeding of the TSF will most likely be done by broadcast seeding. An interim revegetation criteria of 30 % vegetation cover over the area within the TSF (embankment not included) within three years after breaching of the TSF embankment and subsequent capping of the TSF will be applied. A final criteria of 70% vegetation cover over the area within the TSF (embankment not included) after capping will be required for bond release.

In general, however, the primary emphasis of reclamation activities will focus on promoting rapid, natural recovery of indigenous vegetation.

5.5.3.1 Organic Soils

Organic soils over the Project site are thin and, in some places, non-existent. As described above, organic soils, where present and practicable within the area of the plant site, rock stockpile subcuts, tailings dam footprint, tailings storage facility area, and pit area, will be stripped and stockpiled.

Development rock stockpiles will be constructed on silty sand and gravel gradations to provide a competent foundation.

5.6 WATER QUALITY MANAGEMENT

5.6.1 Surface Water

Surface water quality monitoring will occur in accordance with the ADEC approved Rock Creek Project Operation and Closure Monitoring Plan. Applicable parameters will be reviewed during and after mining operations and upon concurrence with ADEC, monitoring for some parameters may be discontinued if ongoing sampling reasonably indicates there to be negligible risk of exceeding water quality criteria.

Surface water quality at closure will meet applicable State of Alaska water quality standards with the exception of natural exceedences of the drinking water standard for arsenic in Rock Creek and Lindblom Creek. Stream reclassification petitions to remove the drinking water use have been submitted to ADEC for Rock Creek and Lindblom Creek based on the naturally occurring pollutants (arsenic) in concentrations that exceed the State Drinking Water Standard and the lack of sufficient flow during winter months to support the drinking water use. Data submitted in support of the stream reclassification is pre-mining data collected at stations ROCK, RCK1, RCK2 and LIND in accordance with the State of Alaska approved Surface Water Quality Monitoring Plan for Alaska Gold Projects.

5.6.2 Ground water

At mine closure, injection and infiltration activities will cease at Big Hurrah. Injection wells and/or the infiltration gallery will remain in use at Rock Creek until the seepage from the TSF meets applicable water quality standards and treatment and discharge are no longer required. Monitoring will continue after mine closure in the three wells associated with the TSF (M-1, M-2, and M-3) in

accordance with an ADEC-approved Surface Water Monitoring Quality Assurance Plan and the Rock Creek Project Operational and Closure Monitoring Plan. Applicable parameters will be reviewed during and after mining operations and upon concurrence with ADEC, monitoring for some parameters may be discontinued if ongoing sampling reasonably indicates there to be negligible risk of exceeding water quality criteria. Ground water quality at closure will show no significant increase above natural background levels as established by ADEC based on baseline studies submitted with the Rock Creek Project Operation and Closure Monitoring Plan.

When groundwater monitoring wells and injection wells are no longer needed they will be plugged and capped.

6.0 STATEMENT OF RESPONSIBILITY

Alaska Gold recognizes its responsibilities and obligations and accepts full responsibility in agreeing to reclaim the Rock Creek and Big Hurrah sites. Mining will be conducted in such a manner as to avoid unnecessary degradation of land and water resources. Any land and water resources that are disturbed, will be returned to a safe and stable condition such that vegetation may be re-established and self sustaining. The site will be restored in accordance with the proposed land use. Best management practices and available technologies will be used to achieve these obligations. Alaska Gold will meet or exceed all required local, state, or federal regulations regarding reclamation of surface mining areas.

In the event that a new operator or land owner assumes control of the Project, they will accept responsibility for reclamation of all lands and structures within the lease, as described in this Reclamation Plan and all applicable permits. The new operator on land owner will provide a bond that will cover all costs of reclaiming the Project site, and that is acceptable to the COE and with ADNR as described in 11 AAC 97.420.

7.0 ESTIMATE OF RECLAMATION COSTS

The total estimated cost to reclaim the Project sites is approximately $4.2 million. The end of mine life reclaimed cost estimates, map, and volume of material information are provided in Appendix B.

Under the provisions of 11 AAC 97.320. (a), Alaska Gold will file an annual report that includes the volume of material mined in that year, the total area reclaimed, and an updated reclamation schedule.

General assumptions used in constructing the cost estimates are as follows:

- Wage rates are based on the Davis Bacon wages for Nome Alaska, including base salary, fringe, Alaska Workmen's Compensation, FICA, and unemployment insurance;
- Estimates for material costs are based on in house estimates and contractor estimates;
- Cost estimates for surety determination assume work being completed by a qualified Alaska contractor; and

- Equipment and productivity rates are based upon 29th Edition of the Caterpillar Performance Handbook.

Since the various facilities such as the pit and development rock stockpiles, have different reclamation sequences, reclamation will be achieved more rapidly for some facilities than others. Therefore, Alaska Gold will seek an incremental surety release on each facility, or affected acreage, as successful reclamation is completed as required in 11 AAC 97.435.

8.0 LANDOWNER REVIEW OF THE ROCK CREEK RECLAMATION PLAN

The Bering Strait Native Corporation and Sitnasuak Native Corporation own lands associated with the Rock Creek Mine Project. In accordance with the exploration and option agreement between Bering Strait Native Corporation, Golden Glacier Inc. (Sitnasuak Corporation), and Alaska Gold Company, the undersigned have reviewed the document on behalf of their corporation and are in agreement with the reclamation terms and agreements as laid out in this Rock Creek Reclamation Plan.

Signature	Date	Corporation
VP LAND and RESOURCES	5/25/06	BERING STRAITS NATIVE CORP.
	5/25/06	GOLDEN GLACIER, INC AS PRESIDENT
	5/25/06	Sitnasuak Native Corporation

APPENDIX A -

Surface Water Quality Summary

Rock Creek Mine/Mill Complex Site Surface Water Quality Summary

Surface water samples were collected at 7 primary stations around the Rock Creek Mine/Mill Complex site. Samples were collected beginning on September 10, 2002, for a single event, then on a weekly basis from July 30, 2003, to December 6, 2004, and on a monthly basis thereafter. While monthly monitoring is ongoing at the site, the data set for this assessment is concluded at May 16, 2005. The total number of samples per site ranges from 48 to 78, with the variation caused by site accessibility, particularly during winter and spring breakup, and the addition of sites midway through the program. All sites, other than RCK1 and RCK2, have more than 60 samples. RCK1 and RCK2 were added midway through the program to provide additional upstream and downstream (respectively) Rock Creek data to augment the data set being collected mid-stream at the Rock Creek, above the road, site. Data are summarized in Tables A-1 through A-7.

Sites are representative of local surface waters draining this mineralized zone. Rock Creek joins the Snake River downstream of the proposed project area. A Surface Water Sampling Stations Map is provided as Figure A-1. Red flags indicate continuous monitoring sites, as well as water quality monitoring sites, and blue flags indicate water-quality monitoring sites without continuous monitors. Rock Creek dissects the mineral deposit proposed for development. Lindblom Creek and Glacier Creek drain the lands adjacent to the proposed project. Following are the designated sampling locations:

- SABC = Snake River above Balto Creek
- LIND = Lindblom Creek
- ROCK = Rock Creek above the road
- RCK1 - Rock Creek above the road
- RCK2 = Rock Creek below road
- SRBG = Snake River below Glacier Creek
- GLAC = Glacier Creek

- **Figure A-1 Rock Creek Sampling Stations**

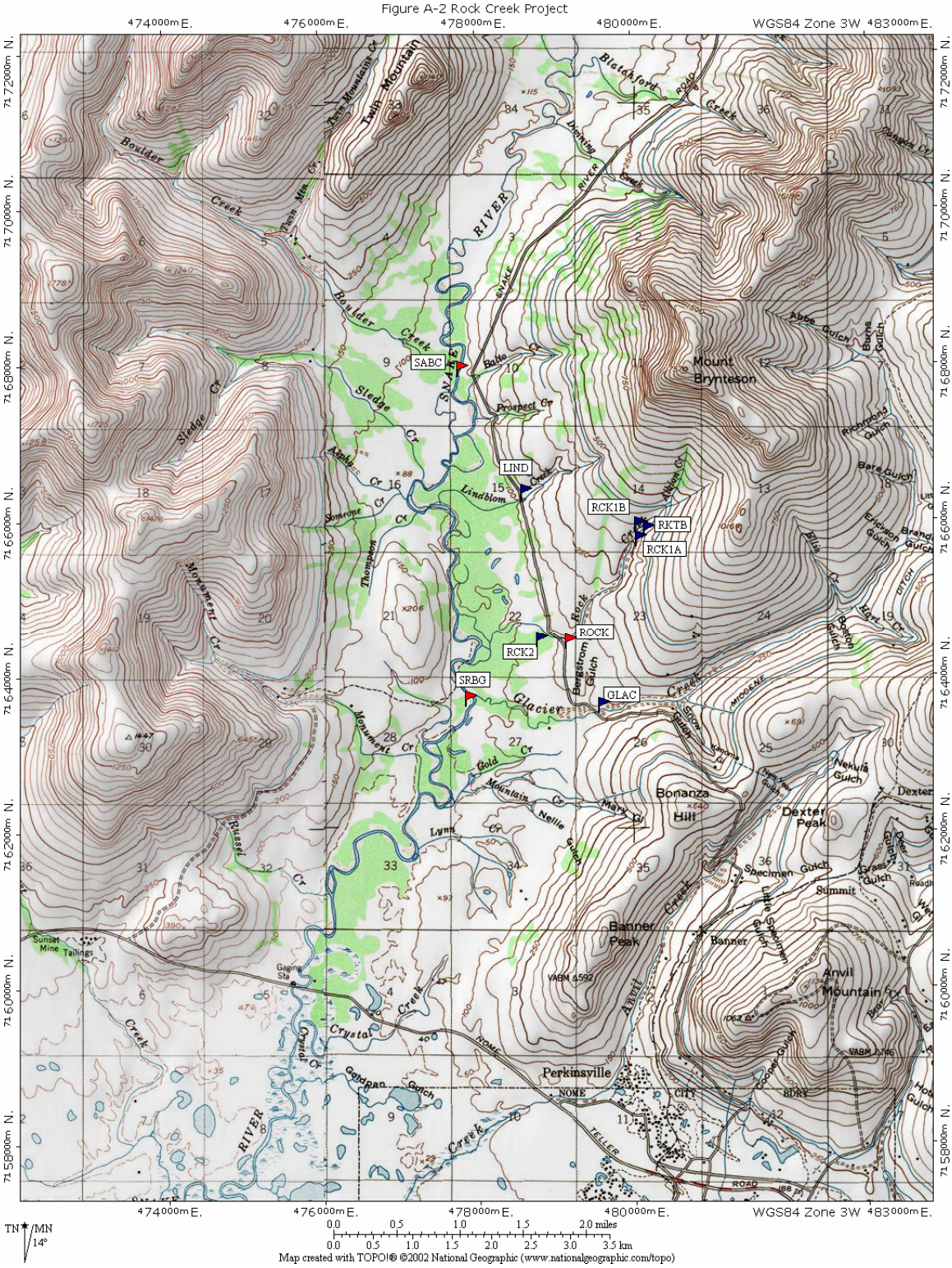


Table A-1 SABC Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.761	21.758	0.048	0.052	92.9	0.062
Standard Deviation	0.56	4.448	0.01	0.009	12.3	0.053
# of values	75	75	75	28	75	75
Lowest fifth percentile	1.975	14.62	0.032	0.05	71.7	0.05
Minimum	1.76	0.05	0.031	0.05	33	0.038
Maximum	4.03	27	0.1	0.1	106	0.465
# of values undetected	0	1	43	28	0	63
# of values between MDL and PQL	0	0	32	0	0	8
Chronic Aquatic Life Criteria (CALC)	230				>20	1.974
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0028	0.0028	0.536	129.3	1.385	115.21
Standard Deviation	0.002	0.0016	0.349	19.8	3.458	20.24
# of values	75	73	73	75	75	75
Lowest fifth percentile	0.0025	0.0025	0.05	92.6	0.2	85.46
Minimum	0.0025	0.0025	0.05	47.5	0.2	36.79
Maximum	0.02	0.016	1.8	164	23.5	218.52
# of values undetected	66	65	62	0	26	0
# of values between MDL and PQL	8	6	7	0	14	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-1 SABC Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	15.66	10.97	0.748	0.645	2.549	2.356
Standard Deviation	28.72	6.13	1.066	0.273	0.671	0.517
# of values	75	75	75	75	75	75
Lowest fifth percentile	8.891	10	0.403	0.399	1.637	1.584
Minimum	6.22	7.12	0.32	0.36	1.41	0.548
Maximum	229	60.2	9.74	2.48	5.19	3.96
# of values undetected	61	71	10	12	28	35
# of values between MDL and PQL	8	1	63	61	46	40
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	2	0	0	0	0	0
# of DWS Exceedences	0	0	1	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	8.669	8.392	0.202	0.2	0.177	0.157
Standard Deviation	1.905	1.583	0.024	0	0.135	0.1
# of values	75	75	75	75	75	75
Lowest fifth percentile	5.763	5.629	0.2	0.2	0.05	0.05
Minimum	4.63	3.11	0.146	0.2	0.05	0.05
Maximum	17.8	11.8	0.4	0.2	0.766	0.25
# of values undetected	0	0	74	75	68	74
# of values between MDL and PQL	0	0	1	0	2	0
Chronic Aquatic Life Criteria (CALC)					0.24	0.22
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	40	40
# of DWS Exceedences	0	0	0	0	0	0

Table A-1 SABC Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	34.159	33.017	0.806	0.674	2.027	2
Standard Deviation	6.02	5.151	0.926	0.621	0.231	0
# of values	75	75	75	75	75	75
Lowest fifth percentile	25.36	24.22	0.411	0.45	2	2
Minimum	10.9	9.8	0.32	0.356	2	2
Maximum	63.9	45.3	5.23	4.21	4	2
# of values undetected	0	0	52	58	75	75
# of values between MDL and PQL	0	0	15	12	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.537	0.497	0.044	0.032	0.116	0.104
Standard Deviation	0.272	0.103	0.081	0.091	0.058	0.024
# of values	75	75	75	75	75	75
Lowest fifth percentile	0.353	0.335	0.015	0.017	0.099	0.1
Minimum	0.319	0.31	0.0126	0.0135	0.065	0.077
Maximum	2.63	1.23	0.492	0.806	0.413	0.287
# of values undetected	56	58	37	64	64	69
# of values between MDL and PQL	17	16	25	8	8	5
Chronic Aquatic Life Criteria (CALC)	8.16	7.83	1		2.60	2.12
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	2	0	0	0

Table A-1 SABC Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	7.253	6.893	2.522	1.409	0.923	
Standard Deviation	1.322	1.089	3.672	0.774	0.873	
# of values	75	75	75	75	74	
Lowest fifth percentile	5.367	5.211	0.625	0.5	0.5	
Minimum	2.32	2.14	0.5	0.5	0.5	
Maximum	14.3	10.1	26.1	4.06	4.5	
# of values undetected	0	0	5	7	54	
# of values between MDL and PQL	0	0	15	18	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5.133	5.055	0.984	0.958	64.933	64.633
Standard Deviation	0.813	0.472	0.216	0.214	49.93	47.332
# of values	75	75	75	75	75	75
Lowest fifth percentile	5	5	0.679	0.663	15	12.87
Minimum	3.69	5	0.622	0.625	9.6	9.65
Maximum	10	9.09	2	1.69	250	250
# of values undetected	72	74	27	22	72	63
# of values between MDL and PQL	3	1	48	53	2	11
Chronic Aquatic Life Criteria (CALC)			45.67	45.53		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-1 SABC Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	245.47	237.85	2.529	2.524	2017.5	
Standard Deviation	58.83	33.833	0.529	0.395	99.121	
# of values	75	75	75	75	4	
Lowest fifth percentile	190.4	192.4	2.5	2.5	1923.5	
Minimum	151	167	0.731	1	1910	
Maximum	611	361	5.55	5.09	2150	
# of values undetected	6	5	69	72	4	
# of values between MDL and PQL	69	70	4	2	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	2	1	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.507	0.5	1887.6	1789.1	0.137	0.133
Standard Deviation	0.058	0	550.285	252.06	0.023	0.027
# of values	75	75	75	75	75	75
Lowest fifth percentile	0.5	0.5	1338	1300	0.1	0.095
Minimum	0.5	0.5	1070	1020	0.042	0.0387
Maximum	1	0.5	4760	2240	0.231	0.277
# of values undetected	74	75	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	3.10	2.63				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-1 SABC Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.512	0.533	10.033	9.9	2.539	2.746
Standard Deviation	0.111	0.157	1.453	0.866	1.402	3.948
# of values	75	75	75	75	75	75
Lowest fifth percentile	0.444	0.5	10	10	1	1
Minimum	0.15	0.15	2.5	2.5	1	1
Maximum	1.08	1.3	20	10	6.92	34.1
# of values undetected	65	66	75	75	55	49
# of values between MDL and PQL	8	6	0	0	7	15
Chronic Aquatic Life Criteria (CALC)					104.88	102.57
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.419	1.474	31.824	30.809		
Standard Deviation	0.98	1.161	10.37	9.964		
# of values	75	75	75	75		
Lowest fifth percentile	0.5	0.5	15.02	12.64		
Minimum	0.5	0.355	4.12	4.96		
Maximum	2.5	6.67	57.2	51.7		
# of values undetected	70	71	0	0		
# of values between MDL and PQL	4	2	1	2		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-1 SABC Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.73	38.4	7.6	208	212
Standard Deviation	2.03	5.9	0.52	38.7	64.7
# of values	67	49	48	47	34
Lowest fifth percentile	0	32.9	6.69	148	110
Minimum	0	32.6	6.22	70	72
Maximum	12.8	50.1	8.54	263	325
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	1	0	0
# of DWS Exceedences	0	0	3	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.93	1.24	103.4	0.031	6.1
Standard Deviation	1.49	0.53	20.8	0.027	2.3
# of values	42	43	41	2	26
Lowest fifth percentile	0.23	0.59	70	0.014	2
Minimum	0.12	0.28	35	0.0125	1.3
Maximum	6.6	3.00	131	0.05	9.5
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	ng/L	=	nanograms per liter
%	=	percent	ORP	=	oxygen reduction potential
°F	=	degrees Fahrenheit	PQL	=	practical quantitation limit
µg/L	=	micrograms per liter	SABC	=	Snake River above Balto Creek
Diss	=	dissolved	TDS	=	total dissolved solids
MDL	=	method detection limit	TSS	=	total suspended solids
mg/L	=	milligrams per liter	WAD	=	weak acid dissociable

Table A-2 LIND Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.762	21.269	0.051	0.052	125.7	0.053
Standard Deviation	0.746	5.643	0.017	0.01	28.9	0.012
# of values	67	67	67	24	67	67
Lowest fifth percentile	2.126	9.746	0.034	0.05	65.6	0.042
Minimum	2.03	5.87	0.031	0.05	41	0.032
Maximum	6.09	44.3	0.131	0.1	230	0.1
# of values undetected	0	0	11	24	0	57
# of values between MDL and PQL	0	0	55	0	0	10
Chronic Aquatic Life Criteria (CALC)	230				>20	1.990
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0029	0.0026	0.498	159.8	0.807	147.73
Standard Deviation	0.0017	0.0007	0.189	33.8	1.129	35.04
# of values	67	65	65	67	67	67
Lowest fifth percentile	0.0025	0.0025	0.05	94.2	0.2	75.12
Minimum	0.0025	0.0025	0.05	72.5	0.2	45.38
Maximum	0.015	0.008	1.02	286	4.9	269.19
# of values undetected	58	61	56	0	34	0
# of values between MDL and PQL	5	3	8	0	7	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	3	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-2 LIND Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	12.3	10.3	0.517	0.455	31.66	30.64
Standard Deviation	7.25	1.68	0.494	0.213	5.514	5.717
# of values	67	67	67	67	67	67
Lowest fifth percentile	10	10	0.316	0.319	20.25	20.31
Minimum	6.35	7.22	0.31	0.313	13.1	7.53
Maximum	43.1	20.7	4.2	1.96	48.7	43.7
# of values undetected	53	63	27	25	0	0
# of values between MDL and PQL	8	3	37	41	0	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	67	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	6.31	6.197	0.2	0.199	0.16	0.72
Standard Deviation	1.169	1.155	0.01	0.006	0.099	4.6
# of values	67	67	67	67	67	67
Lowest fifth percentile	4.203	4.193	0.2	0.2	0.05	0.05
Minimum	2.95	2.89	0.2	0.153	0.05	0.05
Maximum	10.2	10.8	0.27	0.2	0.25	37.8
# of values undetected	0	0	66	66	65	63
# of values between MDL and PQL	1	1	1	1	1	2
Chronic Aquatic Life Criteria (CALC)					0.22	0.20
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	36	35
# of DWS Exceedences	0	0	0	0	0	0

Table A-2 LIND Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	44.39	42.32	0.872	0.908	2	2
Standard Deviation	10.46	10.34	1.066	1.072	0	0
# of values	67	67	67	67	67	67
Lowest fifth percentile	22.81	18.12	0.5	0.5	2	2
Minimum	13.6	12	0.311	0.404	2	2
Maximum	79.4	78.1	7.3	7.83	2	2
# of values undetected	0	0	47	45	67	67
# of values between MDL and PQL	0	0	11	10	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.528	0.56	0.029	0.021	0.11	0.109
Standard Deviation	0.192	0.4	0.034	0.011	0.04	0.048
# of values	67	67	67	67	67	67
Lowest fifth percentile	0.348	0.35	0.02	0.02	0.1	0.1
Minimum	0.319	0.32	0.013	0.018	0.07	0.083
Maximum	1.72	2.81	0.268	0.112	0.29	0.466
# of values undetected	31	34	51	64	55	60
# of values between MDL and PQL	34	31	7	2	8	6
Chronic Aquatic Life Criteria (CALC)	7.31	7.01	1		2.21	1.84
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-2 LIND Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	8.94	8.56	2.312	1.402	1.426	
Standard Deviation	2.204	2.164	6.045	5.502	1.537	
# of values	67	67	67	67	66	
Lowest fifth percentile	4.403	4.127	0.484	0.448	0.5	
Minimum	2.66	2.52	0.327	0.4	0.5	
Maximum	17.2	17.2	44.5	43.5	10.7	
# of values undetected	0	0	35	53	29	
# of values between MDL and PQL	0	0	13	12	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5.046	5.056	1.193	1.139	64.77	64.18
Standard Deviation	0.264	0.477	0.376	0.317	47.7	47.81
# of values	67	67	67	67	67	67
Lowest fifth percentile	5	5	0.864	0.795	15	12.13
Minimum	5	4.4	0.755	0.663	15	9.52
Maximum	6.69	8.66	2.9	2.3	250	250
# of values undetected	65	63	15	15	64	57
# of values between MDL and PQL	2	4	49	50	2	9
Chronic Aquatic Life Criteria (CALC)			40.95	40.83		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-2 LIND Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	280.1	276	2.484	2.468	2710	
Standard Deviation	95.87	100.3	0.289	0.224	161.5	
# of values	67	67	67	66	4	
Lowest fifth percentile	194.7	196	2.5	2.463	2551	
Minimum	155	167	1	1	2530	
Maximum	663	737	4.1	3.1	2920	
# of values undetected	4	3	64	61	4	
# of values between MDL and PQL	59	60	3	6	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	2192.39	2179	0.124	0.12
Standard Deviation	0	0	370.189	407.3	0.028	0.028
# of values	67	67	67	67	67	67
Lowest fifth percentile	0.5	0.5	1756	1590	0.067	0.062
Minimum	0.5	0.5	1320	1260	0.038	0.04
Maximum	0.5	0.5	3950	4420	0.218	0.221
# of values undetected	67	67	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.48	2.11				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-2 LIND Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.574	0.505	9.888	9.888	3.336	2.825
Standard Deviation	0.426	0.088	0.916	0.916	4.383	1.936
# of values	67	67	67	67	67	67
Lowest fifth percentile	0.5	0.5	10	10	1	1
Minimum	0.15	0.15	2.5	2.5	1	1
Maximum	3.74	1.07	10	10	25.3	12.1
# of values undetected	59	60	67	67	45	37
# of values between MDL and PQL	6	6	0	0	11	15
Chronic Aquatic Life Criteria (CALC)					94.03	91.96
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	1	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.462	1.484	42.19	41.05		
Standard Deviation	1.213	1.272	16.69	16.62		
# of values	67	67	67	67		
Lowest fifth percentile	0.5	0.5	13.12	14.36		
Minimum	0.5	0.317	3.13	11.5		
Maximum	7.17	7.53	79.3	91.3		
# of values undetected	64	62	0	0		
# of values between MDL and PQL	2	4	1	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-2 LIND Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.3	38.9	7.76	260	217
Standard Deviation	0.69	6.53	0.78	68.3	71.5
# of values	62	43	42	41	29
Lowest fifth percentile	0	32.71	6.71	103	93
Minimum	0	32.5	5.92	91	87
Maximum	3.61	54.8	10.66	384	325
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	7	0	0
# of DWS Exceedences	0	0	7	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	0.85	0.41	127	0.01	5.78
Standard Deviation	0.72	0.19	33.3	0.01	2.47
# of values	34	37	37	2	22
Lowest fifth percentile	0.07	0.19	51.6	0	1.67
Minimum	0	0.16	45	0	1
Maximum	3.41	0.95	181	0.0125	9.8
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
LIND	=	Lindblom Creek	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-3 ROCK Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.735	33.137	0.048	0.052	119.3	0.053
Standard Deviation	0.595	10.155	0.013	0.01	25.9	0.015
# of values	75	75	75	27	75	75
Lowest fifth percentile	2.1	13.15	0.034	0.05	59.6	0.049
Minimum	0.967	6.8	0.031	0.05	31	0.031
Maximum	4.92	54.5	0.1	0.1	160	0.158
# of values undetected	0	0	18	27	0	63
# of values between MDL and PQL	0	0	57	0	0	11
Chronic Aquatic Life Criteria (CALC)	230				>20	1.952
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.003	0.0026	0.505	170.7	7.301	153.09
Standard Deviation	8E-04	0.0006	0.303	39.6	22.936	35.02
# of values	75	73	73	75	75	75
Lowest fifth percentile	0.003	0.0025	0.05	83.1	0.2	78.84
Minimum	0.003	0.0025	0.05	48.8	0.2	36.33
Maximum	0.008	0.007	2.33	245	166	206.76
# of values undetected	67	68	64	0	8	0
# of values between MDL and PQL	6	4	6	0	14	0
Chronic Aquatic Life Criteria (CALC)	0.005					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	2	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-3 ROCK Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	109	10.7	0.865	0.781	83.67	70.23
Standard Deviation	402	4.55	0.322	0.221	35.12	13.76
# of values	75	75	75	75	75	75
Lowest fifth percentile	6.77	6.82	0.5	0.5	47.05	43.62
Minimum	6.23	6.32	0.479	0.337	28.6	34.8
Maximum	3090	40.1	2.08	1.35	273	106
# of values undetected	34	57	9	11	0	0
# of values between MDL and PQL	26	15	48	53	0	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	8	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	75	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	5.589	4.125	0.2	0.2	0.152	0.15
Standard Deviation	5.061	0.847	0.02	0	0.106	0.1
# of values	75	75	75	75	75	75
Lowest fifth percentile	3.456	2.357	0.2	0.2	0.05	0.05
Minimum	2.28	0.959	0.2	0.2	0.05	0.05
Maximum	38.3	5.68	0.4	0.2	0.5	0.25
# of values undetected	0	1	74	75	69	73
# of values between MDL and PQL	2	5	1	0	5	2
Chronic Aquatic Life Criteria (CALC)					0.23	0.21
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	36	38
# of DWS Exceedences	0	0	0	0	0	0

Table A-3 ROCK Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	44.34	42.82	1.105	1.015	2.016	2
Standard Deviation	9.74	9.502	1.205	1.338	0.25	0
# of values	75	75	75	75	75	75
Lowest fifth percentile	22.58	20.93	0.5	0.5	2	2
Minimum	10.8	9.62	0.422	0.371	1.2	2
Maximum	58.4	57.4	6.15	7.77	4	2
# of values undetected	0	0	50	50	74	75
# of values between MDL and PQL	0	0	6	8	1	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.753	0.52	0.249	0.023	0.34	0.105
Standard Deviation	0.783	0.2	0.837	0.012	0.7	0.041
# of values	75	75	75	75	75	75
Lowest fifth percentile	0.342	0.33	0.017	0.02	0.09	0.1
Minimum	0.326	0.31	0.012	0.013	0.07	0.072
Maximum	5.36	1.91	5.07	0.087	4.16	0.453
# of values undetected	21	35	32	67	45	71
# of values between MDL and PQL	45	39	22	2	15	3
Chronic Aquatic Life Criteria (CALC)	7.61	7.31	1		2.35	1.94
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	4	0	3	0
# of DWS Exceedences	0	0	8	0	0	0

Table A-3 ROCK Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	10.28	9.852	7.32	2.293	1.834	
Standard Deviation	2.696	2.647	13.09	2.533	2.007	
# of values	75	75	75	75	74	
Lowest fifth percentile	5.238	4.562	0.5	0.446	0.5	
Minimum	2.27	2.06	0.318	0.35	0.5	
Maximum	16	15.6	87	14.9	12.4	
# of values undetected	0	0	4	9	23	
# of values between MDL and PQL	0	0	6	17	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	2	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5.017	5.011	1.492	1.223	64.98	63.96
Standard Deviation	0.638	0.292	0.863	0.363	49.85	47.42
# of values	75	75	75	75	75	75
Lowest fifth percentile	5	5	0.874	0.855	15	11.84
Minimum	3.21	3.37	0.67	0.644	15	9.8
Maximum	10	6.81	5.45	2.5	250	250
# of values undetected	72	72	14	16	72	64
# of values between MDL and PQL	3	3	51	57	3	10
Chronic Aquatic Life Criteria (CALC)			42.66	42.53		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-3 ROCK Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	278.1	257.9	2.521	2.503	2583	
Standard Deviation	94.09	69.03	0.418	0.23	229.4	
# of values	75	75	75	75	4	
Lowest fifth percentile	202.8	204.1	2.5	2.5	2334	
Minimum	190	167	0.766	1	2290	
Maximum	780	647	5	3.66	2850	
# of values undetected	5	4	72	73	4	
# of values between MDL and PQL	67	69	3	2	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	1	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.505	0.499	1997.2	1972	0.13	0.125
Standard Deviation	0.06	0.012	260.242	258.4	0.027	0.027
# of values	75	75	75	74	75	75
Lowest fifth percentile	0.5	0.5	1577	1596	0.07	0.063
Minimum	0.355	0.4	1270	1120	0.036	0.032
Maximum	1	0.5	2760	2610	0.169	0.164
# of values undetected	74	75	0	0	0	0
# of values between MDL and PQL	1	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.70	2.29				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-3 ROCK Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.587	0.526	10.03	9.9	2.705	2.6
Standard Deviation	0.346	0.314	1.453	0.866	2.195	2.619
# of values	75	75	75	75	75	75
Lowest fifth percentile	0.5	0.471	10	10	1	1
Minimum	0.341	0.15	2.5	2.5	1	1
Maximum	3.07	3.18	20	10	11.6	21.9
# of values undetected	65	70	75	75	50	53
# of values between MDL and PQL	6	4	0	0	11	9
Chronic Aquatic Life Criteria (CALC)					97.96	95.8
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	1	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.441	1.411	44.77	41.88		
Standard Deviation	0.996	1.008	17.34	16.65		
# of values	75	75	75	75		
Lowest fifth percentile	0.5	0.5	16.94	11.04		
Minimum	0.5	0.489	2.5	2.5		
Maximum	2.5	2.85	78	76.8		
# of values undetected	73	72	1	1		
# of values between MDL and PQL	1	3	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-3 ROCK Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	5.23	40.98	7.58	278	214
Standard Deviation	13.3	9.44	0.73	78.9	65.6
# of values	68	48	45	46	32
Lowest fifth percentile	0	33.04	6.7	101	108
Minimum	0	32.36	6.33	72	76
Maximum	92.1	61	8.86	399	315
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	2	8	0	0
# of DWS Exceedences	0	0	10	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.4	0.71	135	0.106	6.19
Standard Deviation	1.14	0.59	37.9	0.133	2.91
# of values	37	36	42	2	27
Lowest fifth percentile	0.27	0.28	63.2	0.022	0.9
Minimum	0.07	0.26	36	0.0125	0.02
Maximum	4.6	2.59	193	0.2	11.5
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	ng/L	=	nanograms per liter
%	=	percent	ORP	=	oxygen reduction potential
°F	=	degrees Fahrenheit	PQL	=	practical quantitation limit
µg/L	=	micrograms per liter	ROCK	=	Rock Creek above the road
Diss	=	dissolved	TDS	=	total dissolved solids
MDL	=	method detection limit	TSS	=	total suspended solids
mg/L	=	milligrams per liter	WAD	=	weak acid dissociable

Table A-4 RCK1 Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.492	27.68	0.047	0.05	122.1	0.05
Standard Deviation	0.587	21.102	0.01	0	26.2	0.003
# of values	61	61	61	13	61	61
Lowest fifth percentile	2.05	8.28	0.032	0.05	67	0.05
Minimum	0.929	4.89	0.031	0.05	34.5	0.035
Maximum	5.25	176	0.086	0.05	150	0.067
# of values undetected	0	0	23	13	0	57
# of values between MDL and PQL	0	0	38	0	0	4
Chronic Aquatic Life Criteria (CALC)	230				>20	1.925
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0026	0.0028	0.57	167.4	3.44	147
Standard Deviation	0.0005	0.0023	0.373	39.9	7.246	33.21
# of values	61	60	59	61	61	61
Lowest fifth percentile	0.0025	0.0025	0.05	87.5	0.2	75.38
Minimum	0.0025	0.0025	0.05	60	0.2	40.84
Maximum	0.0052	0.02	2.71	313	48.4	189.11
# of values undetected	55	56	51	0	3	0
# of values between MDL and PQL	5	3	5	0	8	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-4 RCK1 Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	47.5	10.4	0.489	0.465	47.42	40.29
Standard Deviation	164	1.93	0.163	0.163	29.43	12.95
# of values	61	61	61	61	61	61
Lowest fifth percentile	6.79	10	0.327	0.324	27.1	21.9
Minimum	6.49	7.48	0.317	0.313	2.35	10.5
Maximum	1220	23	1.16	1.54	251	78.7
# of values undetected	32	55	25	27	0	0
# of values between MDL and PQL	19	5	34	33	1	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	5	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	60	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	5.077	4.419	0.2	0.2	0.176	0.18
Standard Deviation	1.632	0.941	0	0	0.103	0.1
# of values	61	61	61	61	61	61
Lowest fifth percentile	3.86	1.87	0.2	0.2	0.05	0.05
Minimum	2.65	1.37	0.2	0.2	0.05	0.05
Maximum	13.4	5.65	0.2	0.2	0.459	0.25
# of values undetected	0	1	61	61	55	61
# of values between MDL and PQL	1	3	0	0	5	0
Chronic Aquatic Life Criteria (CALC)					0.22	0.20
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	37	40
# of DWS Exceedences	0	0	0	0	0	0

Table A-4 RCK1 Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	43.75	42.15	0.976	0.898	1.991	2
Standard Deviation	9.448	9.33	1.128	1.039	0.069	0
# of values	61	61	61	61	61	61
Lowest fifth percentile	22.9	21.9	0.492	0.5	2	2
Minimum	12.8	11.4	0.324	0.327	1.46	2
Maximum	54.6	52.2	5.88	6.99	2	2
# of values undetected	0	0	41	41	60	61
# of values between MDL and PQL	0	0	6	7	1	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.574	0.81	0.119	0.021	0.17	0.1
Standard Deviation	0.35	2.54	0.411	0.005	0.29	0.009
# of values	61	61	61	61	61	61
Lowest fifth percentile	0.334	0.34	0.017	0.02	0.1	0.1
Minimum	0.321	0.32	0.013	0.013	0.08	0.062
Maximum	2.51	20.3	3.04	0.058	2.27	0.142
# of values undetected	31	38	29	56	50	56
# of values between MDL and PQL	24	22	19	4	4	5
Chronic Aquatic Life Criteria (CALC)	7.33	7.03	1		2.22	1.85
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	1	1	0	1	0
# of DWS Exceedences	0	0	4	0	0	0

Table A-4 RCK1 Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	9.152	8.825	6.146	3.271	1.331	
Standard Deviation	2.389	2.375	9.283	3.38	1.159	
# of values	61	61	61	61	61	
Lowest fifth percentile	4.41	4.13	0.976	0.5	0.5	
Minimum	2.15	1.92	0.549	0.371	0.5	
Maximum	12.9	12.5	65.4	17.1	4.8	
# of values undetected	0	0	0	3	30	
# of values between MDL and PQL	0	0	6	12	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	1	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5.068	5	1.266	1.151	70.96	71.19
Standard Deviation	0.465	0	0.636	0.359	40.43	40.41
# of values	61	61	61	61	61	61
Lowest fifth percentile	5	5	0.844	0.73	15	10.8
Minimum	5	5	0.749	0.629	15	9.55
Maximum	8.6	5	5.31	2.35	100	100
# of values undetected	59	61	14	14	59	54
# of values between MDL and PQL	2	0	42	45	2	6
Chronic Aquatic Life Criteria (CALC)			41.07	40.95		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-4 RCK1 Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	260	244	2.514	2.519		
Standard Deviation	136.9	92.53	0.168	0.147		
# of values	61	61	61	61		
Lowest fifth percentile	171	169	2.5	2.5		
Minimum	163	153	2.12	2.5		
Maximum	1090	752	3.75	3.65		
# of values undetected	9	9	59	60		
# of values between MDL and PQL	49	50	2	1		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1854.59	1800	0.128	0.124
Standard Deviation	0	0	250.796	211	0.03	0.029
# of values	61	61	61	61	61	61
Lowest fifth percentile	0.5	0.5	1520	1470	0.069	0.064
Minimum	0.5	0.5	1170	1090	0.033	0.029
Maximum	0.5	0.5	2700	2390	0.179	0.169
# of values undetected	61	61	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.50	2.12				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-4 RCK1 Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.555	0.499	10	10	2.324	2.394
Standard Deviation	0.256	0.029	0	0	1.592	1.329
# of values	60	61	61	61	61	61
Lowest fifth percentile	0.5	0.5	10	10	1	1
Minimum	0.34	0.394	10	10	1	1
Maximum	2.08	0.623	10	10	12.4	8.87
# of values undetected	52	56	61	61	47	46
# of values between MDL and PQL	5	5	0	0	10	10
Chronic Aquatic Life Criteria (CALC)					94.3	92.23
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	1	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.187	1.188	43.42	41.75		
Standard Deviation	0.959	0.958	14.84	15.89		
# of values	61	61	61	61		
Lowest fifth percentile	0.5	0.5	17.5	12.7		
Minimum	0.314	0.496	14.8	2.5		
Maximum	2.5	2.5	70.5	68.2		
# of values undetected	59	60	0	1		
# of values between MDL and PQL	2	1	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-4 RCK1 Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	2.3	39.1	7.77	268	223
Standard Deviation	4.53	6.54	0.74	68.6	66.6
# of values	56	49	48	48	34
Lowest fifth percentile	0	33.44	6.64	145	109
Minimum	0	33.3	6.26	67	88
Maximum	25.4	53.4	9.01	380	337
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	7	0	0
# of DWS Exceedences	0	0	9	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.74	0.46	130	0	6.36
Standard Deviation	1.09	0.15	33.4	0	3.45
# of values	42	42	42	2	26
Lowest fifth percentile	0.7	0.26	76.1	0	0.53
Minimum	0.36	0.16	33	0	0.03
Maximum	5.9	0.80	181	0	14.7
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	ng/L	=	nanograms per liter
%	=	percent	ORP	=	oxygen reduction potential
°F	=	degrees Fahrenheit	PQL	=	practical quantitation limit
µg/L	=	micrograms per liter	RCK1	=	Rock Creek above the road
Diss	=	dissolved	TDS	=	total dissolved solids
MDL	=	method detection limit	TSS	=	total suspended solids
mg/L	=	milligrams per liter	WAD	=	weak acid dissociable

Table A-5 RCK2 Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.745	30.163	0.043	0.05	110.9	0.056
Standard Deviation	0.616	9.244	0.011	0	27.2	0.028
# of values	48	48	48	16	48	48
Lowest fifth percentile	2.098	9.778	0.032	0.05	42.9	0.045
Minimum	2.05	6.81	0.031	0.05	32	0.033
Maximum	4.9	53.3	0.1	0.05	166	0.231
# of values undetected	0	0	16	16	0	38
# of values between MDL and PQL	0	0	32	0	0	8
Chronic Aquatic Life Criteria (CALC)	230				>20	2.030
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0028	0.56	157.7	15.304	142.3
Standard Deviation	0.0008	0.0013	0.379	39.7	35.135	36.45
# of values	48	48	46	48	48	48
Lowest fifth percentile	0.0025	0.0025	0.05	73.4	0.4	54.93
Minimum	0.0025	0.0025	0.05	45	0.25	35.62
Maximum	0.0078	0.011	1.83	243	162	225.71
# of values undetected	43	43	38	0	1	0
# of values between MDL and PQL	4	4	4	0	3	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-5 RCK2 Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	192	11.1	0.889	0.807	93.69	70.87
Standard Deviation	570	4.93	0.335	0.208	49.93	13.94
# of values	48	48	48	48	48	48
Lowest fifth percentile	7.42	6.58	0.5	0.5	64.41	39.94
Minimum	6.29	6.23	0.441	0.347	26.1	35.6
Maximum	3380	32.3	2.02	1.28	392	97.9
# of values undetected	7	33	4	6	0	0
# of values between MDL and PQL	18	12	30	35	0	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	11	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	48	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	6.095	3.919	0.2	0.201	0.17	0.19
Standard Deviation	5.827	0.888	0.01	0.005	0.096	0.09
# of values	48	48	48	48	48	48
Lowest fifth percentile	3.627	1.749	0.2	0.2	0.05	0.05
Minimum	2.53	1.13	0.14	0.2	0.05	0.05
Maximum	40.2	5.43	0.2	0.238	0.25	0.25
# of values undetected	0	1	47	47	43	47
# of values between MDL and PQL	2	4	1	1	4	0
Chronic Aquatic Life Criteria (CALC)					0.17	0.16
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	28	32
# of DWS Exceedences	0	0	0	0	0	0

Table A-5 RCK2 Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	41.7	39.99	0.866	0.757	1.998	2
Standard Deviation	10.59	10.23	0.719	0.657	0.115	0
# of values	48	48	48	48	48	48
Lowest fifth percentile	16.05	15.32	0.5	0.5	2	2
Minimum	10.6	10.5	0.409	0.366	1.4	2
Maximum	64.8	60.4	3.99	3.44	2.51	2
# of values undetected	0	0	27	33	46	48
# of values between MDL and PQL	0	0	9	8	2	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.942	0.58	0.388	0.024	0.62	0.102
Standard Deviation	1.107	0.4	1.072	0.013	1.16	0.016
# of values	48	48	48	48	48	48
Lowest fifth percentile	0.341	0.34	0.017	0.02	0.1	0.087
Minimum	0.315	0.31	0.015	0.02	0.07	0.065
Maximum	5.71	2.97	5.48	0.081	6.5	0.18
# of values undetected	5	12	9	43	17	41
# of values between MDL and PQL	35	34	10	0	9	7
Chronic Aquatic Life Criteria (CALC)	5.59	5.37	1		1.48	1.30
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	1	0	4	0	6	0
# of DWS Exceedences	0	0	9	0	0	0

Table A-5 RCK2 Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	9.259	8.865	14.16	2.347	2.396	
Standard Deviation	2.454	2.397	24.95	2.534	2.069	
# of values	48	48	48	48	48	
Lowest fifth percentile	3.763	3.222	0.924	0.38	0.5	
Minimum	2.22	2.2	0.362	0.315	0.5	
Maximum	15.5	14.5	136	14.1	10.2	
# of values undetected	0	0	0	3	10	
# of values between MDL and PQL	0	0	3	12	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	3	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	4.968	5.06	1.631	1.145	72.54	70.8
Standard Deviation	0.228	0.417	1.263	0.261	39.09	40.42
# of values	48	48	48	48	48	48
Lowest fifth percentile	5	5	0.783	0.904	15	15
Minimum	3.42	5	0.693	0.727	15	11.8
Maximum	5.06	7.89	7.52	1.92	106	100
# of values undetected	46	47	8	12	43	44
# of values between MDL and PQL	2	1	32	36	3	4
Chronic Aquatic Life Criteria (CALC)			31.42	31.33		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-5 RCK2 Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	288.4	251.6	2.558	2.51	2595	
Standard Deviation	126.7	63	0.397	0.074	304.06	
# of values	48	48	48	48	2	
Lowest fifth percentile	199.7	202.4	2.5	2.5	2401.5	
Minimum	193	165	1.68	2.46	2380	
Maximum	904	587	4.76	3.01	2810	
# of values undetected	0	1	45	46	2	
# of values between MDL and PQL	44	46	3	2	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1980.21	1917	0.122	0.117
Standard Deviation	0	0	255.622	253.5	0.03	0.029
# of values	48	48	48	48	48	48
Lowest fifth percentile	0.5	0.5	1633.5	1470	0.054	0.048
Minimum	0.5	0.5	1290	1260	0.036	0.035
Maximum	0.5	0.5	2790	2610	0.186	0.177
# of values undetected	48	48	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	1.45	1.23				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-5 RCK2 Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.506	0.51	10	10	2.971	2.112
Standard Deviation	0.044	0.069	0	0	2.44	0.71
# of values	48	48	48	48	48	48
Lowest fifth percentile	0.5	0.5	10	10	1	1
Minimum	0.5	0.5	10	10	1	1
Maximum	0.802	0.978	10	10	14.6	3.89
# of values undetected	47	47	48	48	31	38
# of values between MDL and PQL	1	1	0	0	9	8
Chronic Aquatic Life Criteria (CALC)					72.12	70.53
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.2	1.166	41.48	36.25		
Standard Deviation	0.941	0.953	17.47	16.04		
# of values	48	48	48	48		
Lowest fifth percentile	0.5	0.5	15.09	10.1		
Minimum	0.5	0.474	5.91	2.5		
Maximum	2.5	2.5	88.7	69.2		
# of values undetected	45	47	0	1		
# of values between MDL and PQL	1	1	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-5 RCK2 Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	8.38	43.72	7.79	253	212
Standard Deviation	15.29	9.98	0.83	81.7	81.1
# of values	47	32	29	30	22
Lowest fifth percentile	0.11	32.7	6.61	86.5	88.7
Minimum	0	32.5	6.3	68	81
Maximum	84.5	63.8	8.91	426	326
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	1	8	0	0
# of DWS Exceedences	0	0	9	0	0
Analyte	Velocity	Depth	TDS (field)	Dissolved Oxygen (%)	
Mean	1.78	0.42	137	6.23	
Standard Deviation	1.08	0.13	55	2.83	
# of values	27	27	30	21	
Lowest fifth percentile	0.52	0.23	54.6	1.9	
Minimum	0.35	0.20	42	1	
Maximum	4.8	0.66	354	11.8	
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	
# of DWS Exceedences	0	0	0	0	

Notes:

#	=	number	ng/L	=	nanograms per liter
%	=	percent	ORP	=	oxygen reduction potential
°F	=	degrees Fahrenheit	PQL	=	practical quantitation limit
µg/L	=	micrograms per liter	RCK2	=	Rock Creek below the road
Diss	=	dissolved	TDS	=	total dissolved solids
MDL	=	method detection limit	TSS	=	total suspended solids
mg/L	=	milligrams per liter	WAD	=	weak acid dissociable

Table A-6 SNBG Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	3.607	20.839	0.047	0.052	91.2	0.052
Standard Deviation	1.087	3.621	0.017	0.01	12	0.011
# of values	71	71	71	25	71	71
Lowest fifth percentile	2.375	14.7	0.032	0.05	67.5	0.05
Minimum	2	6.8	0.031	0.05	41	0.035
Maximum	7.27	32.8	0.166	0.1	123	0.106
# of values undetected	0	0	40	25	0	64
# of values between MDL and PQL	0	0	30	0	0	6
Chronic Aquatic Life Criteria (CALC)	230				>20	2.031
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0027	0.477	128.5	1.289	112.18
Standard Deviation	0.001	0.0015	0.214	21.7	2.357	15.15
# of values	70	68	69	71	70	71
Lowest fifth percentile	0.0025	0.0025	0.05	87.5	0.2	81.44
Minimum	0.0025	0.0025	0.033	63.8	0.2	47.63
Maximum	0.009	0.015	1.13	211	10.4	154.83
# of values undetected	66	64	60	0	29	0
# of values between MDL and PQL	3	3	5	0	12	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	2	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-6 SNBG Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	12.7	10	0.493	0.486	6.509	3.984
Standard Deviation	12.8	0.25	0.116	0.073	16.41	10.46
# of values	71	71	71	71	71	71
Lowest fifth percentile	9.52	10	0.362	0.365	1.8	1.675
Minimum	6.46	10	0.34	0.322	1.5	1.56
Maximum	101	11.8	1.08	0.7	88.3	90.6
# of values undetected	58	69	14	21	18	18
# of values between MDL and PQL	9	2	56	50	42	50
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	3	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	10.26	10.22	0.2	0.2	0.163	0.16
Standard Deviation	4.166	4.033	0.01	0.002	0.1	0.1
# of values	71	71	71	71	71	71
Lowest fifth percentile	4.305	4.56	0.2	0.2	0.05	0.05
Minimum	3.23	2.42	0.2	0.179	0.05	0.05
Maximum	18	18.3	0.26	0.2	0.296	0.25
# of values undetected	0	0	70	70	68	70
# of values between MDL and PQL	0	1	1	1	1	0
Chronic Aquatic Life Criteria (CALC)					0.23	0.21
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	39	38
# of DWS Exceedences	0	0	0	0	0	0

Table A-6 SNBG Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	33.23	32.06	0.77	0.665	2	2
Standard Deviation	4.358	4.903	0.697	0.577	0	0
# of values	71	71	71	71	71	71
Lowest fifth percentile	24.05	21.55	0.5	0.5	2	2
Minimum	14.4	13.6	0.5	0.315	2	2
Maximum	45	48	4.11	3.84	2	2
# of values undetected	0	0	56	58	71	71
# of values between MDL and PQL	0	0	5	9	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.497	0.49	0.029	0.02	0.11	0.106
Standard Deviation	0.078	0.08	0.036	0.003	0.03	0.037
# of values	71	71	71	71	71	71
Lowest fifth percentile	0.369	0.33	0.015	0.02	0.09	0.1
Minimum	0.316	0.31	0.013	0.013	0.07	0.062
Maximum	0.931	0.91	0.279	0.035	0.34	0.323
# of values undetected	51	54	41	63	59	66
# of values between MDL and PQL	20	17	21	8	11	4
Chronic Aquatic Life Criteria (CALC)	7.83	7.51	1		2.45	2.01
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-6 SNBG Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	7.081	6.857	3.32	2.276	0.957	
Standard Deviation	1.071	1.141	2.817	1.717	0.771	
# of values	71	71	71	71	70	
Lowest fifth percentile	5.205	4.835	0.963	0.519	0.5	
Minimum	2.83	2.78	0.5	0.05	0.5	
Maximum	10.3	10.6	14.3	12.5	3.2	
# of values undetected	0	0	2	4	47	
# of values between MDL and PQL	0	0	4	7	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5.011	5.044	0.998	0.96	64.03	64.45
Standard Deviation	0.283	0.373	0.251	0.182	47.7	47.43
# of values	71	71	71	71	71	71
Lowest fifth percentile	5	5	0.673	0.685	15	14.35
Minimum	3.75	5	0.628	0.646	15	11.5
Maximum	7.01	8.14	2.2	1.56	250	250
# of values undetected	69	70	25	29	69	62
# of values between MDL and PQL	2	1	45	42	2	8
Chronic Aquatic Life Criteria (CALC)			43.85	43.71		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-6 SNBG Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	242.5	240.1	2.513	2.555	2192.5	
Standard Deviation	30.68	32.31	0.427	0.272	159.45	
# of values	71	71	71	71	4	
Lowest fifth percentile	198.5	195.5	2.5	2.5	2100	
Minimum	171	164	0.845	2.5	2100	
Maximum	344	372	5.62	4.13	2430	
# of values undetected	7	7	70	69	0	
# of values between MDL and PQL	64	64	0	2	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	1	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	2115.07	2100	0.134	0.129
Standard Deviation	0	0	390.94	387.9	0.024	0.025
# of values	71	71	71	71	71	71
Lowest fifth percentile	0.5	0.5	1575	1545	0.094	0.089
Minimum	0.5	0.5	1200	1080	0.045	0.041
Maximum	0.5	0.5	3170	3120	0.178	0.174
# of values undetected	71	71	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.85	2.42				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-6 SNBG Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.518	0.531	9.843	9.886	2.348	2.315
Standard Deviation	0.128	0.175	0.985	0.964	1.915	1.03
# of values	71	71	71	71	71	71
Lowest fifth percentile	0.5	0.5	10	10	1	1
Minimum	0.15	0.15	2.5	1.88	1	1
Maximum	1.23	1.62	10	10	16	5.98
# of values undetected	66	67	70	70	52	44
# of values between MDL and PQL	3	1	1	1	9	14
Chronic Aquatic Life Criteria (CALC)					100.7	98.47
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.487	1.483	31.4	29.91		
Standard Deviation	1.17	1.265	9.877	9.983		
# of values	71	71	71	71		
Lowest fifth percentile	0.5	0.5	16.85	14		
Minimum	0.5	0.457	3.51	8.08		
Maximum	6.63	8.02	54.3	50.3		
# of values undetected	68	68	0	0		
# of values between MDL and PQL	1	2	1	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-6 SNBG Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.62	39.71	7.43	211	218
Standard Deviation	1.14	7.49	0.6	35.5	71.5
# of values	62	48	47	46	33
Lowest fifth percentile	0	32.77	6.58	158	101
Minimum	0	32.36	6.13	88	58
Maximum	6.5	55.6	8.46	306	333
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	2	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.55	1.66	106	0.006	6.43
Standard Deviation	1.32	0.63	19.6	0.009	4.14
# of values	40	41	39	2	25
Lowest fifth percentile	0.25	0.68	76	0.001	0.96
Minimum	0.17	0.52	44	0	0.2
Maximum	6.3	3.08	153	0.0125	19.8
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	ng/L	=	nanograms per liter
%	=	percent	ORP	=	oxygen reduction potential
°F	=	degrees Fahrenheit	PQL	=	practical quantitation limit
µg/L	=	micrograms per liter	SNBG	=	Snake River below Glacier Creek
Diss	=	dissolved	TDS	=	total dissolved solids
MDL	=	method detection limit	TSS	=	total suspended solids
mg/L	=	milligrams per liter	WAD	=	weak acid dissociable

Table A-7 GLAC Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.554	22.226	0.048	0.052	108.8	0.053
Standard Deviation	0.42	6.741	0.011	0.01	23.2	0.019
# of values	78	78	78	27	78	78
Lowest fifth percentile	2.156	10.881	0.032	0.05	69.4	0.046
Minimum	1.35	0.05	0.031	0.05	34	0.031
Maximum	4.79	44.5	0.102	0.1	244	0.189
# of values undetected	0	1	39	27	0	68
# of values between MDL and PQL	0	0	38	0	0	8
Chronic Aquatic Life Criteria (CALC)	230				>20	1.995
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0025	0.0028	0.48	140.8	0.714	130.63
Standard Deviation	0.0003	0.0014	0.287	32.5	1.848	22.9
# of values	78	76	76	78	78	78
Lowest fifth percentile	0.0025	0.0025	0.05	71.6	0.2	81.06
Minimum	0.0025	0.0025	0.04	18.8	0.2	37.03
Maximum	0.0042	0.012	1.51	191	14.7	160.8
# of values undetected	74	67	68	0	44	0
# of values between MDL and PQL	4	5	5	1	16	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-7 GLAC Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	11.4	11.5	0.468	0.465	6.198	6.137
Standard Deviation	8.14	11.4	0.129	0.109	3.477	3.302
# of values	78	78	78	78	78	78
Lowest fifth percentile	9.68	10	0.328	0.332	2.551	2.5
Minimum	6.82	8.85	0.311	0.326	2.27	2.27
Maximum	71.7	110	1.22	0.868	17.6	16.5
# of values undetected	68	74	21	20	3	4
# of values between MDL and PQL	7	3	56	58	27	31
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	10	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	3.984	4.035	0.2	0.201	0.161	0.16
Standard Deviation	0.977	1.162	0.01	0.018	0.099	0.1
# of values	78	78	78	78	78	78
Lowest fifth percentile	2.585	2.264	0.2	0.2	0.05	0.05
Minimum	1.5	1.5	0.15	0.146	0.05	0.05
Maximum	10.5	11.4	0.2	0.346	0.25	0.25
# of values undetected	1	2	77	75	77	74
# of values between MDL and PQL	6	4	1	3	1	3
Chronic Aquatic Life Criteria (CALC)					0.23	0.21
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	43	42
# of DWS Exceedences	0	0	0	0	0	0

Table A-7 GLAC Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	37.72	36.22	1.184	0.742	2	2
Standard Deviation	6.512	6.305	2.75	0.735	0	0
# of values	78	78	78	78	78	78
Lowest fifth percentile	23.43	22.73	0.5	0.5	2	2
Minimum	10.9	9.95	0.366	0.314	2	2
Maximum	46.4	44.4	23.7	5.33	2	2
# of values undetected	0	0	55	58	78	78
# of values between MDL and PQL	0	0	10	9	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	1	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.502	0.5	0.033	0.02	0.1	0.121
Standard Deviation	0.177	0.12	0.098	0.002	0.02	0.131
# of values	78	78	78	78	78	78
Lowest fifth percentile	0.332	0.36	0.018	0.02	0.1	0.1
Minimum	0.315	0.31	0.014	0.014	0.07	0.088
Maximum	1.78	1.43	0.88	0.03	0.2	1.19
# of values undetected	50	61	68	74	71	71
# of values between MDL and PQL	27	16	6	4	7	5
Chronic Aquatic Life Criteria (CALC)	7.80	7.48	1		2.44	2.00
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	1	0	0	0

Table A-7 GLAC Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	8.836	8.444	1.035	0.702	1.064	
Standard Deviation	1.634	1.607	1.452	0.6	1.013	
# of values	78	78	78	78	77	
Lowest fifth percentile	5.489	5.471	0.403	0.354	0.5	
Minimum	2.38	2.21	0.334	0.318	0.5	
Maximum	10.9	10.6	11.4	3.53	5.6	
# of values undetected	0	0	27	32	46	
# of values between MDL and PQL	0	0	34	37	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	4.979	5.049	1.315	1.016	66.18	66.27
Standard Deviation	0.189	0.417	2.507	0.241	46.85	46.91
# of values	78	78	78	78	78	78
Lowest fifth percentile	5	5	0.721	0.657	15	10.47
Minimum	3.33	4.22	0.62	0.625	15	9.46
Maximum	5	8.4	23	1.73	250	250
# of values undetected	77	75	29	31	76	70
# of values between MDL and PQL	1	3	46	47	2	7
Chronic Aquatic Life Criteria (CALC)			43.67	43.54		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-7 GLAC Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss	Silicon Total	
Mean	204.3	202.2	2.495	2.509	2072.5	
Standard Deviation	35.68	33.1	0.213	0.279	121.21	
# of values	78	78	78	78	4	
Lowest fifth percentile	154.6	160.9	2.5	2.5	1934	
Minimum	150	155	1	1	1910	
Maximum	324	299	3.62	4.27	2200	
# of values undetected	12	12	77	75	4	
# of values between MDL and PQL	66	66	1	3	0	
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1805	1785	0.109	0.106
Standard Deviation	0	0	175.808	175.2	0.018	0.018
# of values	78	78	78	78	78	78
Lowest fifth percentile	0.5	0.5	1548.5	1506	0.071	0.071
Minimum	0.5	0.5	1200	1170	0.036	0.033
Maximum	0.5	0.5	2340	2310	0.136	0.133
# of values undetected	78	78	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.83	2.40				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-7 GLAC Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.516	0.577	9.859	9.904	2.559	2.516
Standard Deviation	0.118	0.309	0.932	0.849	3.139	3.623
# of values	78	78	78	78	78	78
Lowest fifth percentile	0.497	0.5	10	10	1	1
Minimum	0.15	0.5	2.5	2.5	1	1
Maximum	1.32	2.69	10	10	26.8	33.1
# of values undetected	70	72	77	78	63	56
# of values between MDL and PQL	7	1	1	0	7	12
Chronic Aquatic Life Criteria (CALC)					100.3	98.08
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	1.353	1.519	34.46	34.2		
Standard Deviation	0.986	1.362	11.75	12.09		
# of values	78	78	78	78		
Lowest fifth percentile	0.5	0.5	14.47	14.96		
Minimum	0.5	0.5	5.86	9.27		
Maximum	2.5	8.11	56.1	56.8		
# of values undetected	75	74	0	0		
# of values between MDL and PQL	3	1	0	1		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-7 GLAC Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.9	38.94	7.65	234	202
Standard Deviation	4.14	7.73	0.67	51.7	78.3
# of values	68	48	45	45	31
Lowest fifth percentile	0	32.6	6.73	145	67
Minimum	0	32.18	6.02	67	56
Maximum	33.5	62.1	8.8	302	306
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	1	5	0	0
# of DWS Exceedences	0	0	7	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.77	0.75	115	0	6.49
Standard Deviation	1.64	0.31	26.4	0.01	2.37
# of values	39	42	41	3	26
Lowest fifth percentile	0.32	0.33	71	0	2.13
Minimum	0.24	0.30	33	0	1.5
Maximum	6.88	1.57	151	0.0125	10.6
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
GLAC	=	Glacier Creek	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Big Hurrah

Surface water samples were collected at 6 primary stations around the Big Hurrah Mine site. Samples were collected beginning July 7, 2004 on on a weekly basis from July 7, 2004, to October 10, 2004, and on a monthly basis thereafter. While monthly monitoring is ongoing at the site, the data set for this assessment is concluded at May 17, 2005. The total number of samples per site ranges from 16 to 33, with the variation caused by site accessibility, particularly during winter and spring breakup, and frozen conditions at the sites. Data are summarized in Tables A-8 through A-13.

Several tributaries merge with Big Hurrah Creek and these drainages are the ones to receive the surface water monitoring/sampling procedures. Sites are representative of local surface waters draining this mineralized zone. Little Hurrah Creek joins the Big Hurrah Creek within the proposed project area. A Big Hurrah Surface Water Sampling Stations Map is provided as Figure A-2. Red flags indicate continuous monitoring sites, as well as water quality monitoring sites, and blue flags indicate water-quality monitoring sites without continuous monitors.

Following are the designated sampling locations:

- HUFFY = Huffy Creek
- LHRL= Little Hurrah Creek, Lower
- LHRU = Little Hurrah Creek, Upper
- LIDA = Linda Vista Creek
- BHBL = Big Hurrah Creek, Lower
- BHBU = Big Hurrah Creek, Upper

Figure A-2 Big Hurrah Sampling Stations

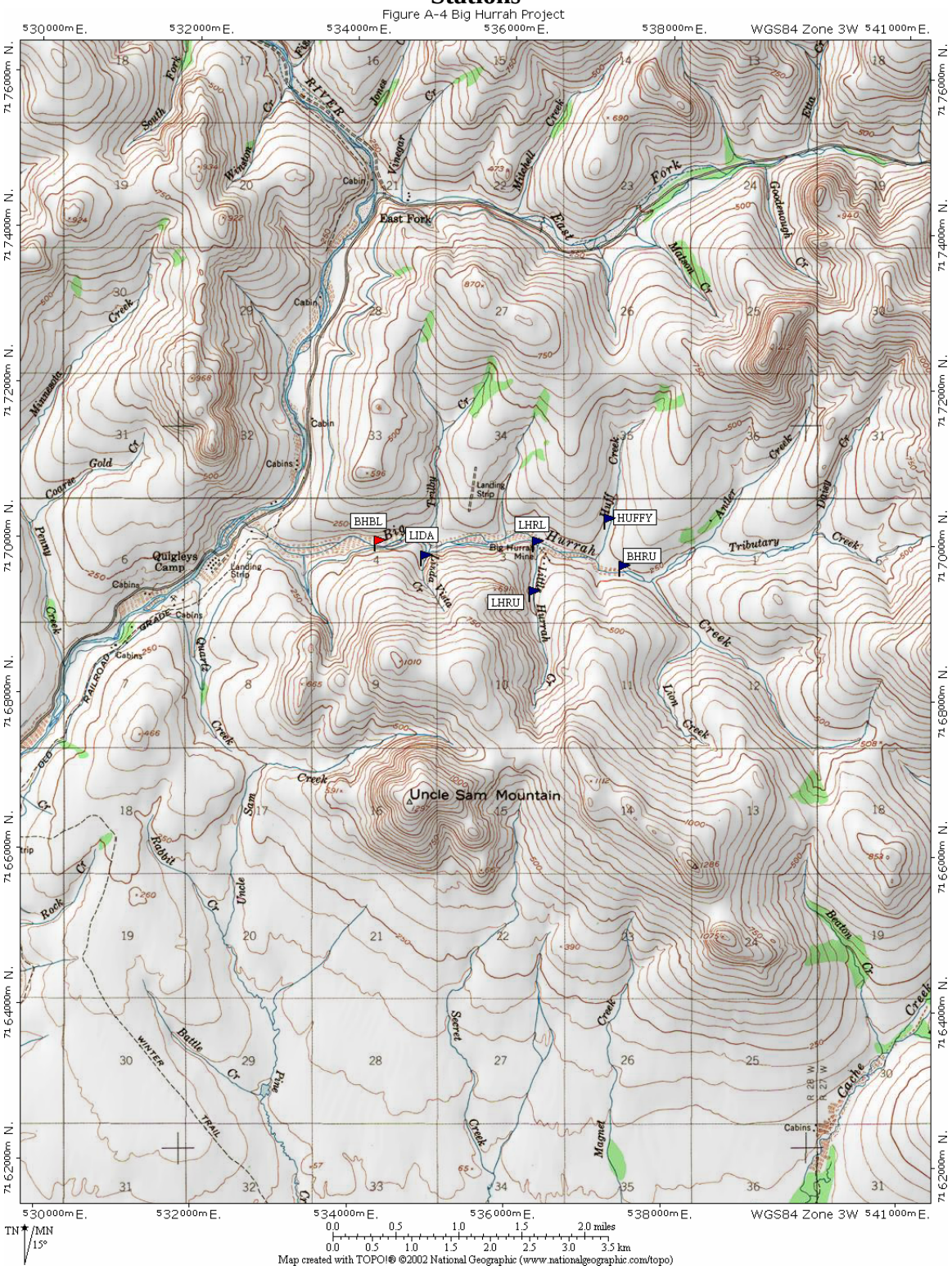


Table A-8 BHRU Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Bromide (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)
Mean	2.5	16.962	0.047	#DIV/0!	104	0.052
Standard Deviation	0.325	3.201	0.008	#DIV/0!	11.4	0.011
# of values	21	21	21	0	21	21
Lowest fifth percentile	2.23	12.8	0.031	#NUM!	92	0.05
Minimum	2.13	11.8	0.031	0	75.5	0.05
Maximum	3.78	26.5	0.062	0	139	0.1
# of values undetected	0	0	16	0	0	20
# of values between MDL and PQL	0	0	5	0	0	0
Chronic Aquatic Life Criteria (CALC)	230				>20	1.226
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0037	0.585	125.6	7.45	119.35
Standard Deviation	0.0006	0.0047	0.363	33.1	32.205	16.29
# of values	21	21	20	21	21	21
Lowest fifth percentile	0.0025	0.0025	0.193	80	0.2	95.34
Minimum	0.0025	0.0025	0.05	11.3	0.2	88.94
Maximum	0.005	0.024	1.74	171	148	167.62
# of values undetected	19	17	15	0	7	0
# of values between MDL and PQL	1	2	1	0	7	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-8 BHRU Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	119	10	0.496	0.5	2.472	2.472
Standard Deviation	500	0	0.017	0	0.129	0.129
# of values	21	21	21	21	21	21
Lowest fifth percentile	8.18	10	0.5	0.5	2.5	2.5
Minimum	6.39	10	0.424	0.5	1.91	1.91
Maximum	2300	10	0.5	0.5	2.5	2.5
# of values undetected	18	21	20	21	20	20
# of values between MDL and PQL	2	0	1	0	1	1
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	44.9	28.7	0.2	0.2	0.242	0.25
Standard Deviation	72.97	3.142	0	0	0.035	0
# of values	21	21	21	21	21	21
Lowest fifth percentile	24.8	23.9	0.2	0.2	0.25	0.25
Minimum	20.7	23.8	0.2	0.2	0.09	0.25
Maximum	363	38.2	0.2	0.2	0.25	0.25
# of values undetected	0	0	21	21	20	21
# of values between MDL and PQL	0	0	0	0	1	0
Chronic Aquatic Life Criteria (CALC)					0.26	0.24
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	0	21
# of DWS Exceedences	0	0	0	0	0	0

Table A-8 BHRU Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	38.62	37.44	0.734	0.508	2.154	2
Standard Deviation	4.965	4.88	0.907	0.094	0.705	0
# of values	21	21	21	21	21	21
Lowest fifth percentile	31	31.9	0.5	0.423	2	2
Minimum	28.9	28.7	0.35	0.375	2	2
Maximum	52.5	52.4	4.64	0.896	5.23	2
# of values undetected	0	0	17	16	20	21
# of values between MDL and PQL	0	0	3	5	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	1.125	0.48	0.476	0.02	0.37	0.099
Standard Deviation	2.95	0.06	2.091	0	1.2	0.006
# of values	21	21	21	21	21	21
Lowest fifth percentile	0.369	0.35	0.02	0.02	0.1	0.1
Minimum	0.313	0.33	0.02	0.02	0.07	0.071
Maximum	14	0.54	9.6	0.02	5.6	0.1
# of values undetected	17	17	20	21	18	19
# of values between MDL and PQL	3	4	0	0	1	2
Chronic Aquatic Life Criteria (CALC)	8.96	8.60	1		2.99	2.39
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	1	0	1	0	1	0
# of DWS Exceedences	0	0	1	0	0	0

Table A-8 BHRU Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	5.545	5.313	16.88	1.117	1.071	
Standard Deviation	0.967	0.897	74.27	2.44	1.638	
# of values	21	21	21	21	21	
Lowest fifth percentile	4.34	4.25	0.5	0.5	0.5	
Minimum	4.06	4	0.39	0.5	0.5	
Maximum	8.85	8.26	341	11.7	7.9	
# of values undetected	0	0	11	16	15	
# of values between MDL and PQL	0	0	7	3	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	1	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	1.626	0.99	100	100
Standard Deviation	0	0	3.091	0.235	0	0
# of values	21	21	21	21	21	21
Lowest fifth percentile	5	5	0.646	0.686	100	100
Minimum	5	5	0.634	0.639	100	100
Maximum	5	5	15.1	1.82	100	100
# of values undetected	21	21	11	12	21	21
# of values between MDL and PQL	0	0	9	9	0	0
Chronic Aquatic Life Criteria (CALC)			50.10	49.95		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-8 BHRU Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	289.8	251.2	2.5	2.5		
Standard Deviation	174.6	25.96	0	0		
# of values	21	21	21	21		
Lowest fifth percentile	214	216	2.5	2.5		
Minimum	158	180	2.5	2.5		
Maximum	1040	296	2.5	2.5		
# of values undetected	4	5	21	21		
# of values between MDL and PQL	16	16	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1882.38	1835	0.141	0.135
Standard Deviation	0	0	259.652	268.7	0.017	0.018
# of values	21	21	21	21	21	21
Lowest fifth percentile	0.5	0.5	1660	1620	0.119	0.12
Minimum	0.5	0.5	1520	1610	0.105	0.103
Maximum	0.5	0.5	2870	2900	0.197	0.192
# of values undetected	21	21	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	3.74	3.18				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-8 BHRU Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.5	0.5	9.841	9.858	3.58	2.6
Standard Deviation	0	0	0.727	0.652	5.397	0.458
# of values	21	21	21	21	21	21
Lowest fifth percentile	0.5	0.5	10	10	1.55	2.5
Minimum	0.5	0.5	6.67	7.01	1.54	2.5
Maximum	0.5	0.5	10	10	27.1	4.6
# of values undetected	21	21	20	20	18	20
# of values between MDL and PQL	0	0	1	1	2	1
Chronic Aquatic Life Criteria (CALC)					115.1	112.5
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	32.71	33.41		
Standard Deviation	0	0	12.67	11.26		
# of values	21	21	21	21		
Lowest fifth percentile	0.5	0.5	17.7	17.6		
Minimum	0.5	0.5	17.5	16.9		
Maximum	0.5	0.5	71	55		
# of values undetected	21	21	0	0		
# of values between MDL and PQL	0	0	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-8 BHRU Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.13	41	8.23	231	239
Standard Deviation	0.29	8.09	0.63	35.4	71.6
# of values	20	20	18	19	12
Lowest fifth percentile	0	33.07	7.58	190	129
Minimum	0	32.4	6.26	189	128
Maximum	1.19	56	8.99	339	338
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	5	0	0
# of DWS Exceedences	0	0	6	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.43	1.22	116	0.02	5.02
Standard Deviation	1.07	0.40	17.3	0.01	2.54
# of values	17	16	19	3	12
Lowest fifth percentile	0.04	0.46	98.6	0.01	1.1
Minimum	0	0.46	95	0.0125	1.1
Maximum	3.46	1.61	169	0.025	9.5
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
BHRU	=	Big Hurrah Creek, upper	TDS	=	total dissolved solids
Diss	=	dissolved	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-9 BHBL Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)	
Mean	2.49	19.264	0.049	94.6	0.052	
Standard Deviation	0.211	5.362	0.01	11.4	0.012	
# of values	22	22	22	22	22	
Lowest fifth percentile	2.23	12.295	0.032	74.3	0.04	
Minimum	2.12	11.6	0.031	67.5	0.034	
Maximum	3.15	37.1	0.083	111	0.102	
# of values undetected	0	0	15	0	18	
# of values between MDL and PQL	0	0	7	0	3	
Chronic Aquatic Life Criteria (CALC)	230			>20	1.601	
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0026	0.0027	0.647	125.1	0.839	112.16
Standard Deviation	0.0003	0.0007	0.577	21.8	1.544	15.51
# of values	22	22	21	22	22	22
Lowest fifth percentile	0.0025	0.0025	0.12	94.3	0.2	81.49
Minimum	0.0025	0.0025	0.05	55	0.2	80.78
Maximum	0.0039	0.005	2.74	149	7.3	139.97
# of values undetected	19	19	17	0	8	0
# of values between MDL and PQL	3	2	0	0	6	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-9 BHBL Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	9.83	9.83	0.5	0.495	2.465	2.5
Standard Deviation	0.8	0.79	0	0.023	0.162	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	8.82	10	0.5	0.5	2.5	2.5
Minimum	6.59	6.3	0.5	0.391	1.74	2.5
Maximum	11	10	0.5	0.5	2.5	2.5
# of values undetected	19	21	22	21	21	22
# of values between MDL and PQL	3	1	0	1	1	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	28.93	27.91	0.2	0.2	0.25	0.25
Standard Deviation	3.476	2.941	0	0	0	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	25.44	24.81	0.2	0.2	0.25	0.25
Minimum	20.5	19.8	0.2	0.2	0.25	0.25
Maximum	36.9	31.8	0.2	0.2	0.25	0.25
# of values undetected	0	0	22	22	22	22
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)					0.23	0.21
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	22	22
# of DWS Exceedences	0	0	0	0	0	0

Table A-9 BHBL Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	35.41	34.08	0.508	0.494	2	2
Standard Deviation	5.018	4.98	0.055	0.022	0	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	25.94	25.77	0.497	0.473	2	2
Minimum	25.7	25.2	0.432	0.4	2	2
Maximum	44.1	43	0.744	0.5	2	2
# of values undetected	0	0	19	20	22	22
# of values between MDL and PQL	0	0	3	2	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.487	0.48	0.021	0.02	0.1	0.099
Standard Deviation	0.044	0.05	0.003	0	0.02	0.003
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.37	0.33	0.02	0.02	0.1	0.1
Minimum	0.342	0.32	0.02	0.02	0.09	0.085
Maximum	0.5	0.5	0.034	0.02	0.2	0.1
# of values undetected	20	20	21	22	20	21
# of values between MDL and PQL	2	2	1	0	1	1
Chronic Aquatic Life Criteria (CALC)	7.83	7.52	1		2.45	2.01
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-9 BHBL Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	5.755	5.534	0.918	0.577	1.545	
Standard Deviation	1.136	1.141	0.99	0.192	3.724	
# of values	22	22	22	22	22	
Lowest fifth percentile	4.105	4.041	0.421	0.42	0.5	
Minimum	3.96	3.82	0.403	0.368	0.5	
Maximum	9.05	8.93	4.74	1.09	18.1	
# of values undetected	0	0	12	13	15	
# of values between MDL and PQL	0	0	4	8	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	1.201	1.145	100	100
Standard Deviation	0	0	0.798	0.791	0	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	5	5	0.832	0.788	100	100
Minimum	5	5	0.793	0.786	100	100
Maximum	5	5	4.72	4.62	100	100
# of values undetected	22	22	10	10	22	22
# of values between MDL and PQL	0	0	11	11	0	0
Chronic Aquatic Life Criteria (CALC)			43.87	43.74		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-9 BHBL Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	249.4	249.6	2.5	2.5		
Standard Deviation	37.92	24.27	0	0		
# of values	22	22	22	22		
Lowest fifth percentile	192.4	219.1	2.5	2.5		
Minimum	162	204	2.5	2.5		
Maximum	317	314	2.5	2.5		
# of values undetected	5	5	22	22		
# of values between MDL and PQL	17	17	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1917.27	1863	0.13	0.125
Standard Deviation	0	0	141.023	142.6	0.016	0.016
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.5	0.5	1720.5	1650	0.099	0.097
Minimum	0.5	0.5	1680	1630	0.093	0.091
Maximum	0.5	0.5	2210	2110	0.158	0.155
# of values undetected	22	22	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.85	2.43				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-9 BHBL Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.5	0.5	9.852	10	3.972	3.636
Standard Deviation	0	0.001	0.693	0	4.233	3.682
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.5	0.5	10	10	2.101	2.5
Minimum	0.5	0.494	6.75	10	1.72	2.22
Maximum	0.5	0.5	10	10	18.4	16.8
# of values undetected	22	21	21	22	16	18
# of values between MDL and PQL	0	1	1	0	3	2
Chronic Aquatic Life Criteria (CALC)					100.7	98.52
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	29.43	32.35		
Standard Deviation	0	0	8.905	11.17		
# of values	22	22	22	22		
Lowest fifth percentile	0.5	0.5	16.95	15.36		
Minimum	0.5	0.5	15.7	15		
Maximum	0.5	0.5	46.6	54.3		
# of values undetected	22	22	0	0		
# of values between MDL and PQL	0	0	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-9 BHBL Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.42	43.9	8.14	211	234
Standard Deviation	0.89	10.48	0.77	39.7	86.6
# of values	19	22	21	20	13
Lowest fifth percentile	0	32.22	7.32	145	114
Minimum	0	32.1	5.92	111	90
Maximum	3.26	60.4	9.29	274	350
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	2	7	0	0
# of DWS Exceedences	0	0	7	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.67	0.76	105	0.01	6.07
Standard Deviation	0.87	0.38	21.3	0.01	2.68
# of values	17	17	20	4	13
Lowest fifth percentile	0.65	0.32	71.7	0	2.9
Minimum	0.24	0.06	46	0	0.5
Maximum	3.51	1.64	137	0.025	12.4
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
BHBL	=	Big Hurrah Creek, lower	TDS	=	total dissolved solids
Diss	=	dissolved	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-10 LIDA Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)	
Mean	2.541	15.862	0.049	29.9	0.048	
Standard Deviation	0.169	5.925	0.01	5.9	0.005	
# of values	17	17	17	17	17	
Lowest fifth percentile	2.336	6.608	0.033	21.2	0.036	
Minimum	2.32	6.52	0.031	14	0.032	
Maximum	2.96	24	0.066	40	0.05	
# of values undetected	0	0	8	0	15	
# of values between MDL and PQL	0	0	9	0	2	
Chronic Aquatic Life Criteria (CALC)	230			>20	1.870	
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	1	0	
# of DWS Exceedences	0	0	0	1	0	
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0026	0.938	56.1	0.568	41.2
Standard Deviation	0.0005	0.0003	0.927	19.5	0.766	13.22
# of values	17	17	16	17	17	17
Lowest fifth percentile	0.0025	0.0025	0.5	22	0.2	21.48
Minimum	0.0025	0.0025	0.5	5	0.2	17.91
Maximum	0.0042	0.0037	3.6	78.8	3.4	59.71
# of values undetected	14	15	12	1	8	0
# of values between MDL and PQL	3	2	1	0	5	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-10 LIDA Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	10.4	10	0.5	0.5	2.374	2.156
Standard Deviation	1.43	0	0	0	0.432	0.462
# of values	17	17	17	17	17	17
Lowest fifth percentile	10	10	0.5	0.5	1.742	1.598
Minimum	10	10	0.5	0.5	1.63	1.59
Maximum	15.9	10	0.5	0.5	3.4	3.19
# of values undetected	14	17	17	17	8	7
# of values between MDL and PQL	3	0	0	0	9	10
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	18.35	17.12	0.2	0.2	0.342	0.34
Standard Deviation	6.537	5.314	0	0	0.138	0.13
# of values	17	17	17	17	17	17
Lowest fifth percentile	8.312	9.112	0.2	0.2	0.157	0.13
Minimum	7.48	8.6	0.2	0.2	0.1	0.08
Maximum	29.9	25	0.2	0.2	0.591	0.49
# of values undetected	0	0	17	17	2	1
# of values between MDL and PQL	0	0	0	0	14	16
Chronic Aquatic Life Criteria (CALC)					0.09	0.08
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	17	16
# of DWS Exceedences	0	0	0	0	0	0

Table A-10 LIDA Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	10.88	10.31	0.5	0.5	2	2
Standard Deviation	3.406	3.095	0	0	0	0
# of values	17	17	17	17	17	17
Lowest fifth percentile	5.762	5.644	0.5	0.5	2	2
Minimum	4.73	4.9	0.5	0.5	2	2
Maximum	15.6	14.7	0.5	0.5	2	2
# of values undetected	0	0	17	17	17	17
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.472	0.5	0.02	0.02	0.11	0.096
Standard Deviation	0.065	0	0.002	0	0.05	0.01
# of values	17	17	17	17	17	17
Lowest fifth percentile	0.313	0.5	0.02	0.02	0.1	0.069
Minimum	0.312	0.5	0.02	0.02	0.1	0.069
Maximum	0.5	0.5	0.026	0.02	0.31	0.1
# of values undetected	14	17	16	17	14	15
# of values between MDL and PQL	3	0	1	0	2	2
Chronic Aquatic Life Criteria (CALC)	2.51	2.41	1		0.45	0.46
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-10 LIDA Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	3.408	3.221	0.929	0.5	0.669	
Standard Deviation	1.148	1.082	1.261	0	0.322	
# of values	17	17	17	17	17	
Lowest fifth percentile	1.72	1.64	0.41	0.5	0.5	
Minimum	1.48	1.44	0.383	0.5	0.5	
Maximum	5.04	4.92	5.72	0.5	1.3	
# of values undetected	0	0	9	17	13	
# of values between MDL and PQL	0	0	5	0	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	10.74	11.62	100	100
Standard Deviation	0	0	7.294	5.302	0	0
# of values	17	17	17	17	17	17
Lowest fifth percentile	5	5	1.32	3.72	100	100
Minimum	5	5	1	3.72	100	100
Maximum	5	5	21.5	19.5	100	100
# of values undetected	17	17	1	0	17	17
# of values between MDL and PQL	0	0	2	0	0	0
Chronic Aquatic Life Criteria (CALC)			14.20	14.16		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	7	6	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-10 LIDA Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	230.6	229.8	2.5	2.5		
Standard Deviation	37.81	37.69	0	0		
# of values	17	17	17	17		
Lowest fifth percentile	162.6	160.2	2.5	2.5		
Minimum	153	157	2.5	2.5		
Maximum	261	250	2.5	2.5		
# of values undetected	12	13	17	17		
# of values between MDL and PQL	5	4	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1977.65	1958	0.051	0.048
Standard Deviation	0	0	96.665	107.8	0.016	0.015
# of values	17	17	17	17	17	17
Lowest fifth percentile	0.5	0.5	1844	1788	0.026	0.026
Minimum	0.5	0.5	1820	1780	0.023	0.023
Maximum	0.5	0.5	2170	2150	0.073	0.073
# of values undetected	17	17	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	0.29	0.24				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	17	17	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-10 LIDA Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.5	0.5	9.779	10	54.41	55.01
Standard Deviation	0	0	0.912	0	28.99	23.07
# of values	17	17	17	17	17	17
Lowest fifth percentile	0.5	0.5	9.248	10	10.58	17.76
Minimum	0.5	0.5	6.24	10	2.5	16
Maximum	0.5	0.5	10	10	94.8	80.9
# of values undetected	17	17	16	17	1	0
# of values between MDL and PQL	0	0	1	0	0	0
Chronic Aquatic Life Criteria (CALC)					32.55	31.83
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	12	13
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	11.18	9.088		
Standard Deviation	0	0	8.967	3.898		
# of values	17	17	17	17		
Lowest fifth percentile	0.5	0.5	3.916	3.14		
Minimum	0.5	0.5	2.5	1.54		
Maximum	0.5	0.5	43	16.6		
# of values undetected	17	17	1	0		
# of values between MDL and PQL	0	0	2	3		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-10 LIDA Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.04	37.78	7.55	86.9	246
Standard Deviation	0.09	3.02	0.52	30.7	106
# of values	15	17	16	16	9
Lowest fifth percentile	0	33.18	6.84	46.3	107
Minimum	0	32.7	6.46	44	92
Maximum	0.36	42.8	8.74	170	367
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	1	0	0
# of DWS Exceedences	0	0	2	0	0
Analyte	Velocity	Depth	TDS (field)	Dissolved Oxygen (%)	
Mean	1	0.06	43.1	5.82	
Standard Deviation	0.9	0.11	15.4	3.15	
# of values	13	13	16	9	
Lowest fifth percentile	0.17	0.01	22.8	2.04	
Minimum	0.1	0.00	22	0.8	
Maximum	2.67	0.42	85	11.1	
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	
# of DWS Exceedences	0	0	0	0	

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
LIDA	=	Linda Vista Creek	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-11 LHRU Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)	
Mean	2.566	21.018	0.05	57.5	0.051	
Standard Deviation	0.17	4.173	0.012	5.3	0.012	
# of values	22	22	22	22	22	
Lowest fifth percentile	2.292	13.28	0.033	47.1	0.05	
Minimum	2.21	12.2	0.033	44	0.032	
Maximum	2.89	30.6	0.092	62	0.1	
# of values undetected	0	0	11	0	20	
# of values between MDL and PQL	0	0	11	0	1	
Chronic Aquatic Life Criteria (CALC)	230			>20	2.028	
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0026	0.693	92.6	0.309	76.69
Standard Deviation	0.0005	0.0003	0.65	19.8	0.128	10.12
# of values	22	22	21	22	22	22
Lowest fifth percentile	0.0025	0.0025	0.05	60.6	0.25	57.84
Minimum	0.0025	0.0025	0.05	36.3	0.2	50.33
Maximum	0.0044	0.0037	2.98	128	0.7	91.07
# of values undetected	20	20	19	0	14	0
# of values between MDL and PQL	2	2	0	0	5	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-11 LHRU Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	9.97	10	0.5	0.5	2.427	2.444
Standard Deviation	0.16	0	0	0	0.241	0.22
# of values	22	22	22	22	22	22
Lowest fifth percentile	10	10	0.5	0.5	1.892	1.921
Minimum	9.26	10	0.5	0.5	1.54	1.68
Maximum	10	10	0.5	0.5	2.5	2.7
# of values undetected	21	22	22	22	20	19
# of values between MDL and PQL	1	0	0	0	2	3
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	33.6	32.26	0.2	0.2	0.211	0.21
Standard Deviation	4.655	4.623	0	0	0.074	0.07
# of values	22	22	22	22	22	22
Lowest fifth percentile	25.29	24.9	0.2	0.2	0.067	0.07
Minimum	23.7	22.2	0.2	0.2	0.05	0.07
Maximum	44.4	44.3	0.2	0.2	0.25	0.25
# of values undetected	0	0	22	22	17	17
# of values between MDL and PQL	0	0	0	0	5	5
Chronic Aquatic Life Criteria (CALC)					0.18	0.17
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	17	17
# of DWS Exceedences	0	0	0	0	0	0

Table A-11 LHRU Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	23.16	22.55	0.485	0.5	2	2
Standard Deviation	2.931	2.815	0.05	0	0	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	17.69	16.74	0.348	0.5	2	2
Minimum	15.2	15.5	0.322	0.5	2	2
Maximum	26.5	26.6	0.5	0.5	2	2
# of values undetected	0	0	20	22	22	22
# of values between MDL and PQL	0	0	2	0	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.53	0.52	0.02	0.02	0.1	0.099
Standard Deviation	0.162	0.07	0	0	0.02	0.003
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.491	0.5	0.02	0.02	0.08	0.1
Minimum	0.423	0.46	0.02	0.02	0.07	0.086
Maximum	1.25	0.78	0.02	0.02	0.2	0.1
# of values undetected	19	19	22	22	18	21
# of values between MDL and PQL	2	3	0	0	4	1
Chronic Aquatic Life Criteria (CALC)	5.84	5.61	1		1.58	1.38
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-11 LHRU Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	4.574	4.417	0.501	0.5	0.55	
Standard Deviation	0.702	0.693	0.055	0	0.213	
# of values	22	22	22	22	22	
Lowest fifth percentile	3.309	3.158	0.5	0.5	0.5	
Minimum	3	2.93	0.334	0.5	0.5	
Maximum	6.04	5.99	0.69	0.5	1.5	
# of values undetected	0	0	20	22	20	
# of values between MDL and PQL	0	0	2	0	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	1.04	1.016	100	100
Standard Deviation	0	0	0.236	0.171	0	0
# of values	22	22	22	22	22	22
Lowest fifth percentile	5	5	0.784	0.796	100	100
Minimum	5	5	0.69	0.727	100	100
Maximum	5	5	1.71	1.58	100	100
# of values undetected	22	22	12	14	22	22
# of values between MDL and PQL	0	0	10	8	0	0
Chronic Aquatic Life Criteria (CALC)			32.83	32.73		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-11 LHRU Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	213.2	232.2	2.5	2.5		
Standard Deviation	45.55	34.54	0	0		
# of values	22	22	22	22		
Lowest fifth percentile	151.2	163.2	2.5	2.5		
Minimum	150	157	2.5	2.5		
Maximum	250	250	2.5	2.5		
# of values undetected	13	17	22	22		
# of values between MDL and PQL	9	5	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	1994.55	1957	0.09	0.088
Standard Deviation	0	0	111.001	256.9	0.011	0.011
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.5	0.5	1782.5	1731	0.068	0.066
Minimum	0.5	0.5	1770	1730	0.06	0.06
Maximum	0.5	0.5	2170	3000	0.105	0.107
# of values undetected	22	22	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	1.58	1.35				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-11 LHRU Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.5	0.492	10	9.837	2.589	2.74
Standard Deviation	0	0.039	0	0.765	0.418	0.975
# of values	22	22	22	22	22	22
Lowest fifth percentile	0.5	0.5	10	10	2.5	2.5
Minimum	0.5	0.318	10	6.41	2.5	1.51
Maximum	0.5	0.5	10	10	4.46	6.77
# of values undetected	22	21	22	21	21	18
# of values between MDL and PQL	0	1	0	1	1	3
Chronic Aquatic Life Criteria (CALC)					75.34	73.69
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	19.9	19.46		
Standard Deviation	0	0	6.464	5.206		
# of values	22	22	22	22		
Lowest fifth percentile	0.5	0.5	12.32	10.25		
Minimum	0.5	0.5	2.5	9.99		
Maximum	0.5	0.5	31	26.8		
# of values undetected	22	22	1	0		
# of values between MDL and PQL	0	0	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-11 LHRU Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.05	39.49	7.72	159	217
Standard Deviation	0.1	5.2	0.64	25.9	100
# of values	21	22	18	20	14
Lowest fifth percentile	0	32.91	6.53	118	49
Minimum	0	32.4	6.31	111	0
Maximum	0.33	47.5	8.5	219	342
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	1	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.29	0.51	74.5	0	5.43
Standard Deviation	0.74	0.24	21.4	0.01	3.06
# of values	17	18	20	3	13
Lowest fifth percentile	0.43	0.28	53.2	0	0.42
Minimum	0.17	0.03	0	0	0
Maximum	2.83	1.18	110	0.0125	10.1
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
LHRU	=	Little Hurrah Creek, upper	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-12 LHRL Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)	
Mean	2.582	22.704	0.049	62.7	0.058	
Standard Deviation	0.158	4.91	0.006	6.4	0.033	
# of values	23	23	23	23	23	
Lowest fifth percentile	2.341	14.33	0.037	49.2	0.05	
Minimum	2.23	12.6	0.033	47	0.05	
Maximum	2.83	32.4	0.058	70	0.206	
# of values undetected	0	0	13	0	20	
# of values between MDL and PQL	0	0	10	0	2	
Chronic Aquatic Life Criteria (CALC)	230			>20	1.862	
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.003	0.003	0.632	102.9	1.523	83.38
Standard Deviation	0	0.001	0.544	15.2	2.715	11.95
# of values	23	23	22	23	23	23
Lowest fifth percentile	0.003	0.003	0.05	81.4	0.25	61.05
Minimum	0.0025	0.0025	0.05	63.7	0.25	54.07
Maximum	0.0042	0.0053	2.42	124	9.7	100.78
# of values undetected	19	21	20	0	6	0
# of values between MDL and PQL	4	1	0	0	4	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-12 LHRL Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	17.8	10	0.5	0.493	2.447	2.507
Standard Deviation	32	0	0	0.032	0.174	0.076
# of values	23	23	23	23	23	23
Lowest fifth percentile	8.47	10	0.5	0.5	1.978	2.5
Minimum	6.46	10	0.5	0.348	1.87	2.34
Maximum	163	10	0.5	0.5	2.5	2.82
# of values undetected	17	23	23	22	21	21
# of values between MDL and PQL	4	0	0	1	2	2
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	1	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	34.52	34.04	0.2	0.2	0.246	0.23
Standard Deviation	4.923	3.939	0.01	0	0.079	0.07
# of values	23	23	23	23	23	23
Lowest fifth percentile	26.01	28.3	0.2	0.2	0.088	0.06
Minimum	19.5	24.7	0.14	0.2	0.066	0.05
Maximum	40.5	40.9	0.2	0.2	0.516	0.25
# of values undetected	0	0	22	23	20	20
# of values between MDL and PQL	0	0	1	0	2	3
Chronic Aquatic Life Criteria (CALC)					0.19	0.17
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	21	20
# of DWS Exceedences	0	0	0	0	0	0

Table A-12 LHRL Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	25.37	24.71	0.52	0.5	2	2
Standard Deviation	3.55	3.387	0.125	0	0	0
# of values	23	23	23	23	23	23
Lowest fifth percentile	18.63	18.63	0.5	0.5	2	2
Minimum	16.4	16.7	0.314	0.5	2	2
Maximum	30.4	30.6	1.06	0.5	2	2
# of values undetected	0	0	20	23	23	23
# of values between MDL and PQL	0	0	2	0	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.495	0.48	0.033	0.02	0.11	0.099
Standard Deviation	0.097	0.05	0.058	0	0.04	0.003
# of values	23	23	23	23	23	23
Lowest fifth percentile	0.347	0.36	0.016	0.02	0.09	0.1
Minimum	0.336	0.34	0.014	0.02	0.07	0.087
Maximum	0.881	0.5	0.298	0.02	0.24	0.1
# of values undetected	17	20	16	23	18	22
# of values between MDL and PQL	6	3	5	0	4	1
Chronic Aquatic Life Criteria (CALC)	6.12	5.87	1		1.70	1.46
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-12 LHRL Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	4.856	4.666	0.87	0.564	1.167	
Standard Deviation	0.758	0.743	1.166	0.223	1.591	
# of values	23	23	23	23	23	
Lowest fifth percentile	3.505	3.408	0.382	0.5	0.5	
Minimum	3.18	3.07	0.357	0.5	0.5	
Maximum	6.13	6.11	5.79	1.46	6.85	
# of values undetected	0	0	14	20	16	
# of values between MDL and PQL	0	0	6	1	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	1.616	0.966	100	100
Standard Deviation	0	0	3.075	0.148	0	0
# of values	23	23	23	23	23	23
Lowest fifth percentile	5	5	0.761	0.672	100	100
Minimum	5	5	0.621	0.634	100	100
Maximum	5	5	15.7	1.24	100	100
# of values undetected	23	23	13	15	23	23
# of values between MDL and PQL	0	0	9	8	0	0
Chronic Aquatic Life Criteria (CALC)			34.36	34.26		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-12 LHRL Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	209.8	206.6	2.5	2.5		
Standard Deviation	40.66	43.76	0	0		
# of values	23	23	23	23		
Lowest fifth percentile	155	151.1	2.5	2.5		
Minimum	155	151	2.5	2.5		
Maximum	250	250	2.5	2.5		
# of values undetected	11	11	23	23		
# of values between MDL and PQL	12	12	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	2030	1991	0.099	0.096
Standard Deviation	0	0	137.047	146.7	0.013	0.013
# of values	23	23	23	23	23	23
Lowest fifth percentile	0.5	0.5	1788	1755	0.073	0.074
Minimum	0.5	0.5	1770	1730	0.065	0.065
Maximum	0.5	0.5	2330	2350	0.121	0.118
# of values undetected	23	23	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	1.74	1.48				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-12 LHRL Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.5	0.5	9.849	9.848	6.243	2.553
Standard Deviation	0	0	0.726	0.73	14.26	0.21
# of values	23	23	23	23	23	23
Lowest fifth percentile	0.5	0.5	10	10	2.5	2.5
Minimum	0.5	0.5	6.52	6.5	1.68	2.5
Maximum	0.5	0.5	10	10	68.5	3.49
# of values undetected	23	23	22	22	20	21
# of values between MDL and PQL	0	0	1	1	1	2
Chronic Aquatic Life Criteria (CALC)					78.87	77.14
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	20.6	22.56		
Standard Deviation	0	0	6.946	5.665		
# of values	23	23	23	23		
Lowest fifth percentile	0.5	0.5	12.43	12.91		
Minimum	0.5	0.5	2.5	10.8		
Maximum	0.5	0.5	31.2	30.8		
# of values undetected	23	23	1	0		
# of values between MDL and PQL	0	0	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-12 LHRL Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	1.01	40.59	7.83	172	238
Standard Deviation	2.48	6.83	0.56	41.3	84.6
# of values	22	23	21	19	13
Lowest fifth percentile	0	32.43	7	129	117
Minimum	0	32.3	6.78	117	100
Maximum	11.06	51.4	8.75	314	345
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	4	0	0
# of DWS Exceedences	0	0	4	0	0
Analyte	Velocity	Depth	TDS (field)	TSS (field)	Dissolved Oxygen (%)
Mean	1.51	0.41	84.1	0.02	6.34
Standard Deviation	1.03	0.16	14.3	0.01	2.7
# of values	17	18	19	5	12
Lowest fifth percentile	0.35	0.23	64.3	0	3.12
Minimum	0.35	0.20	58	0	1.3
Maximum	4.08	0.75	115	0.025	11
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
LHRL	=	Little Hurrah Creek, lower	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Table A-13 HUFF Statistics Report

Analyte	Chloride (.1 mg/L)	Sulfate (.1 mg/L)	Fluoride (.1 mg/L)	Alkalinity (20 mg/L)	Ammonia (.1 mg/L)	
Mean	2.643	13.659	0.052	89.5	0.057	
Standard Deviation	0.42	2.669	0.012	11.8	0.027	
# of values	16	16	16	16	16	
Lowest fifth percentile	2.035	8.23	0.034	64.5	0.032	
Minimum	1.96	7.75	0.033	60	0.032	
Maximum	3.7	16.4	0.08	100	0.144	
# of values undetected	0	0	5	0	14	
# of values between MDL and PQL	0	0	11	0	2	
Chronic Aquatic Life Criteria (CALC)	230			>20	1.934	
Drinking Water Standard (DWS)	250	250	4			
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Cyanide (.005 mg/L) Total	Cyanide (.005 mg/L) WAD	Nitrate/ Nitrite (.1 mg/L)	TDS (lab) (50 mg/L)	TSS (lab) (.4 mg/L)	Calculated Hardness
Mean	0.0027	0.0028	0.695	115.7	0.497	100.75
Standard Deviation	0.0006	0.0008	0.508	13	0.48	15.51
# of values	16	16	15	16	16	16
Lowest fifth percentile	0.0025	0.0025	0.5	93.8	0.238	68.32
Minimum	0.0025	0.0025	0.5	90	0.2	63.33
Maximum	0.0047	0.005	2.42	133	2.2	116.27
# of values undetected	13	13	14	0	6	0
# of values between MDL and PQL	3	2	0	0	6	0
Chronic Aquatic Life Criteria (CALC)	0.0052					
Drinking Water Standard (DWS)	0.2		10	500		
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-13 HUFF Statistics Report (continued)

Analyte	Aluminum (20 µg/L) Total	Aluminum (20 µg/L) Diss	Antimony (1 mg/L) Total	Antimony (1 mg/L) Diss	Arsenic (5 µg/L) Total	Arsenic (5 µg/L) Diss
Mean	10.6	9.54	0.493	0.5	2.5	2.5
Standard Deviation	3.38	1.08	0.027	0	0	0
# of values	16	16	16	16	16	16
Lowest fifth percentile	6.87	7.36	0.473	0.5	2.5	2.5
Minimum	6.31	6.28	0.392	0.5	2.5	2.5
Maximum	21.5	10	0.5	0.5	2.5	2.5
# of values undetected	12	13	15	16	16	16
# of values between MDL and PQL	3	3	1	0	0	0
Chronic Aquatic Life Criteria (CALC)	87					150
Drinking Water Standard (DWS)			6		10	
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Barium (3 µg/L) Total	Barium (3 µg/L) Diss	Beryllium (.4 µg/L) Total	Beryllium (.4 µg/L) Diss	Cadmium (.1 µg/L) Total	Cadmium (.1 µg/L) Diss
Mean	15.24	13.65	0.24	0.2	0.238	0.25
Standard Deviation	4.301	1.458	0.17	0	0.048	0
# of values	16	16	16	16	16	16
Lowest fifth percentile	12.23	11.55	0.2	0.2	0.182	0.25
Minimum	12	11.4	0.2	0.2	0.063	0.25
Maximum	30.6	17.6	0.86	0.2	0.273	0.25
# of values undetected	0	0	15	16	13	16
# of values between MDL and PQL	0	0	0	0	3	0
Chronic Aquatic Life Criteria (CALC)					0.20	0.19
Drinking Water Standard (DWS)	2,000		4			
# of CALC Exceedences	0	0	0	0	15	16
# of DWS Exceedences	0	0	0	0	0	0

Table A-13 HUFF Statistics Report (continued)

Analyte	Calcium (2 mg/L) Total	Calcium (2 mg/L) Diss	Chromium (1 µg/L) Total	Chromium (1 µg/L) Diss	Cobalt (4 µg/L) Total	Cobalt (4 µg/L) Diss
Mean	30.34	29.4	0.521	0.546	2	2
Standard Deviation	4.547	4.333	0.132	0.214	0	0
# of values	16	16	16	16	16	16
Lowest fifth percentile	20.78	20.58	0.46	0.473	2	2
Minimum	19.2	19.3	0.339	0.392	2	2
Maximum	34.9	34.2	0.993	1.34	2	2
# of values undetected	0	0	14	14	16	16
# of values between MDL and PQL	0	0	2	1	0	0
Chronic Aquatic Life Criteria (CALC)			11			
Drinking Water Standard (DWS)			100			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Copper (1 µg/L) Total	Copper (1 µg/L) Diss	Iron (.04 mg/L) Total	Iron (.04 mg/L) Diss	Lead (.2 µg/L) Total	Lead (.2 µg/L) Diss
Mean	0.485	0.45	0.022	0.021	0.13	0.098
Standard Deviation	0.133	0.09	0.01	0.005	0.08	0.007
# of values	16	16	16	16	16	16
Lowest fifth percentile	0.317	0.32	0.013	0.019	0.1	0.093
Minimum	0.311	0.31	0.013	0.015	0.09	0.072
Maximum	0.832	0.58	0.053	0.039	0.41	0.103
# of values undetected	8	7	6	13	13	14
# of values between MDL and PQL	8	9	9	3	1	2
Chronic Aquatic Life Criteria (CALC)	6.74	6.47	1		1.96	1.66
Drinking Water Standard (DWS)	1,000		0.3			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-13 HUFF Statistics Report (continued)

Analyte	Magnesium (.2 mg/L) Total	Magnesium (.2 mg/L) Diss	Manganese (1 µg/L) Total	Manganese (1 µg/L) Diss	Mercury (1 ng/L) Total	
Mean	6.056	5.799	2.479	1.927	1.025	
Standard Deviation	1.023	0.968	1.932	1.403	0.732	
# of values	16	16	16	16	16	
Lowest fifth percentile	3.985	3.925	0.481	0.332	0.5	
Minimum	3.73	3.61	0.424	0.321	0.5	
Maximum	7.06	6.93	6.66	4.82	2.7	
# of values undetected	0	0	1	0	9	
# of values between MDL and PQL	0	0	3	5	0	
Chronic Aquatic Life Criteria (CALC)					770	
Drinking Water Standard (DWS)			50		2,000	
# of CALC Exceedences	0	0	0	0	0	
# of DWS Exceedences	0	0	0	0	0	
Analyte	Molybdenum (10 µg/L) Total	Molybdenum (10 µg/L) Diss	Nickel (2 µg/L) Total	Nickel (2 µg/L) Diss	Phosphorus (30 µg/L) Total	Phosphorus (30 µg/L) Diss
Mean	5	5	1.113	1.071	100	100
Standard Deviation	0	0	0.356	0.271	0	0
# of values	16	16	16	16	16	16
Lowest fifth percentile	5	5	0.734	0.757	100	100
Minimum	5	5	0.72	0.731	100	100
Maximum	5	5	2.14	1.65	100	100
# of values undetected	16	16	6	5	16	16
# of values between MDL and PQL	0	0	9	11	0	0
Chronic Aquatic Life Criteria (CALC)			37.79	37.68		
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-13 HUFF Statistics Report (continued)

Analyte	Potassium (500 µg/L) Total	Potassium (500 µg/L) Diss	Selenium (5 µg/L) Total	Selenium (5 µg/L) Diss		
Mean	220	208.1	2.5	2.5		
Standard Deviation	37.13	41.09	0	0		
# of values	16	16	16	16		
Lowest fifth percentile	161.3	156.3	2.5	2.5		
Minimum	156	151	2.5	2.5		
Maximum	271	250	2.5	2.5		
# of values undetected	7	7	16	16		
# of values between MDL and PQL	9	9	0	0		
Chronic Aquatic Life Criteria (CALC)			5	4.6		
Drinking Water Standard (DWS)			50			
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		
Analyte	Silver (1 µg/L) Total	Silver (1 µg/L) Diss	Sodium (500 µg/L) Total	Sodium (500 µg/L) Diss	Strontium (.01 mg/L) Total	Strontium (.01 mg/L) Diss
Mean	0.5	0.5	2031.88	1955	0.086	0.082
Standard Deviation	0	0	190.271	150.4	0.012	0.012
# of values	16	16	16	16	16	16
Lowest fifth percentile	0.5	0.5	1790	1718	0.061	0.059
Minimum	0.5	0.5	1730	1710	0.057	0.057
Maximum	0.5	0.5	2550	2300	0.099	0.097
# of values undetected	16	16	0	0	0	0
# of values between MDL and PQL	0	0	0	0	0	0
Chronic Aquatic Life Criteria (CALC)	2.11	1.79				
Drinking Water Standard (DWS)	100		250,000			
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0

Table A-13 HUFF Statistics Report (continued)

Analyte	Thallium (1 µg/L) Total	Thallium (1 µg/L) Diss	Vanadium (20 µg/L) Total	Vanadium (20 µg/L) Diss	Zinc (2 µg/L) Total	Zinc (2 µg/L) Diss
Mean	0.492	0.5	10	10	2.5	2.761
Standard Deviation	0.034	0	0	0	0	1.348
# of values	16	16	16	16	16	16
Lowest fifth percentile	0.467	0.5	10	10	2.5	1.958
Minimum	0.366	0.5	10	10	2.5	1.95
Maximum	0.5	0.5	10	10	2.5	7.77
# of values undetected	15	16	16	16	16	13
# of values between MDL and PQL	1	0	0	0	0	2
Chronic Aquatic Life Criteria (CALC)					86.76	84.85
Drinking Water Standard (DWS)	2					
# of CALC Exceedences	0	0	0	0	0	0
# of DWS Exceedences	0	0	0	0	0	0
Analyte	Tin (5 µg/L) Total	Tin (5 µg/L) Diss	Titanium (5 µg/L) Total	Titanium (5 µg/L) Diss		
Mean	0.5	0.5	26.46	28.02		
Standard Deviation	0	0	9.79	10.82		
# of values	16	16	16	16		
Lowest fifth percentile	0.5	0.5	14.35	14.23		
Minimum	0.5	0.5	11.2	12.8		
Maximum	0.5	0.5	45.8	49.8		
# of values undetected	16	16	0	0		
# of values between MDL and PQL	0	0	0	0		
Chronic Aquatic Life Criteria (CALC)						
Drinking Water Standard (DWS)						
# of CALC Exceedences	0	0	0	0		
# of DWS Exceedences	0	0	0	0		

Table A-13 HUFF Statistics Report (continued)

Analyte	Turbidity	Temp (°F)	pH	Conductivity	ORP
Mean	0.11	44.38	7.97	193	241
Standard Deviation	0.27	7.62	0.69	35.4	79.9
# of values	16	16	16	16	8
Lowest fifth percentile	0	33.53	6.58	145	131
Minimum	0	32.7	6.57	133	127
Maximum	1.06	54.2	8.68	282	336
Chronic Aquatic Life Criteria (CALC)		59	>6.0 and <8.5		
Drinking Water Standard (DWS)			>6.5 and <8.5		
# of CALC Exceedences	0	0	5	0	0
# of DWS Exceedences	0	0	5	0	0
Analyte	Velocity	Depth	TDS (field)	Dissolved Oxygen (%)	
Mean	2.08	0.52	95.8	5.95	
Standard Deviation	1.12	0.15	16.1	3.37	
# of values	12	12	16	8	
Lowest fifth percentile	0.75	0.41	72	1.54	
Minimum	0.16	0.39	66	0.06	
Maximum	4.31	0.82	131	9.9	
Chronic Aquatic Life Criteria (CALC)					
Drinking Water Standard (DWS)			500		
# of CALC Exceedences	0	0	0	0	
# of DWS Exceedences	0	0	0	0	

Notes:

#	=	number	mg/L	=	milligrams per liter
%	=	percent	ng/L	=	nanograms per liter
°F	=	degrees Fahrenheit	ORP	=	oxygen reduction potential
µg/L	=	micrograms per liter	PQL	=	practical quantitation limit
Diss	=	dissolved	TDS	=	total dissolved solids
HUFF	=	Huffy Creek	TSS	=	total suspended solids
MDL	=	method detection limit	WAD	=	weak acid dissociable

Appendix B

Pit Lake Water Quality Models

TECHNICAL MEMORANDUM

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Project No.:	2509
From:	Brent Johnson (bjohnson@watermc.com) Kenneth Carroll (kcarroll@watermc.com)
Date	March 27, 2006
Subject:	Rock Creek Preliminary Pit Lake Geochemical Assessment

1 BACKGROUND

This Technical Memorandum presents the data, methods, and results for the geochemical characterization of the pit lake in support of the Environmental Assessment and Reclamation Plan for the Rock Creek Project near Nome Alaska. The purpose of this assessment is to characterize potential impacts to water quality from the mine pit lake and, if impacts are predicted, to provide recommendations for minimizing these impacts.

Post-closure pit lake water quality was predicted as the pit lake filled and at two points in time after the pit lake begins overflowing. These results were compared to applicable water quality standards and to the range of natural background water quality observed in Rock Creek. Three conditions, each with a high (rapid filling) and low flow (natural filling) case, were simulated in order to assess and minimize potential impacts to water quality at Rock Creek. The first simulation is the "conservative" condition, using average measured surface and ground water chemistry values and higher-than-expected groundwater inflow. The second is the "expected" condition which assumes less base flow contribution from groundwater to Rock Creek, which would result in overall better water quality of Rock Creek. And the final "sensitivity" condition simulates an increased groundwater flow contribution and a maximum observed arsenic concentration in order to predict the potential effects of arsenic and increased groundwater flow.

This assessment utilizes the available geochemistry data in predicting the post-closure pit lake water quality.

2 MINE OPERATION

The final mine design will be developed upon completion of the economic feasibility study. However, the working plan for the operation of the mine suggests that operations will begin in 2006 and continue for 3.5 to 4 years. The pit will be dewatered during this time and allowed to refill after completion of operations.

3 MODELING APPROACH

The modeling approach taken for this analysis conceptualizes the pit lake as a completely mixed reactor that results from the volumetric and chemical mixing of inflowing waters with specific chemical compositions. The pit lake is expected to mix seasonally due to wind-driven currents and seasonal changes in temperatures. The hydrologic analysis developed from a site-wide watershed model was based on site specific precipitation records from the Nome Airport and scaled to site flow measurements.

Watershed model results were used as input to the water balance model for the pit lake from the end of mining operations to closure plus one hundred years. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contacts site materials and subsequently enters the pit. These chemistry estimates are used in a thermodynamic chemical equilibrium and mixing model to simulate the final composition upon mixing of different waters and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODEL

The hydrologic pit lake water balance model was developed to predict the rate of pit filling through time, the proportion of various inputs to the lake, and the ultimate pit lake water level. Figure 4.1 shows the conceptual pit lake filling model. The model accounted for pit lake inflow and outflow components as part of a volume balance. Inflows included direct precipitation, Rock Creek surface water, overland flow as pit wall runoff, and groundwater. Outflows included evaporation and pit lake overflow once the pit lake water elevation reached the crest at the southern end of the pit.

Surface water and precipitation inflows were estimated based on Nome Airport mean monthly rainfall records, scaled by a factor of 2. This multiplier was based on measured flows on and around the Rock Creek project area. Groundwater inflow was based on preliminary aquifer testing and basin-scale water accounting calculations.

Currently, elevated metals concentrations observed in the Rock Creek are assumed to be from groundwater discharge. That is, groundwater that has been in contact with the ore body and related mineralization, flows upward into, and mixes with, the relatively clean surface runoff. This results in increasing concentrations in Rock Creek as a function of increasing amounts of groundwater discharge as it flows downstream. After the pit is excavated groundwater elevations will drop significantly upgradient of the pit and upward groundwater discharge into Rock Creek will be largely eliminated. This effect has been simulated and results represent expected conditions.

The points of time selected for the geochemical modeling corresponded to the 1/3 full lake, 2/3 full lake, full without overflow, and approximately 40 years after filling with overflow. For the Base Case model, these times were 0.4, 1.4, 3.3, and 43 years, and for the Alternative Case the simulation times were 0.3, 0.7, 1.6, and 43 years.

5 GEOCHEMICAL MODEL

PHREEQC (Parkhurst and Appelo 1999) was used for all geochemical speciation, mixing, and reaction modeling conducted for this assessment. PHREEQC is an industry standard computer program used worldwide for conducting geochemical calculations for predicting the chemistry of natural or impacted waters in the environment.

For this assessment, geochemical modeling was used to predict the composition of the pit lake water through time after operations cease and pit dewatering wells are turned off. As the pit lake fills, and eventually overflows, the composition of each of the water balance components mix and reactions with rock and air occur, resulting in evolving pit lake water quality.

Pit wall chemical reactions that occur during pit wall runoff and pit wall flooding as the pit lake fills occur in the damaged rock zone (DRZ) of the pit wall and may contribute significantly to the overall solute loading to the pit lake. The DRZ is conceptualized as the surface layer of the pit wall that has been damaged, or cracked, during mining, which may significantly increase the porosity and reactive surface area (Figure 4.1).

Site-specific information was used as input to the model when available, including the average composition of surface and groundwater, the composition of water equilibrated with the rock types, and the volumes and surface areas of the pit.

Table 5.1 lists the different rock types that were sampled for HCT analysis and their relative percentages within the exposed pit wall rock. It was assumed that a uniform mixture of the rock types in their relative percentages (Table 5.1) from the entire pit will be exposed at all times through mining and closure.

Table 5.1 Rock type percentages assumed for pit wall

Description of rock types	Percent of ore	Percent of development rock	Percent of pit wall rock types
Development Rock Quartzitic Graphite Schist (QGS)	NA	5.3	3.5
Development Rock Quartz-muscovite Schist (QMS)	NA	24.7	16.1
Development Rock and Ore Calcareous Schist (CS)	NA	11.8	7.7
Development Rock Calcareous Quartz-muscovite Schist (CQMS)	NA	35.5	23.2
Development Rock Graphitic Quartz-muscovite Schist (GQMS)	NA	22.6	14.7
Ore Composite	100	NA	34.7
Totals	100	99.9	99.9

5.1 Pit lake area estimation

The geochemical modeling requires estimates of the plan-view and actual (perpendicular) areas of the entire pit and the pit lake at each of the geochemical modeling simulation times. The plan area was estimated from site topographic maps, and the actual area is the surface area of the exposed surface of the pit walls at a perpendicular to the pit wall angle. The site plan was used to calculate these areas and associated incremental volumes as a function of elevation in the pit. The pit volume and stage data was used to determine elevations for the 1/3 full, 2/3 full, and full pit lake area calculations. Unsubmerged and submerged pit wall areas were then calculated.

5.2 Water quality of pit lake inflows

Specific water compositions were assigned to each of the inflow and outflow waters included in the pit lake water balance model. Table 5.2 contains the compositions assigned to each of the inflow components except for precipitation. Rainfall was simulated as pure water equilibrated with atmospheric gases.

Table 5.2 Input solution chemistries used for the pit lake geochemical modeling

Compound	Standard Value	Source	Devel. QGS	Devel. QMS	Devel. CS	Devel. CQMS	Devel. GQMS	Ore Composite	Surface water (Best)	Surface water (Worst)	Groundwater	Groundwater (sensitivity)
pH	NS		7.8	7.8	8.0	7.9	7.9	7.8	7.4	7.4	8.0	8.0
Alkalinity	NS		44	90	80	66	100	100	122	122	172	172
Silver	NS		0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0000	0.0005	0.0000	0.0000
Aluminum	0.087	2	0.054	0.023	0.023	0.023	**0.160**	0.023	0.001	0.010	0.009	0.009
Arsenic	0.01	1	**0.270**	0.008	**0.051**	0.007	**5.600**	**0.095**	0.004	**0.040**	**0.042**	**0.052**
Barium	2	1	0	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0000	0.0002	0.0001	0.0001
Bromide	NS		----	----	----	----	----	----	0.01	0.05	0.00	0.00
Calcium	NS		21	28	55	47	37	50	42	42	58	58
Cadmium	0.00033	2	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	0.0000	0.0002	0.0001	0.0001
Chloride	230	2	0.5	0.5	0.5	0.5	0.5	0.5	2.5	2.5	2.2	2.2
Chromium	0.1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.013	2	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.059**	0.000	0.001	0.001	0.001
Fluoride	4	1	0	0	0	0	0	0	0	0	0	0
Iron	1	2	0.005	0.005	0.005	0.005	0.005	0.005	0.002	0.020	0.452	0.452
Mercury	7.7E-04	2	5.0E-05	5.0E-05	5.0E-05	5.0E-05	5.0E-05	5.0E-05	1.3E-07	1.3E-06	1.0E-06	1.0E-06
Potassium	NS		1.2	0.7	1.7	1.4	0.3	1.4	0.2	0.2	0.2	0.2
Lithium	NS		0.05	0.05	0.05	0.05	0.05	0.05	----	----	----	----
Magnesium	NS		4.4	5.9	12.0	14.0	11.0	13.0	8.8	8.8	13.0	13.0
Manganese	NS		0.011	0.070	0.060	0.072	0.019	0.100	0.000	0.003	0.019	0.019
Nitrite (as NO2-)	NS		0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.3	0.3
Ammonium (as NH4+)	NS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrate (as NO3-)	10	1	1	1	1	1	1	1	0	1	0	0
Sodium	NS		1	1	1	1	1	10	2	2	2	2
Nickel	0.075	2	0.005	0.005	0.005	0.005	0.005	0.005	0.000	0.001	0.001	0.001
Dissolved Oxygen	NS		----	----	----	----	----	----	----	----	----	----
Phosphorus	NS		0.25	0.25	0.25	0.25	0.25	0.25	0.01	0.07	0.04	0.04
Lead	0.004	2	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	0.000	0.000	0.000	0.000
Sulfate (as SO4-2)	NS		30	31	140	140	57	120	3	27	27	27
Antimony	0.006	1	**2.000**	0.001	**0.077**	0.001	**0.360**	**0.036**	0.000	0.000	0.000	0.000
Selenium	0.005	2	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0003	0.0025	0.0000	0.0000
Strontium	NS		0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.2	0.2
Thallium	0.002	1	0.001	0.001	0.001	0.001	0.001	0.001	**0.004**	**0.042**	0.000	0.000
Vanadium	NS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	0.169	2	0.005	0.005	0.005	0.005	0.005	0.005	0.000	0.002	0.002	0.002

* Milligrams per liter used for all concentration data (standard units for pH), one half the MDL was used for censored data, and NS is no standard.

1 = Environmental Protection Agency (EPA) maximum contaminant limits (MCLs) are drinking water quality standards (concentrations in bold are above EPA MCL values).

2 = Chronic Aquatic Life Fresh Water criterion

Concentrations in bold exceed current water quality standards

Groundwater concentrations are from the observed averages from well MW03-03, and surface water values (worst case and sensitivity run) are from the averages of Rock Creek collected (at ROCK1 surface water sampling location) upstream of the pit lake. Surface water values for the best case simulation are 1/10 metals dilution of the average values.

Groundwater inflow to the lake was assumed to be represented by the average composition of samples collected from the monitoring well MW03-03 from January of 2004 to November of 2005. The Groundwater inflow chemistry represented for the sensitivity run is contains the maximum arsenic value measured at MW03-03. Two water chemistry sets were developed to represent surface water inflow from Rock Creek. The first was calculated as the average chemical composition of samples collected upstream of the pit (at the location named ROCK1) from November 2003 to December of 2005 and represents a worst case scenario whereby groundwater is discharging to the creek as is currently occurring. The second set represents post-mining creek water whereby the groundwater elevations upgradient of the pit have declined due to drainage of the pit high wall and the poor-quality groundwater is not discharging upward into Rock Creek. It was assumed that reduction of groundwater discharge resulted in a 10:1 metals dilution of current average chemistry observed at ROCK1. The Rock Creek surface waters and groundwater are circum-neutral pH, calcium-bicarbonate waters with excess alkalinity. However, the groundwater does have a higher sulfate concentration than the surface water, and both the surface water (conservative condition) and groundwater compositions exceed the applicable arsenic water quality standard. Both surface water compositions also exceed the applicable standards for thallium.

Precipitation that lands on the pit walls and overland flow into the pit (not associated with Rock Creek) was considered pit wall runoff. Pit wall runoff is simulated to react with minerals contained in the exposed pit walls. The pit wall runoff and the submerged pit wall recirculation water compositions were estimated from humidity cell laboratory tests (HCT) scaled to field conditions and climate.

HCTs are kinetic tests commonly used for estimating weathering rates under accelerated weathering conditions. Approximately 1.2 Kg of sample, crushed to minus 1/4-inch, is subjected to weekly wet-dry cycles then flushed with water. The water is analyzed and the time-series chemistry data are used to estimate the short- and long-term weathering rates of the sample, and to estimate the chemistry of water that would contact similar materials on the mine site. These estimates are used to predict the water chemistry of pit wall runoff, and waste rock and tailings seepage by applying scaling calculations and site-specific climate data.

Week 33-36 composite samples were selected to represent long-term behavior for development QGS, CS, and CQMS. Week 53-56 composite samples were selected to represent long-term behavior for development QMS, GQMS and the ore composite. Results of the week 33-36 and 53-56 composite HCTs for the different rock types are summarized in Table 5.2. The HCTs resulted in circum-neutral pH, calcium-bicarbonate waters with excess alkalinity for all rock types. However, there were some rock types that had HCT data that exceeded the applicable water quality standards for aluminum, arsenic, antimony, cadmium, copper and lead. HCT results for each rock type were scaled to field conditions and combined in proportion to their abundance in the pit walls using the geochemical model, producing an estimate of the bulk pit wall runoff water chemistry.

5.3 Scaling to pit wall runoff and submerged mixing

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the grain size and volume of water used. Because test samples and water volumes are different in the field than in the laboratory, test results were adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over the rock. This scaling was conducted for both the unsubmerged pit wall runoff and the water that enters the lake from the pit wall after submergence.

The HCT concentrations were multiplied by the water flushed through the cell, and divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, which resulted in mass of solute per unit surface area per pore volume of water flushed. The test surface area per unit mass for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com).

The specific surface area of HCT material was assumed to be 17.7 m^2/Kg for all rock types, and samples contained from 1.46 to 1.854 Kg rock in the cells. Over the 36 weeks for the QGS, CS, and CQMS tests, 25.5 to 26.7 liters were flushed through the cells. The QMS, GQMS, and ore composite cells had 38.9 to 40.3 liters flushed through over 56 weeks.

The rates were converted back to field scale concentrations for the unsubmerged pit wall runoff by multiplying by the pit wall reactive surface area and pore volumes and dividing by the total volume of runoff for the simulated period of time. The volume of rock mass that contributes to mass loading to the pit lake was estimated by using an oxygen diffusion model which predicts the extent of pyrite oxidation into the pit wall as a function of moisture content, porosity of the pit wall, pyrite content, and time. The results indicated a production zone ranging from 2.8 to 4.2 ft depending on the time of exposure of the pit walls. The field scaling of the HCT data assumed that the DRZ porosity was 0.1, the rock density was 149 lb/ft^3 and the specific surface area was 1.5 ft2/lb. Scaling was updated for each model time period.

A similar analysis was prepared for the submerged pit wall. The laboratory flux rate was converted to the field scale with the submerged pit surface area and two submerged pit wall pore volumes for the volume of water passing through the submerged pit surface area. Two pore volumes were assumed to be mobilized from the submerged pit wall damaged rock zone.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electroneutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and sodium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for the Rock Creek pit lake simulations.

5.4 Pit lake modeling process

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the pit lake composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Rock Creek site.

2) Mixing the individual components of pit wall runoff, in proportion to their quantities in the pit wall, to estimate an average pit wall runoff chemistry.

3) Mixing the individual components of the flushed DRZ chemistry in proportion to their quantities to estimate an average chemistry of water flushed from the damaged rock zone.

4) Mixing the pit wall solutions with the groundwater, surface water, and rainfall according to proportions from the pit lake water balance model.

5) Removing pure water from the pit lake to account for evaporation in quantities estimated from the pit lake water balance.

6) Equilibration of the pit lake water with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, oxygen, and carbon dioxide).

7) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from the pit lake onto ferrihydrite according to Dzombak and Morel (1990).

The result of the geochemical modeling was a pit lake solution chemistry after a given time period. This procedure was then repeated for each time period. The new solution chemistry from each time period was mixed with the pit lake composition from the previous time step.

6 RESULTS AND RECOMMENDATIONS

6.1 Water-balance model

The results of the water-balance model include pit lake volume and stage elevation for each month after the end of mining operation. Additionally, the volumes into and out of the pit lake were calculated for each component, and the pit lake inflow mixture percentages were developed for use in the geochemical model.

Table 6.1 summarizes the water-balance results and Figure 6.1 shows the pit filling curves for both the high and low flow cases for each simulation For the high flow simulation, the pit lake fills after 1.6 years and the pit fills after 3.3 years for the low flow simulation. The high flow model fills more rapidly due to the diversion of additional surface water into the pit during filling. In all cases and time steps, the surface water is the most significant inflow component, and groundwater and pit wall runoff also constitute a minor fraction of the inflow to the pit. Pit lake evaporation increases until the pit becomes full, and after the pit becomes full overflow occurs in both model cases.

6.2 Geochemical model

Tables 6.2 and 6.3 show the results of the geochemical pit lake models. The geochemical modeling predicted the pit lake chemical composition for each of the selected times for the Base and Alternative Cases for both the conservative and expected conditions. The conservative condition uses high-TDS surface water inflow from Rock Creek that is currently influenced by mineralized groundwater. The expected case uses low-TDS water for Rock Creek inflow that will likely flow into the pit after closure.

Conservative condition

The predicted pit lake compositions for both cases were similar. Both cases had a circum-neutral pH value of 7.9 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 128 to 134 mg/l.

Many of the metals were predicted to have relatively low concentrations in both the base case (low-flow) and alternative cases (high-flow). Many of the metals concentrations were predicted to decrease over time for the alternative case, due primarily to ongoing dilution of pit wall runoff with Rock Creek inflows and sorption to ferrihydrite. For the Base Case, some of the constituents, including chloride and magnesium, were predicted to increase in concentration over time, interpreted to be a function of less Rock Creek inflow compared to evaporative losses. The alternative case did not significantly improve the pit lake water quality compared to the Base Case.

Table 6.1 Pit lake water balance results and mixing percentages

LOW FLOW WATER BALANCE

Time step	Time (years)	Pit lake elevation (meters amsl)	Pit lake volume (L)	Lake precipitation (L)	Groundwater inflow (L)	Pit wall runoff (L)	Surface water inflow (L)	Pit lake evaporation (L)	Pit lake overflow (L)
1	0.4	32	7.20E+08	6.73E+06	1.25E+08	2.74E+07	6.06E+08	3.53E+06	0.00E+00
2	1.4	51	1.81E+09	3.17E+07	2.53E+08	4.01E+07	7.49E+08	2.29E+07	0.00E+00
3	3.3	67	3.31E+09	8.05E+07	4.62E+08	5.57E+07	9.67E+08	6.89E+07	0.00E+00
4	43.3	68	3.42E+09	2.66E+09	1.01E+10	1.61E+09	2.86E+10	2.05E+09	4.08E+10

Time step	Time (years)	Pit lake volume (%)	Lake precipitation (%)	Groundwater inflow (%)	Pit wall runoff (%)	Surface water inflow (%)	Total inflow (%)	Pit Lake overflow (%)	Pit lake evaporation (%)
1	0.4	0%	1%	16%	4%	79%	100%	0%	1%
2	1.4	42%	2%	14%	2%	41%	100%	0%	1%
3	3.3	54%	2%	14%	2%	29%	100%	0%	2%
4	43.3	7%	6%	22%	3%	62%	100%	88%	4%

HIGH FLOW WATER BALANCE

Time step	Time (years)	Pit lake elevation (meters amsl)	Pit lake volume (L)	Lake precipitation (L)	Groundwater inflow (L)	Pit wall runoff (L)	Surface water inflow (L)	Pit lake evaporation (L)	Pit lake overflow (L)
1	0.3	32	7.54E+08	3.64E+06	2.09E+08	2.04E+07	5.22E+08	1.14E+06	0.00E+00
2	0.7	50	1.84E+09	3.31E+07	1.69E+08	4.31E+07	8.61E+08	2.21E+07	0.00E+00
3	1.6	66	3.37E+09	6.18E+07	4.64E+08	4.72E+07	9.95E+08	4.12E+07	0.00E+00
4	43.3	68	3.42E+09	3.74E+09	2.10E+10	2.60E+09	5.42E+10	2.11E+09	7.94E+10

Time step	Time (years)	Pit lake volume (%)	Lake precipitation (%)	Groundwater inflow (%)	Pit wall runoff (%)	Surface water inflow (%)	Total inflow (%)	Pit Lake overflow (%)	Pit lake evaporation (%)
1	0.3	0%	0%	28%	3%	69%	100%	0%	0%
2	0.7	40.5%	2%	9%	2%	46%	100%	0%	1%
3	1.6	53.9%	2%	14%	1%	29%	100%	0%	1%
4	43.3	4%	4%	25%	3%	64%	100%	93%	3%

Table 6.2 Prediction of pit lake composition through time after closure – worst case

				Low Flow Filling Scenario				High Flow Filling Scenario			
	Standard		ROCK1**	Time 1	Time 2	Time 3	Time 4	Time 1	Time 2	Time 3	Time 4
Compound*	Value	Source		0.33 years	1.42 years	3.25 years	43.25 years	0.33 years	0.67 years	1.58 years	43.25 years
pH	NS		7.4	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Alkalinity	NS		122	128	130	132	131	134	130	132	131
Aluminum	0.087	2	0.0103	0.0097	0.0096	0.0095	0.0094	0.0096	0.0096	0.0095	0.0094
Antimony	0.006	1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0005	0.0005	0.0004
Arsenic	0.01	1	**0.040**	**0.038**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.036**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	0.00033	2	0.00018	0.00015	0.00015	0.00014	0.00014	0.00014	0.00015	0.00014	0.00014
Calcium	NS		42	43	44	44	44	45	44	44	44
Chloride	230	2	2.5	12.3	12.8	13.4	13.2	13.9	12.9	13.5	13.5
Cobalt	NS		----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.013	2	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Fluoride	4	1	0	0	0	0	0	0	0	0	0
Iron	1	2	0.0204	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	0.004	2	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	NS		----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.1	9.3	9.5	9.4	9.7	9.3	9.5	9.4
Manganese	NS		0.003	0.006	0.007	0.008	0.007	0.008	0.007	0.007	0.008
Mercury	7.7E-04	2	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Molybdenum	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0012	0.0011	0.0011	0.0011	0.0011	0.0012	0.0011	0.0011	0.0011
Nitrate (as NO3-)	10	1	1	2	2	2	2	2	2	2	2
Phosphorus	NS		0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0025	0.0020	0.0019	0.0018	0.0018	0.0017	0.0019	0.0018	0.0017
Silicon	NS		----	0.1712	0.2175	0.2652	0.2576	0.2884	0.2139	0.2610	0.2753
Silver	NS		0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Sulfate (as SO4-2)	NS		27.2	26.3	26.2	26.2	25.9	26.5	26.3	26.2	25.9
Thallium	0.002	1	**0.0415**	**0.0330**	**0.0310**	**0.0291**	**0.0290**	**0.0288**	**0.0313**	**0.0293**	**0.0283**
Vanadium	NS		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Zinc	0.169	2	0.0024	0.0020	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0018

* Milligrams per liter used for all concentration data (standard units for pH), one half the MDL was used for censored data, and NS is no standard.

1 = Environmental Protection Agency (EPA) maximum contaminant limits (MCLs) are drinking water quality standards (concentrations in bold are above EPA MCL values).

2 = Chronic Aquatic Life Fresh Water criterion

Concentrations in bold exceed current water quality standards

** Surface water concentrations are mean values from the ROCK1 surface water sampling location (assumed to be background levels).

Table 6.3 Prediction of pit lake composition through time after closure – best case

				Low flow filling scenario				High flow filling scenario			
	Standard		ROCK1**	Time 1	Time 2	Time 3	Time 4	Time 1	Time 2	Time 3	Time 4
Compound*	Value	Source		0.33 years	1.42 years	3.25 years	43.25 years	0.33 years	0.67 years	1.58 years	43.25 years
pH	NS		7.4	7.8	7.8	7.8	7.8	7.9	7.8	7.8	7.8
Alkalinity	NS		122	115	115	115	114	116	114	114	113
Aluminum	0.087	2	0.0010	0.0100	0.0099	0.0099	0.0098	0.0100	0.0099	0.0098	0.0098
Antimony	0.006	1	0.0000	0.0008	0.0008	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008
Arsenic	0.01	1	0.004	**0.010**	**0.012**	**0.013**	**0.013**	**0.013**	**0.011**	**0.012**	**0.013**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	0.00033	2	0.00002	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
Calcium	NS		42	43	44	44	44	45	44	44	44
Chloride	230	2	2.5	27.8	27.4	27.1	26.8	27.3	27.5	27.1	26.7
Cobalt	NS		----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.013	2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoride	4	1	0	0	0	0	0	0	0	0	0
Iron	1	2	0.0020	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	0.004	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	NS		----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.1	9.3	9.5	9.4	9.7	9.3	9.5	9.4
Manganese	NS		0.000	0.004	0.005	0.005	0.005	0.006	0.004	0.005	0.006
Mercury	7.7E-04	2	1.3E-07	4.0E-07	4.4E-07	4.8E-07	4.7E-07	4.7E-07	4.3E-07	4.6E-07	4.7E-07
Molybdenum	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0001	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004
Nitrate (as NO3-)	10	1	0	1	1	1	1	1	1	1	1
Phosphorus	NS		0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Silicon	NS		----	0.1712	0.2175	0.2652	0.2576	0.2884	0.2139	0.2610	0.2753
Silver	NS		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Sulfate (as SO4-2)	NS		2.7	6.8	7.9	9.0	8.8	9.5	7.8	8.9	9.2
Thallium	0.002	1	**0.0042**	**0.0033**	**0.0031**	**0.0029**	**0.0029**	**0.0029**	**0.0031**	**0.0029**	**0.0028**
Vanadium	NS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc	0.169	2	0.0002	0.0005	0.0005	0.0006	0.0006	0.0006	0.0005	0.0006	0.0006

* Milligrams per liter used for all concentration data (standard units for pH), one half the MDL was used for censored data, and NS is no standard.
1 = Environmental Protection Agency (EPA) maximum contaminant limits (MCLs) are drinking water quality standards (concentrations in bold are above EPA MCL values).
2 = Chronic Aquatic Life Fresh Water criterion
Concentrations in bold exceed current water quality standards
** Surface water concentrations are mean values from the ROCK1 surface water sampling location with 1/10 metals dilution (assumed to be background levels).

The mean Rock Creek arsenic concentration at the ROCK1 sampling station is 0.040 mg/l, which appears to be a reasonable estimate of the background surface water concentrations at the site. The predicted pit lake arsenic concentrations for both cases at all time steps was predicted to be equal or lower than the background surface water concentrations. The lower predicted arsenic values result from the dilution effect of inflowing groundwater and sorption to ferrihydrite.

For both the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic decreases from 0.040 to 0.037 mg/l and thallium decreases from 0.042 to 0.029 mg/l over the 43 years. The alternative case arsenic decreases from 0.037 to 0.036 mg/l and thallium remains stable at approximately 0.028 mg/l over the 43 years. These concentrations are a direct result of the predominance of Rock Creek water chemistry and does not represent a degradation of surface water quality in Rock Creek.

These results suggest that the pit lake will not significantly impact the surface water quality at the site after closure and may improve water quality from dilution with groundwater. Since, most of the water will flow from Rock Creek into the pit lake during spring runoff when concentrations are the lowest, predicted concentrations will likely be lower than predicted in this conservative condition. Additionally, the rapid pit filling closure scenario simulated with the Alternative Case model is not recommended for closure design, because it did not significantly improve water quality.

Expected condition

The predicted pit lake compositions for both the base case (low-flow) and alternative case (high-flow) models were similar. Both cases had a circum-neutral pH value of 7.8 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 113 to 122 mg/l.

Dissolved concentrations of all constituents were generally low. For the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic increases slightly from 0.010 to 0.013 mg/l, and thallium decreases from 0.0042 to 0.0029mg/l over the 43 years. The alternative case arsenic remains stable at approximately 0.013 mg/l, and thallium remains stable at approximately0.0029 mg/l.

The results of the expected case indicate that the pit lake will not impact the surface water quality at the site after closure and may improve water quality because of reducing or eliminating groundwater discharge to Rock Creek over the long term. Additionally, the rapid pit filling closure scenario simulated with the alternative case model is not recommended for closure design, because it did not significantly improve water quality.

Sensitivity run

A sensitivity simulation was conducted for the analysis of increased groundwater flow with the maximum observed arsenic value in order to predict the maximum effect of increased arsenic in groundwater on the pit lake chemistry at Rock Creek. Similar to the conservative and expected condition simulations, the sensitivity run includes a base case (low-flow) and an alternative case (high-flow). The results of the sensitivity run simulation are presented in Table 6.4.

The predicted pit lake compositions for both the base case and alternative case (high-flow) models were similar. Both cases had a circum-neutral pH value of 7.9 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 122 to 142 mg/l.

Table 6.4 Prediction of pit lake composition through time after closure - sensitivity run

Compound*	Standard		ROCK1**	Low flow filling scenario				High flow filling scenario			
	Value	Source		Time 1 0.33 years	Time 2 1.42 years	Time 3 3.25 years	Time 4 43.25 years	Time 1 0.33 years	Time 2 0.67 years	Time 3 1.58 years	Time 4 43.25 years
pH	NS		7.4	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Alkalinity	NS		122	135	133	135	142	137	132	135	134
Aluminum	0.087	2	0.0103	0.0095	0.0095	0.0095	0.0092	0.0095	0.0096	0.0095	0.0093
Antimony	0.006	1	0.0005	0.0004	0.0005	0.0005	0.0004	0.0004	0.0005	0.0004	0.0004
Arsenic	0.01	1	**0.040**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	0.00033	2	0.00018	0.00014	0.00014	0.00013	0.00012	0.00013	0.00014	0.00013	0.00013
Calcium	NS		42	46	45	45	48	46	45	45	45
Chloride	230	2	2.5	14.1	13.5	14.1	16.2	14.7	13.5	14.2	14.3
Cobalt	NS		----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.013	2	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoride	4	1	0	0	0	0	0	0	0	0	0
Iron	1	2	0.0204	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	0.004	2	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	NS		----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.8	9.5	9.7	10.4	9.9	9.5	9.7	9.7
Manganese	NS		0.003	0.008	0.008	0.008	0.011	0.009	0.007	0.008	0.009
Mercury	7.7E-04	2	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.2E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Molybdenum	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Nitrate (as NO3-)	10	1	1	2	2	2	3	3	2	2	2
Phosphorus	NS		0.07	0.06	0.06	0.06	0.05	0.06	0.06	0.06	0.06
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0025	0.0017	0.0018	0.0016	0.0013	0.0016	0.0018	0.0017	0.0016
Silicon	NS		----	0.3114	0.2655	0.3205	0.4801	0.3462	0.2620	0.3156	0.3316
Silver	NS		0.0005	0.0003	0.0004	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sulfate (as SO4-2)	NS		27.2	26.4	26.3	26.2	26.2	26.5	26.3	26.2	26.0
Thallium	0.002	1	**0.0415**	**0.0277**	**0.0292**	**0.0270**	**0.0208**	**0.0266**	**0.0294**	**0.0273**	**0.0263**
Vanadium	NS		0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
Zinc	0.169	2	0.0024	0.0018	0.0019	0.0018	0.0016	0.0018	0.0019	0.0018	0.0018

* Milligrams per liter used for all concentration data (standard units for pH), one half the MDL was used for censored data, and NS is no standard.

1 = Environmental Protection Agency (EPA) maximum contaminant limits (MCLs) are drinking water quality standards (concentrations in bold are above EPA MCL values).

2 = Chronic Aquatic Life Fresh Water criterion

Concentrations in bold exceed current water quality standards

** Surface water concentrations are mean values from the ROCK1 surface water sampling location (assumed to be background levels).

Dissolved concentrations of all constituents were generally low. For the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic remains stable at 0.039 mg/l, and thallium decreases from 0.0415 to 0.0208 mg/l over the 43 years. The alternative case arsenic remains stable at 0.039 mg/l, and thallium remains stable at approximately0.027 mg/l.

The results of the expected case indicate that the pit lake will not impact the surface water quality at the site after closure and may improve water quality because of reducing or eliminating groundwater discharge to Rock Creek over the long term. Additionally, the rapid pit filling closure scenario simulated with the alternative case model is not recommended for closure design, because it did not significantly improve water quality.

6.3 Summary

Based on this assessment, the Rock Creek pit lake water quality can be managed such that applicable water quality standards or background concentrations are not exceeded for all constituents. In the case of arsenic and thallium, predicted concentrations for the Conservative Condition are above the current drinking water standards of 0.01 mg/l and 0.002 mg/l, respectively. However, the natural background, average concentrations of arsenic and thallium in Rock Creek are 0.033 mg/l and 0.0415, which also exceed the current standards. In this case, the discharge to Rock Creek from the pit lake will have improved water quality over existing conditions pre-mining, due to diluting the creek water with additional clean surficial runoff.

The Expected Condition which simulates reduced naturally-impacted groundwater discharge to Rock Creek, results in water quality exceedances for arsenic and thallium. Background concentrations for Rock Creek are considered with a 10:1 metals dilution, and therefore only exceed the current water quality standards for thallium. Predicted arsenic values for both the base and alternative cases range from 0.010 to 0.013 mg/l and appear to be relatively stable through time. Predicted thallium concentrations range from 0.0028 to 0.0031 mg/l, which are less than the average background (with the 10/1 metals dilution) concentration of 0.0042 mg/l.

A Sensitivity Run was included, whereby groundwater inflow was increased and the representative groundwater chemistry contained the maximum measured value for arsenic concentration. The results indicate overall good water quality with the exception of arsenic and thallium exceedances. The predicted arsenic and thallium concentrations do not exceed the average background concentrations measured at Rock Creek. The discharge from the pit lake, along with clean surficial runoff, will dilute the creek water resulting in improved water quality from existing pre-mining conditions.

Rapid filling of the pit lake after closure reduces the time that reactive pit walls are exposed to oxygen. This reduces the total chemical mass load to the pit, but in this case it does not result in significant long-term benefits to the pit lake water quality.

7 REFERENCES

Dzombak, D.A., and Morel, F.M.M., 1990. Surface complexation modeling--Hydrous ferric oxide: New York, John Wiley, 393 p.

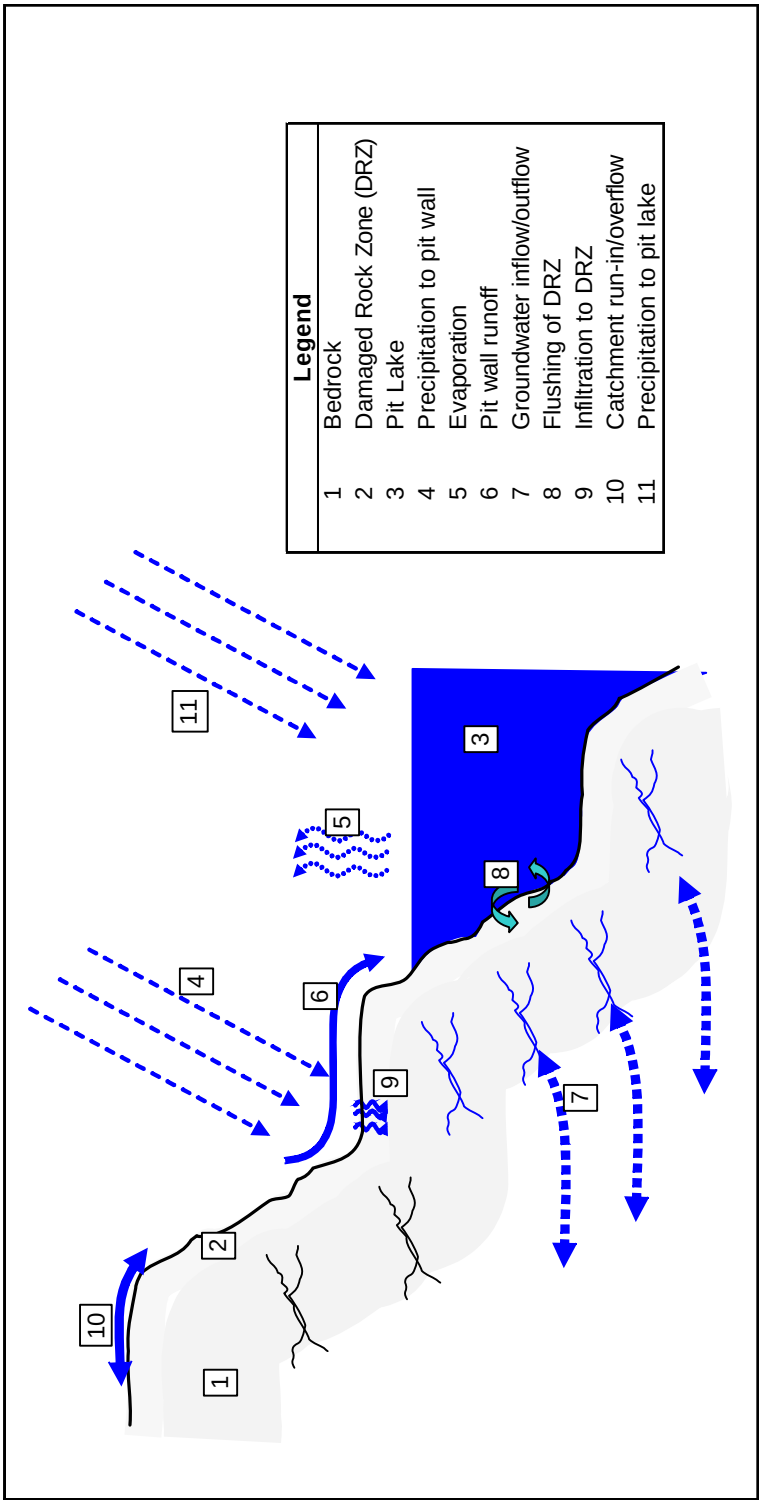
Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

GRAIN 3.0.

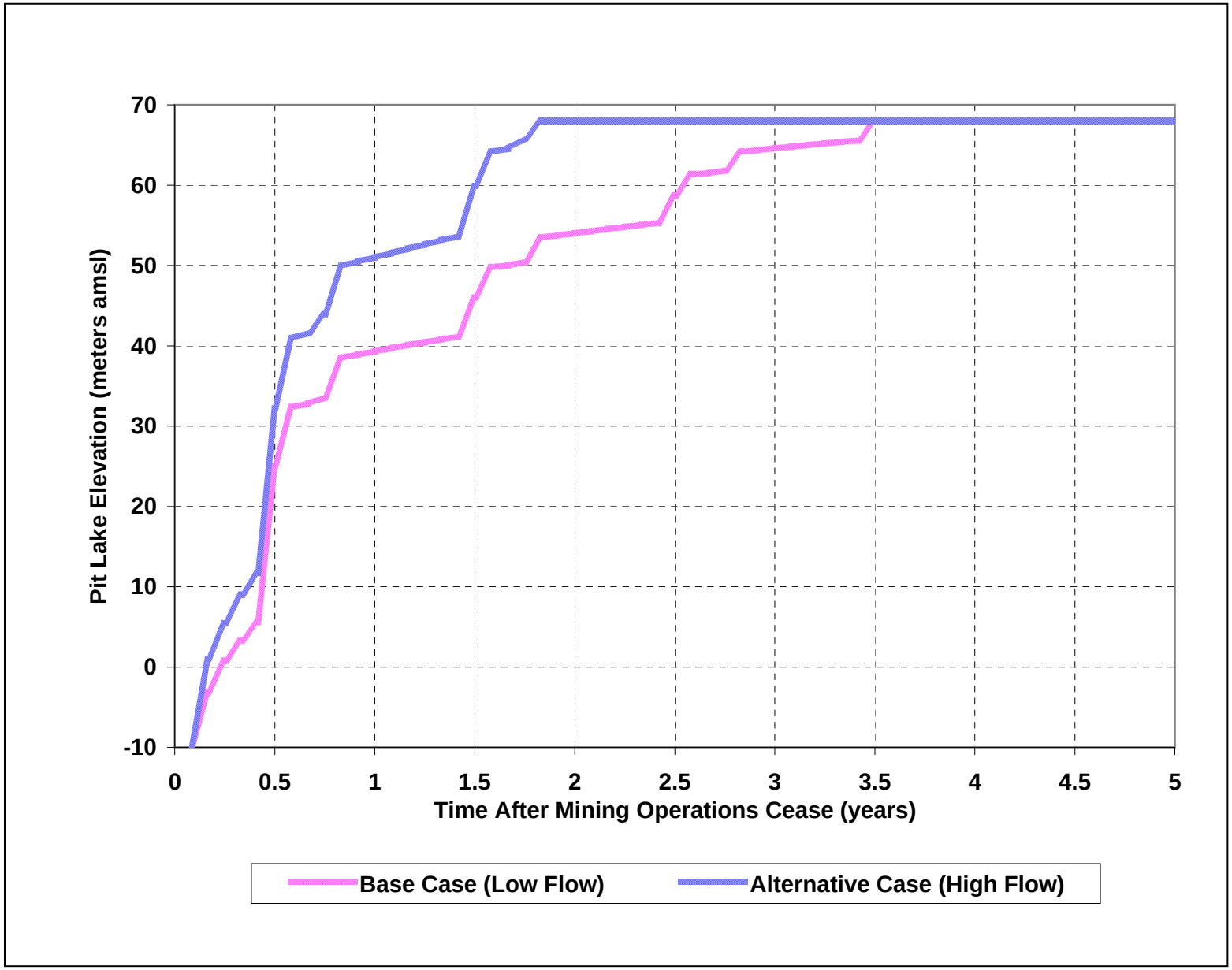
FIGURES

WATER MANAGEMENT CONSULTANTS

Figure 4.1 Pit lake conceptual water-balance model



2573-BIG HUR/AH
FIGURE-4.1



WATER MANAGEMENT CONSULTANTS

Figure 6.1 Predicted pit lake filling curves

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Pit Figure 6.1

5/9/2006

TECHNICAL MEMORANDUM

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Kenneth Carroll (kcarroll@watermc.com)

Date: May 26, 2006

Subject: Big Hurrah Pit Lake Geochemical Assessment

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1 BACKGROUND

This Technical Memorandum presents the data, methods, and results for the geochemical characterization of the proposed Big Hurrah Pit Lake in support of the Environmental Assessment and Reclamation Plan for the Big Hurrah Project near Nome Alaska. The purpose of this assessment is to predict the water chemistry of the pit lake after closure and, if impacts are predicted, to provide recommendations for minimizing these impacts.

Post-closure pit lake water quality for two modeling scenarios (no backfill and potentially acid generating rock (PAG) backfill) was predicted as the pit lake filled and at two points in time after the pit lake begins overflowing. These results were compared to applicable water quality standards and to the range of natural background water quality observed in Little Hurrah Creek. Natural filling of the pit from upstream surface run-in and groundwater was simulated in the geochemical models.

This assessment utilized the available geochemistry data in predicting the post-closure pit lake water quality.

2 MINE OPERATION

The final mine design is ongoing. However, the current plan for the operation of the mine suggests that operations will begin by 2007 and continue for three years. The pit will be dewatered during this time and allowed to refill after completion of operations. During mining, the PAG material will be identified and sorted according to most acid-generating and least acid generating material, and then placed in the PAG staging area adjacent to the pit. After mining, the most acid generating PAG material will be placed in the pit and flooded with the pit lake, thereby eliminating the acid-generating potential of the material. The less acid-generating PAG material will be managed in such a way that will minimize potential impacts.

3 MODELING APPROACH

The modeling approach for the no backfill analysis conceptualizes the pit lake as a completely mixed reactor that results from the volumetric and chemical mixing of inflowing waters with specific chemical compositions. The pit lake is expected to mix seasonally due to wind-driven currents and seasonal changes in temperatures.

Alternatively, the PAG backfill analysis assumes approximately ¾ of the pit is backfilled with PAG development rock material. This assumption is based on the geochemical characterization of development rock and the calculated volume that would be considered PAG. The resulting pit lake chemistry would be a mixture of inflowing waters with specific chemical compositions along with a fraction of the chemical composition represented by the backfill pore water (30% porosity). The uppermost portion of the pit lake is expected to mix seasonally due to wind-driven and inflow currents and seasonal changes in temperatures. Continuous groundwater inflow will prevent the lake from evaporation during the summer months.

The hydrologic analysis developed from a site-wide watershed model was based on site-specific precipitation records from the Nome Airport and scaled to site flow measurements. Watershed model results were used as input to the water balance model for the pit lake from the end of mining operations to closure plus one hundred years. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contacts site materials and subsequently enters the pit. These chemistry estimates are used in a thermodynamic chemical equilibrium and mixing model to simulate the final composition upon mixing of different waters and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODEL

The hydrologic pit lake water balance model was developed to predict the rate of pit filling through time, the proportion of various inputs to the lake, and the ultimate pit lake water level. Figure 4.1 shows the conceptual pit lake filling model. The model accounted for pit lake inflow and outflow components as part of a volume balance. Inflows included direct precipitation, Little Hurrah Creek surface water, overland flow as pit wall runoff, and groundwater. Outflows included evaporation and pit lake overflow once the pit lake water elevation reached the crest at the northern end of the pit.

Surface water and precipitation inflows were estimated based on Nome Airport mean monthly rainfall records, scaled by a factor of 2. This multiplier was based on measured flows on and around the Big Hurrah Creek project area and is considered conservative. Groundwater inflow was based on preliminary aquifer testing and basin-scale water accounting calculations.

The points of time selected for the geochemical modeling corresponded to the full lake, full with overflow, and approximately 100 years after filling with overflow. These times were 0.4, 1.4, and 100.4 years for both models. Simplified, these time intervals may be thought of as the first spring after mining ends, 1 year after initial spring filling of pit, and and 100 years after initial spring filling of pit. Due to the relatively small size of the pit and the high volume of overland flow during spring runoff, the pit lake went from < 1% full to full with overflow within May of the first year after mine closure.

5 GEOCHEMICAL MODEL

PHREEQC (Parkhurst and Appelo, 1999) was used for all geochemical speciation, mixing, and reaction modeling conducted for this assessment. PHREEQC is an industry standard computer program used worldwide for conducting geochemical calculations for predicting the chemistry of natural or impacted waters in the environment.

For this assessment, geochemical modeling was used to predict the composition of the pit lake water through time after operations cease and pit dewatering wells are turned off. As the pit lake fills, and eventually overflows, the composition of each of the water balance components mix and reactions with rock and air occur, resulting in evolving pit lake water quality.

Pit wall chemical reactions that occur during pit wall runoff and pit wall flooding as the pit lake fills occur in the damaged rock zone (DRZ) of the pit wall and may contribute significantly to the overall solute loading to the pit lake. The DRZ is conceptualized as the surface layer of the pit wall that has been damaged, or cracked, during mining, which may significantly increase the porosity and reactive surface area (Figure 4.1).

For the backfill scenario, the initial lake water was predicted to be strongly influenced by the flushing of the PAG material. First flush chemistry data from the geochemical testing was used as the dominant input to the initial lake. After the pit fills, the chemical and flow contribution to the lake from the backfill declines significantly.

Site-specific information was used as input to the model when available, including the average composition of surface and groundwater, the composition of water equilibrated with the rock types, backfill composition and the volumes and surface areas of the pit.

Table 5.1 lists the different rock types and their relative percentages in rock excavated from the pit. These percentages were used to estimate the proportions of materials exposed in the pit wall. It was assumed that a uniform mixture of the rock types in their relative percentages from the entire pit will be exposed at all times through mining and closure.

Table 5.1 Rock type percentages assumed for ore and development rock

Description of rock types	Percent of ore	Percent of development rock
Quartzitic graphite schist (QGS)		52
Quartz-muscovite schist (QMS)		2
Graphite calcite schist (GCS)		8
Marble (MBL)		5
Graphitic Marker Unit (GMU)		2
Graphitic-muscovite schist (GMS)		31
Ore quartz vein (QVN)	100	0
Totals		100

5.1 Pit lake area estimation

The geochemical modeling requires estimates of the plan-view and actual (perpendicular) areas of the entire pit and the pit lake at each of the geochemical modeling simulation times. The plan area was estimated from site topographic maps and the actual area is the surface area of the exposed surface of the pit walls at a perpendicular to the pit wall angle. The site plan was used to calculate these areas and associated incremental volumes as a function of elevation in the pit. The pit volume and stage data was used to determine elevations for the ¾ full, and full pit lake area calculations.

5.2 Water quality of pit lake inflows

Specific water compositions were assigned to each of the inflow and outflow waters included in the pit lake water balance model. Table 5.2 contains the compositions assigned to each of the inflow components except for precipitation. Rainfall was simulated as pure water equilibrated with atmospheric gases.

Groundwater inflow to the lake was assumed to be represented by the average composition of samples collected from well HMW-5A from October and November of 2005. The water chemistry of inflow from Little Hurrah Creek was represented by the average chemical composition of samples collected upstream of the pit (at the location named Little Hurrah Creek - Upper) from June of 2004 through December 2005. Both the Little Hurrah Creek surface water and groundwater are circum-neutral, calcium-bicarbonate waters with alkalinity values of 57 mg/l in Little Hurrah Creek surface water and 204 mg/l in the groundwater at well HMW-5A. Groundwater at Big Hurrah contains elevated concentrations of magnesium, manganese, nickel, sulfate, strontium, and zinc. Groundwater exceeds the applicable water quality standard for arsenic and iron.

Backfill pore water composition was calculated based on HCT chemistry results for the different rock types, scaled to development rock density and surface area, and diluted with volume of pore space water. These calculations resulted in good water quality of submerged backfill, with the exception of low alkalinity.

Precipitation that lands on the pit walls and overland flow into the pit (not associated with Little Hurrah Creek) was considered pit wall runoff. Pit wall runoff is simulated to react with minerals contained in the exposed pit walls. The pit wall runoff and the submerged pit wall recirculation water compositions were estimated from Big Hurrah HCT data.

HCTs are kinetic tests commonly used for estimating weathering rates under accelerated weathering conditions. Approximately 1.2 Kg of sample, crushed to minus 1/4-inch, is subjected to weekly wet-dry cycles, and then flushed with water. The water is analyzed and the time-series chemistry data are used to estimate the short- and long-term weathering rates of the sample, and to estimate the chemistry of water that would contact similar materials on the mine site. These estimates are used to predict the water chemistry of pit wall runoff, and waste rock and tailings seepage by applying scaling calculations and site-specific climate data.

Week 17-20 composite samples were selected to represent long term behavior. Results of the Week 17-20 composite HCTs for the different rock types were used as input to the model and are summarized in Table 5.2. The HCTs resulted in neutral pH, calcium-bicarbonate waters with excess alkalinity for all rock types. However, all three rock types that had HCT data that exceeded the applicable water quality standards for cadmium, copper, and lead. QGS, both acid and alkaline, exceeded the applicable water quality standards for arsenic and antimony. HCT results for each rock type were scaled to field conditions and combined in proportion to their abundance in the pit walls using the geochemical model, producing an estimate of the bulk pit wall runoff water chemistry.

5.3 Scaling to pit wall runoff and submerged mixing

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the grain size and volume of water used. Because field test samples and water volumes are different than those in the laboratory setting, test results should be adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over the rock. This scaling was conducted for both the unsubmerged pit wall runoff and the water that enters the lake from the pit wall after submergence.

The HCT concentrations were multiplied by the water flushed through the cell, and divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, which resulted in mass of solute per unit surface area per pore volume of water flushed. The test surface area per unit mass for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com).

Table 5.2 Input solution chemistries used for the pit lake geochemical modeling

Compound	Standard		QGS (alk)	QGS (acid)	GMS	Backfill pore water	Surface water	Groundwater
	Value	Source						
pH	6.5 – 8.5	1	7.82	7.34	8.03	7.53	6.92	7.44
Alkalinity	20 (min)	3	110	32	160	**0.08**	57	204
Silver	0.00253	2	0.0025	0.0025	0.0025	0.0000	0.0005	0.0002
Aluminum	0.087	3	0.0225	0.0225	0.0225	0.0000	0.0096	0.0031
Arsenic	0.01	1	**0.016**	**0.023**	0.0093	0.0001	0.002	**0.045**
Barium	2	1	0	0	0	0	0	0
Beryllium	0.004	1	0.0005	0.0005	0.0005	0.0000	0.0002	0.0001
Calcium	NS		58	10	210	0.2	22	70
Cadmium	0.00022	3	**0.00050**	**0.00050**	**0.00130**	0.00000	0.00021	0.00010
Chloride	230	3	0.5	0.5	0.5	0.01	2.6	2.8
Chromium	0.1	4	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.00737	3	**0.025**	**0.025**	**0.025**	0.000	0.000	0.000
Fluoride	1.0	1	0	0	0	0	0	0
Iron	1.0	3	0.0050	0.0050	0.0050	0.0000	0.0192	**1.0250**
Mercury	5.0E-05	3	5.00E-05	5.00E-05	**2.20E-04**	0.00E+00	7.06E-07	0.00E+00
Potassium	NS		1.50	1.00	1.90	0.03	0.21	0.48
Lithium	2.5	4	0.00	0.00	0.00	0.00	----	----
Magnesium	NS		4.4	4.4	6.7	0.1	4.3	22.4
Manganese	0.050	5	0.280	0.029	**1.900**	0.000	0.000	0.093
Nitrite (as NO2-)	1	1	0.0	0.0	0.0	0.0	0.1	0.1
Nitrate (as NO3-N)	10	1	1	1	1	0	0	0
Sodium	NS		0	0	0	0.02	2	3
Nickel	0.0413	3	0.0050	0.0050	**0.0560**	0.0004	0.0010	0.0121
Phosphorus	NS		0.25	0.25	0.25	0.00	0.10	0.03
Lead	0.004	3	**0.0050**	**0.0050**	**0.0050**	0.0000	0.0001	0.0000
Sulfate	250	1	98	25	**510**	0.7	20	59
Antimony	0.006	1	0.0026	**0.0180**	0.0013	0.0000	0.0005	0.0034
Selenium	0.005	3	0.003	0.003	**0.008**	0.000	0.002	0.001
Strontium	NS		0.3	0.1	0.6	0.0	0.1	0.4
Thallium	0.0017	5	0.0005	0.0005	0.0005	0.0000	0.0005	0.0002
Vanadium	0.100	4	0.01	0.01	0.01	0.00	0.01	0.01
Zinc	0.0949	2	0.0050	0.0190	0.0050	0.00004	0.0028	0.0033

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
** Surface water concentrations are mean values from the LHRU surface water sampling location (assumed to be background levels)
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness of 75.95 from Average LHRU composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 75.95 from average LHRU composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens
Groundwater concentrations are from the observed averages from HMW- 5A, and surface water values are from the Little Hurrah Creek –Upper surface water site.
Concentrations in bold exceed water quality standard values

The specific surface area of HCT material was assumed to be 17.7 m^2/Kg for all rock types. The HCT samples contained from 1.5 to 1.9 Kg rock in the cells, and over the 20 weeks 17.4 to 18.0 liters were flushed through the cells.

The rates were converted back to field scale concentrations for the unsubmerged pit wall runoff by multiplying by the pit wall reactive surface area and pore volumes and dividing by the total volume of runoff for the simulated period of time. The volume of rock mass that contributes to mass loading to the pit lake was estimated by using an oxygen diffusion model which predicts the extent of pyrite oxidation into the pit wall as a function of moisture content, porosity of the pit wall, pyrite content, and time. The results indicated a production zone ranging from 2.8 to 4.2 feet depending on the time of exposure of the pit walls. The field scaling of the HCT data assumed that the DRZ porosity was 0.1, the rock density was 149 lb/ft^3 and the specific surface area was 1.5 ft^2/lb. Scaling was updated for each model time period.

A similar analysis was prepared for the submerged pit wall and the backfilled material. The laboratory flux rate was converted to the field scale with the submerged pit and backfill surface areas and two submerged pit wall pore volumes for the volume of water passing through the submerged pit and backfill surface area. Two pore volumes were assumed to be mobilized from the submerged pit wall damaged rock zone and available for reaction with the backfill pore water.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electroneutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and sodium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for the Big Hurrah pit lake simulations.

5.4 Pit lake modeling process

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the pit lake composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Big Hurrah site.

2) Mixing the individual components of pit wall runoff, in proportion to their quantities in the pit wall, to estimate an average pit wall runoff chemistry.

3) Mixing the individual components of the flushed DRZ and backfill chemistry in proportion to their quantities to estimate an average chemistry of water flushed through the pit walls and backfilled material.

4) Mixing the pit wall solutions with the groundwater, surface water, and rainfall according to proportions from the pit lake water balance model.

5) Removing pure water from the pit lake to account for evaporation in quantities estimated from the pit lake water balance.

6) Equilibration of the pit lake water with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, oxygen, and carbon dioxide).

7) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from the pit lake onto ferrihydrite according to Dzombak and Morel (1990).

The result of the geochemical modeling was a pit lake solution chemistry after a given time period. This procedure was then repeated for each time period. The new solution chemistry from each time period was mixed with the pit lake composition from the previous time step.

6 RESULTS AND RECOMMENDATIONS

6.1 Water-balance model

The results of the water-balance model include pit lake volume and stage elevation for each month after the end of mining. Additionally, the water volumes into and out of the pit lake were calculated for each component, and the pit lake inflow mixture percentages were developed for use in the geochemical model.

Tables 6.1 and 6.2 summarize the water-balance results and Figure 6.1 shows the pit filling curve. For the simulation, the pit lake fills after 0.4 years, which corresponds to the first spring after mining ends. In all time steps, the surface water is the most significant inflow component. Groundwater and pit wall runoff contribute a very minor fraction of the inflow to the pit. Pit lake evaporation increases until the pit lake reaches its maximum extent and overflow occurs.

6.2 Geochemical model

Table 6.3 shows the results of the no backfill pit lake model simulation. The geochemical modeling predicted the pit lake chemical composition for each of the selected times. The pit lake had neutral pH values throughout the modeled time period, with a range of 7.5 to 7.6, and was of a calcium-bicarbonate water type with alkalinity at approximately 59 mg/l as $CaCO_3$.

Table 6.4 shows the results of the PAG backfill pit lake model simulation. The geochemical modeling predicted the pit lake chemical composition for each of the selected times. The pit lake had a first flush pH of 6.3 at time step 1, and then resumed neutral pH value of 7.5 throughout the rest of the modeled time period. The resulting water chemistry was of a calcium-bicarbonate type. Alkalinity was low (3 mg/L as $CaCO_3$) at the first time step, but quickly increased to 55 mg/L (as $CaCO_3$) after the spring runoff of the next year.

Metal concentrations in the pit lake are relatively low in both models, due to the low metal concentration in the surface water contribution, which dominates the pit lake chemistry. Groundwater entering the pit contained the highest metal concentrations but was such a small percentage of the total inflow of the pit lake that the effects of the groundwater composition were insignificant.

Another contributing factor to the water chemistry is the rapid filling of the pit, submerging exposed wall rock in a short time, limiting the pyrite oxidation process. The pit filled within approximately one month’s time, during the spring breakup. This high influx of buffered surface water diluted any potential contaminants to a level that is in compliance with applicable water quality standards.

The groundwater arsenic concentration at the monitoring well HMW-5A is 0.045 mg/l, which appears to be a reasonable estimate of the background groundwater concentrations at the site. The predicted pit lake arsenic concentrations at each of the time steps was predicted to be lower than the background groundwater concentrations due to dilution from inflowing surface water and sorption to ferrihydrite.

Table 6.1 Pit lake (no backfill) water balance results and mixing percentages

				WATER BALANCE					
Time step	**Time (years)**	**Pit lake elevation (meters amsl)**	**Pit lake volume (L)**	**Lake precipitation (L)**	**Groundwater inflow (L)**	**Pit wall runoff (L)**	**Surface water inflow (L)**	**Pit lake evaporation (L)**	**Pit lake overflow (L)**
1	0.4	46.4	5.18 E+08	2.09E+05	5.00E+04	1.55E+07	5.00E+08	0.00E+00	0.00E+00
2	1.4	60.0	1.07E+09	9.45E+06	5.00E+04	6.21E+06	5.03E+08	0.00E+00	1.94E+08
3	100.4	60.0	1.07E+09	1.21E+07	5.00E+04	3.62E+06	5.20E+10	4.21E+06	5.16E+08

Time step	**Time (years)**	**Pit lake volume (%)**	**Lake precipitation (%)**	**Groundwater inflow (%)**	**Pit wall runoff (%)**	**Surface water inflow (%)**	**Total inflow (%)**	**Pit Lake overflow (%)**	**Pit lake evaporation (%)**
1	0.4	0.0%	0.04%	0.01%	2.97%	96.01%	100%	0.00%	1.0%
2	1.4	49.9%	0.91%	0.01%	0.59%	48.13%	100%	18.55%	0.5%
3	100.4	60.5%	0.86%	0.00%	0.26%	36.95%	99%	36.65%	1.8%

Table 6.2 Pit lake (with backfill) water balance results and mixing percentages

				WATER BALANCE					
Time step	**Time (years)**	**Pit lake elevation (meters amsl)**	**Pit lake volume (L)**	**Lake precipitation (L)**	**Groundwater inflow (L)**	**Pit wall runoff (L)**	**Surface water inflow (L)**	**Pit lake evaporation (L)**	**Pit lake overflow (L)**
1	0.4	60.0	5.00 E+08	3.26 E+05	4.96 E+04	1.54 E+07	5.00 E+08	1.14 E+05	1.84E+07
2	1.4	60.0	5.00 E+08	1.20 E+07	4.96 E+04	3.62 E+06	5.03 E+08	4.21E+06	5.14E+08
3	100.4	60.0	5.00 E+08	1.21 E+09	4.96 E+04	3.62 E+06	5.04 E+08	4.21E+06	5.16E+08

Time step	**Time (years)**	**Pit lake volume (%)**	**Lake precipitation (%)**	**Groundwater inflow (%)**	**Pit wall runoff (%)**	**Surface water inflow (%)**	**Total inflow (%)**	**Pit Lake overflow (%)**	**Pit lake evaporation (%)**
1	0.4	0%	0.059%	0.009%	2.762%	90.012%	100%	3.304%	7.2%
2	1.4	49.0%	1.099%	0.005%	0.330%	45.889%	100%	46.938%	4.0%
3	100.4	50.8%	1.061%	0.004%	0.319%	44.351%	100%	45.364%	3.9%

Table 6.3 Prediction of pit lake composition (no backfill) through time after closure

Compound*	Standard		LHRU**	Time 1	Time 2	Time 3
	Value	Source		0.42 years	1.42 years	100.42 years
pH	6.5 -8.5	1	6.92	7.56	7.55	7.56
Alkalinity	20 (min)	3	57	59	58	59
Aluminum	0.087	3	0.010	0.009	0.009	0.009
Antimony	0.006	1	0.0005	0.0005	0.0005	0.0005
Arsenic	0.01	1	0.002	0.002	0.002	0.002
Barium	2	1	0.03	0.03	0.03	0.03
Beryllium	0.004	1	0.0002	0.0002	0.0002	0.0002
Boron	0.750	4	< 0.01257	< 0.01257	< 0.01257	< 0.01257
Cadmium	0.00022	3	0.000207	0.00020	0.00020	0.00021
Calcium	NS		22	22	22	22
Chloride	230	3	2.6	6.7	6.8	6.7
Cobalt	NS		< 0.00074	< 0.00074	< 0.00074	< 0.00074
Chromium	0.1	4	0.00049	0.00048	0.00048	0.00049
Copper	0.00737	3	0.0005	0.0005	0.0005	0.0005
Fluoride	1.0	1	0.046	0.045	0.045	0.045
Iron	1.0	3	0.0192	< 0.00186	< 0.00186	< 0.00186
Lead	0.004	3	0.000095	0.000042	0.000039	0.000041
Lithium	2.5	4	< 0.00168	< 0.00168	< 0.00168	< 0.00168
Magnesium	NS		4.3	4.2	4.2	4.3
Manganese	0.050	5	0.0005	0.0026	0.0019	0.0021
Mercury	5.00E-05	3	7.1E-07	9.8E-07	8.9E-07	9.3E-07
Nickel	0.0413	3	0.0010	0.0010	0.0010	0.0010
Nitrogen, ammonia (as NH3)	NS		0.053	< 0.0023	< 0.0023	< 0.0023
Total Nitrogen	NS		NA	0.5	0.5	0.5
Phosphorus	NS		0.096	0.093	0.093	0.094
Potassium	NS		0.214	0.212	0.212	0.214
Selenium	0.005	3	0.0024	0.0023	0.0023	0.0024
Silver	0.00253	2	< 0.00057	< 0.00057	< 0.00057	< 0.00057
Sodium	NS		2.0	3.4	2.9	3.1
Strontium	NS		0.086	0.085	0.085	0.086
Sulfate (as SO_4^{-2})	250	1	20	20	20	20
Titanium	NS		< 0.00092	< 0.00092	< 0.00092	< 0.00092
Thallium	0.0017	5	< 0.000677	< 0.000677	< 0.000677	< 0.000677
Vanadium	0.100	**4**	0.009	0.009	0.009	0.009
Zinc	0.0949	2	0.0028	0.0027	0.0027	0.0028

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
** Surface water concentrations are mean values from the LHRU surface water sampling location (assumed to be background levels)
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness of 75.95 from Average LHRU composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 75.95 from average LHRU composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens
Concentrations in bold exceed water quality standard values

Table 6.4 Prediction of pit lake composition (with backfill) through time after closure

Compound*	Standard		LHRU**	Time 1	Time 2	Time 3
	Value	Source		0.42 years	1.42 years	100.42 years
pH	6.5 -8.5	1	6.92	**6.32**	7.53	7.55
Alkalinity	20 (min)	3	57	**3**	55	57
Aluminum	0.087	3	0.010	< 0.00568	0.009	0.010
Antimony	0.006	1	0.0005	0.00020	0.00048	0.00072
Arsenic	0.01	1	0.002	< 0.000255	< 0.000255	< 0.000255
Barium	2	1	0.03	< 0.00039	0.03	0.03
Beryllium	0.004	1	0.0002	< 0.00007	0.0002	0.0002
Boron	0.750	4	< 0.01257	< 0.01257	< 0.01257	< 0.01257
Cadmium	0.00022	3	0.000207	0.000001	0.000199	0.000210
Calcium	NS		22	0.35	22	23
Chloride	230	3	2.6	0.02	6.58	7.08
Cobalt	NS		< 0.00074	< 0.00074	< 0.00074	< 0.00074
Chromium	0.1	4	0.00049	< 0.00042	0.00047	0.00050
Copper	0.00737	3	< 0.00202	< 0.00202	< 0.00202	< 0.00202
Fluoride	1.0	1	0.046	0.003	0.044	0.050
Iron	1.0	3	0.0192	< 0.00186	< 0.00186	< 0.00186
Lead	0.004	3	0.000095	0.000008	0.000035	0.000045
Lithium	2.5	4	< 0.00168	< 0.00168	< 0.00168	< 0.00168
Magnesium	NS		4.3	0.083	4.17	4.48
Manganese	0.050	5	0.0005	0.0014	0.0008	0.0017
Mercury	5.00E-05	3	7.1E-07	2.0E-07	7.0E-07	9.0E-07
Nickel	0.0413	3	0.0010	< 0.00078	0.00100	0.00160
Nitrogen, ammonia (as NH3)	NS		0.053	< 0.0023	< 0.0023	< 0.0023
Total Nitrogen	NS		NA	0.004	0.500	0.500
Phosphorus	NS		0.096	< 0.0085	0.092	0.097
Potassium	NS		0.214	0.029	0.219	0.254
Selenium	0.005	3	0.0024	< 0.00019	0.0023	0.0025
Silver	0.00253	2	< 0.00057	< 0.00057	< 0.00057	< 0.00057
Sodium	NS		2.0	1.2	2.2	2.1
Strontium	NS		0.086	0.001	0.083	0.089
Sulfate (as SO_4^{-2})	250	1	20	1	19	21
Titanium	NS		< 0.00092	< 0.00092	< 0.00092	< 0.00092
Thallium	0.0017	5	< 0.000677	< 0.000677	< 0.000677	< 0.000677
Vanadium	0.100	4	0.009	< 0.002	0.009	0.010
Zinc	0.0949	2	0.0028	<0.0021	0.0027	0.0029

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
** Surface water concentrations are mean values from the LHRU surface water sampling location (assumed to be background levels)
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness of 75.95 from Average LHRU composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 75.95 from average LHRU composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens
Concentrations in bold exceed water quality standard values

These results suggest that the pit lake will not significantly impact the surface water quality at the site after closure due to the rapid filling of the lake, limiting exposure of pit wall rocks and backfill, and the dilution of potential contaminants by neutral, high-buffering surface water entering the pit during heavy precipitation events.

6.3 Summary

Two scenarios were developed; one without backfill and one with PAG backfill. The no-backfill scenario resulted in good water quality during pit filling and long term. The backfill scenario also resulted in good water quality in initial and subsequent time steps, with the exception of pH and alkalinity in the first time step. Alkalinity and pH in the PAG backfill model do achieve neutral values at the second times step, during the spring runoff after 1 year. After the pit lake is full, groundwater inflow which provides the flushing of the backfill, will be minimized and will have a negligible effect on water quality. Early-time pit lake chemistry will be manageable through diverting inflow water as necessary, to give the lake time for settling and subsequent improvement of quality, as necessary.

7 REFERENCES

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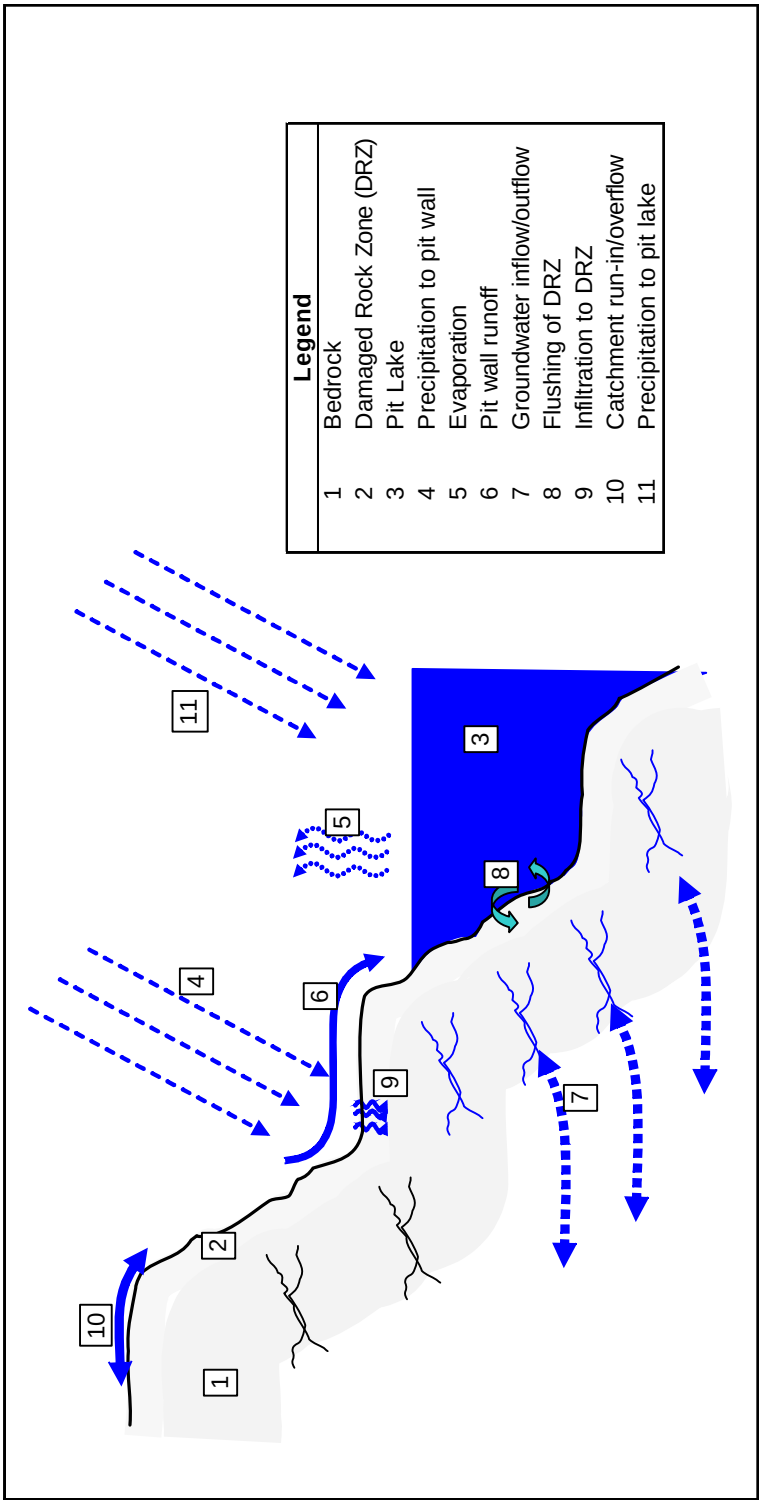
Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

FIGURES

WATER MANAGEMENT CONSULTANTS

Figure 4.1 Pit lake conceptual water-balance model



2573-BIG HUR/AH
FIGURE-4.1

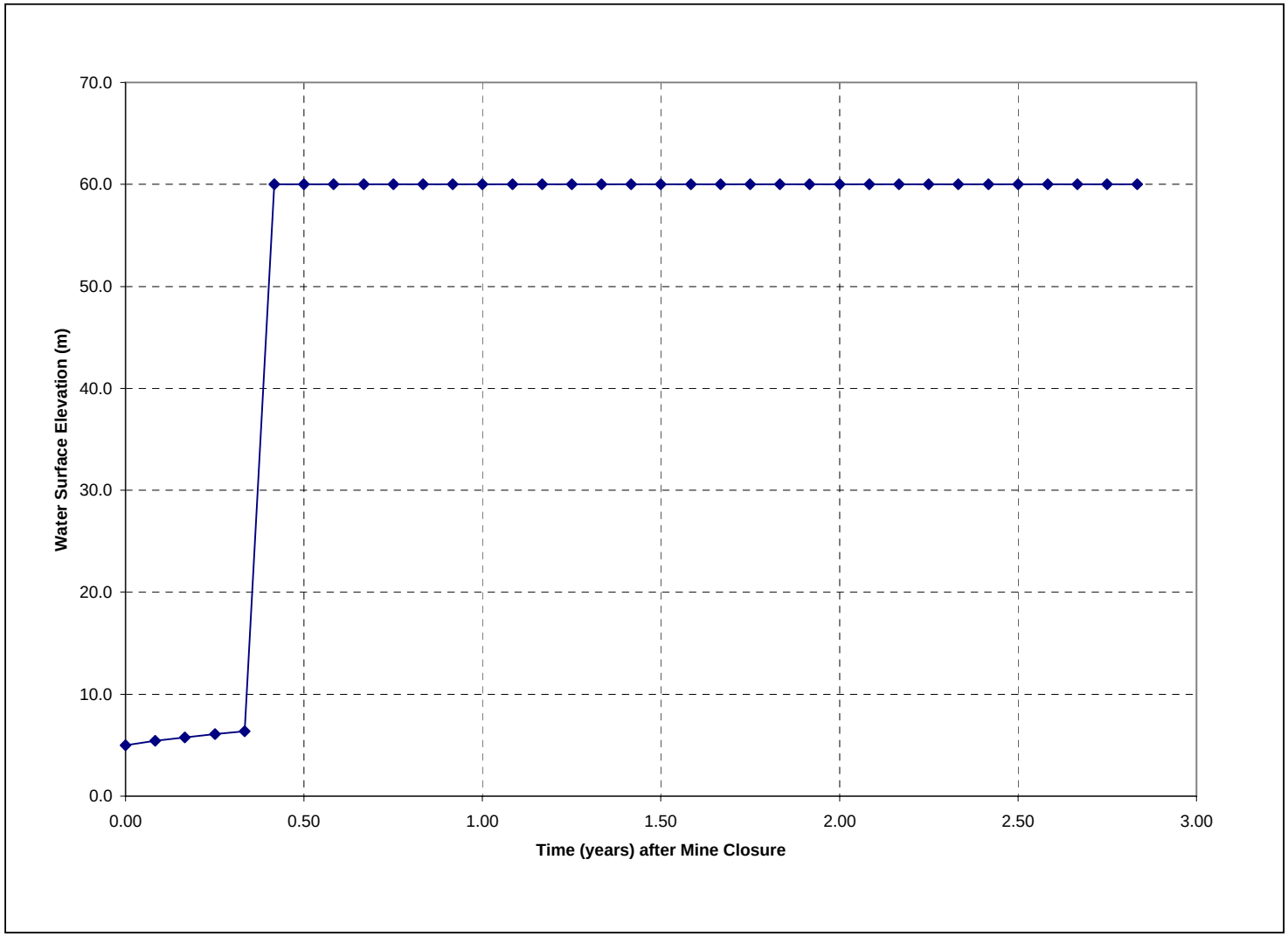


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Figure 6.1 Predicted pit lake filling curve

Appendix C

End of Mine Life Reclaimed Cost Estimates, Maps,
and Volumes of Material

Rock Creek Project
Reclamation Cost Estimate

May 26, 2006

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Project 1011A

Rock Creek Project
Reclamation Cost Estimate

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Rock Creek Project
Reclamation Cost Estimate

1.0 Introduction

1.1 General

The Rock Creek project is a proposed open pit gold mine to be operated by Alaska Gold Company (AGC), a wholly owned subsidiary of NovaGold Resources Inc. (NovaGold). The project consists of two mine sites, the Rock Creek site and the Big Hurrah site. The Rock Creek mine site will be the primary location for the mining and processing activities while only mining activities will occur at the Big Hurrah site.

The principal facilities at the proposed Rock Creek mine include an open pit, processing plant, Tailings Storage Facility (TSF), development rock dumps and storm-water diversion channels. The Rock Creek site will be positioned on mining claims owned by AGC and on land controlled by the Bering Strait Native Corporation (BSNC). BSNC also owns local mineral rights; surface rights are owned by Sitnausuak (the Nome native village corporation). The principal facilities at the proposed Big Hurrah mine include an open pit, ore stockpile pad, development rock dumps and stormwater diversion channels. The project is proposed to be positioned on mining claims and land owned and controlled by AGC.

1.2 Project Location

The Rock Creek and Big Hurrah mine sites are located on the Seward Peninsula along the west coast of Alaska, north of Norton Sound. The Rock Creek site lies approximately 6 miles north of Nome on the east flank of the Snake River Valley within Sections 14, 15, 22, 23, 24, 25, and 26; Township 10 South; Range 34 West of the Kateel River meridian. The Big Hurrah site is located approximately 30 miles east of Nome and can be accessed via the Nome-Council Highway. The site is located within Sections 2, 3, 10, and 11; Township 10 South; Range 24 West of the Kateel River meridian.

1.3 Scope of Work

Smith Williams Consultants, Inc. (Smith Williams) has completed feasibility and detailed engineering of the civil project components at both the Rock Creek and Big Hurrah sites. At the request of AGC, Smith Williams has prepared a cost estimate for performing reclamation

activities for the Rock Creek and Big Hurrah sites. This cost estimate has been prepared following the requirements identified in the Reclamation Plan for the project.

Based on the Reclamation Plan for the project, the following components have been included in the cost estimate:

- Placement of a development rock and topsoil cap over the surface of the tailings within the TSF,
- Spreading seed and fertilizer over the surface of the constructed TSF cap,
- Excavation of a spillway through the TSF embankment to prevent ponding of water over the constructed cap,
- Contouring of the North and South development rock dumps at the Rock Creek site,
- Backfilling and regrading of the stormwater diversion channels at the Rock Creek site, including the removal of the culvert within the Rock Creek drainage,
- Backfilling the Big Hurrah pit to the 192 foot elevation with Potentially Acid Generating (PAG) materials identified during mining operations,
- Contouring the Non-Acid Generating (NAG) materials within the Big Hurrah development rock dump,
- Contouring the ore stockpile pad at the Big Hurrah site,
- Management of solutions at the Big Hurrah and Rock Creek sites,
- Long term monitoring at the Big Hurrah and Rock Creek sites.

2.0 Reclamation Cost Estimate

2.1 Methodology

In preparing the reclamation cost estimate for both sites, Smith Williams utilized the following information:

- Existing ground topography at both mine sites,

- Proposed site layouts and topography for both mine sites,
- Proposed post-reclamation topography for both mine sites,
- Equipment productivity and efficiency rates provided by equipment manufacturers,
- Vendor quotes for equipment rental and purchased supplies,
- Davis-Bacon wage rates and Internal Revenue Service per diem rates.

The initial process in developing the estimate was the estimation of material quantities. This was accomplished using Autodesk AutoCAD and Land Desktop computer application. Mathematical verification of material quantities was also performed. Equipment was then selected and construction methodology determined, based on the equipment availability from rental companies within Alaska and their affiliates. Durations were then calculated for completing each required task using the selected equipment fleet and manufacturer provided production and efficiency guidelines. Using equipment and labor rates and the calculated durations for each activity, costs were then calculated.

2.1.1 Equipment Rates

Equipment rental quotes were provided by NC Machinery, Craig Taylor Equipment Company and Construction Machinery, Inc. Equipment rental rates provided were based on 200 hours per month, operating during a single shift. If the costs for completing an activity were calculated based on a single shift each day, 50 hours per week, this was considered regular time when determining the equipment rental rate as it is the basis for the monthly rental quotes. If an activity required two shifts per day, the monthly rental rate was recalculated, as required by the rental companies, and the double shift rate (overtime rate) was used for all hours worked. The double shift (overtime) hourly rental rate was determined by multiplying the standard monthly rate by 1.5 and then dividing by 400 hours per month.

In addition to the rental rate for the equipment, fuel and maintenance costs were included in the hourly cost for operating the equipment. Fuel costs were calculated using the fuel consumption rates listed in the equipment manufacturer handbooks and the fuel purchase price based upon the average Seattle rack price for #1 and #2 low sulfur clear diesels and a $1.00/gallon transportation surcharge. Maintenance costs were based on historic costs provided by Caterpillar and construction equipment rental and supply companies.

Tables 2 and 3 present the hourly equipment rates for regular and overtime hours. Supporting documentation for the equipment rental and operating costs have been included in Appendix A.

2.1.2 Labor Rates

Labor costs were determined by using the hourly Davis Bacon wage rates and fringe benefits presented in General Decision Number: AK20030001, dated 05/05/2006. The labor costs were determined for both regular hours and overtime hours worked. Regular hours for labor were classified as all hours worked up to 40 hours per week. Overtime was classified as all hours worked in excess of 40 hours per week. The hourly overtime wage rate was determined by multiplying the regular rate by 1.5. Hourly per diem rates were calculated by dividing the maximum allowable Internal Revenue Service per diem rate by the 10-hour shift. The total labor cost per hour was the sum of the hourly wage, fringe benefit and per diem.

Tables 2 and 3 present the wage rates used in the cost estimate for regular and overtime hours. Supporting documentation for the labor and per diem rates has been included in Appendix A.

2.1.3 Equipment Selection and Productivity

Equipment selection was based on the requirement that it was available from rental companies in Alaska or their affiliates. Another criterion, established for equipment selection, was to use the largest equipment available due to the large quantity of material required for the TSF cap and Big Hurrah pit backfilling.

The equipment production was determined by first calculating the distances and grades the equipment would travel in hauling/pushing the required materials. Equipment manufacturer handbooks and guidelines were then used to determine maximum productivity and efficiency correction factors. The maximum productivity rates were then multiplied by the efficiency correction factors to determine the corrected production rates used in the cost estimate.

Supporting documentation for the equipment productivity and efficiency factors has been included in Appendix A.

2.1.4 Activity Duration

The equipment time required to perform each activity was determined using the material quantities and corrected equipment production rates previously calculated. The standard project week was set at 50 hours per week, working a single shift. This was chosen as it is the basis for the monthly equipment rental rates. In order to determine the duration for completing a task, the

equipment time was divided by the standard work week, number of shifts worked and the number of equipment pieces used. The duration of each activity was then optimized by adjusting the number and type of equipment used and the number of shifts per week worked.

When an activity required multiple pieces of equipment to complete the work, the longest calculated duration was selected as the activity duration. This duration was used in the cost calculations for all of the equipment working on the activity.

2.2 Cost Estimate Preparation

After the activity durations and hourly costs for equipment and labor were determined, the costs were prepared for each activity. The activities are presented on Tables 4 through 9 which total the estimated costs for each facility included in the cost estimate. In addition to the costs associated with each facility, costs associated with process solution management are presented in Table 10 and long term monitoring costs are presented in Table 11.

2.2.1 Table 4 – Tailing Storage Facility (TSF)

The Rock Creek TSF table includes the placement of a 3.3 foot thick (1-meter) cap of development rock over the deposited tailings to reduce the potential for precipitation to infiltrate into the tailings mass. Above this cap, a 12-inch layer of topsoil will be placed and seeded to promote the development of vegetation. This topsoil and seeding will further reduce the potential for infiltration into the tailings. At a location along the west embankment, a stormwater spillway will be excavated through the TSF embankment to promote stormwater runoff from the capped and revegetated surface and into the existing Rock Creek drainage. Minimal recontouring of the tailings mass is anticipated in order to direct precipitation runoff through the spillway.

In preparing the cost estimate, it was assumed that the development rock cap placement and the topsoil placement would require two shifts per day to complete the activities. These two activities will require a loader, two haul trucks and a dozer to complete the required work. All other activities are estimated to be completed using a single shift utilizing dozers.

2.2.2 Table 5 – Rock Creek Development Rock Dump Regrading

The regrading of the Rock Creek development rock dumps will require dozers to push material downslope to re-contour the existing development rock to a maximum slope of 3:1 (horizontal:vertical). The North development rock dump will require two lifts of the dump to be

re-contoured. The South development rock dump will be re-contoured during the TSF capping activity as it is the source of the capping material.

In preparing the cost estimate, it was assumed that the development rock regrading would be completed in one shift per day. The North development rock dump will require two dozers to complete the activity.

2.2.3 Table 6 – Rock Creek Diversion Channel Backfilling/Regrading

All diversion channels at the Rock Creek site will be reclaimed to the existing pre-mining conditions with two exceptions. The first exception is the Upper diversion channel located above the North and South development rock dumps and the mine pit. The section of channel above the South development rock dump will not be reclaimed and will be left in place as originally constructed. Additionally, the section of channel above the North development rock dump will be partially reclaimed and partially regraded to direct stormwater flows to the south, towards the mine pit. The second exception is the Lower South diversion channel, which is located around the perimeter of the TSF. This channel will be left in place to minimize the stormwater runoff that is directed over the reclaimed surface of the tailings.

In addition to the backfilling and regrading of the diversion channels, the culverts within the Rock Creek drainage immediately downstream of the mine pit will be removed. The cost estimate assumes a dozer will be the only equipment required to complete the diversion channel reclamation activity. During the initial construction of the diversion channels, the excavated materials will be stockpiled along the downstream edge of the channel. This material will be used to backfill/reclaim the channels.

In preparing the cost estimate, it was assumed that the channel regrading would be completed in one shift per day utilizing a single dozer.

2.2.4 Table 7 – Big Hurrah Development Rock Dump Regrading

The Big Hurrah development rock dump regrading consists of two activities. The first activity is the removal of PAG material which has been temporarily stockpiled in the western section of the main development rock dump. This material will be used to backfill the mine pit to an elevation of 192 feet. A loader, two haul trucks and a dozer will be utilized to perform this activity. The second activity involves using a dozer to re-contour the slope of the remaining NAG material within the development rock dump to a maximum slope of 3:1 (horizontal:vertical).

In preparing the cost estimate, it was assumed that the backfilling of the mine pit with PAG development rock would require two shifts per day to complete the activity. This activity will require a loader, two haul trucks and a dozer to complete the required work. The regrading of the remaining NAG development rock will be completed using a dozer and working one shift per day.

2.2.5 Table 8 – Big Hurrah Ore Stockpile Pad Regrading

The Big Hurrah ore stockpile pad regrading involves using a dozer to re-contour the area which was designated as the ore stockpile during operations. A small development rock dump is positioned adjacent to the ore stockpile pad and will be regraded concurrent with the stockpile pad. This activity will be similar to the regrading of the development rock dumps. The slopes in the vicinity of the stockpile pad will be graded to a maximum slope of 3:1 (horizontal:vertical). The re-contouring of the ore stockpile pad will be completed using a dozer and working one shift per day.

2.2.6 Table 9 – Big Hurrah Diversion Channel Backfilling

All diversion channels at the Big Hurrah site will be reclaimed to pre-mining conditions. The development rock dump diversion channel will be backfilled with the native materials excavated during the initial construction, similar to the backfilling of the channels at the Rock Creek site. The pit diversion channel will be abandoned upon completion of the pit backfilling and at a time designated by the final reclamation plan for the site. The abandonment of the channel will consist of removing the diversion dike above the mine pit and the culverts within the Little Hurrah drainage below the pit.

In preparing the cost estimate, it was assumed that the channel regrading would be completed in one shift per day utilizing a single dozer.

2.2.7 Table 10 – Process Solution Management

The Process Solution Management activity includes two separate activities. The first is the treatment of solutions within the TSF upon closure. The volume of solution to be treated within the TSF was calculated as the average volume of water stored within the facility during normal operating conditions, plus one standard deviation. This equates to 23 million gallons of solution. It has been assumed that the treatment plant constructed in support of the mine operations will be available and operational upon closure. The treatment plant will operate at the current design rate of 600 gallons per minute with an operational cost of $0.50 per 1,000 gallons of water

treated. This is the first activity that will be performed at the Rock Creek site as the solutions must be removed prior to the placement of the development rock cap over the deposited tailings.

The second activity presented in the Process Solution Management cost table is the closure of the wells at the two project sites. This activity consists of backfilling the injection, dewatering and monitoring wells at both sites. It has been assumed that this can be accomplished with one laborer and the well casings will not be removed.

2.2.8 Table 11 – Long Term Monitoring

The Long Term Monitoring activity consists collecting and analyzing water quality samples from the designated monitoring locations. The monitoring will be required during years 1, 2, 5, 10, 20 and 30 after reclamation activity have commenced.

2.2.9 Other Costs

Table 1 summarizes all of the costs presented in Tables 4 through 11 in addition to other additional costs. These other costs are summarized below.

- Mobilization of equipment and personnel to and from the project sites. This cost is estimated the sum of the barge cost incurred transporting the required construction equipment from Anchorage to Nome and 10% of the estimated equipment and material costs.
- Engineering redesign required to finalize the construction plans at the time of reclamation activities. This cost is estimated as 3% of the total project direct costs.
- Contractor overhead and profit, estimated as 10% of the total project direct costs.
- Agency administration, estimated at 3% of the total project direct costs, to offset regulatory agency costs associated with the reclamation of the project sites.
- A contingency equal to 10% of the total project direct costs has been included in the cost estimate to account for unforeseen items or adjustments in costs.

3.0 Reclamation Bond Estimate

As discussed, Table 1 summarizes the costs to reclaim the Rock Creek and Big Hurrah mine sites in addition to the other costs which may be incurred. In preparing the reclamation bond, it is proposed that the bond is a phased such that it will be evaluated annually and funded based on

the projected end of year volume of the development rock dumps at the project sites. Figures 1 through 4 illustrate the development of the Rock Creek site from year 2007 to year 2010 when the mining activity is scheduled to be completed. Figures 5 through 7 illustrate the development of the Big Hurrah site from year 2007 to year 2009 when the mining activity is scheduled to be completed at the site.

It is estimated that the development rock dumps at the Rock Creek site will contain 6.99 million tonnes of material up completion of mining in 2010. At the Big Hurrah site, it is estimated that 5.74 million tonnes (Mt) of material will be stored in the development rock dump at the completion of mining in 2009. The following table presents the estimated volume of material in the dumps at the end of each year and the corresponding percent full this represents.

Development Rock Dump Volumes

Site	2007 Volume (Mt)	2007 % Full	2008 Volume (Mt)	2008 % Full	2009 Volume (Mt)	2009 % Full	2010 Volume (Mt)	2010 % Full
Rock Creek Site	0	0	0.94	13	4.15	59	6.99	100
Big Hurrah Site	2.47	43	3.99	70	5.74	100	5.74	100
Total	2.47	19	4.93	39	9.89	78	12.73	100

Based on the volumes and percentages presented in the above table, the yearly bond requirements are presented in the following table. The estimated direct costs for each site has been multiplied by the percent full presented above for the corresponding year. The indirect costs have been multiplied by the total percent full presented above. One exception to this calculation is the Big Hurrah bond estimate for 2007 has been calculated based on 50% of the total Big Hurrah direct costs. This is to provide additional funding at the start of the project in the event that the reclamation bond must be utilized prior to the pit being large enough to store the PAG development rock.

Phased Reclamation Bond Calculation

	Estimated Total Cost	2007 Bond Amount	2008 Bond Amount	2009 Bond Amount	2010 Bond Amount
Rock Creek Site Direct Costs	$1,362,933	$0	$177,181	$804,130	$1,362,933
Big Hurrah Site Direct Costs	$1,471,446	$735,723	$1,030,012	$1,471,446	$1,471,446
Indirect and Other Costs	$1,610,804	$306,053	$628,214	$1,256,427	$1, 610,804
Total	$4,445,183	$1,041,776	$1,835,407	$3,532,003	$4,445,183

TABLES

TABLE 1
Rock Creek Project
Reclamation Cost Estimate
Summary

Table	Facility	Material	Labor	Equipment	Total
4	Rock Creek Tailings Storage Facility	$52,326	$369,310	$709,835	$1,131,471
5	Rock Creek Development Rock Dumps	$0	$40,513	$113,726	$154,238
6	Rock Creek Diversion Channels/Culvert Removal	$0	$20,287	$56,936	$77,223
Rock Creek Totals		$52,326	$430,110	$880,497	$1,362,933
7	Big Hurrah Development Rock Dump	$0	$494,186	$947,268	$1,441,454
8	Big Hurrah Ore Stockpile Pad	$0	$6,513	$18,392	$24,905
9	Big Hurrah Diversion Channels/Culvert Removal	$0	$1,293	$3,795	$5,087
Big Hurrah Totals		$0	$501,991	$969,455	$1,471,446
Project Direct Cost Totals		**$52,326**	**$932,101**	**$1,849,952**	**$2,834,379**
Mobilization/Demobilization [1]					**$416,311**
Other Indirect Costs					
Item		**% of Direct Cost**		**Subtotal**	
Engineering Redesign		3%		$85,031	
Contractor Overhead & Profit		10%		$283,438	
Agency Administration		3%		$85,031	
Contingency		10%		$283,438	
Other Indirect Costs Total		26%		**$736,938**	
Other Costs					
Item		**Cost**		**Subtotal**	
Process Solution Management and Well Closure (Table 10)		$198,175		$198,175	
Long-Term Monitoring (Table 11)		$259,380		$259,380	
Other Costs Total				**$457,555**	
TOTAL				**$4,445,183**	

[1] Mobilization/Demobilization cost is 10% of the equipment and material cost + barge/freight charge (Northland Services).

Table 2A
Rock Creek Project
Reclamation Cost Estimate
Labor and Equipment Hourly Costs - Regular Rates

Classification/Position [1]	Wage ($/hr)	Fringes ($/hr)	Per Diem ($/hr)	Total Cost ($/hr)
Dozer	$32.92	$12.55	$20.40	$65.87
Loader (+5cy)	$34.46	$12.55	$20.40	$67.41
Loader (2.5-5cy)	$32.92	$12.55	$20.40	$65.87
Scraper (>40cy)	$32.92	$12.55	$20.40	$65.87
Haul Truck (60-100cy)	$33.79	$11.60	$20.40	$65.79
Haul Truck (40-60cy)	$32.72	$11.60	$20.40	$64.72
Haul Truck (20-40cy)	$31.65	$11.60	$20.40	$63.65
Excavator	$34.46	$12.55	$20.40	$67.41
Farm Tractor	$31.62	$12.55	$20.40	$64.57
General	$26.18	$12.75	$20.40	$59.33
Demolition	$26.99	$12.75	$20.40	$60.14
Burning/Cutting	$26.99	$12.75	$20.40	$60.14
Mechanic	$32.92	$12.55	$20.40	$65.87
Grade Setter	$31.38	$12.75	$20.40	$64.53

Equipment (Caterpillar or equivalent)	Monthly Rental Rate [2, 3]	Fuel Costs		Maintenance Cost (per hr) [5]	Total Cost ($/hr)
		Consumption (gal/hr) [4]	Price per Gallon		
D6N Dozer	$9,750.00	5.75	$3.19	$5.95	$73.04
D7R Dozer	$14,500.00	7.5	$3.19	$7.49	$103.92
D8R Dozer	$17,000.00	9.75	$3.19	$8.77	$124.87
D9R Dozer	$27,000.00	14.25	$3.19	$12.94	$193.40
Articulated Haul Truck (32cy)	$15,975.00	5.2	$3.19	$3.00	$99.46
Haul Truck (52cy)	$19,844.00	9.25	$3.19	$10.09	$138.82
Loader-7cy Bucket	$15,785.00	7.5	$3.19	$16.93	$119.78
Loader-8cy Bucket	$21,000.00	11.6	$3.19	$19.99	$161.99
Loader-15cy Bucket	$60,434.00	23	$3.19	$41.14	$416.68
345 - Excavator	$15,500.00	10.6	$3.19	$7.68	$118.99

[1] Labor rates are Davis Bacon Rates for Alaska (May 5, 2006), Per Diem is based on a 10 hour day.

[2] 2006 Equipment rental rates provided by NC Machinery, Craig Taylor Equipment Company and Construction Machinery, Inc.

[3] Monthly Rental Rates are based on 200 hours/month, single shift for all equipment.

[4] Based on Caterpillar Performance handbook Edition 35.

[5] Based upon Caterpillar historic cost data and estimated tire, G.E.T. and undercarriage replacement costs.

Table 2B
Rock Creek Project
Reclamation Cost Estimate
Labor and Equipment Hourly Costs - Overtime Rates

Classification/Position [1]	Wage ($/hr)	Fringes ($/hr)	Per Diem ($/hr)	Total Cost ($/hr)
Dozer	$49.38	$12.55	$20.40	$82.33
Loader (+5cy)	$51.69	$12.55	$20.40	$84.64
Loader (2.5-5cy)	$49.38	$12.55	$20.40	$82.33
Scraper (>40cy)	$49.38	$12.55	$20.40	$82.33
Haul Truck (60-100cy)	$50.69	$11.60	$20.40	$82.69
Haul Truck (40-60cy)	$49.08	$11.60	$20.40	$81.08
Haul Truck (20-40cy)	$47.48	$11.60	$20.40	$79.48
Excavator	$51.69	$12.55	$20.40	$84.64
Farm Tractor	$47.43	$12.55	$20.40	$80.38
General	$39.27	$12.75	$20.40	$72.42
Demolition	$40.49	$12.75	$20.40	$73.64
Burning/Cutting	$40.49	$12.75	$20.40	$73.64
Mechanic	$49.38	$12.55	$20.40	$82.33
Grade Setter	$47.07	$12.75	$20.40	$80.22

Equipment (Caterpillar or equivalent)	Monthly Rental Rate [2, 3]	Fuel Costs		Maintenance Cost (per hr) [5]	Total Cost ($/hr)
		Consumption (gal/hr) [4]	Price per Gallon		
D6N Dozer	$14,625.00	5.75	$3.19	$5.95	$60.86
D7R Dozer	$21,750.00	7.5	$3.19	$7.49	$85.79
D8R Dozer	$25,500.00	9.75	$3.19	$8.77	$103.62
D9R Dozer	$40,500.00	14.25	$3.19	$12.94	$159.65
Articulated Haul Truck (32cy)	$23,962.50	5.2	$3.19	$3.00	$79.49
Haul Truck (52cy)	$29,766.00	9.25	$3.19	$10.09	$114.01
Loader-7cy Bucket	$23,677.50	7.5	$3.19	$16.93	$100.05
Loader-8cy Bucket	$31,500.00	11.6	$3.19	$19.99	$135.74
Loader-15cy Bucket	$90,651.00	23	$3.19	$41.14	$341.14
345 - Excavator	$23,250.00	10.6	$3.19	$7.68	$99.62

[1] Overtime labor rate is 1.5 x Davis Bacon Rates for Alaska (May 5, 2006), Per Diem is based on a 10 hour day.

[2] Equipment rates provided by NC Machinery, Craig Taylor Equipment Company and Construction Machinery, Inc.

[3] Monthly Overtime Rental Rates are based on 400 hours/month, double shift. (Single shift rental rate x 1.5 / 400hrs per NC Machinery)

[4] Based on Caterpillar Performance handbook Edition 35.

[5] Based upon Caterpillar historic cost data and estimated tire, G.E.T. and undercarriage replacement costs.

[6] Fuel Cost based on Seattle Rack Price (80/20 ratio of #1/#2 clear diesel) + $1.00/gallon transportation cost.

TABLE 3
Rock Creek Project
Reclamation Cost Estimate
Dozer Correction Factors

**Job Condition Correction Factors		
Contouring Dumps - Pushing downhill		
	Condition	Factor
Operator	Average	0.85
Material	Hard to drift	0.8
Slot Dozing	-	0
Job Efficiency	50 min/hr	0.83
Grade	25% Grade	1.5
Weight Correction [1]	2600lb/LCY	0.88
		0.75

**Job Condition Correction Factors		
Excavation Spillway/Channels - 0-5% downhill grade		
	Condition	Factor
Operator	Average	0.85
Material	Hard to Cut	0.8
Slot Dozing	-	1.2
Job Efficiency	50 min/hr	0.83
Grade		1
Weight Correction [1]	2800lb/LCY	0.82
		0.56

**Job Condition Correction Factors		
Capping TSF - Level Ground -Development Rock		
	Condition	Factor
Operator	Average	0.85
Material	Hard to drift	0.8
Slot Dozing	-	0
Job Efficiency	50 min/hr	0.83
Grade		1
Weight Correction [1]	2600lb/LCY	0.88
		0.50

**Job Condition Correction Factors		
Capping TSF - Level Ground -Topsoil		
	Condition	Factor
Operator	Average	0.85
Material	Loose Stockpile	1.2
Slot Dozing	-	0
Job Efficiency	50 min/hr	0.83
Grade		1
Weight Correction	1600lb/LCY	1.44
		1.22

Dozer Production and Correction Factors Based on CAT Handbook Edition 35 except Operator Effeciency which is based on Alaska DEC and DNR Guidelines.

[1] Weight Correction for the development rock is based on a 20% swell factor and the material density prior to being being pushed. In place material density is based on site specific soils/rock and the design parameters for the TSF and development rock dumps.

TABLE 4
Rock Creek Project
Reclamation Cost Estimate
Tailings Storage Facility

Earthworks/Reshaping

Description	Equipment	Dozing Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Dozer Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)
Excavating Spillway	D9R Dozer	425	21,500	300	0.56	166.6	129.0

Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Excavating Spillway	D9R Dozer	1	2.6	109.0	20.0	$8,829.28	$24,956.63	$33,785.91
					Total Cost	$8,829.28	$24,956.63	$33,785.91

Earthworks/Reshaping

Description	Equipment	Dozing/Travel Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)
Load & Haul Cap Material	Haul Truck (52cy)	2000	714,600	392	1.00	392	1822
Load & Haul Cap Material	Loader-8cy Bucket	-	714,600	831	1.00	831	860
Spread Cap Material	D9R Dozer	<50	714,600	2,000	0.50	993	860

Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Load & Haul Cap Material	Haul Truck (52cy)	2	9.1	1462	360	$123,811.35	$207,734.15	$331,545.50
Load & Haul Cap Material	Loader-8cy Bucket	1	9.1	731	180	$64,512.91	$123,664.79	$188,177.70
Spread Cap Material	D9R Dozer	1	9.1	731	180	$62,971.34	$145,441.23	$208,412.58
					Total Cost	$251,295.61	$476,840.17	$728,135.78

Topsoil Placement

Description	Equipment	Dozing/Travel Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)
Load & Haul Material	Haul Truck (52cy)	2800	214,400	315	1.00	315	681.3
Load & Haul Material	Loader-8cy Bucket	-	214,400	831	1.00	831	258.0
Spread Material	D7R Dozer	<50	321,600	1,000	1.22	1,219	263.8

Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Load & Haul Material	Haul Truck (52cy)	2	3.4	561	120	$46,055.89	$77,674.86	$123,730.75
Load & Haul Material	Loader-8cy Bucket	1	3.4	281	60	$23,996.47	$46,240.09	$70,236.56
Spread Material	D7R Dozer	1	3.4	281	60	$23,425.68	$54,382.62	$77,808.31
					Total Cost	$93,478.04	$178,297.58	$271,775.62

Scarifying Topsoil

Description	Equipment	Scarifying Width (ft)	Material Quantity (acre)	Maximum Production Rate (ft/hr) [1]	Correction Factor	Corrected Production Rate (ft/hr)	Equipment Time (hrs)
Scarify Topsoil	D7R Dozer	9.75	135	5,280	1.00	5280	114.2

Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Scarify Topsoil	D7R Dozer	1	2.3	94	20	$7,853.58	$11,870.29	$19,723.87
					Total Cost	$7,853.58	$11,870.29	$19,723.87

Reseeding

Description	Equipment	Quantity (acre)	Seed Application Rate (lb/acre)	Fertilizer Application Rate (lb/acre)	Material Cost [3]	Labor Cost	Equipment Cost	Total Cost
Seed & Fertilizer	D7R Dozer	135	50	300	$52,326.00	$7,853.58	$11,870.29	$72,049.87
Seed & Fertilizer	Spreader [4]	135	-	-	$0.00	$0.00	$6,000.00	$6,000.00
				Total Cost	$52,326.00	$7,853.58	$17,870.29	$78,049.87

Summary

Tasks	Material Cost	Labor Cost	Equipment Cost	Total Cost
Earthworks/Reshaping - Excavating Spillway	-	$8,829	$24,957	$33,786
Earthworks/Reshaping - Cap Material Placemen	-	$251,296	$476,840	$728,136
Topsoil Placement	-	$93,478	$178,298	$271,776
Scarifying Topsoil	-	$7,854	$11,870	$19,724
Reseeding	$52,326	$7,854	$17,870	$78,050
TOTALS	**$52,326**	**$369,310**	**$709,835**	**$1,131,471**

[1] Fill Placement Production Based of CAT Handbook Edition 35.
[2] Project Weeks are 50hrs, single shift except for truck haul activities which are double shift.
[3] Seed cost is $6.48/lb and Fertilizer Cost is $0.212/lb.

TABLE 5
Rock Creek Project
Reclamation Cost Estimate
Rock Creek Development Rock Dump Regrading

Earthworks/Reshaping								
Description	Equipment	Dozing Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Dozer Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)	
North Dump - 2 Lifts	D9R Dozer	250	230,000	525	0.75	391	588.0	
South Dump - 1 Lift [2]	D9R Dozer	85	0	1,380	0.75	1028	0.0	
Description	Equipment	Quantity	Project Weeks [3]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
North Dump - 2 Lifts	D9R Dozer	2	5.9	480	108	$40,512.61	$113,725.66	$154,238.27
South Dump - 1 Lift	D9R Dozer	2	0.0	0	0	$0.00	$0.00	$0.00
					Total Cost	$40,512.61	$113,725.66	**$154,238.27**

[1] Fill Placement Production Based of CAT Handbook Edition 35.
[2] South Dump will be regraded during capping of TSF using equipment and labor allocated to cap material placement and spreading.
[3] Project Weeks are 50hrs, single shift

TABLE 6
Rock Creek Project
Reclamation Cost Estimate
Rock Creek Diversion Channel Backfilling/Regrading

Earthworks/Reshaping								
Description	Equipment	Dozing Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Dozer Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)	
Channel Regrading	D9R Dozer	50	327,000	2,000	0.56	1111	294.4	
Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Channel Regrading	D9R Dozer	1	5.9	240	54	$20,287.43	$56,935.94	$77,223.37
					Total Cost	$20,287.43	$56,935.94	**$77,223.37**

[1] Fill Placement Production Based of CAT Handbook Edition 35.
[2] Project Weeks are 50hrs, single shift

TABLE 7
Rock Creek Project
Reclamation Cost Estimate
Big Hurrah Development Rock Dump Regrading

Earthworks/Reshaping							
Description	Equipment	Dozing/Travel Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)
Load & Haul PAG Material	Haul Truck (52cy)	2350	1,305,000	371	1.00	371	3520.4
Load & Haul PAG Material	Loader-8cy Bucket	-	1,305,000	831	1.00	831	1570.4
Spread PAG Material	D9R Dozer	<50	1,305,000	2,000	0.50	993	1570.4
Slope NAG Dump Material	D9R Dozer	<50	200,000	2,000	0.75	1,490	134.2

Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Load & Haul PAG Material	Haul Truck (52cy)	2	17.6	2840	680	$238,962.94	$401,365.83	$640,328.77
Load & Haul PAG Material	Loader-8cy Bucket	1	17.6	1420	340	$124,512.17	$238,934.34	$363,446.51
Spread PAG Material	D9R Dozer	1	17.6	1420	340	$121,539.68	$281,008.89	$402,548.57
Slope NAG Dump Material	D9R Dozer	1	2.7	114	20	$9,170.72	$25,959.12	$35,129.83
					Total Cost	$494,185.51	$947,268.17	$1,441,453.68

[1] Fill Placement Production Based of CAT Handbook Edition 35.

[2] Project Weeks are 50hrs, single shift except for truck haul activities which are double shift.

TABLE 8
Rock Creek Project
Reclamation Cost Estimate
Big Hurrah Ore Stockpile Pad Regrading

Earthworks/Reshaping								
Description	Equipment	Dozing/Travel Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)	
Slope NAG Dump Material	D9R Dozer	250	35,000	494	0.75	368	95.1	
Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Slope NAG Dump Material	D9R Dozer	1	1.9	80	15	$6,512.78	$18,392.09	$24,904.86
					Total Cost	$6,512.78	$18,392.09	$24,904.86

[1] Fill Placement Production Based of CAT Handbook Edition 35.
[2] Project Weeks are 50hrs, single shift

TABLE 9
Rock Creek Project
Reclamation Cost Estimate
Big Hurrah Diversion Channel Backfilling/Regrading and Culvert Removal

Earthworks/Reshaping								
Description	Equipment	Dozing/Travel Distance (ft)	Material Quantity (yd^3)	Maximum Production Rate (yd^3/hr) [1]	Correction Factor	Corrected Production Rate (yd^3/hr)	Equipment Time (hrs)	
Site Channels & Culvert	D9R Dozer	100	20,000	1,250	0.88	1,100	18.2	
Linda Vista Culvert	D9R Dozer	100	1,000	1,250	0.56	694	1.4	
Description	Equipment	Quantity	Project Weeks [2]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost	Total Cost
Site Channels & Culvert	D9R Dozer	1	0.4	18	0	$1,197.64	$3,516.32	$4,713.95
Linda Vista Culvert	D9R Dozer	1	0.0	1	0	$94.88	$278.59	$373.47
					Total Cost	$1,292.52	$3,794.90	$5,087.42

[1] Fill Placement Production Based of CAT Handbook Edition 35.
[2] Project Weeks are 50hrs, single shift

TABLE 10
Rock Creek Project
Reclamation Cost Estimate
Process Solution Management

Solution Management								
Description	Equipment	Treatment Volume (gal) [1]	Treatment Rate (gpm)	Operating Hours/Day	Treatment Days	Operating Hours	Treatment Cost ($/1,000 gallon)	
TSF Solution Treatment	Treatment Plant	23,000,000	600	24	27	639	$0.50	
TSF Solution Treatment	Light Vehicle	-	-	-	27	639	-	
Description	Equipment	Quantity	Project Weeks [3]	Regular Hours	Overtime Hours	Labor Cost	Equipment Cost [2]	Total Cost
TSF Solution Treatment	Treatment Plant	1	3.8	320	319	$42,079.53	$11,500.00	$53,579.53
TSF Solution Treatment	Light Vehicle	1	3.8	320	319	$0.00	$2,517.75	$2,517.75
Total Cost						$42,079.53	$14,017.75	$56,097.28

Well Closure								
Description	Number of Wells	Casing Diameter (in)	Avg. Casing Length (each) (ft)	Time per Well (hrs) [7]	Total Length of Casing (ft)	Volume of Casing (ft^3)	Duration (hrs)	
Injection Wells	22	10	350	2	7700	4,200	44.0	
Interception Wells	16	10	320	2	5120	2,792	32.0	
Monitoring Wells	16	10	150	2	2400	1,309	32.0	
Description	Number of Wells	Project Weeks [6]	Regular Hours	Overtime Hours	Material Cost [8]	Labor Cost	Equipment Cost [2]	Total Cost
Injection Wells	22	0.9	40	4	$59,675.96	$2,662.88	$504.17	$62,843.00
Interception Wells	16	0.6	32	0	$39,680.64	$1,898.56	$403.33	$41,982.53
Monitoring Wells [9]	16	0.6	32	0	$33,108.53	$3,425.57	$717.93	$37,252.04
Total Cost					$132,465.12	$7,987.01	$1,625.43	$142,077.57

Summary				
Tasks	**Material Cost**	**Labor Cost**	**Equipment Cost**	**Total Cost**
Solution Management	-	$42,080	$14,018	$56,097
Well Closure	$132,465	$7,987	$1,625	$142,078
TOTALS	**$132,465**	**$50,067**	**$15,643**	**$198,175**

[1] Treatment volume is the precipitation collected during 6 months.

[2] Vehicle Rental Rate = $90/day (Stampede Rental, Nome), fuel cost = ($3.25 per gallon/15 miles per gallon) x 15 miles/day for water treatment activity or 50 miles/day for well closure activity.

[3] Project Weeks for water treatment are 7 days/week, 2 shifts/day, 12 hrs/shift.

[4] Labor Cost based on 1 General Laborer required per shift.

[5] Treatment Cost is operational cost of treatment system already at the site. Operational cost based on estimated costs for system.

[6] Project Weeks for well closure are 5 days/week, 1 shift/day, 10 hrs/shift.

[7] Time per Well includes 1 hour to backfill well.

[8] Material Cost is bentonite hole plug @ 1 ft^3/bag.

[9] Monitoring Well costs have been adjusted for an inflation rate of 2.6%. The monitoring wells will be required for 30 years after reclamation activities commence.

TABLE 11
Rock Creek Project
Reclamation Cost Estimate
Long Term Monitoring

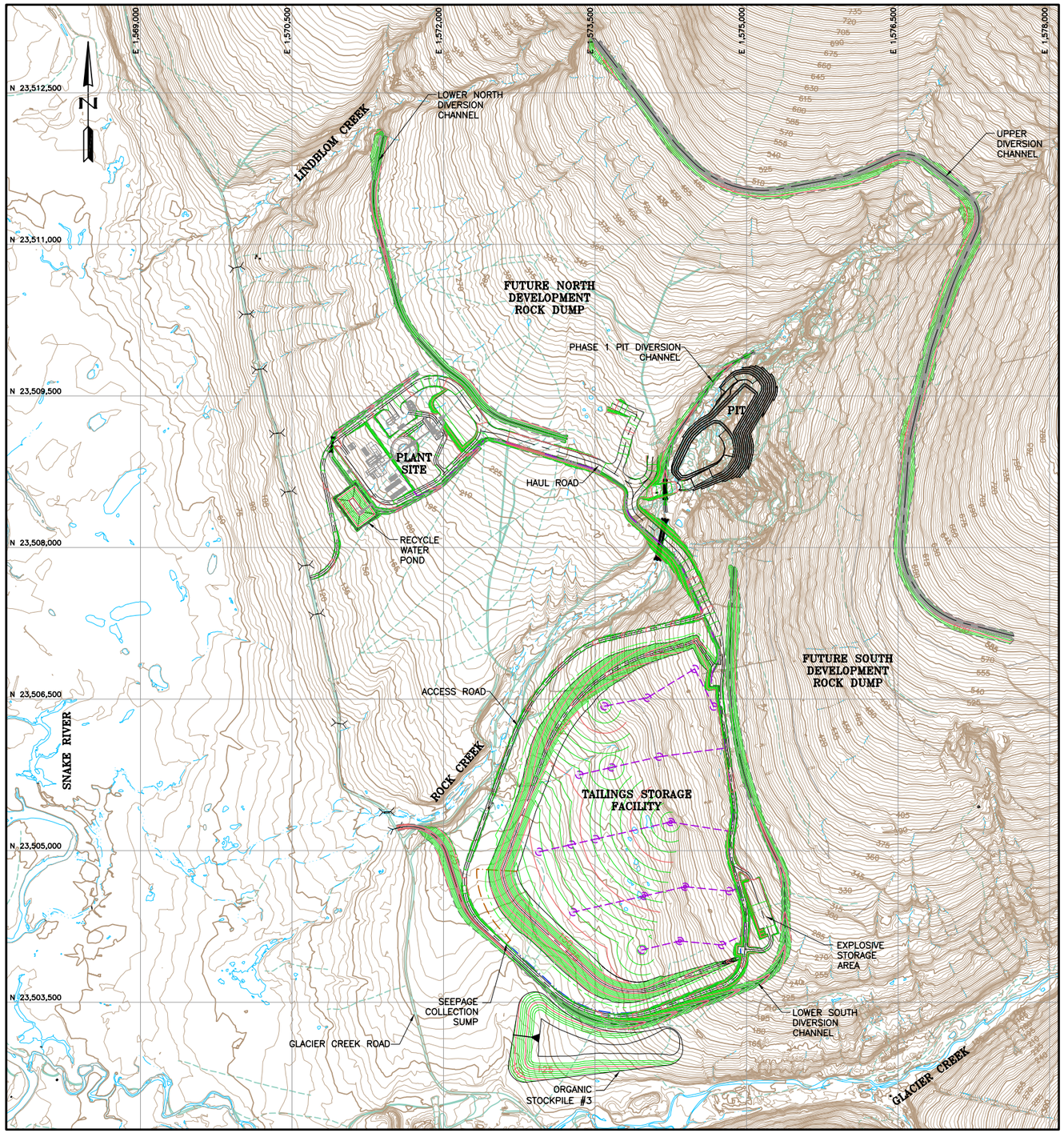
Monitoring Costs											
Item	Labor	Lab Costs	Shipping	Equipment	Airfare	Lodging	Meals	Gas	Car rental	Report	TOTAL
Per Event	$12,800	$19,200	$1,350	$710	$2,000	$1,800	$700	$150	$1,520	$3,000	**$43,230**
1,2,5,10,20,30 years	$76,800	$115,200	$8,100	$4,260	$12,000	$10,800	$4,200	$900	$9,120	$18,000	**$259,380**

Assumptions

Labor	1 day Rock Creek surface sampling	**Lab costs**	$600/sample	**Shipping**	50$/cooler - full - 15 coolers ($750.00)
	2 days Rock Creek groundwater sampling		costs include bottles/coolers		empty coolers/supplies to Nome $500
	1 day Big Hurrah surface sampling		8 surface stations at Rock Creek		supplies back $100
	1 day Big Hurrah groundwater sampling		5 surface stations at Big Hurrah	**Equipment**	camera - $60/week
	1 prep day in town		6 groundwater stations at Rock Creek		tubing,gloves, bags, etc…$300.00
	1 mobilization day		3 groundwater stations at Big Hurrah		pump $50/week
	1 demobilization day		2 (1 each site) equipment rinse for groundwater samples		meter $300/week
	asuume 2 man- 10 hr days		4 matrix spikes (1 each site surface and groundwater)	**Car Rental**	$250/day
	$80/hour consultant labor fee		4 duplicates (1 each site surface and groundwater)	**Lodging**	$150/night
			Anchorage, AK laboratory to process samples	**Meals**	$50/day
			one sample/year	**Airfare**	$2,000.00

Calender Year	Sequence Year	Expenditure 2006 $	Inflated $ Value
2007	0	Startup	-
2008	0	Active Mining	-
2009	0	Active Mining	-
2010	0	Active Mining	-
2011	0	Active Mining	-
2012	1	$43,230	$44,354
2013	2	$43,230	$45,478
2016	5	$43,230	$48,850
2021	10	$43,230	$54,470
2031	20	$43,230	$65,710
2040	30	$43,230	$76,949
Total		$259,380	$335,811

FIGURES



PLAN

600 0 600 1200 FEET

GENERAL NOTES:

1. TOPOGRAPHIC DATA RECEIVED FROM KODIAK MAPPING SURVEY, VIA CD. DATE: NOVEMBER 30, 2004. FILENAME: S:CAD\1011-rock_creek\recv\20041130-Kodiak Mapping Survey\D02\dwg\ROCK CREEK 2004.dwg.
2. HORIZONTAL SURVEY DATUM FOR THE PROJECT IS: UTM NAD83, ZONE 3, FEET.
3. VERTICAL SURVEY DATUM FOR THE PROJECT IS: NAVD88, FEET.
4. PLANT LAYOUT WAS RECEIVED FROM SAMUELS ENGINEERING ON FEBRUARY 25, 2006.

LEGEND:

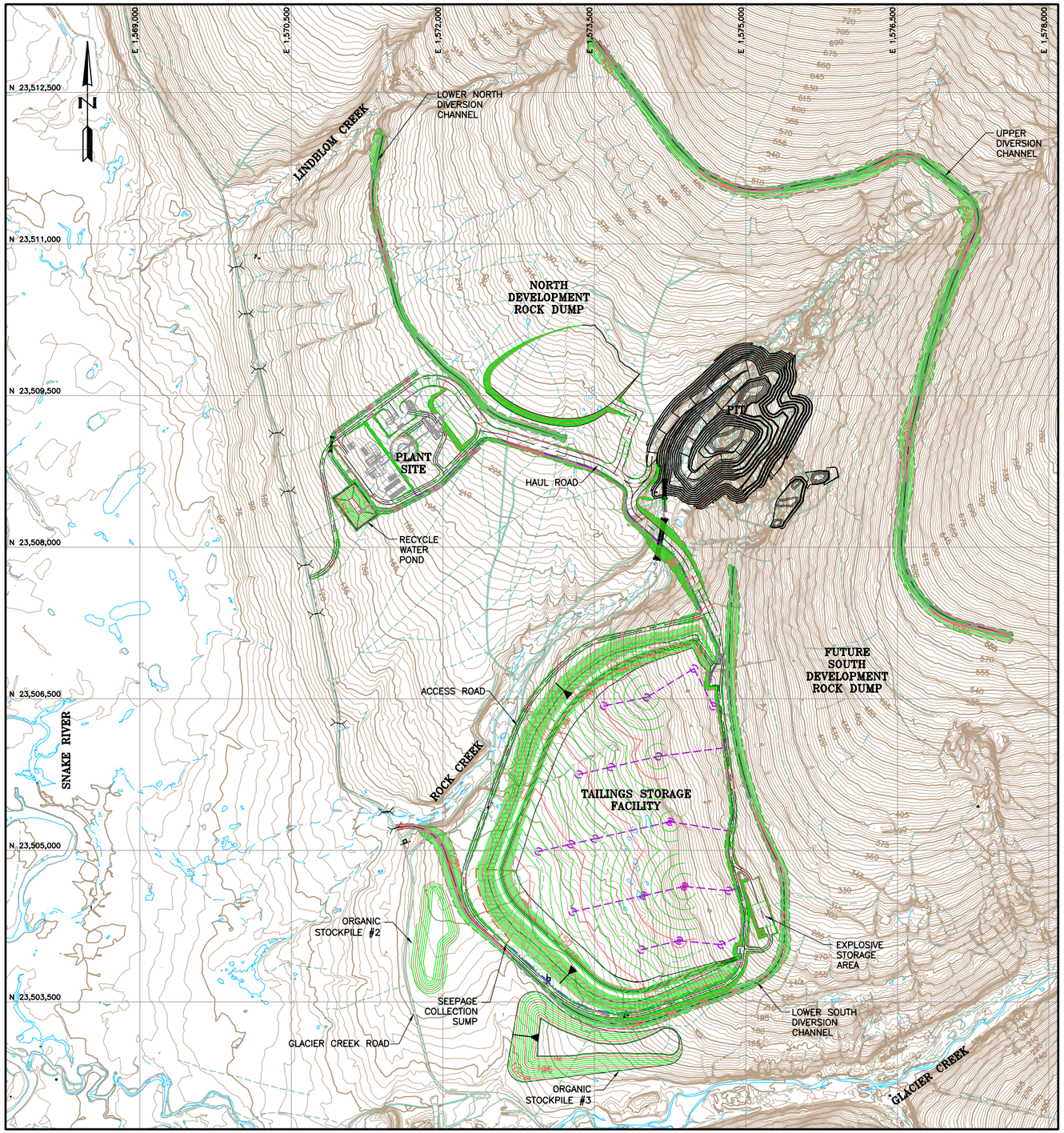
- EXISTING GROUND SURFACE CONTOUR EL, FEET
- PROPOSED GROUND SURFACE CONTOUR EL, FEET
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING STREAM
- EXISTING DITCH
- PROPOSED CONSTRUCTION DAYLIGHT ON EXISTING GROUND
- EXISTING POND/WATER
- EXISTING STRUCTURE
- EXISTING CULVERT
- PROPOSED PIT LIMITS
- PROPOSED CULVERT
- 8" DIAMETER PERFORATED CPeP DRAIN PIPES
- 12" DIAMETER PERFORATED CPeP DRAIN PIPES
- 18" DIAMETER PERFORATED CPeP DRAIN PIPES
- SEEPAGE AND RECLAIM WATER PIPELINE
- TAILINGS DROP BARS AND TAILINGS DEPOSITIONAL TOWERS
- TAILINGS DISTRIBUTION HEADER PIPELINE
- RECLAIM WATER PIPELINE
- RETURN WATER PIPELINE

CLIENT	ALASKA GOLD COMPANY				
PROJECT	ROCK CREEK PROJECT				
TITLE	GENERAL SITE PLAN END OF YEAR 2007				
SWC SMITH WILLIAMS CONSULTANTS, INC. 304 Inverness Way South, Suite 490, Englewood, Colorado 80112 Phone: 303-433-0262 Fax: 303-433-0362	DESIGNED BY	BGD	CHECKED BY	JMN	DATE
	DRAWN BY	BGD	APPROVED BY	RTB	5/25/06
	FILENAME 1011aF51		FIGURE No. 1		REV A

Alaska Gold Company

XREF. NO

PLOT SCALE



PLAN

600 0 600 1200 FEET

GENERAL NOTES:

1. TOPOGRAPHIC DATA RECEIVED FROM KODIAK MAPPING SURVEY, VIA CD. DATE: NOVEMBER 30, 2004. FILENAME: S:CAD\1011–rock_creek\recv\20041130–Kodiak Mapping Survey\D02\dwg\ROCK CREEK 2004.dwg.
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3. VERTICAL SURVEY DATUM FOR THE PROJECT IS: NAVD88, FEET.
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LEGEND:

- EXISTING GROUND SURFACE CONTOUR EL, FEET
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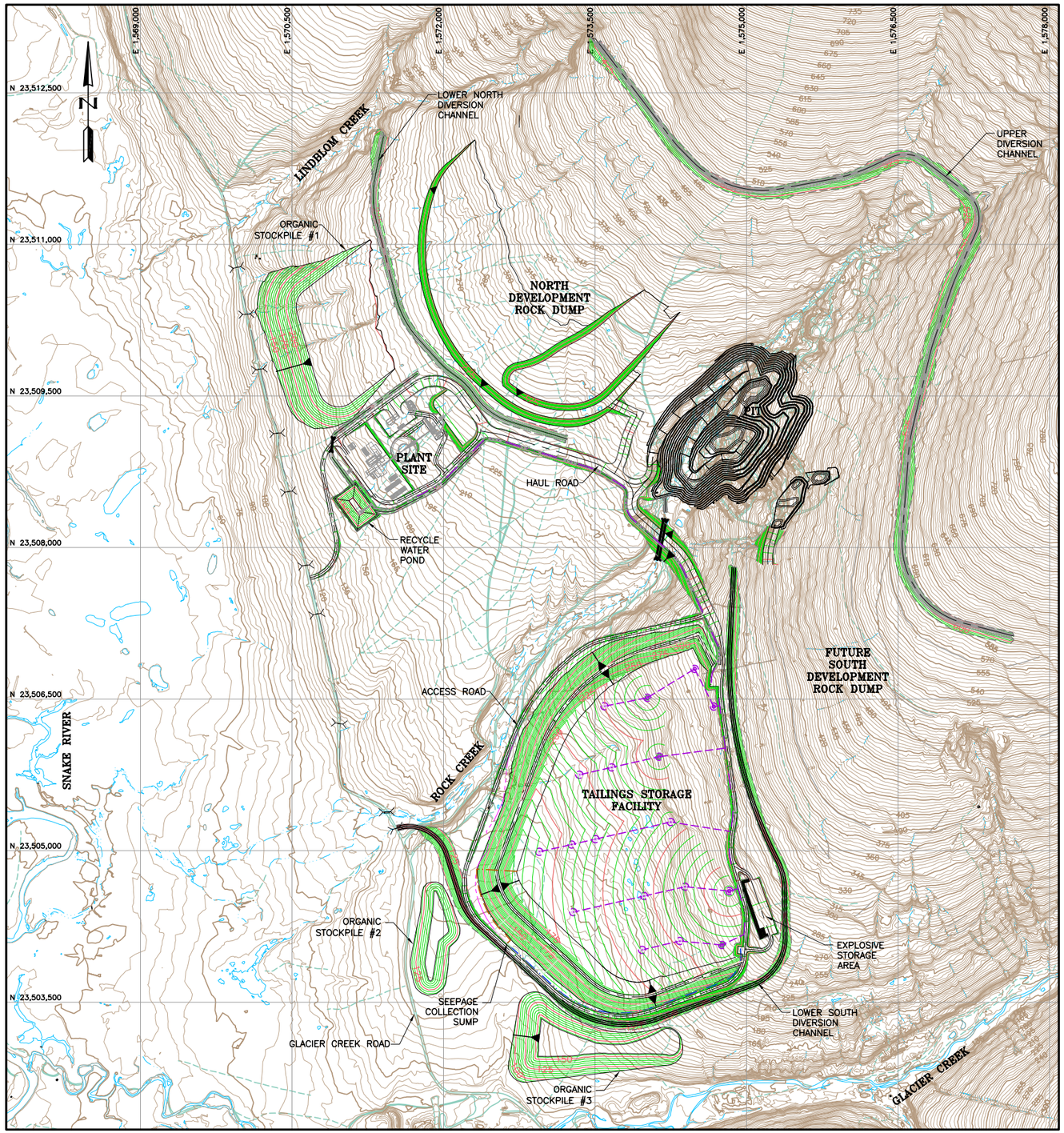
- TAILINGS DROP BARS AND TAILINGS DEPOSITIONAL TOWERS
- TAILINGS DISTRIBUTION HEADER PIPELINE
- RECLAIM WATER PIPELINE
- RETURN WATER PIPELINE

Alaska Gold Company

CLIENT	ALASKA GOLD COMPANY				
PROJECT	ROCK CREEK PROJECT				
TITLE	GENERAL SITE PLAN END OF YEAR 2008				
SMITH WILLIAMS CONSULTANTS, INC. 304 Inverness Way South, Suite 490, Englewood, Colorado 80112 Phone: 303-433-0262 Fax: 303-433-0362	DESIGNED BY	BGD	CHECKED BY	JMN	DATE
	DRAWN BY	BGD	APPROVED BY	RTB	5/25/06
	FILENAME 1011aF52		FIGURE No. 2		REV A



PLAN

600 0 600 1200 FEET

GENERAL NOTES:

1. TOPOGRAPHIC DATA RECEIVED FROM KODIAK MAPPING SURVEY, VIA CD. DATE: NOVEMBER 30, 2004. FILENAME: S:CAD\1011-rock_creek\recv\20041130-Kodiak Mapping Survey\D02\dwg\ROCK CREEK 2004.dwg.
2. HORIZONTAL SURVEY DATUM FOR THE PROJECT IS: UTM NAD83, ZONE 3, FEET.
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LEGEND:

- EXISTING GROUND SURFACE CONTOUR EL, FEET
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- RECLAIM WATER PIPELINE
- RETURN WATER PIPELINE

Alaska Gold Company

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	GENERAL SITE PLAN END OF YEAR 2009

SWC
SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

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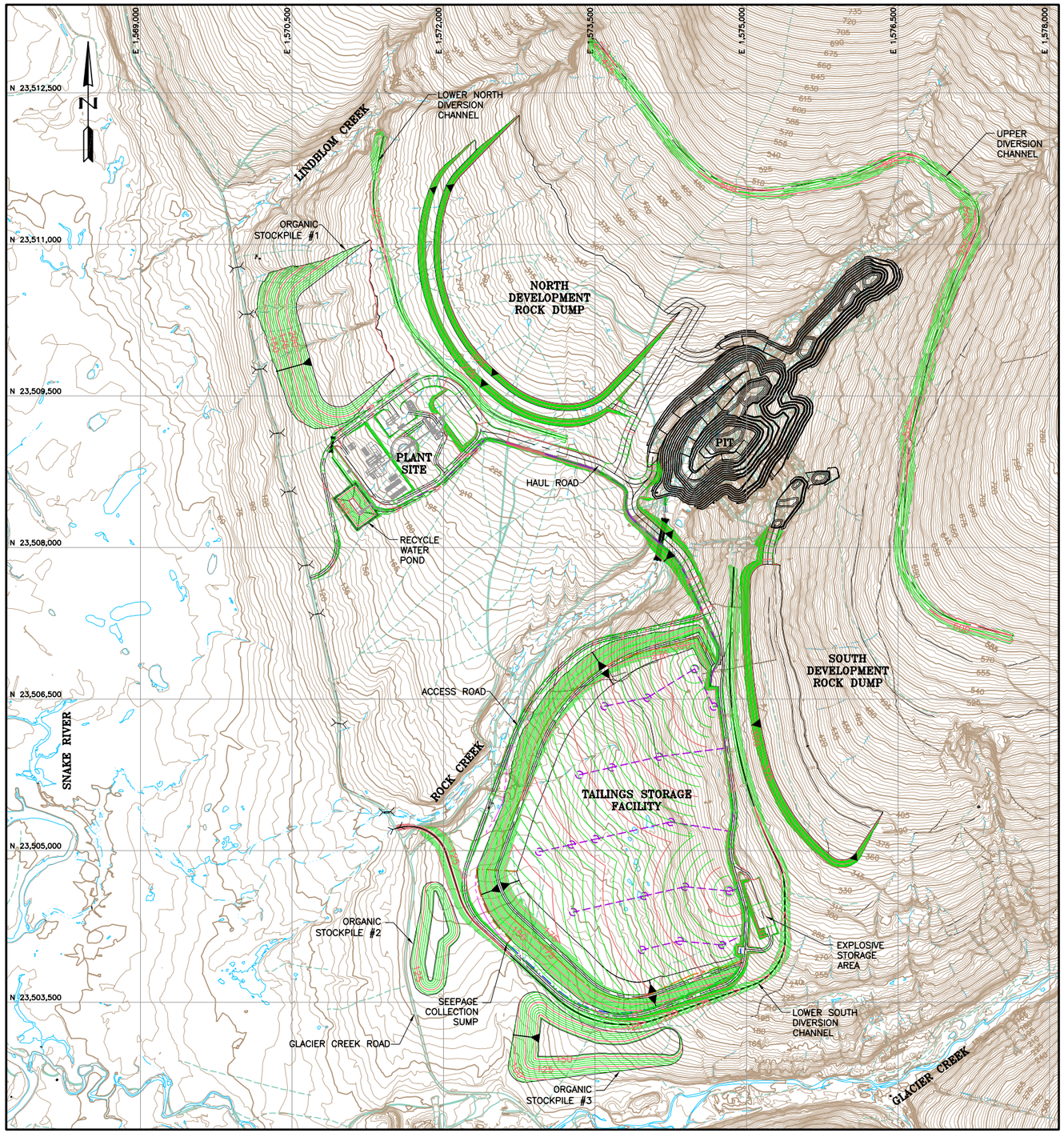
FILENAME 1011aF53			FIGURE No. 3	REV A

XREF. NO

PLOT SCALE



PLAN

600 0 600 1200 FEET

GENERAL NOTES:

1. TOPOGRAPHIC DATA RECEIVED FROM KODIAK MAPPING SURVEY, VIA CD. DATE: NOVEMBER 30, 2004. FILENAME: S:CAD\1011-rock_creek\recv\20041130-Kodiak Mapping Survey\D02\dwg\ROCK CREEK 2004.dwg.
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LEGEND:

- EXISTING GROUND SURFACE CONTOUR EL, FEET
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- EXISTING DITCH
- PROPOSED CONSTRUCTION DAYLIGHT ON EXISTING GROUND
- EXISTING POND/WATER
- EXISTING STRUCTURE
- EXISTING CULVERT
- PROPOSED PIT LIMITS
- PROPOSED CULVERT
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- 12" DIAMETER PERFORATED CPeP DRAIN PIPES
- 18" DIAMETER PERFORATED CPeP DRAIN PIPES
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- TAILINGS DISTRIBUTION HEADER PIPELINE
- RECLAIM WATER PIPELINE
- RETURN WATER PIPELINE

Alaska Gold Company

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	GENERAL SITE PLAN END OF YEAR 2010

SWC
SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

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FILENAME	FIGURE No.	REV
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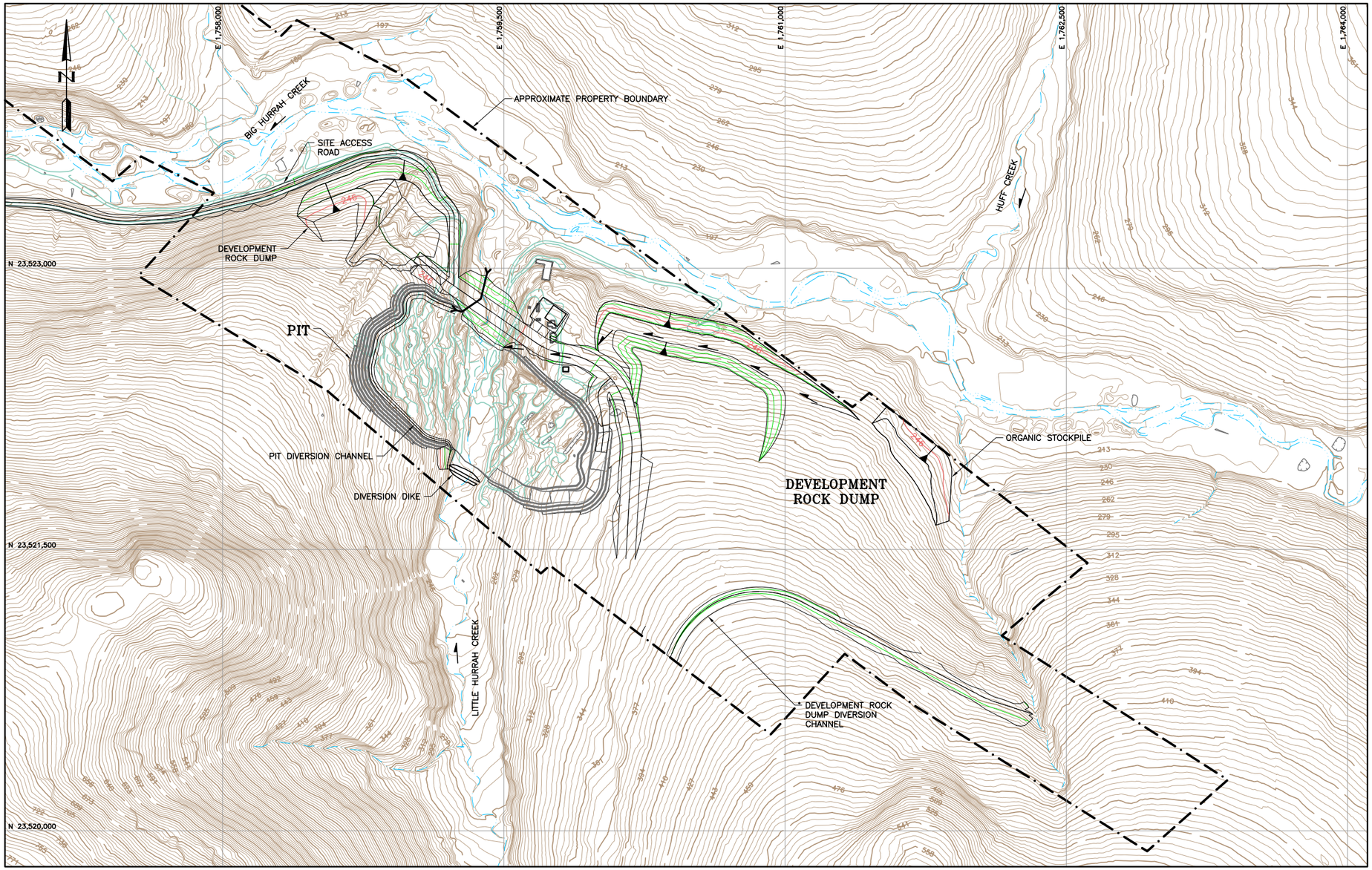
XREF. NO

PLOT SCALE



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- PROPOSED GROUND SURFACE CONTOUR AND EL, FEET
- EXISTING DRAINAGES
- EXISTING ROAD
- EXISTING POND/WATER
- EXISTING STRUCTURE
- PROPOSED DRAINAGE FLOWPATH

PLAN

300 0 300 600 FEET

XREF. NO

PLOT SCALE

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	BIG HURRAH GENERAL SITE PLAN END OF YEAR 2007

SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

Alaska Gold Company

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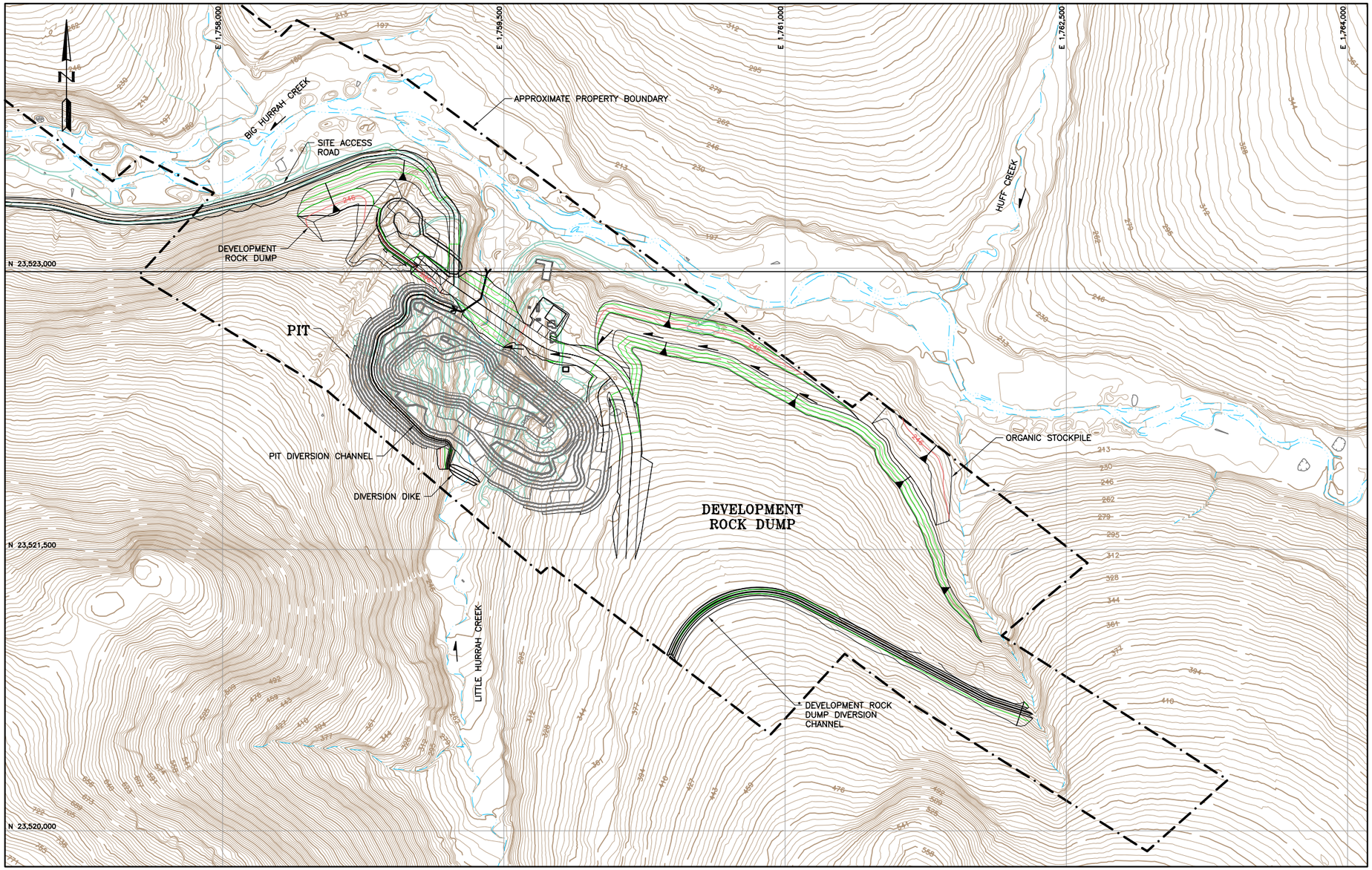
DRAWN BY	DS	APPROVED BY	RTB	5/26/06
FILENAME 1011AF56			FIGURE No. 5	REV A



LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- PROPOSED GROUND SURFACE CONTOUR AND EL, FEET
- EXISTING DRAINAGES
- EXISTING ROAD
- EXISTING POND/WATER
- EXISTING STRUCTURE
- PROPOSED DRAINAGE FLOWPATH
- PROPOSED CULVERT

PLAN

300 0 300 600 FEET

XREF: NO

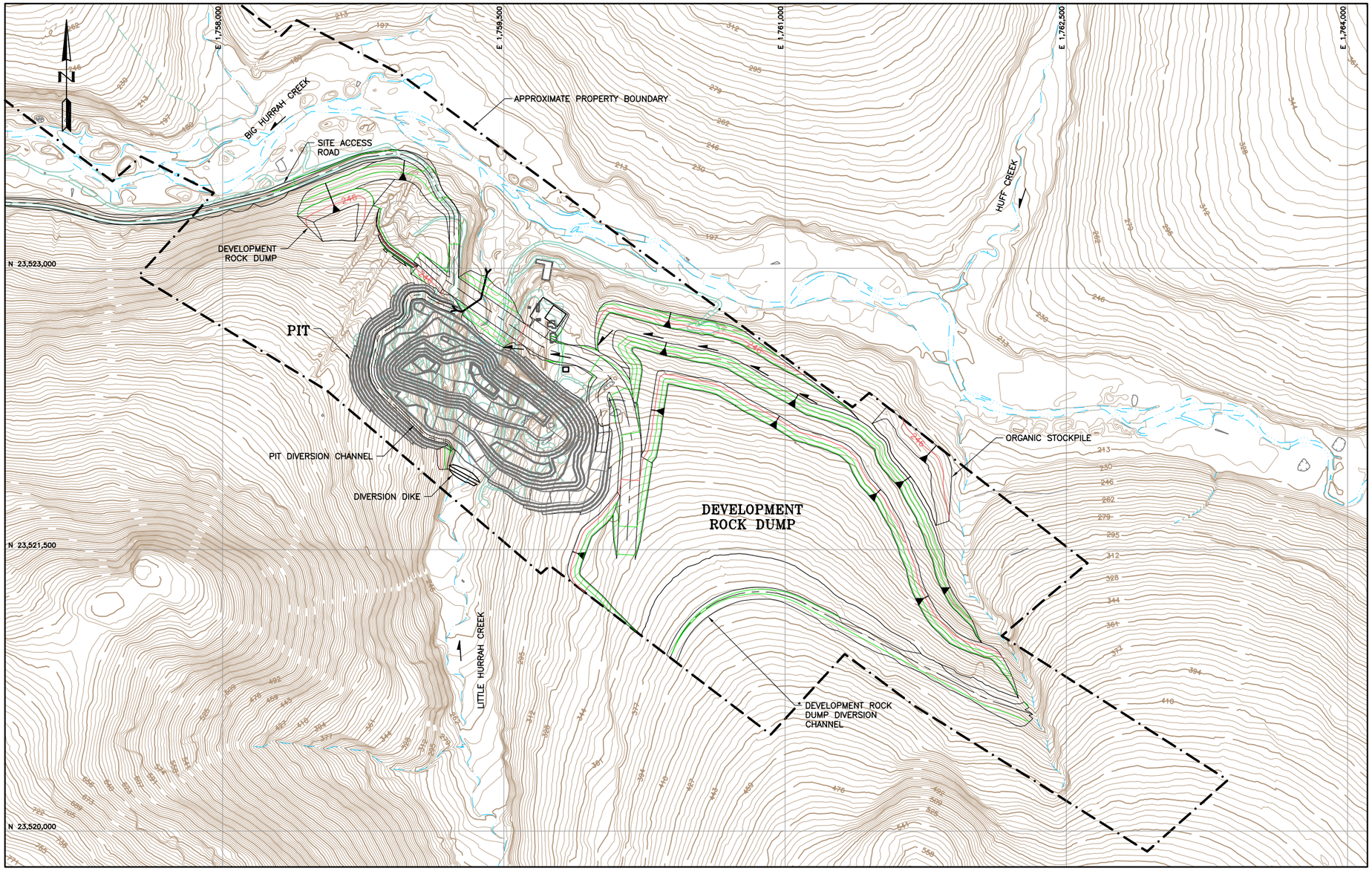
PLOT SCALE

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	BIG HURRAH GENERAL SITE PLAN END OF YEAR 2008

Alaska Gold Company

SWC
SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

DESIGNED BY	RTB	CHECKED BY	JMN	DATE
DRAWN BY	DS	APPROVED BY	RTB	5/26/06
FILENAME 1011AF55			FIGURE No. 6	REV A



LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- PROPOSED GROUND SURFACE CONTOUR AND EL, FEET
- EXISTING DRAINAGES
- EXISTING ROAD
- EXISTING POND/WATER
- EXISTING STRUCTURE
- PROPOSED CULVERT
- PROPOSED DRAINAGE FLOWPATH

PLAN

300 0 300 600 FEET

XREF. NO

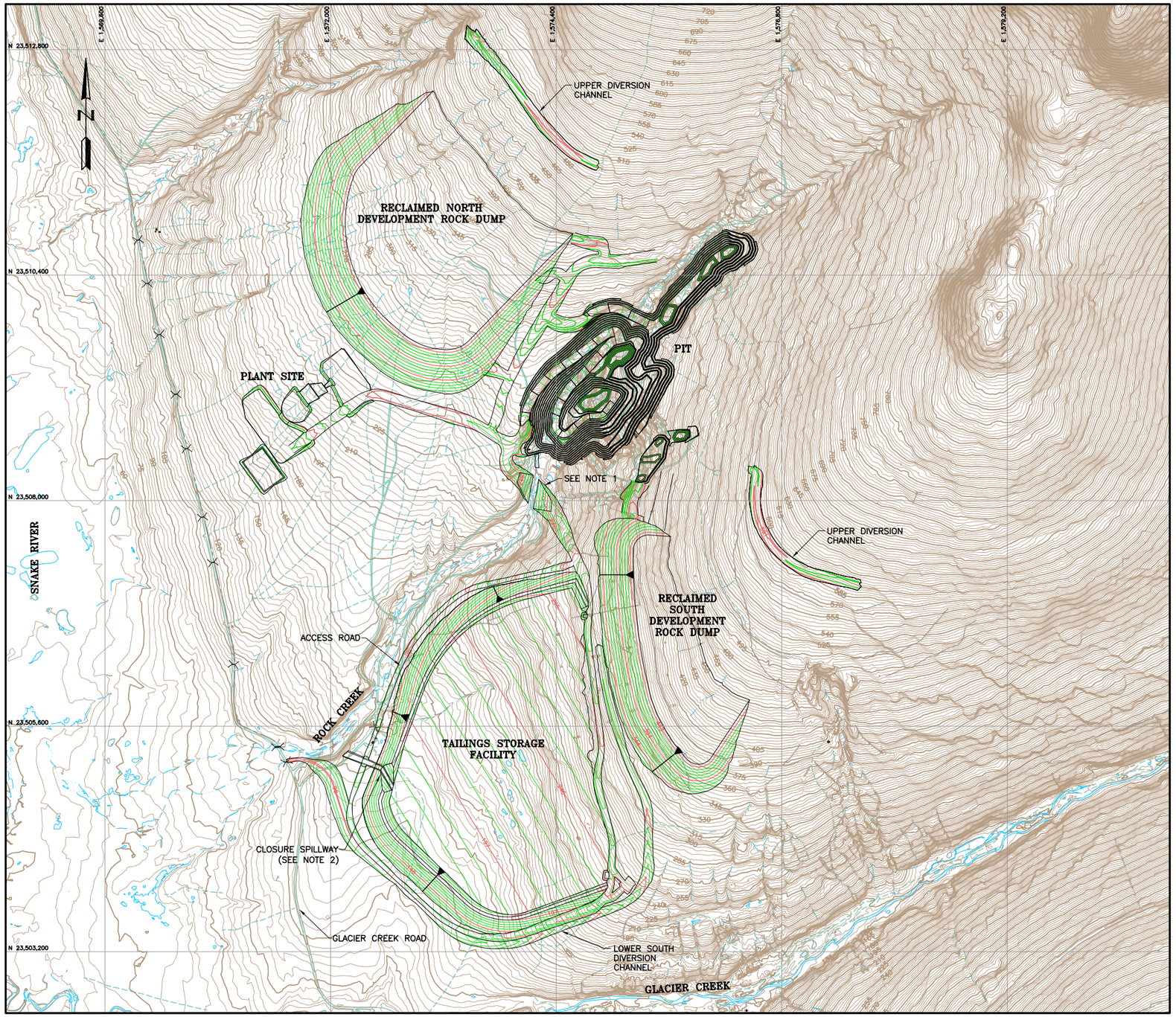
PLOT SCALE

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	BIG HURRAH GENERAL SITE PLAN END OF YEAR 2009

SWC
SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

Alaska Gold Company

DESIGNED BY	RTB	CHECKED BY	JMN	DATE
DRAWN BY	DS	APPROVED BY	RTB	5/26/06
FILENAME 1011AF58			FIGURE No. 7	REV A



PLAN

600 0 600 1200

LEGEND:

- EXISTING GROUND SURFACE CONTOUR EL, FEET
- PROPOSED GROUND SURFACE CONTOUR EL, FEET
- EXISTING ROAD
- EXISTING STREAM
- EXISTING DITCH
- EXISTING POND/WATER
- EXISTING STRUCTURE
- EXISTING CULVERT
- PROPOSED PIT LIMITS

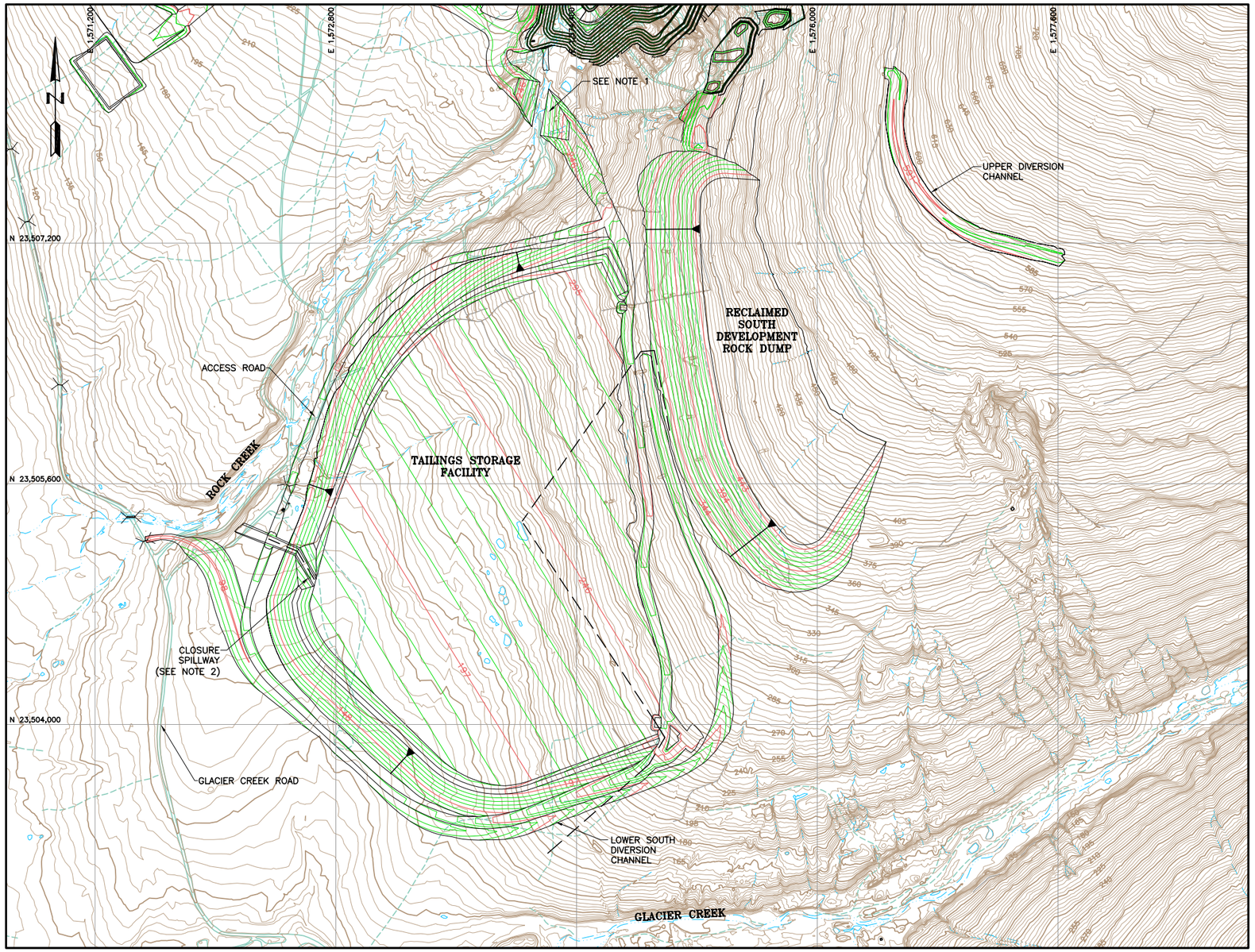
NOTES:

1. CULVERTS TO BE REMOVED AND ROCK CREEK DRAINAGE RE–ESTABLISHED.
2. SURFACE OF TAILINGS TO BE GRADED TO DRAIN TOWARDS THE CLOSURE SPILLWAY. NO WATER WILL REMAIN BEHIND EMBANKMENT.

Alaska Gold Company

CLIENT	ALASKA GOLD COMPANY				
PROJECT	ROCK CREEK PROJECT				
TITLE	RECLAIMED ROCK CREEK GENERAL SITE PLAN				
SMITH WILLIAMS CONSULTANTS, INC.	DESIGNED BY	BGD	CHECKED BY	JNM	DATE
	DRAWN BY	BGD	APPROVED BY	RTB	5/26/06
	FILENAME 1011AF49		FIGURE No. 8		REV A

304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362



PLAN

400 0 400 800 FEET

LEGEND:

- EXISTING GROUND SURFACE CONTOUR EL, FEET
- PROPOSED GROUND SURFACE CONTOUR EL, FEET
- EXISTING ROAD
- EXISTING STREAM
- EXISTING DITCH
- EXISTING POND/WATER
- EXISTING STRUCTURE
- PROPOSED PIT LIMITS
- DOZER/TRUCK TRAVEL DISTANCES

NOTES:

1. CULVERTS TO BE REMOVED AND ROCK CREEK DRAINAGE RE-ESTABLISHED.
2. SURFACE OF TAILINGS TO BE GRADED TO DRAIN TOWARDS THE CLOSURE SPILLWAY. NO WATER WILL REMAIN BEHIND EMBANKMENT.

Alaska Gold Company

CLIENT: ALASKA GOLD COMPANY

PROJECT: ROCK CREEK PROJECT

TITLE: CONCEPTUAL TAILINGS STORAGE FACILITY CLOSURE PLAN

SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

DESIGNED BY	BDG	CHECKED BY	JMN	DATE
DRAWN BY	BDG	APPROVED BY	RTB	5/25/06

FILENAME	FIGURE No.	REV
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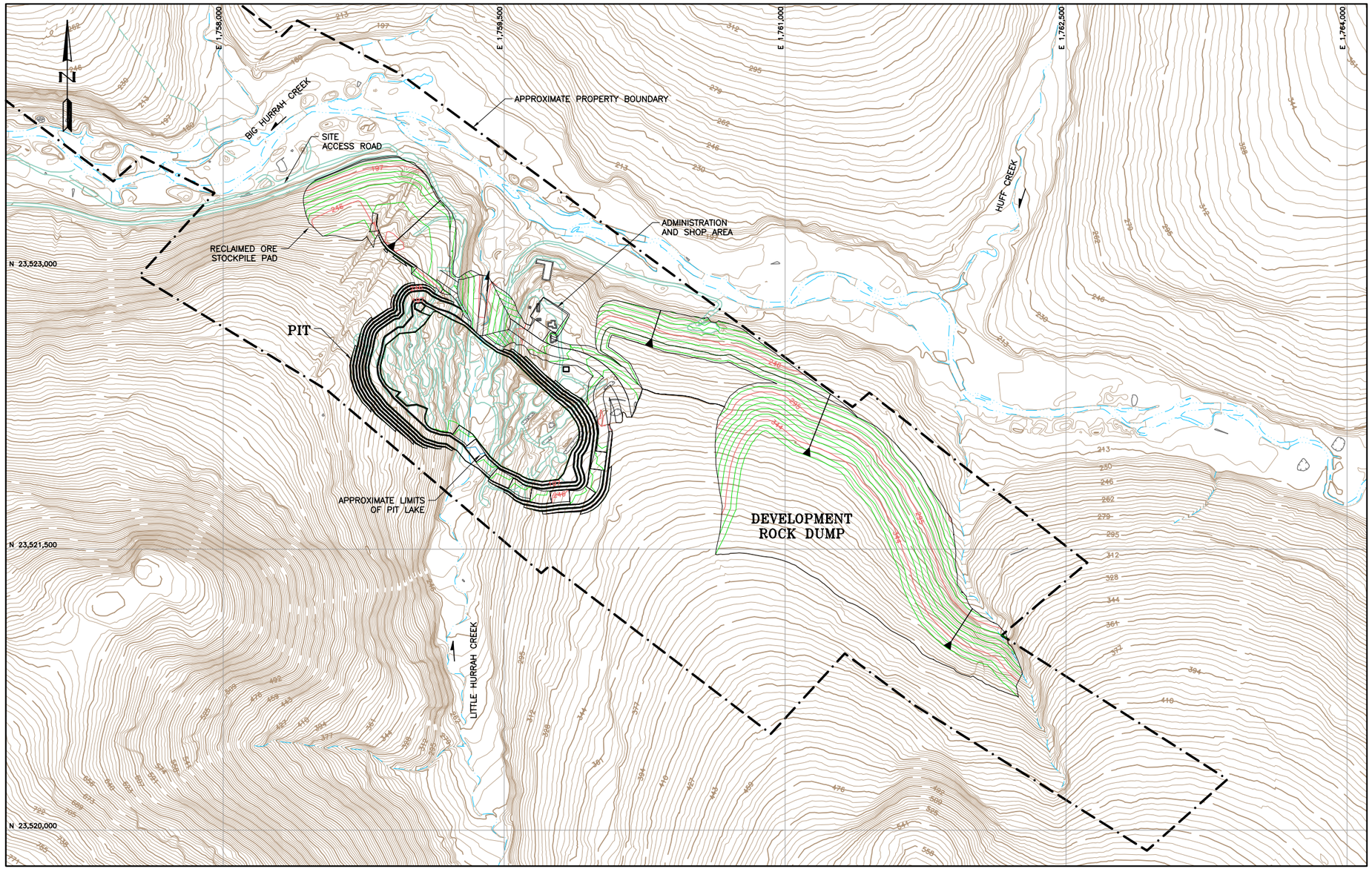

300 0 PLAN 300 600 FEET

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- PROPOSED GROUND SURFACE CONTOUR AND EL, FEET
- EXISTING DRAINAGES
- EXISTING ROAD
- EXISTING POND/WATER
- EXISTING STRUCTURE
- PROPOSED DRAINAGE FLOWPATH
- PROPOSED CULVERT

Alaska Gold Company

CLIENT	ALASKA GOLD COMPANY
PROJECT	ROCK CREEK PROJECT
TITLE	RECLAIMED BIG HURRAH GENERAL SITE PLAN

SMITH WILLIAMS CONSULTANTS, INC.
304 Inverness Way South, Suite 490, Englewood, Colorado 80112
Phone: 303-433-0262 Fax: 303-433-0362

DESIGNED BY	RTB	CHECKED BY	JMN	DATE
DRAWN BY	DS	APPROVED BY	RTB	5/26/06

FILENAME	FIGURE No.	REV
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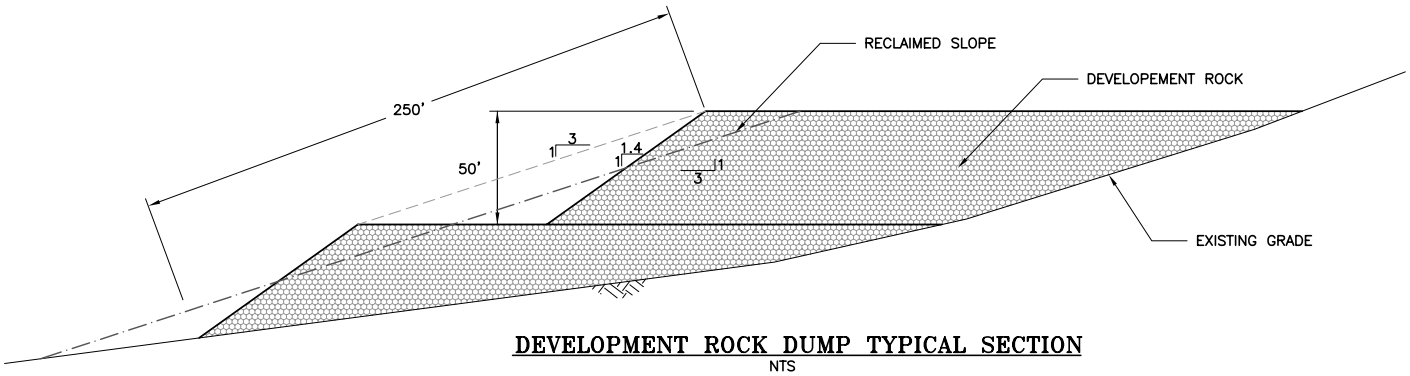
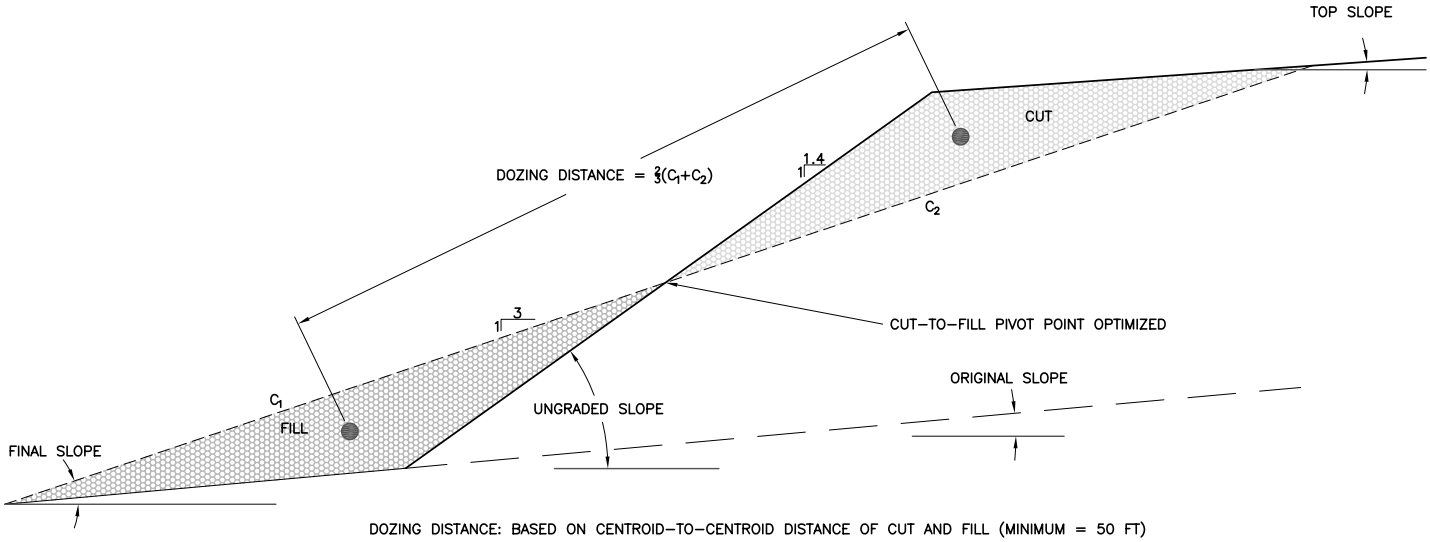


DEVELOPMENT ROCK DUMP TYPICAL SECTION

NTS



DOZING DISTANCE: BASED ON CENTROID–TO–CENTROID DISTANCE OF CUT AND FILL (MINIMUM = 50 FT)

DOZING DISTANCE CALCULATION

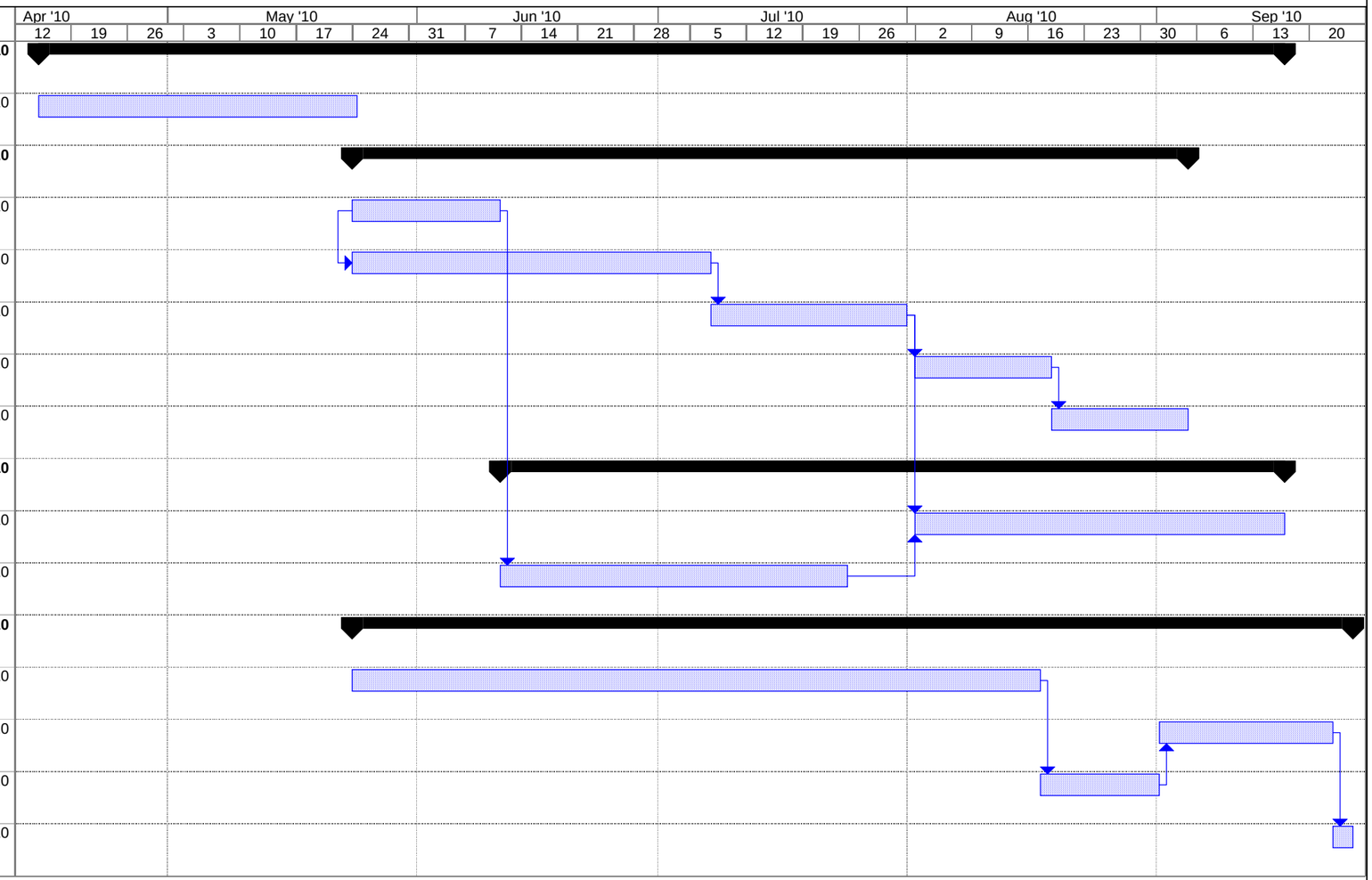
NTS

CLIENT: ALASKA GOLD COMPANY				
PROJECT: ROCK CREEK PROJECT				
TITLE: TYPICAL DEVELOPMENT ROCK DUMP SECTIONS				
SMITH WILLIAMS CONSULTANTS, INC. 304 Inverness Way South, Suite 490, Englewood, Colorado 80112 Phone: 303-433-0262 Fax: 303-433-0362	DESIGNED BY: JNM	CHECKED BY: JMN	DATE	
	DRAWN BY: JLW	APPROVED BY: RTB	5/26/06	
	FILENAME: 1011aF48	FIGURE No.: 11	REV: A	

Alaska Gold Company

FIGURE 12
Rock Creek Reclamation Schedule

ID	Task Name	Duration	Start	Finish
1	**Rock Creek Site**	**106.4 days**	**Thu 4/15/10**	**Thu 9/16/10**
2	Process Solution Management	27 days	Thu 4/15/10	Mon 5/24/10
3	**TSF**	**72 days**	**Mon 5/24/10**	**Sat 9/4/10**
4	Spillway Excavation	13 days	Mon 5/24/10	Fri 6/11/10
5	Cap Material Placement	31 days	Mon 5/24/10	Wed 7/7/10
6	Topsoil Placement	17 days	Wed 7/7/10	Sat 7/31/10
7	Topsoil Scarifying	12 days	Mon 8/2/10	Wed 8/18/10
8	Seeding	12 days	Thu 8/19/10	Sat 9/4/10
9	**Other Regrading**	**67 days**	**Fri 6/11/10**	**Thu 9/16/10**
10	North Dump	32 days	Mon 8/2/10	Thu 9/16/10
11	Channels	30 days	Fri 6/11/10	Sat 7/24/10
12	**Big Hurrah Site**	**86 days**	**Mon 5/24/10**	**Sat 9/25/10**
13	PAG Development Rock Removal Regrading	59 days	Mon 5/24/10	Tue 8/17/10
14	NAG Development Rock Regrading	15 days	Wed 9/1/10	Wed 9/22/10
15	Ore Stockpile Regrading	10 days	Tue 8/17/10	Wed 9/1/10
16	Channel Regrading	2 days	Thu 9/23/10	Sat 9/25/10



Project: Reclamation Schedule
Date: Mon 5/29/06

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

APPENDIX A
Backup Data and Vender Quotes

775 778 6900

To: Ryan

From: JD

181

Aurora Inn

STAMPEDE

VEHICLE RENTALS

Conveniently located at the AURORA INN.

Reasonably priced newer model 4WD vehicles for your driving pleasure. Pickups, vans and SUV's available.

Unlimited mileage.

Rates from $90 - ~~$115~~/day.

For Reservations,

please call:

(907) 443-3838

or

1-800-354-4606

All trucks, SUV's are $90/day

Vans are $130/day

Thanks
— Sean

CRAIG TAYLOR

1733 WELL STREET
FAIRBANKS, AK 99701

PHONE: (907)452-1192 FAX: (907)451-8982

5/5/06 current exchange rate $1 USD = $1.302.02

FACSIMILE TRANSMITTAL

THIS TRANSMITTAL IS PAGE 1 OF ____ PAGES
TO THE ATTENTION OF: Ryan Baker
COMPANY: Smith Williams Consultants
THIS FAX IS SENT BY: John Miscovich
DATE: 5-3-06

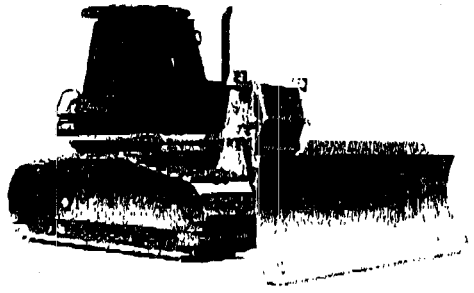
COMMENTS/SUBJECT: This Info is from Coneco Equipment in Canada. Please remember to convert to U.S. Dollars.

Disregard The 3 month Rate and for a MINE Application tack on another 60% to the Monthly Rate as well as a disclaimer stating that Tires, undercarriage on Dozers and excessive wear are Not included in Rate.

Thank you.

775-778-6900 FAX.

Mine Application is 24hrs/d, 7dy/wk. Per J.M.

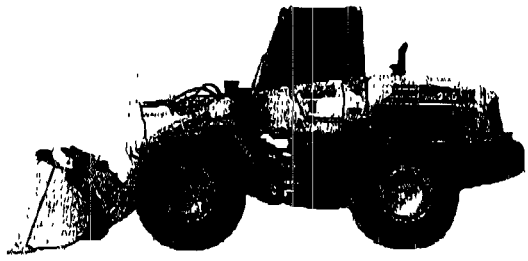


	Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate	US monthly Rate
	D21A	235	950	2750	2500	8	
	D21P	250	1000	3000	2700	9	
	D31E	550	1650	5000	4500	15	
	D31P	465	1850	5500	5000	17	
	D37E	465	1850	5500	5000	17	
	D37P	500	2000	6000	5500	18	
	D39E	500	2000	6000	5500	18	
	D39P	550	2150	6500	6000	20	
	D41E	585	2350	7000	6500	21	
	D41P	625	2500	7500	7000	23	
	D61E	965	3850	11500	9500	35	
	D61P	1125	4500	13500	11500	41	
	D65E	1215	4850	14500	12000	44	
	D65P	1465	5850	17500	15000	53	
	D85E	1465	5850	17500	15000	54	
	D85P	1675	6700	20000	17500	60	
D8	D155A	1675	6700	20000	17500	60	18090 x 1.6 = $28,864
D9	D275A	2500	10000	30000	25000	90	27060 x 1.6 = $43,296
D10	D375A	3000	12000	35000	30000	105	31570 x 1.6 = $50,512
	D475A	4250	17000	50000	45000	150	
	D575A				P.O.R.		

- Utility product

Tractors

Wheel Loaders

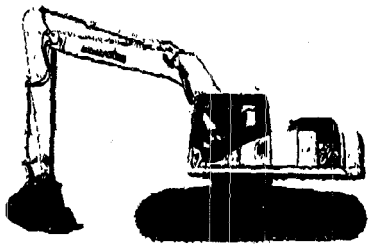


Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
WA30	175	700	2000	1800	6
WA50	215	850	2500	2250	8
WA65	250	1000	3000	2700	9
WA75	300	1200	3500	3150	12
WA95	350	1400	4000	3600	14
WA120	415	1650	5000	4500	15
WA200	500	2000	6000	5500	18
WA250	590	2350	7000	6500	21
WA320	675	2700	8000	7500	24
WA380	840	3350	10000	9000	30
WA420	1000	4000	12000	11000	36
WA450	1250	5000	15000	13500	45
WA480	1375	5500	16500	14850	50
980 – WA500	1465	5850	17500	15000	53 –
988 – WA600	1565	6250	25000	22500	75
WA700			53000	48000	159
992 WA800			67000	60000	201
WA900			72000	65000	216

03 Monthly Rate

60,434

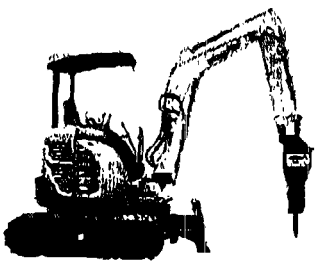
- Utility product



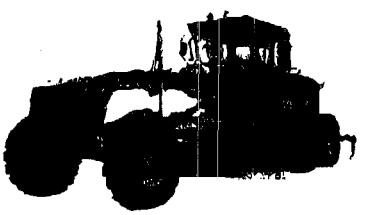
Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
PC09	115	450	1350	1215	4
PC15	150	585	1750	1575	5
PC27	175	675	2000	1800	6
PC35	225	850	2500	2300	8
PC40	250	1000	3000	2700	9
PC50	340	1350	4000	3600	12
PC58	365	1450	4250	3800	13
PC78	375	1500	4500	4000	14
PC95	425	1675	5000	4500	15
PC120	500	2000	6000	5000	18
PC138	525	2100	6250	5600	19
PC158	550	2200	6500	5850	20
PC160	600	2400	7000	6000	21
PW170	850	3400	10000	9000	30
PC200	625	2500	8000	7000	24
PC220	850	3400	10000	9000	30
PC228	850	3400	10000	9000	30
PC270	1000	4000	12000	10000	36
PC300	1125	4500	13000	11000	39
PC308	1125	4500	13000	11000	39
PC400	1350	5400	16000	14000	48
PC600	2125	8500	25000	22500	75
PC750	2500	10000	30000	27000	90
PC1250	3375	13500	40000	36000	120

- Utility product

Excavators W/Breakers
Graders

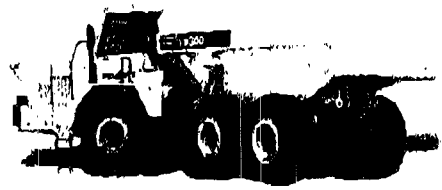


Model	10 hr day	50 hr week	200 hrh month	3 month rate	O.T. rate
PC27	350	1400	4000	3600	25
PC45	425	1700	5000	4500	35
PC200	1250	5000	15000	14000	75
PC300	2000	7000	21000	20000	105



Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
GD530	715	2850	8500	7650	26
GD650/655	800	3200	9500	8550	29
GD650AW	875	3500	10500	9450	32
GD670/675	975	3900	11500	10350	35
GD670AW	1050	4200	12500	11250	38
GD750	1250	5000	15000	13500	45
GD825	2125	8500	25000	22500	75

- Utility product

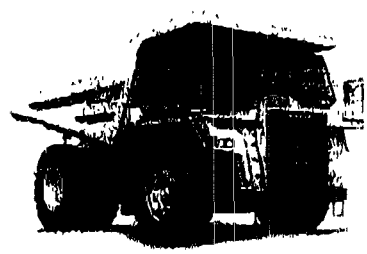


Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
MT30/31/HM300	1200	4700	14000	13000	42
MT36/HM350	1500	6000	18000	16000	54
MT40/HM400	1675	6700	20000	18000	60

← comparable to CAT 735

$16,236 × 60% increase for mine application

$25,978/mo



Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
HD325	1375	5500	16000	14500	48
HD465	1750	7000	20000	18000	60
HD605	1875	7500	22000	20000	66

69.4 ton

$6765

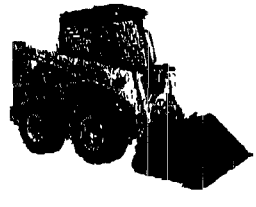
$19,844 × 60% mine application increase

= $31,750 /month

Articulated Trucks
Rigid Trucks

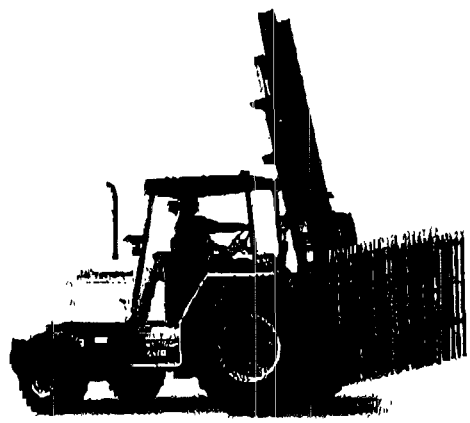
Backhoe Loaders
Skidsteers

Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
BL275(32HP)	120	475	1400	1260	
BL370(46HP)	140	550	1600	1440	
BL375(46HP)	140	550	1600	1440	
BL570(56HP)	175	675	2000	1800	
BL575(56HP)	175	675	2000	1800	
WB140(86HP)	350	1350	4000	3600	12
WB150(98HP)	375	1500	4500	4100	14



Model	10 hr day	50 hr week	200 hr month	3 month rate
463	165	650	2000	1800
553	175	700	2100	1900
753	250	750	2250	2000
763/SK714/SK815	275	800	2400	2200
773/S185/SK818	285	850	2500	2250
863/SK820	300	875	2625	2400
873/SK1020/S250	325	950	2850	2600

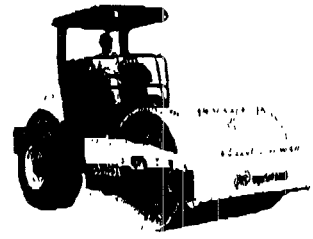
- Utility product



Model	10 hr day	50 hr week	200 hr month	3 month rate
RT708	340	1350	4000	3600
VR518	325	1300	3800	3400
VR530	340	1350	4000	3600
VR623	340	1350	4000	3600
VR642	360	1430	4250	3800
VR843	400	1500	4500	3900
VR1044	425	1700	5000	4500
VR1056	500	2000	6000	5400
WA120F	500	2000	6000	5400
WA200F	600	2400	7000	6000
WA250F	675	2700	8000	7000
WA320F	850	3400	10000	8000

- Utility product

Ride on Soil Compactors



Model	10 hr day	50 hr week	200 hr month	3 month rate	O.T. rate
SD25D	215	850	2500	2250	8
SD25F	250	1000	3000	2700	9
SD45D	345	1370	4100	3700	12
SD45F	365	1450	4300	3900	13
SD77D	425	1700	5000	4500	15
SD77F	465	1850	5500	4000	17
SD100/105D	500	2000	6000	5400	18
SD100/105F	550	2200	6500	5850	20
SD110D	550	2200	6500	5850	20
SD110F	600	2400	7000	6300	21
SD115D	600	2400	7000	6300	21
SD115F	625	2500	7500	6750	23
SD122D	625	2500	7500	6750	23
SD122F	675	2700	8000	7200	24
SD160D	675	2700	8000	7200	24
SD160F	725	2850	8500	7650	26
SD200D	750	3000	9000	8100	27
SD200F	800	3200	9500	8500	29

- Utility product

N C MACHINERY
ALASKA RENTAL RATES
2006

TRACK TYPE TRACTORS

MODEL	WT	HP	BLADE CAP	DAY	WEEK	MONTH
D3G	16,300	70	1.88 CU YD	375	1250	3500
D4G	17,300	80	2.50	395	1350	3800
D5G	19,700	90	2.86	475	1525	4600
D5N	28,300	115	3.40	575	1825	5700
D6N	34,250	140	4.16	750	2400	7250
D6R	42,300	185	7.34	1300	3450	9750
D7R	55,000	240	8.98	1650	4850	14500
D8T	83,500	305	15.30	1995	6200	17000
D9T	108,000	410	21.40	3300	9250	27000
D10	145,500	580	28.70	4500	14000	36000

LOW GROUND PRESSURE

MODEL	WT	HP	BLADE CAP	DAY	WEEK	MONTH
D3G LGP	17,200	70	2.00	445	1325	3950
D4G LGP	18,000	80	2.40	475	1425	4250
D5G LGP	20,500	90	3.10	550	1650	4900
D5N LGP	29,300	110	3.40	675	2050	6100
D6N LGP	37,300	140	4.11	875	2600	7800
D6R LGP	46,400	185	4.83	1170	3500	10500

Winches are available for some models for an additional 20% of the rental rate

HYDRAULIC EXCAVATORS

MODEL	WT	HP	BUCKET CAP	DAY	WEEK	MONTH
301.5/8	4,000	17.4	0.05	250	750	1950
302.5	6,000	22.5	0.07	250	750	1950
303 CR	7,500	24	0.07	275	800	2400
304CR	9,900	25.5	0.15	325	950	2800
305CR	11,000	37.4	0.21	350	1050	3100
307	16,000	54	0.37	400	1250	3750
307 SWING BOOM	18,500	54	0.37	400	1250	3750
308	18,000	55	0.37	400	1250	3750
311	27,680	79	0.75	450	1600	4500
312L	29,000	90	0.75	460	1700	4700
315L	37,000	110	0.90	625	1825	5400
318L	43,300	125	1.50	635	1950	5800
320L	46,500	138	1.50	725	2450	7250
320L Utility	51,000	138	1.50	725	2450	7250
322L	53,350	165	1.50	825	2470	7400
325L	63,000	188	1.50	1125	3250	9975
330L	77,400	247	1.88	1450	4100	12250
345L	98,000	321	3.00	1795	5250	15500
365L	149,000	404	4.00	2600	8995	22000
385L	190,000	513		3400	10250	27500

EXTRA EXCAVATOR BUCKET

	DAY	WEEK	MONTH
301 - 305	40	120	350
307 - 312	55	155	465
315 - 320	65	185	550
325 - 330	75	220	650
345 - 350	90	270	800
365 - 385	105	310	925

N C MACHINERY
ALASKA RENTAL RATES
2006

BACKHOE LOADERS

MODEL	WT	HP	DIG DEPTH	DAY	WEEK	MONTH
416D w/o e-stick	16,700	80	14'5"	300	860	2625
416D	17,200	80	18'2"	300	860	2625
420D	17,500	85	18'2"	325	950	2850
430D	18,000	94	19'11"	350	1035	3100
420D IT (toolcarrier)	19,500	85	18'2"	350	1035	3100
430D IT (toolcarrier)	20,000	94	19'11"	390	1170	3500
Frost Bucket is additional				50	100	450
Extra Bucket				30	80	275

All models are 4WD, Cab and e-stick, tool carrier version includes forks

INTEGRATED TOOL CARRIERS

MODEL	WT	HP	BUCKET CAP	DAY	WEEK	MONTH
924G	22,800	114	2.25	400	1200	3600
IT28G	26,500	125	2.5	460	1375	4125
930G	29,000	149	3.00	460	1375	4125
IT62G	40,225	200	4.5	800	2400	7200
IT Fork Attachment				50	150	450

WHEEL LOADERS

MODEL	WT	HP	BUCKET CAP	DAY	WEEK	MONTH
938G	29,000	160	3.5	650	2100	6100
950G	39,200	180	4.0	690	2500	7100
962G	41,000	200	4.5	875	2800	8350
966G	50,500	235	5.0	1225	3600	11750
972G	55,300	265	6.0	1450	4700	14500
980G	66,500	311	7.0	1725	5150	15995
988	110,000	475	8.0	2350	6995	21000

MOTOR GRADERS

MODEL	WT	HP	BLADE	DAY	WEEK	MONTH
140H	33,500	185	14 FOOT	875	2700	7975
160H	35,500	220	14 FOOT	1125	3300	9750
14H	42,650	240	14 FOOT	1600	4400	13295
16H	54,500	275	16 FOOT	2600	6750	19750

ARTICULATED DUMP TRUCKS

MODEL	WT	HP	CAPACITY	DAY	WEEK	MONTH
725	48,000	280	18.8 Yds	1500	3895	11500
730	50,000	305	22.1	1700	4450	14000
730 Ejector	56,330	317	22.1	1750	5250	14995
735	66,000	365	24.8	1800	5400	15975
740	72,000	415	30.0	1950	5650	16750
740 Ejector	77,660	415	30.0	2400	6100	17775

ASPHALT DRUM COMPACTORS

MODEL	WT	HP	WIDTH	DAY	WEEK	MONTH
CB224	5,750	31.5	47"	250	750	2200
CB334	8,500	43	51"	295	895	2750
CB434	14,300	70	56"	460	1375	4120
CB534	20,270	105	67"	575	1720	5150
CB634	25,750	145	84"	690	2070	6200

N C MACHINERY
ALASKA RENTAL RATES
2006

SOIL DRUM COMPACTORS

MODEL	WT	HP	WIDTH	DAY	WEEK	MONTH
CS323	10,000	70	50"	395	1250	3550
CS433	15,000	100	66"	500	1495	4700
CS563	25,000	153	84"	595	1900	5650
CS583	34,000	153	84"	635	1995	5950
CS663	37,000	179	84"	690	2200	6500
CS683	41,000	179	84"	745	2400	7200
Elliot Grid				125	350	1030

TELESCOPIC MATERIAL HANDLERS

MODEL	WT	CAP LB	LIFT HT	DAY	WEEK	MONTH
TH350B	18,700	6600	36	300	900	2700
TH360B	21,000	7000	44	325	975	2925
TH460B	24,000	9000	44	360	1200	3350
TH560B	26,500	11000	44	435	1300	3900
TH580B	30,100	11000	56	475	1400	4200
3'X3' Basket				65	200	600
4'x8' Platform				100	300	900
Bucket 1.75 cu. Yd.				50	105	310

HYDRAULIC COMPACTION PLATES

MODEL	WT	FORCE	EX MODELS	DAY	WEEK	MONTH
CVP40	910	7800	416/420/430	125	350	1030
CVP75	1,600	16000	312/315	200	600	1800
CVP110	2,300	24500	320/325/330	225	800	2400

HYDRAULIC HAMMERS

MODEL	WT	ENERGY *	EX MODELS	DAY	WEEK	MONTH
H55/H55S/H63			SSL,303-304	200	650	1950
H90			416/420/430	300	860	2575
H100			312/315	770	2300	6900
H130			320/325	900	2600	7500
H160			330	1450	4100	12250
H180			345	1795	5250	15500

SKIDSTEER LOADERS

MODEL	LOADER TYPE	OPER. CAP. *	HP	DAY	WEEK	MONTH
216	Radial	1,400	48	195	620	1850
226	Radial	1,500	54	195	700	2100
236	Radial	1,750	59	195	770	2300
246	Radial	2,000	74	215	860	2575
248 Hi Flo	Radial	2,000	74	225	900	2700
232	Vertical Lift	1,750	49	195	700	2100
242	Vertical Lift	2,000	54	195	770	2300
252	Vertical Lift	2,250	59	215	860	2575
262	Vertical Lift	2,500	74	225	900	2700
268 Hi Flo	Vertical Lift	2,500	74	225	900	2700
247	Track	1,993	54	300	900	2700
257	Track/Vertical	2,306	59	300	900	2700
267	Track	2,900	59	325	950	2850
277	Track	2,950	74	325	950	3600
287	Track/Vertical	3,500	74	325	1275	3800
287 Hi Flo	Track/Vertical	3,500	74	355	1420	4260

* 50% of tipping Load

N C MACHINERY
ALASKA RENTAL RATES
2006

SKIDSTEER ATTACHMENTS

	NOTES	SSL MODELS	DAY	WEEK	MONTH
Auger w/ 1 bit		ALL	100	400	1200
Auger bit		ALL	20	80	240
Auger ext		ALL	5	20	60
Blade, angle	84"	ALL	75	300	900
Broom, angle	$75 / inch of wear	ALL	85	340	1020
Broom, 60" pickup	$75 / inch of wear	ALL	90	360	1080
Broom, 66" pickup	$75 / inch of wear	236/246	100	400	1200
Bucket, grapple		ALL	75	300	900
Bucket, utility		ALL	20	80	240
Cold Planer, PC210	40" drum	Hi Flo	300	925	2750
Compactor, vibratory roller	73" drum	236/246	65	250	750
Forks, utility grapple		ALL	50	200	600
Fks, pallet		ALL	20	80	240
Hammer		236/246	200	650	1950
Rake, LR15	62" working width	ALL	75	300	900
Rake	74" working width	236/246	80	320	960
Trencher	8" x 48"	ALL	200	650	1800

LIGHT TOWERS

MODEL	LIGHTS	GENERATOR	FUEL CAP	DAY	WEEK	MONTH
PRO	4 - 1000 WATT	6 KW	30 GAL	95	250	750
8330	4 - 1000 WATT	8 KW	50 GAL	95	285	850

AIR COMPRESSORS

MODEL	CFM	DAY	WEEK	MONTH
185	185	95	340	1020
375	375	150	600	1800
Extra 50' air hose		5	15	45

HEATERS

	DESCRIPTION	CAPACITY	DAY	WEEK	MONTH
600 DR	Rig Heater	600kBTU	380	1140	3420
E3000	Ground Heater	6000 ft^2	600	2100	6300
Red Wave Blanket		6' x 125'		40	100

PUMPS

	DESCRIPTION	CAPACITY	DAY	WEEK	MONTH
6" Trash Pump	Godwin	1700 gpm	210	625	1875

N C MACHINERY
ALASKA RENTAL RATES
2006

SHORING (TRENCH BOXES)

	DESCRIPTION	Dimensions	DAY	WEEK	MONTH
BH7	Bedding Box	7 cu yd	100	300	900
BH9	Bedding Box	9 cu yd	120	360	1080
MH8DW	Manhole	8X8	70	210	630
MH810DW	Manhole	10X10	70	210	630
4M816	Trenchbox	4"X8'X16'	125	375	1125
4M820	Trenchbox	4"X8'X20'	135	405	1215
6M424	Trenchbox	6"X4'X24'	105	315	945
6M824	Trenchbox	6"X8'X24'	165	495	1485
8DS36S	Spreaders	36" set of 4	20	60	180
8DS48S	Spreaders	48" set of 4	25	75	225
8DS60S	Spreaders	60" set of 4	35	105	315
8DS72S	Spreaders	72" set of 4	40	120	360

AERIAL

	MAKE	DESCRIPTION	WIDTH	DAY	WEEK	MONTH
GS1930	GENIE	19' Scissorlift	30"	125	350	895
GS2032	GENIE	20' Scissorlift	32"	125	350	895
GS2632	GENIE	26' Scissorlift	32"	150	600	
GS2646	GENIE	26' Scissorlift	46"	150	600	
GS3268DC	GENIE	32' Scissorlift	68"	200	800	
GS3268RT	GENIE	32' Scissorlift	68"	200	800	
GS4390RT	GENIE	43' Scissorlift	90"	250	900	
GS5390RT	GENIE	53' Scissorlift	90"	350	1000	2900
S40	GENIE	40' Manlift		250	850	2500
S45	GENIE	45' Manlift		300	900	2700
S65	GENIE	65" Manlift		450	1500	4500
Z45	GENIE	45' Manlift		300	900	2700
Z60	GENIE	60' Manlift		450	1500	24500
Z85	GENIE	85' Manlift		1050	3150	9400

SMALL COMPACTION

	MAKE	DESCRIPTION	DAY	WEEK	MONTH
MT 65	MQ	Jumping Jack	75	300	900
MVH 88	MQ	Plate compactor	75	300	900
MVH 402DS	MQ	Reversible Plate	150	450	1350
RT56/86	WACKER	Remote Roller	350	1050	3000

N C MACHINERY
ALASKA RENTAL RATES
2006
IMPORTANT INFORMATION

Rates quoted are for 10-hour days, 50 hour weeks and 200-hour months. All rates are based on single shifts
Minimum daily rental is for an 10-hour day.
Double shift rates will be charged at 1.5 times the published single shift rat
Unlimited hour rate will be charge at 2 times the published single shift rat
This rental rate card does not indicate that NC Machinery Co. carries all models in inventor

- Rental rates DO NOT include pick-up and delivery charges or fuel
- Measurements may vary depending upon how unit is equipped.

RATES SUBJECT TO CHANGE WITHOUT NOTICE

RENTAL AGRREMENT TERMS AND CONDITIONS

Leassee is responsible for or agrees to the following:

- Normal daily maintenance and service of machine.
- Servicing and changing all lubricants and fluids at required intervals (Note: filters, oil and labor are at renter's expense.
- Lubricating required areas daily.
- Returning unit in reasonably clean condition. Minimum cleaning charge of $100 will be assessed if returned excessively dirty.
- Cylinder head problems caused by lack of or low level coolant.
- Cutting edges and ground engaging tools.
- Excessive tire wear and / or damage.
- Missing fuel, attachments and excessive cleaning.
- Any damage to the machine due to neglect or abuse of the machine
- Returns the machine in good condition, less normal wear and tear.
- Leassor has the right to terminate rental, when in their opinion the machines are being damaged by improper use.
- All transportation is the responsibility of the leassee.
- Return machine to point of origin.
- Maintain liability, theft, vandalism, and fire insurance.

Anchorage Rental Headquarters (907) 786-7500

TOLL FREE:
Anchorage
1-800-478-7000 (in Alaska)
1-800-433-9120 (outside Alaska)
Fairbanks
1-888-852-6760
Juneau
1-800-478-0478

Juneau	(907) 789-0181
Fairbanks	(907) 452-7251

FUEL, LUBE AND WEAR CALCULATIONS				
EQUIPMENT TYPE	**PM Cost Per Hour**(1)	**Under carriage or Tires** (2)	**G.E.T Consumption** (3)	**Hourly Maintenance Equipment Cost**
Bulldozers				
D6R	$2.99		$2.96	$5.95
D7R	$3.10		$4.39	$7.49
D8R	$3.42		$5.35	$8.77
D9R	$4.16		$8.78	$12.94
D10R	$4.29		$12.27	$16.56
D11R	$5.67		$19.05	$24.72
Motor Graders				
14G/H	$2.68	$4.73	$8.81	$16.22
16G/H	$3.14	$5.89	$12.03	$21.06
Track Excavators				
320C	$2.88		$2.35	$5.23
325C	$2.88		$3.25	$6.13
345B	$3.61		$4.07	$7.68
385 BL	$4.04		$7.80	$11.84
Scrapers				
631G	$4.05	$7.54	$4.87	$16.46
637G PP	$5.90	$7.54	$6.11	$19.55
Wheeled Loaders				
928G	$2.45	$2.36	$2.64	$7.45
966G	$2.85	$4.49	$6.17	$13.51
972G	$2.92	$4.49	$6.76	$14.17
988G	$4.74	$6.91	$8.34	$19.99
992G	$6.77	$14.64	$19.73	$41.14
Hydrauilc Hammers				
H-120 (fits 325)	N/A		$3.34	$3.34
H-160 (fits 345)	N/A		$6.62	$6.62
H-180 (fits 365/385)	N/A		$7.86	$7.86
Other Equipment				
420D 4WD Backhoe	$2.36	$1.05	$1.98	$5.39
CS563E Vibratory Roller	$3.04		N/A	$3.04
Light Truck - 1.5 Ton	N/A		N/A	$0.00
Supervisor's Truck	N/A		N/A	$0.00
Air Compressor + tools	N/A		N/A	$0.00
Welding Equipment	N/A	$0.00	N/A	$0.00
Heavy Duty Drill Rig	N/A		N/A	$0.00
Pump (plugging) Drill Rig	N/A		N/A	$0.00
Concrete Pump	N/A		N/A	$0.00
Gas Engine Vibrator	N/A		N/A	$0.00
25 Ton Crane	N/A		N/A	$0.00
Trucks				
769D	$4.75	$3.50	$1.98	$10.23
777D	$6.92	$9.76	N/A	$16.68
613E (5,000 gal) Water Wagon	$2.00	$2.29	N/A	$4.29
621E (8,000 gal) Water Wagon	$3.15	$2.50	N/A	$5.65
Dump Truck (10-12 yd^3)	$4.75	$3.50	N/A	$8.25

Notes:

(1) PM Source: August 2005 Cashman Equipment Rental Rates, Elko, NV (except as noted)
(2) Undercarriage Source: D&D Tire, Inc. 09/06/2005
(3) G.E.T. Source: CAT Historical Data, Cashman Equipment, Elko, NV
(4) Fuel Use Source: Caterpillar Handbook, Edition 35, Ch. 20; or estimated average for smaller vehicles

TIRE COST TABLES

Equipment	Tire Size	# of Tires Per Piece of Equipment	Cost Per Tire	Tire Cost (1)(2)	Life Expectency Hours (Low/Zone A) (3)	Tire Cost per Hour
Bulldozers						
D6R			N/A			
D7R			N/A			
D8R			N/A			
D9R			N/A			
D10R			N/A			
D11R			N/A			
Motor Graders						
14G/H	20.5R25	6	$2,757.40	$16,544.40	3,500	$4.73
16G/H	23.5R25	6	$3,434.85	$20,609.10	3,500	$5.89
Track Excavators						
320C			N/A			
325C			N/A			
345B			N/A			
385 BL			N/A			
Scrapers						
631G	37.25R35	4	$7,542.90	$30,171.60	4,000	$7.54
637G PP	37.25R35	4	$7,542.90	$30,171.60	4,000	$7.54
Wheeled Loaders						
928G	17.5R25	4	$2,658.80	$10,635.20	4,500	$2.36
966G	26.5R25	4	$5,049.00	$20,196.00	4,500	$4.49
972G	26.5R25	4	$5,049.00	$20,196.00	4,500	$4.49
988G	35/65-33	4	$7,774.10	$31,096.40	4,500	$6.91
992G	45/65R45	4	$16,471.30	$65,885.20	4,500	$14.64
Hydrauilc Hammers						
H-120 (fits 325)			N/A			
H-160 (fits 345)			N/A			
H-180 (fits 365/385)			N/A			
Other Equipment						
420D 4WD Backhoe	195LR24	2 + 2	$1,578.00	$3,156.00	3,000	$1.05
CS563E Vibratory Roller			N/A			
Light Truck - 1.5 Ton			N/A			
Supervisor's Truck			N/A			
Air Compressor + tools			N/A			
Welding Equipment						
Heavy Duty Drill Rig			N/A			
Pump (plugging) Drill Rig			N/A			
Concrete Pump			N/A			
Gas Engine Vibrator			N/A			
25 Ton Crane			N/A			
Trucks						
769D	18.00R33	6	$3,496.90	$20,981.40	6,000	$3.50
777D	27.00R49	6	$8,134.50	$48,807.00	5,000	$9.76
613E (5,000 gal) Water Wagon	23.5R25	4	$3,435.70	$13,742.80	6,000	$2.29
621E (8,000 gal) Water Wagon	33.25R29	4	$5,001.40	$20,005.60	8,000	$2.50
Dump Truck (10-12 yd^3)		6	$3,496.90	$20,981.40	6,000	$3.50

Notes:

(1) Unit Cost Basis: Cost per set

(2) Cost Basis: Total cost for all required tires.

(3) Tire Cost Source: D&D Tire, Inc. 09/06/2005

(4) Tire Wear Source: Caterpillar Handbook, Edition 35; Ch. 20

CASHMAN CAT
5010 E. Idaho Street, Elko, NV 89801 | Phone: (775) 738-9871 | Fax: (775) 738-7865

Mr. Jim Collard
CORTEZ GOLD MINES
HC66 Box 1250
Crescent Valley, Nevada 89821-1250

Dear Jim;

Thank you for your recent request for additional rental rates from **CASHMAN EQUIPMENT.**

Attached you will find the additional machines you asked about.

The rental costs shown were obtained from **CASHMAN EQUIPMENT'S** current rental rate schedule; the PM Costs were obtained from **CASHMAN EQUIPMENT** historical data and assume a lube truck on site; G.E.T. consumption was obtained from **CATERPILLAR** historical data and the Fuel Consumption rates were obtained from the **CATERPILLAR PERFORMANCE HANDBOOK (Edition 35),** Owning & Operating Costs, Section 20, using the 'average' or the 'medium' consumption levels. Neither undercarriage or tire costs are included in these rates.

Please note the following: The monthly rental rate is calculated on a single-shift, 176-SMU hour month; all machines are subject to availability and quoted F.O.B. **CASHMAN EQUIPMENT** yard; any necessary assembly and/or disassembly costs are not included (although the machines listed herein can be hauled assembled in most all areas of the state); major repairs to engines, transmissions, torque converters, wheel groups and differentials is included in the rental cost (unless caused by abuse, negligence, etc.); expenses incurred in the day-to-day operations of each machine (fuel, operator, insurance, etc.) is not included in the rental rate. Also, these rates are subject to change due to unforeseen circumstances that may arise.

Also, specific to the hammer prices, the rates quoted must be added to the rate for the corresponding machine that the respective hammer fits.

Last, the rates quoted would be available to any credit-worthy customer, as well as to any recognized local, state or Federal governmental agency such as the Nevada Department of Environmental Quality, Bureau of Land Management or U.S. Forest Service.

Thanks again, Jim! If there is anything further you need, please feel free to give me a call.

With Best Regard
CASHMAN EQUIPMENT,

Tony P. Araquistain
Mine Sales Representative

Encl.

MACHINE	MONTHLY RATE 176 SMU HRS	PM COST PER HOUR	G.E.T. COST PER HOUR	FUEL USAGE GAL/PER HOUR
TRACTORS				
D3G	$3,495.00	$2.22	$0.95	3.25
D4G	$3,995.00	$2.35	$1.08	3.25
D5G	$5,395.00	$3.34	$1.27	3.75
D5N	$5,995.00	$3.37	$1.68	3.75
D6N	$6,575.00	$3.78	$2.39	4.75
D6R	$8,995.00	$2.99	$2.96	5.75
EXCAVATORS				
301	$1,595.00	$2.56	$1.57	0.7
302	$1,740.00	$2.56	$1.63	0.95
303	$2,375.00	$2.56	$1.69	1.15
304	$2,950.00	$2.56	$1.74	1.38
305	$3,290.00	$2.56	$1.80	1.63
307	$3,495.00	$2.56	$1.82	1.65
308	$3,495.00	$2.56	$1.90	1.75
312	$4,300.00	$3.03	$2.05	1.87
313	$4,425.00	$3.05	$2.30	2
314	$4,300.00	$3.05	$2.30	2
315	$5,485.00	$2.88	$7.03	2.85
320	$6,700.00	$2.88	$2.35	4.9
325	$7,300.00	$2.88	$3.25	6.6
330	$8,506.00	$3.54	$2.98	8.25
345	$10,000.00	$3.61	$4.07	10.6
SCRAPERS				
613	$7,500.00	$3.42	$4.70	6
615	$10,950.00	$3.70	$5.67	8.75
WATER WAGON				
613 (5,000 GAL)	$8,395.00	$2.00	NA	10.75
WATER TOWER				
MPT-10 (10k GAL)	$1,395.00	NA	NA	NA
MPT-12 (12k GAL)	$1,495.00	NA	NA	NA
OFF-HWY TRUCK				
769 (35-TON)	$12,320.00	$4.75	$1.84	9.25
773 (50-TON)	$16,250.00	$5.70	$2.21	13
LDR/BACKHOE				
416	$2,625.00	$2.36	$1.80	2.75
420	$2,900.00	$2.36	$1.98	3
430	$3,135.00	$2.36	$2.05	3.25
446	$4,995.00	$2.51	$2.10	3.7
COMPACTORS				
815	$9,950.00	$3.54	$5.11	10.25
825	$15,250.00	$3.67	$5.97	14.25

MACHINE	MONTHLY RATE 176 SMU HOURS	PM COST PER HOUR	G.E.T. COST PER HOUR	FUEL USAGE GAL/PER HOUR
HAMMERS				
H-70 (fits 416)	$2,100.00	NA	$1.46	NA
H-90 (fits 420/430)	$2,315.00	NA	$1.69	NA
H-100 (fits 446)	$3,060.00	NA	$2.38	NA
H-115 (fits 320)	$3,475.00	NA	$2.96	NA
H-120 (fits 325	$4,840.00	NA	$3.34	NA
H-140 (fits 330/345)	$5,940.00	NA	$4.75	NA
H-160 (fits 345)	$6,950.00	NA	$6.62	NA
H-180 (fits 365/385)	$8,210.00	NA	$7.86	NA
INTEGRATED	TOOLCARRIERS			
IT-14	$3,475.00	$2.60	$2.06	2.25
IT-24	$4,125.00	$2.79	$2.55	2.75
IT-28	$4,880.00	$3.27	$2.64	3.5
IT-38	$5,765.00	$3.28	$3.23	4
IT-62	$7,785.00	$3.22	$6.17	4.45
MOTORGRADERS				
140H	$7,400.00	$2.50	$6.10	4.5
14H	$11,300.00	$2.68	$8.81	6.25
WHEEL LOADERS				
914	$3,485.00	$3.01	$2.06	2.25
924	$4,195.00	$3.08	$2.55	2.75
928	$4,995.00	$2.45	$2.64	3.5
938	$5,450.00	$3.18	$3.23	4
950	$6,950.00	$3.05	$4.90	4
962	$7,550.00	$3.38	$6.17	4.05
966	$9,900.00	$2.85	$6.17	5.75
972	$10,900.00	$2.92	$6.76	6.25
980	$11,900.00	$3.53	$7.79	7.5

D&D TIRE, INC.

THE TIRE PROFESSIONALS

"Providing uncompromising *VALUE* in products, services and information which will enrich our customers"

June 2, 2004

Roger Tallini
Placer Dome Cortez Mine
Senior Environmental Engineer
HC 66 Box 1250
Crescent Valley, Nv 89821-1250

Dear Mr. Tallini,

We have assembled the following quote based on the following parameters:

- Equipment descriptions provided by you
- All tires quoted are Goodyear and are all designed for mining application (a heaver tire) and not construction (a lighter tire)
- The stated pricing herein is good for any private party
- Pricing is good for one year and subject to change based on market conditions thereafter

Description	***# Wheel Positions***	***Tire Size***	***Tire Cost***	***Extended Cost***
631G Scraper	4	37.25R35	$7,325.00	$29,300.00
16H Grader	6	23.5R25	$3,368.00	$20,208.00
988F Loader	4	875/65R33	$6,764.00	$27,056.00
992G Loader	4	45/65R45	$15,250.00	$61,000.00
621E Water Truck	4	33.25R29	$5,062.00	$20,248.00
777D Haul Truck	6	2700R49	$7,008.00	$28,032.00
Grove RT530E	4	29.5R25	$3,827.00	$15,308.00
16 Ton Dump Truck	10	11R24.5	$489.00	$4,890.00

Roger, thank you for the opportunity to provide you with this information. If I can be of any further assistance please do not hesitate to contact me.

Sincerely,

Britt T. Johnson
Vice President
D&D Tire, Inc. / ETMS

1505 E. NEWLANDS DR. – FERNLEY, NV 89408
775-575-3321 or 1-800-873-2353 for ALL LOCATIONS

Equipment	Tire Size	# of Tires Per Piece of Equipment	June 2005 Cost Per Tire	Tire Cost (1)(2)	Life Expectency Hours (Low/Zone A) (3)	Tire Cost per Hour
Motor Graders						
140H	17.5R25	6	$ 2,658.80	$ 15,952.80	3,500	$4.56
14H	20.5R25	6	$ 2,757.40	$ 16,544.40	3,500	$4.73
16H	23.5R25	6	$ 3,434.85	$ 20,609.10	3,500	$5.89
Trucks						
Dump Truck (10-12 yd^3)			$ -			
769D	18.00R33	6	$ 3,496.90	$ 20,981.40	6,000	$3.50
773E	24.00R35	6	$ 6,514.40	$ 39,086.40	6,000	$6.51
777D	27.00R49	6	$ 8,134.50	$ 48,807.00	5,000	$9.76
Scrapers						
613C	18.00R25	4	$ 3,171.35	$ 12,685.40	4,000	$3.17
615C	26.5R25	4	$ 5,049.00	$ 20,196.00	4,000	$5.05
631G	37.25R35	4	$ 7,542.90	$ 30,171.60	4,000	$7.54
637G PP	37.25R35	4	$ 7,542.90	$ 30,171.60	4,000	$7.54
Wheeled Loaders						
914G	17.5R25	4	$ 2,658.80	$ 10,635.20	4,500	$2.36
924G	17.5R25	4	$ 2,658.80	$ 10,635.20	4,500	$2.36
928G	17.5R25	4	$ 2,658.80	$ 10,635.20	4,500	$2.36
938G	20.5R25	4	$ 2,758.25	$ 11,033.00	4,500	$2.45
950G	23.5R25	4	$ 3,435.70	$ 13,742.80	4,500	$3.05
962G	23.5R25	4	$ 3,435.70	$ 13,742.80	4,500	$3.05
966G	26.5R25	4	$ 5,049.00	$ 20,196.00	4,500	$4.49
972G	26.5R25	4	$ 5,049.00	$ 20,196.00	4,500	$4.49
980G	29.5R25	4	$ 6,315.50	$ 25,262.00	4,500	$5.61
988G	35/65-33	4	$ 7,774.10	$ 31,096.40	4,500	$6.91
992G	45/65R45	4	$ 16,471.30	$ 65,885.20	4,500	$14.64
Backhoes			***FRONTS***			
416D 4WD	340/80R18-195LR24	2	$ 728.00	$ 1,456.00	3,000	$0.49
420D 4WD	340/80R18-195LR24	2	$ 728.00	$ 1,456.00	3,000	$0.49
430D 4WD	340/80R18-195LR24	2	$ 728.00	$ 1,456.00	3,000	$0.49
446D 4WD	15R19.5--21LR24	2	$ 600.00	$ 1,200.00	3,000	$0.40
			REARS			
		2	$ 850.00	$ 1,700.00	3,000	$0.57
		2	$ 850.00	$ 1,700.00	3,000	$0.57
		2	$ 850.00	$ 1,700.00	3,000	$0.57
		2	$ 937.00	$ 1,874.00	3,000	$0.62
Other Equipment						
Supervisor's Truck (Pickup)		4		$ -		
613E (5,000 gal) Water Wagon	23.5R25	4	$ 3,435.70	$ 13,742.80	6,000	$2.29
621E (8,000 gal) Water Wagon	33.25R29	4	$ 5,001.40	$ 20,005.60	8,000	$2.50

Notes:
1) Total cost for all required tires.
2) Source: D&D Tire, Inc. 09/06/2005
3) Caterpillar Handbook, Edition 34; Estimated Tire Life Curves Ch. 20

GENERAL DECISION: **AK20030001** 05/05/2006 AK1

Date: May 5, 2006
General Decision Number: **AK20030001** 05/05/2006

Superseded General Decision Number: AK020001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	06/13/2003
1	11/28/2003
2	02/06/2004
3	03/05/2004
4	04/02/2004
5	04/16/2004
6	05/14/2004
7	06/18/2004
8	07/23/2004
9	08/06/2004
10	08/20/2004
11	09/10/2004
12	10/01/2004
13	10/15/2004
14	10/22/2004
15	12/10/2004
16	01/21/2005
17	02/11/2005
18	02/18/2005
19	03/04/2005
20	04/22/2005
21	05/20/2005
22	07/08/2005
23	07/29/2005
24	08/12/2005
25	08/26/2005
26	09/02/2005
27	09/16/2005
28	09/23/2005
29	09/30/2005
30	10/28/2005
31	11/18/2005
32	12/16/2005
33	01/27/2006
34	02/10/2006
35	02/17/2006
36	03/17/2006
37	04/07/2006
38	05/05/2006

ASBE0097-001 01/01/2006

```
                                    Rates          Fringes

  Asbestos Workers/Insulator
  (includes application of all
  insulating materials
  protective coverings,
  coatings and finishings to
  all types of mechanical
  systems).......................$ 31.89            10.60
-----------------------------------------------------------------
ASBE0097-002 01/01/2006

                                    Rates          Fringes

  Hazardous Material Handler
  (includes preparation,
  wetting, stripping, removal
  scrapping, vacuming, bagging,
  and disposing of all
  insulation materials, whether
  they contain asbestos or not,
  from mechanical systems)........$ 26.45            10.60
-----------------------------------------------------------------
BOIL0502-002 01/01/2006

                                    Rates          Fringes

  Boilermaker....................$ 34.93            18.52
-----------------------------------------------------------------
BRAK0001-002 07/01/2005

                                    Rates          Fringes

  Bricklayer, Blocklayer,
  Stonemason, Marble Mason,
  Tile Setter, Terrazzo Worker...$ 31.83            13.45
  Tile & Terrazzo Finisher.......$ 26.40            13.45
-----------------------------------------------------------------
CARP1243-003 07/01/2005

North of the 63rd Parallel

                                    Rates          Fringes

  Carpenter/Lather/Drywall
  Applicator.....................$ 31.75            14.51
  Carpenter: Fire or Flood
  Repair Work....................$ 32.33            14.51
  Millwright.....................$ 32.37            14.10
-----------------------------------------------------------------
CARP1281-004 07/01/2005

SOUTH OF 63RD PARALLEL

                                    Rates          Fringes

  Acoustical Applicator and
  Lather.........................$ 30.39            14.05
  Carpenters & Drywallers........$ 30.39            14.05
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  Millwright.....................$ 32.37            14.10
-----------------------------------------------------------------
CARP2520-003 08/01/2005

                                     Rates          Fringes

  Diver
     Stand-by....................$ 34.06            14.05
     Tender......................$ 33.06            14.05
     Working.....................$ 68.12            14.05
  Piledriver
     Carpenter...................$ 30.39            14.05
     Piledriver; Skiff Operator
     and Rigger..................$ 29.39            14.05
     Sheet Stabber...............$ 30.39            14.05
     Welder......................$ 31.39            14.05
-----------------------------------------------------------------
ELEC1547-004 05/02/2005

                                     Rates          Fringes

  Cable splicer..................$ 34.67         3%+14.85
  Electrician;Technician.........$ 32.92         3%+14.85
-----------------------------------------------------------------
* ELEC1547-005 01/01/2006

Line Construction

                                     Rates          Fringes

  Cable splicer..................$ 39.80         3%+17.85
  Linemen (Including Equipment
  Operators, Technician).........$ 38.05         3%+17.85
  Powderman......................$ 36.05         3%+17.85
  Tree Trimmer...................$ 26.85         3%+17.85
-----------------------------------------------------------------
ELEV0019-002 01/01/2006

                                     Rates          Fringes

  Elevator Mechanic..............$ 41.195      13.265+a+b

FOOTNOTE: a.  Employer contributes 8% of the basic hourly rate
    for over 5 year's service and 6% of the basic
    hourly rate for 6 months to 5 years' of service
    as vacation paid credit.   b. Eight paid holidays:
    New Year's Day; Memorial Day; Independence Day;
    Labor Day; Veteran's Day; Thanksgiving Day; Friday after
    Thanksgiving and Christmas Day
-----------------------------------------------------------------
ENGI0302-002 09/01/2005

                                     Rates          Fringes

  Power equipment operators:
     GROUP 1.....................$ 32.92            12.55
     GROUP 1A....................$ 34.46            12.55
     GROUP 2.....................$ 32.25            12.55
     GROUP 3.....................$ 31.62            12.55
     GROUP 4.....................$ 26.20            12.55
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POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller; Back Filler; Barrier Machine (Zipper); Batch Plant Operator: Batch and Mixer over 200 yds.; Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Shovels, Backhoes, Draglines, Clamshells; Gradalls-3 yards and under; (b) Hydralifts or Transporters, all track or truck type,(c) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine Operator, concrete paving, Laser Screed, sidewalk, curb and gutter machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell Sno Cat; Hydro Ax: Feller Buncher and similar; Loaders: Forklifts with power boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps, Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Sauerman-Bagley; Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, C.M.I. and C.M.I. Roto Mills and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler

GROUP 1A: Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Shovels, backhoes, draglines, clamshells-over 3 yards, (b) Tower cranes; Loaders over 5 yds.; Motor Patrol Grader (finish: when finishing to final graders and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Sidebooms over 45 tons; Slip Form Paver C.M.I. and similar types; Scrapers over 40 yards

GROUP 2: Batch Plant Operators: Batch and Mixer 200 yds. per hour and under; Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator; Loaders, Elevating Grader, Dumor and similar; Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trencing Machine under 16 inches.

GROUP 3: "A" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for

hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives:Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Mixers: Concrete Mixers and Batch 200 yds. per hour and under; Oil, Blower Distribution; Post Hole Diggers, mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 300 k.w.; Pumps-water; Rig oiler/assistant engineer, over 45 ton, over 3 yards or over 150 foot boom; Roller-other than Plantmix; Saws, concrete; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Assistant Engineer (Advances to Group III if over 45 tons or 3 yards or 150 ft. boom); Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work.

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* IRON0751-003 08/01/2005

	Rates	Fringes
Ironworkers:		
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER, BENDER OPERATOR	$ 29.05	16.10
FENCE, BARRIER AND GUARDRAIL INSTALLERS	$ 25.55	16.10
GUARDRAIL LAYOUT MAN	$ 26.29	16.10
HELICOPTER, TOWER	$ 30.05	16.10

LABO0341-005 07/01/2005

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1	$ 26.08	12.85
GROUP 2	$ 26.89	12.85
GROUP 3	$ 27.60	12.85
GROUP 3A	$ 30.20	12.85
GROUP 3B	$ 31.28	12.85
GROUP 4	$ 17.81	12.85
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 28.70	12.85
GROUP 2	$ 29.59	12.85
GROUP 3	$ 30.37	12.85
GROUP 3A	$ 33.23	12.85
GROUP 3B	$ 34.42	12.85
Laborers: South of the 63rd Parallel & West of Longitude 138 Degrees		
GROUP 1	$ 26.18	12.75

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GROUP 2.....................$ 26.99            12.75
GROUP 3.....................$ 27.70            12.75
GROUP 3A....................$ 30.30            12.75
GROUP 3B....................$ 31.38            12.75
GROUP 4.....................$ 17.91            12.75
TUNNELS, SHAFTS, AND RAISES
 GROUP 1....................$ 28.80            12.75
 GROUP 2....................$ 29.69            12.75
 GROUP 3....................$ 30.47            12.75
 GROUP 3A...................$ 33.33            12.75
 GROUP 3B...................$ 34.52            12.75
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LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all

type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

PAIN1140-004 07/01/2005

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
Painters:		
Brush, Roller, Sign, Paper and Vinyl, Swing Stage, Hand Taper/Drywall, Structural Steel, and Commercial Spray	$ 24.80	13.35
Machine Taper/Drywall	$ 25.00	13.35
Spray-Sand/Blast, Epoxy and Tar Applicator	$ 25.60	13.35
Steeple Jack & Tower	$ 26.60	13.35

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* PAIN1140-005 02/01/2006

	Rates	Fringes
Soft Floor Layer	$ 27.07	9.09

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* PAIN1140-006 01/01/2006

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
Glazier	$ 28.60	12.97

PAIN1555-004 06/01/2005

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
Hazardous Material Applicator STRUCTURAL, SANDBLAST, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, FLOORCOVERER, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS MATERIAL HANDLER, TAPER, TEXTURING	$ 28.10	14.39
Painter BRUSH, ROLLER PAINTER, WALLCOVERER	$ 27.60	14.39

PAIN1555-005 04/01/2006

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
Glazier	$ 32.41	12.34

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* PLAS0867-001 02/01/2006

	Rates	Fringes
Plasterer		
NORTH OF THE 63RD PARALLEL	$ 31.74	12.70
SOUTH OF THE 63RD PARALLEL	$ 31.49	12.70

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* PLAS0867-004 02/01/2006

	Rates	Fringes
Cement Mason		
North of the 63rd Parallel	$ 31.49	12.70
South of the 63rd Parallel	$ 31.24	12.70

PLUM0262-002 07/01/2005

East of the 141st Meridian

	Rates	Fringes
Plumber; Steamfitter	$ 29.59	12.80

PLUM0367-002 07/01/2005

South of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 32.13	14.57

PLUM0375-002 07/01/2005

North of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 35.21	15.70

PLUM0669-002 04/01/2006

	Rates	Fringes
Sprinkler Fitter	$ 39.05	14.15

ROOF0190-002 09/01/2005

	Rates	Fringes
Roofer (including Built Up, Composition and Single Ply)		
North of the 63rd Parallel	$ 31.62	10.00
South of the 63rd Parallel	$ 29.62	10.00

SHEE0023-003 07/01/2005

South of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker	$ 33.34	14.55

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* SHEE0023-004 09/01/2005

North of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker	$ 35.95	15.05

TEAM0959-003 09/01/2005

	Rates	Fringes
Truck Driver		
GROUP 1	$ 32.72	11.60
GROUP 1A	$ 33.79	11.60
GROUP 2	$ 31.65	11.60
GROUP 3	$ 30.96	11.60
GROUP 4	$ 30.48	11.60
GROUP 5	$ 29.82	11.60

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with

pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas, Commanders, Rollogans, and similar equipment; Mechanics; Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards;

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Water Wagon (when pulled by Euclid or similar type equipment); Partsman; Oil Distributor Drivers; Trucks/Jeeps (push or pull)

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Stringing Truck; Fuel Truck; Fuel Handler with truck; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Wagon, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards; All Terrain Vehicles; Boom Truck/Knuckle Truck Over 5 tons; Bus Operator, Over 30 Passengers

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon, single axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers;

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within

the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5 (a) (1) (ii)).

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative

Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

MAXIMUM PER DIEM RATES OUTSIDE THE CONTINENTAL UNITED STATES TRAVEL PER DIEM ALLOWANCES

COUNTRY/STATE: **ALASKA**

IMPORTANT NOTES:

1. Use the **OTHER** rate if neither the **CITY** nor **MILITARY INSTALLATION** is listed.
2. For other allowances that are based on per diem rates **(e.g., TLE, TLA, TQSE, TQSA)**, see the appropriate rules for those allowances regarding what per diem rate to use.
3. The standard **ONBASE INCIDENTAL RATE is $3.50** OCONUS wide.
4. When **Government meals** are directed, the appropriate Government meal rate, as prescribed in Appendix A, is applicable.
5. Per Diem Rate = Max Lodging + Meals (Local, Proportional, or Government) + Incidental Rate (Local or OnBase)

*** All rates are in US Dollars**

Locality	Seasons (Beg-End)	Max Lodging	Local Meals Rate	Prop. Meals	Local Incidental Rate	Footnote	Footnote Rate	Max Per Diem Rate	Eff. Date
ADAK	01/01-12/31	120	63	36	16			**199**	07/01/2003
ANCHORAGE [INCL NAV RES]	05/01-09/15	170	71	40	18			**259**	06/01/2004
ANCHORAGE [INCL NAV RES]	09/16-04/30	95	65	37	16			**176**	06/01/2004
BARROW	01/01-12/31	159	76	42	19			**254**	05/01/2002
BETHEL	01/01-12/31	119	62	35	15			**196**	06/01/2004
BETTLES	01/01-12/31	135	50	29	12			**197**	10/01/2004
COLD BAY	01/01-12/31	90	58	33	15			**163**	05/01/2002
COLDFOOT	01/01-12/31	135	57	33	14			**206**	10/01/1999

COPPER CENTER	05/16-09/15	109	50	29	13	**172**	07/01/2003
COPPER CENTER	09/16-05/15	99	50	29	13	**162**	07/01/2003
CORDOVA	05/01-09/30	110	59	34	15	**184**	04/01/2005
CORDOVA	10/01-04/30	85	58	33	14	**157**	04/01/2005
CRAIG	04/15-09/14	125	51	30	13	**189**	04/01/2005
CRAIG	09/15-04/14	95	49	29	12	**156**	04/01/2005
DEADHORSE	01/01-12/31	95	54	31	13	**162**	05/01/2002
DELTA JUNCTION	01/01-12/31	89	60	34	15	**164**	06/01/2004
DENALI NATIONAL PARK	06/01-08/31	114	48	28	12	**174**	04/01/2005
DENALI NATIONAL PARK	09/01-05/31	80	46	27	11	**137**	04/01/2005
DILLINGHAM	01/01-12/31	114	55	32	14	**183**	06/01/2004
DUTCH HARBOR-UNALASKA	01/01-12/31	121	58	33	15	**194**	04/01/2005
FAIRBANKS	05/01-09/15	159	70	39	18	**247**	06/01/2004
FAIRBANKS	09/16-04/30	75	63	36	16	**154**	06/01/2004
FOOTLOOSE	01/01-12/31	175	14	11	4	**193**	06/01/2002
GLENNALLEN	05/01-09/30	125	58	33	15	**198**	04/01/2005
GLENNALLEN	10/01-04/30	89	55	32	14	**158**	04/01/2005
HEALY	06/01-08/31	114	48	28	12	**174**	04/01/2005
HEALY	09/01-05/31	80	46	27	11	**137**	04/01/2005

HOMER	05/15-09/15	125	58	33	15	**198**	04/01/2005
HOMER	09/16-05/14	76	54	31	14	**144**	04/01/2005
JUNEAU	05/01-09/30	120	64	36	16	**200**	06/01/2005
JUNEAU	10/01-04/30	79	62	35	15	**156**	04/01/2005
KAKTOVIK	01/01-12/31	165	69	39	17	**251**	05/01/2002
KAVIK CAMP	01/01-12/31	150	55	32	14	**219**	05/01/2002
KENAI-SOLDOTNA	05/01-08/31	129	66	37	16	**211**	04/01/2005
KENAI-SOLDOTNA	09/01-04/30	79	62	35	15	**156**	04/01/2005
KENNICOTT	01/01-12/31	189	68	38	17	**274**	04/01/2005
KETCHIKAN	05/01-09/30	135	66	37	16	**217**	04/01/2005
KETCHIKAN	10/01-04/30	98	62	35	16	**176**	04/01/2005
KING SALMON	05/01-10/01	225	73	41	18	**316**	05/01/2002
KING SALMON	10/02-04/30	125	65	37	16	**206**	05/01/2002
KLAWOCK	04/15-09/14	125	51	30	13	**189**	04/01/2005
KLAWOCK	09/15-04/14	95	49	29	12	**156**	04/01/2005
KODIAK	01/01-12/31	112	64	36	16	**192**	04/01/2005
KOTZEBUE	05/15-09/30	141	69	39	17	**227**	02/01/2005
KOTZEBUE	10/01-05/14	135	68	38	17	**220**	02/01/2005
MCCARTHY	01/01-12/31	189	68	38	17	**274**	04/01/2005
METLAKATLA	05/30-10/01	98	38	23	10	**146**	05/01/2002

METLAKATLA	10/02-05/29	78	38	23	9	**125**	05/01/2002
MURPHY DOME	05/01-09/15	159	70	39	18	**247**	06/01/2004
MURPHY DOME	09/16-04/30	75	63	36	16	**154**	06/01/2004
NOME	01/01-12/31	120	67	38	17	**204**	04/01/2005
NUIQSUT	01/01-12/31	180	42	25	11	**233**	05/01/2002
PETERSBURG	01/01-12/31	80	50	29	12	**142**	06/01/2005
POINT HOPE	01/01-12/31	130	56	32	14	**200**	03/01/1999
POINT LAY	01/01-12/31	105	54	31	13	**172**	03/01/1999
PORT ALSWORTH	01/01-12/31	135	70	39	18	**223**	05/01/2002
PRUDHOE BAY	01/01-12/31	95	54	31	13	**162**	05/01/2002
SEWARD	05/01-09/30	145	63	36	16	**224**	04/01/2005
SEWARD	10/01-04/30	62	57	33	14	**133**	04/01/2005
SITKA-MT. EDGECUMBE	05/01-09/30	119	53	31	13	**185**	04/01/2005
SITKA-MT. EDGECUMBE	10/01-04/30	99	51	30	13	**163**	04/01/2005
SKAGWAY	05/01-09/30	135	66	37	16	**217**	04/01/2005
SKAGWAY	10/01-04/30	98	62	35	16	**176**	04/01/2005
SLANA	05/01-09/30	139	44	26	11	**194**	02/01/2005
SLANA	10/01-04/30	99	44	26	11	**154**	02/01/2005
SPRUCE CAPE	01/01-12/31	112	64	36	16	**192**	04/01/2005
ST. GEORGE	01/01-12/31	129	44	26	11	**184**	06/01/2004

TALKEETNA	01/01-12/31	100	71	40	18		**189**	07/01/2002
TANANA	01/01-12/31	120	67	38	17		**204**	04/01/2005
TOGIAK	01/01-12/31	100	31	20	8		**139**	07/01/2002
UMIAT	01/01-12/31	180	86	47	21		**287**	04/01/2005
UNALAKLEET	01/01-12/31	79	64	36	16		**159**	04/01/2003
VALDEZ	05/01-10/01	129	59	34	15		**203**	04/01/2005
VALDEZ	10/02-04/30	79	55	32	14		**148**	04/01/2005
WASILLA	05/01-09/30	134	62	35	16		**212**	04/01/2005
WASILLA	10/01-04/30	80	58	33	15		**153**	04/01/2005
WRANGELL	05/01-09/30	135	66	37	16		**217**	04/01/2005
WRANGELL	10/01-04/30	98	62	35	16		**176**	04/01/2005
YAKUTAT	01/01-12/31	110	54	31	14		**178**	03/01/1999
[OTHER]	01/01-12/31	80	44	26	11		**135**	09/01/2001

*Use the OTHER rate if neither the CITY nor MILITARY INSTALLATION is listed.

Request a review of a Per Diem Rate.

Find out more about (Prop. Meals) Proportional Per Diem?

Per Diem Rates

Rate Quote Estimate

Northland Services
MARINE TRANSPORTATION

Quote# KH0509601

DATE: 5/9/2006			PAGE: 1
REQUESTED BY: Ryan Baker	PHONE: (775) 778-3200	ORIGIN: Anchorage	DESTINATION: Nome
COMPANY NAME: Smith Williams Consultants	FAX: (775) 778-6900	SHIP DATE:	BID DATE:
ADDRESS: ryan@goswc.com	PREPARED BY: Kerri Hakoda	PHONE: 206-892-2592	E-MAIL: KHakoda@NorthlandServices.com
CITY, STATE, ZIP:	PROJECT DESCRIPTION / CONSIGNEE: Haul truck, 52 yd		

		COMMODITY / SPECIFICATION									
QTY	ITEM NO.	DESCRIPTION	LENGTH	WIDTH	HEIGHT	WEIGHT (EA)	RATE BASIS	RATE	MIN	ESTIMATE	TTL WEIGHT
2	1520	Haul truck, 52 yd	31	18	14.5	101200	SF	$48.73		$54,382.68	202400
1	1520	Dozer D7	19	10	12	55000	SF	$48.73		$9,258.70	55000
3	1520	Dozer D9	23	11	13	109200	SF	$48.73		$36,986.07	327600
1	1520	Loader 8 CY	41	11.5	13.5	109300	SF	$48.73		$22,976.20	109300
		Rates apply from Anchorage dock to									
		Nome dock.									
		Fuel Surcharge						12.5%		$15,450.46	
		• Rate subject to the Fuel Surcharge in effect at the time of shipment.									
		Total Estimated Charges:								**$139,054.09**	

RATES AND ESTIMATED FREIGHT CHARGES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHALL NOT BE CONSTRUED AS A TARIFF. FREIGHT CHARGES SHALL BE ASSESSED BASED ON THE DESCRIPTION OF CARGO AND THE RATES IN EFFECT AT THE TIME OF SHIPMENT.

MAILING ADDRESS:
P.O. BOX 24527
SEATTLE, WA 98124

SEATTLE TERMINAL 115
6700 W MARGINAL WAY SW
SEATTLE, WA 98106

PHONE: 206-763-3000
TOLL FREE: 800-426-3113
PRICING DEPT. FAX: 206-264-4930

Rock Creek Project
Reclamation Cost Estimate
Barge Charges for Mobilization of Equipment

Equipment	Quantity	Length	Width	Height	Weight (ea)	Rate Basis	Rate	Estimate
Haul Truck, 52 yd	4	31	18	14.5	101200	Square Foot	$48.73	$108,765.36
D7 Dozer	1	19	10	12	55000	Square Foot	$48.73	$9,258.70
D9 Dozer	3	23	11	13	109200	Square Foot	$48.73	$36,986.07
Loader, 8cy	2	41	11.5	13.5	109300	Square Foot	$48.73	$45,952.39
Fuel Surchage							12.5%	$25,120.32
Total								$226,082.84

ALASKA GARDEN & PET SUPPLY, INC.
114 N. ORCA, ANCHORAGE, ALASKA 99501
P.O. BOX 101246, ANCHORAGE, ALASKA 99510
PHONE 907-279-4519
FAX 907-222-2060
EMAIL: steve.akgarden@acsalaska.net

FAX TRANSMITTAL SHEET

TO: Ryan	FROM: Steve Rooke
COMPANY:	DATE: May 18, 2006
FAX NUMBER: 303-433-0362	TOTAL NO. OF PAGES INCLUDING COVER:
PHONE NUMBER: 303-433-0262	
RE: Quote	PROJECT NUMBER:

NOTES/COMMENTS:

Seed:

50% Bering hairgrass 40% Arctared fescue 10% Annual rye	7000#	$6.48/lb

Fertilizer

20-20-10 Bulk Bag	20 Ton	$423.95/Ton

Prices are F.O.B. Anchorage warehouse and good for 30 days.

Thanks, Steve

Productivity - Bulldozers

Dozer Specifications					
Description	**D11R**	**D10R**	**D9R**	**D8R**	**D7R**
Blade Width (SU)	18.33 ft	15.92 ft	14.17 ft	12.92 ft	12.08 ft
Shank Guage (3 shanks)	9.83 ft	8.67 ft	7.67 ft	7.08 ft	6.50 ft
Pocket Spacing	4.75 ft	4.33 ft	3.87 ft	3.58 ft	3.25 ft
Ripping Width (Ripper + 1 Pocket)	14.58 ft	13.00 ft	11.54 ft	10.66 ft	9.75 ft
Ripping Speed	1.0 mph	1.0 mph	1.0 mph	1.0 mph	1.0 mph
Ripping Maneuver (turn) Time	0.25 min	0.25 min	0.25 min	0.25 min	0.25 min
Ripping Hourly Production (less maneuvering time)	5280 ft	5280 ft	5280 ft	5280 ft	5280 ft

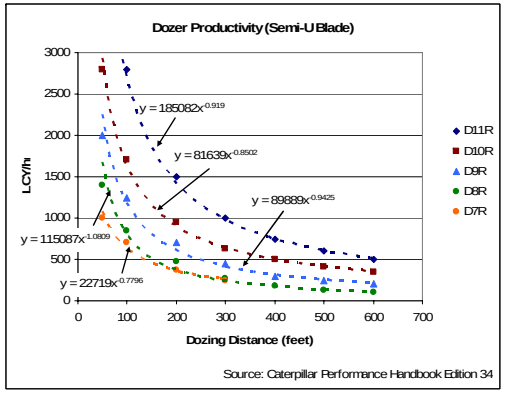
Source: Caterpillar Performance Handbook Edition 35

Dozer Productivity vs. Grading Distance					
Average Dozing Distance (feet)	**Production (LCY/hr)**				
	D11R	**D10R**	**D9R**	**D8R**	**D7R**
50	4800	2800	2000	1400	1000
100	2800	1700	1250	850	700
200	1500	950	700	475	375
300	1000	625	450	275	250
400	750	500	300	175	
500	600	410	250	125	
600	500	350	200	100	

Source: Caterpillar Performance Handbook Edition 35

dozer productivity = k x Dozing Distance^{p}
(see graph)

k =	185082	81639	89889	115087	22719
p =	-0.919	-0.8502	-0.9425	-1.0809	-0.7796



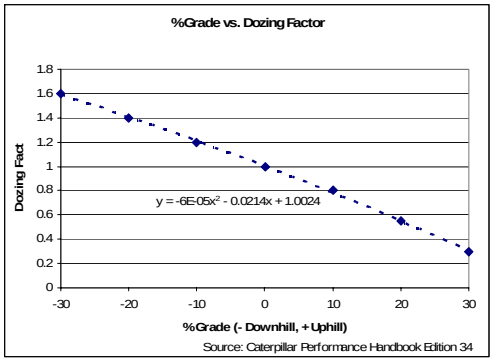
Source: Caterpillar Performance Handbook Edition 34

Productivity - Bulldozers (cont.)

% Grade vs. Dozing Factor	
% Grade	Dozing Factor
-30	1.6
-20	1.4
-10	1.2
0	1
10	0.8
20	0.55
30	0.3

Source: Caterpillar Performance Handbook Edition 35

% Grade Dozing Factor = $-6E^{-05}x^2 - 0.0214x + 1.0024$
(see graph)



Source: Caterpillar Performance Handbook Edition 34

Job Condition Correction Factors - Bulldozers	
OPERATOR	
Average	0.75
MATERIAL (1)	
Loose stockpile	1.20
Hard to cut; frozen — with tilt cylinder	0.80
	0.80
Hard to drift; "dead" (dry,non-cohesive material) or very sticky material	
Rock, ripped or blasted	0.60
SLOT DOZING OR SIDE BY SIDE	1.20
DOZING (1)	
VISIBILITY	
Good conditions	1.00
JOB EFFICIENCY	
50 min/hr	0.83

(1) Selected in facility worksheets. Other factors included as standard factors.

Source: Caterpillar Performance Handbook Edition 35

Productivity - Wheel Loaders

Wheel Loader Specifications

Description	928G	966G	972G	988G	992G
Payload Capacity					
Struck	2.5 cy	4.46 cy	4.71 cy	6.9 cy	13.2 cy
Heaped	3.25 cy	5 cy	5.5 cy	8.33 cy	16 cy
Average	2.88 cy	4.73 cy	5.11 cy	7.62 cy	14.60 cy
Matched Truck	N/A	N/A	N/A	52 yd^3	79 yd^3
Average Cycle Time	0.45 min	0.50 min	0.50 min	0.55 min	0.60 min
Passes to Fill Truck	N/A	N/A	N/A	6	5
Time to Fill Truck	N/A	N/A	N/A	3.26	2.75
Rolling Resistance**	2.5%	2.5%	2.5%	2.5%	2.5%

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Wheeled Loaders	General Purpose	Spade Nose-Rock
928G	3.25 cubic yard	not available
966G	5.0 cubic yard	not available
972G	5.5 cubic yard	not available
988G	not available	8.3 cubic yard
992G	not available	16.0 cubic yard

note: capacities are 2:1 heaped, SAE standards

NOTES: Buckets for both Track Excavators and Wheel Loaders are offered by CECo & available for the rental rates quoted. Bucket sizes and capacities obtained from CATERPILLAR PERFORMANCE HANDBOOK, ED 34; Section 12, Wheel Loader and Section 4, Excavators Bucket capacity and width dictated by material weight and configuration, ie., shot, loose, tight bank, stockpile, rock, etc. Typical Nevada applications were used to determine above bucket capacities as related to materials & densities. Job site specifics may alter specific bucket requirements. (Cashman Equipment, Elko, Nevada - February 21, 2005)

Printed from the Nevada Standardized Bond Calculation
Productivity

Productivity - Haul Trucks

Haul Truck Specifications

Description	769D	777D
Chassis Weight	53,506 lb	111,575 lb
Body Weight	17,200 lb	36,788 lb
Standard Liner Weight		
Total Truck Weight	70,706 lb	148,363 lb
Payload Capacity		
Struck	21.6 cy	55 cy
Heaped	31.7 cy	78.6 cy
Average	26.65 cy	66.8 cy
Maneuver to Load Time	0.7 min	0.7 min
Maneuver and Dump Time	1.1 min	1.1 min
Job Efficiency	0.83	0.83
Rolling Resistance**	2.5%	2.5%

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials

Material	lb/cy	Truck (769D) Load lb	Truck (777D) Load lb
Basalt	3,300	87,945	220,440
Granite - broken	2,800	74,620	187,040
LS - broken	2,600	69,290	173,680
LS - crushed	2,600	69,290	173,680
Sandstone	2,550	67,958	170,340
Shale	2,100	55,965	140,280
Stone - crushed	2,700	71,955	180,360
Topsoil	1,600	42,640	106,880

Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)

	769D					777D				
Material	Loaded Weight (lbs)	20.0%	15.0%	10.0%	5.0%	Loaded Weight (lbs)	20.0%	15.0%	10.0%	5.0%
Basalt	158,651	11	11	11	20	368,803	7	7	12	21
Granite - broken	145,326	11	11	15	26	335,403	7	9	12	29
LS - broken	139,996	11	1	15	26	322,043	7	9	12	29
LS - crushed	139,996	11	11	15	26	322,043	7	9	12	29
Sandstone	138,664	11	11	15	26	318,703	7	9	16	29
Shale	126,671	11	11	15	26	288,643	7	9	16	29
Stone - crushed	142,661	11	11	15	26	328,723	7	9	12	29
Topsoil	113,346	11	11	15	26	255,243	9	12	16	29
	Empty	15	15	26	36	Empty	16	16	29	39

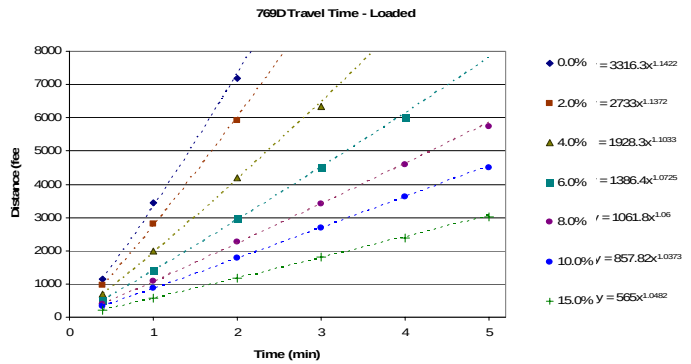
Source: Caterpillar Performance Handbook Edition 35

769D Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	*k*	*p*
0.0%	1148	3428	7183				3316.3	1.1422
2.0%	951	2821	5904				2733	1.1372
4.0%	689	1984	4198	6330			1928.3	1.1033
6.0%	508	1427	2952	4510	6002		1386.4	1.0725
8.0%	394	1082	2263	3411	4592	5740	1061.8	1.06
10.0%	328	869	1771	2690	3608	4510	857.82	1.0373
15.0%	213	574	1181	1804	2394	3018	565	1.0482

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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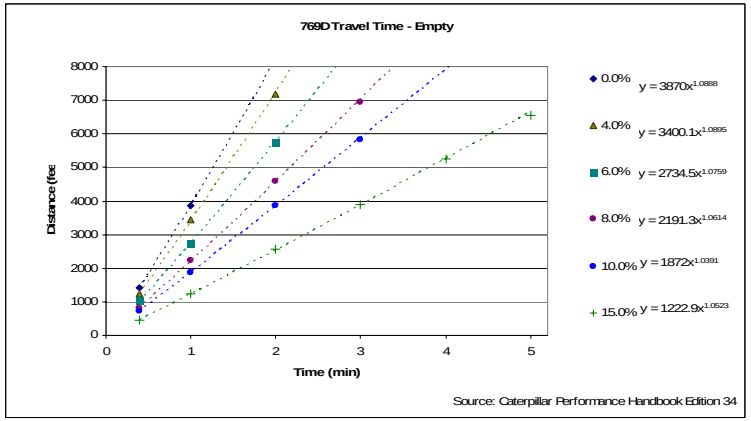
Productivity - Haul Trucks (cont.)

769D Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	**Time (min)**						*k*	*p*
	0.4	1	2	3	4	5		
0.0%	1427	3870					3870	1.0888
4.0%	1246	3444	7183				3400.1	1.0895
6.0%	1017	2755	5740				2734.5	1.0759
8.0%	820	2230	4592	6954			2191.3	1.0614
10.0%	722	1870	3870	5838			1872	1.0391
15.0%	459	1246	2558	3903	5248	6560	1222.9	1.0523

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

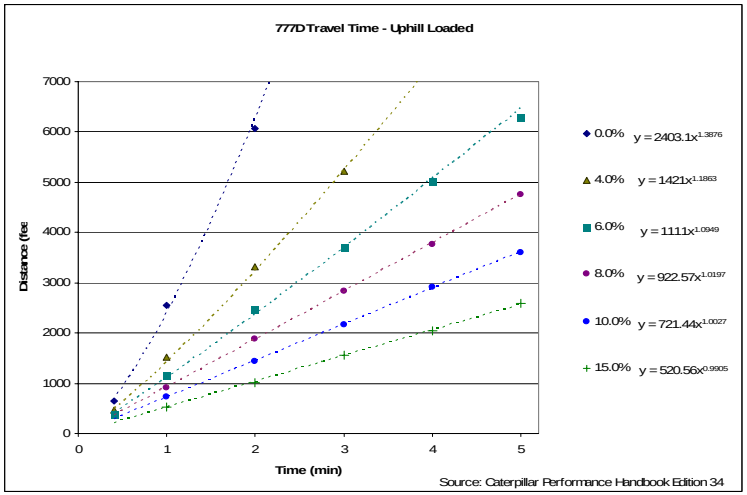


Source: Caterpillar Performance Handbook Edition 34

777D Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	**Time (min)**						*k*	*p*
	0.4	1	2	3	4	5		
0.0%	656	2558	6068				2403.1	1.3876
4.0%	459	1509	3313	5215	7085		1412	1.1863
6.0%	394	1148	2460	3706	5018	6298	1111	1.0949
8.0%		918	1886	2837	3772	4756	922.57	1.0197
10.0%		722	1443	2165	2919	3608	721.44	1.0027
15.0%		525	1017	1558	2034	2591	520.56	0.9905

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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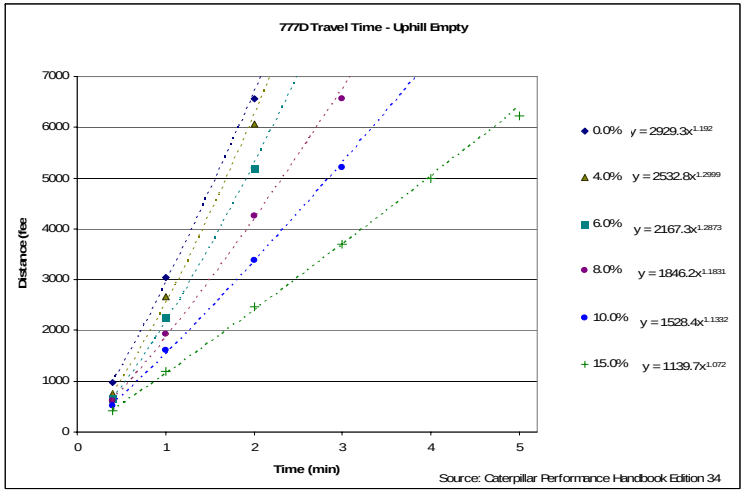
Productivity - Haul Trucks (cont.)

777D Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	**Time (min)**							
	0.4	1	2	3	4	5	*k*	*p*
0.0%	968	3034	6560				2929.3	1.192
4.0%	754	2657	6068				2532.8	1.2999
6.0%	656	2247	5182				2167.3	1.2873
8.0%	607	1935	4248	6560			1846.2	1.1831
10.0%	525	1607	3378	5215	7282		1528.4	1.1332
15.0%	410	1197	2460	3706	4986	6232	1139.7	1.072

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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USE OF BRAKE PERFORMANCE CURVES

The speed that can be maintained when the machine is descending a grade with retarder applied can be determined from the retarder curves in this section when gross machine weight and total effective grade are known.

Select appropriate grade distance chart that covers total downhill haul; don't break haul into individual segments.

To determine brake performance: Read from gross weight down to the percent effective grade. (Effective grade equals actual % grade *minus* 1% for each 10 kg/metric ton (20 lb./U.S. ton) of rolling resistance.) From this weight-effective grade point, read horizontally to the curve with the highest obtainable speed range, then down to maximum descent speed brakes can safely handle without exceeding cooling capacity. When braking, engine RPM should be maintained at the highest possible level without overspeeding. If cooling oil overheats, reduce ground speed to allow transmission to shift to next lower speed range.

USE OF RIMPULL-SPEED-GRADEABILITY CURVES

(See Wheel Tractor Scraper Section)

Total Effective Grade (or Total Resistance) is grade assistance *minus* rolling resistance.

10 kg/metric ton (20 lb/U.S. ton) = 1% adverse grade.

Example —

With a favorable grade of 20% and rolling resistance of 50 kg/metric ton (100 lb/U.S. ton), find Total Effective Grade.

(50 kg/metric ton) = 50 ÷ 10 = 5% Effective Grade (from Rolling Resistance)

100 lb/ton = 100 ÷ 20 = 5% Effective Grade

20% (grade) – 5% (resistance) = 15% Total Effective Grade

TYPICAL FIXED TIMES FOR HAULING UNITS

Wait time, delays and operator efficiency all impact cycle time. Minimizing truck exchange time can have a significant effect on productivity.

Fixed time for hauling units include:

1. Truck load time (various with loading tool)
2. Truck maneuver in load area (Truck exchange) (Typically 0.6-0.8 min.)
3. Maneuver and dump time at dump point (Typically 1.0-1.2 min.)

Total cycle time is the combination of:

1. The above fixed time
2. Hauling time (Loaded)
3. Return time (Empty)

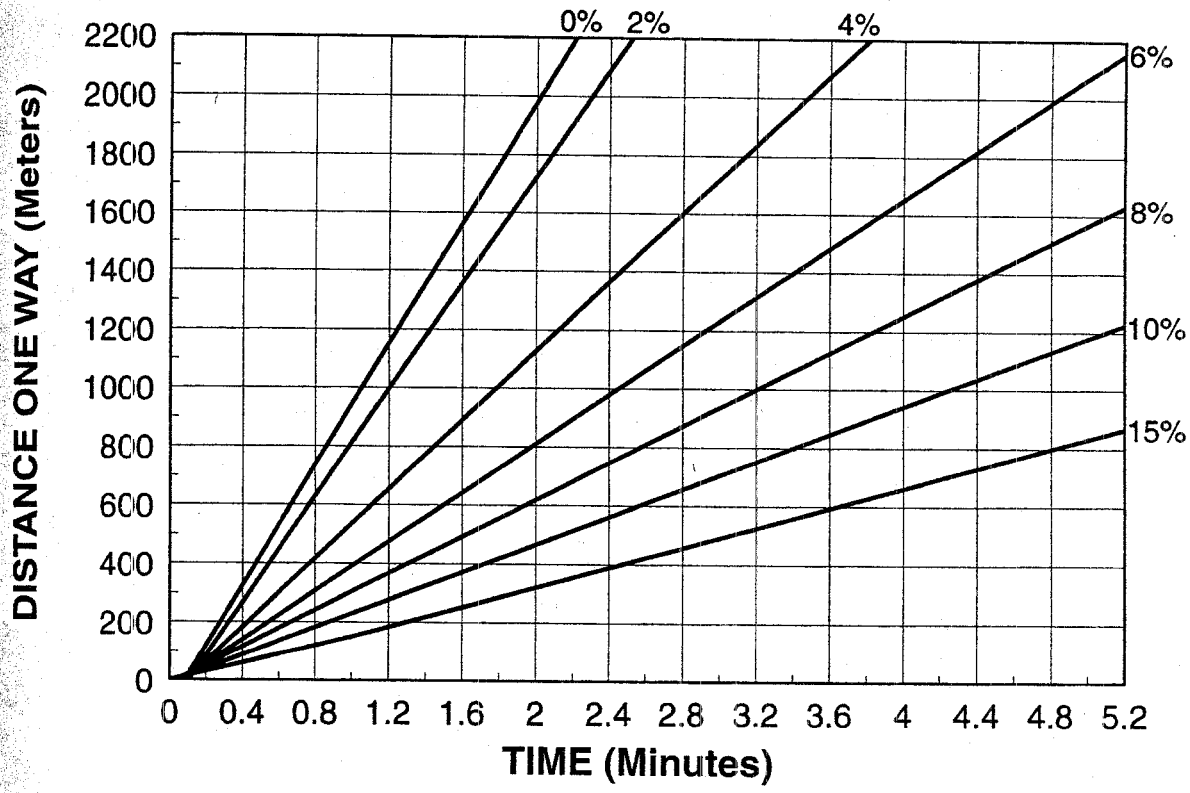
Example — assume load tool spots hauler with full bucket

		988F	5130B
cycle times		.60	.45
First pass	(dump time)	.10 min.	.05 min.
2 passes	(full cycle)	.70	.50
3 passes	"	1.30	.95
4 passes	"	1.90	1.40
5 passes	"	2.50	1.85
6 passes	"	3.10	2.30
7 passes	"	3.70	2.75
8 passes	"	4.30	3.20
9 passes	"	4.90	3.65
10 passes	"	5.40	4.10

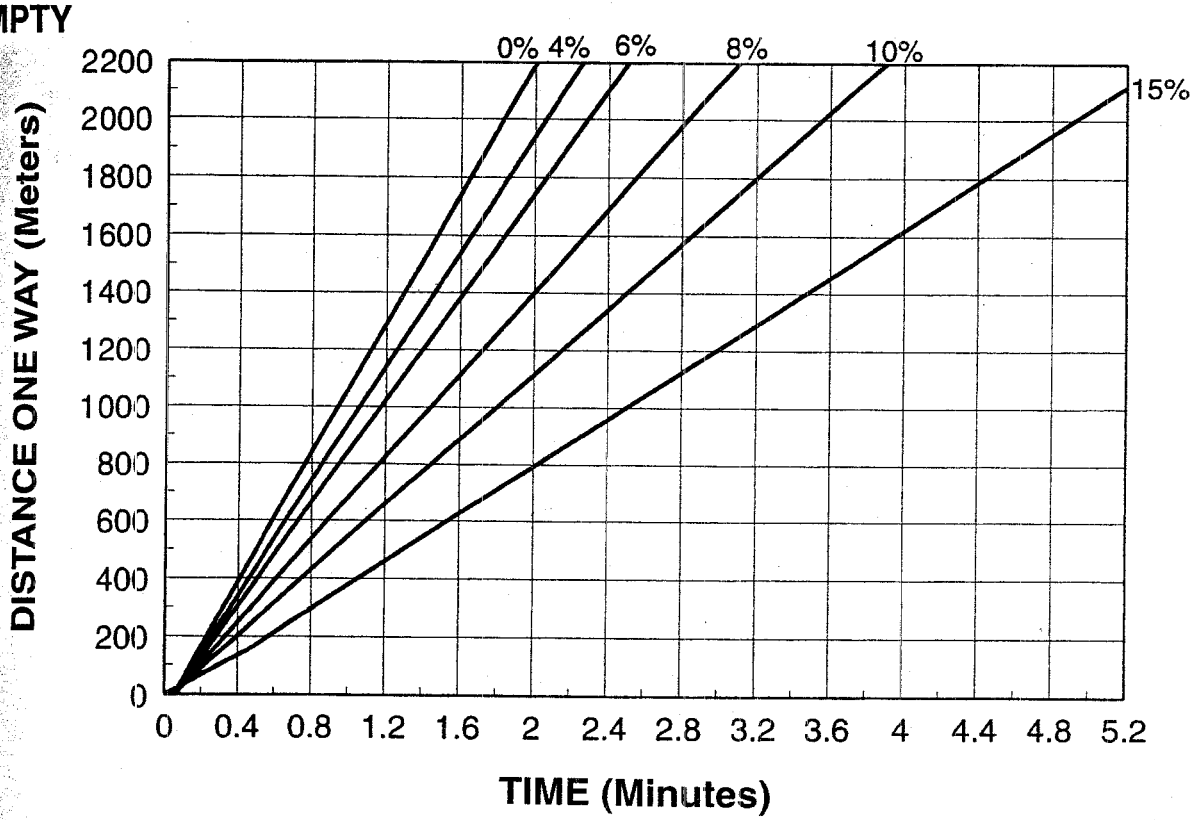
NOTE: Other sizes of loading tools will have different cycle times. See Wheel Loader section for **average** cycle times for truck loading.

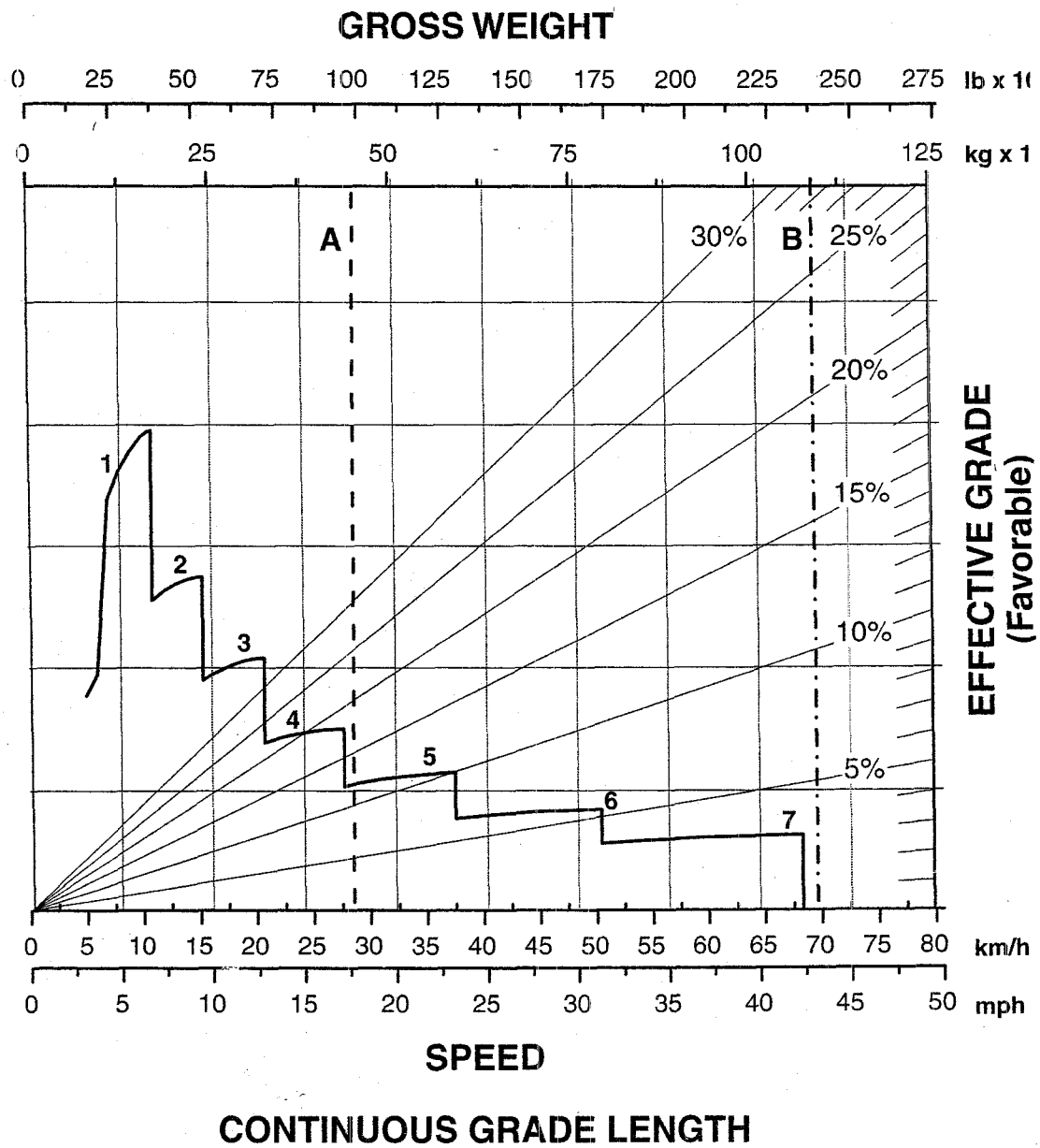
9

LOADED



EMPTY





CONTINUOUS GRADE LENGTH

KEY

1 — 1st Gear
2 — 2nd Gear
3 — 3rd Gear
4 — 4th Gear
5 — 5th Gear
6 — 6th Gear
7 — 7th Gear

KEY

A — Empty 43 953 kg (96,900 lb)
B — Max GMW 108 400 kg (239,000 lb)

Rock Creek TSF
Alaska Gold Co.
Nome, Alaska
Average Yr.

Startup Volume in pond - june finish

Tailings Properties

	Tailings
Initial Tailings Moisture Content (%)	35%
Moisture Content "Lost" to initial runoff and draindown (%)	10%
Effective Placed Moisture Content (%)	25%
Draindown Moisture Content (%)	25%

	Initial Tailings RO Coeff	Snowmelt Runoff Coefficients		
	1	0.95	1	0.65

1 if reclaim, 0 if not

Year	Month	Runoff Factor	Pond Reclaim Factor	EOM Date	Monthly Rainfall (Water Equivalent)	Monthly Snowfall (Water Equivalent)	Monthly Pond Evap.	Monthly Sublimation	Monthly Runoff Coefficient Natural Ground	Wet Tails Filling Rate	Dry Tailings Filling Rate	Monthly Wet Tails Filling Rate	Dry Tailings Filling Rate	Monthly Filling Rate - Consolidated Tails	Cumulative Tails Vol. (Wet)	Monthly Slurry Water	Total Entrained Water	Monthly Slurry Ice Accum	Cumul Slurry Ice	Total Tributary Area	Exposed Liner	Area of Tails	Natural Ground	Rainfall Runoff Tailings Surface	Rainfall Runoff Exposed Lined Areas	Rainfall Runoff Natural Ground	Snowpack (WE)	Snowmelt (WE)	Snowmelt Runoff Tailings Surface	Snowmelt Runoff Exposed Lined Areas	Snowmelt Runoff Natural Ground	Slurry Water Ice Melt	Evap from Tails/Pond Surface	Net Monthly Inflow of Free Water	Total Free Water in Pond Prior to Seepage and Reclaim	Seepage Lost & Collected
--	--				(mm)	(mm)	(mm)	(mm)	--	(m^3/day)	(tonnes/d)	(m^3/mo)	(tonnes/mo)	(m^3/day)	(m^3)	(m3)	(m^3)	(m^3)	(m^3)	(m^2)	(m^2)	(m^2)	(m^2)	(m^3)	(m^3)	(m^3)	(m)	(m)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
2006	Jul	1		7/31/2006																																
2006	Aug	1		8/30/2006																																
2006	Sept	1		9/30/2006																																
2006	Oct	0.5		10/31/2006																																
2006	Nov	0		11/30/2006																																
2006	Dec	0		12/31/2006																																
2007	Jan	0	0	1/31/2007																																
2007	Feb	0	0	2/28/2007	0	30	3	12	0.00	5,007	7,004	152,458	213,277	4,608	140,314	74,812	53,319	21,493	21,493	518,974	29,530	44,600	444,844	0	0	0	0.02	0.00	0	0	0	0	76	-76	0	0
2007	Mar	0	0	3/31/2007	0	26	0	5	0.00	5,007	7,004	152,458	213,277	4,608	280,627	74,812	106,638	21,493	42,986	518,974	27,621	75,729	415,624	0	0	0	0.04	0.00	0	0	0	0	0	0	0	0
2007	Apr	0.5	1	4/30/2007	15	15	52	0	0.50	5,007	7,004	152,458	213,277	4,608	420,941	74,812	159,958	10,746	26,866	518,974	25,939	106,543	386,491	1,621	395	2,940	0.03	0.03	2,767	709	6,869	26,866	3,053	49,861	49,861	0
2007	May	1	1	5/31/2007	31	0	98	0	0.30	5,007	7,004	152,458	213,277	4,608	561,254	74,812	213,277	0	0	518,974	24,988	124,539	369,447	3,874	777	3,448	0.00	0.03	3,235	683	6,566	26,866	6,713	60,230	80,230	480
2007	Jun	1	1	6/30/2007	46	0	170	0	0.30	5,007	7,004	152,458	213,277	4,608	701,568	74,812	266,596	0	0	518,974	23,535	165,401	330,037	7,592	1,080	4,545	0.00	0.00	0	0	0	0	15,483	19,226	39,226	720
2007	Jul	1	1	7/31/2007	94	0	158	0	0.35	5,007	7,004	152,458	213,277	4,608	841,882	74,812	319,915	0	0	518,974	19,611	204,001	295,361	19,143	1,840	9,701	0.00	0.00	0	0	0	0	17,716	34,461	54,461	960
2007	Aug	1	1	8/30/2007	144	0	93	0	0.35	5,007	7,004	152,458	213,277	4,608	982,195	74,812	373,234	0	0	538,994	39,518	223,162	276,314	32,171	5,697	13,942	0.00	0.00	0	0	0	0	11,439	61,863	81,863	14,400
2007	Sep	1	1	9/30/2007	104	0	58	0	0.40	5,007	7,004	152,458	213,277	4,608	1,122,509	74,812	426,553	0	0	538,994	37,892	234,741	266,361	24,422	3,942	11,085	0.00	0.00	0	0	0	0	7,540	53,403	76,703	10,800
2007	Oct	0.5	1	10/31/2007	32	32	21	0	0.50	5,007	7,004	152,458	213,277	4,608	1,262,822	74,812	479,873	10,746	10,746	538,994	36,267	246,320	256,408	7,789	1,147	4,054	0.03	0.00	0	0	0	0	2,859	20,877	40,877	8,100
2007	Nov	0	1	11/30/2007	0	48	0	12	0.00	5,007	7,004	152,458	213,277	4,608	1,403,136	74,812	533,192	21,493	32,239	538,994	34,641	257,898	246,455	0	0	0	0.07	0.00	0	0	0	0	43	-43	19,957	0
2007	Dec	0	1	12/31/2007	0	38	0	5	0.00	5,007	7,004	152,458	213,277	4,608	1,543,450	74,812	586,511	21,493	53,732	538,994	33,015	269,477	236,501	0	0	0	0.10	0.00	0	0	0	0	0	0	19,957	0
2008	Jan	0	0	1/31/2008	0	38	0	9	0.00	5,007	7,004	152,458	213,277	4,608	1,683,763	74,812	639,830	21,493	75,225	538,994	31,349	282,647	224,998	0	0	0	0.13	0.00	0	0	0	0	0	0	19,957	0
2008	Feb	0	0	2/28/2008	0	30	3	12	0.00	5,007	7,004	152,458	213,277	4,608	1,824,077	74,812	693,149	21,493	96,718	538,994	31,349	282,647	224,998	0	0	0	0.15	0.00	0	0	0	0	482	-482	19,476	0
2008	Mar	0	0	3/31/2008	0	26	0	5	0.00	5,007	7,004	152,458	213,277	4,608	1,964,390	74,812	746,468	21,493	118,211	538,994	29,683	300,179	209,132	0	0	0	0.17	0.00	0	0	0	0	0	0	19,476	0
2008	Apr	0.5	1	4/30/2008	15	15	52	0	0.50	5,007	7,004	152,458	213,277	4,608	2,104,704	74,812	799,788	10,746	64,478	538,994	29,683	304,542	204,769	4,634	452	1,558	0.09	0.09	26,691	2,739	12,279	64,478	8,727	114,851	134,326	0
2008	May	1	1	5/31/2008	31	0	98	0	0.30	5,007	7,004	152,458	213,277	4,608	2,245,018	74,812	853,107	0	0	538,994	29,683	308,905	200,406	9,610	923	1,870	0.00	0.09	27,074	2,739	12,018	64,478	16,650	123,555	202,625	900
2008	Jun	1	1	6/30/2008	46	0	170	0	0.30	5,007	7,004	152,458	213,277	4,608	2,385,331	74,812	906,426	0	0	538,994	29,683	313,268	196,043	14,379	1,362	2,700	0.00	0.00	0	0	0	0	29,325	10,609	158,315	900
2008	Jul	1	1	7/31/2008	94	0	158	0	0.35	5,007	7,004	152,458	213,277	4,608	2,525,645	74,812	959,745	0	0	570,159	36,659	320,029	190,097	30,032	3,440	6,244	0.00	0.00	0	0	0	0	27,793	33,415	126,008	1,800
2008	Aug	1	1	8/30/2008	144	0	93	0	0.35	5,007	7,004	152,458	213,277	4,608	2,665,958	74,812	1,013,064	0	0	570,159	43,635	326,791	184,151	47,110	6,290	9,292	0.00	0.00	0	0	0	0	16,751	67,434	131,431	47,190
2008	Sep	1	1	9/30/2008	104	0	58	0	0.40	5,007	7,004	152,458	213,277	4,608	2,806,272	74,812	1,066,383	0	0	570,159	50,610	333,553	178,205	34,703	5,265	7,416	0.00	0.00	0	0	0	0	10,714	58,164	131,086	22,990
2008	Oct	0.5	1	10/31/2008	32	32	21	0	0.50	5,007	7,004	152,458	213,277	4,608	2,946,586	74,812	1,119,703	10,746	10,746	570,159	57,586	340,314	172,258	10,761	1,821	2,723	0.03	0.00	0	0	0	0	3,949	22,102	92,919	12,100
2008	Nov	0	1	11/30/2008	0	48	0	12	0.00	5,007	7,004	152,458	213,277	4,608	3,086,899	74,812	1,173,022	21,493	32,239	570,159	55,802	350,053	164,304	0	0	0	0.07	0.00	0	0	0	0	58	-58	27,554	0
2008	Dec	0	1	12/31/2008	0	38	0	5	0.00	5,007	7,004	152,458	213,277	4,608	3,227,213	74,812	1,226,341	21,493	53,732	570,159	54,019	359,791	156,349	0	0	0	0.10	0.00	0	0	0	0	0	0	20,000	0
2009	Jan	0	0	1/31/2009	0	38	0	9	0.00	5,007	7,004	152,458	213,277	4,608	3,367,526	74,812	1,279,660	21,493	75,225	570,159	50,118	371,847	148,194	0	0	0	0.13	0.00	0	0	0	0	0	0	20,000	0
2009	Feb	0	0	2/28/2009	0	30	3	12	0.00	5,007	7,004	152,458	213,277	4,608	3,507,840	74,812	1,332,979	21,493	96,718	570,159	46,217	383,903	140,039	0	0	0	0.15	0.00	0	0	0	0	655	-655	19,345	0
2009	Mar	0	0	3/31/2009	0	26	0	5	0.00	5,007	7,004	152,458	213,277	4,608	3,648,154	74,812	1,386,298	21,493	118,211	570,159	45,566	388,751	135,842	0	0	0	0.17	0.00	0	0	0	0	0	0	19,345	0
2009	Apr	0.5	1	4/30/2009	15	15	52	0	0.50	5,007	7,004	152,458	213,277	4,608	3,788,467	74,812	1,439,618	10,746	64,478	570,159	44,914	393,599	131,645	5,989	683	1,001	0.09	0.09	34,497	4,144	7,894	64,478	11,279	118,155	137,500	0
2009	May	1	1	5/31/2009	31	0	98	0	0.30	5,007	7,004	152,458	213,277	4,608	3,928,781	74,812	1,492,937	0	0	570,159	44,262	398,448	127,449	12,396	1,377	1,189	0.00	0.09	34,922	4,084	7,643	64,478	21,476	126,105	208,349	1,210
2009	Jun	1	1	6/30/2009	46	0	170	0	0.30	5,007	7,004	152,458	213,277	4,608	4,069,094	74,812	1,546,256	0	0	570,159	43,611	403,296	123,252	18,511	2,002	1,697	0.00	0.00	0	0	0	0	37,753	5,951	159,381	1,210
2009	Jul	1	1	7/31/2009	94	0	158	0	0.35	5,007	7,004	152,458	213,277	4,608	4,209,408	74,812	1,599,575	0	0	570,159	42,959	408,144	119,055	38,300	4,031	3,910	0.00	0.00	0	0	0	0	35,445	32,289	125,949	2,420
2009	Aug	1	1	8/30/2009	144	0	93	0	0.35	5,007	7,004	152,458	213,277	4,608	4,349,722	74,812	1,652,894	0	0	570,159	42,308	412,993	114,859	59,537	6,099	5,795	0.00	0.00	0	0	0	0	21,170	71,754	135,694	47,190
2009	Sep	1	1	9/30/2009	104	0	58	0	0.40	5,007	7,004	152,458	213,277	4,608	4,490,035	74,812	1,706,213	0	0	570,159	41,656	417,841	110,662	43,472	4,334	4,605	0.00	0.00	0	0	0	0	13,421	60,483	137,668	22,990
2009	Oct	0.5	1	10/31/2009	32	32	21	0	0.50	5,007	7,004	152,458	213,277	4,608	4,630,349	74,812	1,759,533	10,746	10,746	570,159	39,980	425,476	104,703	13,454	1,264	1,655	0.03	0.00	0	0	0	0	4,938	22,182	99,581	12,100
2009	Nov	0	1	11/30/2009	0	48	0	12	0.00	5,007	7,004	152,458	213,277	4,608	4,770,662	74,812	1,812,852	21,493	32,239	570,159	38,303	433,112	98,744	0	0	0	0.07	0.00	0	0	0	0	71	-71	34,202	12,100
2009	Dec	0	1	12/31/2009	0	38	0	5	0.00	5,007	7,004	152,458	213,277	4,608	4,910,976	74,812	1,866,171	21,493	53,732	570,159	36,627	440,747	92,785	0	0	0	0.10	0.00	0	0	0	0	0	0	20,000	0
2010	Jan	0	0	1/31/2010	0	38	0	9	0.00	5,007	7,004	152,458	213,277	4,608	5,051,290	74,812	1,919,490	21,493	75,225	570,159	34,951	448,382	86,825	0	0	0	0.13	0.00	0	0	0	0	0	0	20,000	0
2010	Feb	0	0	2/28/2010	0	30	3	12	0.00	5,007	7,004	152,458	213,277	4,608	5,191,603	74,812	1,972,809	21,493	96,718	570,159	33,274	456,018	80,866	0	0	0	0.15	0.00	0	0	0	0	778	-778	19,222	0
2010	Mar	0	0	3/31/2010	0	26	0	5	0.00	5,007	7,004	152,458	213,277	4,608	5,331,917	74,812	2,026,128	21,493	118,211	570,159	31,598	463,653	74,907	0	0	0	0.17	0.00	0	0	0	0	0	0	19,222	0
2010	Apr	0.5	1	4/30/2010	15	15	52	0	0.50	5,007	7,004	152,458	213,277	4,608	5,472,230	74,812	2,079,448	10,746	64,478	570,159	29,922	471,289	68,948	7,171	455	525	0.09	0.09	41,306	2,761	4,135	64,478	13,505	118,072	137,294	0
2010	May	1	1	5/31/2010	31	0	98	0	0.30	5,007	7,004	152,458	213,277	4,608	5,612,544	74,812	2,132,767	0	0	570,159	29,415	478,479	62,265	14,885	915	581	0.00	0.09	41,936	2,714	3,734	64,478	25,790	124,947	206,985	1,210
2010	Jun	1	1	6/30/2010	46	0	170	0	0.30	5,007	7,004	152,458	213,277	4,608	5,752,858	74,812	2,186,086	0	0	570,159	29,162	482,074	58,923	22,127	1,339	811	0.00	0.00	0	0	0	0	45,127	643	152,709	1,210
2010	Jul	1	1	7/31/2010	94	0	158	0	0.35	5,007	7,004	152,458	213,277	4,608	5,893,171	74,812	2,239,405	0	0	570,159	28,655	489,264	52,240	45,913	2,689	1,716	0.00	0.00	0	0	0	0	42,490	29,320	116,307	2,420
2010	Aug	1	1	8/30/2010	144	0	93	0	0.35	5,007	7,004	152,458	213,277	4,608	6,033,485	74,812	2,292,724	0	0	570,159	28,402	492,859	48,898	71,051	4,094	2,467	0.00	0.00	0	0	0	0	25,264	73,841	128,139	47,190
2010	Sep	1	1	9/30/2010	104	0	58	0	0.40	5,007	7,004	152,458	213,277	4,608	6,173,798	74,812	2,346,043	0	0	570,159	28,148	496,454	45,557	51,651	2,929	1,896	0.00	0.00	0	0	0	0	15,946	62,022	131,652	22,990
2010	Oct	0.5	1	10/31/2010	32	32	21	0	0.50	5,007	7,004	152,458	213,277	4,608	6,314,112	74,812	2,399,363	10,746	10,746	570,159	28,148	496,454	45,557	15,698	890	720	0.03	0.00	0	0	0	0	5,761	22,293	93,677	12,100
2010	Nov	0	1	11/30/2010	0	48	0	12	0.00	5,007	7,004	152,458	213,277	4,608	6,454,426	74,812	2,452,682	21,493	32,239	570,159	28,148	496,454	45,557	0	0	0	0.07	0.00	0	0	0	0	82	-82	28,288	0
2010	Dec	0	1	12/31/2010	0	38	0	5	0.00	5,007	7,004	152,458	213,277	4,608	6,594,739	74,812	2,506,001	21,493	53,732	570,159	28,148	496,454	45,557	0	0	0	0.10	0.00	0	0	0	0	0	0	20,000	0

Rock Creek TSF
Alaska Gold Co.
Nome, Alaska
Average Yr.

Total Reclaim (m3/hr): 93.6

Process Pond Trib Area (m2: 194,230
Effective Pit Runoff - to TSF: 0.00 assumed pit stormwater does not go to pit or reclaim

Year	Month	Free Water After Seepage & Before Reclaim	Pit Dewatering Wells	Open Pit Trib. Area	Process Pond Basin Rainfall Runoff	Open Pit Rainfall Runoff	Process Basin and Pit Snowmelt	Process Pond and Pit Stormwater Inflows	Process Pond and Pit Stormwater Inflows	Max. Impoundment Reclaim Rate	Seepage Reclaimed	Seepage Reclaim Rate	Remaining Reclaim Rate	Max Impound Reclaim Vol.	Reclaimed Impound Water	Impound. Reclaim Rate	Final Pond Volume Required (Sol'n)	Total Impoundment Water Capacity Available	Remaining Impoundment Water Capacity	Additional Makeup Req'd	Pit Water Used as Makeup	Additional Makeup Required	Pit Water Used as Makeup	Pit Water Requiring Discharge	Pit Water Requiring Discharge				English Values: Final Pond Volume Required (Sol'n)	Remaining Impoundment Water Capacity	Impound. Reclaim Rate	Pit Water Requiring Discharge	Additional Makeup Required	Pit Water Used as Makeup	Final Pond Volume Required (Sol'n)	Remaining Impoundment Water Capacity
--	--		(m^3)	(m^2)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3/hr)	(m^3/hr)	(m^3)	(m^3/hr)	(m^3/hr)	(m^3)	(m^3)	**(l/s)**	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(l/s)	(m^3)	(l/s)				CY	CY	gpm	gpm	gpm	gpm	acre-ft	acre-ft
2006	Jul																												0	0	0	0	0	0	0	0
2006	Aug																									0	0	English	0	0	0	0	0	0	0	0
2006	Sept																												0	0	0	0	0	0	0	0
2006	Oct																												0	0	0	0	0	0	0	0
2006	Nov																												0	0	0	0	0	0	0	0
2006	Dec																									Max Storage	Min Capacity		0	0	0	0	0	0	0	0
2007	Jan																									23,300	276,135		0	0	0	0	0	0	0	0
2007	Feb	0	99,408	68,583	0	0	0	0	0	94	0	0	93.6	68,403	0	0	0	607,913	607,913	68,403	68,403	0	26	31,005	12	30,475	361,171	English	0	795,120	0.0	187.1	0	413	0	493
2007	Mar	0	99,408	84,225	0	0	0	0	0	94	0	0	93.6	68,403	0	0	0	507,459	507,459	68,403	68,403	0	26	31,005	12				0	663,731	0.0	187.1	0	413	0	411
2007	Apr	49,861	99,408	99,867	1,478	0	3,452	4,930	7	87	0	0	87	63,465	29,861	11	20,000	460,685	440,685	33,604	33,604	0	13	65,804	25				26,159	576,394	179.9	397.1	0	203	16	357
2007	May	79,750	99,408	115,508	1,813	0	3,452	5,265	7	86	480	1	86	62,649	59,750	23	20,000	347,194	327,194	2,898	2,898	0	1	96,510	37				26,159	427,953	360.0	582.4	0	17	16	265
2007	Jun	38,506	99,408	131,150	2,675	0	0	2,675	4	89	720	1	89	65,003	18,506	7	20,000	332,628	312,628	46,496	46,496	0	18	52,912	20				26,159	408,902	111.5	319.3	0	281	16	253
2007	Jul	53,501	99,408	146,792	6,379	0	0	6,379	9	84	960	1	84	61,052	33,501	13	20,000	296,135	276,135	27,551	27,551	0	10	71,857	27				26,159	361,171	201.8	433.6	0	166	16	224
2007	Aug	67,463	99,408	162,433	9,800	0	0	9,800	13	60	14,400	20	60	44,163	44,163	17	23,300	836,315	813,015	0	0	0	0	99,408	38				30,475	1,063,383	266.1	599.9	0	0	19	659
2007	Sep	65,903	99,408	178,075	8,083	0	0	8,083	11	68	10,800	15	68	49,489	45,903	17	20,000	786,619	766,619	3,586	3,586	0	1	95,822	36				26,159	1,002,699	276.5	578.2	0	22	16	622
2007	Oct	32,777	99,408	193,717	3,071	0	0	3,071	4	78	8,100	11	78	57,214	12,777	5	20,000	736,923	716,923	44,437	44,437	0	17	54,971	21				26,159	937,699	77.0	331.7	0	268	16	581
2007	Nov	19,957	99,408	209,358	0	0	0	0	0	94	0	0	94	68,403	0	0	19,957	687,226	667,269	68,403	68,403	0	26	31,005	12				26,103	872,754	0.0	187.1	0	413	16	541
2007	Dec	19,957	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,957	637,530	617,573	68,403	68,403	0	26	31,005	12	Max Storage	Min Capacity		26,103	807,754	0.0	187.1	0	413	16	501
2008	Jan	19,957	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,957	555,362	535,405	68,403	68,403	0	26	31,005	12	147,706	198,909		26,103	700,282	0.0	187.1	0	413	16	434
2008	Feb	19,476	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,476	555,362	535,886	68,403	68,403	0	26	31,005	12	193,193	260,164	English	25,473	700,913	0.0	187.1	0	413	16	434
2008	Mar	19,476	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,476	431,001	411,526	68,403	68,403	0	26	31,005	12				25,473	538,255	0.0	187.1	0	413	16	334
2008	Apr	134,326	99,408	225,000	1,478	0	11,647	13,125	18	76	0	0	76	55,256	55,256	21	79,070	388,809	309,739	0	0	0	0	99,408	38				103,420	405,122	332.9	599.9	0	0	64	251
2008	May	201,725	99,408	225,000	1,813	0	11,647	13,460	18	74	900	1	74	54,019	54,019	21	147,706	346,616	198,909	0	0	0	0	99,408	38				193,193	260,164	325.4	599.9	0	0	120	161
2008	Jun	157,415	99,408	225,000	2,675	0	0	2,675	4	89	900	1	89	64,822	64,822	25	92,593	304,423	211,830	0	0	0	0	99,408	38				121,107	277,063	390.5	599.9	0	0	75	172
2008	Jul	124,208	99,408	225,000	6,379	0	0	6,379	9	82	1,800	2	82	60,210	60,210	23	63,998	494,440	430,443	0	0	0	0	99,408	38				83,706	562,997	362.7	599.9	0	0	52	349
2008	Aug	84,241	99,408	225,000	9,800	0	0	9,800	13	15	47,190	65	15	11,319	11,319	4	72,922	684,458	611,535	0	0	0	0	99,408	38				95,378	799,858	68.2	599.9	0	0	59	496
2008	Sep	108,096	99,408	225,000	8,083	0	0	8,083	11	51	22,990	32	51	37,279	37,279	14.2	70,817	874,475	803,658	0	0	0	0	99,408	38				92,625	1,051,144	224.6	599.9	0	0	57	652
2008	Oct	80,819	99,408	225,000	3,071	0	0	3,071	4	73	12,100	17	73	53,207	53,207	20	27,612	1,064,492	1,036,880	0	0	0	0	99,408	38				36,115	1,356,187	320.6	599.9	0	0	22	841
2008	Nov	27,554	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	7,554	3	20,000	1,057,719	1,037,719	60,849	60,849	0	23	38,559	15				26,159	1,357,285	45.5	232.7	0	367	16	841
2008	Dec	20,000	99,408	225,000	0	0	0	0	0	94	0	0	94	68,403	0	0	20,000	1,050,946	1,030,946	68,403	68,403	0	26	31,005	12	Max Storage	Min Capacity		26,159	1,348,426	0.0	187.1	0	413	16	836
2009	Jan	20,000	99,905	230,000	0	0	0	0	0	94	0	0	94	68,403	0	0	20,000	993,069	973,069	68,403	68,403	0	26	31,502	12	153,431	503,275		26,159	1,272,725	0.0	190.1	0	413	16	789
2009	Feb	19,345	100,402	235,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,345	935,191	915,846	68,403	68,403	0	26	31,999	12	200,680	658,259	English	25,303	1,197,880	0.0	193.1	0	413	16	742
2009	Mar	19,345	100,899	240,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,345	885,758	866,413	68,403	68,403	0	26	32,496	12				25,303	1,133,225	0.0	196.1	0	413	16	702
2009	Apr	137,500	101,396	245,000	1,478	0	11,647	13,125	18	76	0	0	76	55,256	55,256	21	82,244	836,326	754,082	0	0	0	0	101,396	39				107,571	986,301	332.9	611.9	0	0	67	611
2009	May	207,139	101,893	250,000	1,813	0	11,647	13,460	18	73	1,210	2	73	53,709	53,709	20	153,431	786,893	633,463	0	0	0	0	101,893	39				200,680	828,537	323.6	614.9	0	0	124	514
2009	Jun	158,171	102,390	250,000	2,675	0	0	2,675	4	88	1,210	2	88	64,512	64,512	25	93,659	737,461	643,801	0	0	0	0	102,390	39				122,502	842,060	388.7	617.9	0	0	76	522
2009	Jul	123,529	102,887	260,000	6,379	0	0	6,379	9	82	2,420	3	82	59,589	59,589	23	63,940	688,028	624,089	0	0	0	0	102,887	39				83,630	816,277	359.0	620.9	0	0	52	506
2009	Aug	88,504	103,384	265,000	9,800	0	0	9,800	13	15	47,190	65	15	11,319	11,319	4	77,185	638,596	561,411	0	0	0	0	103,384	39				100,954	734,297	68.2	623.9	0	0	63	455
2009	Sep	114,678	103,881	270,000	8,083	0	0	8,083	11	51	22,990	32	51	37,279	37,279	14	77,399	589,163	511,764	0	0	0	0	103,881	40				101,234	669,362	224.6	626.9	0	0	63	415
2009	Oct	87,481	104,378	275,000	3,071	0	0	3,071	4	73	12,100	17	73	53,207	53,207	20	34,274	567,200	532,927	0	0	0	0	104,378	40				44,828	697,041	320.6	629.9	0	0	28	432
2009	Nov	22,102	104,875	280,000	0	0	0	0	0	77	12,100	17	77	56,283	2,102	1	20,000	545,238	525,238	54,181	54,181	0	21	50,695	19				26,159	686,985	12.7	305.9	0	327	16	426
2009	Dec	20,000	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	0	0	20,000	523,275	503,275	68,403	68,403	0	26	36,804	14	Max Storage	Min Capacity		26,159	658,259	0.0	222.1	0	413	16	408
2010	Jan	20,000	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	0	0	20,000	501,313	481,313	68,403	68,403	0	26	36,804	14	152,066	253,498		26,159	629,533	0.0	222.1	0	413	16	390
2010	Feb	19,222	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,222	479,350	460,128	68,403	68,403	0	26	36,804	14	198,895	331,563	English	25,142	601,824	0.0	222.1	0	413	16	373
2010	Mar	19,222	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	0	0	19,222	457,388	438,165	68,403	68,403	0	26	36,804	14				25,142	573,098	0.0	222.1	0	413	16	355
2010	Apr	137,294	105,207	285,000	1,478	0	11,647	13,125	18	76	0	0	76	55,256	55,256	21	82,038	435,425	353,387	0	0	0	0	105,207	40				107,301	462,213	332.9	634.9	0	0	67	286
2010	May	205,775	105,207	285,000	1,813	0	11,647	13,460	18	73	1,210	2	73	53,709	53,709	20	152,066	405,564	253,498	0	0	0	0	105,207	40				198,895	331,563	323.6	634.9	0	0	123	206
2010	Jun	151,499	105,207	285,000	2,675	0	0	2,675	4	88	1,210	2	88	64,512	64,512	25	86,987	390,634	303,647	0	0	0	0	105,207	40				113,775	397,155	388.7	634.9	0	0	71	246
2010	Jul	113,887	105,207	285,000	6,379	0	0	6,379	9	82	2,420	3	82	59,589	59,589	23	54,298	360,773	306,475	0	0	0	0	105,207	40				71,019	400,854	359.0	634.9	0	0	44	248
2010	Aug	80,949	105,207	285,000	9,800	0	0	9,800	13	15	47,190	65	15	11,319	11,319	4	69,630	345,842	276,212	0	0	0	0	105,207	40				91,072	361,272	68.2	634.9	0	0	56	224
2010	Sep	108,662	105,207	285,000	8,083	0	0	8,083	11	51	22,990	32	51	37,279	37,279	14	71,383	330,912	259,529	0	0	0	0	105,207	40				93,366	339,450	224.6	634.9	0	0	58	210
2010	Oct	81,577	105,207	285,000	3,071	0	0	3,071	4	73	12,100	17	73	53,207	53,207	20	28,370	330,912	302,542	0	0	0	0	105,207	40				37,106	395,710	320.6	634.9	0	0	23	245
2010	Nov	28,288	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	8,288	3	20,000	330,912	310,912	60,115	60,115	0	23	45,092	17				26,159	406,657	49.9	272.1	0	363	16	252
2010	Dec	20,000	105,207	285,000	0	0	0	0	0	94	0	0	94	68,403	0	0	20,000	330,912	310,912	68,403	68,403	0	26	36,804	14				26,159	406,657	0.0	222.1	0	413	16	252

Average Pond Volume =	48,020	cubic meters
Standard Deviation =	38,453	cubic meters
Standard Deviation + Average Volume=	86,472	cubic meters
Standard Deviation + Average Volume=	22,843,577	gallons

Average Pond Volume =	62,807	cubic yards
Standard Deviation =	50,294	cubic yards
Standard Deviation + Average Volume=	113,101	cubic yards
Standard Deviation + Average Volume=	22,843,559	gallons

Appendix D

Additional Reclamation Practices for Consideration

APPENDIX D
ADDITIONAL RECLAMATION PRACTICES FOR CONSIDERATION.

Topsoil replacement, ripping, fertilization, and reseeding are not necessarily requirements under an approved alternate post-mining land use on private land, therefore, they are not discussed extensively in the Rock Creek Project Reclamation Plan. Alaska Gold is attaching this appendix as a means to further discuss and encourage the use of these practices where appropriate and practicable for promoting optimal revegetation and erosion control at the Rock Creek and Big Hurrah sites. The inclusion of the following discussion does not commit Alaska Gold to the implementation of these practices except as written in the body of the Reclamation Plan above.

TOPSOIL REPLACEMENT

Topsoil is thin to non-existent in many areas at Rock Creek and Big Hurrah. Organic material should be stockpiled where practicable for use at mine closure.

- It is suggested that stockpiled organics may be spread on the development rock stockpiles in a layer about 12 inches (30 cm) thick.

- Spreading of organic soils over the backfilled/regraded channels should be considered to promote the establishment of vegetation.

SEEDBED PREPARATION

Regrading and soiling operations may result in a compacted surface that requires preparation prior to revegetation. Compacted areas such as roads, lay down areas, or flat benches of development rock stockpiles, may also be ripped with a dozer to facilitate revegetation. Tilling the organic soils will encourage filtration, reduce wind erosion, reduce restrictions on root advance, and generally promote plant germination and establishment. Where it can be safely accomplished, slopes may be ripped or scarified along the contour of the slopes to reduce the potential for sheet erosion. The dozers are well suited to ripping and scarifying the seedbed surfaces. Alternatively, a motor grader equipped with ripper shanks may be used in lighter applications.

FERTILIZATION

Fertilization has the potential to enhance the initial establishment of desirable species. It is particularly important for use in areas where early success with revegetation is important for land stabilization and erosion control. However, there are a variety of factors to be considered to ensure it's use is appropriate and beneficial for the environment.

- If there exists low nutrient retention capacity in the development rock, nitrogen and potassium may be leached from the materials and impact downstream water quality. An adequate thickness of organic material as cover over development rock may allow for safer application of fertilizer in this situation. The suggested 12" cover of organic material for the

development rock stockpiles at Rock Creek should be adequate, according to ADNR, to ensure the fertilizer is mostly retained in the soils.

- Fertilizer will enhance the growth of all plant species. If the intent is to grow a specific species of vegetation, fertilizer could increase the establishment and growth of undesirable colonizing species and species existing as dormant ruderals in the growth medium allowing them to establish themselves faster than the seed material and out-compete the target species.

- The ADNR Plant Materials Center has recommended an application rate of 225 # per acre of 20N-20P-10K everywhere that will be either seeded or allowed to recolonize with native species.

All fertilizer applications should be done sparingly and carefully managed to minimize impacts to surface waters.

RESEEDING

- Seed Selection

A seed mix should be chosen to ensure that compatible, native species are represented, and that pre-existing vegetation communities are approximated. For example, willow and cottonwood tree shoots may be placed along re-established streambeds and surrounding wetlands.

The general seed mix should be developed in consultation with the Alaskan Plant Center and approved by ADNR.

- Seed Application

Seeding in most areas should most likely be done by broadcast seeding, although steep slopes may require hydro-seeding for safety purposes.

Willows and cottonwoods are best replaced by hand-planting along streambeds using shoots cut from live branches. The shoots are inserted into gravel along the stream banks to a depth where the roots will be in contact with the groundwater.

On a case-by-case basis, additional benefits for select species may be obtained by seeding and transplanting plugs of indigenous emergent aquatics into reclaimed shallow-water, wetland habitats early in the successional process.

MULCH

To ensure effective revegetation, it may be necessary to promote seed growth with the use of mulch, although other Arctic sites have not generally required the use of mulch. Mulching materials may include hay, straw, or commercially developed products. Common cost-effective rates of mulch

application range from 1 to 2 tons per acre. Slopes too steep for mulching may require hydro-mulch via a hydro-seeder for safety purposes.

REVEGETATION SEQUENCE

It is expected that during concurrent reclamation enough experience will be gained so as to make an estimate of the optimum growing season. Seeding may occur from early spring through mid-July to take advantage of the moisture left in the soils from the spring thaw. The latter half of the summer is often subject to heavy rains which may wash the seeds away and is not a recommended time for reseeding. Seeding may also occur just after the first frost in the fall. The seeds will be protected by the snowfall and can then take advantage of moisture resulting from snowmelt in the spring to maximize their initial growth. This method of revegetation has proven successful at other Arctic sites. When erosion potential is so high as to necessitate immediate re-establishment of vegetation, seeding operations should take place as soon as is practicable after seedbed preparation.

A successful reseeding effort should show an interim success rate of 30 % vegetation cover within three years after reclamation and a final objective of 70% or greater vegetation cover.