ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET

Permit Number: AK0053627

Rock Creek Mine

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Technical Contact: Allan S. Nakanishi, P.E.
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-4028
Fax: (907) 334-2415
Allan.Nakanishi@alaska.gov

Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

ROCK CREEK MINE

For wastewater discharges from

Rock Creek Mine
P.O. Box 640
Nome, AK, 99762

The Alaska Department of Environmental Conservation (the Department or DEC) issued an APDES individual permit (permit) to Alaska Gold Company. The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Rock Creek Mine Tailings Storage Facility and the development of the permit including:

- a listing of proposed effluent limitations and other conditions
- technical material supporting the conditions in the permit
- proposed monitoring requirements in the permit

Public Comment

Public comment on the draft permit was available from April 29 to May 31, 2011. Following the close of the public comment period, the Department reviewed the comments received on the draft permit and prepared a Response to Comments document that is available to the public. A final permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the final permit, fact sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review.

See http://www.dec.state.ak.us/commish/InformalReviews.htm for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800.

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information regarding appeals of Department decisions.

Documents are Available

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm .

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-4028	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99801 (907) 451-2136

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

1.0 EXECUTIVE SUMMARY

This fact sheet provides the basis for the conditions and requirements of the APDES permit AK0053627, which authorizes the discharge of treated wastewater to Rock Creek from the Rock Creek Mine tailings storage facility (TSF), the main pit, and recycle water pond (RWP) located near Nome. The permit authorizes discharges while the mine remains in temporary closure status (i.e., no active process operations or tailings deposited to TSF during the term of this permit). If a decision is made to re-open the mine, DEC would require the applicant to apply for a new APDES permit authorizing discharges from the entire operating mine facility. The permit includes effluent limits and monitoring requirements for proposed discharges to Rock Creek. The effluent limits are both technology- and water quality-based. No mixing zones are authorized.

2.0 APPLICANT

This fact sheet provides information on the APDES permit for the following entity:

Facility Name:	Rock Creek Mine
APDES Permit Number:	AK0053627
Facility Location:	Mile 3 Glacier Creek Road Nome, Alaska
Mailing Address:	P.O. Box 640
Facility Contact:	John Odden, Operations Manager

The map in APPENDIX A to this Fact Sheet shows the location of the treatment plant and the proposed discharge point to Rock Creek.

3.0 FACILITY INFORMATION

3.1 Background

Alaska Gold Company (AGC), a wholly owned subsidiary of NovaGold Resources Inc., received federal and state approval to construct the Rock Creek Mine located on the Seward Peninsula along the west coast of Alaska. The Rock Creek site is accessed by the Glacier Creek Road.

The mine site includes a variety of facilities, including an open-pit gold mine; development rock stockpiles; a process plant site with a gold recovery plant; and the TSF. AGC applied for an APDES permit to discharge treated water from the TSF, main pit, and RWP during the period of temporary mine closure.

Construction activities began at the Rock Creek site in late 2006 and continued into 2008. AGC initiated mining and processing operations at Rock Creek in September 2008, although operations were suspended in November 2008 when the project was placed into temporary care and maintenance status. The mine remains in temporary closure status at the time of this permit issuance.

The Rock Creek Mine TSF, the main pit, and RWP are components of the overall Rock Creek mine facility, and they presently contain primarily storm water runoff from upland areas that has

collected during temporary closure. Likewise, the water contained in the main pit and RWP consists primarily of storm water runoff, with small volumes of groundwater and seepage water. AGC is not applying for an APDES permit for the entire Rock Creek mine facility, because AGC is considering whether to re-open the mine, permanently close the mine, or request an extension of the temporary closure period. If the mine is re-opened, AGC must apply for a new APDES permit authorizing discharges from the entire operating mine facility. Consequently, the "facility" that is the subject of the current APDES permit application is different from the "entire mine facility" that AGC may seek to cover in a future APDES permit application for mine operations.

3.2 Current Wastewater Disposal

AGC is currently permitted to inject treated wastewater to 30 injection wells under the provisions of EPA Underground Injection Control Permit No. AK-5X27-001-A and State Waste Management Permit (WMP) No. 2003-DB0051, Rock Creek and Big Hurrah Mines. Injection of treated wastewater began in May 2009. AGC intends to continue to use the permitted injection well field in conjunction with the surface discharge under this APDES permit.

3.3 Proposed Discharge

AGC proposes to transport the effluent from the water treatment plant (WTP) to a new outfall that discharges to Rock Creek (Figure 1). The outfall will be constructed upstream of the highest elevation of the designated anadromous fish reach in Rock Creek (100 feet upstream the Glacier Creek Road culvert). The discharge will be to the Rock Creek channel through Outfall 001 located immediately above the culvert that conveys Rock Creek under the Glacier Creek Road. The maximum discharge would be 500 gallons per minute.

The discharge line from the WTP to Outfall 001 will consist of an 8- to 10-inch diameter insulated pipe with a heat trace system to prevent freezing in the winter. To further minimize the risk of ice buildup at the culvert, AGC will discharge to Rock Creek only during open water periods in Rock Creek, typically May through December. AGC will monitor ambient temperatures and discontinue the discharge if conditions begin to cause ice buildup inside or downstream of the culvert. The pipe would track approximately 2000 feet directly down the shallow hillside from the WTP to the outfall (Figure 1). The pipe would be laid in an engineered ditch with a constant ½ to 1 percent slope. The constant slope will ensure full drainage of the line when discharges from the WTP are shut off. The ditch would be approximately 2 to 3 feet wide and would be lined with rip rap to prevent erosion and undercutting.

Prior to 2010, flow through the Glacier Creek Road culvert during the winter months would create an ice flow build up immediately downstream of the culvert. The ice would continue to build up throughout the winter months and cover the road. In 2009, AGC installed a heat trace system to the culvert that prevented ice from forming in and immediately below the culvert. As a result, Rock Creek in and around the culvert does not fully freeze in winter and ice does not build up appreciably downstream of the culvert.

4.0 COMPLIANCE HISTORY

APDES Permit No. AK0053627 regulates a new discharge for the TSF at Rock Creek Mine; no compliance history is available for this proposed outfall. However, there have been compliance issues with storm water at this facility.

5.0 RECEIVING WATER BODY

5.1 Low Flow Conditions

The *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (EPA, 1991) and the Alaska Water Quality Standards recommend the flow conditions for use in calculating water quality-based effluent limits (WQBELs) using steady-state modeling. The TSD and the Alaska Water Quality Standards (WQS) state the WQBELs intended to protect aquatic life uses should be based on the lowest seven-day average flow rate expected to occur once every ten years (7Q10) for chronic criteria and the lowest one-day average flow rate expected to occur once every ten years (1Q10) for acute criteria.

Upstream from the Rock Creek Mine's main pit, the Rock Creek channel has been diverted to flow around the facility, redirecting the flow to Lindblom Creek to the northwest (Figure 1). Groundwater springs, however, regenerate the main Rock Creek channel downstream from the diversion point continuing to the Snake River. Flow data for Rock Creek were not available for calculating statistical low flows. AGC has not requested a mixing zone for the proposed Rock Creek Mine discharge. Effluent limits, therefore, are calculated without credit for dilution.

5.2 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the Alaska WQS. The WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each water body.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Rock Creek has not been reclassified nor has site-specific criteria been established.

Current uses designated to Rock Creek under 18 AAC 70.020 include:

- water supply for drinking, culinary, and food processing; agriculture, including irrigation and stock watering; aquaculture; and industrial;
- water recreation for contact recreation and secondary contact recreation; and
- growth and propagation of fish, shellfish, other aquatic life and wildlife.

5.3 Water Quality Limited Segment

Any part of a water body for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment."

Section 303(d) of the Clean Water Act (CWA) requires states to develop a Total Maximum Daily Load (TMDL) management plan for a water body determined to be water quality limited. The TMDL documents the amount of a pollutant a water body can assimilate without violating a state's WQS and allocates that load to known point sources and nonpoint sources.

Rock Creek is not listed as impaired in the *Alaska Final 2008 Integrated Water Quality Monitoring and Assessment Report* (April 1, 2008) nor is it listed as a CWA §303(d) water body; TMDLs are not required.

5.4 Mixing Zone Analysis

In accordance with State regulations at 18 AAC 70.240, as amended through June 23, 2003, the Department has authority to designate mixing zones in permits. The applicant has not requested a mixing zone for discharge to Rock Creek; therefore, a mixing zone analysis is not required.

5.5 Receiving Water Body Limitations and Monitoring Requirements

The applicant has not requested a mixing zone for the discharge to Rock Creek; therefore, all effluent limits contained in this permit are applicable at the point of discharge.

WMP No. 2003-DB0051 requires AGC to collect water quality samples from Rock Creek and the Snake River once per quarter (Temporary Closure Plan, Table D.3, Profile 3). Samples are analyzed for conventional and priority pollutants (metals, cyanide), including all parameters for which effluent limits have been developed under the APDES permit (Figure 2). Samples collected under the WMP may be used to satisfy the receiving water monitoring requirements of this permit, provided they meet the requirements specific to the APDES permit.

Receiving water monitoring samples are collected at appropriate locations downstream from Outfall 001 at Rock Creek (DC3-A) and in the Snake River (SRTB) to evaluate downstream impacts, if any, resulting from the discharge. Upstream samples are collected at Rock Creek (DC3-C) to provide reference data. The receiving water monitoring sample schedule is shown in Table 1.

Table 1: Receiving Water Monitoring

Sample Point	Description	Frequency[a]
DC3-A	Within Rock Creek, 20 feet downstream from the outfall from Diversion Channel #3	Quarterly
DC3-C	Within Rock Creek, 30 feet upstream from the outfall from Diversion Channel #3	Quarterly
SABC	Snake River above Balto Creek	Quarterly
SRTB	Snake River at Teller Bridge	Quarterly

Note:

a. Sample must be taken during the quarter that any discharge occurs.

6.0 EFFLUENT LIMITATIONS

6.1 Basis for Permit Effluent Limits

In general, the CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based limits. A technology-based limit is set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the WQS of a water body are being met. Water quality-based effluent limits may be more stringent than technology-based effluent limits. The basis for the proposed effluent limits in the permit is provided in APPENDIX B.

6.2 Proposed Effluent Limits

The permit contains limits that are both technology-based and water quality-based. Table 2 summarizes the effluent limits (see Appendices B through D for more details).

Table 2: Effluent Limits – Outfall 001

Parameters	Units	Maximum Daily Limit	Average Monthly Limit	Range
Antimony	µg/L	10.8	6.00	--
Copper	µg/L	12.01	4.49	--
Cyanide	µg/L	9.30	3.90	--
Lead	µg/L	4.75	1.66	--
Manganese	µg/L	163	50	--
Zinc	µg/L	104	37.8	--
pH	standard units	--	--	6.5 – 8.5
Total Suspended Solids	mg/L	30.0	20.0	--
Total Dissolved Solids	mg/L	682	500	--

6.3 No Discharge Allowed

No discharge is allowed of any floating solids, visible foam in other than trace amounts or oily wastes that produce a sheen on the receiving water body.

7.0 ANTIBACKSLIDING

As noted above in Section 3.1, AGC is presently applying for an APDES permit covering discharges of treated water from the mine's TSF, main pit, and RWP during temporary closure. AGC may apply in the future for a new APDES permit covering the entire mine site if the mine is re-opened. A new permit for the entire mine site may contain effluent limits that differ from effluent limits applicable to the TSF, main pit, and RWP.

The effluent limits in this permit are consistent with 18 AAC 83.430. Furthermore, this is the first issuance of an APDES permit for the Rock Creek mine TSF, main pit, and RWP; therefore, effluent limits are newly established, so anti-backsliding requirements are not applicable.

8.0 ANTIDEGRADATION

8.1 Receiving waters

Outfall 001 discharges treated mine drainage water to Rock Creek, which flows southwest from the mine site, through culverts under the Glacier Creek Road and towards the Snake River. Anadromous Dolly Varden rearing has been documented in Rock Creek to a point approximately 100 hundred feet upstream of the Glacier Creek Road. A defined channel extends for a distance of about one-quarter of a mile downstream of the Glacier Creek Road and during periods of rainfall a surface connection from Rock Creek to the Snake River has been observed. The lower half-mile section of channel does intermittently go subsurface with no surface expression during prolonged dry periods. Rock Creek commonly exceeds water quality standards for arsenic, lead, manganese and iron.

8.2 Tier Determination

The Department's approach to implementing the antidegradation policy found in 18 AAC 70.015 is based on the requirements in 18 AAC 70 and *Interim Antidegradation Implementation Methods* dated July 14, 2010. Using these requirements and policies, the department determines whether a water body or portion of a water body is classified as Tier 1, Tier 2, or Tier 3, where a larger number indicates a greater level of water quality protection. To qualify as a Tier 3, or "outstanding national resource" water, one of two criteria must be met. The water must either be 1) in a national or state park or wildlife refuge or 2) a water with exceptional recreational or ecological significance. The Rock Creek Project is not in a national or state park or wildlife refuge, and the water in Rock Creek is not identified as having exceptional recreational or ecological significance. Therefore, the Department determined that Rock Creek is not a Tier 3 water.

The reaches of Rock Creek, near the mine, are accessible to anadromous fish up to 100 feet upstream of the Glacier Creek Road and there is a intermittent connection between Rock Creek and the Snake River. Rock Creek is included in the Alaska Department of Fish and Game's (ADF&G) Catalog of Water Important for Sapwning, Rearing or Migration of Anadromous fishes. Although several parameters exceed WQS applicable to the protection and propagation of fish, shellfish, and wildlife and recreation in and on Rock Creek [see CWA 101(a)(2)]; as a conservative assumption, Rock Creek is treated as a Tier 2 water for the purposes of this permit.

Since this water body considered a Tier 2 water, a Tier 1 evaluation was not necessary since it is a less conservative designation.

8.3 Analysis

The Antidegradation Policy of the Alaska WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing and designated uses must be maintained and protected. The Department may allow reduction of water quality only after

finding that five specific criteria are met. These criteria and the Department's findings are as follows:

The effluent limits in the Permit meet the Antidegradation Policy. As described in APPENDIX B to this fact sheet, the updated limits are calculated and designed to meet the applicable WQS in Rock Creek and to maintain and protect existing and designated uses.

Further, although the Department has determined that the permit limits do not result in a reduction in water quality, and so no antidegradation analysis is triggered, the adjustments meet the five criteria applicable to allowing such a reduction under a Tier 2 analysis. These criteria and the Department's findings are as follows:

8.3.1. 18 AAC 70.015 (a)(2)(A). Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

- Rationale: Issuance of the permit will allow for a reliable long-term discharge option for the mine site during the temporary closure period. As such, it will help to continue to sustain the more than 20 full-time employees at the mine, as well as the indirect benefits to the Nome economy.

  As described in Sections 8.3.2 through 8.3.5, the limits in the Permit will meet WQS, provide for water quality adequate to protect existing uses, and treat and control discharges by the most effective and reasonable means and to the highest statutory and regulatory requirements. Allowing the adjustments is necessary to update the Permit for a Project that is important economically and socially for the Seward Peninsula, Alaska. Imposing more stringent limits would not be consistent with current data and analysis regarding what is needed to adequately protect and maintain water quality.

- The department finds that the criterion is satisfied.

8.3.2. 18 AAC 70.015 (a)(2)(B). Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

- Rationale: Discharge allowed by the permit at Outfall 001 conforms to the requirements of 18 AAC 70.020, 18 AAC 70.235, and 18 AAC 70.030. A mixing zone is not authorized at Outfall 001, and WQS are met at the end of pipe before the discharge enters Rock Creek. More specifically, the effluent limits in the permit for Outfall 001 are based on the applicable WQS (18 AAC 70.020), converted to maximum daily and average monthly values using established calculations and the recalculated coefficient of variation (CV) from the past effluent data.

- The department finds that this criterion is satisfied.

8.3.3. 18 AAC 70.015(a)(2)(C). The resulting water quality will be adequate to fully protect existing uses of the water.

- Existing uses and designated uses are identical therefore protection of the designated uses would protect the existing uses.

- Rationale for Outfall 001: No mixing zone is authorized. The WQS, upon which the effluent limits are based, serve the specific purpose of protecting the existing and designated uses and are met at the end of pipe before the discharge enters Rock Creek. The effluent limits in this permit are based on actual data of past performance of the WTP, as described in Figure 2 and Figure 3.

- The department finds that the resulting water quality will be adequate to fully protect existing and designated uses and that the criterion is satisfied.

8.3.4. 18 AAC 70.015(a)(2)(D). The methods of pollution prevention, control, and treatment found by the department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.

- Rationale: The mine has constructed and optimized the operation of a water treatment plant for treatment of wastewater contained in the TSF, main pit, and RWP. Treatment is achieved through chemical precipitation, oxidation, microfiltration, and pH adjustment for removal of metals. The treatment plant will ensure compliance with water quality standards without a mixing zone.

- Rationale: The Department finds the most effective methods of prevention, control, and treatment are the practices and requirements set out in the permit and currently in use at the treatment plant. Mine operators are required to implement a best management practices (BMP) plan as required by the permit. The Permittee is required to review the BMP Plan annually. The BMP Plan includes pollution prevention measures and controls appropriate for each facility and discharge. The design, construction, and performance of the treatment plant has also been reviewed and approved by the Department.

- The Department finds that this criterion to address pollution prevention, control, and treatment is satisfied.

8.3.5. 18 AAC 70.015(a)(2)(E). All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.

- *Rationale: For Outfall 001, applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30), as amended June 26, 2003. Accordingly, there are three parts to the definition. First, it includes all federal technology-based effluent limitation guidelines as found in 40 Code of Federal Regulations, Part 440, Subpart J. The permit implements the technology-based Effluent Limits Guidelines (ELGs) for the subcategory of gold mines. The second part considers discharge of sewage to sewers and is not applicable to this permit. The third part includes any more stringent treatment required by State law, including 18 AAC 70. The correct operation of equipment, visual monitoring, and following the BMPs, as wells as other permit requirements, will control the discharge and satisfy all applicable federal and state requirements. This achieves the highest statutory and regulatory requirements.*

- *The department finds that the treatment required in this permit achieves the highest statutory and regulatory requirements and that the criterion is satisfied.*

9.0 MONITORING REQUIREMENTS

9.1 Basis for Effluent and Receiving Water Monitoring

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed of. Monitoring in permits is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving water body quality.

9.2 Effluent Monitoring

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than required under the permit. These additional samples must be used for averaging if they are conducted using the Department – approved test methods (generally found in 18 AAC 70 and 40 CFR Part136 [adopted by reference in 18 AAC 83.010]), and if the Method Detection Limits (MDLs) are less than the effluent limits.

Table 3 presents the effluent monitoring requirements.

Table 3: Effluent Monitoring Requirements

Parameter	Units	Frequency [a]
Antimony	µg/L	Monthly
Copper	µg/L	Monthly
Cyanide (weak acid dissociable)	µg/L	Monthly
Lead	µg/L	Monthly
Manganese	µg/L	Monthly
Zinc	µg/L	Monthly
pH	standard units	Daily
Total Suspended Solids	mg/L	Monthly
Total Dissolved Solids	mg/L	Monthly
Chlorine	mg/L	Monthly
Mercury	µg/L	Monthly
Flow	gpm	Continuous
Whole Effluent Toxicity	TU_c	Monthly

[a] During periods when discharging only

9.3 Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limitations on whole effluent toxicity (WET) when a discharge has reasonable potential to cause or contribute to an in-stream excursion above the numeric criterion for WET. The numeric WET criterion is 1.0 chronic toxicity unit (TU_c). The permit includes monthly WET monitoring. The permit does not establish limits, because there is no previous effluent monitoring data for determination of reasonable potential to cause or contribute to an exceedance of the WET numeric criterion. The toxicity trigger of 2 TU_c has been set that will require a Toxicity Reduction Evaluation (TRE) and Toxicity Identification Evaluation (TIE) if exceeded.

WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two different durations of toxicity tests: acute and chronic. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure. Chronic toxicity monitoring shall be conducted according to the methods and species approved by US EPA in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, 4th Edition (2002), Technical Report No. EPA-821-R-02-013.

10.0 OTHER PERMIT CONDITIONS

10.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the Quality Assurance Project Plan (QAPP) within 60 days of the effective date of the final permit. The QAPP shall consist of standard operating procedures the permittee must follow for

collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The plan shall be retained on site and made available to the Department upon request.

10.2 Operation and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limits, monitoring requirements, and all other permit requirements at all times. The permittee is required to develop or update and implement an operation and maintenance plan for its facility within 60 days of the effective date of the final permit. The plan shall be retained on site and made available to the Department upon request.

10.3 Best Management Practices Plan

In accordance with AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed of. This permit requires the permittee to develop a Best Management Practices (BMP) Plan in order to prevent or minimize the potential for the release of pollutants to waters and lands of the State of Alaska through plant site runoff, spillage or leaks, or erosion. The permit contains certain BMP conditions that must be included in the BMP plan. The permit requires the permittee to develop or update and implement a BMP plan within 60 days of the effective date of the final permit. The permittee currently has a BMP that may be updated, on an as needed basis, to satisfy this requirement. The Plan must be kept on site and made available to the Department upon request.

10.4 Standard Conditions

Appendix A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

11.0 OTHER LEGAL REQUIREMENTS

11.1 Alaska Coastal Management Program

According to AS 46.096(b) DEC is required to coordinate the consistency review of the project since it requires only a DEC permit. Prior to conducting a consistency review DEC implements the DEC Single Agency Coastal Management Consistency Review Procedures by consulting with affected coastal districts on the scope of activities subject to an ACMP consistency review, which would include activities subject to enforceable district policies of an approved coastal district plan. The specific activities subject to the Permit are excluded from the project consistency review and will not be included in the scope of the project subject to a consistency review according to AS 46.40.040(b)(1). Rock Creek Mine is in a coastal district, Bering Straits CRSA and was reviewed for consistency with ACMP (ACMP I.D. Number AK 0605-05AA). Based on district responses during consultation the Department determined that no additional consistency review was necessary.

11.2 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) Marine Fisheries and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species.

The applicant prepared an environmental impact document (EID) for the proposed mining project in 2006, which included an evaluation of threatened and endangered species (Alaska Gold Company, Rock Creek Project, Plan of Operations, Volume 2, Environmental Information Document, May 2006). The U.S. Army Corps of Engineers (Corps) noted in its 2006 Clean Water Act 404 Permit Decision Document that the Rock Creek Mine was within the migratory ranges of spectacled eiders and Steller's eiders, both listed as threatened species under the ESA. However, the Corps noted that neither species has been documented as breeding in the Nome area, nor does the area around the mine constitute potentially suitable breeding, molting, or nesting habitat for either species. FWS previously noted that mine construction and operation would not adversely affect these listed species or other listed species.

In 2008, FWS listed polar bears as a threatened species under the ESA. FWS finalized the polar bear critical habitat boundary, which extends along coastal areas of the Seward Peninsula, including Nome, in November 2010. In the Nome vicinity, critical habitats are defined as sea ice and barrier islands; onshore denning critical habitats are not found in this region. The Rock Creek Mine is located approximately 24 miles northwest of the Safety Sound Barrier Islands critical habitat and 25 miles east of the Sledge Island critical habitat. Likewise, the Rock Creek Mine is located approximately 8 miles inland from Norton Sound and winter sea ice. Polar bear sightings in the Nome vicinity are rare and have not been recorded at the Rock Creek Mine site; therefore, the project should have no effect on this listed species.

To minimize human-bear interactions, AGC implements a bear management/safety program that suspends all activities in a particular location (e.g., monitoring, inspections) if bears are present. Any observations of listed species will be recorded in the wildlife management log and reported to FWS.

11.3 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH.

The receiving water, Rock Creek, for proposed discharges from Rock Creek Mine is not an EFH; however, it does have a seasonal and intermittent connection to the Snake River, which is designated as EFH for salmon species. The proposed discharge limits will ensure compliance with all applicable water quality criteria without a mixing zone. Therefore this discharge will have no adverse impacts on designated EFH in the Snake River.

11.4 Permit Expiration

The permit will expire five years from the effective date of the permit.

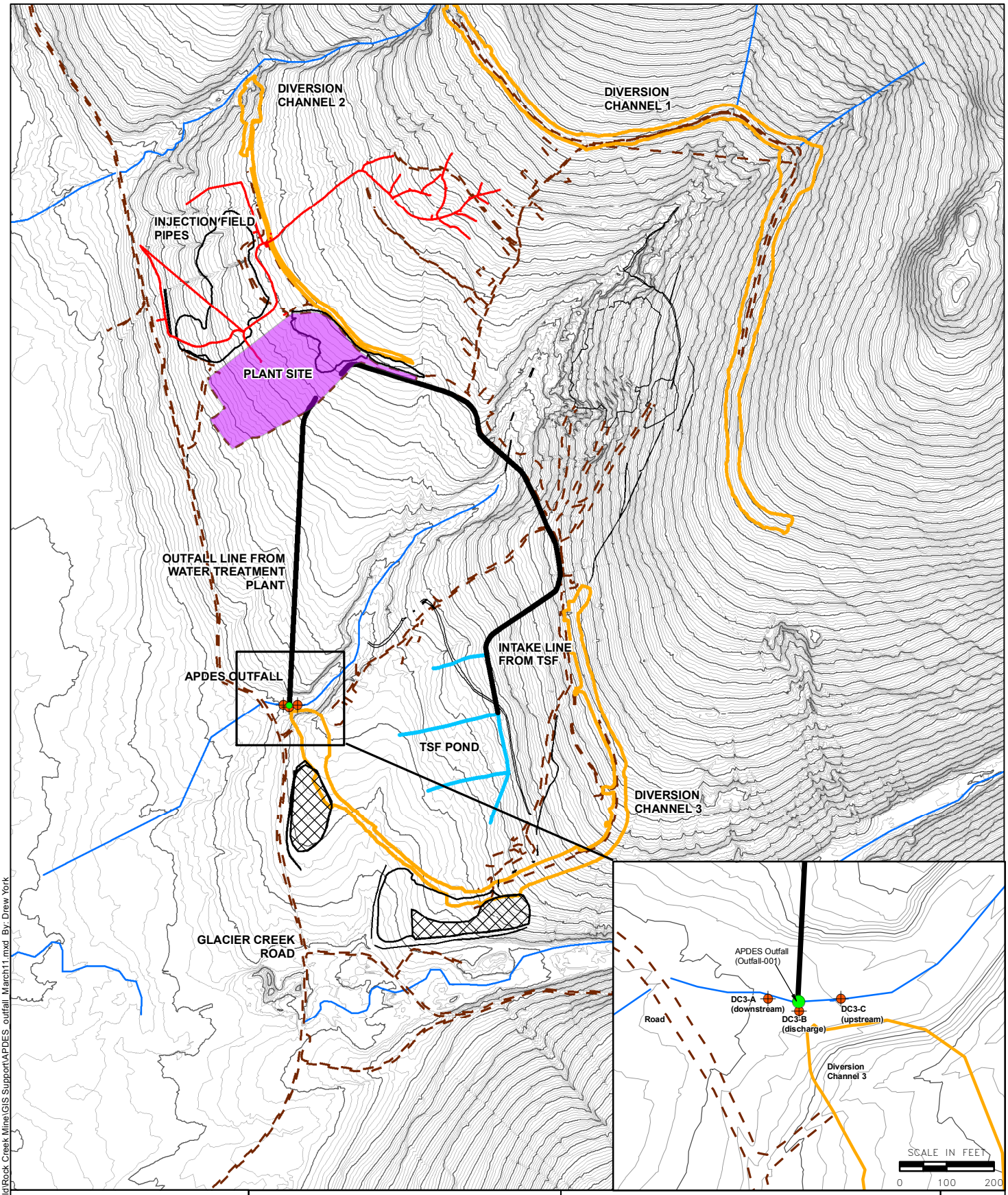
12.0 REFERENCES

1. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
2. Alaska Gold Company, 2006. *Rock Creek Mine Plan of Operations Volume 2, Environmental Information Document*, May, 2006.
3. Alaska Gold Company, 2011. *Rock Creek APDES Application*, March 1, 2011.

APPENDIX A. FACILITY INFORMATION

Facility Name and Location		
Name:	Rock Creek Project	
APDES ID Number:	AK0053627	
Location: Mailing Address:	Mile 3 Glacier Creek Road Nome, AK 99762 P.O. Box 640 Nome, AK 99762	
Facility Background:	The proposed permit is for a new discharge. The current permit application was received on [date].	
Collection System Information		
Service Area:	N/A	
Service Area Population:	N/A	
Collection System Type:	N/A	
Facility Information		
Treatment Train:	Oxidation, pH adjustment, chemical precipitation, and microfiltration	
Design Flow:	550 gpm	
Existing Flow:	438 gpm (average daily for October 2009 - March 2010), winter discharge to the injection field	
Months when will Discharge Occur:	May to December (open water season)	
Outfall Location:	Latitude: 64° 36' 16.04143" North (NAD83)	Longitude: 165° 26' 18.18603" West (NAD83)
Receiving Water Body Information		
Receiving Water Body:	Rock Creek	
Subbasin:		
Beneficial Uses:	Water supply, recreation, and aquatic life	
Water Quality Limited Segment:	N/A	
Low Flow:	NA	

Figure 1: Rock Creek Mine Map



N

SCALE IN FEET

0 1,000 2,000

Issued by:

TETRA TECH

350 Indiana Street, Suite 500
Golden, Colorado 80401
(303) 217-5700 (303) 217-5705 fax

ROCK CREEK MINE
APDES OUTFALL

A REVISION

Project:	Project No.:
NOVA GOLD	114-XXXX
Location:	Date:
NOME, ALASKA	06/2011

FIGURE 1

JUNE 2011 T:\Clients\Nova Gold\Rock Creek Mine\GIS Support\APDES_outfall_March11.mxd By: Drew York

Figure 2: Rock Creek Wastewater Treatment Plant Process Flow Diagram

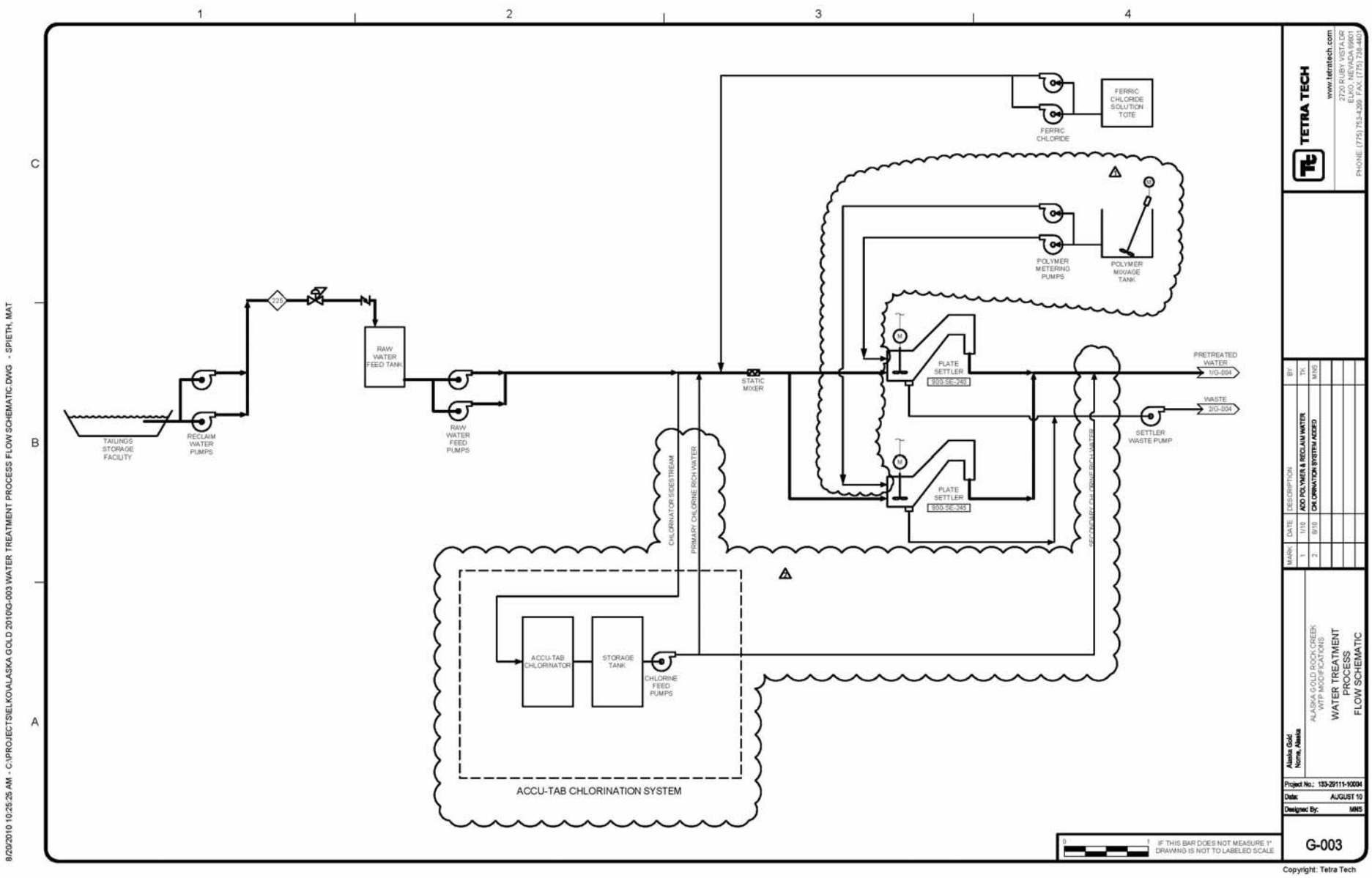
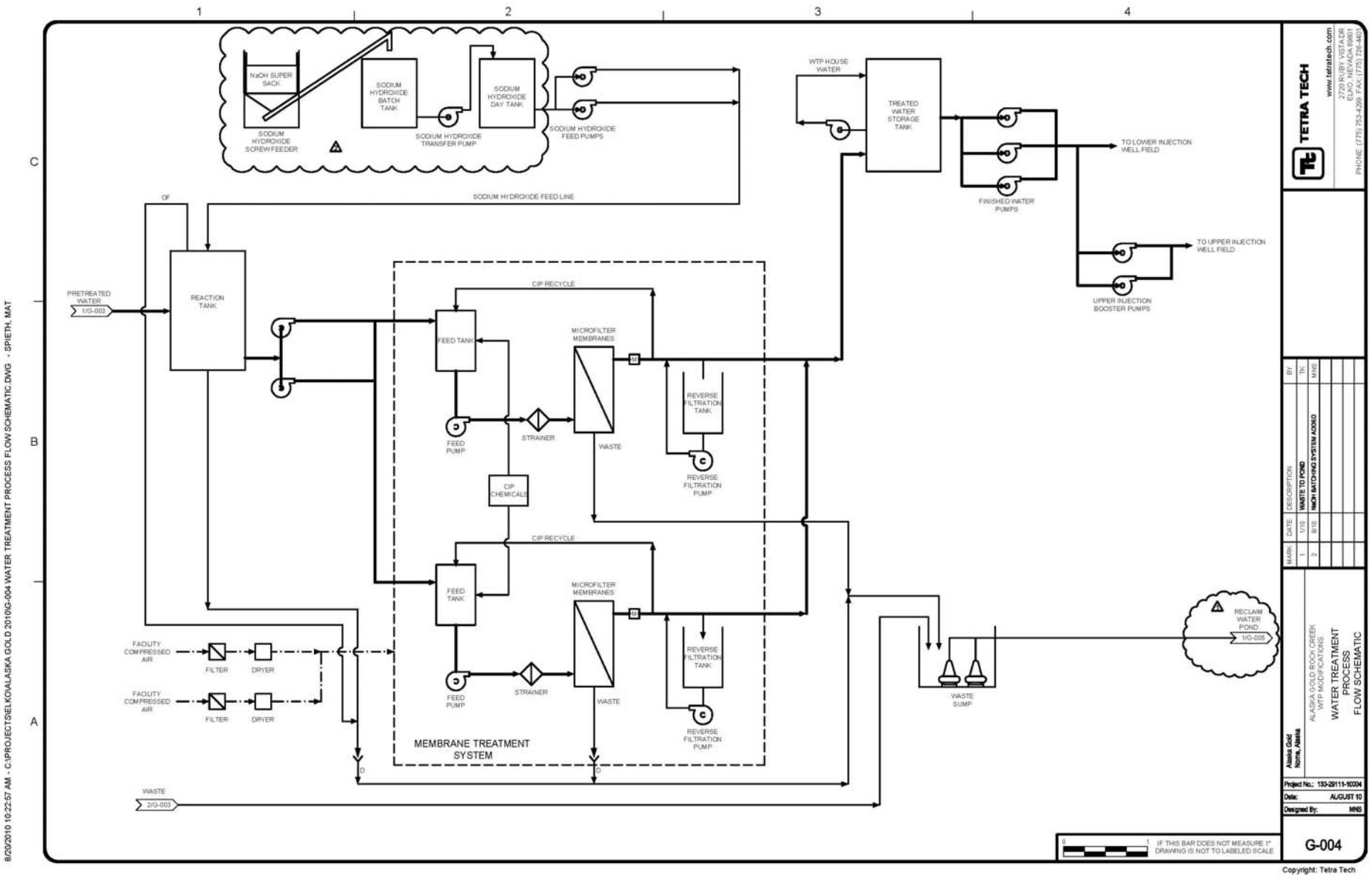


Figure 3: Rock Creek Wastewater Treatment Plant Process Flow Diagram (continued)



APPENDIX B. BASIS FOR EFFLUENT LIMITS

The following discussion explains in more detail the statutory and regulatory basis for the technology and water quality-based effluent limits contained in the permit. Part 1 discusses technology-based effluent limits (TBELs), Part 2 discusses water quality-based effluent limits (WQBELs) in general, and Part 3 discusses facility-specific WQBELs.

1. Technology-Based Effluent Limits

Effluent Limitation Guidelines

EPA promulgated effluent limitation guidelines (ELGs) for the ore mining and dressing point source category at 40 CFR Part 440, which include technology-based limits for this point source category. Subpart J is applicable to Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategories.

The ELGs applicable to a new source, which is a source that has commenced construction after the ELGs were established on December 3, 1982, are applicable to discharges from active mines. Since Rock Creek is an inactive mine, these ELGs are not directly applicable. The Department exercised its best professional judgment (BPJ) in establishing TBELs based on these ELGs. Cadmium and mercury ELGs were not applied as TBELs, because monitoring has demonstrated they are not expected to be found in the effluent.

Table B-1: Technology-Based Effluent Limits for Mine Drainage [40 CFR § 440.104(a)]

Parameter	Units	Maximum for any 1 day	Average of daily values for 30 consecutive days	Range
Copper	mg/L	0.30	0.15	---
Zinc	mg/L	1.5	0.75	---
Lead	mg/L	0.6	0.3	---
pH	s.u.	---	---	6.0 – 9.0
TSS	mg/L	30.0	20.0	---

The ELGs also include the following requirements and discharge prohibitions.

- There shall be no discharge of process wastewater to navigable waters from mills that use the cyanidation process to extract silver or gold, except in the following event:
    - In the event that the annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility exceeds the annual evaporation, a volume of water equal to the difference between the annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility and annual evaporation/groundwater infiltration may be discharged subject to the limits in the Table B-1.

Currently, the mine is in temporary closure status and the process plant is inactive. As a result, all wastewater contained in the TSF, the main pit, and recycle water pond is precipitation and groundwater infiltration. Under current temporary closure conditions, effluent limits applicable to mine drainage (see

Table 1) are, applicable to discharges from the Rock Creek mine TSF, pit, and recycle water pond. No flow limit is included in the draft APDES permit.

2. Water Quality-Based Effluent Limits

Statutory and Regulatory Basis

Regulations at 18 AAC 70.10 prohibit conduct that causes or contributes to a violation of the State Water Quality Standards (WQS). Regulations at 18 AAC 15.090 require that permits include terms and conditions to ensure criteria are met, including operating, monitoring, and reporting requirements.

The regulations require the permitting authority to make this evaluation using procedures that account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant concentration in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. WQBELs in the permit must be stringent enough to ensure that WQS are met and must be consistent with any available Total Maximum Daily Load (TMDL).

Reasonable Potential Analysis

When evaluating the effluent to determine if WQBELs based on numeric criteria are needed, the Department projects the receiving water concentration downstream of where the effluent enters the receiving water for each pollutant of concern. The Department uses the concentration of the pollutant in the effluent and receiving water and, if appropriate, the dilution available from the receiving water, to project the receiving water concentration. If the projected pollutant concentration in the receiving water exceeds the numeric criterion for that substance, then the discharge has the reasonable potential to cause or contribute to an exceedance of the applicable WQS, and a WQBEL is required.

Procedure for Deriving WQBELs

The first step in developing a WQBEL is to develop a wasteload allocation (WLA) for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of WQS in the receiving water.

In cases where a mixing zone is not authorized, either because the receiving water already exceeds the criterion, the receiving water flow is too low to provide dilution, or for some other reason, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion. The following discussion details the development of WQBELs.

Once a WLA is developed, the Department calculates effluent limits which are protective of the WLA using statistical procedures described in APPENDIX D – Effluent Limit Calculations.

3. Specific WQBELs

Hardness-Dependent Metals

The toxicity of some metals varies with the hardness of the water; the aquatic life water quality criteria for these metals also vary with hardness. The receiving water hardness is used to determine the water quality criteria for such metals. For discharges from Rock Creek Mine, the receiving water is Rock

Creek, a tributary to the Snake River. The upstream ambient background condition of the receiving water was evaluated for hardness. Data were collected at a sample point nearest to the proposed outfall location DC3-B (Figure 1) from August 2003 through August 2006 before any disturbance at the site. The 5th percentile of the observed hardness values was 85 mg/L as $CaCO_3$, which was used to determine the hardness-based metal criteria.

The hardness-dependent aquatic life criteria for the metals of concern are expressed as dissolved metal. The dissolved fraction of a metal is the fraction that will pass through a 0.45-micron filter. Total recoverable metal is the concentration of the metal in an unfiltered sample. Regulations at 18 AAC 83.525 state that any permit limits for a metal must be expressed in terms of total recoverable metal. Translators are used to translate the dissolved criteria into total recoverable criteria for comparison to effluent data and for development of WQBELs, when applicable. Translators can either be site specific numbers or default numbers. EPA has published guidance related to the use of translators in permits in *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 82313-96-007, June 1996). In the absence of site specific translators, this guidance recommends the use of water quality criteria conversion factors as the default translators. Site-specific translators were not available; therefore, the conversion factors in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (DEC, 2008) were used in the reasonable potential analysis and effluent limit calculations.

Table B-2 summarizes the hardness-based water quality criteria used in the reasonable potential analysis.

Table B-2: Hardness-Dependent Metals Criteria Values (µg/L)
Calculated using a hardness value of 85 mg/L as $CaCO_3$

Parameter	Acute Criterion Total Recoverable (µg/L)	Translator	Acute Criterion Dissolved (µg/L)	Chronic Criterion Total Recoverable (µg/L)	Translator	Chronic Criterion Dissolved (µg/L)
Cadmium	1.81	0.915	1.72	0.24	0.880	0.22
Chromium III	1578	0.316	499	75.44	0.860	64.88
Copper	12.01	0.960	11.53	8.12	0.960	7.79
Lead	66.39	0.691	54.08	2.59	0.691	2.11
Nickel	409	0.998	408	45.46	0.997	45.33
Silver	3.07	0.85	2.61	---	---	---
Zinc	104	0.978	102	104	0.986	103

[1] Calculated using a hardness value of 85 mg/L as $CaCO_3$

pH

The most stringent water quality criterion for pH is for the protection of aquatic life and aquaculture water supply. The pH criteria for these uses state that the pH must be no less than 6.5 and no greater than 8.5 standard units and may not vary more than 0.5 pH units from natural conditions.

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Department used to determine if the discharge authorized in the permit has the reasonable potential to cause or contribute to a violation of Alaska Water Quality Standards (WQS). The Department used the process described in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA, 1991) and DEC's guidance, Reasonable Potential Procedure for Water Quality-Based Effluent Limits, APDES Permits (January 2009) ("RPA Guidance") to determine the reasonable potential for any pollutant to exceed a water quality criterion.

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the Department compares the maximum projected receiving water body concentration to the criteria for that pollutant. Reasonable potential to exceed exists if the projected receiving water body concentration exceeds the criteria, and a water quality-based effluent limitation must be included in the permit (18 AAC 83.435). This section discusses how the maximum projected receiving water body concentration is determined.

C.1 Mass Balance

For a discharge to a flowing water body, the maximum projected receiving water body concentration is determined using a steady state model represented by the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \qquad \text{(Equation C-1)}$$

where,

C_d = Receiving water body concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = 95th percentile measured receiving water body upstream concentration

Q_d = Receiving water body flow rate downstream of the effluent discharge = $Q_e + Q_u$

Q_e = Effluent flow rate (set equal to the design flow of the WWTP)

Q_u = Receiving water body low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_e Q_e + C_u Q_u}{Q_e + Q_u} \qquad \text{(Equation C-2)}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with the receiving stream. If a mixing zone based on a percentage of the critical flow in the receiving stream is allowed based on the assumption of incomplete mixing with the receiving water body, the equation becomes:

$$C_d = \frac{C_e Q_e + C_u (Q_U \times MZ)}{Q_e + (Q_u \times MZ)} \qquad \text{(Equation C-3)}$$

where MZ is the fraction of the receiving water body flow available for dilution. Where mixing is rapid and complete, MZ is equal to 1 and equation C-2 is equal to equation C-3 (i.e., all of the critical low flow volume is available for mixing).

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water body concentration, and

$$C_d = C_e \quad \text{(Equation C-4)}$$

Flow data is not available for Rock Creek; therefore, the receiving water concentration for each pollutant was determined without dilution or a mixing zone, and is set equal to the pollutant concentration in the effluent. Upstream background pollutant concentrations were therefore not considered in this analysis.

C.2 Maximum Projected Effluent Concentration

The maximum projected effluent concentration was calculated according to section 3.3 of the TSD, "Determining the Need for Permit Limits with Effluent Monitoring Data", and the APDES Program Description (October 2008), page 29, which states that the maximum projected effluent concentration will be established at the 95th percentile confidence level.

Effluent data from October 1,2009 through October 31, 2010 were evaluated for potential outliers using EPA's ProUCL statistical analysis software. The following outliers were identified and removed from further analysis: chromium (11.6 µg/L), molybdenum (4.32 µg/L), iron (2630 µg/L), copper (15 µg/L), and lead (12.5 µg/L). Additionally, a manganese sample (300 µg/L) collected during malfunction of the oxidation system is removed from further analysis because it was not representative of normal operations. This adjustment resulted in more stringent manganese limits.

The RPA Guidance requires a distribution determination for each parameter's dataset based on non-detects and the number of samples (*n*). The spreadsheet developed under the RPA Guidance ("RPA Tool") uses the following criteria:

- $n < 10 \rightarrow$ Default (CV = 0.6)
- $10 \leq n$ (all detected) $\leq 30 \rightarrow$ Lognormal
- n (all detected) $> 30 \rightarrow$ Normal
- Mixed (detected & non-detected) $\rightarrow$ Delta lognormal

Since there are a limited number of data points available, the maximum projected effluent concentration is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier (RPM). The RPM is the ratio of the 95th percentile concentration to the maximum reported effluent concentration and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation to the mean of the data set. When fewer than ten data points are available, the TSD recommends making the assumption that the CV is set equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

Using the equations in section 3.3.2 of the TSD, the RPM is calculated based on the CV as follows. The following discussion presents the equations used to calculate the RPM.

First, the percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - \text{confidence level})^{1/n}$$

Where,

p_n = the percentile represented by the highest reported concentration

n= the number of samples

confidence level = 95% = 0.95

The RPM is the ratio of the 95th percentile concentration (at the 95% confidence level) to the maximum reported effluent concentration. This is calculated as follows:

$$\text{RPM} = \frac{C95}{Cp}$$

Where,

$C = \exp(z\sigma - 0.5\sigma^2)$,

$\sigma^2 = \ln(CV^2 + 1)$,

CV = coefficient of variation = (standard deviation) ÷ (mean), and

z = the inverse of the normal cumulative distribution function at a given percentile

The maximum projected effluent concentration (C_e) is determined by simply multiplying the maximum reported effluent concentration by the RPM:

C_e = (RPM)*(MEC)

Where,

MEC = Maximum Effluent Concentration

3. Maximum Projected Receiving Water Concentration

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant. In this case, the maximum projected receiving water concentration (C_d) is calculated without a mixing zone or credit for dilution and so is set equal to the projected maximum effluent concentration (C_e), as follows.

$$C_d = C_e$$

A summary of the projected maximum effluent concentrations used in the RPA are provided in the Table B-3.

Table C-1: Projected Maximum Effluent Concentration Calculations from the RPA Tool							
Parameter	*MEC*	*CV*	*RPM*	*Ce*	*Cd*	*Most Stringent Criterion*	*Reasonable Potential?*
Aluminum (µg/L)	13.3	0.250	1.01	13.4	13.4	750 – chronic aq. life [5]	No
Antimony (µg/L)	6.48	0.469	1.01	6.54	6.54	6 – drinking water	**Yes**
Arsenic (µg/L)	1.25 [4]	N/A	1.0	1.25	1.25	10 – drinking water	No
Barium (µg/L)	18.2	0.218	1.01	18.4	18.4	2000 – drinking water	No
Beryllium (µg/L)	0.065 [4]	N/A	1.0	0.065	0.065	4 – drinking water	No
Cadmium (µg/L)	0.075 [4]	N/A	1.0	0.075	0.075	0.24 – chronic aq. life	No
Chloride (mg/L)	69.0	0.241	1.01	69.7	69.7	230 – chronic aq. life	No
Chromium (µg/L)[1]	2.05	0.794	1.14	2.33	2.33	11 - chronic aq. life for Cr^{+6}	No
Chromium Total (µg/L)[2]	2.38	0.502	1.02	2.42	2.42	100 - chronic aq. life for Cr^{+3} Total	No
Cobalt	2.00	0.0905	1	2.00	2.00	50 – irrigation	No
Copper (µg/L)	15.3	1.17	1.02	15.6	15.6	8.12 – chronic aq. life	**Yes**
Cyanide WAD (µg/L)[3]	14	0.89	1.0	14	14	5.2 – chronic aq. life	**Yes**
Fluoride (µg/L)	122	0.338	1.01	123	123	1000 – irrigation	No
Iron (mg/L)	927	2.35	1.05	973	973	1000 – chronic aq. life	No
Lead (µg/L)	6.66	1.45	1.05	6.99	6.99	2.59 – chronic aq. life	**Yes**
Manganese (µg/L)	129	3.01	1.07	138	138	50 – human health	**Yes**
Molybdenum (µg/L)	4.32[4]	0.267	1.05	4.52	4.52	10 – irrigation	No
Nickel (µg/L)	19.7	0.520	1.01	19.9	19.9	45.46 – chronic aq. life	No
Selenium (µg/L)	3.11	0.208	1.01	3.14	3.14	5.0 – chronic aq. life	No
Thallium (µg/L)	0.155 [4]	N/A	1.0	0.155	0.155	2.0 – drinking water	No
Total Dissolved Solids (mg/L)	595	0.222	1.01	601	601	500 – water supply	**Yes**
Nitrate + Nitrite (mg/L)	1.81	0.591	1.01	1.83	1.83	10.0 – drinking water	No
Vanadium (µg/L)	3.10 [4]	N/A	1.0	3.10	3.10	100 – irrigation	No
Zinc (µg/L)	438	1.29	1.04	456	456	104 – acute/chronic aq. life	**Yes**

Notes:

[1] Data presented is for dissolved chromium and the dissolved criterion for chromium VI. To note, the data presented is that with a statistical outlier removed. The sample collected on October 15, 2009 was determined to be a statistical outlier when compared to the full data set, and was therefore removed from the maximum projected effluent concentration calculations.

[2] Data presented is for total recoverable chromium and the total recoverable criterion for chromium III.

[3] Data and criterion presented are for weak acid dissociable (WAD) cyanide.

[4] Parameter was undetected in all analyzed samples; this value represents one half of the MDL.

[5] Based on hardness of 85 mg/L and pH of greater than 7.0, the chronic standard is 750 µg/L.

N/A = not applicable (see note 4)

Data used to determine reasonable potential were collected from October 2009 through October 2010. By October 2009, optimization of the Rock Creek WTP was completed to ensure that all discharge limits in the Waste Management and Underground Injection permits were met. Optimization of the plant generally consisted of enhancements to the plant controls (e.g., filter cleaning procedures, chemical dosage rates, and pH levels) and performance monitoring systems. Data collected prior to October 2009 do not represent the full treatment capability provided by the WTP optimization, and therefore were not used as representative data in the RPA.

Effluent data were not available for mercury. However, ambient and TSF water sampling shows levels well below the lowest applicable water quality standard, 0.012 µg/L. Monthly mercury monitoring is included in the permit to verify this assumption.

The standard for total dissolved solids (TDS) is based on the water supply designation of Rock Creek. Based on effluent data collected from October 2009 through October 2010, the projected maximum effluent concentration is 595 mg/L, which is greater than both the AML and the MDL for TDS. It is anticipated, however, that the discharge will comply with the effluent limits for TDS, since discharges will primarily occur during months (May through December) when inflows of freshwater from rain and snowmelt will be the primary component of the influent to the WTP.

APPENDIX D. EFFLUENT LIMIT CALCULATION

The following calculations demonstrate how WQBELs were calculated for those pollutants that demonstrate reasonable potential.

1. Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis, as follows.

$Q_dC_d = Q_eC_e + Q_uC_u$,

Where,

Q_d = downstream flow = $Q_u + Q_e$

C_d = aquatic life criteria that cannot be exceeded

Q_e = effluent flow

C_e = effluent concentration

Q_u = upstream flow

C_u = upstream background pollutant concentration

The mass balance equation can be rearranged to determine the effluent concentration, which is the wasteload allocation, as follows.

$$C_e = WLA = \frac{Cd(Qu + Qe) - QuCu}{Qe}$$

When the upstream flow is zero (i.e., no mixing zone), then the WLA is set equal to the effluent concentration (*Ce*).

The next step is to compute the long term average concentrations which will be protective of the WLAs. This is done using the following equations from the *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$LTA_{acute} = WLA_{acute} * \exp(0.5\sigma^2 - z\sigma)$

Where,

$\sigma^2 = \ln(CV^2 + 1)$, and

z =2.326 for the 99th percentile probability basis

$LTA_{chronic} = WLA_{chronic}{}^{*} \exp(0.5\sigma^2 - z\sigma)$

Where,

$\sigma^2 = \ln[(CV^2/4)+ 1]$, and

z =2.326 for 99th percentile probability basis

The LTAs are compared and the more limiting LTA is used to develop the daily maximum and monthly average permit limits as shown below.

2. Derive the maximum daily and average monthly effluent limits

The maximum daily limit (MDL) and the average monthly limit (AML) are calculated according to the TSD as follows.

$MDL = LTA_{(limiting)} * \exp(z\sigma - 0.5\sigma^2)$

Where,

$\sigma^2 = \ln (CV^2 + 1)$

$z = 2.326$ for the 99th percentile probability basis

CV = coefficient of variation

$AML = LTA_{(limiting)} * \exp(z\sigma - 0.5\sigma^2)$

Where,

$\sigma^2 = \ln [(CV^2/n) + 1]$

$z = 1.645$ for the 95th percentile probability basis

n = number of sampling events required per month (minimum of 4)

WQBEL Calculations – Aquatic Life								
Pollutant	*Units*	WLA_{acute}	$WLA_{chronic}$	LTA_{acute}	$LTA_{chronic}$	$LTA_{limiting}$	*MDL*	*AML*
Copper	µg/L	12.0	8.12	2.13	2.66	2.13	12.01	4.49
Cyanide (WAD)	µg/L	22	5.2	4.98	2.12	2.12	9.3	3.9
Lead	µg/L	66.4	2.6	9.84	0.70	0.70	4.75	1.66
Zinc	µg/L	104.4	104.4	19.4	17.4	31.51	104	37.8

For WQBELs set for protection of human health, the TSD states that the AML should be set at the WLA, and the MDL should be calculated using the effluent variability and the multipliers provided in Table 5.3 of the TSD. The multiplier may be calculated according the following equation.

$$\text{MDL/AML} = \frac{\exp[z_m\sigma - 0.5\sigma^2]}{\exp[z_a\sigma_n - 0.5\sigma^2{}_n]}$$

Where,

$\sigma_n^2 = \ln(CV^2/n+1)$

$\sigma^2 = \ln(CV^2 + 1)$

CV = coefficient of variation

n = number of samples per month (minimum of 4)

z_m = percentile exceedance probability for the MDL

z_a = percentile exceedance probability for the AML

WQBELs – Human Health					
Pollutant	*Units*	*WLA*	*MDL/AML Multiplier*	*MDL*	*AML*
Antimony	µg/L	6.00	1.01	10.8	6.00
Manganese	µg/L	50	1.07	163	50

3. Comparison of TBELs and WQBELs

The following table provides a summary of the comparison between the applicable numeric TBELs and WQBELs. The most stringent limits are indicated in bold.

Comparison of Tech-based and Water Quality-based Limits					
Pollutant	*Units*	*TBELs*		*WQBELs*	
		MDL	*AML*	*MDL*	*AML*
Antimony	µg/L	--	--	**10.8**	**6.00**
Copper	µg/L	300	150	**12.01**	**4.49**
Cyanide WAD	µg/L	--	--	**9.3**	**3.9**
Lead	µg/L	600	300	**4.75**	**1.66**
Manganese	µg/L	--	--	**163**	**50**
Zinc	µg/L	1500	750	**104**	**37.8**
pH	s.u.	6 - 9		**6.5 – 8.5**	
TDS	mg/L	--	--	**682**	**500**
TSS	mg/L	**30.0**	**20.0**	---	---