FACT SHEET

NPDES Permit Number:	AK-003865-2
Date:	Feb. 2, 2006
Public Notice Expiration Date:	March 6, 2006
Technical Contact:	Cindi Godsey (907) 271-6561 or 1-800-781-0983 (within Alaska) godsey.cindi@epa.gov

The U.S. Environmental Protection Agency (EPA) Plans To Re-issue A Wastewater Discharge Permit To:

Teck Cominco Alaska, Inc.
Red Dog Mine

near
Kotzebue, Alaska

and the State of Alaska proposes to Certify the Permit

EPA Proposes NPDES Permit Issuance.

EPA proposes to re-issue a *National Pollutant Discharge Elimination System* (NPDES) permit to Teck Cominco's Red Dog Mine. The draft permit sets conditions on the discharges of pollutants from the mine to the Middle Fork of Red Dog Creek, tundra wetlands and various receiving waters as described for storm water outfalls. 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.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current discharge
- a description of the discharge locations and a map, and
- technical material supporting the conditions in the permit

Alaska State Certification.

EPA requests that the Alaska Department of Environmental Conservation (ADEC) certify the NPDES permit for Red Dog Mine under section 401 of the Clean Water Act. EPA may not issue the NPDES permit until the state has granted, denied, or waived certification. The state of Alaska has provided a draft certification for the permit (See Appendix B). For more information concerning this review, please contact Luke Boles at (907) 451-2142 or 610 University Avenue, Fairbanks, Alaska 99709 or Luke_Boles@dec.state.ak.us

Alaska Coastal Management Program

In a letter dated June 16, 2005, the Alaska Department of Natural Resources, Office of Program Management and Permitting (OPMP), Alaska Coastal Management Program (ACMP) stated that the reissuance of the Red Dog Mine NPDES permit does not require further review for consistency with the ACMP.

National Environmental Policy Act (NEPA)

In compliance with EPA headquarter guidance for re-issued NPDES permits, the EPA Region 10 NEPA Compliance Program has evaluated the proposed changes to the NPDES permit and prepared an Environmental Assessment and a Finding of No Significant Impact (FONSI) for this permit reissuance.

Public Comment

EPA will consider all comments before issuing the final permit. Those wishing to comment on the draft permit or FONSI may do so in writing by the expiration date of the Public Notice. All comments should include name, address, phone number, a concise statement of basis of comment and relevant facts upon which it is based. All written comments should be addressed to the Office of Water & Watersheds Director at U.S. EPA, Region 10, 1200 Sixth Avenue, OW-130, Seattle, WA 98101; submitted by facsimile to (206) 553-0165; or comments on the draft permit may be submitted via e-mail to godsey.cindi@epa.gov and comments on the FONSI may be submitted via e-mail to shaw.hanh@epa.gov

After the Public Notice expires and all significant comments have been considered, EPA's regional Director for the Office of Water & Watersheds will make a final decision regarding permit re-issuance. If no comments requesting a change in the draft permit are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If significant comments are received, EPA will address the comments and issue the permit along with a response to comments. The permit will become effective 30 days after the issuance date, unless the permit is appealed to the Environmental Appeals Board (EAB) within 30 days.

Persons wishing to comment on State Certification should submit written comments by the public notice expiration date to the Alaska Department of Environmental Conservation c/o Luke Boles, 610 University Avenue, Fairbanks, Alaska 99709 or Luke_Boles@dec.state.ak.us

Documents are Available for Review.

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below). Draft permits, Fact Sheets, and other information can also be found by visiting the Region 10 website at www.epa.gov/r10earth/water.htm

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-0523 or
1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permit are also available at:

EPA Alaska Operations Office
222 W. 7th Avenue #19
Anchorage, Alaska 99513-7588
(800) 781-0983 toll free in Alaska only

Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, Alaska 99709

For technical questions regarding the permit or fact sheet, contact Cindi Godsey at (907) 271-6561 or godsey.cindi@epa.gov. Services can be made available to persons with disabilities by contacting Audrey Washington at (206) 553-0523.

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TECHNICAL INFORMATION

I. APPLICANT

Teck Cominco Alaska, Inc.
Red Dog Operations
3105 Lakeshore Dr. Bldg A Suite 101
Anchorage, AK 99507

Facility Contact: Mark Thompson (907) 426-9145
Facility Location: foothills of the DeLong Mountains near Kotzebue, Alaska

II. FACILITY ACTIVITY

Teck Cominco Alaska Incorporated (TCAK), in partnership with the NANA Regional Corporation, operates the Red Dog zinc/lead mine in the Northwest Arctic Borough (NWAB) of Alaska, 90 miles north of Kotzebue and 47 miles inland from the coast of the Chukchi Sea. The mine site is located on a ridge between the Middle and South Forks of Red Dog Creek, in the DeLong Mountains of the Western Brooks Range. Red Dog is the world's largest zinc mine. NANA Management Services, Inc. provides camp management, housekeeping, catering and other services; and NANA/Lynden LLC, operates trucks carrying mineral concentrates from the mine to the Alaska Industrial Development and Export Authority's (AIDEA's) Delong Mountain Transportation System port facility.

The Red Dog deposit consists of metal sulfides in a Mississippian shale. The orebody lies within the drainage basin of the Middle Fork of Red Dog Creek. Facilities at the mine site include an open pit zinc/lead mine, concentrator, tailings impoundment, concentrate storage building, maintenance facilities, power generation plant and an accommodations complex. The open pit mine is established on both sides of the valley of the Middle Fork of Red Dog Creek.

Mine production at Red Dog Mine involves the stripping and stockpiling of ore, waste (i.e., rock with sub-economic value), and overburden/topsoil. Mill production involves crushing, grinding and processing to produce mineral concentrates. Based on the current economic pit design, the Red Dog Mine main pit is expected to remain in production until 2012. The current five-year forecast shows an ore production rate of 3.5 million tonnes per year. Mining is done by open-pit methods and averaged 8,900 ore tonnes per day in 2002. The mill requires a consistent feed of homogeneous ore material to optimize recovery. To accommodate this requirement, layered stockpiles, typically holding 280,000 tonnes, are built to combine the various types and grades of ore.

The mill is located on a graded pad adjacent to, and northeast of, the tailings dam. The operation includes two crushing plants and grinding, flotation, reagent and dewatering facilities. Stockpiled ore is rehandled to a gyratory crusher where it is reduced to a size of less than six inches in one pass. The crusher product is conveyed to an enclosed, coarse ore stockpile. The building is capable of holding about 15,000 tonnes of mill feed in one large pile. Coarse ore is withdrawn from underneath the stockpile to feed

three Semi-Autogenous Grinding (SAG) mills. The grinding circuit overflow is delivered to the prefloation circuit. Froth flotation processes separate materials into floating (particles attached to bubbles) and sinking components, which produce concentrate and tailings, respectively.

Final lead and zinc concentrates are thickened and dewatered to a final cake. These filtered concentrates are stored in the mill site concentrate storage building. From there, the concentrate is transferred by truck to the port site for shipment.

The concentrator tailings are pumped from the mill to the tailings facility and deposited either sub-aqueously or sub-aerially. The facility includes a rock fill dam and impoundment, a seepage collection and pumping system, a tailings discharge system (pumps and pipeline), and a water reclamation system.

The current dam crest is at elevation 950 ft. The pond elevation is at 947 ft elevation. Upstream (south) from the dam the impoundment is 8,000 ft long and 2,600 ft wide at its widest point. It is bounded on the south end by the Overburden Stockpile built on the divide between the South Fork of Red Dog Creek and Bon's Creek. The impoundment has an ultimate capacity of approximately 39.3 million cubic yards (cy) of tailings, assuming that the tailings remain covered by water.

III. BACKGROUND

In the early 1980s, TCAK submitted several applications for federal authorizations for the project. The surface water discharge was a new source which required EPA to prepare an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). The EIS was issued in 1984 and the first NPDES permit was issued in 1985 and expired in 1990. The permit was reissued in 1998, modified in 2003, and expired in 2003. TCAK re-applied for the reissuance of their NPDES permit in a timely manner so the permit has been administratively extended until it is reissued.

The 2003 modification of the permit was appealed and the TDS limits during grayling spawning were stayed. The Fact Sheet addresses the grayling spawning TDS limits that were included in the modification as well as the site specific criteria for TDS that has been proposed by ADEC.

IV. RECEIVING WATERS

A. Outfall Location. The facility proposes to discharge to the Middle Fork Red Dog Creek through outfall 001. Outfall 001, the discharge point for treated mine drainage and excess precipitation, is located at latitude 68º 04' 17" N, and longitude 162º 52' 05" W. Outfall 002, the discharge point for treated domestic wastewater, is located at latitude 68º 01' 45" N, and longitude 162º 54' 56" W. Stormwater is also discharged through outfalls in the facility vicinity; and the outfall locations are defined in the Stormwater Pollution Prevention Plan (SWPPP).

B. Water Quality Standards. The Alaska State Water Quality Standards (WQS) include use classifications, numeric and/or narrative water quality criteria, and the antidegradation policy. The use classification system designates the beneficial

uses that each water body is expected to achieve (such as contact recreation, growth and propagation of fish, etc.). The criteria for each parameter are the criteria deemed necessary by the State to support the beneficial use classification of each water body.

The Middle Fork Red Dog Creek is protected in the WQS [18 AAC 70.230(e)(19)] for freshwater Class (1)(A)(iv) for industrial water supply use from the headwaters to the terminus of the Red Dog Mine Water Management System. Lower Middle Fork Red Dog Creek from the terminus of the Red Dog Mine Water Management System to the confluence with North Fork Red Dog Creek is protected in the WQS [18 AAC 70.230(e)(20)] for freshwater Classes (1)(A)(iv), (1)(B)(i) contact recreation, wading only and (1)(B)(ii) for secondary recreation (except fishing). The main stem of Red Dog Creek from the confluence of the Middle and North Forks to Ikalukrok Creek is protected in the WQS [18 AAC 70.230(e)(18)] for freshwater Classes (1)(A)(iv), (1)(B)(i) contact recreation, wading only, (1)(B)(ii) for secondary recreation, and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. Ikalukrok Creek from its confluence with Red Dog Creek to the Wulik River is protected in the WQS [18 AAC 70.230(e)(8)] for freshwater Classes (1)(A)(iv), (1)(B)(i) contact recreation, wading only, (1)(B)(ii) for secondary recreation, and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

The water quality parameters that could be affected by the discharge from the facility include metals, solids and pH. These are common potential water quality parameters of concern in treated mine water discharges.

ADEC has proposed a site-specific criterion (SSC) for Total Dissolved Solids (TDS) that would result in effluent limitations different from those that would be required in the permit under the current WQS. The proposed change was adopted by the state of Alaska and if approved by EPA prior to finalizing the permit, the SSC would be used.

ADEC has proposed, in its 401 Certification, an SSC for cadmium which is based on the natural condition. The State may implement this type of SSC in a 401 Certification according to 18 AAC 70.235(a)(1), without a State regulatory change. EPA approval of the SSC is necessary prior to its use in an NPDES permit.

V. DESCRIPTION OF DISCHARGE

The tailings pond at the Red Dog Mine receives water from a variety of sources. These sources potentially include: water associated with the tailings from the milling process which include small amounts of the reagents used in the process; domestic wastewater, assay laboratory, filter press discharge, thickener overflows, and heavy equipment washing water carried by the gravity line from the mill/housing area; truck wash water; waste dump seepage; overburden pumpback; CSB air scrubber (if installed); SCR wastewater; natural gas produced water; filter clothes which are buried with the tailings; soil cement used on the exposed tailings beach; seepage pumpback; blasting agents; secondary containment water; snow dump; mine sump water; sand filter backwash and sand deposited on the tailings beach; and Port wastewaters hauled

to the mine site such as regeneration solution from the ion exchange treatment process at the Port. These contributions to the Tailings Impoundment are described in the re-application package.

Tailings pond water, often called reclaim water, is pumped by floating barge pumps in the tailings pond to two different water treatment plants at the mill facility. Water treatment plant 1 (WTP-1) operates year round at a nominal rate of 6,000 gallons per minute (gpm) and provides the mill with treated process water. Water treatment plant 2 (WTP-2) is seasonally operated and treats reclaim water for discharge at Outfall 001 at a maximum capacity of 14,500 gpm. WTP-2 also has the ability to provide process water to the mill when excess treated was is available.

At WTP-2, reclaim water is first treated in the pipeline with at least 6 mg/L of sodium sulfide and mixed in an in-line mixer. The sulfide reacts with the dissolved cadmium in the reclaim water to form insoluble cadmium sulfide, which is stable throughout the remainder of the treatment process. Reclaim water then flows into a 6,500 cubic-foot (cuft) rapid mix tank where reacted line and recycled solids are added to adjust the pH to approximately 10.3. From the rapid mix tank the solution gravity flows into a 50,000 cuft lime reactor that provides a nominal 20 minute residence time for complete chemical reactions. Large amounts of compressed air are sparged in to the rapid mix tank to ensure full oxidation of all ions in solution.

The significant chemical reaction occurring in the lime reactor is the precipitation, altering the form of an ion from a dissolved state to a solid state, of soluble metals as insoluble metal-hydroxides. The precipitated solids are maintained in suspension and flocculent is added, coalescing the smaller particles into larger solids. The flocculent is allowed to react in agitated floc mix tank. From the floc mix tank, the solution gravity flows into a 200 foot diameter circular clarifier where the solids are allowed to settle under gravity and separate from the water. Settled solids are removed through the “underflow” and the treated water leaves the clarifier through the “overflow”. The majority of the underflow solids are recycled back to the beginning to the treatment process to a 1,200 cuft lime/sludge mix tank where the solids are mixed with lime (calcium hydroxide). Product in the lime/sludge mix tank is then fed into the rapid mix tank with the raw reclaim water.

Clarifier overflow water then gravity flows to three sandfilters operated in parallel. The sand filters remove any residual solids not settled out of solution in the clarifier. From the sand filters, automated pH and turbidity meters take final measurements. If the pH is within permit limits and a range established which ensures effective treatment and the turbidity is within an establish range which indicates that effective suspended solids removal has been accomplished, the water is discharged to Red Dog Creek. If the pH and turbidity are not within the narrowly prescribed range, the filtered water is discharged back into the tailings impoundment.

VI. PERMIT REQUIREMENTS

A. Applicable Laws and Regulations

In general, the Clean Water Act requires that the effluent limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based limits. A technology-based effluent limit requires a minimum level of treatment for industrial point sources based on currently available treatment technologies. A water quality-based effluent limit is designed to ensure that the water quality standards of a waterbody are being met. For more information on deriving water quality-based effluent limits, see Appendix C.

B. Effluent Limitations

1. Wastewater from Outfall 001

An evaluation for the discharge from Outfall 001 was done comparing the technology- based limitations in 40 CFR Part 440 Subpart J, plus other parameters of concern, with the WQ-based limitations discussed in Appendix C. For most parameters, the WQ-based limitation is more restrictive.

a. The following summarizes the effluent limitations that are in the draft permit:

TABLE 1 – Effluent Limitations and Monitoring Requirements for Outfall 001

Parameter (in ug/L unless otherwise Noted)	Daily Maximum	Monthly Average	Weekly Average	Sample Frequency	Sample Type[1]
Cadmium[2]	0.94	0.44	---	1/week	24 hour composite
Cadmium[2] (proposed)	3.4	2.0	---	1/week	24 hour composite
Calcium, mg/L	---	---	---	1/week	24 hour composite
Copper[2]	34.40	17.15	---	1/week	24 hour composite
Chromium[2]	---	---	---	1/week	24 hour composite
Lead[2]	17.53	8.78	---	1/month	24 hour composite
Magnesium, mg/L	---	---	---	1/week	24 hour composite
Manganese[2]	---	---	---	1/week	24 hour composite
Mercury, total	0.02	0.01	---	1/month	24 hour composite
Selenium[2]	7.80	4.23	---	1/week	24 hour composite
Zinc[2]	386.32	237.11	---	1/week	24 hour composite
Total Suspended Solids (TSS), mg/L	30.0	20.0	---	1/week	24 hour composite
Total Dissolved Solids (TDS), mg/L	See Permit Part I.A.8.			1/week	24 hour composite
Cyanide, WAD	---	---	---	1/week	Grab
Fecal Coliform, #/100 ml	---	200	400	1/ 2 months	Grab

TABLE 1 – Effluent Limitations and Monitoring Requirements for Outfall 001					
Parameter (in ug/L unless otherwise Noted)	Daily Maximum	Monthly Average	Weekly Average	Sample Frequency	Sample Type[1]
Aluminum[2]	159.35	55.20	---	1/month	24 hour composite
Iron[2], µg/L	---	---	---	1/month	24 hour composite
Total Residual Chlorine, mg/L	---	---	---	1/month	Grab
Biochemical Oxygen Demand, mg/L	---	---	---	1/month	24 hour composite
Total Ammonia as N, mg/L	10.64	6.80	---	1/week	24 hour composite
Organic Priority Pollutant Scan[3], µg/L	---	---	---	see note 3	24 hour composite
Turbidity, NTU	---	---	---	1/week	Grab
Temperature, °C	---	---	---	Daily	Grab
Cumulative Volume, gallons	See Permit Part I.A.3.		---	Continuous	Recording
Whole Effluent Toxicity, TUc	12.2	9.7	---	1/month	See Permit Part I.H.
pH, standard units	6.5 to 10.5			1/week	Grab

1. Effluent samples collected shall be representative of the effluent discharged without dilution from or contact with any outside sources. Results of analyses conducted under Part I.A.1. of this permit shall be submitted monthly on the discharge monitoring report.
2. All metals shall be analyzed as total recoverable unless otherwise indicated.
3. Volatile organics shall be monitored using EPA analytical method 624, semi-volatile organics shall be monitored using EPA analytical method 625. Testing shall be conducted once in May, July, and September.

2. Whole Effluent Toxicity (WET) Requirements

Chronic WET testing is included in the draft permit on a monthly basis. The testing will occur at Outfall 001 so that the full effects of the discharge into the Middle Fork Red Dog Creek will be determined.

3. Outfall 002

This outfall is for the discharge from the construction camp of domestic wastewater as defined in 18 AAC 72.990(23) as “waterborne human wastes or graywater derived from dwellings, commercial buildings, institutions or similar structures.” As such, the appropriate standards are the wastewater disposal standards found in 18 AAC 72.

a. The following table summarizes the limitations that are in the draft permit for Outfall 002

TABLE 2						
Parameter[1]	**7-Day Average**	**30-Day Average**	**Daily Maximum**	**Units**	**Sampling Frequency**	**Sample Type[2]**
Flow	---	---	---	Gpm	Continuous	Measurement

TABLE 2						
Parameter[1]	**7-Day Average**	**30-Day Average**	**Daily Maximum**	**Units**	**Sampling Frequency**	**Sample Type[2]**
Biochemical Oxygen Demand (BOD_5) Influent & effluent	45	30	60	mg/L	1/month	Composite
Biochemical Oxygen Demand (BOD_5) Influent & effluent	---	---	---	lb/day	1/month	Composite
Total Suspended Solids (TSS) Influent & effluent	45	30	60	mg/L	1/month	Composite
Total Suspended Solids (TSS) Influent & effluent	---	---	---	lb/day	1/month	Composite
Fecal coliform	---	200	400	#/100 ml	1/month	Grab
Total Residual Chlorine[3]	---	---	---	mg/L	1/month	Grab
Ammonia as N	---	---	---	mg/L	1/quarter	Grab
pH	See requirements below			s.u.[4]	1/month	Grab

1 – For additional monitoring requirements see Permit Part I.B.5.
2 – Composite samples of effluent shall be composed of a mixture of four discrete grab samples of effluent. The grab samples shall be collected and combined within a 24 hour period. Each grab sample shall be collected and stored in accordance with procedures prescribed in Standard Methods, 18th, 19th or 20th Editions.
3 – TRC shall be analyzed immediately after sample collection using the DPD or amperometric method approved by EPA
4 – s.u. are standard units

b. The permittee must not discharge any floating solids, visible foam in other than trace amounts, or oily wastes that produce a sheen on the surface of the receiving water.

c. The pH must not be less than 6.5 standard units (s.u.) nor greater than 8.5 standard units (s.u.).

e. Percent removal for BOD_5 and TSS must be reported monthly on the DMR. Percent removal requirements for BOD_5 and TSS are as follows: for any month, the monthly average effluent load shall not exceed 15 percent of the monthly average influent load. Loading shall be calculated using the following formula:

8.34 X pollutant concentration (mg/L) X daily flow (mgd)

f. The permittee must collect effluent samples from the effluent stream after the last treatment unit prior to discharge into the receiving waters.

g. Results of the sample analyses shall be submitted monthly with the discharge monitoring reports (DMRs)

4. Stormwater Outfalls

The discharge of pollutants to waters of the United States via stormwater is controlled in the Red Dog permit by the establishment of a Stormwater Pollution Prevention Plan (SWPPP). The basis for the SWPPP is described in Part VI.D. of this Fact Sheet and the requirements are found in Permit Part I.I.

5. Surface Water (Ambient) Monitoring

The following ambient monitoring shall be conducted:

The changes highlighted in this Table compare what is proposed to what was in the current permit.

TABLE 4 – Ambient Monitoring Requirements									
Parameter[1]	Station 2	Station ~~73~~ 160[2]	Station 9[2]	Station 150	Station ~~10~~ 151 [2]	Station 12[2]	Station 20	Station 140[2]	Tributary[2]
Aluminum	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Cadmium	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Chromium	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Copper	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
~~Cyanide[3], total, µg/L~~	~~1/month~~	~~2/month~~	~~---~~	~~---~~	~~2/month~~	~~---~~	~~---~~	~~---~~	~~---~~
Cyanide[4], WAD, µg/L	---	---	---	---	2/month	---	2/month	---	
Iron	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Lead	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
Manganese	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Nickel	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Selenium	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
~~Silver~~	~~1/month~~	~~2/month~~	~~2/month~~	~~---~~	~~2/month~~	~~2/month~~	~~---~~	~~2/month~~	~~---~~
Zinc	1/month	2/month	2/month	---	2/month	2/month	---	2/month	1/month
Total ammonia as N, mg/L	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
Conductivity, µmhos/cm	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
Hardness, mg/L $CaCO_3$	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
Temperature, °Celsius	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---

TABLE 4 – Ambient Monitoring Requirements									
Parameter[1]	Station 2	Station ~~73~~ 160[2]	Station 9[2]	Station 150	Station ~~10~~ 151 [2]	Station 12[2]	Station 20	Station 140[2]	~~Tributary[2]~~
Total Dissolved Solids (TDS), mg/L	1/month	1/week	2/month	1/week	1/week	2/month	---	2/month	---
TDS Anions and Cations[5]	---	1/month	---	1/month	1/month	---	---	---	
pH, standard units	1/month	2/month	2/month	---	2/month	2/month	---	2/month	---
~~Dissolved Oxygen[5], mg/L~~	~~3/month~~	~~3/month~~	~~---~~	~~---~~	~~3/month~~	~~---~~	~~---~~	~~---~~	~~---~~
~~Hydrogen Sulfide[6], mg/L~~	~~3/month~~	~~3/month~~	~~---~~	~~---~~	~~3/month~~	~~---~~	~~---~~	~~---~~	~~---~~
Turbidity, NTU	---	---	---	---	---	3/month	---	3/month	---
Whole Effluent Toxicity[6], TU_c	---	---	1/month	---	---	1/month	---	---	---

1. Monitoring for metals shall be in ug/L and total recoverable unless otherwise noted. For additional monitoring requirements for aluminum, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, ~~silver~~, and zinc see section I.A.5.b.
2. The permittee shall spread out the sample collection dates so that the samples collected are representative of the calendar month. To the extent practicable, ambient monitoring shall coincide with effluent monitoring. If weather, safety, shipping, and other environmental constraints prevent the permittee from collecting representative samples, the permittee shall document the condition which prevented the representative samples from being collected on the discharge monitoring reports.
3. For additional monitoring requirements for cyanide, see Permit Part I.A.6.
4. The permittee shall notify the ADEC and the OHMP immediately by telephone should WAD cyanide concentrations exceed the detection limit of 3 ug/L.
5. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including, but not limited to, carbonates, chlorides, sulfates, potassium, magnesium, calcium, and sodium. The carbonate analysis may be estimated based on direct measurement of alkalinity..
6. See Permit Part I.G. for additional testing requirements.

C. Monitoring Requirements

40 CFR 122.48(b) requires that the permit contain monitoring requirements. Self-monitoring of effluent parameters is necessary for the permittee to demonstrate compliance with effluent limitations, to assure that state water quality standards are met, and to provide information for future permitting actions. Monitoring frequencies are based on the Agency's determination of the minimum sampling frequency required to adequately monitor the facility's performance. Required sample types are based on the Agency's determination of the potential for effluent variability. These determinations take into consideration several factors, of which

the most important are the type of pollutants of concern and the type of treatment system. The Limitation Tables, above, include the monitoring frequency and sample type proposed in the draft permit.

D. Best Management Practices

Section 304(e) of the CWA requires EPA to include conditions in the NPDES permit that require the permittee to develop a Best Management Practices (BMP) Plan and/or a Stormwater Pollution Prevention Plan (SWPPP) to control potential discharges such as runoff, spillage, and leaks. This permit requires a Plan that combines general BMP Plan requirements with SWPPP requirements to control the discharge of toxics or hazardous pollutants by way of plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage. On a mine site, not all precipitation related drainage is considered stormwater for regulatory purposes. Drainage from the mine site is regulated as “mine drainage” rather than “storm water.”

The intent of the SWPPP is to recognize the hazardous nature of various substances used and produced by the facility and the way such substances may be accidentally dispersed. The SWPPP should incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990, 42 U.S.C. 13101.

The SWPPP must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants.

E. Quality Assurance Plan

The permit requires the permittee to develop and implement a Quality Assurance Plan. The purpose of the Quality Assurance Plan is to establish appropriate sampling, handling and analytical procedures for all effluent and ambient water samples taken.

F. Other Requirements or Changes from the current Permit

1. This permit prohibits the use of Untreated mine water for road watering, even inside the mine pit. This provision is included in the permit to prevent the transport of pollutants contained in the untreated wastewater to sites that are not sloped toward the tailings impoundment.

2. TCAK has indicated that they will not be discharging in the winter. This draft permit does not include any permit requirements that were related only to winter discharging (including Permit Parts I.C.11. and 12. and Notes 5 and 6 in the Table in Permit Part I.D.7. of the current permit)

3. TCAK has proposed to include some biomonitoring requirements in their Solid Waste permit, which will be developed by ADEC, and have requested that these requirements be removed from the NPDES permit. In the current permit, EPA included these requirements based on the State’s CWA Section

1998 § 401 Certification. ADEC has proposed changes to the current biomonitoring program in its draft § 401 Certification for this draft permit. EPA is requesting comments on the changes which EPA has highlighted in the draft permit.

4. TCAK is also requesting a change in their ambient monitoring frequencies with the monitoring either being moved to the Solid Waste Permit or reduced. ADEC has proposed changes to the current ambient monitoring program in its draft § 401 Certification for this draft permit. EPA is requesting comments on the changes which EPA has highlighted in the draft permit.

5. TCAK has requested Alternative Test Procedures (ATPs) for WAD cyanide, chlorides and metals. The ATPs for chlorides and metals were approved during the cycle of the current permit and will be included in this permit. The ATP for WAD cyanide was approved by EPA in a letter dated November 16, 2005.

6. TCAK has requested that hardness be calculated rather than measured in the effluent. EPA has included monitoring in the draft permit to make this calculation possible.

7. Several parameters, including nickel and silver, monitored during the current permit cycle have shown no reasonable potential to violate the water quality criteria. The monitoring for these parameters has been removed from the permit.

8. TCAK has requested different method detection limits (MDLs). These are listed in the table below along with those MDLs included in the current permit:

Table 2 – Method Detection Limits

Parameter[1]	MDL (ug/L)	Requested MDL[2] (ug/L)
Aluminum	20	20
Cadmium	0.1	0.5
Chromium	1	2
Copper	1	5
Iron	30	40
Cyanide, WAD	3	3
Lead	0.08	1
Manganese	1	2
Mercury, total	0.2	0.005
Selenium	2	2
Zinc	2	5
Total Ammonia as N	10 ug/L	0.5 mg/L
BOD	8 mg/L	8 ug/L
TRC	10	0.1

1 All metals shall be measured in total recoverable unless otherwise noted.
2 The permittee may request less restrictive method detection limits for ambient monitoring. The request shall be submitted to EPA in writing, and is subject to EPA approval.

All requested MDLs are below the effluent limitations for parameters that are limited in the draft permit. As such, there are no Minimum Levels designated as compliance levels in the draft permit.

G. Additional Permit Provisions

Sections II, III, and IV of the draft permit contain standard regulatory language that must be included in all NPDES permits. Because they are regulations, they cannot be challenged in the context of an NPDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

VII. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to request a consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding potential effects an action may have on listed endangered species. EPA sent letters to the Services on August 23, 2005.

In a letter dated September 21, 2005, USFWS determined that the reissuance of the NPDES permit is not likely to adversely impact listed species so further consultation under Section 7 of the ESA is not necessary.

In a letter dated September 28, 2005, NMFS stated that there are no threatened or endangered species listed under their jurisdiction in the project area.

With the above information, EPA has determined that the re-issuance of this permit will have no effect on threatened or endangered species.

B. Essential Fish Habitat

Section 305(b) of the Magnuson-Stevens Act [16 USC 1855(b)] requires federal agencies to determine whether any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated Essential Fish Habitat (EFH) as defined by the Act. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EPA has determined that issuance of this permit is not likely to have an adverse effect on EFH in the vicinity of the discharge. Effluent limitations have been incorporated into the draft permit based on criteria considered to be protective of overall water quality in Red Dog Creek based on the designated uses of the creek. There is also a barrier to fish passage that prevents fish from coming into contact with the discharge. EPA will provide NMFS with this determination for their review

and possible recommendations. Any recommendations received from NMFS regarding EFH will be considered prior to final issuance of this permit.

C. State Certification

Section 401 of the Clean Water Act requires EPA to seek state certification before issuing a final permit. As a result of the certification, the state may require more stringent permit conditions to ensure that the permit complies with WQS. The certification may also require additional monitoring requirements and authorize a mixing zone. A draft 401 Certification is included as Appendix B in this Fact Sheet.

D. Permit Expiration

This permit will expire five years from the effective date of the permit. Permits may be administratively extended under 40 CFR 122.6 if all the requirements of that regulation are met.

VIII. **REFERENCES**

Application package dated February 25, 2003.

EPA 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington, DC., March 1991. EPA/505/2-90-001.

EPA 1999. *1999 Update of Ambient Water Quality Criteria for Ammonia.* Office of Water, Washington, D.C., December 1999. EPA-822-R-99-014.

Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia. 64 Federal Register 71974 – 71980, December 22, 1999.

18 AAC 70, the Alaska Department of Environmental Conservation's Water Quality Standards.

18 AAC 72, the Alaska Department of Environmental Conservation's regulations for Wastewater Disposal.

18 AAC 80, the Alaska Department of Environmental Conservation's regulations for Drinking Water.

Proposed Revision to the TDS criterion for Red Dog Creek. Alaska Department of Environmental Conservation. Public Noticed September 26, 2005.

1998 Permit Package including the final permit, response to comments and 401 Certification.

2003 Permit Modification Package including the final permit, response to comments, fact sheet, Environmental Assessment, and 401 Certification.

Letter dated November 16, 2005, from William Riley, EPA, to R.G. Scott, TCAK, regarding Alternative Test Procedures (ATPs).

Letter dated June 16, 2005, from DNR/OPMP to TCAK regarding the ACMP review.

Letter dated December 10, 2005, from R.G. Scott, TCAK, to Luke Boles, ADEC, requesting that the SSC for zinc not be re-certified.

“WET Limit with Consideration to Updated Site-side Water Balance” submitted by TCAK to EPA on November 21, 2005.

EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998].

APPENDIX A
Red Dog Mine Location

APPENDIX A
Red Dog Mine Location

APPENDIX B

DRAFT § 401 STATE CERTIFICATION

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DRAFT CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, as required by Section 401 of the Clean Water Act, has been requested by TeckCominco Alaska for NPDES Permit AK-003865-2 for the discharge of treated non-domestic wastewater, treated domestic wastewater and stormwater from the Red Dog Mine.

Public Notice of the application for this certification will be made in accordance with 18 AAC 15.140.

Water Quality Certification is required because the activity will be authorized by an Environmental Protection Agency permit identified as NPDES Permit AK-003865-2 and discharges will result from the activity.

This NPDES permit certification covers wastewater disposal from the following discharges:

1. Outfall 001 – Discharge of treated mine drainage and excess precipitation to the Middle Fork of Red Dog Creek. Outfall 001 is located at Latitude 68° 04'17" N, Longitude 162° 52' 05" W.

2. Outfall 002 – Discharge of treated domestic wastewater to the tundra. Outfall 002 is located at Latitude 68° 01' 45" N, Longitude 162° 54' 56" W.

3. Discharge of snowmelt and rainfall runoff from the site as indicated in the Stormwater Pollution Prevention Plan.

Appendix A is hereby incorporated by reference as part of this Certification. Appendix A provides the Department's rationale for the establishment of a Natural Condition Based Site Specific Criterion (NCBSSC) as the applicable water quality criterion for cadmium in Main Stem Red Dog Creek and in Ikalukrok Creek. This action is taken under 18 AAC 70.235(b). The Department has reviewed the applicant's request for a NCBSSC and finds the prevailing highest quality natural condition cadmium concentration in Ikalukrok Creek to be a total concentration of 2 μg/L in Ikalukrok Creek. See Appendix A of this Certificate for a discussion on the cadmium NCBSSC.

The Department has reviewed TeckCominco Alaska's request to rescind the NCBSSC for zinc applied to Main Stem Red Dog Creek that was approved in the 401 certification issued for the 1998 NPDES permit. At the time of the certification the zinc NCBSSC was less stringent than the applicable zinc water quality criterion (WQC) at 18 AAC 70.020(b). Since the approval of the NCBSSC for zinc in the 1998 NPDES permit certification, the WQC for zinc has become less stringent, resulting in the NCBSSC being more stringent than the currently applicable WQC for zinc listed in 18 AAC 70.020(b)(11). The Department finds that the NCBSSC for zinc in the Main Stem Red Dog Creek is not required to protect existing uses of the waterbody and removal of the zinc NCBSSC is hereby approved. The applicable WQC for zinc in the Main Stem Red Dog Creek shall

be determined as required in 18 AAC 70.020(b) and the *Alaska Water Quality Criteria Manual*. These are the criteria the effluent limits in this NPDES permit should be based on. This finding has been reviewed with respect to the Antidegradation policy, specifically 18 AAC 70.015(a)(2), and found to be consistent with this policy.

The Department has reviewed the application with respect to the antidegradation policy of the Alaska Water Quality Standards and finds the reduction in water quality to be in compliance with the requirements of 18 AAC 70.015, provided that the terms and conditions of this certification are made part of the final NPDES Permit.

The Department has reviewed the discharges with respect to the Alaska Coastal Management Program (ACMP), as required under 11 AAC 110, and finds that there are no major modifications proposed from the previous ACMP consistency finding. This facility was previously found to be consistent with the ACMP during the previous NPDES Permit renewal. Therefore, pursuant to 11 AAC 110.820(k)(3) and (4), consistency review is not required for this permit reissuance.

Having reviewed the preliminary draft permit, the Alaska Department of Environmental Conservation certifies that there is reasonable assurance that the proposed activity, as well as any discharge that may result, is in compliance with the requirements of Section 401 of the Clean Water Act, which includes the Alaska Water Quality Standards (18 AAC 70). Through this certification, in accordance with 18 AAC 15.120 ADOPTION OF NPDES PERMITS, the final NPDES permit will constitute the permit required under AS 46.03.100 Waste Disposal Permit, provided that the terms and conditions of the final certification are made part of the final NPDES Permit. The department is specifying the following permit terms and conditions under authority of AS 46.03.110(d):

1. The ADEC authorizes the following mixing zones in this certification (NPDES Preliminary Draft Permit parts I.A.1 and I.A.8a):

   A mixing zone in Main Stem Red Dog Creek of 1.5:1 (2.5x) dilution extending from the confluence of the Middle Fork Red Dog Creek with the North Fork Red Dog Creek to Station 151. The Main Stem Red Dog Creek mixing zone is approximately 1,930 feet in length. The mixing zone is granted for the following parameters: total dissolved solids (TDS), ammonia and WAD cyanide.

   A mixing zone in Ikalukrok Creek of 1:1 (2x) dilution extending from the confluence of Main Stem Red Dog Creek and Ikalukrok Creek to Station 150. The mixing zone is approximately 3,420 feet in length. The Ikalukrok Creek mixing zone is granted for TDS.

<u>Rationale:</u> In accordance with State Regulations 18 AAC 70.240, the Department has authority to designate mixing zones in permits or certifications. The authorized mixing zones will ensure that the water quality standards are met at all points outside of the mixing zones.

The Department considered all aspects required in 18 AAC 70.015 (Antidegradation) and 18 AAC 70.240-270 (Mixing Zones) including, but not limited to, the potential risk to aquatic life based on existing monitoring data of effluent, and, Ikalukrok Creek and Main Stem Red Dog Creek water quality.

The Department finds that the sizes of the mixing zones authorized for discharge in this certification are appropriate and provide reasonable assurance that existing uses of Ikalukrok Creek and Main Stem Red Dog Creek outside of the mixing zones are maintained and fully protected.

2. The pH effluent limits for Outfall 001 are 6.0 to 10.5 pH units (NPDES Preliminary Draft Permit part I.A.2)

<u>Rationale:</u> *The Department proposes to certify the same pH effluent limits as contained in the current NPDES Permit.*

The most stringent Alaska Water Quality Standard regulation for pH protects Growth and Propagation of Fish, Shellfish, other Aquatic Life and Wildlife. It requires that pH "not be less than 6.5 or greater than 9.0 and not vary more than 0.5 pH unit from natural conditions."

An optimum pH, approximately 9.5 to 10.5 pH units, will precipitate metals from the effluent before it is discharged. Baseline pH at Station 30 (just above the present effluent discharge location) ranged from 5.8 to 6.7. Data collected at the discharge and in the receiving waters since mine operations began, indicate that pH stabilizes shortly after discharge into Red Dog Creek. pH is above 6.5 at Station 20 and is approximately 7 pH units at the mouth of Red Dog Creek; i.e., the mixing of basic discharge waters with acidic creek waters results in a slightly basic to neutral pH where fish occur. No mixing zone for pH is needed with the NPDES effluent limit range of 6.0 to 10.5 pH units.

3. Preliminary Draft Permit part I.A.8.b – the following language likely will not be necessary in the final Permit: "Prior to beginning discharge, the permittee shall consult with EPA, Alaska Department of Natural Resources, Office of Habitat Management and Permitting (OHMP), and Alaska Department of Environmental Conservation (ADEC), and the permittee must receive written approval from EPA."

<u>Rationale:</u> *The regulation package adopting a Total Dissolved Solids Site Specific Criterion (SSC) under 18 AAC 70.235(c) was adopted by the State of Alaska and is expected to be approved by EPA prior to final Permit issuance. The proposed TDS SSC would allow TDS concentrations up to 1500 mg/L in Main Stem Red Dog Creek without timing restrictions. The Department finds that the notification and subsequent approval process will no longer be necessary to ensure that discharge will not affect aquatic life uses of the waterbody if the TDS SSC regulations are adopted as proposed.*

4. Preliminary Draft Permit part I.A.8.c shall be updated as follows:

   After the commencement of discharge, the permittee shall limit the TDS load discharged from Outfall 001 so as to maintain in-stream TDS concentrations at or below:

   (1) 1500 mg/L at the edge of the mixing zone in Main Stem Red Dog Creek,

   (2) 1000 mg/L at the edge of the mixing zone in Ikalukrok Creek throughout the discharge season, and

   (3) 500 mg/L from July 25th through the end of the discharge season at Station 160.

<u>Rationale:</u> *The regulation package adopting a Total Dissolved Solids Site Specific Criterion under 18 AAC 70.235(c) was adopted by the State of Alaska and is expected to be approved by EPA prior to*

final Permit issuance. The proposed TDS SSC would allow TDS concentrations up to 1500 mg/L in Main Stem Red Dog Creek without timing restrictions. The Department finds that the in-stream limits are required to ensure that existing uses are protected.

In 1999, the Department changed the water quality criterion under 18 AAC 70.020(b)(Note 12) for inorganic dissolved solids, regulated as TDS, to the following:

> *Total Dissolved Solids (TDS) in concentrations up to 1000 mg/L in Ikalukrok Creek are in effect from the confluence of Ikalukrok Creek with Main Stem Red Dog Creek down to the Wulik River,* ***except*** *during chum salmon and/or Dolly Varden spawning in Ikalukrok Creek, when the aquatic life criterion of 500 mg/L will apply at Station 160.*

This criterion is in effect in the Ikalukrok Creek for the areas listed above.

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

5. The Department believes that Preliminary Draft Permit parts I.A.8.d and I.A.8.e will not be applicable and could be deleted in the final Permit.

Rationale: The regulation package adopting a Total Dissolved Solids Site Specific Criterion under 18 AAC 70.235(c) was adopted by the State of Alaska and is expected to be approved by EPA prior to final Permit issuance. The proposed TDS SSC would allow TDS concentrations up to 1500 mg/L in Main Stem Red Dog Creek without timing restrictions. The Department finds that the in-stream limits are required to ensure that existing uses are protected.

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the Department shall include a statement of the extent to which each condition of the draft permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Preliminary Draft Permit "could" be made.

6. Preliminary Draft Permit part I.A.8.f(1) shall reference Station 151 as the downstream edge of the mixing zone in Main Stem Red Dog Creek. Station 150 shall be referenced as the downstream edge of the mixing zone in Ikalukrok Creek. Monitoring at Station 151 for TDS shall occur weekly. Monitoring for TDS at Station 150 shall occur monthly.

   Preliminary Draft Permit part I.A.8.f(2) could be deleted.

   Preliminary Draft Permit part I.A.8.f(3) shall read: "Conductivity and temperature shall be monitored concurrently with TDS at Stations 150, 151 and 160".

Preliminary Draft Permit part I.A.8.g, I.A.8.h, I.A.8.i and Preliminary Draft Permit part I.A.8.k shall replace Station 10 with Station 151.

Rationale: In accordance with State Regulations 18 AAC 70.245, the Department has authority to ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected. The specified monitoring will provide evidence to the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water. The Preliminary Draft Permit required more monitoring than is required to reasonably demonstrate compliance with the Water Quality Standards (18 AAC 70).

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the Department shall include a statement of the extent to which each condition of the draft permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Preliminary Draft Permit "could" be made.

7. Preliminary Draft Permit part I.D - Ambient Monitoring Requirements – may be updated as follows:

   I.D.1 – delete reference to Stations 2, 9, 20 and Tributaries. Replace Station 73 with Station 160. Replace Station 10 with 151.

   I.D.2 – delete reference to Station 2 and replace with Station 151.

   I.D.6 – Ambient monitoring results from Stations 151 and 160 shall be submitted to EPA, ADEC and OHMP with the monthly DMR. Other required ambient monitoring results could be submitted in the Annual Water Monitoring Summary Report required in section II.J (see condition #10 of this certification).

   I.D.7 – Table 5 – Ambient Monitoring Requirements: reference to Stations 2, 9, 20 and Tributaries could be deleted. Station 73 shall be replaced with Station 160. Station 10 shall be replaced with 151.

   I.D.8 – References to streamflow measurements at Stations 2, 8, 9, 10, 12 and 140 could be deleted. Streamflow shall be monitored at Stations 151 and 160 as required to perform the calculations in I.A.8.i. Streamflow results from Stations 151 and 160 shall be submitted in the Annual Water Monitoring Summary Report required in section II.J (see condition #10 of this certification).

Rationale: In accordance with State Regulations 18 AAC 70.245, the Department has authority to ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected. The specified monitoring will provide evidence to the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water. The Preliminary Draft Permit required more monitoring than is required to reasonably demonstrate compliance with the Water Quality Standards (18 AAC 70). Some of the Ambient Monitoring Program contained in

the current NPDES permit and not required by this certification will be required in the Monitoring Plan associated with the Waste Management Permit issued by ADEC for the management of tailings, waste rock and other wastes at the facility.

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the Department shall include a statement of the extent to which each condition of the draft permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Preliminary Draft Permit "could" be made.

8. Preliminary Draft Permit part I.F – Bioassessment Program Requirements shall be updated as follows:

   I.F.1 could be deleted as it is duplicative of I.F.2.

   I.F.2 shall be updated as follows:

   Bioassessment conditions required by the Alaska Department of Environmental Conservation Certificate of Reasonable Assurance: Within 60 days of the effective date of the permit, the permittee shall submit for review and approval to ADEC and OHMP, <u>an updated version of the Biomonitoring Plan - ADF&G Methods for Aquatic Life Monitoring to Satisfy requirements under 1998 NPDES Permit - submitted by Cominco Alaska Inc, 1998, which</u> was designed to detect possible aquatic community changes related to the mine effluent as follows:

   Upon approval, the permittee shall implement the plan <u>annually</u>.

   I.F.2 –Table 6 could be updated as follows:

TABLE 6 – Bioassessment Sites

Sample Site	**Factors Measured**
North Fork Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Main Stem Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Ikalukrok Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use

<u>Rationale</u>: In accordance with State Regulations 18 AAC 70.245, the Department has authority to ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected. The specified monitoring will provide evidence to the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water. The Preliminary Draft Permit required more monitoring than is required to reasonably demonstrate compliance with the Water Quality Standards (18 AAC 70). The remaining biomonitoring program contained in the current NPDES permit will be required in the Monitoring Plan associated with the Waste Management Permit issued by ADEC for the management of tailings, waste rock and other wastes at the facility.

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the Department shall include a statement of the extent to which each condition of the draft permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Preliminary Draft Permit "could" be made.

9. Preliminary Draft Permit parts I.A.1, I.D.7 and I.G – Whole Effluent Toxicity (WET)

This certification does not require effluent limits for WET as contained in I.A.1 – Table 1 and these effluent limits could be removed. Monthly WET monitoring of the effluent is required by this certification. WET monitoring of the effluent shall be conducted on the fathead minnow, *Pimephales promelas* (larval survival and growth test) and on the water flea, *Ceriodaphnia dubia* (survival and reproduction test).

WET monitoring at Stations 9 and 12 is not required in this certification and could be removed in the Final Permit.

<u>Rationale:</u> The Department believes that there is no reasonable potential for the effluent to exceed the pre-mining natural toxicity of Red Dog Creek. The methodology used in the 1998 NPDES Permit to estimate natural toxicity in Red Dog Creek by assigning a WET value contained numerous assumptions and uncertainties that cannot be confirmed. While the pre-mining toxicity cannot be quantitatively confirmed, the Department believes that the effluent is less toxic than the natural condition of Red Dog Creek. Comparisons of water quality data for metals concentrations indicate that the discharge is less toxic than the natural condition in Red Dog Creek. The following paragraph is from this Department's 401 certification of the NPDES Permit that is currently in effect, which was issued in 1998:

> *"Finally, given all the uncertainties that surround not only our estimate of the natural toxicity in the Red Dog system, but also in the precision of WET testing itself, it makes sense to take advantage of the comprehensive biological monitoring that is occurring in those waters. Ultimately, direct observation and sampling of aquatic life in the system is more meaningful than laboratory WET testing. For that reason, we are strengthening the monitoring program that is already occurring. The new monitoring plan is included on p.2 of the revised draft certification. It may be that*

when this draft permit is reissued in five years, we will have enough confidence in our biological monitoring that we can dispense with WET limits altogether."

Additionally, the 1998 401 certification discussed the applicability, at the point of discharge, of the regulations found at 18 AAC 70.020(b)(11)(C) and 18 AAC 70.030 regulating discharge of toxicity. The 1998 401 certification stated that since aquatic life is not a designated use at the point of discharge these regulations do not apply. Further, the Department's 1998 certification discussed that the effluent from the Red Dog Mine has less toxicity than the receiving water, which is clearly not contemplated under 18 AAC 70.020(b)(11)(C) and 18 AAC 70.030. The Department's position remains as stated in the 1998 401 certification: that 18 AAC 70.020(b)(11)(C) and 18 AAC 70.030 do not apply at the point of discharge and that the biomonitoring program is ultimately more meaningful than WET testing.

Aquatic biomonitoring at the Red Dog Mine began in 1990 and has continued annually since then. In 1999, an expanded biological monitoring program was initiated as a requirement of the NPDES Permit and the ADEC certification. The biological monitoring program (water quality, periphyton, aquatic invertebrates, and fish) has continued each year. Annual technical reports summarizing biomonitoring have been reviewed, and while changes have been observed, there have been no observed negative effects to the ecosystems of Red Dog and Ikalukrok Creeks resulting from the effluent or mine related activities affecting Red Dog Creek. The Department is requiring that the biomonitoring program in the 401 certification be at stations necessary to ensure that potential effects from the discharge are monitored (see condition # 8 of this certification). The remaining biomonitoring program will be contained in the Monitoring Plan associated with the Waste Management Permit issued by ADEC for the management of tailings, waste rock and other wastes at the facility.

Although ADEC finds there is not a reasonable potential for the toxicity of the effluent to exceed the toxicity of the receiving water in its natural condition, to provide additional assurance that the existing uses in Red Dog Creek are being protected, ADEC is continuing the comprehensive biomonitoring program. ADEC is also requiring monthly WET testing of the effluent to serve as an indicator of potential changes in the discharge over time, changes which might take longer to detect using field observations.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the Department shall include a statement of the extent to which each condition of the draft permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Preliminary Draft Permit "could" be made.

10. The following Permit part, II.J - Annual Water Monitoring Summary Report, shall be added to the Permit:

    All monitoring results for a year must be included in an Annual Water Monitoring Summary Report and submitted by March 1 of the following year. The report must include a presentation of the analytical results and an evaluation of the results of monitoring required in Permit parts I.A, I.B, I.C, I.D, I.E, I.F and I.G. The evaluation must include an electronic spreadsheet containing monitoring data from the previous five years, a graphical presentation of the data at each monitoring station, a comparison of upstream and downstream monitoring results (to show any differences) and a comparison of monitoring results for each station over

time (to show any trends). The Annual Water Monitoring Summary Report may reference the monthly reports for QA/QC information.

All monitoring results for a calendar year shall be reported in the Annual Water Monitoring Summary Report. At a minimum, the report must include the following:

a. Dates of sample collection and analyses.
b. Results of sample analysis.
c. Relevant quality assurance/quality control (QA/QC) information.

Rationale: In accordance with State Regulations 18 AAC 70.245, the Department has authority to ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected. The specified monitoring will provide evidence to the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water.

In accordance with State Regulations 18 AAC 15.090, the Department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

January 20, 2006 — Date

DRAFT
Gretchen Keiser
Program Manager
Wastewater Discharge Program

APPENDIX A
CADMIUM NATURAL CONDITION
BASED SITE SPECIFIC CRITERION

Introduction

The Red Dog Mine is a lead/zinc mine located near the Arctic Circle. It is in the foothills of the De Long Mountains of northwest Alaska, approximately 100 miles northwest of Kotzebue and 52 miles from the Chukchi Sea coastline. It is a remotely located facility accessible only by ship or chartered airplane. There are no other industrial facilities in the area. The nearest village is Kivalina, population 300, located at the mouth of the Wulik River on a barrier beach on the Chukchi Sea.

The Red Dog ore deposit is in the form of metal (zinc, lead) sulfides in a Mississippian shale formation lying on and within a ridge between the Middle Fork Red Dog Creek and South Fork Red Dog Creek (see Attachments A-1 and A-2).

The mill site lies to the west of the ore deposit and above the tailings impoundment. The tailings impoundment is formed by a dam across the South Fork of Red Dog Creek. Baseline data collection occurred from 1981 through 1987. Removal of overburden from the ore deposit and construction of

the tailings dam began in 1987. The first ore was delivered to the mill late in 1989, and the first concentrates were produced in December 1989.

Request for Site Specific Criterion

TeckCominco Alaska, Inc., the operator of the Red Dog Mine has requested that the Department of Environmental Conservation (ADEC) grant relief from the existing chronic aquatic life criterion for cadmium. They have requested a site-specific criterion based on the natural condition of the Main Stem Red Creek from the confluence of North Fork Red Dog Creek to the confluence with Ikalukrok Creek; and in Ikalukrok Creek from its confluence with Main Stem Red Dog Creek to its confluence with Dudd Creek. These are the stream segments where it has been documented that the natural background cadmium levels exceed the Alaska chronic aquatic life criterion.

Regulatory Requirements

Federal regulations at 40 CFR 122.44 (d)(1)(iv) and (v) require an effluent limit for cadmium to be incorporated into a National Pollutant Discharge Elimination System (NPDES) permit when a discharge has the reasonable potential to cause or contribute to an in-stream excursion above a numeric or narrative criterion within an applicable state water quality standard.

Alaska water quality standards (WQS) regulations allow for the development of a site-specific criterion (SSC), see 18 AAC 70.235. More specifically, Alaska WQS contain a provision that allows the development of a SSC based on the natural condition of a water body. Under 18 AAC 70.235(b), "If the department finds that a natural condition of a water body has been demonstrated to be of lower quality than a water quality criterion set out in 18 AAC 70.020(b), the natural condition constitutes the applicable water quality criterion." Natural condition is defined, by the State, as any physical, chemical, biological, or radiological condition existing in a waterbody before any human-caused influence on, discharge to, or addition of material to, the waterbody [18 AAC 70.990(41)].

Applicable Water Quality Standards

Alaska's WQS are composed of use classifications and numeric and/or narrative water quality criteria. The first part of a Alaska's water quality standard is a classification system for water bodies based on the expected designated uses of those water bodies. The second part of a state's water quality standards is the water quality criteria deemed necessary to support the designated use classification of each water body. These criteria may be numeric or narrative.

I. Designated Uses

The State of Alaska water quality standards protect Main Stem Red Dog Creek, and Ikalukrok Creek below Red Dog Creek for the following designated uses:

- Industrial water supply;
- contact recreation, wading only;
- secondary recreation, and;
- growth and propagation of fish, shellfish, other aquatic life, and wildlife

As specified in 18 AAC 70.230(e)(8) and 18 AAC 70.230(e)(18) the following designated uses have been removed from Main Stem Red Dog Creek, and Ikalukrok Creek below Red Dog Creek:

- Drinking, culinary, and food processing water supply;
- agriculture water supply;
- aquaculture water supply, and;
- contact recreation, with the exception of wading

II. Criteria to Protect the Designated Uses

The criterion for industrial water supply is a narrative criterion that states that substances that pose hazards to worker contact may not be present. A review of the available literature indicates that criteria to protect workers have not been developed for cadmium (EPA Quality Criteria for Water, 1976).

The Table at 18 AAC 70.230(e)(18) states that the Main Stem Red Dog Creek is protected for contact recreation, wading only. However the definition section at 18 AAC 70.990(16) defines contact recreation to "not include wading". Due to the cold temperature and the natural condition exceeding the Drinking Water MCL for Cadmium, the direct and intimate contact recreation uses including swimming, diving, and water skiing are not protected, but wading with rubber boots for activities including water quality sampling is protected. The applicable cadmium criterion for contact recreation (wading only) and secondary recreation is a narrative criterion: "Concentrations of substances that pose hazards to incidental human contact may not be present".

The most stringent cadmium criteria for the Main Stem Red Dog Creek, and Ikalukrok Creek below Red Dog Creek are associated with the aquatic life use designation. There are two types of criteria for the protection of aquatic life: acute and chronic. Acute criteria protect against short term deleterious effects to aquatic life, and chronic criteria protect against long term deleterious effects to aquatic life. For Alaska, the acute criterion for cadmium is a hardness-based criterion that is found in 18 AAC 70.020(b)(11)(C). The acute criterion for cadmium is 5.09 μg/L dissolved concentration, based on the site's ambient hardness of 260 mg/L. The chronic criterion for cadmium is 0.48 μg/L dissolved concentration, based on the site's ambient hardness of 260 mg/L.

Natural Condition Determination

As part of the development of the Use Attainability Analysis (UAA) for reclassification of waterbodies in the vicinity of Red Dog mine, EPA requested information regarding any human activities (land disturbance from road building, camp construction, or exploration) that could have contributed to the water quality exceedences that were found in the pre-mining water quality data base. The UAA concludes that there were no human activities in the vicinity of the mine that could have caused significant changes in the water quality until overburden was removed in the spring of 1987. In accordance with 18 AAC 70.990(41) there were no anthropogenic sources of pollution and the baseline water quality (1981 - 1987) is representative of natural conditions.

Demonstration that the Natural Condition is of Lower Quality than the Applicable Criteria

The waters of Red Dog Creek are atypical of most undeveloped Arctic streams because of the high concentrations of cadmium, lead, and zinc that enter the Middle Fork of Red Dog Creek as it flows through a highly mineralized ore body. The unique character of the Red Dog mineralization and its interaction with ground and surface waters was recognized in scientific studies of the area in the late 1970's and early 1980's (e.g. Ward and Olson 1980). Natural levels of metals were known to be

unusually high, and fish kills (in Main Stem Red Dog Creek) were documented. From 1981 through 1984, Cominco Alaska funded a series of baseline studies to document water quality and biological conditions in Red Dog Creek, Ikalukrok Creek, and the Wulik River (Houghton 1983, Petersen and Nichols 1983). In 1982, ADEC funded a detailed toxicological, biophysical, and chemical assessment of Red Dog Creek (E.V.S. Consultants, Ltd. 1983). In the 1984 Final Environmental Impact Statement (EIS), these studies formed the basis for addressing aquatic and water quality impacts associated with the development of the Red Dog Mine Project.

Water in the Middle Fork Red Dog Creek, beginning adjacent to the highly mineralized orebody, was naturally degraded and remained in this condition downstream to the confluence with the South Fork (L. A. Peterson & Associates, Inc. 1983, Water Quality of Red Dog Creek, Alaska, 1983, in Supplement to Environmental Baseline Studies, Red Dog Project. Dames & Moore report to Cominco Alaska, Inc.). The Middle Fork flowed directly over heavily mineralized rock, and the creek received surface and groundwater draining from the orebody, which contained high metal and sulfide concentrations (U.S. Environmental Protection Agency and U.S. Department of the Interior. 1984. Final EIS, Red Dog Mine Project, Northwest Alaska). Recovery of water quality began at the confluence of the Middle Fork and the South Fork, but was not particularly significant until flow from the North Fork diluted the Middle Fork to form the Main Stem. Pre-disturbance ambient samples collected at station 10 confirm that Main Stem Red Dog Creek had naturally occurring cadmium concentrations above the current water quality criteria. Pre-disturbance ambient samples collected at station 8 confirm that Ikalukrok Creek also had naturally occurring cadmium concentrations above the current water quality criteria.

The dissolved data collected prior to the development of the mine site is summarized in Attachment A-3. In Main Stem Red Dog Creek (station 10) dissolved concentration water quality data were collected from July 23, 1982 through September 3, 1983. At station 10 the cadmium data ranged from a dissolved concentration of 2 μg/L to 41 μg/L. In Ikalukrok Creek (station 8) dissolved concentration water quality data were collected from July 18, 1981 through June 15, 1983. At station 8 the cadmium data ranged from a dissolved concentration of 2 μg/L to 34 μg/L. The 5th percentile of the dissolved data at station 10 is 12.5 μg/L. The 5th percentile of the dissolved data at station 8 is 3.5 μg/L. All of the data collected in these stream segments demonstrate that the water is of lower quality than the cadmium chronic aquatic life criterion of 0.48 μg/L.

The total data collected prior to the development of the mine site is summarized in Attachment A-4. In Main Stem Red Dog Creek (station 10) total concentration water quality data were collected from May 30, 1982 through September 13, 1983. At station 10 the cadmium data ranged from a total concentration of 2 μg/L to 44 μg/L. In Ikalukrok Creek (station 8) total concentration water quality data were collected from May 30, 1982 through August 17, 1987. At station 8 the cadmium data ranged from a total concentration of 1 μg/L to 38 μg/L. The 5th percentile of the total data at station 10 is 9 μg/L. The 5th percentile of the total data at station 8 is 2 μg/L. All of the data collected in these stream segments also demonstrate that the water is of lower quality than the cadmium chronic aquatic life criterion of 0.48 μg/L

Natural Condition Based Site-Specific Criteria Development

The natural levels of cadmium in the ambient waters vary in two ways. First, the cadmium levels decease as the distance downstream from the orebody increases. The cadmium levels are highest in Middle Fork immediately after passing through the orebody, and lowest in the Ikalukrok Creek below

the Main Stem. Ikalukrok Creek below Main Stem represents the highest quality water of those stream segments affected by the orebody. To ensure that cadmium levels in Ikalukrok Creek do not increase above pre-mining levels, this stream segment (station 8) was used to develop the site-specific criterion for Ikalukrok Creek..

Second, the cadmium levels vary over time. The Department's regulation states, in part, that if a natural condition varies with time, the natural condition will be determined to be the prevailing highest quality natural condition measured during an annual, seasonal, or shorter time period. Pre-mining water quality data exist from 1981 to 1987. Water quality monitoring was conducted in 1981 and 1982 in order to establish the pre-mining baseline water quality for use in the EIS that was being prepared before mine development. Additional pre-mining water quality data were gathered in 1983, 1986, and 1987. The 1981 - 1987 pre-mining cadmium concentration data from stations 8 and 10 were used to develop the site specific criterion to ensure that variation in the levels of cadmium from year to year is represented. Some pre-mining data were not used because dissolved cadmium concentrations were not analyzed in those samples. The dissolved cadmium concentration was used to calculate the criteria as required in the Alaska Water Quality Standards (18 AAC 70)[1], however the total cadmium concentration at station 8 was used to calculate the criteria required by EPA for use in setting effluent limits.

To represent the highest quality water, the 5th percentiles of the pre-mining data sets from stations 8 and 10 have been used. The 5th percentiles of the data sets are dissolved cadmium concentrations 3.5 μg/L and 12.5[2] μg/L for stations 8 and 10, respectively, and 2 μg/L and 9 μg/L for stations 8 and 10, respectively. This means that 5 times out of 100 the natural cadmium concentrations were equal to or lower than these numbers (higher water quality) in the respective water bodies. Another way of stating this is that 95 percent of the natural cadmium concentrations were greater than these numbers (lower water quality) in the respective water bodies. Using the Ikalukrok Creek site specific criterion (2 μg/L) means the mine effluent will be required to reflect the highest quality water that naturally occurred in Ikalukrok Creek. Therefore, 95 percent of the time the total cadmium concentration in the mine's effluent will be lower than the total concentration of cadmium in the receiving water. The 5th percentile approach using station 8 data to develop the NCBSSC is a very conservative approach.

The Department believes that the Main Stem Red Dog Creek site specific criterion (12.5 μg/L) is the appropriate criterion to use in calculating effluent limits for the Red Dog Mine facility, however using the Ikalukrok Creek site specific criterion (2 μg/L) is more conservative.

Designated and Existing Use Protection

Federal WQS regulations require that a State specify the water uses to be achieved and protected and there are two broad use categories, designated uses and existing uses. A designated use is a use specified in State WQS regulations for a water body whether or not it is being attained. The designated uses for the waterbodies at the site are listed on page 2 of this appendix: industrial water supply; contact recreation (wading only); secondary recreation; and growth and propagation of fish,

[1] Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, May 15,2003, Table III; as referenced in 18 AAC 70.020(b)(11)(C).

[2] For sample results that were reported as less than the MDL (generally 25 μg/L); ½ the MDL (12.5 μg/L) was substituted in the dataset for purposes of calculating the 5th percentile. Some results were reported below 25 μg/L; in this case the value reported was used when calculating the 5th percentile.

shellfish, other aquatic life and wildlife. An existing use is, by definition [18 AAC 70.990(24)], "the uses actually attained in a waterbody on or after November 28, 1975."

The Antidegradation Policy requires that existing uses must be protected by a SSC. The Antidegradation Policy states, in part, that "existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected" (18 AAC 70.015(a)(1)).

The following discussion examines whether each designated and existing use could be protected by a site-specific cadmium criteria of 3.5 μg/L and 12.5 μg/L in Ikalukrok Creek and Main Stem Red Dog Creek, respectively. The analysis of designated uses looks at the current and future condition of the waterbodies. For example, is aquatic life currently found at the site or is growth and propagation of aquatic life a future goal for the waterbodies at the site. The time frame for the analysis of an existing use extends from November 28, 1975 to the current time.

I. *Industrial, Contact Recreation (wading only), and Secondary Recreation Uses*

The Red Dog and Ikalukrok Creeks Use Attainability Analysis (UAA) (December 1996) evaluated whether the industrial, contact recreation, and secondary recreation designated uses were existing water uses and whether the designated uses should be retained in the future. The UAA evaluated the "actual" use and the water quality adequate to support the uses. As described in the second paragraph under Section *II. Criteria to Protect the Designated Uses* above, the UAA concluded that contact recreation (wading only) and secondary recreation were existing uses. The proposed site-specific criterion for cadmium of 2 μg/L is not reasonably expected to exceed the narrative criteria for the industrial, contact recreation (wading only), and secondary recreation uses. This expectation considered that the primary Maximum Contaminant Level (MCL) for cadmium is 5 μg/L. Considering the conservative assumptions used in the calculation of an MCL[3] the Department finds that the proposed site specific criteria will not pose a hazard from incidental contact or pose hazards from worker contact. It will therefore, protect these existing and designated uses.

II. *Aquatic Life Use*

Detailed studies were not conducted to document the presence of aquatic invertebrates, macrophytes, or periphyton prior to mining. Limited information is available on benthic invertebrates and fish prior to mine development. Since 1995 studies have been conducted to characterize periphyton and benthic invertebrates. Fish studies have been conducted in the area from 1991 through 2005. A comparison of the aquatic macroinvertebrate and fish communities before and after mine development is summarized in the following paragraphs.[4]

a. Fish

Before mine development, Arctic grayling were rarely seen in Main Stem Red Dog Creek and were not reported in Middle Fork Red Dog Creek (Hougton and Hilgert, 1983). Fish were observed in Main Stem Red Dog Creek within the influence of North Fork (Dames and Moore, 1983) and fish mortalities were documented in Main Stem Red Dog Creek (EVS Consultants Ltd., 1983). Before mine development, Arctic

[3] The MCL is calculated based on the assumption of daily consumption of 2 liters of water containing the MCL throughout lifetime of an average human.
[4] For more information see a report titled: *Comparison of Mainstem Red Dog Creek Pre-Mining and Current Conditions*, Scannell Technical Services, March 1995.

grayling adults were assumed to migrate through Main Stem Red Dog Creek in early spring when discharges were high and metals concentrations low. Outmigration of adults probably occurred during high-water events and young-of-the-year Arctic grayling left as water temperatures cooled
in the fall or as they were displaced by high-water events.

After mine development, use of Main Stem Red Dog Creek by Arctic grayling adults and young-of-the-year was higher than that reported during baseline studies in the early 1980s. Stressed or dead fish were not observed. In many cases, adult fish were observed actively feeding on drift and terrestrial insects. Beginning in 1995, juvenile Dolly Varden were caught with minnow traps in Main Stem Red Dog Creek below the North Fork. Juvenile Dolly Varden use of Main Stem has continued to be documented each summer since 1995.

The growth and propagation of fish is an existing use as well as a designated use because fish have occurred in the past and currently use Main Stem Red Dog Creek during the ice free season. Based on the fisheries field work from 1995 through 2005, the fish use of Main Stem Red Dog Creek and Ikalukrok Creek is not diminished compared to the pre-mining fish use.

b. Aquatic Benthic Macroinvertebrates, and Periphyton

Aquatic invertebrate communities were sampled by EVS and Ott Water Engineers (1983) and Dames and Moore (1983) as part of the baseline studies conducted for Red Dog Creek. Post mining aquatic invertebrate communities were sampled by the Alaska Department of Fish and Game from 1995 through 2005.

When compared to baseline studies, aquatic invertebrate densities were lower in station 73 in 1995 than in station 73 or station 8 during baseline studies (Red Dog Use Attainability Analysis Aquatic Life Component, February 1996, pp. 31-34). However, these differences likely reflect the fact that the two studies used different methods to collect invertebrates and because invertebrate taxonomy has changed since the baseline sampling.

The growth and propagation of other aquatic life is an existing use as well as a designated use because aquatic invertebrates and other aquatic life have occurred and currently occur at the site. The lack of aquatic invertebrate, or periphyton field survey data prior to mining preclude making a determination about the quality and biodiversity of these populations prior to mining. Since the pre-mining fish were dependent on these lower trophic levels for survival, it can be assumed that they were present in adequate numbers and diversity to maintain pre-mining fish resources. The 1995 through 2005 post-mining field surveys have firmly established that growth and propagation of aquatic invertebrates, and periphyton are an existing and designated use.

c. Aquatic Life Conclusions

Resident and migratory fish and other aquatic life have acclimated to the natural cadmium concentrations. Current ambient cadmium concentrations are no higher than the pre-mining ambient cadmium concentrations. Therefore, because the cadmium concentrations in the mine's effluent are much lower than the pre-mining natural ambient cadmium concentrations, the growth and propagation of fish existing and designated use will be protected.

ADEC Findings

Based on the information in Attachments A-3 and A-4, ADEC has determined that the baseline water quality is representative of natural conditions in accordance with 18 AAC 70.990(41). The pre-mining water quality data set demonstrates that the natural condition is of lower quality than the applicable cadmium chronic aquatic life criterion. A method for determining the prevailing highest quality natural condition (5th percentile) has been described above and used to develop the site specific criteria: total cadmium concentration of 2 μg/L in Ikalukrok Creek. This site specific criteria is more stringent than the narrative criteria that protect the industrial, contact recreation, and secondary recreation uses and will therefore protect these designated uses. This decision is consistent with the November 5, 1997 EPA policy on establishing site-specific aquatic life criteria equal to natural background, which states in part, "for aquatic life, where the natural background concentration for a specific parameter is documented, by definition that concentration is sufficient to support the level of aquatic life expected to occur naturally at the site absent any interference by humans." Therefore, the growth and propagation of fish, shellfish, other aquatic life, and wildlife use is protected.

Due to federal Anti-Backsliding regulations the effluent limits for cadmium in future NPDES Permits may be the same regardless of which NCBSSC is used in the calculation. The Department believes that using the cadmium NCBSSC for Ikalukrok Creek sets a precedent that is overly conservative when examining whether downstream uses are protected in setting NCBSSC. We believe that in this case using the NCBSSC for Main Stem Red Dog Creek is appropriate for the following reasons:

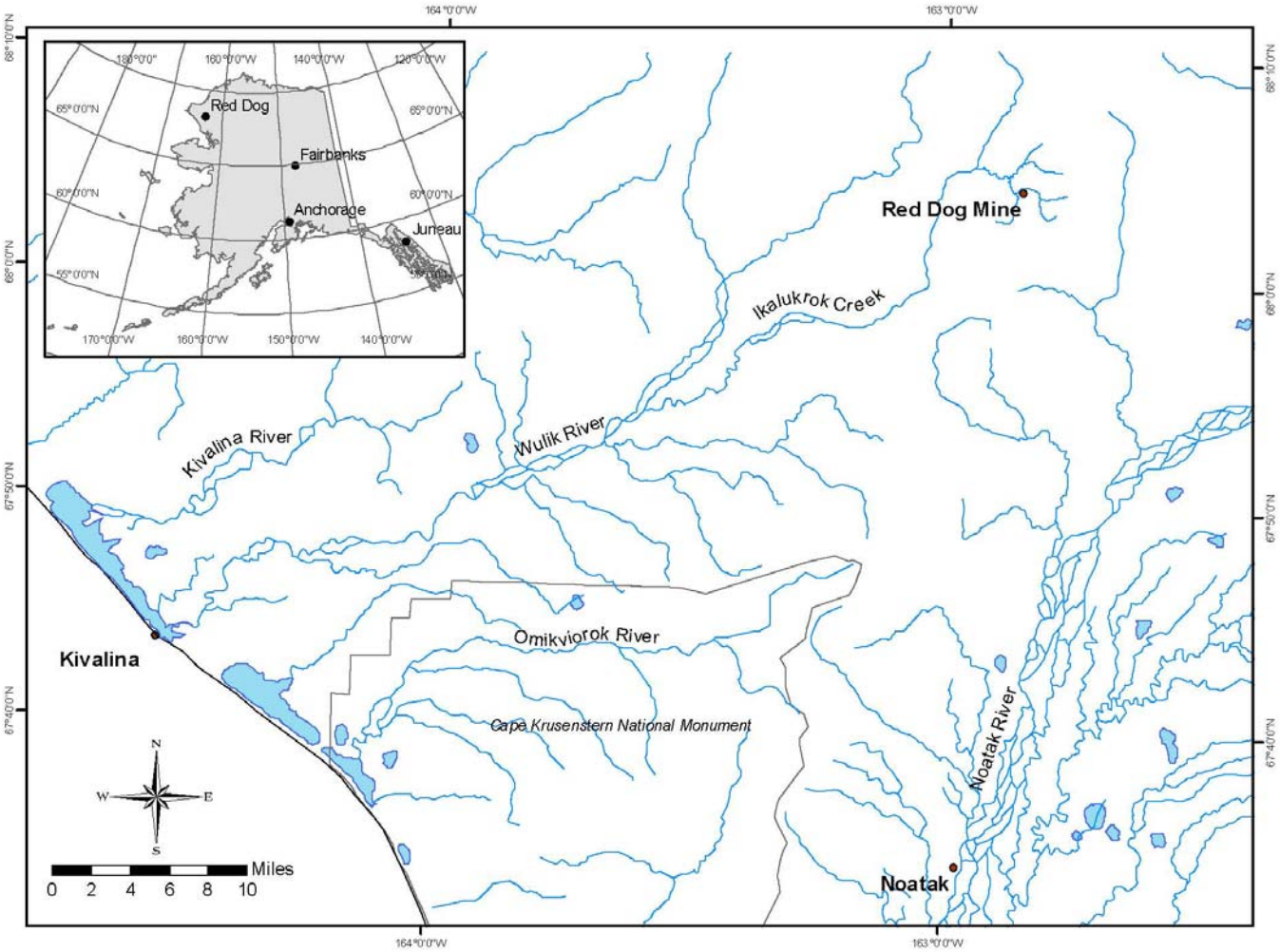
- Station 10 is located in Main Stem Red Dog Creek prior to its confluence with Ikalukrok Creek and best represents water quality nearest the effluent outfall where the aquatic life criteria apply.
- The mine facilities have been documented to cause a decrease in cadmium loading to Main Stem Red Dog Creek; therefore, applying the Main Stem Red Dog Creek NCBSSC to the effluent would ensure that the effluent is not contributing to cadmium concentrations above the natural condition downstream in Ikalukrok Creek. Applying the Main Stem Red Dog Creek NCBSSC would therefore protect downstream uses.
- The NCBSSC for Ikalukrok Creek is overly conservative due to the location of Station 8, which the NCBSSC is based on. Station 8 is located in Ikalukrok Creek just below the confluence with Main Stem Red Dog Creek. Station 8 does not represent well mixed water from the two creeks, but rather is located at a point where upstream Ikalukrok Creek water dominates. Since the Upper Ikalukrok Creek is generally of higher water quality than Main Stem Red Dog Creek, samples collected from Station 8 represent higher quality water than the actual mixed water of the two creeks.

The Department’s position remains as stated earlier: that calculating NPDES Permit effluent limits based on the Ikalukrok Creek NCBSSC (2 μg/L), would be protective of existing and designated uses

and comply with 18 AAC 70. However, the Department believes that this approach is overly conservative and is not required by applicable State of Alaska regulations.

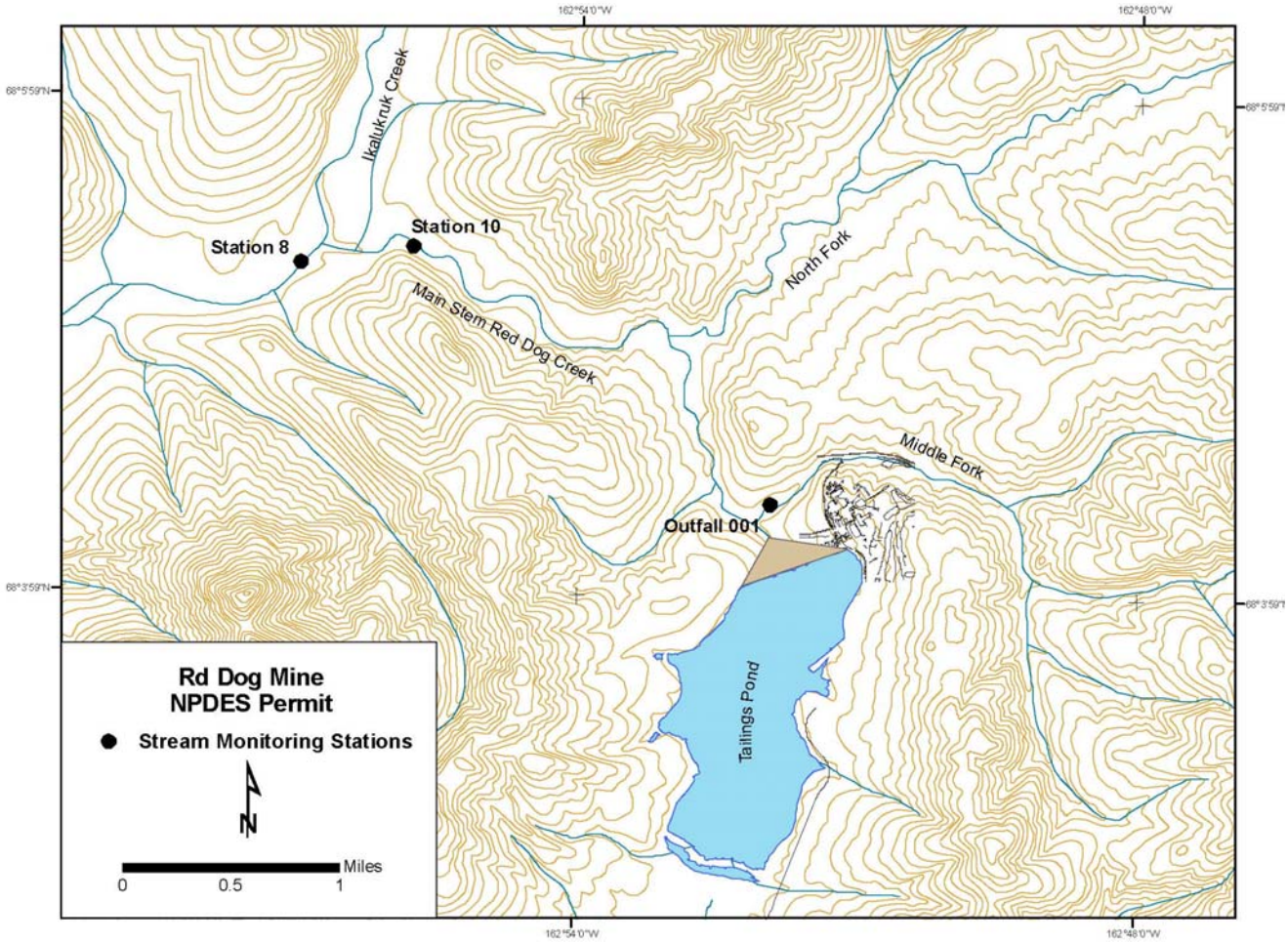
Attachment A-1

Location of Red Dog Mine Site



Attachment A-2

Location of Baseline Monitoring Stations in Mainstem Red Dog Creek and Ikalukrok Creek



Attachment A-3

Pre-Mining Dissolved Water Quality Data for Cadmium

Date	Station 10 Mainstem Red Dog Creek	Station 8 Ikalukrok Creek below Mainstem Red Dog Creek
6/17/81	22	
7/17/81	25	
7/18/81		10
8/11/81	26	7
9/4/81	38	8
5/30/82	2	
7/6/82	25	
7/8/82	23	14
7/14/82	27	
7/21/82	32	
7/22/82	35	
7/23/82	34	
7/23/82	40	
7/24/82	36	
7/26/82	<25 (12.5)	
7/29/82	27	
7/30/82	<25 (12.5)	
7/31/82	<25 (12.5)	
8/1/82	26	
8/12/82	34	
8/12/82	<25 (12.5)	
8/14/82	17	
9/13/82	34	19
10/19/82	41	34
6/15/83		2

Summary Statistics	Station 10	Station 8
Median	26	9
Maximum	41	34
Minimum	2	2
5th Percentile	**12.5**	**3.5**

* Cadmium data is expressed in micrograms/liter in the dissolved concentration

Attachment A-4

Pre-Mining Total Water Quality Data for Cadmium

Date	Station 10 Mainstem Red Dog Creek	Station 8 Ikalukrok Creek below Mainstem Red Dog Creek
5/30/1982	2	1
7/6/1982	26	
7/8/1982	24	16
7/14/1982	29	
7/21/1982	31	
7/22/1982	35	
7/23/1982	34	
7/23/1982	38	
7/24/1982	35	
7/26/1982		
7/29/1982	28	
7/30/1982	< 25	
7/31/1982	< 25	
8/1/1982	26	
8/7/1982	36	
8/12/1982	41	25
8/13/1982		
8/14/1982	20	
9/13/1982	38	20
10/19/1982	44	38
5/28/1983	9	4
6/14/1983		
6/15/1983	10	4
7/10/1983	29	7
8/3/1983	33	4
9/3/1983	34	14
6/9/1986		10
6/16/1986		< 2
6/23/1986		< 2
6/30/1986		< 2
7/7/1986		< 2
7/14/1986		10
7/21/1986		< 2
7/28/1986		< 2
6/1/1987		< 2
6/8/1987		4
6/16/1987		
6/22/1987		7
6/29/1987		8

7/7/1987		9
7/14/1987		< 2
7/20/1987		< 2
7/28/1987		13
8/3/1987		14
8/10/1987		7
8/17/1987		15

Summary Statistics	**Station 10**	**Station 8**
Median	29	7
Maximum	44	38
Minimum	2	1
5th percentile	**9**	**2**

* Cadmium data is expressed in micrograms/liter in the total concentration

APPENDIX C
Development of Effluent Limitations

This section discusses the basis for and the development of metals, pH, total dissolved solids, and total suspended solids limitations in the draft permit. The discussions include the development of technology-based effluent limitations (Section A.) and water quality-based effluents limitations (Section B.) and a summary of the effluent limitations developed for the draft permit.

I. Outfall 001

A. Technology-based Evaluation

Section 301(b) of the CWA requires technology-based controls on effluents. Red Dog Mine is considered a new source. The term "*new source*" means any source, the construction of which is commenced after the publication of proposed regulations prescribing a standard of performance under this section (Section 306 of the CWA) which will be applicable to such source, if such standard is thereafter promulgated in accordance with this section. On December 3, 1982, EPA published effluent guidelines for the mining industry which are found in 40 CFR Part 440. Within these guidelines, Subpart J of Part 440, titled *Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory*, applies to the mine discharges from Red Dog. The New Source Performance Standards (40 CFR 440.104) are used to provide the technology-based effluent limitations for copper, zinc, lead, mercury, cadmium, pH and TSS.

40 CFR 440.104(a) states that the concentration of pollutants discharged in mine drainage from mines that produce copper, lead, zinc, gold, silver or molybdenum bearing ores or any combination of these ores from open-pit or underground operations other than placer deposits shall not exceed the following concentrations:

Table C-1
Technology-based Effluent Limitation Guidelines

Parameter (in ug/L unless otherwise noted)	Average Daily	Daily Maximum
Copper	150	300
Zinc	750	1500
Lead	300	600
Mercury	1	2
Cadmium	50	100
TSS, mg/L	20	30
pH, standard units	Within the range of 6.0 to 9.0	

40 CFR 440.130(d)(1) allows for a pH adjustment above 9.0 where the application of neutralization and sedimentation technology to comply with relevant metal limitations results in an inability to comply with the pH range of 6 to 9. This is the case for Red Dog where metals precipitate out of solution better at higher pH. The current permit contained a pH range of 6.0 to 10.5 and EPA included this range in the draft permit.

40 CFR 440.104(b) states that there shall be no discharge of process wastewater to navigable waters from mills that use the froth-flotation process alone or in conjunction with other processes for the beneficiation of gold ore. In the event that the annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility exceed the annual evaporation (net precipitation), a volume of water equal to the difference may be discharged subject to the limitations set forth in Table C-1, above.

The flow regime at Red Dog is complicated and difficult to understand. The information provided by TCAK (the annual discharge and precipitation numbers, below) lead to a conclusion that the level in the impoundment should be falling, not rising as has been the case in the last few years. The following table shows the actual discharge for each year, the actual precipitation and the calculated value of the net precipitation. The last column shows the difference between the actual discharge and calculated net precipitation.

Table C-2
Discharge and Net Precipitation

Year	Discharge (bgal/yr)	Precip (in)	Precip – Evap* ("Net Precip") (bgal/yr)	Difference between Net Precip & Discharge
1992	0.5	15.2	0.62	0.12
1993	0.2	19.7	0.82	0.62
1994	0.9	25.6	1.07	0.17
1995	1.9	14.8	0.6	-1.3
1996	1.7	16.9	0.7	-1
1997	1.1	16.2	0.67	-0.43
1998	1	20.5	0.85	-0.15
1999	1.5	11.8	0.47	-1.03
2000	1.2	21.7	0.91	-0.29
2001	1.4	19.3	0.8	-0.6
2002	1	20.7	0.86	-0.14
2003	1	19.3	0.8	-0.2
2004	1	20.3	0.85	-0.15
2005	1.5	15.3	0.63	-0.87
Total	15.9		10.65	-5.25

*Evaporation was determined to be 9 inches per year over a 200 acre tailings impoundment

Since 1992, the Table shows that 5.25 billion gallons more were discharged than can be accounted for by the net precipitation in the drainage area. Based on the provided precipitation and evaporation data this would seem to indicate that, even while there are other flow contributors to the tailings impoundment (these are listed earlier in this Fact Sheet) there is some flow into the impoundment that is unaccounted for in attempting to explain the rise in the water level in the impoundment. To give an idea of the scale of this discrepancy, discharging 5 billion excess gallons over 14 years is

equivalent to discharging over 1 million gallons of excess water per day, every day for all of those 14 years.

In the current permit, EPA and ADEC acknowledged that there was water in the water balance unaccounted for in the conventional measuring of the inflows and the outflows from the impoundment. Though the source is unknown, there doesn't appear to be any source of the water besides net precipitation or ground water infiltration, so EPA is proposing to retain the same effluent volume limit of 2.418 bgal/year as in the current permit. As a practical matter, the wastewater flow is dictated by the instream TDS requirements so the effluent volumes under the current permit remained far below the maximum allowable discharge.

B. Water Quality-based Evaluation

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards. Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under section 401 of the CWA.

The NPDES regulation [40 CFR 122.44(d)(1)] implementing section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality."

The regulations require that this evaluation be made using procedures which account for existing controls on point and non-point sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

When evaluating the effluent to determine if water quality-based effluent limits are needed based on chemical-specific numeric criteria, a projection of the effluent water concentration for each pollutant of concern is made. If a mixing zone is authorized, then the dilution would be considered. The chemical-specific concentration of the effluent and ambient water and, if appropriate, the dilution available from the ambient water are factors used to project the receiving water concentration. If the projected concentration of the effluent exceeds the numeric criterion for a specific chemical, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

The water quality parameters that may be affected by the discharge are metals, cyanide, pH, dissolved solids, and turbidity.

1. **Toxics - Metals and Cyanide**

Water quality-based effluent limitations for metals and cyanide were developed based upon guidance in EPA's Technical Support Document for Water Quality-based Toxics Control (TSD). The water quality-based analysis consists of four steps:

- ► Determine the appropriate water quality standard,
- ► Determine if there is "reasonable potential" for the discharge to exceed the standard in the receiving water,
- ► If there is "reasonable potential", develop a wasteload allocation (WLA), and a long term average (LTA), then
- ► Develop effluent limitations based on the LTA.

The following sections provide a detailed discussion of each step. Appendix D provides an example calculation to illustrate how these steps are implemented.

a. Water Quality Standards

The first step in developing water quality-based limitations is to determine the applicable water quality standard. For Alaska, the current State Water Quality Standards (WQS) are found in 18 AAC 70.020. The applicable standards are based on the designated uses of the receiving water, the Middle Fork Red Dog Creek, which is protected for the uses described in Section IV.B. of this Fact Sheet. The applicable water quality standards are used to calculate water quality-based effluent limitations. EPA has determined that the appropriate standards to use are those protecting for the downstream use of Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife (aquatic life standards).

Under the anti-backsliding provisions of the Act, any limits in a reissued permit must be at least as stringent as the current limits unless a change meets one of the exceptions listed in CWA § 402(o)(2) or in CWA § 303(d)(4)(B). These are listed below:

402(o)(2) EXCEPTIONS — A permit with respect to which paragraph (1) applies may be renewed, reissued, or modified to contain a less stringent effluent limitation applicable to a pollutant if —

> (A) material and substantial alterations or addition to the permitted facility occurred after permit issuance which justify the application of a less stringent effluent limitation;
>
> (B)(i) information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance; or

(ii) the Administrator determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under subsection (a)(1)(B).

(C) a less stringent effluent limitation is necessary because of events over which the permittee has no control and for which there is no reasonably available remedy;

(D) the permittee has received a permit modification under section 301(c), 301(g), 301(h), 301(i), 301(k), 301(n), or 316(a); or

(E) the permittee has installed the treatment facilities required to meet the effluent limitations in the current permit and has properly operated and maintained the facilities but has nevertheless been unable to achieve the current effluent limitation, in which case the limitation in the reviewed, reissued, or modified permit may reflect the level of pollutant control actually achieved (but shall not be less stringent than required by effluent guidelines in effect at the time of permit renewal, reissuance, or modification).

303(d)(4) LIMITATIONS ON REVISION OF CERTAIN EFFLUENT LIMITATIONS —

(B) STANDARD ATTAINED — For waters identified under paragraph (1)(A) where the quality of such water equals or exceeds levels necessary to protect the designated use for such waters or otherwise required by applicable water quality standards, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section, or any other permitting standards may be revised only if such revision is subject to and consistent with the antidegradation policy established under this section.

Some of the metals standards are hardness-based. In calculating these standards, an increase in hardness results in higher criteria. This is because at a higher hardness, these metals are less toxic. The current permit used a hardness of 260 mg/L $CaCO_3$ to calculate the effluent limitations. This hardness was calculated as the 5th-percentile hardness of the receiving water at Station 10, the downstream edge of the mixing zone where aquatic life uses are to be protected. EPA believes this location is appropriate to determine the hardness level for use in the draft permit.

The standards are provided in Table C-3.

Table C-3 Water Quality Standards			
Parameter, (in ug/L unless noted otherwise)	Current Standards		Proposed Standards
	Acute	Chronic	
Aluminum	750	87	
Ammonia[2], mg/L	16.4	7	
Cadmium	5.63	0.55	2
Chromium, III	3943	188	
Chromium, VI	16	11	
Copper	34.4	21.1	
Cyanide[3]	22	5.2	
Iron	—	1000	
Lead	275.5	10.7	
Manganese	—	—	
Mercury	2.4	0.012	
Nickel	1053	117	
Selenium	20	5	
Silver	21	—	
Zinc		269[4]	
TDS[5]	Shall not exceed 500.		Shall not exceed 1000/1500.
TDS[6]	Shall not exceed 1500		

1 – Proposed Standards will be used in developing permit limits only if EPA approves the proposed standard prior to reissuance of the permit.

2 – Ammonia criteria are based on the pH and temperature data collected at Station 10 in the main stem of Red Dog Creek.

3 – The cyanide standards is free cyanide measured as weak acid dissociable (WAD).

4 - TCAK requested, in their application package, that EPA retain the SSC developed for zinc during the current permit issuance but in a letter to ADEC dated December 10, 2005, TCAK requested that ADEC not re-certify the SSC for zinc. The SSC was 210.

5 – This standard is applicable to the instream monitoring point that corresponds to the edge of the mixing zone in the Main Stem of Red Dog Creek at Station 151 during grayling spawning. See B.2. below for further information.

6 – This standard is applicable to the instream monitoring point that corresponds to the edge of the mixing zone in the Main Stem of Red Dog Creek at Station 151 after free flow is established but not during spawning unless the SSC for TDS is approved by EPA prior to the issuance of the final permit.

A permit must be issued using the WQS in effect at the time of issuance. Table C-3 also contains the WQS that ADEC has proposed. These standards may be adopted by ADEC and approved by EPA

before the Red Dog permit is finalized. Permit limitations have been calculated using the new standards as well as those currently in effect.

b. Reasonable Potential Evaluation

A reasonable potential analysis was performed to determine the need for limits. This analysis compares the maximum projected effluent concentration (C_e) to the criteria for that pollutant. If the projected effluent concentration exceeds the criteria, there is "reasonable potential" (RP) and a limit must be included in the permit. EPA uses the recommendations in Chapter 3 of the TSD to conduct this analysis.

The maximum projected effluent concentration (C_e) is defined by the TSD as the 99th percentile of the effluent data. This is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier (RPM).

For parameters with technology-based effluent limitations guidelines, the maximum effluent concentration used to determine the RP is the technology-based maximum daily limitation. The technology-based limit is used since water quality-based limits are only required if discharges at the technology-based limits have the RP to exceed water quality standards in the receiving water. The RPM accounts for uncertainty in the effluent data and statistically depends upon the amount of effluent data and variability of the data as measured by the coefficient of variation (CV) of the data. The RPM decreases as the number of data points increases and the variability of the data decreases. If the maximum projected effluent concentration is greater than an applicable water quality standard then a water quality-based effluent limit is required.

Table C-4 Reasonable Potential Determination						
Parameter (in ug/L unless otherwise noted)	Effluent Concentration	CV[1]	N= # of Samples	RPM	Maximum Projected Effluent Concentration	Reasonable Potential when compared with standards in Table C-2
Aluminum	210	1.5	77	2.27	476.7	Yes
Ammonia[2,4]	10.7	0.238	174	1.095	11.72	Yes
Cadmium[3]	100			1.0	100	Yes
Copper[3]	300			1.0	300	Yes
Cyanide[4]	6.9	0.614	131	1.332	9.2	No
Iron	<250	2.6	87	2.7	<675	No
Lead[3]	600			1.0	600	Yes
Lead[5]	3.6	0.5944	147	1.29	4.64	No
Mercury[3]	2			1.0	2	Yes
Nickel	51.9	1	144	1.47	76.5	No
Selenium	6.8	0.5	140	1.25	8.53	Yes
Silver	0.2	1.4	75	2.22	0.44	No
Zinc[3]	1500			1.0	1500	Yes

1 - CV is defined as the Standard Deviation ÷ the Mean of a data set.

2 - See Section 3.E., below.

3 - Metals with technology-based effluent guidelines.

4 - TCAK has requested mixing zones for these parameters. The effluent would be diluted to 40% at the edge of the requested mixing zone.

5 - Reasonable potential for lead if based only on water quality standards – see Appendix D.

c. Water Quality-Based Permit Limitation Derivation

Once EPA has determined that a water quality-based limitation is required for a parameter, the first step in developing the permit limitation is development of a Wasteload Allocation (WLA). A WLA is the concentration (or loading) of a pollutant that the permittee may discharge without causing or contributing to an exceedence of water quality standards in the receiving water. WLAs and permit limitations are derived based on guidance in the TSD. WLAs for this permit were established based on meeting aquatic life standards or site specific criteria at the end-of-pipe using the Alaska WQS.

The acute and chronic WLAs are then converted to long term average concentrations (LTAs) and compared. The most stringent LTA concentration for each parameter is statistically converted to effluent limitations. This section describes each of these steps.

Calculations of WLAs:

Where no mixing zone is allowed, the standard becomes the WLA. Establishing the standard as the WLA ensures that the permittee does not contribute to an exceedence of the standard.

ADEC has authorized a MZ for some parameters in their 401 Certification of the draft permit for TDS, WAD cyanide, and ammonia.

The NPDES regulations require that metals limits be expressed as total recoverable (TR) metals [40 CFR 122.45(c)]. This is because changes in water chemistry as the effluent and receiving water mix could cause some of the particulate metal in the effluent to dissolve and become bioavailable. Because the proposed WQS are expressed in dissolved, a translator is used in the WLA equation to convert the dissolved criteria to total recoverable. Since the State has not proposed translators in the recent revision to the WQS and there are no site-specific translators, the default translator is 1/CF where CF is the conversion factor in the WQS.

the WLA (TR) = the standard (diss) * the translator.

The standards are expressed as a total recoverable number or equation multiplied by a conversion factor (CF). Since the default translator is 1/CF, the equation becomes:

WLA (TR) = CF* standard (TR) * 1/CF
WLA (TR) = standard (TR).

Appendix D provides an example of how the WLAs for lead in Outfall 001 were developed.

Calculations of Long-term Average (LTA) Concentrations:

As discussed above, WLAs are calculated for each parameter for each standard (acute, chronic). Because standards are based on the different criteria which apply over different time frames, it is not possible to compare them or the WLAs directly to determine which results in the most stringent limits. For example, the acute criteria are applied as a one-hour average while the chronic criteria are applied as a four-day average (30 day for ammonia).

To allow for comparison, the acute and chronic WLAs are statistically converted to LTA concentrations. The conversion is dependent upon the coefficient of variation (CV) of the effluent data and the probability basis used. The probability basis corresponds to the percentile of the estimated concentration. EPA uses a 99th percentile for calculating the LTA, as recommended in the TSD. The following equations from Chapter 5 of the TSD are used to calculate the LTA concentrations (Table 5-1 of the TSD may also be used).

$$LTA = WLA * \exp[0.5\sigma^2 - z\sigma]$$

Where:

$\sigma^2 =$ $\ln(CV^2 + 1)$ for acute WLA, and
$\sigma^2 =$ $\ln(CV^2/4 + 1)$ for chronic WLA
$\sigma^2 =$ $\ln(CV^2/30 + 1)$ for ammonia
CV = coefficient of variation (standard deviation/mean)
Z = 2.326 for the 99th percentile probability basis (TSD)

Calculation of Effluent Limitations:

The LTA concentration is calculated for each WLA and compared. The most stringent LTA concentration is then used to develop the maximum daily limitation (MDL) and the average monthly limitation (AML) to be used in the permit. The MDL is based on the CV of the data and the probability basis while the AML is dependent upon these two variables and the monitoring frequency. As recommended in the TSD, EPA used a probability basis of 95 percent for the AML calculation and 99 percent for the MDL calculation. The MDL and AML are calculated using the following equations from the TSD (Table 5-2 of the TSD may also be used).

$$MDL \text{ or } AML = LTA * \exp[z\sigma - 0.5\sigma^2]$$

For the MDL: $\sigma^2 = \ln(CV^2 + 1)$
z = 2.326 for the 99th percentile probability basis

For the AML: $\sigma^2 =$ $\ln(CV^2/4 + 1)$
$Ln(CV^2/30 + 1)$ for ammonia
z = 1.645 for the 95th percentile probability basis

Where there is only one standard specified, such as the site specific criteria for cadmium, it is used as the chronic WLA and the permit limitations are calculated as above except using just one LTA instead of the more stringent between an acute or a chronic LTA.

Appendix D shows an example of the permit limitation calculation for lead in Outfall 001.

2. **Total Dissolved Solids (TDS)**: TDS consists of inorganic salts and small amounts of organic matter dissolved in water. The principal constituents are: carbonates, chlorides, sulfates, potassium, magnesium, calcium, and sodium. TDS is typically introduced into surface waters by geologic formations underlying an area, groundwater (via seeps and springs into a freshwater system), wind-borne sea spray, and human activities (mining and other surface excavation, water treatment chemicals, road salting, residential and urban runoff, agricultural chemicals, and irrigation). The levels of TDS proposed in this permit reissuance are not designed to prevent adverse affects to aquatic life.

The following summarizes the proposed effluent limitations that are in the draft permit for the facility:

1. Effluent may be discharged so as to maintain the in-stream TDS concentrations at the approved site specific criteria (SSC) of 1500 mg/L at the edge of the mixing zone in Main Stem Red Dog (Station 151). The discharge may start after the free flow of water in the Main Stem Red Dog Creek begins and may continue at this level prior to grayling spawning which generally occurs several weeks later (when the water temperature at Station 151 reaches 3°C). If the SSC of 1500 mg/L for the grayling spawning period is approved, there would be no need to determine when spawning occurs since the criteria would be the same for both periods. If the SSC is not approved, the spawning period would be determined based on the temperature of the water at Station 151. The current permit contained provisions for approval by the Agencies to determine the beginning and the end of spawning. If necessary, these provisions will remain.

2. If the SSC of 1500 mg/L is not approved prior to issuance of the permit and ADEC approves TCAK's December 17, 2005, request for an adjustment up to 1000 mg/L TDS as allowed under the WQS [18 AAC 70.020 Note 12], EPA will utilize 1000 mg/L during spawning periods. If the SSC is not approved and ADEC does not approve the adjustment up to 1000 mg/L, then EPA will utilize 500 mg/L in the permit during spawning.

3. In Ikalukrok Creek, the effluent from the mine site must be regulated at the discharge point so that the TDS concentration outside the mixing zone (Station 150) in Ikalukrok Creek does not exceed 1000 mg/L.

4. When salmon and Dolly Varden are spawning in Ikalukrok Creek (July 25 through the end of the discharge season), effluent from the mine site must be regulated so that the TDS concentration in Ikalukrok Creek where spawning occurs does not exceed 500 mg/L (Station 160).

5. In the current permit, the end-of-pipe limit of 3900 mg/L was included for TDS. The primary reason for including this limit was to make assumptions that were being used to determine the flow that the facility could discharge and still remain in compliance with its in-stream limits. The limit of 3900 was not a water quality-based effluent limitation but the best professional judgment at the time the permit was modified. During this reissuance, EPA is removing this end-of-pipe limit from the permit based on new information showing that the control of flow is more of a determining factor in controlling the downstream concentration of TDS than is the TDS concentration in the effluent. EPA is replacing the 3900 in the equations with 110% of the highest measured effluent value. A review of the equations in Permit Part I.A.8.j. shows that this will be more conservative than relying on an absolute value of 3900 because the equations will assume higher effluent concentrations and therefore will not underestimate the downstream impact of the effluent.

   If the SSC during spawning is approved or the other proposed values are utilized in developing permit limits during spawning, less stringent limitations will appear in the permit. An exception to the anti-backsliding provision of the CWA is that a reissued permit may contain a higher limitation in light of new information [CWA § 401(o)(2)(B)(i)]. The studies that TCAK conducted contain new information specific to the site that was not available at the time the current permit limitations were imposed. As such, EPA is proposing to use the less stringent limitations.

3. **Turbidity:** The aquatic life standard for turbidity is that turbidity may not exceed 25 nephelometric turbidity units (NTU) above natural conditions. Natural condition, as defined in 18 AAC 70.990(42), means any physical, chemical, biological, or radiological condition existing in a waterbody before any human- caused influence on, discharge to, or addition of material to the waterbody.

   The highest value for turbidity that was found in the effluent was 2.1 NTU. It is not expected that the maximum projected effluent would reach 25 NTU so this parameter is not limited in the permit although monitoring will continue.

4. **pH**: The WQS require a pH range of 6.5 - 8.5 standard units for waters protected for contact recreation. In the 401 Certification, ADEC includes a justification for the limits of the current permit which were 6.5 – 10.5. EPA will include these limits in the draft permit.

5. **Ammonia:** The ammonia criteria are dependent on the pH and temperature of the receiving water. Since these two parameters can vary, EPA determined the pH and temperature based on data collected from 2001 – 2005 at the edge of the mixing zone, previously represented by Station 10. EPA calculated the 95th percentile of the data set to determine the criteria to be applied (2.798 mg/L). EPA multiplied this criterion by the dilution factor (2.5) authorized by ADEC in the § 401 Certification to determine the effluent goal (7.0 mg/L). EPA then compares this goal to the maximum projected effluent value (11.72 mg/L). This value is calculated by multiplying the maximum effluent value (10.7 mg/L) by the reasonable potential multiplier (1.095). Since 11.72 mg/L is greater than 7.0 mg/L, there is reasonable potential for the effluent to exceed the standard and a limit is necessary.

   TCAK provided EPA with two Monte Carlo simulations (dynamic model). One simulation indicated that there is reasonable potential for ammonia to exceed the acute criterion. The other indicated that there was no reasonable potential for ammonia to exceed any criteria. EPA considered this additional information but determined that the additional complexity and did not provide added value to the analysis.

6. **Cyanide:** ADEC has proposed a mixing zone for cyanide with a dilution factor of 2.5. EPA determined the most stringent criteria to be applied (5.2 chronic). EPA multiplied this criterion by the dilution factor (2.5) to determine the effluent goal (13.0). EPA then compares this goal to the maximum projected effluent value (9.2). This value is calculated by multiplying the maximum effluent value (6.9) by the reasonable potential multiplier (1.332). Since 13.0 is greater than 9.2, there is no reasonable potential for the effluent to exceed the applicable criteria, and no limit is necessary. Monitoring shall remain in the permit on a weekly basis. Ambient monitoring for WAD cyanide has also been added to Station 151.

   ADEC has stated in its draft § 401 Certification that the use of a mixing zone for cyanide does not violate the State's Antidegradation Policy. The above analysis indicates that the effluent should not cause exceedences of the criteria at the edge of the mixing zone so it should be protective of the designated and existing uses downstream as required by 18 AAC 70.015(a)(1) Antidegradation Policy. As such, the permit may allow backsliding based on the CWA § 303(d)(4)(B) exception outlined above.

7. **Zinc:** The State has not re-certified the site specific criterion used for zinc in the current permit, which contained a zinc limit based on the natural condition site specific criteria provided in the State's 1998 § 401 Certification of the permit of 210 ug/L. This means that the state-wide criteria of 269 ug/L (both acute and chronic at a hardness of 260 mg/L $CaCO_3$) would be utilized to calculate the permit effluent limit. ADEC has determined that the use of this criteria would not violate their Antidegradation Policy. Also, EPA believes that the adoption by ADEC of the EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998] for this parameter is protective of existing uses downstream of the outfall as required by 18 AAC 70.015(a)(1)

Antidegradation Policy, so the permit may allow backsliding based on the 303(d)(4)(B) exception outlined above.

8. **Whole Effluent Toxicity (WET):** In a document entitled, "WET Limit with Consideration to Updated Site-side Water Balance," TCAK requested a change to their WET limit based on a new water balance. This water balance eliminates the water of unknown origin from the calculation stating that all the flows into the tailings impoundment are proportional to precipitation. As such, the flow with the lowest assigned toxicity would be eliminated and the WET limits would be higher than those in the current permit.

   The discussion in Part I. of this Appendix on flow indicates that there seem to be inflows to the impoundment not accounted for in the water balance. This supports the inclusion of the water of unknown origin in the determination of the WET limit.

   The WET limits will remain the same as the current permit because (1) the existing limit is based on the natural background, (2) the natural background was based on a calculation of the natural condition, and (3) the water balance indicates that there is water of unknown origin entering the impoundment.

9. Fecal Coliform: For discharges to Red Dog Creek, the most protective applicable standard for fecal coliform is for Water Recreation - Secondary. 18 AAC 70.020(b)(2)(B)(ii) states, "In a 30-day period, the geometric mean may not exceed 200 FC/100 ml, and not more than 10% of the total samples may exceed 400 FC/100 ml." An average of 200 FC/100ml and a maximum of 400 FC/100ml are included as limits in the draft permit – the same as the current permit.

C. Summary of Draft Permit Effluent Limitations – Outfall 001

As discussed in Section V.A. of the fact sheet, the draft permit contains the more stringent of technology and water quality-based effluent limitations. The water quality-based limits are more stringent than the technology-based limits for the metals and have therefore been included in the permit. The draft permit contains those limits based on the latest version of the EPA-approved WQS. EPA believes that the adoption by ADEC of the EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998] for these parameters is protective of existing uses downstream of the outfall as required by 18 AAC 70.015(a)(1) Antidegradation Policy so the permit may allow backsliding based on the 303(d)(4)(B) exception outlined above.

Table C-5 shows a comparison between the technology-based and water quality-based effluent limitations and which limitations are in the draft permit.

Table C-5
Draft Permit Effluent Limitations

Parameter[1]	Technology-based		WQ-based		Draft Permit Limits	
	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly

Table C-5 Draft Permit Effluent Limitations						
Parameter[1]	Technology-based		WQ-based		Draft Permit Limits	
	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly
Aluminum	-	-	159.35	55.20	159.35	55.20
Ammonia, mg/L N	-	-	10.64	6.80	10.64	6.80
Cadmium[2]	100	50	0.94	0.44	0.94	0.44
Cadmium[3]	100	50	6.30	2.95	3.4	2.0
Copper[2]	300	150	34.40	17.15	34.4	17.1
Cyanide, WAD	-	-	-	-	-	-
Lead[2]	600	300	17.53	8.78	17.53	8.78
Mercury	2	1	0.02	0.01	0.02	0.01
Selenium	-	-	7.80	4.23	7.8	4.2
Zinc	1500	750	386.32	237.11	386.32	237.11
TSS, mg/L	30	20	-	-	30	20
pH, S.U.	6.0 to 9.0[4]		6.5 to 10.5		6.5 to 10.5	
WET, TU_c	-		12.2	9.7	12.2	9.7

1 - Units are ug/L unless otherwise noted.
2 - Hardness based metals criteria used a hardness of 260 mg/L $CaCO_3$
3 - These are the cadmium limits which would be used if the proposed SSC were to be approved by EPA prior to permit issuance.
4 - The Effluent Limitation Guidelines allow this to exceed 9 in certain circumstances, see Fact Sheet Appendix C Part I.

II. Outfall 002 - Domestic Wastewater Discharge

A. Technology-based limitations

Secondary Treatment [18 AAC 72.040 and 18 AAC 72.990(64)]

Biological Oxygen Demand (BOD_5): The regulations for secondary treatment require that BOD meet a 7 day average of 45 mg/L, a 30 day average of 30 mg/L and the arithmetic mean of the values for effluent samples collected in a 24-hour period does not exceed 60 mg/L.

Total Suspended Solids (TSS): The regulations for secondary treatment require that TSS meet a 7 day average of 45 mg/L, a 30 day average of 30 mg/L and the arithmetic mean of the values for effluent samples collected in a 24-hour period does not exceed 60 mg/L.

pH: pH levels be maintained between 6 and 9 standard units.

B. Water Quality-Based limitations

The receiving waters under this permit are protected for all uses. The most protective criteria will be used in the Permit.

Fecal Coliform: For freshwater, the most protective standard for fecal coliform is for drinking, culinary and food processing use since no uses have been

removed from the tundra wetlands. 18 AAC 70.020(b)(2)(A)(i) states, “In a 30-day period, the geometric mean may not exceed 20 FC/100 ml, and not more than one sample, or more than 10% of the samples may exceed 40 FC/100 ml.” An average of 20 FC/100ml and a maximum of 40 FC/100ml are included as limits in the draft permit.

Chlorine: The WQS contain aquatic life criteria for acute (19 ug/L) and chronic (11 ug/L). EPA used the process outlined in Section I. above, utilizing 0.6 as the CV. The permit limits for chlorine would be an average of 9.01 ug/L and a maximum of 18.07 ug/L.

If chlorine (Cl) is used for disinfection, the compliance evaluation level will be 0.1 mg/L as a daily maximum. The effluent limit for chlorine is not quantifiable using EPA approved analytical methods. The ML for EPA Methods 330.3 and 330.4 is 0.1 mg/L and is used as the compliance evaluation level for this parameter.

pH: For fresh waters, the most protective limitations on pH are for aquaculture and contact recreation. This level is 6.5 to 8.5 standard units.

Dissolved Oxygen: The WQS require a minimum concentration of 7 mg/l for dissolved oxygen for discharges to fresh water. The maximum concentration for dissolved oxygen is 17 mg/l. A minimum of 7 mg/L and a maximum of 17 mg/L are included as effluent limits in the draft permit.

APPENDIX D - Example Water Quality-based Effluent Limitation Calculation

This appendix demonstrates how the water quality-based analysis (reasonable potential determination and development of effluent limitations was performed using cadmium in Outfall 001 as an example. Because of the proposed changes to the WQS, the calculations are shown for the current standards as well as the proposed.

Step 1: *Determine the applicable water quality standard.*

The current Alaska water quality standards for lead are provided below at a hardness value of 260 mg/L $CaCO_3$.

Table D-1 Lead criteria		
Parameter	Acute standard	Chronic standard
Lead, ug/L	275.5	10.7
* these standards are already translated from the proposed dissolved standard to a total recoverable standard		

Step 2: *Determine if there is reasonable potential for the discharge to exceed the standard.*

To determine reasonable potential, the maximum projected effluent concentration, when no mixing zone is authorized, is compared to the applicable water quality standards. If this exceeds the standard, then a reasonable potential exists and a water quality-based effluent limit is established.

Since lead is a technology-based effluent limit, the following equation applies:

300 * RPM (reasonable potential multiplier) = 300 * 1 = 300

If this had been based on a water quality-based limit, the statistics discussed in the previous Appendix would have been applied to determine the RPM:

The tables in the TSD used to determine reasonable potential multipliers are not broad enough for parameters with more than 20 data points. EPA utilized the equations on page 52 of the TSD to determine the multiplier for lead. The maximum effluent measure for lead was 3.6 ug/L, the CV is 0.64, the number of effluent samples is 147 and the RPM is 1.29. The maximum projected effluent value for lead would be 4.64 ug/L and is less than the chronic criteria of 10.7 ug/L. So if the RP was determine strictly on a WQ basis, there would be no reasonable potential for lead to violate the criteria.

The effluent from outfall 001 has the reasonable potential to exceed the lead aquatic life standard based on the analysis of the technology-based limitation. Therefore, water quality-based limitations are required.

Step 3: *Determine the wasteload allocation.*

The wasteload allocations (WLAs) for lead are equal to the standards:

	WLA
Acute	275.5
Chronic	10.7

Step 4: *Develop long-term average (LTA) concentrations.*

Effluent limitations are developed by converting the aquatic WLAs to LTAs. The most stringent of the acute or chronic LTA is then used to develop the effluent limitations.

$$LTA = WLA * \exp[0.5\sigma^2 - z\sigma]$$

where,
z = 2.326 for 99th percentile probability basis (per the TSD)
CV = 0.59
For acute: $\sigma^2 = \ln(CV^2 + 1) = \ln[(0.59*0.59) +1] = 0.2987$ $\sigma = 0.5465$
For chronic: $\sigma^2 = \ln(CV^2/4 + 1) = \ln[(0.59*0.59/4) +1] = 0.0834$ $\sigma = 0.2889$

LTA	
Acute	89.16
Chronic	5.67

The most stringent LTA concentration will be used to derive the effluent limitations for lead. In this case, the chronic LTA is used.

Step 5: *Develop effluent limitations*

The LTA concentration is converted to a maximum daily limit (MDL) and an average monthly limit (AML).

$$MDL, AML = LTA * \exp[z\sigma - 0.5\ \sigma^2]$$

where, for the MDL:
z = 2.326 for 99th percentile probability basis (per the TSD)
$\sigma^2 = \ln(CV^2 + 1) = \ln[(0.64*0.64) +1] = 0.3433$

for the AML:
z = 1.645 for the 95th percentile probability basis (per the TSD)
$\sigma^2 = \ln(CV^2/n + 1) = \ln[(0.64*0.64/4) +1] = 0.0975$
since n = number of samples per month = 4
(4 is the minimum recommended by the TSD)

MDL $= 5.4 * \exp[z\sigma - 0.5\ \sigma^2] = 5.4 * \exp[2.326*0.5859 - 0.5*0.3433] = 17.53$

AML $= 5.4 * \exp[z\sigma - 0.5\ \sigma^2] = 5.4 * \exp[1.645*0.3122 - 0.5*0.0975] = 8.78$

MDL = 17.53 ug/L
AML = 8.78 ug/L