Exhibit 1

Comments on
Teck Cominco Alaska Incorporated (TCAK)
Red Dog Mine
February 2, 2006 Draft NPDES Permit

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INTRODUCTION

Teck Cominco Alaska Incorporated (TCAK) is pleased to submit these comments on draft NPDES Permit No. AK-003865-2 for its Red Dog Mine, that is located in the Northwest Arctic Borough, approximately 90 miles north of Kotzebue, Alaska. TCAK recognizes and appreciates the enormous effort and diligence the agencies have expended in the preparation of these documents. TCAK is privileged to have had the opportunity to work with many of the experienced staff members at EPA, ADEC and ADNR and has been favorably impressed with the professional attitude displayed.

TCAK has thoroughly reviewed the draft permit, Fact Sheet, and Environmental Assessment (EA) prepared by Region 10 of the U.S. Environmental Protection Agency (EPA) and our comments address permit limits and conditions in the draft permit that we believe are incorrect and/or inappropriate and not supported by available data and the permit record.

TCAK is especially concerned with the unnecessary limits for whole effluent toxicity (WET) and ammonia-nitrogen in the draft permit, which have the potential to cause future compliance issues because of test method variability but that add no benefit for protecting water quality and the environment. The NPDES permit continues to require much of the current, extensive ambient water quality monitoring at sampling stations with long monitoring records that show no adverse water quality effects and which generate data that are neither needed nor used by EPA and the Alaska Department of Environmental Conservation (ADEC).

ADEC's conclusions and recommendations with respect to state water quality standards in its proposed Clean Water Act Section 401 certification are well-reasoned and entitled to extensive deference. The Fact Sheet and draft permit offer no significant reasons for deviating from the rational and expertise of State water quality experts. ADEC's proposed certification supports TCAK's request to remove the WET limits from the draft permit and also recommends eliminating ambient surface water quality and flow monitoring at existing sampling stations that we have requested be removed from the permit because the data are redundant and not used. EPA did not adopt ADEC's recommendations on these permit conditions, but the Fact Sheet is silent on the basis for EPA's decisions.

TCAK's comments are extensive, and we have organized them in an order that, for the most part, follows our degree of concern with the proposed limits and conditions. The comments address, in order, the following issues with the draft permit:

1. WET permit limits for *Ceriodaphnia dubia* and *Pimephales promelas*.
2. Ambient surface water quality and flow monitoring requirements.
3. Proposed new permit limits for ammonia-nitrogen.
4. The hardness concentration used to calculate water quality-based effluent limits (WQBELs) for metals with hardness-based water quality criteria.
5. The maximum annual flow cap for discharges from Outfall 001.
6. Certain language and references to other, non-Clean Water Act, regulations in the storm water provisions.
7. Comments intended to clarify certain provisions and correct typographical and/or grammatical errors.
8. Limits for the following metals — cadmium, aluminum, and mercury.
9. The inability to provide comments on a complete permit record.
10. Comments specific to the ADEC 401 Certification.

There are numerous attachments and references cited in these comments. Reference materials that are readily available to the public are not included as attachments (e.g., EPA guidance documents). Similarly, references to documents pertaining to the Red Dog Mine that are already in the permit record (e.g., previous Fact Sheets, the Environmental Impact Study, etc.) and/or were produced by EPA are not included as attachments. All other references cited in the comments are included as attachments and are provided on a compact disc (CD), because of their number and volume.

TCAK also incorporates by reference all comments filed on the proposed NPDES permit by NANA Regional Corporation.

General Comment

In a recent letter from Dr. Alvin G. Ott (ADNR) to Mr. Luke Boles (ADEC), Dr. Ott made the following statement, "Our annual technical reports, that we have prepared, indicate that changes have occurred, but there have been no observed negative effects to the ecosystems of Red Dog and Ikalukrok Creeks resulting from the waste water effluent. In fact, data we have collected on biological conditions in Mainstem Red Dog Creek since mining started indicate that this system is more biologically productive than it was premining." The simple fact that a preeminent biologist of Dr. Ott's caliber and position

can make a statement such as this is remarkable and is true evidence that the outstanding efforts of EPA, ADEC, ADF&G, ADNR, NANA and TCAK and the NPDES program as a whole has accomplished an exceptional feat; an industrial discharge that has not only had no impact on the environment, but has actually resulted in great improvements to the receiving ecosystem. Everyone involved with this draft permit and the preceding permits should take enormous pride in this great achievement.

SPECIFIC COMMENTS

1. WHOLE EFFLUENT TOXICITY

The total toxicity limits for *Ceriodaphnia dubia* and *Pimephales promelas* that are expressed as chronic toxic units (TU_c) should be eliminated from the draft Red Dog Mine permit.

Permit requirements related to total toxicity should be limited to monitoring whole effluent toxicity (WET) for the fathead minnow, *Pimephales promelas* and the water flea, *Ceriodaphnia dubia.* The Alaska Department of Environmental Conservation (ADEC) has specifically stated in its draft Clean Water Act Section 401 Certification that the total toxicity limits for both *C. dubia* and *P. promelas* can be removed from the NPDES permit and such removal will not jeopardize compliance with the state's water quality standards and designated uses for the receiving streams.

The WET limits for the fathead minnow should be deleted from the draft permit because a reasonable potential analysis (RPA) of the historic WET monitoring data has shown that there is no reasonable potential that the effluent is or will be toxic to the fathead minnow. The historic WET test data collected by Red Dog Mine over multiple years represents "new information," which makes removal of the total toxicity limits for this species from the NPDES permit acceptable pursuant to the antibacksliding provisions of the NPDES regulations.

Based on extensive site-specific bioassessments and other studies, literature surveys, and the exhaustive and scientifically thorough toxicity identification evaluations/toxicity reduction evaluation (TIE/TRE) studies of the effluent from the Red Dog Mine, it is apparent that the survival and reproduction (chronic) test for the water flea, *C. dubia*, should be removed from the WET limitations portion of the mine NPDES permit because it is a poor predictor of risk to the aquatic invertebrate community in the receiving streams. The chemical-specific limit of 1,500 mg/L for TDS appropriately protects that invertebrate community, and is supported by the invertebrate bioassessments performed in the receiving streams. Under a weight of the evidence approach, the *C. dubia* chronic toxicity test clearly should not be included in this NPDES permit.

Such flexibility to delete a non-predictive WET test for *C. dubia* is legally permissible under a recent court challenge to the validity of the WET methodology, and the judicious use of such flexibility by permitting authorities was a key holding in the decision not to strike down WET testing as a Part 136 methodology.

C. dubia WET testing is merely a less than perfect predictor of whether something is toxic in toxic amounts to invertebrates in a receiving stream, and a weight of the evidence approach must be used where extensive supplementary studies of invertebrate toxicity have been conducted. In the case of the Red Dog Mine, an exception to the general tendency of *C. dubia* to predict in-stream invertebrate chronic toxicity has been demonstrated by site-specific evidence relevant to the local conditions, including site-specific bioassessments, the performance of expensive and exhaustive TIE/TRE studies on the Red Dog Mine effluent, a comparison of pre-mining versus post-mining aquatic invertebrate communities in the receiving streams, and a literature survey as to the adequacy of TDS as a predictor for threats to the invertebrate community.

Given the NPDES permit requirements for bioassessment of the receiving stream invertebrate community (which so far has demonstrated dramatic increase in vitality after the operation of the mine caused a tremendous improvement in stream quality), and the chemical-specific TDS limits of 1,500 mg/L that is adopted to protect that receiving stream vertebrate and invertebrate communities, the Red Dog Mine NPDES permit will assure protection of the invertebrates in the receiving streams (without resorting to the inappropriate chronic *C. dubia* WET test). In point of fact, the operation of the Red Dog Mine has dramatically contributed to the health of the invertebrate communities (and vertebrate communities) by significantly enhancing water quality above natural, pre-mining conditions in the receiving streams. This is exactly the type of case the federal Court of Appeals for the D.C. Circuit singled out as appropriate for permitting flexibility when it decided that any problems with the general applicability of the WET test could be resolved by permitting authorities in a site-specific application.[1]

1.A Ceriodaphnia dubia

***Ceriodaphnia dubia* is a scientifically inappropriate WET test species for the Red Dog Mine effluent. It is unsuitable for measuring aquatic toxicity of the effluent because of its sensitivity to total dissolved solids (TDS).**

1.A.i

EPA guidance recommends that fresh water species not be used for WET testing of waters with TDS concentrations greater than 1,000 mg/L.

[1] United States Court of Appeals for the District of Columbia Circuit, Edison Electric Institute, et. al. v. EPA, No. 96-1062, December 10, 2004.

Both *C. dubia* and *P. promelas* are fresh water species. The EPA methods manual for the chronic WET tests[2] states that if the receiving[3] water salinity[4] is greater than 1,000 mg/L, the choice of WET test organisms should be based on state water quality standards and/or permit requirements. It also directs the user to the EPA's *Technical Support Document for Water Quality-based Toxics Control*[5] (TSD) when effluent and receiving water salinity "requires special consideration." The TSD states the following regarding high salinity effluents and receiving water:

> *"As a general rule, EPA recommends that freshwater organisms be used when the receiving water salinity is less than 1,000 mg/L, and that marine organisms be used when the receiving water salinity equals or exceeds 1,000 mg/L." (TSD, page 61)*

The TSD also recommends that when a saline discharge is to a fresh receiving water, then freshwater species should be used in WET tests. However, this recommendation assumes that a mixing zone will be included in the determination of the critical in-stream dilution for the WET test. This is not the case for the Red Dog Mine, where the proposed WET limits are applied to the undiluted effluent at Outfall 001.

There are many published studies that document the toxicity of inorganic salts to *C. dubia*. Goodfellow, W.L. et. al. (2000)[6] summarizes these studies and the issue of major ion toxicity in the standard WET test. The Gas Research Institute (GRI) published a study in 1994[7] that presents a model of the salinity toxicity relationship (STR) for seven common cations and anions to three WET test species — *C. dubia*, *P. promelas*, and *Daphnia magna*. The STR model was developed using data from over 3,000 individual acute WET tests for these species and is a good predictor of the toxicity of the common ions to these species.

The GRI report and STR model document that sulfate is the least toxic of the common cations and anions that were tested and had statistical significance in their regression model (sodium, potassium, magnesium, calcium, chloride, bicarbonate,

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[2] EPA, October 2002, *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, EPA-821-R-02-013, Washington, D.C.

[3] Receiving water in this instance is Mainstem Red Creek with a SSC for TDS less than or equal to 1,500 mg/L.

[4] Salinity is a measurement of the total concentration of inorganic dissolved salts in a water sample, e.g., sea water and brines. Ocean water contains primarily halogen salts (i.e., sodium chloride, sodium bromide). Solutions of other dissolved inorganic cations and anions, including calcium and sulfate, have similar properties to ocean water and brines and exert similar ionic effects on fresh water species. In this document, we will use the terms TDS and salinity interchangeably, to account for the fact that the RDM effluent salts are predominantly calcium sulfate.

[5] EPA, March 1991, *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001, Washington, D.C.

[6] Goodfellow, W.L., 2002, et. al., "Major Ion Toxicity in Effluents: A Review with Permitting Regulations," *Environmental Toxicology and Chemistry*, Vol. 19, No. 1, pp. 175-182.

[7] GRI, December 1994, *The GRI Freshwater STR Model and Computer Program: Overview, Validation, and Application*, Chicago, Illinois.

sulfate). The STR model predicts a 79.2% survival of *C. dubia* in the 48-hour WET test at the mean RDM effluent sulfate concentration of 2,300 mg/L. Because this is an acute test endpoint, it demonstrates that the sulfate in the Red Dog Mine effluent can be expected to exert significant toxicity to *C. dubia* at the prevailing effluent concentrations. The sub-lethal effects in the chronic WET test would be equal to or greater than the observed acute effects at the 2,300 mg/L sulfate concentration. In contrast, the GRI STR model predicts 95% survival of *P. promelas* at the same effluent sulfate concentration, which is consistent with the RDM effluent WET testing results that show little or no toxicity to the minnow.

1.A.ii

Mock effluent testing confirms that there is no toxicity threat to the resident aquatic invertebrate community in the Red Dog receiving streams.

Beginning in the 2004 discharge season, Red Dog Mine began conducting side-by-side WET testing of effluent samples and mock effluent samples. The mock effluent samples consist of synthetic laboratory water that is spiked with the principal inorganic cations and anions present in the effluent to concentrations that simulate the TDS, hardness, alkalinity, and ionic composition of a corresponding effluent sample. Because the mock effluent sample contains only the principal TDS cations and anions that are present in the effluent (calcium, magnesium, potassium, sodium, sulfate, bicarbonate, and chloride), the chronic toxicity caused by the TDS composition of the effluent is measured by the WET test of the mock effluent sample and all other potential sources of toxicity are excluded.

The results of the mock effluent testing are consistent with the scientific literature with respect to the toxicity of the common inorganic cations and anions that are found in the RDM effluent. Figures 1 and 2 present the mock effluent data collected during the period from May 2004 through June 2005.

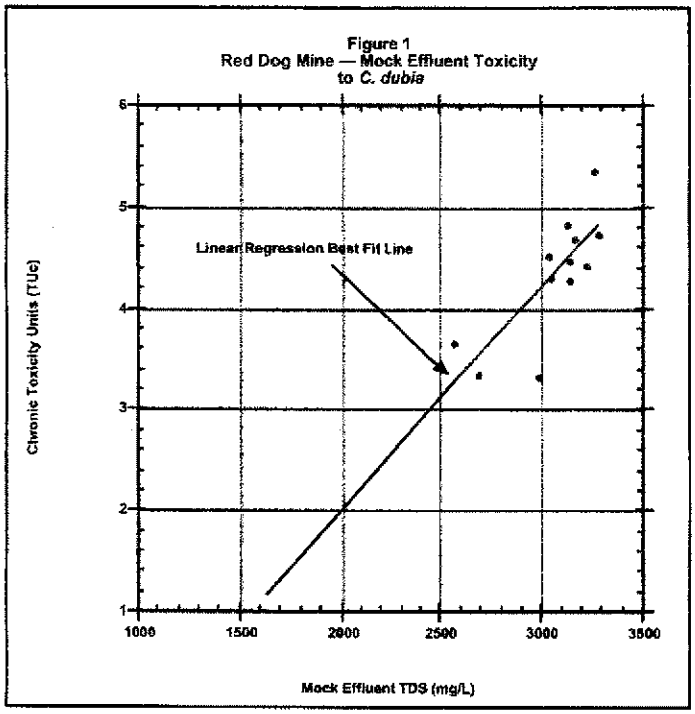


Figure 1
Red Dog Mine — Mock Effluent Toxicity
to C. dubia
Linear Regression Best Fit Line
Chronic Toxicity Units (TUc)
Mock Effluent TDS (mg/L)
1
2
3
4
5
6
1000
1500
2000
2500
3000
3500

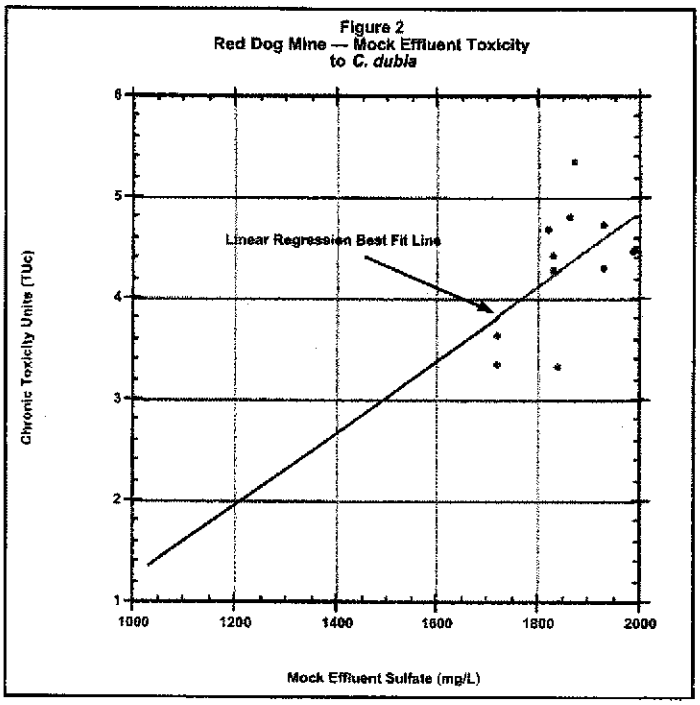


Figure 2
Red Dog Mine — Mock Effluent Toxicity
to C. dubia
Linear Regression Best Fit Line
Chronic Toxicity Units (TUc)
Mock Effluent Sulfate (mg/L)
1
2
3
4
5
6
1000
1200
1400
1600
1800
2000

As shown by the data in Figure 1, the mock effluent TDS concentrations greater than 2,400 mg/L cause chronic toxicity to *C. dubia*, which is the expected response based on the scientific literature and EPA's recommendations in the TSD regarding acceptable TDS concentrations in the WET test. The best-fit linear regression line indicates that a TDS concentration of approximately 1,500 mg/L would result in no chronic toxicity to *C. dubia* (survival basis only; sub-lethal effects may occur at lower TDS concentrations). The site-specific criterion for TDS in Red Dog Creek is 1,500 mg/L, which historic data indicate is consistently achieved at the edge of the mixing zone. Therefore, if the WET test were performed with the receiving water-effluent mixture under actual discharge conditions (i.e., at the downstream edge of the mixing zone in Red Dog Creek), rather than in 100% effluent, the chronic WET test for *C. dubia* would not show lethality.

Figure 2 shows the relationship between the sulfate concentration in the mock effluent samples and the chronic toxicity of these samples to *C. dubia*. As described above, the STR model predicts 79.2% survival of *C. dubia* in the 48-hour acute WET test at a sulfate concentration of 2,300 mg/L. The mock effluent testing demonstrates that at sulfate concentrations of 1,700 mg/L or higher, the minimum level of chronic toxicity measured is 3.3 TU_c. A 3.3 TU_c represents 30.3% mock effluent mixed with synthetic dilution water, which at a mock effluent sulfate concentration of 1,700 mg/L corresponds to a sulfate inhibition concentration that affects 25% of the test organisms (IC_{25}) of about 700 mg/L.[8,9] The extrapolated best-fit line indicates that the effluent would be non-toxic to *C. dubia* (survival) at a sulfate concentration of approximately 680 mg/L, which is close to the predictions of the STR model.

The mock effluent testing demonstrates that it is TDS, primarily in the form of the sulfate ion, which explains the toxicity of 100% effluent to *C. dubia*. The mock effluent data also demonstrate that at the site-specific TDS criterion for Red Dog Creek of 1,500 mg/L, it is probable that there would be no measurable toxicity (lethality) to *C. dubia* in the chronic WET test. These data support the justification for deleting the WET limits in the permit that are based on testing 100% effluent, because the *C. dubia* WET test is not a reliable predictor of toxicity in the receiving waters. The TDS concentrations in the Red Dog Mine effluent are toxic to *C. dubia*, but the concentrations in the discharge are not the same as the TDS concentrations Red Dog Creek at the downstream edge of the mixing zone because they are diluted by a minimum factor of over 2.5 by the upstream receiving water flow.

1.A.iii

[8] This calculation assumes that 1.0 TU_c is equal to the IC_{25} in the chronic WET test.
[9] Calcium may be as toxic as sulfate. However, the database for the STR model did not show a statistically significant effect of calcium concentration on acute toxicity of salt solutions to *C. dubia* so these comments use sulfate for the comparison between the toxicity of the RDM effluent and the predictions of the STR model.

The WET limit in the draft permit for *C. dubia* is incapable of detecting toxicity in the Red Dog Mine effluent at levels below the natural condition toxicity.

When a reasonable potential analysis is conducted for the *C. dubia* WET limit, as specified at 40 CFR 122.44(d)(1)(ii), the complete lack of functionality of the WET limit is truly demonstrated.

The permitting regulation at 40 CFR 122.44(d)(1)(v) states that EPA is not required to include a WET limit in a permit when it is demonstrated that chemical-specific limits for the effluent are sufficient to attain State water quality standards. Part 122.44(d)(1)(ii) outlines procedures for the reasonable potential demonstration. Specifically, the following factors must be considered:

1. Existing controls on point and non-point sources of pollution;
1. Variability of the pollutant in the effluent;
2. The sensitivity of the species to toxicity testing;
3. Dilution of the effluent in the receiving water (where applicable).

Existing Controls

The existing controls for toxicity in the Red Dog Mine effluent are to chemically precipitate the high concentrations of heavy metals followed by gravity separation and filtration as necessary. The resulting effluent is significantly less toxic to aquatic species after the metals are removed, but has an elevated TDS (calcium and sulfate) concentration because lime (calcium) is used as the precipitating agent and sulfate is formed by the oxidation of sulfide minerals. As EPA indicated in the 2003 Environmental Assessment (EA) to the modified permit, there is no feasible treatment technology for TDS in the Red Dog Mine effluent. TCAK is aggressively pursuing source control of TDS to the treatment facility, but it is not expected that source control alone will have any appreciable effect on the effluent toxicity to *C. dubia* and certainly not within the term of the draft permit.

For several years, TCAK has attempted to determine the fraction of the whole effluent toxicity in the mine effluent that is attributable to TDS. Concurrent testing of the whole effluent and a "mock" effluent composed only of the TDS salts at the concentrations and ratios in the effluent and clean lab water was performed to define this fraction. In 2005, the concurrent testing methodology was further refined to better represent the effluent composition and the results of split sample analysis performed at two different toxicity testing laboratories are contained in the table below.

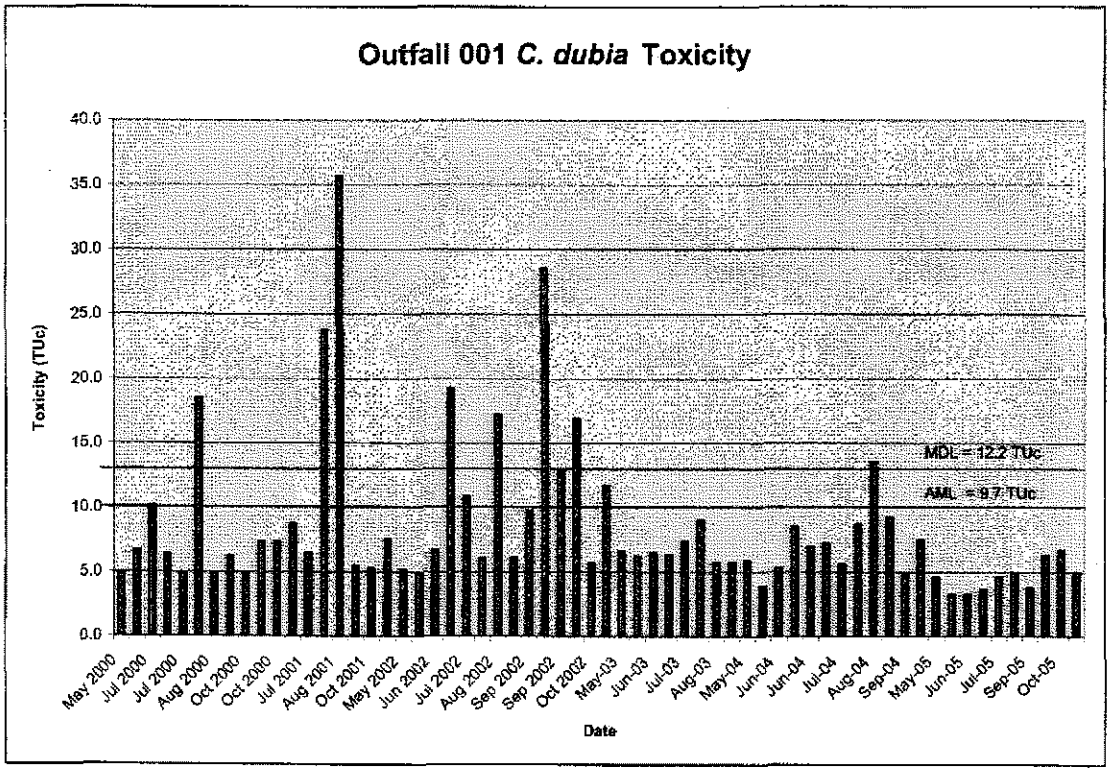
2005	Laboratory			
	ENSR		**CH2M Hill**	
	Whole	**Mock**	**Whole**	**Mock**
May	3.28	3.95	4.57	4.88
June	3.65	4.72	3.30	4.74
July	4.91	5.82	4.59	5.21
August	3.57	4.38	3.94	5.03
September	6.34	3.45	3.82	3.66
October	5.02	4.28	6.71	3.91
Average	**4.46**	**4.43**	**4.49**	**4.57**
C.V. (%)	26.3	18.1	26.6	13.9

All values in TU_c

As the data in the table indicate (specifically, the averages and coefficients of variation of each data set which minimize the effects of interlaboratory variability), the toxicity of the effluent to *C. dubia* is attributable entirely to TDS. TDS is regulated by numeric effluent flow limits and in-stream TDS limits to attain and maintain applicable numeric and narrative Alaska water quality standards utilizing the existing controls. Further, as stated above, additional controls are infeasible or would not have significant impact on the effluent toxicity, particularly within the effective term of the draft permit.

Variability

Below is a graph of the WET test results for *C. dubia* and the mine effluent from May 2000 through October 2005.



Prior to the 2003 discharge season, there were intermittent apparent "toxic events" and the effluent toxicity had relatively extreme variability, as expressed in TU_c. Each "toxic event" was explored using the classical TRE/TIE procedures with the more recent investigations exploring non-traditional sources of toxicity. None of these investigations revealed the presence of any toxicants in the effluent other than TDS, and TDS alone could not account for the high level of toxicity apparently present in the effluent compliance samples. Complicating the investigations was the lack of persistence of the "toxic event". Samples collected within days or weeks of each other had dramatically different toxicities, despite the fact that the water being treated and discharged was drawn from a 4-billion gallon well-mixed reservoir. It was generally believed in the early 2000's that the toxicity investigations needed to be refined to identify this non-persistent "mystery" toxicity.

Complicating all these investigations was the inability to reproduce WET test results, even when tests were conducted on true split samples (i.e., poor interlaboratory precision). The table below presents the 2002 results of split sample analysis of *C. dubia* WET tests on the mine effluent conducted at two different toxicological laboratories. The very poor interlaboratory precision of the WET test for *C. dubia* pointed to intra-laboratory precision as the most probable cause of the variable effluent toxicity that was manifested in the apparent "toxic events" observed in the record.

2002	Laboratory	
	ENSR	CH2M Hill
May	5.19	4.94
June	19.27	6.65
July	6.06	10.89
August	6.12	17.24
First Sept.	28.41	9.8
Second Sept.	12.99	16.95
October	5.74	11.8

All values in TU_c

An investigation was conducted in 2003 that focused on how to improve the interlaboratory and intralaboratory precision of the WET tests. It was identified that the dilution series specified by EPA in the 1998 permit introduced inherent imprecision in the WET tests. This poor precision was responsible for the highly variable WET test results for samples of an effluent with very consistent chemical characteristics.

Starting in the 2003 discharge season, a different dilution series was implemented. This dilution series, which uses more closely spaced sample dilutions in the WET test procedure than was specified in the permit, was designed to improve the intralaboratory and interlaboratory precision of the *C. dubia* chronic test. The EPA WET methods manual discusses how test precision is affected by the test dilution factor (i.e., the spacing between test dilutions).[10] Use of closer spaced dilutions will improve test precision, which is the basis for TCAK's change in the dilution factors that it uses for WET testing.

As illustrated in the figure presented above, since 2003 the intralaboratory precision has been greatly improved; TU_c variation over time has been greatly reduced; and "toxic events" have been eliminated or greatly reduced in frequency and magnitude (depending on how split sample results are interpreted). It is obvious that the non-persistent "mystery" toxin was simply an artifact of the methodology and dilution series, a fact that has been confirmed by the TDS mock effluent testing. TCAK has concluded that the actual variability of the whole effluent toxicity of the mine discharge is negligible because the variability in the historic WET test results is an artifact of the testing methodology and does not represent variation in the effluent toxicity. Based on the test results shown in the above figure, one might conclude that there has been a dramatic decrease in the effluent toxicity since 2003, as evidenced by the absence of exceedances of the WET limits. However, the fact is that the effluent composition has not changed at all; only the WET test methodology has been modified to reduce the uncertainty in the test results.

Sensitivity of the Species to Toxicity Testing

[10] Op. Cit., EPA, October 2002, Section 4.14.6.

The proposed and current WET limits for *C. dubia* in the draft and current permit do not protect the indigenous aquatic community because *C. dubia* measures only toxicity caused by the TDS concentrations in the Red Dog Mine effluent. A WET limit above 1 TU_c is usually based on a mixing zone and a critical low flow dilution factor to assure protection of the receiving water aquatic community. However, at Red Dog Mine, the permit WET limit is appropriately based on the natural condition toxicity in the stream prior to any human affects on the stream system. This approach establishes a WET limit that is much higher than what would be set by conventional approaches using the critical low flow dilution. Furthermore, if the natural conditions were neglected, a grossly inappropriate action, and the WET limit was matched to the critical in-stream dilution (i.e. 1:2.5[11] or 3 TU_c), *C. dubia's* sensitivity to TDS alone would cause every WET test to exceed this limit. This implied result (discharge of an effluent that is toxic to invertebrate species) conflicts with the numerous in-stream studies performed by TCAK and Alaska state agencies which demonstrate that TDS and effluent concentrations much higher than this are not toxic to the indigenous invertebrate and vertebrate biota. Simply stated, given the concentration of TDS in the Red Dog Mine effluent, the sensitivity of *C. dubia* to TDS, and the highly toxic natural conditions, *C. dubia* is an inappropriate species for WET testing to a compliance limit in the draft permit, as well as in the current permit.

TCAK is not recommending the removal of WET testing as a monitored parameter from the draft permit. TCAK is also willing to investigate alternate WET test species, but would oppose testing for compliance with a permit limit unless the alternate species is approved at 40 CFR 136. TCAK also opposes the triggering of resource intensive investigations (TRE/TIE) based on a single or even consecutive WET test results, as described in a later comment. Instead, TCAK proposes to conduct statistical analysis of a discharge season's WET test results versus previous year's test results as a basis for determining if more detailed studies of WET are required.

Dilution of the effluent

Typically, WET limits greater than 1 TU_c are only implemented in an NPDES permit in conjunction with a mixing zone.[12] The WET limit is established based on the minimum low flow dilution factor for the receiving water and is then converted into TU_c ($TU_c = 100/IC_{25}$; IC_{25} = the effluent dilution resulting in 25% lethal or sub-lethal effects to the test organisms). TU_c and effluent dilution are inversely proportional, i.e., increasing TU_c means increasing sample toxicity; increasing effluent dilution means decreasing toxicity.

The WET limit at Red Dog Mine is based on natural condition toxicity, not a mixing zone effluent dilution. The current and proposed WET limits are based on the natural condition toxicity and are a maximum monthly average of 9.7 TU_c and a daily

[11] See ADEC 401 certification.
[12] See 18 AAC 70.030.

maximum of 12.2 TU_c. Based on the definition of TU_c, the 9.7 TU_c average can be expressed as an effluent dilution (equivalent to an IC_{25}) of approximately 1 part effluent to 10 parts clean water. This is to say that if an IC_{25} is determined at lower dilutions (i.e. more effluent in the mix), 1 part effluent to < 10 parts clean water, compliance with the WET limit is demonstrated. Conversely, if an IC_{25} is determined at higher dilutions (less effluent is in the mix), 1 part effluent to >10 parts clean water, an exceedance of the WET limit is indicated. However, in Red Dog Creek, a minimum dilution of 1 part effluent to 1.5 parts stream water is allowed by the permit, based on assuring compliance with the site-specific TDS water quality criterion. Much more effluent is allowed in the mix in the stream system than would trip an exceedance of the proposed WET limits, if those limits are expressed as effluent dilutions rather than on natural background toxicity. So what does it mean when there is no toxicity to *C. dubia* in a WET test at 1 part effluent to 10 parts clean water (compliance with the limit), but the stream is exposed to a much higher effluent concentration; 1 part effluent to 1.5 parts stream water? It does not mean that the WET limit is protecting the indigenous biota. Conversely, what does it mean when there is toxicity to *C. dubia* in a WET test at 1 part effluent to 10 parts clean water (exceedance of the limit), but the stream is routinely exposed to a much higher effluent concentration; frequently 1 part effluent to 1.5 parts stream water and the biomonitoring definitively indicates a sustainable, healthy and thriving aquatic community? It does not mean that exceeding the WET limit indicates a toxic event.

When one considers the natural conditions (and the WET limit based on these natural conditions), the actual concentration of effluent in the receiving water, results of the extensive multi-year biomonitoring program, and the sensitivity of *C. dubia* to TDS, one must conclude:

1. The natural conditions were more toxic than the effluent;
2. *C. dubia* is an inappropriate species for compliance testing of the Red Dog Mine effluent;
3. *C. dubia* WET testing is incapable of reflecting or predicting toxicity to the receiving environment; and
4. The WET limits in the draft permit are dysfunctional and were only implemented for the sake of having a WET limit; there is no reasonable potential that compliance or noncompliance with the *C. dubia* WET limits has any meaning in the context of protecting the water quality and designated uses in the receiving stream.

Conclusion

The proposed WET limit in the draft permit is meaningless and does nothing to ensure the protection of the receiving water quality. Protection of the receiving water quality is accomplished through chemical-specific limits for the effluent, and under 40 CFR 122.44(d)(1)(v), the WET limit should be removed from the permit. The WET limit

as proposed does nothing but impart compliance liability to the permittee through its inherent variability and use of non-indigenous species with no commensurate benefit to water quality, human health or the environment.

TCAK agrees with ADEC that the comprehensive biomonitoring program coupled with WET monitoring will be more than sufficient to ensure that the chemical-specific limits for the effluent are protecting the uses in Red Dog and Ikalukrok Creeks.

1.B Natural Conditions

Natural conditions in Red Dog Creek and Ikalukrok Creek downstream of its confluence with Red Dog Creek were toxic to vertebrate and invertebrate species before the mine commenced operations. The existing and proposed permits do not adequately account for the pre-existing toxicity in the evaluation of the need for and the numeric value of WET limits.

1.B.i

The Alaska Department of Environmental Conservation (ADEC) has determined, as stated in its draft §401 Certification for the draft NPDES permit, that WET limits are not required to protect water quality and designated uses in the receiving waters.

The ADEC draft §401 State Certification for the proposed NPDES permit states that:

> *"This certification does not require effluent limits for WET as contained in I.A.1 — Table 1 and these effluent limits could be removed." (Fact Sheet Appendix B at page 27)*

The ADEC's rationale for this recommendation consists of several conclusions:

1. The methodology used in the 1998 NPDES permit to estimate natural toxicity in Red Dog Creek contained numerous assumptions and uncertainties that cannot be confirmed. ADEC believes that the effluent is less toxic than the natural condition of Red Dog Creek, although the reduced level of toxicity cannot be quantitatively reported (because there are no pre-mine data for WET). ADEC believes that the comprehensive biological monitoring of the stream that is required by the NPDES permit is more meaningful than WET testing.
2. ADEC restates its position in the 1998 §401 Certification, which is that because aquatic life use is not a designated use at the point of discharge, its

regulations relating to toxicity (18 AAC 70.020(b)(11)(C) and 18 AAC 70.030) are not applicable to the discharge.

3. ADEC states in the Certification that annual biomonitoring has been conducted in Red Dog Creek and Ikalukrok Creek since 1990, and states that 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."

ADEC's conclusion that eliminating the WET limits for both test species will not have any negative affects on the water quality and aquatic ecosystems of Red Dog and Ikalukrok Creeks is scientifically supported and recognizes that WET limits are unnecessary to protect the designated uses of all receiving waters. As ADEC has stated, the effluent discharge has improved the water quality in Red Dog and Ikalukrok Creeks and the toxicity limits are not required by the Alaska water quality standards.

1.B.ii

ADEC's decision on WET is entitled to substantial deference, and there is no substantive justification to overcome that State decision.

The ADEC has certified that state regulations (18 AAC 70.020 and 18 AAC 70.030) do not require that a whole effluent toxicity limit be included in the renewed NPDES permit for the Red Dog Mine. ADEC asserts this position for a variety of reasons; one of the more notable reasons is that the effluent is less toxic than natural conditions. Evidence to support this assertion is the demonstration that the Mainstem Red Dog Creek, the first reach of receiving stream classified for aquatic life use, is less toxic now, with the mine effluent, than it was prior to mining.

TCAK agrees that it is EPA's responsibility to implement permit requirements more restrictive than those required in the state's certification, when those actions are deemed reasonably necessary to protect the existing uses of the receiving waters. However, in the draft fact sheet for the proposed permit, EPA provides no explanation for their actions in requiring more restrictive permit provisions than ADEC specified as consistent with state regulations, which demand that the State also be protective of existing uses.

Since the State provided ample justification for its actions and the draft Fact Sheet sets forth no substantive justification for rejecting the State's well-reasoned determination, the WET limit should be removed. Failure to remove the WET limit, given the State's Certification, would be arbitrary and capricious absent substantial justification.

1.B.iii

ADEC's Determination that the WET limit was inappropriate is of significant import. Fairness requires the publication of any preliminary rationale for rejecting this critical State determination, and the opportunity to comment.

In addition to the State Certification indicating that the naturally occurring toxicity in Red Dog Creek negates the requirement for a WET limit, TCAK provided several documents via e-mail on July 15, 2005 and October 9, 2005 to EPA concerning the natural conditions in Red Dog Creek. EPA declined to discuss the natural condition issue with TCAK and ADEC (November 7, 2005 teleconference). EPA should have been aware that the natural condition issue would be raised by both TCAK and the State regarding this permit, particularly as it pertained to the WET limit. By failing to provide any justification for overruling the State's certification or any justification for ignoring TCAK submittals, EPA has deprived TCAK of its right to comment on EPA's basis for its proposed permit decision. Because this justification has been requested to be provided in response to comments, and after the comment period closes, no comments or additions to the record can be supplied by anyone other than EPA, please ensure that the response to comments requesting justification of this permit decision is complete, thorough, definitive and without speculative interpretation of the pre-mining data (e.g. what if; second guessing of baseline report conclusions; etc.). Alternatively, TCAK requests that EPA reopen this particular decision for comment and allow additional information into the record after the justification is provided to the commenters.

1.B.iv

Deference to State determinations on State Water Quality Standards issues is appropriate in the absence of any conclusive demonstration that such deference is inappropriate.

TCAK requests that EPA provide justification for implementing a more restrictive requirement in the permit than what was certified by ADEC. To "overrule" the State on an approved water quality standards issue, this justification should be overwhelmingly conclusive and beyond any reasonable reproach. Without strong and persuasive justification in the permit record, EPA must defer to the reasoned decision of ADEC on this water quality standard issue.

The State has certified, "Annual technical reports summarizing biomonitoring have been reviewed, and while changes have been observed, there have been no observed negative effects to the ecosystem of Red Dog and Ikalukrok Creeks resulting from the effluent or mine related activities affecting Red Dog Creek." This statement was supported in the attached letter from ADNR (Dr. Alvin G. Ott, Operations Manager, Office of Habitat Management and Permitting, Department of Natural Resources), which goes onto to say that the stream is "more biologically productive than it was premining." It would be completely inappropriate to ignore the extensive multi-million dollar site-specific record of WET testing and biomonitoring, and assert the non-regulatory based

principle of independent applicability of WET testing and biomonitoring. While TCAK fundamentally agrees with the principle of independent applicability when applied to facilities with limited historic record, it should not be generically applied in all situations, particularly when sufficient data exists to make site-specific determinations.

1.B.v

Given that the information supporting the ADEC decision is extensive and highly persuasive, the ADEC decision on WET limits must be followed.

The following references are offered in support of ADEC's decision that a WET limit is not required in the renewed Red Dog Mine NPDES permit. Notwithstanding the State's determination that WET limits are not applicable since the point of discharge is to a stream not designated for aquatic life use, if it can be demonstrated that there is a significant and sustained improvement in the aquatic life uses in the Mainstem of Red Dog Creek, then ADEC's conclusion that the effluent is less toxic than natural conditions is justifiable. That conclusion is then compared to the water quality standard. In the case of the Red Dog Mine, the standard has been established in the 1998 state certification, current permit and draft permit and it is that there cannot be an introduction of toxics in toxic amounts above the natural condition toxicity and that the effluent cannot impart an additional one (1) TU_c above the natural condition toxicity. Obviously, the toxicity is to aquatic life and therefore, the standard becomes applicable, if at all, at the point in which the effluent first encounters a reach of stream designated for aquatic life use; the Mainstem Red Dog Creek.

Expert Biological Opinion

Attached to these comments are letters from Dr. Alvin Ott (ADNR-OHMP), Dr. Phyllis Scannell (ADF&G - retired), Dr. Jonathan Houghton (formerly with Dames and Moore) and Mr. Al Townsend (ADF&G – retired)[13] supporting the technical basis for ADEC's decision to not require a WET limit in the renewed Red Dog Mine NPDES permit. It is indisputable that these individuals are the foremost experts on the condition of the biological community in Red Dog Creek. Each of them is in complete unqualified agreement with the technical foundation for ADEC's decision, specifically, that the Mainstem of Red Dog Creek with the mine effluent is currently less toxic than it was in its pre-mining condition. EPA has not cited any direct observations or studies of their own, or other sources, related to the pre- and post-mining conditions in Red Dog Creek. If such data or reports exist and EPA relied on them, then EPA must cite them to support its proposed permit decision. If EPA has independently assessed the current or pre-mining biological conditions in Red Dog Creek, then that assessment should be made part of the NPDES permit record. In the absence of EPA cites to any studies and observations,

[13] The letter from Al Townsend was provided to ADEC as a comment and is incorporated into this document by reference.

it can only be assumed that EPA is basing their decision on studies and documents prepared by the very same biological experts that are unconditionally supporting ADEC's conclusion that WET limits are unnecessary to protect the receiving waters.

EPA's dismissal of the ADEC certification recommendation regarding WET limits conflicts with its own assessment of historic receiving water quality as reported in the studies and documents prepared by the Agency to comply with the National Environmental Policy Act (NEPA). The 1984 Environmental Impact Statement (EIS) prepared by EPA describes the Mainstem Red Dog Creek as:

> *"Very toxic concentrations of cadmium, lead, silver, and zinc are present and concentrations of aluminum, chromium, mercury and nickel also exceed EPA criteria for aquatic life." (EPA, 1984; page IV-30)*
>
> *"The most severely stressed area in terms of reduced numbers of benthic invertebrates....." (EPA, 1984; page IV-30)*
>
> *"Baseline water quality characteristics and caged-fish studies (E.V.S. Consultants, 1983) at the mouth of Red Dog Creek show that these waters are toxic to fish during the summer." (EPA, 1984; page IV-36)*
>
> *"Studies by Dames & Moore (183a, 1983b), and E.V.S. Consultants (1983) and Alt (1983b) indicate that Red Dog Creek and its tributaries are largely devoid of fish except for small numbers of Arctic char [Dolly Varden] and Arctic grayling that ascend to the North Fork during high spring flows to spawn." (EPA, 1984; page IV-36)*

In contrast, the Environmental Assessment (EA) prepared by EPA for this draft permit describes the Mainstem Red Dog Creek as follows:

> *"ADNR-OHMP (2005) has documented the reduced concentrations [of heavy metals] from pre-mining levels" (EPA, 2006; Page 13)*
>
> *Since mine development, grayling spawning has been known to occur in Mainstem Red Dog Creek...." (EPA, 2006; page 15-16)*
>
> *[Grayling] Fry hatch in late June and rear in Mainstem Red Dog Creek...." (EPA, 2006; Page 16)*
>
> *ADF&G and ADNR (2005) have observed significant numbers of grayling young –of-the-year in Mainstem Red Dog Creek in 1995, 1996, 1997, 1999, 2003 and 2004....." (EPA, 2006; page 16)*
>
> *"Increased use [by Arctic grayling] is likely related to overall improvements in water quality, increased primary production and*

increased numbers and diversity of benthic invertebrates (Weber Scannell, 2005)." (EPA, 2006; page 16)

"The benthic community found in Mainstem Red Dog Creek is highly variable and can be comprised of up to 20 different taxa. In 2003 and 2004, the majority of the taxa collected were composed of pollution-sensitive taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT), typical of high-latitude streams (ADNR-OHMP, 2005a). Similar to Mainstem Red Dog Creek, the benthic community in North Fork Red Dog Creek includes up to 25 different taxonomic groups including EPT." (EPA, 2006; page 18)

It is inconsistent for EPA to use the studies and investigators referenced in the above citations as the basis for their NEPA decisions and actions, and then reverse itself and determine that these same studies and investigators are unreliable, inconclusive, insufficient and lack the data and precision necessary to draw an accurate comparison between pre and post mining biological conditions. These NEPA documents use them to describe and establish the conditions pre and post mining.

Fish Use

In two months in 1982 there were 200 documented natural mortalities of fish in Mainstem Red Dog Creek (EVS and Ott[14], 1983). Some individuals have speculated that these fish kills may have resulted from the nets installed by the investigators to collect dead fish floating downstream. While it is true that an unstressed age zero (0) grayling would likely die if impinged on a net for an extended length of time, this explanation does not explain the mortalities of 35 juvenile and sub-adult grayling and char (Dolly Varden) over the same time period. Healthy sub-adults would have easily been able to negotiate the nets. Further, as described in Scannell, 2005 (attached), in 1978, prior to the installation of the nets, Ward and Olson observed 800 to 1000 juvenile and adult grayling mortalities and a lesser number of char mortalities in Red Dog Creek in just over two months. EVS and Ott (1983) reported a mean time to death from in situ bioassays (fish held in pens) conducted in Mainstem Red Dog Creek on adult grayling and char of 97.2 hours and 66.0 hours respectively. There can be no question that it was the water quality, not the test methodology that was responsible for the death of the fish, because identical in-situ bioassays were conducted in the North Fork of Red Dog Creek with no fish mortality. It is undeniable that the pre-mining conditions in Mainstem Red Creek were acutely toxic to fish at all time except during high stream flow events. It can further be concluded that the younger the fish, the shorter the exposure duration needed to cause lethality.

[14] Ott Water Engineers; no affiliation or relation with Dr. Al Ott.

EPA acknowledges these facts. In a December 18, 1996 letter from Kathleen Collins (EPA Region 10) to Charlotte MacCay (Teck Cominco, formerly Cominco), it is stated when describing the natural condition of some of the streams in the area:

> *Station 10 [Mainstem Red Dog Creek]: natural fish kills, in-situ fish kills and severe impacts to the benthic communities;*

Throughout the effective life of the existing permit, there has not been a single fish kill event documented in Mainstem Red Dog Creek. This is despite the nearly daily observation of Red Dog Creek during free flow periods for over seven years. TCAK environmental technicians check on the real-time monitoring stations in Mainstem Red Dog Creek daily and collect samples at least twice per week. ADNR and ADF&G biologists spend weeks during each discharge season sampling and monitoring the biota of Mainstem Red Dog Creek. Mainstem Red Dog Creek is over-flown routinely by helicopters carrying environmental technicians, state biologists, exploration geologists, USGS personnel, state and federal visitors, EPA and ADEC inspectors, exploration drillers, NANA personnel, environmental department staff, etc., and yet not a single fish kill has been identified. Pre-mining investigators observed approximately 100 fish mortalities per month. It is virtually impossible that fish mortalities at this frequency could be missed given the level of human observation of Mainstem Red Dog Creek. There is but a single conclusion that can be drawn from these data; the toxicity of Red Dog Creek is significantly less than it was under pre-mining conditions and that this reduction in toxicity has been sustained for an extended period of time.

In 2005, Dr. Houghton returned to Red Dog Creek for the first time since his three-year biological baseline studies of the stream in the early 1980's. In one afternoon, Dr. Houghton angled 60 adult grayling in Mainstem Red Dog Creek (Houghton, 2005; attached), a reach of stream he had fished for three years in the early 80's and had not caught a single fish.[15] EVS and Ott (1983) reported that, "Natural mortalities from Red Dog Creek displayed considerable amounts of brown precipitate and mucus on gill surfaces; the occasional occurrence of gill hemorrhaging and eye opaqueness was noted." When asked if any of the fish that he caught in 2005 displayed any of these symptoms, even to the slightest degree, Dr. Houghton responded, "Definitely not! They were all beauties" (personal communication to Mark Thompson, TCAK, 2006).

Water Quality

The dramatic and sustained decrease in toxicity is not surprising in the least when comparisons of water quality data are considered. The following series of graphs were taken from the 2006 Environmental Assessment prepared by EPA for the draft permit:

[15] Dr. Houghton had caught 3 fish in Mainstem Red Dog Creek during baseline studies, but all were in North Fork Red Dog Creek water, not in Mainstem water.

Figure 4. Mainstem Red Dog Creek Median Cadmium Concentrations
Pre-Mining and 1999-2004

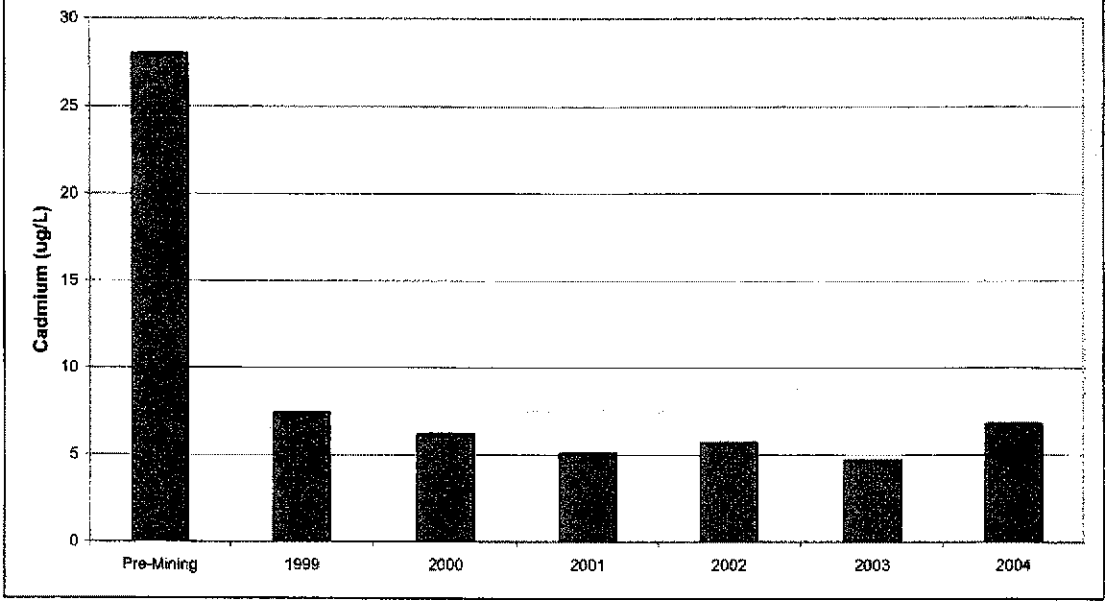
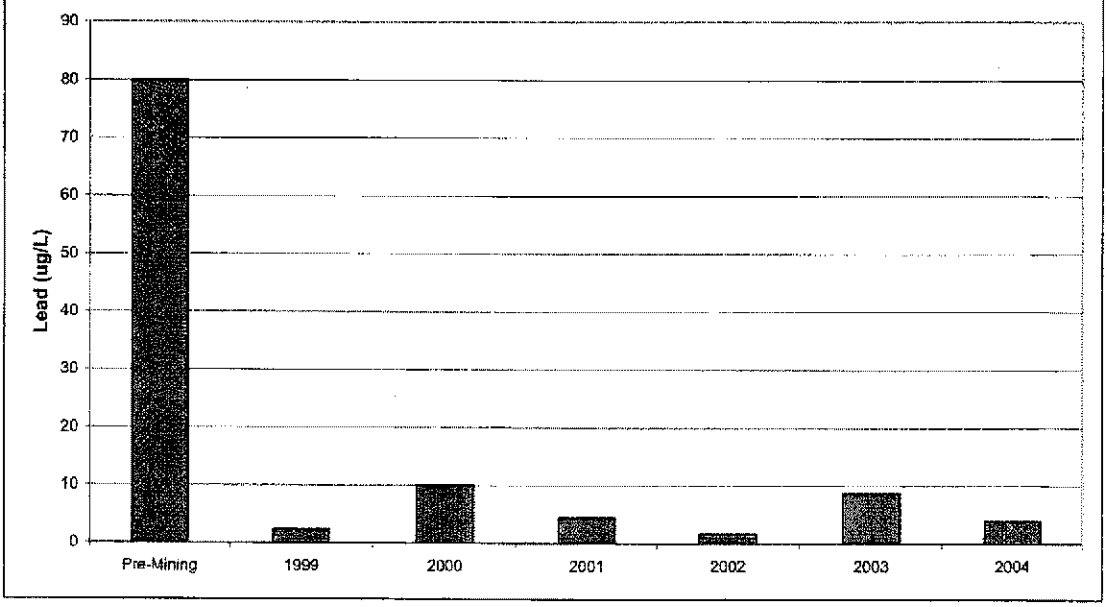
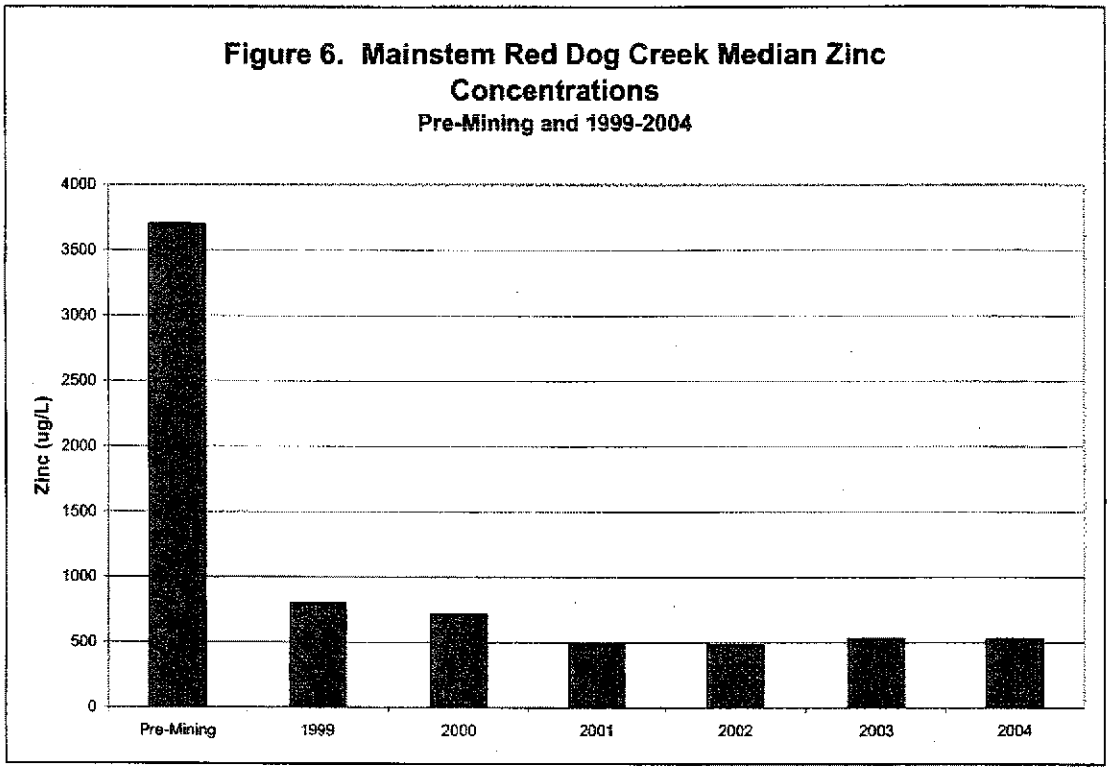


Figure 5. Mainstem Red Dog Creek Median Lead Concentrations
Pre-Mining and 1999-2004





These graphs indicate that under pre-mining conditions, the aquatic community in Mainstem Red Dog Creek was exposed to:

1. a median cadmium concentration that was 5 times higher than the current Alaska acute aquatic life criterion and 50 times higher than the current state chronic aquatic life criterion[16] for cadmium;
2. a median lead concentration that was 7.5 times higher than the current state chronic aquatic life criterion[17] for lead; and
3. a median zinc concentration that was 13.7 times higher than the current state acute and chronic aquatic life criteria[18] for zinc.

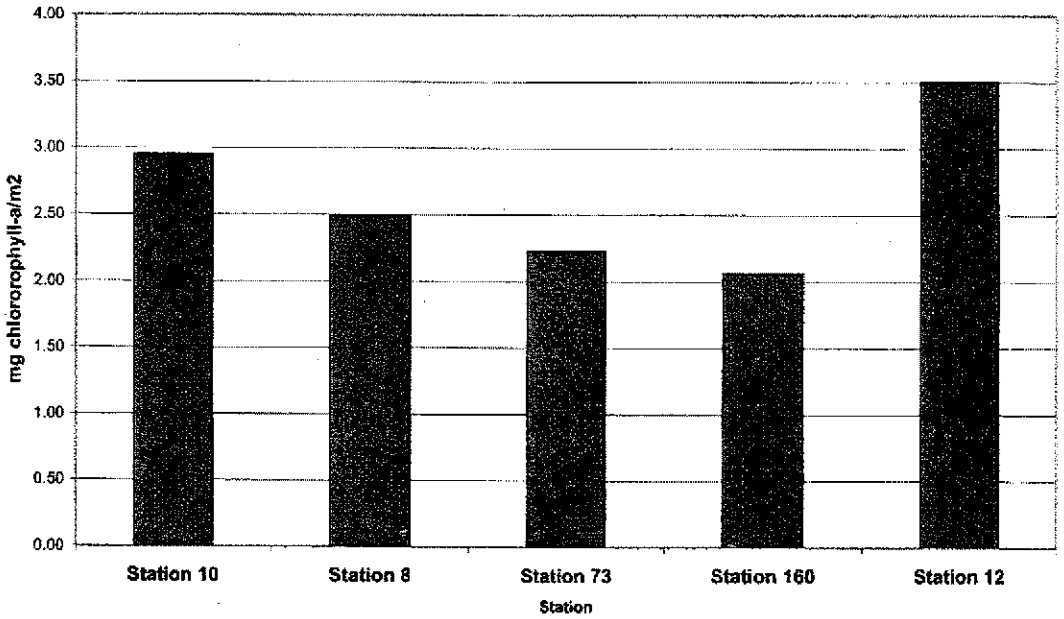
It stands to reason that with this level of historical natural exceedance of aquatic life criteria there was a significant amount of acute and chronic toxicity in Red Dog Creek, extending downstream into Ikalukrok Creek. The current conditions for these metals are greatly improved from the highly toxic natural conditions. Based on Alaska water quality criteria for the protection of aquatic life, Mainstem Red Dog Creek is currently less toxic than under natural conditions.

[16] Total recoverable criteria at a hardness of 260 mg/L as $CaCO_3$.
[17] Total recoverable criteria at a hardness of 260 mg/L as $CaCO_3$.
[18] Total recoverable criteria at a hardness of 260 mg/L as $CaCO_3$.

Periphyton

The following graph was taken from the 2006 Environmental Assessment prepared by EPA for the draft permit.

Figure 7. Average Values of Periphyton in Red Dog and Ikalukrok Creeks, 1999 - 2004



The graph indicates that the Mainstem Red Dog Creek (Station 10) has a higher average rate of primary productivity than any other monitored site with the exception of the North Fork Red Dog Creek (Station 12); one of the most productive streams in the entire Ikalukrok Creek Drainage (Ott, personal communication to Mark Thompson, TCAK, 2006)[19]. This periphyton comparison includes monitored locations over 16 miles downstream in Ikalukrok Creek (Station 160), which contain less than 1/3 of the amount of effluent concentration than Mainstem Red Dog Creek. Actually, it appears that productivity decreases as the effluent is diluted in the downstream receiving water, possibly indicating that the protectiveness of the effluent hardness from the natural toxicity of the receiving water enhances periphyton growth. This graph contained in EPA's Environmental Assessment are in stark contrast to information and statements in the pre-mining baseline reports on Mainstem Red Dog Creek such as "the absence or near

[19] "We've worked virtually all of the streams in the Ikalukrok Creek drainage, and North Fork Red Dog Creek is one of the most biologically productive, in terms of periphyton, benthic invertebrates, and fish use."

absence of periphyton, macrophyton, insects and fish" (Scannell, 2005 and Dames and Moore, 1983). While data for a quantitative periphyton comparison between current and pre-mining productivity are not available, qualitative information can be used to arrive at the indisputable conclusion that the current conditions in the Mainstem Red Dog Creek are less toxic than under the natural conditions.

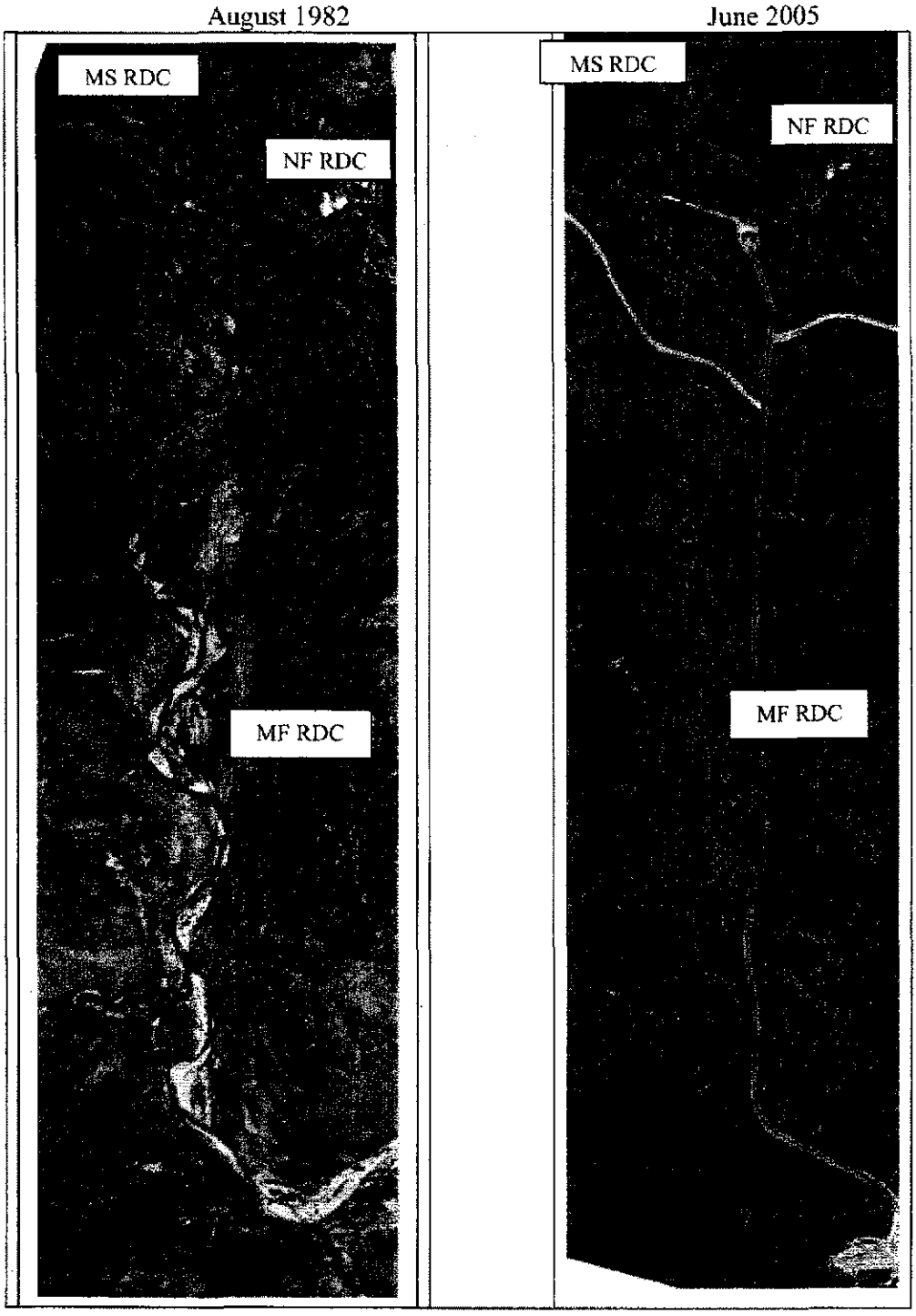
Stream Side Vegetation and Precipitate Formation

Shown below are 1982 and 2005 aerial photographs of the Middle Fork Red Dog Creek (MF RDC). Photos are from similar time of day and time of year. Unfortunately, photos providing a similar comparison of the Mainstem Red Dog Creek are not available. At the top of the photos, short sections of Mainstem Red Dog Creek (MS RDC) and North Fork Red Dog Creek (NF RDC) are visible.

Notice in the 1982 photo how severely the toxicity of Middle Fork Red Dog Creek has impacted the streamside vegetation and how these toxic impacts extend into Mainstem. Notice in the 2005 photo how the riparian vegetation has rebounded once the toxicity was significantly reduced after mining operations began. This reduction in toxicity in the Middle Fork of Red Dog Creek must result in significant decreases in downstream toxicity with the highest decrease in toxicity occurring in Mainstem Red Dog Creek.

The 1982 photo also shows a large amount of orange staining and precipitate in both Middle Fork and Mainstem Red Dog Creeks. This situation must have created a significant amount of physical toxicity to periphyton and invertebrates as they would have been covered by staining and smothered by precipitate. As the 2005 photo shows and Dr. Houghton's field memo (attached) and the ADNR annual bioassessment reports indicate, the orange staining and precipitate development no longer occur.

Middle Fork, Red Dog Creek
Before and After Mine Operation Began



Benthic Macroinvertebrates

Pre-mining invertebrate sampling and current invertebrate sampling results from Mainstem Red Dog Creek cannot be directly compared due to the differences in sampling methodology. However, when the relative ranking within the different test methodologies of the invertebrate population in various streams is considered, it is clear that there has been a significant and sustained increase in invertebrates in Mainstem indicative of reduced toxicity. EVS and Ott (1983) sampled 11 stream segments in 1982 for benthic invertebrates. They segregated the 11 sample sites into three categories:

1. Sites with no pollution related stress;
   a) North Fork Red Dog Creek (EVS Station 410)
   b) Red Dog Creek above the ore deposit (EVS Station 180)
2. Sites with slight or periodic stress;
   a) 2 sites in Ikalukrok Creek below Red Dog Creek (EVS Stations 710 and 720)
   b) Ikalukrok Creek above Red Dog Creek (EVS Station 620)
   c) South Fork Red Dog Creek (EVS Station 210)
3. Severely stressed sites.
   a) Mainstem Red Dog Creek (EVS Station 520)
   b) Middle Fork below South Fork Red Dog Creek (EVS Station 310)
   c) Middle Fork above South Fork Red Dog Creek (EVS Station 110)
   d) 2 sites in the Middle Fork within the ore deposit (EVS Stations 160 and 170)

Based on this pre-mining data, all of the severely stressed sites have had the aquatic life use designation removed with the exception of Mainstem Red Dog Creek. Despite consistently having a lower number of individual invertebrates, sometimes the lowest of the sampling event, than the other severely stressed sites in Red Dog Creek within the ore body, the aquatic life use for Mainstem of Red Dog Creek was not removed because of the documented migration of grayling through the Mainstem to access high quality spawning areas in the North Fork Red Dog Creek.

In contrast to the severely impacted invertebrate community documented during pre-mining studies, current conditions demonstrate that Mainstem Red Dog Creek consistently has higher abundance, density and taxonomic richness than sites in Ikalukrok Creek. Furthermore, the Mainstem frequently has higher percentages of pollution-sensitive taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT) than even North Fork Red Creek. In the 2006 Environmental Assessment for the draft permit prepared by EPA, the following was stated concerning the benthic macroinvertebrate community in Mainstem Red Dog Creek:

"The benthic community found in Mainstem Red Dog Creek is highly variable and can be comprised of up to 20 different taxa. In 2003 and 2004, the majority of the taxa collected were composed of pollution-sensitive taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT), typical of high-latitude streams (ADNR-OHMP, 2005a). Similar to Mainstem Red Dog Creek, the benthic community in North Fork Red Dog Creek includes up to 25 different taxonomic groups including EPT." *(January 2006, EA, p. 18)*

That EPA can state, "[s]imilar to Mainstem Red Dog Creek, the benthic community in North Fork Red Dog Creek", is in such a stark contrast to how the baseline investigators compared the Mainstem to North Fork, the conclusion that there has been a significant and sustained decrease in toxicity becomes undeniable.

Conclusion

Based on the overwhelming weight of evidence, particularly the current condition data (collected since 1999) that was not available for consideration when the current WET limit was developed, it is impossible for EPA to justify "overruling" ADEC's decision that WET limits are not required in the NPDES permit to protect water quality and designated uses.

The following documents are either attached or included into the record by reference:

1. Scannell, 2005
2. EVS and Ott, 1983
3. Dames and Moore, 1983
4. ADNR-OHMP, 2005
5. Houghton, 2005
6. Ward and Olson, 1980.
7. EPA, January 2006
8. All documents in the reference section of Scannell 2005 (attached).
9. All documents in the reference section in the 2006 Environmental Assessment for the draft permit – EPA 2006.

1.B.vi

The reasonable potential analysis of fathead minnow WET test data for Outfall 001 demonstrates that there is no potential that the effluent will have toxicity that exceeds the natural toxicity of Red Dog Creek and therefore no WET permit limit is justified for this species.

Twenty-eight Outfall 001 samples collected between May 2000 and September 2004 were analyzed for WET with the fathead minnow as the test species. The maximum measured toxicity was 1.9 TU_c and the mean toxicity was 1.325 TU_c. The coefficient of variation (CV) of this database is 19.34%. A reasonable potential analysis (RPA) of the WET data was performed by TCAK using EPA's methodology,[20] comparing the maximum projected effluent toxicity calculated by the RPA method to the proposed permit limits of 9.7 TU_c maximum monthly average and 12.2 TU_c daily maximum.

The calculated RPA maximum projected effluent toxicity multiplier for the maximum TU_c value is 2.052. Therefore, the predicted maximum Outfall 001 toxicity to the fathead minnow is 3.9 TU_c, which is 40% of the 9.7 TU_c maximum monthly average limit proposed in the NPDES permit. Therefore, according to EPA's RPA methodology there is no reasonable potential for the Outfall 001 discharge to be toxic to the fathead minnow and no WET limit is required. TCAK requests that the WET limits for the fathead minnow be removed from the final NPDES permit so that the permit is consistent with EPA guidance and policy.

The fathead minnow WET data collected between May 2000 and September 2004 constitute "new information" and therefore the antibacksliding provisions of 40 CFR 122 and Section 303(d)(4)(b) are not applicable. Antidegradation policy is not applicable to removal of the WET limit because the designated use of the receiving water is not aquatic life protection (see ADEC draft §401 Certification).

1.C WET Limits

There are no regulatory impediments to eliminating the WET limits for both species from the NPDES Permit. The weight of evidence clearly supports ADEC's conclusion that WET limits are not required to protect water quality and designated uses.

1.C.i

Permitting flexibility is legally appropriate given the site-specific evidence of no toxicity to the invertebrate community of Red Dog and Ikalukrok Creeks. This exact permitting flexibility was the core legal principle that allowed the WET methodology in Part 136 to withstand a general legal challenge asserting the fact the WET test occasionally falsely predicts a problem. The D.C. Circuit stated that these occasional false prediction problems should be addressed with flexibility in the permitting phase, much as TCAK is now requesting.

In the Red Dog Mine situation where WET testing already has been done for years and where the expensive and exhaustive TIE/TRE studies and in-stream

[20] EPA (March 1991) *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001, Section 3.3.2, pp. 56, 57.

invertebrate bioassessments show that the test is not predictive of aquatic invertebrate toxicity and that such concerns are already adequately addressed by bioassessments and a 1,500 mg/L TDS limit (as further confirmed by a literature survey), the only legal question is whether a regulatory agency can appropriately decide to remove this WET test species for chronic toxicity if the weight of scientific evidence is that this WET test species is not a good indicator for impact of this effluent discharge on aquatic invertebrates in the receiving stream. The recent court ruling on the WET test confirms this flexibility exists,[21] as discussed below

The discretion on the part of the NPDES permitting agency to remove an inappropriate WET test was expressly confirmed by the recent (December 2004) D.C. Circuit court case regarding when WET testing methodology is appropriate. In that case, regulated entities directly challenged the legality of including general WET testing methodology in 40 CFR Part 136. The court was faced with indisputable evidence that the *C. dubia* chronic WET test sometimes falsely predicted a problem with the invertebrate community in the receiving stream. **The flexibility to address "false positive" problems with WET testing during the permitting process was a key basis for the Court *generally* upholding the use of the WET test as a predictor of aquatic toxicity.**

In other words, by leaving the safety valve of permitting flexibility to exclude the WET test in permitting (even where it might otherwise be indicated under Part 136), the Court said EPA's WET test methodology was otherwise generally acceptable. It was that safety valve of a permitting agency showing flexibility where the science demanded it that allowed the Court to overrule a challenge that highlighted the unfairness of the WET test in those specific situations.

As noted by the court in the December 10, 2004 Edison Electric Institute v. EPA decision (No. 96-1062) regarding the general propriety of the WET test by the D.C. Circuit,

> *"Even by EPA's calculations, WET tests will be wrong some of the time...."*[22]

The court then noted, while it was upholding the general validity of WET testing, that in these types of situations where the WET test was not appropriately predictive of problems in the receiving stream, the permitting agency should then, based on that site-specific weight of the evidence, make appropriate changes to the permit to cure that deficiency.

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[21]The Court specifically noted *these WET tests are occasionally not good predictors in a specific permitting situation.* The Court of Appeals then upheld the testing method against a *general* challenge that it was insufficiently predictive in some cases (i.e., in false positive cases) because, as the Court noted, when evidence is developed in a *specific* case that a chronic *C. dubia* test is not predictive, the permitting agency can use that as a basis for leaving this chronic *C. dubia* test out of the NPDES permit.

[22] Slip Opinion at 9; opinion is available online at the following location: http://pacer.cadc.uscourts.gov/docs/common/opinions/200412/96-1062a.pdf.

"EPA took the sensible approach of relying on sampling techniques to draw general conclusions, while leaving some implementation details to local entities. See Am. Iron & Steel Inst. v. EPA, 115 F.3d 979, 1005 (D.C. Cir. 1997). Pursuant to the Clean Water Act's National Pollutant Discharge Elimination System, 33 U.S.C. Section 1342(a), ***states retain discretion, subject to EPA guidance and recommendations, to set their toxicity thresholds in order to compensate for local conditions at the permitting stage****. See 40 C.F.R. Section 122.44(d)(1)(iii). In light of this discretionary, rather than mandatory, nature of state implementation of standards and thresholds, we also are unpersuaded by petitioners' assertion that the WET program amounts to an illegal federal water quality standard....* ***The WET test methods offer only a means of measuring compliance with those limits — individual dischargers remain free to challenge their permits, on a case-by-case basis, if they believe that local authorities are regulating at a level that poses only a minimal risk to aquatic life****. See 40 C.F.R. Sections 124.19, 124.21." Slip Op. at 12-13 (bold emphasis added).*

A decision by Region 10 in this case to leave out *C. dubia* chronic toxicity testing is thus legally permissible if there is adequate evidence to support the WET test's unreliability in a particular situation. Here, in the context of the Red Dog Mine NPDES permit, precisely because a detailed, systematic study of the receiving water (the court's **local conditions at the permitting stage**) showed no manifestation of chronic toxicity or other adverse impact on aquatic life-related beneficial uses, mock effluent toxicity testing demonstrates that 100% of the effluent toxicity to *C. dubia* is caused by TDS, and because there are adequate permit safeguards already provided by the 1,500 mg/L TDS limit and the invertebrate, instream, bioassessments being performed by TCAK, that legal flexibility is highly justified. Conversely, Region 10's inclusion of the *C. dubia* limit simply because a WET limit is required in an NPDES permit when the classical reasonable potential analysis indicates a potential to exceed a standard, is directly contrary to EPA's argument to the federal court on when WET limits are appropriate.

Evidence of EPA's intent to provide the flexibility to permitting authorities to exclude WET limits from a permit, in light of the weight of the evidence, is provided at 40 C.F.R. Section 122.44(d)(1)(v):

"Limits on whole effluent toxicity are not necessary where the permitting authority demonstrates in the fact sheet or statement of basis of the NPDES permit, using the procedures in paragraph (d)(1)(ii) of this section, that chemical-specific limits for the effluent are sufficient to attain and maintain applicable numeric and narrative State water quality standards."

Where site specific information confirms that a chemical limit (such as the 1,500 mg/L TDS limit) is sufficient to protect the aquatic invertebrate community in the

receiving stream, and where *both* exhaustive TIE/TRE work and bioassessments confirm the lack of threat to aquatic invertebrates in the receiving streams, it simply is not appropriate to include a *C. dubia* chronic toxicity WET limit that falsely predicts risks to the receiving streams' invertebrate community. This principle overrides the general rule as to when a WET chronic toxicity test based on *C. dubia* should be included.[23]

The vulnerability of the permittee to citizen suits based on continued false predictions of toxicity makes the continued inclusion of such a *C. dubia* chronic TU_c limit in the permit highly unfair. In fact, even just the triggering of additional TIE/TRE studies based on such a TUc limit for *C. dubia* is a waste of money and time, because such studies have already been done and nothing has been identified as an invertebrate toxic in the Red Dog Mine effluent (so long as the numeric chemical standards [such as 1,500 mg/L TDS] are met). Indeed, that is exactly what the final sentence of 40 C.F.R. Section 122.41(d)(1)(v) expressly states — no numeric WET limit for *C. dubia* chronic toxicity is necessary because that chronic toxicity is adequately controlled at 1,500 mg/L TDS with a chemical specific limit.

1.C.ii

The weight of the evidence is that Red Dog Mine discharges meeting numeric limits for TDS and other chemical parameters are not toxic to the indigenous invertebrate communities in Red Dog and Ikalukrok Creeks. Past TIE/TRE investigations conducted by TCAK, coupled with bioassessments of the receiving streams, have confirmed that the *C. dubia* chronic testing is not a usable predictor of impacts to the receiving streams' invertebrate community. There is no reasonable potential for

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[23] In the July 21, 1997 Memorandum from Tudor Davies and Michael B. Cook at EPA Headquarters to EPA Regions I-X entitled "Clarifications regarding Whole Effluent Toxicity Test Methods Recently Published at 40 CFR Part 136 and Guidance on Implementation of Whole Effluent Toxicity in Permits," EPA Headquarters provided the following relevant guidance:

> "2. With the promulgation of 40 CFR Part 136, did EPA mandate which WET test methods NPDES authorities must use for the different types of designated uses of receiving waters?
>
> No. To date, including the WET methods rulemaking, EPA has not mandated which test methods NPDES permitting authorities must use under different exposure conditions. The WET analytical methods rule simply prescribes how to conduct the tests, and that, if the permitting authority makes the decision to include a WET limit in a permit, one of the promulgated methods must be used. 40 CFR 122.41(j)(4). Of course, procedures for approval of alternate test procedures under 40 CFR 136.4 and 136.5 still continue to apply...."

Region 10 may decide to keep the WET monitoring for the vertebrate, but it is not required to keep C. dubia monitoring in the Red Dog Mine permit given the overwhelming weight of evidence that such a limit is highly misleading with respect to the resident aquatic invertebrate communities in the receiving streams.

toxics in toxic amounts that warrants inclusion of a chronic toxicity *C. Dubia* limit in the Red Dog Mine NPDES permit.

There is an abundance of data, based on the weight of the evidence approach, that the receiving streams' invertebrate communities are well established and that nothing in the effluent (meeting the 1,500 mg/L TDS standard) is present in toxic amounts (based on expensive and exhaustive TIE/TRE studies done by Red Dog with respect to the effluent from its mine). As a result, it would be unfair in the extreme to include a *C. dubia* chronic toxicity limit in the Red Dog NPDES permit, since it falsely predicts impairment of the uses of the receiving streams by the invertebrate community.

The *C. dubia* chronic WET test is designed to show the possibility of toxics being present in the effluent in toxic amounts. There is no such toxicity at Red Dog Mine for effluent meeting the TDS limit. EPA's *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organism*[24] specifically states as follows:

> *"2.1 INTRODUCTION*
> *2.1.1. The objective of aquatic toxicity tests with effluent or pure compounds is to estimate the 'safe' or 'no effect' concentration of these substances, which is defined as the concentration which will permit normal propagation of fish and other aquatic life in the receiving waters.*
> * * *
> *2.1.16. The use of short-term toxicity tests including subchronic and chronic tests in the NPDES Program is especially attractive because they provide a more direct estimate of the safe concentrations of effluents in the receiving waters than was provided by acute toxicity tests, at an only slightly increased level of effort, compared to the fish full life-cycle chronic and 28-day ELS tests and the 21-day daphnid, Daphnia magna, life-cycle test."*

The original *C. dubia* chronic WET limit in the Red Dog Mine permit was designed as a predictor of the health of the invertebrate communities in the receiving stream.[25] The Red Dog Mine effluent has shown sporadic *C. dubia* chronic WET test failures. Toxicity identification evaluations of the mine effluent did not indicate the presence of toxicants[26] and the WET test itself came under suspicion. Split samples to different labs would show varying results, with the same sample passing in one case and failing in another. TCAK ultimately determined that the sporadic WET test failures were caused by the sample dilution series required by the 1998 permit, which results in widely-spaced dilutions that do not satisfactorily capture the variability in sensitivity of the test organisms to the effluent TDS.

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[24] Op. cit., EPA (October 2004), p. 3 and 5.
[25] Note that the pre-mining invertebrate populations were absent or depauperate in Red Dog Creek and Ikalukrok Creek, as documented in the EIA and elsewhere in these comments.
[26] There is always a "background" toxicity due to the TDS of the effluent samples.

The EPA guidance on TIE/TREs suggests it now is entirely appropriate, as a matter of permitting, to remove the *C. dubia* chronic WET limit from the permit in a site-specific case such as at Red Dog Mine, if exhaustive and expensive TIE/TREs have already been performed and no toxicity is found. In the March 27, 2001 "Clarifications Regarding Toxicity Reduction and Identification Evaluations in the National Pollutant Discharge Elimination System Program,"[27] EPA headquarters guidance explicitly states:

> *"Inconclusive TREs and TIEs*
> *In some rare instances, TREs and TIEs have been unsuccessful or inconclusive. EPA acknowledges that some permittees have aggressively pursued a TRE using highly qualified technical support, but have been unable to resolve the problem. EPA has demonstrated its intent for appropriate discretion and constructive resolution through its established record of working cooperatively with permittees in these cases."* [28]

In a report prepared on the *Application of TIEs/TREs to Whole Effluent Toxicity: Principles and Guidance,* attached to a memorandum from Rodney Parrish dated June 30, 1998 of the Society of Environmental Toxicology and Chemistry (SETAC), it was noted as follows:

> *"7. What, if any, are the technical limitations of the TIE process?*
> * * *
> *One must distinguish between actual toxicity and 'apparent' toxicity resulting from unusual data sets (e.g., statistical differences detected from unusually low variance or inverted exposure-response curves) that would indicate a biologically unimportant effect or an effect that would not translate from the laboratory into the field."* [29]

In an article by Jerry Diamond, Christiana Dale and Michael Barbour of Tetra Tech, Inc. entitled *Defining Relationships Between Whole Effluent Toxicity and Instream Toxicity,* a database of WET test, instream assessment and supporting data for over 250 municipal and industrial wastewater facilities was compiled and evaluated. Among the Conclusions and Recommendations were the following:

> *"Seventh, some form of in-situ or ambient toxicity monitoring, or biological assessment, should accompany standard WET testing to determine the degree to which laboratory tests accurately portray pollutant bioavailability instream. This additional form of monitoring is especially desirable if WET test results indicate unacceptable effluent toxicity."* [30]

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[27] EPA (March 27, 2001) "Clarifications Regarding Toxicity Reduction and Identification Evaluations in the National Pollutant Discharge Elimination System Program," Office of Wastewater Management, Washington, D.C.
[28] Id., p. vi.
[29] *Application of TIEs/TREs* at page 9 of 14.
[30] *Id.* at page 6 (bold emphases added).

Indeed, this report showed where biological assessments have been done, such as in Red Dog Creek, they will often show an error[31] in the predictive nature of the WET test where WET failure has occurred, with the WET test only being 50 percent reliable as an indicator of biological impairment.[32]

Where scientific data, such as the TIE/TRE investigations[33] and instream biological assessments at Red Dog, indicate a healthy invertebrate community (even healthier than prior to Red Dog operations), it is entirely appropriate to use such information in making NPDES WET permit decisions. In fact, EPA has expressly stated that its WET methods rule was not intended to foreclose how those methods should be implemented in an NPDES permit. As EPA stated in the 2002 final rule preamble to the WET method adoption in Part 136:

> *"6. Implementation.*
>
> *Some commenters commented on issues specifically related to the implementation of WET permits, such as reasonable potential*

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[31]In the August 14, 1995 Memorandum from Robert Van Heuvelen and Michael Cook to the EPA Regions I-X, EPA Headquarters addressed the inherent unfairness in having a WET limit that implies a particular toxicity problem when the TIE/TRE indicates there is nothing toxic (even more the case here given the bioassessment showing a vastly increased invertebrate community in the Red Dog receiving stream after construction of the mine's wastewater treatment system:
"Inconclusive TREs
The 1989 'Whole Effluent Toxicity Basic Permitting Principles and Enforcement Strategy' states on page 9:
'In a few highly unusual cases where the permittee has implemented an exhaustive TRE plan, applied appropriate influent and effluent controls, maintained compliance with all other effluent limits , compliance schedules, monitoring, and other permit requirements, but is still unable to attain or maintain compliance with the toxicity-based limits, special technical evaluation may be warranted and civil penalty relief granted. Solutions in these cases could be pursued jointly with expertise from EPA and/or the States as well as the permittee.' "
August 14, 1995 Memorandum at 2.

32"Among those sites in which WET tests consistently failed, there was approximately a 50:50 chance of the stream being impaired." *Id.* at 4. While the report indicates passing a WET test is a good predictor of no impairment, failing the WET test does not mean impairment in 50 % of the cases. In Red Dog Mines's case, the invertebrate biological assessment shows no impairment; indeed, it shows a massive improvement in the receiving stream invertebrate community as a result of Red Dog Mine operations.

[33]It is fair to say that these TIE/TREs, combined with the bioassessments, make it clear that there is no adverse chronic effect on aquatic invertebrates and these old WET test results are not representative of toxicity to the resident invertebrate community. In the July 21, 1997 Memorandum from Tudor Davies and Michael B. Cook at EPA Headquarters to EPA Regions I-X entitled "Clarifications regarding Whole Effluent Toxicity Test Methods Recently Published at 40 CFR Part 136 and Guidance on Implementation of Whole Effluent Toxicity in Permits," EPA Headquarters provided the following relevant guidance about drawing new conclusions about old data after a TIE/TRE of sufficient quality has been completed: "EPA discourages continued reliance on data that is no longer representative of the facilities operations." July 21, 1997 Memorandum at page 7.

determinations, independent applicability of WET limits, discharge monitoring report certifications, and use of WET methods in NPDES permits. Many such comments are beyond the scope of this rulemaking. ***In the proposed rulemaking, EPA invited comments 'only on the conduct of WET test methods and not on the implementation of WET control strategies through NPDES permits.' EPA recognizes that NPDES permittees have continuing concerns about implementation of WET requirements in NPDES permits.*** *" 67 Fed. Reg. 69951, 69968-9 (November 19, 2002) (bold emphasis added).*

Significantly, at Red Dog Mine, exhaustive bioassessments of the receiving streams' invertebrate community were conducted that confirm the lack of invertebrate toxicity indicated by the WET testing process. In the July 21, 1997 Memorandum from Tudor Davies and Michael B. Cook at EPA Headquarters to EPA Regions I-X entitled "Clarifications regarding Whole Effluent Toxicity Test Methods Recently Published at 40 CFR Part 136 and Guidance on Implementation of Whole Effluent Toxicity in Permits," EPA Headquarters provided the following relevant guidance about using such bioassessments to inform the WET permitting decision:

"[B]ioassessments provide useful information to augment data demonstrating problems with attainment of water quality standards, specifically, the 'reasonable potential' evaluation about the need for a chronic toxicity limitation." (July 21, 1997 Memorandum at page 5)

The Red Dog Mine bioassessments confirm the lack of adverse impact to the invertebrate communities, making it clear the *C. dubia* chronic toxicity test is a false positive predictor at Red Dog Mine.

In a July 4, 2003 report prepared by Phyllis W. Scannell, an Alaska governmental specialist in this area, entitled "Justification for Modified TDS Limits in Red Dog Creek and Ikalukrok Creek," the following was noted:

" As with periphyton communities, ***aquatic invertebrate communities in Red Dog Creek show no indication that they have been reduced, either in density or taxonomic richness, by the current water quality conditions in Mainstem Red Dog Creek.*** *In fact, the aquatic communities in 1995-2002 are in sharp contrast to communities during baseline when few, or no invertebrates were found." (Justification at page 22 (bold emphasis added))*

In other words, the pre-mining conditions in Red Dog Creek, which had naturally occurring, high concentration of metals, were dramatically improved by the implementation of a wastewater treatment system at the Red Dog Mine that creates conditions that are far less toxic to the aquatic invertebrate communities:

"A primary effect of water management practices at the Red Dog Mine is elimination of the periodic peaks in metals and low pH experienced during pre-mining." (Scannell Justification at 13)

EPA Region 10 also concluded in a report, consistent with the Scannell determination referenced above, that Red Dog receiving stream invertebrate bioassessments had confirmed no toxicity in toxic amounts (so long as TDS did not exceed limits of 1,500 mg/L). In the Environmental Assessment performed by Region 10 of EPA for the Red Dog Mine Project NPDES Permit Modification (dated January 2003), EPA noted:

"Toxicity tests and field studies have been conducted to determine the effect that TDS concentrations are expected to have on aquatic invertebrate communities. These studies are summarized below (See Table 7). ***In general, the available data indicate that the proposed levels of TDS would not have an adverse impact on aquatic invertebrate communities.***

* * *

Toxicity Tests ADEC, ADF&G, and EPA developed toxicity test to determine the potential impact on aquatic invertebrates from TDS concentrations similar to Red Dog effluent. Both EVS (EVS 1996) and EPA (USEPA 1999) conducted toxicity tests on Chironomid larvae using simulated Red Dog effluent and the toxicity test methodology developed by ADEC, ADF&G, and EPA. Table 7 provides a summary of the results of the toxicity tests performed by EVS and EPA. Table 7 provides a summary of the results of the toxicity tests performed by EVS and EPA. The results of the toxicity tests are recorded in terms of one or more of the following parameters:

- *NOEC, which is the 'no observed effect concentration.' It is the highest tested concentration at which no adverse effect was observed on the Chironomid.*
- *LOEC, which is the 'lowest observed effect concentration.' It is the lowest concentration that results in statistically significant adverse effects on the Chironomid.*
- *IC0, is the, inhibition concentration zero, or the concentration causing inhibition to 0% of the population.*
- *LC50, is the lethal concentration 50, or the concentration of TDS causing 50% mortality.*

The lowest NOEC and LOEC of TDS, observed in various studies, for Chironomid survival was 1,295 mg/L and 1,835 mg/L, respectively. A regression analysis was used to calculate an IC0 of 1,598 mg/L TDS. These data indicate that adverse impacts to sensitive life stages of aquatic insect larvae could be expected at TDS concentrations greater than 1,500 mg/L TDS.

At Station 150 in Ikalukrok Creek the maximum recorded TDS concentration, based on data collected from 2001 through 2002 (when discharge limits under the compliance order were comparable to those under the proposed permit modification), was 876 mg/L (see Table 3), which is well below the NOEC; thus ***adverse impacts to aquatic invertebrates are not expected in Ikalukrok Creek. At Station 10 in Mainstem Red Dog Creek, the median TDS concentration of the data collected from 1999 to 2002 (again, under discharge conditions similar to those proposed in the permit modification)*** *was 1,090 mg/L, which was below the NOEC value, and the maximum concentration was 1,820 mg/L (see Table 3), which was below the LOEC value. The permit will require the mine to limit its effluent discharge so that the in-stream concentration of TDS does not exceed 1,500 mg/l at any time in Mainstem Red Dog Creek.* ***The toxicity tests indicated that adverse impacts to sensitive life stages of aquatic invertebrates are not expected.***

Literature Survey *The ADF&G literature survey reviews a number of studies that examined the effects of TDS on invertebrates.* ***This literature survey concludes that aquatic invertebrate growth and survival is affected by concentrations of TDS greater than 1,500 mg/L*** *(concentrations of TDS showing adverse effects ranged from 1,692 mg/L to greater than 2,430 mg/L). There were no reported adverse effects at concentrations below 1,692 mg/L." (January, 2003 EPA Environmental Assessment at pages 27-29 (bold emphasis added))*

Thus, both the Alaska regulators and EPA Region 10 have concluded that Red Dog Mine effluent meeting its numeric limits for chemical parameters does not have a reasonable potential to cause toxics to be present in amounts that would be toxic to the receiving streams' invertebrate communities. As a result of the literature surveys, the bioassessments and the exhaustive TIE/TREs already performed, it would be inappropriate to continue to include the *C. dubia* chronic toxicity limits in the Red Dog Mine NPDES permit.

The weight of the evidence, developed through the TIE/TRE studies done at Red Dog Mine, the literature surveys, and the bioassessments done of the invertebrate communities in the receiving stream at Red Dog Mine, clearly demonstrate that there is no reasonable potential for the effluent to cause harm to the resident aquatic invertebrate community in the Red Dog Mine receiving streams, so long as numeric chemical-specific limits are met. Thus, no numeric *C. dubia* chronic toxicity limit should be placed in the Red Dog Mine NPDES permit as it is not warranted under 40 C.F.R. Section 122.44(d)(1).[34]

[34]The EPA memorandum dated July 21, 1997 sent out to Region 10 and other places with headquarters guidance: http://www.epa.gov/npdes/pubs/owm0127.pdf, on page two, question 2, states:

The WET expert scientific community publications support this regulatory flexibility to overrule the general inclusion of a *C. dubia* chronic toxicity limit when more detailed testing and bioassessments have shown, by the weight of the evidence, that *C. dubia* chronic toxicity testing is not a good predictor in a particular permitting situation (especially where the invertebrate chronic toxicity concern is adequately addressed by a 1,500 mg/L numeric TDS parameter). In a document entitled "FREQUENTLY ASKED QUESTIONS ???," generated by the WET Expert Advisory Panels Steering Committee[35] [all members of the Society of Environmental Toxicology and Chemistry (SETAC) committee here were considered an expert in some aspect of WET], the consensus of the Committee's collective expertise at the time this document was written (Feb., 1999) was as follows:

> *"What do episodic pulses of toxicants to which Ceriodaphnia respond mean to an aquatic resource?*
>
> *It is the Steering Committee's opinion (as well as the Pellston workshop proceedings) that if exposure is appropriate* ***C. dubia is a good surrogate of potential instream toxicity. However on a scientific basis, C. Dubia like any single species, does not model all systems, all times. Using WET C. dubia testing as the sole criterion for judging adequate protection of the aquatic resource is not appropriate****. From a scientific objective, toxicity impact should be judged on its impact or potential impact to the aquatic resource being protected.* ***A carefully designed, with adequate statistical power, bioassessment may be a more representative tool for evaluating impact....***
>
> * * *

"2. With the promulgation of 40 CFR Part 136, did EPA mandate which WET test methods NPDES authorities must use for the different types of designated uses of receiving waters?
No. To date, including the WET methods rulemaking, EPA has not mandated which test methods NPDES permitting authorities must use under different exposure conditions. The WET analytical methods rule simply prescribes how to conduct the tests, and that, if the permitting authority makes the decision to include a WET limit in a permit, one of the promulgated methods must be used. 40 CFR 122.41(j)(4). Of course, procedures for approval of alternate test procedures under 40 CFR 136.4 and 136.5 still continue to apply. **The permit writer has considerable discretion in selecting the appropriate test method (i.e., <u>which</u> test) as long as the method selected is consistent with the State's water quality standards and will protect the individual water in question, including the designated use.** "
Question 5 on page 7 tells permit writers to consider what they found out from TIE/TRE work that may have been done at that facility.

[35]This information is intended to stimulate further discussion about WET, WET-related research, and the science underlying WET. While the information is not to be construed as representing an official position of the U.S. Environmental Protection Agency, it was produced under the WET Cooperative Agreement No. CX 824845-01-0

Can biologically significant levels of effect be selected for toxicity tests in order to reduce the reliance upon statistical significance in WET data interpretation?

This is a question discussed since the early days of environmental toxicology. The existence of a standard or even method/endpoint specific effect level which can be deemed biologically significant in all cases is doubtful....

What biological conclusions can be made from the statistical analysis of toxicity tests?

A significant conclusion of the Pellston Conference of WET was that these tests are effective tools for predicting environmental impacts. However, further field bioassessment studies are needed to examine the relationship between WET tests and ecosystems.... This research is necessary because ***the relationship between toxicity in an effluent toxicity test and the biological or ecological impact in the receiving stream is not direct****....It is also important to recognize that the only toxicological/biological conclusions of which we are reasonably certain based upon a single toxicity test result are limited to that laboratory test and may vary with test design and conduct.* ***A weight of the evidence approach using sufficient chemical, bioassessment and toxicity test data is an effective way to address the uncertainty of a response predicted by the results of a single toxicity test.****"*

(Bold emphasis added to SETAC expert responses). (This technical document is available online at http://www.setac.org/wetFAQs.html#4pulses.)

Instream biological survey data demonstrating the absence of adverse effect from an effluent on aquatic life use attainment — a direct measure of the receiving water environment — is superior to solely considering past, variable WET test results when determining the need for WET limitations based on *C. dubia* chronic testing. This is particularly true where repeated TIE/TRE extensive investigations have failed to reveal any toxics in the effluent. EPA's 1997 draft WET Implementation Strategy references "evaluating the feasibility of a more integrated bioassessment program, including the use of biological assessments, WET test results, and chemical analyses in a weight-of-evidence decision-making process to assess receiving system impacts caused by effluents." Participants in the Pellston WET Workshop (1995) also supported that "biological assessments, WET test results and chemical analyses be used in concert for integrated decision-making."

1.C.iii

EPA Region 10 should eliminate the *C. dubia* and *P. promelas* chronic toxicity numeric limitations from the Red Dog NPDES permit.

So long as Red Dog Mine complies with the numeric chemical parameters in its NPDES permit, especially the 1,500 mg/L TDS limit, there is no reasonable potential that toxics will be discharged in amounts that are toxic to aquatic invertebrates in the receiving streams.

The weight of the evidence, based on expensive and exhaustive TIE/TRE studies on the Red Dog Mine effluent, invertebrate bioassessments in Red Dog and Ikalukrok Creeks, the EPA WET methods recommendations regarding the applicability of the *C. dubia* test to high TDS water, and on literature surveys, demonstrates that a *C. dubia* chronic toxicity limit at Red Dog will not be predictive of compliance with the narrative "no toxics in toxic amounts," and may frequently create a false positive result. Under the current permit language, such a misleading result would require wasteful TIE/TRE expenditures and would make the permittee vulnerable to citizen suits by giving a false indication there was a harm to the invertebrate community in the receiving streams.

The chronic toxicity numeric limitation for *P. promelas* should also be deleted from the Red Dog Mine NPDES permit because there is no reasonable potential that the effluent will be toxic to this species at the proposed permit limits. Twenty-eight samples of effluent that were tested with this species over a four-year period demonstrated that no sample exceeded 20% of the monthly average permit limit proposed by EPA in the draft permit. This level of compliance clearly achieves EPA's definition of "no reasonable potential" for toxicity and justifies deletion of the WET limit for this species from the final permit.

The ADEC draft §401 Certification states that WET limits are not required for either *C. dubia* or *P. promelas*. ADEC gives three reasons for its recommendation:

1. The receiving water does not have a designated aquatic life use.
2. The invertebrate bioassessment data demonstrate that the discharge has no negative affect on the downstream invertebrate communities.
3. The naturally-occurring toxicity in the receiving waters was greater than the current levels of toxicity when the effluent is being discharged.

These ADEC conclusions justify, based on regulation and scientific data, the deletion of the WET limits from the permit.

The *C. dubia* and *P. promelas* chronic toxicity numeric limits should be deleted from the permit.[36] There is no reasonable potential for the effluent to exert toxicity on

[36]While it is critical that the permit limits be removed, TCAK is not proposing to discontinue monitoring of effluent toxicity to *C. dubia*. Indeed, TCAK in other comments is proposing to conduct *C. dubia* WET tests so that trending of effluent toxicity may be performed. This proposed method would have the advantage of detecting increases in toxicity trends prior to triggering any

resident aquatic species because the mine effluent characteristics are highly predictable, well characterized, and Red Dog Mine already has numeric standards in the permit to address the pollutants that could be toxic to the vertebrate and invertebrate communities if discharged in toxic amounts (as confirmed by the ADEC recommendation, bioassessments, literature survey and previous TIE/TRE studies). Finally, the continuing bioassessments will allow the regulatory agencies the opportunity to determine if any chronic toxicity occurs, contrary to the overwhelming weight of the site-specific evidence at Red Dog that 1,500 mg/L TDS effluent will not have any reasonable potential to cause invertebrate or vertebrate chronic toxicity.

1.D Flow Balance and Mixing Zone

In the event that WET limits are included in the final NPDES permit, the limits in the proposed permit require must be corrected to properly represent the site water balance and incorporate a mixing zone.

1.D.i

The calculated WET limits in the draft permit are based on an incorrect water balance. The accurate water balance submitted by TCAK to EPA as a component of the NPDES permit application results in revised "natural background" TU_c values that increase the proposed WET limits.

The July 22, 1998 State 401 certification to the 1998 NPDES permit outlines the methodology used to determine the waste load allocation (WLA) for WET, which in turn was used to set permit limits for Outfall 001. The WLA was based on the interpretation of the state WET narrative criteria that a discharger could not impart one additional TU_c to a receiving waterbody above naturally occurring toxicity. It was recognized that under natural conditions the water in the receiving streams, which is now discharged at Outfall 001, contained toxic pollutants in toxic amounts.

This state certification estimates the naturally occurring toxicity from the water now discharged at Outfall 001 through a flow-weighted average of the estimated toxicity for each flow component of Outfall 001. In 1998, the flow components to Outfall 001 and their relative flow volumes were as follows:

1. Middle Fork Red Dog Creek diversion - 0.3 billion gallons a year (bgy)
2. South Fork Red Dog Creek - 1.3 bgy
3. "Additional" water - 0.8 bgy

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predetermined level. However, given the variability associated with any single or even two *C. dubia* WET tests during a discharge season and the unnecessary and unwarranted concern that these results could cause in concerned citizenry, TCAK has recommended that resource intensive investigations such as TRE/TIE not be triggered by individual tests, but by trending analysis of an whole discharge season toxicity performance.

4. Total flow, 2.4 bgy

The 1998 state certification assigned a toxicity to each of the flow components from *C. dubia* bioassay data collected from 1994 to 1997.

1. The Middle Fork was assigned 35.2 TU_c based on the lower 5th percentile of WET data from Station 140.
2. The South Fork was assigned 6.1 TU_c based on the median of WET values from Stations 9 (Ikalukrok Creek) and Station 12 (North Fork Red Dog Creek).
3. The "additional" water was assigned 2.9 TU_c based on the lower 5th percentile of WET data from Station 9.
4. The WLA was then calculated using the following flow-weighted average:

   WLA = ((0.3 bgy X 35.2 TU_c) + (1.3 bgy X 6.1 TU_c) + (0.8 bgy X 2.9 TU_c)) / (2.4 bgy) = 8.7 TU_c

The 1998 NPDES permit required the collection of data including precipitation, evaporation and mine sump (diverted water from Middle Fork Red Dog Creek) flow rates to better define the site-wide water balance used in the calculation. All significant inflows of water into the tailings impoundment, the source of water for Outfall 001, are surface flows and therefore are proportional to precipitation. This proportionality holds for stored water as well as water accumulated throughout a current year. The origin of water stored and water entering the tailings impoundment and ultimately discharged at Outfall 001 is approximately 71% South Fork water and 29% diverted Middle Fork water. The "additional water" flow component to Outfall 001 was eliminated through the collection of hydrologic data as specified in the 1998 permit. Incorporating the improved water balance into the flow-weighted WLA calculation used in the 1998 State certification, the WLA becomes 14.5 TU_c.

$$WLA = \frac{(0.29 \times 35.2\ TU_c) + (0.71 \times 6.1\ TU_c)}{1} = 14.5\ TU_c$$

It is not recommended that the assigned toxicities for stations 140, 12 and 9 be updated with new data for two reasons. First, the diversion of Hilltop Creek from the Middle Fork into the mine drainage system and improvements in the clean water bypass system such as diversion of the tributaries through pipes, culverts and lined channels has dramatically decreased the toxicity of the Middle Fork. Second, naturally occurring seeps in the Upper Ikalukrok Creek drainage have significantly increased the toxicity at Station 9.

Permit limits for WET to be used in the reasonable potential analysis should be derived from the WLA of 14.5 TU_c following EPA methods. If the reasonable potential analysis is performed with the correct water balance, then it demonstrates even more

strongly that no WET limits are required to protect water quality in Red Dog Creek and Ikalukrok Creek.

1.D.ii

In the event that WET limits are continued in the NPDES permit, TCAK requests that a mixing zone be established for WET.

TCAK believes that a mixing zone for WET in Red Dog Creek should be established for the calculation of any WET limits. A mixing zone would raise the waste load allocation (WLA) from which the WET permit limits are based. The 1998 NPDES permit limits for WET were established on the concept of not adding any toxicity to Red Dog Creek above pre-mining toxicity. A mixing zone could only be justified if at the end of the mixing zone, toxicity did not exceed pre-mining levels at that same point.

A mixing zone for WET was not requested from ADEC because the mixing would be occurring in a reach of stream not designated for aquatic life use (i.e. Middle Fork Red Dog Creek). Therefore it was not anticipated that a formal mixing zone would be required by ADEC since it is assumed that the State water quality standard for toxicity only applies in streams designated for aquatic life use.

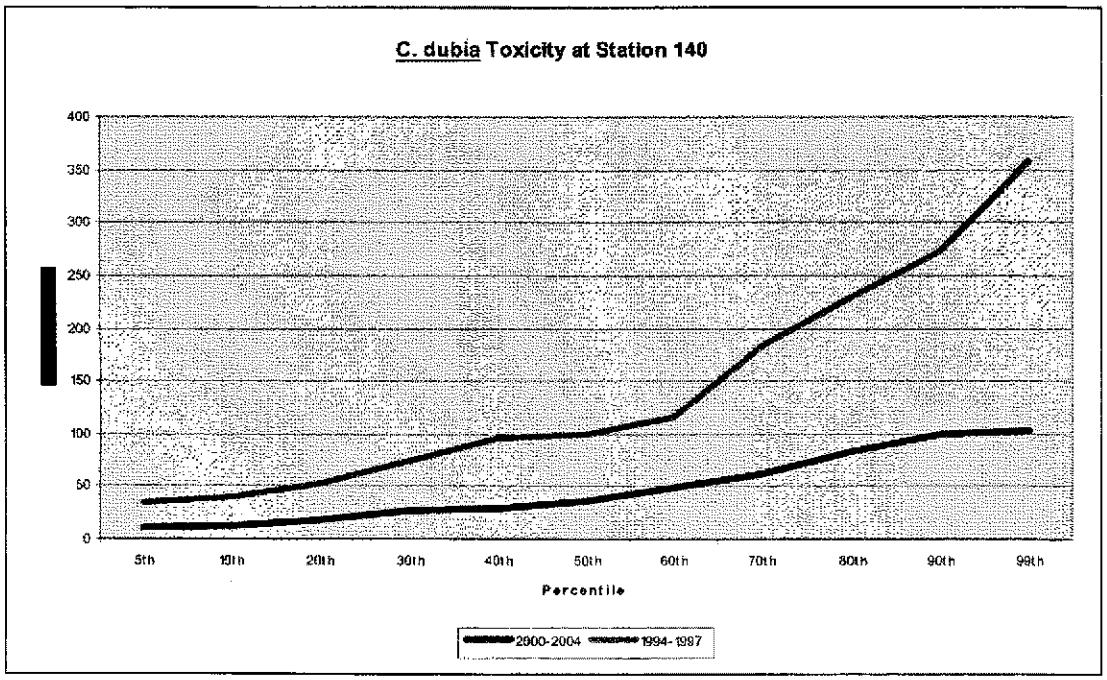
The 1998 WET limit development estimated a natural toxicity for the sum of the flow components in Outfall 001. It was then assumed that all other flows (e.g. Middle Fork and North Fork Red Dog Creek and Ikalukrok Creek) had the same or lower toxicity than that that was present pre-mining and based on this assumption, the toxicity at all points downstream would be less than or equal to pre-mining toxicity. If it can be demonstrated that the toxicity of one of these flows has been reduced, a mixing zone with this flow and the effluent could change the WLA assigned to Outfall 001.

In 1996, recognizing that a significant amount of the pollutant loading to the clean water bypass water came from Hilltop Creek, TCAK diverted Hill Top Creek from the clean water bypass into the mine drainage system for treatment prior to release to Red Dog Creek. Additionally, starting in 2000, TCAK constructed diversions of the tributaries (Connie and Shelly Creek) through pipes, culverts and lined channels. The diversions were constructed near the mouths of the creeks where the creeks contacted the most mineralized material. These diversions significantly reduced pollutant loading to the Middle Fork of Red Dog Creek. Finally, in 2004, the clean water bypass was upgraded and a large portion of the bypass was completely enclosed in piping to prevent any pollutant loading from reaching the otherwise "clean" water. Through the ongoing isolation of the clean water tributaries from mineralized material and seeps, the overall toxicity of the Middle Fork Red Dog Creek has been greatly reduced.

The 1998 State certification of the NPDES permit indicated the 5th percentile of the *C. dubia* toxicity data collected at Station 140 (Middle Fork Red Dog Creek) was 35.2 TU_c. The 5th percentile (n=26) of monthly (during the discharge season) *C. dubia* toxicity testing at Station 140 from 2000 through 2004 is 10.8 TU_c. The 24.4 TU_c

reduction can be attributed to the actions implemented at the Red Dog Mine, as described above. As the chart below indicates, the 5th percentile is the minimum improvement that results from these changes.

If a mixing zone were granted in the Middle Fork below Outfall 001, the reduction in toxicity in the upper Middle Fork could be reallocated to the effluent WLA.[37] A conservative minimum dilution factor at Station 20 (Middle Fork below the Outfall) would be 75% effluent and 25% Middle Fork water. This would mean that as many as 6 TU_c could be added to the effluent WLA and Station 20 would remain at or below its natural condition toxicity consistent with the state WET narrative criterion and the 1998 State certification. Since the Middle Fork of Red Dog Creek is not designated for aquatic life uses, issuance of a mixing zone for WET does not conflict with the requirements of the Water Quality Standards. Similar to the 1998 state certification, if Station 20 is at or below its natural condition toxicity, all points downstream will also be at or below their respective natural condition toxicity. Therefore, TCAK requests a mixing zone based on 75% effluent.



1.D.iii

The correct water balance for the Red Dog Mine must be utilized. The water balance for the Mine is now well understood and there are no material unknown components in this water balance.

[37] This is conceptually the same as effluent trading, where a point source receives a credit for producing improvements elsewhere in the watershed, such as by reducing non-point sources.

A water balance is presented in Part I of Appendix C of the fact sheet (page 44), which concludes that the Red Dog Mine should have a 5.25 billion gallon deficiency of water. EPA understood that this result is obviously erroneous, as it is well known that the mine has a multi-billon gallon surplus of water. However, the determination in the fact sheet that there must be an unidentified source of water into the tailings impoundment is inaccurate for the following reasons:

- Measured precipitation data were used instead of actual precipitation;
- An evaporation estimate from 1993 was used;
- Incorrect areas for precipitation and evaporation were used;
- It was assumed that groundwater was an unaccounted source of inflow;
- It was assumed that TCAK does not possess an accurate water balance.

TCAK provided EPA with measured precipitation data. These data were used directly in the fact sheet water balance without using appropriate corrections for measurement bias. Attached is a report from Geomatrix Consultants Inc. explaining in detail the need to correct measured precipitation data. For the Red Dog mine water balance, a factor 1.4 is applied to the measured precipitation data collected from October through April. A factor of 1.4 is appropriate based on:

- Technical literature; citations for some of which are contained in the attachment.
- Snow pack water content measurements required by the current permit and reported annually in the DMRs, but not used in the fact sheet water balance.
- Back calibration of TCAK's water balance to the tailings pond water level elevation.
- Forward calibration of the water balance since 2002.

As with the snow pack water content measurements, evaporation measurements are also required by the permit and reported in the DMRs. These data, however, were not used in the fact sheet water balance. It should be noted that like the precipitation data, evaporation data must also be corrected for measurement bias. The attachment explains the evaporation pan coefficient used in TCAK's water balance.

While the basis for the fact sheet water balance were not cited, it is obvious that the plan area used to calculate precipitation volume is a significant underestimation. Additionally, the tailings pond area is grossly incorrect. Based on back calculation, it appears that these areas are very similar to the 1993 fact sheet. Unfortunately, there have been significant changes in the last 13 years that were unaccounted for in the 2006 fact sheet water balance.

As stated in the attachment, the $3.5 million dollar groundwater investigation directed by EPA in the late 1990's concluded that groundwater inflows and outflows from the tailings pond were an insignificant component of the water balance. Part I of Appendix C of the fact sheet insinuates that groundwater might be part of the 5.25 billon gallon "unknown" source of water. This simply is not the case.

TCAK presented a diagrammatic version of its water balance as part of the renewal application package submitted on February 25, 2003. While this was an oversimplification of the TCAK water balance for a single year, it does demonstrate that all flows in the water balance are well known. This same water balance has been very accurate in predicting monthly, weekly and even daily tailings pond inflows since 2002. During development of the water balance, the model was calibrated to 10-years of previous monthly pond levels. It cannot be disputed that TCAK's water balance accounts for all inflows into the tailings pond. On several occasions, it had been discussed with EPA that TCAK should present this water balance to EPA. Unfortunately, this never happened. The water balance had been presented to ADEC through the Waste Management Permit program.

1.D.iv

The calculation of the WET limits in the current permit is based on certain water balance assumptions, i.e., flows of unknown origin, that are now known to be incorrect. Correction of the water balance eliminates the need for assigning toxicity to an "unknown" source of flow.

The last paragraph in section I.B.8 on page 56 of Appendix C of the Fact Sheet states that the WET limit in the current permit is based on the natural background and that the natural background was based on the natural condition. However, in reviewing the derivation of the current WET limit in the July 22, 1998 State 401 certification (incorporated into the record by reference), Appendix B section II.B.3 on page 6, it is clear that the water of "unknown origin" was arbitrarily assigned a toxicity level known to be protective of the receiving environment. This appears logical since if the flow is of an unknown origin, the toxicity level of that flow must also be unknown. However, a significant portion of the allocation of toxicity used to derive the current permit WET limit comes from an unknown origin with an unknown toxicity. It appears contrary for the fact sheet to the draft permit to now state that the current WET limit was based on "natural condition" and "natural background", because at the time that the limit was derived, an insufficient amount of data existed to accurately define the "natural condition" and "natural background" and "unknowns" had to be conservatively estimated.

As so often happens, with additional investigation and data collection, it is possible to make the "unknown" known. As discussed in previous comments, the origin of the water of "unknown origin" is from an underestimation of precipitation into the basin. Also as discussed in previous comments, there is no significant groundwater inflow into the treatment facility leaving direct precipitation and surface water flows as the natural condition source of water being discharged.

Section I.B.8 on page 56 of Appendix C of the Fact Sheet refers to a document provided by TCAK entitled "WET Limit with Consideration to Updated Site-Wide Water

balance" (attached). The premise in this document that the origin of natural condition inflows and subsequently the treated discharge from the tailings impoundment is proportional to precipitation was dismissed by EPA citing the water balance presented in Part I of Appendix C of the fact sheet. Previous comments have demonstrated that the water balance in the fact sheet is flawed and that indeed precipitation in the drainage basins drives the site-wide water balance both now and under natural conditions and that the origins of all flows are understood. Since this was the only fault identified by EPA in "WET Limit with Consideration to Updated Site-Wide Water balance", it is assumed that EPA agreed with the remainder of the document.

TCAK requests that EPA updates the WET limit WLA calculation to reflect the correct natural condition water balance provided in "WET Limit with Consideration to Updated Site-Wide Water balance". As this approach justifiably removes water of unknown origin, it must therefore be a better estimate of pre-mining flows, natural background toxicity and natural condition toxicity.

1.D.v

Two important documents submitted to EPA support TCAK's requests for WET limit changes in the permit and deserve explicit and appropriate consideration. These documents are titled *"WET Limit with Consideration to Updated Site-Wide Water Balance" and "Mixing Zone for Waste Load Allocation".*

The document "WET Limit with Consideration to Updated Site-Wide Water balance" was provided to EPA along with another documents entitled "Mixing Zone for Waste Load Allocation" (attached). However, no mention of this document was made in the fact sheet.

"Mixing Zone for Waste Load Allocation" identified the voluntary actions undertaken by TCAK to reduce the toxicity in Middle Fork Red Dog Creek from a lower 5th percentile of 35.2 TU_c in 1998 to a lower 5th percentile of 10.8 TU_c in 2004 (see Figure in comment I.D.ii). TCAK reduced this natural loading of toxicity by collecting naturally contaminated seeps, flows and entire creeks into the mine water treatment system that otherwise would have reported to Red Dog Creek. By collecting these flows, TCAK increased the volume of water requiring treatment, increased its water treatment costs and increased the TDS loading to the water treatment system. Through treatment TCAK removes heavy metals toxic at low concentrations to the indigenous aquatic communities and replaced these metals with "TDS" at concentrations very toxic to the non-native *C. dubia* but as demonstrated in numerous investigations, not at all toxic to the indigenous aquatic communities. "Mixing Zone for Waste Load Allocation" requested that EPA recognize TCAK's voluntary efforts to improve water quality in Red Dog Creek by reallocating a small portion of the removed toxicity to the WLA for the outfall. TCAK proposed a pseudo mixing zone scenario in a reach of stream not classified for aquatic life use (Middle Fork Red Dog Creek), at the end of which, natural condition

(pre-mining) toxicity would not be exceeded, thus still complying with the State wide WET criteria at a point prior to which aquatic life criteria apply (Mainstem Red Dog Creek). TCAK did not formally request a mixing zone from ADEC since the mixing for the aquatic life water quality standard for toxicity would be occurring in a stream reach not classified for aquatic life use.

TCAK requests that EPA review the document "Mixing Zone for Waste Load Allocation". TCAK further requests that EPA strongly consider adopting the proposals identified in the document as it would provide encouragement to the desirable behavior of voluntarily improving naturally degraded water while incurring significant operational costs. Further, these types of activities result in real and tangible benefits to the indigenous aquatic communities. Conversely, restrictive end-of-pipe *C. dubia* WET limits rob valuable resources that could otherwise be directed towards the indigenous aquatic communities. Additionally, as demonstrated by the 69% reduction in toxicity in the Middle Fork Red Dog Creek, real and significant reductions in toxicity have occurred through these voluntary activities, which cannot be achieved by restrictive end-of-pipe *C. dubia* toxicity limits. Given the unusual sensitivity of *C. dubia* to TDS, it is not realistic to believe that any significant reduction in whole effluent toxicity could ever be achieved with the Red Dog mine effluent. Even if this were possible, there is no assurance that the decrease in effluent toxicity to *C. dubia* would translate into a decrease in toxicity to the indigenous aquatic community.

2. MONITORING

2.A

EPA should defer to the ADEC's well-reasoned and persuasive rationale in the State certification on the appropriate level of monitoring required to reasonably demonstrate compliance with State water quality standards.

For EPA to override the requirements in the State 401 certification, some form of justification must be provided.

ADEC's rationale for these changes to the historic monitoring program is that the recommended monitoring will provide the evidence required to assure the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water. In addition, ADEC states that:

> *"The Preliminary Draft Permit required more monitoring than is required to reasonably demonstrate compliance with the Water Quality Standards (18 AAC 70)." (Fact Sheet, Appendix B, page 25)*[38]

[38] ADEC also notes that it may require additional ambient monitoring, as needed, in the Waste Management Permit that it will issue to Red Dog Mine.

Alaska water quality personnel are intimately familiar with the Red Dog receiving streams, and are the best qualified and experienced personnel for deciding what monitoring levels are appropriate for compliance with State water quality standards. The State, including ADNR, has a near constant presence at Red Dog during the discharge season, conducts numerous independent investigations of the receiving waters, and has a more thorough understanding of the stream system in the area than any other regulatory body. Given the State's extensive on-site experience, conduct and review of many water quality related studies, and its unquestioned expertise with respect to the attainment of designated uses in the Red Dog receiving streams, EPA should defer to ADEC's expert judgment as to the level of monitoring necessary in this NPDES permit. ADEC has based its certification on intimate knowledge of the area, streams, and interactions of the receiving waters with the effluent. EPA should defer this decision to ADEC, which also has the identical responsibility to protect water quality.

ADEC not only has the site-specific knowledge but also provides a regulatory basis for their decision. Failure to provide adequate deference to the State's expertise on water quality issues and monitoring at the Red Dog Mine, given the State's Certification, would be arbitrary and capricious absent substantial justification.

2.B

Given the tremendous monitoring expense and time burden already imposed by this NPDES permit, deference to the State on the level of monitoring is particularly appropriate in the absence of other countervailing justification.

According to the fact sheet, 40 CFR 122.48(b) and section 308 of the Clean Water Act, EPA has reasonably broad authority to require monitoring in an NPDES permit. However, the monitoring must be justified by one of the following three categories:

1. demonstrate compliance with effluent limits;
2. assure that State water quality standards are met; and
3. provide information for future permitting.

Compliance with effluent limits is achieved through Outfall monitoring, with the exception of TDS, which is actually demonstrated through limiting flow at end-of-pipe. Since State water quality standards are met at end-of-pipe, with the exception of TDS, ammonia and cyanide, no downstream monitoring should be needed for assurance that state water quality standards are met other than for TDS, ammonia and weak acid dissociable (WAD) cyanide. With the exception of TDS, TCAK is unaware that data for any other parameters, including flow rates from anywhere other than Red Dog Creek, was used to develop this draft permit. Further, with 7 years of intensive ambient monitoring, additional intensive monitoring could not be justified for a future permit, particularly since it was not used in this permit. The lack of justification or adherence to

the State certification as to which monitoring stations and monitored parameters to delete and which to keep makes EPA's actions appear arbitrary and capricious.

Please provide some form of justification for each parameter at each location in the ambient monitoring section in excess of what is required in the draft State certification.

2.C

Ambient monitoring should be discontinued when discharge has been discontinued for the season.

Section A.D.3. states that ambient monitoring can be discontinued 30-days after discharge from Outfall 001 has ceased. Discharge is discontinued when freezing conditions prevent accurate monitoring of in-stream TDS levels. This coincides with dramatic decreases in stream flow used for TDS dilution. Requiring monitoring 30-days after these conditions are occurring is very excessive, burdensome, costly and needless. Under these conditions, water freezing into ice excludes salts from the ice and into the remaining flowing water causing unusual concentrations of metals and other solutes. When this happens it is impossible to distinguish any effects from residual discharge, if there was any, and normal stream conditions during this time of year.

TCAK objects to continuing ambient monitoring for 30 days after it has committed to cease discharge for the season. TCAK estimates that it costs approximately $20,000 per month per remote monitoring station and $10,000 per month per non-remote monitoring station to comply with the current permit (sampling and reporting only; no biomonitoring or flow monitoring). An additional month (30 days) of monitoring after there is no discharge per the proposed permit station will cost approximately $110,000 per year or over half a million dollars over the 5-year permit. This does not include the liability imparted by the compliance tasks. TCAK sees absolutely no benefit to collecting these data; they were not used to develop the draft permit (for most sites, these data were not even requested to be provided); they cannot be used to determine compliance with effluent limits (as there is no effluent); and with the freeze crystallization effect, these data cannot be used to assure that state water quality standards are met relative to the discharge. It is nothing more than monitoring for the sake of monitoring.

Further, these sampling events during the freeze crystallization process bias the entire monitoring station's dataset. Organizations familiar with this phenomena and/or the Red Dog mine dataset, are careful to exclude these data when evaluating the area's water quality, including potential impacts from the discharge. For example, when ADF&G compiled the water quality data for the annual bioassessments, they specifically excluded any water quality data collected when water temperatures were at or near 0 degrees Celsius[39], specifically the post discharge season data. It is believed that ADNR and ADEC treat the data in a similar manner.

[39] Personal communication with Phyllis Weber-Scannell, March 14, 2006.

2.D

Section I.D.5. is redundant.

Section II.E. already requires the date and time of all sampling conducted per the draft permit be recorded. Please delete section I.D.5.

2.E

Ambient water quality monitoring stations 2, 9, and 20 should be deleted from the NPDES permit, as recommended by ADEC.

TCAK has monitored ambient water quality at seven receiving water stations since its 1998 NPDES permit was issued. Additional sampling was required at certain tributary stations. This sampling program, which requires sampling frequencies from once per month to three times per month, depending on the parameter and station location, is very resource intensive and expensive. TCAK has requested that EPA and ADEC reduce the number of stations, and frequency of sampling, based on the long historic record that has been accumulated and the value added by each existing monitoring station to the overall ambient water quality database.

In the draft §401 Certification, ADEC recommended the following changes to the monitoring program in the existing permit (Fact Sheet, Appendix B, page 25):

1. Delete Stations 2, 9, and 20, and the tributaries from the monitoring program required by the existing NPDES permit. Replace Station 73 with Station 160 and Station 10 with Station 151.
2. Submit monthly reports of ambient data collected at Stations 151 and 160 to EPA, ADEC, and OHMP with the monthly discharge monitoring reports (DMR). All other required ambient monitoring results should be submitted in the Annual Water Monitoring Summary Report.
3. Delete all references to stream flow measurements at Stations 2, 8, 9, 10, 12 and 140. Monitor stream flows at Stations 151 and 160 and report the flows in the Annual Water Monitoring Summary Report.

ADEC's rationale for these changes to the historic monitoring program is that the recommended monitoring will provide the evidence required to assure the Department that the effluent treatment and mixing zone size are adequate to protect all existing uses in the receiving water. In addition, ADEC states that:

"The Preliminary Draft Permit required more monitoring than is required to reasonably demonstrate compliance with the Water Quality Standards (18 AAC 70)." (Fact Sheet, Appendix B, page 25)[40]

TCAK concurs with ADEC's recommended changes to the ambient water quality and stream flow monitoring program. However, EPA's draft NPDES permit includes ambient water quality and stream flow monitoring at Stations 2, 9, and 20. The draft permit makes ADEC's recommended changes to Stations 160 (replaces Station 73) and 151 (replaces Station 10) and removes the required tributary monitoring. The Fact Sheet (page 12) provides no justification for continuing the monitoring at Stations 2, 9, and 20, contrary to ADEC's Certification recommendations to remove monitoring for these stations. TCAK objects to keeping these stations in the monitoring program because, despite many years of monitoring, they have contributed no significant value to the stream monitoring program while requiring considerable expenditure of resources. Station 2, which is located on the Wulik River, is extremely remote from the mine and historic data from this station has never shown any measurable effects[41] of the mine discharge. To the best of TCAK's knowledge, EPA, ADEC, and OHMP have never used the Station 2 monitoring for stream flow data for any evaluations of the mine discharge. Because there is now a long historic record for water quality and flow at Station 2, TCAK requests that it be deleted from the NPDES permit ambient monitoring requirements. The estimated cost of including this Station 2 in the monitoring program is approximately $400,000 over the 5-year term of the permit.

Station 9 is located in Ikalukrok Creek upstream of the confluence with Red Dog Creek. Monitoring at this station has provided data on the background water quality in the creek before it mixes with the mine effluent that is present in Red Dog Creek (when the mine is discharging). Station 9 data, while useful before there was an extensive record of water quality at Station 150 (at the end of the Ikalukrok Creek-Red Dog Creek mixing zone) and Station 160, no longer contributes any value to assessing compliance of Ikalukrok Creek with applicable water quality standards and designated uses. Further, no Station 9 data were used to develop the draft permit. Therefore, there is no basis for continuing monitoring at Station 9, and TCAK requests that it be deleted from the NPDES permit. The estimated cost of including this Station 9 in the monitoring program is approximately $500,000 ($100,000 for WET tests) over the 5-year term of the permit.

Station 20, which is located in Middle Fork Red Dog Creek upstream of the confluence with North Fork Red Dog Creek, monitors the Outfall 001 effluent mixed with flows from the Middle Fork tributaries. Middle Fork Red Dog Creek upstream of Outfall 001 has a designated use of industrial water supply (Class (1)(A)(iv)) from its headwaters to the discharge point (Fact Sheet, page 7). Lower Middle Fork Red Dog

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[40] ADEC also notes that it may require additional ambient monitoring, as needed, in the Waste Management Permit that it will issue to Red Dog Mine.

[41] Positive effects in the form of significantly reduced metals loading have been demonstrated, but continued monitoring would not enhance this demonstration. While this issue has been a beneficial PR position for both the regulatory agencies and TCAK, PR is not a justification to require monitoring in an NPDES permit.

Creek, from Outfall 001 to the confluence with North Fork Red Dog Creek, has a designation of industrial water supply, contact recreation, wading only (Class (1)(B)(i)), and secondary recreation (except fishing) (Class (1)(B)(ii)). Because the permit limits at Outfall 001 are protective of these uses in the Middle Fork (i.e., 100% effluent achieves the applicable water quality criteria), monitoring at Station 20 is not needed to demonstrate compliance with the designated uses and associated water quality standards. Again, there is a long historic record at Station 20 demonstrating that the designated uses are achieved. Therefore, TCAK requests that monitoring at Station 20 be removed from the NPDES permit.

Monitoring at Station 20 was included in the current permit by ADEC in the 1998 State 401 certification. The draft 401 certification now specifically states that ADEC no longer requires monitoring at Station 20. Further, footnote 4 to table 4, also included as part of the 1998 cert, should be deleted as the State no longer requires monitoring at Station 20, it is reasonable to assume that they are not interested in being notified of the results of the monitoring that they are not requiring.

The specific provisions of the draft NPDES permit that should be modified to delete Stations 2, 9, and 20 are: I.D.1. and I.D.7.

2.F

WET Monitoring at Stations 9 and 12 should not be required.

Toxicity data from Stations 9, 140, and 12 were used in the 1998 State certification to estimate natural condition toxicity. EPA did not find it necessary to use the toxicity data collected at these background stations per the current permit, in the draft permit. It is estimated that it costs $100,000 per station to conduct these WET tests over the 5-year permit. There is nearly half a million dollars of WET test data available that was not used in the draft permit. TCAK proposed to use WET test data from Station 140 (a location that the permit does not even require testing at), but this request was denied with no explanation. Now the draft permit is requiring the collection of an additional $200,000 worth of WET testing for no apparent purpose.

2.G

Turbidity monitoring at Stations 12 and 140 should be eliminated or the frequency reduced to 2/month.

It is unknown why turbidity monitoring at Stations 12 and 140 is required 3 times per month, while all other parameters are required twice per month or less. Please eliminate turbidity monitoring (see comment on Outfall turbidity; see Fact Sheet - no reasonable potential to exceed water quality standards for turbidity) or make the frequency more consistent with the other monitored parameters to reduce the compliance liability, or provide some justification for the odd sampling frequency.

2.H

Flow monitoring at stations 2, 8, 9, 12 and 140 should be deleted from the permit.

As indicated in the previous comment, ADEC's §401 Certification recommended deleting stream flow monitoring at Stations 2, 8, 9, 10, 12 and 140 from the NPDES permit. TCAK supports ADEC's recommendation because stream flow monitoring at these stations is unnecessary and wasteful of resources.

The rationale for deleting stream flow monitoring at these five stations is that the data are not used or needed to assess compliance with water quality standards, there is a long historic record of flows from previous permit monitoring requirements, and the resources required to perform this flow monitoring are extensive. It should not be anticipated that stream flows, particularly from background monitoring stations, will be significantly different than the data collected over the last 7-years; the flow record is long enough. Receiving water flow rates should not change either unless the Outfall flow rates change, and the Outfall flow rate is already a continuously monitored parameter.

The reasons given in a previous comment for deleting Station 2 (Wulik River) and Station 9 (Ikalukrok Creek) from the ambient water quality monitoring program are equally applicable to stream flow monitoring. Data from these stations are not used for any assessment of compliance with the water quality standards, and require the commitment of extensive resources by TCAK. Existing flow data from Stations 2 and 9 were not used to develop this draft permit.

Station 8 is located downstream of the confluence of Red Dog Creek and Ikalukrok Creek, but upstream of Station 150 on Ikalukrok Creek. Station 150 is the established station at the edge of the mixing zone on Ikalukrok Creek. Because Station 8 is located within the mixing zone of Red Dog Creek and Ikalukrok Creek, it is irrelevant for compliance purposes. Station 150, at the edge of the mixing zone on Ikalukrok Creek, is the appropriate monitoring point for the mixing zone. Because Station 8 is unnecessary for compliance purposes, and serves no other purpose, TCAK requests it be deleted from the NPDES permit. Existing flow data from Station 8 were not used to develop this draft permit.

Station 12, which is located on North Fork Red Dog Creek, provides stream flow data upstream of its confluence with Red Dog Creek. As with Station 9 on Ikalukrok Creek, this station provided a historic database that may have been useful before there was a long historic record of mine discharges and their effect on stream flow and water quality in Red Dog Creek. Monitoring at Station 151, which is located at the end of the mixing zone for Red Dog Creek after its confluence with the North Fork of Red Dog Creek, provides all of the ambient water quality and flow data required to assess the compliance of Red Dog Creek with its designated uses and water quality criteria. Flow monitoring at Station 12 should be deleted because data collected at this station are of no value for assessing the compliance of the discharge with the applicable water quality standards. Existing flow data from Station 12 were not used to develop this draft permit.

Station 140, which is located on Middle Fork Red Dog Creek upstream of Outfall 001, does not provide any stream flow data that are useful for assessing compliance with water quality standards and designated uses. The volume of water discharged from Outfall 001 is controlled by TCAK using a specific conductivity-total dissolved solids (TDS) correlation developed from historic monitoring data (Part I.A.8 in the current NPDES permit) in order to assure compliance with the water quality standards at Station 151 (edge of Red Dog Creek mixing zone), Station 150 (edge of mixing zone with Ikalukrok Creek), and Station 160 (downstream Ikalukrok Creek). This monitoring is continued in the draft permit. Because the dilution factor in the downstream receiving waters is controlled by the Outfall 001 discharge rate and the applicable water quality criteria for TDS, there is no need for the upstream stream flow data collected at Station 140. Existing flow data at Station 140 was not used to develop this draft permit.

TCAK requests that EPA delete the flow monitoring requirements at Stations 2, 8, 9, 10, 12 and 140 from Part I.D.8. of the draft NPDES permit. It is estimated that this program will cost over $500,000 over the 5-year term of the permit. None of these data were requested or used to develop the draft permit.

If for whatever reason flow monitoring at stations other than 151 and 160 are required by the permit, please acknowledge in the permit that there are certain times in the spring and fall that flow monitoring cannot be safely accomplished due to ice conditions. As ice forms, particularly on the smaller streams (all stations other than Station 2), stage monitoring equipment cannot function properly and the rating equations used to calculate flow rates based on stage become useless as the ice changes the channel cross-section morphology. Further, as ice is forming in the channels and on the stream banks, it is unsafe for personnel to enter the stream to take direct flow measurements. Therefore, it is impossible to provide accurate flow information during certain times of the spring and fall. There are no references in the permit to safety considerations other than footnote 2 in table 4, which only covers the sample collection required by table 4 and does not reference flow monitoring activities. Since the CWA is a strict liability act, without specific provisions in the permit, failure to collect any required monitoring data is technically a violation of the permit and subject to enforcement by EPA, ADEC or any citizen[42].

Further, if flow monitoring at locations other than Station 151 and 160 are required by the permit, please change the reporting frequency to the annual report and not the monthly DMRs.

2.I

[42] Even if the citizen has no standing to bring a third party suit against TCAK, TCAK must prove that the citizen has no standing in Federal Court, which is quite expensive as well as the mere act of having a suit filed blemishes the corporate reputation regardless of whether the suit has merit or not.

Please remove Section I.E. It is outdated and incorrect.

The section on precipitation and evaporation is outdated and does not reflect how the data are currently being collected. Annual precipitation data were requested and used incorrectly in developing the draft permit. However, evaporation and snow pack data were not even requested nor used to develop the draft permit. It is in TCAK's best interest to collect these data not only for NPDES and Title V air permits, but also for required operational needs. The permit does not need to require the collection and reporting of these data.

2.J

Please remove the requirement to record and report the total volume pumped from the "Dirty Water Sump" in each DMR.

Section I.C.4 requires that the total volume pumped for each month from the "Dirty Water Sump" be recorded and reported with the DMR for that month.[43] Certainly management and handling of mine drainage internal to the operation, not affecting the characteristics of the permitted Outfall is beyond the authority of a NPDES permit. Monitoring of internal mine drainage flows should also be beyond NPDES authority. However, even if it isn't, this monitoring is not necessary to determine compliance with Outfall limits, State water quality standards and was not used in development of this draft permit. Indeed, if EPA had used these data that were provided in the monthly DMRs for the last 7-years, it would have known that its water balance presented in the fact sheet was quite inaccurate. Further, there is no anticipation that these flows will significantly change over time. Therefore the existing data set is sufficient.

It is in TCAK's best interest to monitor these flows for among other things operation and maintenance of the pumping facility itself. It is not necessary to require recording and reporting of these internal mine drainage flows in a permit and expose TCAK to the liability associated with this requirement.

Please remove the recording and reporting requirements from section I.C.4. If for whatever reason this requirement is retained, please change the reporting frequency to the annual report and not the monthly DMRs.

3. AMMONIA

3.A

Because the toxicity of ammonia depends on the pH and temperature of the receiving water, EPA should have done the reasonable potential analysis for ammonia based on the natural variability in instream

[43] In another comment, TCAK requests that this section be reworded.

conditions, as EPA recommends in its water quality criteria document for ammonia, and as supported by ADEC regulations.

The toxicity of ammonia depends on the instream conditions for pH and temperature, and a reasonable potential analysis (RPA) should include the instream effects of these parameters. Such effects are incorporated in EPA's guidance to implementing the ammonia water quality criteria. EPA states in the 1999 ammonia criteria document:[44]

> *"Because the ammonia criterion is a function of pH and temperature, calculation of the appropriate weighted average temperature or pH is complicated. For some purposes, calculation of an average pH and temperature can be avoided For example, if samples are obtained from a receiving water over a period of time during which pH and/or temperature is not constant, the pH, temperature, and the concentration of total ammonia in each sample should be determined. For each sample, the criterion should be determined at the pH and temperature of the sample, and then the concentration of total ammonia nitrogen in the sample should be divided by the criterion to determine a quotient. The criterion is attained if the mean of the quotients is less than 1 over the duration of the averaging period."*

Furthermore, ADEC's water quality standards regulation allows for such an RPA approach, one that is based on real time instream mixing.[45] Although ADEC has provided an explicit mixing zone dilution factor of 2.5 for ammonia (Fact Sheet, Appendix B, page 22), it does not by itself incorporate conditions of real time mixing, and additional evaluation is necessary. The real time mixing conditions are represented at Station 10 on Middle Fork Red Dog Creek, where aquatic life criteria are first applied.

TCAK submitted an RPA for ammonia to EPA that included these conditions, as discussed in these comments.

3.B

Dynamic modeling reflecting real time mixing is more appropriate for the ammonia RPA. This approach is recommended by EPA in its guidelines for water quality based toxics control. EPA should redo its RPA for ammonia using dynamic modeling.

An RPA based on real time mixing requires dynamic modeling. As described in EPA's TSD for water quality based toxics control (page 80 - 81), dynamic modeling based on probability distributions allows the risk of noncompliance to be determined directly from the model output, and as such, is cost-effective in setting pollution control levels. In contrast, steady-state modeling does not determine the risk of noncompliance,

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[44] U.S. Environmental Protection Agency, *1999 Update of Ambient Water Quality Criteria for Ammonia*, EPA-822-R-99-014, December 1999, pp. 84-85.
[45] 18 AAC 70.255.(f)(1)

and when based on worst-case conditions, can be too conservative. That is, in steady state modeling, the chance of multiple parameters being at their worst levels all at the same time can be extremely remote, and represent a risk level much lower than the accepted target.

EPA conducted its RPA for ammonia using a steady-state approach based on worst case conditions for effluent ammonia and instream temperature and pH (Fact Sheet, page 55) and predicted that there was a reasonable potential to exceed the acute ammonia criterion. However, if EPA had used a dynamic modeling approach such as the Monte Carlo RPA done by TCAK, it would have seen that that there was no reasonable potential for the acute criterion to be exceeded. The no reasonable potential outcome of the dynamic modeling demonstrates that EPA's steady state modeling was too conservative.

TCAK requests that EPA redo its ammonia RPA using a dynamic modeling approach.

3.C

The TCAK RPA for ammonia, with the Monte Carlo approach, is scientifically appropriate and should be utilized by EPA for ammonia. EPA Region 10 has recognized the validity of this approach in other mining NPDES permits.

As noted in the Fact Sheet (page 55), TCAK provided EPA an RPA for ammonia based on Monte Carlo simulations. TCAK's RPA was presented to EPA in two documents, both of which are unfairly and inappropriately dismissed by EPA in the Fact Sheet (page 55).

The Monte Carlo approach is a statistical tool useful in analysis where conditions are variable, such as instream pH and temperature and their effect on ammonia toxicity. The Monte Carlo approach is a general statistical approach that is not limited to RPAs, and has been recommended by EPA in the TSD for determining wasteload allocations as well as in other environmental programs.[46] In the TSD, EPA recommends the Monte Carlo approach as one of several techniques where dynamic modeling is used (pages 79 – 82).

In the first RPA document, which was provided to EPA as a draft,[47] TCAK presented a Monte Carlo simulation for the acute and chronic ammonia criteria based on 1,000 runs. This analysis demonstrated that there was no reasonable potential to exceed the chronic criterion; in fact, none of the averages predicted by the Monte Carlo simulation exceeded the chronic criterion.

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[46] U.S. Environmental Protection Agency, Guiding Principles for Monte Carlo Analysis, EPA/630/R-97/001, March 1997.

[47] Teck Cominco Alaska Inc. (TCAK) Red Dog Mine, "RPA for Ammonia Using Monte Carlo Approach," Draft, December 19, 2005.

TCAK also concluded that there was no reasonable potential to exceed the acute ammonia criterion because the Monte Carlo simulations predicted that the criterion would be met greater than 99% of the time, which exceeded EPA's typical RPA standard of 99%. Even though the RPA met this standard, TCAK had been concerned about the data distribution used for pH because it generated overly high pH values, which had not been seen in actual measurements. The normal distribution was used to predict the range in pH values, but in this first RPA, the pH data set was limited. Even though the upper values were much greater than any values actually measured, which made TCAK question using this distribution, TCAK nevertheless decided to provide the analysis to EPA as a draft. Even with the overly high pHs, the Monte Carlo simulation predicted that exceeding the acute criterion would be a rare event, less than 0.1% of the time (only one run exceeded the criterion). EPA's comment on the draft RPA was that the acute ammonia criterion could not be exceeded more than one hour every three years, which, based on about six months of discharge every year for TCAK, is equal to a probability of less than 0.008% of the time [one hour out of 13,140 hours (3 years times 365 days, divided by 2, multiplied by 24 hours)]. This standard was not consistent with EPA's normal RPA target of 99%, but TCAK decided to revise the ammonia RPA with the higher target.

The number of runs in the first draft RPA (1,000) was too small to be able to show one exceedance out of 13,140 runs, so TCAK did a second draft RPA based on 15,000 runs. While doing so, TCAK also pulled together additional pH data to better characterize its data distribution. The additional data showed more clearly that the upper pH values had been too high in the first RPA. TCAK also looked closer at the correlation between pH and ammonia and incorporated this correlation into the Monte Carlo simulation. This second RPA was provided to EPA also as a draft.[48] The result of the second draft RPA was that the probability of exceeding the acute ammonia criterion was less than 0.008%. In fact, the RPA showed that the highest expected acute ammonia quotient (instream ammonia divided by the ammonia criterion) was 0.64, much less than the quotient limit of 1 (instream ammonia equals the criterion). To complete these comments, TCAK has finalized its RPA for ammonia and includes it as an attachment to the comments.

In the Fact Sheet, EPA's summary of the two draft RPAs is misleading (Fact Sheet, page 55). About the first draft, EPA states that one Monte Carlo run indicated that there is a reasonable potential to exceed the acute ammonia criterion. What the first draft showed actually, is that there were not enough Monte Carlo simulations made to be able to calculate a probability less than 0.008%. That is, when only 1,000 runs are made, the smallest percentage that can be calculated for one exceedance is 0.1% (1 divided by 1,000). This was the reason why TCAK increased the number of runs to 15,000 in the second draft of the RPA. EPA's states that it considered the second draft, but that the additional complexity did not provide added value to the analysis. TCAK disagrees that the additional complexity adds no value; moreover, TCAK believes that it is necessary because the ammonia criteria are more complex than most other water quality criteria and

[48] Teck Cominco Alaska Inc. (TCAK) Red Dog Mine, "RPA for Ammonia Using Monte Carlo Approach," Draft, December 27, 2005.

the standard RPA approach is inappropriate. The RPA that TCAK has performed is not particularly complex and should not be difficult for EPA to assess.

As described in the draft Fact Sheet (page 55), EPA's RPA for ammonia was based on fixed values for instream conditions and effluent quality, and did not use a Monte Carlo approach, which would have reflected the variability of these data. EPA selected the upper 95th percentile of pH and temperature at the edge of the mixing zone at Station 10 to represent instream conditions, and the maximum effluent ammonia concentration. Each of these values is very conservative and using them in combination results in a risk factor that is overly conservative. It is for situations like this that the Monte Carlo technique is more suitable. The permit writer for TCAK's permit, has used the Monte Carlo technique in at least one other recent permit, the Coeur Alaska Kensington Mine.[49] In this permit, the RPA analysis using Monte Carlo techniques, was far more complex than the one presented by TCAK for ammonia. EPA needs to explain why it did not use a Monte Carlo approach to the ammonia RPA for TCAK's permit and why it believes that TCAK's Monte Carlo analysis could not be used.

3.D

The same RPA standard should be applied to ammonia as is used for the other water quality parameters in this permit and most other permits.

EPA should justify its decision to make the RPA analysis for ammonia so much more stringent than for other water quality parameters. For all other parameters, it sets the RPA target to the 99th percentile value. That is, if the maximum measured value (times a multiplying factor) exceeds the expected 99th percentile value of the data distribution, a reasonable potential to exceed the criterion exists. This is a 1 out of 100 exceedance target, because 1% of the values are expected to exceed the 99th percentile. In contrast, setting an RPA target of 0.008% just for ammonia is at least 125 times more stringent.

3.E

If EPA decides to maintain a limit for ammonia in the permit, one should only be set for the daily maximum because there is no reasonable potential for the chronic criterion to be exceeded.

The RPA for ammonia presented by TCAK to EPA has demonstrated that there is no reasonable potential for the effluent to exceed either the acute or chronic water quality criteria for ammonia. Although EPA has some remaining issues with TCAK's RPA relative to the acute criterion, the permit writer indicated to TCAK that TCAK's RPA for the chronic criterion was acceptable. Therefore, if EPA decides to maintain a limit for ammonia in the final permit because of concerns in meeting the acute criterion, TCAK requests that there only be a daily maximum limit based on the acute ammonia criterion not the chronic criterion. The daily maximum limit directly controls compliance with the

[49] Coeur Alaska, Inc., Kensington Project, NPDES permit no. AK-005057-1, Fact Sheet, June 21, 2004 (page 11), and Appendix G.

acute criterion, and we have already shown that there is no reasonable potential for the chronic criterion to be exceeded. TCAK realizes that the TSD presents the RPA and limit derivation process as two separate steps, and that when deriving limits, the more restrictive of the LTA-chronic and LTA-acute is used. However, the TSD could never have anticipated that the least restrictive criteria (acute) would demonstrate reasonable potential to exceed, while the more restrictive criteria (chronic) does not. This situation not only demonstrates the complexity of the ammonia criteria itself, but also the short comings of the static modeling approach in the TSD when applied to the ammonia criteria. If limits need to be established for ammonia, the limits need to be set to protect for exceedances of that portion of the criteria that has reasonable potential to be exceeded (acute standard), not set based on a more conservative portion of the criteria (chronic standard) that has no reasonable potential to be exceeded; the LTA-acute should be used to set limits. Use of the LTA-chronic is unjustifiable and coupled with the exceptionally conservative static modeling assumptions results in overly restrictive limits that are inconsistent with 40 CFR 122.44(d)(1)(ii). There are no regulations or guidance documents that require the RPA to be applied to the entire criteria and that the acute and chronic portions of the criterion cannot be treated separately.

3.F

If EPA decides to maintain a limit for ammonia in the permit based on the 30-day chronic criterion, then EPA should use the upper 90th percentile of the 30-day averages for pH and temperature to calculate the criterion.

Use of the 90th percentiles of the 30-day averages for pH and temperature is in accordance with recommendations from EPA headquarters.[50]

3.G

Best Management Practices (BMP) have proven to be extremely effective in the control of the ammonia concentration in the Red Dog Mine effluent.

TCAK has provided EPA with both evidence and explanation of how operational practices have dramatically and effectively decreased the concentration of ammonia in the Red Dog Mine effluent. Based on the data provided to EPA, effluent limits in the draft permit should not be exceeded by the effluent. In fact, several of the previous comments argue that there is no reasonable potential for the effluent to exceed the limits in even the most extreme case (99.992%). However, once numeric effluent limits are attained there is no incentive for any on-going improvements in effluent quality. Management of effluent quality through BMPs would encourage improvements even below the numeric effluent limits. Since it is proven that BMPs can effectively control ammonia in the effluent, it may be more beneficial to require BMPs and not effluent

[50] See, slide 95 in EPA power point presentation re 1999 Update of Ambient Water Quality Criteria for Ammonia, Water Quality Standards Academy, Intermediate Presentation.

limits in the case of ammonia. Both means of regulatory control are equally as enforceable, but implementation of numeric effluent limits effectively eliminates the opportunity to require comprehensive BMPs for ammonia control to below the effluent limits. The permit could require that the BMPs be approved by EPA, at which time EPA could approve or reject any proposed management practices for the control of ammonia. This would relieve EPA from independently having to develop BMPs, nor would it be appropriate for EPA stipulate internal operational controls in a permit.

4. HARDNESS

4.A

Because there is no mixing zone available, EPA should calculate all hardness dependent metals criteria based on the lower 5th percentile of the effluent hardness at Red Dog Mine for use in setting water quality-based effluent limits. The requested approach is protective of water quality, is consistent with permitting decisions made by EPA elsewhere in Region 10, and is the logical approach to implementing standards when no dilution benefit is available.

Detailed comments are provided in the following sections.

4.B

Metals in the draft permit were calculated using an incorrect hardness value.

Metals limits for hardness-dependent metals criteria (cadmium, copper, lead and zinc) in I.A.1. in the draft permit were based on a hardness of 260 mg/L $CaCO_3$, which was the hardness value used to calculate the limits in the current permit.

Because no mixing zone was requested, the applicable water quality standards for metals are to be met at the end-of-pipe. Calculation of end-of-pipe metals standards should use the hardness at end-of-pipe; i.e., the effluent hardness. EPA has acknowledged the correctness of using the hardness of the effluent in other NPDES permit decisions in Region 10. There is no reason to apply a more restrictive approach for Red Dog Mine than for other permitted facilities in EPA Region 10.

No mixing zone was requested for metals because most of the metals naturally exceed the water quality criteria in Red Dog Creek and there is no assimilative capacity in Red Dog Creek or Ikalukrok Creek. When no mixing zone is allowed, the permit should establish limits that assure that the water quality criteria will be met at the end-of-pipe.

Applicable state criteria for cadmium, copper, lead and zinc are hardness dependent formulas. The state's criteria are based on EPA criteria. For calculation

purposes, the metals criteria for all hardness values greater than 400 mg/L $CaCO_3$, are calculated at 400 mg/L $CaCO_3$.

4.C

The Red Dog Mine should be provided the same hardness-dependent metals calculations as other similarly situated Region 10 NPDES permittees (based on effluent hardness).

EPA Region 10 has considered the issue of permitting dischargers for hardness-dependent metals in situations where the receiving waters exceed the metals criteria. In such cases, mixing zones were not allowed and EPA applied the water quality criteria directly to the effluent, using the hardness of the effluent. To assure that the permit limits are protective, EPA used the lower 5th percentile hardness of the effluents to calculate single value numeric criteria as the basis for establishing water quality-based effluent limits. Examples are described below:

City of Boise, Lander Street wastewater treatment facility (WWTF) and West Boise WWTF, NPDES Permit Numbers ID-002044-3 and ID-002398-1.

The limits for lead for both discharges, and for cadmium at the Lander Street WWTF were based on the effluent hardness. The rational is found in pages 5 and 6 of EPA's Response to Comments dated September 27, 1999 (attached).

> *"Traditionally, Region 10 has used the mixed hardness to calculate the criteria, except when the criteria are applied end-of-pipe (i.e., where there is no dilution). The draft permits, however, did not use mixed hardness (i.e., hardness at the edge of the mixing zone). In the final permits, criteria were developed using the effluent hardness data submitted during the comment period by the City. Where the 95th percentile of background concentration exceeded the criterion that was calculated using mixed hardness (cadmium and lead at Lander Street, lead at West Boise), the criteria were re-calculated using the 5th percentile of effluent hardness."*

Hayden Area Regional Sewer Board, NPDES Permit Number ID-002659-0; City of Post Falls, NPDES Permit Number ID-002585-2; and City of Coeur d'Alene, NPDES Permit Number ID-002285-3

The permits for these three communities were issued on November 2, 1999. Page C-17 of the June 18, 1999 fact sheet for the City of Coeur d'Alene provides the basis for the metals limits for cadmium, lead and zinc.

> *"For cadmium, lead, and zinc, the 95th percentile upstream concentration exceeds the criteria. Therefore, there is no "clean" upstream water to dilute the effluent, so criteria must be met at the point of discharge. In this case, the hardness used to calculate the criteria was the effluent hardness (132 mg/l $CaCO_3$). Silver was also evaluated this way."*

EPA provides similar wording on page C-14 of the fact sheet for the City of Post Falls and on page C-15 of the fact sheet for the Hayden Area Regional Sewer Board. Footnotes in Table C-6 of the fact sheet for the City of Post Falls, and in Table C-1 of the fact sheet for the Hayden Area Regional Sewer Board note that for cadmium, lead and zinc, a 5th percentile effluent hardness was used.

The logic of using the effluent hardness to calculate the metals criteria is implicit in the hardness-dependent criteria themselves. EPA should treat the Red Dog Mine discharge consistent with how they have treated other Region 10 permittees in the same situation. There is no technical or policy justification for EPA to treat Red Dog Mine in a more restrictive manner than the five permitted discharges described above.

4.D

EPA's approach in the referenced Idaho permits is appropriate.

TCAK agrees with EPA's approach in the cited Idaho permits. Calculation of the metals criteria should be based on the hardness of the water at the point the criteria are to be attained. When mixing zones are issued, the criteria must be met at the downstream edge of the mixing zone. The hardness concentration to be used in calculating the metals criteria should be a conservative estimate of the hardness at the end of the mixing zone; the point at which the criteria are to be attained. The calculated criteria are then transferred back to the end-of-pipe using the mixing zone dilution factor to establish the water quality-based effluent limits. The larger the mixing zone, the closer the hardness value will approach the receiving water hardness. The smaller the mixing zone, the closer the hardness concentration will approach the effluent hardness, until the mixing zone becomes so small that it is comprised entirely of effluent. At this point the criteria must be attained at end-of-pipe, and an end-of-pipe hardness concentration should be used to calculate the criteria.

The hardness-dependent criteria for metals such as copper and zinc are designed so that once an effluent has achieved compliance with the criteria, the effluent cannot cause any downstream excursions above the criteria. In other words, the effluent only has to demonstrate compliance with the criteria once, and it can be assured that all points downstream have been protected from the metals in the effluent.

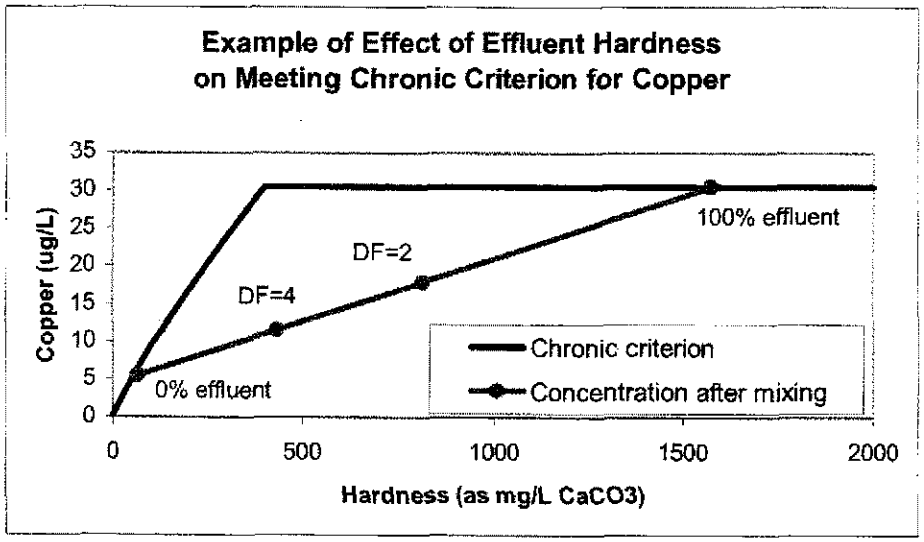
In the case of Red Dog Mine, the natural conditions of the receiving waters in Red Dog and Ikalukrok Creeks exceed the metals criteria. Effluents discharged (in compliance with the metals criteria based on effluent hardness) to streams not naturally attaining the criteria do not exacerbate the natural non-attainment, but as explained below, actually help the situation.

4.E

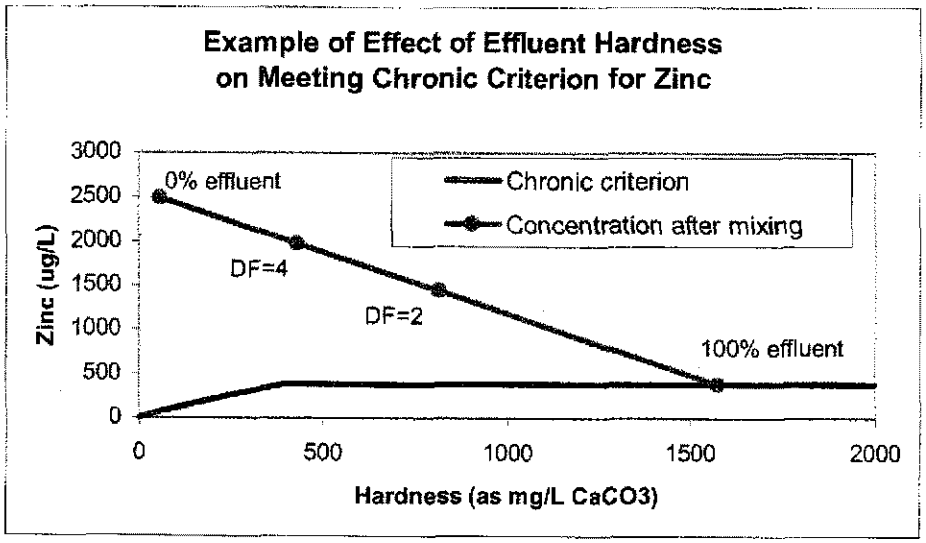
Basing effluent limits for metals on the effluent hardness is protective of water quality.

The Red Dog Mine effluent has a very high hardness, typically between 1,500 and 2,500 mg/L as $CaCO_3$. The 5th percentile effluent hardness is 1,576 mg/L $CaCO_3$.

The following figures graphically illustrate the chronic criteria for copper and zinc, expressed as total recoverable metals. The figures also illustrate how a hypothetical effluent, meeting the copper and zinc criteria at a hardness of 1,576 mg/L $CaCO_3$, would combine with a hypothetical receiving water that meets the copper criterion and does not meet the zinc criterion at a hardness of 50 mg/L $CaCO_3$. The metals criteria increase as hardness increases, but for all hardness values above 400 mg/L $CaCO_3$, the criteria are calculated using 400 mg/L $CaCO_3$ as a cap.



DF = Dilution Factor



DF = Dilution Factor

The straight lines drawn between the hypothetical effluent and receiving water concentrations represent the sum of all possible combinations for the copper and zinc examples. The halfway point represents a dilution factor of 2. The straight lines illustrate why effluent limits, based on meeting the hardness dependent criteria at the hardness of the effluent, are protective.

In the copper example, where the background water of lower hardness achieves the copper criterion, all combinations of the two waters fall below the chronic copper criterion curve. Even though the effluent is shown as just meeting the copper criterion, it is actually beneficial for all mixtures because its hardness is substantially above 400 mg/L $CaCO_3$. Effectively, the effluent adds to the assimilative capacity of the system.

In the zinc example, any mix of the effluent and the receiving water exceeds the chronic zinc criterion value but any combination of the two is closer to meeting the criteria than the receiving water is without the effluent present. In the zinc example, the receiving water and not the effluent is the cause of exceedances in the mixture. That is the reason no mixing zone can be allowed for zinc.

The copper and zinc examples described above would be for effluent limits that are calculated to achieve the copper and zinc criteria at the end-of-pipe. Compliance with such a limit means that the effluent would consistently be less than the metals criterion, and therefore would routinely add assimilative capacity to the stream. Ninety-five percent of the time the effluent has a higher hardness concentration than the value used in the examples, and this means there is significant benefit to the assimilative capacity for metals. The figures illustrate the protectiveness of setting water quality-based effluent limits for metals based on the effluent hardness, when no mixing zone is available or authorized.

5. DISCHARGE FLOW

5.A

The annual flow maximum in I.A.2 should be deleted because TCAK's tailing impoundment is so large that the design storm exemption in 40 CFR Part 440, Subpart L eliminates any regulatory requirement that might support an annual flow limitation calculated from or otherwise based on Subpart J.

The draft permit includes a provision in I.A.2 that states "[t]he maximum cumulative volume discharged from Outfall 001 shall not exceed 2.418 billion gallons from January 1 through December 31 every year." TCAK requests deletion of this draft permit provision. The basis of the volume limitation appears to be derived from the Ore Mining and Dressing Point Source Category Subpart J Effluent Limitations Guidelines (ELG), which initially allow discharges only to the extent evaporation exceeds precipitation, as set forth in 40 CFR Part 440. Because the design storm capacity

exemption of 40 CFR 440 Subpart L is now achieved by TCAK's tailings impoundment, there is no longer a regulatory need for this Subpart J annual flow limitation.

Any type of Subpart J limitation on the amount of flow in the draft permit should be eliminated because TCAK is retaining the amount of water required by 40 CFR 440 Subpart L. As a result, there are no technology-based effluent limit (TBEL) limitations on discharge whatsoever, only WQBEL limitations. 40 CFR Section 440.131 includes what is known as the "storm exemption" from any TBEL limitations. No flow limitation (which is TBEL derived) applies to TCAK:

> *"if the following conditions are met:*
>
> > *1) The facility is designed, constructed and maintained to contain the maximum volume of wastewater which would be generated by the facility during a 24-hour period without an increase in volume from precipitation and the maximum volume of wastewater resulting from a 10-year, 24 hour precipitation event or treat the maximum flow associated with these volumes. In computing the maximum volume of wastewater which would result from the 10-year, 24-hour precipitation event, the facility must include the volume which would result from all areas contributing runoff to the individual facility, i.e., all run-off that is not diverted from the active mining area and runoff which is not diverted from the mill area." (40 CFR 440.13(b)(1)), As noted by Region 10 EPA in its January 2003 guidance document entitled, 'EPA and Hard Rock Mining: A Source Book for Industry in the Northwest and Alaska,' found on the Internet at the following location: http://yosemite.epa.gov/R10/WATER.NSF/840a5de5d0a8d1418825650f00715a27/e4ba15715e97ef2188256d2c00783a8e/$FILE/Main text.pdf,*
>
> *"Under certain conditions, Part 440 provides a 'storm exemption' from applicable ELGs for discharges from qualifying facilities in all subcategories." (EPA and Hard Rock Mining at 10)*

The guidance document notes that

> *"Storm exemption for discharge and no discharge facilities.... Facilities designed/constructed/maintained to contain or treat normal process water and 10-year/24-hour volume includes runoff from all active mine areas that is not diverted." (EPA and Hard Rock Mining at 12)*

Since the TCAK tailings impoundment already holds substantially in excess of the required design volume, the ELG storm exemption eliminates the need for TBEL limitations in this permit. The design storm amount that TCAK would have to retain to qualify for the storm exemption would not exceed 81 million gallons (1.8 inch rain event

over 72 million ft^2 catchment). TCAK's tailings impoundment is currently holding approximately 4 billion gallons, and thus is clearly in excess of the design holding capacity that qualifies it for Subpart L relief from all Subpart J requirements that could create a flow limitation. As a result, any type of Subpart J derived annual volume limit on flow is not justified.

A review of seven other individual NPDES permits developed and issued by Region 10 to other mining facilities covered by Part 440 shows that these other facilities do not appear to have these types of annual flow limitations.[51] Once a mining facility has built a tailings dam of the size that TCAK has, there is simply no way that the design volume holding capacity for the Subpart L storm exemption from the TBEL limits has not been met. As a result, the permit discharge limits for effluents covered by 40 C.F.R. 440 are then determined by the WQBELs, not the TBELs. Subpart J annual flow limitations have no place in the Red Dog Mine NPDES permit.

The original regulatory basis for the draft permit including a Subpart J annual flow restriction has been superseded by the construction of a massive tailings impoundment with a holding capacity dramatically in excess of the design storm exemption amount in Subpart L. The Part 440 Subpart L design storm exemption overrides any regulatory requirement for an annual flow limitation based on Part 440 Subpart J.

5.B

EPA should encourage TCAK's discharges of its high quality effluent that achieves WQBELs, as these discharges improve receiving stream quality and enhance the resident biotic community.

This annual flow draft permit condition does not have a sound environmental basis, as there is no environmental need to restrict the flow of discharges that meet the

[51](1) The Coeur Alaska Kensington Mine Permit is found at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/CurrentAK822/$FILE/Coeur_Alaska_Kensington_Final_Permit.pdf;
(2) the Kennecott Greens Creek Mine Permit is at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/CurrentAK822/$FILE/AK0043206FP.pdf;
(3) the draft permit for Coeur Silver Valley is at http://yosemite.epa.gov/r10/WATER.NSF/95537302e2c56cea8825688200708c9a/d99f1f33c25fe20388256d9d005f5116/$FILE/ATTU89R2/ID0000027%20DP.pdf;
(4) the Hecla Lucky Friday Mine Permit is at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319/$FILE/Hecla_Lucky_Friday_Final_Mod_Permit.pdf;
(5) the Hecla Grouse Creek Permit is at http://yosemite.epa.gov/R10/WATER.NSF/95537302e2c56cea8825688200708c9a/2978a2d617a53f36882568790059bd3c/$FILE/ATT14KTB/ID0026468%20FP.PDF;
(6) the Meridian Beartrack Mine Permit is at http://yosemite.epa.gov/r10/WATER.NSF/840a5de5d0a8d1418825650f00715a27/2978a2d617a53f36882568790059bd3c/$FILE/ID0027022FP.pdf; and
(7) the Thompson Creek Mining Permit is at http://yosemite.epa.gov/R10/WATER.NSF/95537302e2c56cea8825688200708c9a/2978a2d617a53f36882568790059bd3c/$FILE/ATTJK63L/ID0025402%20FP.PDF.

WQBELs. TCAK discharges have been documented to improve the water quality in the receiving stream and TCAK discharges have dramatically enhanced the viability and vigor of the resident aquatic community. It is important to note that the natural mineralization and natural seeps that were occurring at Red Dog (many still are in this general area) caused the concentrations of many metals in the natural streams to be toxic to the development and health of the local aquatic communities. Pre-mining surveys and data confirm the high levels of toxics that were present.[52]

Generally, the environmental basis of the TBEL's limitation on discharge in Subpart J was to require mines to build a certain level of holding capacity prior to any discharge, on the assumption that discharges would be adverse for the receiving streams as a general rule.[53] That general rule, however, does not apply at the Red Dog Mine. The opposite is true.

When TCAK activities resulted in the discharge of higher quality waters with toxic constituents reduced far below those naturally present in the receiving streams, communities like the aquatic invertebrates prospered. Contrary to the general rule, mine discharges improve receiving stream water quality as a result of the cleaner effluent from Red Dog Mine diluting and reducing the natural toxicity of the receiving streams. This improvement has been documented by several bioassessment studies.[54]

5.C

The NPDES permit should encourage, not discourage, the reduction of retained waters in the impoundment.

In the interests of safety as well as good environmental practice, the NPDES permit should encourage greater annual discharges of Red Dog Mine effluent that achieves the WQBELs in the permit. The reduction in water volume retained in the tailings impoundment would provide additional holding capacity should any unforeseen circumstances interfere with the ability to discharge on a temporary basis or otherwise create a need for extra retention capacity.

Even if the Subpart L storm exemption were not met, it does not make sense to apply a Subpart J limitation as an annual discharge flow limitation with an annual "use it or lose it" proposition. The goal of the Subpart J TBEL was to assure a minimum holding

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[52]"Comparison of Mainstem Red Dog Creek Pre- and Post-Mining," by Dr. Phyllis Weber Scannell (March 2005).

[53]These effluent limitations, of course, predated substantially the development of a much more expansive and comprehensive WQBEL standard setting program that reflects substantially more numeric parameters to assure that toxics are carefully regulated in wastewater discharges.

[54]These TBEL restrictions initially were developed in the 1970s, prior to the development of extensive WQBEL limitations designed to assure discharges did not interfere with designated uses. As of the time of adoption in the 1970s, given the paucity of WQBEL limitations, the intent was to force a mine to retain a substantial quantity of water without discharging, and then to require some limited TBEL levels of treatment. TCAK has extensively characterized its effluent, running TIE/TRE investigations, and has a consistent track record of predictable and consistent effluent quality that has demonstrably enhanced the quality of the receiving streams for a number of metals parameters. As TCAK has built a holding capacity qualifying it for the design storm exemption, and has extensive WQBELs to assure receiving stream protection, the annual flow limitation is legally and environmentally unnecessary and unwise.

capacity on the part of a mine by allowing only net precipitation to be discharged. This requirement resulted in a facility's need to design and implement a holding capacity that would store the amount of water equivalent to the annual net precipitation, and EPA's effluent guidelines were based on the understanding that once that amount of water retention was provided in the system, the permittee should be allowed to discharge any excess water (assuming numeric TBEL and WQBEL effluent limitations are met). The Subpart J TBEL regulations do not set a time limitation on when that allowable discharge may occur. As long as TCAK has retained the requisite amount of water specified by the TBEL, it should be permitted to discharge the collected water that exceeds that amount without the time restriction imposed by the TBEL. There should not be a "use it or lose it" annual discharge requirement where the failure to discharge a specified quantity by the end of a calendar year means that the unused volume is lost. At a minimum, the unused allowable flow amounts should carry over to the next year.

The proposed 2.418 billion gallon flow annual limit penalizes TCAK for its construction and retention of greater quantities of water than required by the TBEL in its tailings pond over the years. That is not the intent of the TBEL regulation, which is intended to require a minimum holding capacity prior to treatment and to allow discharge of excess water above that holding capacity. To the extent TCAK in the past minimized discharges during periods when it was upgrading its treatment capabilities, it seems particularly unwise to now penalize TCAK for such environmentally beneficial activities. The draft permit limitation essentially penalizes TCAK for failing to discharge all allowable flows. This is unsound public policy.

Given the limitations on when discharges can be made (including restrictions to free flow periods in Red Dog Creek), it is even more critical to provide TCAK with discharge flexibility that can be accumulated over time.

5.D

The draft permit requires TCAK to capture flows that are not subject to the effluent limitations guidelines, which increases the probability that the maximum flow limit will become problematic in the future.

In the draft permit, EPA requires TCAK to capture flows that are not subject to the ore mining and dressing limitations, thus subjecting the mine to the 440 limitations for additional flows that impinge upon the storage capacity of the tailings pond. For example, the draft permit changes the regulatory definition of "mine drainage" from the Part 440 definition by adding "seeps from the ore" to the definition of mine drainage at page 40 of the draft permit. Then, the draft permit requires (at I.C.3) that "[m]ine seepage from the ore site shall be collected" and then "pumped into the tailings impoundment" or otherwise "retained until it can be treated." In addition, in the definition of "stormwater" in the draft permit at pages 40-41, Region 10 is excluding traditional industrial stormwater (not subject to Part 440 flow limitations) from the definition and then seeks to place such stormwater into the category of "mine drainage" by requiring such stormwater in I.C.2 that "[t]he permittee shall ensure that precipitation falling on the overburden

stock pile shall be directed into the tailings impoundment." The second sentence in the draft permit definition of stormwater on pages 40-14 states that:

> *"Runoff from waste rock piles, ore and sub-ore piles, spent ore piles, overburden, unreclaimed disturbed areas and other active mining areas constitutes 'mine drainage,' not storm water."*

This draft permit requirement that TCAK continue to convert 40 CFR 122.26(b)(14) industrial storm water into mine drainage directly contradicts EPA Headquarters' policy and the regulations. As EPA Headquarters stated in the Federal Register, in order to resolve a lawsuit brought by the National Mining Association over the scope of the Part 440 effluent limitations, this draft permit interpretation was originally incorrectly advanced by EPA Headquarters in the 1995 multi-sector general permit (MSGP). EPA Headquarters had attempted to set out in a Table G-4 of the MSGP a clarification consistent with that used by the draft permit at issue. EPA had to admit that was incorrect, and set forth a corrected guidance and corrected Table G-4:

> *"Today's interpretation and guidance describe a distinct class of discharges that was not apparent from the face of Table G-4 when the Agency published the Multi-Sector Permit. Specifically, today's interpretation identifies some discharges that could have been interpreted to be 'mine drainage' under the plain language of the Guidelines and ineligible for coverage under the ore mining and dressing portion of the Multi-Sector General Permit (and under Table G-4) even though the Agency did not evaluate the technological feasibility and cost impacts of diverting drainage from those sources into the active mining area when it developed the Ore Mining and Dressing Guidelines. Based on today's clarification, such an interpretation would be inaccurate because EPA did not require diversion of flows from outside the active mining area for treatment. For this class of discharges described by today's notice, i.e., those from overburden and/or waste rock sources that do not combine with mine drainage not otherwise subject to the Part 400 regulations, authorization under a EPA general permit for storm water may be available..." (63 Fed. Reg. 42539, August 8, 1998)*

Aside from the lack of any continuing regulatory basis for the annual flow limitation (given the established holding capacity well in excess of the storm exemption holding requirement in 440, Subpart L), sound public policy supports removal of the old annual flow limitation. It is essentially indisputable that the construction of the mine and the treatment and discharge of high quality effluent from the TCAK Outfall Number 1 has actually substantially improved the ambient quality of the receiving streams. Improvements in the resident aquatic communities have been documented in numerous expensive studies and bioassessments.

For all of the reasons cited in these comments, the limitations on annual flow should be, first, removed, and, if not removed, at least revised to make them consistent with what is legally required.

5.E

The provision at I.C.1 requiring mine drainage to be directed into the tailings impoundment or retained until treated should be modified.

NPDES permit limits on the discharge of process wastewater (Part 440 wastewater) are based on TBELs and WQBELs. So long as the TBELs and WQBELs are met, then the discharge is legal. If for some reason mine drainage from a particular area can meet TBELs and WQBELs for discharge without first being directed into the tailings impoundment or retained until treated, discharge should be permissible. This permit provision assumes the only possible ways mine drainage could be discharged is if it first collected in the tailings impoundment or if it was first retained and then treated. TCAK has no problems with the permit limiting mine drainage discharges to specified outfalls, and with the requirement that it meet applicable effluent limitations at the time of discharge.

Currently, the draft permit provides as follows:

"I.C.1. Mine drainage shall be:
a. directed into the tailings impoundment; or
b. retained until it can be treated."

Because the real concern is that mine drainage not be discharged unless it meets applicable effluent limitations (in this case, primarily WQBELs), TCAK suggests that the following language be substituted in this provision:

I.C.1. Mine drainage shall be:
a. directed into the tailings impoundment; or
b. otherwise retained unless and/or until it can be discharged in accordance with the permit limitations set forth herein.

It is possible that some mine drainage (i.e., some lightly contaminated runoff that fits within the definition of mine drainage) might be of sufficient quality to discharge without additional treatment. Rephrasing I.C.1 slightly as suggested retains this flexibility, while assuring that WQBELs are met.

5.F

The definition of mine drainage must be modified to make it consistent with the Part 440 definition.

"Mine drainage" is a term of art, defined at 40 C.F.R. Section 440.132(h) as "any water drained, pumped or siphoned from a mine." This specific term has a specific purpose, for all mine drainage (as defined) is subject to the TBEL limitations in Part 440. The draft permit seeks to modify the Part 440 scope of coverage by changing the definition in the ELG. This is not permissible, as there is no legal basis for this.

A review of seven other individual mining permits[55] issued by Region 10 shows that no other comparable facility is subjected to this redefinition of mine drainage. Thus, the last five words "including seeps from the ore" must be stricken from the definition of mine drainage and the definition must be made consistent with the Part 440 regulations.

The first problem is that there are many natural seeps in this area that are independent of any mining activities by TCAK. To the extent the draft NPDES permit could be read to require TCAK to control such natural seeps not in any way caused by the Red Dog Mine is not legally authorized. The NPDES program relates to TCAK additions of a pollutant through a point source to a water of the U.S., not to nature's own additions of pollutants to such waters.[56] Thus, the definition needs to be changed to make it consistent with the regulatory definition of mine drainage.

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[55](1) The Coeur Alaska Kensington Mine Permit is found at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/CurrentAK822/$FILE/Coeur_Alaska_Kensington_Final_Permit.pdf;
(2) the Kennecott Greens Creek Mine Permit is at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/CurrentAK822/$FILE/AK0043206FP.pdf;
(3) the draft permit for Coeur Silver Valley is at http://yosemite.epa.gov/r10/WATER.NSF/95537302e2c56cea8825688200708c9a/d99f1f33c25fe20388256d9d005f5116/$FILE/ATTU89R2/ID0000027%20DP.pdf;
(4) the Hecla Lucky Friday Mine Permit is at http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319/$FILE/Hecla_Lucky_Friday_Final_Mod_Permit.pdf;
(5) the Hecla Grouse Creek Permit is at http://yosemite.epa.gov/R10/WATER.NSF/95537302e2c56cea8825688200708c9a/2978a2d617a53f36882568790059bd3c/$FILE/ATT14KTB/ID0026468%20FP.PDF;
(6) the Meridian Beartrack Mine Permit is at http://yosemite.epa.gov/r10/WATER.NSF/840a5de5d0a8d1418825650f00715a27/2978a2d617a53f36882568790059bd3c/$FILE/ID0027022FP.pdf; and
(7) the Thompson Creek Mining Permit is at http://yosemite.epa.gov/R10/WATER.NSF/95537302e2c56cea8825688200708c9a/2978a2d617a53f36882568790059bd3c/$FILE/ATTJK63L/ID0025402%20FP.PDF.

[56]TCAK is not responsible for background levels of contamination such as those resulting from precipitation-caused natural seeps. TCAK's activities must cause the contamination, or it is not regulated:

> "[There is] language in the legislative history [of the 1987 CWA amendments establishing the storm water NPDES program] that the determination of whether storm water is contaminated by contact with overburden, raw material, intermediate product, finished product, byproduct, or waste products 'shall take into consideration whether these materials are present in such storm water runoff . . . above natural background levels.' Vol. 132 Cong. Rec. H10574 (daily ed. Oct. 15, 1986) Conference Report." 55 Fed. Reg. at 48032 (Nov. 16, 1990).

The receiving stream, Red Dog Creek, always has been contaminated by seeps and flow of streams across the high-grade natural ore deposits in the general area. The natural seeps and stream flows across the ore body have caused the well-documented natural contamination of the stream. Red Dog Mine operations have minimized the impact of such natural ore seeps and stream flows on Red Dog and Ikalukrok Creeks by collecting and treating many of them. However, there is nothing in the NPDES permit program that authorizes EPA to require a company, once it starts mining in an area, to undertake a commitment to remove all pre-existing, naturally occurring hydrologic contamination of the receiving stream from ore bodies that has existed for thousands of years.

It is also unfair to include seeps from ore in the Red Dog Mine area as "mine drainage" because such seeps were not within the 1978 and 1982 cost calculations and regulatory development documents for determining the cost of complying with the Part 440 regulations, and thus could not be required by Part 440.[57]

5.G

The definitions (V.H and V.I.) and provisions (I.C.3, I.C.4 and I.C.5) relating to collection of seeps should be modified.

To the extent EPA is concerned about discharge of seepage from disturbed ores in the pit area where ores are being extracted, this is apparently addressed by the language defining "Dirty Water Ditch" and "Dirty Water Sump" at page 39 of the draft permit. These are referring to what is more appropriately termed on the diagrams for this NPDES permit as the "Mine Drainage Collection System" ("Dirty Water Ditch") and the "Mine Drainage Collection Dam" ("Dirty Water Sump"). EPA Region 10 is seeking to assure that this mine drainage from the ore area (which is commingled with some seeps in the area, thus turning these seeps into mine drainage by virtue of the commingling principle) be discharged only if it meets the applicable limitations in the permit. Thus, I.C.3, I.C.4 and I.C.5 all relate to the Mine Drainage Collection System that collects the mine

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The 1987 CWA amendments, and the requirement that TCAK be responsible for an addition of pollutants through a point source, make it clear that TCAK is not responsible for such natural background contamination. EPA Headquarters has noted
"[M]ining sites typically have background levels that are naturally distinct from the surrounding areas. This is due to the geologic characteristics that makes them valuable as mining sites to begin with." 55 Fed. Reg. at 48032 (Nov. 16, 1990).
To the extent any language in the draft NPDES permit could be read as requiring TCAK to be responsible for such natural contamination, this would be illegal.

[57]In the 1998 Federal Register clarification of discharges covered under Part 440 and those under 1222.26, EPA Headquarters expressly noted that any seeps from active mining areas for which TCAK might have responsibility still are not under Part 440. EPA Headquarters referred to such seeps as "cases where there is a dry weather discharge outside the scope of the Guidelines." 63 Fed. Reg. at 42539. If such a seep occurs and TCAK is legally considered to be the point source discharger, this would be outside the Part 440 Guidelines but could not be discharged by TCAK unless in accordance with this permit's limitations.

drainage from the extraction location (other than that retained in the pit) and directs it to the retention system at the Mine Drainage Collection Dam, where it is then routed to the tailings impoundment where it is managed in accordance with the discharge limitations in the permit.

Currently, those provisions in the draft permit read as follows:

"V.H. "Dirty Water Ditch" is the collection channel for the ore body seeps.

V.I. "Dirty Water Sump" is the pit into which the Dirty Water Ditch flows.

I.C.3. Mine seepage from the ore site shall be collected by the Dirty Water Ditch. The water in the Dirty Water Sump shall be:

a. pumped into the tailings impoundment; or

b. retained until it can be treated.

I.C.4. When water in the Dirty Water Sump is pumped into the tailings impoundment, the pumped volume shall be recorded. The total volume pumped for each month shall be recorded and reported with the DMR for that month.

I.C.5. The permittee shall ensure that the water in the Dirty Water Sump does not leak into Red Dog Creek."

These provisions should be rephrased so that they achieve the legitimate objectives and requirements of the NPDES permit program which is to assure that mine drainage (including these commingled seeps from this active mining area) meets discharge limitations, without the use of more expansive terms than those authorized by the Clean Water Act NPDES program.

The draft permit language should be revised as follows to more accurately characterize the Red Dog Mine water management system and the NPDES permit requirements:

V.H. "Mine Drainage Collection System" is the collection channel (ditch) for the certain mine drainage, including any ore body seeps collected and commingled here. [page 39 of NPDES draft]

V.I. "Mine Drainage Collection Dam" is the dam and the impoundment it creates into which the Mine Drainage Collection System flows. [page 39 of NPDES draft]

I.C.3. The mine drainage from the ore site (including commingled seeps) shall be collected by the Mine Drainage Collection System, to the extent not retained in the pit. The water collected at the Mine Drainage Collection Dam shall be:

a. pumped into the tailings impoundment; or

b. retained until it can be treated or otherwise discharged in accordance with permit terms and conditions. [Page 13 of NPDES draft]

I.C.4. When water in the Mine Drainage Collection Dam impoundment is pumped into the tailings impoundment, the pumped volume shall be recorded. The total volume pumped for each month shall be recorded and reported with the DMR for that month. [Page 13 of NPDES draft][58]

I.C.5. The permittee shall not discharge water in the Mine Drainage Collection System into Red Dog Creek except in compliance with this permit. [Page 13 of NPDES draft]

EPA Region 10 may legitimately request that all mine drainage from the extraction area be handled appropriately and that it be discharged only as authorized under this permit. The above-suggested rewrite of the draft permit language retains and correctly states requirements that apply to such mine drainage, but eliminates any ambiguous terms or other language that would go beyond the scope of this permit.

One of the reasons for making the suggested changes is to clarify the use of the ambiguous terms "leak" and "seep." Both are problematic in terms of the scope of Part 440 and in terms of the scope of the NPDES program.

First, as previously noted, any naturally occurring seeps and leaks are not the responsibility of TCAK unless such seeps and leaks are commingled with mine drainage.

Second, only those discharges studied and cost-evaluated within the Part 440 rulemaking and litigation over scope are considered to be mine drainage, and those discharges do not include these seeps and leaks. Thus, it is improper to use different terms in applying containment requirements for mine drainage that would potentially sweep waters into the permit that are not contemplated by Part 440 in the rulemaking. For example, these terms arguably could be read to encompass a groundwater connection to a receiving stream. That would clearly be beyond the scope of the Part 440 ELGs that were developed, and so EPA may not subject those connections to an ELG-based capture and containment requirement. Just as EPA recently stated with respect to another set of ELG regulations:

> *"EPA believes that requirements limiting the discharge of pollutants to surface water via groundwater that has a direct hydrologic connection to surface waters are beyond the scope of today's ELGs.*
>
> *Furthermore, EPA recognizes there are scientific uncertainties and site specific considerations with respect to regulating discharges to surface water via groundwater with a direct hydrologic connection to surface water. EPA also recognizes there are conflicting legal precedents on this issue."*

[58] Note that TCAK is objecting to the permit requirement to record and report, in the monthly DMR, the pumped volume of mine drainage to the tailings impoundment (mine sump flow rate) in different comment.

ELGs do not cover groundwater discharges unless the ELG expressly covers them. In the case of Part 440 regulatory development, there was no intent to address groundwater issues whatsoever.[59]

As EPA notes, there are many court cases stating that EPA cannot regulate subsurface percolation and that the state programs on groundwater quality protection have jurisdiction over those concerns, not EPA. To the extent EPA asserts jurisdiction over groundwater, it is generally under the Safe Drinking Water Act (SDWA), not the CWA.[60] Where EPA has sought to exert its jurisdiction, it does so only where there is a perceived direct hydrologic connection and usually some indication of a problem with receiving stream quality that can be attributed to such subsurface direct hydrologic connection. Groundwater discharges are never regulated under an ELG unless the ELG expressly addressed such an issue, which 40 CFR Part 440 did not.

There is no indication of undue losses to groundwater at TCAK facilities. In fact, the opposite is the case.[61] The water balances show an excess of buildup of water in the tailings pond, for example, as opposed to unexplained losses of water that would be consistent with significant subsurface losses.[62]

5.H

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[59] In fact, at the Ray Mine which was the basis for the Part 440 ELGs, EPA intentionally found percolation ponds with subsurface disposal to be entirely consistent with the ELGs and not covered by the ELGs.

[60] In a Memorandum from the EPA General Counsel (Joan Z.Bernstein) to the Director of the Water Division at Region II, included on EPA's website guidance at http://www.epa.gov/waterscience/library/wqstandards/underground.pdf, the following is stated:

> "1. General Rule: The CWA Does Not Extend to Groundwater.
>
> Generally, EPA's authority under the CWA is limited to surface waters. While Section 502(7) defines "navigable" waters broadly to include all waters of the United States, the legislative history shows that Congress did not intend to stretch navigability so far as to encompass underground waters. Both the Senate and the House rejected such an approach.
>
> * * *
>
> We once took the limited position that EPA could regulate a plant's subsurface discharge if that plant were also discharging to surface waters. Even this limited position was rejected by the Fifth Circuit in Exxon v. Train, 554 F. 2d 1310 (5th Cir. 1977).... [W]e now accept the Fifth Circuit's decision as controlling in light of the Safe Drinking Water Act's coverage of underground waters. 43 Fed. Reg. 37081, August 21, 1978."

[61] A study was performed by TCAK at EPA's request that confirmed that the permafrost subsurface conditions at Red Dog result in a subsurface, permanently frozen "ice" barrier that effectively prevents subsurface migration of tailings water to a stream.

[62] If, at some point over the course of the next permit cycle, EPA Region 10 received any data showing a likelihood of some subsurface seepage issue over which Region 10 might assert jurisdiction, then a seepage study might be appropriate for the following permit cycle as was done in permit condition I.C. on page 18 of the Lucky Friday Mine NPDES Permit ID-000017-5, http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319/$FILE/Hecla_Lucky_Friday_Final_Mod_Permit.pdf. Since there is no such indication of a problem at TCAK facilities, this is not appropriate in this case.

The provisions (I.C.6, I.C.7 and I.C.8) should similarly be modified.

The same change in language is also appropriate with respect to the handling of water in I.C.6, I.C.7, and I.C.8. The draft permit language reads:

> *"I.C.6 Water in the Seepage Pond and related seepages, at the base of the tailings impoundment dam, shall be pumped back into the tailings impoundment, pumped to the high density solids treatment facility, or recycled through the mill.*
>
> *I.C.7. The permittee shall ensure that water in the Seepage Pond does not leak into Red Dog Creek.*
>
> *I.C.8. The permittee shall ensure that water in the tailings impoundment does not leak into Red Dog Creek. The permittee shall immediately pursue corrective actions if any water in the tailings impoundment leaks into Red Dog Creek."*

For all of the reasons discussed in the previous section, it would be appropriate to modify these provisions as well. Suggested language is as follows:

> I.C.6 Water in the Seepage Pond and related seepages, at the base of the tailings impoundment dam, shall be pumped back into the tailings impoundment, pumped to the high density solids treatment facility, or recycled through the mill or reused as otherwise appropriate.
> I.C.7. The permittee shall not discharge water in the Seepage Pond into Red Dog Creek except as authorized pursuant to this permit.
> I.C.8. The permittee shall not discharge water in the tailings impoundment into Red Dog Creek except as authorized in this permit.

One of the reasons for making the suggested changes is to clarify the use of the ambiguous terms "leak" and "seep." Both are problematic in terms of the scope of Part 440 and in terms of the scope of the NPDES program.

First, as previously noted, any naturally occurring seeps and leaks are not the responsibility of TCAK unless such seeps and leaks are commingled with mine drainage.

Second, only those discharges studied and cost-evaluated within the Part 440 rulemaking and litigation over scope are considered to be mine drainage, and those discharges do not include these seeps and leaks. Thus, it is improper to use different terms in applying containment requirements for mine drainage that would potentially sweep wastewaters not contemplated by Part 440 in the rulemaking. For example, these terms arguably could be read to encompass a groundwater connection to a receiving stream. That would clearly be beyond the scope of the 40 CFR Part 440 ELGs that were developed, and so EPA may not subject those to an ELG-based capture and containment requirement. Just as EPA recently stated with respect to another set of ELG regulations:

"EPA believes that requirements limiting the discharge of pollutants to surface water via groundwater that has a direct hydrologic connection to surface waters are beyond the scope of today's ELGs. Furthermore, EPA recognizes there are scientific uncertainties and site specific considerations with respect to regulating discharges to surface water via groundwater with a direct hydrologic connection to surface water. EPA also recognizes there are conflicting legal precedents on this issue."(68 Fed. Reg. at 7216, February 12, 2003)

ELGs do not cover groundwater discharges unless the ELG expressly regulates it. In the case of 40 CFR Part 440 regulatory development, EPA did not address groundwater issues.[63]

As EPA notes, there are many court cases stating that EPA cannot regulate subsurface percolation and that the state programs on groundwater quality protection have the jurisdiction over those concerns, not EPA. To the extent EPA asserts jurisdiction over groundwater, it is generally under the SDWA, not the CWA.[64] Where EPA has sought to exert its jurisdiction, it does so only where there is a perceived direct hydrologic connection[65] and usually some indication of a problem with receiving stream quality that can be attributed to such subsurface direct hydrologic connection. It is never under an ELG unless the ELG expressly addressed such an issue, which 440 did not.

There is no indication of undue losses to groundwater at TCAK facilities. In fact, the opposite is the case. The water balances show an excess of buildup of water in the tailings pond, for example, as opposed to unexplained losses of water that would be consistent with significant subsurface losses.[66]

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[63]In fact, at the Ray Mine which was the basis for the Part 440 ELGs, EPA intentionally found percolation ponds with subsurface disposal to be entirely consistent with the ELGs and not covered by the ELGs.

[64]In a Memorandum from the EPA General Counsel (Joan Z.Bernstein) to the Director of the Water Division at Region II, included on EPA's website guidance at http://www.epa.gov/waterscience/library/wqstandards/underground.pdf, the following is stated:

> "1. General Rule: The CWA Does Not Extend to Groundwater.
> Generally, EPA's authority under the CWA is limited to surface waters. While Section 502(7) defines "navigable" waters broadly to include all waters of the United States, the legislative history shows that Congress did not intend to stretch navigability so far as to encompass underground waters. Both the Senate and the House rejected such an approach.
> * * *
> We once took the limited position that EPA could regulate a plant's subsurface discharge if that plant were also discharging to surface waters. Even this limited position was rejected by the Fifth Circuit in Exxon v. Train, 554 F. 2d 1310 (5th Cir. 1977).... [W]e now accept the Fifth Circuit's decision as controlling in light of the Safe Drinking Water Act's coverage of underground waters. 43 Fed. Reg. 37081, August 21, 1978."

[65]As previously noted, at great expense TCAK already conducted such a study which confirmed the lack of any subsurface hydrologic connection because of the permafrost barrier that exists in this location many miles north of the Arctic Circle.

[66]If, at some point over the course of the next permit cycle, EPA Region 10 received any data showing a likelihood of some subsurface seepage issue over which Region 10 might assert jurisdiction, then a seepage

6. STORM WATER

6.A

The definition of storm water in the permit should be made consistent with the law and regulations.

The second sentence in the draft permit definition of storm water on pages 40-41 states that:

> *"Runoff from waste rock piles, ore and sub-ore piles, spent ore piles, overburden, unreclaimed disturbed areas and other active mining areas constitutes 'mine drainage,' not storm water."*

The draft permit thus is excluding traditional industrial storm water (not subject to 40 CFR Part 440 flow limitations and instead regulated under 40 CFR 122.26) from the definition of storm water. EPA seeks to place such storm water into the category of "mine drainage" by requiring in I.C.2 that "[t]he permittee shall ensure that precipitation falling on the overburden stock pile shall be directed into the tailings impoundment."

This draft permit requirement that TCAK convert 40 CFR 122.26(b)(14) industrial storm water into mine drainage directly contradicts EPA Headquarters' policy and the regulations. As EPA Headquarters noted in the Federal Register, in order to resolve a lawsuit brought by the National Mining Association over the scope of the Part 440 effluent limitations, this very same interpretation (that a NPDES permit should require overburden runoff to be converted to mine drainage in all cases) was originally incorrectly advanced by EPA Headquarters in the 1995 MSGP. EPA Headquarters had attempted to set out in a Table G-4 a clarification consistent with that used by the draft permit for TCAK. EPA had to admit that was incorrect, and set forth a corrected guidance and corrected Table G-4:

> *"Today's interpretation and guidance describe a distinct call of discharges that was not apparent from the face of Table G-4 when the Agency published the Multi-Sector Permit. Specifically, today's interpretation identifies some discharges that could have been interpreted to be 'mine drainage' under the plain language of the Guidelines and ineligible for coverage under the ore mining and dressing portion of the Multi-Sector General Permit (and under Table G-4) even though the Agency did not evaluate the technological feasibility and cost impacts of*

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study might be appropriate for the following permit cycle as was done in permit condition I.C. on page 18 of the Lucky Friday Mine NPDES Permit ID-000017-5, http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319/$FILE/Hecla_Lucky_Friday_Final_Mod_Permit.pdf. Since there is no such indication of a problem at TCAK facilities, this is not appropriate in this case.

diverting drainage from those sources into the active mining area when it developed the Ore Mining and Dressing Guidelines. Based on today's clarification, such an interpretation would be inaccurate because EPA did not require diversion of flows from outside the active mining area for treatment. For this class of discharges described by today's notice, i.e., those from overburden and/or waste rock sources that do not combine with mine drainage not otherwise subject to the Part 400 regulations, authorization under a EPA general permit for storm water may be available..." (63 Fed. Reg. 42539 (August 8, 1998))

TCAK currently directs flows from the overburden stock pile into the tailings pond, commingling it with mine drainage and making it into mine drainage. The 1998 Table G-4 expressly states such commingling makes the overburden runoff into mine drainage.

At first glance, then, it seems that this comment regarding the definition of storm water is "much ado about nothing." TCAK does not contest that its commingled overburden precipitation must be handled in the same fashion as mine drainage. TCAK requests, however, that any permit language, such as that in the draft permit storm water definition's second sentence, that necessarily prevents Red Dog Mine from ever managing any precipitation from overburden, waste piles, etc. as industrial storm water regulated under 40 CFR 122.26, instead of as "mine drainage" under 40 CFR Part 440, is an illegal restriction of TCAK's rights to discharge such non-commingled precipitation as Part122.26 industrial storm water. If TCAK chooses to commingle such industrial storm water, then it becomes mine drainage. EPA cannot force, however, TCAK to take this industrial storm water out of one regulatory program where it may properly reside, and force TCAK to handle it under a different, often more stringent program for mine drainage.

TCAK has been directing all of its overburden runoff to the tailings pond making it into mine drainage. TCAK will continue to direct all of its overburden runoff to the tailings pond for the duration of this permit, thus discharging it in accordance with mine drainage. At some point, overburden piles could be reclaimed such that stormwater would be suitable for discharged under an industrial stormwater program. TCAK desires the flexibility to utilize such a program when appropriate and in compliance with stream quality standards.

As noted, the second sentence of the draft permit definition of "storm water" is inconsistent with the law and regulations, and expressly contravenes EPA Headquarters guidance on this issue. This second sentence should be deleted in its entirety.

6.B

The provision at I.C.2 requiring TCAK to ensure that overburden precipitation must be directed to the tailings impoundment should be modified to eliminate its mandatory nature.

The provision at I.C.2 should be modified. It presently states that:

"I.C.2.
The permittee shall ensure that precipitation falling on the overburden stock pile shall be directed into the tailings impoundment."

First, such a provision does not have a basis in law and expressly contravenes EPA Headquarters guidance after a suit in the 1990s by the National Mining Association challenged EPA's jurisdiction to require overburden precipitation to be commingled with mine drainage, which would then be subject to Part 440 effluent limitations:

"[T]he Agency did not evaluate the technological feasibility and cost impacts of diverting drainage from those sources into the active mining area when it developed the Ore Mining and Dressing Guidelines. Based on today's clarification, such an interpretation would be inaccurate because EPA did not require diversion of flows from outside the active mining area for treatment. For this class of discharges described by today's notice, i.e., those from overburden and/or waste rock sources that do not combine with mine drainage not otherwise subject to the Part 440 regulations, authorization under a EPA general permit for storm water may be available..." (63 Fed. Reg. 42539, August 8, 1998, emphasis added)

Indeed, EPA Headquarters stated further as follows:

"EPA published a notice in the Federal Register that clarified the scope of the Guidelines' applicability"

There is no legal basis for this provision, and it is inappropriate as a permit requirement. TCAK does not contest that, if the precipitation flow from its overburden areas is commingled with mine drainage, it then must be handled as mine drainage. If this is the intent of I.C.2, TCAK requests that the provision be rewritten as follows:

I.C.2. Precipitation falling on the overburden stockpile that is directed into the tailings impoundment shall be handled as mine drainage and shall not be discharged except in accordance with the permit limits for process wastewater discharges.

The point is that this NPDES permit cannot force TCAK to take industrial storm water regulated by 40 CFR122.26 and force it to be managed as Part 440 mine drainage. The Red Dog Mine should be permitted the legal option of managing storm water from overburden areas under the industrial storm water program, if it chooses not to commingle the storm water with mine drainage.

6.C

There are several types of storm water at the Red Dog Mine that theoretically could discharge to a water of the United States, if not otherwise managed or controlled to avoid such discharges. Under this permit, TCAK will manage each as appropriate, given EPA's regulatory programs for these types of storm water.

The first type of storm water generated at the Red Dog Mine is included in "mine drainage," as regulated under the technology-based effluent limitations adopted at 40 CFR Part 440. This is managed in a system that has been constructed, maintained and operated so as to keep process wastewater and "mine drainage" from reaching a water of the U.S. unless it meets discharge limits specified for Outfall 001. These limits properly and adequately protect receiving waters from harmful impacts in the process wastewater/mine drainage areas.

The second type of storm water is "storm water discharge associated with industrial activity," as defined in 40 C.F.R. Section 122.26 (b)(14), exclusive of the "mine drainage" already regulated under Part 440.[67] This industrial storm water discharge requires the preparation of an industrial storm water pollution prevention plan (SWPPP) in accordance with the guidance referenced in the draft NPDES permit. Best management practices (BMPs) for these areas will be developed by TCAK consistent with industrial storm water BMP guidance.

The third type of storm water generated at the Red Dog Mine is construction storm water, which can be discharged and requires management pursuant to a construction storm water SWPPP consistent with the construction guidance referenced in the draft permit. Construction BMPs will be utilized in these areas that meet the definition of construction sites.

There is a fourth type of storm water that may occur at Red Dog Mine, which is storm water associated with natural gas exploration. TCAK will manage this storm water under this permit consistent with the new Congressional provisions and new EPA regulations (currently proposed) for such gas exploration.[68] Appropriate storm water plans, consistent with those new requirements when finalized, will be developed.

Finally, there is a category of completely unregulated storm water that may be discharged. This storm water is exempt because it is uncontaminated by Red Dog Mine activities or is not within the definitions of mine drainage, industrial storm water, or

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[67]Unless commingled, these two types of "CWA-regulated" storm water are managed under separate NPDES regulatory programs, with "mine drainage" discharges being regulated under the traditional NPDES process wastewater discharge program and the "storm water discharge associated with industrial activity" being regulated under the NPDES storm water discharge program which requires use of storm water management practices.

[68]Proposed Amendments to the NPDES Regulations for Storm water Discharges Associated with Oil and Gas Exploration, Production, Processing, or Treatment Operations, or Transmission Facilities, 71. Fed. Reg. 894 (January 6, 2006).

construction storm water.69 TCAK will identify in its SWPPP, for each type of regulated storm water, the areas from which discharge pursuant to that SWPPP type is allowed. Each will be managed in accordance with the applicable requirements and guidance, as referenced in the permit.

6.D

The provisions in I.I.2.i. (iii), (iv) and (v) should be deleted.

On page 26 of the draft permit are three conditions [I.I.2.i. (iii), (iv) and (v)] which are not appropriate NPDES permit conditions and they should be deleted. These provisions seek to take regulatory programs for activities such as dam safety (iii), solid and hazardous waste management (iv) and spill prevention control and countermeasures (SPCC) (v) and make them all part of the NPDES permit. There is no legal authority that permits an NPDES permitting agency to incorporate by reference other federal and state environmental laws and regulations and simply make them all into NPDES permit requirements. The NPDES permit is not intended to be a "belt and suspenders" permit that can require an NPDES permittee to identify its legal requirements under other laws and regulations, and then have them all folded into this one NPDES permit.

These provisions should be deleted. The Response to Comments can make it clear that the requirements still exist for TCAK, but are appropriately regulated under the other laws and regulations.

7. GENERAL COMMENTS

7.A

TCAK requests EPA to delete the second paragraph of section I.A. in its entirety.

Section I.A., second paragraph – Given the in-stream TDS limits, how can Red Dog Mine discharge without free flow of water in Mainstem Red Dog Creek? This statement has no meaning in the context of when discharge is initiated. Without defining "free flow", this statement is overly vague and meaningless.

Item #5 in the state certification specifically indicates that the state does not require consultation prior to the initiation of discharge. The state recognizes that the mine will not commence discharge until there is sufficient stream flow such that the in-stream TDS limits can be achieved and instrumentation to monitor in-stream TDS levels as required by section I.A.7 can be effectively operated in the stream. The state has

[69]The 1987 Clean Water Act amendments and subsequent EPA regulations make it clear that this storm water is not, at least at present, subject to NPDES requirements (so long as it is not commingled with other regulated forms of storm water).

approved the initiation of discharge under the stream flow conditions in which discharge can actually be initiated.

This paragraph requires written notification to EPA within 24-hours of the initiation of discharge. What will EPA do with this information provided within 24-hours that it could not do if the information was provided in the DMR, which is required to be provided without any specific provisions in the permit? This compliance obligation imparts liability to the permittee without commensurate benefit to water quality, human health or the environment. Please delete the second paragraph of section I.A. in its entirety.

7.B

TCAK requests that monitoring of calcium and magnesium once per week from composite effluent samples be removed from the permit and monthly monitoring of "TDS anions and cations" be from composite samples as required by regulations.

Section I.A.1. Table 1. – This table requires the monitoring of calcium and magnesium once per week from composite samples and once per month from a grab sample (footnote #3). The fact sheet at page 15 indicates that TCAK requested the additional calcium and magnesium monitoring so that hardness can be calculated instead of measured. TCAK did not request this. In fact, TCAK's request was to avoid exactly what the table in the draft permit is requiring. TCAK pointed out that requiring the determination of hardness as its own outfall parameter was redundant to requiring the determination of calcium and magnesium in the effluent as specified in section I.A.8. of the current permit. Seven years of TDS composition (major anions and cations) and hardness monitoring definitively demonstrate that that the effluent composition of TDS and hardness are not variable and can easily be predicted through a correlation analysis based on monthly data. Further, EPA did not use any effluent hardness data in developing the draft permit. Even if it had used effluent hardness to determine effluent limits for hardness dependent metals criteria, given the level of hardness in the effluent, monthly hardness data is more than sufficient because of the low variability of effluent hardness.

TCAK objects to more frequent than monthly monitoring for any of the TDS-related constituents, including hardness. Section I.A.4. can remain unchanged, although TCAK questions why EPA needs the minimum, maximum and average. This appears to be data reporting for data reporting sake because effluent hardness data are irrelevant in how the draft permit was developed.

7.C

Since it is well known that hexavalent chromium does not occur naturally in any significant quantities, TCAK objects to the continued monitoring of total chromium in the effluent or at any ambient monitoring stations, especially at a once per week frequency.

Over the past five discharge seasons (2001), TCAK has sampled Outfall 001 for total chromium 111 times. Seventy-two (72) of those samples contained non-detectable amounts of chromium. The maximum concentration in the 38 samples with detectable amounts of total chromium was 5.68 µg/L.

Chromium occurs in two valence states; chromium III (trivalent) and chromium VI (hexavalent). Total chromium is the sum of both forms of chromium. Chrome III (the lower oxidation state) is the predominant naturally occurring form, such as in ore deposits, and chromium VI (the higher oxidation state) is a man-made form of chromium used in industries such as electroplating. The mine does not use any chemicals that contain chrome VI, and none of the mining processes can oxidize chrome III to chrome VI. Therefore, the vast majority of the total chromium in the Red Dog Mine effluent samples is chromium III with very little to no chromium VI present.

From October 2005 through February 2006, TCAK analyzed 13 samples from water treatment plant 1 (WTP-1) for total and hexavalent chromium. WTP-1 treats the same water with the same process as WTP-2 but provides slightly less treatment; it includes no sulfide addition for cadmium treatment and no sand filtration for the removal of particulate matter. WTP-1 effluent has very similar characteristics to the mine effluent with regards to speciated chromium. Of the 13 WTP-1 samples, all had non-detectable amounts of chromium VI, 10 had non-detectable amounts of total chromium, and three had detectable amounts of total chromium at levels < 0.5 ppb.

The 111 Outfall 001 samples collected over a 5-year period show that the level of total chromium in the effluent is roughly half of the most restrictive fresh water quality criterion for chromium species, which is for chromium VI.[70] Because chromium VI is a very small fraction of the total chromium in the effluent, there is no justification for weekly monitoring of total chromium in the effluent. In fact, given that there are no detectable amounts of hexavalent chromium in the effluent, there is no need for any monitoring of total chromium.

Since it is well known that chromium VI does not occur naturally in any significant quantities and Red Dog does not do any electroplating or engage in any other process which uses hex chrome, TCAK objects to the continued monitoring of total chromium in the effluent or at any ambient monitoring stations, particularly at a once per week frequency. This compliance obligation imparts liability to the permittee without commensurate benefit to water quality, human health or the environment.

7.D

TCAK requests that the limits for fecal coliform be removed from the permit based on a finding of no reasonable potential to exceed the water

[70] The chronic aquatic life water quality standard for chromium III is 188 ppb at 260 mg/L hardness and 269 mg/L at 400 mg/L hardness. The chronic aquatic life water quality standard for chromium VI is 11µg/L.

quality criteria for bacteria, based on the TSD methodology. Further, given the difference between the proposed effluent limits and the available monitoring data, monitoring for fecal coliform should be removed from the renewed permit.

Section I.A.1. Table 1. – Fecal coliform (FC) analysis has been preformed on the mine effluent once every other month during discharge since the effective date of the current permit. Since 2000, 17 FC samples have been analyzed. Fifteen of the samples were reported at 0 colony forming units (cfu)/100 milliliter (ml). The remaining two samples were reported at 1 cfu/100 ml. These results are in the Red Dog Mine DMRs. The draft permit limits for FC are a monthly average of 200 cfu/100 ml and a daily maximum of 400 cfu/100 ml. These data definitively demonstrate that between the chlorination in the mine sewage treatment plant (STP), the low pH in the tailings pond, and the very high pH in the water treatment facility, fecal coliform bacteria survival is negligible in the Red Dog Mine wastewater. Because the fecal coliform bacteria limit is not a technology-based limit, it is within EPA's discretion to remove these limits and monitoring requirements.

7.E

TCAK requests that the requirement to monitor for turbidity in the effluent be removed.

Section I.A.1. Table 1. – The draft permit requires turbidity monitoring of the treated mine effluent once per week. Turbidity data has been collected weekly for over 7 years. The fact sheet to the draft permit at page 54 states that the highest observed value of turbidity in the effluent is at least 12 times lower than the most restrictive water quality standard. The fact sheet states that EPA has no expectation that turbidity in the effluent could ever reach the most restrictive water quality standard, yet EPA continues to require weekly monitoring.

This compliance obligation imparts liability to the permittee without commensurate benefit to water quality, human health or the environment. TCAK objects to continued turbidity monitoring of the effluent, particularly at a frequency of once per week and requests that this monitoring requirement be deleted from the permit.

7.F

The monitoring frequencies specified in the draft permit for zinc and TSS is overly burdensome and should be reduced.

Section I.A.1. Table 1. – TCAK understands that the permit must contain limits on the mine effluent for zinc and total suspended solids (TSS) as they are ELG parameters in 40 CFR 440. TCAK further understands that the more restrictive of the technology based limits and water quality based limits must be used in the permit. However, because there is no reasonable potential for the effluent to exceed water quality

standards for zinc and TSS, the monitoring frequency should be reduced. Despite Red Dog Mine being a zinc mine, available data indicate that there is no significant variation of zinc and TSS in the treated effluent that justifies the proposed weekly monitoring.

This compliance obligation imparts liability to the permittee without commensurate benefit to water quality, human health or the environment. TCAK objects to weekly monitoring of the effluent for zinc and TSS and requests that the monitoring frequency be reduced.

7.G

The proposed monitoring frequency for organic priority pollutant scans (OPPS) is overly burdensome, based on the almost total absence of such pollutants in the Red Dog Mine effluent.

Since the effective data of the current permit, TCAK has conducted 24 Organic Priority Pollutant Scans (OPPS) at a cost of over $50,000[71] in analytical fees alone, not to mention the cost to collect and ship samples with short holding time from a remote site, which more than doubles the total cost. The results of the scans are in the permit application, addendums to the permit application, and DMRs, but can be summarized by stating that there are approximately 2000 non-detect results for the organic constituents in an OPPS. In all the OPPS conducted, there have been two (2) values measured that were above the method reporting limits. Neither of these constituents have water quality standards or were reported at a level of concern. As explained in the application addendum, neither of these chemicals is used at Red Dog Mine and they are both extremely common laboratory cross-contaminants.

This compliance obligation imparts liability to the permittee without commensurate benefit to water quality, human health or the environment. TCAK objects to the continued monitoring for OPPS, particularly at the frequency specified in the draft permit. An OPPS will have to be conducted for the permit renewal application 4.5 years after the effective date of the renewed permit, and this is sufficient to provide ongoing documentation that the effluent is free of these chemicals. The Red Dog Mine effluent has been thoroughly characterized and no significant planned changes to the process are anticipated or identified in the renewal application. Continued OPPS characterization at this frequency is simply a waist of money, time and effort. TCAK requests that the OPPS sampling be deleted from the proposed permit.

7.H

The analytes for organic priority pollutants analyses should be defined in the permit, if EPA declines to delete the OPPS monitoring requirement.

[71] EPA permit writer's manual indicates that OPPS will cost approximately $2,000 per sample.

Section I.A.1. Table 1. – EPA should define, reference and/or provide a list of analytes for the required "Organic Priority Pollutant Scan". If the scan contains analytes for constituents that are not used and have no potential to be present at the Red Dog Mine, such as PCB and pesticides, TCAK requests that EPA specify in the permit that these compounds are not required to be analyzed in the event that EPA does not remove the OPPS monitoring requirement as requested by TCAK.

7.I

Section I.A.1. Table 1. footnote 3 requires clarification.

Section I.A.1. Table 1. footnote 3. – Defining analysis of "TDS cations and anions", footnote 3 states, "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 measurements of alkalinity."

The permit should list the specific analytes required for "a standard and complete suite of those cations and anions…" The proposed language is too indefinite to constitute a permit requirement, because it could be misinterpreted to require analysis of all cations and anions in the wastewater, thus presenting a potential compliance issue.

TCAK objects to the retention of the wording "…but not limited to…" in this footnote. A permittee can never prove that it complies with this condition. If EPA is targeting any cation or anion other than those listed that is significantly "contributing to TDS" in the effluent, then such cations and anions should be explicitly identified in the footnote. As with all assumptions in a permit, if new information is acquired after the permit becomes effective, the permittee has the obligation to notify EPA so that the Agency may reopen the permit and correct any assumptions that are proven incorrect, as necessary. EPA should explicitly identify the cations and anions that are significantly "contributing to TDS" in the effluent and must be monitored to prevent an open-ended provision from creating a potential compliance issue.

There is no analytical method for "carbonates" in 40 CFR 136. The method for this analysis needs to be specifically identified in the NPDES permit. The statement, "[t]he carbonate analysis may be estimated based on direct measurements of alkalinity", is insufficient, because there is not an approved method or a method specified to guide how these calculations are to be performed. EPA has approved two methods for alkalinity analyses; EPA 310.1 and EPA 310.2. *Standard Methods for the Examination of Water and Wastewater* (18th Edition) Method SM 2320B provides for "Calculation of alkalinity relationships" that is capable of proportioning total alkalinity between carbonate alkalinity, bicarbonate alkalinity and hydroxide alkalinity, but this section is not included in the EPA approved methods (310.1 and 310.2).

TCAK recommends that the analysis of carbonates be changed to analysis for alkalinity, which is an approved method in 40 CFR 136. TCAK assumes when EPA

refers to "the carbonate analysis," it is referring to the calculation method for carbonate and bicarbonate alkalinity in SM 2320B. EPA should verify this assumption in the permit by explicitly identifying SM 2320B as the method that shall be used to measure carbonate and bicarbonate alkalinity. Review of alkalinity data collected since 2003 under the provisions of the current permit indicates that this change makes no real difference in determining anions "contributing to TDS."

7.J

Delete the "for example" sentence in section I.A.2.

The permit does not require the "for example" sentence in section I.A.2. The requirement is clear enough without the example.

7.K

EPA Method 300 should be allowed in the permit for all approved anions, not just chloride.

Section I.A.5.a. – The November 16, 2005, alternative test procedure (ATP) approval letter from William Riley to R.G. Scott, approves the use of EPA Method 300 for all anion analyses identified in "The Determination of Inorganic Anions In Water by Ion Chromatography." TCAK does not understand why the draft permit limits the use of EPA Method 300 to chloride analyses. TCAK anticipates being able to use EPA Method 300 for, at a minimum, chloride and sulfate analyses. TCAK requests that the word "chloride" be replaced with "anions," similar to the way that the word "metals" is used for EPA method 200.8 in the same sentence.

7.L

The method detection limits (MDLs) requested by TCAK were not randomly or arbitrarily selected; they were requested based on MDLs that can consistently and reliably be achieved when analyzing the mine effluent matrix.

Section I.A.5.b. Table 2. – While the Fact Sheet correctly states that TCAK requested the MDLs specified in the draft permit, TCAK is not clear as to whether EPA is proposing to include these MDLs in the final permit, or will continue with the current permit MDLs. Assuming that EPA is proposing these new MDLs, it should have been clarified in the Fact Sheet that these MDLs were requested based on contract laboratory recommendations from laboratories that are experienced in analyzing the complex mine effluent matrix.

When addressing any comments received concerning these requested or proposed MDLs, EPA should consider its own laboratory's performance when analyzing the Red Dog Mine effluent. Below is a statement from a January 14, 2004 letter from R.G. Scott

to Eva Chum (EPA Compliance Officer) regarding EPA's laboratory performance on Red Dog Mine effluent collected during a 2003 compliance inspection:

> *"Additionally, it should be noted that the EPA laboratory failed to report down to the permit required method detection limits for silver, aluminum, cadmium, chromium, copper, lead and selenium, or nearly half of the analyses conducted on the sample. Further, the EPA lab reported a non-detectable value for selenium in the effluent at over 2 times the permit limit for selenium, and non-detectable values of copper and cadmium within 3.18 times the permit limits."*

The TCAK contract labs recommending these MDLs consistently achieve significantly lower MDLs than EPA's laboratory. The MDLs requested by TCAK were not randomly or arbitrarily selected; they were requested based on MDLs that can consistently and reliably be achieved when analyzing the mine effluent matrix.

7.M

The terms, MDL and minium level (ML), should be defined in the permit.

Section I.A.5.d – Please define MDL and ML.

7.N

Selenium requires a ML as a Compliance Evaluation Level.

Section I.A.5.d – An MDL is the analytical level at which it can be determined with statistical validity (99% confidence level) that a specific constituent is present in a sample at a concentration greater than zero (*see* 40 CFR 136, Appendix B). An ML is the concentration at which an analytical method can quantify, within a specified degree of statistical confidence, the reported concentration of a specific constituent in a sample.

The fact sheet at page 16 states, "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." This statement is contrary to the intent of the language in section I.A.5.d., which identifies the interval between the MDL and ML as a region where reported values have a statistical level of uncertainty such that their reliability is insufficient to determine compliance. In other words, achieving MDLs below the effluent limitations does not necessarily assure accurate analytical results at the effluent limits or that an ML Compliance Evaluation Level is unnecessary.

This consideration specifically applies to the analysis of selenium. The "requested" MDL and existing permit MDL are the same (i.e., both are 2 µg/L). However, the ML compliance evaluation level of 6 µg/L has been removed from the draft

permit without any change to the MDL. As a rule of thumb according to EPA, the ML is 3.3 times the MDL. This criterion supports including an ML (compliance evaluation level) of 6 µg/L in the draft permit, which is the same ML Compliance Evaluation Level as that in the current permit.

Furthermore, the draft permit indicates that the AML for selenium is 4.23 µg/L, which is less than 6 µg/L. As stated in the previous comment, EPA's laboratory cannot achieve an MDL, let alone an ML, at levels two times greater than the current effluent limits for selenium. TCAK's contract laboratories can do better than this, but their performance does not justify the removal of the compliance evaluation level (ML) for selenium in the draft permit. TCAK requests that the ML of 6 µg/L for selenium be included the final NPDES permit. Additionally, since the MDL for weak acid dissociable (WAD) cyanide is the same as for total cyanide in the current permit, TCAK requests a 9 µg/L ML (compliance evaluation level) for WAD cyanide be included in the permit, if for any reason cyanide limits below the ML concentration are imposed in the renewed permit.

7.O

The permit should state that the lengths of the mixing zones described in the permit are approximate.

Section I.A.7.a.(1) and (2) – When defining the distance downstream that the mixing zones extend, please insert the word "approximately" in front of the numeric distances. TCAK provided these distances to EPA and ADEC, and they are approximate distances. The point of confluence between two streams is a difficult point to define and changes based on stream stage and from year to year. Furthermore, stream distances change as stream banks erode and other stream morphological changes occur, and as such these distances should be clearly identified as approximations so that they could never be construed as absolute distances.

7.P

The permit should clearly state that Station 151 is located at the end of the mixing zone in Red Dog Creek.

Section I.A.7.b. – Please insert "(Station 151)" at the end of the sentence just after ".... edge of the mixing zone in Main Stem Red Dog Creek", so that it is clear that Station 151 and the "edge of the mixing zone in Main Stem Red Dog Creek" are the same location. This is necessary because the current permit contains incorrect assumptions to the contrary, particularly at Station 150.

7.Q

The cited redundant statement should be deleted from the permit.

Section I.A.7.e. – Delete "… and the date and time of sample collection must be recorded" from the second sentence in this section. It is redundant to section II.E. of the permit, which requires that the date and time of all samples collected through requirements in the permit to be recorded.

7.R

Section I.A.7.e.(1) of the permit related to total dissolved solids requires some corrections and clarifications.

Delete all but the first sentence of this provision. This language is similar to that in the current permit, in which there was a mistaken assumption that Station 151 was not located at the downstream edge of the mixing zone in Red Dog Creek and that Station 150 was not located at the downstream edge of the mixing zone in Ikalukrok Creek.

Since TDS limits do not apply at Station 160 until July 25th, sampling for TDS should not be required until July 25th. There is an extremely large TDS data set currently existing for Station 160. It certainly is not necessary to monitor TDS at Station 160 except for compliance purposes after July 25th.

Item #6 in the State certification calls for TDS monitoring at Station 150 at a frequency of once per month not once per week. ADEC has authorized this reduction in monitoring frequency based on 184 laboratory determinations of TDS at Station 150 since May 2001. The maximum observed TDS at Station 150 is 788 mg/L. The State recognizes that with the in-stream TDS limits at Station 151 specified in the draft permit, there is no potential for TDS to exceed the 1000 mg/L limit at Station 150 in Ikalukrok Creek. TCAK objects to once per week monitoring at Station 150 and requests that the monitoring requirement be deleted from the permit.

This section requires weekly monitoring of the effluent for TDS using grab samples. Table 1 in section I.A.1. requires weekly monitoring of the effluent for TDS using composite samples. These separate TDS monitoring requirements are excessive and TCAK objects to this redundant effluent monitoring. TCAK requests that the effluent monitoring requirements in section I.A.7.e.(1) be deleted.

7.S

There is a simpler and more technically correct way to present the mass balance equations that are specified in the draft permit.

Section I.A.7.g.STATION 151 – If the expressions in (4) and (5) are substituted into the expression in (6) and algebraically reduced, the following simplified equivalent expression results:

$$Q_{allowable} = Q_E + (Q_{151(total)} (1500 - C_{151(total)})) / (C_E - 1500)$$

An attachment to these comments entitled "TDS Mass Balance Calculation - Control of Red Dog Mine Discharge" derives this equation and demonstrates that it is equivalent to the three equations in the permit. TCAK requests that (4) and (5) be deleted and the equation in (6) be replaced with the above equation. This provides the least complex presentation of the mass balance equation in its simplest terms and minimizes the potential for error associated with three separate equations. Furthermore, since a full derivation of the mass balance equations and associated assumptions are not provided in this section of the permit or anywhere else, the unnecessary intermediate equations in the draft permit make this section even more confusing and bulky.

A similar equation was suggested in the 2003 permit modification, but was dismissed by EPA citing the need to verify the calculated results. Because the same field measurements are variables in the simplified equation and the three equations in the draft permit, and because the three equations in the draft permit are equivalent to the single equation, EPA's response to the 2003 comment was incorrect. Verification of the calculated results can be accomplished using either set of equations; the derivation and application of the mass equation was misunderstood.

The same equation should be applied to Station 160 with the appropriate adjustment of variable names and TDS limits.

7.T

Section I.A.7.h. demonstrates that the linear regression analysis for the TDS-conductivity correlation was misunderstood.

This section was added to the 2003 modified permit as part of a response to comments and demonstrates that the linear regression analysis of the conductivity-TDS database was misunderstood.

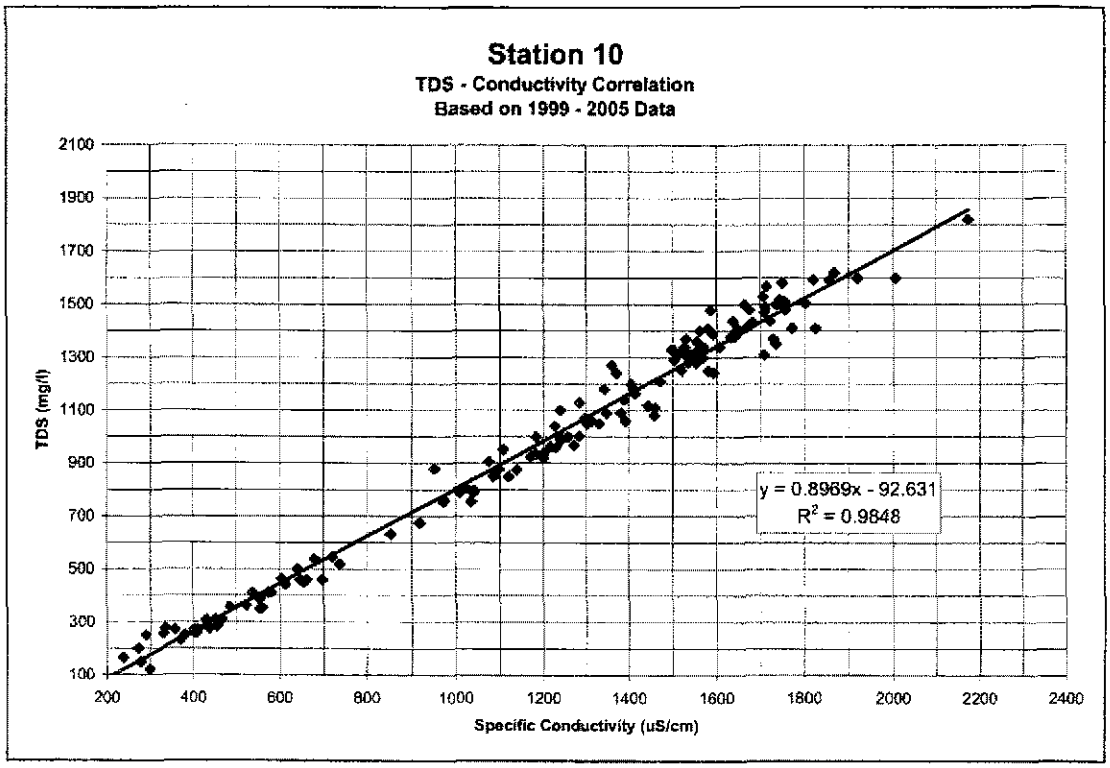
Section I.A.7.h.(1) – This section indicates that Station 151 and the end of the mixing zone in Red Dog Creek are different locations. As stated in the previous comment, Station 151 is the end of the mixing zone. This section should be corrected.

Section I.A.7.h.(1) and (3) – These data are already required to be reported in each DMR. This requirement should be deleted.

Section I.A.7.h.(2) and (4) – This comparison is already required in section I.A.7.f. This should be deleted.

When the "TDS/Conductivity correlation curves" are updated as new data are generated, the information used to calculate TDS concentrations (conductivity and temperature) at Stations 151 and 160 are compared to the TDS concentrations determined by laboratory analysis. The TDS/Conductivity correlation curve is a linear regression analysis of specific conductivity and laboratory measured TDS results, with the measured specific conductivity used as the independent variable (X) and the measured TDS used as

the dependent variable (Y). The goodness of fit or correlation coefficient (R^2) is a measure of how well the linear model fits the measured data, or in other words, how accurately TCAK can predict the actual concentration of TDS given measurements of conductivity and temperature.[72] Currently the R^2 for Station 151 is 0.9941. This means that TDS can be very accurately estimated from the measured conductivity and temperature data. The data required in Section I.A.7.h. are provided in the DMR when the correlations are updated, as well as a statistical evaluation of the linear model (i.e. R^2). Each time the correlations are updated with new data, a chart similar to the one shown below as well as the tabular data used to generate the chart is submitted in that month's DMR (for example, see October 2005 DMR).



When the comment, "Teck Cominco needs to supply the public with an analysis of the accuracy of their TDS model prediction and field confirmation of actual TDS concentrations in spawning areas" was submitted as a comment to the 2003 permit modification, the appropriate EPA response should have been that the correlation between the predicted and the measured TDS was highly accurate and this accuracy is confirmed and presented to the public in the DMRs every time that the correlations are updated. The response could have presented a chart, similar to the one shown above, and stated that the line represents the TDS that the linear "model" predicts at a specified conductivity and that the points shown on the graph are the measured TDS, at the

[72] In statistical terminology, R^2 is an estimate of the amount of the uncertainty in the linear relationship between the independent and dependent variables that is explained by the correlation of the two variables. An R^2 of 1.0 represents a perfect correlation between the variables; a value of zero represents no correlation.

reported conductivity. EPA should also have pointed out to the commenter that an R^2 of 0.9848, based on the large number of paired samples used in the correlation analysis, demonstrates that the confidence in the predictive relationship is very high. Furthermore, EPA should have identified the equation in the text box of the chart as the method that could be used to calculate TDS from any given specific conductance value. Instead, EPA's response to the comment was to require superfluous, burdensome and redundant reporting from TCAK. This reporting requirement should be deleted from this permit.

In addition to the correlation update data, TCAK already reports in its DMRs conductivity, temperature, stream flow, and calculated TDS measurements that are collected twice per day, in addition to measured weekly TDS laboratory results with corresponding measured conductivity and temperature. TCAK objects to the redundant and unnecessary reporting requirements specified in this provision of the permit and requests that they be deleted.

7.U

Real-time monitoring at Station 160 is not needed or useful and is an overly burdensome requirement.

As with Station 150, there is no potential to exceed the in-stream TDS limits at Station 160, given the TDS limits specified at Station 151. This fact was demonstrated in the document "In-Stream Control of TDS at Red Dog Mine" (attached) and in the documents used by the state to approve the site-specific criterion (SSC) for TDS in Mainstem Red Dog Creek. There is an additional year of data from 2005 to confirm the analysis presented in the attachment, wherein the 500 mg/L TDS limit at Station 160 was not exceeded when TDS was controlled at or below 1,500 mg/L at Station 151.

ADEC, in its certification of the draft permit, has required weekly sampling to ensure that the limit at Station 160 is not exceeded. TCAK requests that the requirements for real-time monitoring of TDS at Station 160 be removed from the permit. The only advantage of real-time monitoring is that the information can be used to control the effluent flow rate to ensure compliance with in-stream limits. However, as described in the attached document, the response lag time to Station 160 makes it infeasible to control effluent flow based on the TDS concentration at that location. Further, it is not needed when TDS is controlled at Station 151, as required by the draft permit. Because Station 151 controls the TDS in the stream system, the minimum effluent flow rate (end-of-pipe compliance for TDS) as calculated using the equations in section I.A.7g. will always be based on compliance at Station 151, particularly when the safety factors used by TCAK to control the discharge are applied to Station 151 (see attachment).

Maintenance of a remote real-time monitoring station is very resource intensive. Without valid justification, this requirement is overly burdensome and imparts liability to the permittee without commensurate benefit to water quality, human health or the environment. TCAK requests that this requirement be deleted from the permit.

7.V

Any single WET test lacks the precision to trigger resource intensive investigations.

Numerous documents written by EPA and federal courts conclude that given the inherent properties of bioassays, and particularly *C. dubia*, EPA should not base a required response on a single WET test result. This concept is explicitly applicable to resource intensive investigations such as a TRE and TIE.

For the past 10 years, TCAK has conducted dozens of TRE and/or TIE investigations with no resulting benefit. As described earlier in these comments, all of these studies were ultimately determined to be caused by the sensitivity of *C. dubia* to TDS. Given this WET monitoring history, TCAK requests the removal of the requirement to initiate a TRE if a single WET test exceeds permit limits or a TIE after two WET tests exceed permit limits. Instead, the permit should require an annual statistical evaluation of the toxicity trends of the effluent based on the results from an entire discharge season. If the trend analysis indicates a statistically significant (more than analytical noise) increase in toxicity from year to year, then a TRE/TIE work plan would be required. This approach would identify toxicity trends that might not exceed permit limits, thus possibly preventing the potential for future violations.

The TRE work plan would specify how and when the analysis would be performed and what work would be required during the post discharge season and during the next discharge season. EPA could specify that it would require approval of the TRE work plan, with the provision that it is automatically approved if EPA takes no action on the work plan within 60 days after its submittal. Given the long history of toxicity testing and TRE/TIE work on the Red Dog effluent, that the effluent is drawn from a 4 billion gallon well-mixed reservoir, and that the water treatment plant is operated within very tightly controlled parameters, the theory of toxicity "spikes" should be abandoned and the focus should be toward longer term trend analyses of effluent toxicity.

7.W

Section I.G.4 is redundant and contains requirements outside of TCAK's control. Please remove the entire section from the permit.

This provision requires that TCAK submit the full WET test report to EPA by the end of the month that the DMR is submitted. Nearly all of the information that is required to be submitted in the WET test report is required to be submitted in the monthly DMRs. However, providing the full WET report by the end of the month that the DMR containing the WET test results is problematic.

The toxicology laboratories often do not provide these reports to TCAK in the time frame required by the permit. The reports are lengthy and quite involved and are frequently delayed by analyses that are not required by the permit, but are necessary for

the WET test reports. Therefore, the reporting time provision in the draft permit presents TCAK with potential compliance liability for a requirement over which it does not have complete control. An additional factor is that the Red Dog Mine does not have a post office. The reports from the toxicology laboratories have to be sent to the mine and then copied and mailed to EPA by transporting them by air to a U.S. post office. Given the fact that air transport weather delays can last for 10 days or more, this requirement is overly burdensome and should be revised.

Finally, in subsection d of I.G.4, what is the "chronic manual chapter"? There does not appear to be any need for section I.G.4., please delete it from the permit.

7.X

Section I.G.6. incorrectly specifies the requirement to conduct a TIE.

Section I.G.6. states "If Chronic toxicity is detected in the effluent in any two of the toxicity tests conducted during the discharge season....." Chronic toxicity to *C. dubia* is detected in all effluent toxicity tests because of the TDS of the effluent. In the event that the permit continues to include WET limits, the requirement for a TIE must be linked to a trend of WET test results that exceed the relevant limits, as described earlier in these comments.

7.Y

The Red Dog Mine is a remote site. Special considerations must be made in the permit for the submittal of monthly DMRs.

The current permit requires the submittal of the DMRs by the 15th day of the following month.[73] The draft permit requires submittal of the DMRs by the 10th day of the following month. TCAK requests that the DMRs be submitted by the 20th day of the following month. Given the remoteness of the mine and the sampling frequency required by the draft permit, this revision of the reporting requirements is justifiable.

Because the nearest post office is over 100 miles away, and the mine cannot postmark letters, it may sometimes be impossible to comply with this reporting requirement. Weather can prevent the shipment of mail from the mine for as long as 10 days or more and therefore TCAK has, following guidance from EPA compliance officers, been faxing the signed and certified DMR cover letters to the compliance officer to indicate submittal of the reports in a timely manner. TCAK wishes to continue this reporting practice for the renewed permit, and requests that it be incorporated into the permit language. TCAK does not believe that it is possible to achieve consistent compliance with Section II.B. as written, regardless of the DMR due date. Therefore, TCAK requests that the permit specifically authorize facsimile transmittal of the DMR cover letters within a specified time period (20th) following the month sampled, with a postmarked copy to be provided as soon as practicable.

[73] The month that follows the month when the samples were collected.

7.Z

The draft permit assumes that all continuous monitoring data are stored on strip charts. Modern instrumentation typically records digital data on electronically-accessible media. The permit condition needs to be revised to allow the use of multiple types of media for storage of continuous monitor data.

Section II.F. of the draft permit states that records of "original strip chart recordings for continuous monitoring instrumentation" must be retained. This statement assumes that strip charts are the only method used for recording the results of continuous monitoring. The requirement could also be interpreted to mean that digitized strip charts or scanned strip charts are not acceptable records for continuous monitoring data.

Modern continuous monitoring equipment typically records digital data to a local or off-site computer, where it is stored on magnetic or optical media. Digital data records are efficient and easily accessible, and should be encouraged.

TCAK requests that EPA revise Section II.F. to explicitly authorize electronic storage of continuous monitoring data. The revision should also allow strip charts to be digitized or scanned for records storage to meet the permit recordkeeping requirements.

7.AA

The description of how split sample results are supposed to be handled is confusing. TCAK suggests a simpler wording and moving the provision to the reporting requirements section.

The draft permit includes a new provision on the handling of split sample results (Draft Permit, I.A.5.e, B.3.g). When samples are split and valid test results are obtained from each, the results are to be averaged. TCAK agrees with this policy, but believes the wording in the draft permit is confusing. In addition, the policy should state that the type of average should be appropriate for the parameter. For example, the average for fecal coliform results should be the logarithmic mean. The logarithmic mean is already included in the definition of fecal coliform in the draft permit (Part V.K); however, it would be helpful to include a general statement in the split sample policy. TCAK's suggested rewording of the policy is given below. Also, TCAK suggests that instead of having the same policy in two different sections of the permit (I.A. Outfall 001 Limitations and Monitoring Requirements, I.B. Construction Camp Site Requirements (Outfall 002)), that it be moved to Part II. Monitoring, Recording and Reporting Requirements.

Suggested rewording of split sample policy:

When split samples are analyzed, all results that are considered valid will be averaged and this average will be taken as the sample value for compliance

calculations and reporting. A valid result is one from a sample that is representative of the discharge, and has been properly collected, preserved, and analyzed by methods specified in the permit. For example, if a sample collected on a given day is split into two samples and analyzed separately, the two analytical results (when valid) are averaged, and the average is the value reported for the daily discharge. If a split sample result is determined to be invalid, it will not be used in any average. Split samples are reported as a single, average value regardless of the number of times a sample is split. When determining the maximums and averages for the month, the daily values may be a mix of sample results from unsplit samples and averages from split samples. The type of average should be appropriate for the parameter. For example, for fecal coliform, the average shall be calculated as the logarithmic mean.

7.BB

The permit provisions relating to use of dust suppressant water should be made consistent with legal requirements and modified to encourage recycling of reclaimed water as opposed to the use of fresh water.

An NPDES permit regulates discharges of pollutants to waters of the U.S., and such discharges shall be consistent with legally applicable limitations (such as TBELs and WQBELs for process wastewater). Provisions in the NPDES permit must be based on a legal requirement to manage discharge in a certain fashion, or those provisions are not authorized by the CWA. The goal of the NPDES permit is to appropriately regulate discharges to waters of the U.S.

Two provisions in the draft permit relate to the use of wastewater for dust suppressant purposes, both of which should be modified. Currently, the draft permit states the following:

> *"I.C.9. The permittee may use treated wastewater as a dust suppressant on roads, pads and airport runways within the jurisdiction of this permit. Best management practices shall be used to insure that all waters sprayed do not drain into waters of the U.S. The permittee shall not use untreated wastewater as a dust suppressant.*
> *I.C.10. The permittee shall not use treated wastewater as a dust suppressant on the haul road to the port."*

The provision in I.C.10 should be deleted altogether as the haul road to the port is not part of this NPDES permit. The haul road is covered by a separate NPDES permit and whatever requirements exist with respect to that facility need to be in that permit. It is inappropriate to set limitations in one facility's NPDES permit as to what can be done on lands not within the permit, especially when those lands are already subject to a different NPDES permit (with its own requirements for the haul road in question).

The last sentence in I.C.9 also should be modified to read as follows:

> The permittee shall not use untreated wastewater as a dust suppressant, except in locations where the wastewater and any commingled storm water will be collected and handled as mine drainage (subject to all the requirements of this permit prior to any discharge of such mine drainage).

What this change does is allow the use of reclaimed water and other untreated wastewater in the mine operational areas. From an economic and pollution prevention standpoint, this is entirely logical.

The legitimate EPA concern with restricting the use of untreated mine drainage and tailings reclaim water for dust control is that wastewater that is subject to 40 CFR Part 440 requirements could subsequently run off with storm water discharges into waters of the U.S. without meeting the management requirements under this permit for such process wastewater. If, however, the use of such recycled mine drainage and reclaimed water is only in areas where the mine drainage (i.e, associated storm water) is captured, then this legitimate EPA concern is appropriately addressed. There is no legal basis whatsoever to prohibit the reuse of untreated water unless such reuse would result in an impermissible discharge. For this reason, the suggested change must be made.

Specifically, in the Fact Sheet, EPA indicates that the prohibition of the use of untreated "mine water" is to prevent the transport of pollutants contained in untreated wastewater to sites that are not sloped towards the tailings impoundment. Given that nearly all of the mine drainage from the pit (untreated mine water) originates as precipitation that falls into the pit and subsequently accumulates "pollutants" from contact with pit rock, it appears overly conservative to assume that by prohibiting the reapplication this same water to this same pit rock, transport of these pollutants would be minimized. Transport of these pollutants is best minimized through BMPs and not by limiting the methods by which wind born transport can be controlled. TCAK supports EPA's position in this matter, but believes thorough and effective BMPs serve the greater good more than a complete ban on a potentially effective option for dust suppression. Realistically, very little pit equipment, the assumed transporter of the pollutants, ever leaves the pit or a small area on the far edge of the mill pad.

In addition, from a pollution prevention standpoint, it makes no sense to prohibit TCAK from safely recycling mine drainage and reclaimed water where no prohibited discharge occurs. If this is not allowed, TCAK will have to treat the water before it is used for dust suppression, creating additional air pollution as energy is expended in such treatment, and more use of chemicals in the water treatment process. This makes no sense from an environmental perspective. TCAK's other choice is to pull more fresh water for use as dust control in the mine operating area, thus converting even more water into mine drainage and contaminating more water with mine contaminants. Again, this makes no sense from a pollution prevention standpoint. Pollution prevention relies on recycling to reduce the volume of wastewater generated, and legitimate recycling of reclaimed water and mine drainage water in the mine area should be encouraged, not discouraged.

It is also an economic waste to expend funds on treating mine drainage or reclaimed water, only to put it back down on exposed benches in the mine where it becomes mineralized again, and then must be treated again. It makes much more sense to recycle this water for dust suppression within the active mining area.

7.CC

Provision I.C.11 should be deleted from the permit or reworded because it is vague, beyond the scope of the Clean Water Act, is without equivalent precedent in other Region 10 mining permits, and it implies that this permit process is inadequate to meet the requirements of the Clean Water Act.

The draft permit provision I.C.10 on page 14 states as follows:

> *"I.C.11. The permittee shall ensure that operations at Red Dog Mine do not cause downstream water quality problems, such as the exclusion of fish or fish kills in Ikalukrok Creek or the exclusion of fish migrating up the North Fork of Red Dog Creek."*

TCAK wants to emphasize that its operations are conducted with the goal of protecting water quality and it is also well documented that its operations have greatly enhanced fish uses in the Mainstem of Red Dog Creek. That said, there are a number of reasons why this provision should be deleted, or substantially re-worded. First, this permit can only regulate discharges that require NPDES permits under the CWA. The broad language here would include "downstream water quality problems" that are not related to regulation by NPDES permits as authorized by the CWA. Only discharges of pollutants as those terms are CWA defined are regulated by an NPDES permit. There are other regulatory programs that address non-discharge related threats to water resources, such as the Clean Air Act or RCRA.

Second, the term "problems" is vague and TCAK does not have fair notice of what is meant by this provision. There are no EPA Office of Water or Region 10 guidance documents that would explain to a permittee what its obligations are when a permit provision says don't cause any downstream water quality "problems."

Third, there is a permit shield that generally applies when an NPDES permittee receives a permit. The concept of the permit shield is that the permittee and the agency have spelled out the requirements with the permit limits and conditions. The permittee is then given a shield from requirements not spelled out in the permit. The proposed provision in this draft permit negates the permit shield TCAK is entitled to, because any "problem" is automatically a violation of the permit. This is impermissible.

Fourth, the discussion of fish kills or fish exclusion is contrary to the terms of this permit. There have been hundreds of thousands of dollars spent by TCAK to obtain

agency concurrence that appropriate permit limits have been developed and set to protect fish and fish migration. Studies of spawning, bioassessments, site specific criteria, limitations on the time of discharge, etc., all have been exhaustively completed and negotiated so that appropriate permit terms (of which TCAK as the permittee has fair notice) have been created and proposed in this permit process. The prevention of fish kills and the issue of fish exclusion have been extensively addressed throughout this permit process. To now state that all of that effort, all of these limits, and all of this monitoring is insufficient and that some other vague method of predicting if these other "problems" should be divined by the permittee is simply unfair and beyond the scope of this permit.

Finally, this provision is an open invitation for outside parties to file a CWA lawsuit based on their own assessment of what constitutes a water quality "problem." There is already a history of third party litigation over the current NPDES permit, and a vague provision such as this is inappropriate.

For all of these reasons, this provision must be deleted from the draft permit. In the alternative, if EPA is not inclined to delete the provision, then it should be modified as follows to make it consistent with the scope of an NPDES permit:

> I.C.11. Discharges from operations at Red Dog Mine shall not cause downstream water quality problems, such as the exclusion of fish or fish kills in Ikalukrok Creek or the exclusion of fish migrating up the North Fork of Red Dog Creek.

7.DD

A compliance evaluation level of 100 ug/l should be specified for TRC at Outfall 002.

Table 3 presents the limits for Outfall 002. In table 3 there are limits for total residual chlorine (TRC). The requested (hopefully proposed) MDL for TRC is 100 ug/L. Therefore the specified method in footnote 3 cannot quantify TRC at the permit limit concentrations. Having a compliance evaluation level of 100 ug/L (0.1 mg/L, when converted with the appropriate number of significant figures) is consistent with the general permit AKG-57-0000 for small sewage treatment plants (STP) identical in size the ConPAC STP discharging to Outfall 002.

8. CADMIUM

8.A

EPA and ADEC's actions with the draft permit cadmium limits are appropriate.

TCAK appreciates EPA and ADEC's efforts in establishing a natural condition based site-specific criteria for cadmium. The data collected prior to any significant anthropogenic activities clearly indicate that the application of the statewide aquatic life criteria for cadmium in the Red Dog and Ikalukrok Creek drainage is inappropriate. Recognizing this, EPA and ADEC had taken the most suitable and logical course of action in establishing the water quality-based effluent limits in the draft permit.

8.B

Table C-5 in the Fact Sheet is inconsistent with the limits in the draft permit.

Table C-5 on page 57 in Appendix C of the Fact Sheet indicates that when the proposed NCBSSC for cadmium is applied, the water quality-based maximum daily and average monthly limits are 6.30 and 2.95 µg/L respectively. TCAK cannot reproduce these limits based on the NCBSSC in the state's 401 certification. The preliminary draft permit shows these limits as 4.3 and 2.0 µg/L, respectively. TCAK can reproduce these limits. TCAK requests that EPA check the calculations to validate that the correct limits are included in the permit.

8.C

Assuming that EPA approves the NCBSSC for cadmium, it then has the justification for backsliding of the maximum daily cadmium limit.

EPA allowed backsliding of several water quality-based effluent limits in the draft permit based on the CWA 303(d)(4)(B) exemption, provided that the relaxed limits are consistent with the state antidegradation policy. The antidegradation policy protects existing uses downstream of the outfall. However, as when EPA approved the NCBSSC for zinc in the current permit that is applicable to the same location, the same pre-mining data set, the same methodology, and nearly the exact supporting documentation (draft 401 certification) as the proposed cadmium NCBSSC, the water quality standards rule at 40 CFR 131.5(a)(2) requires that EPA approve a state water quality criterion only if the criterion is protective of all downstream designated uses.

In Ikalukrok Creek the existing aquatic life use is less than the designated aquatic life use. Therefore, EPA approval of the NCBSSC for cadmium is also certification that the criterion is consistent with the state antidegradation policy and backsliding of effluent limits calculated from the criterion is allowable. Furthermore, Appendix A in the state certification to the draft permit provides ample information demonstrating that the criterion is protective of designated and existing uses in all receiving streams designated for aquatic life use and the state has certified the criterion as being consistent with its antidegradation policy. TCAK requests that the maximum daily limit for cadmium be set at 4.3 µg/L.

9. ALUMINUM

This comment is a recommendation to EPA for the draft permit, a request to ADEC to include the recommendation from this comment in the final 401 certification, and a request to ADEC to undertake rulemaking to delete the chronic freshwater aluminum criterion from the state's water quality standards manual.

The need for water quality-based aluminum limits is driven by the state's chronic aluminum criterion of 87 µg/L. The state adopted EPA's chronic criterion without critically examining the basis for the criterion, and EPA subsequently approved it. Recent permitting decisions have determined a need for WQBELs for aluminum in NPDES permits, driven by the chronic criterion. The permit limit requirement led TCAK to more closely evaluate the criterion itself.

TCAK believes that the chronic aluminum criterion is not supported by EPA's own science and further, that the state would be justified in eliminating the chronic criterion from its water quality standards. This action would make the Alaska water quality standards consistent with those of many other states, which have either adopted no criteria for aluminum or only an acute criterion for this metal.

Because of this reasonable possibility, TCAK proposes that the permit include a simple, self-implementing provision to inactivate the aluminum limit and monitoring requirement in the event that the state eliminates or changes its chronic aluminum criterion such that a limit would no longer be needed. ADEC would have to adopt the change and the change would have to be approved by EPA before the provision would be triggered. This approach is recommended to save the work of reopening a permit to make a later change, and to also avoid having a prolonged period of having to comply with a limit after the basis for the limit is removed. This permit condition could be incorporated as a footnote for aluminum in table 1 on page 5 and in table 4 on page 15. The footnote could be as simple as:

> *If the state eliminates the freshwater chronic aluminum criterion, and EPA approves the change, then the limit and monitoring requirement for aluminum no longer applies.

The fresh water chronic aluminum criterion of 87 µg/L should be deleted from the state water quality criteria. Many states have chosen to not adopt any standards for aluminum, and of those that have, many have intentionally adopted only the acute criterion as a standard. In EPA Region 10, Idaho, Oregon and Washington have not adopted surface water quality standards for aluminum. Significantly, in the cases where EPA has adopted toxicant standards for states, they have not adopted standards for aluminum, nor has EPA deemed it necessary to adopt aluminum standards for any states in the northwest.[74]

[74] See, 57 FR 60911 in the National Toxics Rule, 65 FR 31712 in the California Toxics Rule and, 60 FR 15391-15392 in the Great Lakes Rule.

Pennsylvania's Department of Environmental Protection provided an explanation of why the chronic aluminum criterion should not be adopted in June of 2000[75] as follows:

> *"The Department believes that the chronic criterion of 87 µg/l should not be adopted because it is based on chronic toxicity test results that show inconsistencies within tests and between studies. The chronic studies described in EPA's 1988 Ambient Water Quality Criteria for Aluminum document do not show a consistent pattern of toxicological response to the different exposure concentrations within or between the various tests described. The final chronic value developed following EPA's procedures and based on available acute-chronic ratios is 750 µg/l, the same value as the acute criterion. However, EPA then lowered the final chronic value to 87 µg/l, claiming it to be necessary to protect brook trout and striped bass. EPA's justification for this adjustment was data derived from studies that EPA later described as data that should not be used in the criteria development. EPA staff have agreed that the aluminum toxicity is very complex due, in part, to the complexity of its chemistry and interactions with local water quality conditions and biological community. EPA also agrees that the studies that were used in driving the derivation of the chronic criterion are limited in their application and should receive additional review. The Department cannot adopt the flawed chronic criterion for use in Pennsylvania without better justification. As recently as December 1999, EPA reiterated that aluminum criteria issues are not a priority of the agency. Therefore, we believe that aluminum toxicity to fish and aquatic life will be adequately managed using the acute criterion of 750 ug/l. The Department will also continue to monitor the scientific literature and EPA's evaluations of aluminum toxicity and amend the criterion or add a chronic criterion, if indicated."*

10. MERCURY

10.A

Mercury limits in the draft renewed permit are significantly more restrictive than what is needed for the protection of human health and the environment.

TCAK understands the regulations requiring that effluent limits be based on state water quality criteria that have been approved by EPA. However, TCAK wants to go on record concerning the mercury limits imposed in the draft permit. The statewide aquatic life criteria for mercury were promulgated by the ADEC through a public process in

[75] See, http://www.dep.state.pa.us/dep/subject/eqb/2000/June20/FinalPreamble517009293959697.pdf pages 16-17.

2003. Despite the state adopting the national numeric criteria for mercury, in 2004 EPA declined approval of its own criterion for use in the state of Alaska. This is the same criterion that was approved nationally through extensive technical and peer review, a public process, notification in the Federal Register, publication in EPA's "Recommended Water Quality Criteria" and has been implemented in states and NPDES permits throughout the country. However, through EPA Region 10's non-public administrative technical evaluation, without peer review, this criterion was determined not to be appropriate for the State of Alaska, despite the people of Alaska's clear voice to the contrary. Consequently, Alaska dischargers such as the Red Dog Mine are required to meet effluent limitations for mercury that are 65 times more restrictive than other point sources throughout the country including dischargers in states with waters actively supporting various species of salmonids. EPA has remained silent for the past two years with regard to clarifying the lack of technical justification for its own criterion provided when it declined to approve the State's implementation of the federal criterion.

10.B

This comment constitutes both a recommendation to EPA for the draft permit and a request to ADEC to include the recommendation from this comment in the final 401 certification.

This comment is similar to the comment for aluminum, with the exception that the state has already adopted a new chronic criterion for mercury. The new criterion that the state adopted is identical to EPA's new national recommended criterion. However, EPA Region 10 has not yet approved the state's new mercury criteria.

For reasons similar to those described for aluminum above, EPA should include a footnote for the mercury limits, and ADEC should endorse inclusion of the footnote in the 401 certification of the final permit. The footnote should state:

> *The state has changed its freshwater chronic mercury criterion to equal EPA's national recommended criterion. When EPA approves this change, then the limit and monitoring requirement for mercury no longer applies.

11. Minor Edits and Errors

These comments cover minor editing and error corrections in the draft permit. Cross-outs are used to show deleted text and underlines are used to show inserted text.

11.A Draft Permit

Cover Sheet

The applicant's correct name is "Teck Cominco Alaska Incorporated".

Table of Contents

Section I.G.W has some spacing problems.

Page 5, Table 1

The note for sample frequency for organic priority pollutant scans should be "see note 4."

Pages 7 and 8, Section I.A.7.

With the italicized section, it is difficult to understand how section b would meld into section d, and what would become section c if the TDS SSC is approved. Also, should section d.(1) been italicized? It has reference to a grayling spawning period. TCAK believes these to be typos and that EPA's intentions are somewhat obvious. However, if the obvious assumptions on how that section will come together in the final permit are incorrect, TCAK would request the opportunity to comment on this section without the confusing errors.

Pages 15-16, Table 4

In footnote 1, the referenced permit sections should be I.A.5.a and b. Footnote 1 should be added to WAD cyanide on page 15.

Footnote 3 referring to Permit Part I.A.6 should be deleted because this reference has changed and moved to footnote 1. With this footnote deleted, footnotes 4 – 6 should be renumbered 3 -5. The footnote number for WAD cyanide on page 15 should be changed to 3. The footnote number for TDS anions and cations on page 15 should be changed to 4. The footnote number for Whole Effluent Toxicity on page 16 should be changed to 5.

Page 21 and throughout the remainder of the document

Section H on page 21 and throughout the remainder of the document, there are references to "insert state agency". Should this be ADEC?

Page 28, Section I.J.

A parenthetical states "(to who any trends)." Should this be (to show any trends)?

11.B Fact Sheet

Page 8, first paragraph, last sentence

Correction: WTP-2 also has the ability to provide process water to the mill when excess treated ~~was~~ water is available.

Page 8, second paragraph, third sentence

Correction: Reclaim water then flows into a 6,500 cubic-foot (cu ft) rapid mix tank where reacted ~~lime~~ lime and recycled solids are added to adjust the pH to approximately 10.3.

Page 9, Table 1

The permit section for TDS should be Part I.A.7.

Pages 12-13, Table 4

In footnote 1, the referenced permit sections should be I.A.5.a and b. Footnote 1 should be added to WAD cyanide on page 12.

Footnote 3 referring to Permit Part I.A.6 should be deleted because this reference has changed and moved to footnote 1. With this footnote deleted, footnotes 4 – 6 should be renumbered 3 -5. The footnote number for WAD cyanide on page 12 should be changed to 3. The footnote number for TDS anions and cations on page 13 should be changed to 4. The footnote number for Whole Effluent Toxicity on page 13 should be changed to 5.

Page 15, Item 8, Table 2

The requested MDL for total residual chlorine (TRC) should be 100 **ug/L**.

Page 16, first paragraph

Correction: With the exception of total residual chlorine (TRC), all requested MDLs are below the effluent limitations for parameters that are limited in the draft permit. A Minimum Level of 0.1 mg/L is designated as the compliance evaluation level for TRC. ~~As such~~ For all others, there are no Minimum Levels designated as compliance levels in the draft permit. This is considered a typo, because the limits for TRC at Outfall 002 are obviously less than the requested MDL.

Page 45, last paragraph, last sentence

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

Page 49, Item b, first paragraph, second sentence

Suggested change to clarify mixing zones in an RPA: This analysis compares the maximum projected effluent concentration (Ce) to the criteria (after adjustment for any mixing zone) for that pollutant.

Page 53, Item 2, first paragraph, last sentence

Correction: The levels of TDS proposed in this permit reissuance are ~~not~~ designed to prevent adverse affects to aquatic life.

Page 60, first paragraph

Suggested change to clarify that the effluent meets the technology-based effluent limits: ~~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.~~ Technology-based limits for the effluent are greater than the water quality-based limitations. Therefore, water quality-based limitations are required.

Page 60, Step 4

The CV in the example (0.59) appears to be incorrect. The CV, which is stated on page 59, is 0.64.

12. EPA Calculations and Dataset Used

12.A EPA would not provide its permit limit calculations or the datasets that it used to develop the permit limits in the draft permit.

TCAK requested that EPA provide its calculations and the datasets used to determine reasonable potential and develop the permit limits in the draft permit. EPA declined to provide the requested information. Without the exact datasets it is nearly impossible to calculate the CV used in the reasonable potential analysis and permit limit derivations. Not all CVs were provided in the Fact Sheet. Further, without the requested information, it is impossible to check EPA's calculations for errors. The 1998 permit contained several math errors, most notably in the calculation of the current cadmium limits. Given the number of transcription errors in the Fact Sheet it is nearly impossible to duplicate EPA's work in this draft permit. It appears contrary to the transparent public process required by the CWA to withhold this requested information.

13. Comments Specific to ADEC's Certification

While, numerous comments presented above are directed to both EPA and ADEC, the following comments are limited to ADEC's 401 certification.

13.A TCAK's comments raise issue with how EPA has implimented State Water Quality Standards. ADEC should weigh in on how its standards should be implimented.

Several comments presented above raise issue with how EPA has implemented State Water Quality standards, most notably the aquatic life criteria for ammonia and hardness dependant metals. ADEC should dictate how the State's water quality standards are implemented, not EPA or TCAK.

14. LIST OF ATTACHMENTS

Goodfellow, W.L., 2002, et. al., "Major Ion Toxicity in Effluents: A Review with Permitting Regulations," *Environmental Toxicology and Chemistry*, Vol. 19, No. 1, pp. 175-182.

GRI, December 1994, *The GRI Freshwater STR Model and Computer Program: Overview, Validation, and Application*, Chicago, Illinois.

Scannell, P., March 2005, Comparison of Mainstem Red Dog Creek Pre-Mining and Current Conditions

Letter from Kathleen Collins (EPA Region 10) to Charlotte MacCay (Teck Cominco, formerly Cominco), December 18, 1996

Memorandum from J. Houghton to Mark Thompson, TCAK, July 15, 2005, Re: Red Dog Creek Revisited

Letter from J. Houghton to Mark Thompson, TCAK, March 23, 2006, Re: Draft NPDES Permit AK-003865-2 for Red Dog Mine.

Letter from ADNR-OHMP to ADEC, August 17, 2005, Re: Total Dissolved Solids, Mainstem Red Dog Creek, Arctic Grayling.

Letter from ADNR-OHMP to ADEC, March 10, 2006, Re: Draft NPDES Permit AK-003865-2 for Red Dog Mine

EPA (July 21, 1997) Memorandum from Tudor Davies and Michael B. Cook at EPA Headquarters to EPA Regions I-X entitled "Clarifications regarding Whole Effluent Toxicity Test Methods Recently Published at 40 CFR Part 136 and Guidance on Implementation of Whole Effluent Toxicity in Permits,"

EPA (March 27, 2001) "Clarifications Regarding Toxicity Reduction and Identification Evaluations in the National Pollutant Discharge Elimination System Program," Office of Wastewater Management, Washington, D.C.

Application of TIEs/TREs to Whole Effluent Toxicity: Principles and Guidance, attached to a memorandum from Rodney Parrish dated June 30, 1998 of the Society of Environmental Toxicology and Chemistry (SETAC)

EPA (August 14, 1995) Memorandum from Robert Van Heuvelen and Michael Cook to the EPA Regions I-X, EPA Headquarters.

Document entitled "FREQUENTLY ASKED QUESTIONS ???," generated by the WET Expert Advisory Panels Steering Committee, SETAC

Memo from Jeff Weaver, Geomatrix Consultants Inc. to Mark Thompson, TCAK, March 23, 2006, Re: Red Dog Water Balance Study

TCAK, RPA for ammonia using Monte Carlo Approach (Dec. 19 and Dec. 27 drafts, March 2006 final)

EPA, 1999, Power Point slide 95 in the presentation on the 1999 Ammonia Criteria presented by EPA at a Water Quality Standards Academy

EPA Response to Comments, City of Boise NPDES permit

Letter from R.G. Scott to Eva Chum (EPA Compliance Officer), January 14, 2004, re: July 15-18, 2003 NPDES Compliance Inspection

Letter from William Riley, EPA, to R.G. Scott, November 16, 2005, Re: Alternate Test Procedure approval

"In-stream control of TDS at RDM," TCAK

"TDS Mass Balance Calculation - Control of Red Dog Mine Discharge," TCAK

Coeur Alaska, Inc., Kensington Project, NPDES permit no. AK-005057-1, Fact Sheet, June 21, 2004, Appendix G.

EPA NPDES Fact Sheets for City of Post Falls and the Hayden Area Regional Sewer Board.

Scannell, P., letter to A. Ott, ADNR, re: Review of Draft NPDES Permit AK-003865-2 , March 24, 2006

"Mixing Zone for WET Waste Load Allocation," TCAK

"WET Limit with Consideration to Updated Site-Wide Water Balance," TCAK

Scannell Technical Services

Phyllis Weber Scannell, PhD
1235 Schodack Landing Road
Schodack Landing, NY 12156
(518) 732-0071

March 24, 2006

Dr. Alvin G. Ott, Statewide Operations Manager
Office of Habitat Management and Permitting
Alaska Department of Natural Resources
1300 College Road
Fairbanks, AK 997091

RE: Services Provided under State of Alaska Agreement SAF-10-04-051; Review of Draft NPDES Permit AK-003865-2 for Red Dog Mine

Dear Dr. Ott:

As requested, I have reviewed the Draft 401 certification to the draft NPDES permit for the Red Dog Mine including Section 9 pertaining to Whole Effluent Toxicity (WET) limits. I agree with the technical basis for the Alaska Department of Environmental Conservation's (ADEC's) decision to not require a WET limit, which was based on the following statements:

- The Department believes that there is no reasonable potential for the effluent to exceed the pre-mining natural toxicity of Red Dog Creek.
- 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.

I prepared a document entitled "Comparison of Mainstem Red Dog Creek Pre- and Post-Mining" (attached) which I believe supports the State's position. This report was prepared for ADNR-OHMP and is a thorough compilation of the available data from pre-mining (baseline) studies and from biomonitoring conducted by ADF&G/ADNR-OHMP since 1999, much of which I collected during my tenure at ADF&G. Below is a table from the report that summarizes my analysis of the pre- and post-mining conditions in Mainstem Red Dog Creek.

Summary of the characteristics of the aquatic communities and water quality between pre-mining and post-mining, Mainstem Red Dog Creek.

	Pre-mining	Post-Mining
	1982-1983	1999-2003
Water Quality	High metals, Most water samples (>90%) exceed 5 times the acute standard for Cd and Zn.	Somewhat elevated metals. No samples exceeded 5 times acute standard for Cd and Zn.
Fish Populations	Few fish, migration only.	Arctic grayling spawning and rearing, Dolly Varden rearing
Invertebrate communities	No or few invertebrates observed	Abundant community with high taxonomic richness.
Periphyton Communities	No periphyton observed	Abundant periphyton, community richness indicated by presence of all three major pigments.

Sincerely,

Phyllis W. Scannell

Phyllis Weber Scannell, PhD
Scannell Technical Services

cc: Jim Kulas, TCAK, Red Dog
Pete McGee, ADEC, Fairbanks
William Morris, ADNR, Fairbanks
Cam Leonard, AG, Fairbanks
Robert McLean, ADNR, Fairbanks

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF HABITAT MANAGEMENT AND PERMITTING

FRANK H. MURKOWSKI, GOVERNOR

1300 COLLEGE ROAD
FAIRBANKS, ALASKA 99701-1599
PHONE: (907) 459-7289
FAX: (907) 456-3091

March 11, 2005

Mr. Pete McGee
Division of Water
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709-3643

Dear Mr. McGee:

RE: Comparison of Mainstem Red Dog Creek Pre- and Post-Mining

Enclosed is a copy of a report titled "Comparison of Mainstem Red Dog Creek Pre- and Post-Mining" prepared by Dr. Phyllis Weber Scannell under contract to the Office of Habitat Management and Permitting. Dr. Weber Scannell's report compares water quality, fish use, aquatic invertebrate, and periphyton data collected in the Red Dog Creek drainage before and after mining. If there are any questions, please contact me at 907-459-7289.

Sincerely,

Robert F. "Mac" McLean, Habitat Biologist IV
Office of Habitat Management and Permitting
Department of Natural Resources

Enclosure

ecc: w/enclosure
Rosie Barr, NANA, Anchorage
Keith Cohen, EPA, Seattle
Ed Fogels, ADNR, Anchorage
Lil Herger, EPA, Seattle
Cam Leonard, ADL, Fairbanks
Pete McGee, ADEC, Fairbanks
Steve McGroarty, ADNR, Fairbanks
Walter Sampson, NANA, Kotzebue
Jim Vohden, ADNR, Fairbanks
Luke Boles, ADEC, Fairbanks
Fred DeCicco, ADF&G, Fairbanks
Larry Hartig, Anchorage
Jim Kulas, Teck, Red Dog
Jackie Luke, NANA, Anchorage
Patty McGrath, EPA, Seattle
William Morris, ADNR, Fairbanks
Mark Thompson, Teck, Red Dog

RFM:ago

"Develop, Conserve, and Enhance Natural Resources for Present and Future Alaskans."

Comparison of Mainstem Red Dog Creek Pre-Mining and Current Conditions

Phyllis Weber Scannell

Scannell Technical Services

March 2005

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Comparison of Mainstem Red Dog Creek Pre-Mining and Current Conditions

Pre-Mining Conditions

Middle Fork Red Dog Creek flows through the main Red Dog ore body containing substantial amounts of Al, Ba, Cd, Cu, Fe, Pb, Zn, Ag, and Se. Erosion and oxidation from exposed mineralization and seepage through the ore body contributed dissolved metals to Middle Fork Red Dog Creek, resulting in periodic high concentrations of metals in both Mainstem Red Dog and Ikalukrok creeks. Neither fish spawning nor fish rearing was documented in Mainstem Red Dog Creek. The primary use of Mainstem Red Dog Creek by fish was as a migration corridor to North Fork Red Dog Creek. Periodic fish kills were documented. Few aquatic invertebrates were observed (sampling was limited to visual observations). No pre-mining sampling was done for periphyton.

WATER QUALITY

Pre-mining water quality studied in Mainstem Red Dog Creek found:

Cadmium	100% of the samples exceeded the Chronic WQS For Aquatic Life, 95% exceeded the acute WQS, and 92% exceeded 5 times the acute WQS.
Lead	Most of the pre-mining water samples were reported at the detection limit, which was nearly equal to the acute limit for aquatic life;
Zinc	100% of the samples exceeded the Chronic WQS For Aquatic Life, 100% exceeded the acute WQS, and 95% exceeded 5 times the acute WQS.

Water quality in Mainstem Red Dog Creek was considered to be "degraded by metals" (EVS and Ott Water Engineers 1983), with low pH and high metal concentrations, especially cadmium and zinc.

Causes of periodic increases in metals were not investigated, but may have been related to high rainfall remobilizing metals in the soils (Dames and Moore 1983), because the highest metals concentrations occurred as stream flows declined after a storm event. Analysis of the pre-mining data (excluding samples that were reported as less than the

Method Detection Limit or collected when the creek was frozen[1]) found concentrations of all metals in Mainstem Red Dog Creek were high (Table 1), and often many times higher than the Water Quality Standards for Aquatic Life.

Table 1. Pre-mining water quality in Mainstem Red Dog Creek and the acute and chronic Water Quality Criteria for Aquatic Life (USEPA 1983), assuming hardness of 100 mg/L for hardness dependent criteria. Data from Dames and Moore (1983).

	Chronic Limit, µg/L	Acute Limit, µg/L	Median Concentration µg/L	Maximum Concentration µg/L	Minimum Concentration µg/L	Number of Samples
Al, µg/L			150	1190	20	38
Cd, µg/L	1.1	3.9	28	98	2	43
SpCond, µSi/cm			328	1090	154	8
Cu, µg/L	12	18	4	19	2	15
Hardness, mg/L			127	227	21	21
Pb, µg/L	3.2	82	80*	100	0.8	43
pH			6.65	7.3	6.1	10
SO4, mg/L			69.6	440	7.9	11
TDS, mg/L			198	876	8.8	11
Zn, µg/L	47	320	3700	13000	567	43

*The detection limit in pre-mining samples.

FISH IN MAINSTEM RED DOG CREEK

According to Ward and Olson (1980), EVS and Ott Water Engineers (1983) and Dames and Moore (1983):

- Fish use of Red Dog Creek was limited to migration to North Fork Red Dog Creek during spring high flows;
- Rearing Arctic grayling (age 1+ and 2+) frequently were excluded from North Fork Red Dog Creek by high concentrations of metals in Red Dog Creek;
- Few rearing Arctic grayling and Dolly Varden were found;
- Fish experienced high mortalities in Red Dog Creek during downstream migrations;
- Periodic fish kills occurred in Mainstem Red Dog Creek; and
- There was no evidence of spawning in Mainstem Red Dog Creek.

[1] Pre-mining water sample analysis by EVS and Ott Water Engineers used method detection limits (e.g. 25 ug/L for Cd) that were higher than EPA Water Quality Standards and the data were not included in Table 1.

Pre-mining studies suggest that fish use of Red Dog Creek was restricted to migration to North Fork Red Dog Creek during high water events, especially during break-up. The historic evidence for fish kills in Red Dog Creek is strong. As early as 1978, Ward and Olson (1980) conducted a baseline aquatic investigation of fishes and water quality in the Kivalina and Wulik River drainages. The purpose of their study was to conduct a detailed investigation intended to identify potential environmental problems related to mineral exploration and extraction. No specific mineral deposit had been targeted at this time. Ward and Olson reported:

> During the course of field investigations, we observed six individual fish kills in Red Dog Creek between 21 June and 29 August 1978. During these kills, a total of about 800 to 1000 juvenile and adult grayling and lesser numbers of juvenile arctic char died. Of the streams we examined, fish kills occurred only in Red Dog Creek and they often occurred five to ten days after precipitation began, i.e. when precipitation was sufficient enough to cause a 10 to 20 cm increase (100 – 300 cfs) in the water level.

The frequency and extent of these kills was documented as follows.

> Red Dog Creek was visited at least once a day throughout the entire field season. This visit included some form of visual inspection or sample collection. In addition, the largest, deepest, and quietest pool in Red Dog Creek was located next to camp [located near the mouth of Red Dog Creek]. Two smaller, quiet pools were located within 1.6 km upstream. The remainder of RDC is characterized by shallow, fast water riffles extending from the headwaters to the mouth. Each time a kill occurred, dead fish would begin accumulating in each of the three pools. When fish began appearing, the field crew counted and collected all possible. At the time of each kill, RDC was surveyed both from low-level helicopter and on foot to at least 4.8 km upstream of the mouth. During these surveys, an occasional dead or dying fish was found floating downstream. Village Creek, Sir Creek, Ikalukrok Creek, and GC [Grayling Junior Creek] were similarly surveyed

during each kill to determine if kills were occurring, but no dead fish were sighted in these streams at any time.

Houghton and Hilgert (1983) reported that Arctic grayling were rarely seen in Mainstem Red Dog Creek and were not reported as present in Middle Fork Red Dog Creek. Fish were observed in Mainstem Red Dog Creek within the influence of North Fork Red Dog Creek (Dames and Moore 1983). Arctic grayling adults were assumed to migrate through Mainstem Red Dog Creek in early spring when discharges were high and metals concentrations low. Outmigration of adults was believed to occur during high-water events. Young-of-the-year Arctic grayling migrated downstream as water temperatures cooled in the fall or they were displaced by high-water events.

EVS and Ott Water Engineers (1983) also reported limited use of Red Dog Creek by fish. They found abundant post-spawning Arctic grayling throughout Ikalukrok Creek in the vicinity of the Red Dog Creek confluence, but no evidence of Arctic grayling spawning in Red Dog Creek. The abundance of Arctic grayling was low in Red Dog Creek, compared to Ikalukrok Creek: "The abundance of spent and non-spawning sub-adult Arctic grayling (>200 mm) was estimated at 100 [fish]/river km in [Ikalukrok Creek in the] vicinity of the Red Dog Creek confluence. By comparison, Arctic grayling abundance in lower Red Dog Creek at this time was approximately 10 [fish] / river km, and 3-5 [fish] /river km in the upper reaches, downstream of North Fork Red Dog Creek. Approximately 200 Arctic grayling (range 100-400), comprised of spawners, non-spawning sub-adults and post-fry were observed earlier in the season in North Fork Red Dog Creek." EVS noted that Arctic grayling abundance in Red Dog Creek was only 1 to 2 fish per river km during periods of mid-summer low flows.

EVS reported young-of-the-year Arctic grayling in North Fork Red Dog Creek by July 10 and in Ikalukrok Creek near the confluence of Red Dog Creek by July 15. Young of-the-year and age 2+ Arctic grayling were "represented among natural fish kills in Red Dog Creek."

EVS electrofished Ikalukrok Creek in the vicinity of Red Dog Creek to document the presence of juvenile Dolly Varden. They reported "Despite extensive electrofishing

effort within a 3 km length of Ikalukrok Creek in the Red Dog Creek area, only one 1+ Arctic char was found (75 mm; June 27). Relative abundance compared with Tutak, Rabbit and Five Fingered Creeks (known areas of char reproduction), was virtually nil (0.01 char/river km). However, 37 Arctic char ranging from 55-113 mm were found dead in Red Dog Creek at various times throughout the study."

EVS described the dead fish found in Red Dog Creek: "Natural mortalities from Red Dog Creek displayed considerable amounts of brown precipitates and mucus on gill surfaces; the occasional occurrence of gill hemorrhaging and eye opaqueness was noted. Fish collected from Ikalukrok Creek were free of precipitates, mucus or hemorrhaging."

Dames and Moore (1983) summarized the use of Red Dog Creek by Arctic grayling:

> Information gathered over the past 2 years suggests the following pattern of use of the Upper Ikalukrok / Red Dog Creek system by Arctic grayling. Adult spawners enter the stream as stream temperature begins to rise above 2 to 3 C in the spring. This probably occurs soon after the majority of in-channel ice has melted. Spawning occurs for perhaps 1 to 2 weeks with the major activity usually completed by late June. Fry hatch by the first or second week in July and remain in very low velocity backwaters and pockets until late July or early August when they are also found among cobbles and boulders in shallow areas with moderate current. During the early summer, many fry from North Fork Red Dog Creek are displaced downstream by current and enter the main stem of Red Dog Creek. Many, if not the majority, of these fish perish due to high metals levels in Red Dog Creek.
>
> Following breakup, age 1+ and 2+ subadult grayling also move upstream into most of the medium-sized tributaries in the area. Since no age 1+ and few (if any) age 2+ grayling have been found in North Fork Red Dog Creek, it may be hypothesized that they lack the swimming abilities to move through the toxic lower main stem to reach the "safe" area of North Fork Red Dog Creek.

Later in the summer and fall there is a natural downstream movement of fry to overwintering areas in Ikalukrok Creek, which again takes them into the Mainstem Red Dog Creek where many succumb.

AQUATIC INVERTEBRATE AND PERIPHYTON COMMUNITIES

Dames and Moore (1983) and EVS and Ott Water Engineers (1983) summarized the aquatic communities of Mainstem Red Dog Creek:

- An absence or near-absence of algal growth on the stream bottom;
- An absence of aquatic macrophytes; and
- An absence of aquatic invertebrates.

Dames and Moore (1983) summarized the ecology of Red Dog Creek:

> The Red Dog mineralization has been shown to have a profound effect on the water quality and, hence, the aquatic ecology of not only Red Dog Creek itself but also Ikalukrok Creek for some distance downstream. Within much of the Mainstem Red Dog Creek, this influence is graphically demonstrated by the absence or near absence of periphyton, macrophyton, insects and fish. Fish from the Ikalukrok [Creek] are completely cut off from the relatively good habitat in the South Fork of Red Dog Creek [presently dammed for the tailings impoundment] by the acutely toxic conditions in 5 kilometers of the mainstem. The spawning population in North Fork Red Dog Creek apparently persists by migrating swiftly through the 3 kilometers of the lower mainstem during the spring runoff when water metals levels (cadmium, zinc) are at their seasonal lows. Furthermore, this spawning population persists despite heavy mortalities of downstream migrating fry and the apparent lack of access to North Fork Red Dog Creek for rearing by age1+ and 2+ grayling.

Current Conditions in Mainstem Red Dog

A number of construction projects and changes in operational procedures at the Red Dog Mine resulted in changes to water quality in the Red Dog Creek drainage; these projects are discussed in greater detail by Ott (2004), Weber Scannell and Andersen (2000) and Weber Scannell and Ott (1998). The significant events, as summarized by Ott (2004), are presented below. Following are discussions of changes in water quality and aquatic populations that have been observed by ADF&G and ADNR.

1987-89	Construction of the mine facility, including the tailing dam. Tailing dam cut off flow from South Fork Red Dog Creek
1990	Installation of sumps and pumps by Teck-Cominco partially minimized metals-laden water from entering Red Dog Creek
1991	Clean water bypass system designed, built, and modified
1992	Water treatment plant modified
1993	Sand filters installed to remove particulate zinc
1994	Water treatment capacity increased by thickening tank conversion Wastewater discharge increased from 7.5 cfs to 23 cfs
1995	Clean water bypass system extended to intercept Hilltop Creek
1998	NPDES Permit reissued by USEPA Additional treatment installed to meet reduced cadmium limits
2001	Catch-box and pipeline (about 430 m) placed in Shelley Creek to move water past disturbance due to expansion of the pit
2002	A bypass was installed in Connie Creek during Winter 2001-2002. The bypass captures the upstream creek and carries the water through a pipe to the clean-water bypass system and across areas disturbed by expansion of the pit The bypass system for Shelly Creek was modified by adding a lined ditch to contain clean-water overflow and direct it to the clean-water bypass system

WATER QUALITY

Biomonitoring studies in Mainstem Red Dog Creek found substantial changes in water quality as compared to pre-mining conditions: Although many of the water samples collected from 1998 through 2003 exceeded the US EPA Water Quality Criteria, overall concentrations were lower than pre-mining (Table 2).

Table 2. Percent of water samples from Station 10, Mainstem Red Dog Creek (collected during ice-free season) that exceeded the US EPA chronic and acute criteria for aquatic life and that exceed 5 times the acute criteria.

	% of Samples Exceeding Chronic Criteria		% of Samples Exceeding Acute Criteria		% of Samples Exceeding 5 times Acute Criteria	
	Pre-mining	Current Conditions	Pre-mining	Current Conditions	Pre-mining	Current Conditions
Cd	100	100	95	75	92	0
Pb	*	51	*	5	0	0
Zn	100	100	100	91	95	0

*Method Reporting Limit for lead in pre-mining data was too high to provide meaningful analysis.

Loehr (pers. comm. to Mark Thompson, TeckCominco, 2004) compared pre-mining and current water quality data for Red Dog Creek and Ikalukrok Creek. He limited the data to samples collected in the month of July to eliminate seasonal variations. Loehr suggested comparisons among sites based on the "exceedance factor," which he defined as the amount of metal in a water sample divided by the hardness-based standard. An exceedance factor of 1 means that the sample equals the standard, and factors less than 1 mean the sample is lower than the standard. Loehr used hardness concentrations measured at the same time the samples were taken, when they were available, or estimated hardness concentrations based on samples collected at about the same time. Data were limited to samples analyzed as total recoverable and compared with a water quality standard based on total recoverable analysis (ADEC 2003).

According to Loehr's method of comparison, the average July concentrations of Cd measured at Station 10 exceeded the Chronic Limit for Aquatic Life by 91 times before development of the mine and by a factor of 13.3 after mine development (Figure 1). Similar, although not as substantial, differences were found when Cd concentrations were compared to the Acute Limit for Aquatic Life: July water samples exceeded the acute limit for Cd by 11 times before mine development and by 1.2 times after mine development (Figure 2). His analysis demonstrates that, while Cd concentrations at Station 10 often exceed water quality standards for aquatic life, the concentrations are lower after mine development than before mining. Considerable reductions in cadmium from historic conditions are also evident at Stations 20 and 140.

Similar comparisons were made with concentrations of lead at Station 10; however reductions in lead concentrations are not as apparent. Pre-mining water analysis for lead used a high (80 ug/L) detection limit, which is nearly equal to the acute limit for aquatic life. Most of the pre-mining water samples collected at Station 10 were reported at the detection limit for lead. Lead concentrations at Stations 20 and 140 (where pre-mining data were substantially higher than the detection limits) show improvements in water quality when compared to both the Acute (Figure 3) and Chronic (Figure 4) limits for aquatic life.

Reductions in both Cd and Pb at Station 140 result from measures taken by TCAK to control drainage water in the region of the ore body. These measures include construction of the clean water bypass system, construction of the mine sump pump back system, and the more recent clean water bypass systems in Connie and Shelley Creeks. Reductions in metals at Station 20 are due to both a combination of the drainage control measures and dilution by the mine effluent. Metals in the mine effluent remain low (Figures 1 through 4).

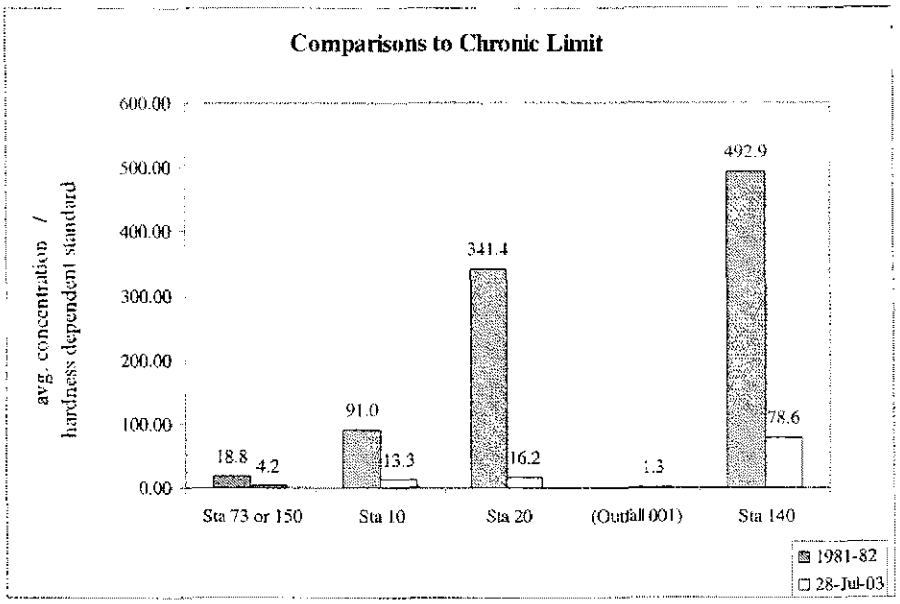

Figure 1. The amount that July water samples exceeded the Cd chronic limit for aquatic life (based on total recoverable analysis) at various stations, pre-mining and current conditions.

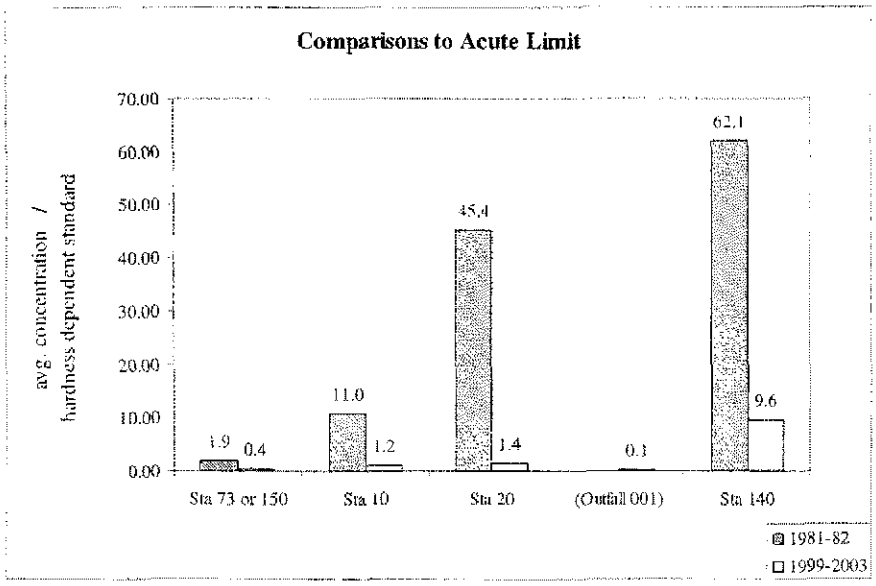

Figure 2. The amount that July water samples exceeded the Cd acute limit for aquatic life (based on total recoverable analysis) at various stations, pre-mining and current conditions.

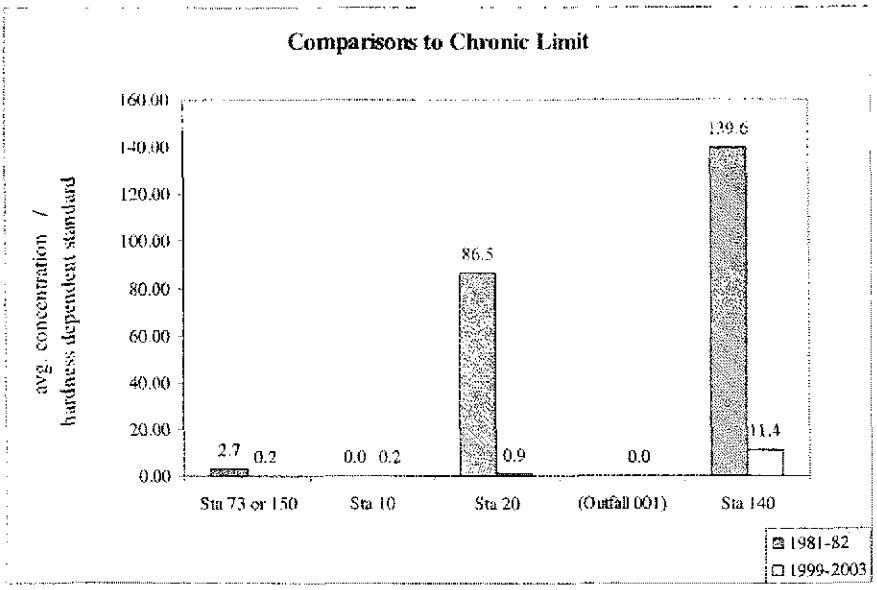

Figure 3. The amount that July water samples exceeded the Pb chronic limit for aquatic life (based on total recoverable analysis) at various stations, pre-mining and current conditions.

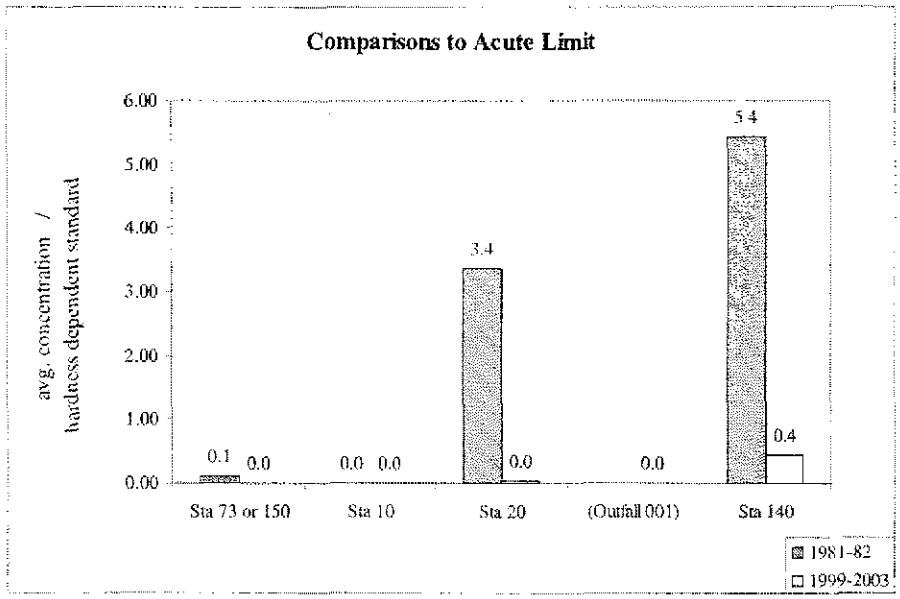

Figure 4. The amount that July water samples exceeded the Pb acute limit for aquatic life (based on total recoverable analysis) at various stations, pre-mining and current conditions.

Water quality data presented by Ott (2004) show that although there were occasional spikes in Cd (Figure 5) and Zn (Figure 6), the median concentrations during mine operation were substantially lower than pre-mining concentrations. Median concentrations of Pb (Figure 7) also appear lower than during baseline; however, the high detection limits used for pre-mining metals analysis limit the value of this comparison. Samples from 2000, 2003, and 2004 show occasional peaks in lead concentrations that are above both chronic and acute limits for aquatic life.

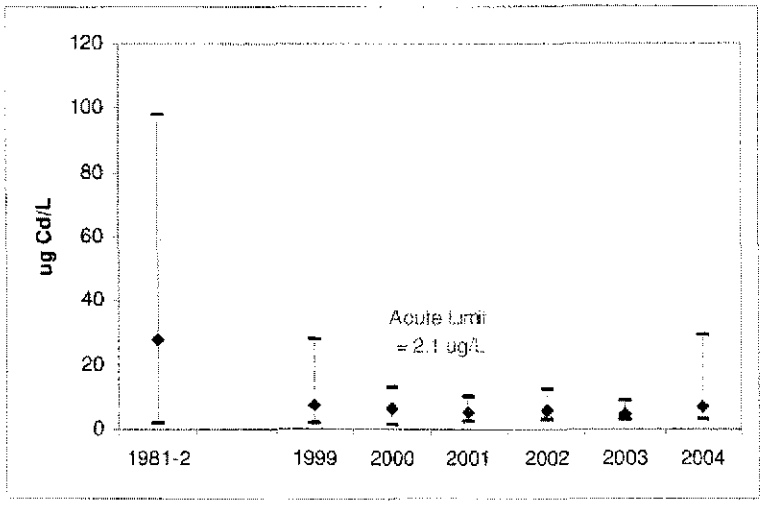

Figure 5. Median, maximum, and minimum concentrations of Cd at Station 10. Data from Alaska Department of Natural Resources, used with permission. The acute limit for aquatic life is based on the pre-discharge median hardness of 100 mg/L.

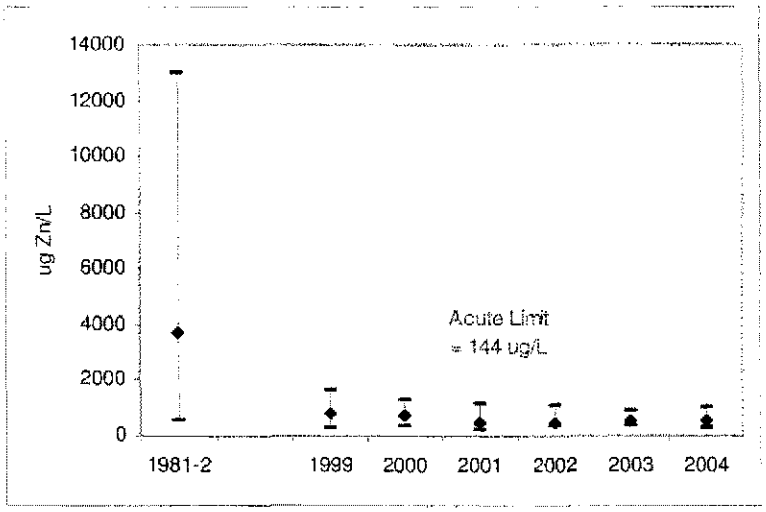

Figure 6. Median, maximum, and minimum concentrations of Zn at Station 10. Data from Alaska Department of Natural Resources, used with permission. The acute limit is based on the pre-discharge median hardness of 100 mg/L.

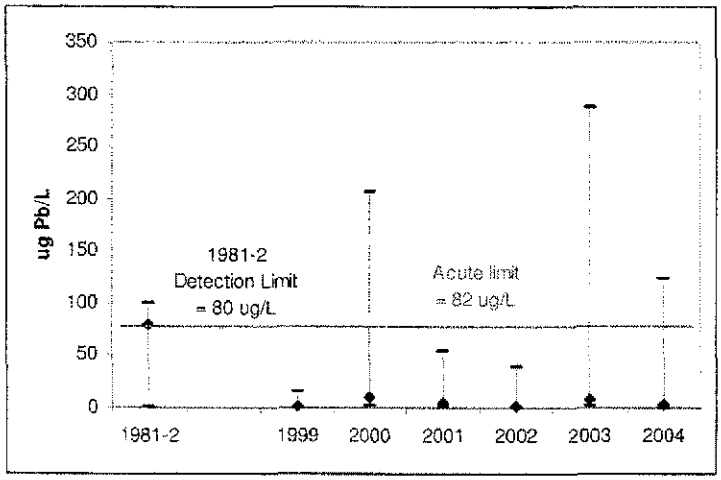

Figure 7. Median, maximum, and minimum concentrations of Pb at Station 10. Data from Alaska Department of Natural Resources, used with permission. The acute limit is based on the pre-discharge median hardness of 100 mg/L.

FISH IN MAINSTEM RED DOG CREEK

- The Alaska Department of Fish and Game first observed adult Arctic grayling in Mainstem Red Dog Creek in 1994.
- In 1995, both young-of-the-year Arctic grayling and adult fish were observed in Mainstem Red Dog Creek.
- Young-of-the-year Arctic grayling 13-15 mm long were caught in drift nets in late June 1997 near Station 10 and they were still present in August and September of 1997, indicating that both spawning and rearing was occurring.

Ott (2004) describes the Arctic grayling populations in Mainstem Red Dog Creek:

> Visual surveys of Mainstem Red Dog Creek have been conducted annually from 1994 to 2003. The purpose of these surveys is to document use of Mainstem Red Dog Creek by Arctic grayling and compare it with information available from the baseline studies. Use of Mainstem Red Dog Creek prior to development of the mine was limited to migration, with some adult use of the lower portion of the creek. Arctic grayling use (adults and age 0 fish) of Mainstem Red Dog Creek currently is higher than that described in the baseline studies. Changes in use are likely related to overall improvement in water quality as compared with pre-mining conditions.
>
> Beginning in 1995 and continuing through 2004, juvenile Dolly Varden were caught with minnow traps in Mainstem Red Dog Creek below North Fork Red Dog Creek. Dolly Varden use of tributary creeks is substantial and highly variable [Table 3]. Depending on environmental conditions (stream flows and water temperature), peak use of these creeks occurs from late July through mid-August with few fish caught early in the spring and late in the fall. Juvenile Dolly Varden use of Mainstem Red Dog Creek was first found in 1995 and presence and use continued to be documented in summers 1996 through 2004.

The mine effluent is warmer but does not appear to have a direct effect on the temperature of Mainstem Red Dog Creek at Station 10. In the spring, after the mine has

commenced discharging, the creek reaches 4° C before North Fork Red Dog Creek warms. Arctic grayling key on temperatures around 4° C to begin spawning. Arctic grayling that historically migrate through Mainstem Red Dog Creek to spawn in North Fork Red Dog Creek are more likely to spawn upon reaching the warmer water of Mainstem Red Dog Creek. Therefore, at least part of the Arctic grayling population spawns earlier in Mainstem Red Dog Creek than before development of the mine. These changes in spawning habits are not necessarily positive or negative.

Table 3. Summary of total catch of Dolly Varden in Red Dog Creek, 1997-2003.

Year	Mainstem Red Dog Creek Near Station 10	Mainstem Red Dog Creek Below North Fork
1997 (early August)	10	14
1998 (early August)	21	70
1999 (early August)	66	86
2000 (late July)	1	13
2001 (late July)	3	9
2002 (late July)	12	12
2003 (early August)	12	2
2004 (mid July)	9	7

Note: Middle Fork Red Dog Creek was sampled in 1995, 1996, and 1997 with five traps (two sample events per summer) and no Dolly Varden juveniles were captured.

INVERTEBRATE AND PERIPHYTON COMMUNITIES

- Mainstem Red Dog Creek contains abundant and diverse aquatic invertebrate communities, compared to no or few invertebrates found in pre-mining;
- Mainstem Red Dog Creek contains abundant and diverse periphyton communities, compared to no or little periphyton pre-mining;

Ott (2004) summarized the biomonitoring studies conducted over the 1999-2003 NPDES Permit monitoring period and compared the results with pre-mining observations. In contrast to pre-mining, when no or few invertebrates were found, 1999 - 2003 sampling in Mainstem Red Dog Creek found high invertebrate densities (Figure 8) with many taxa

(Figure 9). Periphyton, estimated by concentrations of chlorophyll-a, also was abundant in Mainstem Red Dog Creek (Figure 10). Periphyton samples collected from 2001 through 2003 show a predominance of chlorophyll-a, with some chlorophyll-c and small amounts of chlorophyll-b (Figure 11). Samples collected in 1999 and 2000 were analyzed with a fluorometer and estimates of the different pigments were not made. The presence of chlorophylls a, b, and c is indicative of a complex and diverse algal community.

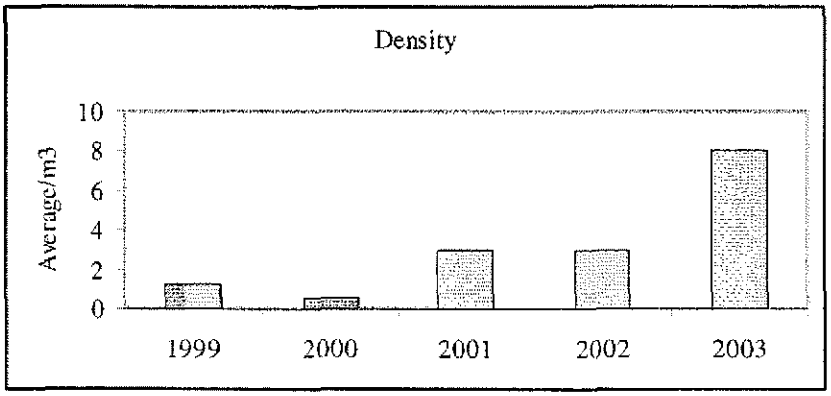

Figure 8. Density of aquatic invertebrates collected in Mainstem Red Dog Creek at Station 10.

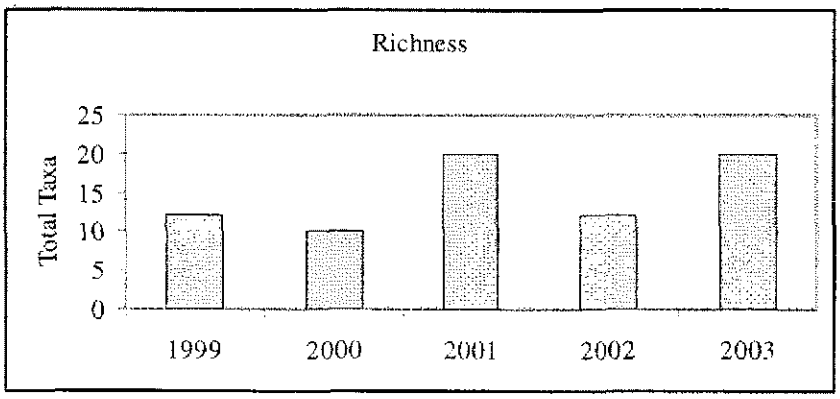

Figure 9. Taxa richness of aquatic invertebrates collected in Mainstem Red Dog Creek at Station 10.

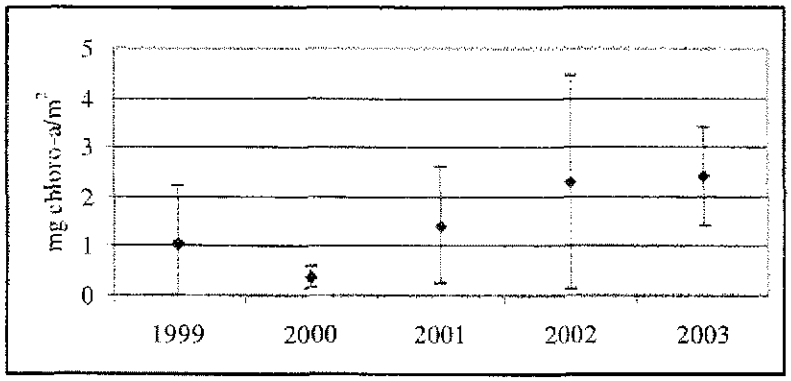

Figure 10. Average concentrations of chlorophyll-a, plus and minus one standard deviation, in Mainstem Red Dog Creek at Station 10.

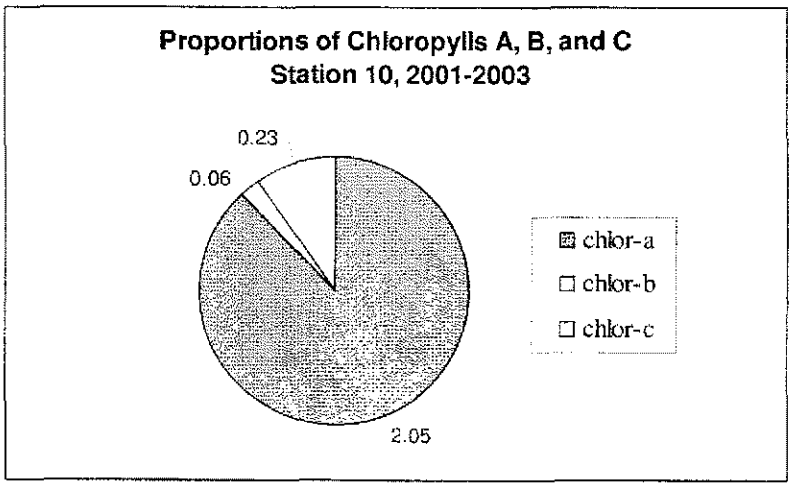

Figure 11. Concentrations and relative proportions of chlorophyll-a, b, and c (mg/m^2) in Mainstem Red Dog Creek at Station 10 in 2003.

Over the last six years (1998 through 2004) there has been a viable aquatic community in Mainstem Red Dog Creek with the current water quality and mine discharge. Analysis of the water quality data supports the finding that the mine discharge is a net benefit to the creek. The naturally occurring concentrations of metals (especially cadmium and zinc) are diluted, the pH is moderated, and the higher hardness of the discharge water moderates the toxicity of the metals.

Summary of Comparisons of Pre-Mining and Current Conditions

- Before development of the Red Dog Mine, (a) water quality was naturally degraded in Red Dog Creek; (b) fish use was limited to migration to North Fork of Red Dog Creek during high water events; (c) no fish spawning was documented in Red Dog Creek; and (d) natural fish kills commonly occurred in Red Dog Creek;
- Development of the Red Dog Mine included a number of water management practices that resulted in improved water quality in Red Dog Creek. These practices included collection, treatment and discharge of mineralized water; discharge of high volumes of water with low metals concentrations; and improvements in water treatment;
- High volumes of treated water are discharged to Middle Fork Red Dog Creek. This water dilutes the naturally occurring metals in Red Dog Creek, moderates the pH, and lessens the toxicity of metals by increasing the hardness;
- As a result of improved water quality, Arctic grayling began using Mainstem Red Dog Creek for spawning and rearing and Dolly Varden for rearing;
- Improved water quality was followed by development of abundant and diverse aquatic invertebrate and periphyton communities; and
- Over the last six years (1998 through 2004) there is a viable aquatic community in Mainstem Red Dog Creek with the current water quality and mine discharge.

Table 4. Summary of the characteristics of the aquatic communities and water quality between pre-mining and current conditions, Mainstem Red Dog Creek.

	Pre-mining 1982 - 1983	Current Conditions 1999 - 2003
Water Quality	high metals, Most water samples (>90%) exceed 5 times the acute standard for Cd and Zn.	somewhat elevated metals. No samples exceeded 5 times acute standard for Cd and Zn.
Fish Populations	Few fish, migration only.	Arctic grayling spawning and rearing, Dolly Varden rearing
Invertebrate Communities	No or few invertebrates observed	Abundant community with high taxonomic richness.
Periphyton Communities	No periphyton observed	Abundant community, richness represented by all three major pigments.

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PENTEC ENVIRONMENTAL

MEMORANDUM

DATE: July 15, 2005
TO: Mark Thompson, Teck Cominco
FROM: Jon Houghton, Pentec

RE: **Red Dog Creek Revisited**

12048-10

CC: Lincoln Loehr, Heller Erhman

Introduction

This memo describes my observations of conditions in Red Dog Creek (RDC) in early summer of 2005 and compares them with conditions in this watershed as documented in the several years of work I performed in the watershed during the early 1980's. I arrived at Red Dog in the evening of June 24, 2005 and conducted a day and a half of intensive field surveys of the RDC system.

Aerial Observations

Accompanied by Mr. Devin Harbke, of Teck Cominco, on June 25, I flew in a helicopter from the mill site, down RDC to Ikalukrok Creek and about 1/4 mile downstream of the Red Dog/Ikalukrok Creek confluence. I was struck by the clarity of water in RDC and the visible presence of grayling in many holes in the mainstem. In numerous similar flights down the mainstem in the 1980s, I had never seen fish in this reach. No fish were immediately visible in Ikalukrok Creek above or below the confluence.

Ikalukrok Creek

We landed above the confluence and angled with wet flies and spinners in Ikalukrok Creek from the first bedrock hole upstream, down to the confluence area without success. This area had held grayling during some of our 1980s surveys, primarily in mid to late summer. Stream margins where grayling young of the year would be expected to reside were searched for fish without success. Examination of cobbles in riffles in this reach (Station 9) found a normal

periphyton cover and moderate numbers of simuliids, along with a few mayflies (Ephemeroptera), and caddis flies (Tricoptera).

The Ikalukrok/Red Dog confluence hole (Station 8) had changed substantially from the 1980s with less deep water or pool water for grayling or char holding. No fish were seen or captured in this hole. In quantitative surveys in 1982, cobbles and pebbles in the riffle across the tail out of the confluence area had shown a strong gradient invertebrate density with few invertebrates on the Red Dog side and many on the Ikalukrok Creek side. In June 2004, these cobbles were examined and no pattern of abundance differences in periphyton or invertebrates was seen across the riffle. Most abundant invertebrates were simuliids with a single mayfly and a single caddis fly larva seen on the Red Dog side.

Red Dog Creek

The reach from the confluence upstream to Station 10 at the old Dog Leg Camp had changed substantially since the 1980s but still lacked significant adult fish holding water. Red rocks, previously prevalent throughout the stream bed were only scattered about, most above the present stream bed in a dry, former stream terrace. No fish were seen or captured by angling. Periphyton and invertebrates in this reach were similar to those seen in Ikalukrok Creek with benthos represented mostly by simuliids with a few mayflies. In the first two deep bedrock holes we captured single grayling adults (355 to 400 mm fork length). In the large bedrock hole immediately behind the former camp site, we captured four grayling (320 to 360 mm) including two with white tags from ADNR tagging in May 2004. Adult grayling had been seen in this hole on one occasion in the early 1980s sampling and one was captured in early July 1982.

This set the pattern for the remainder of the mainstem: at all reasonable looking pools, especially those formed by bedrock, we captured one or (usually) more grayling. Fish size ranged from 245 to 430 mm with most between 310 and 380 mm (Table 1). Above about the middle of the reach, we also took fish in runs with 0.3 to 0.6 meters of water and moderate to slow velocities. In all, we caught a total of 60 grayling on wet and dry flies and on spinners in the Mainstem. The GPS locations of holes/runs where fish were captured were are shown on Figure 1.

Four tagged fish were caught in the lower few pools and another three were captured in the vicinity of the North Fork Confluence (Station 151 and above). These fish had been tagged from 1997 through 2005 (Table 2) with recaptures of fish tagged in both the Mainstem and in the North Fork. The pattern of marking and subsequent recaptures shows a pattern of movement between the two reaches and steady growth in the system. The longevity of a

fish tagged in the North Fork in 1995 and recaptured over the last 10 years in both the North Fork and Red Dog creek is remarkable and suggests a free movement through and growth in the system over the period.

In angling conducted over several years in the early 1980s I caught fish in the Mainstem on only three occasions, only in the immediate vicinity of the confluence of the Mainstem and North Fork (first two holes), and then, only on the North Fork side of the creek. On June 25, 2005 the last two fish caught in the Mainstem were taken in the immediate confluence pool of Mainstem and North Fork water, but in water that was totally Mainstem water.

Invertebrates throughout the mainstem included, as in Ikalukrok Creek, a preponderance of simuliids, with mayflies common and caddis flies rare. Periphyton appeared to be reasonably present up to the vicinity of Station 151. Above about Station 151, many stream bed cobbles exhibited a light-colored slime and periphyton and invertebrates were less common.

We also fished a short distance up the North Fork of RDC to about the location of the DNR fyke net in 2005 and the Station 12 water quality installation. Two more grayling were captured and others were seen. Invertebrates appeared to be more abundant in the North Fork than they were in the Mainstem; simuliids remained most abundant and mayflies were somewhat more abundant than in the Mainstem.

In the morning of June 26, we returned to the hole below the North Fork confluence and took seven grayling, including two tagged fish that had been captured the previous day. One of these had been released in the lowest hole of the North Fork and recaptured below the confluence while the second was captured both times in a pool on the south side of the creek in what was largely Middle Fork water. No fish were taken in the confluence hole itself. Overall, fish taken in the mainstem of RDC averaged 359.9 mm (fork length; Table 1).

In the North Fork, a few grayling were found in each pool or run that appeared to have good grayling habitat. A total of 18 fish were taken in the several excellent holes in the lower few hundred yards of the stream; five of these were tagged (fifty percent of fish over 290 mm). In shallow laminar glides in a braided section of the stream just above the first series of bedrock holes we encountered numerous juvenile grayling and captured seven ranging from 200 to 295 mm. Overall, fish taken in the North Fork of RDC averaged 296.9 mm (fork length; Table 2).

Red Dog Middle Fork

Fish access to the Middle Fork of RDC above the North Fork confluence is blocked by a weir and this reach was not fished. Despite good physical habitat and clear water above the weir, no fish or invertebrates were seen.

Summary

Based on my observations in June 2005, conditions in the RDC Mainstem are irrefutably improved over those I had seen in the pre-mining condition of the early 1980s. Periphyton growth and invertebrate presence along the Red Dog side of the RDC/Ikalukrok Creek confluence and in the lower two thirds of the RDC Mainstem were much improved from conditions measured before mine operation. In the 1980s, these reaches had strong red (iron) staining which, in part, gave the creek its name and eliminated normal benthos.

In 2005, grayling were widely abundant and actively feeding throughout the Mainstem reach of RDC where, pre-mining, fish could only survive by migrating quickly through the toxic waters. Presence in the reach of fish from several different years of ADEC tagging also indicates long-term survival and summer residency of fish in this reach.

Attachments:

Figure 1 – Lower Red Dog Creek drainage and locations of grayling captures, June 2005
Table 1 – Red Dog Creek arctic grayling catch data; June 25-26, 2005
Table 2 – Grayling mark/recapture data

PENTEC ENVIRONMENTAL

Delivering smarter solutions

March 23, 2006

Anchorage

Mr. Mark Thompson
Teck Cominco Alaska Incorporated
3105 Lakeshore Drive
Anchorage, AK 99517

Re: Draft NPDES Permit AK-003865-2 for Red Dog Mine
12048-10

Denver

Dear Mr. Thompson:

I have reviewed the Draft 401 certification to the draft NPDES permit for the Red Dog Mine including Section 9 pertaining to Whole Effluent Toxicity (WET) limits. I agree with the technical basis for the Alaska Department of Environmental Conservations' (ADEC's) decision to not require a WET limit and believe this decision to be sound. ADEC's reliance and belief in the following statements in the draft certification are, in my opinion, appropriate and justifiable:

Edmonds

- The Department believes that there is no reasonable potential for the effluent to exceed the pre-mining natural toxicity of Red Dog Creek.
- 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.

Philadelphia

As one of the principle investigators for Dames & Moore's "Environmental Baseline Studies – Red Dog Project" I conducted the pre-mining aquatic life survey in 1981 through 1983. I revisited Mainstem Red Dog Creek in 2005, and was greatly impressed by the dramatic improvements (cf. the pre-mining conditions) in water quality and the aquatic community and the significant decrease in the stream's toxicity as indicated by the substantial numbers and apparent good health of grayling throughout the reach. A memo describing my trip is attached. I have reviewed "Comparison of Mainstem Red Dog Creek Pre- and Post-Mining" prepared by Dr. Phyllis Weber Scannell and believe that this document is consistent

Portland

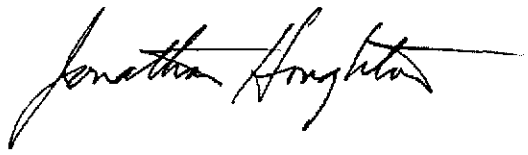
Seattle

120 Third Avenue South, Suite 110
Edmonds, Washington 98020-8411
Fax 425.778.9417
Tel 425.775.4662

with my observations and studies. Further, I believe that ADEC's use of the available data, information and observation is appropriate and justifiable.

Sincerely,

PENTEC ENVIRONMENTAL



JONATHAN P. HOUGHTON, PH.D.
Senior Principal Fisheries Biologist

cc: Luke Boles, ADEC

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