



Mining Scenario

- 2012 Water Quality Standards Academy
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Overview of mine

- Location
- Mine overview
- Pit
- Tailings Dam
- Waste Rock
- Water Treatment
- Outfall
- Fish Weir
- Telemetry Monitoring
- Clean Water Bypass
- Mixing zones
- Water Quality Standards

Location

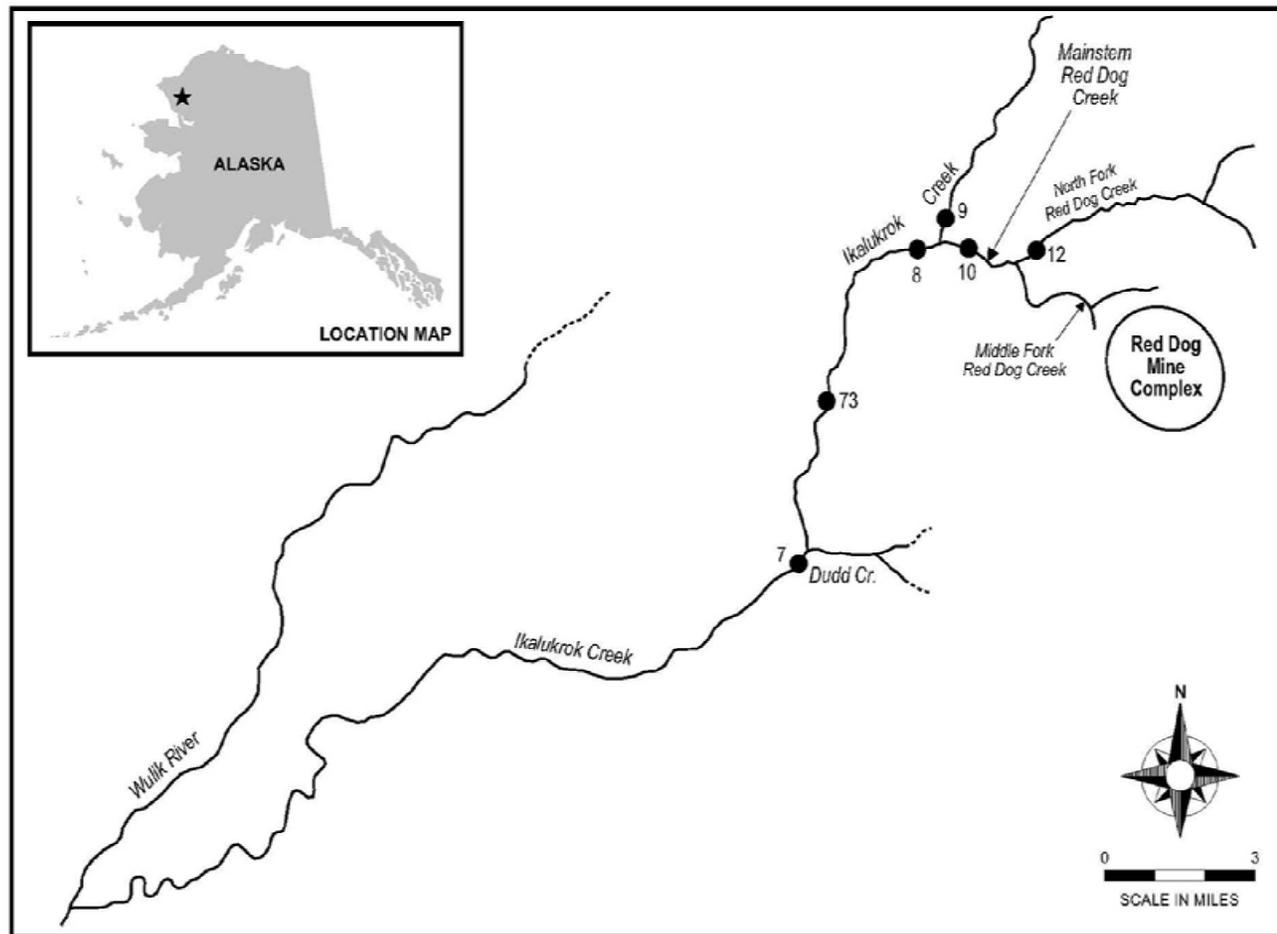


Figure 1. Location of Red Dog Mine and Sampling Stations in Ikalukrok and Red Dog Creeks.

Red Dog Mine



Pit



Mill and Camp



Mill



Sag Mill



Floatation circuit



Tailing Dam



Tailing Pond from Waste Rock





Water Treatment Process

- All mine drainage water and mining impacted waters are collected in the tailings impoundment.
- Mining activities accelerate the naturally occurring oxidation of sulfide minerals, which results in the mine drainage water containing high levels of dissolved metal sulfates.
- The Red Dog Mine utilizes lime treatment plants for the removal of heavy metal contamination in the tailings impoundment water.
- The treatment plant removes the dissolved metals from solution and replaces them with calcium.
- The treatment plant effluent, which is ultimately discharged to Red Dog Creek, contains high levels of calcium sulfate TDS. The TDS concentration in the whole effluent is approximately 3,300 mg/L (ranging between 2,400 and 3,900 mg/L).



Water Treatment Steps

- Collection
 - Lime Precipitation
 - Clarification
 - Sand Filtration
 - Discharge based on available dilution
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Outfall



Outfall and Middle Fork



Red Dog Creek



Fish weir



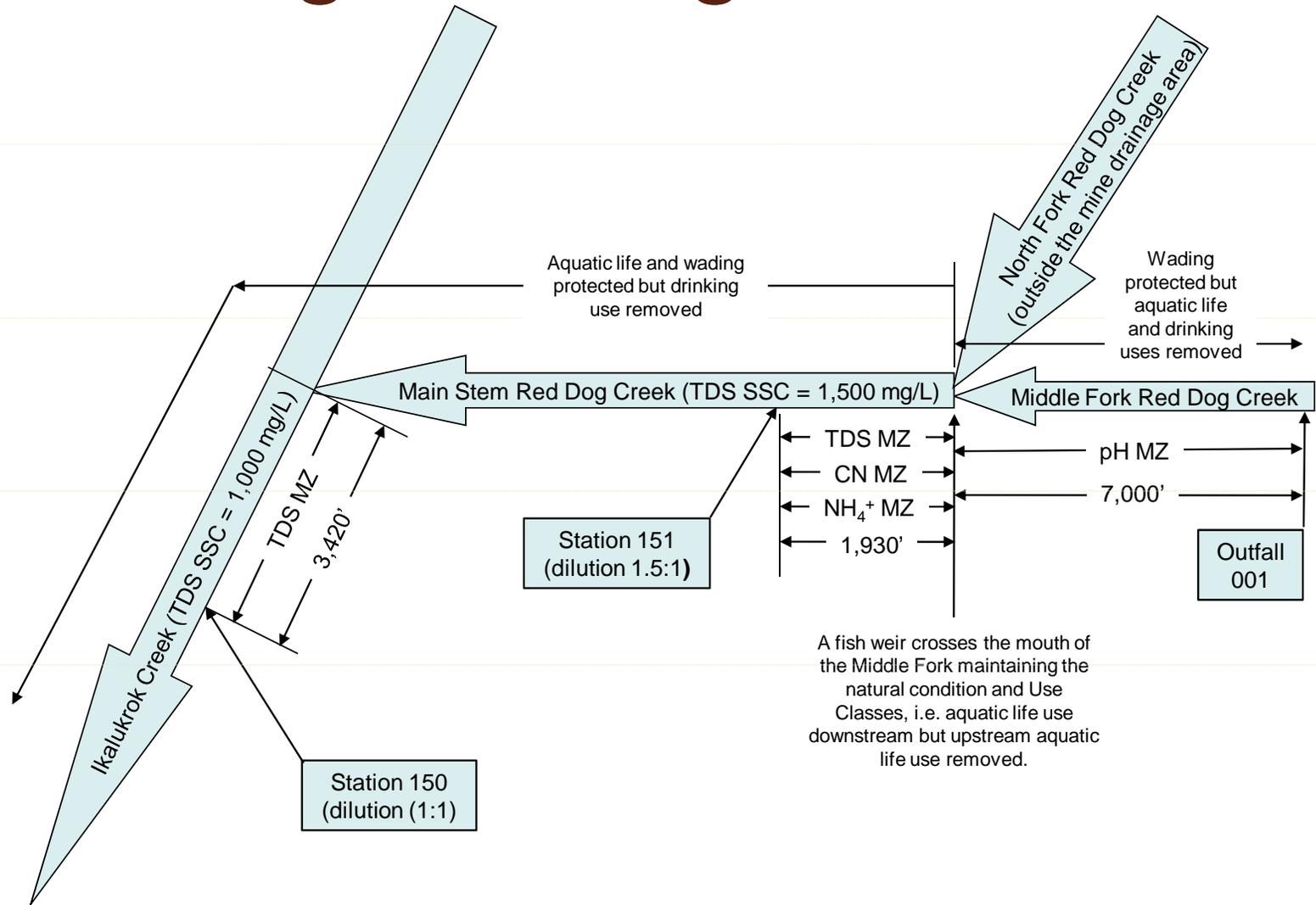
Telemetry Monitoring



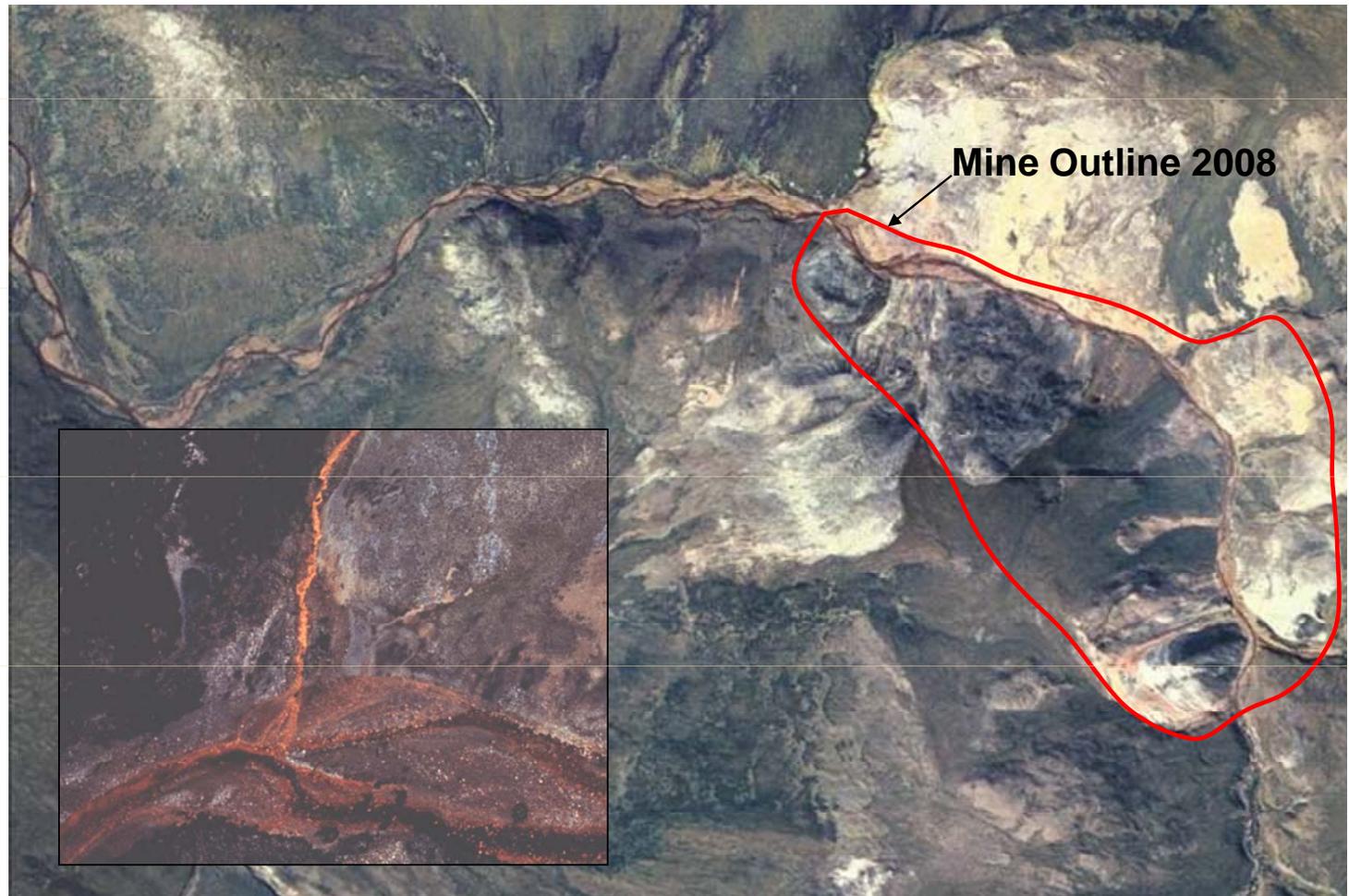
Clean Water Bypass



Mixing zone diagram



Red Dog Pre-Mining





Water Quality Issues

- Natural conditions
 - High metals levels, low Ph, and low TDS
 - 1/3rd above background for TDS (Monthly average 170)



Water Quality Issues

- Designated uses
 - UAA (Nancy)
 - Reclassifications 18 AAC 70.230(e)
 - (18) Main Stem Red Dog Creek
 - (19) Upper Middle Fork Red Dog Creek
 - (20) Lower Middle Fork Red Dog Creek



Water Quality Issues

- Antidegradation
 - Several treatability studies done
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Water Quality Issues

- Human Health
 - Drinking water use removed down to Ikalukroc Creek
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Water Quality Issues

- Aquatic Life
 - Aquatic Life Criteria removed in Middle Fork Red Dog Creek
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Water Quality Issues

- Site specific criteria
 - Fertilization study in 2005
 - TDS may not exceed 1500 mg/L for calcium > 50% by weight of the cations in the main stem Red Dog Creek (18 AAC 70.236(b)(5))

Regulatory History

7 Step Pattern for SSC Development

- **Study Plan – what, approach, & QAQC**
 - **EPA- Upfront and technical reviews**
- **Study Discussions –chemical, physical,& risk**
- **Data reviews and discussion**
- **Decision Memos**
- **Approvals DEC & EPA**
 - **Sometimes Appeals**



Regulatory History – Red Dog

Studies & Initial Permits 1982 – 1990

Baseline studies, EIS, Permit Applications

Complaints and Water Quality violations

Fish Biomonitoring -proposed by ADF&G

Compliance order by consent WQ

Violations, NOI for Water Quality violations

Regulatory History – Red Dog

Water Quality Work 1990-94

- Clean Water bypass system designed & constructed
- Improvements to water quality were documented
- Sand filters to remove particulate zinc installed

Use Attainability – Stream Reclassifications 1994-97

- Studies, public notice for stream reclassification
- Stream reclassification incorporated into regulation
- Fish barrier constructed -Middle Fork Red Dog Creek

Site Specific Criteria-

Total Dissolved Solids (1997 – 2003)

- Laboratory experiments on egg fertilization & egg development initiated
- Wet fertilization studies to test effects of TDS on fish embryos continued
- TDS Formally requested (2000)
- Finalized & incorporated DEC SSC in NPDES

Mixing Zones and TDS (2003)

Site Specific Criteria - TDS (2005-07)

- Arctic grayling studies concluded that TDS concentrations at or below **1,500 mg/L** Red Dog Creek provides protection of Arctic grayling (2005)
- DEC amends SSC for TDS - the **500 mg/L** limit during Arctic grayling spawning was removed and replaced with a **1,500 mg/L** limit (2/06)
- EPA approved SSC (4/ 2006)



Site Specific Criteria - Zn (1998)

- EPA Approved Main stem Red Dog & Ikalukrok Creeks
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- NPDES issued by EPA & certified by DEC

APPEALS

Modified permit appealed by Kivalina
Relocation Planning Committee

Station 150, at the end of the mixing zone in Ikalukrok Creek, was fitted with real time total dissolved solids and flow determination equipment and telemetry to link the station directly into the mill process control system

Appeals – 2007 and 2008

Appealed 2007

DEC issued Certificate of Reasonable Assurance
EPA issued NPDES permit for the Red Dog Mine discharge

EPA withdraws NPDES Permit, during interim, mine operates under 1998 NPDES Permit

Settlement 2008

Lawsuit Alleged violations of the mine's NPDES permit. Agreement was a commitment (barring certain requirements) by Mine to design, permit and construct a pipeline to carry treated mine effluent to the ocean



Closure Plan 2008

Final Draft of Red Dog Mine Closure and Reclamation Plan

Result of over six years of work by Mine in consultation with state and federal agencies and the public



Permits and Appeals 2009 & 2010

Permits

2009 DEC issued Certificate of Reasonable Assurance for the NPDES Permit for discharge of treated wastewater & stormwater

2010 EPA issued NPDES Permit

Appeals

2010 Two nonprofit law firms, representing local tribes and environmental groups, filed an appeal of 401 cert - asserting - not comply with CWA

Petitions Filed 2010

- 2 nonprofit law firms filed for review of the EPA permit with the Environmental Appeals Board. EPA stayed several contested conditions of NPDES
- EPA withdrew conditions from the 2010 NPDES Permit, including: effluent limits for lead, selenium, zinc, and weak acid dissociable (WAD) cyanide, and **Total Dissolved Solids (TDS)**.
- limits for those parameters in the **1998 NPDES Permit remain in effect.**



Law Suites continue
April 2011, TDS
