Fact Sheet

NPDES Permit Number: **AK-004785-6**
Date:
Public Notice Expiration Date:

Technical Contact: **Mike Lidgard (206) 553-1755 or**
1-800-424-4372 (within Region 10) or
lidgard.michael@epa.gov

The U.S. Environmental Protection Agency (EPA)
Proposes to Reissue a Wastewater Discharge Permit to:

Municipality of Anchorage -
Anchorage Water and Wastewater Utility
(Girdwood Wastewater Treatment Facility)
3000 Arctic Boulevard
Anchorage, Alaska 99503-3898

and
the State of Alaska proposes to Certify the Permit and
Review Consistency of the Permitted Project
with the Alaska Coastal Management Program

EPA Proposes NPDES Permit Reissuance

EPA proposes to reissue a National Pollutant Discharge Elimination System (NPDES) permit to the Girdwood Wastewater Treatment Facility which is owned and operated by the Municipality of Anchorage Water and Wastewater Utility. The draft permit sets conditions on the discharge of pollutants from the wastewater treatment facility to Glacier Creek. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged.

This fact sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current and proposed discharge
- a listing of past and proposed effluent limitations and other conditions
- a map and description of the discharge location
- detailed background information supporting the conditions in the draft permit

The State of Alaska Proposes Certification

The Alaska Department of Environmental Conservation (ADEC) proposes to certify the NPDES permit for the Girdwood Wastewater Treatment Facility, under section 401 of the Clean Water Act. EPA may not issue the final NPDES permit until the state has granted, denied, or waived certification.

The State of Alaska Proposes A Consistency Finding

The State of Alaska, Office of Management and Budget, Division of Governmental Coordination (DGC), proposes to review this action for consistency as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended [16 U.S.C 1456(c)(3)].

Public Comment

Persons wishing to comment on or request a public hearing for the draft permit may do so in writing by the expiration date of the Public Notice. All comments or requests for a public hearing should include the name, address and telephone number of the commenter and a concise statement of the exact basis of any comment and the relevant facts upon which it is based. All comments and requests for a public hearing must be in writing and should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 33 days after the issuance date, unless a request for an evidentiary hearing is submitted within 33 days.

Persons wishing to comment on State Certification should submit written comments before the public notice expiration date to the Alaska Department of Environmental Conservation at this address:

Alaska Department of Environmental Conservation
Division of Air and Water Quality
555 Cordova Street
Anchorage, Alaska 99503

Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below).

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

The fact sheet and draft permit are also available at:

EPA Alaska Operations Office, Room 537
Federal Bldg.
222 W. 7th Avenue, #19
Anchorage, Alaska 99513-7588

EPA Alaska Operations Office
410 Willoughby Avenue
Juneau, Alaska 9980-1795

For technical questions regarding the permit or fact sheet, contact Mike Lidgard at the phone numbers or email address at the top of this fact sheet. Those with impaired hearing or speech may contact a TDD operator at 1-800-833-6384. Ask to be connected to Mike Lidgard at the above phone numbers. Additional services can be made available to persons with disabilities by contacting Mike Lidgard.

The draft permit and fact sheet can also be found by visiting the Region 10 web site at www.epa.gov/r10earth/water.htm.

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LIST OF ACRONYMS

AWWU	Anchorage Water and Wastewater Utility
BOD_5	Five-day biochemical oxygen demand
cfs	Cubic feet per second
CWA	Clean Water Act
DMR	Discharge Monitoring Report
lb/day	Pounds per day
mgd	Million gallons per day
mg/l	Milligrams per liter
ml	Milliliters
NPDES	National Pollutant Discharge Elimination System
TSS	Total suspended solids
TSD	*Technical Support Document for Water Quality-based Toxics Control*, (EPA 1991)
USGS	United States Geological Survey
WWTF	Wastewater treatment facility
µg/l	Micrograms per liter

BACKGROUND INFORMATION

I. APPLICANT

Municipality of Anchorage-
Anchorage Water and Wastewater Utility
NPDES Permit No: AK -004785-6

Facility Name: Girdwood Wastewater Treatment Facility

Facility Location: Ruane Drive
Girdwood, AK 99587

Facility Contact: Kris Warren, Treatment Division Manager

Mailing Address: 3000 Arctic Boulevard
Anchorage, AK 99503-3898

II. FACILITY ACTIVITY

The Girdwood wastewater treatment facility is owned and operated by the Anchorage Water and Wastewater Utility (AWWU). The facility handles the domestic wastes from the Alyeska Ski Resort, the small community of Girdwood, and nearby subdivisions and developments. The plant consists of primary treatment, aeration basins, secondary clarifiers, mixed media filtration, chlorination, and dechlorination. The facility had an average daily flow of 0.405 mgd in 1999 and a design flow rate of 0.600 mgd. The Girdwood facility receives no industrial wastes. All sludge is transported to the AWWU's Point Woronzof treatment plant for incineration.

See Appendix A for a map of the location of the treatment plant and discharge. Appendix B contains a detailed discussion of the treatment processes and waste streams.

III. RECEIVING WATER

The Girdwood facility discharges to Glacier Creek at latitude 60^{O} 56' 42" and longitude 149^{O} 09' 23". The creek flows into the Turnagain Arm of Cook Inlet. Glacier Creek is classified by the Alaska Water Quality Standards for use as water supply, primary and secondary contact recreation, and propagation of fish, shellfish, other aquatic life, and wildlife.

IV. FACILITY BACKGROUND

A. Permit Status

The facility began operation in 1978. For the first 10 years of operation, the plant discharged to a percolation pond and had no surface water discharge, therefore, no NPDES discharge permit was necessary. In 1988, modifications were made to the facility including changing the effluent discharge. The effluent was modified to discharge to a perforated leaching pipe that was constructed parallel to the bank of Glacier Creek. A permit was issued with an effective date of April 10, 1989. The permit expired on April 11, 1994. The Municipality of Anchorage submitted an application for renewal on April 12, 1990. Because the application for renewal was timely, under the conditions of 40 CFR § 122.6, the permittee is authorized to continue discharging under the terms of the existing permit until a new permit is issued.

B. Compliance Status

A review of discharge monitoring reports (DMRs) submitted by the Municipality from December 1994 through October 1999 shows that the permittee has generally reported compliance with the limits in the 1989 permit. The DMRs show no violations of any of the five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), or chlorine limitations. The DMRs show 2 violations of the pH limitation, 3 violations of the daily fecal coliform limitation, and 2 violations of the monthly average flow limitation over the past five years. All the violations occurred prior to 1998. No violations have occurred during the past two years.

V. EFFLUENT LIMITATIONS

EPA followed the Clean Water Act (CWA), State and federal regulations, and EPA's 1991 *Technical Support Document for Water Quality-Based Toxics Control* (TSD) to develop the proposed effluent limits. In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either the technology-based or water quality-based limits. Appendix C provides the basis for the development of technology-based and water quality-based effluent limits.

Technology-based limits are set based on the level of treatment that is achievable using readily available technology. For publicly owned treatment

works, federal and State regulations include technology-based limits for three parameters: five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

The Agency evaluates the technology-based limits to determine whether they are adequate to ensure that water quality standards are met in the receiving water. If the limits are not adequate, EPA must develop additional water quality-based limits. These limits are designed to prevent exceedences of Alaska's water quality standards in the Glacier Creek. The proposed permit includes water quality-based limits for fecal coliform bacteria, pH, copper, and chlorine.

Table 1 contains a summary of the limits in the draft permit.

Table 1: Effluent Limitations for Outfall 001

Parameter	Effluent Limitations		
	Average Monthly	Average Weekly	Maximum Daily
Five-day Biochemical Oxygen Demand (BOD_5)			
mg/l	30	45	60
lb/day	150	225	300
Percent Removal	85[1]	---	---
Total Suspended Solids (TSS)			
mg/l	30	45	60
lb/day	150	225	300
Percent Removal	85[1]	---	---
Fecal Coliform, #/100 ml	100[2]	---	200
Total Residual Chlorine, mg/l	---	---	0.002[3]
Copper			
Fg/l	32	---	44
lb/day	0.16	—	0.22

Table 1: Effluent Limitations for Outfall 001			
Parameter	**Effluent Limitations**		
	Average Monthly	Average Weekly	Maximum Daily

Footnotes:
1 This value represents a minimum percent removal.
2 The geometric mean of all samples collected during the calender month shall not exceed 100 FC/100ml.
3 The final effluent limit for total residual chlorine (TRC) is below detection limits using EPA approved analytical methods, therefore, EPA will use the minimum level (ML) of 0.100 mg/l as the compliance evaluation level for TRC. When the daily maximum concentration is below the ML, the permittee will be in compliance with the TRC limit. The analytical method for TRC analysis shall achieve a method detection limit (MDL) of 0.010 mg/l.

In addition to the limitations in Table 1, the draft permit requires that the pH be in the range of 6.5 to 8.5 at all times and prohibits the discharge of floating solids, visible foam in other than trace amounts or oily wastes which produce a sheen on the surface of the receiving water.

VI. MUNICIPAL SEWAGE SLUDGE/BIOSOLIDS MANAGEMENT

Girdwood's sewage sludge (biosolids) is transported to the Anchorage Water and Wastewater Utility's John M. Asplund Water Pollution Control facility for disposal by incineration. The 1989 permit had minimal biosolids requirements which have been eliminated from the draft permit. The basis for this change is Region 10's recent decision to separate wastewater and sludge permitting. Under the CWA, EPA has the authority to issue separate sludge-only permits for the purposes of regulating biosolids. EPA will issue a sludge-only permit to this facility at a later date.

Until the issuance of a sludge-only permit, the facility's sludge activities will continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program. The Part 503 regulations are self-implementing, meaning that permittees must comply with them whether or not a permit has been issued. Therefore, the CWA does not require the facility to have a permit prior to use or disposal of biosolids.

The Part 503 regulations require that permittees have a current sludge application on file with the permitting authority. AWWU submitted an application to EPA on March 31, 2000.

VII. MONITORING REQUIREMENTS

A. Effluent Monitoring

Section 308 of the Clean Water Act and federal regulation 40 CFR 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. The Anchorage Water and Wastewater Utility is responsible for conducting the monitoring and for reporting results to EPA on DMRs.

Table 2 summarizes the proposed monitoring requirements in the draft permit. Monitoring frequency is based on the minimum sampling necessary to adequately monitor the facility's performance as well as the monitoring requirements in the 1989 permit. The 1989 permit required BOD_5, TSS, and fecal coliform monitoring twice per week. AWWU request monitoring of these parameters be reduced to once per week. AWWU cites EPA guidance which allows monitoring reductions based on past performance. Girdwood's discharge does meet the requirement for reduced monitoring, therefore, these parameters will be monitored weekly. The requirement to monitor loadings of BOD and TSS as pounds per day is a new requirement and needed due to the loading limits in the permit. Flow, chlorine, and pH monitoring are all carried over from the 1989 permit. Copper monitoring is required due to the effluent limitation which is a new permit requirement. Copper monitoring will be required once per month. Total ammonia and metals monitoring is required during the fourth year of the permit in order to gather information for the next permit reissuance.

Table 2: Outfall 001 Monitoring Requirements

Parameter	Monitoring Requirements	
	Sample Frequency	Sample Type
BOD_5, mg/l, lb/day, percent removal[1]	1/Week	24-hr Composite
TSS, mg/l, lb/day, percent removal[1]	1/week	24-hr Composite

Table 2: Outfall 001 Monitoring Requirements		
Parameter	**Monitoring Requirements**	
Fecal Coliform Bacteria, #/100 ml	1/Week	Grab
pH, standard units	5/week	Grab
Total Residual Chlorine, mg/l	Continuous	Recording
Total Flow, mgd	Continuous	Recording
Copper	Monthly	24-hour Composite
Total Ammonia, mg/l	Monthly[2]	24-hour Composite
Total Metals[3]	Monthly[2]	24-hour Composite

Footnotes:
1 The draft permit and the 1990 permit require influent and effluent monitoring to determine compliance with effluent limitations and percent removal requirements.
2 Monitoring for ammonia and metals is required during the fourth year of the permit only.
3 The following metals must be analyzed and reported as total recoverable: arsenic, cadmium, chromium, lead, mercury, nickel, silver, and zinc.

B. Ambient Monitoring

The State of Alaska has developed a preliminary Clean Water Act Section 401 certification for this draft permit (See Section IX.B. of this fact sheet). As part of the certification the State included the following stipulation regarding ambient monitoring. This stipulation has been included in the draft permit:

> "The ADEC will require monitoring at the outside edge of the mixing zone for fecal coliform bacteria. The samples must be collected from a minimum of one downstream/down current location at the outer edge of the mixing zone, (or as close to it as is practical due to site and access limitations), at a frequency of once every month during the time per, (May 1 through September 30) and twice during the remainder of the year, (November 1 through April 30). The monitoring may be discontinued after two years if the results indicate that the discharge has not caused the State of Alaska Water Quality Standards to be exceeded. The monitoring must start again if the method of disinfection is changed and may also be discontinued after two years if the results

indicate that the discharge has not caused the State of Alaska Water Quality Standards to be exceeded outside of the mixing zone."

C. Whole Effluent Toxicity

Federal regulations at 40 CFR 122.44(d)(1) require that permits contain limits on whole effluent toxicity when a discharge has reasonable potential to cause or contribute to an exceedence of a water quality standard for toxicity.

Whole effluent toxicity tests are laboratory tests that measure the total toxic effect of an effluent using living organisms. Whole effluent toxicity tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two different durations of toxicity test: acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

Whole effluent toxicity testing has not been conducted at the Girdwood facility. Toxicity is not anticipated for this discharge for a number of reasons which are outlined in section IV of Appendix C. Routine whole effluent toxicity monitoring will not be required for this facility. A one-time test in year four of the permit will be conducted in order to gather information to be used when the permit is reissued. See section IV of Appendix C for further discussion of whole effluent toxicity.

D. Representative Sampling

The draft permit requires representative sampling as specified in the federal regulations at 40 CFR 122.41(j). This provision specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. If such a discharge occurs, the AWWU must conduct additional, targeted monitoring to quantify the effects of the discharge on the final effluent. This provision is included in the draft permit because routine monitoring could miss permit violations and/or water quality standards exceedences that could result from bypasses, spills, or non-routine discharges.

VIII. OTHER PERMIT CONDITIONS

A. Quality Assurance Plan

Federal regulations at 40 CFR 122.41(e) require permittees to properly operate and maintain their facilities, including "adequate laboratory controls and appropriate quality assurance procedures." To implement this requirement, the draft permit requires that the Anchorage Water and Wastewater Utility develop a Quality Assurance Plan to ensure that monitoring data are accurate and to explain data anomalies if they occur. AWWU is required implement the plan within 120 days of the effective date of the draft permit. The Quality Assurance Plan must include standard operating procedures the permittees must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting.

B. Operation & Maintenance Plan

Section 402 of the Clean Water Act and federal regulations 40 CFR 122.44(k)(2) and (3) authorize EPA to require best management practices, or BMPs, in NPDES permits. BMPs are measures for controlling the generation of pollutants and their release to waterways. For municipal facilities, these measures are typically included in the facility's Operation & Maintenance (O&M) plan. These measures are important tools for waste minimization and pollution prevention.

The draft permit requires AWWU to incorporate appropriate BMPs into its O&M plan within 180 days of permit issuance. Specifically, the permittees must consider spill prevention and control, optimization of chemical use, public education aimed at controlling the introduction of household hazardous materials to the sewer system, and water conservation. To the extent that any of these issues have already been addressed, the permittees need only reference the appropriate document in its O&M plan. The O&M plan must be revised as new practices are developed.

As part of proper operation and maintenance, the draft permit requires AWWU to develop a facility plan when the annual average flow exceeds 85 percent of the design flow of the plant (design flow 0.600 mgd x 85% = 0.510 mgd). This plan requires AWWU to develop a strategy for remaining in compliance with effluent limits in the permit.

C. Additional Permit Provisions

In addition to facility-specific requirements, sections II through IV of the draft permit contain “boilerplate” requirements. Boilerplate is standard regulatory language that applies to all permittees and must be included in NPDES permits. Because the boilerplate requirements are based on regulations, they cannot be challenged in the context of an NPDES permit action. The boilerplate covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and general requirements.

IX. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (the Services) if their actions could beneficially or adversely affect any threatened or endangered species. On March 27, 2000, EPA requested species lists from the Services. The National Marine Fisheries Service (NMFS) responded on April 10, 2000, that Stellar sea lions are occasional visitors to Turnagain Arm and are listed as endangered under ESA. The letter also noted that Beluga whales are commonly found in the waters of Turnagain Arm. The Cook Inlet population of beluga whales is currently listed as a candidate species under the ESA. NMFS also reported that Cook Inlet beluga whales will be designated as depleted under the Marine Mammal Protection Act. On April 14, 2000, the U.S. Fish and Wildlife Service responded that there were no threatened or endangered species under its jurisdiction anticipated to occur within the action area.

Glacier Creek is classified by Alaska Water Quality Standards for propagation of fish, shellfish, other aquatic life, and wildlife. The draft permit limits were developed to protect all aquatic life species in Glacier Creek by complying with applicable water quality criteria. As discussed in Appendix C, all applicable water quality criteria are met either at the discharge point or at the edge of an authorized mixing zone.

Since the proposed permit has been developed to protect all aquatic life species in Glacier Creek in accordance with water quality standards, EPA has tentatively determined that issuance of this permit will have no affect on Stellar sea lions or Beluga whale present in Turnagain Arm. EPA will provide the Services with copies of the draft permit and fact sheet during the public notice period. Any comments received from the Services regarding ESA will be considered prior to reissuance of this permit.

B. Essential Fish Habitat

The Magnuson-Stevens Act (January 21, 1999) requires federal agencies to consult with NMFS when any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated Essential Fish Habitat (EFH) as defined by the Act. The EFH regulations define an *adverse effect* as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

In an April 10, 2000, letter to EPA, NMFS indicated that the NPDES analysis should include an EFH assessment. The EFH species for the area of Turnagain Arm which Glacier Creek empties into are king, sockeye, coho, pink, and chum salmon.

Since the proposed permit has been developed to protect all aquatic life species in Glacier Creek in accordance with the Alaska water quality standards, EPA has tentatively determined that issuance of this permit is not likely to adversely affect any EFH in the vicinity of the discharge. EPA will provide NMFS with copies of the draft permit and fact sheet during the public notice period. Any comments received from NMFS regarding EFH will be considered prior to reissuance of this permit.

B. State Certification

Section 401 of the Clean Water Act requires EPA to seek certification from the State that the permit is adequate to meet State water quality standards before issuing a final permit. The regulations allow for the State to stipulate any more stringent condition in the permit, if the certification cites the Clean Water Act or State law provisions upon which that condition is based. In addition, the regulations require a certification to include statements of the extent to which each condition of the permit can be made less stringent without violating the requirements of State law.

The Alaska Department of Environmental Conservation (DEC) issued a preliminary certification of the draft permit on June 23, 2000, in a letter from William D. McGee to Mark Premo of the Municipality of Anchorage. In the letter the DEC provided stipulations for inclusion in the permit which are

listed below. A rationale for each stipulation was also included in the letter. The stipulations have been incorporated into the draft permit:

1. Treated wastewater discharged from this facility shall not exceed a monthly average of 0.6 million gallons per day and a daily maximum of 2.6 million gallons per day.

2. The ADEC designates a mixing zone for fecal coliform bacteria, dissolved oxygen, temperature, total chlorine residual, pH, metals, nutrients, and whole effluent toxicity, contained in the discharge from the facility.

   The mixing zone for this discharge has a dilution of 10:1 and is defined as the area including the 90 meters for the diffuser discharge area and extending downstream from the downstream end of the diffuser discharge area a distance of 600 meters, with a width of 2.7 meters. The diffuser is buried adjacent to the shoreline of Glacier Creek.

3. The ADEC requires that the number of fecal coliform bacteria in the secondary treated effluent discharged from the Girdwood Wastewater Treatment Facility shall not exceed a 30 day geometric mean of 100 per 100 milliliters of sample and the daily maximum shall not exceed 200 per 100 milliliters of sample.

4. The ADEC will require monitoring at the outside edge of the mixing zone for fecal coliform bacteria. The samples must be collected from a minimum of one downstream/down current location at the outer edge of the mixing zone, (or as close to it as is practical due to site and access limitations), at a frequency of once every month during the time per, (May 1 through September 30) and twice during the remainder of the year, (November 1 through April 30). The monitoring may be discontinued after two years if the results indicate that the discharge has not caused the State of Alaska Water Quality Standards to be exceeded. The monitoring must start again if the method of disinfection is changed and may also be discontinued after two years if the results indicate that the discharge has not caused the State of Alaska Water Quality Standards to be exceeded outside of the mixing zone.

5. The ADEC requires that a sign, or signs, be placed on the shoreline near the mixing zone and outfall line. The sign, or signs, should state that treated domestic wastewater is being discharged, the name and

owner of the facility and the approximate location and size of the mixing zone. The sign, or signs, should inform the public that a mixing zone exists and that certain activities should not take place in the mixing zone, and give a facility contact telephone number for additional information.

As noted in stipulation number 2 above, the State's preliminary certification authorized a mixing zone for this discharge. The authorized mixing zone with a 10:1 dilution ratio was used in determining permit limits. If the State authorizes a different mixing zone in its final certification, EPA will reevaluate the effluent limitations based on the dilution available in the final mixing zone. If the State does not certify the mixing zone, EPA will reevaluate the permit limitations based on meeting water quality standards at the point of discharge.

C. Coastal Zone Management Act (CZMA)

The State of Alaska, Office of Management and Budget, Division of Governmental Coordination, will review this action for consistency as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended [16 U.S.C. 1456(c)(3)].

The consistency certification is a statement of assurance that this federally permitted activity, which will affect the coastal zone, will be conducted in a manner consistent with the enforceable policies and standards of the Alaska Coastal Management Program.

D. Permit Expiration

This permit will expire five years from the effective date.

APPENDIX A - GIRDWOOD WASTEWATER TREATMENT FACILITY LOCATION

-map, insert box here -

APPENDIX B - GIRDWOOD WWTF
WASTE STREAMS AND TREATMENT PROCESSES

I. Discharge Composition

In determining the pollutants present in the discharge and their maximum concentrations, EPA considered the NPDES application and discharge monitoring reports submitted by AWWU. Table B-1 lists the maximum concentration of pollutants reported by the Utility as being detected in its discharge.

Table B-1: Pollutants Detected in Discharge

Pollutant Type	Parameter	Maximum Reported Concentration
Conventional	BOD_5	16 mg/l
	TSS	16 mg/l
	pH, min - max	6.4 - 7.7
	Fecal coliform bacteria	12 colonies/100 ml
Toxic	Arsenic[1]	3 µg/l
	Beryllium[1]	ND (non-detect)
	Cadmium[1]	ND
	Chromium[1]	ND
	Copper[1]	20 µg/l
	Lead[1]	2 µg/l
	Mercury[1]	ND
	Nickel[1]	20 µg/l
	Silver[1]	.2 µg/l
	Zinc[1]	30 µg/l
Non-conventional	Total Ammonia[1]	10.4 mg/l
	Chlorine residual	ND

Footnotes
1 Metals concentrations are reported as total metals. Sampling was conducted over 14 days in January 2000.

II. Treatment Processes (excerpts from section 2A-B.3. of March 2000 application)

Preliminary treatment:

Domestic wastewater flows into the headworks which contains a channel that collects settled grit and gravel. Flow then goes through a bar screen that removes larger unsettleable objects.

Primary treatment:

Following preliminary treatment, the wastewater flows into an influent wet well. It is then pumped through two rotary screens that are capable of removing 12-18% of solids greater than 0.30 inches in size. Primary effluent then flows by gravity into the influent splitter box. From the splitter box, primary influent normally flows into the mixed liquor wet well where it is mixed with Return Activated Sludge (RAS) and gravity fed into the aerators. The screenings from the rotary screen fall into a screenings press where lime is added to raise the pH to 12.0 or higher and the moisture content of the screenings is reduced to 20% The screenings are then dropped into a hopper, sealed in plastic bags, and taken to the Girdwood Solid Waste Transfer Station for disposal.

Secondary treatment:

Mixed liquor from the mixed liquor wet well gravity flows into the four parallel aeration basins where diffused air is added to aerate and mix the solution. After sufficient time to biologically reduce the solids, the mixed liquor flows by gravity over the discharge weir and into the four in-line secondary clarifiers. The supernatant (secondary effluent from the clarifiers) flows by gravity over the top of the clarifier weirs to the mixed media filter splitter box.

Tertiary treatment:

Secondary effluent from the clarifier is distributed equally into four 100 square foot mixed media filters via the filter splitter box. The tertiary effluent filtrate flows by gravity into the effluent wet well.

Disinfection/dechlorination:

Effluent headers collect tertiary effluent from the mixed media filters in the filter underdrain system. The tertiary effluent flows by gravity to the effluent wet well where it is chlorinated and then pumped to the chlorine contact chamber. From the chlorine contact chamber, the effluent flows by gravity to, and over, the final effluent weir. Sulfur dioxide is injected into the final effluent below the final effluent weir, mixing and dechlorinating it, as it flows by gravity from the facility.

Biosolids (sludge) handling

Waste Activated Sludge (WAS) from the sludge recycle tank or mixed liquor from the aerators is pumped to the gravity belt thickener where polymer is added to assist in solids de-watering. Sludge produced from the gravity belt thickener is pumped to a 10,000 gallon thickened sludge storage tank where it is held until it is transported from the site for disposal.

APPENDIX C - BASIS FOR EFFLUENT LIMITATIONS

I. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations to determine which conditions to include in the draft permit.

In general, the EPA first determines which technology-based limits must be incorporated into the permit. EPA then evaluates the effluent quality expected to result from these controls, to see if it could result in any exceedences of the water quality standards in the receiving water. If exceedences could occur, EPA must include water quality-based limits in the permit. The draft permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent. A table of the limits that EPA is proposing in the draft permit is found in Section V of the Fact Sheet. This Appendix describes the technology-based and water quality-based evaluations for the Girdwood Wastewater Treatment Facility (WWTF).

II. Technology-based Evaluation

The 1972 Clean Water Act required publicly owned treatment works (POTWs) to meet performance-based requirements based on available wastewater treatment technology. Under Section 301(b)(1)(B) of the CWA, EPA was required to develop a performance level referred to as “secondary treatment” for POTWs.

Based on this statutory requirement, EPA developed secondary treatment regulations which are specified in 40 CFR Part 133.102. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

In addition to the federal technology-based requirements for POTWs, the State of Alaska's regulations at 18 AAC 72.050 require that domestic sewage discharges meet secondary treatment prior to discharge to surface water. "Secondary treatment" is defined at 18 AAC 72.990 for BOD_5, TSS, and pH. Section IV of this Appendix discusses the details of the evaluation for each of these pollutants.

III. Water Quality-based Evaluation

In addition to the technology-based limits discussed above, EPA evaluated the discharge to determine compliance with Section 301(b)(1)(C) of the Clean Water Act. This section requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977.

The regulations at 40 CFR 122.44(d)(1) implement section 301(b)(1)(C) of the Clean Water Act. These regulations require that NPDES permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality." The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation (WLA).

In determining whether water quality-based limits are needed and developing those limits when necessary, EPA uses the approach outlined below.

a. Determine the appropriate water quality criteria.
b. Determine whether there is reasonable potential to exceed the criteria.
c. If there is reasonable potential, develop a WLA.
d. Develop effluent limitations based on the WLA.

Appendix D provides example calculations to illustrate how the reasonable potential evaluation was conducted.

A. Determine Water Quality Criteria

The first step in developing water quality-based limits is to determine the applicable water quality criteria. The applicable criteria are determined based on the beneficial uses of the receiving water as identified in Section III of this Fact Sheet. For any given pollutant, different uses may have different criteria. To protect all beneficial uses, the permit limits are based on the most stringent of the water quality criteria applicable to those uses (see Table C-1).

B. Reasonable Potential Evaluation

To determine if there is reasonable potential to cause or contribute to an exceedence of the water quality criteria for a given pollutant, EPA compares applicable water quality criteria to the maximum projected downstream concentrations for a particular pollutant (i.e., the concentration at the edge of

the mixing zone). If the projected downstream concentration exceeds the criteria, there is reasonable potential and a water quality-based effluent limit must be included in the permit. Table C-1 summarizes the data, multipliers, and criteria used to determine reasonable potential to exceed criteria.

EPA used the recommendations in Chapter 3 of the *Technical Support Document for Water Quality-based Toxics Control* (TSD, EPA 1991) to

Table C-1: Reasonable Potential Evaluation

Parameter	Maximum Reported Conc	Number of Samples	CV	Reasonable Potential Multiplier	Maximum Projected Effluent Conc (C_e)	Projected Downstream Conc (C_d) (10:1 ratio)	Most Stringent Criterion	Reasonable Potential to Exceed?
Arsenic, µg/l	3	14	0.6	2.6	8	0.8	50	No
Beryllium, µg/l	non-detect (ND)	14	0.6	2.6	ND	ND	11	No
Cadmium, µg/l	ND	14	0.6	2.6	ND	ND	.36	No
Chromium III, µg/l	ND	14	0.6	2.6	ND	ND	62	No
Chromium VI, µg/l	--	--	0.6	2.6	--	---	11	No
Copper, µg/l	20	14	0.5	2.3	46	4.6	3.4	Yes
Lead, µg/l	2	14	0.6	2.6	5	0.5	.5	No
Mercury, µg/l	ND	14	0.6	2.6	ND	ND	.012	No
Nickel, µg/l	20	14	0.6	2.6	52	5.2	31	No
Silver, µg/l	0.2	14	0.6	2.6	.5	0.05	7.2	No
Zinc, µg/l	30	14	0.4	2.0	60	6.0	47	No
Ammonia, mg/l	10.4	14	0.2	1.4	14	1.4	1.43	No

conduct this reasonable potential analysis for the Wastewater Treatment Facility. An example reasonable potential (RP) analysis for ammonia is found in Appendix D.

The maximum projected downstream concentration, C_d, is determined using the following mass balance equation.

$$C_d = \frac{(C_e \times Q_e) + (C_u \times Q_u)}{Q_d}$$

where,

C_d = receiving water concentration downstream of the effluent discharge (at the edge of the mixing zone)
C_e = maximum projected effluent concentration
= maximum reported effluent value X reasonable potential multiplier
Q_e = design flow
C_u = upstream concentration of pollutant
Q_u = upstream flow
Q_d = receiving water flow downstream of the effluent discharge
= $Q_e + Q_u$

Substituting the equality:

$$D = \frac{(Q_u + Q_e)}{Q_e}$$

where,

D = dilution factor

the equation becomes:

$$C_d = \frac{(C_e - C_u)}{D} + C_u$$

The paragraphs below discuss each of the factors used in the mass balance equation to calculate C_d.

The maximum projected effluent concentration (C_e) in the mass balance equation is based on the 99th percentile, calculated using the statistical approach recommended in the TSD. The 99th percentile effluent

concentration is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier.

The reasonable potential multiplier accounts for uncertainty in the data. The multiplier decreases as the number of data points increases and variability of the data decreases. Variability is measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. A partial listing of reasonable potential multipliers can be found in Table 3-1 of the TSD. See Table C-1 for a summary of maximum reported effluent concentrations, reasonable potential multipliers, and maximum projected effluent concentrations.

The dilution available in the mixing zone surrounding the outfall depends on the size of the mixing zone and the physical characteristics of the discharge and the receiving water.

The river flow used to ensure that water quality standards are met at low flow conditions is the 7Q10 (7-day, 10-year low flow). The 7Q10 is the 7-day average low flow that has a 10 percent chance of occurring in any given year. The 7Q10 for Glacier Creek is 13 cubic feet per second (cfs) calculated from USGS data gathered from 1965 through 1978.

The Anchorage Water and Wastewater Utility (AWWU) performed dilution calculations based on critical flow conditions and the Fischer Mixing Model. The AWWU submitted a mixing zone request with the permit application. In accordance with Alaska's water quality standards, only the State may authorize mixing zones. As discussed previously in this fact sheet, Alaska DEC has preliminarily authorized the following mixing zone for this discharge:

> "The mixing zone for this discharge has a dilution of 10:1 and is defined as the area including the 90 meters for the diffuser discharge area and extending downstream from the downstream end of the diffuser discharge area a distance of 600 meters, with a width of 2.7 meters. The diffuser is buried adjacent to the shoreline of Glacier Creek."

EPA has incorporated the 10:1 dilution rate in calculating permit limits. If the State authorizes a different size mixing zone or a different dilution factor in its final Clean Water Act Section 401 certification, EPA will recalculate the reasonable potential and effluent limits based on the final mixing zone. If

the State waives its right to certify the permit or does not authorize a mixing zone in its 401 certification, EPA will recalculate the limits based on meeting water quality criteria at the point of discharge.

IV. Pollutant-specific Analysis

This section outlines the basis for each of the effluent limitations in the Girdwood WWTF draft permit.

A. Biochemical Oxygen Demand

The Girdwood WWTF is a publicly owned treatment works (POTW). As such, the facility is subject to the technology-based requirements for oxygen-demanding substances. Typically, oxygen-demanding substances are controlled by limitations on five-day biochemical oxygen demand (BOD_5), as specified in 40 CFR 133.102(a)(1)-(3). The technology requirements for BOD_5 are 30 and 45 mg/l as monthly and weekly average concentrations, respectively. The federal regulations also specify that POTWs must achieve a monthly average percent removal requirement for BOD_5 of at least 85 percent.

In addition to the federal technology-based requirements for POTWs, the State of Alaska's regulations at 18 AAC 72.050 require that domestic sewage discharges meet secondary treatment prior to discharge to surface water. "Secondary treatment" is defined at 18 AAC 72.990 for BOD_5, TSS, and pH. This definition includes the same requirements as the federal secondary treatment requirements, with the addition of daily maximum limits for BOD_5 and TSS of 60 mg/l.

Finally, under 40 CFR 122.45(f), permits must contain mass-based limitations. The concentration requirements were converted to mass limits by multiplying them by the design flow (0.6 mgd) and a conversion factor of 8.34. Based on this calculation, the monthly average, weekly average, and daily maximum loadings in the draft permit are 150, 225, and 300 pounds per day (lb/day), respectively.

The 1989 NPDES permit includes BOD_5 limitations of 20, 30, and 40 mg/l for the AML, AWL, and MDL respectively and associated loading limits. The 1989 fact sheet explains that the limits, more stringent than technology-based limits, were applied at that time since past performance indicated that the facility was performing beyond technology standards. The fact sheet

cites 40 CFR 133.105(f) for justification. The provisions in this section of the regulations describes the minimum level of effluent quality for facilities that are "eligible for treatment equivalent to secondary treatment." The Girdwood facility does not meet the definition of 40 CFR 133.101 for a facility eligible for treatment equivalent to secondary treatment and therefore, the more stringent limitations of the 1989 permit were in error. Secondary treatment technology-based requirements outlined above should have been applied in the 1989 permit. Under 40 CFR 122.44(l), limits in a reissued permit must be as stringent as those in the previous permit with limited exceptions. One exception is the determination that a mistaken interpretation of law was made in issuing the previous permit, which is the case for this facility. Therefore, the draft permit contains the standard secondary treatment BOD_5 limitations.

B. Total Suspended Solids

The federal regulations at 40 CFR 133.102(a)(1)-(3) specify technology-based requirements for total suspended solids (TSS) for POTWs. Like BOD_5, these requirements are 30 and 45 mg/l as monthly and weekly average concentrations, respectively, with a monthly average percent removal of at least 85 percent. In addition, the State requires a daily maximum limit of 60 mg/l. These requirements were incorporated as limits in the draft permit. In addition, the draft permit contains monthly average, weekly average, and daily maximum loading limits of 150, 225, and 300 lbs/day, respectively, based on the design flow and a conversion factor of 8.34. Like the BOD_5 limits the TSS limits of the existing permit were based on mistaken interpretation of law and, therefore, not included in the draft permit but replaced with the standard secondary treatment technology-based limits.

C. pH

In addition to limits on BOD_5 and TSS, 40 CFR 133.102 requires that effluent pH be within the range of 6.0 to 9.0 standard units for POTWs. The State water quality standard for pH for Glacier Creek is 6.5 to 8.5 standard units in order to protect freshwater uses. The previous permit includes this standard as the permit limit due to the low dilution ratio in the creek. The reissued permit retains this water-quality based pH limitation which is more stringent than the technology-based limit. Also, 40 CFR 12.44(l) prevents backsliding of permit limits with limited exceptions.

D. Fecal Coliform Bacteria

Alaska's fresh water standards for fecal coliform state that the geometric mean of fecal coliform bacteria may not exceed 20 colonies/100 ml and no more than 10 percent of the samples used to calculate the mean may exceed 40 colonies/100 ml to protect waters for use as water supply.

The 1989 NPDES permit incorporated the fecal standard directly into the permit as a limitation. This was done in order to protect Glacier Creek for freshwater use and likely in recognition of the low dilution that was available in the Creek.

In the recent NPDES permit application submitted to EPA, the AWWU request that the fecal coliform limits be raised. The AWWU is strongly considering ultraviolet disinfection treatment at the Girdwood facility. Use of ultraviolet disinfection would be environmentally beneficial since it would eliminate the use of disinfection chemicals and associated hazards. The current low fecal limits, however, would need to be increased in order for the ultraviolet disinfection system to be viable. The AWWU suggest the following limit: "In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 ml, and not more than one sample, or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 ml". The mixing zone would need to be applied in order to meet water quality standards with this limitation. As discussed previously, the mixing zone authorized by Alaska DEC would achieve a 10:1 dilution ratio. With this dilution, a 100 FC/100 ml discharge would be reduced to 10 FC/100 ml, and a 200 FC/100mL would be reduced to 20 FC/100 ml at the edge of the mixing zone, both in compliance with water quality standards. In the State's preliminary certification letter, DEC stipulated that the effluent "shall not exceed a 30 day geometric mean of 100 per 100 milliliters of sample and the daily maximum shall not exceed 200 per 100 milliliters of sample." The draft permit includes the limit as specified by DEC.

The proposed fecal coliform limit is less stringent than the previous permit. Under 40 CFR 122.44(l), limits in a reissued permit must be as stringent as those in the previous permit although there are a number of limited exceptions. One exemption exist for a substantial alteration to the permitted facility. The change in the disinfection process is considered a substantial alteration and in this case provides an exemption under 40 CFR 122.44(l).

E. Total Residual Chlorine

The 1989 permit includes a daily maximum limit that total residual chlorine (TRC) shall be below detectable limits based on the DPD colorimetric method of analysis as described in the most recent edition of Standard Methods. Girdwood now uses the amperometric method with an on-line meter which has a lower detection limit than the DPD method (AWWU memorandum 11/9/98). The 1989 permit also requires continuous monitoring.

Alaska's most stringent water quality standards for chlorine are 2 Fg/L when salmonids are present and 10 Fg/L when salmonids are not present. In order to protect Glacier Creek for the most stringent use, the 2 Fg/L standard will be incorporated as the daily maximum limit. The permit will require that the analytical method used to analyze TRC achieve a minimum detection limit of 10 Fg/L. Since the limit of 2 Fg/L is below the current capability to detect and quantify TRC, EPA is establishing the minimum level (ML) as the quantification level and also the compliance level for TRC in the permit. The ML for TRC is 100 Fg/L. Daily samples below 100 Fg/L will be considered in compliance with the daily limitation.

EPA believes that the use of the ML as an analytical chemistry performance standard provides an unambiguous and rational means to demonstrate that the best chemistry available at the time of permit issuance is being used. The ML is defined as the lowest concentration that gives recognizable signals and an acceptable calibration point. It is the equivalent concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes and processing steps have been followed. MLs are analyte- and method-specific and are established during the development and validation of the method. While the permittee must report all values measured that are above the method detection limit, the permittee will be judged in compliance with the limit specified in the permit if the values reported are less than the ML. Only values above the ML are judged to be exceedences of the permit limit.

F. Metals

In Alaska's water quality standards, the most stringent criteria for metals other than arsenic are the chronic criteria for the protection of aquatic life. For arsenic, the most stringent criterion (50 µg/l) is for protection of human health.

The State's aquatic life criteria for cadmium, chromium III, copper, lead, nickel, silver, and zinc are calculated as a function of hardness, measured in milligrams per liter calcium carbonate (mg/l $CaCO_3$). As the hardness of the receiving water increases, the toxicity decreases. Table C-2 shows the criteria equations and the resulting criteria. All criteria are expressed as total recoverable metals, in µg/l.

Table C-2: Hardness-dependent Metals Criteria for the Glacier Creek

Parameter		Criterion Formula	Criterion (µg/l)
Cadmium	Acute	exp(1.128*ln[hardness]-3.828)	0.75
	Chronic	exp(0.7852*ln[hardness]-3.490)	0.36
Chromium III	Acute	exp(0.8190*ln[hardness]+3.688)	520
	Chronic	exp(0.8190*ln[hardness]+1.561)	62
Copper	Acute	exp(0.9422*ln[hardness]-1.464)	4.4
	Chronic	exp(0.8545*ln[hardness]-1.465)	3.4
Lead	Acute	exp(1.266*ln[hardness]-1.416)	13
	Chronic	exp(1.266*ln[hardness]-4.661)	0.50
Nickel	Acute	exp(0.8460*ln[hardness]+3.3612)	410
	Chronic	exp(0.76*ln[hardness]+1.06)	31
Silver	Acute	exp(1.72*ln[hardness]- 6.52)	0.32
	Chronic	N/A	N/A
Zinc	Acute	exp(0.8473*ln[hardness]+ 0.8604)	34
	Chronic	N/A[1]	47

1 Alaska's chronic criterion for zinc is not hardness-based.

EPA used a hardness value from a USGS data base. Thirteen samples were analyzed from 1966-1970. Typically, EPA Region 10 uses the 5th percentile hardness value to represent a worst case value. In this case, EPA used the lowest value, 23 mg/l, which is the worse case condition. This compares to 61 mg/l, an average value, used in the 1989 analysis. Based on the effluent data submitted by the permittee, the analysis shown in Table C-1 indicates that only copper has a reasonable potential to contribute

to exceedences of the metals criteria in the receiving water. Therefore, a copper limit has been included in the draft permit (See Appendix D for derivation of copper limit). Although no reasonable potential to exceed exist for the other metals, the maximum measured effluent value for lead does exceed criteria at the discharge point. After applying the reasonable potential multipliers (see Table C-1) nickel and zinc also exceed criteria at the discharge point, however, after mixing in-stream the discharge meets the metal criteria at the edge of the mixing zone for these pollutants. Due to the fact that some metals require mixing zone dilution in order to meet water quality criteria, EPA will require the permittee to monitor for metals to gather data prior to the next permit reissuance. The draft permit will require monthly monitoring during the fourth year of the permit so that an adequate data base will be available for evaluation prior to the next reissuance.

G. Total Ammonia (as N)

Because the toxicity of ammonia is dependent upon pH and temperature, the criteria are also pH and temperature dependent. EPA Region 10 uses the 95th percentile temperature and pH to represent reasonable worst-case conditions when calculation ammonia water quality criteria. In this case, very little in stream data is available. Four samples were collected by Alaska DNR in 1994 (AK DNR September 1994). The greatest temperature value (6.0EC) and pH value (8.0) were used to represent worse case conditions. As a result, the acute and chronic ammonia criteria are 7.4 and 1.43 mg/l, respectively. This 1989 permit expressed the criteria as a range of between 11.4 to 35 mg/l for acute and 2.2 to 2.5 for chronic. Using the absolute worse case temperature and pH results in a lower, more protective criteria than the 1989 permit. Data collected by the permittee in January 2000 was evaluated to determine whether there was reasonable potential to cause or contribute to an exceedence of the criteria. The maximum measured effluent value of 10.4 mg/l was evaluated (see Table C-1). No reasonable potential was found, so no limit was included in the draft permit. However, the draft permit requires monthly effluent monitoring during the fourth year of the permit so that current data may be used to determine reasonable potential when the permit is reissued. Sampling in the fourth year will allow for timely review of the data prior to reissuance of the permit.

H. Whole Effluent Toxicity

Federal regulations at 40 CFR 122.44(d)(1) require that permits contain limits on whole effluent toxicity when a discharge has reasonable potential to

cause or contribute to an exceedence of a water quality standard. Alaska's water quality standards contain a provision requiring that whole effluent toxicity not exceed 1.0 chronic toxic units (TU_c) at the edge of the mixing zone, or at the discharge point if there is no mixing zone.

Whole effluent toxicity has not been conducted at the Girdwood facility. Toxicity is not anticipated for this discharge for a number of reasons. The wastewater is of domestic origin and there is no industrial component discharged to the Girdwood facility. Also, the facility chlorinates to disinfect, but dechlorinates prior to discharge to Glacier Creek. Total residual chlorine in the discharge is consistently below detection (AWWU is considering ultraviolet disinfection treatment). Ammonia, another contributor to toxicity at publically owned treatment works, does not appear elevated based on available data and the evaluation of this fact sheet found no reasonable potential to exceed criteria under critical conditions (see above ammonia section). Due to these factors, and the volume of the discharge, routine whole effluent toxicity monitoring will not be required. A one-time test in year four of the permit will be conducted in order to gather information to be used when the permit is reissued.

APPENDIX D - SAMPLE EFFLUENT LIMIT CALCULATIONS

Example NPDES Permit Reasonable Potential Calculation - Ammonia

Step 1: Determine the appropriate criteria

1A. Determine the uses

Glacier Creek is protected for the following uses: water supply, primary and secondary contact recreation, and propagation of fish, shellfish, other aquatic life, and wildlife.

1B. Determine the most stringent criterion to protect the uses

The most stringent criterion associated with these uses is the freshwater aquatic life chronic criterion of 1.43 mg/l (based on a temperature of 6.0EC and a pH of 8.0).

Step 2: Determine whether there is reasonable potential to exceed the criteria

2A. Determine the reasonable potential multiplier

The reasonable potential multiplier (RPM) is a factor that converts the maximum reported effluent concentration into the maximum projected effluent concentration. The maximum projected concentration corresponds statistically to the 99th percentile. The RPM is based on the coefficient of variation (CV) of the data and the number of data points. In this case, there were 14 data points, with a CV of 0.2. Using Table 3-1 of the TSD, the RPM is 1.4.

2B. Calculate the concentration of the pollutant at the edge of the mixing zone

There is reasonable potential to exceed criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the criterion. The maximum projected concentration is calculated from the following equation:

$$C_d = \frac{C_e - C_u}{D} + C_u$$

where,

C_d = receiving water concentration at the edge of the mixing zone
C_e = maximum projected effluent concentration
= maximum reported effluent concentration times reasonable potential multiplier (10.4 mg/l * 1.4 = 14 mg/l)
C_u = upstream concentration of pollutant (0 mg/l)
D = dilution factor (10)

$$C_d = \frac{14 - 0}{10} + 0$$

C_d = 1.4 mg/l

The concentration at the edge of the mixing zone (1.4 mg/l) is less than the chronic criterion (1.43 mg/l), therefore, no limit is necessary.

Derivation of Water Quality Based Effluent Limitations for Copper

The reasonable potential evaluation found that there is a potential to exceed copper criteria in-stream, therefore, a permit limitation is required. The purpose of a permit limit is to specify an upper bound of acceptable effluent quality. For water quality based requirements, the permit limits are based on maintaining the effluent quality at a level that will comply with the water quality standards, even during critical conditions in the receiving water (i.e., low flows). These requirements are determined by the wasteload allocation (WLA). The WLA dictates the required effluent quality which, in turn, defines the desired level of treatment plant performance or target long-term average (LTA).

To support the implementation of EPA's national policy for controlling the discharge of toxicants, EPA developed the "*Technical Support Document for Water Quality-Based Toxics Control*" (EPA/505/2-90-001, March 1991). The following is a summary of the procedures recommended in the TSD in deriving water quality-based effluent limitations for toxicants. This procedure translates water quality criteria for copper to "end of the pipe" effluent limits.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic waste load allocations (WLA_{acute} or $WLA_{chronic}$) for the receiving waters based on the following mass balance equation:

$$Q_dC_d = Q_eC_e + Q_uC_u$$

where, Q_d = downstream flow = $Q_u + Q_e$
C_d = aquatic life criteria that cannot be exceeded downstream
$C_{d(acute)}$ = 4.4 µg/L
$C_{d(chronic)}$ = 3.4 µg/L
Q_e = effluent design flow

C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = upstream flow
C_u = upstream background concentration of pollutant = 0 (no data available therefore, assume there is no background concentration)

Rearranging the above equation to determine the effluent concentration (C_e) or the wasteload allocation (WLA) results in the following:

$$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e}$$

when Cu is zero the equation becomes:

$$C_e = WLA = \frac{Q_d C_d}{Q_e}$$

With a 10:1 dilution ratio the equation becomes:

WLA_{acute} = 10 X C_d

= 10 X 4.4 µg/L = 44 µg/L

$WLA_{chronic}$ = 10 X C_d

= 10 X 3.4 µg/L = 34 µg/L

Step 2 - Determine the LTA

The acute and chronic WLAs are then converted to Long Term Average concentrations (LTA_{acute} and $LTA_{chronic}$) using the following equations:

$LTA_{acute} = WLA_{acute} \times e^{[0.5F^2 - zF]}$
where,
F^2 = $\ln(CV^2 + 1)$
z = 2.326 for 99th percentile probability basis
CV = coefficient of variation = 0.5
$LTA_{chronic} = WLA_{chronic} \times e^{[0.5F^2 - zF]}$
where,
F^2 = $\ln(CV^2/4 + 1)$
z = 2.326 for 99th percentile probability basis
CV = coefficient of variation = 0.5

(See TSD Table 5-1, page 102 for LTA multipliers)

Calculate the LTA_{acute} and the $LTA_{chronic}$:

LTA_{acute} = 44 µg/L X 0.373 = 16.4 µg/L
$LTA_{chronic}$ = 34 µg/L X 0.581 = 19.8 µg/L

Step 3

To protect a waterbody from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. In this case, the LTA_{acute} is used to determine effluent limits. The TSD recommends using the 95th percentile when calculating the Average Monthly Limit (AML) and the 99th percentile for calculating the Maximum Daily Limit (MDL).

Step 4 - Determine the Permit Limits

1. The maximum daily limit (MDL) and the average monthly limit (AML) would be calculated as follows:

$MDL = LTA_{acute} \times e^{[zF-0.5F^2]}$
where,
F^2 = $\ln(CV^2 + 1)$
z = 2.326 for 99th percentile probability basis
CV = 0.5
(See Table 5-2, page 103 of the TSD for multiplier)
MDL = 16.4 µg/L X 2.68
MDL = 44 µg/L

$AML = LTA_{acute} \times e^{[zF- 0.5F^2]}$
where,
F^2 = $\ln(CV^2/n + 1)$
z = 1.645 for 95th percentile probability basis
CV = coefficient of variation = standard deviation/mean
n = number of sampling events required per month for copper = 4
(See Table 5-2, page 103 for multiplier)
AML = 16.4 µg/L X 1.95
AML = 32 µg/L

Step 5 - Loading limitations

Federal regulations (40 CFR 122.45 (f)) require effluent limits to be expressed as mass based limits. The mass loading limitations for copper is as follows:

AML = (AML Concentration)(Design Flow Rate)(Conversion Factor)

where:
Monthly Concentration Limit = 32 µg/L = .032 mg/L
Design Flow Rate = 0.6 mgd
Conversion Factor = 8.34
AML = .16 lbs/day

MDL = (MDL Concentration)(Design Flow Rate) (Conversion Factor)
where:
Daily Maximum Concentration = 44 µg/L = .044 mg/L
MDL = 0.22 lbs/day