FACT SHEET AND TECHNICAL EVALUATION

U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue (OW-130)
Seattle, Washington 98101
(206) 553-0523

Permit No: AK-002324-8 **Date:**

PROPOSED REISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO PROVISIONS OF THE CLEAN WATER ACT (CWA)

Alyeska Pipeline Service Company
1835 South Bragaw Street
Anchorage, Alaska 99512

has applied for reissuance of an NPDES permit to discharge pollutants pursuant to provisions of the CWA. The fact sheet includes a) the tentative determination of the Environmental Protection Agency (EPA) to reissue the permit, b) information on public comment, public hearing and appeal procedures, c) description of the current discharge, d) an explanation of tentative effluent limitations and other conditions, and e) a sketch or detailed description of the discharge locations. We call your special attention to the technical material presented in the latter part of this document.

Public Comments on Draft Permit: Interested persons may submit written comments on the tentative determinations contained in the draft permit to EPA, Region 10, at the address above to the attention of the Director, Office of Water. Comments must be received within the 60 day public notice period to be considered in the formulation of the final permit reissuance. All comments 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.

The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the Public Notice period. If no substantive comments are received, the permit will become effective immediately upon issuance. If comments are received, the permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

Public Comments on State Certification and State Consistency Determination: This Notice will also serve as Public Notice of the intent of the State of Alaska, Department of Environmental Conservation to consider certifying that the subject discharge will comply with the applicable provisions of Section 208(e), 301, 301, 303, 306 and 307 of the Clean

Water Act. In addition, this Notice will serve as Public Notice of the intent of the State of Alaska, Office of Management and Budget, Division of Governmental Coordination (DGC), to review this action for consistency with the approved Alaska Coastal Management Program. Please see the attached public notice regarding submission of comments to the either ADEC or DGC concerning the aforementioned state determinations.

Administrative Record: The draft NPDES permit and other related documents are on file and may be inspected at the above EPA address any time between 8:00 a.m. and 4:30 p.m., Monday through Friday. The draft permit and fact sheet is also being sent to the following location:

EPA Alaska Operations Office
Room E551, Federal Building
701 C Street, Box 19
Anchorage, Alaska 99513

Copies and Other Information: Copies of the draft permit and fact sheet may be requested by calling the EPA Region 10 Public Information Center at 1-800-424-4EPA or Audrey Washington at (206) 553-0523; or send a written request to EPA (OW-130), 1200 Sixth Avenue, Seattle, WA 98101. Copies are also available on the Region 10 website www.epa.gov/r10earth/. For further technical information, please contact Mike Lidgard, EPA Region 10, at the address listed above, by telephone at (206) 553-1755, or by E-mail at lidgard.michael@epamail.epa.gov.

To ensure effective communication with everyone, additional services can be made available to persons with disabilities by contacting an EPA representative. For those with impaired hearing or speech, please contact EPA's telecommunication device for the deaf (TDD) at (206) 553-1698.

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LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BETX	Benzene, ethylbenzene, toluene, and xylene isomers
BMP	Best Management Practices
BOD	Biochemical oxygen demand
BWT	Ballast Water Treatment Facility
BTTs	Biological Treatment Tanks
CFR	Code of Federal Regulations
DAF	Dissolved air floatation
DMR	Discharge Monitoring Report
NPDES	National Pollutant Discharge Elimination System
PAH	Polycyclic aromatic hydrocarbons (also called polynuclear aromatic hydrocarbons)
RCAC	Prince William Sound Regional Citizens' Advisory Council
TAG	Alyeska Technical Advisory Group
TAH	Total aromatic hydrocarbons
TPAH	Total polycyclic aromatic hydrocarbons
TAqH	Total aqueous hydrocarbons
TOC	Total organic carbons
TOEM	RCAC's Terminal Operations and Environmental Monitoring Committee
TSD	Technical Support Document (EPA 1991)
TSS	Total suspended solids
TU	Toxic unit (TU_a = acute toxic unit, TU_c = chronic toxic unit)
VOC	Volatile organic compounds
WET	Whole effluent toxicity

INTRODUCTION

EPA proposes to reissue the NPDES permit for the Alyeska Pipeline Service Company's (hereafter "Alyeska") ballast water treatment facility (BWT) and marine terminal in Valdez, Alaska. Two outfalls are proposed to be covered by the draft permit. The discharges from the facility consist of treated ballast and bilge water and other operational wastes associated with oil storage and transport in Port Valdez (Outfall 001). Sanitary wastes are also treated and discharged at a separate discharge point (Outfall 002).

As part of permit development, EPA has reevaluated the effluent limits and monitoring requirements in Alyeska's existing permit. EPA reviewed the NPDES renewal application submitted by the permittee and monthly and annual monitoring reports required by the existing permit. The limitations, monitoring requirements and other conditions of the permit are deemed to be essentially sufficient. EPA has also reviewed technical reports submitted by the Prince William Sound Regional Citizens Advisory Council (hereafter "PWSRCAC").

The Alaska Department of Environmental Conservation (ADEC) has provided EPA with the preliminary 401 Certification of Reasonable Assurance for the draft permit and it is included as a separate document in this draft permit package. Stipulations of the certification have been included in the draft permit. If conditions in the final certification action differ from the preliminary certification (for example, the mixing zone determinations) then those changes will be reflected in the final NPDES permit.

The public is invited to comment to EPA on the draft permit and to provide any additional relevant information that should be considered in the final permit determination. Similarly, the public is invited to submit comments to ADEC regarding the preliminary 401 Certification of Reasonable Assurance.

I. APPLICANT

Alyeska Pipeline Service Company

Mailing Address:
1835 South Bragaw Street
Anchorage, Alaska 99512

Facility Location:
Sec. 13, T9S, R7W, Copper River Meridian
Valdez, Alaska 99686

Contact: David Connor, Ballast Water Treatment, Operations Specialist

II. ACTIVITY

The Alyeska marine terminal in Valdez, Alaska is located at the southern terminus of the Trans Alaska Pipeline System. The pipeline transports crude oil produced on the North Slope to Port Valdez. Oil is temporarily stored on land prior to transfer to tankers, which moor at one of the terminal's berths. The major discharges from this facility arise from ballast water carried by the tankers for added stability as they travel northwards, without cargo, to Valdez. The tankers come into the Port of Valdez loaded with water that picks up residual oil contaminants in a tanker's hold, off-load this water to the ballast water treatment plant, and fill their tanks with oil for transport to refineries. Additional discharges include bilge water, other operational wastes associated with oil storage and transport and sanitary wastes.

The ballast water treatment plant accomplishes two purposes, oil recovery and wastewater treatment. The treatment process consists of gravity separation, dissolved air flotation, biological treatment and on/off air strippers. Crude oil recovered from the ballast water is ultimately mixed with the pipeline oil supply and loaded onto the tanker ships. On a volume basis, tanker discharges account for approximately 90 percent of the BWT discharges. The remaining wastewaters are generated by the Terminal operations (including surface run off contained in drainage areas). The influent streams to the BWT are identified and quantified in the BMP Plan at Tables 2-1 and 2-2.

Sanitary wastes from the terminal are handled through a small extended aeration biological treatment plant and are discharged through a separate outfall.

III. RECEIVING WATERS

The facility is located near Jackson Point in Port Valdez, a subarctic fjord. The treated ballast water and other operational wastes are discharged through a 200 foot long, 48-inch diameter diffuser connected to the end of a 1100 foot long outfall pipe (designated Outfall 001). The diffuser lies along a slope, and the shallow end is located at a water depth of approximately 62 meters (200 feet); the offshore end is at a depth of

approximately 82 meters (270 feet). Outfall 001 is at latitude 61° 05'26" N and longitude 146° 23'08" W. Sanitary wastes are discharged through an outfall (designated Outfall 002) to approximately 12 meters (40 feet) of water at latitude 61° 05' 14" N and longitude 146° 23' 24" W.

Port Valdez is classified by the Alaska Water Quality Standards as Classes IIA(I)(ii)(iii), C and D. The waters are designated for all uses; i.e., aquaculture, seafood processing, and industrial water supply, water contact and secondary recreation, growth and propagation of fish, shellfish, aquatic life and wildlife and harvesting for consumption of raw molluscs or other raw aquatic life.

IV. DISCHARGE COMPOSITION

The following pollutants were reported by the Permittee as being present in the discharge, according to Alyeska's NPDES application. The toxic and conventional pollutants categories are defined in the regulations (40 CFR 401.15 and 401.16). The category of nonconventional pollutants includes all pollutants not listed in either of the other categories.

The following pollutants were believed to be present in the treated ballast water discharge (Outfall 001).

Conventional Pollutants: biochemical oxygen demand (BOD), oil and grease, total suspended solids (TSS), and pH.

Toxic Pollutants: cadmium, chromium, copper, lead, nickel, selenium, zinc, phenols, benzene, ethylbenzene, toluene, and xylene.

Nonconventional Pollutants: chemical oxygen demand (COD), total organic carbon (TOC), temperature, ammonia, nitrate-nitrite, total organic nitrogen, total phosphorous, sulfate, sulfide, surfactants, and iron,

The following pollutants were believed to be present in the sanitary waste discharge (Outfall 002).

Conventional Pollutants: biochemical oxygen demand (BOD), total suspended solids (TSS), pH, and fecal coliform.

Toxic Pollutants: none.

Nonconventional Pollutants: chemical oxygen demand (COD), total organic carbon (TOC), temperature, ammonia, nitrate-nitrite, total organic nitrogen, and total

phosphorous.

In developing the draft permit conditions, EPA has evaluated the concentrations of these pollutants relative to the levels allowed under federal regulations and the Alaska Water Quality Standards.

V. COMPLIANCE HISTORY

A review of the Discharge Monitoring Reports (DMRs) and Inspection Reports since issuance of the current permit shows that Alyeska has an excellent record of compliance with terms of the existing permit. Compliance with the BETX, flow, pH, and TSS limits for Outfall 001 has been absolute since the reissuance of the permit in 1997.

The sanitary discharge has also been in compliance with the permit limitations. There has been only one exceedance of the maximum daily TSS limit (60 mg/l) at 83.3 mg/l in February of 2000. All other monitoring results are in compliance with permit requirements.

VI. BACKGROUND

A. Permit History

Alyeska is an existing discharger which was first issued an NPDES permit for ballast water treatment on December 30, 1974. The permit was reissued in August 1980, May 1989, and May 1997. The 1989 and 1997 permits included sanitary wastewater discharges from the marine terminal.

Alyeska requested an evidentiary hearing on the 1989 permit. The Region 10 Regional Administrator granted the request in part and denied it in part. Alyeska then appealed the Regional Administrator's partial denial to the EPA Administrator. Alyeska also requested a state adjudicatory hearing on the Certificate of Reasonable Assurance issued by the state of Alaska under Section 401 of the Clean Water Act.

The NPDES permit was modified on November 14, 1990, and the challenges to the 1989 permit were dropped. A private citizen requested an evidentiary hearing on the permit modification. The Regional Administrator granted the hearing request on January 14, 1991. Ultimately Administrative Law Judge Lotis ruled and decided in favor of EPA on November 17, 1993, and the modified permit was upheld.

Alyeska applied for reissuance of the permit in November 2001. The existing permit has been administratively continued since its expiration date of May 21, 2002. The existing permit, therefore, remains fully effective and enforceable until reissuance.

B. Effluent Limits and Monitoring in the Existing Permit

Table 1 below presents the effluent limits for Outfall 001 in the existing NPDES permit re-issued May 21, 1997.

Table 1: Existing BWT Discharge (Outfall 001) Effluent Limitations

Parameter	Daily Maximum	Monthly Average	Units
BETX[1]	1.0	0.3	mg/l
Total Suspended Solids, TSS (except for the 24-hour composite samples collected on the day of and the day after stripper activation)	40	25[2]	mg/l
Total Suspended Solids, TSS (on the day of and the day after stripper activation)	170	NA	mg/l
Flow[3]	30	21	mgd
pH	Between 6.0 - 8.5 SU at all times		Standard units

Notes:

1/ BETX is the sum of the measured concentrations of benzene, ethylbenzene, toluene, and the xylene isomers. Each aforementioned component shall be separately quantified by the methods given in 40 CFR Part 136 or other EPA-approved methods, and the total reported as BETX on the DMR.

2/ TSS measured on the day of and the day after stripper activation shall not be included in the calculation of the monthly average.

3/ Flow shall be measured using the existing continuous flow meter or other methods of similar accuracy (at least ± 5%), as approved in advance by EPA, in consultation with ADEC.

The permit also requires the following parameters to be routinely monitored: temperature, density, dissolved inorganic phosphorous, ammonia, total hydrocarbons, dissolved oxygen, total recoverable zinc, and individual aromatic hydrocarbons. Data reported by Alyeska in the monthly Discharge Monitoring Reports, which are required by the permit, have been compiled and placed in the administrative record for this permit. Table 2 below presents the effluent monitoring requirements for Outfall 001 in the existing NPDES permit.

Table 2: BWT Discharge (Outfall 001) Monitoring Requirements			
Parameter	Measurement Requirements	Sample Type	Reported Value(s)
BETX[1]	3/week[2]	Grab	Maximum daily and monthly average (mg/l)
TSS[2]	3/week (and on the day of and the day after stripper activation)[2,3]	24 hr. Composite	Maximum daily and monthly average (mg/l)
Flow	Continuous	Recording	Maximum daily and monthly average (mgd)
pH	Continuous	Recording	Maximum, minimum and all exceedances
WET[4]	Quarterly	Grab	TUc
TAqH	Monthly[5]	Grab	Maximum Value (mg/l)
Dissolved Inorganic Phosphorous	Monthly	Grab	Concentration (mg/l as P)
Ammonia	Monthly	Grab	Concentration (mg/l as N)
Density	Weekly	Grab/Hydrometer	Maximum daily & monthly average (sigma t)
Total Rec. Zinc	Quarterly	24 hr. Composite	Concentration (mg/l)

Notes:

1/ BETX is the sum of the measured concentrations of benzene, ethylbenzene, toluene, and the xylene isomers. Each of the aforementioned components shall be separately quantified by the methods given in 40 CFR Part 136, and the total reported as BETX on the DMR.

2/ Samples collected to comply with the 3/week measurement frequency shall be collected at least 24 hours apart.

3/ TSS samples shall be collected daily. A minimum of three TSS samples shall be analyzed per week. If the strippers are activated then the effluent samples collected on the day of and the day after stripper activation shall also be analyzed for TSS. Where necessary, the TSS sample(s) associated with stripper activation may satisfy the three times per week measurement frequency monitoring requirements. The Permittee shall submit with the DMR a monthly air stripper activity report which identifies the dates and times of stripper activation and deactivation.

4/ See Part III.A. of this permit for specifics regarding the WET monitoring requirement.

5/ TAqH analyses shall be conducted in accordance with 18 AAC 70.020, Note 8. If TAqH is not measured

in excess of 0.54 mg/l during the first year of the permit, then the monitoring frequency for TAqH may be reduced to quarterly upon request by the Permittee.

C. Effluent Toxicity Monitoring in the Existing Permit

Alyeska's existing NPDES permit requires whole effluent toxicity (WET) testing using BWT effluent. The permit requires quarterly sublethal (or chronic) WET testing of sea urchin or sand dollar sperm and annual lethal (or acute) WET testing of a mysid. The toxicity tests demonstrate that the Alyeska BWT effluent exhibits low toxicity, with the no effect concentrations varying between 50% to 100%+ of the effluent in 27 of 32 tests. All five of the WET tests that detected whole effluent effects at less than 50% used the sperm of the sand dollar, *Dendraster excentricus*, in sublethal tests of fertilization rates, suggesting that this species may be more sensitive than the other species tested. A summary of the analyses conducted since permit reissuance is provided in Table 3 below.

Table 3: Summary of the Whole Effluent Toxicity Tests for the Alyeska Ballast Water Treatment facility in Valdez, AK 1997 - 2002

Dates of Collection	Test Organism and	NOEC	LOEC	IC25 or	IC50 or	TUc or
2/10/97, 2/11/97	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
2/10/97, 2/11/97	Mysid, *M. bahia*; acute	100%	>100%	>100%	>100%	n.a.
4/22/97, 4/25/97	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
4/22/97, 4/25/97	Mysid, *M. bahia*; acute	100%	>100%	>100%	>100%	n.a.
8/19/97, 4/20/97	Sand dollar sperm, *D.excentricus*; chronic	90%	>90%	>90%	>90%	n.a.
8/19/97, 4/20/97	Mysid, *M. bahia*; acute	50%	100%	>100%	>100%	n.a.
11/10/97, 11/11/97	Sea urchin sperm, *S. purpuratus*; chronic	92.5%	>92.5%	>92.5%	>92.5%	n.a.
11/18/97, 11/19/97	Mysid, *M. bahia*; acute	100%	>100%	>100%	>100%	n.a.
1/12/98, 1/15/98	Sea urchin sperm, *S. purpuratus*; chronic	50%	100%	>100%	>100%	< 1.0
1/12/98, 1/15/98	Mysid, *M. bahia*; acute	50%	100%	86.7%	>100%	< 1.0
5/4/98, 5/5/98	Sea urchin sperm, *S. purpuratus*; chronic	89%	>89%	>89%	>89%	< 1.12
8/25/98, 8/26/98	Sand dollar sperm, *D.excentricus*; chronic	100%	>100%	>100%	>100%	< 1
10/21/98, 10/22/98	Sand dollar sperm, *D.excentricus*; chronic	50%	90%	>90%	>90%	<1.1
2/9/99, 2/10/99	Sea urchin sperm, *S. purpuratus*; chronic	50%	100%	96.2%	>100%	1.0
2/9/99, 2/10/99	Mysid, *M. bahia*; acute	100%	>100%	>100%	>100%	< 1.0
4/20/99, 4/20/99	Sea urchin sperm, *S. purpuratus*; chronic	50%	100%	89.7%	>100%	1.1
9/15/99, 9/16/99	Sand dollar sperm, *D.excentricus*; chronic	< 6.25%	< 6.25%	>100%	>100%	n.a.
12/2/99, 12/3/99	Sea urchin sperm, *S. purpuratus*; chronic	50%	100%	>100%	>100%	< 1.0
2/1/00, 2/2/00	Sea urchin sperm, *S. purpuratus*; chronic	50%	>100%	>96%	>100%	1.0
2/1/00, 2/2/00	Mysid, *M. bahia*; acute	100%	>100%	> 100%	> 100%	< 1.0
4/6/00, 4/6/00	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
7/18/00, 7/19/00	Sand dollar sperm, *D.excentricus*; chronic	< 6.25%	6.25%	17%	31%	n.a.

Table 3: Summary of the Whole Effluent Toxicity Tests for the Alyeska Ballast Water Treatment facility in Valdez, AK 1997 - 2002

Dates of Collection	Test Organism and	NOEC	LOEC	IC25 or	IC50 or	TUc or
8/15/00, 8/16/00	Sand dollar sperm, *D.excentricus*; chronic	< 6.25%	12.5%	23%	>100%	n.a.
10/13/00, 10/15/00	Sand dollar sperm, *D.excentricus*; chronic	12.5%	25%	24%	57%	n.a.
1/17/01, 1/18/01	Sea urchin sperm, *S. purpuratus*; chronic	80%	>80%	>80%	>80%	n.a.
1/17/01, 1/18/01	Mysid, *M. bahia*; acute	80%	>80%	>80%	>80%	n.a.
4/5/01, 4/5/01	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
7/12/01, 7/12/01	Sand dollar sperm, *D.excentricus*; chronic	5.38%	10.75%	17.25%	35.12%	n.a.
10/1/01, 10/2/01	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
1/2/02, 1/3/02	Sea urchin sperm, *S. purpuratus*; chronic	100%	>100%	>100%	>100%	n.a.
1/2/02, 1/3/02	Mysid, *M. bahia*; acute	100%	>100%	> 100%	> 100%	n.a.
4/3/02, 4/4/02	Sea urchin sperm, *S. purpuratus*; chronic	50%	100%	>100%	>100%	n.a.

1.NOEC means no observed effect concentration, LOEC means lowest observed effect concentration, IC, inhibition concentration, is a point estimate of the toxicant concentration that would cause a given percent reduction in a nonlethal biological measurement of the test organisms, such as reproduction or growth, LC, lethal concentration, is the point estimate of the toxicant concentration that would be lethal to a given percentage of the test organisms during a specific period, TU, toxic unit, is a measure of acute or chronic toxicity.

D. Background on Environmental Monitoring Under the Existing and Previous Permits

The 1989 permit required annual environmental monitoring which included the following components: (1) benthic infauna monitoring, (2) sediment hydrocarbon monitoring, (3) sediment toxicity monitoring, (4) tissue hydrocarbon monitoring of the mussel, *Mytilus edulis*, and (5) monitoring of hydrocarbons in flatfish bile. Environmental monitoring beyond that required by the NPDES permit has also been conducted by Alyeska in Port Valdez. Alyeska performed the required environmental monitoring and submitted numerous individual, annual, and supplementary reports (Feder and Shaw, 1988, 1990, 1991, 1992, 1993, 1994, 1995, 1996; Feder and Blanchard, 1991, 1992, 1993, 1994).

The 1997 permit required annual environmental monitoring which included the following components: (1) benthic abundance and community structure and (2) sediment hydrocarbon monitoring. Alyeska performed the required environmental monitoring and submitted numerous annual and supplemental reports (Feder and Shaw, 1997, 1998, 1999, 2000; Feder, Shaw, Blanchard 2001, 2002; Feder, Shaw, Blanchard, McIntosh, 1998, 1999, 2000, 2001, 2002). The June 2001 Environmental Study report contains analysis of both current results and the historic database. The 1997 permit required the additional analysis in order to provide information for permit renewal. The June 2001

report includes environmental monitoring program recommendations for consideration during permit reissuance. All of the monitoring reports submitted in accordance with the existing permit requirements are included in the administrative record for this reissuance.

For purposes of providing background for the reissued permit, EPA will briefly summarize below the monitoring conducted pursuant to the previous permits. Also see Part VIII.F. of this fact sheet for more on environmental monitoring.

The spatial and temporal distributions of benthic infauna have been monitored in the vicinity of the discharge from Outfall 001 since 1971. Fluctuations in the number of taxa, biomass, and abundance of benthic infauna have been observed in Port Valdez (Feder and Shaw, 1996; Tetra Tech, Inc., 1994; Feder, Shaw, Blanchard 2001). The benthic community in Port Valdez is unstable with “successional faunal events” occurring every several years (Feder and Shaw, 1996; Feder, Shaw, Blanchard 2001). While the causes of the fluctuations are uncertain, it has been speculated that they may be the function of changes in the organic carbon levels. These changes may also be natural and unrelated to the BWT effluent. Changes in the relative populations of copepods and phytoplankton in the water column can have a significant impact on the carbon levels and consequently the structure of the benthic community. It appears that the carbon discharged from the BWT outfall enhances the benthic infauna near the discharge point (ibid.) At the Scientific Meeting on Environmental Monitoring of Port Valdez in January 1995 (BWT Work Group, 1995), the following general agreement was reached:

> "(a)though changes have been observed in the benthic community in close proximity to the BWT effluent discharge below the mixing zone, there is no evidence that the Port Valdez ecosystem is being altered by the BWT effluent discharge. However, knowledge of potential effects to all ecosystem components is incomplete."

It was also generally concluded at the above-referenced meeting that there was significant merit to continuing the benthic abundance and community structure monitoring in the 1997 permit. Results from benthic monitoring conducted pursuant to the 1997 permit support the 1995 statement. The June 2001 Report states “A variety of descriptive multivariate statistical techniques... were employed in an effort to find associations between attributes of the benthic infaunal community structure and hydrocarbon concentrations in Port Valdez sediments. These analyses have consistently shown that water depth from which the sediments were collected is much more strongly associated with infaunal community structure than any hydrocarbon concentration or other chemical parameter. ...faunal data for Port Valdez demonstrated that effluent from the Ballast Water Treatment Plant (BWTP) does not negatively affect benthic organisms in the Deep Basin and rarely influences Shallow-Shelf stations.”

Sediment hydrocarbon monitoring has been conducted to determine the fate, concentrations, and impacts of petroleum hydrocarbons in the sediments below the mixing zone and within Port Valdez. The monitoring has revealed a spatial gradient in sediment hydrocarbon concentrations with relatively higher concentrations measured in shallow near-field areas, especially at the station nearest Outfall 001 (D33). Hydrocarbon concentrations in Port Valdez sediments are lower by a factor of ten than the marine sediment quality standards developed by the State of Washington (WAC, 1991); this is true even for the station closest to the outfall. Concentrations of hydrocarbons at the outfall have not been measured at level which are recognized as harmful to benthic organisms or of significant risk to human health (Feder and Shaw, 1996). Tarry materials, variously described as oil smudges, oil drops, tar balls, and tar clumps, as well as paint chips have been observed in samples collected in near-field shallow and near-field deep stations. Attendees at the January 1995 scientific meeting reached general agreement that

> "(a)though hydrocarbon concentrations are elevated in sediments close to the BWT effluent discharge and below the mixing zone, these elevations are well below existing sediment quality guidelines, criteria or related values." (ibid.)

Recent sediment hydrocarbon monitoring required by the 1997 permit support the 1995 findings stated above, with the exception of the results from one site discussed below. The 2001 report concludes: “Generally, in the 1990's, hydrocarbon concentrations in Port Valdez sediments showed steady or declining values. Concentrations tended to decline until about 1993 and fluctuate or remain low thereafter.”

During sampling in 1995, and again in 1996, samples collected for biological analysis at the near-field station number D25 showed indications of petroleum contamination. Additional sampling was conducted in 1997 to further investigate the extent of possible hydrocarbon contamination at station D25. Chemical analysis showed 1997 sediments contained degraded Alaska North Slope petroleum at station D25, and biological analysis showed a decrease in abundance of infauna and other indicators of negative impacts associated with hydrocarbon concentration. A focused measurement program was designed and implemented in 1998 and repeated in 1999, 2000, and 2001. The monitoring found the increased concentration of hydrocarbons led to negative effects within a very small area. In 2001, the concentration of hydrocarbons continue to be elevated (although well below ERL effects values) relative to sediments to the east or west of the diffuser, however, the hydrocarbons are declining. “These findings of a decline in hydrocarbon concentrations from previous years and the clustering of residual elevated concentrations in the vicinity of the diffuser are consistent with a past (no longer continuing) source associated with treated ballast discharge” (Shaw, Feder, Blanchard, McIntosh 2002).

Sediment toxicity monitoring was conducted annually during the 1989 permit (except in 1994 and 1995). The objective of the monitoring was to determine if the sediments demonstrated acute toxicity to the marine amphipod, *Rhepoxinius abronius* or an equivalent species. During the course of the 1989 permit, the following alternative species were used in sediment toxicity testing: *Eohaustorius estuarius, Corophium spinicorne, and Ampelisca abdita*. Acute tests conducted in the early 1990's using the above species, indicated that Port Valdez sediments do not cause statistically significant mortality relative to the Heather Bay reference sediments (Karle, Ward, and Word, 1994).

Tissue hydrocarbon monitoring using *Mytilus edulis* collected at stations in Port Valdez was required under the 1989 permit because the sedentary filter feeder has been shown to accumulate water-borne pollutants. The objectives of the monitoring were to determine whether hydrocarbon levels in tissues of the intertidal filter feeder were changing. Sampling was done in the springs of 1990, 1991, 1992, 1993, 1994, and 1995; and in the falls of 1989, 1990, 1992, 1993, 1994, and 1995. Shaw et al. (1996) report that the types and concentrations of hydrocarbons detected in Port Valdez mussels indicate that biogenic (rather than petroleum) hydrocarbons are the major contributor. Temporal and spatial comparisons of hydrocarbon concentrations in mussels did not show significant differences. Shaw et al. (1995 and 1996) concluded that mussel tissue hydrocarbon data are less useful than sediment hydrocarbon data due to the high variability of non-petroleum hydrocarbon concentrations in mussels from Port Valdez.

Flatfish bile monitoring was conducted in 1993. Three species of flatfish were targeted for collection in the vicinity of the terminal, Old Valdez, and at Jack Bay (reference site). Yellow fin sole collected near the terminal contained higher concentrations of polynuclear aromatic hydrocarbon (PAH) metabolites than bile from fish collected at the other sites (Columbia Aquatic Sciences, 1993). The likely source of PAH in the flatfish bile is contaminated sediment, tarballs, or contaminated food. However, the test results were difficult to interpret since flatfish are mobile and it is not possible to separate inputs from the BWT discharge and other non-combustion sources of hydrocarbons (e.g., spills).

Environmental monitoring conducted by Alyeska but not required by the NPDES permit has focused on a variety of topics. This research includes, but is not limited to, studies on the Dayville mudflats, Port Valdez *Macoma* clams, Tanner crab populations, life-cycles of *Mytilus* and barnacles in Port Valdez, salmon fry from the nearby hatchery, and the Port Valdez sea otter population. None of the studies demonstrate significant adverse impacts to the Port Valdez ecosystem.

RCAC has been conducting the Long-Term Environmental Monitoring Program (LTEMP) to provide long-term baseline measurements at sites within Prince William Sound and the Gulf of Alaska. The program focuses on sampling shallow subtidal sediments and intertidal mussels. Two of the sampling stations are within Port Valdez -

one near the Terminal and another near Gold Creek. RCAC also collected a sample shortly after the T/V Eastern Lion spill in May 1994. A review of the results did not revealed previously unrecognized environmental concerns in Port Valdez (RCAC, 1995).

E. Pollution Reduction Activities

During the last two NPDES permit cycles, Alyeska has made significant investments in the BWT to improve the performance of the treatment system and reduce the pollutant loading in the effluent. Key projects, implemented during the 1990's include the following:

- installation of the new ballast water treatment tanks (BTTs) and associated on/off air strippers have produced a significant reduction in effluent BETX concentration and pollutant loading to Port Valdez,
- installation of an on-line BETX monitor which resulted in improved control of the BTTs and significant reduction in the use of the on/off air strippers,
- improved control of nutrient injection to the biological treatment system,
- improvements and refinements to the Best Management Practices (BMP) Plan and Ballast Water Survey Form which resulted in the reduced transfer of tanker wastes and eliminated transfer of halogenated tank cleaning agents from tanker vessels,
- improved sludge handling which reduced the amount of material requiring disposal,
- increased training of Terminal personnel on proper waste handling procedures (e.g., proper disposal of waste oil and other chemicals), treatment plant operation, and NPDES permit/BMP Plan requirements,
- installation of an online Turner fluorometer to monitor the effluent to improve detection of sheen events, and
- installation of vapor controls on berths four and five.

The existing permit required Alyeska to prepare and submit a framework document for incorporating pollution prevention into Terminal activities. This document was submitted as specified by the permit. An updated pollution prevention framework document was submitted by Alyeska in June 2000.

The proposed permit requires Alyeska to update the framework document within one year after the effective date of the permit. In addition to the objectives required to be addressed previously, the proposed permit also requires the pollution prevention report to analyze the efficiency of the design and operation of the current BWT treatment process. This analysis must consider specific changes that have occurred, or are forecasted to occur, that may effect treatment efficiency. These changes include decreased throughput and physical changes in the crude oil. This requirement is discussed further in the Best Management Practices section of this fact sheet.

F. Other Studies

RCAC issued a report entitled: “Evaluation of Mixing Zone and NPDES Permit Renewal Applications for BWTF at Alyeska Marine Terminal”, dated April 24, 2002. The study evaluated the results from the Alyeska Environmental Monitoring Program and other available Port Valdez data. The report includes evaluation of current test methods, environmental effects of the discharge, issues related to the mixing zone such as plume behavior and mapping, whole effluent toxicity monitoring results, engineering considerations, and other issues relevant to the NPDES permit. The report includes a number of proposed modifications for the NPDES permit. Some of the recommendations are discussed in Section VIII, Specific Permit Conditions. The RCAC report has been included as part of the administrative record to this permit reissuance.

VII. BASIS FOR PERMIT CONDITIONS

A. General Approach

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

In general, EPA first determines which technology-based limits are required, as well as best management practices or other requirements. EPA then evaluates the effluent quality expected to result from these controls, to see if the effluent could result in any exceedances of water quality standards in the receiving water. If exceedances could occur, EPA must include water quality-based limits in the permit. The permit limits will thus reflect whichever limits (technology-based or water quality-based) are necessary to ensure that the water quality standards will not be exceeded.

Under section 308 of the Act and 40 CFR 122.44(I), EPA must also include monitoring requirements in the permit to determine compliance with effluent limitations. Effluent and ambient monitoring may also be required to gather data for future effluent

limitations or to monitor effluent impacts on receiving water quality.

B. Technology-Based Evaluation

1. Statutory Basis for Technology-Based Limits

The Act requires categories of industrial dischargers to meet the effluent limitations established by EPA. The Act initially focused on the control of "traditional pollutants" (conventional pollutants and some metals) through the use of best practicable technology (BPT). Industries were required by section 301(b)(1)(A) of the Act to meet this level of control by July 1, 1977. Section 301(b)(3) of the Act allowed a deadline of March 31, 1989, under certain circumstances, but that deadline has also passed. Thus, permits issued after March 31, 1989, must include any conditions necessary to ensure that the BPT level of control is achieved.

Section 301(b)(2) and (3) of the Act require further technology-based controls on effluents. After March 31, 1989, all permits are required by section 301(b)(2) and (3) of the Act to contain effluent limitations for all categories and classes of point sources which: (1) control toxic pollutants and nonconventional pollutants through the use of best available technology economically achievable (BAT) and (2) represent best conventional pollutant control technology (BCT) for conventional pollutants. In no case may BAT or BCT be less stringent than BPT.

In many cases, BPT, BAT, and BCT limitations are based on effluent guidelines developed by EPA for specific industries. The Alyeska marine terminal can be considered to be an industrial type classified as "shore-reception facilities." EPA has not developed nationwide effluent limitations guidelines for discharges from ballast water treatment facilities in this industrial category. Where EPA has not yet developed guidelines for a particular industry or a particular pollutant, permit conditions must be established using Best Professional Judgment (BPJ) procedures (40 CFR 122.43, 122.44, and 125.3).

As required by section 304(b)(2)(B) of the Act, when developing BPJ/BAT permit conditions, the Agency must consider the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impacts (including energy requirements), and such other factors as EPA deems appropriate.

As required by section 304(b)(4)(B) of the Act, when developing BPJ/BCT permit conditions, the Agency must consider the reasonableness of the relationship between the

costs of attaining a reduction in effluent and the effluent reduction benefits derived, the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources, the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, and non-water quality environmental impact (including energy requirements) and such other factors as EPA deems appropriate.

2. Previous BAT Determination

During the development of the 1989 NPDES permit, Alyeska's biological treatment system operated in two unlined earthen impound ponds. As part of issuing the 1989 permit, EPA conducted a BAT/BPJ evaluation (see fact sheet and response to comments document for 1989 permit; SAIC, 1987) and determined that BAT constituted biological treatment with the addition of a third basin. In order to comply with stringent water quality-based BETX effluent limits in the 1989 permit, Alyeska needed to make modifications to the treatment system.

To meet the more stringent BETX effluent limits in their 1989 permit, Alyeska first proposed to use on/off air strippers as well as two additional lined earthen basins. Ultimately, Alyeska changed its construction plan and built an above-ground concrete tank with two compartments (hereafter "concrete tanks") instead of the lined earthen impound basins. Above ground concrete tanks would not require RCRA permits, would be designed specifically for biological treatment and would obviate the need to retrofit or replace the basins at a later date. This would allow improvements in mixing, aeration, and process controls to be designed into the system. The concrete would also be strong enough to accommodate added equipment and structures to improve treatment, if found to be necessary in the future. Alyeska also proposed to include on/off air strippers as part of the design to handle occasional spikes in BETX concentration.

As part of a 1990 permit modification request, Alyeska asked EPA to reconsider the BAT determination made for the 1989 permit to recognize the construction of the concrete tanks and on/off air strippers. In its request to modify the 1989 permit, Alyeska asked EPA to evaluate whether the stringent winter BETX limit of 1.3 mg/l could be technology-based instead of water quality-based. In support of its request, Alyeska provided effluent data which indicated that they could meet a 1.3 mg/l maximum daily limit more than 90 percent of the time with their existing impound basins. Alyeska attributed the improvement in effluent quality to continued improvements in treatment plant operation as a result of increased operator experience and skills, and management attention.

To address the aforementioned permit modification request, the Agency considered the BAT determination using the factors at 40 CFR 125.3. As explained in the

fact sheet and response to comments for the 1990 permit modification, EPA determined that the best available technology for the winter BETX limit is a biological treatment system using concrete tanks followed by on/off air strippers to handle occasional spikes in BETX concentration. The BETX limit was determined to be a technology-based limit which also meets water quality standards.

3. BAT Evaluation For Reissuance

The following addresses the factors identified at 40 CFR 125.3 applicable to a BPJ/BAT determination for Alyeska's BWT facility. This determination, completed to support the 1997 permit, has been reviewed and found to be valid for this permit reissuance. In conducting this evaluation, EPA considered the information submitted by Alyeska in their discharge monitoring reports and other monitoring reports, the NPDES permit application and amendment, as well as correspondence from Alyeska and ADEC concerning the treatment technology, and relevant BWT Working Group discussions.

a. Process Employed, Process Changes, and Age of Equipment

The BWT removes most of the floating and dispersed oil; however, some of the more soluble constituents remain in the effluent. These pollutants consist primarily of compounds known as hydrocarbons, which are the predominant constituents of crude oil. Hydrocarbons consist of groups of compounds that can be described as straight-chained or branched (including the alkanes and alkenes), cyclic, or aromatic. Those with a single ring include benzene, ethylbenzene, toluene, and xylene (BETX). They are among the most acutely toxic components of crude oil. They are also among the most water soluble aromatic hydrocarbons and therefore comprise over 90% of the aromatic hydrocarbons in Alyeska's effluent. Aromatic hydrocarbons containing multiple rings are called polynuclear or polycyclic aromatic hydrocarbons (PAHs); they are much less water soluble than the BETX compounds and are present in much lower concentrations in the effluent.

The existing treatment process for ballast water at the BWT includes (1) ballast water storage/gravimetric treatment tanks, (2) dissolved air flotation tanks, (3) biological treatment, and (4) on/off air strippers to handle occasional spikes in BETX concentration. Oil recovered from the gravimetric tanks and recovered dissolved air flotation (DAF) float is stored in the oil storage tanks where it remains until it is returned to an outgoing vessel. The biological treatment system is seasonably variable due to the colder ambient winter temperatures and the higher throughput during the winter (because incoming tankers must carry more ballast to be stable during the rougher winter seas).

As noted above, to meet the BETX effluent limits in the 1989 permit and to address a new RCRA regulation, Alyeska modified the ballast water treatment system. The modifications included replacement of the earthen impound ponds with above-ground

concrete biological treatment tanks and on/off air strippers. The BTTs were designed specifically for biological treatment which allowed for improvements in mixing, aeration, and process control to be designed into the system. The concrete tanks were also designed to be strong enough to accommodate added equipment and structures to improve treatment, if necessary, in the future. Alyeska completed modifications to the treatment system in October 1991. The new treatment phases constructed during the 1990's significantly improved treatment levels and reduced BETX concentrations in the effluent.

b. The Engineering Aspects of the Application of Various Types of Control Techniques

A key engineering aspect for this analysis concerns the on/off air strippers. Of specific concern are the following: (1) the strippers capability to achieve the BETX effluent limit; (2) the capability of the on-line BETX analyzer to serve as a trigger for strippers operation; (3) the impact that the BETX limit has on amount of time the strippers are operated; (4) the maintenance/cleaning impacts of stripper operation; and (5) the non-water quality aspects of stripper operation. Items 3, 4 and 5 are non-water quality related impacts and are addressed in more detail below.

The strippers were designed to produce effluent that would meet the 1.3 mg/l BETX limit when BETX concentrations in the BTTs reached a maximum design level of 5 mg/l. Alyeska has noted that the efficiency of the strippers is reduced when the BETX concentration is lowered (correspondence from Alyeska dated 1/26/96). As the concentration of BETX is reduced the ability of the strippers to remove the BETX is diminished.

Alyeska has installed an on-line BETX analyzer which is fed waste water from the East BTT on fifteen minute intervals. The on-line analyzer is a process control tool used to enable the BWT operators to meet the BETX limits. While the BTTs are well-mixed, the tanks are not “perfectly” mixed and hence the on-line analyzer provides only representative samples of water entering the air strippers. On-line analyzer results are a key component of the standard operating procedure for stripper operation; the strippers are currently turned on when the on-line analyzer detects BETX at 0.6 mg/l. The current standard operating procedure (SOP) for activation of the strippers includes a 0.7 mg/l buffer between the maximum daily BETX limit and the BETX concentration measured by the on-line analyzer. Alyeska has indicated that accuracy of the analyzer and system variability requires such a buffer between stripper activation and the effluent limit.

Alyeska has indicated that if the BETX limit is reduced then the air stripper trigger will also need to be reduced (letters from Alyeska dated 11/20/95, 12/20/95, and 1/26/96). If the stripper trigger is reduced then there will likely be a corresponding increase in

stripper operation and an increase in air emissions. In Attachment 2 of Alyeska's letter dated 1/26/96, they forecasted that a BETX limit of 1.0 mg/l would necessitate a stripper trigger of 0.3 ppm. Alyeska further projected that a BETX limit of 1.0 mg/l would cause the strippers to be operated 680 hours/year which is about double the hours of stripper operation for a BETX limit of 1.3 mg/l. A stripper operation level of 680 hours/year would still be significantly less than the design level.

c. The Cost of Achieving Such Effluent Reduction

Alyeska spent considerable funds to construct the new BTT/air stripper treatment units. The cost of the concrete treatment tanks was substantially greater than that required to construct the originally proposed additional earthen impound basins. Much of the costs, however, are properly attributable to RCRA requirements and not NPDES permit requirements. The only portion of the costs solely attributable to the permit would be the air stripper.

Additional costs that Alyeska has incurred to ensure compliance with the limits, include operation and maintenance of the BTTs and stripper units (including landfilling of material cleaned from the stripper media balls). Substantial costs are related to installation, operation, and troubleshooting the on-line analyzer. In addition, Alyeska has a team at the terminal dedicated to monitoring the ballast water flow, dissolved oxygen, BETX concentrations, and other parameters twenty-four hours a day. Alyeska has also increased the training level of BWT operators.

d. Other Factors

Other factors considered in this BPJ/BAT analysis include compliance with the permit limits, the fact that the treatment system upgrades have recently been made, and the results of environmental monitoring in Port Valdez. As discussed at Part V in this fact sheet, Alyeska has achieved high compliance with their previous permit limits. In addition EPA recognizes that the treatment system has recently undergone extensive and expensive modification to enable the Permittee to comply with BETX limits imposed in the 1997 permit. The upgraded treatment system has enabled Alyeska to achieve consistently low levels of aromatic hydrocarbons in their discharge.

Alyeska's NPDES permit requires substantial environmental monitoring in Port Valdez. The monitoring program has not demonstrated to date that Port Valdez ecosystem is being altered by the BWT discharge.

4. Alternate Treatment Processes

Alternate treatment processes are discussed in greater detail in a technology review conducted by Mr. John Barich, EPA (dated May 30, 1995). In his review, Mr. Barich concluded that several standard treatment technology databases and references identify biological treatment as state of practice for BETX removal from water. These include EPA's Treatability Data Base, the Vendor Information System for Innovative Technologies, the U.S. Department of Energy's ReOpt system, and the interagency Remediation Technologies Screening Matrix. While the above sources do reference alternate technologies, there is no information to suggest that other innovative technologies represent a preferable alternative to the system already in place at Alyeska.

5. Preferred BAT Technology

For the reissuance of this permit, EPA has tentatively determined that if the primary waste water treatment objective of the ballast water treatment facility is reduction of BETX in a water matrix, then a treatment system that includes biological treatment and dissolved air flotation continues to represent state-of-practice technology.

C. Water Quality-Based Evaluation

1. Statutory Basis for Water Quality-based Limits

Section 301(b)(1) of the Act requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977. Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under section 401 of the Act.

The NPDES regulations at 40 CFR 122.44(d)(1)(I) require that permits include limits on all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

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

The regulations also specifically address when toxicity and chemical-specific limits are required. A toxicity limit is required whenever toxicity is at a level of concern relative to either a numeric or narrative standard for toxicity. The only exception is where chemical-

specific limits will fully achieve the narrative standard. A chemical-specific limit is required whenever an individual pollutant is at a level of concern relative to the numeric standard for that pollutant. The regulations also provide three options for developing a chemical-specific limit needed to control a pollutant which does not have a numeric standard, but is contributing to a problem with the narrative standard.

In proposing to reissue this permit, EPA has considered Alaska's antidegradation policy (18 AAC 70.015). The reissuance will not result in additional pollutant loading to the receiving water; therefore, this action complies with the State's antidegradation policy.

2. Waste Load Allocations and Mixing Zone Boundary

The waste load allocation is the concentration (or loading) of a pollutant that may be discharged by the Permittee without exceeding water quality criteria in the receiving water at the edge of a designated mixing zone. For the Alyeska facility, ADEC has tentatively designated the following mixing zones for Outfall 001 (draft certification transmitted via electronic correspondence from Luke Boles, DEC to Michael Lidgard, EPA, April 2, 2003):

For Outfall 001, the mixing zone for the BWT discharge where human health and chronic aquatic life criteria apply is defined as follows:

- The top boundary shall be at all times fourteen (14) meters (46 feet) below the receiving water surface.
- The mixing zone shall extend to the bottom of the water column, but shall exclude the bottom sediments which shall remain subject to protection under the State’s Water Quality Standards.
- The horizontal (lateral) boundaries of the mixing zone are shown in Figure 1 of the draft permit.

The mixing zone for Outfall 001 where acute aquatic life criteria apply is defined as follows:

- The mixing zone shall extend to the bottom of the water column, but shall exclude the bottom sediments, which shall remain subject to protection under the State’s Water Quality Standards.
- The remaining boundaries of the mixing zone shall be at all times fifteen (15) meters (50 feet) in all directions from the diffuser.

In its preliminary certification, ADEC concluded that the minimum dilution at the edge of the

chronic mixing zone is 100:1 and at the edge of the acute zone is a minimum of 38:1. If the preliminary determination for the mixing zone changes in the final certification for the permit, then EPA will reevaluate the water quality assessments.

For Outfall 002, ADEC has provided the following preliminary mixing zone determination where human health and chronic aquatic life criteria apply:

- The mixing zone is defined as a cylinder with a radius of 10 meters (33 feet) centered on the outfall, rising vertically to the receiving water surface.

- The mixing zone extends from the marine bottom to the receiving water surface.

ADEC has concluded that the minimum dilution ratio at the edge of this zone is 600:1. A mixing zone for Outfall 002 was not designated for acute life criteria.

3. Permit Limit Derivation

Waste load allocations are compared to reported effluent values to determine if limits are needed for individual parameters. Under 40 CFR 122.4(d)(1), limits must be included if the discharge shows "reasonable potential" to exceed water quality standards. EPA's Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1991, hereafter referred to as “TSD”) defines "reasonable potential" as being within a percentage of the waste load allocation. The TSD establishes a statistical procedure for determining whether "reasonable potential" exists on the basis of effluent monitoring data. In deriving the water quality-based permit limits, Region 10 applied the statistical permit limit derivation approach described in the TSD. This approach takes into account effluent variability in setting limits which are low enough to ensure that the water quality standards are met. The approach also takes into account the difference in time frames and frequency of sampling between the water quality standards and monthly average and daily maximum limits. In addition to waste load allocation values above, EPA used the following values in deriving limits using formulas in the guidance documents:

Probability values for:	
long-term average calculation	99%
monthly average limits	95%
daily maximum limits	99%
Frequency of monitoring	
BETX	weekly
TAqH	Monthly
WET	Quarterly
Zinc	Quarterly

The coefficient of variation was calculated using the available data set. Monitoring frequency is reflective of the monitoring in the existing permit, compliance record, and EPA guidance regarding monitoring frequency (U.S. EPA, 1996). The resulting limits which EPA is proposing for each parameter are also discussed below.

D. Monitoring Authorized by Section 308

Under section 308 of the Act and 40 CFR 122.44(I), EPA must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations, assist in the development of effluent limitations, and assess the quality of receiving waters. The draft permit contains both effluent monitoring and ambient environmental monitoring requirements which is discussed further in Section VIII of this fact sheet.

VIII. SPECIFIC PERMIT CONDITIONS

A. Approach

The determination of appropriate conditions for each discharge was accomplished through:

1. consideration of technology-based effluent limitations to control conventional pollutants under BCT

2. consideration of technology-based effluent limitations to control toxic and nonconventional pollutants under BAT,

3. inclusion of permit terms necessary to ensure compliance with Alaska Water Quality Standards and preliminary mixing zone determinations provided by ADEC,

4. inclusion of appropriate effluent monitoring, environmental monitoring, and other conditions necessary to carry out the provisions of the Act.

B. BWT Discharge (Outfall 001)

Flow: EPA proposes to maintain the flow limits in the previous permit. These limits are a daily maximum of 30 mgd and monthly average of 21 mgd.

There are five main reasons to limit flow as proposed: (1) the limits combined with the concentration limits for individual pollutants provide a control on the mass of pollutants discharged, (2) the maximum flow limit encourages proper operation of the treatment

system, (3) the maximum flow limit is approximately equal to the flow assumed in dilution modeling of the discharge performed by EPA (Yearsley 1987), (4) Alyeska has achieved compliance with the flow limits in the previous permit and (5) environmental monitoring has not found significant adverse environmental impact as a consequence of the current flow rate .

It should be noted that it is not EPA's intention to cause delays in tanker servicing at the Valdez Marine Terminal, but rather to ensure adequate flow averaging through the treatment system to provide the best possible BETX reductions.

BETX: The draft permit contains BETX limits that are a result of EPA's review of BETX daily monitoring data, the BPJ/BAT evaluation of Alyeska's treatment system (see Part V.I.B. of this fact sheet), operational and environmental concerns regarding the air strippers, results of environmental monitoring and WET testing, and ADEC's preliminarily determination of a mixing zone and dilution factor for the BWT discharge. The BETX proposed limitations are carried forward from the 1997 permit. The following discussion of derivation of the limits is primarily from the fact sheet supporting the 1997 permit and is found to be applicable to this permit reissuance.

In developing the BETX limits, EPA's goals are to ensure that water quality standards for total aromatic hydrocarbons (TAH) are achieved at the edge of the mixing zone, ensure that Alyeska continues to strive to achieve low effluent BETX concentrations, and yet not encourage over use of the air strippers (and the consequential transfer of hydrocarbons to the air). Imposing a very low daily maximum or monthly average effluent limit would likely cause Alyeska to increase strippers use to ensure compliance with the limit. EPA does not intend to impose such a low BETX limit which would in turn result in a significant increase in stripper usage. The proposed BETX limits are an attempt balance these various factors.

As indicated, the air strippers play an important role in determining the BETX limits. The strippers are beneficial because they allow the permittee to ensure compliance with the BETX effluent limit; however, there are several negative operational and environmental outcomes of stripper usage (see also Part VII.B.3. of this fact sheet). The strippers do not treat the BETX but rather transfer it from the waste water into the air. In contrast, BETX remaining in the waste water continues to be naturally biodegraded by microorganisms in the water. Operationally, the air strippers are expensive to operate, maintain, and clean. Furthermore, cleaning of the stripper media balls generates waste which needs to land filled. Alyeska uses an on-line BETX analyzer as a process control tool to guide stripper operation. The on-line analyzer has enabled Alyeska to significantly reduce strippers operation. There is a BETX concentration buffer or safety margin between the effluent limit and the trigger for stripper activation to account for a variety of operational concerns. If the BETX limit is lowered significantly, then it may be difficult for the on-line analyzer to provide

reliable information for stripper operation.

Using procedures in the TSD, EPA determined the effluent BETX limits necessary to meet water quality standards at the edge of the preliminarily determined chronic mixing zone. For this determination it is appropriate to use only the chronic mixing zone (see TSD, p.103). A maximum daily limit of 1.0 mg/l and a monthly average limit of 0.6 mg/l would be necessary to ensure that the TAH standard is achieved at the edge of the mixing zone. The mixing zone dilution factor is a conservative estimate of dilution.

EPA determined the technology-based limits during the previous, 1997 permit issuance. EPA used the historical BETX data base for the period since the BTTs and air strippers were in place and other relevant factors to determine technology-based effluent limits. The effluent data set included the period from November 1, 1991 through March 31, 1996, and includes 1610 measurements of BETX. The highest BETX concentration measured is 1.61 mg/l and the mean value is 0.02 mg/l. This data set is reflective of current operation. Using the data base, a strict evaluation of 95th and 99th percentiles would result in a maximum daily limit of about 0.5 mg/l and a monthly average limit of 0.1 mg/l. If the aforementioned values were proposed as effluent limits then Alyeska is projected to substantially increase stripper usage, even possibly to the point of nearly continuous stripper operation (letter from Alyeska dated 1/26//96 and Rutz, 1996). In their letter, Alyeska predicted that if the BETX maximum daily limit was 0.8 mg/l then the strippers are predicted to be used 1214 hours/year. While higher than the 95th and 99th percentile values, the proposed limits are at, or lower than, the concentrations needed to meet the TAH standard at the edge of the chronic mixing zone.

As required by 40 CFR 125.3, EPA also considered non-water quality impacts and other unique factors in conducting the BPJ/BAT evaluation (see also Part VII.B. of this fact sheet). Non-water quality costs or impacts associated with lowering the BETX limit include increased stripper usage and consequent increases in the amount of material cleaned from the strippers which requiring land filling (and related transportation and environmental costs associated with land filling), increased energy needs to run the strippers, and increased air emissions from the power plant which provides the energy to run the strippers. As noted above there is also the issue of pollutant transfer to another media (air) rather than treatment.

Given the above discussion and using best professional judgment, EPA proposes to continue the effluent BETX limitations of the previous permit: maximum daily limit of 1.0 mg/l and a monthly average limit 0.3 mg/l.

The draft BETX limits are technology-based and also achieve water quality standards at the edge of the preliminary mixing zone determined by the State. EPA believes that these draft limitations will achieve the total aromatic hydrocarbons standard

at the edge of the mixing zone, limit BETX loading to Port Valdez, are achievable by Alyeska, and minimize stripper usage which resultants in cross-media transfer of pollutants.

Review of data submitted by Alyeska over the five year permit cycle finds the discharge consistently in compliance with BETX requirements. Over the five year permit period, 49 out of 60 monthly reports show the BETX concentrations below even the quantification levels. The maximum monthly average during this period was 0.109 mg/L. The maximum daily concentration reported is 0.70 mg/L. Both the maximum monthly and daily values occurred in early 1999.

BETX monitoring in the reissued permit is proposed to be conducted once per week . This is a reduction in monitoring frequency from the 3 times/week monitoring required in the existing permit which is a reflection of the consistently low values of BETX measured in Alyeska's effluent, the facility's good compliance record and a continued nationwide initiative to reduce the monitoring burden of NPDES permits. The President's "Regulatory Reinvention Initiative for the EPA" established a goal of reducing NPDES reporting and monitoring by at least 25%. Following available Interim Guidance for Performance-based Reduction of NPDES Permit Monitoring Frequencies (U.S. EPA, 1996), EPA has determined that it is appropriate to reduce the monitoring frequency for BETX. Given the consistently low BETX concentrations relative to the limits, it is highly unlikely that a violation of the permit limit will go undetected even with the reduced monitoring frequency.

TAqH: Alaska Water Quality Standards specifies a total aqueous hydrocarbons (TAqH) criterion of 15 ug/l and the methodology to be used in analyses. Alyeska must comply with this standard at the edge of their chronic mixing zone.

During the previous 1997 permit evaluation, an analysis was conducted to determine if the discharge had a reasonable potential to contribute to an exceedance of the Alaska water quality criteria. Forty-eight TAqH samples were available at that time. Given the state's determination of a mixing zone and the dilution factor of 100:1 and using procedures in the TSD, it was determined that there was not a reasonable potential for TAqH to exceed the criterion at the edge of the mixing zone. Given the low likelihood of exceedance and lack of TAqH data for the winter operating conditions, EPA proposed that TAqH be monitored once per month.

TAqH data collected over the last five years confirms the analysis and conclusions used to develop the 1997 NPDES permit. The maximum daily value measured during the existing permit term was 17.5 µg/L. A majority of the samples analyzed since 1997 have been below quantification levels. Given the results of the monthly monitoring, EPA finds the conclusions reached during development of the 1997

permit issuance are valid. EPA finds that there is no reasonable potential for TAqH to exceed the criterion at the edge of the mixing zone and effluent limitations are not needed. The reissued permit proposes that TAqH monitoring on a monthly frequency be retained.

PAH Alkylated Homologues: The 1997 NPDES permit specified TAqH analysis be conducted in accordance with 18AAC70.020, Note 8. Note 8 requires a combination of EPA Method 602 and 610 to quantify monoaromatic hydrocarbons and polynuclear aromatic hydrocarbons (PAHs) respectively. As discussed in the 2000 Environmental Studies Report (Feder, Shaw, Blanchard, 2001), these methods were first developed in the 1980s and since that time more specific methods of hydrocarbon determination and quantification based on gas chromatography - mass spectrometry (GC/MS) have been developed and widely implemented. The GC/MS methods give information about additional analytes which can be useful for hydrocarbon source identification. The authors recommend the GC/MS methods be adopted in the reissued NPDES permit for future hydrocarbon determinations.

This hydrocarbon test method issue is also addressed in greater detail in the RCAC 2002 report "Evaluation of Mixing Zone and NPDES Permit Renewal Applications for BWTF at Alyeska Marine Terminal". In the report the authors compare selected ion monitoring (SIM) GC/MS results with results from other procedures. RCAC has utilized the SIM GC/MS methods exclusively in the Long Term Environmental Monitoring Program throughout Prince William Sound since 1993. The report states the position that many PAH components are missed by the previous method that would otherwise be quantified with the SIM GC/MS methods. It also states the SIM GC/MS methods would allow the possibility to evaluate a sample's "fingerprint" and thus provide another useful tool to the environmental monitoring program. The report includes updating the chemistry methods as a recommendation for any modification to the NPDES permit.

EPA agrees that use of the SIM GC/MS methods would likely enhance the characterization of the discharge. Results from the SIM GC/MS methods would give information about additional analytes which could be useful for hydrocarbon source identification. The draft permit includes a requirement to monitor for PAH alkylated homologues once a month in addition to the previous BETX and TAqH monitoring requirements.

TSS: TSS limits were originally included in the 1989 permit in response to concerns that sludge not be recycled into the treatment system. When developing the TSS limits EPA was careful not to impose limitations which may hinder the efficiency of the biological treatment system which relies on maintaining active biomass (measured as TSS) in the impound basins. EPA also recognizes that the BWT does not have the capability to reduce TSS beyond gravitational settling.

Since the first TSS limits were established in the 1989 permit Alyeska has added on/off air strippers to the treatment train. The strippers are used to ensure compliance with the BETX limit during periodic spikes in BETX concentration. As is noted above, use of the strippers has been tied to spikes in TSS concentration. It is believed that biomass builds up on the stripper media balls and sometimes sloughs off when the strippers are turned on after a period of non-use. Material collected during a TSS spike has been analyzed and found to contain minimal levels of persistent, toxic components of petroleum hydrocarbons. In light of the apparent connection between stripper activation and short-term bursts of high TSS concentrations, Alyeska has requested that an alternate TSS daily maximum limit be established for the period 24 hours immediately following stripper activation (letter from Alyeska dated 12/27/95). By a letter dated March 20, 1996, ADEC informed EPA that the department approves of developing a higher alternate limit for TSS. This was also discussed at the BWT Work Group meeting (BWT WG, 1996) and it was generally agreed that dual TSS limits are appropriate.

Given the above information regarding effluent TSS concentrations and the background behind the TSS limit, EPA is proposing continuation of the BPJ limits for TSS (except within 24 hours of stripper operation) of 40 mg/l and 25 mg/l, maximum daily and monthly average, respectively. Within 24 hours of stripper operation an alternate higher maximum daily TSS limitation of 170 mg/l would apply. The monthly average would not include TSS measurements within 24 hours after stripper use. Sampling frequency for TSS is proposed to be daily; however, a minimum of only three samples per week are required to be analyzed. If the strippers are activated then the samples collected within 24 hours of stripper activation is also required to be analyzed. Daily sampling will ensure that a 24 hour composite sample is collected for analysis in the event of stripper activation. EPA believes that these proposed limits and monitoring frequency for TSS are protective of the environment, reflect operation of the BWT during the current permit, are achievable by Alyeska (no exceedances of the limits during the existing permit term), and address real concerns regarding stripper operation and TSS.

pH: Since the 1989 permit, the measured pH has been within the limits in the permit (pH between 6.0 and 8.5 Standard Units). The Alaska Water Quality Standard for pH will be easily met inside the mixing zone tentatively determined by ADEC. Therefore, the previous pH limit has been retained as the BCT limitation in the draft permit. Since pH is continuously monitored, the frequency has not been changed.

Whole Effluent Toxicity: In accordance with 40 CFR 122.44 (d) (1), EPA is required to evaluate a discharge for its reasonable potential to cause or contribute to an exceedance above water quality standards. EPA reviewed the extensive WET database developed during the current permit term to determine whether there is a reasonable potential for the receiving water concentration (RWC) to exceed the water quality standard at the edge of either the acute or chronic mixing zones (see also Part VI.C. of the fact

sheet for the draft permit). WET test results were summarized previously in Table 3. EPA has tentatively determined that there is no reasonable potential for WET to violate the standards at the edge of either the chronic or acute mixing zones. This is explained below.

In calculating the reasonable potential, EPA used the AWQS and followed the procedures in the TSD. The AWQS criterion for toxicity is 1.0 chronic toxic unit (TUc) at the edge of the chronic mixing zone. Since there is no acute toxicity standard in the AWQS, EPA has assumed 0.3 TUa as the acute criteria (or criteria maximum concentration (CMC)), per guidance in the TSD (p. 60).

For this permit reissuance, EPA has determined to use the inhibition concentration (IC_{25}) as the measurements of WET effects, instead of the NOEC. ADEC has indicated that they will certify this in the 401 Certification. The IC is a point estimate interpolated from the actual effluent concentrations at which measured effects occurred during a chronic test. The IC_{25} for a reproduction test represents the effluent concentration at which a 25 percent reduction in reproduction occurred. WET data in IC_{25} (instead of NOEC) was used in the following evaluation.

The 1997-2002 data shown previously in Table 3 was used to determine reasonable potential. The following equation was used to determine the RWC at the edge of the mixing zone:

RWC = (maximum concentration)(reasonable potential multiplier)/dilution factor

where,
reasonable potential multiplier = 1.8 (from Table 3-1 in the TSD, with n=23, CV=0.35)
chronic dilution factor = 100
acute dilution factor = 38
maximum TUc measured = 5.88 (IC25=17% on July 2000)
acute to chronic ratio (ACR) = 10

Using the equation and values above and the procedure in the TSD, the

RWC chronic = 0.11 TUc < 1 TUc, and
RWC acute = 0.03 TUa < 0.3 TUa.

Since the both predicted chronic and acute RWCs are significantly less than the applicable criteria, there is not a reasonable potential to violate the toxicity criterion. Hence a WET limit is not needed. If the mixing zone determination by ADEC changes prior to finalization of the permit, then this evaluation will be redone.

The pollutants of concern at the facility are being regulated through chemical specific limits; however, these controls alone cannot assure that complex effluent effects are not occurring. As a result the facility will be required to continue to conduct whole effluent toxicity tests. Accordingly, EPA is proposing quarterly monitoring of effluent toxicity using the echinoderm fertilization test and annual acute testing using mysids.

Dissolved Oxygen: Dissolved oxygen (DO) is a key control parameter for operation of the BWT, especially the biological treatment tanks. The sampling location is after the weir at the end of the BTTs. Since air is entrained when the water goes over the weir, the DO measurements at the sampling location are not reflective of conditions in the BTTs. Alyeska also measures DO in the BTTs for process control of the BWT. EPA is proposing as a specific BMP Plan requirement that Alyeska continue to measure DO daily in the BTTs and make the results available to EPA and ADEC upon request (see Part II. of the draft permit).

Metals: Information regarding metals concentrations in the BWT effluent has come from several avenues. Alyeska has been conducting quarterly monitoring for zinc in the BWT effluent and submitting the results in their DMRs. In addition, during development of the 1997 permit Alyeska submitted two sets of metals data. One set included data recovered from the raw data deliverables produced by the laboratory instrument software during analysis for zinc (letter from Alyeska dated 6/23/95). Another set of metals data is the result of the Section 308 Request for Information issued by EPA to Alyeska (letter from Alyeska to EPA dated October 13, 1995).

Analyses of the following metals were included in the 1997 review: aluminum, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. Metals concentrations were compared to the acute and chronic marine water quality criteria to determine whether there is a reasonable potential to violate water quality standards at the edge of the preliminarily determined mixing zone. None of the metals demonstrated a reasonable potential to violate water quality standards and so effluent limits on metals were not included in the permit. Given the known source of zinc contamination (anodes in tank vessels and in tankage at the terminal), EPA is proposing to continue quarterly monitoring for total recoverable zinc.

Nutrients: Dissolved inorganic phosphorous and ammonia monitoring has been required since the 1989 permit. Both parameters provide important process control information on the biological treatment system. EPA proposes to continue monitoring nutrients at a monitoring frequency of once per month.

Density: Density monitoring has been required since the 1989 permit to provide information pertinent to determining the dispersion of the discharge plume in Port Valdez.

Density monitoring is proposed to be continued at a monitoring frequency of once per week. This monitoring is intended to provide information necessary for analysis of effluent plume dynamics which could be useful for future permit reissuance.

Temperature: Temperature has been monitored continuously in the current permit. Temperature is an inexpensive measurement yet provides information that is useful in optimization of BWT operation. Temperature is also one of the parameters used to monitor the condition of the BTTs. Continuous monitoring for temperature is proposed to be continued as a Best Management Practices Plan requirement (see Part II.E.8.a. of the draft permit).

Total Recoverable Oil and Grease (TROG): TROG monitoring of the effluent is currently done voluntarily by Alyeska and reported to EPA on the monthly DMR. The RCAC has recently reviewed and analyzed TROG concentrations of the effluent over the period 1994 through 2002 (RCAC letter from John S. Devens, Executive Director, to M. Lidgard, EPA, L. Boles, DEC, and S. Stambaugh DEC, March 17, 2003). The RCAC report found TROG concentrations and TROG itself to exhibit a statistically significant increasing trend during the period of 2000-2002. The report found the ballast water throughput to decrease during 1994-2002, although the rate of decrease was less during 2000-2002.

Alaska water quality standards do not include a numeric criteria for TROG but does include a requirement that a discharge can not cause a film, sheen, or discoloration on the surface of the receiving water. This criteria has been included in the existing permit and is proposed for the reissued permit. There are no regulatory compliance issues associated with the TROG values. As RCAC points out in the report, increasing TROG values while throughput volumes are decreasing may be indicative of changes occurring in operation of the treatment process. RCAC request the reissued permit include TROG monitoring as a tool for observing and quantifying changes at the facility. EPA and DEC agree that the TROG trend warrants further investigation and that routine TROG monitoring may provide information relative to proper operation of the treatment process. For these reasons, EPA proposes the draft permit include TROG monitoring at a frequency of once per month during the term of the permit.

The proposed draft permit also includes a requirement under the pollution prevention report for the permittee to analyze the efficiency of the design and operation of the current BWT treatment process. The pollution prevention report requires the permittee to consider some of the factors raised in the RCAC report including changes in the amount of throughput at the facility and physical changes in the crude that could potentially effect treatment efficiency.

SUMMARY: The following table summarizes the proposed effluent limitations and

monitoring requirements for the BWT discharge.

Table 4: Draft Effluent Limitations and Monitoring Requirements for BWT Discharge (Outfall 001)			
Effluent characteristic	Limitation		Measurement Requirements
	Maximum Daily	Monthly Average	
BETX	1.0 mg/l	0.3 mg/l	Weekly
Flow	30 mgd	21 mgd	Continuous
TSS (except within 24 hrs of stripper activation)	40 mg/l	25 mg/l[1]	3/week (and on the day of and day after stripper activation)
TSS within 24 hrs of stripper activation	170 mg/l	NA	see above
pH	Between 6.0 - 8.5 SU		Continuous
Density	--	--	Weekly
TAqH	--	–	1/month[2]
PAH alkylated homologues	--	–	1/month
Dissolved Inorganic Phosphorous	--	--	1/month
Ammonia	--	--	1/month
Total Recoverable Oil and Grease (TROG)	–	–	1/month
WET	--	--	Quarterly
Total Rec. Zinc	--	--	Quarterly

Footnotes:

1. Results from samples collected within 24 hours after stripper activation will not be included.
2. Provision for reducing monitoring frequency to quarterly defined in permit.

C. Sanitary Wastes (Outfall 002)

Outfall 002 is a domestic sanitary waste discharge which is subject to secondary treatment. The discharge has not been chlorinated in the past and if it were to be chlorinated then the chlorine would likely be the most toxic component. As it is, the primary toxicant likely to be present is ammonia.

The existing permit contains limitations on flow, biological oxygen demand (BOD), total suspended solids (TSS), and pH. The draft permit maintains the flow, BOD, TSS, and pH limits which were in the previous permit. These limitations are based upon Best Professional Judgement and the Alaska waste water disposal regulations (18 AAC 72).

Table 5: Draft Effluent Limitations and Monitoring Requirements for Sanitary Wastes Discharge (Outfall 002)

Effluent characteristic	24 hour Max.	7 day Avg.	30 day Avg.	Measurement Requirements
Flow (gpd)	10,000	--	--	Continuous
BOD_5 (mg/l)	60	45	30	Monthly
TSS (mg/l)	60	45	30	Monthly
pH	Between 6.0 - 9.0 SU			Daily
Fecal Coliform	--	–	--	Quarterly

During development of the existing permit, EPA conducted an analysis on available fecal coliform data and concluded there was no reasonable potential for the discharge from outfall 002 to cause or contribute to an exceedance of the state fecal coliform criteria and a limitation, therefore, was not warranted. Quarterly fecal coliform monitoring was included in the 1997 permit in order to gather additional data prior to t reissuance. Data collected from 1997 reveals that the effluent fecal coliform concentration ranged from 120 - 30,000 colonies/100ml (sample size=23). The average value was 4,132 colonies/100ml. With a dilution of 600:1 provided by the authorized mixing zone for outfall 002, an updated analysis continues to demonstrate that a reasonable potential to exceed criteria does not exist and that a fecal coliform limitation will not be included in the reissued permit. However, fecal coliform monitoring at a frequency of quarterly will be continued.

D. Best Management Practices Plan

Alyeska's existing permit requires the development and implementation of a Best Management Practices Plan (BMP) Plan. During the effective period of Alyeska's permit the BMP Plan has been modified. The most recent plan is "BMP Plan, Ballast Water Treatment Facility, MP-69-1, Edition 2, Revision 03, 2001." The draft permit continues and expands the BMP Plan requirement to encompass recent developments.

Pursuant to Section 402(a)(1) of the Clean Water Act, development and implementation of BMP Plans may be included as a condition in NPDES permits. Section 402(a)(1) authorizes EPA to include miscellaneous requirements in permits on a case-by-case basis which are deemed necessary to carry out the provisions of the Act. BMPs, in addition to numerical effluent limitations, are required to control or abate the discharge of pollutants in accordance with 40 CFR 122.44(k). The BMP Plan requirement has also been incorporated into this permit in accordance with EPA BMP guidance (EPA, 1993). The requirements are also reflective of the pollution prevention provisions present in the AWQS at 18 AAC 70.015(2)(D). This provision is part of the antidegradation policy and requires that "methods of pollution prevention, control, and treatment" should be applied to "wastes and other substances to be discharged."

The draft permit requires the development and implementation of a BMP Plan which prevents or minimizes the generation and potential release of pollutants from the facility to the waters of the United States through best management practices. This includes, but is not limited to, material storage areas, site runoff, storm water, in-plant transfer, process and material handling areas, loading or unloading operations, spillage or leaks, sludge and waste disposal, or drainage from raw material storage. The BMP Plan should incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990. (42 U.S.C. 13101).

The BMP Plan must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants. The BMP Plan will become an enforceable condition of the permit; a violation of the BMP Plan is a violation of the permit.

Alyeska submitted permit application amendments on August 10, 1995 and April 3, 1996, requesting permit coverage for berth, dock and buoy construction/maintenance and fire pump/hydrant testing/maintenance activities at the Valdez Marine Terminal. The existing permit included provisions in the BMP Plan for these waste streams.

The primary discharges expected from the berth, dock and buoy construction/maintenance activities include surface preparation, hydro blasting, cleaning, demolition, welding, metal cutting, and other similar activities. Discharge materials include

abrasive blasting material, paint chips, and other miscellaneous materials associated with construction and maintenance. The primary pollutants expected from this source are metals in the solid phase in the form of abrasive blasting solids and paint chips. Metals which may be encountered include zinc, with the potential for lesser amounts of barium and nickel. The permit includes specific BMP requirements which are intended to control and mitigate pollution from this discharge.

There is a fire fighting system at the Valdez Marine Terminal to respond to potential fires. The firewater is seawater which is pumped from Port Valdez. The fire pumps and hydrants must be tested frequently to ensure that the fire fighting equipment is in good working condition as required by state fire safety regulations (13 AAC 50.025). Unscheduled maintenance may also be needed to ensure that the fire pumps are in good working order and may require discharges. In addition, to maintain adequate system pressure a jockey pump operates and discharges continuously. Some of these discharges enter the oily water sewer system and are already addressed in the BMP Plan (see Wastecode C in Tables 2-1 and 2-2). Some firewater discharges, however, occur to areas that are outside the oily water sewer collection area and cannot be collected in the oily water sewer system.

The fire system test discharges that do not enter the oily water sewer collection system are presently either absorbed by the ground or enter No Name or Dayville Creeks. The creeks are both high gradient drainages and neither is hydraulically connected to Port Valdez. The creeks each flow through a separate series of three containment settlement basins designed to recover crude oil in the event of a large spill. After the third basin, the water enters Port Valdez via the interstitial spaces in the containment basin sea wall. Alyeska has indicated that there are “no significant concentrations of mammals or birds that inhabit the drainage system and no fish species are known to inhabit either creek” (letter dated April 3, 1996). The permit requires BMPs for the fire system test discharges which are not collected by the oily water sewer system which will augment the provisions addressing the firewater collected by the oily water sewer system.

Operation of oil/water separation tanks. The reissued draft permit includes additional BMP requirements related to the operation of the separation tanks. As discussed previously, ballast water is pumped from ships into three barge tanks which are used for initial settling and oil/water separation. The three tanks are referred to as the 90's tanks. Each tank has a set of floating oil skimmers to remove separated oil. Recovered oil is drained to two oil tanks which are known as the 80's tanks.

The most important parameter that affects the efficiency of the oil separation process in the 90's tanks is residence time. The Best Management Practices Plan for the facility states that the standard operating procedure is to achieve a 4-hour holding time for the ballast water. A number of factors can reduce residence time and potentially reduce

the efficiency for the 90's tanks: accumulation of solids on the bottom of the tank, accumulation of floating oil in the tank, removal of a tank from service for maintenance, and higher than average ballast water flow. All of these factors reduce the volume available for ballast water treatment and potentially reduce the residence time provided by the treatment facility. Alyeska reports scheduling cleanout of each 90's tank once every five years.

In 2002, ADEC personnel made EPA Region 10 staff aware of a number of issues related to the 90's tanks which may significantly reduce the holding capacity of the treatment system and potentially reduce the removal efficiency. The problem is believed to be related to the ability of the skimmers to remove waxy oil, coupled with a tank being out of service for an extended time for scheduled maintenance. Both of these actions would contribute to increased levels of oil being contained in the operational tanks. Increased oil levels in the tanks can lead to reduced volume available for ballast water and shorter separation time. Although discharge monitoring reports continue to report acceptable effluent quality, EPA is concerned that if storage capacity has been reduced and continues to decline, the operational efficiency of the treatment system may be compromised at some point in the future.

The previous permit under section IV.E., and EPA regulations at 40 CFR 122.41(e), require proper operation and maintenance of the treatment facility. “The permittees shall at all times properly operate and maintain all facilities and system of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit...”

It is generally recognized that in recent years, changes have occurred at the facility which can affect tank operation. These changes include: reduction in throughput of crude through the pipeline, changes in volume of oily ballast water with the introduction of more segregated ballast tankers, and changes in the nature of the separated oil. Given these changes, along with the requirement to properly operate and maintain the treatment facility, EPA proposes to require Alyeska to develop and implement the following additional BMPs in the Alyeska BMP Plan:

1. The Permittee shall maintain the facility’s three gravity-separation (90's) tanks in accordance with their design specifications and treatment efficacy.
2. The Permittee shall insure that the ballast water is retained in the gravity-separation (90's) tanks for a minimum treatment duration of four (4) hours.
3. The Permittee shall develop and implement effective oil skimming treatment that is adapted to deal with changes in the nature of the separated oil contained in the gravity separation (90's) tanks.
4. The Permittee shall maintain the facility’s two crude oil recovery (80's) tanks in accordance with their design specifications and storage capacity.

The proposed permit also includes a requirement under the pollution prevention report for the permittee to analyze the changes identified above and the potential effects on the efficiency of the design and operation of the current treatment process. The pollution prevention report is required to be submitted to EPA and DEC one year after the effective date of the permit.

E. Quality Assurance Requirements

The quality assurance requirements proposed in the draft permit are the same as those of the existing permit and are intended to assist in planning for the collection and analysis of environmental samples in support of the permit and in explaining data anomalies when they occur. In order to ensure reliable analytical results it is necessary to consider quality assurance in all stages of the measurement of environmental parameters. Annual verification of QA implementation is required and can be satisfied by a letter from the Permittee attaching verification letters from in-house and contracted laboratories.

F. Environmental Monitoring

1. Introduction

The following discussion addresses the bases and rationale for the environmental monitoring requirements in Alyeska's draft NPDES permit. The environmental monitoring requirements are very similar to the requirements in the previous permit. Much of the following rationale is from the fact sheet of the pervious permit with updates to incorporate recent monitoring results. Like the existing permit, the requirements have been structured in accordance with the primary exposure pathways for pollutants discharged from the BWT: the water column and the sediments. To guide development of the monitoring program, an overarching environmental question has been posed in conjunction with pathway-specific questions. Hypotheses and tools which will be used to address the overarching question and pathway-specific questions are also identified.

The BWT and sanitary wastes discharges from the Alyeska marine terminal authorized by this permit are only a subset of many potential human influences to the environmental quality of Port Valdez. Other influences include, but are not limited, to the following: oil spills, the small boat harbor, the hatchery, the seafood processors, storm water runoff from the city of Valdez and environs, tanker discharges, commercial/recreational boats, and the Valdez POTW.

The environmental monitoring requirements in this draft permit for the Alyeska marine terminal and BWT are intended to assess the impacts of the permitted discharges only, and not the aforementioned list of discharges. Given the relative discharge flows and nature of the discharges, the BWT is expected to have significantly greater influence on the

environmental quality of Port Valdez than the sanitary waste discharge. The BWT discharge is therefore the focus of the monitoring program.

The environmental monitoring program has been designed to take advantage of the existing monitoring data and the principles of ecological risk management. Numerous discussions regarding the environmental monitoring program were held among representatives of EPA, ADEC, TAG, Alyeska, and RCAC during the Scientific Meeting on Environmental Monitoring of Port Valdez held in January 1995 (BWT Work Group, 1995) and during subsequent BWT working group meetings prior to permit issuance in 1997. As a result of the aforementioned efforts, development of the environmental monitoring program has been guided by the following overarching statement and question:

> Recognizing that not all components of the Port Valdez ecosystem have been assessed, the environmental monitoring of Port Valdez to date suggests that the ecosystem is not being adversely impacted by the BWT discharge. Is there any change in this assessment?

The primary components of the Port Valdez environment potentially affected by the BWT discharge and corresponding exposure pathways have been identified in Figure 1 of this document. While the ecosystem in Port Valdez is much more complex than depicted, the figure is only intended to identify the two key pathways which are the water column and the sediment. The monitoring program has been structured around these two exposure pathways by developing corresponding sets of media specific questions, hypotheses, and tools. These questions, hypotheses, and tools are reflected in the environmental monitoring requirements addressed below and are reflected in the draft permit.

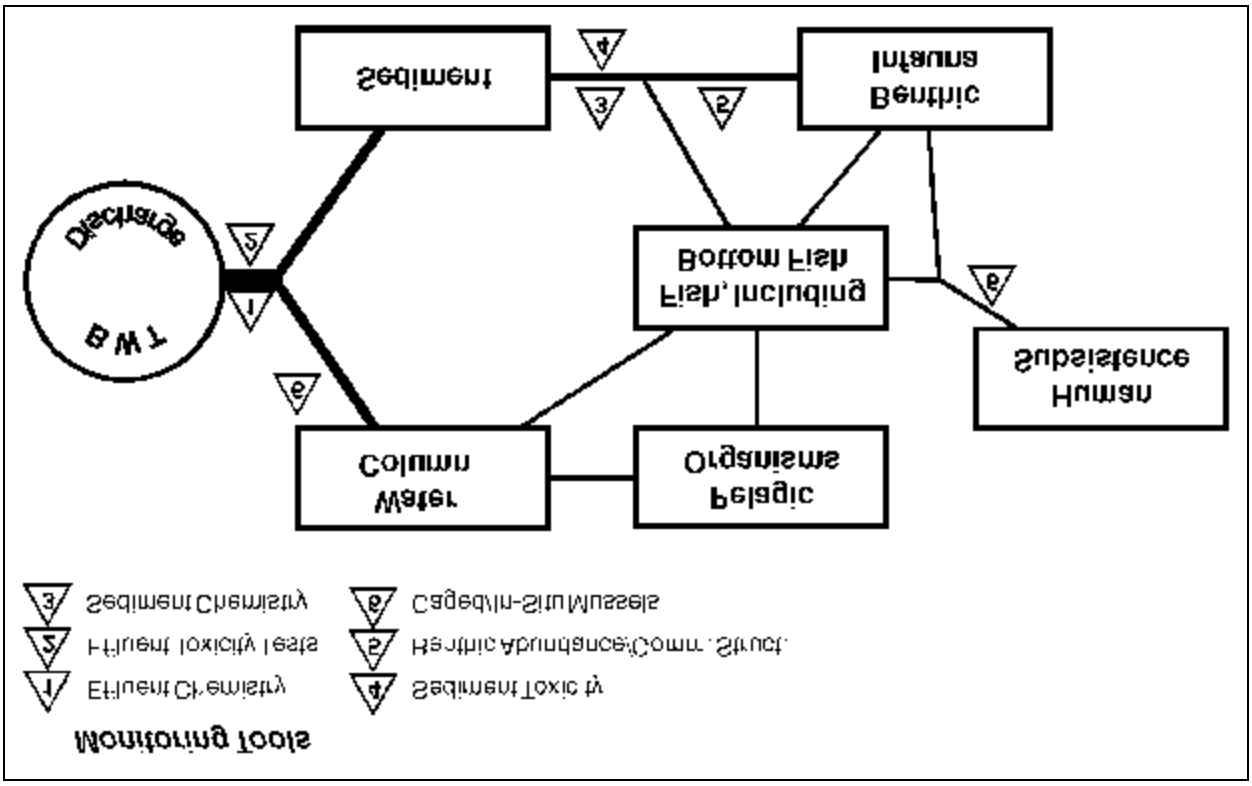

Figure 1: Key pathways of environmental exposure to BWT effluent.

2. Objectives

The following continue to be the objectives of the environmental monitoring program for the draft NPDES permit:

a. Early detection and warning of any significant adverse effects due to the BWT discharge,

b. Ensure compliance with Alaska Water Quality Standards,

c. Determine statistically significant and ecologically significant changes in the sediment hydrocarbon concentrations over time and distance due to the BWT discharge,

d. Determine statistically significant and ecologically significant changes in the biota of subtidal Port Valdez over time and distance due to the BWT discharge,

e. Determine whether changes to the monitoring program are warranted, and

f. Gather information for permit renewal/future regulatory decisions (e.g., trends, exceedances of benchmarks or criteria, etc.).

3. Questions and Hypotheses

Identified below are the questions and hypotheses for both the water column and sediment pathways developed for the 1997 permit. The hypotheses continue to be relevant to this permit reissuance. Monitoring tools to address the hypotheses are detailed in the next section.

a. Exposure by the Water Column

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(1) Overarching Water Question. Are the contaminants in the BWT discharge bioaccumulating or adversely impacting the survival, growth or reproduction of marine species in the water column?

(2) Water Hypotheses.

Hw1: Contaminants in the effluent are not exceeding levels protective of the environment outside of the acute mixing zone for lethality to passing organisms and outside the chronic mixing zone for chronic effects.

Hw2: Effluent toxicity is not adversely impacting survival, growth or reproduction of aquatic organisms outside the mixing zone in the fjord as a whole.

Hw3: Effluent contaminants in the water column do not bioaccumulate, concentrate, or persist in members of the food web to significant adverse levels.

b. Exposure by Sediments

(1) Overarching Sediment Question. Do contaminants discharged in the BWT effluent bioaccumulate, concentrate, or persist in sediments or in benthic infauna at levels causing statistically significantly unacceptable adverse effects?

(2) Sediment Hypotheses.

Hs1: Petroleum concentrations in the sediment are not increasing.

Hs2: Sediment toxicity is not adversely impacting survival, growth or reproduction of aquatic life including benthic infauna.

Hs3: Sediments are not toxic beneath the mixing zone.

4. Monitoring Tools

The following discussion explores each of the monitoring tools and relates them to specific hypotheses.

a. Effluent Chemistry and Effluent Toxicity

To assess exposure via the water column and to address objectives a, b, e, and f, and hypotheses Hw1 and Hw2, the draft permit continues to require that the permittee annually quantitatively assess whether the water quality standards for the monitored chemical parameters and effluent toxicity are being met at the edge of the mixing zone. The review should also ensure that acute criteria are met at the edge of the initial zone of dilution. This requirement does not require additional data collection, but will require a review of existing data and comparison of estimated concentrations at the edge of the mixing zone to the applicable water quality standards. The presumption is that meeting water quality criteria will protect the organisms in Port Valdez for those contaminants for which water quality criteria exist.

b. Sediment Chemistry

This monitoring has been required in the previous NPDES permit and has proved to be a useful monitoring tool. The monitoring of sediment chemistry is proposed in the draft permit to assess whether petroleum concentrations are increasing (see objectives a, c, e, and f, and Hs1 above). Sediment chemistry values shall also be compared to available criteria which in part addresses Hs3. Sediment samples shall be analyzed for polynuclear aromatic hydrocarbons (PAH) and total organic carbon (TOC). Hydrocarbon analyses shall be performed using GC/MS methods, consistent with the effluent sampling discussed in section VIII.B. of this fact sheet.

Sediment hydrocarbon monitoring prior to the 1997 permit involved collection and analysis of three replicates from each station. The 1997 permit included collection of three

samples at each station, however, all three replicates were only analyzed at the station closest to the treated ballast water diffuser. At the remaining stations, one replicate was analyzed and the results were compared to a trigger value. If the measured concentration exceeded the trigger value, the remaining two replicates were then analyzed. This tiered strategy is proposed for continuation under the reissued permit. At stations D25, D33, 143, and 145 (inclusion of 143 and 145 is discussed below), the stations closest to the diffuser, all three replicates will be automatically analyzed. The trigger value for the remaining stations will continue to be the 95 percentile of the data collected from 1989 through 1995. This strategy focuses a major portion of the effort close to the diffuser.

To ensure an adequate sediment hydrocarbon data base for the next reissuance of the permit, the draft permit requires that in the fourth year of the permit all three replicates from all of the environmental monitoring stations be analyzed for sediment hydrocarbons.

5. Monitoring Stations

In the draft permit EPA has refined the stations used in the environmental monitoring. The goal of these changes is to maximize the usefulness of the data collected. In evaluating the merits of the stations, EPA considered the recommendations provided in the report “Environmental Studies in Port Valdez, Alaska: 2000" (Feder, Shaw, Blanchard, 2001).

The stations proposed for inclusion in the annual environmental monitoring program are:

Diffuser: D33, 143, 145
Nearfield Shallow: D25, D51, D69, 80, 82
Near-field Deep: D-73, D-77, 16
Far-field Deep: 11, 40, 50

Station locations are illustrated in maps presented in Figure 2. The latitude/longitude coordinates of the stations are also identified in Table 5 of the permit.

The selection of the above stations has the advantage of using much of the historical database extending as far back as 1971 for some stations. As discussed in the 2001 environmental studies report, “...this suite of stations has evolved through a process of alterations during previous permit renewals to give an excellent balance among the chemical and biological regimes of Port Valdez. Consequently, these stations provide a basis for distinguishing between Port-wide and regional environmental changes, which have natural or non petroleum-related sources, and those localized around the Alyeska Terminal that might be related to changes in petroleum hydrocarbon concentrations in sediments.”

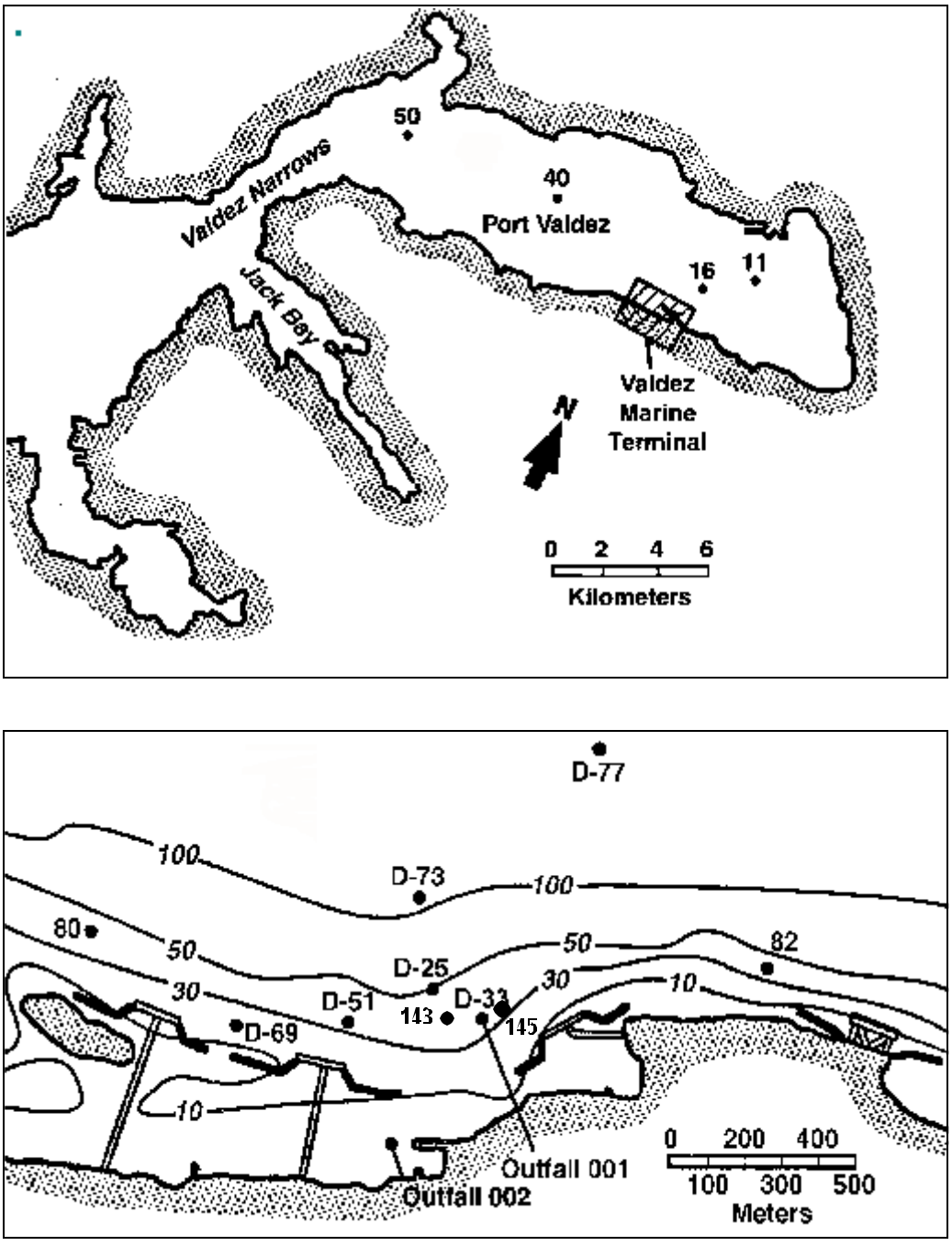

Figure 2: Environmental monitoring sampling stations in Port Valdez. The upper panel depicts stations in the Port Valdez area and the lower panel shows the stations near the terminal and the outfall locations. The rectangle in the upper panel indicates the approximate area shown in the lower panel. The contour lines in the lower panel show depths in fathoms. (Figure modified from Feder and Shaw, 1996.)

Changes form the previous permit include discontinuation of station 45 and addition of stations 143 and 145. Station 45 has been proposed for elimination in light of data demonstrating no impact to the far-field. Three other far-field sites remain in the permit and are adequate to characterize the Port Valdez deep benthic environment. Station 143 and 145 are proposed for incorporation into the monitoring plan to provide timely indication of elevated hydrocarbon concentrations near the diffuser. These two stations were established as part of the "grid stations", in response to observations from 1995 to 1997 of elevated hydrocarbon concentrations near the diffuser.

G. Unauthorized Discharges

Based on concerns about the potential discharge of pollutants and/or waste streams not listed in the permit application, the permit does not authorize discharges of waste streams that are not part of the normal operation of the facility as disclosed in the permit application and its attachments (e.g., the BMP Plan).

IX. OTHER LEGAL REQUIREMENTS

A. Oil Spill Requirements

Section 311 of the Act prohibits the discharge of oil and hazardous materials in harmful quantities. Routine discharges specifically controlled by the permit are excluded from the provisions of Section 311. However, this permit does not preclude the institution of legal action or relieve permittees from any responsibilities, liabilities, or penalties for other unauthorized discharges of oil and hazardous materials which are covered by Section 311 of the Act.

B. Endangered Species Act

The Endangered Species Act (ESA)requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if the agency's actions could beneficially or adversely affect any threatened or endangered species. The EPA has tentatively determined that the discharge has no effect on the listed threatened and endangered species identified by the services below.

The EPA requested a listing of threatened or endangered species in the vicinity of the Alyeska BWT facility from NMFS and from USFWS (M. Lidgard, letters, dated March 13, 2003).

Based on recent correspondence with the USFWS while reissuing the Municipality of Valdez NPDES permit, no listed species are anticipated to occur within the Alyeska

NPDES permit project area. Further, no critical habitat coincides with the project area. There were also no species listed nor critical habitat identified under USFWS jurisdiction during issuance of the permit in 1997.

During the recent issuance of the Municipality of Valdez permit, the NMFS indicated that of the listed species, the Steller sea lion (Eumetopias jubatus) occurs in the nearshore waters of Port Valdez and Prince William Sound. This was a new species listing since the 1997 Alyeska permit issuance during which no species were identified. The Steller sea lion is distributed around the North pacific rim from the Channel Islands off Southern California to northern Hokkaido, Japan. Their distribution extends northward into the Bering Sea and along the eastern shore of the Kamchatka Peninsula. The center of distribution is in the Gulf of Alaska and the Aleutian Islands. Within this distribution, the land sites used by the sea lions are referred to as rookeries and haulout sites. The Alyeska BWT facility does not discharge near any Steller sea lion rookeries (3 mile buffer included) or haulout sites and is expected to have no effect on the species.

The EPA will provide NMFS and USFWS with copies of the draft permit and fact sheet during the public notice period. Any comments received from these agencies regarding this determination, or updates to the candidate species list, will be considered prior to the reissuance of this permit.

C. Coastal Zone Management Act

EPA has determined that the activities authorized by this permit are consistent with local and state Coastal Management Plans. The proposed permit and consistency determination will be submitted to the State of Alaska for state interagency review at the time of public notice. The requirements for State Coastal Zone Management Review and approval must be satisfied before the permit may be issued.

D. Marine Protection, Research, and Sanctuaries Act

Since no marine sanctuaries exist in the vicinity of the permit area, the requirements of this Act are not pertinent to the permit decision.

E. Water Quality Standards and State Certification

Since state waters are involved in this permitting action, the provisions of Section 401 of the Act apply. In accordance with 40 CFR 124.10(c)(1), public notice of the draft permit has been provided to the state of Alaska agencies having jurisdiction over fish, shellfish, and wildlife resources.

F. Essential Fish Habitat

Section 305(b) of the Magnuson-Stevens Act (16 USC 1855(b)) requires federal agencies to consult with the 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.

EPA's assessment of EFH includes a listing of EFH species in the facility area, characterization of the discharge, and evaluation of potential effects. EPA has identified the following EFH species in Port Valdez: salmon (pink, chum, sockeye, chinook, and coho), herring, halibut, Tanner crab, Dungeness crab, spot shrimp, coon-striped shrimp, and several species of rock fish. The facility activity, receiving water characteristics, and discharge composition were described in Parts II-IV of this fact sheet. As discussed previously, the requirements of the draft permit including the effluent limitations were developed to protect water quality in accordance with state water quality standards. The standards protect the beneficial uses of Port Valdez, including all life stages of aquatic life. During development of the draft permit limitations, the basic elements of ecological risk were evaluated including: effluent characterization including toxicity evaluation, exposure assessment, transport of pollutants, effluent and transport variability, and effluent and environmental monitoring results.

Since the draft and existing permits have been developed to protect aquatic life species in Port Valdez in accordance with the Alaska water quality standards, and the facility has consistently been in compliance with the requirements of the existing permit, the EPA has tentatively determined that reissuance of this permit is **not likely to adversely affect** any EFH in the vicinity of the discharge. Furthermore, environmental monitoring suggest that the ecosystem in not being adversely impacted by the discharge. The draft permit requires continuation of the monitoring program in order to assess potential environmental impacts throughout the term of the permit. The 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 the reissuance.

X. REFERENCES

ADEC

04/02/03: e-Mail to EPA, re: BWT draft pre-certification
03/22/96: Letter to EPA, re: Mixing zone for Outfall 001.
05/22/96: Letter to EPA, re: Mixing zone for Outfall 001 and 002.
07/02/96: Letter to EPA, re: Preliminary 401 Certificate of Reasonable Assurance

Alyeska

07/23/92: Letter to EPA, re: Annual Report for the period from 6/91 - 5/92.
11/20/95: Letter to EPA, re: BWT discharge.
12/20/95: Letter to EPA, re: BETX limits and air stripper operation.
12/27/95: Letter to EPA, re: TSS limits during stripper operation.
05/13/96: Letter to EPA, re: Modeling of Outfall 002.
1996. Best Management Practices Plan for the Ballast Water Treatment Facility.
2001. Best Management Practices Plan for the Ballast Water Treatment Facility.
2001. Mixing Zone Application, NPDES Permit No. AK0023248 Renewal, BWTF and STP Submittal 11/01.
2001. Letter to EPA, re: NPDES Permit No. AK0023248, Renewal Application 11/20/01.

Barich, J. 1995.

Technology review: Alyeska Pipeline Service Company, BWT, Valdez, Alaska. May 30, 1995.

BWT Work Group. 1995.

Final Draft meeting minutes: Scientific meeting on environmental monitoring of Port Valdez. January 17-18, 1995, Seattle, Washington.

BWT Work Group. 1996.

Final Draft meeting minutes: Port Valdez. March 26 & 27, 1996, Anchorage, Alaska.

Columbia Aquatic Sciences. 1993.

Analysis of flatfish bile for metabolites of aromatic compounds. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and A. Blanchard. 1992.

Environmental studies in Port Valdez, Alaska. 1991. Supplemental Report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and A. Blanchard. 1993.
Environmental studies in Port Valdez, Alaska. 1992. Supplemental Report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and A. Blanchard. 1994.
Environmental studies in Port Valdez, Alaska. 1993. Supplemental Report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and A. Blanchard. 1995.
Environmental studies in Port Valdez, Alaska. 1994. Supplemental Report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1988.
Environmental monitoring studies in Port Valdez, Alaska, 1987. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1990.
Environmental monitoring studies in Port Valdez, Alaska, 1989. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1991.
Environmental monitoring studies in Port Valdez, Alaska, 1990. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1992.
Environmental monitoring studies in Port Valdez, Alaska, 1991. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1993.
Environmental monitoring studies in Port Valdez, Alaska, 1992. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1994.
Environmental monitoring studies in Port Valdez, Alaska, 1993. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1995.
Environmental monitoring studies in Port Valdez, Alaska, 1994. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1996.
Environmental monitoring studies in Port Valdez, Alaska, 1995. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1997.
Environmental monitoring studies in Port Valdez, Alaska, 1996. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1998.
Environmental monitoring studies in Port Valdez, Alaska, 1997. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 1999.
Environmental monitoring studies in Port Valdez, Alaska, 1998. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M. and D.G. Shaw. 2000.
Environmental monitoring studies in Port Valdez, Alaska, 1999. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M., D.G. Shaw, and A.L.Blanchard. 2001.
Environmental monitoring studies in Port Valdez, Alaska, 2000. Final report. Prepared for Alyeska Pipeline Service Co.

Feder, H.M., D.G. Shaw, and A.L.Blanchard. 2002.
Environmental monitoring studies in Port Valdez, Alaska, 2001. Final report. Prepared for Alyeska Pipeline Service Co.

Karle, L.M., J.A. Ward, and J.Q. Word. 1994.
Toxicological evaluation of sediment samples from Port Valdez, Alaska: 1993 sediment study. Prepared for Alyeska Pipeline Service Co. June 1994.

RCAC. 2003.
PWSRCAC TROG Analysis and Request for Monitoring Requirements. Letter from John S. Devens, to M.Lidgard, EPA, and S. Stambaugh and L.Boles, DEC. March 17, 2003.

RCAC. 2002.
Evaluation of Mixing Zone and NPDES Permit Renewal Applications for BWTF at Alyeska Marine Terminal. Presented by Payne, et.al. April 24, 2002.

RCAC. 1995a.
Prince William Sound RCAC Long-term Environmental Monitoring Program. Annual Monitoring Report -1994. Presented by Kinnetic Laboratories Inc. and Texas A&M University. February 1995.

RCAC. 1995b.
Letter dated April 24, 1995, from Leann Ferry, RCAC/TOEM, to Steve Provant, ADEC, re: BWT Working group - discussion papers regarding (1) full life-cycle chronic sediment toxicity test and (2) caged bivalve studies.

Rutz, C. 1996.
Personal communication with Anne Dailey, EPA on May 22, 1996, re: projected stripper operation.

Science Applications International Corporation (SAIC). 1987.
Indentification of Best Available Technology Economically Achievable for Alyeska Terminal BWT Facility. Prepared for EPA Region 10.

Shaw D.G, Feder H.M., Blanchard A.L., and McIntosh D.J. 2001.
Supplemental Environmental Studies of Port Valdez, Alaska, 2000. Final report. Prepared for Alyeska Pipeline Service Co.

Shaw D.G, Feder H.M., Blanchard A.L., and McIntosh D.J. 2002.
Supplemental Environmental Studies of Port Valdez, Alaska, 2001. Final report. Prepared for Alyeska Pipeline Service Co.

Tetra Tech, Inc. and E.V.S. Consultants. 1986.
Recommended protocols for conducting laboratory bioassays on Puget Sound sediments. Prepared for U.S. EPA, Region 10, Office of Puget Sound. Final Report TC-3991-04. May 1986.

Tetra Tech, Inc. 1994.
Review and assessment of the 1993 NPDES environmental monitoring program for the Alyeska Pipeline Service Company Ballast Water Treatment Facility, Port Valdez, Alaska. Prepared for U.S. EPA, Region 10.

U.S. EPA. 1991.
Technical support document for water quality-based toxics control. Office of Water. March 1991.

U.S. EPA. 1993.

Guidance manual for developing best management practices (BMP). Office of Water. EPA 833-B-93-004. October 1993.

U.S. EPA. 1996.
Interim guidance for performance-based reduction of NPDES permit monitoring frequencies. Office of Water. April 1996.

WAC. 1991.
Sediment management standards. Chapter 173-204. Washington Administrative Code. pp. 1-28.