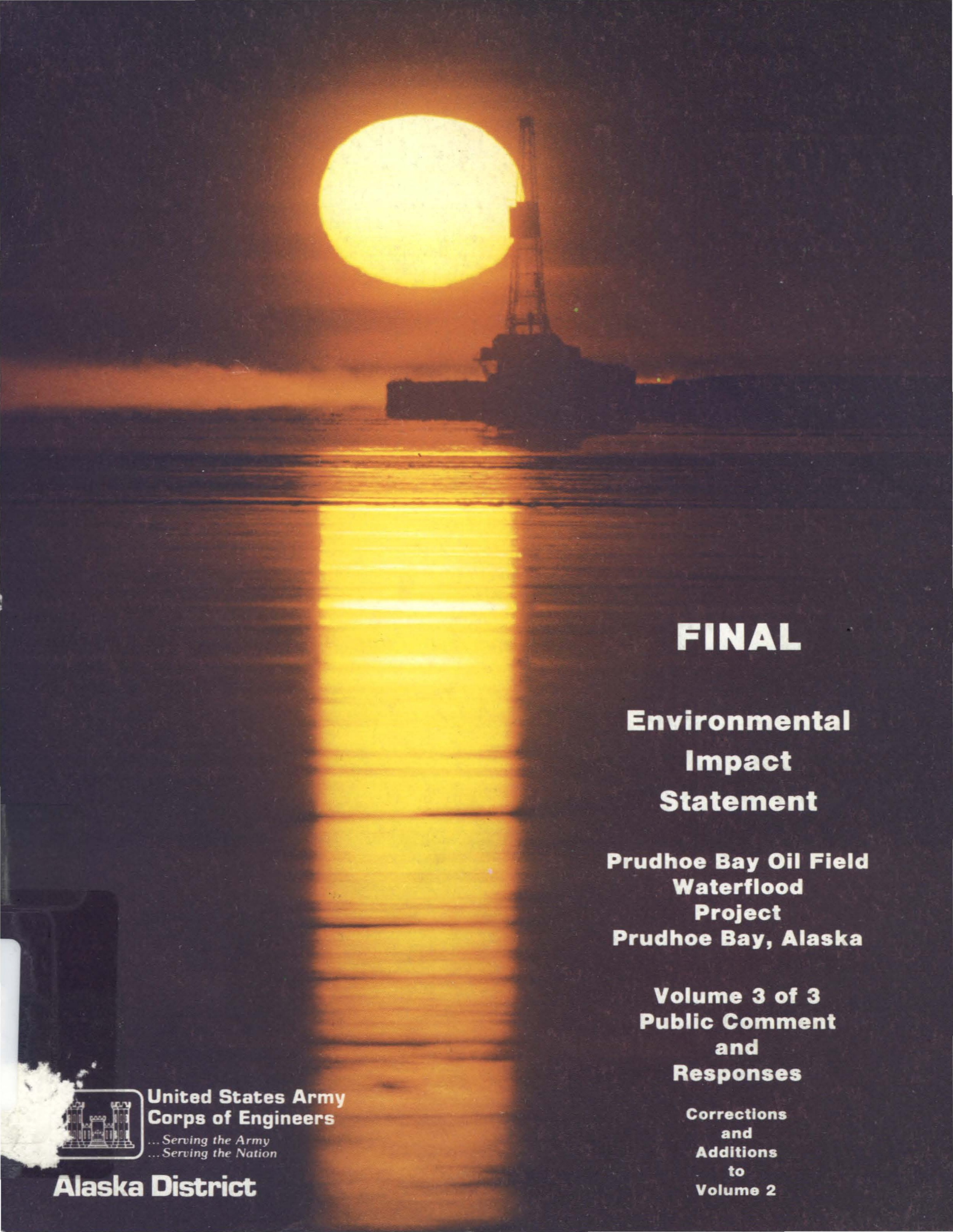

FINAL

Environmental Impact Statement

Prudhoe Bay Oil Field Waterflood Project Prudhoe Bay, Alaska

Volume 3 of 3 Public Comment and Responses

Corrections and Additions to Volume 2

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Alaska District

FINAL ENVIRONMENTAL IMPACT STATEMENT
Prudhoe Bay Oil Field
Waterflood Project

Prudhoe Bay, North Slope Borough
Alaska

October 1980

Prepared by: U.S. Army Corps of Engineers, Alaska District
P. O. Box 7002, Anchorage, AK 99510
Information Contact: (907) 752-3861 (Ben Kutscheid)

Cooperating Agencies: National Marine Fisheries Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

Technical Assistance Provided by: Dames & Moore, Anchorage

Volume 3

PUBLIC COMMENTS AND RESPONSES
VOLUME 2 CORRECTIONS AND ADDITIONS

Last Date to Accept Comments: 17 November 1980

VOLUME III

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PUBLIC COMMENTS AND RESPONSES

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

18 JUL 1990

Colonel Lee R. Nunn
District Engineer
Alaska District Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

We have completed our review of your draft Environmental Impact Statement (DEIS) on the Prudhoe Bay Oil Field Waterflood Project. In our view, the DEIS provides an objective and substantially adequate analysis of environmental issues. It is a major improvement over the draft environmental assessment we reviewed this spring. 1

With the exception of two subject areas, the location of the treatment facility outfalls and alternative treatment methods, EPA will not need a substantial amount of additional information which is appropriate for an EIS for us to complete our environmental reviews. Our comments describing the type of information which will satisfy our needs for our NPDES permit actions as well as other suggestions to improve the EIS are detailed in the attachment.

One aspect of the DEIS with which we are especially pleased is the Corps' selection of the gravel island treatment plant and Alternative B (Figure 1) pipeline and road alignment as part of the Environmentally Preferred Alternative. We urge the Corps to select this gravel island design, with the main outfall to the north and the marine life return line to the west, when making decisions on the Section 10/404 permits. The Corps' decisions on these permits, as well as the public's comments and the State of Alaska's consistency determination will be considered by EPA prior to issuance of the NPDES permit. Due to environmental impacts, the Corps' decision to select the gravel island alternative would be a mitigation measure which would aid EPA's approval of applicable permits.

1 Noted.

Our rating of this DEIS is based on the applicants' proposed action and the identification of an environmentally preferable alternative, the construction of a gravel island rather than a causeway extension. From the standpoint of the Environmental Protection Agency's areas of concern and expertise, we are rating this statement ER-1 (ER - Environmental Reservations; 1 - Adequate Information). This rating will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal Actions under Section 309 of the Clean Air Act, as amended.

As a cooperating agency, we commend the Corps for the very adequate DEIS. In our view, the efforts made to produce this DEIS will result in a better decision-making process. We realize that much work remains to be done and many decisions are yet to be made. We hope that the close working relationship between EPA's Alaska Operations Office and you and your staff will continue through the FEIS and the decision-making stages.

Sincerely,

Elizabeth Corbyn

Elizabeth Corbyn, Chief
Environmental Evaluation Branch

Prudhoe Bay Waterflood Project
Environmental Protection Agency Comments

EPA's NPDES Permit Needs:

1. The EIS's discussion of alternative treatment methods must be expanded and improved.

The section on backwash waste treatment alternatives needs to be expanded, particularly the review of centrifugation (page 2-75). Centrifugation of filter backwash and strainer solids was dismissed, primarily on the basis of costs. However, no cost information was presented to back up this conclusion. Capital and annual operation and maintenance costs, transportation logistics, and the volume of dewatered solids and centrate to be disposed should be presented.

The discussion of biocide alternatives also needs expansion. Ozone can be generated on-site, as can sodium hypochlorite, and has advantages over hypochlorite because it is less toxic to fish and marine organisms than hypochlorite. We feel that the overall economics of biocide addition and deaeration should be presented for ozone vs. on-site chlorine generation.

Other biocide alternatives which should be considered include operational control of hypochlorite addition to further reduce the hypochlorite concentration in the backwash water. To accomplish this, hypochlorite addition would be terminated for a period of time (at least as long as the hydraulic detention time within the filter) prior to filter backwash. If this were done, there would be little or no hypochlorite present in the filter immediately prior to backwash and, therefore, little or no hypochlorite present in the backwash water. This technique of ceasing hypochlorite addition immediately prior to backwash should not impact filter efficiency, decrease the overall length of subsequent filter runs, nor result in increased biological growths in the filters. It may also be possible that shock doses could adequately control any possible growths, thereby eliminating any hypochlorite in the backwash water.

Another operational control technique which could be utilized to minimize the mass emission of hypochlorite in the main outfall discharge at any one time would be to prevent simultaneous backwashing of more than one filter. Control over simultaneous backwashing could be accomplished through the instrumentation and control system.

If neither of the above two operational control techniques is implemented, a surge tank could be used to smooth out the large flow fluctuations that are caused in the main outfall by the filter backwashing operations.

1. An analysis process was followed such that detailed costs were developed only for those methods that were considered technically feasible and did not have unacceptable environmental effects.

Hydrogen peroxide was eliminated because its slow decomposition would continue to generate oxygen downstream of the deaerators, causing severe corrosion to pipelines and injection wells and adding to the potential for bacterial growth in the wells. One of the major functions of the seawater treating plant is to remove oxygen from the seawater and hydrogen peroxide would defeat this purpose.

Ozone was also considered as a means of controlling marine growth in the system. It was eliminated because introducing ozone into the system increases the oxygen in the process stream and increases the demands on the deaeration equipment. Deaeration of 40°F seawater to the required residual oxygen level of 20 ppb approaches the maximum performance for state-of-the-art equipment.

Considerable attention has been given to the operational control of sodium hypochlorite addition into the system and the following description reflects current plans. However, the system is still in the design stages, with further refinements anticipated. Accordingly, the operating plan may, by necessity, be varied to meet process requirements. These changes in operation, however, will be consistent with maintenance of the discharge quality within required regulatory limits. To provide sufficient reaction time to effectively kill bacteria in the system, it is anticipated that hypochlorite addition must take place immediately downstream of the strainers.

The system as now designed allows a maximum of two filters to be backwashed at the same time. This would occur only during summer storms when solid loads are at their maximum and when natural dispersion of the backwash effluent is at its highest. The rest of the year only one filter will be backwashed at a time.

During the backwash cycle, the backwash fluid is piped to a large surge tank where it is co-mingled with backwash water from the strainers, which is free of chlorine. Agitation and retention for thorough mixing of these waters in the surge tank, along with about 3 minutes of transit time in the outfall pipeline will normally provide a discharge esentially free of residual chlorine when returned to the sea. With these features, it is expected that even under worst-case conditions the 0.1 mg/l chlorine (dilution factor 50) will be obtained. It should be noted that this worst-case discharge is far less than most municipal discharges in Alaska.

The NPDES permit will expire about 1-1/2 years after project operation begins. Thus, specific experience and monitoring data will be available for use in considering changes in the new permit.

2. The EIS should contain a very direct discussion stating that the treatment plant outfall location must be north of the facility at approximately the 14 foot depth contour in order to meet the NPDES permit requirements and the State water quality standards.

For instance, page 2-35 details the applicant's proposed discharge. It should be clarified that the ADEC mixing zone was based on calculations assuming an outfall 1000 feet north of the treating plant and a dilution factor of 50. Effluent limitations in the NPDES permit for chlorine residual (0.1 mg/l) and ammonia (1.5 mg/l) would allow for a violation of water quality standards at a dilution factor of 25.

Again, it would be appropriate somewhere in the Operations Impacts section (page 4-36) to indicate that the ADEC mixing zone was determined based on an outfall location 1000 feet north of the treatment plant at approximately the 14-foot depth contour. This would be the case regardless of what alternative is permitted (i.e. gravel island or causeway).

The first sentence of page 2-77, last paragraph, should be worded to once again emphasize NPDES requirements: "Locating the outfall line offshore of the treating plant would virtually eliminate chances of recycling and will be required for the applicant to comply with State water quality standards". The following sentence regarding effects on biota is misleading and could be replaced with: "The modeling prepared for this outfall location (Mangarell 1980) provides a dilution factor of 50 within the ADEC approved mixing zone".

3. The sections on chlorine residuals should be improved. For instance, the section (page 4-41) on chlorine residual should state that a violation of water quality standards would be likely at the applicant's proposed location. This issue seems to have been circumvented by saying "...The chlorine residual in the discharge under normal conditions should meet Alaska water quality standards. If the discharge is controlled to .1mg/l at a dilution factor of 25, there will be a consistent violation of water quality standards. Also the section on Alternative B (p4-43) should be expanded to show chlorine residual values with the increased dilution factor.

4. Page 2-12, Paragraphs 2 and 3: The discussion on alternative water sources states that seawater was the only source of sufficient quantity and quality, and deep sub-surface water was infeasible due to limited volumes and poor quality. A discussion should be added as to the level of water quality desired for injection water purposes, including dissolved oxygen levels. This information would be helpful from the standpoint of evaluating the treatment processes which are proposed.

5. Page 2-74 (4th paragraph): It is unlikely that 50-foot deep settling ponds would be used. Given the permafrost and wetland environment, dikes or shallow ponds would more likely have to be used and consequently 10 feet deep rather than 50 feet is more reasonable. Perhaps a more appropriate calculation showing the extent of land area needed would be 62.5 acres at 10 feet deep rather than 13.5 acres at 50 feet deep.

6. Tables - pages 4-38 to 4-44: Mangarella's modelling (1980) allowed for overlap of backwash pulses when calculating dilution factors. Consequently, it is not accurate to show separate excess concentrations in the receiving water for a "During Backwash" event. The two dilution factors represented, 25 and 50, were calculated based on the frequency of backwash pulses encountered under the given condition. It would also be more clearly represented if the tables indicated that the "During Backwash" figures were excess concentrations.

2. The applicant has modified the proposed project to include the treatment plant outfall at the 4.2-m (14-ft) contour. Text is changed accordingly and includes a dilution factor of 50.

3. Text has been revised using a dilution factor of 50.

4. Agree. Text has been revised accordingly.

5. Agree. Figures for settling ponds have been changed to: 5.3 ha (66 acres) if 3-m (10-ft) deep.

6. Agree. Text has been revised.

7 Page 4-38: It should be referenced that Mangarella's calculations (1980) extrapolated the excess concetration zone at the proposed outfall location to extend indefinitely due to the creation of a stagnant zone. The concentrations above water quality standards would extend much further than the edge of the ADEC mixing zone.

8. Page 2-17 - Main Outfall Line: Two statements on under-ice conditions were made in this paragraph. One, significant recycling is not expected to occur. Two, according to Mangarella, the probability of recirculation of TSS is high. These two statements contradict each other.

The offshore location for the outfall is specified at 1000 feet, but the direction is not indicated.

Additional Comments:

9. Page S-9: The Environmentally Preferred Alternative should be described with the main outfall located northward of the facility and the marine life return line discharge off the west side of the island.

10. Page 2-33: The statement "This discharge volume is comparable to that of a treatment plant for a very large city" is misleading. Using the figures presented in the paragraph, the daily flow is 730,000 gallons=(2915 gal/min) (9 min/cycle) (28 cycles/day). A "large city", for example Anchorage, has a daily average flow of 34,000,000 gallons.

11. Page 2-35, First Paragraph, last sentence: Is there any documentation that substantiates the natural variation of TSS?

12. Figure 2.5-17 is incomplete. It does not show the probable locations for the filter backwash outfall or the marine life return line. The probable locations are identified in the text.

13. In Section 4.1, Page 4.2, paragraph 4 may be rewritten to identify "associated changes in circulation, sediment characteristics and water quality . . ." The association between sediment characteristics and benthic species does not receive sufficient attention in the DEIS or Appendix E, especially because sediment characteristics west of the causeway are likely to change greatly with time. Characteristics of change should include mechanical grading as well as organic carbon and nutrients.

14. On Page 4-7, last paragraph, line 9, it seems that the causeway may do more than delay migrations. As stated elsewhere, some fish may also abort their migration and also suffer a greater mortality rate from predators and entrapment in the water treatment plant.

15. On Page 4-36, under Alternative B (gravel island), it would seem desirable to have an indication of how the gravel island will be protected from erosional processes such as those reported in DEIS, Figure 3.8-2.

16. In the impact section of the next to last paragraph on Page 4-57 it may be useful to cite the concept that the intake structure and associated water inflow may attract some species to the intake opening. This concept is cited in Appendix E-5.

17. The status of the Prevention of Significant Deterioration permit (PSD) on page 1-6 should be updated. The Preliminary Determination (of approvability) was made in a public notice dated June 21, 1980, which was previously sent to the Corps.

7. Agree. Text has been revised to reflect new outfall location meeting water quality standards.

8. There is a high probability of a slight amount of recirculation of TSS with the inshore outfall alternative. The text has been rewritten to eliminate confusion. It should be noted that applicant now proposes to use the offshore location for the main outfall line, which eliminates the possibility of recycling. Text has been revised.

9. Agree. Text has been revised accordingly.

10. The annual average flow rate of 2915 gal/min times 60 min/hr times 24 hrs/day = 4,197,600 gal/day; much less than the City of Anchorage but comparable to the discharge from many municipalities. Text modified.

11. Yes. Information has been included in the FEIS.

12. Agree. The marine life return line and outfall locations are now included on the figure.

13. Agree that sediment characteristics are important in determining distributions of benthic biota. However, epibenthic biota, which are the primary resource entering higher trophic levels, are not as strongly related to sediment types as are benthic infauna. Text has been modified to emphasize importance. Additional discussion occurs in Section 4.2, Marine Biology.

14. Noted.

15. Protection from wave forces would be provided by the shallow slope of the protective gravel berm and by the addition of concrete filled bags.

16. This concept is addressed in the paragraph cited. It is noted that behavioral entrapment may occur due to the presence of the intake or induced currents.

17. Agree. The table has been updated.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 80/657

AUG 20 1980

Colonel Lee R. Nunn
District Engineer
Department of the Army
Post Office Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

The Department of the Interior has reviewed the Draft Environmental Statement for the Prudhoe Bay Oilfield Waterflood Project, Section 10 and Section 404 Permit Application, Prudhoe Bay, North Slope Borough, Alaska and have the following comments.

1 Our Fish and Wildlife Service (FWS) is a cooperating agency with the Corps of Engineers on the Waterflood Project. They are now working with the Alaska District Engineer in the writing of the final environmental impact statement (FEIS). We support the Corps' Environmentally Preferred Alternative (page 5-9 of the DEIS). We understand that the FEIS will present the final project design for which the Corps would issue the required permits. Our FWS comments on the Section 10 and Section 404 permits, in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), will be provided to the District Engineer within the FEIS review period.

1. Noted

Cultural Resources

2 The statement includes a succinct overview of the prehistory and history of the general area, which places the project area in historical context, but otherwise the treatment of cultural resources is rather superficial. Assessment of impact appears to have been based on data from surrounding areas but only on preliminary investigation of the project area (3-2). In the absence of comprehensive inventory and evaluation (as required by E.O. 11593 and the National Historic Preservation Act of 1966), site-specific impact would be impossible to assess; general impact assessment would be unreliably based.

2. A complete on-site reconnaissance survey was performed with results coordinated with the State Historic Preservation Officer. The latest edition of the National Register of Historic Places and its supplements were consulted. The proposed action or the alternatives described in detail in the DEIS were found to have no effect on archaeological or historical material. The FEIS indicates these findings.

3 The treatment of subsistence as a cultural issue is somewhat nebulous in its isolation from the cultural milieu. That is, any impact on subsistence would expectedly have ramifying effects throughout the cultural system, not just the economic elements of the system. To correctly and completely assess impacts to the native cultures of the area, their culture should be considered holistically. Contrary to the tenor of the statement, cultural impact is quantifiable and, within reason, predictable. A description of the culture should not be confused with an assessment of impact on the culture. The latter should be included in the final statement.

3. The analysis of sociocultural effects has been made more complete. However, attempts to "quantify" humanistic aspects of sociocultural effects risk masking essential issues about the North Slope people and, in the Corps' opinion, are of little practical value in this instance.

9

4 There exists the possibility that our Bureau of Indian Affairs (BIA) will have further comments concerning the impact of the project on the subsistence lifestyles of the Native Americans in this region.

4. The official comment period for the DEIS ended 31 July 1980 (including the 10-day time extension granted to the Department of the Interior). Although this letter is 3 weeks past that official closing date, it has been incluced primarily because of the interest to include the concerns and opinions of the U.S. Fish and Wildlife Service, which is a formal "cooperating agency" in this endeavor. Comments from BIA were not received.

Recreation Resources

5 The draft statement is incomplete in its analysis of recreation impacts. It has failed to consider the potential demand for offshore recreational boating opportunities associated with increased tourism at Prudhoe Bay resulting from the anticipated public use of the Haul Road. The significant sport fishing and wildlife observation opportunities associated with boating in Simpson Lagoon, Gwydyr Bay, and other nearby coastal waters will provide another recreation dimension in Prudhoe Bay. The demand for boat rentals and commercial sightseeing and/or sport fishing boats could very well materialize with increased visitation. The causeway extension proposed in Alternative A would clearly be a visual intrusion to boaters using Prudhoe Bay as well as a navigational obstacle for those boaters desiring to travel west toward Simpson Lagoon. The final statement should identify these and other project-related impacts, if any, to offshore recreational boating.

5. Recreational boating use of Prudhoe Bay is very limited because it is ice-free only about 4 months each year, has poor weather conditions much of the time, and fish runs are somewhat unpredictable. Also, tourist goals are related primarily to the oil field development. The recreational resource base for activities cited is very large compared to the expected demand in the Arctic Ocean within the life of the proposed project. The extended causeway alternative is not expected to have a significant effect on visual resources since it is a developed area. Considerations regarding navigational hazards have been included in the FEIS.

Fish and Wildlife Resources

A. Environmentally Preferred Alternative - The DEIS has not presented adequate justification to support the gravel island concept in the environmentally preferred alternative. We believe there is sufficient biological, geomorphological, and legal justification to support the alternative of placing the seawater intake and treating plant on a gravel island rather than at the end of an extended causeway. Specifically, we have the following concerns:

7

6 1. See the discussion at the bottom of page 4-53 and beginning of page 4-54, Environmental Consequences of the Proposed Project.

The potential disruption of the transport of epibenthic invertebrates, a major process in the lagoon/barrier island ecosystem, has not been sufficiently explained here. During the open water season, sea ducks and anadromous fish congregate in the lagoons and feed heavily. The primary food source for both the fish and the birds is the epibenthic invertebrates (not benthic, as emphasized in the DEIS). The epibenthic invertebrates are transported by the longshore current into and through the lagoons, thereby providing a limitless food supply. Blocking the current with an extended causeway would also block this influx of invertebrates. Without this constantly renewing food supply the affected portion of the lagoon would lose value as a feeding habitat. The gravel island alternative would have a negligible effect on the transport of epibenthic invertebrates.

6. Text revised.

7 2. The DEIS predicts the eastward elongation of Stamp Island toward the existing causeway. But the stability of the Jones Island group depends on the westward longshore littoral drift. The extended causeway alternative may decrease the longshore littoral drift and cause net erosion of the barrier islands protecting Simpson Lagoon (Birdsall, in draft). Section 4.2, Physical and Chemical Oceanography, does not predict this threat.

8 3. The gravel island alternative would meet the intent of the Alaska Coastal Management Program (ACMP). Issuance of Federal permits for the proposed causeway extension would not be consistent with ACMP Standard 6AAC 80.130(5) which protects barrier islands and lagoons. This is discussed but not adequately emphasized in pages 4-8 through 4-9 of the DEIS.

7. The prediction of the possible (low probability) eastward migration of Stump Island is predicated on the following hypothesis. Littoral transport on Stump Island is presently in both directions, as evidenced by the relative permanence of the island, at least over the last 50 years or more; net drift may be slowly and inexorably to the west. If westward drift is eliminated on Stump Island as a result of the extension creating a shelter for waves from the east, the only transport remaining might be to the east -- barring possible westward drift due to diffraction around the causeway tip or reflection off the causeway.

   It is doubtful that a source of sediment has been available to Stump Island in the most recent past. Perhaps it was available when the Sagavanirktok discharged coarser sediment than at present. A popular theory for the formation of these barrier islands has them resulting from the encroachment of the marine environment onto a freshwater setlands through coastal erosion. This theory would not need a separate sediment source and seems to adequately explain the existing features of the barrier islands.

   Once created, the islands could undergo a migration from their original position. This migration could be accomplished through the selective removal of finer material (including in some cases the gravels) with the remainder being coarse material. This could be the origin of the isolated boulder patches.

   In conclusion, the possible effects of the causeway are primarily related to Stump Island. Effects on other islands of the Jones Island group are considered negligible.

8. The Corps does not issue permits for activities that are found to be inconsistent with the ACMP. Consistency is a State determination that has not yet been made.

9 B. Cumulative Effects - Cumulative effects of the waterflood project and other petroleum development on the North Slope and Beaufort Sea environments are difficult to predict. The Sadlerochit petroleum formation at Prudhoe Bay has been fairly well delineated and so has the Kuparuk formation adjacent to the west. But the deeper Lisburne formation and other oil and gas formations on the North Slope have not been adequately explored to delineate their boundaries or economic feasibility. Assessment of the Waterflood Project's incremental impact in a continuum of development may be compared to looking at one frame of a motion picture. The authors of the DEIS have recognized on pages 3-82 and 3-84 that resource use planning process is essential to prevent degradation of the North Slope environment. Separate planning processes on the North Slope have been initiated by the State of Alaska Department of Natural Resources, the North Slope Borough, and the Bureau of Land Management (in the National Petroleum Reserve - Alaska). Because of the importance of the Clean Water Act to the protection of the extensive wetlands on the North Slope we believe the FEIS should discuss the establishment of a federally supported North Slope resource use planning body with open participation by local, State, and Federal agencies, the petroleum industry, and the public.

9. The Corps shares the concern for proper development planning. Indeed, there is a great need for resource planning on the North Slope. The best practical way to address concerns about most cumulative effects of hydrocarbon development is by establishing a dynamic planning process that can anticipate development and conservation needs before permit applications are received. The Alaska Department of Natural Resources has agreed to be the lead agency in development of this process. It is the Corps' understanding that Federal agencies can play a significant role in this effort. However, organizatio of this open process has not proceeded to the point where it can be detailed in the EIS.

10 C. Monitoring Program - A comprehensive monitoring program must be established based on whatever final design is chosen, permitted, constructed, and operated. Pages 5-1 through 5-3 of the DEIS briefly categorize monitoring programs in the three areas of project performance, permit compliance, and accidents. The Environmental Protection Agency, which must issue a National Pollution Discharge Elimination System permit before the project can operate, has proposed an influent and effluent characteristics monitoring program and a receiving water monitoring program. In May 19-21, 1980, the Arctic Project Office of the Outer Continental Shelf Environmental Assessment Program (NOAA/OCSEAP) conducted an interagency, interdisciplinary workshop at the University of Alaska, Fairbanks, expressly to address monitoring the Waterflood Project. In addition to resource agency personnel, industry representatives and physical and biological research scientists familiar with the nearshore Beaufort Sea were present. The workshop addressed the worst case project scenario - building an extended causeway - and recommended an interdisciplinary, highly coordinated monitoring program based on final project design. Using Adaptive Environmental Assessment (Holling, C.S. ed. 1978. Adaptive environmental assessment and management. John Wiley and Sons, New York. 377p.) as a framework for interdisciplinary coordination was suggested. A complete report on the workshop has been drafted (Birdsall, in draft) and will be available soon.

10. Chapter 5.0 has been expanded.

We hope these comments will be of assistance to you.

Sincerely,

James H. Rathlesberger

Special Assistant to

Assistant SECRETARY

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Policy
Washington, D.C. 20230

AUG 1 1980

Colonel Lee R. Nunn
Alaska District, Corps of Engineers
Department of the Army
Post Office Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

This is in reference to your draft environmental impact statement entitled, "Prudhoe Bay, North Slope Borough, Alaska." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thanks for the opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final environmental impact statement.

Sincerely,

Robert T. Miki

Robert T. Miki
Deputy Assistant Secretary for
Regulatory Policy (Acting)

Enclosure Memo from: Robert W. McVey
National Marine Fisheries Service
Juneau, Alaska - NOAA

1. Noted.

10

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 1668
Juneau, Alaska 99802

Rec'd PPEC JUL 23 1980

Date July 14, 1980

Reply to Attn. of:

To PP/EC - Joyce M. Wood

From F/AKR - Robert W. McVey

Subject: Review of DEIS No. 8006.11 - Prudhoe Bay, North Slope Borough, Alaska

11

2 The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) for the Prudhoe Bay Waterflood Project. Since our agency purview is the protection and enhancement of marine, estuarine and anadromous species and their habitats, the review was conducted from that perspective. Overall, the DEIS was found to be a thorough and clear description of the project, its alternatives and the potential adverse impacts which would arise from each alternative. Very little can be added to the discussions of the resources present in the Prudhoe Bay area. A determination was made earlier (see attached) that endangered marine mammals are not likely to be adversely affected by this project. We will, therefore, focus our comments on the alternatives perceived to be the most desirable from the standpoint of the resources for which NMFS is responsible.

2. Noted.

The project, as proposed by the applicant, consists of a causeway extended into the Beaufort Sea for approximately 2½ miles; a sea water intake and treatment facility; gravel pads and facilities for pressurizing seawater; distribution pipelines and water injection wells. The first two components are those which are most likely to have an impact on marine, estuarine and anadromous resources. The other parts of the project will primarily affect terrestrial and freshwater species and habitats and, therefore, were not considered in the NMFS review.

There are two alternatives to extending the existing causeway for an additional 3700 feet: building a gravel island some distance from the existing dock (DH3) and laying water intake pipes in a dredged channel. It is acknowledged that building a causeway will have some detrimental effects on migrating anadromous fish, water circulation and salinity in the area. A dredged channel is less desirable from an ice engineering aspect and because of maintenance problems. A gravel island would lack the environmental problems presented by the causeway since it would not hamper either fish migrations or water circulation and other coastal processes. Of the three alternatives, NMFS prefers the gravel island as being the least environmentally disruptive (Alternative B, Fig. 2.5-17).

3 If, for some reason, the gravel island is not a viable choice, NMFS would suggest the construction of the causeway with two breaches, as shown in Fig. 2.5-21 (Alternative D). This alternative shows a 50 foot bridge built in the extension just north of the existing DH3 and a 16.4 foot diameter culvert in the old causeway near its connection with the shore. It is felt that this alternative would maximize opportunities for both nearshore and offshore fish to pass through the causeway. Currently, the applicant is considering one breach: a 25 foot diameter culvert near DH3 in the new causeway. A causeway with one breach would be our third alternative and would be considered by the agency only if the culvert is converted to a 50 foot bridge (Alternative C, Fig. 2.5-21).

3. Noted.

The sea water intake structure will be another potential hazard to marine life and anadromous fish. This system is described in Section 2 and Appendix H of the DEIS. Fish, larvae, eggs and other organisms can be sucked into the system and either be impinged or entrained. Most organisms will be shunted into the marine life return system and released back into the sea before the seawater is filtered, coagulated and treated with a biocide. Two alternatives for construction of intakes have been suggested in the DEIS (Fig. 2.5-8). One alternative, which is proposed by the applicant, involves a rotating screen fitted with fish buckets. When a fish comes into the intake it is scooped up by a fish bucket and rotated to a point where a water spray removes the fish from a bucket. It then falls into a trough and is transported to the sea via the marine life return system. The second alternative involves an angled screen and fish by-passes. Fish swimming into the intake are guided by the flow along the angled screen, into the fish by-pass and out through the marine life return. Both systems appear to be fairly successful with the traveling screen producing about 10-15% mortality and the angled screen by-pass about 5-10%. Of the two systems, the angled-screen by-pass is preferred by NMFS because it appears to involve fewer mechanical parts which would be subject to icing and failure. Also, it returns the fish to the sea with a minimum of handling. Whatever system is used must be designed for easy maintenance and have a back-up system incorporated.

4 In order to facilitate fish passage through the marine outfall line, it is suggested that the pipe diameter be increased to at least 10 to 12 inches. Fish are usually less hesitant to enter larger openings than smaller ones and return lines of 10-12 inches are a common size in other parts of the country. It is also suggested that the pipe interior be coated with an epoxy or other fouling-resistant substance. The use of plastic pipe could be considered for this purpose. It is necessary to keep the lines from fouling so that velocities are maintained and fish passage is not impeded. The final EIS should discuss the various anti-fouling methods and their expected consequences.

4. See response No. 21 below.

5 The water treatment facility will return approximately 4 million gallons of water per day to the Beaufort Sea. This water will contain an average of 75.6 tons of sediment and various chemicals resulting from the biocide and coagulant. The biocide will most likely be sodium hypochlorite. The Alaska Department of Environmental Conservation has suggested a mixing zone of 1000 feet radius around the water discharge. Within this zone the Alaska Water Quality Standards for chlorine are expected to be exceeded. There appears to be little cause for concern over the amount of sediment which will be discharged from the treatment facility. The waters in the vicinity are normally turbid and the bottom is silty. Organisms in the area are adapted to a soft-bottom habitat. Some limited damage in the proximity of the outfall could be expected and this should be monitored to make sure that any effects are strictly localized and do not become more wide-spread than anticipated.

5. Noted.

6 As for chemicals which will be discharged, it is apparent that some effects upon local marine life will have to be accepted if the project is to go forward. At this point, it would seem that the effects will be relatively minor and will not adversely impact critical resources or habitats. However, since the impact projections are speculative at this point, NMFS requests that monitoring programs be comprehensive and well-designed so that if water quality problems of a greater magnitude do develop, they can be identified quickly and measures taken to solve the problem.

Monitoring programs are considered by NMFS to be extremely important from two standpoints. Since there is a paucity of data available for the area where the Waterflood project will be constructed, the effects of the project can only be surmised in many cases. It is difficult to develop mitigative measures when the adverse impacts are conjectural. Therefore, it is necessary to monitor the project carefully so that mitigation can be adjusted if the original measures do not achieve the desired effects.

Equally as important, it is most likely that this causeway and facilities will be only the first of many similar structures proposed for this area. It will be necessary to monitor the effects in order to predict the cumulative impacts of multiple structures. From this standpoint, it is imperative that this project be built and maintained with the best technology and environmental information available. It must be viewed as a prototype for all future such projects.

NMFS proposed that the resource agencies and industry collectively discuss monitoring for this project. It is anticipated that a well-designed program will be able to satisfy industry's permit requirements and the agencies' needs for data. Cooperation in designing and implementing the program would assure that all parties would have access to the data and that duplication of effort will be avoided.

6. Detailed monitoring plans will be coordinated prior to permit decisions. Chapter 5.0 has been expanded.

7 Another concern is with the applicant's plans for project abandonment. According to the DEIS, no plans have currently been formulated. NMFS suggests that any permit granted by Corps of Engineers contain stipulations that require an abandonment plan to be formulated at least five years prior to project termination. These plans should be reviewed and approved by the cooperating agencies. It is NMFS' contention that some potential permanent adverse impacts resulting from Waterflood can be mitigated by proper removal of the facilities upon termination. This project has an estimated life of 20 to 26 years. The fish and wildlife resources of the area, if properly handled, should last indefinitely. Therefore, in order to maintain future options for resource utilization, care must be taken so that the project does not adversely affect resources long after its usefulness has ceased.

7. Abandonment goals have been included as a possible permit constraint.

Detailed comments are made according to page and paragraph.

	Page No.	Paragraph or Figure	Comments	
8	5-3	2	Change "behavorial" to "behavioral"	8. Agree.
9	5-4	sentence 3	State to whom or what "certain natural systems" are of high value. This statement is repeated on p. 2-4 and should be clarified there also.	9. Agree. Text revised.
10	2-22	4	Appendix K is referenced here but does not pertain to the subject of sediment transport. Perhaps Appendix I is the correct reference.	10. Agree. Appendix I is the correct reference. Text revised.
11	2-23	3	There is some concern that an 8 inch diameter pipe may not be sufficient to allow fish to pass undamaged. Is there a possibility of increasing the diameter to 10-12 inches?	11. Believe this comment refers to page 2-33. See response No. 21 below.
12	2-37	2	It is suggested that the possibility of upland disposal of dredged material be considered and discussed as an alternative in the Final EIS.	12. On land disposal was dismissed early in the analysis because of the lack of a suitable site and because the material is not adaptable for construction use. Land within a practical distance from the dredging site is largely wetland with relatively greater natural resource value. Effects of an on land disposal were considered permanent, whereas effects of open-water disposal were considered temporary, especially in light of the clean material to be dredged.
13	2-48	4	Correct "supernatent" to "supernatant."	13. Noted.
14	2-67	1	The meaning of the last sentence is unclear.	14. Agree. Sentence corrected to clarify.
15	2-76	4	The term "saverage" is not defined in the glossary.	15. Corrected phrase is "47 gal/s average outfall rate."
16	2-77	2	The reasons why the water treatment plant cannot be located onshore are not fully explained. The statement is made that if located onshore, it would have to be placed in ecologically sensitive coastal tundra. Environmentally, one must consider which is the least disruptive and which habitat is in the scarcest supply: estuarine/marine location with its attendant fisheries problems or a terrestial location. Why must the onshore facility be located in "ecologically sensitive coastal tundra?" Are not other possibilities available?	16. Onshore location of the treating plant would require placement in ecologically sensitive coastal tundra area because available gravel pad space is fully committed to other uses and because location in less sensitive upland areas would require very long piping systems. These pipes would be highly susceptible to fouling and freezing since they would be carrying untreated and unheated seawater. Even with an onshore plant, a relatively large intake structure and pumping facility would still be required at the 12-foot water depth. This would be necessary to prevent freezing and in order to provide an acceptable marine life return system.
17	2-78	4	NMFS prefers active backfill of underwater pipeline trenches rather than "the proposed alongside disposal of dredged materials." However, upland disposal of waste is preferred.	17. Noted.

18	2-83	4	It is preferable to bury electrical lines in the causeway to avoid killing birds despite the increased costs of this alternative.	18. Applicant's revised project includes buried powerlines along the causeway. However, powerlines from the Central Compressor Plant to the causeway still would be elevated.
19	2-85	4	Suggest inserting the word "terrestrial" between "permanent" and "habitat disruption." Offshore gravel mining would certainly spare terrestial areas from permanent habitat disruption but could subject marine areas instead. A determination of the relative habitat values, mitigative measures and possibility for habitat destruction must be made before a decision on undersea vs. upland/ riverine gravel mining is made.	19. The use of offshore gravel is to a great extent limited to offshore construction because of adverse effects of high saline leachate on low saline tundra systems and because of the relatively greater costs. Available geologic information indicates it may not be feasible to use offshore gravel deposits. Future geologic and environmental studies, however, may demonstrate the viability of these offshore sites.
20	2-86	2	Project abandonment should be treated fully by the applicant.	20. As indicated in the DEIS and in the Prudhoe Bay Unit Agreement (1977), abandonment will be conducted in compliance with all applicable local, state, and federal laws and regulations. All abandonment actions must receive the concurrence and approval of the State of Alaska Department of Natural Resources. Abandonment has been included as a possible permit constraint.
21	2-88	3	NMFS suggests consideration of larger diameter (10") marine life return line with an anti-fouling non-toxic coating.	21. The applicant's revised project includes 8-inch (minimum) inside diameter gathering line combining to a 15-inch inside diameter marine life return outfall line. A specific anti-fouling system has not yet been selected. Several alternatives are currently under study including pipe construction materials, coatings and linings, and various mechanical scraping alternatives.
22	3-1	1	Change "(OCEAP)" to "(OCSEAP)"	22. Agree.
23	3-2	1	Change "behavorial" to "behavioral."	23. Agree.
24	4-21/22	all	The applicant should be required to demonstrate his ability to deal with any oil or hazardous substance spill resulting from construction, operation and maintenance of the Waterflood Project.	24. Recommendation noted. It has been included as a possible permit constraint.
25	4-44	1	Points 2 and 3 are the same: is this a repetition in typing or has point 3 been omitted?	25. Repetition corrected. Text changed to reflect applicant's revised project.
26	4-54	4	These are the reasons for continued and thorough monitoring of the causeway's effects on anadromous fish migrations.	26. Noted.
27	4-58	4.2-4	Correct title to read "TABLE" rather than "TABEL." Correct "Larvea" to "Larvae" for Arctic Cisco.	27. Agree.

28	4-59	3	We assume that fish which are less than 100 mm are expected to be entrained.	28. Assumption is correct.
29	4-64	2	The "worst case" scenario should be adjusted to reflect the results of the meeting held between the Corps of Engineers and the cooperating agencies in Anchorage, Alaska on July 1, 1980.	29. Agree. Revisions made.
30	5-2	3	NMFS supports sampling efforts at the intake, at, within and beyond the mixing zone boundary. The actual methodology and frequency of all aspects of the monitoring programs should be agreed upon by industry and the concerned agencies. The studies should possibly be prioritized in order to determine allocation of time and money. Prioritization could be based on the likelihood of an impact occurring and the severity of the impact.	30. The potential monitoring program has been revised as presented in Chapter 5.0.
31	6-1	Glossary	The glossary or another appropriate section should contain a list of acronyms and abbreviations.	31. Agree. Text revised.
32	E-47	5	Add footnote 1 to Bearded Seals.	32. Agree. Text has been corrected.
33	E-48	1	Arctic fox is managed by the State of Alaska Department of Fish and Game.	33. Agree. Text has been corrected.

CLEARANCE:

F/HP: JWROTE

SIGNATURE AND DATE:

James W. Rote July 22, 1980

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER(dpl)
Seventeenth Coast Guard District
P.O. Box 3—5000
Juneau, Alaska 99802

907-586-7355

16600

17 JUL 1980

Department of the Army
Alaska District, Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

ATTN: NPAEN-PL-EN

Dear Sirs,

We would like to offer the following comments in response to the Draft Environmental Impact Statement for the proposed Waterflood Project at Prudhoe Bay, Alaska.

1 The preferred seawater intake alternative, from the standpoint of least interference to navigation, is the gravel sea island. If this alternative is used, consideration should be given to the problem of damage to the piping by grounding vessels or dragging anchors.

2 The intake structure, whether a separate island or connected by a causeway, is considered an obstruction to navigation which will require marking with a flashing white light.

3 In accordance with the Coast Guard/Corps of Engineers agreement of 18 April 1973, Coast Guard permit jurisdiction for the proposed causeway/bridge structure is waived.

Sincerely,

E. NELSON, JR.
CAPTAIN, U. S. COAST GUARD
COMMANDER, SEVENTEENTH COAST GUARD DISTRICT
(ACTING)

1. This consideration has been included in the FEIS.

2. Noted.

3. Noted.

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ALASKAN REGION
701 C STREET BOX 14
ANCHORAGE, ALASKA 99513

JUN 11 1980

Colonel Lee Nunn
Department of the Army
Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

We have reviewed the draft EIS, Prudhoe Bay Oil Field Waterflood Project. Our only comment relates to the potential impacts on the air transportation system.

In reviewing the draft statement, we did not find any section that addressed the potential impacts that might be anticipated from movement of the proposed work force. Since air transportation will be the primary mode for movement of people, we suggest that the statement be expanded to address this issue.

We appreciate the opportunity to review and comment on your draft statement.

Sincerely,

ROBERT J. BALDWIN
Chief, Planning Staff, AAL-4

18

Discussion has been added in the revised text.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
ARCADE PLAZA BUILDING, 1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101

July 11, 1980

REGION X

IN REPLY REFER TO:

10C

Lee R. Nunn
Colonel, Corps of Engineers
District Engineer
P.O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

Subject: Draft Environmental Impact Statement
Prudhoe Bay
Waterflood Project

We have reviewed the statement submitted with your June 3, 1980 letter.

We do not feel that this proposed project would have any significant impact in our areas of concern. Our Anchorage Area Office has also reviewed your statement and they find no conflicts with our housing or community development activities. They are interested, however, in any updated socio-economic data and any impacts on fish and wildlife that could affect subsistence for any of the communities in the area.

Updated information on subsistence and socioeconomics is contained within the revised text.

Thank you for the opportunity to comment.

Sincerely,

for Gordon N. Johnston
Regional Administrator

cc: John Duffy, HUD

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Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

Reply to:

Lake Plaza South, Suite 616
44 Union Boulevard
Lakewood, CO 80228

June 19, 1980

Colonel Lee R. Nunn
District Engineer
Corps of Engineers, Alaska District
Department of the Army
P.O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

Thank you for your request of June 3, 1980, for comments on the draft environmental statement (DES) for the proposed Waterflood Project at Prudhoe Bay, Alaska. Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 and the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800), we have determined that your DES does not contain sufficient information concerning historic and cultural resources for review purposes. Please furnish the following data indicating:

Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320).

The DES must demonstrate that either of the following conditions exists:

1. No properties included in or that may be eligible for inclusion in the National Register of Historic Places are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires:

a) Evidence that you have consulted the latest edition of the National Register (Federal Register, March 18, 1980, and its monthly supplements);

b) Evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer (SHPO), whose comment should be included in the final environmental statement. The SHPO for Alaska is Mr. William S. Hanable.

2. Properties included in or that may be eligible for inclusion in the

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The DEIS stated that a reconnaissance would be conducted during summer 1980 and the results included in the FEIS. A cultural resources reconnaissance survey was recently completed with the conclusion that the proposed action would have no effect. The State Historic Preservation Officer has concurred with this finding. The text has been revised accordingly. See also response No. 2, U.S. Department of Interior letter.

National Register are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental impact statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's regulations.

Should you have any questions, please call Betty J. LeFree of my staff, at 303/234-4946, an FTS number.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

JAY S. HAMMOND, Governor

OFFICE OF THE GOVERNOR

DIVISION OF POLICY DEVELOPMENT AND PLANNING

POUCH AD
JUNEAU, ALASKA 99811
PHONE: 465-3573

August 4, 1980

Colonel Lee R. Nunn, District Engineer
Alaska District, Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Subject: Prudhoe Bay Oilfield Waterflood Project D.E.I.S.
State I.D. No. FD020-80061901ES

Dear Colonel Nunn:

The Alaska State Clearinghouse (SCH) has coordinated an interagency review of the referenced Draft Environmental Impact Statement (DEIS). Comments were received from the Departments of Natural Resources (DNR), Environmental Conservation (DEC), Fish and Game (ADF&G), Community and Regional Affairs (CRA), Transportation and Public Facilities (DOT/PF), the Office of Coastal Management (OCM), and the Alaska Oil and Gas Conservation Commission. Thus, this is the unified response of the State of Alaska.

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1 We commend the Corps of Engineers for the overall quality of this document. It is a well written, comprehensive analysis which, within the limits of available information, accurately and objectively assesses most of the potential impacts of the waterflood project on the Prudhoe Bay environment.

1. The comment is appreciated.

2 Utilization of a secondary recovery method to maximize the production of both oil and gas from the Sadlerochit formation is obviously in both the Nation's and the State's best interest. The State of Alaska concurs that utilization of a waterflood technique is a safe and effective method to increase the ultimate recovery rates.

2. Noted.

3 We are acutely aware that significant delays in the start-up of actual water injection can have serious impacts upon the ultimate recovery from any given formation. The seriousness of these impacts varies from one formation to the next, but the common point is that they are invariably negative. Some time is usually necessary to develop information on how the field will produce, in order to avoid mistakes in recovery. However, when waterflooding is used, any unanticipated delays require that more water be injected in an attempt to catch up. This increased flow results in higher risks that "by-pass" will occur, whereby, uneven displacement results in injection water breaking through to production wells leaving pockets of unrecoverable oil in the formation. Thus, the State is very aware of the need to select an alternative that does not result in an economically unacceptable delay.

3. Noted.

4 There are, however, areas of the document which the State feels require additional information before our analysis can be completed. Because of our concern over the adequacy of the information presented or what we view as information gaps, the State finds it difficult to objectively evaluate economic and technical aspects of the various alternatives at this time. Major areas of concensus are discussed in the following narrative, and are separated into those relating to completeness of the material presented and those relating to Alaska Coastal Management Program federal consistency.

4. Noted.

Cost Comparison of Alternatives

5 The first area of concern is the lack of adequate comparative cost analysis of both the applicant's proposed alternative and the environmentally preferred alternative. The current cost estimates have not, in our view, been adequately substantiated or itemized in detail in order to evaluate economic considerations inherent to any "feasible and prudent" determination. An itemized breakdown of costs associated with each aspect of both construction and operation/maintenance phases (labor, materials etc.) is needed.

5. An island-based plant would require an additional $66 million (1980 dollars) in initial capital costs and an incremental annual operation and maintenance cost of approximately $6 million (1980 dollars). Detailed cost information has been made available to state personnel.

Remote Water Intake Alternative

6 Secondly, the remote underwater intake alternative to the applicant's proposed causeway is not adequately analyzed from a technical or economic perspective. This option, originally proposed as an alternative by the operator and mentioned on page 2-57, would have the treatment plant at dockhead 3 with large buried pipelines transporting water from a remote intake. Some of the apparent advantages are:

1) Compared to the extended causeway alternative, no extension would be necessary, hence water quality and migratory fish patterns would not be altered beyond the existing conditions;

2) Compared to the dredged channel alternative, periodic dredging would not be necessary; and

3) Compared to the island alternative, an island would not have to be built, resulting in a saving in gravel and in surface area disturbed. From an operating point of view, the treatment plant would be readily accessible on a year-round basis; only the intakes would not be readily accessible. Placement of the remote intakes in deeper water may preclude some of the concerns from an engineering/reliability standpoint.

The concensus of State agencies is that, of the alternatives considered, the remote water intake and gravel island alternatives respectively offer the least environmental degradation. However, the DEIS does not adequately address the reasons the remote water intake alternative was discounted. The State has, of course, a very strong interest in the reliability of any waterflood method, but it is felt that a more detailed narrative regarding any engineering, design, and reliability constraints would be appropriate.

6. The remote intake system was developed to a high degree of conceptual completion before concurrent research on icing and ice forces confirmed that remote intakes and low velocity submarine pipelines were extremely vulnerable to ice keel damage, sedimentation, ice rubble, frazil ice, and anchor ice. Ice keel damage could be mitigated by placing remote intake structures in large dredged basins on the sea bottom; however, this design would be aggravated by sedimentation problems.

Experience with remote intakes in freshwater has shown that this type of intake will ice-over, especially during freeze-up. Field work in the Beaufort Sea has shown that anchor ice forms on the sea bottom and on structures placed on the sea bottom. Experience has also indicated that structures projecting above the sea bottom have a tendency to create rubble piles. In freshwater installations, screens have been eliminated at the intake and heat is provided by electric heating, hot water, or stream to prevent freezing.

There is no known reliable or feasible system for heating remote intake structures off DH 3 in the Beaufort Sea. Even if such a system could be designed, should the system fail, it could not be thawed out in cold weather and the system would be down all winter. Existing systems applicable for freshwater intakes would be extremely unreliable in the Arctic and would pose considerable environmental concern due to the necessary elimination of fish screens at the intake. Accordingly, it was concluded that remote intake structures would not work in the Beaufort Sea. Because this alternative has serious reliability limitations, it was eliminated from further detailed environmental impact assessment. An editorial objective is to limit document space to the most likely alternatives so they may be explored in detail. Thus, discussion of this alternative is considered adequate.

Extension of the Existing Causeway Alternative

7 The State has carefully studied the applicant's proposal for both a causeway extension and westward located outfall and finds that it is likely to result in significant environmental degradation. The applicant's proposal for a westward outfall location to discharge 4.2 million gallons of wastewater per day into Prudhoe Bay is a major concern regardless of which alternative is ultimately approved. The effects of wastewater discharge are expected to be most serious during the winter when under-ice currents are very weak and there will be minimal dilution or dispersion. The applicant's proposed westward location will likely violate Alaskan water quality criteria for suspended sediment and quite probably for chlorine residual. The Department of Environmental Conservation (DEC), therefore, cannot legally issue a Certificate of Reasonable Assurance that the discharge will meet water quality standards at the proposed location. Circulation studies and modeling have shown that dilutions achieved in water depths exceeding 14 feet will meet the standards such that relocating the outfall northward off the end of the facility to depths exceeding 14 feet would be acceptable. Thus, the Department of Environmental Conservation will be requiring the northward outfall location through direct citation in the NPDES permit issued by EPA or in DEC's 401 certification. The discussion of outfall location should be revised accordingly in the FEIS to acknowledge this action.

7. The applicant's revised project includes the outfall north of the treating plant at the 14-foot contour. This location will meet Alaska water quality standards. An inshore location, now considered an alternative, will likely violate the State standards. Text has been revised accordingly.

8 While acknowledging the substantial committment of the applicant to design as environmentally acceptable a breach as practicable within the constraints of their decision to proceed with an extended causeway, the State continues to have serious reservations about the effectiveness of the breach in maintaining "adequate water flows and natural circulation patterns" and providing for relatively unimpeded migration of coastal fish species. We are concerned that any causeway extension is certain to augment already documented hydrographic changes in eastern Simpson Lagoon, the long-term biological implications of which are yet to be determined. In addition, the general concensus is that the proposed 20-foot wide by 300-foot long culvert is too small to allow for maintenance of natural salinity patterns and provide adequate fish passage because of:

1) low light levels - the limited information available shows that most anadromous fish species prefer lighted passageways. Because of the limited diameter, extremely small air space (1.6-3.0 feet), and length of the proposed culvert, the center sections will most likely be very dark;

2) high-water velocities - because of the small culvert diameter, any wind induced water height differential of greater than 2 inches on either side of the culvert will induce currents in the culvert which will exceed the swimming capabilities of the juveniles of many of the anadromous fish species expected to use the culvert. Based on meteorological records, this would occur at least 20 to 25 percent of the time; and

3) ice blockage - unless artificially thawed each spring, it is likely that because of the small air space in the culvert and the permafrost core in the causeway, an ice plug would remain in the culvert long after breakup. This would mean that it would not be available for fish usage during the period of greatest fish movement.

8. Of the alternatives considered, only the no action or the gravel island alternatives would avoid intensified changes in currents, salinity, temperature, and other parameters related to the more marine system created west of the causeway alignment. Based on concerns expressed with the culvert breach, the applicant has revised the proposed project to include a 50-foot clear span bridge in the extended causeway. Text and worst-case scenario have been revised accordingly.

Should a breach of the causeway be ultimately approved, a bridged breach of sufficient width to provide for reliable fish passage during 90 to 95 percent of the open water period is recommended. The larger passageway, greater air space, and natural bottom (which would allow some scouring) would reduce the frequency of extreme water velocities. The increased size of the opening, greater airspace, insulative value of the bridge abutments, and natural bottom would facilitate ice melting, and the increased air space and possibility of using an open matting type roadway would eliminate any lighting problems.

9 Other factors which cause concern over the likely environmental degradation of the applicant's preferred alternative include:

1) likelihood that the 3700-foot extension of the existing west dock will affect salinity patterns by causing significant additional diversion of the flow of fresh water from the Putuligayuk and Sagavanirktok Rivers into Simpson Lagoon and block normal nearshore anadromous fish movements;

2) likelihood that location of the seawater intake at the end of the causeway will tend to lead migrating fish into the seawater intake; and

3) the extraction of large quantities of gravel needed for construction and maintenance of the causeway extension (1.4 million cubic yards).

9. Agree in part. Under the reasonable worst (i.e., causing greatest change) set of assumptions for which predictive modeling was carried out, a salinity change of 3 - 4 ppt is expected. These assumptions took into consideration diverted river flows. Fish movements could be blocked with the continuous fill causeway alternative. Mitigative measures are available, however. The FEIS cites the State's concerns.

Gravel Island Alternative

10 Of the alternatives presented for which the State of Alaska feels adequate information has been included in the DEIS, we concur with the Corps of Engineers that this alternative is preferred from the standpoint of potential environmental degradation. This concurrence is based on the following reasons:

10. The State's opinions are noted.

1) It will not have any additional effect on water quality or critical fish and wildlife habitat in Simpson Lagoon;

2) It will essentially eliminate any impingement and entrainment of anadromous fish, and will significantly reduce the potential for impingement and entrainment of marine fishes in the seawater intake;

3) By minimizing the impacts accruing from the waterflood project, it will reduce the cumulative impacts of, and facilitate the permitting process for, similar projects in the future;

4) By minimizing interference with existing circulation patterns, it will reduce the probability of wastewater recirculation and increase dilution of wastewater such that it meets State water standards;

11 5) It will provide a level of operational reliability for the seawater intake system similar to the applicant's proposal. Reliable access could be provided during the 6 months of winter by ice road, and by hovercraft, helicopter, or boat, during the openwater period. These are the same methods used to provide access to offshore platforms in Cook Inlet and the North Sea. The FEIS should present more specific information about any added risks to workers as a result of these methods of access, and provide an analysis of the cost effectiveness of access for each alternative considered.

11. Although various modes of transportation are indeed feasible for year-round transportation in the Arctic Ocean, a road connection is considered more reliable and offers less risk to workers. Although detailed data do not exist to quantify the risk differential in this area, the Corps of Engineers considers it important.

12 6) It will significantly reduce the amount of gravel needed for maintenance compared to the solid fill causeway proposal and will eliminate the possible need for maintenance dredging between Stump Island and any proposed causeway extension.

12. Noted.

13 We would, however, like to reiterate that the lack of specific economic analysis of the alternatives leads the State to conclude that there is a great deal of room for error in estimating costs and benefits at this time. While not insensitive to the financial obligations of the applicant and given adequate supporting documentation from which we can conduct an independent cost/benefit analysis, we are willing to accept that the gravel island alternative could cost $100 million more than the applicant's proposal. However, this documentation is absent from the DEIS and we cannot, therefore, give what we feel to be appropriate weight to economic factors in formulating our evaluation of the alternatives. Though we recognize the difficulties in preparing specific estimates for a project of this size, they are a key element in the State's decision making process. For example, are costs associated with burial of electric wires and breaching of the existing causeway included in the $100 million estimate? The specific activities and unit costs associated with labor and materials should be specified.

13. See response No. 5.

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We also have the following comments on specific elements of this alternative, which also apply to any other alternatives which would utilize them.

14 Intakes: Neither the traveling screen nor the center flow screen system have been tested under arctic conditions, however, the center flow screen system and bypass appears to be the best method to minimize fish impingement and entrainments since it will increase the survival of fish entering the system by approximately 10 percent over the proposed system.

14. Agree.

15 Marine Life Return Line: The size of the marine life return line should be increased from 6 inches to at least 12 inches to minimize the possibility of abrasion of impinged animals on the walls of the pipe and to compensate for any biofouling which may occur.

15. Applicant's revised project includes minimum 8-inch inside diameter gathering lines leading to a 15-inch inside diameter marine outfall line.

16 Main Outfall Line: The outfall line should be redesigned so that the diffuser is located at least 1000 feet north of the proposed plant site in water depths of at least 14 feet. This realignment will allow greater dilution and dispersion of wastewater and eliminate recycling of wastewater in the winter, thus ensuring that water quality standards for sediments and chlorine are maintained.

16. See response No. 7.

17 Pipeline Freeze Protection: The proposed system of freeze protection is satisfactory, however, in the event of a system malfunction all efforts must be taken to ensure the contents will not be dumped into Prudhoe Bay. The large amount of heated, chlorinated water could cause widespread mortality in marine life in the area affected by the discharge. During the winter months, the contents of the system could be dumped on top of the sea ice, or into a reservoir prepared for that purpose in one of the area's abandoned gravel pits during any season. The FEIS should explore this issue in more detail.

17. The need to discharge pipeline water is considered highly unlikely. However, if it were to occur, a concentration of 0.01 mg/l chlorine residual would be the highest reasonably expected. Discharge on top of the sea ice is examined as a mitigative measure and potential permit condition (Chapter 5.0). Discharge into a land based reservoir is not considered viable as the saline water would have to be pumped out eventually. This alternative would risk long-term saline contamination of tundra habitat.

18 Breaching the Existing Causeway: A 16.4 foot culvert breach of the existing causeway between shore and dockhead 2 is not strongly advocated by the State. As has already been noted, very real technological problems associated with culverting exist in shallow areas.

18. Noted.

19 Low-Pressure Pipeline Routing: The State currently supports the low pressure pipeline alignment along alternative route A-2. However, should access roads and pipelines along route A-1 in support of Kuparuk and Prudhoe Bay development become probable in the future, the State may reconsider its selection of routes. The best available information on comprehensive transportation planning in the westward area and necessary road networks should be discussed in the FEIS.

Although alternative route B would reduce impacts on historically important caribou calving and insect relief habitat, only limited benefits would be realized by using this route since the cumulative impacts of existing structures and facilities (e.g., pipelines and roads) which were not adequately designed for caribou passage, etc., have already reduced caribou usage of this area. To minimize additional impacts on caribou, however, the low pressure pipelines should be buried in the access road. If this is not feasible, the pipelines should be elevated a minimum of 5 feet above the pad in areas where caribou contact could occur.

19. The multiple use of and the economic and engineering justification for an alternative A_1, A_2, or A_3 alignment is well documented. Indeed, Sohio Petroleum Co. has a permit application relating to oil pipeline and road (for module movement) use of this alignment independent of the Waterflood Project. A modified A_3 alignment was recently formulated to minimize impacts on habitat. However, it does not avoid the habitat fragmentation effect. Only alternative B accomplishes this. Various mitigation measures for alignment A_3 have been included in the FEIS, and the document has been expanded to discuss future transportation.

Inaction Alternative

20 This alternative discusses the various means of gaining an equivalent amount of oil/energy should the waterflood project not be approved. Examples include: energy conservation, alternative forms of energy; foreign oil; and new domestic oil fields. With the possible exception of energy conservation, which we consider an essential goal, consistent with any production alternative, all of these alternate energy sources create their own environmental problems. To produce solar energy over the 28-year period equivalent to 1 billion barrels of oil would require solar collectors covering an area of approximately 165,000 acres. To produce an equivalent amount of oil from new domestic onshore oil fields (equivalent to 5 Swanson River fields), the surface area utilized for roads and facilities would be many times greater than the surface area used for this project. Because of this, the overall environmental effects of the waterflood project should be relatively less. This should be pointed out in the FEIS.

20. Agree. Concept included in the FEIS.

Future Development Needs

21 Our next general concern revolves around transportation of modules and mobilization of equipment both for this project and also for future developments. We feel that the transportation and mobilization of equipment for the waterflood project should be identified in the DEIS. In addition, future requirements for transporting modules across the existing causeway or additional causeways are not adequately addressed. Given the number of major projects currently underway or projected over the next 5 years it appears that, even with widening of the existing causeway, new structures may be necessary to meet the projected load. The likely location of any future causeways and the cumulative effects that they and material requirements collectively represent should receive more detailed treatment in the DEIS.

21. The FEIS has been expanded to include information on the future use of the causeway (existing or expanded). The DEIS indicated that three other causeways are possible, but not in the vicinity of the one under current analysis. See also response No. 24 below.

22 There are indications that industry presently has some difficulty handling all present barge shipments with existing facilities. Future projections indicate that 3 to 4 times the current number of modules may be coming into Prudhoe Bay annually in the next few years. This indicates that additional barge offloading facilities may be required in addition to the west dock expansion.

22. See response No. 21.

23 Known future development includes waterflood, well pad manifold expansion, expansion of produced water facilities, low pressure separation expansion, Beaufort lease exploration, and the recently announced decision to go to 80-acre spacing in the Prudhoe Bay unit. All of these projects and several other possibilities (Point Thomson development) will have an impact on present gravel sources, will require access to the west dock and will impact all of the service facilities presently available at Prudhoe Bay. The section on cumulative impacts (pages 4-4 through 4-6) should be expanded to better address known future development to the extent existing data allows without causing delay in the Waterflood project. As you know, the Department of Natural Resources has made a committment with the Corps to address the cumulative impacts of future North Slope development on a much broader scale.

23. Cumulative impacts have been expanded.

24 We feel it important to know if the Prudhoe Bay Unit operators have any conceptual or specific plans for construction of new dock causeways in the area or any other plans to further develop or expand the west dock. It seems probable that development of the Kuparuk field would include such plans and the State's decisions on the Waterflood project may set a precedent for decisions on these aspects.

24. The Prudhoe Bay Unit does not have any plans for future causeways or docks other than the extension and expansion associated with the Waterflood Project. In expanding the cumulative impacts portion of the FEIS, the potential for expanded waterflood facilities is discussed. Should this occur, major changes in the proposed causeway, if constructed, are not anticipated. See response No. 21 above.

25 Another concern is the lack of reliable data upon which to assess environmental impacts and to make permitting decisions. For example, the numerical estimate of marine fish, egg, and larval impingement was based upon a total of seven months of sampling in 1979. In the Arctic, the abundance and geographic distribution of most species may vary dramatically from year to year, and, therefore the limited information base cannot be totally relied upon to accurately depict numbers or population dynamics in marine fish populations at this location.

Subsequently, several of the "reasonable worst case" estimates are very speculative and conceivably could greatly underestimate the real impacts of the project. Similar problems exist for oceanographic parameters and several other types of information necessary for impact evaluation. Thus, the long-term effects of causeway related salinity, temperature, and sediment transport changes on anadromous fish and benthic populations in Simpson Lagoon have yet to be objectively determined.

25. The data upon which to make regulatory and permitting decisions for a project as complex as this in the arctic environment do not allow exact quantitative estimates of all potential impacts. The limitations of the data from Prudhoe Bay have been plainly stated where appropriate in this document. Regulations of the President's Council on Environmental Quality and Corps of Engineers implementing regulations acknowledge that this situation may arise and allow for development of worst-case scenarios to aid the decision-maker in evaluating the worst situation that it is reasonable to assume could occur as a result of a given action.

The Corps convened a meeting (July 1, 1980) of biologists with relevant expertise from State and Federal agencies, industry, and several consulting firms specifically for the purpose of developing a reasonable worst-case scenario for the particularly sensitive issue of potential waterflood related impacts on area fish populations and fisheries.

The scenario developed was generally agreed upon as a best judgment, based on information that is available, of the worst impact that would be expected from the proposed project and several alternatives. Long-term impacts of causeway-related changes on the salinity, temperature and sediment transport regimes of the project area are considered to be insignificant relative to the very real threat from impingement and entrainment. The long-term effects on local ecosystems very likely could only be determined by a long-term and highly sophisticated monitoring program. It is important to note that the adverse cumulative effects of petroleum development on marine and lagoonal ecosystems are of greater significance to decisions committing natural resources in the Beaufort Sea than are those resulting only from the Waterflood Project. An exhaustive analysis has been made of possible causeway (and other alternatives) effects with consultation among agencies, the academic community, and the general public. The Corps of Engineers has determined that the state-of-the-art regarding this issue cannot be significantly advanced without an unacceptable cost in time and money. In this light, it is concluded that effects have been thoroughly and objectively determined.

Project Monitoring

26 Additionally, because most of the design criteria for the waterflood project are based on very limited data and none of the proposed systems have been tested under Arctic conditions, the State recommends the following monitoring programs be incorporated into the appropriate permits or authorizations for project approval, including the Corps 404 permit. Measurements we feel necessary to monitor system performance and the adequacy of mitigating measures are: (1) frazil ice formation on the intake structure and outfall line; (2) impingement of organisms and ice on the intake screens; (3) entrainment of organisms in the intake system; (4) biofouling of the intake structure; (5) sea-ice level in relation to the intake structure; (6) effects of ice stresses (including ice override) on the marine structures and development of an early warning system for ice override events; (7) intake velocities; and (8) the physical condition of fish in the marine life return system, and their fate and behavior after leaving the outfall (e.g. predation and disorientation).

Measurements felt necessary as part of the NPDES permit to verify compliance with State water quality criteria include: (1) measurements of effluent flow; total suspended solids, chlorine residual, settleable solids, volitile solids, pH, and temperature. Measurements should be taken at the mixing zone boundary, at the intake, within the mixing zone, and at various stations outside the mixing zone; and (2) determination of backwash cycle frequency, and monitoring for the Environmental Protection Agency's list of 65 priority toxicants.

26. See revised monitoring program, Chapter 5.0.

Air Quality

27 The discussion of air quality on page 4-73 and 4-74 is unacceptable and represents nothing more than a referencing of pertinent documents. At the very least, providing a reasonable summary of the findings and questions developed in the Prevention of Significant Deterioration (PSD) application should be highlighted for the readers, the vast majority of whom will not have the opportunity or time to read the PSD application. Potential emmissions are listed with no effort to describe their potential impacts on the surrounding environment. Particular pollutants of interest include CO and NO_x.

27. This document was written with CEQ guidelines that state space need not be devoted to repeating material readily available in other documents. However, some clarifying information has been included in this section.

ALASKA COASTAL MANAGEMENT PROGRAM FEDERAL CONSISTENCY COMMENTS

28 The Office of Coastal Management (OCM) has reviewed the Draft Environmental Impact Statement (DEIS) for the Prudhoe Bay Oil Field Waterflood Project against the standards of the Alaska Coastal Management Program (ACMP). OCM's review of the DEIS however, does not constitute a consistency determination, but rather is intended to alert the Corps and the applicant, Atlantic Richfield Company (ARCO), to any potential conflicts which may exist with the ACMP standards in the DEIS. An actual consistency determination will be made at the time that the Final EIS is reviewed. It is intended that the following comments will assist both the Corps and ARCO in incorporating the recommended changes in the FEIS in order that the Waterflood Project will be consistent with the ACMP. Therefore, in an effort to facilitate the relationships between the State's comments and consistency with Section 307(c) of the Coastal Zone Management Act of 1976, all comments are catagorized according to which standard of the ACMP Guidelines and Standards the comment most appropriately is associated with.

28. Noted.

First, the DEIS was well prepared and in general, addresses most concerns. However, those which were either not addressed or not addressed adequately are listed below:

6 AAC 80.00. COASTAL DEVELOPMENT

No comments

6 AAC 80. 050. GEOPHYSICAL HAZARD AREAS

No comments

6 AAC 80. 060. RECREATION

No comments

6 AAC 80. 070. ENERGY FACILITIES

Please see:

1. "Environmental Impact Information" (Also pertains to 6 AAC 80.130)
2. "Cost Comparison of Alternatives" (Also pertains to 6 AAC 80.130)
3. "Remote Water Intake" (Also pertains to 6 AAC 80.130)
4. "Extension of the Existing Causeway" (Also pertains to 6 AAC 80.130)
5. "Gravel Island Alternative" (Also pertains to 6 AAC 80.130)
6. "Marine Life Return Line" (Also pertains to 6 AAC 80.130)
7. "Low-Pressure Pipeline Routing" (Also pertains to 6 AAC 80.130)
8. "Intakes" (Also pertains to 6 AAC 80.130)
9. "Future Development Needs" (Also pertains to 6 AAC 80.130)

6 AAC 80. 080 TRANSPORTATION AND UTILITIES

No comments

6 AAC 80. 090 FISH AND SEAFOOD PROCESSING

No comments

6 AAC 80. 100 TIMBER HARVEST AND PROCESSING

No comments

6 AAC 80. 110. MINING AND MINERAL PROCESSING

No comments

6 AAC 80. 120 SUBSISTENCE

No comments

6 AAC 80. 130 HABITATS

1. The applicant's present proposal, if left unmodified in the Final EIS, would be inconsistent with sections (c)(2) and (c)(5) of the Habitats standard (6 AAC 80.130), and with the Air, Land, and Water Quality standard (6 AAC 80.140). However, in the absence of a feasible and prudent alternative(s) to the applicant's extended causeway proposal, the extension could be authorized under the Alaska Coastal Management Program (ACMP) only if it were proven that such an alternative(s) do not exist. Therefore, in order for the State to make a determination that no feasible and prudent alternative(s) exist under section (d)(2) of 6 AAC 80.130, the following data is required, the absence of which would preclude the State from finding the proposal consistent with the ACMP.

29 a) A demonstration that significant delays would result if the applicants proposal is not approved. Data presented should include a project schedule for the environmentally preferred alternative similar to the schedule diagram contained in Figure 2.5-14 of the DEIS.

An explanation for the causes of any delays should be presented, i.e. delays due to permitting design, barge scheduling or other reasons;

30 b) If a delay is demonstrated, the probable effects on the rate and quantity of oil recovered from the Prudhoe Bay oil field should be addressed.

32

31 c) An estimate of the number, location and size of future docks or dock expansions in the vicinity should be presented;

32 d) A demonstration that the additional cost of the environmentally preferred alternative significantly affects the economic viability of the project. (These comments pertain also to 6 AAC 80.070)

2. Please see comments under 6 AAC 80.070, Energy Facilities. This discussion also applies.

29. A diagram showing the project schedule for the proposed action and the environmentally preferred alternative is included in the revised text. Detailed information has been made available to the State of Alaska.

30. As shown on the project schedule in the revised text, the critical path for a gravel island alternative, as compared to the causeway extension, has been extended 7 months in total, consisting of an additional 3 months of preliminary design engineering and an additional 4 months of fabrication time. The Prudhoe Bay Unit owners have indicated that a one-year delay in the start-up of the project would reduce offtake capacity 100,000 - 200,000 barrels per day in the mid-1980's. Ultimate recovery would not be affected, but an increase in project size by about 4 percent would be necessary with resulting increased environmental effects.

31. See response No. 24, above.

32. The project, with implementation of the gravel island alternative, is considered to be viable.

6 AAC 80. 140 AIR, LAND, AND WATER QUALITY

Please see:

33

1. Item 4 ("extension of the Existing Causeway") under 6 AAC 80.070 Energy Facilities.

2. "Environmental Impact Information" under 6 AAC 80.070 Energy Facilities.

3. "Main Outfall Line"

4. "Pipeline Freeze Protection"

5. "Project Monitoring"

6. "Air Quality"

In addition to the more general comments above, we also wish to offer a number of page-specific comments which are discussed at some length in Attachment 1.

In closing, the State of Alaska appreciates the opportunity to comment on this important project. As you are aware, it is one which the State is strongly supportive of and we share your interest in making the best information available for significant project related decisions.

If, as the FEIS is being finalized, you feel that a meeting between the applicant, members of the Corps and State agencies would be useful, the Alaska State Clearinghouse would be pleased to facilitate such.

33

This letter satisfies the review requirements of the Office of Management and Budget Circular A-95.

Sincerely,

Michael Whitehead
State-Federal Coordinator

Attachment

cc: w/attach.

Comm. LeResche, DNR
Comm. Mueller, DEC
Comm. McAnerney, CRA
Bob Waldrop, Office of the Governor
Kay Brown, DNR
Douglas Terhune, DMEM
Hoyle Hamilton, AOGCC
Richard Logan, ADF&G
Tom Barnes, OCM
Bruce Baker, DPDP
Ron Faulkner, DOT/PF
Fred Smith, DNR
Ike Waits, DNR
Douglas Redburn, DEC
Joseph Solove, ARCO
Charles Cavness, ARCO

33. Noted.

ATTACHMENT I

Specific Comments of the State of Alaska on the Draft Environmental Impact Statement (DEIS) for the Prudhoe Bay Waterflood Project:

SECTION S

PAGE		
34	S-2	The fourth paragraph now reads "113km (35mi)"; it should read "113 km (70 mi)" and "133 km (120 mi)" should be 133 km (82 mi)".
35	S-3	Paragraph 1 should read similar to "of the estimated 9.6 billion barrels of recoverable oil in the Prudhoe Bay field, approximately ten percent of that amount is contingent on the timely initation of a (source) water flood."
36	S-4	Under the No Action paragraph, the words "enhanced primary recovery techniques" are an illogical combination because primary recovery means "unassisted" while enhanced recovery means "utilizing sophisticated recovery techniques beyond pressure maintenance and water flooding." This sentence should be deleted or at least rewritten. For the approximately 1 billion barrels of oil being considered, if the industry loses $10-15 billion, it does not appear reasonable that the State would lose $10-27 billion in royalty and taxes. While the future price of oil is hard to predict, the operators would probably pay out about one-third to the State in royalties and taxes, about one-third to the federal government for taxes, and would retain about one-third for amortization, operating expense, and profits.
37	S-5	Under the section "Alternatives at the National Level", the last sentence of the first paragraph is not clear and should be deleted or rewritten.
38	S-5 & S-6	Under Alternatives for Enhanced Oil Recovery at Prudhoe Bay, we make the following comments: Increased well density, well recompletions, artifical lift, and low pressure gathering systems are not "additional primary recovery measures". The above mentioned items are routinely accomplished during, and are part of the operations for enhanced recovery techniques. In the third paragraph on page S-6, the first sentence is a good statement; however, the last sentance is confusing and inaccurate. It should, therefore, be deleted.
39	S-7	"Significant environmental effects would be as follows:" Paragraph 3 states that anadromous fish populations may be reduced by as much as ten percent (due to the causeway extension). Is this ten percent for Prudhoe Bay, Simpson Lagoon area, the whole Beaufort Sea Coast, or for...?

34

34. Distances have been corrected.

35. Agree. Text revised accordingly.

36. Agree, "enhanced primary recovery" changed to "enhanced oil recovery."

Chapter 4.0 (Socioeconomic Effects, Operation Impacts, Public Finance) describes the derivation of the $10 - 27 billion sum for the State. The text of the FEIS Summary has been revised.

37. Agree. Text revised.

38. The text here and in Section 2.4, ALTERNATIVES TO ENHANCE OIL RECOVERY (ADDITIONAL PRIMARY RECOVERY METHODS), may have been misleading. In the Summary under Alternatives for Enhanced Oil Recovery at Prudhoe Bay and in Section 2.4 the text has been clarified.

39. Ten percent figure applied to reasonable worst-case scenario for Sagavanirktok River anadromous fish. This figure has been revised in light of the applicant's revised proposal.

40 Paragraph 4 states that the elevated powerline would kill some birds. If birds kill themselves by flying into powerlines, there must be some data available as to the magnitude of this effect.

40. A more detailed discussion of potential bird mortality resulting from the elevated power line alternative has been added to Chapter 4.0.

41 S-9 Under "The Environmentally Preferred Alternative" there are five items listed. The order of listing infers that the last four items are only useable with the gravel island alternative. However, these five items are not mutually dependent, that is, the electrical lines could be buried in the extended causeway proposal; the improved flow-through fish by-pass and return system in the intake structure could be used in any of the alternatives. We suggest that the heading of this section be changed to "Environmentally Preferred Alternatives" and that the items be listed as follows:

1. Electrical powerlines...
2. An improved flow-through fish by-pass...
3. A 7.6 m (25 ft.) culvert breach...
4. Alternative B (Figure 1) pipeline and road alignment...
5. A gravel sea island...

41. Although changing the heading would denote the absence of interdependency among the items, it may be confusing to some by implying an "either/or" choice among the items. Since the intent is to present an environmentally preferable way of meeting the public interest, a complete plan was described.

SECTION 1

42 1-2 through 1-5 Project Purpose and Need: It is highly likely that the State of Alaska will not allow the Prudhoe Bay field to be produced inefficiently. For conservation purposes, waterflooding is ultimately necessary. If gas sales are to commence, simultaneous waterflooding is mandatory. The study currently fails to stress the mandatory need for waterflooding if oil production is to continue and early gas sales are anticipated.

42. The policy of the State of Alaska has been included in the FEIS.

SECTION 2

43 2-3 Table 2.1-1.

The cost itemization supporting the projections that the gravel island alternative will cost $100 million more to construct than the proposed alternative are absent. Without these figures, the cost-benefit analysis that is necessary for a "feasible and prudent" determination cannot be conducted.

43. Supporting cost itemizations have been made available to the State of Alaska.

44 2-5 "From an economic standpoint, with no action the company owners of the Prudhoe Bay Unit would loose approximately $10 to $15 billion dollars over the 20 years the waterflood project would have been in operation."

It is assumed that the $10 to $15 billion dollars referred to are profits and do not include operational cost. This is an important consideration in computing the relative costs of the various alternatives to the applicants proposal.

44. Economic losses to the applicant and State and Federal governments have been rephrased.

45 The no action alternative should acknowledge that, as a result, gas sales would, problematically, not take place until the oil reservoir is depleted. The oil offtake rate may also have to be adjusted if gas sales and waterflooding are not considered.

45. See response No. 42.

46	2-5 & 2-6	The delay alternative should acknowledge that gas sales would also likely be delayed, and that once the waterflood project was implemented, the effect of the delay may be to require an even larger project than is currently being considered.	46. Agree. Text revised.
47	2-6	Under national alternatives, it should be mentioned that there are probably no currently feasible national alternatives that could immediately insure between 0.86 and 1.52 billion barrels of new domestic oil production.	47. Agree. Text revised.
48	2-7	Most of the alternative secondary recovery techniques mentioned require as much or more source water injection, as well as additional chemicals or gasses. This should be explicit.	48. Agree. The FEIS notes those methods used in conjunction with a waterflood.
49	2-10	It is stated that a micellar solution flood might achieve a 40 percent recovery of the original oil-in-place. Then the erroneous statement is made that after water flooding, "some 12 billion barrels of oil will still be in the ground at Prudhoe Bay, that could imply an additional 4.8 billion barrels." This appears to be an incorrect interpretation. The some 12 billion barrels remaining after water flooding at Prudhoe Bay represents a recovery of some 40 percent of the original oil-in-place. It's incorrect to apply another 40 percent recovery factor to this residual oil.	49. Agree. Text revised.
50	2-11	Under "Additional Primary Recovery Measures", four types of things are listed. This is the same situation as discussed in our comment for pages S-5 and S-6. Additionally, the second technique listed "Artificial lift (pumping) systems" is incorrect and should have the word "pumping" removed. The artificial lift system currently proposed for Prudhoe Bay is a gas lift system. The gas serves to lighten the fluid gradient in the tubing so that the existing reservoir pressure can flow greater volume of fluids to the surface. This section "Additional Primary Recovery Measures" needs to be reconsidered.	50. Agree. Text revised.
51	2-20	Figure 2.5-4 The Department of Environmental Conservation will be requiring the northward outfall location through the NPDES permit or in its 401 certification. The westward proposal (as diagrammed) is unacceptable. The Final Environmental Impact Statement (FEIS) should be revised accordingly.	51. Applicant's revised project now includes the outfall located northward at the 14-foot contour. Text modified accordingly.
52	2-24	It should be noted that any causeway extension would augment the already documented hydrographic changes, such that salinity changes quoted in the DEIS are in addition to existing changes.	52. Agree. This comment is addressed on page 4-52 of the DEIS. Chapter 2.0 has been revised to clarify.
53	2-32	The table mentions that "if sodium hydroclorite is used..." This compound has been included in the NPDES permit application and therefore, either this biocide will be used or a modification to the NPDES application must be made.	53. Noted.

54 2-34 *The discussion of environmental effects and mixing zones is made under the assumption that the western outfall will be permitted. Such an outfall, as mentioned in the text, would likely result in total suspended solids and residual chlorine violations. The FEIS should provide a detailed discussion of the northward outfall location.*

54. Applicant's revised project places the outfall northward at the 14-foot contour. Text revised accordingly.

Also, specific coagulants, anti-foam agents and scale inhibitors planned for use should be listed, even if several are being considered.

Three potential coagulants are mentioned in the revised text.

"This accumulation (average depth less than .25 cm, 0.1 in., over 8 ha) would result in some destruction of fauna in areas of greatest accumulation (less than or equal to 1 ha) but, as in the summer, would be highly attractive to scavenging organisms and their predators."

The area surrounding the outfall is likely to be contaminated with lethal levels of residual chlorine, chlorine compounds, and chlorine killed organisms, and will probably not be attractive to most organisms.

Disagree that chlorine reaction products are likely to deter scavengers from the vicinity. The low levels of chlorine reaction products in the discharge, solubility of many of these compounds, and dispersion over a large area prior to settling all would tend to reduce the build-up of potential toxicants in the discharge vicinity. However, monitoring programs (Chapter 5.0) would be instituted to evaluate conditions in the area. The NPDES permit will expire 1-1/2 years after scheduled start-up. Monitoring data and operation experience gained in this interval can then be applied to revising the permit if necessary.

37

55 2-35 "The applicant has predicted that chlorine (the proposed biocide) would react with bacteria, algae, ammonia, and other oxidizable compounds, and that no free chlorine would be present in the discharge."

55. Applicant has not guaranteed that there will be no residual chlorine in the wastewater. The sentence following the sentence quoted by the State on DEIS page 2-35 stated, "Although the residual of free chlorine would be zero, there would be a residual of combined chlorine." Chapter 4.0 provides a more complete discussion of chlorine.

It is unlikely that the operator can guarantee that there will be no residuual chlorine in the wastewater because it will be impossible to achieve a perfect balance between the varying biomass of potentially fouling organisms entering the system and the amount of chlorine necessary to kill them. To be safe, it is likely that the operators will put a slight excess of chlorine in the system to insure a 100 percent kill. However, because the operator has apparently not completed the design of the disinfectant system it is probably premature to predict what the impacts will or will not be.

56 2-47 The frequency of projected evaluations of the low-pressure lines is not estimated. It is likely that the provisions for monitoring following an emergency discharge will be a condition of the NPDES permit.

56. The answer to this comment (two per project life) is contained in the first paragraph on the cited page of the DEIS.

57 2-63 Table 2.5-6

As mentioned earlier, these comparative cost figures on construction and operation/maintenance have not been substantiated by any evidence presented to the agencies.

57. See response No. 5.

58 Following the discussion of "Alternate C-Dredged Channel" there should be included an "Alternate D-Remote Intake". This option, originally proposed as an alternate by the operator and mentioned on page 2-57, would have the treating plant at dockhead 3 with large buried pipelines transporting water from a remote intake. Some of the apparent advantages are as follows:

1. Compared to the extended causeway alternative, no extension would be necessary, hence water quality and migratory fish patterns would not be altered beyond existing conditions;

2. Compared to the dredged channel alternative, periodic dredging would not be necessarry; and

3. Compared to the island alternative, an island would not have to be built, thus a saving in gravel and in surface area disturbed. From an operating point of view, the treating plant would be readily accessible. However, the intakes could be set in even deeper water than now planned.

58. See response No. 6 above.

59 2-67 The last sentence in the first paragraph seems to be confusing, it reads "...is most economically feasible (e.g, the island alternative would be more economical.)" What does this mean?

59. Sentence corrected.

2-68 "Breaches should have maximum wetted cross-sectional area. Breaches should intersect both the water surface and the seafloor to provide light to guide fish, air flow to speed melting, and a "natural" bottom. An air space of 0.5 - 1 m (1.6 - 3.3 ft) is desirable."

60 The amount of air space in a breach should be related to the length and diameter of a breach, not a set figure of 1.6-3.3 ft. To provide fish passage, the air space should be sufficient to light the entire passageway and to allow normal ice melting. The airspace should be large enough so that no ice will persist within the breach after the surrounding ice has broken up.

"Breaches should be located inside DH 2 in about 1 m of water for fish moving along the shoreline and in the extended causeway (to allow fish to bypass the intake)."

60. Concur with the noted reasons for seeking a large air space in a breach.

61 This is an ideal situation which may not be possible to achieve as long as the original causeway is needed to carry heavy freight and the State is using it as a basis for territorial claims.

61. Noted.

"At least 75 percent of the time, water velocity in a given direction should be within the swimming speed capabilities of the weakest swimming anadromous species likely to be present. Allowable velocity would depend on the length of the breach."

62 The State feels that the breach should be designed to guarantee fish passage at least 90-95 percent of the open water period, not 75 percent as indicated here. The recommended 0.5 fps water velocity for a 600-ft breach and 2 fps for a 60 ft breach are maximum acceptable velocities, not recommended design criteria.

62. The State's criteria are noted. However, velocity through a breach is largely a function of water elevational differences across the breach (or the causeway in this case). Little can be done from an engineering standpoint to alter the conditions affecting sea level on either side of the causeway and baffling or other devices within the culvert would obstruct fish passage and hinder breakup of ice in the culvert.

2-69 "Since winds average about 60 percent occurrence from the dominant direction (Figure 3.12-3) and since the unverified modeling analysis showed that velocity through a 6-m (20 ft) breach would not exceed 21 cm/s (0.7 ft/s) (Appendix D), it appears that velocities through the type of breach shown in figure 2.5-5 would not alone prevent the passage of most fish, most of the time."

63 The existing data on wind setup and water height differentials on either side of the causeway are insufficient to determine if water velocities inside the 20ft culvert will be within the swimming capabilities of fish most of the time. It appears that the figures provided are based on wind velocities of less than 12 mph (75 percent of the open water period), whereas the Department feels that fish passage should be guaranteed up to 25 mph winds (90-95 percent of the open water period). Using Manning's formula, a water height differential of only 3 inches on either side of the causeway would result in a 2.32 fps water velocity within the 20-ft x 300-ft culvert proposed by the applicant, and would exceed the known swimming capabilities of juveniles of several of the indigeneous fish species found in the area.

63. Concur that existing data are insufficient to determine water velocities. Statement is made on the basis of model predictions which anticipate less than a 3-inch differential across the causeway (due to current set up) for winds up to 25 kt. Wave set up would add slightly to this differential but would not greatly alter the predicted velocities through the breach (see Table D-3). However, guaranteeing fish passage for 90 - 95 percent of the openwater period is not within the state-of-the-art.

64 2-73 The State has reviewed and supports the alternative high-velocity angled screen and bypass intake system because of its anticipated higher survival rate of entrained fish (90 percent) and the likelihood that it will be more reliable under arctic conditions. However, neither of the proposed intake systems have been used in the arctic. If the design selected proves unreliable, the impact on fish resources may be greater than the worst reasonable case presented in the DEIS.

64. Based on concerns expressed by agencies and the general public, the applicant has revised his project to include the angled screen bypass. Implicit in the worst-case analysis is the potential for malfunction. If the screening system malfunctions, flow through the affected intake channel would be terminated.

65 2-77 Change the first sentence in the last paragraph to read: "Locating the outfall line offshore of the treating plant will virtually eliminate chances of recycling and will be necessary for the applicant to meet water quality standards."

65. Applicant's revised project now includes the outfall located northward at the 14-foot contour. Text revised.

66 2-80 Pipeline Mode: A surface-to-pipe clearance of 2 ft is not adequate for caribou passage. Where routing is adjacent to existing pipelines of similarly poor design, this is a moot point. However, pipe clearance should be given considerable attention in new, undeveloped areas and where adjacent pipelines are elevated sufficiently.

The proposed alternative is a "field proven technique" only from the geotechnical point of view. With few exceptions, existing production lines are effective barriers to caribou movement, and gravel ramp crossings are all but useless. Observations of caribou movements in the Prudhoe Bay oil field indicate that any pipelines with less than 5 ft of clearance underneath are effective barriers to caribou movement. Because an elevated pipeline mode is apparently the only feasible option at the present time, the pipeline should be elevated a minimum of 5 ft above the pad in areas where caribou contact could occur.

The existing constraints on other construction modes from the economical, technical, and environmental points of view are recognized. However, these and other alternatives should be explored for possible future application in other areas. In particular, pipeline burial in existing roads or road extensions is a desirable and technically achievable approach which may be desirable if adequate gravel is available. This would limit disturbance spatially by combining roads and pipelines, would require only moderate amounts of additional gravel, would result in a minimum destruction of habitat, and would probably be an acceptable compromise from the standpoint of caribou passage.

Both pipeline routing and construction mode should be viewed in the context of proposed future development in the region. Specifically, if the entire coastal area between the Sagavanirktok and Kuparuk is to be intensively developed within a few years, then placing costly constraints on industry at this point would be a useless exercise. It is worth considering the author's overall view (Pages 4-5) that "Because the proposed project would modify habitat in close proximity to existing development, the effect of this action would be minor compared to singular past and (probable) future actions."

67 2-84 Road and Pad Construction: A low profile road would reduce the "visual barrier" perceived by caribou and is the preferred alternative. Also an alternative construction method which reduces the requirement for gravel should be considered.

68 2-86 Fish Guidance Measures: It is doubtful that either the bubble curtain or the fine mesh diversion net would achieve the results expected. Fish would probably become accustomed to and might even be attracted by the bubble curtain. The diversion net would probably gill large numbers of small fish unless constructed of extremely fine mesh. Debris would probably build up on a very fine mesh net and eventually break it.

66. This section has been revised to include considerations of surface-to-pipe clearance for accommodation of caribou passage, de-emphasize gravel ramp crosings, and problems of gravel berms.

67. Noted.

68. Agree. Text has been modified to identify potential problems with employing these systems.

69 2-88 The environmentally preferred plan presented in page 2-88 accurately presents the design alternatives which would have the least impact on fish and wildlife resources and their habitats. Although, the statement that the environmentally preferred alternative would increase total project cost by 5-15 percent may be accurate, no evidence supporting the additional costs identified has been provided. If economics is the primary factor in the selection of a design alternative, then a detailed cost breakdown of all project alternatives should be provided.

69. See response No. 5.

SECTION 3

70 3-11 In the first full paragraph, it is inferred that the Alaska Coastal Management Act received federal approval during 1979. The full Alaska Coastal Management Program, of which the Alaska Coastal Management Act is a part, is what received federal approval during 1979.

70. Agree. Text has been corrected.

71 3-28 & 3-29 Also on page 2-38, under the discussion of caribou, nothing conclusive can be stated about the Central Arctic Caribou Herd until past 1975. Between 1975 and 1977, calf production and survival improved significantly, and the herd has probably been increasing steadily since 1977. The increase in calf production and survival, and the documented increase in the Central Arctic Herd population, coincided with a series of mild winters in the late 1970's and the almost total eradication of the area's wolf population during the spring of 1978. The increase in the herd population since 1977 is estimated to be 1000 to 1500. Despite the potential adverse impacts that the TAPS line and the Prudhoe Bay complex may have had on the caribou, the herd has grown significantly; therefore it appears reasonable that the adverse effects are not great. We recommend an objective discussion of Central Artic Caribou Herd population dynamics in the FEIS.

71. This section has been revised to more completely document recent increases in the Central Arctic caribou herd.

In some years, a major portion of the Central Arctic herd may winter on the coastal plain near Prudhoe Bay.

It should be emphasized that while east-west movements during summer are indeed common on either side of the Prudhoe Complex, they no longer extend through the oil field to any appreciable degree.

72 3-30 Polar Bears. Although the section on polar bears indicates that the Prudhoe Bay region is of little importance for polar bears, tagging studies in which bears were marked and recaptured off the coasts of Alaska and northwestern Canada indicate that bears which occur in the Beaufort Sea north of Alaska form a somewhat discrete population experiencing only a limited amount of interchange with other Alaskan bears to the west and with Canadian bears to the east. Much of the denning for the Beaufort Sea population of bears north of Alaska occurs in a strip along the Alaska coast inland for 25 miles and offshore to the edge of the shorefast ice. This denning zone extends from the Canadian border west to Pt. Barrow and then southwest toward Pt. Lay. During winter months, female polar bears seek out suitable sites for denning. Female bears give birth to young in winter snow dens, and maintenance of undisturbed denning areas is especially critical for maintenance of polar bear populations. More dens and newborn cubs just out of dens have been found between the mouth of the Colville River and Flaxman Island than elsewhere along the coast. The most important bear denning habitat within the Prudhoe Bay region lies within a 10 mi. zone along the coast and consists of river drainages having stream-cut banks which can accumulate snow to depths in excess of 10 ft.

The barrier islands which afford relief of greater than 10-ft also provide denning habitat for female polar bears during winter months. Cross Island, in particular, provides good denning opportunities. The importance of this good polar bear denning habitat lies in the fact that although all of the stream-cut banks and barrier islands may not be used every year, denning may occur in all of these drainages over a period of time.

Activities associated with oil and gas development have the potential for disrupting polar bear denning activities. Females coming to shore to den in October and November, if disturbed, may avoid or abandon preferred denning areas. Disturbed bears would be forced to den on the less stable drift ice, resulting in cub mortality and population declines.

The DEIS should be modified to include this information.

72. The descriptive information in this section has been expanded to indicate the significance of the polar bear on Alaska's north coast.

3-44 "Work by Schell (1974) in Simpson Lagoon shows that inorganic nitrogen present at the start of the summer is rapidly depleted through biological utilization, thus limiting the phytoplankton productivity, while phosphates appear to be well in excess of limiting concentrations."

73 On appendix page C-28, it is noted that rivers are the main source of nitrogen, and that nitrogen is the limiting factor in the production of marine phytoplankton. It is quite possible that the deflection of nitrogen laden Sagavanirktok River water offshore may perceptably lower productivity in Simpson Lagoon. This problem should be discussed in the reasonable worst case scenario.

73. At a meeting held in Anchorage (July 1, 1980) and attended by members of the scientific community with expertise in arctic ecology and fisheries, the concensus was that the noticeable effects on fish populations of any nutrient redistribution caused by the causeway extension would be unlikely in light of the very real threat due to intake system operation. Birdsall and Norton (1980) concluded that the abundance of epifaunal prey species and their generally broad tolerances to the expected range of environmental variations likely to be induced would make any effects on fish or bird populations through alterations in the ecosystem in Simpson Lagoon highly unlikely.

74 3-51 "Marine and anadromous fish comprise the component of the marine biota of the Prudhoe Bay area most vulnerable to impacts from the proposed project including intake operation and causeway extensions."

Epibenthic crustaceans and planktonic organisms, which are very numerous and poor swimmers, are actually more vulnerable to impacts from the proposed project than marine fish. However, these species are not directly utilized by man. This statement should be reworded to indicate that of the species utilized by man and other organisms at the top of the food chain, fish are the most vunerable to impacts.

74. Planktonic organisms will be entrained by the intake and killed in proportion to their densities in the water column in the vicinity of the intake. Numbers entrained and killed will be far greater than number of fish affected; however, because of their large numbers and rapid reproduction rates, effects on their populations are expected to be slight. Epibenthic organisms will be similarly vulnerable when they are in the water column, but will be protected when near the bottom by the 0.3-m (1-ft) sill below the intake openings. From a population standpoint, it is believed that fish are indeed the marine group most vulnerable to project impacts. Text has been modified to clarify this qualification.

75 3-84 In the first paragraph, adoption of a "Mid-Beaufort Coastal Zone District Plan" is referred to as an assumption. Most recent thinking, as reflected in a new coastal management grant contract recently executed between the North Slope Borough and State Department of Community and Regional Affairs, is that the Borough will prepare a Coastal Management Program for its entire coastline, including the Mid-Beaufort Area, and will submit a consolidated program to the State for review and approval. This approach is in response to guidance contained in a State Coastal Policy Council resolution encouraging submittal of a single program for the entire coastal area within a coastal resource district at one time. Under current legislative provisions, the Borough would be required to submit its program by December 4, 1981. The Borough is, of course, the most appropriate entity to explain the status and expectations of its Coastal Management Program.

75. Agree. Text has been corrected.

76 3-91 The list of "future actions should include future Federal OCS lease sales in the Chukchi and Bering Seas which would also effect some of the species which seasonally utilize portions of the Prudhoe Bay region including ringed seals, bowhead whales, belugas, and some species of waterfowl.

76. Agree. Text revised.

77 3-93 Caribou: The adverse effects of an east-west road/pipeline complex within the coastal plain is potentially more serious than the analysis implies. It is the <u>value</u> of lost habitat that should be emphasized. The consequences of reduced access to calving grounds are unknown, although the simple fact that such areas are occupied regulary suggest a degree of intrinsic value. Repeated use may reflect special habitat needs or simply the existence of a familiar and comfortable environment for calving.

The fact that insect relief areas near the coast are valuable is almost axiomatic. The loss of feeding/nursing opportunity and the increase on energy expenditure by caribou under insect attack has been well established, These bioenergetic consequenses can <u>directly</u> reduce overwinter survival of both calves and adults.

77. Noted. Text expanded.

SECTION 4

78 4-1 Project benefits should also include the benefits of gas sales, if gas sales are desired. With no waterflood, gas sales will likely be delayed until oil production is near completion.

78. Agree. Text revised.

79 4-3 Short-term vs. Long-term Productivity: Recognizing that caribou are highly traditional in terms of range occupancy, it is possible that long-term displacement from developed areas will result in permanent abandonment or extremely slow reoccupation following project termination.

"Based on limited available data, impingement and entrainment by the seawater intake could destroy approximately 120,000 fish eggs and 16 million fish larvae during 20 years of waterflooding."

This statement should be carefully qualified and confidence limits should be applied to the estimates of fish mortality. A review of Appendix H reveals that the estimate of the number of fish eggs entrained over a 20-year period was based on a total of 4 months sampling in the spring of 1979, and the estimate of larval fish mortality was based on three months of sampling in the summer of 1979. The sampling period only included a portion of the spawning period of the arctic cod which is thought to occur between November and February. However, the life history of the arctic cod is not known, so it may occur at some other period. One year's sampling is insufficient to formulate accurate estimates of potential long term mortality, especially in the arctic where large fluctuations in species abundance, distribution, and reproductive success are commonplace. Because of the almost total lack of basic life history information on the arctic cod and other arctic marine species it is impossible to make an accurate estimate of mortality based on the type of information currently available. Because of the very speculative nature of the data used in the analysis it is possible that the most reasonable worst-case scenario could be many times greater than the mortality estimates provided.

The mortality estimates also fail to take into account the fact that the proposed dock extension will increase salinity and reduce temperatures behind the dock. This habitat modification may actually attract greater numbers of marine species such as arctic cod which are apparently associated with the marine/freshwater interface. The presence of large numbers of marine fishes in the area of the intake could result in a much greater impingement and entrainment problem than current estimates indicate.

79. Comment regarding caribou is noted. Comment regarding impingement and entrainment of fish eggs and larvae is noted. The limitations of the available data are noted in this section and fully detailed in Appendix H. Despite the limited nature of available data, they do indicate that numbers of fish eggs and larvae are relatively low in the intake vicinity. Moderate losses of eggs or larvae of marine forage fish are usually considered compensatory in that they result in greater survival rates later in life with little effect on adult populations. Thus, while it is impossible to place confidence limits around the estimates given, the safety factors provided in the worst-case scenario (Chapter 4.0) are considered sufficiently conservative. A safety factor of 35 has been applied in the worst-case scenario to account for unknowns and for the known concentration of arctic cod near the end of the existing causeway.

80 4-4 See earlier comments on cumulative effects.

80. Noted.

81	4-15	The statement at the top of the page should be rewritten to read as follows: "It appears unlikely that subsidence would occur at the Prudhoe Bay field (Wondzell 1980) which is considerably deeper than the Long Beach area, because of the structural configuration and because the producing formation (the Sadlerochit) is consolidated sandstone and thus has grain-to-grain contact." The next sentence, "However, expertise in this area of science is extremely limited,..." is simply not true; there is considerable expertise concerning subsidence. That sentence should be deleted. The last two sentences should be re-examined.	81. Agree. Text revised.
	4-28	"Figure 4.2-3 shows the predicted salinity changes that would occur from the extended causeway. East winds result in salinity decreases of up to 4 ppt north of the causeway extension and increases of 2 - 4 ppt up to 8 km (5 mi) downwind in eastern Simpson Lagoon. West winds resulting in salinity decreases up to 3 ppt just west of the causeway extension. Elsewhere, changes are generally less than 2 ppt. Changes in circulation and water quality for the under-ice condition were not modeled due to limited understanding."	
82		Confidence limits should be placed on these estimates of salinity changes resulting from the causeway extension. Although this model has probably accurately predicted that salinity and temperature changes will occur as a result of the causeway extension, the actual change in salinity and temperature could vary significantly (higher or lower) from the estimates provided.	82. The nature of the modeling process precludes placing confidence limits around these values. The major value of the model was in examining relative directions and magnitudes of changes.
83		Salinity changes referenced (up to 4 ppt) apply only to low river flows and are misleading if stated alone. Salinity gradients across the causeway can be expected to be much greater during high flow periods.	83. Salinity changes referenced (up to 4 ppt) apply to both high and low river discharges under normal northeasterly wind conditions. Under westerly wind conditions salinity decreases of as much as 6 ppt from present conditions are predicted. Text modified to clarify.
	4-30	The figures on this page represent only <u>low</u> flow conditions and the resultant effects on salinity patterns around the causeway are therefore misleading. <u>High</u> flow conditions represent the worst case in salinity differences on east and west sides of the causeway and should be included. DEC uses the worst case salinity changes in evaluating the water quality implications of any extended causeway.	
84	4-38 through 4-42	Clarification is necessary in this section explaining that the dilution factor of 25 was developed for the inshore mixing zone and does not apply to conditions northward of the proposed causeway or gravel island.	84. Text modified to accommodate change in proposed action.
85	4-61	Residual Chlorine and organochlorine toxicity are significant issues associated with waterflood. We recommend this section be modified to also address selected marine references in "EPA's Redbook: Quality Criteria for Water" and the American Fisheries Society's "A review of the EPA Redbook: Quality Criteria for Water" in the discussion of chlorine toxicity.	85. Agree. Text revised accordingly.

86 4-64 Intuitively the "reasonable worst-case scenario" for the worst case even though it is largely based on very speculative information. However, some consideration of the causeway induced habitat modifications (e.g., higher salinities and lower temperature) in Simpson Lagoon on anadromous fish populations should have been included in the worst-case scenario. The lagoons comprise the most important (highest density) anadromous fish habitat in terms of fish usage, and the loss of a portion of it could result in measurable declines in anadromous fish populations. Additionally it is our feeling that the 20-ft culvert proposed as mitigation for both fish passage and entrainment problems may not be utilized by the 25 percent of the fish which would have been entrained into the seawater treatment plant passage as indicated in the DEIS. The reasons include:

1. unacceptably higher water velocities in the culvert (due to the water level differential generated by wind setup) that may exceed the swimming capabilities of some of the fish species and smaller individuals of all species found in the area;

2. low light levels in the center of the culvert which may deter some fish from entering; and

3. potential ice blockage during the spring migration period due to the insulative effects of the causeway may prevent use during the spring outmigration.

The estimate that the 50-ft bridge alternative might pass as many as 50 percent of the potentially entrained fish may be an accurate estimate, since most of the aforementioned problems would be reduced or eliminated by the bridge.

SECTION 5

87 5-1 Potential Monitoring Programs: The State supports a comprehensive monitoring program for the waterflood project for the following reasons:

1. There is no previous experience with a facility of this type in the Arctic.

2. Additional causeways and waterfloods are projected. If mistakes have been made they should be corrected on future projects.

3. The short and long term effects of many of the impacts of the project (e.g., large water withdrawals, wastewater discharges, circulation changes) are not known and should be quantified.

4. The existing information on the life history and behavior of marine fishes and invertebrates is inadequate to predict or quantify the short or long term effects of the project on local populations.

5. Much of the data used in the development of design criteria for the intake solid fill causeway extension, discharge system, and some of the mitigatory measures was very speculative and should be verified.

86. The first part of this comment is not clear. The potential effect of habitat changes on the reasonable worst-case scenario has been covered above (response No. 73).

The number of fish avoiding intake mortality by passing through a 25-foot culvert breach was changed in the revised, reasonable worst-case scenario to 20 percent. The 50-ft breach was assumed to pass 50 percent of vulnerable fish.

87. Items 1-5 of State of Alaska letter are noted.

The State strongly recommends that the monitoring programs identified under 5.1 Programs Relating to Project Performance and Engineering and 5.2 Monitoring for Permit Compliance be made a requirement for project approval. This is particularly important if the solid fill causeway alternative is adopted. Because of the problems previously encountered with obtaining any useful information from the monitoring studies which were required to assess the effects of the first dock extension on the physical and biological environment of the Beaufort Sea region, we recommend that:

1. Adequate baseline studies be conducted before construction of the causeway extension and operation of the waterflood system so that the impacts of the facility can actually be determined.

2. The study for both the monitoring and baseline studies should extend a sufficient distance from the causeway and waterflood facility to encompass the entire area affected by the project. This should include a 3 mile radius around the causeway and all of Simpson Lagoon.

3. Scientifically sound sampling methods should be used for both the baseline and monitoring programs. The same sampling methods and sample stations should be used for both the baseline and monitoring programs, and sufficient samples should be taken to allow statistical verification of any waterflood induced changes in the environment.

4. Studies should include both the open water and ice covered periods. Sampling should continue during both the critical freezeup and breakup periods.

Programs Relating to Project Performance and Engineering: The comprehensive monitoring program described here should be a requirement of project approval. In addition variations in water intake velocity, should be monitored to assess potential effects on fish impingement and entrainment.

Recommendations 1, 2, and 3 of the State of Alaska letter are noted. However, preconstruction baseline data collection will be limited if the proposed commencement of construction in 1981 is achieved. Moreover, the need to extend water quality studies from Prudhoe Bay westward to the mouth of the Colville River appears limited. Model predictions show little physical change extending west of the Karapuk. However, information on recovery of tagged fish and escapement levels to the Colville River are desireable.

Recommendation 4. Agree.

Programs relating to performance and engineering - noted.

88 5-2 Monitoring for Permit Compliance: In addition to the comprehensive monitoring program outlined in this section of the DEIS, the following changes and additions should be made:

1. The DEIS has proposed "a. Monitoring the physical condition of fish in marine life return system." as a monitoring requirement. However, this should also include a study of the predation on and the behavior of entrained fish and marine invertebrates leaving the marine outfall line. Predators may concentrate at the outfall to feed on fish and invertebrates leaving the marine life return line, and by concentrating fish and invertebrates in a disoriented condition in a small area the marine outfall line may be a significant source of project generated mortality. The species composition, abundance and seasonal changes in fish, fish eggs, and larvae entrained in the system should be monitored and both the main intake line and the marine outfall line should be constructed to allow for sampling of entrained organisms and fish.

2. The new requirements to monitor "b. other water quality parameters (e.g., nutrients, temperature)" should be expanded. Because the causeway extension is expected to cut off the supply of warm nitrogen laden waters from the Sagavanirktok River to the Simpson Lagoon, changes in temperature and nutrients (particularly nitrogen) within Simpson Lagoon should definitely be monitored. It is also essential that an adequate baseline be established before construction and operation of the facility.

3. Add new monitoring requirement "g. Monitor erosional and depositional changes in the dock, Stump Island, and in the Stump Island Channel."

4. Add new monitoring requirement "h. Monitor fish abundance distribution, species composition, and behavior in the area affected by causeway induced water quality changes. Establish an adequate pre-construction baseline to do this."

5-3 Add a new monitoring requirement to "Conduct bioassays on the effects of the wastewater discharge on fish and marine invertebrates."

88. Noted. Monitoring program has been expanded and modified.

48

89

APPENDIX M

M-1 Ultimate oil recovery is not very sensitive to a delay in waterflood start-up given the start-up occurs sometime prior to 1985. Due consideration must be given the long lead time for design, equipment procurement, transportation and installation prior to waterflood start-up. An indefinite delay cannot be tolerated. Also, the longer the delay, the bigger the final waterflood project becomes.

M-4 Significant new Alaskan oil supplies will never be available if no new commercial discoveries are made. Prelease estimates of basin oil or gas reserves are not always proven out by exploratory drilling, especially in wildcat areas such as Alaska.

89. Noted.

JAY S. HAMMOND, GOVERNOR

ALASKA OIL AND GAS CONSERVATION COMMISSION

3001 PORCUPINE DRIVE-ANCHORAGE, ALASKA 99501

July 15, 1980

Lee R. Nunn, Colonel
Alaska District Engineer
Corps of Engineers
Department of Army
P. O. Box 7002
Anchorage, Alaska 99510

Ref: Public Hearing of Proposed Draft Environmental Impact Statement for Prudhoe Bay Field Waterflood Project, North Slope Borough Assembly Room, Barrow, Alaska.

Dear Sir:

The Alaska Oil and Gas Conservation Commission (AOGCC) staff members are just this week completing a list of technical comments on this EIS which are to be submitted to the Corp through the State-Federal Coordinator for the state Department of Policy and Development Planning. I have been informed by these veteran EIS reviewers that this is "the best EIS" document they had "read", even so, there appears to be several errors and misconceptions which, when corrected, will make it the complete and worthy document it must and should be.

49

The Alaska Oil and Gas Conservation Commission is charged by statute to prevent the waste of oil and gas. In other words, we work toward maximizing the recovery of hydrocarbons from a reservoir. This can involve both the recovery mechanism employed and the rate the reservoir is produced. For example, to ensure that maximum recovery will be achieved, we have been studying the Sadlerochit reservoir in the Prudhoe Bay Unit for the last eight years. Less than two months ago, the AOGCC held a public hearing much like this one which focused upon the best method of maximizing oil recovery from the Prudhoe Oil Pool reservoir. The Commission went on record then, and wishes to go on record here, concerning the following:

1. Waterflooding of the Prudhoe Oil Pool reservoir with large volumes is necessary to maximize ultimate oil recovery and is essential to maintain the 1.5 million barrels per day maximum production rate as long as possible.

2. Waterflood can yield in excess of one billion barrels of additional oil from this reservoir, if commenced as soon as possible with an adequate source water injection system.

3. Water injection from a 2 million barrel/day source water system should commence by early 1984, which appears to be the earliest practical date the project could be accomplished.

Comments have been incorporated into revised text.

4. To meet an injection start-up in 1984 will require project permit approvals by late 1980.

In Volume 1, pages S-4 and 2-5 under the heading Delay, it is stated that "Postponing secondary recovery activities 1-3 years.... would not affect ultimate recovery....", yet on pages 2-5 and 2-6 it states that delay"...beyond early 1985 will cause a progressive production loss of as much as 0.5 -1 per cent per year of the oil in place (i.e. 100-200 million bbl)." According to our studies, a 3 year delay would require a 12% greater injection rate for the remainder of the project to "catch up". This may well be beyond the practical and economic "catch up" limit. Based on the 28 year *"floodlife" of our study, the following tables show rates necessary to catch up for each year of delay.

No. of Years delayed beyond 1984	MM bbls/day Source Water Injection rate required to equal and "catch up" to injection started in 1984	Percent Injection Increase
1	2.08	4
2	2.16	8
3	2.25	12.5
4	2.33	16.5
5	2.43	21.5

We estimate that a 10 percent increased injection rate would require some 20 additional injection wells and we are not sure that this increased injection would actually yield as much ultimate oil, because overinjection can actually harm a reservoir and result in less ultimate oil recovery.

The Commission wishes to re-emphasize here that, if some source water injection is delayed, it may be numerically possible to "catch up" by adding additional injection capacity but from a practical viewpoint, it soon reaches a point of being impossible from reservoir and economic considerations.

As an oil and gas conservation agency, we are concerned with the timing of the waterflood and respectfully urge publication of the final EIS with the minimum restraints and alternative considerations necessary to provide a basis for your timely approval of all project permits for the Prudhoe Bay Unit Waterflood project this year. We will be glad to answer any questions regarding the reservoir management aspects as related to this project to aid your continued progress in this endeavor.

*Any shorter flood life would magnify the effect of delay even more.

Sincerely,

Lonnie C. Smith,
Member of the Commission

NORTH SLOPE BOROUGH
P. O. BOX 69
BARROW, ALASKA 99723

TELEPHONE (907) 852-2611

July 25, 1980

Colonel Lee R. Nunn
District Engineer
U.S. Army Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Re: Prudhoe Bay Waterflood Project
Draft Environmental Impact Statement

Dear Colonel Nunn:

The North Slope Borough wishes to submit the following comments on the Draft Environmental Impact Statement of the Prudhoe Bay Waterflood Project. We endorse the environmentally preferred alternative as outlined in the DEIS and would like to see this as the permitted activity rather than the applicant's proposed project. Although this DEIS is an exceptionally well written document which adequately addresses many areas of concern, it fails to pay substantive attention to the concerns outlined below. We would like the Final Environmental Impact Statement to consider these concerns and comments.

1. The effect of wave action on the applicant's proposed design is not explored in depth. The design wave is not stipulated, or what effect this would have on the proposed causeway extension. A more thorough discussion of the wave height, storm surges, length of time between wave crests, and the probable difference in wave pattern for the proposed causeway extension is needed. The susceptibility of the proposed dock extension and/or gravel island to 100 year storms is also not discussed. A five to ten-hour storm occurred during fall, 1979 which caused significant changes in coastal features. The effect of wave action was noted in the erosion of the existing causeway and dockhead (Barnes and Ross, 1980).

51

1. To clarify the interest of the Corps of Engineers, it should be noted that the main purpose of the EIS is to explore the probable environmental effects of alternative actions. The details of design regarding the durability of structures are significant only if failure may significantly affect the environment. In this light, gravel needs, spills of polluting substances etc. that may result from failures or poor design are of concern.

   Critical design criteria with respect to strength and configuration of offshore structures are related to ice forces not wave forces. Dimensions of the alternative structures would allow for substantial erosion to occur without damage to critical structures. The expected permanent ice core within the causeway or gravel island would limit the extent of erosion from any one storm. The 5 to 1 slope of the embankments minimizes erosion. Maintenance grading and recovery or replacement of lost gravel would restore structural integrity between storms.

2. In analyzing projected ice forces, the value of ice thickness and crushing strength used result in a rather small factor of safety against failure. A worst case scenario could result in projected failure of the causeway embankment. The FEIS should address this issue from the standpoint of the worst case scenario. The moderate numbers used in the calculation of the ice forces need further justification.

2. Analyses provided in Appendix J indicate that ice force design criteria applied to offshore structures would be adequate to resist complete failure under reasonable worst-case conditions. Cutting of embankment is possible (pages J-15 through J-17) during the first winter of placement but would not result in a significant adverse environmental impact. Basal failure of the causeway is also a possibility during the first year or two of placement (until the ice core penetrates the basal materials).

3. The DEIS briefly discusses the possible impacts of the proposed project on fish populations and marine terrestrial birds and mammals, but the impact on Inupiat subsistence species is not directly addressed. Impacts of the proposed action on present and future subsistence harvests is not discussed. There is also no quantitative description of present subsistence use or how the existing dock facilities have affected this activity. Projections of impacts on anadramous fish are assumed at about ten percent (Waterflood DEIS, pg. S-7), but no projections of the consequences of this reduction in stocks to subsistence fisheries is given.

The DEIS also lacks an evaluation of subsistence impacts from: a) physical presence of dock extension: b) toxicity and other effects from warmed effluent: c) entrainments and impingement within the intake. This is a serious omission and it should be corrected prior to further evaluation of the project.

3. The potential impact of the proposed action and alternatives on Inupiat subsistence species is expanded in the FEIS.

Coverage of likely impacts on subsistence fisheries is provided in the revised worst-case scenario. All of the cited factors have been accounted for in this scenario.

4. It appears that long-term sub-lethal impacts are possible from the proposed projects. These include the effects from disposal of wastewater containing bacteriocide and other compounds. Enhancement of microbial populations by increased concentrations of organic matter with warmer temperatures could lead to far-reaching effects in local food chains.

4. Long-term sublethal effects are possible, but the "rule of reason" dictates that they are highly unlikely. Monitoring programs described in Chapter 5.0 would detect the onset of adverse conditions such that remedial measures could be taken. It should be noted that the discharge permits administered by the U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation would be valid for only 1-1/2 years after the proposed project goes into operation. At that time effects of the discharges will be reviewed, adjustments made in treatment (if needed), and a new permit issued.

Enhancement of microbial populations to the detriment of other biota is not expected to occur. Microbes proliferating on any organic matter discharged would be readily assimilated by the many detritevore in the area. The relatively small thermal increment of the discharge will rapidly dilute to background temperature.

5. A fish guidance device or barrier screen protecting the intake may be a consideration for primary design rather than a mitigating measure in case of high mortality. An enclosure screen located outside the intake may prevent losses entirely. This measure was not discussed in the DEIS. Also, no projection was given of mortalities resulting from the intake activities. Such data is available from many projects which use natural bodies of water for cooling.

5. Noted. Such devices were not included in the basic design because they are relatively easy to add if monitoring indicates a need. Also, these devices would work best if installed on a temporary basis. Potential problems associated with such devices have been discussed in the revised text. Intake mortalities have been covered in both Chapters 2.0 and 4.0 and Appendix H.

6. The DEIS states that monitoring programs "may" be conducted in certain areas, but it makes no commitments and provides no details of the parameters to be measured. The North Slope Borough wishes to see a well coordinated inter-disciplinary program implemented during the construction phase of the project. We want to emphasize the importance of this effort: monitoring of impacts on resources and subsistence values is an important means for the Borough to ensure that it's needs are adequately addressed. We would also like to receive the monitoring details prior to any decision making.

6. A coordinated monitoring program has been the subject of concern to many agencies. Detailed specifications of required monitoring programs that will be required by the NPDES permit are given in Appendix O. Monitoring programs that may be required by the Corps of Engineers permits receive greater detail in Chapter 5.0. The exact specifications on the Corps' permits have not yet been determined. This will take place after coordination among agencies (including the North Slope Borough) and the applicant.

7. Another major concern which is not discussed adequately in the DEIS is the long-term modification of the Simpson Lagoon ecosystem. The physical, chemical, and biological oceanography and sediment transport systems have been changed by the existing dock facility. Further expansion of the causeway may continue and accentuate this change. No firm information is available on consequences to subsistence species populations and the near-shore ecosystem of this change. Closing this information gap should be an initial priority.

7. As discussed in the FEIS, the causeway extension is expected to accentuate alterations of marine conditions that have resulted from the existing causeway. Reductions of resource values caused by changes in Simpson Lagoon are difficult to predict with the present data base. This information was determined to be too costly in terms of money and/or time. Therefore, the required worst-case analysis was applied. Upon a thorough examination of the available knowledge and consultation with experienced arctic biologists, the worst-case scenario was revised. The revised reasonable worst-case scenario indicates that losses in the subsistence fisheries of Nuiqsut would be slight (up to 2.6 percent loss). Losses to Kaktovik also would be very slight (1 percent or less). Both estimates of reduction become important not for magnitude (they could not actually be detected), but for the indicated direction of change. The concern exists, therefore, for the cumulative effect of this project together with future projects.

Thank you for this opportunity to comment.

Sincerely,

Shehla Anjum

Shehla Anjum
Administrator, Interim Zoning

References:

Barnes, P. and R. Ross. 1980. Fall Storm, 1979 - A major, modifying coastal event. Attachment E. In Barnes, P. and Reimnitz. Geologic processes and hazards of the Beaufort Sea shelf and coastal regions. Outer Continential Shelf Environmental Assessment Program, Research Unit No. 205, Quarterly Report. pg. E-3

U.S. Army Corps of Engineers, Draft Environmental Impact Statement, Prudhoe Bay Oilfield Waterflood Project. Volume 7, pg. S-7.

cc: Joe Solove, ARCo
Herman A. Schmidt, Sohio
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July 29, 1980

Lee R. Nunn
Colonel, Corps of Engineers
District Engineer
Alaska District, Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Re: NPAEN-PL-EN
Permits for Prudhoe Bay Oil Field Waterflood Project

Dear Colonel Nunn:

1 This letter and the enclosed detailed comments on the Draft Environmental Impact Statement on this project are submitted to you on behalf of the Village of Kaktovik, through its elected City Council.

54

The Village of Kaktovik requests that permits for the Waterflood Project not be issued at this time. The DEIS has identified many important data gaps about the environmental effect of this massive project. The solution for some of them is said to be monitoring programs of the effects of the project after it is in place. But then it is too late, and the vast sums of money spent for it will prevent other alternatives from being explored.

The delay in the project will allow adequate studies to be made. If any small decrease in the amount of oil to be recovered occurs because of the delay, that price is small compared to the devastation that may come from a hastily-designed Waterflood effort.

Once the studies are complete, the project can be evaluated once again and a fresh determination made if it should be allowed to go forward. The public must once again be involved before such a decision is made.

2 The Village of Kaktovik would also like to specifically point out that this DEIS has many strengths as an analysis of the waterflood project. But it cannot be used as any sort of "Programmatic EIS" about the future development of the Prudhoe Bay field. The discussion of cumulative activities and impacts is far too brief for the EIS to be used beyond the waterflood project itself.

1. Based on a very thorough analysis, including consultation with other agencies, the academic community, and the general public, it is determined that the environmental assessment presented herein is sufficient to make an informed decision. This is not to imply that the analysis is free of data gaps. However, in those instances where data gaps were related to significant potential adverse effects, the regulations of the President's Council on Environmental Quality and the Corps of Engineers implementing regulations allow for a worst-case condition to be applied. It should be noted that during the EIS process, the schedule was lengthened to take time to collect data on wetlands, sediment, water quality, wildlife habitat, and other elements where new data were judged to be cost- and time-effective in advancing our knowledge. Indeed, comments to the DEIS assisted in refining the issues and focusing information on them. Other than the no action alternative, the alternative that may be ultimately permitted will require extensive monitoring with the opportunity for public review of results and the opportunity to modify the project if it is not meeting regulatory performance.

2. Agree. It is not the intent of this document to serve as a program EIS covering more than the Waterflood Project.

3 It has been difficult for the village to submit written comments on this DEIS because of the very limited time availabili to it. The lack of comment on any section of the DEIS should not construed as approval (or disapproval) of any facts or analysis set forth in that section.

These comments are being submitted prior to the July 31, 1980, deadline for written comments announced at the Public Hearing on the Waterflood Project in Barrow on July 15, 1980.

I appreciated the opportunity to meet you during your trip to the North Slope for that hearing, and I know that the village people appreciated the effort you made to visit Nuiqsut and Kaktovik to discuss the on-ice drilling mud experiment proposal. It is unfortunate that your schedule did not allow time for longer meetings to also consider the waterflood project.

For your information, and for the record, I am also enclosing a transcript from the most recent opportunity given to Kaktovik residents to comment on the record on Beaufort Sea drilling issues. The meeting was held June 18, 1980, in Kaktovik for the federal government to take oral comments on the Draft Supplement to the Final EIS on the Beaufort Sea Lease Sale. It provides a more complete insight into the feelings of the village residents than you were able to obtain during your brief visit there on July 15.

55

Thank you for the opportunity to comment on this project.

Sincerely,
ALASKA LEGAL SERVICES CORPORATION
Attorneys for the Village of Kaktovik

BY: Michael I. Jeffery

Encls.

cc. City Council of Kaktovik

By Express Mail

3. Noted.

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July 29, 1980

DETAILED COMMENTS

Prudhoe Bay Oil Field Waterflood Project

Draft Environmental Impact Statement

Summary Section of DEIS

4 The Summary is a very helpful introduction to the entire volume. The reader is immediately presented with the basic information about the project and the alternatives. The Summary, together with the Glossary and the Index at the end of the volume, make it much simpler for the reader to use the Draft Environmental Impact Statement (DEIS).

5 Government agencies proposing projects in rural Alaska should also consider the special needs of the village people that are most directly threatened by the project's effects. In this case, only one or two copies of the two-volume DEIS were delivered to Kaktovik. Not only is the number of documents and the time given for review inadequate (as they arrived weeks after their release in Anchorage) but the size and complexity of the DEIS intimidates most people from even starting to read it.

When remote Alaskan communities are involved in these projects, the agency should draft a summary of the project that is written in clear, basic English. This summary could include some graphics to make sure that the concepts were clearly before the reader. Then, that summary could be published seperately and distributed freely. For example, a large number of the summaries could be sent to the US Post Office in each community directly affected by the project. A prepaid postcard could be attached to the summary so that interested persons could send for the DEIS. Several copies of the DEIS should be sent to the village along with the summaries. The documents should be sent by package express or hand delivered so that the delays in mailing printed materials can be avoided.

Finally, government agencies should realize that in rural Alaska a large number of adults have great difficulty with the English language. Inupiaq is the language of the North Slope. The government agencies should explore the development of video tapes for television or audio tapes for radio that are in both English and Inupiaq so that the basic facts about the project, and the opportunities for comment on it, can be widely understood.

4. Noted.

5. The FEIS is accompanied by a separate summary with English and Inupiaq translations. These will be made available in affected North Slope villages as suggested and will be delivered concurrently with the main document.

Chapter 1.0 Introduction

6 No Comment.

6. Noted.

Chapter 2.0 Alternatives

7 2.1 Introduction: The charts are 2-2 & 2-3 are a useful method for the reader's consideration of the major factors of the various alternatives.

7. Noted.

8 2.2 No Action and Delay Alternative: This alternative is preferred by the City Council of Kaktovik. A delay of the project is required to answer the many "unknowns" set out in the DEIS about such crucial issues as: effect of chlorine compounds on the environment, effect of the enormous outfall on the lagoon system--especially during the nine months of winter when the ice is present, effect of the project on the food supply of bowhead whales, methods or reducing the tons of pollutants to be released into the air; and similar issues. If the further research demonstrates that the project will still require that tons of pollutants enter the air, the water, and the food chain, then the No Action alternative should be selected at that time.

8. The preference for delay is noted. See also response No. 1 to these comments.

9 The DEIS states at 2-5 that there will be continuing pressure to develop new areas if the waterflood project does go forward. The Kaktovik people know very well that this tremendous pressure to develop new areas will continue whether or not the waterflood project continues. The issue is not replacing further development with the waterflood effort; instead, the Kaktovik people are really being asked whether they want to add the tremendous amount of disturbance from the waterflood project to the problems already being caused by present oil activities, and the greater problems to come in the future. The DEIS candidly points out that the goal of the oil companies operating the Prudhoe Bay field is "the greatest profit" (1-2), and this goal will concentrate terrific forces for development on the Arctic Slope for the foreseeable future.

9. Noted.

10 The delay in the project need not cause any reduction in the amount of oil to be recovered from the Prudhoe Bay field, at least for a few years. Gas injection, for example, will be continuing until after the gas pipeline is complete, and this method is "highly efficient" for maintaining the field, (DEIS, K-8). A one year delay would apparently have no effect on final recovery, (DLIS, 2-5).

10. Agree in part. A one-year delay would cause a reduction of 100,000 - 200,000 barrels per day of oil in the late 1980's, but ultimate recovery would be the same. However, an increase in oil field development of about 4 percent would be required to "catch up." This increase in development would have a related increase in environmental effects.

11 2.3 Alternatives at the National Level: Kaktovik is asking for the government decision-makers to fully understand the effect of the project on the arctic environment. It may be that the project should be cancelled. This section of the DEIS should be expanded to fully discuss how sensible the alternative of national conservation of oil and the development of alternative energy sources by the mid 1980's and beyond really is.

11. Projections of energy demand and supply have been analyzed and indicate a significant need to conserve energy presently available and to develop new sources. The EIS summarizes this and is considered adequate.

12 2.4 Alternatives to Enhance oil Recovery: The DEIS makes a convincing case for not discussing most of the alternatives listed in this section. Gas injection should be discussed at greater length, however, as Figure 2.4-1 indicates that this method will in fact maintain the productivity of the field for a significant period of time. The possible delays in gas pipeline construction require that the decision-maker be presented with a more detailed discussion of gas injection as an environmentally preferable method of maintaining the field as compared to waterflooding. Some material from Appendix K could be brought forward and expanded for this analysis.

2.5 Alternatives to Accomplish Waterflooding

13 Evaluation of this section of the DEIS is difficult because "environmental impacts" of various options are discussed in Chapter 2, while the "environmental consequences" of the options are discussed in Chapter 4. Some questions and some gaps in the analysis in Chapter 2 are in fact answered later on in the DEIS. Many problems remain unanswered in the DEIS, however, and that is why Kaktovik is recommending a delay of the project.

The discussion of the applicant's proposed extension of the causeway at pages 2-22 to 2-25 presents a convincing case for not allowing it to happen. As stated at 2-68, the Kaktovik subsistence fishing has been declining. The causeway extension would under the reasonable worst case scenario cause the fish runs to decline. The DEIS correctly notes the important point that such a decline would have an "adverse impact" on the people of Kaktovik and Nuiqsut. Testimonies offered by the village people at the Beaufort Sea public hearings in May, 1979, and other occasions, amply support this conclusion.

58

14 Cumulative impacts of the causeway extension are noted at the bottom of 2-25. The point should be more fully explored. A reference to Chapter 4 would be helpful, but the DEIS never fully addresses the cumulative impacts of the project. Recently, both federal and state judges have required government agencies to fully address the cumulative impacts of what they are doing in the Beaufort Sea. This DEIS remains weak on this issue. A Programmatice Environmental Impact Statement on the future development of the Prudhoe Bay oil field may be the best solution for fully addressing the cumulative impacts of all the proposed projects in the area. In the meantime, the discussion in this DEIS should be expanded.

12. Agree. The text has been revised to address this information more clearly. In fact, gas injection -- along with well recompletion, artificial lift, low-pressure gathering system, and increased well density -- comes under the no-action alternative. As stated in the DEIS, gas injection has been underway since production began in 1977. This procedure would only stop in the event the gas was:

    1) no longer needed to maintain reservoir pressure;

    2) ready for transportation to market.

    The FEIS discusses no-action more completely. However, gas injection would not maintain productivity. Only an enhanced oil recovery technique (e.g., waterflood) will maintain the current 1.5 million barrels per day productivity beyond 1987 (as shown on Figure 2.4-1 in the DEIS, now Figure 2.2-1).

13. Based on concerns expressed, the applicant has modified the proposed project to reduce projected impacts on subsistence resources. As discussed in the FEIS, the causeway extension is expected to accentuate alterations of marine conditions that have resulted from the existing causeway. Reductions of resource values caused by changes in Simpson Lagoon are difficult to predict with the present state-of-the-art. This information was determined to be too costly in terms of money and/or time. Therefore, the required worst-case analysis was applied. Upon a thorough examination of the available knowledge and consultation with experienced arctic biologists, the worst-case scenario was revised. The revised reasonable worst-case scenario indicates that losses in the subsistence fisheries of Nuiqusut would be slight (up to 2.6 percent loss). Losses to Kaktovik also would be very slight (up to 1 percent). Both estimates of reduction become important not for the magnitude of change (they could not actually be detected), but for the indicated direction of the change. The concern remains, therefore, for the cumulative effect of future projects. The shared information is appreciated.

14. Cumulative impacts are expanded in Section 4.1.

15 The environmental impacts of the sea water treatment facility concern Kaktovik people very much. Kaktovik is on an island on the Beaufort Sea coast, and people depend on the sea for much of their diet. One point not discussed in the DEIS is the effect on the lagoon environment of having thousands of dead fish accumulating at the outfall area. By DEIS estimates 10 to 30% of the fish and other marine life entering the intake will be killed. The effect on existing populations "would probably be minor", if the 70% survival rate is attained, (DEIS, 2-31). There is an important qualification on the conclusion--"this prediction does not include operation problems, such as an intake system breakdown, that could occur under the difficult arctic conditions to be encountered". (Id.)

16 Once again, the cumulative impact discussion at 2-33 on the treatment plant is all too brief. The fact that an average of 3.6 tons per day (with a range of 1.5 to 75.6 tons per day) of solid material is going into the lagoon system is an incredible prospect. The effect would be especially significant in the winter months, when the ice cover prevents circulation from dispersing the material. Chlorine and other chemicals in the outfall material would rest in a concentrated area all winter, and enter the food chain over an even wider area in the ice free season.

15. Your concerns are shared by others who have commented. Based on these concerns, the applicant has revised the proposed project to include mitigating features while retaining a causeway extension. Estimated "reasonable worst-case" losses of fish have been revised. The presence of vast numbers of scavengers in the area would insure a rapid assimilation of any dead fauna. Relocation of the outfall offshore would greatly reduce the likelihood of any discharge effects being felt within Simpson Lagoon.

The revised bypass intake design would be more reliable than the originally proposed continuously traveling screens. Additionally, if the intake system malfunctioned the affected portion of the system would be shut down. Flow would not continue in bays with malfunctioning intake screening devices.

16. Discharge impact discussion has been revised to reflect the new discharge location. The material discharged would consist almost entirely of materials naturally in suspension in the water column and the offshore location would probably preclude significant impacts on the lagoon inside Stump Island.

The discussion of potential long-term impacts of chlorine reaction products has been revised.

The specific long-term effects of residual chlorine reaction products in the Beaufort Sea marine food web are acknowledged to be unknown and indeed beyond the current state-of-the-art. However, data are available from other areas. Fish from heavily industrialized and populated areas in Puget Sound that have received extremely heavy doses of chlorine reaction products, PCB's, and a host of other pollutants have been demonstrated to have a somewhat higher incidence of disease than fish from nearby, less-polluted areas. To date, there has been no indication of unusual human health problems resulting. Levels of pollutants in these areas are far greater than would result from the proposed project even in the very localized area surrounding the discharge. Therefore, there would be no health threat to North Slope residents from these discharges. The "ultimate sinks" of potentially toxic materials discharged from the Waterflood Project cannot be predicted (nor can they in the much-studied Puget Sound). No reasonable amount of laboratory or field study in other locations would allow prediction of these impacts with a high degree of confidence. Low levels of discharge and high dilution volumes suggest a relatively insignificant impact. It is because of the uncertainties that a worst-case condition is applied to decisions, and a monitoring program similar to that in Chapter 5.0 is proposed.

17 Concern also surrounds the cumulative effect on the lagoon system of simply removing the huge amount of 2+ million barrels of sea water daily. The effect could be especially significant in the winter months, when the water will be removed from underneath the ice. There is little discussion in the DEIS of possible impact of the water removal on the integrity of the ice sheet, the availability of overwintering areas for fish and other marine live, and similar problems. As noted later in these comments, the DEIS simply says that "the significance of any changes in currents are not known". (DEIS, 4-37).

18 The scale of the effects on the environment from the outfall from the treatment plant is indicated by the DEIS comment that it is comparable to the discharge volume from "a treatment plant for a very large city" (emphasis supplied)(DEIS, 2-33). The discuss at 2-34 & 2-35 leaves many unanswered questions:

-what will be the effect on the under-ice environment from dumping tons of outfall per day beside the outfall?

-the effect of the chlorine products in the outfall solids is "unknown", (DEIS,2-35). It is surely a weak rationale for not having this crucial information that the "[a]nalysis of the long-term behavior of the reaction products of chlorine, coagulent and sea water under arctic conditions has not been made because the specific coagulent is unknown". (Id.)

-even if Alaska water quality standards will be met outside the 1,000 foot mixing zone near the outfalls, where will the ultimate sinks of the poisons entering the water be? It is surely quite likely that they will end up in the same deep pools under the ice where fish and other marine life is surviving the difficult winter months under already very stressed conditions.

60

19 The discussion of the environmental impact of the proposed injection plants is inadequate in its treatment of air quality. The air quality deterioration is identified on DEIS 2-40 as one the main contributors to the decline of habitat values in the area. The effect is seen as "minor" in the DEIS, and on 2-48 the whole issue of air emissions is dismissed in a short paragraph. It is hard to reconcile the unsupported conclusion that there will be "no significant adverse impacts" from the pollutants going into the air, when Table 2.5-3 reveals that each year an estimated 87 tons of carbon monoxide, 517 tons of nitrogen oxide compounds and other pollutants will go into the air. A table discussing the effects of such compounds should be included in the FEIS. For example, the table reproduced below is from the US Environmental Protection Agency publication Alaska Environmental Quality Profile (USEPA, Seattle, WA; December, 1979, page one):

17. The volume of water removed would not affect the sea level, nor the integrity of the ice sheet. The only potential project-related impact on fish over-wintering areas would be from direct habitat loss due to presence of the causeway extension and to a far lesser degree the small area of accumulation of sediments around the discharge.

Effects of changes in current cannot be accurately predicted and are therefore specifically unknown. However, they are not expected to be of significance.

18. Effects of discharged materials on the under-ice environment are covered in Section 4.2. The discussion of chlorine reaction products has been revised. See also response No. 16, above. The analogy was overstated in the DEIS and was perhaps misleading. First, the discharge is not comparable to a municipal sewage discharge because most of it will consist of material filtered from the sea, not from human or industrial wastes. Second, it is comparable to many municipal discharges, but not to that of a very large city. The discharge from the City of Anchorage is some 34 million gal/d compared to about 4.2 million gal/d for the proposed Waterflood Project.

19. A thorough review of data related to air emissions has been made. No significant effect on human health, wildlife, vegetation, or material is expected to occur. It may appear alarming at first when emissions are presented in terms of tons of pollutants. However, the relative volume or weight of the pollutant is perhaps a more meaningful term. In this light, the carbon monoxide discharge would be 40 ppm or less, and nitrogen oxide compounds would be 150 ppm or less (Table 2.5-3).

Section 4.2 has been expanded to further explain the minor impacts of air emissions that would result from the proposed project. Comparisons to Class I standards are also given. It should be noted that increments of TSP and SO_2 would be below the EPA "significance" levels for both Class I and Class II maximum allowable increments (revised Table 4.2-6).

Table 1.
Effects of Major Air Pollutants on Health and Property

POLLUTANT	HEALTH EFFECTS	PROPERTY EFFECTS
Suspended Particulates	Correlated with increased bronchial and respiratory disease especially in young and elderly	Corrodes metals and concrete discolors surfaces soils exposed materials; decreases visibility
Sulfur Dioxide	Upper respiratory irritation at low concentrations more difficult breathing at moderate concentrations (3000 ug/m³), correlated with increased cardio-respiratory disease; acute lung damage at high concentrations	Corrodes and deteriorates steel marble copper nickel aluminum and building materials causes brittleness in paper and loss of strength in leather deteriorates natural and synthetic fibers "burns" sensitive crops
Carbon Monoxide	Physiological stress in heart patients; impairment of psychomotor functions dizziness and headaches at lower concentrations; death when exposed to 1000 ppm for several hours	Corrodes limestone and concrete structures
Ozone	Irritates eyes nose throat deactivates respiratory defense mechanisms; damages lungs	Deteriorates rubber and fabrics; corrodes metal; damages vegetation
Nitrogen Dioxide	Combines with hydrocarbons in the presence of sunlight to form photo-chemical smog; irritates eyes, nose, throat; damages lungs	Corrodes metal surfaces deteriorates rubber fabrics and dyes

The effect of this pollution deserves greater discussion than the few sentences on 2-48. An underlying issue is the standard to be used in evaluating the issue. The DEIS only discusses the Class II standard. It is certainly possible that the North Slope may be reclassified as a Class I area--how do these predicted air emissions compare to the more strict standards of Class I?

61

The gravel use issue is deservedly described as "controversial" at 2-52. An important issue is raised by the possible offshore mining of gravel. Present Beaufort Sea stipulations do not restrict the timing of such activities. It is entirely possible that increased gravel needs for the waterflood project and other oil activities will result in strong pressure to allow such offshore gravel mining during such sensitive periods as the fall bowhead migration and bird nesting and moulting season.

20

20. Noted.

The labor supply section is perhaps deliberately vague. The applicants promise North Slope people only that their "informal recruiting" will be "continued and expanded", and that they would "fill all openings with Alaska residents to the extent possible". (DEIS, 2-55). The effort to make sure that the people affected by the project, the North Slope residents, have a chance for the jobs to be developed from the project should be much stronger. The DEIS should also discuss and evaluate the Tribal Employment Rights Office that has been established by the Inupiat Community of the Arctic Slope for all North Slope projects.

21

21. The issue of native employment is indeed a difficult issue, fraught with concerns related to reducing pressure for social change, union/industry relations, financial, institutional, and other aspects. It is not explored in detail in the EIS because it is an editorial objective to limit the size of the document by concentrating and summarizing information.

The Corps of Engineers has no authority in industry/labor relations. It appears that the Tribal Employment Rights Office would be limited to encouraging and monitoring native-hire practices. Specific mention of this organization is included in the revised text.

Alternatives other than the proposed project

22 If the project goes ahead, the causeway alternative B, setting up the gravel pad instead of the causeway extension would be the preferable alternative for the reasons set out in the DEIS at 2-58 to 2-64.

22. Noted.

23 If the project goes ahead, the clear span bridge would be the preferable design for making breaches in the causeway, in order to fulfill the requirements described at DEIS 2-68 & 2-69. In addition, a breach should be made at the nearshore location in the existing causeway between dockheard 1 and 2 in order to restore the traditional nearshore migration route of the fish. If a bridge is possible at this location, it should be used. Otherwise, the culvert system described at DEIS 2-71 & 2-73 would have to be used.

23. Noted.

24 If the project goes ahead, the alternative of having the"high-velocity, angled screen and bypass intake with a jet pump return system" should be used in order to provide the predicted 90% survival rate for fish caught in it. (DEIS, 2-73). It would be helpful to have more discussion of this alternative at page 2-73, rather than referring the reader so quickly to Appendix H.

24. Agree. This discussion has been expanded.

25 It is amazing that the important issue of alternative biocides is so quickly dismissed on 2-76. Hydrogen peroxide and ozone both "rapidly dissipate to harmless products in the environment" (id.), while the effects of the chlorine are apparently adverse, but still "unknown", (DEIS, 2-35). The brief discussion indicates only that cost was the factor influencing the applicants' decision to use the more dangerous chlorine. This section should be expanded to indicate what reasons, if any, justify the rejection of the other, environmentally safer biocides.

25. An analysis process was followed such that detailed costs were developed only for those methods that were considered technically feasible and did not have unacceptable environmental costs.

Hydrogen peroxide was eliminated because its slow decomposition would continue to generate oxygen downstream of the deaerators, causing severe corrosion to pipelines and injection wells. One of the major functions of the seawater treating plant is to remove oxygen from the seawater and hydrogen peroxide would defeat this purpose.

Ozone was also considered as a means of controlling marine growth in the system. It was eliminated because introducing ozone into the system increases the oxygen in the process stream and increases the demands on the deaeration equipment. Deaeration of 40°F seawater to the required residual oxygen level of 20 ppb approaches the maximum performance for state-of-the-art equipment.

Applicant has given considerable attention to the operational control of sodium hypochlorite addition into the system and the following description reflects current plans. However, the system is still in the design stages, with further refinements anticipated. Accordingly, the operating plan may, by necessity, be varied to meet process requirements. These changes in operation, however, will be consistent with maintenance of the discharge quality within required regulatory limits. To provide sufficient reaction time to effectively kill bacteria in the system, it is anticipated that hypochlorite addition must take place immediately downstream of the strainers.

The system as now designed allows a maximum of two filters to be backwashed at the same time. This would occur only during summer storms when solid loads are at their maximum and when natural dispersion of the backwash effluent is at its highest. The rest of the year only one filter will be backwashed at a time.

During the backwash cycle, the backwash fluid is piped to a large surge tank where it is co-mingled with backwash water from the strainers, which is free of chlorine. Agitation and retention for thorough mixing of these waters in the surge tank, along with about 3 minutes of transit time in the outfall pipeline will normally provide a discharge essentially free of residual chlorine when returned to the sea.

26 If the project goes ahead, the Corps will clearly have to carefully consider SOHIO's plans to construct a road in any case between Pads E & K, (DEIS, 2-80). If the road is to be constructed in any case, then the environmentally preferred alternative for the low pressure pipeline in that area should probably coincide with that road. If the road will not be built, then the pipeline should follow existing roads in other areas, as suggested in the environmentally preferred Alternative B, (DEIS, 2-79 & 2-80).

26. Multiple use facilites for oil development are usually preferred from an environmental point of view. Road and pipeline alternatives will be analyzed and permits will be decided upon with this concept in mind.

27 The low-profile road described at 2-84 & 2-85 is clearly the preferable construction method for the reasons stated in the DEIS. This kind of road has been used successfully in Kaktovik itself.

27. Noted. However, the capability of these roads to withstand heavy module loads is not proven. This would preclude use of such insulation on the road to the west side of the field if multiple use of this facility were to be realized.

28 The discussion of gravel sources offshore at 2-85 should be expanded to discuss the concerns cited above at page five of these detailed comments.

28. Agree. Text has been revised to reflect concern for fall whale migrations.

29 The alternative of requiring the applicants to take reasonable steps to "enhance the rate of natural recovery or restore the area to near its former condition" should be used if the project goes ahead, (DEIS, 2-86). Concern for the continuing effects of these activities after the project is complete is already present in the previously-proposed North Slope Borough Coastal Zone Management Program. Since the CZM program is not yet in effect under the Borough's control, this requirement should be included any federal permits involving this project.

29. This has been included as a potential permit constraint (Chapter 5.0).

2.6 Mitigative Measures:

30 The various options considered so briefly in this section deserve much more analysis. The fish guidance measures, drainage readjustments, protection from ice override, procedural measures, and marine life return line change are all particularly important.

30. Chapter 5.0 has been expanded to include potential permit constraints. The exact permit stipulations are not established at this time. Upon agency coordination, they will be incorporated into the permit. Mitigative measures included in Section 2.6 may be mandated in these stipulations.

The DEIS does nothing more than identify some possibilities, and sets out the fact that the applicants did not consider them, (DEIS, p. 2-86). The DEIS makes no effort to fully analyze the alternatives or why they are not appropriate for detailed consideratic The DEIS is deficient in not doing so.

64

2.7 The Environmentally Preferred Plan:

31 Although the Village of Kaktovik advocates delay and possible cancellation of this waterflood project, if the project goes ahead the environmentally preferred plan identified at 2-86 should be chosen. The reasons for chosing the various elements of the plan are set out in these comments and in the DEIS. The tremendous cumulative impacts of the projects going forward and planned in the Prudhoe Bay area mandate that each project be constructed in most environmentally responsible manner.

31. Noted.

Chapter 3.0 Affected Environment

3.1 Introduction

32 No comment.

32. Noted.

3.2 Prehistory/history

33 No comment.

33. Noted.

3.3 Land Use

34 The discussion at 3-4 to 3-5 about the large land use required by the native communities is an important point that should be expanded. The continuing interest of the village communities, even though physically 90 to 160 miles away from the center of Prudhoe Bay results from the necessary land use patterns indicated at Figure 3.3-1. The comment that these patterns come from "resource harvesting associations", (DEIS, 3-4) deserves expansion. A more detailed look at the kinds of harvest that occur and the critical importance of the wildlife accessibility to the village people would be appropriate here.

34. Agree. Discussion on resource harvesting associations has been expanded.

35 The land status discussion should be expanded to include the presence of several approved native allotments and several more that are still pending before the Bureau of Land Management in the Prudhoe Bay area. The discussion at 3-6 to 3-11 totally fails to mention them. These parcels are often especially important sites for subsistence hunting. Moreover, trespass on these holdings by those pursuing oil activities in the area opens the trespassers to civil damage claims in the court. The Bureau of Indian Affairs is actively investigating several such claims at this time. At least one of them is in the immediate area of the West Dock, and it is therefore in an area critical to the future of the proposed project.

35. Agree. Land status discussion has been updated.

36 Moreover, the brief mention of the marine sanctuary nomination for the Beaufort Sea ignores the fact that such a designation could result in an alternative management scheme for the offshore area. The proposed project could well violate such a marine sanctuary management scheme. The failure to discuss this possibility more fully violates the requirements for Environmental Impact Statement analysis that have been so recently reemphasized by US District Court Judge Aubrey Robinson, Jr. in the Beaufort Sea litigation in federal court.

36. The purpose of Section 3.3 is to present the existing environment without the proposed project. Therefore, it does not discuss the possible conflict that the proposed action may have with a possible marine sanctuary. It is agreed, however, that the lack of discussion on this impact in Section 4.2 of the DEIS, was a deficiency. This section has been revised to include this discussion.

65

37 Similarly, the DEIS should evaluate more fully the future North Slope Borough Coastal Zone Management Plan as a management option in the project area. The present Interim Zoning Ordinance would be replaced, by its terms, by such a program.

37. The DEIS and FEIS are unable to discuss the borough's coastal zone management plan, as it has yet to be reformulated. The DEIS and FEIS do state the temporary nature of the borough's Interim Zoning Ordinance and the pending adoption of a coastal zone management plan.

3.4 Geology and soils

38 No comment.

38. Noted.

3.5 Vegetation

39 The consideration of the endangered plant Thlaspi arcticum at 3-22 would be more relevant if some details about the plant were given--especially the kind of activities that could harm the plant. Without such information, it is impossible for the decision-makers to evaluate whether it will be properly protect if the project goes forward.

39. It should be noted that Thlaspi arcticum has been suggested for classification as a "threatened" species. It is not classified as threatened and it is extremely unlikely that it would be affected by waterflood as it has only been found on the gravel river terrace south of the Kaparuk River bridge. Greater detail regarding species characteristics is not thought to be justified in view of the general level of treatment in the DEIS and the low probability of impact; Thlaspi would only be affected if an area containing the species were directly altered.

As detailed plans are developed and reviewed by the government, the specific areas to be modified will be examined for this species.

3.6 Wildlife

40 The brief discussion on 3-23 and Figure 3.6-1 are an excellent introduction to this section. An expanded discussion of the migratory nature of the wildlife using the North Slope would be even more useful. It is a critically important issue, as it demonstrates the extremely wide effects that disturbance of wildlife in the Beaufort Sea will have. It is clear from Figure 3.6-1 that so many relevant species to the life and health of the village people migrate through the Prudhoe Bay aree and then continue to the areas near the villages.

40. We concur that the migratory nature of North Slope wildlife is an important issue. In expanding various sections of the EIS, this aspect has received attention.

41 Figure 3.6-1 would be more useful if it included the migration of the bowhead whale in the map. This endangered mammal is of extreme importance in the proper consideration of the environmental impacts of actions in the Prudhoe Bay area. Showing its migration route on this figure would help the decision-maker keep firmly in mind that the migration route must be respected and the wide impact that harm to the bowhead whale would have.

41. Agree. The bowhead whale is discussed in detail in Appendix E. Figure E-6 illustrates migration routes. These routes have also been added to Figure 3.6-1.

42 The discussion on birds brings out the need for delay to complete studies that are vital to the project's evaluation. The DEIS at 3-27 states that the effect of the early snow melting on birds is "unknown". Another issue is the effect of the tons of new air pollutants entering the air near the nesting and moulting sites will have on the birds, including the peregrine falcons.

42. Effects of the proposed project on birds from early snow melting and dust accumulations are relatively minor. Since no demonstrable impacts have occurred, adverse impacts are considered negligible. The revised air quality section in Section 4.2 further clarifies the negligible impact of emissions on humans, vegetation, and wildlife.

3.7 Wetlands

43 No comment.

43. Noted.

3.8 Physical and Chemical Oceanography

44 The comment emphasizing the great importance of storm conditions and the effect of especially high waves on the coastal areas is appropriate, (DEIS, 3-35). This comment, as well as the storm surge discussion at 3-36 underline the concern expressed by Kaktovik people and Nuiqsut people at public hearings on Beaufort Sea offshore drilling issues. The concern is directed at the fact that the industry has not really experienced the extreme conditions that can occur in the Beaufort Sea. There can be little confidence that such conditions can be dealt with successfully, when the village people know that the extreme conditions seen in their lifetime have not happened to occur in the particular years of oil industry and government studies of the Beaufort Sea.

44. Noted.

45 The discussion in the water quality subsection at 3-40 to 3-44 gives additional support for the need to breach the causeway between dockheads one and two. (see page six of these comments).

45. Noted.

46 The discussion of ice at 3-44 to 3-49 is a significantly improved portrayal of the realities of the ice conditions in the Beaufort Sea than in other recent Impact Statements. The facts set forth in this subsection find ample support in the testimony of the village people at public hearings on the North Slope over the last two and a half years.

46. Noted.

3.9 Marine Biology

67

47 The need for further fish studies is indicated by comments like that appearing at 3-54 in which it is admitted that important effects of the existence of the causeway on fish migrations have not been studied. When these issues have not even been addressed as to the existing causeway, the causeway must surely not be extended.

47. The effects of the existing causeway are judged to be adverse, although they are slight. See also response No. 15 to the letter from Sohio and ARCO (applicants).

48 The discussion of bowhead whales in the marine mammals subsection is much too brief. There is no discussion of the fact that the bowhead feeds on the kind of zooplankton and other marine life that could be affected by the outfall from the sea water treatment plant. The chlorine compounds in the outfalls would be entering the food chain, and that chain includes the bowhead whale.

In addition, the DEIS glosses over the significant point that bowheads do in fact use the lagoon system inside the barrier islands. The DEIS mentions two occasions. Village testimonies and affidavits prepared over the last few years have documented that bowheads use water at least as shallow as the twelve foot depth at the seawater intake plant. Moreover, the bowhead will use the lagoons inside the barrier islands for the fall migration in the years in which fall storms blow the ice pack against the islan

48. Agree in part. Sections 3.9 and 4.2 are revised. See also Appendix E. Potential impacts on bowhead whales through food chain organisms are extremely unlikely. The National Marine Fisheries Service has evaluated this project and anticipates no significant impacts on bowhead whales. The text has been revised to include the information on bowhead whale range.

3.10 Freshwater Resources

49 No comment.

49. Noted.

3.11 Groundwater Resources

50 No comment.

50. Noted.

3.12 Meteorology and Air Quality

51 The discussion of air quality at 3-67 should be expanded to evaluate the different kinds of "National Air Quality Standards". The conditions at Prudhoe Bay should be compared with the Class I standards as well as those of Class II, since it is quite possible that the classification of the Prudhoe Bay area could change to Class I in the future. It may be that the more strict Class I standards are not, in fact, being attained.

51. Agree in part. Text revised.

3.13 Sound

52 Another one of the many important data gaps that exist is identified at 3-67: "Wildlife adaptability to sounds associated with recent oil field development is generally unknown".

The discussion reveals that the true effect of the seawater treatment plant's operation out in the lagoon system cannot be accurately assessed at this time. The decision-maker is left in the dark as to the effect of the noise from the operation on the environment. Once again, it would be appropriate to delay the project until such effects are fully known. The Alaska Eskimo Whaling Commission is attempting to gather some of the needed information as to whales, but many more studies need to be completed.

52. While the Corps shares the concern that more information should be gathered on acoustics in the marine environments, adequate information exists to make an informed decision regarding this project. National Marine Fisheries Service considered noise in their finding of no significant impacts.

3.14 Socioeconomic Conditions

53 The discussion of the meaning of subsistence hunting to North Slope native people is more adequate than those in other recent government efforts to describe it. The summary comments at 3-74 need to be strengthened, however. The unanimous testimony about subsistence hunting at North Slope public hearings on offshore issues over the last 2-3 years amply demonstrate that fish and wildlife resources are not just "preferred by many" (id.). Instead, the witnesses continually point out that the continuation of subsistence hunting is basic to not only the person's own health, but to the actual survival of the community. Studies contracted by the Bureau of Indian Affairs considering the effect of limitations on bowhead whale hunting on the life of the whaling communities show that fish and wildlife resources remain a primary part of the Inupiat diet. The economic realities of village life and the arctic climate also cause non-native village residents to share in the essential subsistence harvest. Even in Barrow, over half of the food intake of the residents come from subsistence hunting according to the Peterson study completed in 1978 for the BIA.

53. Discussion has been modified to incorporate in the reviewer's comments.

54 The discussion at 3-78 concerning North Slope population and employment makes the mistaken comment that there is "very little immigration into smaller villages" from Barrow. In fact, the new village of Nuiqsut and the new village of Atqasuk were both brought about by significant migrations of native people out of Barrow. Many of them were searching for the opportunity to live a more subsistence hunting centered life than they had found possible in Barrow.

54. Agree. Text revised.

3.15 The Future Without the Proposed Project

55 Figures 3.15-1 and 3.15-2 contain faulty information about the planned lease sales in the Beaufort Sea. In particular, the Beaufort Sea sale no. 71 proposed for 1983 may include the area from Cape Halkett in the National Petroleum Reserve-Alaska, to the Canning River. Possible future lease sales to be held by the state and the proposed federal Chukchi and Hope Basin sales are also not identified.

55. Agree. Text and figures revised.

The discussion of additional projects on the Arctic Slope at 3-89 to 3-91 is very inadequate. Recognition should be given to the fact that many offshore wells are already under active planning for areas like the Sagvanirktok River Delta.

56 Further details of the planned development scenarios are available in publications like those of Dames and Moore prepared for the Alaska OCS office. The effect of multipication of gravel pads, new pipelines both on shore and offshore, possible new causeways and even new waterflood projects should be set out and discussed.

56. Agree. Text and figures revised.

69

57 The section on Canadian developments at 3-91 is very inadequate. A much-expanded discussion should be given of DOME/CanMar's adventures in the Canadian Beaufort Sea. There have been some recent discoveries in the area, including one announced last week. There have been gas blowouts and formation water flows that have worried many North Slope people, especially people living in Kaktovik. Kaktovik is the closest Alaskan community to those activities, and it is caught between the efforts in both the Canadian and Alaskan Beaufort Sea.

57. Agree. Text and figures revised.

58 The future environmental and social profiles section should also be expanded to contain an adequate discussion of the future effects of the identified future development activities. There is only the most conclusory references to these future developments at present, and the brief discriptions are of little value to the decision-maker in evaluating the future threats to the environment from these other projects.

58. Agree. Text and figures revised.

Chapter 4.0 Environmental Consequences

4.1 Evaluation of Proposed Project

59 It is useful for the reader to have this overview at the beginning of the section.

59. Noted.

4.2 Comparison of Impacts

60 The discussion of land use is enhanced by the clear discussion of the project in relation to the standards of the Alaska Coastal Zone Management Program. Compliance with these standards is rightly emphasized as an important element of the decision-making process about the project. Compliance with the standards is, of course, required by state and federal law.

60. Noted.

61 The forthright declaration that the applicants' proposed plan would violate the standards is clearly correct. The conclusion that the Environmentally Preferred Alternative will not violate these standards must, however, be qualified. There are many unknown factors in the consideration of the impacts of the project. It can therefore not be definitely stated that the alternative B would not violate the standards. Delay of the project to allow additional research on the impacts would be the appropriate course of action.

61. Consistency with the Alaska Coastal Management Program is a determination to be made by the State of Alaska. However, the Corps alerts permit applicants to potential conflicts with the standards. Thus, the EIS is written in terms of possible violations since the Office of Coastal Management has not yet made a determination. The Corps will not issue a permit if it is found to be in violation of the Alaska Coastal Management Act.

62 The discussion of the Interim Zoning Ordinance of the North Slope Borough should be qualified by the remark that it may be replaced by a more complete coastal zone management program.

62. Permits obtained under the Interim Zoning Ordinance are assumed to be valid under the future regional coastal zone management plans. Text revised.

63 The interim zoning ordinance adopted by the Borough was adopted over protests from Kaktovik's representative that the ordinance had substantial gaps and weaknesses in protecting the environment and subsistence hunting values of North Slope residents. The more complete CZM program should address these concerns more adequately, but the fact that the CZM must also pass the state legislature makes any final plan unlikely to fully address the concerns of the North Slope residents.

63. Noted.

64 The discussion of the endangered plant Thlaspi arcticum at 4-17 in the Vegetation and Terrestrial Wildlife subsection should be supplemented by at least some description of the plant and the kinds of environmental effects that would threaten it.

64. See response No. 39, above.

65 The summary at 4-23 of the cumulative impacts on "regional and worldwide wildlife populations" is unsatisfactory. It gives the decision-maker little help to have this kind of conclusion: "These reductions in range or useable habitat could cause long-term population reduction with potential implications relative to subsistence and recreational use of international resources". (id.) What are the implications? And what will be the resulting effects on the local people?

65. The cumulative effects of anticipated oil development on wildlife populations cannot be quantified. However, a qualitative discussion of socioeconomic impacts is presented in detail later in Section 4.2. The Corps is an advocate of resource and development planning on the North Slope. Indeed, the best way to address concerns about most cumulative effects of hydrocarbon development is by establishing a detailed dynamic planning process that can anticipate, in the public arena, development and conservation needs before permit applications are received. It should also be compatible with the Alaska Coastal Management Program and the Borough's ordinances.

66 Long-term effects of the poisons from the chemicals used in the waterflood project entering the food chain of the lagoon system are not mentioned in the paragraph at 4-28 that discusses the effect of the chemicals on water quality. What are the ultimate sinks of these chemicals? To say that the water column itself will meet water quality standards ignores the effect of the accumulation of the chemicals on the bottom. The most likely organisms to be affected are those overwintering in the deep pools under the ice, as the outfall washes into the surrounding area.

The effect of these chemicals on the fish or bottom-dwelling marine life should not be the limit of the inquiry. What is the effect on higher orders of life, including the local people of the Beaufort Sea area, of the buildup of these chemicals in the food chain? The DEIS does not address the issue. When the chemical buildup will start causing the cancers in people may be difficult to assess, but the possibility should not be ignored.

66. See response No. 16. Section 4.2 of the text has been revised.

67 Another data gap is identified at 4-33: the effect on the lagoon system productivity from blocking the Kuparuk River runoff from the normal mixing in the lagoon system.

67. Text revised. This data gap is not indicative of a significant negative impact that has been overlooked.

68 The discussion of ice forces at 4-34 & 4-35 contains a quite justifiable emphasis on the destructive and unpredictable nature of the sea ice. As stated earlier in these comments, such conclusions in the EIS confirm to the decision-maker the kind of testimony that the village ice experts have also been giving. The study by Shapiro and Metzner, "Historical References to Ice Conditions Along the Beaufort Sea Coast of Alaska", with the assistance of Kenneth Toovak, is an official Scientific Report of the Geophysical Institute of the University of Alaska, Fairbanks dated September, 1979, that brings out the observations of many Inupiat elders about these destructive ice forces.

68. Noted.

71

69 The concern expressed by Kaktovik residents about the effect of the operation of the project on the under ice environment is echoed by the DEIS comments at 4-36 & 4-37. Once again, however, after admitting the potentially significant impact that the project could have during the nine winter months on the under ice environment, the DEIS must conclude that "the significance of any changes in currents is not known." (DEIS, 4-37).

69. Noted.

70 The discussion of water quality on the same page is also unsatisfactory. It is hardly comforting to be told that there the "priority pollutant toxic list" of chemicals will not be "detectable" in the discharge. What about the other toxic chemicals? What about the low-grade effects over time of the buildup of these other chemicals in the food chain? We are told of the 100 acre "mixing area" in which the Alaska water quality standards will admittedly not be met, and how the sediments accumulating during the winter could be washed away in the spring. (DEIS, 4-38). But the effects of the exposure of the under ice marine life to the toxic substances all winter is not stated. We are simply told that some "chlorine reaction products" have "significant disinfecting power. All the potential specific reaction products for the discharge are not known." (DEIS, 4-40).

These questions should be answered before the project is allowed to proceed.

70. This comment exhibits four concerns: 1) toxic chemicals, 2) build-up of chemicals in the food chain, 3) Alaska water quality standards not being met within the mixing zone, and 4) toxic substances in accumulated sediment under-ice. Alaska Water Quality Standards provide for mixing zones under 18 AAC 70.032, where water quality standards may be exceeded within the mixing zone. However, "The department will disallow mixing zones in instances where the substance discharged is bioaccumulative in food chains, concentrates in sediments, is persistent, carcinogenic, mutagenic or teratogenic, or if the potential ecological or human health effects are so potentially adverse that a mixing zone is not appropriate." DEC and EPA personnel provided a mixing zone based on data appearing in the DEIS. They are also concerned about toxic chemicals and have included testing for the 65 priority pollutants in the discharge permit as well as monitoring of total chlorine residual in water, sediment, and organisms (see Appendix O). Available data indicate that none of the 65 priority pollutants will be detectable in the discharge and that chlorine reaction products will be in the parts per billion to parts per trillion range. Section 4.2 contains a revised discussion of the potential long-term impacts of chlorine reaction products.

71 It should be noted at 4-44 that even though the total suspended solids may be within the "natural variation of background TSS concentrations", they are still an overall addition to the total amount of these concentrations. The effect of this addition should be analyzed.

71. Agree: Text revised.

72 The marine biology subsection should bring out more information about the effect of the project on the food supply of the bowhead whale during the discussion at 4-48. This issue has apparently not been fully considered by the government scientists, but it is a possible major long-term impact of the project on these endangered whales.

72. See response No. 48, above.

73 As stated above, the long-term effects of chlorine in the food chain must be brought out in discussions like that on 4-62. The solution offered there for the lack of knowledge of the effects of the chlorine is "monitoring of water, sediments, and biota". But that process would be happening after the project is in place, and the applicants and the government are committed to allowing the pollution to go forward after the huge financial investment in the waterflood project is complete. The studies should be carried out before the project proceeds.

73. See responses Nos. 16 and 70 above.

74 The comment at 4-72 that additional thaw lakes could be formed that would result in "thaw instability of the soils supporting nearby roads and pads" is a significant point indicating the caution that must be exercised in approving any proposals affecting the delicate arctic environment.

74. Noted.

75 As stated in other portions of these comments, the air quality review consideration should consider the more stringent class I standards. The discussion at 4-73 & 4-75 and Table 4.2-6 should be revised to include this standard.

75. Agree. Text revised.

76 The socioeconomic effects subsection is particularly weak in the three sentence consideration of "sociocultural conditions" at 4-86. This topic deserves considerably expanded coverage. What kind of reductions could occur in the wildlife? What kind of stress, and what would be the effect of the stress on the people? The decision-maker is left with no answers to such questions.

76. This section has been expanded.

77 The cumulative impacts discussion at 4-88 is similarly unsatifactory. There is no discussion of the terrible problems that would occur from the continued rapid social change on the North Slope. Identifying a few possible issues and then concluding that "[v]arious measures are and could be taken by government and industry to reduce the adverse effects of change, however" is hardly adequate. The discussion should be expanded to include a more sophisticated examination of these social problems. It may well be that the continued building of these projects will cause the rate of change to be so great that severe social problems that cannot be mitigated will result.

77. This section has been expanded.

Chapter 5.0 Potential Monitoring Programs

78 This section needs to be sharply expanded. One of the issues frequently raised by Kaktovik residents is their distrust of stipulations and permit conditions because of lack of effective monitoring of them. They have seen lax monitoring during the Trans Alaska Pipeline Construction and also with offshore wells such as the Exxon well at Flaxman Island. They know the great practical difficulties in having adequate government inspections of the offshore operations.

These considerations should be addressed in this section with some concrete proposals for how the project will be effectively monitored. And if the conclusion is that effective monitoring cannot be done at this time, there is another strong reason for delaying the project until the monitoring system is adequately developed.

78. Chapter 5.0 has been expanded. It is believed that coordination with agencies will result in an acceptable monitoring program.

73

Chapter 6.0 List of Preparers and Reviewers

79 No comment.

79. Noted.

Chapter 7.0 Public Involvement

80 The analysis made at the beginning of these comments about ways of bringing the news about the project to rural Alaskans are applicable here as well.

Serious questions under the National Environmental Policy Act have also been raised by the failure of the government agencies to inform and consult with the regional tribal organization on the North Slope, the Inupiat Community of the Arctic Slope.

80. A brochure summarizing the FEIS is now available to North Slope residents. During the lengthy period of scoping, including public announcements and public meetings in North Slope communities, this organization did not identify itself, nor was it brought to the attention of the Corps. Every reasonable effort is made to identify any interested or affected party. The referenced organization is now on the mailing list.

Chapter 8.0 Glossary

81 This section is very helpful. It would be good to expand it to include more technical terms that rural Alaskans would not understand. Consideration should be given for funding an Inupiat language dictionary or other document that would discuss these terms in the native language of the area.

81. Although the development of such a dictionary would indeed have many distinct advantages, it is considered beyond the scope of this EIS.

Chapter 9.0 Index

82 No comment.

82. Noted.

VOLUME 2 APPENDICES

Appendices A-D.

83 No Comment.

83. Noted.

Appendix E Marine Biology

84 The additional information provided here is a useful supplement to that contained in Volume 1. However, the statement made at E-54 that "[b]owheads are not expected inside the barrier islands at any time" is clearly incorrect. The statements in Volume I admit actual sightings inside the barrier islands, and the testimonies given by village and Barrow residents at the Beaufort Sea public hearings amply confirm the fact that bowhead can be expected inside the barrier islands.

84. Statement in Chapter 3.0 and Appendix E has been corrected.

Appendix F.

85 No comment.

85. Noted.

Appendix G Acoustics

86 The inclusion of the lists of noise values for various machines and activities is not very helpful. There is no discussion of the effect of these noises on wildlife. If the reason is that people do not know, then the project must be delayed for people to find out.

86. Appendix G is intended to provide technical data. Chapter 4.0 provides impact discussions.

Appendices H-J

87 No comments.

87. Noted.

Appendix K Reservoir Engineering

88 A highly significant comment is buried in this appendix at K-8. The point is made that the field can be efficiently produced as long as the gas is reinjected. When gas sales commence, then efficiency would drop off. The fact that oil production would remain "highly efficient" as long as there were no gas sales and the gas was reinjected should clearly be brought out much more clearly in the discussion of this issue in Volume I.

88. The context of the "highly efficient" phrase concerns the early years of reservoir production when gas reinjection is highly efficient for pressure maintenance of the oil pool and thus gravity drainage is relied upon (producing oil via the natural energy of the reservoir). Commencing gas sales during this period without an alternative energy mechanism (e.g., water injection) would deprive the reservoir of sufficient energy to "push" the oil. On page K-12, gas injection in lieu of water injection is discussed in the context of the comment; i.e., as an alternative, temporary or permanent, to water injection.

The FEIS Chapter 2.0 has been expanded to clarify this point.

Appendices L-M.

89 No comments.

89. Noted.

Appendix N Endangered Species Act Coordination

90 The fact that "[k]ey biological parameters (e.g. recruitment, mortality, and age structure) controlling the population of bowhead whales is virtually unknown" (DEIS, N-5) should highlight the need for the decision-maker to push ahead with projects bordering the whales' migration route until the key environmental impact uncertainties are removed.

90. In view of the reviewer's previous comments, we believe this comment should read, ". . . the need for the decision-maker not to push ahead with projects. . ." Assuming this, the following response is made: Upon a preliminary review of the proposed action in 1979, the Corps of Engineers determined that opinions should be sought from agencies with authority to administer the Threatened Species Act of 1973. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service were contacted, and subsequent biological opinions were issued that there would be no significant effect. Therefore, although the Corps and agencies cooperating in this EIS share in the concern for the continued existence of the bowhead whale and encourage research in this area, it is concluded that enough information exists to determine that the proposed action will not have a significant effect.

Appendix O Draft NPDES Permit

91 Comments on water quality issues are contained in the previous pages of the comments. As stated in the cover letter to the Environmental Protection Agency, the village of Kaktovik urges that this permit not be issued at this time. The purpose of the delay is to allow necessary environmental studies to go forward and then to allow a full reevaluation of the project based on the new information obtained.

91. Noted.

Appendix P Draft PSD Permit

92 Comments on air quality issues are contained in the previous pages of these comments. As stated in the cover letter to the Environmental Protection Agency, the Village of Kaktovik urges that this permit not be issued at this time. The purpose of the delay is the same as set out in the comment to Appendix O.

92. Noted.

Conclusion

93 The Village of Kaktovik appreciates the opportunity to comment on this vast project planned for the Prudhoe Bay area. The village's position is that the project should not go forward at this time. Very important unknowns exist about the effect of the project on the environment. The uncertainties are especially great for the under ice environment during the winter months.

The project should be delayed until these uncertainties have been removed. Then the project can be fully evaluated, with a new chance for public participation, to consider the new research findings. A determination can then be made if the waterflood should be allowed to go forward.

The scale of the Prudhoe Bay waterflood project is vast. The millions of dollars of revenue to the state and borough government will be exceeded only by the even greater profits flowing to the operators. Huge quantities of water will be sucked out of the ocean and put into the ground, leaving tons of solid matter behind. Tons of pollutants will go into the air. The project is surrounded by unknown factors, the most dangerous being the ultimate effect of the pollution on the life and health of the people.

The great quantity of oil that may be recovered is significant, of course. The village people of Kaktovik, speaking through their elected city council, are simply asking that the project be slowed down until the answers to the deep questions they have raised have been obtained.

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Only with the complete information can a valid decision be reached about whether the amount of oil to be obtained from waterflooding will outweigh the risks the project would impose on the health of the people and the arctic environment.

Respectfully submitted,

ALASKA LEGAL SERVICES CORPORATION
Attorneys for the Village of Kaktovik

By: _____
Michael I. Jeffery

93. Noted.

P.O. Box 40
Kaktovik, Alaska 99747
20 July 1980

Lee R. Munn, District Engineer
Alaska District
U.S. Army Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Munn:

1 This letter constitutes my comments on your office's draft environmental impact statement (EIS) for the "Prudhoe Bay Oil Field Waterflood Project". During the initial scoping process I demonstrated my interest in this matter by submitting a comment card and requesting to be kept inform of future developments. Nevertheless, I have never received any response to those comments and became aware of the likelihood that a draft EIS was being processed only through receipt of a public notice from the U.S. Environmental Protection Agency (EPA) regarding lated permits under that agency's jurisdiction. As a result of that public notice I sent my letter of 29 June 1980 to your office. The response to that letter was Harlan E. Moore's letter to me of 11 July 1980 which provided a copy of the draft EIS under separate cover and indicated that a meeting would be held in Kaktovik on 15 July 1980 to discuss this matter. As you know, I attended that meeting and (probably due to the lateness of commencement) this matter was not discussed at it. Therefore, from my perspective, the public participation process has been less than satisfactory. My earlier comments have not been responded to separately and neither can I see some of them dealt with in the draft EIS itself. My request for a hearing on this matter to be held in Kaktovik resulted in no action. These comments must be greatly reduced in content and scope due to the lack of time to review the draft EIS since it was not provided to me despite request until one week ago.

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2 In my earlier comments I had mentioned the need for analysis of the optimum dynamics of reservoir development in the Prudhoe Bay oil field as a part of this EIS process. I cannot find such an analysis in the draft EIS. Sections 2.2 and 2.4 touch on this aspect of the situation without providing it. It is my belief that since the nation has become committed to developing the oil and gas found in the Prudhoe Bay field that the public interest disctates ensuring optimum recovery of energy (combination of both oil and gas) over the long-term life of the field with provision for minimizing adverse environmental impacts. This may be far different from the short-term economic viewpoint that often dominates oil industry thinking and tends to heavily discount the future. There have already been serious questions raised to the effect that the oil industry is pumping oil at too high a rate at this time, has waited too long to consider enhanced recovery measures such as waterflood, and hasn't adeqautely dealt with the question of timing and production rates for gas either. The draft EIS should provide a thorough and detailed analysis of this topic since it is the fundamental rationale for the project. The draft EIS does not.

3 The waterflood project appears to be an inseperable component of the total trans-Alaska oil pipeline system (TAPS) project including the development at Prudhoe Bay, the pipeline and associated facilities such as pumping stations and the Valdez marine terminal, the marine transportation leg from Valdez, and other elements of the processing and transportation system for Prudhoe Bay (or associated fields) oil including modifications to refineries to process Prudhoe Bay crude oil and such

1. The Corps has no record of receiving the comment card. Hopefully, they are addressed adequately in the FEIS.

2. Section 2.2 has been revised and expanded to provide greater depth to the analysis of reservoir conservation. It should be noted that the Alaska Oil and Gas Conservation Commission held public hearings in June 1980 to determine best reservoir regulations to assure greatest recovery.

3. The FEIS has been expanded to include the relationship of the proposed project to TAPS. This relationship is largely associated with continuing operation of the pipeline system. Restoration is included in Chapter 5.0 as a possible permit constraint.

pipelines to transport it as the proposed Northern Tier system. Unfortunately, the TAPS EIS failed to deal with the total project in a systematic way leading to the subsequent piecemeal approach which has resulted in this draft EIS. The draft EIS continues in this tradition by providing only a truncated and very shallow look at cumulative impacts despite the promise to do more. The draft EIS fails to explain the precise relationship of the waterflood project to the TAPS project and why it, as a de facto portion of the TAPS project, is not included under the coverage of the TAPS stipulations which, among other things, are supposed to cover such items as ultimate project facility disposition (i.e., restoration to as near natural a situation as possible). In that regard, the draft EIS mentions on page 2-86 that the applicant (Sohio and ARCO) has only made a committment to abandon facilities in a condition that "would satisfy the Commissioner of the Alaska Department of Natural Resources". Since what would satisfy that Commissioner may be very little and may be environmentally disruptive (particularly if the Commissioner at the time is anything like the present Commissioner) such a promise is of little meaning. The applicant should be required to salvage all material possible and restore the area to as near natural conditions as possible.

4 In discussing alternatives, the draft EIS presents several options for the proposed project including "The Applicant's Proposed Project" and "The Environmentally Preferred Alternative". Due to the limited review time and the incomplete information in the draft EIS it is not possible for me to adequately judge whether or not "The Environmentally Preferred Alternative" is the best alternative. Assuming that it is, and there are indications that it is certainly superior to "The Applicant's Proposed Project" in several ways (i.e., it provides for breaching the existing causeway to improve circulation of water and fish passage, it precludes extension of the existing causeway which would aggravate existing problems of that type, and it provides for a fish bypass and return system) there should be no question that the public interest demands that approach and, as stated in paragraph two of this letter, it is my belief that it does. However, "The Environmentally Preferred Alternative" of the draft EIS also calls for construction of a gravel island. There are certain risks inherent in the utilization of that technology in that environment and these have been discussed to some degree with regard to offshore oil and gas leasing in the Beaufort Sea (currently in litigation). To some degree these same risks would effect "The Applicant's Proposed Project" and would therefore be no greater than in that alternative. The gravel island concept would involve less gravel than the causeway extension concept and is attractive from that standpoint; however, the difference would require burial of pipes and lines between the gravel island and the existing causeway and the draft EIS does not provide substantial discussion of the unique aspects of that burial including construction and operational technology and methods as well as impacts. It should.

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5 The draft EIS indicates significant adverse environmental impacts from this project itself and from cumulative impacts in the future to be reduction in water quality, reduction in anadromous fish populations (primarily cisco, whitefish, and char), reduction in caribou habitat, and subsequent reduction in human subsistence based on these resources (this would effect primarily the Inuit eskimo villages of Kaktovik and Nuiqsut). These adverse impacts would be greater for "The Applicant's Proposed Project" than for "The Environmentally Preferred Alternative". They should be reduced to the maximum extent possible. In all cases, the applicant should be required to comply with existing relevant laws. With regard to protection of water

4. The ultimate permit decision will be based on all aspects of the public interest including energy needs, economics, human health, engineering feasibility, etc., in addition to environmental aspects. Burial of marine pipelines for seawater and fuel gas is not considered "unique" and, as such, could use conventional construction techniques for the Arctic.

5. The Corps will not issue a permit for an action that violates the law.

quality and fish resources (of major interest to me) that means compliance with the Clean Water Act and Alaska Water Quality Standards (in this regard it should be noted that the Clean Water Act also requires compliance with Alaska Water Quality Standards and effluent limitations must be so tailored). Due to the limited review time I have not been able to check the water quality analysis in the draft EIS. In scanning it, however, I note that for "The Applicant's Proposed Project" the analysis indicates that Alaska Water Quality Standards (and thereby also the Clean Water Act) would be violated in at least two and possible three ways as listed below:

6

1. On page 4-38 it is stated that suspended sediment standards would not be met;

7 2. On page 4-41 is is indicated in the summer and winter average flow cases that chlorine residual would exceed standards in the "worst case"; and

8 3. On page 4-38 it is indicated that sediment would accumulate in the winter, however, it is not put into context that this may be a violation of standards (whereas I do not have a copy of Alaska Water Quality Standards with me at this time it is my recollection that such an accumulation would be a violation for at least some water classifications and probably this one).

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9 The analysis in the draft EIS further indicates that for "The Environmentally Preferred Alternative" that greater mixing would occur and therefore excessive suspended sediment concentrations would be the only violation of Alaska Water Quality Standards. Whereas that's an improvement, if true, it's also necessary to either meet the suspended sediment standards or to obtain a waiver through established procedures. To my knowledge, a waiver has not been applied for.

10 Your consideration of these comments would be appreciated. Please inform me of your response to them and please provide me with a copy of the final EIS. If it is published after 15 September 1980 please mail it to my temporary mailing address c/o FOE, 4512 University Way, N.E., Seattle, Washington 98105.

Sincerely yours,

G.M. Zemansky

6. Agree. Within the inshore location, State standards would not be met. The applicant's revised project places the outfall offshore. At that location the discharge will meet State standards because of better dilution, diffusion, and dispersion. Text revised.

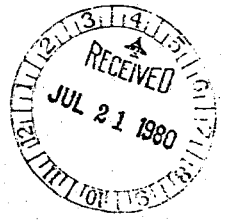
7. See response No. 6.

8. Sediment deposition was calculated for the original diffuser site (inshore from the water treatment plant) and stated to cover less than 20 acres at an average depth of less than 0.1 in under-ice. This location provided 4 feet of water under 6 feet of ice. Applicant has subsequently moved the proposed outfall location to the offshore site in 14 feet of water (8 feet during winter) where mixing is better. Therefore, sediment deposition can be expected to occur over a larger area and the resulting sediment accumulation will be less than originally calculated for the inshore location. State water quality standards relate primarily to discharges and effects on the water column. Sediment accumulation as a result of this project will not be in violation of State water quality standards.

9. See response No. 8.

10. Noted.

July 21, 1980



Mr. Jon Houghton
Dames & Moore
800 Cordova
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Mr. Ben Kutscheid
U.S. Corps of Engineers
Box 7002
Elmendorf AFB, Alaksa 99510

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT-
PRUDHOE BAY UNIT WATERFLOOD

Gentlemen:

Attached are:

(1) Testimony presented verbally at the Public Hearing in Barrow.

(2) The Applicants' comments on the DEIS text and Appendices.

In both the testimony and the written comments, the Applicants have limited their remarks to only those items of greatest significance. Minor items viewed as having little impact on the DEIS have not been addressed.

Please advise if further explanation is necessary.

Sincerely,

Joseph R. Solove
ARCO Oil & Gas Company

Herman A. Schmidt
Sohio Alaska Petroleum Company

cc
Attachments

80

1 Pages S-9, 2-58 to 2-64 and Chapter 4 - Discussion of Gravel Island Alternative - The Environmentally Preferred Alternative was selected to be a gravel island for the Seawater Treating Plant. The DEIS analysis of this alternative and its impacts overlook certain important negative features. While the high incremental costs of $100MM initial and $10MM annual are included, the impacts associated in these costs are ignored. The island alternative will require:

a) on-site power generation with associated diesel emergency fuel storage and handling,

b) expanded, more intensive support facilities, including quarters, warehouse, bulldozers, etc.,

c) the implementation of a year-round, all-weather transportation system, including boats, helicopters, and ice-roads, to transport personnel and supplies,

d) the laying of large submarine pipelines between Dockhead #3 and the island, a substantial offshore trenching effort; and

e) a delay of one year for project implementation to incorporate such a major change into the project design and to revise the PSD permit application (turbine/ generator emissions).

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2 The current Waterflood Project is the product of two and one-half years of conceptual and preliminary engineering work. The project has now moved into detail design, with major financial commitments and major equipment orders targeted for the end of this year. By contrast, only two months of conceptual screening engineering have been conducted on a gravel island concept. A change to the island concept at this stage would entail considerable additional engineering to properly define the scope and cost of the project. Additional permits would also be required. The time required at this late stage for design, permits, and construction caused by a gravel island alternative would result in a full year delay in start-up of the Waterflood Project, when assessed against the current EIS schedule.

3 As stated on pg. 2-5 of the DEIS, delays of a year or more in beginning secondary oil recovery could substantially reduce oil production in the mid-1980's. The Applicants estimate that this reduction in oil production capacity could amount to 100 MB/D to 200 MB/D in the mid-1980's.

4 The gravel island alternative appears to have been selected because of fish movement and water quality concerns. The DEIS suggests, however, that mitigating measures are available, i.e., a bridged breach at the Dockhead No. 3 location and a flow-through fish bypass intake design (refer pg. S-8).

1. The cited sections have been expanded as appropriate.

2. Agree. The Corps of Engineers has conducted a thorough analysis of comparative critical path networks and acceptable engineering practices for alternative projects. It is reasonable to anticipate a 1-year delay in start-up for the island alternative.

3. Agree. These estimates have the concurrence of the Alaska Oil and Gas Conservation Commission.

4. Agree that mitigating measures exist. However, the gravel island remains the environmentally preferred alternative because it represents a least environmental risk approach and avoids cumulative adverse effects.

5 Page 1-6 Table 1.4-1 - The DEIS claims that the solid-fill causeway is in potential conflict with the Alaska Coastal Zone Mangement Act. We do not find any specific prohibition against solid-fill causeways in either the federal or state statutes. We therefore suggest that the material in parentheses opposite Coastal Zone Management Act in Table 1.4-1 be removed, as well as the Alaska Coastal Management Plan reference on pg. 2-66.

Page 2-2 Table 2.1-2 - Comparative Impacts of Alternatives - Comments regarding the columns entitled "Gravel".

6 This table indicates gravel savings of 940,000 yds^3 for Intake Configuration "B" (Gravel Island) as compared to Intake Configuration "A" (Breached Extension; proposed). This reduction in gravel requirements is overstated; our estimate for gravel requirements for the Gravel Island is 715,000 yds^3 for a reduction of 685,000 yds^3 of gravel. Table 2.5-4, pg. 2-53, shows gravel requirements for the causeway extension to be 900,000 yds^3 and Seawater Treating Plant berm gravel requirements of 550,000 yds^3. The Gravel Island will require a larger gravel berm than Configuration "A" because of additional facilities shown on pg. 2-60, Figure 2.5-17. This is the basis for our estimate of 715,000 yds^3.

Comments regarding the column entitled "Operational Reliability and Efficiency".

1. The Intake Configuration "B" (Gravel Island) would result in a significant decrease in "operational reliability and efficiency" rather than a slight decrease. Our previous comments addressing the Gravel Island alternative justify this description of impact.

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8 2. The Onshore Configuration "C" (Low Profile Pad) would result in a "decrease" in "operational reliability and efficiency" rather than the "same". While rigid insulation layers have been successfully used in the Arctic for gravel pads, particularly pads surrounding or supporting buildings or other structures, they have not proven, in general, to be a viable method for construction of roads, which must handle module transport. The load-bearing capacity of the roadway would be compromised with the low-profile road and the capacity to carry loads in excess of 2,000 tons is not proven. Because the load-bearing capacity is highly dependent upon the thickness of gravel and the characteristics of the soils underlying the tundra, it is important that the road thickness be designed according to the soil characteristics. In thaw-unstable soils, even a five-foot-thick pad may be inadequate. Should the insulation materials break down, there could be a serious impact on the tundra and the timing of logistic movements.

5. Disagree. Although there may not be specific references to solid-fill causeways in the ACMP, there are provisions opposing the adverse effects of such a structure on water quality, lagoonal circulation, etc. Federal/State Beaufort Sea lease sale conditions specifically prohibit continuous fill causeways. Applicant's proposed action now includes a 50-ft clear-span bridge in the causeway extension. Text modified accordingly.

6. Agree. Table corrected.

7. Noted.

8. Agree in part. For waterflood alone, the road would not be required for module movement. However, the multiple use potential for the road is recognized.

3. Delayed Waterflood would result in a "decrease" in "operational reliability and efficiency" rather than "same". A delay could necessitate a larger project configuration and more components which would reduce the efficiency of the project.

9

Comments regarding the column entitled "Effect on Local Water Quality and Circulation":

10 Waterflood Secondary Recovery (proposed) and the Intake Configuration "A" (breached extension) should be designated "moderate" rather than "high". The modeling efforts conducted have shown little change in water quality, especially when compared to natural changes caused by river runoff volumes and wind direction and velocities. While circulation patterns may change, indications are that any such changes would not be of such magnitude to justify a description of the effect on local water quality and circulation as "high".

Comments regarding the heading "Alternate Secondary Recovery Methods":

11 This table states that the environmental impact of alternate secondary recovery methods is less than the proposed action. This item should be noted as unknown since it has not been adequately addressed. However, most of the alternatives discussed also include the injection of source water.

12 Page 2-5 Fourth paragraph - From an economic standpoint, the No Action alternative would have a significant impact on the U.S. economy, both in terms of the negative impact on the national balance of payments (as was noted in the third paragraph) and the loss in federal income tax revenues. Both of these effects should be quantified in order to put the importance of the project in better perspective.

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For example, using an approximate average current OPEC price of oil of $30/barrel and assuming that lost Prudhoe Bay production without the waterflood of 350 MB/D in the late 1980's (from Table 1.3-1) would have to be made up by foreign imports, the effect on the balance of payments (in constant 1980 dollars) would be approximately a negative $4 billion per year. This would be a significant contributor to a balance of payments deficit, amounting to about 10% of recent U.S. annual trade deficits and would tend to weaken the U.S. dollar abroad, increase inflation, and generally negatively impact the U.S. economy by the reduction in the money supply.

Also having a significant impact would be the reduction in federal tax revenues without the waterflood and it is suggested that this reduction and its impact be quantified as well.

9. Agree in part. A delay would probably result in a larger project (about 4 percent larger) that would increase costs and thereby reduce efficiency. No significant reduction in reliability would occur, however.

10. Disagree. It is the Corps' opinion that the partitioning effect of the causeway extension and subsequent changes toward a more marine environment will indeed cause a "high" effect on local conditions. Although induced changes are somewhat small compared to natural fluctuations, these changes are in addition to natural fluctuations. The fact that exact predictions of resulting ecosystem changes is beyond the state-of-the-art requires a cautious approach to effect assessment such that the decision-maker does not risk using information that understates resource values in the realm of public interest.

11. Agree in part.

12. Agree in part. No action would have a significant impact on the U.S. economy. However, the $4 billion overstates the impact. A more appropriate forecast would use a levelized average of the incremental production during the peak years (presented in Table 1.3-1) discounted to present worth, which would then be valued at $30/bbl. Alternatively -- and more simply -- the $30/bbl price (assumed constant), could be applied to the total anticipated incremental production of one billion bbl, then averaged over 20 years, which amounts to a $1.5 billion annual increase in the balance of payments deficit. The effect of this increased deficit is not taken lightly, however. It is considered to be a significant adverse effect of the "no action" alternative.

The impact of the reduction in federal tax revenues is problematic -- far too amorphous to quantify since a multitude of assumptions would affect any scenario in which corporate tax filings are central.

However, the State of Alaska has commented that, "while the future price of oil is hard to predict, the operators would probably pay out about one-third for amortization, operating expense, and profit." Under this assumption the three parties would share equally in lost (or gained) revenue. Chapter 4.0 (SOCIOECONOMIC EFFECTS, Operational Impacts, Public Finance) describes the derivation of the $10 - 27 billion sum for the State. The text of the FEIS has been revised accordingly to incorporate the assumptions discussed here.

13 Page 2-7 - First paragraph addressing alternative at the national level - This paragraph implies that conservation practices on a nation-wide scale are an option to the proposed project. This is not a valid implication. All recent supply/demand forecasts have shown that all conceivable demand reduction programs fall short of eliminating foreign imports during the next several years. Therefore, if the waterflood is not undertaken, reliance on foreign imports will increase. There is no other realistic alternative for reduction of the nation's dependency on foreign oil imports than increased domestic production.

13. Disagree with inference. Section 2.3 simply discusses national alternatives, of which secondary recovery of Prudhoe Bay reserves illustrates a type of conservation option, as does reduced consumption. The two strategies are compatible, and no implication is made that the nation should forego secondary recovery at Prudhoe in lieu of reduced consumption.

14 Page 2-18 Causeway Extension and Modifications - First Paragraph - Whereas the Applicants agreed to the concept of breaching the extended causeway just north of DH #3, the type of breach to be installed was and still is under evaluation. Therefore, no commitment on the type of breach was made. The 25-foot semi-elliptical breach is one of the alternatives still being evaluated, as well as the other alternatives discussed on p. 2/69-71.

14. Applicant's proposed action now includes a 50-ft clear-span bridge in the causeway extension. Text modified accordingly.

15 Page 2-33 - First complete paragraph - There does not appear to be a sound basis for the statement in this paragraph that "Effects of the existing causeway are judged to be adverse". Nor is any basis provided that would support the selection of a 25-foot culvert breach in the existing causeway as the Environmentally Preferred Alternative.

Overall, the justification and environmental benefit of such a breach has not been shown in the DEIS. In fact, as related in Chapter 3 (pg. 3-54), the studies that have been made on the effect of the existing causeway show no adverse impact. There are substantial reasons against the nearshore breach. First, the specified 25-foot size is not practical in this location where the water is 3-4 feet deep and the causeway elevation only eight feet. As correctly noted on pg. 2-69, this portion of the causeway must support module transport weights in excess of 2,000 tons each, and the design of the bridge to reliably support such loads in the Arctic is a technical risk.

We propose, therefore, that the nearshore breach alternative be abandoned as unnecessary.

15. Agree in part. The basis for judging the existing causeway as having an adverse impact is indeed conceptual, based on a reasonable worst-case philosophy because adequate studies do not exist to provide complete field data. Furthermore, this judgment is based on the results of modeling that show a change to a more marine environment to the west of the causeway. Finally, in terms of cumulative effects, the current proposal for a causeway extension is evidence of additive future actions that may cumulativelyt act to intensify the effects of the existing causeway to a point where adverse effects are evident. The reason for including the culvert in the existing causeway as part of the environmentally preferred plan, was to address the conceptual need to intercept alongshore fish movements as close to shore as possible. It is recognized that this culvert is only marginally feasible from an engineering and biological standpoint. The size of the culvert has been reduced to 16 feet.

16 Page 2-47 "Environmental Impact of System Freeze Protection" - Recent results of reservoir studies indicate there is a possibility that injected seawater may cause hydrate formation if the water is not heated above 40°F. Injection water temperatures possibly as high as 80°F might be required. The need, method, and location of such heating is currently under study. The FEIS should reflect the possibility of additional heat and an assessment of possible related impacts such as additional air emission and warmer water in supply and transfer lines.

16. Agree. Appropriate changes have been made.

17 For completeness, a description of the freeze protection system for water injection wells should be included in this section as well as Appendix B.

17. Disagree.

18 Page 3-78 Second to the last paragraph - This paragraph is incorrect and needs rewording because some goods and services are purchased locally. There is labor utilized from the North Slope residents, part of the oil field product is consumed within the Borough, and there are significant wage and salary payments to resident employees within the region.

18. Agree. Text revised.

19 Page 3-93 - "Caribou" - There is a statement in this section which indicates the long-term adverse impacts on the three caribou herds utilizing the North Slope are difficult to predict, but significant negative impacts are indicated. Significant negative impacts have not been indicated. To the contrary, extensive studies over the last ten years indicate that the populations and health of caribou are improving. This happens to correspond with the time of major oil development on the North Slope. This demonstrates that significant negative impacts related to development are not indicated.

19. Disagree. The section relates to future development. Data have been developed by the Alaska Department of Fish and Game and the University of Alaska that clearly indicate that the collective Prudhoe Bay development has caused the cow/calf segment of the Central Arctic caribou herd to be displaced from former calving habitat within the oil field. This is considered to be a significant negative impact in terms of long-term implications of oil development on the North Slope. The causes of recent increases in population of the Central Arctic caribou herd have not been determined, but State scientists have suggested that increased calf survival "coincided with a series of mild winters in the late 1970's and the almost total eradication of the area's wolf population during the spring of 1978" (ADF&G response to DEIS). It should be noted that potential adverse effects of Prudhoe Bay development on caribou are a recognized concern of the PBU owners and operators. Through their own studies and coordination with agencies, they have made adjustments to reduce these effects.

20 Page 4-4 - First complete paragraph (also pg. 1-2) - The DEIS states that "an energy equivalent of approximately 200 million bbls. (10 percent of expected recovery) of oil would be expended during construction and operation of the proposed project".

The Prudhoe Bay Unit has estimated and furnished in earlier comments, that the fuel requirements for the Waterflood Project will amount to 5% to 10% of the incremental oil recovery from the waterflood, or 50 to 100 million barrels. This is much less than the 200 million barrels figure cited in the DEIS.

20. Agree. Text corrected.

21 Page 4-15 - Seismological Activity - The Prudhoe Bay area is generally considered to be a low seismic risk area. (Relative Seismicity Factor of 1 - effective ground acceleration of 0.05g) In addition, it is believed that water injection, when injection pressure does not approach overburden pressure (as will be the case at Prudhoe Bay) will not increase the frequency or severity of earthquakes.

Waterflooding is carried out routinely in more seismically active areas (California, Cook Inlet).

21. Noted.

22 Pages 4-85 to 4-87 - North Slope Borough Fiscal Impact - On pg. 4-87 of the DEIS, it is noted that "the facility is estimated to require a crew of approximately 50 people, or a total work force of 100 (rotation of 7 days on, 7 days off)". This is in error. As indicated in Table 2.5-6 on pg. 2-63, the number of permanent operation positions needed for the project is estimated to be 60-70, and maintenance positions, some 20-25. With approximately four people required for each operator position, as noted in the footnote on Table 2.5-6 (two 12-hr. shifts; two rotations), and assuming two people for each maintenance position, the total work force addition would be in the range of 280 to 330, or considerably more than 100.

22. Agree. Text revised.

23 It is our understanding that for tax revenue purposes, the North Slope Borough uses the total work force rather than the number of positions. Consequently, the property tax revenues quoted on pg. 4-87 would appear to be understated, since they are based on a work force figure of only 50, rather than the total estimated additional work force of 280-330.

It is also our understanding that from the formula in AS 29.53.045(c) it would not be appropriate to use bonded indebtedness in calculating the per capita incremental impact on tax revenues of the waterflood.

Accordingly, the figure of $7,203 per capita quoted on Table 4.2-11, footnote (b) (pg. 4-85) does not appear to be appropriate in estimating the estimated fiscal impact of project construction on the North Slope Borough.

98 Fiscal impacts on the North Slope Borough, therefore, during both the construction and operational phases, should be appropriately revised in Section 4.

23. It appears that there is some confusion about how North Slope Borough population estimates at Prudhoe Bay were derived in the past. Part of the confusion stems from the fact that at the time counts were taken a large proportion of the population was contract personnel with leave rotations quite different from those of oil company operating employees. Nevertheless, the theory was that only workers on site at the time of the census were to be included in the census. This is clearly expressed in a recent letter from the U.S. Census Bureau Regional Manager (Schweitzer, March 16, 1980): "Historically, the Bureau has enumerated construction and maintenance workers at the location where they spent most of the week which included the census day. For example, this would mean that the workers at the drilling sites on the North Slope on April 1, 1980 would be included in the population counts for the North Slope Borough."

The foregoing notwithstanding, it appears that fiscal impact analysis is now outdated. The U.S. Census Bureau intends to change its residency rules regarding remote work sites such as Prudhoe Bay. Henceforth, the Bureau will enumerate workers at these sites to their permanent place of residence. Since virtually none of the North Slope oilfield workers make Prudhoe Bay their permanent place of residence, they will not be counted among the population of the North Slope Borough. It is the opinion of the Alaska Department of Community and Regional Affairs that the State must use U.S. Census data for its determination of revenue sharing and other per capita entitlements such as 43.56 Tax Credit. This policy will result in a substantial reduction of revenue that the North Slope Borough will recieve for general operating purposes (i.e., revenue limited by AS 29.53). It also means that the incremental permanent and temporary workforce generated by the Waterflood Project will have no impact on general government revenues of the North Slope Borough. The incremental assessed value of North Slope Borough property represented by the waterflood facilities will not affect revenue of the Borough used to retire outstanding bonded debt. In the long run, this incremental value may enhance the ability of the Borough to sell future bond issues by lowering the ratio of net general obligation bonded debt to assessed value. In sum, it now appears that the Waterflood Project may have no significant public fiscal impact in the near term on the North Slope Borough. Text is revised accordingly.

24 Page 5-2 - "Programs Relating to Project Performance and Engineering" - Because of the depth of the reservoir, noticeable subsidence is extremely unlikely. Moreover, the impact of the Waterflood Project on subsidence would be a positive impact acting to reduce the potential for it. A special ongoing monitoring program is unnecessary and not cost-effective.

25 There is no need to measure biocide and coagulant levels in the effluent during and after backwash; proper monitoring is to measure residual biocide and total suspended solids in the effluent.

26 Page 5-2 "Monitoring for Permit Compliance" - The fourth suggestion for air quality evaluation in the vicinity of new emission source is not reasonable. The air quality at Prudhoe Bay approaches pristine quality and there is no danger of exceeding ambient air quality standards or incremental limitations. Furthermore, a simple test of the emission rates to verify compliance will ensure national ambient air standards are not exceeded.

27 Page S-9 - Second Paragraph - This paragraph regarding the West Operating Area low pressure pipeline alternative routes does not recognize the need for an access road between Pad "K" and Pad "E" for field production development.

Production from Pad "K" (expected in 1982) must be routed to Gathering Center #1 in order to process oil from that portion of the field. A route to G.C. #1 via the environmentally preferred alternative, i.e., Alternative B, is not practical. The road from Pad "K" to Pad "E" would not only accommodate oil and gas producing pipelines for Pad "K" development as well as combine facilities for men, materials, and module transportation, but would also accommodate Waterflood low pressure pipelines. Thus, the road provides multiple-use for not only the West side of Prudhoe Bay field, but also for oil development west of Prudhoe Bay.

Since the need for this road is established under a separate permit application, and is independent of the Waterflood Project, a low pressure pipeline route not using the shortest alignment would probably result in more damage to the habitat.

28 Page S-9 - "Electric Power Lines Buried in the Causeway" - The method of providing power to the Seawater Treatment Plant is still under study and evaluation, but at the current time the Applicant sees no reason to deviate from the method as described in the "Proposed Project" contained in Appendix B, namely, burying the power cables in the causeway. The impact of stringing these cables overhead should still, however, be addressed. Moreover, the Applicants feel that bird kill could be quantified (p. 2-83) and that it would show that a fatal collision by birds with the power lines would be rare and, hence, not a significant impact (refer to Chapter 4). The question of whether to bury the power lines or to go overhead would then be an engineering optimization.

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24. Agree in part. Waterflooding will reduce the current remote chance of subsidence. However, establishing survey points is very inexpensive and would cover this eventuality. This is in the purview of the Alaska Department of Natural Resources and the Alaska Oil and Gas Conservation Commission.

25. Agree in part. See revised Chapter 5.0 and revised NPDES permit draft (Appendix O).

26. Noted. Final air quality or emissions monitoring requirements will be established by EPA.

27. In naming the environmentally preferred components, alternatives that would avoid or reduce adverse effects on important wetland values; aquatic resources; wildlife migration pathways; and feeding, breeding, or calving areas, wilderness values, visual resources, and subsistence were considered. The short-term, long-term, and cumulative effects on these items were considered, as well as the feasibility and practicality of alternatives. The environmentally preferred alternative does not result from great weight being put on economic or efficiency criteria. Through this process, the categorical values and effects of alternatives available to the decision maker can be made more clear. In making final decisions on the waterflood permit applications, the Corps will consider all relevant items that are in the public interest. In the case at issue, route "B" was designated the environmentally preferred alternative primarily because it avoids habitat fragmentation. Alternative B would cause a greater loss of wetlands. This loss would, however, occur adjacent to existing roadways and pipeline routes. In conclusion, route B remains the environmentally preferred alternative because it avoids habitat fragmentation. Route A-3 would be the second choice.

28. The text of the Summary, Chapter 2.0, and Chapter 4.0 has been modified to accommodate buried power cables as part of the proposed project. A more detailed discussion of possible bird mortality resulting from overhead lines has been added to Chapter 4.0. Bird mortality cannot be "quantified" since it depends on site-specific conditions. Isolated instances of higher mortality during unusual conditions could affect local bird poplations on a short-term basis.

29 Page 60 Figure 2.5-17, p. 2-62, p. 2-88 and Appendix B - Power for Gravel Islands - Description of the gravel island option in the DEIS indicates power cables would be buried along the existing West Dock causeways. This is not correct, as power would be generated locally for the gravel island, thus eliminating the need for extension of the power transmittal system from the CCP.

29. Agree. Text modified.

Introductory Remarks on Appendix K Comments - The Applicants in the following comments have limited their remarks to only those items of greatest significance. Minor items viewed as having little impact on the DEIS have not been addressed.

Appendix K - On page K-2 - Reference is made to various reservoir studies conducted by Prudhoe Bay Unit Owners and the Alaska Oil and Gas Conservation Commission (AOGCC).

30 Item 6 states that the waterflood will increase gas recoveries by 15% of the gas-in-place. Apparently this indicated increase is based on reservoir studies by H.K. van Poollen for the AOGCC. The van Poollen results present recoveries at the end of the oil producing period which does not necessarily correspond to the end of gas production.

30. Noted. Text clarified to include this point.

31 Item 7 states that Gas Sales should not commence prior to the start-up of source water injection. However, this conclusion is not supported by any of the reservoir studies quoted.

31. Disagree. Studies by H. K. van Poollen for the Alaska Oil and Gas Conservation Commission make this conclusion, supported by Figure 2.2-1.

88 32 Appendix K - On page K-7 - High gas oil ratios in the Eastern portion of the Field are quoted as evidence of excessive withdrawal rates. The Owner Companies recognized from the outset that the presence of continuous shales in the area would prevent adequate gas cap support and effective gravity drainage. However, it was necessary to withdraw fluids to verify the continuity of these shales. Such verification has now made this portion of the reservoir a prime candidate for waterflooding and the companies have restricted the area offtake to arrest the localized abnormal pressure decline until waterflooding can be initiated.

32. Noted.

33 Appendix K - On page K-8 - Several alternate recovery methods are discussed in regard to their application at Prudhoe Bay and the DEIS generally concludes that no tertiary process is viable. While the technical and/or economic feasibility of tertiary recovery processes at Prudhoe Bay has not been demonstrated at this time, continued improvement of EOR (Enhanced Oil Recovery) technology could allow implementation in the future. The PBU Working Interest Owners are continuing and intensifying their study of EOR processes for application to some areas of the Prudhoe Bay Reservoir. All processes being studied are generally enhanced recovery techniques that are compatible with, and supplemental to, waterflooding, and that would generally be conducted concurrently with waterflooding.

33. Agree.

34 Appendix O - Preliminary Draft NPDES Permit - Prudhoe Bay Unit will submit detailed comments on NPDES Permit to EPA. Comments on other permits (i.e., PSD, water quality certifications, etc.) will be submitted as necessary.

34. Noted.

Anchorage
CHAMBER of COMMERCE

Crossroads of | *the Air World*

July 15, 1980

Col. Lee Nunn
Corps of Engineers
P.O. Box 7002
Anchorage, Ak 99510

Dear Col. Nunn:

The Economic Development Council of the Anchorage Chamber of Commerce has reviewed the draft EIS for the proposed waterflood project and in their opinion, the impact assessment described in the document appears to be complete and thorough. We feel that the requirement of the Environmental Policy Act of 1969 guidelines have been met. We have noted that the Environmental Impact Statement has identified alternatives to the project and alternatives within the project by which the waterflood may be implemented. In our view, none of the alternatives are viable as substitutes for the project. The 1 billion barrels of oil which will be generated by the waterflood project are urgently needed to augment our national energy supply. The only reasonable alternative supply is increased oil imports, with the consequent increase in our international balance of payments deficit and the risk of interruption of access to that supply. In addition, the alternative ways of accomplishing the waterflood which have been identified, in our view, are not justified.

Comments noted.

The waterflood project is not only important to the Prudhoe Bay Unit Owners, but to the nation as a whole. As the DEIS points out, the one billion barrels of oil recovered as the result of waterflooding is equivalent to finding a world-class, giant oil reserve. From a national economic standpoint, the project will have a positive impact on the balance of foreign payments and increase tax revenues. The waterflood project will reduce the cost of foreign imports by $4 billion per year in the late 1980's. This amounts to about 10% of the current deficit. Federal tax revenues would be on the order of $1-2 billion per year in the same time frame. The favorable impact on the nation's economy would tend to strengthen the U. S. dollar abroad and decrease inflation. From a national security viewpoint, the project will decrease our reliance on foreign imports. There is no other realistic alternative for reduction of the nation's dependency on foreign oil imports (about 50% of our needs) than to increase domestic production which is the purpose of this project.

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This project appears to be one which all Alaskans can support, since the benefits are large and the potential harmful impacts very small.

The Anchorage Chamber of Commerce therefore urges the Corps of Engineers to approve the applicant's applications and issue the requested permits.

Sincerely,

Frank N. Van Zant

Frank N. Van Zant
Executive Vice President

FNVZ/sp

The following is a transcript of the public hearing. The entire testimony was considered in preparation of the FEIS and is available here for further reference. Responses to numbered questions and concerns not previously addressed follow the testimony.

TESTIMONY
PUBLIC HEARING
PRUDHOE BAY WATERFLOOD PROJECT
1:30 P.M. 15 JULY 1980
BARROW, ALASKA

Colonel Nunn welcomes the assembled to the Corps Environmental Protection Agency meeting witn regard to waterflood project.

COL. NUNN: We appreciate you taking the time to attend this meeting and to share your views with us. We realize that many of the items to be discussed are a direct concern to the people here in Barrow as well as the people across the North Slope. I'd like to take a moment here to ask everyone who has not done so, to pick up a copy of the handout labelled Public Hearing-Barrow, Alaska. We have some copies of slides in there which we will not be able to project today, but you'll need to refer to during my presentation today. Also, there are copies of the draft Environmental Impact Statement and copies of NPDES and PDA permits that have been issued on the table to your right. I'd also like to introduce the people sitting here with me today that will make up this review panel and who will attempt to answer your questions.

Jim Sweeney: Director of the Alaska Operations Office of the Environmental Protection Agency.

Ben Kutscheid: Corps' Environmental Resources Section in our Engineering Division.

Captain Mike Mahoney: Corps' Regulatory Functions Branch, the permitting brancn of the Corps of Engineers.

The purpose of this public hearing is to give you an opportunity to express your views on the draft Environmental Impact Statement which we refer to as the DEIS for the issuance of Section 10 and Section 404 permits for the Waterflood Project; Section 10 permits being primarily related to navigation, and Section 404 permits to water quality, the disposal of dredge and fill materials into the water. This project is proposed by the SOHIO Petroleum Company and the ARCO Oil and Gas Company in order to recover an additional 1 billion barrels of oil from the presently producing Prudhoe Bay Oil Field.

The EPA, The National Marine Fisheries Service, and U.S. Fish and Wildlife Service are what is known as cooperating agencies in the preparation of this EIS. In other words, they are of equal stature with the Corps with regard to the review and preparation of the EIS. Under a third party contract the firm of Dames & Moore

performed much of the detailed analysis in the proposal under the direction of the Corps of Engineers. So the documents that you have, which are two volumes with the sunset scene on the front, were prepared with the help of Dames & Moore but under the Corps of Engineers supervision and direction and with the full review of these cooperating agencies. The Corps is ultimately responsible for the EIS.

The people from Dames & Moore, ARCO, and SOHIO were held up in there departure from Anchorage today because of the weather here in Barrow. I expect that they are in route and will arrive sometime during the course of this meeting. There absence should not hold us up in any way, but if you have questions that we cannot answer they might answer them later, we will make them available to respond to those questions. There are other permits required in addition to the Corps permits. The U.S. Environmental Protection Agency, which is responsible for insuring permits for discharges into the air and water is jointly conducting these hearings with the Corps as I indicated. I'll give the floor to Mr. Jim Sweeney of the Alaska Office of the EPA to give you an overview of their involvement with the project.

JAMES SWEENEY: As the Colonel said, I'm here today to present a statement on what EPA's role has been in this process. As mentioned specifically, there are two EPA permits involved in the Waterflood Project. One is the National Pollutant Discharge Elimination System permit, which is a wastewater discharge permit. For short it's called the NPDES permit. The other is a permit for the prevention of significant deterioration that's the air emission permit and for short its called the PSD permit. Also, I will be commenting briefly on the draft EIS as in a role as a cooperating agency with the Corps of Engineers. But before I get into these permits as such, I would like to make clear that I'm here for two reasons. One to provide information on our proposed EPA actions and the second is to get comments from you on anything that you have that concerns the project. After the hearing today the comment period on these permits will continue to be open and any comments that you want to make in writing I would suggest and encourage you to do that and to submit those comments to the EPA.

As said, EPA has been actively involved in the preparation of this EIS, and much of the information that EPA used in the drafting of these permits has come from the EIS.

The first permit I'd like to talk about in some detail is the NPDES permit. The draft NPDES permit for the Prudhoe Bay Waterflood Project is based on the requirements of the Clean Water Act of 1977. The Act specifies two major considerations EPA has to make and for evaluating a particular discharge. One of these is the technology for reducing or eliminating the discharge and the second consideration is the Water Quality Standards. The most stringent limitation based on these two factors is used in limiting the

discharge. That is, if under evaluation it shows that a minimum technology level is achievable regardless of the impact on water quality then that technology level has to be applied. But if, even after applying that technology level, the Water Quality Standards will be violated, then additional technology has to be provided in the treatment of the discharge. These technology limits that I'm referring to here are called the Best Available Technology Economically Achievable and the Best Conventional Klutch Control Technology. There are no EPA promulgated guidelines for these two particular technology levels and therefore, what EPA did in looking at this project was to review these technology levels based on the best engineering judgment that our technical staffs in EPA made. The Water Quality Standards we're talking about in this case are the Alaska Water Quality Standards that apply to marine waters. The Water Quality Standard is Class 2 and the uses to be protected are the growth and propagation of fish, shellfish, aquatic life, wildlife, and seabirds, waterfowl and fur bearers. With this background, I'd like to specifically discuss the two discharges that are involved in the application for the Waterflood Project. One of those is the filter plant backwash discharge which is called outfall 001 and then there's the marine life that's slouth from the untreated seawater which is called outfall 002. The applicant proposed to discharge the first outfall through the difuser system about 1,000 feet west of the proposed causeway. The second discharge was proposed to be discharged east of the seawater treatment plant at the end of the causeway. In evaluating these discharges, EPA determined that there was no reasonable technology available under our determination of best practical treatment or best conventional treatment and best available treatment. This is mainly resulted from the uniqueness of the arctic environment where some of the alternatives that would normally be used such as solids removal land disposal just were not technically or economically feasible. This had to mainly do with the disposal of the solids after you recover them on land. Therefore, the major emphasis in our review was in looking at Water Quality Standards that applied to the receiving water. And in this regard, the State of Alaska, Department of Environmental Conservation provided much of the information which we based our evaluation on and we have two representatives of the Department of Environmental Conservation here today, Doug Lowry and Paul Bateman and they could also be available to answer any more detailed questions in the water quality considerations.

In conducting the water quality analysis review, we determined where the applicant proposed to discharge the filter water backwash called outfall 001 is not acceptable. At the proposed discharge location west of the treatment plant the Water Quality Standards in our evaluation would be violated for suspended solids. Therefore, we specified in this draft permit that the outfall be more than 1,000 feet north of the seawater treatment plant and for discharge in about 15 feet of water. At that point in time, with that discharge location, the Water Quality Standards would be met. Now, there was

no technology limits that we applied to the discharge so essentially we have limited the discharge in the proposed permit at the levels included in the permittee's application. These levels were determined by us to be reasonable based on information available on the Beaufort Sea water quality. Rather than go through and list to you the specific limitations in the permit, I would refer to the copies of the draft permit which is available over on the desk. If anybody has any specific questions, I'd be glad to go over that in more detail after this. So the main thing we did is move the discharge from the applicant's proposed location and then we included in the permit an extensive monitoring program to further assure that the discharge would not have any adverse water quality impacts. We have added a monitoring program that would essentially provide for accumulation of additional background information on receiving water and provide information that could be used in subsequent permit issuance. Now the monitoring program in the permit includes influence and affluence discharge monitoring for most of the parameters listed in the pemit. It includes an analysis of the 65 priority toxic pollutants covered under the Clean Water Act and it includes a receiving water monitoring program developed by Alaska Department of Environmental Conservation for water quality and biological sampling.

In summary, it's EPA's tentative determination that a 5 year permit could be issued to ARCO and SOHIO for the discharge of pollutants into the Beaufort Sea associated with the Waterflood Project. The permit may also contain additional mitigation measures which we determined to be necessary and appropriate as developed through this public review process. That is essentially the information on the NPDES permit. Next I would like to discuss the PSD permit or our air emission permit.

Before a major new source can be constructed they have to have a PSD permit for the air emissions. To get a PSD permit they have to make essentially three demonstrations to the Environmental Protection Agency. They have to demonstrate the source is providing the best available control technology for controlling the air pollutants. That the source will not cause a violation of the PSD increment. This particular demonstration is not applicable to the Waterflood Project because of the types of pollutants that are associated with the air emission. The third demonstration is the source will not contribute to a violation of the National Ambiant Air Quality Standards. The procedure for determining the best available treatment is relatively straight forward. It's based on a review of what other types of industries are doing in the U.S. and coming up to make sure that the emissions are at the lowest reasonable level based on energy and technology limitation and economic limitation. To assess the National Ambiant Air Quality Standards, a combination of activities is necessary and it involves evaluating meteorlogical conditions and existing pollution sources. This air impact analysis was conducted and from the studies it was determined that the project would not cause violations of any of the National Ambiant

Air Quality Standards. The PSD application is for ten gas-fired turbines and nine gas-fired heaters and the review that EPA conducted under PSD was for the nitrogen oxide and carbon monoxide discharges. Based on this review we have determined that a PSD permit is appropriate to be issued unless some substantive information is offered during this public review process that demonstrates that it's not appropiate.

The last thing I'd like to talk about is the draft EIS. We have conducted a detailed review of the EIS and overall its the judgment of EPA that the draft EIS does address the significant environmental issues related to the project. As a result the EPA supports the Corps of Engineers environmentally preferred alternative over that of the applicants proposed project. That's all I wanted to say, Colonel Nunn.

COL. NUNN: As I indicated earlier, the U.S. Fish and Wildlife Service is also a cooperating agency within the EIS process and we've been working very closely with their Northern Ecological Services Office in Fairbanks. Representing that office today is Jerry Strobele and Jerry would like to make a statement.

You'll have opportunities to direct your questions to any of these people as soon as we finish these introductory remarks and descriptions of the project.

JERRY STROBELE: My comments will address three areas and pertain both to the Corps EIS process and to the NPDES permit process. For openers, the Fish and Wildlife Service supports the Corps environmentally preferred alternative. This is the design that we would like to see constructed. I would like to stress the importance of a well coordinated monitoring program to followup on the construction and operation of the project, once the permits have been issued. Here I would particularly address the NPDES permit program. The inffluent and affluent characteristics monitoring program seems entirely adequate to us. The receiving water monitoring program we would like to see incorporated into a much broader scope monitoring effort. In May of this year, the Outer Continental Shelf Environmental Assessment Program Arctic Project Office conducted a 3-day workshop in Fairbanks where scientists have been working under the OCSEAP program. Industry representatives, and concerned resource representatives, were present and discussed the parameters of a strong monitoring program. Now the results of such a program would be dependent upon the final design of the Waterflood Project. However, the strongest point that came out of the workshop was that a single monitoring effort, extremely well coordinated, would be the best and most cost efficient monitoring program. And so I'm here today making a pitch to EPA and to the Corps to take the leadership and coming up with a strong interdisciplinary monitoring program for the project.

My only other comment concerns the DEIS itself. As the Colonel has said, the Fish and Wildlife Service is a cooperating agency in this effort. We have been involved in part of the writing of the DEIS but most of the work was borne by the environmental accessment prepared by the consultants to industry. I would like to take this opportunity to say that Ben Kutscheid on the Corps staff has done a marvelous job we think, of taking information provided in the accessment by industry and turning it into this DEIS. We will provide formal comments to the Corps on the DEIS through the Department of Interior in Washington D.C. My only comment on the
2 DEIS would be I'd like to see the role of the benthic invertebrates in Gwydyr Bay emphasized. These invertabrates are of extreme importance to feeding anadromous fish and waterfowl and I'd like to see that particular section of the DEIS strengthened to show that the benthic invertebrates are provided by the current system which comes in from the east on Gwydyr Bay. That's the extent of my comments I will be available later on for any questions if anybody has any.

COL. NUNN: Today's agenda has two parts; the first part will be a brief presentation explaining the EIS process and the effects of the several alternatives, and the second and most important part will be listening to your comments.

Now if you'll refer to the handout which we have prepared for today's meeting, the second page is Figure 1 and Figure 2 represents the process that we're going through in the preparation of this document with regard to the Waterflood Project and the final response that will be made to that document once it is prepared as a final EIS. This step that we're at today is just one step in deciding whether to issue, deny, or issue with conditions, a Corps permit.

After the application is received, we decide if an Environmental Impact Statement is needed, and that's a definite step at that point, we then hold scoping meetings to identify the issues. As you recall, we held scoping meetings during the month of December here in Barrow, in Nuiqsut, Kaktovik, and they were also held in Fairbanks and in Anchorage. Once these issues are identified, we prepared the draft EIS. After 45 days of public review, a final EIS will be prepared and circulated. After that step there is a 30 day period following the distribution of the final EIS before I can make a decision whether or not to issue the permit. The EIS is an important aid in my decisionmaking process. The final EIS, of course, will include your comments, both comments here today and those which may be submitted in writing. Therefore all of this information will come to me for a final decision (before I make my final decision on the permit). During this entire process the Corps remains neutral, we're neither supporters nor detractors of the project. It's our intention to assess all the alternatives including the applicant's proposed project and the no-action

alternative. In Figure 2 we have an outline of the Waterflood Project extent. It reflects the proposals and the alternative actions. At Prudhoe Bay, practical alternative waterflood methods have two basic parts. One is the method of getting water from the sea, and the other part is getting the water to the injection wells to be forced down into the oil bearing formation. During this EIS process we looked closely at the environmental effects of an island, various ways to breach a causeway that might be built in lieu of a island, several alternative pipeline routes, and an alternative intake system.

I want to spend a little time now on each of these. On Figure 3, you can see that the applicant's proposed project includes a breach in the extended causeway. We looked closely at various ways to breach the causeway. A causeway using culverts or bridges. The bridge breach is believed to have a far greater capability of allowing fish to pass through the causeway than a culvert breach would be. Figure 3 reflects the various locations, types, and sizes of breaches in that causeway.

Figure 4 illustrates an island alternative. This island alternative involves locating the water intake in a treating plant on the island with pipelines buried in the sea floor back to the existing causeway. We consider that this approach has the least environmental risk with regard to movement of fish and other organisms that live in this area. This would not effect circulation and does not guide fish to the intake as would a causeway. This particular method however, is significantly more costly and is considered to be less reliable.

In Figure 5 we have two methods (two alternate methods) for designing the intake. Alternative designs of the intake have noticably different effects on fish survival. On the left of Figure 5 is an illustration of proposed traveling screen which transports entrapped fish on buckets to a marine life return line. The alternative on the right is a high volume angled screen method which would cut fish casualties by about 50 percent as oppossed to the traveling screen method.

On Figure 6 we have a reproduction of an aerial photograph which reflects some of the alternative pipeline routes. The proposed west pipeline route is labelled A-1, the center line on the map. The A-2 and A-3 avoid, to a great extent, the valuable drained lake basin complex but they are more costly. Alternative B involves expanding an existing route. It's about $25 million more expensive then the applicant's proposed route but modifications of habitat, wildlife habitat in the area would be avoided. I should note for you that there are economic and engineering justifications for pipelines other than waterflood between Pad K and Pad E. Pad K is at the top of the alternative route shown there and Pad E at the bottom.

In Figure 7 we have a chart which reflects the comparative impacts of the various alternatives. The alternatives are listed down the left side, and across the top you see the major impacts of these alternative. This table then, just conveniently protrays what the Corps considered to be the major impacts in a compact form so that you could access the relative impacts of the various alternatives. At this time I'm going to see if Ben has any specific points with regard to this matrix that he would like to bring to your attention. Again we are still looking at Figure 7.

BEN KUTSCHEID: Thank you Colonel. I think it's important to note in this matrix that the proposed project has the highest operational reliability but it also has a potentially important impact on anadromous species. Also the proposed project does have a disturbance element, there for migratory birds, waterfowl, and such. Now that part of the project is primarily caused by the elevated powerlines that are proposed to run out the causeway. As an alternative to that there is the method of burying those powerlines in the causeway. Or, of course, with the island there wouldn't be the need for powerlines. In terms of the contribution to cumulative effects the proposed causeway with the proposed intake we feel has an important effect on cumulative impacts. The gravel island has almost negligible effects, cumulatively. Now, there are mitigation possibilities for the proposed causeway and that is with the breeches or with the alternate intake system. Those of course, reduce the direct impact and reduce the cumulative effects. That's all that I have to say Colonel.

COL. NUNN: If there's any questions with regard to this chart or if you'd like an expansion on it, we'll be available later. The information, of course, is available in the draft EIS and we've just pulled it out here to make special note of it, since we think it will be a useful document for your review and consideration.

At this time I'd intended to allow the applicants to present some additional details about their proposed project. Is Mr. Owens here yet? (He was not there)

Mr. Joe Solove, who represents the ARCO Oil and Gas Company and has been working with waterflood since its inception, will describe some of the main features from the industry's standpoint and if Mr. Owens arrives late and has some material that would aid in explaining this we'll give him a few minutes at that time.

JOE SOLOVE: As the Colonel's indicated my name's Joe Solove, I'm with ARCO Oil and Gas Company, and I'm in the Land Department. I intend to give a description of the waterflood system, sort of an overview.

The proposed Prudhoe Bay Unit Waterflood Project will provide the facilities for injection of approximately 2.2 million barrels of seawater per day into the Sadlerochit oil producing formation for the purpose of recovering approximately 1 billion additional barrels of oil. In addition to seawater injection, approximately 1 million

barrels of water are produced with oil, that is of produced water, will be injected into the formation. The produced water injection facilities are planned to be installed as required by the oil producing operator and aren't a part of this project. These are separate facilities and will be the subject of separate permit applications submitted by the appropriate operator. Seawater would be taken from the Beaufort Sea directly into the seawater treatment plant where it would be filtered, oxygen removed that is deteriorated, and heated to prevent freezing during transit in the pipeline distribution system. This heated seawater would be pumped in insulated pipeline to each of two injection plants located on either side of the field. The injection plants would raise the pressure of the water for distribution and injection and will provide additional heating of the seawater to prevent freezing. The seawater and produced water would be pumped to well pads local to the injection plants and additionally will be transferred to the intermediate manifolds for further distribution to the injection well sites. The seawater and produced water would be distributed separately through insulated high pressure pipelines.

Seawater Treatment Plant: To insure a reliable water source during periods of maximum ice thickness, the seawater treating plant, with a intrical intake must be located at a water depth of 12 feet which would be at the end of a causeway extension from the existing west dock. This plant built in a single construction increment would be required to condition the raw seawater from the existing west dock. This plant built in a single construction increment would be required to condition the raw seawater to make it suitable for waterflood injection. Seawater would flow directly from the Beaufort Sea into the intake located on the shoreward end of the plant. Heated water would be circulated into the intake to mitigate frazzled ice problems. The water would pass through the screens for removal of ice, large debris, and marine organisms. A separate outfall line with a local discharge would be necessary for the return of marine life removed from the screens. The screens would be followed by the backwashable strainers for the removal of large suspended material. The seawater would then be pumped through filters containing media such as gravel and sand for the removal of very fine particles. If required the seawater would be treated with a biocide, possibly clorine, to prevent biological growth in the filters. Periodically, each of the filters would be backwashed with raw seawater to remove the accumulation of solid particles and a coagulant, a filtering aid, within the media. The backwash affluent would be returned to the sea through the main outfall line. The filtered seawater would be pumped into the deaerators for the removal of dissolved oxygen to prevent corrosion of the piping systems. Provision of adding scale and corrosion inhibitor chemicals downstream at the seawater treating plant would be made but they would not be used unless their need is demonstrated. The seawater treating plant would be protected from wave and ice forces by a gravel berm. The plant would be floated onto place and ballasted to rest on a gravel pad placed in a dredged depression.

The Low Pressure Supply Lines: One seawater supply line will run to each injection plant from the seawater treating plant sized for 1.2 million barrels to the east and 1 million barrels to the west. The east pipeline would be approximately 14 miles of 42 inch diameter pipe, the west approximately 10 miles of 38 inch diameter pipe. Both lines would be installed in one construction increment. They would be above ground and supported on piles. The clearance of the tundra and the bottom of the pipeline would be sufficient to avoid thawing the permafrost. Almost all pipelines would follow existing pipeline routes, utilizing existing supports and construction pads wherever possible. The only planned exception would be the supply to the west side which would follow the roadway between the module staging area and Pad K and the planned roadway from there to Pad E.

Injection Plants: Injection plants would be provided on each side of the field. They would be located adjacent to Flow Station 1 on the east side and Gathering Center 1 on the west side. The treated seawater from the seawater treating plant would be received at the injection plants through a low pressure manifold which would route the seawater to an inlet tank. From this tank the water would pass through the booster pumps to provide sufficient suction pressure for the main gas turbines ribbon injection pumps. The main pumps would increase the seawater pressure up to 3,200 pounds per square inch for delivery to the discharge manifold for subsequent distribution to the injection well sites. Prior to entering the main pumps, the seawater would be heated using waste heat recovered from the main turbine exhaust. The two plants would be installed in a single construction increment except for some of the pumps, which would be installed in a second increment.

High Pressure Pipelines: The high pressure pipeline systems would consist of transfer lines and individual well pad injection lines, that is, all lines dealt downstream of the injection plants. The transfer pipelines would transport water from the injection plant to the two intermediate manifolds on each side of the field. From the intermediate manifolds water would be distributed to associated injection well pads through distribution lines. The high pressure pipeline routes would follow existing pipeline corridors. The total length of high pressure pipeline would be approximately 120 miles ranging in size from 6 to 30 inch diameter. These high pressure pipelines are planned to be installed in two construction increments with the majority to be included in the first increment which is projected for commencement in the fall of 1982.

Freeze Protection: A freeze protection system will be required to protect the water pipelines and water injection wells from freezeup during the original startup and normal operation and shutdown restart. The primary freeze protection scheme for pipelines involves insulating the lines and heating the water to maintain a water temperature above freezing. Emergency generators, dual fuel heaters, and dual fuel pump drivers, spare equipment, etc. would be

provided to maintain a minimum flow of heated water even with a loss of fuel gas or field electrical systems. The intent is to avoid the necessity of displacing water from the lines. In the unlikely event that displacement of all or part of a system should be required, surface lines would be displaced with gas from the existing field system. All water would be displaced into wells, tankage, or the opposite side of the field. An exception would be the simultaneous displacement of both the low pressure supply lines from an injection plant back to the seawater treating plant and subsequently into the Beaufort Sea. The injection well lines and wells would be displaced with a liquid having a depressed freezing point. Lines would be rewarmed with gas prior to initiating a water flow. A warmup gas would be circulated to the existing production systems.

Eight Well Pads: These wells will be either a converted producing wells or new wells drilled for water injection. Increment 1 will include approximately 50 injection wells located at Flow Station 2 and Gathering Center 2 areas. The remaining wells will be included in Increment 2. (unclear on tape)

The Schedule: The proposed project schedule has been developed to provide for a startup of the first increment facilities by mid 1984 and startup of the second increment by mid 1985. The conceptual and preliminary design phase has been completed. Detailed design has commenced and is proceeding so that the purchase of major equipment could commence in November 1980 subject to issuance of construction permits. The fabrication of major facilities modules would begin in a Lower 48 construction yards by November 1981. The first sealift of piling, pipe, and general cargo would take place in 1982 and initial North Slope site preparation in construction would also commence that same year. The major sealift of modules would take place in 1983 for the first increment facilities and would be followed by another sealift in 1984 for the second increment facilities. Initial placement of gravel for the proposed causeway extention and seawater treating plant protective gravel berm would take place in 1981. Placement of gravel in 1981 is necessary to develop stable foundations and accommodate the construction schedule. That ends the project description.

COL. NUNN: At this time I'd like to start the public comment period and I'd like to first open the hearing to comments from any elected officials that may be present. As you come up, if you would state your name and the organization that you represent so that we can include this in the transcript of the hearing.

MAYOR NATE OLEMAUN; Mayor Nate Olemaun, city of Barrow. You have come here to give us information contained in these papers, and you have done this speaking in English, but with no intention of translating the informaion into Inupiaq. I will speak in Inupiaq. The people of Barrow to whom you have come to rely the information knew the proceedings would not be translated into Inupiaq; consequently the attendance is small.

3 It is evident after looking at the papers you have given us that you are planning to enlarge the west dock which the North Slope Coastal Zone Management had opposed. We did not want the west dock to be constructed and now you are planning on extending it. In your presentation you mentioned that from 25 to 50 feet is needed to
4 extend the west dock, but you have not shown us how the ocean has altered the west dock, nor have you mentioned what the impact has been on the dry dock by the movement of the ice since its construction. The papers which you have given to us do not contain any information about these matters. You have only tried to present
5 to us a view of the proposed constructions with a great deal of cosmetics applied. Also in your public hearings you always give us the pictures of how the gravel pads will look, but you never let us see the results of the completed construction 3 to 4 years later. We know that the gravel has been washed away from these pads.

6 Also the oil people representatives always read their papers quickly in English without an interpretation into Inupiaq. It is because that you do not have interpreters that very few people come to your public hearings. Then when we meet to discuss the issues, they ask: "Did they do this? Are they following or adhering to this or that?"

You have come here to present this information only to the workers and to the elected officials of the North Slope Borough, not to the public! You always come without an interpreter. I want you to experience how it feels not to understand what is being said, therefore, I am making my delivery in Inupiaq only. Thank you.

COL. NUNN: Thank you, Mayor. Are there any other elected officials that wish to make a prepared statement or otherwise? If not, I'd like to open the hearing to any comments that anyone would like to make. And I would ask again that as you come forward you state your name clearly and the organization that you represent.

JOE SOLOVE: My name is Joe Solove and I'm with ARCO Oil and Gas Company and I'm a land man with the company. I'm going to be giving testimony in place of Millard Owens who hasn't as yet arrived and subsequently, if he doesn't arrive, for Preston Renny. Millard Owens is the project manager for the Prudhoe Bay Waterflood Task Force. His responsibilities have included managing the conceptual design and licensing support effort for the Waterflood Project. I will speak in his behalf.

The applicants have reviewed the draft EIS and have compiled detail technical comments for the Corps' consideration. Those comments will be submitted in writing at a later date. I would like to, however, summarize some of the prime thrusts of our comments and reactions to the DEIS. First of all I'd like to acknowledge the fine effort by the Corps of Engineers and the cooperating agencies on the DEIS. We also appreciate the assistance provided by other

State, Federal, and local resource groups in attempting to expedite this process. The purpose as stated earlier of the Waterflood Project is to recover approximately 1 billion additional barrels of oil from the Prudhoe Bay field. The intent of the applicants is to acheive this in an efficient, expeditious, environmentally sound manner, while complying with all local, State, and Federal regulations. The project is currently scheduled to start up in 1984. In order to meet this objective, permits are needed by November 1980, so that major equipment items may be ordered for a timely delivery. Detailed engineering has already commenced and the first phase of onsite gravel work is scheduled for next year. Our analysis of this schedule indicates that a 1984 start up is achievable. However, the schedule is very tight and dependent on timely permit issuance. Consequently, any significant change in project scope or slippage in permit approval has the potential of delaying the project for a full year by causing us to miss the short barge shipment season. A 1 year delay in the project would have a very serious impact on the oil off take capacity of the field. We estimate that this impact would be a capacity reduction of some 100 to 200,000 barrels a day in the mid 1980's. As has been noted in the DEIS this would come at a particularly critical time in the nation's energy supply situation.

Now I would like to address some of the major concerns the applicants have with the environmentally preferred alternative identified in the DEIS. In particular, we believe unwarranted emphasis has been placed on the gravel island concept. In view of the mitigating measures available for our proposed project it appears to us that the environmental impacts of the island approach are not markedly less than those afforded by a relatively short causeway extention. One of the important negative aspects of the gravel island of course, is it's considerably higher capital and operating costs on the order of $200 million. This has been noted in the DEIS. In addition, as we have previously stated there are several negative aspects of a gravel island alternative which were overlooked or understated in the DEIS. These could have potential environmental or operational reliability impacts and include the following:

1. Onsite power generating with associated diesel emergency fuel storage and handling would be required in the case of a gravel island.

2. Because the gravel island would become inaccessable during certain times of the year it would have to contain much more expensive onsite support facilities, including such things as living quarters, a warehouse, bulldozers, etc.

3. A gravel island would require the implementation of a year round, all weather transportation system, including boats, helicopters, and ice roads to transport personnel and supplies.

4. A gravel island would require laying large submarine pipelines between dockhead #3 and the island, a substantial offshore trenching effort.

In addition to the impacts associated with these factors there's also the important impact of a gravel island alternative on the project schedule. As we indicated, in our earlier comments in April when assessed against a current EIS schedule, a change in project scope to a gravel island would result in a delay of waterflood start up of 1 year. This schedule delay impact of a gravel island was not considered in the DEIS. As mentioned earlier the probable impact of such a delay would be a significant reduction in oil offtake capacity in the mid 1980's on the order of 100,000 to 200,000 barrels a day. In summary, there's are serious drawbacks associated with the gravel island alternative. Namely, the considerably higher cost, the 1 year delay in start up, and the reduction in operational reliability. When all of these factors are taken into account, we believe there is insufficient justification for a major scope change to a gravel island and that our proposal for a breached causeway is clearly superior to a gravel island concept. Let me emphasize that the applicants are concerned about environmental values and believe that our proper project is environmentally sound and strikes a proper balance between all factors that must be considered.

To illustrate this, I would like to discuss the major environmental concerns that have been raised and how our project addresses them. Two of the environmental concerns identified by the DEIS as significant were the potential impact on water quality in Simpson Lagoon and the impact on fish movement. In regard to water quality the modeling work performed by Dames and Moore for the DEIS and contained in Appendix D, is useful for comparing the relative effects of the causeway extention to those due to natural causes such as wind and river runoff. The results of this work indicate that the salinity changes due to the causeway extention are less than the normal natural variations. For example, the DEIS indicates a maximum impact of the project as a 2 to 4 parts per 1,000 increase in salinity. Whereas salinity variations due to natural causes range from 5 to 19 parts per 1,000. I refer you to Table 2 in the DEIS for example. It identifies the natural changes in salinity of 5 to 14 parts per 1,000 due to wind speed and 5 to 19 parts per 1,000 associated with river runoff volumes. Consequently, when put into perspective we believe the effect of our proposed project on water quality in Simpson Lagoon will not be significant.

An additional concern raised in the DEIS had to do with fish migration and entrainment. The field data does not clearly support that there would be a serious impact in these areas. Nevertheless we have recognized these as concerns and have taken measures in design of both the causeway extension and the seawater intake to accommodate fish movement and minimize fish entrainment. In regard to the causeway extension, we are planning to incorporate a breach

at dockhead #3 to allow passage of near shore migrating fish. For the water intake design we will include a state-of-the-art marine life return system to minimize the impact on fish further offshore.

In summary, we believe the basic design of our proposed project is environmentally sound and environmentally acceptable. A major change in scope to a gravel island does not appear necessary or justified. In closing I would like to once again emphasize the importance of the project, not only to the Prudhoe Bay unit owners, but to the North Slope Borough, the State of Alaska, and the Nation as a whole. To put the project in perspective an additional 1 billion barrels of oil will be recovered as a result of waterflooding. As the DEIS points out this is equivalent to finding a world class giant oil reserve. From a national economic standpoint, the project will have a positive impact on the balance of foreign payments and will increase tax revenues. Just based on current oil prices the Waterflood Project would reduce the cost of foreign imports by some $4 billion per year in the late 1980's. This amounts to about 10 percent of recent U.S. annual trade deficites. The favorable impact on the nation's economy would tend to strengthen the U.S. dollar abroad and decrease inflation. In addition, although not noted in the DEIS there would also be a significant annual increase in Federal tax revenues. From the State and local economic standpoint, as noted in the DEIS the State would benefit by receiving an additional $9 to $26 billion in royalties, severance, and property taxes over the life of the project. The North Slope Borough would benefit by receiving some $20 million additional. From a national security viewpoint, the project will decrease our reliance on uncertain foreign imports. There is no other realistic alternative for reduction of the nation's dependency on foreign oil imports, currently about 50 percent of our needs, than to increase domestic production which is the purpose of this project. This concludes my testimony, I appreciate the opportunity to have commented on the DEIS and the Waterflood Project.

COL. NUNN: Thank you, Mr. Solove. We'll enter that into the record as your testimony on behalf of Mr. Owens with the oil company, and I understand that you will be submitting written testimony at a later time.

Mr. Mayor did you intend to leave with us any written testimony?

MR. SOLOVE: There's further testimony from Preston Renny, who is the manager of Development Engineering for SOHIO Alaska Petroleum Company in Anchorage. In his absence I will present his testimony.

There are references in here to a visual aide which I do not have. It will be best to refer you to Figure 2 in the handout as a reference point. And I'll attempt to refer you to the areas of concern as I'm going through the testimony. As stated, this testimony is for Preston Renny, the Manager of Development Engineering for SOHIO Alaska Petroleum Company in Anchorage. In the

discussion today, I will focus on two logistical aspects of the Waterflood Project and will show how these have been coordinated with other planned field development in order to minimize the additional facilities required for the Waterflood Project itself. The two logistical aspects I will discuss are: (1) The low pressure water supply line route to the west side of the field and its relationship to plan development of Pad K and (2) The expansion of the existing dock to handle increased module traffic.

Turning first to the west side low pressure water supply line route as mentioned previously in my testimony of Millard Owens, it is planned to transport treated seawater into the injection plants via low pressure pipelines. The current plan on the west side of the field is to take the most direct route with the water supply line as shown on this map. In Figure 2, I refer you to the route from dockhead 3 as it breaks off toward what is marked as term well A, Pad K and toward Pad E. That is right off the dockhead. That is a 36" line, would be installed from the vicinity of the west dock to the injection plant located near gathering center 1, a distance of about 7 miles. For 5 of these 7 miles the pipeline route follows that of existing roads. The only current missing portion of the road is a 2 mile stretch between Pad E and Pad K, and this is planned to be added as part of the Pad K development. The DEIS on the other hand has selected a less direct route as the environmentally preferred alternative. Again referring you to the map, this route is approximately 5 miles longer and would cost an additional $25 million. This is illustrated, somewhat on Figure 6, also.

COL. NUNN: As indicated with the dotted line there between the compressor plant and WF1.

JOE SOLOVE: Yes, taking off from the dockhead following the dotted line to the central compressor plant then toward WF1, the intermediate manifold, and back to gathering center 1. As you can see, this route is approximately 5 miles longer and would cost an additional $25 million. The basis for the DEIS selection of this route as environmentally preferred alternative was that it will allow the low pressure water supply lines to follow existing roads and pipelines and avoid disturbance to the area between Pad E and Pad K. We question the rationale for selecting this route as environmentally preferred alternative since we have indicated as noted in the DEIS that we plan to install a road and pipelines between Pad K and Pad E as part of the planned field oil development. This access road to Pad K will be necessary for safe and efficient operation in oil production from Pad K. Since Pad K is currently planned for installation in 1981, the incremental impact of routing the waterflood supply lines along the road between Pad K and Pad E would be minimal. In addition to serving as an access road, this road will also be designed to carry module loads for future Prudhoe Bay projects. In addition to the waterflood as noted in the DEIS, there are other projects planned for the field in the near future, such as

drill site expansions, for the addition of Pad K, low pressure gathering systems, and artificial lift systems. For all of these projects a total of approximately 220 nonwaterflood modules are planned to be transported to the west side of the field over this road. These modules will have weights up to 2,000 tons. Use of the new road will greatly reduce the module transport time and distance and the consequent dust and noise over using the existing road system. In addition to these modules required for development of the SOHIO operated west side of the field the road will handle modules needed for planned development of the Prudhoe Bay field west of the Kaparuk River. There is also the possibility that this road would be useful for the transport of modules for other nonunit developments west of the Prudhoe Bay field. Consequently, this planned road between Pad E and Pad K is a good example of multiple use; serving as an access road, an oil pipeline route to Pad K, as the waterflood supply line route, and the west side module road.

I would now like to briefly touch on the plans to expand the existing docks to handle the expected increase in module traffic resulting from field development projects. As mentioned earlier, with currently planned field developments there will be a substantial increase in field facilities. The major modules associated with these field facilities expansion projects, will as in the past, be transported up to Prudhoe Bay on barges during the summer openwater season and offloaded on the present west dock. The number of modules planned to be offloaded during several of these barge seasons is projected to be significantly higher than in past sealifts. For example, during the 1983 sealift season it is projected that approximately 200 modules will be offloaded at the west dock or more than double the previous maximum sealift of 67 modules in 1976. Moreover it does not consider the requirement for a significant number of modules associated with gas sales which would be presumably handled through the use of this dock in the same time frame. Consequently, to accommodate these planned field development expansions it is planned to widen the existing west dock to accommodate two-way traffic. This expansion will be entirely compatible with and will also serve the waterflood by allowing space for burial of the seawater supply lines in the causeway between the seawater treatment plant and the shore. In this discussion, I've attempted to show that the Waterflood Project has been integrated into plans for other field development insofar as possible in order to minimize the incremental need for facilities for the waterflood itself. We believe that such multiple use planning for logistical facilities makes good sense from both an environmental and a business point of view. This concludes the Prudhoe Bay unit testimony. I appreciate the opportunity to have commented on the DEIS and the Waterflood Project.

DOUG LOWRY: Regional Supervisor for the Alaska Department of Environmental Conservation. I have a written statement from the department to present.

The Department of Environmental Conservation has actively participated in the planning process for the Waterflood Project from the inception of the scoping process in November through active participation on the agency-industry task force and in the review stages of the environmental assessment and the draft environmental statement. Throughout this process the department's concern has focused on insuring that all phases of the project conform to our environmental standards, specifically air and water quality standards. Also that the project conform to all standards of the Alaska Coastal Management Program, which all State agencies by law, are mandated to address in issuing their permits or authorizations. The legal mechanisms through which we address these standards include the Certificate of Reasonable Assurance for the Section 404 and NPDES permits, air quality control permits to operate and waste disposal permits. Through these means the department is responsible for insuring that all feasible and prudent steps are taken to maximize conformance with all environmental and habitat standards of the Alaska Coastal Management Program. The department indorses, with some specific exceptions, the environmentally preferred alternative presented in the Corps of Engineers draft Environmental Impact Statement for the Waterflood Project. This alternative calls for construction of a gravel sea island for siting, treating, and intake facilities, and marine outfall line located north of the facility. We feel that these conditions best meet the intent of the Alaska Coastal Management standards and guidelines which implicitly include water quality standards for suspended sediments and chlorine residual as well the estuarine and Barrier Island lagoon habitat standards expressed in Title 6 AAC 80.130. These latter standards require barrier islands and lagoons to be managed so that adequate flows of sediment detritus and water are maintained and alterations or redirection of wave energy are avoided, which would lead to the filling in of lagoons or the erosion of barrier islands. In addition, estuaries must be managed so as to assure adequate waterflow and natural circulation patterns. Moreover, the regulations allow for variances from conformance of the standands only if no feasible or prudent alternative exists to meet the public need and all feasible and prudent steps to maximize conformance with the standards have been taken. The applicants proposal does not demonstrate to the department's satisfaction that feasible and prudent steps have been taken to maximize conformance with these standards. Several aspects of the applicant's proposal, if left unmodified, suggest conflicts with several State water quality standards and likely substitute inconsistencies with respect to other standards of the ACMP. First the applicant's present proposal for a westward outfall location will likely violate Alaska water quality criteria for suspended sediment and quite possibly chlorine residual. The Department of Environmental Conservation cannot, therefore, legally issue a certificate of reasonable assurance that the discharge will meet water quality standards at the proposed location. Circulation studies and modeling have shown that dilution acheived in water depths exceeding 14 feet will meet the standards such that relocating the outfall northward off the end of the

facility to depths exceeding 14 feet would be acceptable. Secondly, while acknowledging the efforts of ARCO to design an environmentally acceptable breach as practical within the constraints of their decision to proceed with an extended causeway the department continues to have serious reservations about the effectiveness of the breach and maintaining adequate waterflows and natural circulation patterns, and providing for relatively unimpeded migration of coastal fish species. Instead any causeway extension is likely to augment already documented hydrographic changes in eastern Simpson Lagoon. The long term biological implications of which have yet to be determined. The department has requested on several occasions but has not yet received a detailed itemization of life cycle costs associated with the construction and operation maintenance of both the applicant's proposed alternative and the gravel island environmentally preferred alterative. The current cost estimates have not been adequately substantiated to rule out the environmentally preferred gravel island alternative. On economic considerations inherent to any feasible and prudent determination. For the reasons stated above the department feels the gravel island alternative, including the northward located outfall, is considered a feasible alternative to meet the public need and demonstrates to our satisfaction that all feasible and prudent efforts to maximize conformance with State regulations will have been taken. We withhold comment in other aspects of the environmentally preferred alternative, specifically the 25-foot culvert breach in the existing causeway varied electic lines, and pipeline road alinements until we have been able to review these aspects in more detail. The department submits this testimony for the hearing record and will be providing the Corps of Engineers with more detailed written comments by the close of the public comment period on the draft environmental statement. Thank you.

COL. NUNN: Thank you, Mr. Lowry. Yes, sir.

LONNIE C. SMITH: Colonel Nunn, My name is Lonnie C. Smith and I'm here as a member of the Alaska Oil and Gas Conservation Commission. Thank you for the opportunity to address this timely and most important issue of the draft environmental impact of the Prudhoe Bay Unit Waterflood Project.

The Alaska Oil and Gas Conservation Commission staff members are just this week completing a list of technical comments on this draft EIS which are to be submitted to the Corps through the State-Federal coordinator for the State Department of Policy and Development Planning. I've been informed by our reviewers that this is the best EIS document they have read. Even so there appears to be several errors and misconceptions which when corrected will make it the complete and worthy document it must and should be. In Volume I of the EIS, pages 2-4 and 2-5, under the heading delay, it is stated that "Postponing secondary recovery activities 1 to 3 years would not effect ultimate recovery" yet on pages 2-5 and 2-6 it states that Delay "Beyond early 1985 will cause a progressive production

loss of as much as 5/10 to 1 percent per year of the oil in place, for example 100 to 200 million barrels." According to our studies a 3 year delay would require a 12 percent greater injection rate for the remainder of the project to catch up. This may well be beyond the practical and economic catchup limit and make up for any further delay will most probably result in loses of ultimate oil recovery. Based on the 28 year flood life of our study, I've included the following table which show the rates necessary to catch up for each year of delay. The tabulation is in three columns headed - the number of years of delay beyond 1984 with 1 through 5 years and 1,000,000 barrels per day of source water injection rate required to equal and catch up to injection started in 1984. This commences with the first year at 2.08 millions per day and progresses to 2.43 millions barrels per day for the fifth year. Then the equivalent percent injection increase amounts to 4 percent the first year, and up to 21-1/2 percent for the last year - the fifth year. This shows a progressive requirement of additional amounts of water needed to be injected to catch up. We also estimate that a 10 percent increased injection rate, for instance, would require some 20 additional injection wells and we are not sure that this increased injection would actually yield as much oil as project because overinjection can actually harm a reservoir and result in less ultimate oil recovery. The commission wishes to reemphasize here that if source water injection is delayed it may be numerically possible to catchup by additional injection capacity, but from a practical viewpoint it soon reaches a point of being impossible for reservoir and economic conditions and considerations. The Alaska Oil and Gas Conservation Commission is charged by statute to prevent the waste of oil and gas. In other words, we work toward maximizing the recovery of hydrocarbons from a reservoir. This can involve both the recovery mechanism employed and the rate the reservoir is produced. For example, to insure that maximum recovery will be achieved we have been studying in the Sadlerochit Reservoir and the Prudhoe Bay Unit for the last 8 years. Less than 2 months ago the commission held a public hearing, much like this one, which focused upon the best method of maximizing oil recovery from the Prudhoe Oil Pool Reservoir. The commission went on record then and wishes to go on record here concerning the following:

1. Waterflooding of the Prudhoe Oil Pool Reservoir with large volumes is necessary to maximize ultimate oil recovery and is essential to maintain the 1,500,000 barrels per day maximum production rate as long as possible.

2. Waterflood can yield an excess of 1 billion barrels of additional oil from this reservoir. If commenced as soon as possible with an adequate source water injection system.

3. Water injection from a 2 million barrel per day source water system should commence by early 1984, which now appears to be earliest practical date the project could be accomplished.

4. To meet an injection startup in 1984, will require project permit approvals by late 1980.

As an oil and gas conservation agency, we are concerned with the timing of the waterflood and respectively urge publication of the final draft EIS with a minimum restraints and alternative considerations necessary to provide a basis for your timely approval of all project permits for the Prudhoe Bay Unit Waterflood Project this year. Thank you.

COL. NUNN: Thank you, Mr. Smith. Is there other public testimony that anyone would wish to come forward and give at this time.

OTHNIEL OOMITTUK: Mr. Nunn, I'm Othniel Oomittuk from the North Slope Borough Environmental Protection Office. On Figure 2, I would like 7 to know if that direction of the directional arrow is correct on that Figure 2. I'm pretty sure it's supposed to be about 45° more. It should be more to the right.

Also on the alternatives on the end of the causeway. I feel that we should follow the contour of the barrier islands that we want to extend it because of the erosion problem from the northerly direction.

COL. NUNN: You recommend that the causeway follow the contour of the barrier islands.

OTHNIEL OOMITTUK: Otherwise, the shifting of the bottom of the ocean would erode the causeway and weaken the pipeline corridor. After 8 looking at so many injection points, I feel that the permafrost should be considered also. We reheat the seawater and inject it various points I fear that there will be a meltdown in the permafrost which would enlarge Prudhoe Bay considerably. Perhaps they could have a good harbor for the oil tankers.

We have submitted the Prudhoe Bay Waterflood Project comments on December 9, 1979 to your office and I'm pretty sure you folks have received it already. I would like to point out some of the fears that I have looking at the proposed alternative action.

COL. NUNN: Go right ahead if you'd like to reiterate what you sent us it will be incorporated as one of the comments if you so desire.

Flosie Hopson has prepared a comment on the waterflood that will be included in the final EIS.

COL. NUNN: Mr. Ben Kutscheid thought it might be of interest to comment about the effects on the permafrost. It is something that he's followed and I think he'd make some remarks that might be useful to you.

BEN KUTSCHEID: The effect on the melting of that layer we don't feel will be very great, because the water that is going to be going in is really not warmed up that much. The temperature of the oil that comes out is much greater than that of the water going in and the oil wells have been insulated to protect against that.

OTHNIEL OOMITTUK: We have heard that some of the drill wells have
9 collapsed due to tne oil heat loss on the way up. Consider that also and waterflooding that some hole would lower the elevation from sea level and if we do happen to have a storm then the lower collapsing of the elevation would cause the sea to rush in.

I see here the reneated seawater melts some of the permafrost down that would create the earth shiftment of the Prudhoe Bay area and that easily can be engulfed by the force of the ocean, if my theory is correct.

COL. NUNN: There have been, in the past, some of the well casing collapsing in the earlier wells as a result of the melting and then the refreezing of the ice. I understand all of those instances had occurred on land and because of the different sizes and strengths of pipes that are used offshore that they've never had an instance of that offshore. However, your concern about the relative effects of heated water, the heated oil, and what it will do to permafrost will be taken into consideration and has been already, of course, but because you've brought it up we'll take a good look at the theory in your comments that you've submitted in writing.

Thank you. Are there other persons desiring to make public testimony. Yes, sir.

GEORGE AHMAOGAK: My name is for the record is George Ahmaogak and I'm with the Inupiat community of the Arctic Slope. There's several areas I'd like to address concerning the Waterflood Project which SOHIO, BP, and Atlantic Richfield had proposed and I roughly reviewed their EIS just for a short amount of time, but I would perfer having more time to make further comments knowing some of the deficiencies but I didn't have the time to come up here and do my homework ahead of time, but some of the stuff I did in the back I prefer making my statement in Eskimo because there are several other concerns that other people might be approaching me on and some of tne issues that I'll be discussing are meteorlogy, air quality, land use, Beaufort Sea water, socioeconomic conditions, causeway extension, dredging, sound, water injection plants, and status of major licenses, permits and policy compliance, but all of these I'll be talking in Eskimo so it's up to you get your own interpreter and I thought maybe there'd be somebody on the staff here who can interpret most of the stuff that we would say; Mayor Olemaun had noted earlier his testimony was in Eskimo. But in future I would prefer having somebody of our native people working along with some of these hearing to interpret part of the testimony. I imagine some

people here would like to come in and testify but since there's nobody interpreting I imagine they didn't want to show up. There probably are some people concerned that would like to be here...

COL NUNN: We had made arrangements for someone to be here and they had to be out of town and couldn't and be available today. Is there anyone here that does not understand English? (Someone in the background noted that he didn't understand the technical terminology.)

GEORGE AHMAOGAK: If you'll let me proceed, most of the subjects that I'll be addressing will be in Eskimo. The purpose of the Waterflood Project which is beginning now in the east (towards Canada) is to force the oil from under the ground near Prudhoe Bay. You are aware of the fact that they are pumping now. They are increasing the pressure by pumping water underground thus causing the oil to surface. They called this the Waterflood Project. They want the ocean water to flow underground thus enabling the oil to flow up to the surface.

The first topic which I will be talking about involves what was said in the environmental impact statement which states that 10 gas-fired heaters along with gas turbine units will be in operation when the water is being pumped. My question after quickly looking at the environmental impact statement is, (although I have not finished reading the statement thus enabling myself to say more) is .... my though is this: How will the air/atmosphere in the Arctic Slope Region be affected when the exhaust fumes from the large turbines and the gas-fired heaters are released? How will the air change? For the past few years we have had quite a bit more rain than we usually get. It has not always been thus - but we know that 'flaring' is being conducted in the Prudhoe Bay area...it is my thinking that maybe our air is being altered by the 'flaring' activities. I believe we are receiving too much rain. My question regarding this matter is: When the gas-fired heaters and the nine gas turbine units are in operation a large volume of exhaust will be released into the air. My question is: How will our air be affected? Carbon dioxide is one of the waste by-products in the exhaust...it will certainly cause a change in the clouds and the air. These papers state that they have conducted studies now; but they do not make an environmental impact statement about the changes which will occur as a result of this project. There is uncertainty in this area therefore, I am skeptical about their statements.

But we do know that changes to our air have occurred since the activity has began in the Prudhoe Bay area. We all know that the amount of rain that we have been getting in the past few years has increased. You aware of this, I know.

Now I would like to say something about the air that we breathe, and how it will be affected when the gas-fired heaters and the gas turbine units are in operation. The United States Congress has a

11 Clear Air Water Act which industries must comply with when they begin operations. The present environmental impact statement does not address this issue. How will the air we breathe be affected by the exhaust fumes emitted from the gas-fired heaters and the gas turbine units? I would like to know how many parts per million the carbon dioxide content will be in the fumes emitted from the exhaust pipes? The environmental impact statement does not address the issue of how dirty the air will become.

12 The impact statement contains only a synopsis of the data which the local weather station has accumulatd of our weather during the past years. There is no statement of how our weather is going to change as a result of these proposed changes.

13 Another topic that I would like to comment on involves the concept of land use. The proposed sites for the water injection plants and the water lines like the west Prudhoe Bay dock traverse over land held under native allotment. Have you been notified of these trespasses? The fact that the roads and the pipes will be constructed on native allotment lands is not mentioned at all in the environmental impact statement. I wonder why this is? The other land use studies in Prudhoe Bay Unit Agreement Act involving the State of Alaska and the oil companies is mentioned, but nothing is written of the land held by natives under the Native Allotment Act since 1906. Why is the land held by natives being used again without our consent? The Waterflood Project has apparently been designed without consulting the owners of the lands held under native allotments. The State of Alaska, ARCO, and SOHIO have apparently began their project without consulting the land owners. I do not approve of this, therefore, I am explicitly making this issue clear. I firmly recommend that the owners of the land be contacted and asked.

14 Another topic that I would like to comment on involves the Beaufort Sea water. The oil companies are beginning plans to pump water underground so that the oil can be forced up. They are saying that the pressure which normally forces the oil upward has dropped. They are planning to pump the water underground in order to force the oil up from the ground. My question is this: How will the cool temperatures of the ocean be affected? I would like to know what temperature changes will occur in the ocean when the gravel islands and the causeways are built. There is nothing in the environmental impact statement addressing the issue of how the ecological sites traditionally occupied by ducks and fish will be affected. I do not approve of the environmental impact statement because it excludes these issues that I am addressing. I am most concerned of how the temperature of the offshore is going to change when the currents which carry the cold waters to the shores is altered when the gravel islands and the causeways are built. The gravel islands and the caseways will undoubtedly alter the course of the currents.

15 How is the fish which are in our waters be affected? What will be the effects on the fish which are in the rivers near the offshore area where the pumping will be? This issue is also not addressed in the environmental impact statement. This issue of the effect on the fish is not even mentioned. Invariably the food source which originates or rather comes to the ocean from the rivers will be pumped underground, thus altering a food chain. The effect of pumping on the ecological food system has not been addressed.

16 Another question I have, involves the ice. Millions of barrels of ocean water will be pumped underground. When this is done what will the effect be on the ice? Those of us who whale know the characteristics of the ice. We know that when the rivers begin to flow that the ice is lifted up and carried or rather broken loose by the current of the flowing rivers. How will the ice move when the water is sucked under undoubtedly with great force. This issue has not been addressed in the environmental impact statement either. In Duck Island towards the east where oil drilling is being conducted, we know that the water is continuously flowing underground. No one can stop the flow of the ocean water underground. We know that the ice conditions will change when pumping begins in the area of socio-economic conditions. Since the beginning of the construction of the trans-Alaska pipeline the hardships which we have and are experiencing have beeb great. Our lifestyles have been affected

17 greatly. Price of food has risen due to the rise of freight rates. There are numerous jobs now, but we also know that there are now many nonnatives in the area. The issue of what socioeconomic changes will occur have not been mentioned in the environmental impact statement. What further changes in our present lifestyles will we experience when a large job market is once again opened on the North Slope? What is the projected increase in freight rates and cost of food due to the influx of the increased population of the labor force on the North Slope?

18 How high will the rental rates for apartments and houses increase? How many new schools will need to be built in anticipation of the increased population?

The competion date of the project is 1985. This environmental impact statement does not even attempt to address the changes from the beginning of the project to its completion.

19 We know that the causeway extension located in west Prudhoe Bay was built on someone's property without his permission. Now, the plan is to extend the causeway out further into the ocean. What will be the effect of the extent of the causeway on the ocean water, the ice? I would like an answer to this question. The environmental impact statement does not contain any information of what the effects of the food chain by the building of the causeway extension. We know that the annual flow of the rivers help to dislodge the ice from the shore every spring. What will be the effect of the extended causeway on the ability of the flow of the

rivers to dislodge the ice? We heard earlier in Nate Olemaun's testimony that the native populace objected to the construction of the causeway, but that the oil companies did not listen and despite the objection constructed the causeway. Now they want to extend it!

20 Another topic that I would like to comment on, is on the activity of dredging. They have said that 1.7 acres of ocean floor will be removed thus causing the loss of valuable food source areas of the ocean mammals. My question is: What will be effects of dredging in the area which contains fish traditionally? What will happen to the fish which we depend on as a food source? This question has not been addressed in the environmental impact statement, although they clearly state that dredging will be part of the operations.

21 The environmental impact statement is thick but it does not begin to answer any of the questions I have concerning the ice and its movements. There is no mention of the safeguards which will be used when pumping begins.

22 Another issue I would like to bring forth is noise abatement. We are all aware of the fact that noise accompanies any engine. There will be gas-fired heaters as well as nine gas turbines operating at the same time. They claim as stated in the environmental impact statement that: "Wildlife adaptability to sound associated with recent oil field development is generally unknown." They do not know what the impact will be on our animals when all the engines are opeating. The noise is bound to be loud. Although noise level studies have been conducted no one knows whether the noise will drive the whales away. I want an answer to this question! Will the noise drive the whale away?

23 Another issue I would like to comment on involves the water injection plan. The plan is to pump ocean water into the ground. My question is: Will there be any sudden sinking of ground after the pumping is done? What will the effect be on permafrost? Will it start melting and conse- quently the ground sinking? We all know that any strong water current causes erosion. What erosion will occur? These questions are not answered in the environmental impact statement. Will our land suddenly sink? How far will they take us into this development not knowing the answers to the issues which I have brought forth!

24 Another comment I would like to make involves the status for major license permits and policy compliance. Several governmental agencies, including the North Slope Borough and the State of Alaska are mentioned, as having to obtain license and permits, but the Inupiaq tribal council known as the Inupiat community of the Arctic Slope was not included although it is an entity with a constitution and recognized as an authority in the area.

In closing, I would like to say that this project will have heavy consequences for us as habitants of the area. This project will inflict traumatic changes not only on the land, but also in our water which in turn will affect the environment of the animals which we depend on. Thank you.

COL. NUNN: Are there other public testimonies that anyone would like to present at this time?

ARNOLD BROWER, JR.: I'm Arnold Brower Jr. I'm on the staff for the North Slope Borough and I'm a permanent resident of the Arctic Slope and the borough.

COL. NUNN: Are you representing a particular agency of the borough or just the borough in general?

ARNOLD BROWER, JR: I'm Deputy Director for the Assessment Department of the North Slope Borough. I work as land selection agent for the borough as well. First of all I'd like to direct a question, is this a statement that we had testified for within this year or last year about this time and this issue of the extension is this an updated revised document, or are these impact statements here updated from that last time you intended to put the causeway for this dredging?

COL. NUNN: The last meeting, which was held here in December, presented the applicant's proposal as he then had it outlined and presented what the resource agencies considered to be the major concerns plus any other concerns that the Corps of Engineers had been made aware of. Since that time, the project which the applicant has proposed here within the draft impact statement has remained essentially the same. Of course, the DEIS has a more comprehensive description; however, as a result of our review and the comments here, we will ultimately come up with a project in one form or another which may not be exactly as it's described in this particular draft Environmental Impact Statement. To answer your ques- tion, what we have in this EIS is essentially the same as it was presented in December.

MR. BROWER: I would make my testimonies similar as to the previous testimony that I made. I believe you were here then.

COL. NUNN: (Yes)

MR. BROWER: In regard to the sensitivity of the Beaufort Sea and the environmental land use sensitivity. I think the impact statement presented then had very little knowledge of what to expect out of testimonies from Barrow or probably from any other village in the North Slope. Because of the insensitivity of the program presented on the dredging and on the causeway extension, the ground that has been touched by the industry has been poorly rehabilitated. I see alot of problems arising on that issue itself and as for water

intake particles from the intake to the wells, I still see alot of sensitive issues not being brought out as to what kind of
25 resolvement to the sensitivity of the thing (whether the ground is going to sink; eventually it's going to sink). Anything you put in the water that weighs more than water gradually sinks or it sinks right away. The amount of land and amount of oil that's being taken out from the area, it's going to cause alot of sinkage of land and the dredging is going to promote environmental erosion on the bottom which will deteriorate the natural nutrients of the fishes that are hatched there each year as well as the feed of the seals and other migrating mammals within the area up to the large bowhead whale.
26 And, as I had mentioned in the past on that previous testimony, the land issue not just on land use I don't see the property owner advised of the allotments or the adjacent allotment owners on the impact of their properties over there; what effect it will have on their properties in the water areas as well as the ground area, as well as the air area, the atmospheric changes. Is the atmospheric
27 changes going to be drastic to harm the people's lungs that will cause it to deteriorate and cause cancer or is the water going to be contaminated to contaminate the food sources of the fish, contaminate the fish and then eventually contaminate those people that fish there? These are some of the small issues that we just begin to think about when exploration starts of this size. I think that the Corps or who has the responsibility of putting this impact statement together that all of these issues had to be answered to the planning department of the borough, the Inupiat Committee of the Arctic Slope who has alot of environmental concerns within our whole north Arctic Slope region. From the assessment point of view, I would hardly have any statements to add but since I am directly involved with being living here 99.9 percent of the year round then it's the food source that I eat here with the people. It involves my health also and I think for our minds to be strong here and to be healthy that our nutrients, our food sources must be also be healthy like any other human being that wants to have a healthy mind and they have to have a healthy body. I think all of these issues have to be answered before anything this size has to take place.

COL. NUNN: I would like to say at this point, Arnold, that it is the intention of the Corps of Engineers to reveiw this project to insure that what is done does not harm the environment in the ways that you've expressed a concern. That's also why we are joined by the Environmental Protection Agency and by the Alaska Department of Environmental Conservation, U.S. Fish and Wildlife Service, and others in putting together this study. This study is a scientific look at what the industry is proposing to do in an effort to see what the impacts are and to see whether or not the ways that their doing things or the ways that their going to protect the environment are satisfactory. If they are not, the permit would be denied, if they are marginally satisfactory then we might issue a permit with conditions that make it satisfactory and if the proposal adequately protects why we could issue a permit without any concern. But we have heard these concerns, we're very interested in those concerns,

we are looking into them. In general, there is not going to be a deterioration of air out there that would cause anybody's health to be impaired or would cause cancer. We give that assurance, I think across the board, but we may not have stated it as clearly and simply as that and that may be an error in the way we're approaching this EIS document. The same is true with regard to the fish. We do not intend to do anything to either the nutrients used by the fish or fish used by the people, that would be a change that would cause health hazards. That perhaps goes without saying but perhaps we've been wrong in not saying it more explicitly because those may be the most important to the people of the North Slope and if we have erred in being insensitive in the way we've presented those things we regret that. We will take another look at our presentation and the way we are speaking to the North Slope to see if we can improve that. I appreciate your comments very much.

MR. BROWER: Then our testimony here, how much impact would it have on the application being approved or for reveiw. Would you take how much consideration are you weighing our testimony here?

COL. NUNN: What I do is I use the Environmental Impact Statement when it is complete and all the comments that are included as an aide in my making a decision as to whether to issue a permit and as to which conditions we would put into the permit if we decide to issue it. Your remarks are weighed heavily because I have to make a determination as to whether or not the issuance of the permit is in the public interest. And you certainly are the most immediately effected public although not the entire effected public. You are effected most directly by the physical impacts of the project in your midst. The energy resource which is located here on the North Slope and which could be potentially lost if this project is not carried out in a timely fashion is in the public interest of a larger public and I have to balance those things and try to make a decision which is in the best interest of everyone concerned. That's a very hard thing to do and this EIS is the document that is to be the greatest assistance to me in that process. Everything that you say will be transcribed and put into the final impact statement and I will consider it and we try to make the final impact statement address these concerns that you've brought up today. For instance, concerns about subsidence as a result of the removal of oil or the injection of water perhaps that's not been explicitly enough addressed, but there are good precedence these sorts of things have been done elsewhere, perhaps not on this scope or in the same types of rock formations but we can certainly take your comments into consideration and consider or not whether it should cause us to do an additional study or relook at the project.

MR. BROWER: It hurts my mind when I hear somebody before me say, I have
28 made the statement before, that you still have not consulted all property owners there of the on-going project because I'm knowledgeable of the fact that alot of these allotments in the Prudhoe Bay area are now getting surface patents and the causeway

itself is on private property and I think it would be beneficial for you to consult these people before further planning should take place and I'm glad you folks are here for our comments but I have made this statement before but I'm sorry to hear that somebody doesn't make a testimony to say that they have had not been reached. I don't have anything else to add to my testimony.

JOE SOLOVE: Mr. Brower, do you have a copy of this? This is the EIS. The material you have there is some material regarding specific type permits and it won't have the type of information in the package you have there that has this environmental assessment. I don't think the EIS here says things as clearly as your concerns were but it does address them probably in a more technical scientific terminology. The Colonel said we should come out and say what we mean. There are copies of this available aren't there, Ben that will alleviate some of your concerns where it would actually go through and talk about the impacts on the air, show exactly what the changes would be and make some kind of a judgement as to what that change means in terms of what the people that are in the areas.

COL. NUNN: Arnold, we try to make as wide a distribution to the public and to reach the public as well as we can with all our notices of meetings, the documents that are prepared, and keep them informed. If anyone is aware of people who are being overlooked and not being reached, if you'll let me know we'll make an extra effort to see to it that they are kept advised as to what is going on, what information is available and what decisions are made.

Other persons desiring to make testimony?

MICHAEL JEFFERY: I'm an attorney living in Barrow, I work with the Alaska Legal Services Corporation, speaking today not on behalf of the Alaska Legal Services Corporation because it as a corporation doesn't take positions on issues like this. We take positions on behalf of our clients. Since you are tonight going to visit the village of Kaktovik, I won't speak directly on behalf of any clients and I'll speak today primarily as an individual who has been legally trained, who has been living here for about 3-1/2 years and I've visited all the villages of the North Slope and extensively the villages of Kaktovik and Nuiqsut in connection with issues raised by Beaufort Sea oil development. It may be that I'll be presenting written comments in the future also.

First of all, I'd really like to address some of the concerns that Arnold Brower Jr. raised, and that is the process. I'd like to compliment and commend you and the other panel members for coming to Barrow to have this hearing, you picked the place in Alaska to have, if you're going to have only one hearing, this is the place to have it. These are the people, as you say, that are the most directly affected. It's more or less a coincidence but I think it's also extremely good that your visiting these two villages at this time also. The problem is and as we have all had this experience most

recently with the Beaufort Sea Impact Statement that the State and Federal agencies that are proposing these projects have not yet hit upon a way that effectively gets the word out to village people in Alaska who have to deal with these concerns. I don't know many copies of the impact statement were sent to Kaktovik and Nuiqsut, I think it may have only been one. I don't know how many actually came to the city of Barrow in addition to the North Slope Borough. The problem is there's only a very, very few people who are going to have the time and the energy to go through it all. I have and a few other people have but very few other people. This impact statement is as was said earlier by Mr. Smith and I would agree it's one of the best I've seen, I mean there are comments that need to be made but it's a very good effort and especially to have at the beginning this summary of the project and at the end the glossary which begins to attempt to help people who aren't scientifically trained to understand many of the technical terms. The only problem is that that's adequate for someone with alot of education. The summary is a good summary and the glossary is helpful to me. The problem is it's still not at a level that's going to be meaningful to the village people. Many government agencies, for example the Bureau of Land Management, in an individual decision document that they are giving to people will have a cover letter in very, as Jim Sweeney (EPA) says, you were saying we "say what we mean". Right on. They have a cover letter that says Dear so-and-so this is a decision about your native allotment and here's what it says and here's what your rights are. See attached. And then they still attach the legal notice. So the person can look at the letter, and it's in pretty basic English and they can understand basically what that is and then they can help in understanding the technical document. In addition to the summary or maybe in place of this summary which is written again at a rather technical level I'd hope that Corps and other State and Federal agencies would produce a summary that's written in a very clear way and a very basic kind of clear way which gives an understanding of the project and then in addition to that to as I think this is actually suggested on a larger scale even in the government of the Counsel of Environmental Quality Regulations is to make that summary very widely available. For example, in this case had such a summary existed you could have perhaps sent 20-30 copies of that to the Post Offices of these affected communities. Or it could have been picked up by people right at the beginning, it would have had to have been and this means early in the process not late in the process. So the people could read those and have a basic understanding and then have more copies of the draft EIS available for more people who would want them. It is surprising in the Beaufort Sea statement many villagers did in fact take the time to read substantial portions of that document. Had there been substantial numbers of the document available to the villages I think that more people than have would have actively considered it.

Now another thing that has just come up today and I think it's only fair to the people who have testified in Inupiaq that you make it clear on the record today what procedures you will go through to

make sure that their testimonies are promptly translated into English and so that you will have them available. I hope that you would do that before the end of the hearing. The Inupiaq Language Commission here at the North Slope Borough is available I'm sure and there might be other ways too, but other agencies have the Alaska OCS office has had good success in using North Slope Borough people to produce a transcript in English full translation promptly. You will need that. I think some of the valuable comments you will be hearing both here and in the villages is in Inupiaq.

COL. NUNN: We agree, and we're making arrangements to get the recording copied and translated.

MR. JEFFERY: Well soon.

COL. NUNN: That will be in the final EIS too but we can send copies of the transcript forward for such use as might be appropriate up here. I agree with you. The remarks of the mayor and others will be considered some of the most important.

MR. JEFFERY: There's the very limited time and again I realize that this is within the legal limits according to law but unfortunately some of those legal limits don't recognize realities of Alaskan villages and Alaskan communities. We didn't get the impact statement up here till well after it released in Anchorage. I would urge either that a formal extension of time be granted for at least 10 days or 2 weeks or at the bare minimum that the post mark of July 21st rather than receipt on July 21st. When you consider that these have to reach Juneau and places like that they have to mailed today to make that for sure and that's completely unfeasible. But I would hope that there would be an extension of time to fully allow people after this meeting, after these village meetings to sit down and think about what they want to say about it and get it to you to be considered on the record rather then maybe considered or maybe not.

COL. NUNN: You know there is an extension till 31 July.

MR. JEFFERY: No, I wasn't aware of that.

COL. NUNN: Yes, we've granted an extension that long and certainly during the time this thing's going to publication while I may not include it in a formal way in something that's going to print I'll certainly personally take it into account.

MR. JEFFERY: One other thing again about process. I think these hearings are notable in that you as the decisionmaker have personally come to hear the testimonies. In the offshore lease hearings there were people that came but they were not the decision-makers. I don't know the other gentlemen, I don't know to what extent they are decision-makers also but I think that is very strong thing and I think it's very beneficial for the education of both the decision-makers and of the people here that the actual people that

are doing the business come and see the people, see the communities, and take that into their account in addition to the written testimonies and the oral comments. Also the ideas of this being a joint hearing I think is a good idea. It's important that there is public comments on the EPA permits on the Coastal Zone Management Program consistency and certainly none of us wants to go to five or six different hearings to have these same comments made. I think that joint hearings such as this is a very good solution so that to make sure that all the different agencies do come and do have a public hearing so that they don't say it's too expensive and this and that. It doesn't have to be. Have it a joint hearing. Have all the people come.

Now just a couple of other comments on the realities of the situation because I think the kind of concerns that have been raised about the health of the people are the main or real concern here. I'm not a life-long resident here, I have attended a very large number of public hearings in the last 2 or 3 years and I think I've got a pretty good idea of what kind of concerns the people are raising and the kinds of concerns that you heard today are very typical of that. It's a very important issue -- health, life, our survival up here. This is the issue. We're not talking about cost benefit curves and were not talking about insurance rates or different things that sometimes come up in the offshore drilling here, operating maintenance cost and this and that. We're talking about "is my grandchild going to die of cancer." That's what we're talking about these kinds of issues and this has been expressed here today. And may I note in material provided by the Environmental Protection Agencies, for example we're talking about correct me if I'm wrong, but under the BASCT review section here we're talking about nitrogen oxides pollutants at the rate of 4,358 tons per year, right? Being acceptable, am I wrong there? That's the way this chart reads.

MR. SWEENEY: I don't recall the number.

MR. JEFFERY: But on that order.

MR. SWEENEY: That's correct.

MR. JEFFERY: Carbon monoxide which we all know is what is a lethal thing in car exhaust and so on. Eight hundred twenty three tons per year are going into the Beaufort Sea environment from the project and this is considered to be acceptable. This is the limit of what's acceptable. The same thing in the impact statement, and I'm not sure that I can find it offhand but we're talking of many tons of discharge going into the water I think it was on the order in certain conditions up to 75 tons of discharge much of that being natural material but again there are affects, for example from the chlorine in there which are admitted in the impact statement not to be known and we're just going to do monitoring to try and find that out. So there are concerns, and you can understand why people are

concerned. It gets back to an issue that's come up in other parts of the country and that is/are the National Ambient Air Quality Standards or the National Water Pollution Discharge Standards and so on. Are they adequate in a place which has purer air and purer water then that? Or instead are you going to base the standards that you use in these determinations on the quality that exists on the quality of the air and the quality of the water. It's fine when you're talking about, and I grew up in Los Angeles and I've seen days where tne smog has been so thick it looks like fog. That's what I grew up in and you couldn't take a deep breath without coughing, and that's great to try and bring down that to something cleaner; but up here the air is very pure and should we say okay these national standards are acceptable up here and I think that's the real question. I realize that's beyond your level but I think it's definitely a concern.

MR. SWEENEY: The PSD permit that's P evention of Significant Deterioration, that is intended to apply where the air is cleaner than the standards and it doesn't allow you to use up all the way to the standard. It sets a level or in this term it is the PSD increment but we're not talking about a PSD increment here because we haven't established PSD increment for the carbon monoxides and the nitrogen oxides, I think it is. But there is also a level of significance which we use and these levels, these increases in pollutants don't even reach what agency's have established as a level of significance. So yes, we do not look and let it come all the way up to the standards. The same thing applies in terms of the waste water discharge too, is what is called the Anti-Degradation Policy. The Water Quality Standards don't let you degrade something all the way up to the point where the standard is. You can't do that and that's one of the comments that the agency will be making when we talk about some of the parameters in there that say that if you do this it won't cause the standard to be violated. We have to say that's not exactly the case you use. The case is, will it significantly deteriorate the environment, will it violate the Anti-Degradation Policy and we don't think that any of the levels we're talking about, not only will they not exceed up to the standard we don't think that they will cause significant degradation of the environment.

MR. JEFFERY: You mean 838 tons of the CO_2.

MR. SWEENEY: That again, put into the context in some places it would cause a significant problem, but, because of the meteorology and the lack of alot of other types of sources it doesn't cause a water quality or an air quality problem.

MR. JEFFERY: The thing that this gets down to in all these discussions of permits and monitoring and this and that is the monitoring. The monitoring discussion of two and a half pages I do feel is inadequate. Monitoring, I think and again this has come out of the many public hearing up here, what's going on over there. At least

now we are at a point where the government and the industry have taken the initiative to come out to the place, to the villages, and to Barrow to at least inform people about what's going on. But there is another level and that is making sure that permit stipulations and permit conditions are in fact followed by the people. I mean this is a remote area and it's cold in the winter and it's dark and I can imagine that whoever does inspections probably would rather not come up here, but on the other hand this, amply pointed out in the EIS, is a very sensitive area. Again in the EIS you quite rightly emphasized the migratory nature of the game and how if things happen here they are going to affect quite a wide range. If something happens to bowhead whales it affects villages from Savoonga to Kaktovik and that applies to birds and fish and alot of the other wildlife. So it's extremely important and I think would considerably increase the confidence of local people in the proposal project area, if you really do spell out in great detail exactly what the project is, who does the monitoring, how often they're going to do it, what the penalties are, and maybe make sure that those are adequate. There are instances in the past, and I don't know how current they are because I don't monitor myself but there are times in the past where there have been allegations that in fact permits have been violated, things have been dumped, and these kinds of things which people have sometimes seen for themselves when they fly over or whatever cause real concern when people say well its safe and they'll stay within it. The question is putting aside that issue, is that standard even safe? Will they really stay within it? I'm aware that the EPA in particular depends a great deal on monitoring reports supplied by the industry itself and the question is are those adequate and I realize there's penalties there but you can understand that people often distrust all that and I think that monitoring is a very key area. It was also pointed out by Mr. Strobele.

29 Finally, the cumulative impacts section and the map Figure 15-1, I think, there could be more discussion of the future offshore leasing plans of the Federal Government. In particular the offshore lease sale that proposed for 1983 is considerably larger than is suggested here and basically when you look at all these things, when you look at this project, all the present development, and all the offshore development, and the gas conditioning plan and all these things releasing tons of pollutants into the atmosphere you can understand why many people would prefer to have the environmentally preferred alternative. My personal testimony is very definitely in favor of the government's selection of the environmentally preferred alternative. There have been studies which have shown the effect of the existing causeway on fish, on the temperature, on the salinity, in the lagoon system. Studies that show how sensitive the temperature and salinity is to the wildlife in there and has already caused changes and I was ver" encouraged to see the preferred alternative not only didn't add to that problem by having a separate gravel island and allowing the currents and everything to go between the existing causeway and the gravel island but even had the

proposal for a break in the causeway to allow the fish to go through. All these things are very important. Every one of these projects that's coming along we always get the argument from industry representatives, "Well, it won't cost that much, let us go ahead and do it the cheaper way because it won't that much more harm." The problem is there's a lot of projects going, there are alot of impact statements coming along the track and every one of these we get the same argument "Let's do it the cheaper way. Of course we're going to put some safeguards in there but let us do it the cheaper way." It's encouraging, in this particular case, the government has identified another quite feasible alternative system. Yes, it would increase costs somewhat but significantly lower and maybe even eliminate much of the effect on subsistence resources which are depended upon by the village people and the people of the North Slope. Every time these projects come along the same thing comes up, and the only way to prevent a serious decline of the ability of the people up here to exist on their subsistence hunting and fishing is that every point where there is a choice and there's a feasible way to do it that is environmentally safe but would get the job done, that one be chosen. I appreciate the opportunity to make some comments today.

COL. NUNN: Thank you, Mike. I do appreciate your remarks and I think that we can particularly address the monitoring section in a little more forward and direct manner as you have indicated. Also I'd like to comment just briefly about the environmentally preferred solution.

Of course, when we prepare an Environmental Impact Statement we prepare that from an environmental standpoint because these things have been neglected in the past. We look at a solution, each aspect of which causes the least environmental impact. We don't include in there an economically preferred solution or an engineering preferred solution, although such solutions exist and very often the industry propsal is closer to that than anything else. What we hope is that through this process we will have the applicants, whoever they may be, whether its here in the North Slope or elsewhere, come forward with such engineering innovations early enough that it doesn't have too severe an economic penalty and thus gives us an optimum which balances environmental sensitivity and protection with sound engineering and economics. That is why we go thru such a technical document which does not always speak to the local community in ways that we should; but there are ways of communicating better, the summaries such as you've suggested, and we'll certainly take those under advisement and for my part I've been here a relatively short time and tried to learn as much as I can about the State in which I live in, the people that are here, and trying to understand them and I think that you automatically come into a system and do things the way they have been done in the past. We've tried to change that already. We've done some things which I think do address the concerns of the people more directly than had been in the past, and I hope this is understood. I also think people should have some confidence that the agencies that have come up here and who are

authoring and sponsoring this document are doing so from an independent way and we also monitor our stipulations in the same fashion. Industry may submit a report collect data and tell us what's going on. That in no way inhibits us from going out and taking independent spot checks, verification and for that matter, I received then daily unsolicitated from Fish and Wildlife, Fish and Game, private citizens, competitors-some firm wanting to do in another one-will send in word that this firm is doing something wrong or something that's improper. So by using satellite photography, and other techniques we can crosscheck to see if people are exceeding the stipulations of the permits with regard to fill or other operations that they may be involved in and I can tell you that if we were to come across something that amounted to falsification of the records or deliberate distortion of a report, it would be extremely serious and the penalties are extremely serious and we're not talking about financial penalties, we're talking about stopping ongoing projects of tremendous value. There's too much at stake that we don't write it off and say "No they wouldn't dare do things like that." There are independent checks and balances and I would want the people to understand that the agencies are indepentent and for my part I feel confident from the year that I've worked with Mr. Sweeney, and Jerry Strobele and others, the agencies are very concerned that their integrity and independence be understood and recognized and we would not want anything like that to concern the people that their concerns are not being addressed. I don't think you were alluding anything sinister in that respect but I do appreciate your bringing it up so that we can be specific about those things. It's not well understood. We travel sometimes together with the applicants. The local people may not understand that this association is not thicker than just what is using the same conveyance for travel. We will take into account all these remarks and you were not at the earlier meeting that we held last December and we did address some of these points and I'm glad to have the opportunity to do it again. Thank you very much.

MARC KUMIKUK: I'm a paralegal aid for the village of Nuiqsut and I work for Alaska Legal Services and at this time I'd like to speak as an individual. I reside at Nuiqsut which is the closest place where all this activity is going on. First I'd like to go to your Environmental Impact Statement on the second page, the second paragraph. A little further down it says "Other essential information relevant to potential significant adverse impacts was not collected because of the limited prospects to resolve scientific uncertainty by application of the state-of-the-art and because of the cost in time and money to advance the state-of-the-art were excessive." As I understand your impact statement is very irregular in which I say this is that, when this was being prepared I believe there was not that much imput from the local people, from the elders on down from the different villages. Only those who can understand English and speak English and speak and understand Eskimo were the ones that testified. Then after that much of us tried our best to go through your reports and impact statement to our elders and to

whomever was interested in this. The main problem to this was that it has always been put out and it was sent late, we got it late and the local people were asking why didn't they hire an interpreter, why didn't they take time to come over and explain all this and this includes all the different agencies which are involved in this. As you know the village of Nuiqsut is the closest to Prudhoe Bay where all the activity is going on. As you've been there yesterday, you've seen some people fishnetting, you seen some dried fish. All
31 the marine wildlife, fishes that are abundant, are not that much abundant anymore as I've seen it for the last 3 years. In glancing through your impact statement I do not see anything pertaining to the impact to the villages, economic wise. If everything goes all at once and it's already going and if you add another big project like this then the total unity of the community will go down the drain. And so will the next generation and after all this is gone, after the oil is gone so will the money. But what about the lives of all the people that are affected by this. In your last meeting in December you went over there to Nuiqsut, there was a fair amount of input from the elders, and I've been told by some of them again to read those comments and what they had to say.

The main reason why I'm so concerned about this is livelihood, our ecosystem within the villages. We are dependent on what we eat. Which is greater, the money that comes from oil or our lives and the next generation's lives? Thank you.

COL. NUNN: Thank you, Marc. For you people who are not aware of it, last December when the Corps made the initial scoping session visits, we went to Kaktovik, and Nuiqsut, Ben and I travelled alone, briefed the project as it was then conceived and sat down with the elders, the mayors, the people of those two villages to get their comments and concerns. I recognize the critical comments that have been made here are being made in good faith and we intend, in good faith to take them into consideration in preparation of the final EIS; but I do want to point out, and some people here pointed out, that this is a very high quality document compared to other EIS's which have been prepared and I do want to assure you Marc and the people along the North Slope here that Ben, who is with me on this, has taken into consideration each comment that those people made. Now, we haven't rewritten what they said and then said this is what we've done about it but in preparation of the EIS we have insured that those individuals' concerns, if they're concerned about fish then we're concerned about fish. We were concerned about whether or not the activity would effect the migration, the overwintering, the spawning, the smolts, the mature fish, whether or not the fishes food was going to be effected, the salinity of the water they were in, and so forth. So the comment in Nuiqsut may have been fish, it may have been caribou in Kaktovik, but I want to assure you that in the preparation of this document we did make a very sincere effort to consider each and every remark and comment by the senior citizens of those communities and I personally wrote the notes down and acted as recorder in those instances but I still have those and I'll read

my handwritten notes to make sure that what they had said has been adequately addressed and Ben and I will go over that together. Thank you very much, Marc.

Others that would like to make testimony?

MAYOR LLOYD AHVAKANA: Acting mayor of North Slope Borough. I just want to, after a fashion, welcome you here and also the new Eskimos who just walked in.

I just want to state that my staff is preparing a written statement for further comments on your Environmental Impact Statement, and that we will submit this report thereafter and I want to comment too, on the work that you're doing with these public hearings and you're doing a good job. Thank you.

COL. NUNN: Thank you, Mayor Ahvakana. and I would like to say that we will be interested in your views of ways that we can do better in working with the North Slope people and perhaps gaining some assistance on the translation and the dissemination of translated material to them. As a matter of fact, I would like to work closely with you and the institute here to try to put together a summary in whatever form, whether it be better written, pictures, Inupiat, or whatever, in order for it to be understood and if you would agree to that we'll work closely with you on that.

MAYOR AHVAKANA: Some of our staff members here in the borough have given support on the Eskimo translations.

COL. NUNN: Thank you. Yes, Sir?

RAYMOND NAGEAK: Welcome sir, gentlemen. I have a couple of questions. Have you confronted yourself to the tribal government of the Arctic Slope?

COL. NUNN: I don't understand the question.

RAYMOND NAGEAK: We have a tribal government which is called Inupiut Community of the Arctic Slope which has in fact the same authority as the State of Alaska which should be asked of some type of authority from the tribal government "Go Ahead" and to this types of projects. You have failed to recognize the tribal comments in all the projects that you have done in Prudhoe Bay. As a member of the Tribal Counsel, I can easily say we, I am ashamed to say, haven't been given notice of the EIS for any projects. I cannot understand the reason behind not recognizing the Inupiut Community of the Arctic Slope. Later ask tribal government who will have to be noticed and notified of such a project because we are a federally chartered government. Thank You.

COL. NUNN: If we've overlooked a group of that type either locally or anywhere on the North Slope, I would solicite the assistance of anyone here that can give us the names and the addresses so that we can best get the public information to that group and solicite their review and comments.

RAYMOND NAGEAK: They've been in existence for 40 years.

COL. NUNN: Certainly the effort that we made last December to let people know that this was coming has resulted in alot of people asking that they be added to our mailing list that we keep them advised and we make a special effort to do that and we'll do that in your case now. I regret it if you were not mailed the material, were not given an opportunity to comment but that's water over the dam. We'll see to it that it doesn't happen again.

Are there other comments now that anyone would like to make. Yes, sir.

MORGAN SOLOMON: Members of the panel, ladies and gentlemen, my name is Morgan Solomon. I'm a member of the City Counsel here in Barrow. As a concerned citizen I would like to review some of the comments with you that most of the native people here had stated.

Let me first address to the panel -- the oil company employees and their representatives -- that I am not opposing any development in terms of energy programs for the State of Alaska and the United States but I strongly oppose any type of development programs with the Prudhoe Bay area which does not have sound, well financed development program to protect that particular project. We as the native people within the whole slope of Alaska wanted to protect our ocean out there. The North Slope Borough had developed a Coastal Management Program for us, the State of Alaska had worked this with us very intelligently. The oil companies turn around and oppose and wanted to make amendments on some of the programs that were going on for the last 1-1/2 to 2 years. Now you come up with a waterflood project. First there was a permit to be seeked by the oil companies for this particular project or for a project to get outside of Barrier Island from the Corps of Engineers. I believe we had lengthy public meeting on this particular responsibility by the Corps of Engineers throughout the State. This development project that you have in front of you is going to make millions of dollars for the oil companies and at the same time it is going to develop what we call up here unbalance, financial problems to our native people and nonnative people that are working to make a living here in the northern region. We don't have to have a research program to get into this. In the last couple of years our fuel has doubled to our outlying villages. The last several years our food intake has doubled because of the development of Prudhoe Bay. The last several years we had to spend alot of money just to provide education for our children. I understand there's going to be some $20,000,000 here available once this project is on the roll. I don't know

whether it is going to be for annually or semi-annually or whatever, but I would like for this committee here, the Corps of Engineers, Environmental Protection Agency, for the State of Alaska to work very precisely with the native people. I have heard some problems that are going to arise during this project especially when there is air pollution. I'm afraid that one day the government is going to say and make a statement in this effect Enter Prudhoe Bay at your own Risk. I hate to see this project stumble because of air pollution. We have sea animals, sea mammals and ground animals that we want to protect so we can have subsistence lifestyles as we normally had since time began. Sure we want to help develop the oil fields but it has to be under a sound management program. This is the first time that I've been able to have been addressed on this public hearing pertaining to this floodwater project because the last one was for the issuance of a permit to go out into the Barrier Islands. Now if the oil companies are going to work with the native people, and the North Slope Borough, and the city government, and the State government, and the Federal Government, they should at least come into the local government and into the North Slope Borough to work with the Planning Department that is directly involved in these projects. Thank you.

COL. NUNN: Thank you, I appreciate your comments, Mr. Solomon. It seems plain that we're going to have to spend a little bit more money and time coming up here and talking to the people of the North Slope. I'm getting the message loud and clear that whatever we've done, it has not been satisfactory. I appreciate your remarks.

Other people wishing to make public testimony? Well if there are no further testimonies, I have to try to catch a plane, get across to Kaktovik and have another public meeting this evening. I'm looking forward to that. These meetings have gone on rather long. Last night ended at around 1:30 and it's a long day by the time you drop off the people at Deadhorse and then come back to Barrow for the night and we are going to have to do this again tonight. So if there are no further testimonies to be presented then I will can this hearing adjourned and we will be holding a public meeting in Kaktovik this evening as close to 7:30 as we can and then we will be returning here to Barrow. While I'm in the city of Barrow, and I will be in the area tomorrow morning, if there is anyone who would like to talk to me about any of the issues that have been raised here in some more detail privately, I'll make myself available. I am staying at the Top of the World and I would be happy to discuss anything that you have a concern about. I will be over in this building tomorrow morning. I'll leave word with Miss Anjum where I could be located if anyone would like to take advantage of that.

JOHN AMUNDSEN: I apologize for our late arrival, weather kept us. My name is John Amundsen, I'm with Union Oil Company. I'm here today representing Alaska Oil and Gas Association and my capacity is Chairman of the Environmental Committee. The Alaska Oil and Gas Association also known as AOGA is a trade association whose 28

member company account for the bulk of oil and gas exploration, production and transportation activities in Alaska. Our membership includes the largest and some of the smallest petroleum firms in the industry. AOGA is the Alaska division of the Western Oil and Gas Association. We have reviewed the Draft EIS for the waterflood project. Our primary finding is that in several instances the harmful impacts were overstated. A relative quantification of impacts in these instances might have added some perspective to the analysis. I any case, we believe a favorable decision on applicant's proposal is clearly indicated. Our members can recall no case in the past when a project can contribute as much to our national energy supply and national security with so little change in environment. Thank you.

COL. NUNN: These testimonies that have been taken today are taped. They will be transcribed and translated. They will be incorporated as a part of the final EIS document in a summary fashion, following the comment period as I outlined in the the beginning. We will be preparing the final EIS and filing that document with the EPA. After that, it will be 30 days before a decision can be issued as to whether or not a permit will be issued, and we will keep the people interested here closely advised as to how we are proceeding in the schedule in that regard.

MR. SWEENEY: The EPA permits for the wastewater discharge and the air emissions would be in essence, issued approximately at the same time the Corps of Engineers permits would be, and the target date to complete the process in October or November of 1980.

This hearing is adjourned. Thank you very much for your attention and attendance.

Comments of
John D. Amundsen
Alaska Oil and Gas Association
on
Draft EIS
Prudhoe Bay Waterflood Project
Barrow, Alaska - July 15, 1980

My name is John D. Amundsen and I am with Union Oil Company of California. I am here today representing the Alaska Oil and Gas Association in my capacity as Chairman of the Environmental Committee. The Alaska Oil and Gas Association (AOGA) is a trade association whose 28 member companies account for the bulk of oil and gas exploration, production and transportation activities in Alaska. Our membership includes the largest and some of the smallest petroleum firms in the industry. AOGA is the Alaska division of the Western Oil and Gas Association.

We have reviewed the Draft Environmental Impact Statement for the Waterflood Project. Our primary finding is that in several instances the harmful impacts were overstated. A relative quantification of impacts in these instances might have added some perspective to the analysis.

In any case, we believe a favorable decision on applicants' proposal is clearly indicated. Our members can recall no case in the past when a project could contribute as much to our national energy supply and national security with so little change to the environment.

Resource Development Council
for Alaska, Inc.

444 West 7th Avenue, Anchorage, Alaska
Box 516, Anchorage, Alaska 99510 - 907/

Testimony: Prudhoe Bay
Waterflood Project
Barrow, Alaska
July 15, 1980

My name is Paula Easley. I am executive director of the Resource Development Council for Alaska, Inc., and have been with the organization five years.

The Council was organized in 1975 and is the largest citizens group in Alaska with a membership of nearly 10,000. Members are individuals, companies, labor and other organizations and municipalities.

Our objectives are to create a broadbased, diversified economy, long-term, stable employment, industrial growth and improved living standards for Alaskans, while at the same time assuring reasonable protection for the environment Alaskans cherish.

We are keenly aware of the numerous government agencies and groups outside government--many funded with tax dollars--whose purposes are to protect environmental concerns. The focus of our Council is to achieve a balance, recognizing that the ecology can be protected and enhanced along with nourishing the economic welfare of our state and nation.

Several members of our Technical Review Committee have review the draft EIS for the proposed

waterflood project. They reported that the general intent and specific requirements of the National Environmental Policy Act of 1969 appeared to have been met.

It was noted that the environmental impact statement contains identified alternatives to the project and alternatives within the project by which the waterflood may be implemented. In their view, none of the alternatives is technically, environmentally or fiscally sound as substitutes for the project. In addition, the alternative ways of accomplishing the waterflood which have been identified did not appear justified.

The one billion barrels of oil which will be generated are urgently needed to augment our national energy supply. Today this supply is threatened by unstable external political elements. The only currently available alternative energy supply is increased oil imports, with the consequent increase in our national balance of payments deficit and the risk of interruption of access to that supply. The EIS acknowledges this.

In our opinion the nation as a whole should support the waterflood project since the benefits are large in terms of economic and strategic security.

RESPONSES TO NUMBERED TESTIMONY COMMENTS

1. An expanded monitoring program is presented in Chapter 5.0, which will form the basis of the program ultimately undertaken, depending on the specific permit action. Overall management of the program is a topic of current study.

2. The EIS has been changed in several places to include recognition of this element.

3. The Corps of Engineers will not permit an activity under our jurisdiction which the State of Alaska finds to be inconsistent with the Alaska Coastal Management Plan.

4. The existing dock undergoes erosion each year from wave forces, currents, ice scour, freezing and thawing, and other factors. A significant amount of the gravel lost through this process is recovered each year by periodic maintenance activities. However, additional new gravel is needed and is brought by truck from active gravel mines. The existing causeway was built as a temporary feature and, as such, is prone to ice override and other damaging forces of the ice. The applicant's proposed project will raise the causeway to offer more protection. This design reflects its more permanent (about 26 years) use.

5. Figure 3.8-2 shows what erosion can do to gravel islands (or a causeway) if it is not maintained. See also response No. 4 above.

6. A summary of the FEIS is now available in an Inupiaq translation.

7. The arrow on the figure depicts true north. It is agreed that magnetic north is approximately 45° to the right.

8. A small amount of permafrost melting might occur around the well (3 ft) after several years of operation. No widespread permafrost melting, caused by high oil or water temperatures in the well, is expected.

9. In other parts of the world, especially where shallow oil wells exist, an overall dropping of the land (subsidence) has been known to occur as the oil is withdrawn. This is very unlikely to occur at Prudhoe Bay, however, because the rock is different and the wells are very deep (2 miles).

It is important to note that waterflooding will reduce even further the chance for widespread subsidence because the injected water will replace much of the oil removed. Monitoring for subsidence is the responsibility of the Alaska Oil and Gas Conservation Commission and the Alaska Department of Natural Resources. To the Corps' knowledge, these agencies have no plans to monitor subsidence.

10. See Section 4.2 of the FEIS for air quality discussion. The U.S. Environmental Protection Agency (EPA) does not consider air pollution from the project to be significant. This is primarily because of the excellent circulation in the area.

11. Air pollutant emissions caused by the project are found in Table 4.2-7 of the FEIS.

12. The EPA does not expect any weather changes as a result of the proposed project. Thus, the EIS is not detailed in this area.

13. A Corps of Engineers permit does not convey any property rights, either in realty or personalty, to the permit holder. Where, as here, there has been raised a question regarding the ability of the permit applicant to proceed with a relatively minor portion of his proposed project over lands whose ownership has been questioned, there appears no valid reason to curtail the processing of the application to its ultimate conclusion, particularly where the vast majority of lands affected are in clear ownership or leasehold status.

    The ultimate burden of resolving this apparent conflict is on the applicant. If the ultimate decision by the Corps is to issue the permit for the Waterflood Project, the Corps could still suspend the permit if, at the time the project is to have an effect on the lands in question, a cognizable conflict still exists.

    The rights of the property owners are clear. At this time, if they are assured by survey that the project will affect their lands, they may resort to legal action to satisfy their claims. That same legal action exists whether or not the permit is issued. Therefore, any solution to this conflict must be in an action between the alleged owners and the prospective users, not the Corps of Engineers. The conflict has been mentioned in the EIS, however.

14. The prediction is that if the causeway is extended, cooler, more saline marine water would occupy the area just west of the causeway. See Figures 4.2-2 and 4.2-3 in the FEIS.

15. The EIS Summary contains general information about effects on fish. Chapters 2.0 and 4.0 have specific information.

16. Removal of water from the ocean for the proposed project would not significantly affect ice conditions.

17. More information on socioeconomic conditions and effects has been included in the FEIS. The proposed project is not expected to noticeably change freight rates for the North Slope.

18. The proposed project should have no noticeable effect on population growth rates, housing, or schools on the North Slope since population changes will occur almost entirely within the Prudhoe Bay enclave.

19. The FEIS has been expanded to discuss food chain effects of the discharge. Changes in ice movement caused by the proposed project are not expected to have a significant adverse effect, although freshwater flow from the Sagavanirktok River would be diverted further to sea.

20. There will be a permanent loss of 67 acres of productive marine bottom as a result of causeway construction. The effects of dredging would be largely short-term and related to higher turbidity and smothering of organisms. Areas dredged are expected to recolonize with benthic organisms. No significant effect on the fish population is expected from dredging activities.

21. Intake design and operation has been a major concern throughout the EIS process. It should be noted that the applicants have altered their proposal to include a state-of-the-art fish bypass system that will become operable when pumping begins.

22. While it is recognized that noise effects on wildlife have not been studied in depth, it is the biological opinion of the National Marine Fisheries Service that the proposed project will have no significant effect on the bowhead whale.

23. See response No. 9 above.

24. The Inupiat Community of the North Slope is currently on the mailing list for materials regarding the Waterflood Project. A final decision will be based on a review of all comments received. However, the Inupiat Community of the North Slope does not have any known approval authority regarding Corps permits and, as such, does not meet the "local government" standard of our regulations.

25. See response No. 9 above.

26. See response No. 13 above.

27. Air emissions and water discharges have been studied thoroughly. It is concluded that the proposed action would have no significant effect from these sources on humans or fish. Because of the concern in the area of water discharges, however, the monitoring program that will be started if the project is permitted will include monitoring of concentrations of discharged substances.

28. See response No. 13 above.

29. Parts of the FEIS addressing cumulative effects have been expanded. See Sections 3.15 and 4.1.

30. Prior to preparing the DEIS, meetings were held in Barrow, Nuiqsut, and Kaktovik to describe the proposal and to hear the questions and concerns of the North Slope people. An interpreter was used at both Nuiqsut and Kaktovik. The Corps of Engineers was impressed by the discussions that took place and factored this information into the EIS process. Also, as is the purpose of the DEIS, other information has become available to the Corps and is being considered.

31. See discussions on pages 4-2, 4-7, 4-11, 4-12, and 4-95 of the FEIS.

APPENDIX B

APPLICANT'S PROPOSED PROJECT

Replacement pages for B-2, B-4, B-6, B-11, B-12, B-13, B-14, B-15, B-16, B-17, B-18, B-19, B-42, B-44 are attached to reflect changes in the applicant's proposed project.

a reliable water source of good quality with minimum intake of marine organisms. The plant would condition the raw seawater to make it suitable for waterflood injection. The necessary equipment to achieve this required quality would be installed on a barge as shown in Figure B-1.

Processing would remove suspended solids and dissolved oxygen and provide heat for freeze protection in the low-pressure pipeline system.

FACILITY DESCRIPTION

Seawater would flow directly into the seawater treating plant inlet reservoir through openings in the shoreward end of the platform. The bottom of the openings would be approximately 0.3 m (1 ft) above the seabed and about 0.3 m below maximum sea ice thickness allowing an opening 1.5 m (5 ft) in height. The area of opening created would provide a water intake velocity of less than 15 cm/s (0.5 ft/s) and the upper and lower sills would minimize entrainment of organic and inorganic solids and slush ice. Flow would then be directed through a state-of-the-art intake system fitted with angled fixed or traveling screen (Appendix H). Fish, ice, and debris would be carried past the screens with an induced bypass flow and returned to the sea. The seawater passing through the screens would then be pumped through in-line strainers to remove entrained biota and fibrous tundra particles that would be detrimental to the media filter performance. The accumulation of particles on the in-line strainers would be backwashed and pumped back to the sea through the main outfall pipeline.

After straining, the seawater would be heated to approximately 4.4°C (40°F) to prevent freezing. A small volume of heated water (21°C, 70°F) would be returned to the intake reservoir to mitigate frazil and slush ice problems. The amount of heat added is anticipated to have little measurable effect on the intake reservoir water temperature. The main process flow of seawater would next enter

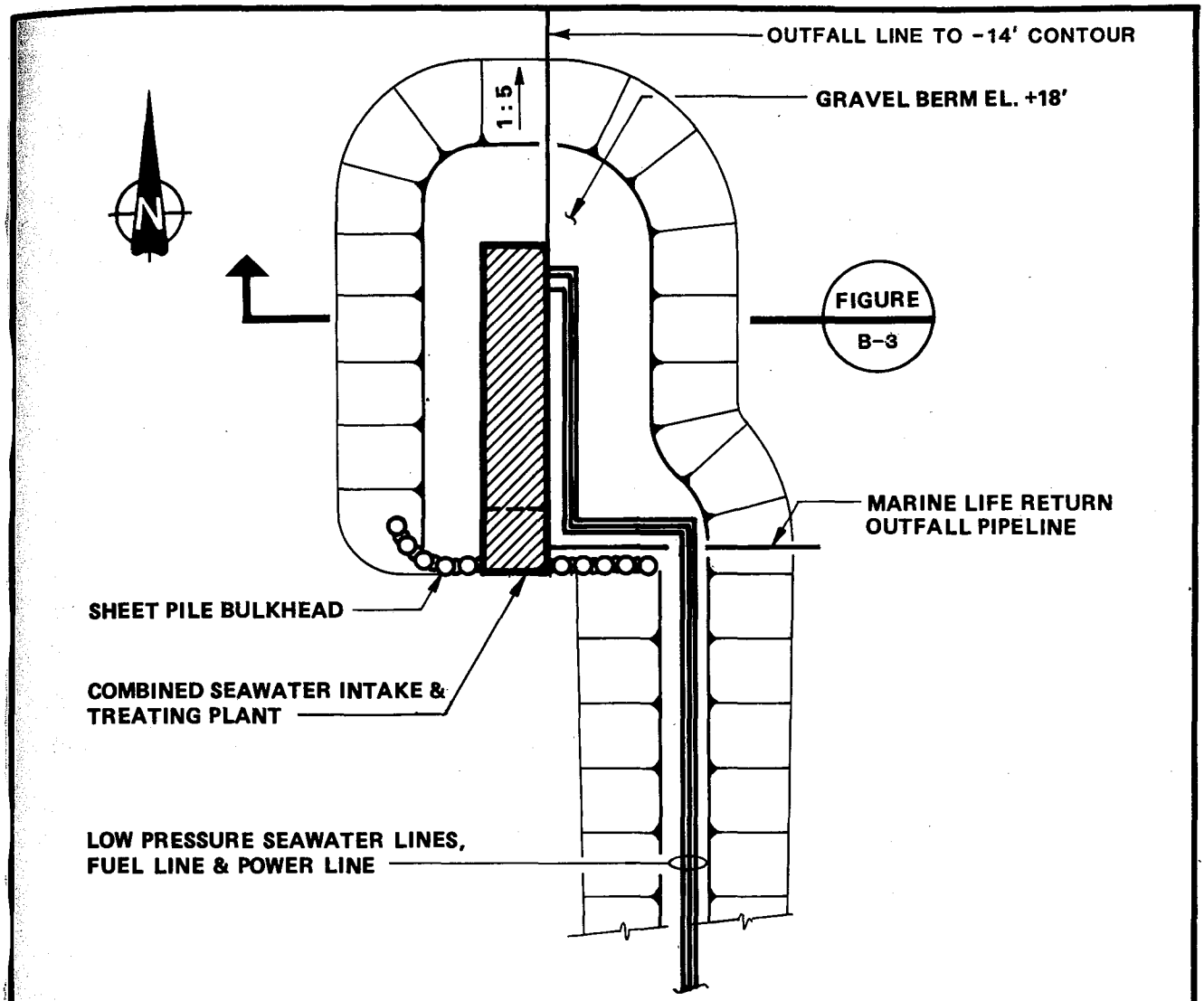
filters containing media such as gravel and sand for the removal of very fine particles. As needed, a coagulant (probably a polyamine) and a biocide (probably sodium hypochlorite) would be added to improve filter performance. Periodically, each of the filters would be backwashed with strained unheated and untreated seawater to remove the accumulation of solid particles and coagulant within the media. The backwash effluent would be returned to the sea through the outfall line.

The filtered seawater would flow through deaerators for dissolved oxygen removal to prevent piping system corrosion. The deaerators would consist of columns containing packing material and would operate at less than atmospheric pressure. The seawater would flow down over the inert packing material, while a small volume of natural gas would flow up. Vacuum pumps would reduce the internal operating pressure of the column. The reduced pressure, combined with the stripping action of the natural gas, would liberate oxygen and mix it with the gas. The gas from the deaerators would be burned in heaters.

Probable water treating chemicals that would be added at three locations in the treating plant process flow, estimated concentration in the system, and frequency of application are provided in Table B-1.

Only chemicals added upstream of the filters (coagulant and biocide) would be discharged in the outfall line through backwash operations. The chemicals added upstream and downstream of the deaerators would not be discharged into the sea during normal operations. The filter aid chemical would be nontoxic and biodegradable.

The seawater treating plant would be protected from ice forces and waves by a gravel berm as shown in Figures B-2 and B-3. Treated seawater would be pumped through low-pressure pipelines to the injection plants located on each side of the field. These pipelines



PROPOSED SEAWATER TREATING PLANT
FACILITY LAYOUT

PBU Waterflood Environmental Impact Statement	Figure B-2

FACILITY DESCRIPTION

The gravel causeway extension from DH 3 to the seawater treating plant would incorporate the low-pressure seawater supply pipelines as well as the fuel gas pipeline and electric power lines. The causeway extension would be designed to withstand predicted ice forces. Cross-section dimensions, shown in Figure B-5a, reflect the associated gravel quantities, but dimensions may be altered during detailed design to reflect updated open-water surge and wave predictions. The causeway extension would provide only vehicle access to the seawater treating plant and would not constitute an extension of the existing dock offload facilities. The extended causeway would be breached with a 15-m (50-ft) clear-span bridge to allow fish passage (Figure B-6). The existing causeway to DH 3 would be expanded as shown in Figure B-5b to provide protection for the low-pressure seawater supply and fuel gas pipelines and the electrical distribution system cables. In addition, this expansion would accommodate two-way crawler traffic.

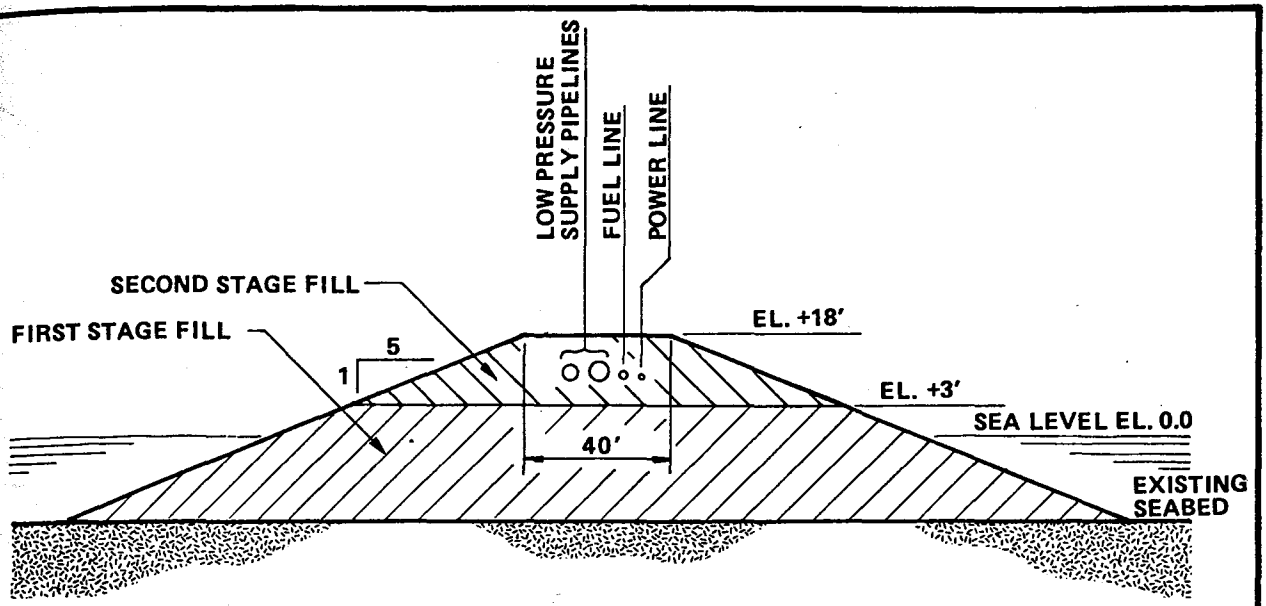
DH 3 would require a slight reorientation to the northeast to allow extension of the causeway to the seawater treating plant. This reorientation would utilize, for the most part, existing gravel at DH 3.

CONSTRUCTION

Gravel placement for the causeway extension and expansion would be accomplished in two increments. Initial placement for both would be in summer 1981. Pipeline construction and placement for the remaining gravel would be completed in 1982.

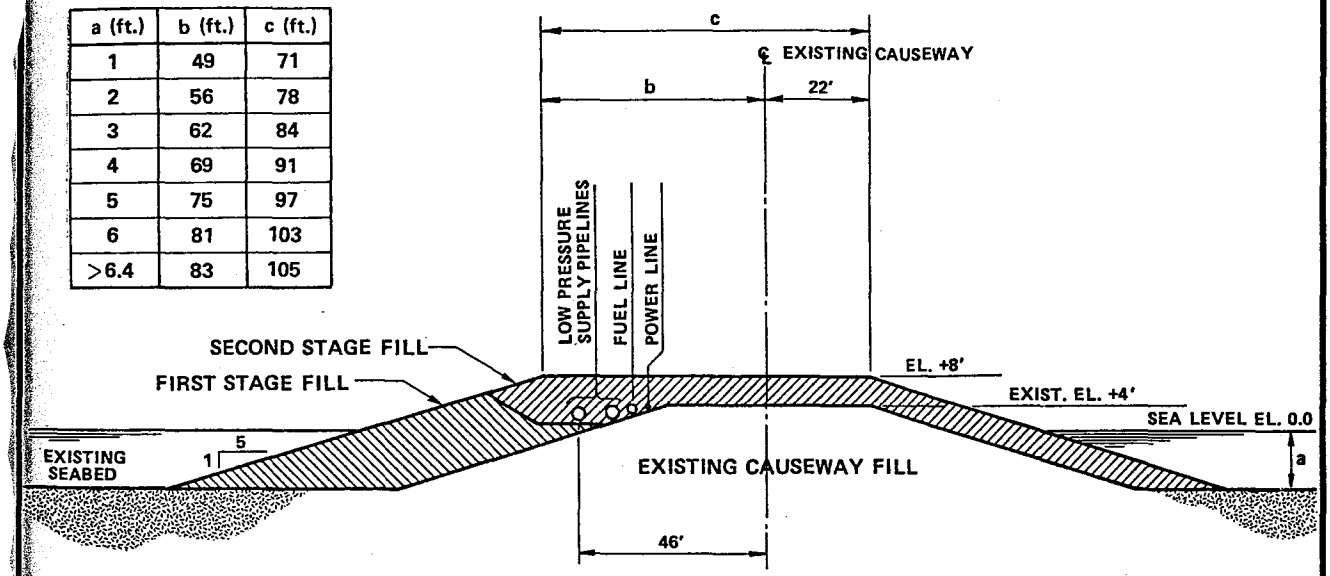
ICE FORCE DESIGN CRITERIA

The ice force criteria used in the design of the causeway extension and widening are summarized in Table B-2.



A. EXTENDED CAUSEWAY

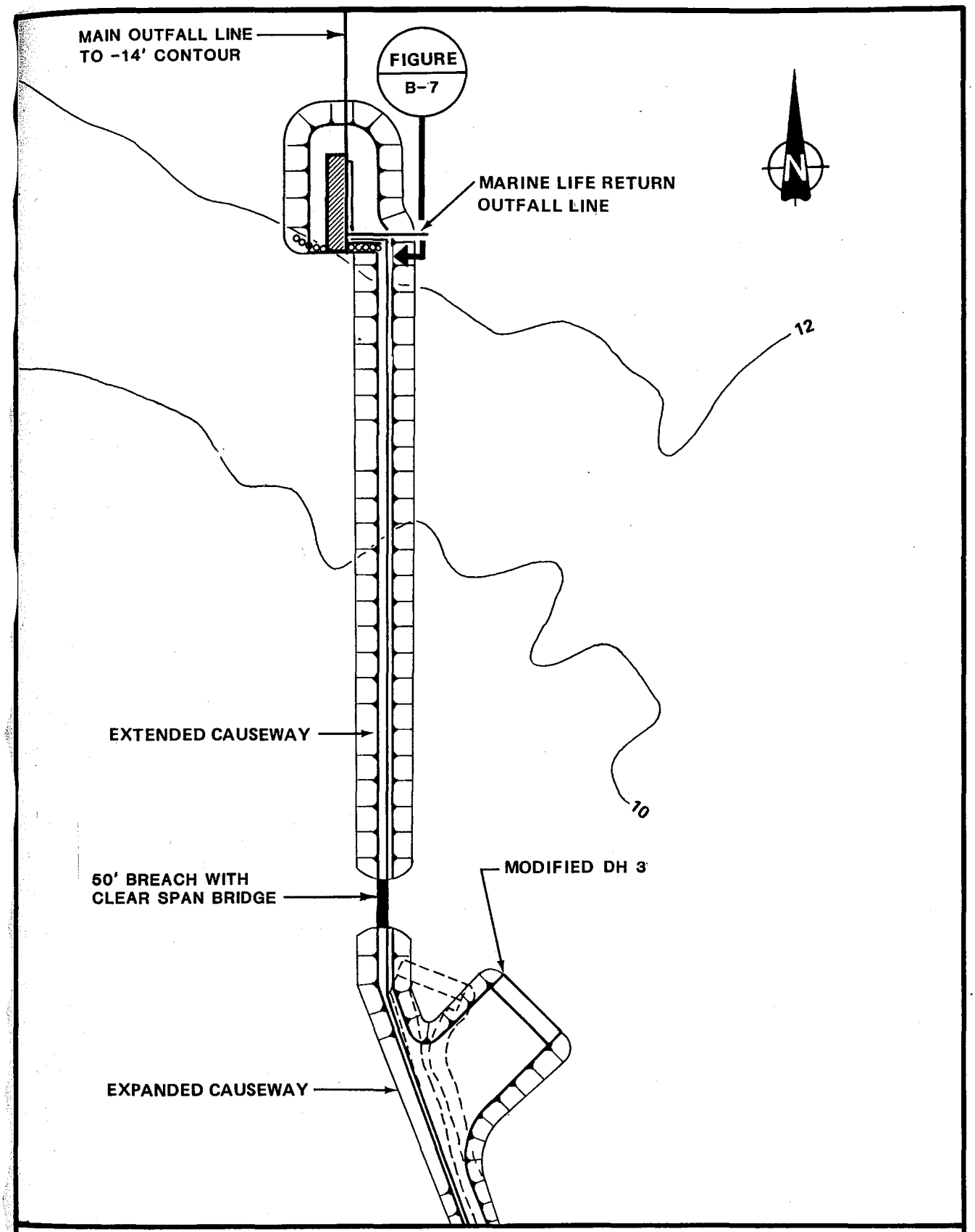
a (ft.)	b (ft.)	c (ft.)
1	49	71
2	56	78
3	62	84
4	69	91
5	75	97
6	81	103
>6.4	83	105



B. EXISTING CAUSEWAY

PROPOSED CAUSEWAY MODIFICATIONS

PBU Waterflood Environmental Impact Statement	Figure B-5



PROPOSED OUTFALL PIPELINES
LOCATION PLAN

PBU Waterflood Environmental Impact Statement	Figure B-6

4.0 OUTFALL PIPELINES

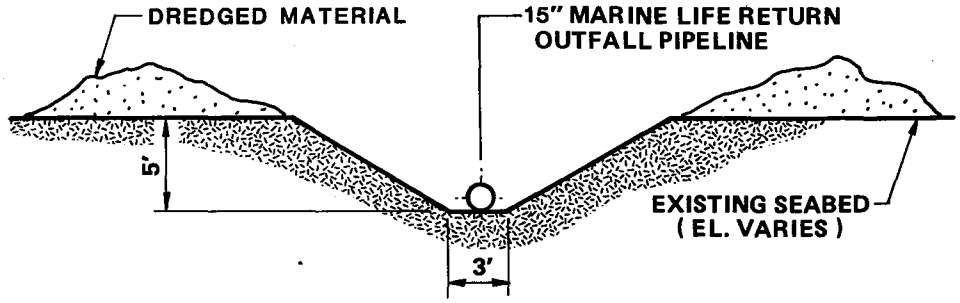
FUNCTIONAL DESCRIPTION

The main outfall pipeline would transport process effluents from the seawater treating plant to an outfall located approximately 300 m (1000 ft) north of the treating plant, in a water depth of about 4.3 m (14 ft). The marine life return outfall line would transport fish and other marine life removed from the traveling screens in the seawater treating plant inlet reservoir, to an outfall located approximately 150 m (500 ft) east of the seawater treating plant. Pipeline locations are shown on Figure B-6.

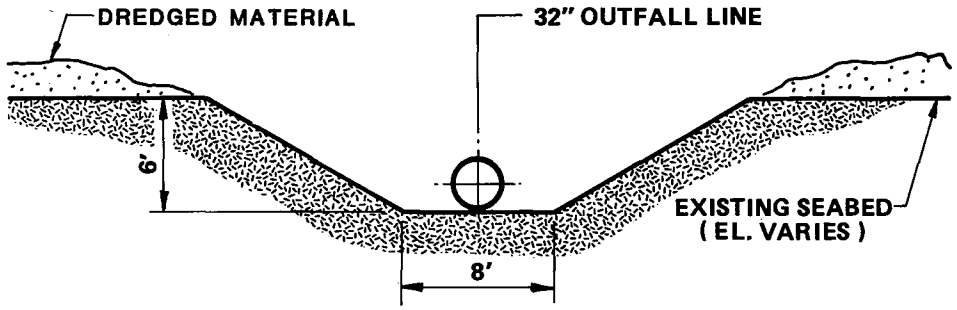
FACILITY DESCRIPTION

The main 81-cm (32-in, outside diameter) outfall pipeline would extend for about 300 m north of the treating plant, terminating at the outfall location (Figure B-6). It would be placed in a trench beneath the seabed at a depth lower than ice keels that have been known to penetrate the area (Figure B-7). The barrier islands and shallow water generally keep large masses of ice with keels from moving into the area. If the line did become damaged, however, it would be repaired as quickly as possible. Natural sediment deposition would be expected to backfill the trench within one or two open-water seasons.

The diffuser section would have 22, 15.2-cm (6-in) diameter nozzles, spaced 3 m (10 ft) apart. These diffuser nozzles would be located beneath the original seabed elevation, angled about 20° to the horizontal, and oriented parallel to the prevailing current (Figure B-8). This design would provide for dilution ranges of 10 - 15 within a radius of about 30 m (100 ft) of the point of discharge and 50 at the edge of the State of Alaska approved mixing zone.



MARINE OUTFALL

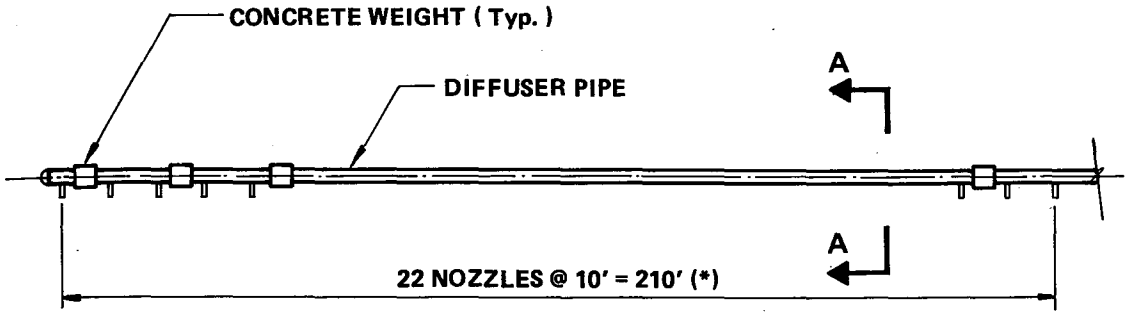


MAIN OUTFALL

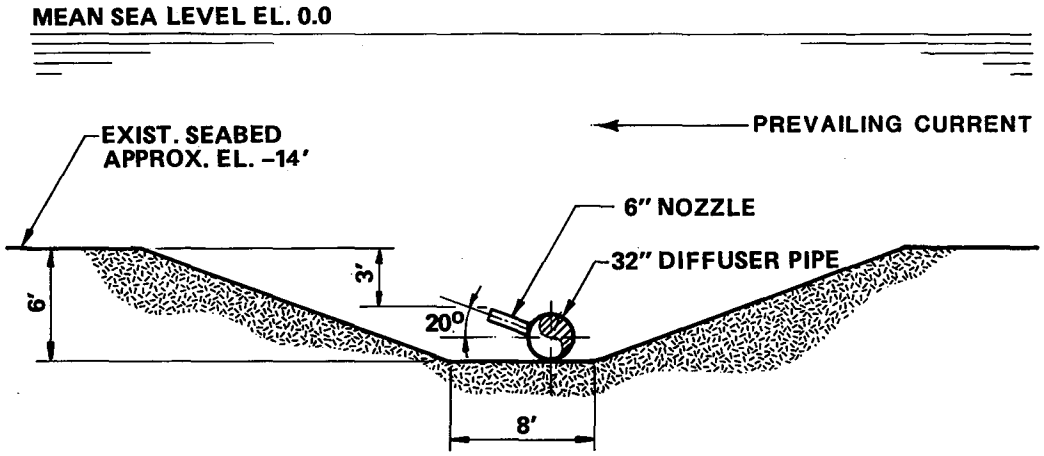
SECTIONS FROM FIGURE B-6

PROPOSED MARINE LIFE RETURN OUTFALL PIPELINE
&
PROPOSED MAIN OUTFALL PIPELINE

PBU Waterflood Environmental Impact Statement	Figure B-7



PLAN



SECTION A – A
NOT TO SCALE

(*) These dimensions to be verified.

PROPOSED MAIN OUTFALL PIPELINE DIFFUSER
PLAN & SECTION

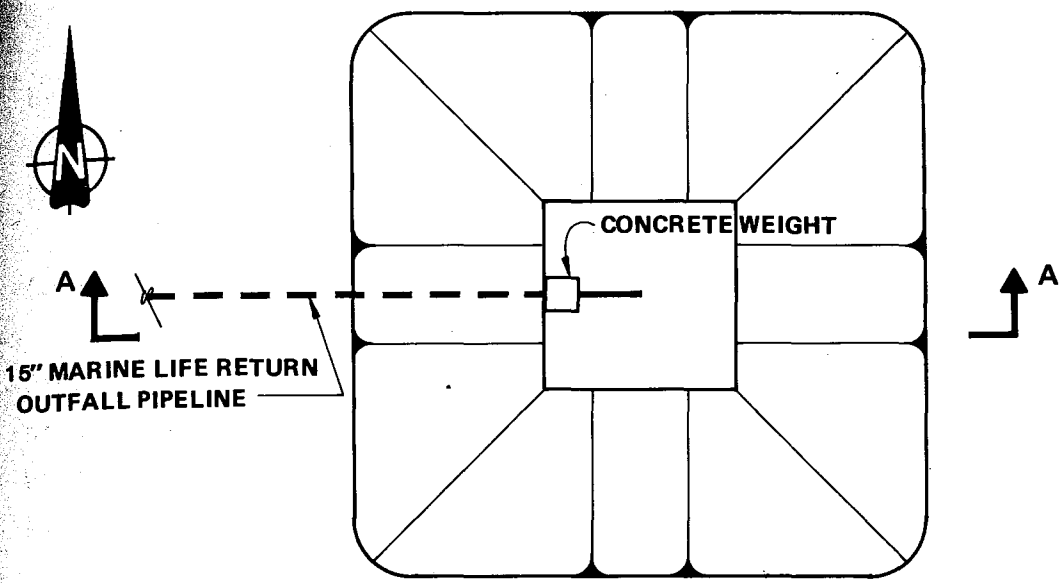
PBU Waterflood Environmental Impact Statement	Figure B-8

The coagulated particles within the effluent would be deposited over an area of 2.0 - 18.2 ha (5 - 45 acres) and would be further dispersed by summer wind and wave activity.

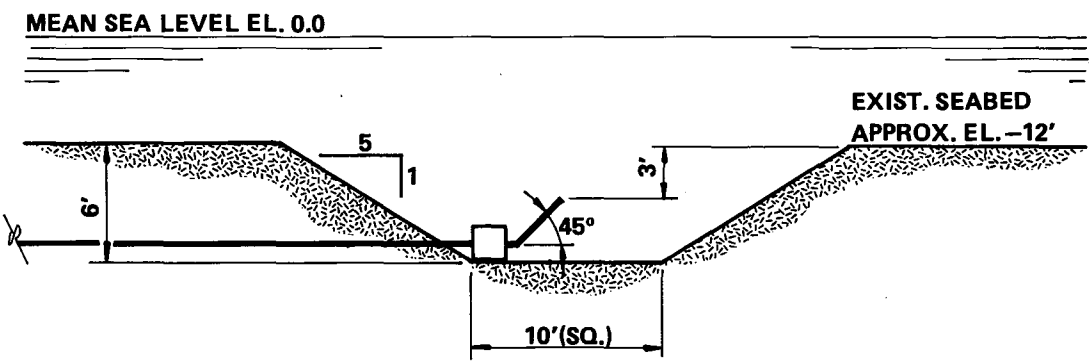
The maximum effluent flow rate in the main outfall line would be about 1.10 m^3/s (17,325 gal/min) and would be derived from three sources within the seawater treating plant. Most of the flow, 0.51 m^3/s (8080 gal/min), would result from filter backwashing operations. During maximum loading conditions when filters are not being backwashed, untreated seawater would be used to maintain the total flow rate at 1.16 m^3/s (18,360 gal/min). The strainer backwash contributes 0.44 m^3/s (7030 gal/min). The annual average effluent flow rate would be 0.19 m^3/s (2915 gal/min) since backwashing frequency would be considerably less than for the maximum condition and makeup water to maintain the flow rate would be used only during maximum loading conditions.

Effluent character would depend upon the seawater quality. During the open-water season, wave action greatly increases suspended solids concentrations in the seawater and consequently, would increase the total amount of effluent solids. The outfall design is based on this maximum case. Raw seawater conditions used in outfall effluent calculations are based on seawater sampling done during pilot filtration tests conducted during the summer of 1979, and on earlier periodic year-round sampling. Pilot tests were conducted at 2.4 m (8 ft), but samples were obtained at water depths from 2.4 - 6.7 m (8 - 22 ft). The data for the 2.4-m depth represent the most stringent load conditions and were used for design purposes.

The 38-cm (15-in) open-ended marine life return outfall line (Figure B-9) would be installed from the seawater treating plant to an outfall location approximately 150 m (500 ft) to the east as shown in Figure B-6. This line would transport fish and other marine life



PLAN



SECTION A – A
NOT TO SCALE

PROPOSED MARINE LIFE RETURN OUTFALL PIPELINE

PBU Waterflood Environmental Impact Statement	Figure B-9

back to the sea. The anticipated velocity in this line would be about 30 cm/s (12 in/s) with a discharge rate of about 1920 m^3/d (506,000 gal/d).

CONSTRUCTION

Pipeline materials would be trucked to Prudhoe Bay in the first quarter of 1982. Pipeline portions buried in the berm and submarine portions would be installed in 1982. Submarine pipelines would be assembled on the causeway extension, floated into position, and placed into a dredged trench by controlled sinking. The diffuser unit for the main outfall line would be connected after line installation and secured in place with concrete weights.

5.0 LOW-PRESSURE PIPELINES

FUNCTIONAL DESCRIPTION

The treated seawater low-pressure supply pipelines would have capacity to transmit the total flow rate of 4.07 m^3/s (64,506 gal/min) of seawater from the seawater treating plant to the injection plants. This total would be divided into 2.22 m^3/s (35,185 gal/min) to the east side of the field and 1.85 m^3/s (29,320 gal/min) to the west side.

FACILITY DESCRIPTION

One 102-cm (40-in) diameter insulated low-pressure seawater supply pipeline, about 20.8 km (13 mi) long, would be installed between the seawater treating plant and the east injection plant. Similarly one 96-cm (36-in) insulated line, about 16 km (10 mi) long, would be installed between the seawater treating plant and the west injection plant (Figure B-10). Both lines would start at the seawater treating plant and would be installed in the causeway extension and expansion as described in Section B-3. After reaching shore, the lines would be installed above ground, supported on pile bents. The clearance between

of freezing during normal operations when ambient temperature is -48.3°C (-55°F).

	Discharge Temperature	Reaction Time
Seawater Treating Plant to Injection Plants	4.4°C (40°F)	66 hours
Injection Plants to Intermediate Manifolds	8.9°C (48°F)	24 hours
Intermediate Manifolds to Well Pads	8.9°C (48°F)	16-36 hours

Shut-downs exceeding these reaction times may be tolerated if a higher ambient temperature prevails. In the event these times are approached and the previously described systems fail, the pipelines would be displaced with gas.

A batch of nonfreezing fluid would be introduced at the gas/liquid interface to prevent ice formation of any water bypassing the displacement pig. Displacement of the system would be as follows:

- Between the injection plants and seawater treating plant, water would be displaced toward the treating plant. Displaced water would be redistributed in the event of a single line evacuation. If both lines are to be evacuated, displaced water would be directed to the outfall line and discharged to the Beaufort Sea.

FUEL GAS

Fuel gas would be required for building and process heaters at the injection plants and at the seawater treating plant. Fuel gas would also be required for injection pump turbine drivers, for oxygen stripping in the seawater treating plant deaerators, and for line evacuation. The existing distribution system would service the injection plants, requiring only appropriate tie-ins at each facility. A new 30.5-cm (12-in) fuel gas supply line would be provided for the seawater treating plant. This pipeline would run from the CCP above ground on pile bents, parallel to the eastern low-pressure seawater supply pipeline, to the shore end of the causeway and would be installed concurrently with that line. The offshore portion would be buried in the causeway modification and extension and would be installed with the other buried pipelines.

POWER

Waterflood electric power of approximately 45 megawatts would be generated by the permitted capacity in the central power station. The waterflood facilities would operate at a medium-voltage level of 4160V and a low-voltage level of 480V. The existing electric distribution systems would serve the injection plants, intermediate manifold modules, well pad modules, and wellheads with the addition of substations and secondary line extensions. A new 69 kV distribution line would be required from the CCP to the seawater treating plant. Powerlines would be elevated to the base of the causeway and buried within the causeway. In addition to this field-connected power source, the individual facilities would be provided with emergency backup generators as required for life support and freeze protection systems.

PRESSURE VESSELS

Specifications on the pressure vessels for various waterflood facilities are provided in Table B-3. These are subject to change with better definition in detail design.

APPENDIX E

MARINE BIOLOGY

Replacement pages E-47 and E-48 are attached to reflect corrections and comments of the National.Marine Fisheries Service.

Replacement page E-54 is attached to reflect comments from the Village of Kaktovik.

Amphipods and shrimp were the main organisms consumed by humpback whitefish. In the fall spawning period few fish had empty stomachs and they continued to feed at 0.1°C (32°F) and 9 parts per thousand salinity (Kogl and Schell 1974).

A summer commercial fishery, which operates in the Colville Delta, took 1000 humpback whitefish (Alt and Kogl 1973).

Other Species

Other anadromous fish are not numerous enough to be of importance in impact assessment. Also, the species listed above are useful as indicators of the general habitat requirements of such species.

MARINE MAMMALS

Orientation

Sixteen species of marine mammals have been recorded in the Beaufort Sea and at least six additional species could enter the area (NOAA-BLM 1978). These species are listed as follows:

a. Year-Round Residents
   - Ringed seals (*Phoca hispida*)[1]
   - Bearded seals (*Erignathus barbatus*)[1]
   - Polar bears (*Ursus maritimus*)[2]

b. Summer Seasonal Visitors
   - Bowhead whales (*Belaena mysticetus*)[1]
   - Belukha whales (*Delphinapterus leucas*)[1]
   - Spotted seals (*Phoca vituliua largha*)[1]

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[1] Currently under protection of the National Marine Fisheries Service.

[2] Currently under protection of the U.S. Fish and Wildlife Service.

c. Special cases

Walruses (Odobenus rosmarus)[2]

Gray whales (Eschrichtius robustus)[1]

Arctic foxes (Alopex logopus)[4]

d. Other mammals (rare or low numbers)

Killer whales (Orcinus orca)[1]

Harbor porpoises (Phocoena phocoena)[1]

Narwhals (Monodon monoceros)[1]

Fur seals (Callorhinus ursinus)[1,3]

Northern sea lion (Eumetopias jubata)[1]

Hooded seals (Cystophora cristata)[1]

Harp seals (Phoca groenlandica)[1]

e. Chukchi Sea mammals that conceivably enter the Beaufort Sea

Humpback whales (Megaptera novaeangliae)[1]

Fin whales (Balaenoptera physalus)[1]

Sei whales (Balaenoptera borealis)[1]

Minke whales (Balaenoptera acutorostrata)[1]

Sperm whales (Physeter catadon)[1]

Ribbon seals (Phoca fasciata)[1]

Only limited marine mammal surveys have been conducted in the Prudhoe Bay project area. However, general observations of the Beaufort Sea area have indicated that the major species of concern in the Prudhoe Bay vicinity are:

Bowhead whales
Belukha whales
Bearded seals
Ringed seals
Polar bears
Arctic foxes

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[1] Currently under protection of the National Marine Fisheries Service.

[2] Currently under protection of the U.S. Fish and Wildlife Service.

[3] Harvest regulated by the North Pacific Fur Seal Commission.

[4] Managed by the Alaska Department of Fish and Game.

the entire Beaufort Sea. These sightings are the result of aerial surveys conducted mostly west of 150° W longitude. Although fewer animals were observed east of 150° W longitude, the paucity of sightings is thought to be directly proportional to the effort expended (i.e., less extensive aerial surveys). Numerous fall sightings have been made in nearshore shallow waters between Point Barrow and Smith Bay during the past 5 years, suggesting that this is an area of importance to bowheads. The whales appeared to be involved in feeding activity at the time of these sightings. It is not possible at this time to determine whether the western portion of the Beaufort Sea is more critical to the bowhead than the eastern portion. Limited surveys east of 150° W longitude have not established heavily utilized areas in the eastern Beaufort Sea, although it is certainly possible that these areas exist."

In October 1979, 11 bowheads were sighted within an area 16.6 km (10.3 mi) north and 11 km (6.9 mi) northeast of Cross Island. In addition, one bowhead was sighted 5.5 km (3.4 mi) north of Narwhal Island (Naval Ocean Systems Center 1980). Burns (1980) and Brewer (1980) reported that surveys by the Alaska Department of Fish and Game indicate no bowheads inside the barrier islands near Prudhoe Bay during spring migration because of extensive shorefast ice. The whales are well to the northeast by the time the shorefast sea ice melts in June. However, they indicated that whales do move closer to the barrier islands during fall migration and follow the "intermediate shelf." Bowheads are generally not expected inside the barrier islands during their fall migration; however, Jeffrey (1980) reports that Eskimo villagers have observed bowheads in waters as shallow as 3.7 m (12 ft) including areas inside the barrier islands.

Belukha Whales

The belukha (also spelled beluga) whales of the Beaufort Sea have been recently described by Klinkhart (1966), Smith (1974), Sergeant and Brodie (1975), Braham and Krogman (1977), Braham et al. (1977, 1979), and Fraker et al. (1978). Braham et al. (1979) provided information used in a synopsis by Swope (1979) as follows:

APPENDIX H

ENTRAPMENT, IMPINGEMENT, AND ENTRAINMENT IMPACTS

Appendix H has been revised to reflect changes in the applicant's proposed project, the latest engineering data, and the revised worst-case scenario.

APPENDIX H

ENTRAPMENT, IMPINGEMENT, AND ENTRAINMENT IMPACTS

1.0 INTRODUCTION

Potential impacts of operating the water withdrawal intakes would be those primarily concerned with the entrapment and subsequent handling or entrainment of marine life. Impingement is considered to be of secondary importance in the proposed system.

In this analysis, entrapment refers to the entry of marine life into the intake structure and emphasizes the prevention of the escape of organisms (USEPA 1977). Impingement is the blocking of larger organisms by a barrier, generally the screening system (USEPA 1977). Impingement is often lethal to fish due to stress (including exhaustion, starvation, and reimpingement), descaling (caused by screen contact or screen wash), or asphyxiation. Asphyxiation can occur due to removal from water (USEPA 1976) during rotation of travelling screens or when fish are forced against the screen for prolonged periods. Bypass or diversion devices, as proposed here, are defined as physical structures that are designed to alter flow conditions so that fish will be guided or diverted away from the main water flow, usually to a collection device or fish return system. Handling mortality refers to the death of marine organisms due to stress, asphyxiation, descaling, and hemorrhage, generally caused by mechanical damage from abrasion, pumping, or other effects of mechanical handling. Entrainment of organisms refers to those smaller organisms that are drawn through intake screening devices into pumps, strainers, and water treatment sections of the plant. It is assumed for all alternative intake designs that entrainment of organisms through the primary screening system would result in 100 percent mortality.

For all design alternatives, the intake would be designed to withdraw about 4.25 m^3/s (67,430 gal/min) of water. Reliability of the intake is a concern in the adverse and rather extreme operating environment of the Prudhoe Bay area.

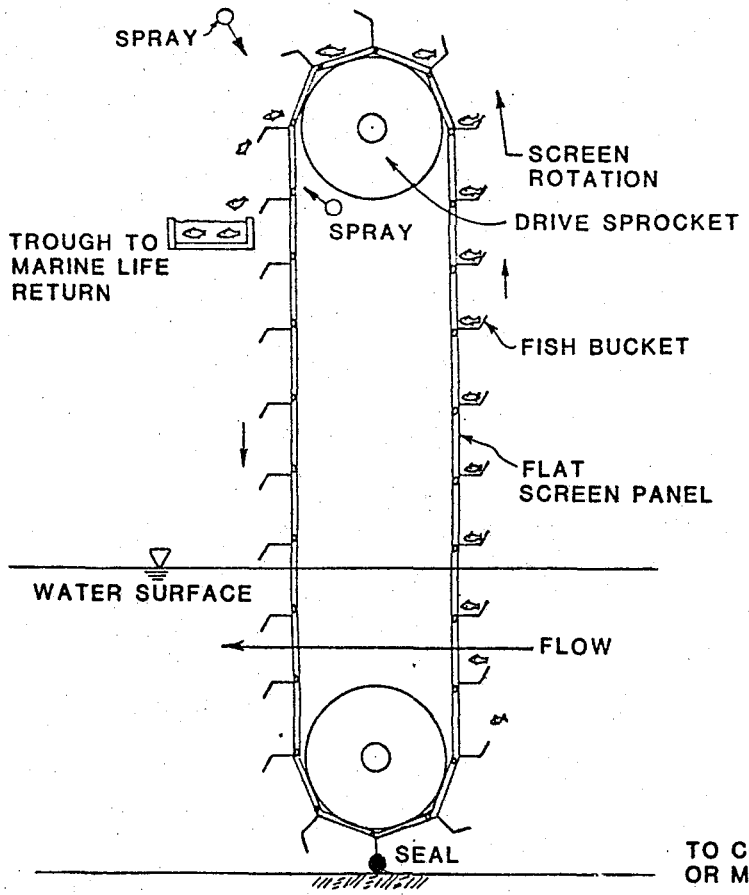
2.0 DESCRIPTION OF PROPOSED DESIGN

Approximately eight intake bays, as depicted in Figure H-1, are proposed (the exact number of bays will be determined by detailed engineering). Each bay would have an opening sized so that the bottom of the opening would be approximately 0.3 m (1 ft) above the seabed. Water velocity through this opening would be less than 15 cm/s (0.5 ft/s). A set of "trash bars" designed to block entrance of large submerged objects and ice would be situated in the underwater opening. These bars should not affect fish passage but might be heated to prevent icing.

It is planned (if practicable) to increase the water velocity in each channel to about 0.3 m/s (1 ft/s) to direct fish towards the fish bypass system (thereby reducing entrapment duration) and marine return line. The specific details of the channel velocity and configuration will be determined during detailed engineering design work now underway.

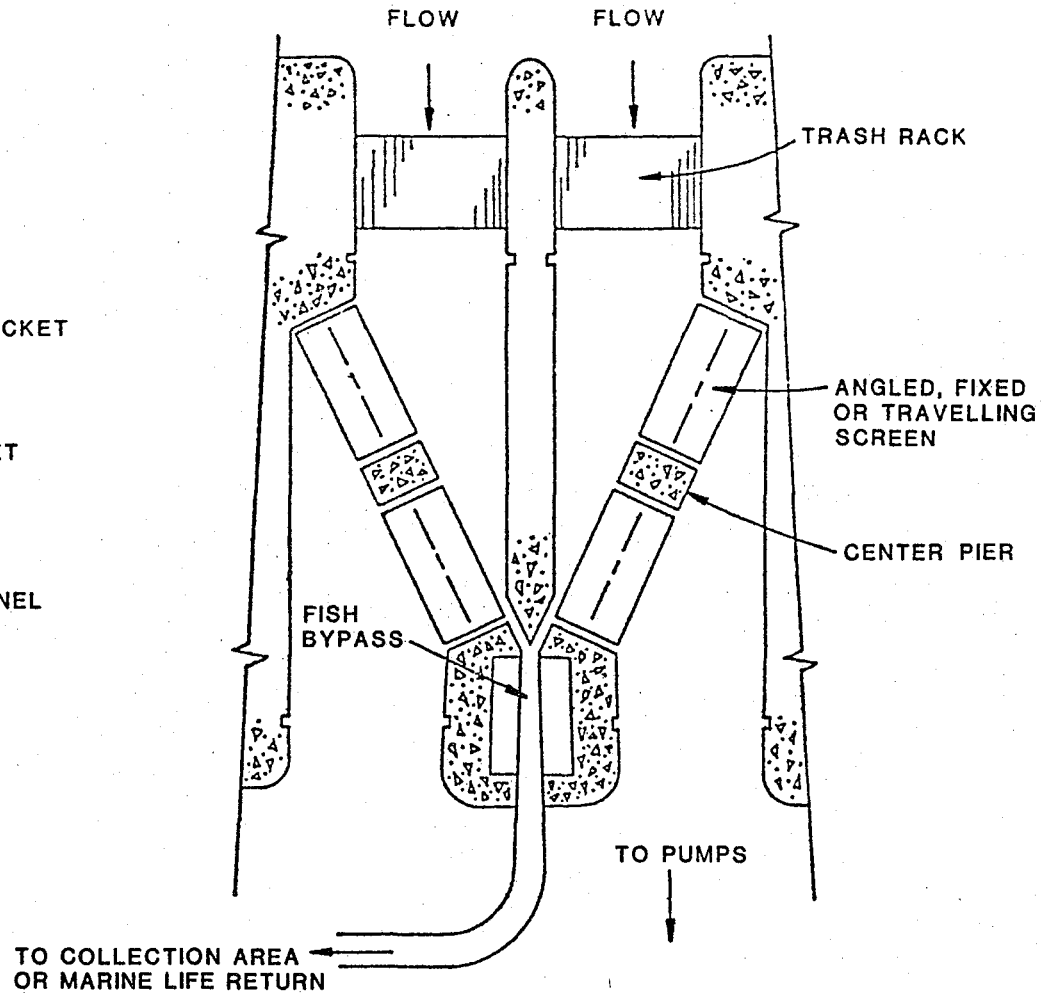
Warm water (approximately 21°C, 70°F) would be mixed into each channel through diffusers at a rate of about 0.06 m^3/s (2 ft^3/s) during much of the year to control ice buildup (actual flow to be determined by detailed engineering).

Angled screens would be used to divert fish to a bypass that would lead to a marine life return system. The screens could be fixed screens or vertical travelling screens set at a 25° angle to the channel flow (Figure H-1 and Alternative B schematic on Figure H-2). The screens would be 9.5-mm (3/8-in) by 25.4-mm (1-in) bar screen made of T316 grade



ALTERNATIVE A

VERTICAL TRAVELLING SCREENS
(TYPICAL SIDE VIEW)

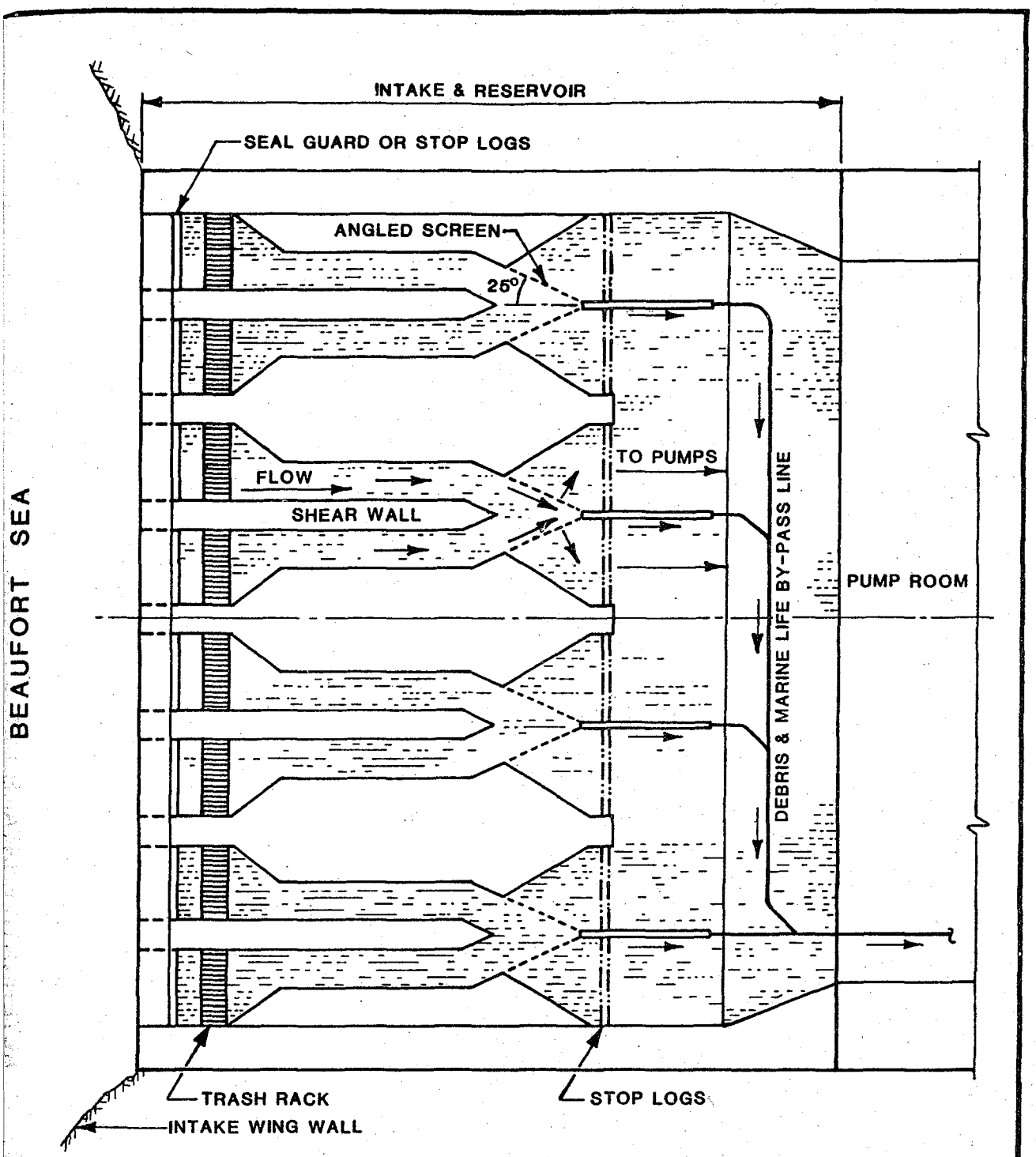


ALTERNATIVE B

FISH BYPASS SYSTEM WITH ANGLED SCREENS
(TYPICAL PLAN VIEW)

Figure H-2

ALTERNATIVE INTAKE DESIGN CONCEPTS



PROPOSED INTAKE SYSTEM SHOWING
MARINE LIFE BYPASS WITH EIGHT FIXED SCREENS

PBU Waterflood Environment Impact Statement	Figure H-1

stainless steel. The final design details will be determined during detailed engineering design.

3.0 BIOLOGICAL IMPLICATIONS

ENTRAPMENT

The USEPA (1976) has recognized the potential for adverse impacts associated with approach channel intakes similar to that proposed if a means of bypass is not provided. They note that setting screens back in a channel increases the potential for entrapment as does the use of a wall ("skimmer wall") of the type envisioned to allow water withdrawal from under the ice near the bottom. USEPA (1976) states that these walls create non-uniform velocities and entrapping dead spaces. They further state, "fish will not usually swim back under the wall to safety." USEPA (1976) recommends a fish guidance and bypass system as an alternative. This has been incorporated in the present design. The placement of the screens in the channel and the hydraulics are being evaluated to reduce impact to the extent practicable.

The overall potential for fish entrapment by the proposed design should be low. Behavioral entrapment would be more significant than velocity entrapment. Entrapment would vary seasonally and among species. Organisms would be exposed to the lowest velocities at the entrances to the intake channels. However, the major fish species present at the proposed intake location are not expected to be vulnerable to velocity-induced entrapment at the entrance as adults or large juveniles.

The velocity at each channel entrance would be no greater than 15 cm/s (0.5 ft/s). This velocity has been cited as a swimming speed attainable by many species of small fish and the mean cruising speed of all young salmon at low temperatures (USEPA 1976). In addition, tests on several

species of cod and the longhorn sculpin (same genus as fourhorn sculpin) determined that they had sustained swimming capacities substantially greater than 15 cm/s (Beamish 1978). Temperature has also been shown to have little or no effect on burst speed (the highest speed fish can maintain for 20 s or less) (Beamish 1978). Almost all fish tested had burst speeds of at least 15 cm/s.

In particular, anadromous fish would be less vulnerable to intake entrapment than marine species. Anadromous fish are present in the Beaufort Sea primarily during the open-water season, usually as older, larger fish. Therefore, when it is possible for these fish to encounter the intake, their sustained swimming capacity would be well in excess of 15 cm/s (0.5 ft/s).

Smaller fish (particularly larvae), plankton and meroplanktonic macroinvertebrates would probably pass more or less passively into the intake channels. These organisms would probably enter in roughly the same concentrations as their density in the water column. Motile benthic macroinvertebrates (e.g., Saduria) would move freely on the hard substrate provided by the intake structure and could move into and out of the entrance to the intake channel along that substrate.

Some larger fish may enter the intake channels "voluntarily." Fish have been found to orient to intake structures (Lifton and Storr 1977), and have been observed swimming around many kinds of submerged structures and into and out of water withdrawal intakes. Tarbox and Thorne (1979) indicate fish (arctic cod) in the project area are attracted to structures.

Since the opening to the intake channel would be near the bottom, pelagic species would be less likely than demersal fish to enter and become entrapped. However, if pelagic species should enter the intake, they would be less likely to find the low entrance and escape.

schooling species, such as arctic cod, may have a greater potential for entrapment than non-schooling fish, as schooling fish would likely enter the intake in greater numbers at a given time.

The advantage of a fish diversion or bypass system is that it provides a means of removing fish with reduced handling and mortality.

FISH DIVERSION

It is important to remove entrapped fish from the various intake channels quickly and with as little stress and mortality to the fish as practicable. The proposed method utilizing the angled screen concept does this. It is a very desirable method of handling fish since fish are not impinged and therefore suffer considerably less stress than a conventional screening system. In this system, travelling screens or fixed screens are placed at an angle to the flow of water. Fish travel along the screens rather than become impinged and are led to a bypass area where they are returned to the water body with relatively little handling.

Studies of both fixed and travelling angled screens have indicated that these devices are highly effective in diverting fish at many life stages. Studies of the bypass of fish 25 - 150 mm (1 - 6 in) in length were conducted for a number of large power plants (Taft et al. 1976). It was found that an angled 9.5-mm (3/8-in) screen oriented at 25° to the main flow was able to bypass 100 percent of the fish tested. Of the fish bypassed, there was 96 percent one-week latent survival (Taft et al. 1976). Studies of other species, including Atlantic tomcod (Microgadus tomcod), 50 - 150 mm (2 - 6 in) in length, also achieved 100 percent bypass (Stone and Webster 1976b). Angled screens have also been utilized at a number of hydroelectric facilities. Gunsolus and Eicher (1970) reported on the screens at the Northfork Project. At the

Mayfield Dam (Washington State), Thompson and Paulik (1967) reported that they obtained 100 percent guidance efficiencies by covering an angled louver system with woven mesh screening.

The use of the diversion effectively eliminates impingement and the major part of entrapment stress as contributors to fish mortality.

Any fish large enough to be retained by the screens would be diverted and bypassed. Experience with field studies of fish diversion by screens has also indicated that in bypass designs, even many fish smaller than those large enough to be retained by the screens can be diverted as well. Most data on the ability of fish to be retained by screens have been developed in relation to screens where impingement is the primary consideration. By utilizing this same criterion, the size of fish that would be bypassed by the proposed system would be estimated conservatively. That is, these data would overestimate the minimum size of fish that would escape entrainment and be bypassed.

Tests of retention on mesh screens indicated that the body depth of a fish was the factor most responsible for determining if a fish was large enough to be retained on a screen (Tomljanovich et al. 1978). Existing fish size distribution data from the Prudhoe Bay area are based on length. Studies by Dames & Moore (1979) indicated that certain species of fish more than several centimeters long could pass through a 9.5-mm (3/8-in) screen. Kerr (1953) found that 9.5-mm (3/8-in) woven square mesh screening could retain chinook salmon or striped bass as small as 51 mm (2 in) long. A review by Sonnichsen et al. (1973) indicated that fish of lengths between about 58 - 84 mm (2.3 - 3.3 in) are the smallest fish that would be retained by a 9.5-mm (3/8-in) screen, depending upon the body length to depth ratio of the fish. Analysis of Kerr's (1953) data shows that a body depth of about 13 mm (1/2 in) is necessary to preclude entrainment through the screens. Based upon data contained in Morrow (1980), the anadromous salmonids found in the vicinity of the

intake will be large enough to be retained upon the screens. The two most common marine species expected to be vulnerable to the intake are the arctic cod and the fourhorn sculpin. A substantial number of the arctic cod found near the proposed intake site were relatively small in size (<70 mm, 2.8 in, total length) (Moulton et al. 1980, Tarbox and Moulton 1980, Tarbox and Spight 1979). The body depth of these fish (Morrow 1980) would make them vulnerable to entrainment rather than impingement.

Fourhorn sculpins were not as abundant as arctic cod in the vicinity of the intake. The size range (total length) in the general area included fish vulnerable to entrainment and those large enough to be retained on the screens. Fish larger than 52 mm (2 in) total length should be large enough to be retained upon the screens.

It is therefore probable that other species of fish smaller than 50 - 60 mm (2 - 2.3 in) in length reaching the screens would be entrained. Fish over 100 mm (3.9 in) are large enough to be retained on similar sized screens. Fish between 60 - 100 mm in length (2.3 - 3.9 in) may fall into either category, depending upon general fish body shape and, in particular, body depth, with anadromous fishes of this size not being entrained, and smaller arctic cod passing through the screens.

MARINE LIFE RETURN SYSTEM

Once fish are guided or diverted to the bypass leading to the marine life return system (Figure H-2B), they will be transported back to the ocean through the return system. The marine life return system will use a water velocity of at least 1.2 m/s (4.0 ft/s) to transport fish through a pipe system to the ocean. The flow will be maintained by an impeller-type fish pump. This velocity would be sufficient to

swiftly transport fish back to the water body, and should be very effective for the size of fish expected to be found near the intake.

For later life stages, survival of an impingement and return system has been shown to be relatively high. At the VEPCO Surrey Station, survivals average 93.3 percent (White and Brehmer 1976). Murray and Jinnette (1978) have found survivals of 86 percent of older fish and invertebrates in a center-flow screen system. Therefore, it may be conservatively expected that 86 percent or more of those older fish and larger invertebrates bypassed by the screens would survive and be returned alive to the water body. This would reflect 95 percent survival of the diversion bypass and 90 percent survival of the return system. These literature survival data reflect both impingement and return system survival. It should be noted that fish in this bypass system would not be subject to the stress of impingement and would probably exhibit survivals of over 90 percent. Tests by Taft et al. (1976) and Stone and Webster (1976a, 1976b) found 1-week survivals over 96 percent for bypassed fish returned to a holding and collection tank.

IMPINGEMENT

Impingement is not considered to be an important problem for a guidance-diversion fish bypass system. Similar systems, such as those tested by Stone and Webster (1976a, b), Taft et al. (1976), and Thompson and Paulik (1967) had 100 percent bypass.

In tests by Thompson and Paulik (1967), impingement only occurred when the bypass was closed off. There were, occasionally, fish that showed signs of abrasion.

ENTRAINMENT

The entrainment of smaller organisms through the screens would be in proportion to their density in the water body. In general, data are not sufficent to estimate year-round losses of phytoplankton and zooplankton (other than ichthyoplankton). It should be pointed out, however, that only a small percentage of the water present in the intake vicinity would be withdrawn. This would insure a relatively small entrainment loss.

Since some data on ichthyoplankton abundance are available (Tarbox et al. 1979, Tarbox and Moulton 1980, Tarbox and Spight 1979), a quantitative estimate of entrainment losses was made based on the volume of water withdrawn from the Beaufort Sea and the density of fish eggs and larvae found in the vicinity of the proposed intake. The actual entrainment of the ichthyoplankton by the intake would vary depending upon weather conditions, and consequent hydrographic conditions. The presence of various offshore water masses of differing salinities greatly affects the numbers and taxa of organisms present (Tarbox and Moulton 1980), and therefore estimates prepared in this manner should be used as a guide to the expected level of entrainment and not as definitive answers.

Calculation of Potential Entrainment

The results of an estimate of potential entrainment of fish eggs and larvae are shown in Table H-1. These estimates are based upon a flow of 4.25 m^3/s (67,430 gal/min) through the intake. This volume represents a daily intake of about 0.09 percent of the volume of water inside the 6-m (20-ft) isobath between the mouths of the Sagavanirktok and Kuparuk Rivers (based on surface area calculations of Tarbox and Spight 1979). It was assumed that all larvae present in water drawn through the intake would be entrained. Densities of eggs and larvae present in the

TABLE H-1

POTENTIAL 6.5-MONTH ENTRAINMENT OF FISH EGGS AND LARVAE BY THE PROPOSED INTAKE BASED UPON DATA COLLECTED FROM FEBRUARY 13 THROUGH SEPTEMBER 1, 1979

Taxon	Estimated Number Entrained
Eggs	5,856
Larvae:	
Arctic Cod[a]	239,648
Fourhorn Sculpin	163,220
Snailfish[b]	397,179
Unidentified Larvae	6,076
Total Larvae	806,122

[a] Includes larvae definitely and tentatively identified as arctic cod

[b] Includes larvae definitely and tentatively identified as snailfish

proposed intake area were based upon data presented by Tarbox and Moulton (1980) and Tarbox et al. (1979). Tarbox et al. (1979) collected pump samples periodically from the site of the proposed intake from February 13 through May 3, 1979. Eggs were the only early life history stage of fish collected. Tarbox and Moulton (1980) collected ichthyoplankton and zooplankton with a tow net at six stations near the proposed intake periodically from July 17 through September 1, 1979. Fish larvae only were analyzed. Of the stations sampled, Stations 1 and 3 were located nearest the site of the proposed intake; therefore, the averages of near-bottom densities at these two stations were used in calculating potential entrainment.

To calculate the potential number of eggs and larvae entrained, the time covered by the two programs was broken into a number of periods. These periods corresponded to sampling dates and time spans between sampling dates. In both studies, samples were not taken on a daily basis; therefore, ichthyoplankton density in a period between sampling dates was estimated as the average of densities on the end-point dates for that period. Near-bottom densities in each period were multiplied by the number of days in a period times the daily intake volume of 409,536 m^3 (14,462,625 ft^3); this yielded the numbers of eggs and larvae entrained during each period. These quantities were summed over the time span covered by the sampling programs to yield total potential entrainment from February 13 through September 1, 1979.

By these estimates, 239,648 arctic cod larvae would have been entrained by the proposed intake during the 6.5-month period for which these estimates were made. Using data for North Sea cod cited by Cushing (1973), 1 percent is a reasonable estimate of survival from larvae to age 2. Assuming 1 percent survival from larvae to reproducing adult, 2396 adults would potentially have been removed from the arctic cod population present in the Prudhoe Bay area. This represents less than 0.01 percent of the conservatively estimated 28 million arctic cod

present in the Prudhoe Bay area in 1978 (Tarbox and Spight 1979). These data are based on only one-half year's sampling as an additional measure of conservatism for the reasonable worst case, and because of the known preference of arctic cod larvae and juveniles for near-bottom waters and for artificial structures, an order of magnitude safety factor has been added to increase the estimated loss rate to 0.1 percent of the standing stock in the area. Even at this rate, cropping by entrainment should not noticeably reduce the numbers of arctic cod present in the Prudhoe Bay area. Although calculations were not made, a similar loss rate due to entrainment can be assumed for other marine species, such as bartail snailfish and fourhorned sculpin, that have planktonic larvae.

4.0 SYSTEM ALTERNATIVES

SCREENING SIZE

The size of fish that may be bypassed by the screens and returned to the water body via the marine life return system will depend on the screening size. In order to protect as many fish as feasible it would be desirable to use screening with a smaller opening size. Screens with finer openings to retain smaller juveniles as well as larger larvae have been investigated by Murray and Jinnette (1978), Tomljanovich et al. (1977), Sazaki et al. (1972), and Skinner (1974). It has been shown that high survival of even delicate species is obtainable. However, in the project area, icing is expected to be greater for smaller screen sizes and reliability correspondingly reduced.

Studies have been conducted to determine if the use of fine screen diversion and bypass is feasible. Guidance of younger life stages and smaller fish is obtainable also. Work by Prentice and Ossiander (1974)

with angled horizontal screens showed that they could achieve 97 percent diversion of 70 - 170-mm (3 - 7-in) salmonid fingerlings.

Work by Heuer and Tomljanovich (1979) showed that for very small larvae (mean length less than 15 mm, 0.6 in), substantial numbers could bypass fine opening screens, even when not set at an angle. Work reviewed by Pavlov and Pakhorukov (1973) in the USSR included studies on fine-mesh fish diversion screens employed in both laboratory and prototype studies. These showed that bypass of 10 - 40-mm (0.4 - 1.6-in) fish could be achieved with up to 97.6 percent efficiency, depending upon approach velocity and bypass flow.

ALTERNATE SCREENING SYSTEMS

An alternate screening system would have the vertical travelling screens oriented at 90° to the flow. One set of vertical travelling screens would be located at the interior end of each channel (Figure H-2, Alternative A). Each travelling screen would be 2.9 m (9.5 ft) wide and extend from the channel bottom to a vertical height of 12.2 m (40 ft). The screening surface would be composed of panels of 9.5-mm (3/8-in) by 25.4-mm (1-in) opening "mesh" made of T316 grade stainless steel. Velocity through the screens would be 7 cm/s (0.24 ft/s). Water withdrawal pumps would be located sufficiently far back from the screens to assure uniform velocities and flow through each screen set.

The screen panels would be fitted with fish buckets and the screens would operate continuously. Depending upon the debris loading conditions experienced, one of two available screen speeds would be used: either 0.76 m/min (2.5 ft/min) or 3.05 m/min (10 ft/min). A dual screen wash system would be utilized. A fish removal wash, consisting of a 20 lb/in^2 gauge water jet, would wash marine life into a marine life

return line. A 70 lb/in^2 wash would remove debris from the screens into a separate sluice for return to the water body.

Specific numbers, dimensions, etc., given in this section reflect the applicant's preliminary design and may be altered somewhat during final design stages.

In this system, once fish enter the intake channel they would either leave through the opening or remain within the intake channel until they tired or otherwise became impinged upon the travelling screens. The travelling screens would provide the only other exit from each of the intake channels. The velocity of water flowing though the travelling screens would be low (7 cm/s, 0.24 ft/s). Smaller fish that generally have lower swimming capacities and physiologically impaired fish are more likely to become impinged.

Survivals would be expected to be lower than those for the diversion-bypass system due to much greater handling of fish and could be expected to be on the order of 72 percent. That is, 80 percent survival of the impingement experience and 90 percent survival of the return system (0.80 x 0.90 = 0.72, or 72 percent).

An alternative travelling screen system that is used commercially in Europe and at one power plant in the United States is the center-flow type screen. This screen system is described by USEPA (1976). Each center-flow screen would be oriented parallel to the approaching water flow. Water would enter the screens through a central "keyhole" or entrance port and would exit through both the ascending and descending screen faces. The system consists of a series of semi-circular screen baskets that increase the filtering area of the screen and allow easy installation of fish buckets. This system uses an overhead wash system that washes debris and organisms into the return sluice. The center wash makes it possible to retrieve organisms more gently than

with many other systems. In operation, this system has been shown to allow high fish survivals (Murray and Jinnette 1978). Laboratory tests also have indicated that high survivals of juveniles and larvae may be expected (Tomljanovich et al. 1977, 1978).

Due to the geometry of these screens, the highest water velocities occur at the screen entrance port or "keyhole". Depending upon the geometry of the specific screen installation, the "keyhole" velocity may be 2 - 3 times greater than the intake channel velocity or the approach velocity to the screens. In some installations this would be a disadvantage; however, in the alternate system application this would provide a means of removing entrapped fish from the intake channels and sending them to the marine life return system with less stress and subsequently lower mortality than the 90° vertical travelling screen system. This system would be considerably more efficient than the conventional travelling screen design at removing fish. There are other mechanical, engineering, and cost advantages to the use of this system as well. This system has not been shown to provide the higher levels of fish survival provided by the proposed fish diversion-bypass system.

DETERRENCE

It may be possible to deter fish from actually entering the intake channel entrance by use of a behavioral device such as an air bubble curtain. These devices have been used at several locations to divert fish and have had mixed success. The efficency of these systems may vary according to temperature, light intensity, and fish species. Research by Bibko et al. (1974) and Stone and Webster (1976a) showed that an air bubble curtain could be effective in deterring fish from entering an intake. Studies at other types of intakes under turbid water conditions (Lieberman and Muessiy 1978) have indicated no effect

on impingement. An air bubble curtain may, however, have an additional use of keeping certain types of ice out of intake channel entrances.

Potential problems associated with use of this type of deterrent under arctic conditions have never been fully evaluated.

MARINE LIFE RETURN SYSTEM

Use of a jet pump, rather than the proposed impeller pump to induce flow in the marine life return system would greatly reduce the chances of mechanical damage to fish. As discussed previously, the 1.3-m/s (4-ft/s) water velocity in the marine life return life has the advantage of being high enough to overcome the expected swimming capacities of several of the species that may be expected to be placed in the system. Studies of usable fish return line velocities (Taft et al. 1976) showed that minimal mortality was suffered by fish in a return system utilizing velocities up to 2.4 m/s (8 ft/s). At that velocity, maximum residence time in the marine return line would be less than 76 s and the system would be capable of even more quickly removing all species encountered. Another advantage to higher velocities would be a reduction in the potential for biofouling in the return line due to high velocity scouring (Office of Saline Waters 1973).

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APPENDIX L

TERRESTRIAL HABITAT MAPPING AND EVALUATION

Habitat classification changes as a result of ground truthing during the summer of 1980 resulted in substantial changes in the habitat maps of both the low-pressure pipeline corridors and several of the drill pad sites. The most common change was from the wet graminoid tundra (Va) to moist graminoid tundra (IV). Only relatively few changes occurred within the proposed pad expansion areas or road/pipeline corridors. These pad expansion areas include west side well site S, well site Y, and WF-1; east side well sites 14 and 16. Changes within the pipeline corridors, although measurable, are probably insignificant considering the method used to determine the actual pipeline routes and the width of the right-of-way. The increases and decreases in overall habitat value for the western corridor canceled each other, but there was an increase in the low quality habitat and a decrease in the low moderate habitat (0.9 hectares).

SUMMARY OF SIGNIFICANT CHANGES

	Change	Area (hectares)*
INJECTION WELL SITES		
West Side		
Pad S	Va to IV	5.6
Pad Y	Va to IV	0.2
WF-1	Va to IV	0.7
East Side		
Pad 14	Va to IV	0.4
Pad 16	Va to IV	0.9
PIPELINE CORRIDORS		
East	Va to IV	0.90
	I to VIII	0.03
	VIII to IV	0.02
	VIII to IV	0.09
	X to VIb	0.04
West	Va-VI to IV	0.09
	IV to Va	0.62
	Va to IV	0.65
	Va to IV	0.38

*Corrected to area directly used by waterflood.

Corrected pages attached.

SURFACE AREA OF WETLAND AND OPEN-WATER HABITATS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Wetlands	Open Water	Non-Wetland	Total
Injection Well Sites West Side					
A	50	0.4(b)	0.4	0	0.8
B	25	1.3	0.3	1.7	3.3
D	30	1.4	0.2	0.2	1.8
E	--	0	0	0	0
F	20	0.7	T(c)	0	0.8
H	--	0	0	0	0
M	30	1.7	T	0.1	1.9
N	10	0.2	T	0.1	0.4
Q	--	0	0	0	0
R	--	0	0	0	0
S	100	0.2	0.2	9.4	9.8
X	35	1.7	0.2	0	1.9
Y	35	1.3	0.4	0.2	1.9
WF1	100	10.3	0	0.9	11.2
Injection Well Sites East Side					
2	10	0.9	T	0.7	1.7
3	12	0.6	0	0.3	0.9
4	10	2.1	0	0	2.1
5	14	0.4	T	0.4	0.9
7	13	0.6	T	0.3	1.0
9	12	2.0	0.2	0.4	2.6
11	1	0.2	0	0.1	0.3
12	23	0.9	0	0	0.9
13	12	0.8	0.1	0.5	1.4
14	13	0.6	0.1	1.1	1.8
15	11	0.6	T	0.2	0.9
16	15	1.2	0.1	1.1	2.4
17	19	1.6	0.3	0.4	2.3
18	17	1.2	0	0.2	1.4
Intermediate Manifolds					
2W	100	0.8	0	0	0.8
3W	100	0.5	0	0.3	0.8
2E	100	0.2	0	0	0.2
3E	--	0	0	0	0
West Low-Pressure Pipeline Corridor	100	6.4	0.2	4.6	11.2
East Low-Pressure Pipeline Corridor	100	3.1	1.6	4.8	9.5
Gravel Sites Putuligayuk North	100	0	6.3	28.4	34.7
Putuligayuk South	100	5.5	T	10.8	16.3
West Injection Plant	100	1.6	0	1.0	2.6
Totals		51.3	11.0	68.2	130.5

(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

TABLE L-16

SURFACE AREAS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES--PRIMARY PRODUCTIVITY
(OPEN-WATER, PONDED AREAS, AND AREAS DISTURBED BY GRAVEL MINING NOT INCLUDED)

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Productivity Rating High	Moderate	Low	Total
Injection Well Sites West Side					
A	50	0.4[b]	0	0	0.4
B	25	0.5	1.8	0	2.3
D	30	1.3	0.1	0.1	1.5
E	--	0	0	0	0
F	20	0.5	0.2	0	0.7
H	--	0	0	0	0
M	30	1.7	0	0.2	1.9
N	10	0.2	0.2	0	0.4
Q	--	0	0	0	0
R	--	0	0	0	0
S	100	0.2	9.4	0	9.6
X	35	1.7	0	0	1.7
Y	35	1.3	0.2	0	1.5
WF1	100	10.3	0.9	0	11.2
Injection Well Sites East Side					
2	10	0.8	0.6	T[c]	1.4
3	12	0.3	0	0.4	0.7
4	10	0.6	0.1	0	0.6
5	14	T	0.8	0	0.8
7	13	0.4	0.3	T	0.7
9	12	0.6	0.3	0.1	1.0
11	1	0.2	T	T	0.2
12	23	0.3	0	0	0.3
13	12	0.3	0.4	0	0.7
14	13	0.4	0.7	0	1.1
15	11	0.6	0.2	0	0.8
16	15	1.2	1.1	0	2.3
17	19	1.6	0.5	0	2.1
18	17	1.2	0.1	0	1.3
Intermediate Manifolds					
2W	100	0	0	0	0
3W	100	0.5	0.3	0	0.8
2E	100	0.2	0	0	0.2
3E	--	0	0	0	0
West Low-Pressure Pipeline Corridor	100	6.4	4.3	0.3	11.0
East Low-Pressure Pipeline Corridor	100	2.6	4.8	0.1	7.5
Gravel Sites Putuligayuk North	100	0	0	34.7	34.7
Putuligayuk South	100	0	1.4	0	1.4
West Injection Plant	100	3.7	2.3	0	6.0
Totals		40.1	31.1	35.1	106.3

(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

SURFACE AREAS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES--SALTWATER SENSITIVITY (OPEN-WATER NOT INCLUDED)

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Sensitivity Rating: High	High Moderate	Low Moderate	Low	Total
Injection Well Sites West Side						
A	50	0[b]	0	0.5	0	0.5
B	25	0	1.8	0.5	0.7	3.0
D	30	0	0.1	1.4	T[c]	1.6
E	--	0	0	0	0	0
F	20	0	0.1	0.5	0.2	0.8
H	--	0	0	0	0	0
M	30	0.2	0	1.7	0	1.9
N	10	0	0.2	0.2	0	0.4
Q	--	0	0	0	0	0
R	--	0	0	0	0	0
S	100	0	9.4	0.2	0	9.6
X	35	0	0	1.7	0	1.7
Y	35	0	0.2	1.3	0	1.5
WF1	100	0	0.9	10.3	0	11.2
Injection Well Sites East Side						
2	10	T	0.5	0.8	0.2	1.5
3	12	0.4	0	0.2	0.6	1.2
4	10	0	0.1	0.6	1.1	1.8
5	14	0	0.4	0.4	0	0.8
7	13	T	0.2	0.4	0.2	0.9
9	12	0.1	0.3	0.5	1.5	2.4
11	1	T	T	0.2	T	0.4
12	23	0	0	0.3	0.7	1.0
13	12	0	0.3	0.3	0.5	1.1
14	13	T	0.7	0.3	0.5	1.5
15	11	0	0.2	0.6	0	0.8
16	15	0	1.1	1.2	0	2.3
17	19	0	0.5	1.6	0	2.1
18	17	0	0.1	1.2	0	1.3

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Sensitivity Rating: High	High Moderate	Low Moderate	Low	Total
Intermediate Manifolds						
2W	100	0	0	0	0.8	0.8
3W	100	0	0.3	0.5	0	0.8
2E	100	0	0	0.2	0	0.2
3E	--	0	0	0	0	0
West Low-Pressure Pipeline Corridor	100	0.3	4.3	6.4	0.3	11.3
East Low-Pressure Pipeline Corridor	100	T	4.9	2.6	0.5	7.9
Gravel Sites Putuligayuk North	100	0	0	0	28.5	28.5
Putuligayuk South	100	0	1.4	0	14.8	16.2
West Injection Plant	100	0	1.0	1.6	0	2.6
Totals		1.2	11.9	55.2	51.2	119.6

(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

SURFACE AREAS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES--BIRD HABITAT VALUES

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Habitat Value Rating High	High Moderate	Low Moderate	Low	Total
Injection Well Sites West Side						
A	50	0	0	0.8[b]	0	0.8
B	25	0	0	0.8	2.5	3.3
D	30	0	0.3	1.3	0.2	1.8
E	--	0	0	0	0	0
F	20	0	T[c]	0.5	0.2	0.9
H	--	0	0	0	0	0
M	30	0	0.3	1.4	0.2	1.9
N	10	0	0	0.4	0	0.4
Q	--	0	0	0	0	0
R	--	0	0	0	0	0
S	100	0	0	0.4	9.4	9.8
X	35	0	0	1.9	0	1.9
Y	35	0	0	1.7	0.2	1.9
WF1	100	0	0	10.3	0.9	11.2
Injection Well Sites East Side						
2	10	0.1	0.2	0.6	0.8	1.7
3	12	0.2	0	0	0.7	0.9
4	10	0	0	0.6	1.2	1.8
5	14	T	0.4	0	0.4	0.9
7	13	0	0.1	0.3	0.4	0.8
9	12	T	0	0.7	1.8	2.6
11	1	0	T	0.2	T	0.3
12	23	0	0	0.3	0.7	0.9
13	12	T	0	0.9	0.4	1.4
14	13	T	0	0.5	1.2	1.8
15	11	T	0	0.4	0.4	0.9
16	15	T	0.2	1.0	1.1	2.4
17	19	0	0.9	0.9	0.5	2.3
18	17	0	0	1.3	0.1	1.4

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Habitat Value Rating High	High Moderate	Low Moderate	Low	Total
Intermediate Manifolds						
2W	100	0	0	0	0.8	0.8
3W	100	0	0.5	0	0.3	0.8
2E	100	0	0	0.2	0	0.2
3E	--	0	0	0	0	0
West Low-Pressure Pipeline Corridor	100	2.5	0.7	3.5	4.7	11.2
East Low-Pressure Pipeline Corridor	100	2.3	0	2.0	5.2	9.5
Gravel Sites Putuligayuk North	100	0	0	0	34.7	34.7
Putuligayuk South	100	0	0	0	16.3	16.3
West Injection Plant	100	0	0	1.6	0	2.6
Totals		5.5	3.7	48.9	73.1	130.1

(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

TABLE L-19

SURFACE AREAS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES--MAMMAL HABITAT VALUES

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Habitat Value Rating High	Moderate	Low	Total
Injection Well Sites West Side					
A	50	0	0	0.8[b]	0.8
B	25	0	2.5	0.8	3.3
D	30	0	0.2	2.8	3.0
E	--	0	0.1	0.7	0.8
F	20	0	0	0	0
H	--	0	0	0	0
M	30	0.2	0	1.7	1.9
N	10	0	0.2	0.2	0.4
Q	--	0	0	0	0
R	--	0	0	0	0
S	100	0	9.4	0.4	9.8
X	35	0	0	1.9	1.9
Y	35	0	0.2	1.7	1.9
WF1	100	0	0.9	10.3	11.2
Injection Well Sites East Side					
2	10	T[c]	0.4	1.2	1.7
3	12	0.4	0	0.8	1.2
4	10	0	0.1	1.7	1.8
5	14	0	0.4	0.5	0.9
7	13	T	0.3	0.7	1.1
9	12	0.1	0.3	2.2	2.6
11	1	T	T	0.2	0.3
12	23	0	0	0.9	0.9
13	12	0	0.4	0.9	1.3
14	13	0	0.7	1.1	1.8
15	11	0	0.2	0.6	0.8
16	15	0	1.1	1.2	2.3
17	19	0	0.5	1.8	2.3
18	17	0	0.2	1.2	1.4
Intermediate Manifolds					
2W	100	0	0	0.8	0.8
3W	100	0	0.3	0.5	0.8
2E	100	0	0	0.2	0.2
3E	--	0	0	0	0
West Low-Pressure Pipeline Corridor	100	0.3	3.6	7.3	11.2
East Low-Pressure Pipeline Corridor	100	0.1	4.8	4.6	9.5
Gravel Sites Putuligayuk North	100	0	0	34.7	34.7
Putuligayuk South	100	0	1.4	14.8	16.2
West Injection Plant	100	0	1.6	1.0	2.6
Totals		1.3	30.3	100.2	131.8

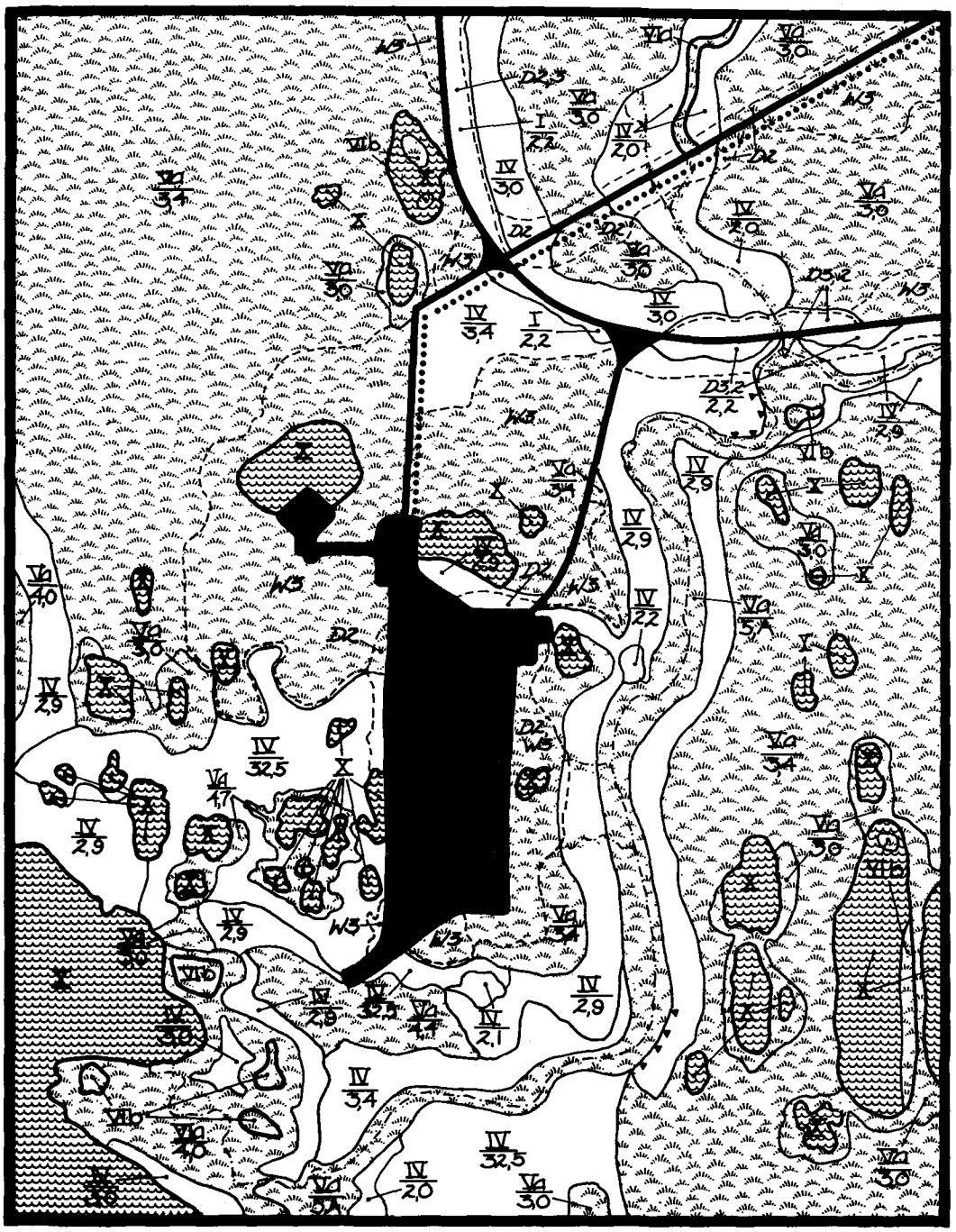
(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

SURFACE AREAS DIRECTLY ALTERED BY WATERFLOOD PROJECT FACILITIES--OVERALL HABITAT VALUE/SENSITIVITY

Project Site	Percent Waterflood[a]	Affected Area (Hectares) Habitat Value/Sensitivity Rating: High	High Moderate	Low Moderate	Low	Total
Injection Well Sites West Side						
A	50	0	0	0.8[b]	0	0.8
B	25	0	0	0.8	2.5	3.3
D	30	0	0.3	1.3	0.2	1.8
E	--	0	0	0	0	0
F	20	0	T[c]	0.5	0.2	0.8
H	--	0	0	0	0	0
M	30	0.2	0.3	1.4	0	1.9
N	10	0	0	0.4	0	0.4
Q	--	0	0	0	0	0
R	--	0	0	0	0	0
S	100	0	0	0.4	9.4	9.8
X	35	0	0	1.9	0	1.9
Y	35	0	0	1.7	0.2	1.9
WF1	100	0	0	10.3	0.9	11.2
Injection Well Sites East Side						
2	10	0.1	0.1	0.8	0.6	1.6
3	12	0.1	0.3	0	0.5	0.9
4	10	0	0	0.6	1.2	1.8
5	14	T	0	0.4	0.4	0.9
7	13	0.1	0.1	0.4	0.4	1.0
9	12	T	0.1	0.7	1.8	2.7
11	1	0.1	0.1	1.9	0.2	2.3
12	23	0	0	0.3	0.7	1.0
13	12	T	0	0.9	0.4	1.4
14	13	T	0	0.5	1.2	1.8
15	11	T	0	0.4	0.4	0.9
16	15	T	0.2	1.0	1.1	2.4
17	19	0	0.9	0.9	0.5	2.3
18	17	0	0	1.3	0.1	1.4
Intermediate Manifolds						
2W	100	0	0	0	0.8	0.8
3W	100	0	0	0.5	0.3	0.8
2E	100	0	0	0.2	0	0.2
3E	--	0	0	0	0	0
West Low-Pressure Pipeline Corridor	100	2.6	1.0	3.5	4.1	11.2
East Low-Pressure Pipeline Corridor	100	2.3	0.1	1.9	5.2	9.5
Gravel Sites Putuligayuk North	100	0	0	6.3	28.5	34.8
Putuligayuk South	100	0	0		16.3	16.3
West Injection Plant	100	0	0	1.6	1.0	2.6
Totals		5.8	3.6	43.6	78.3	131.3

(a) Estimated percent of the mapped pad expansion areas that would be dedicated to Waterflood Project facilities.
(b) Calculated areas equal total area for all future uses x the percent dedicated to Waterflood Project facilities.
(c) T = trace -- less than 0.05 hectares.

DRILL SITE 14



0 100 200 300 400 500
METERS

N

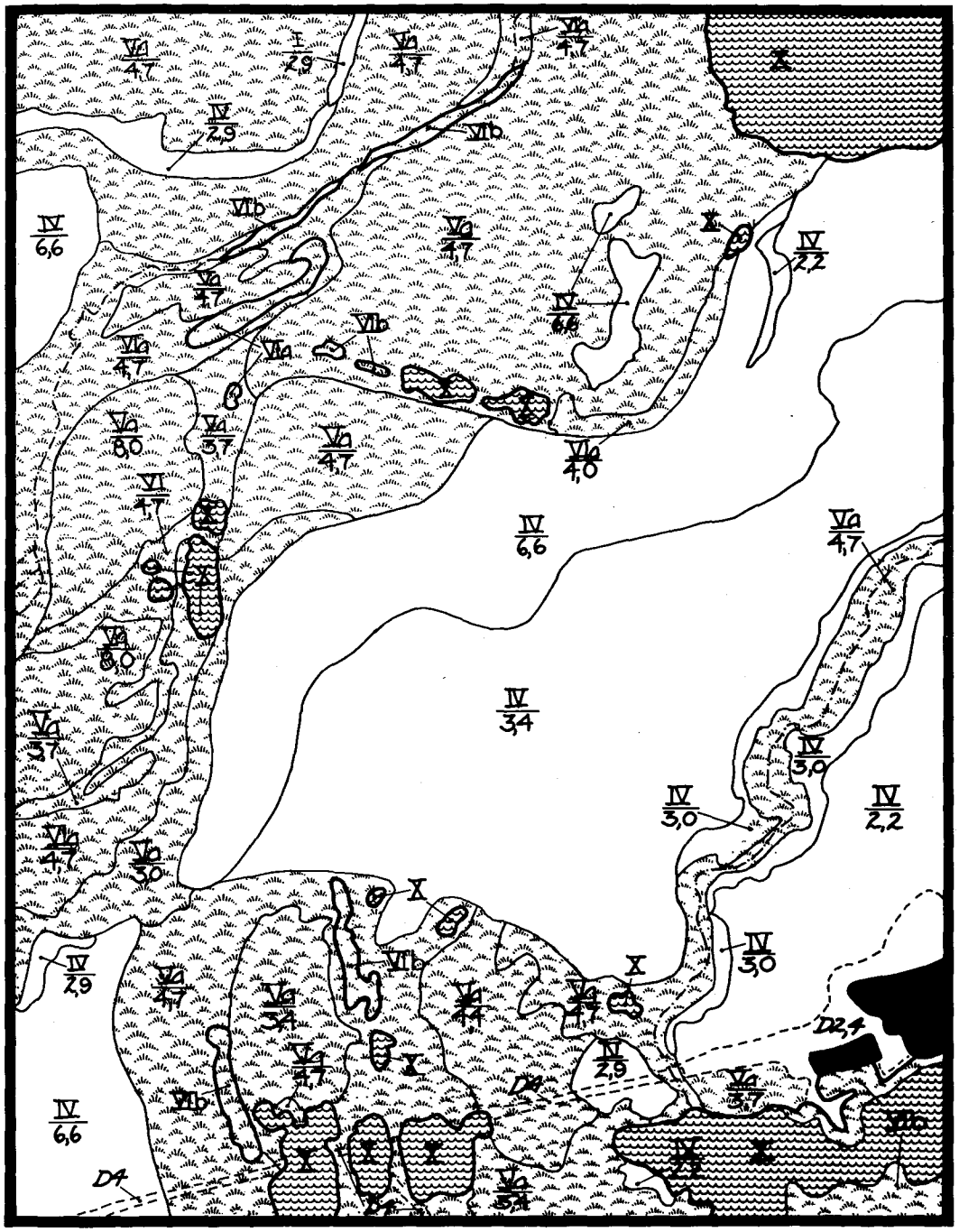
Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 8-16
Vegetation: *D.A. Walker & R.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 6 / 25 / 80

WETLAND AND OPEN WATER COMMUNITIES

Figure L-13

DRILL SITE 16



0 100 200 300 400 500
METERS

N

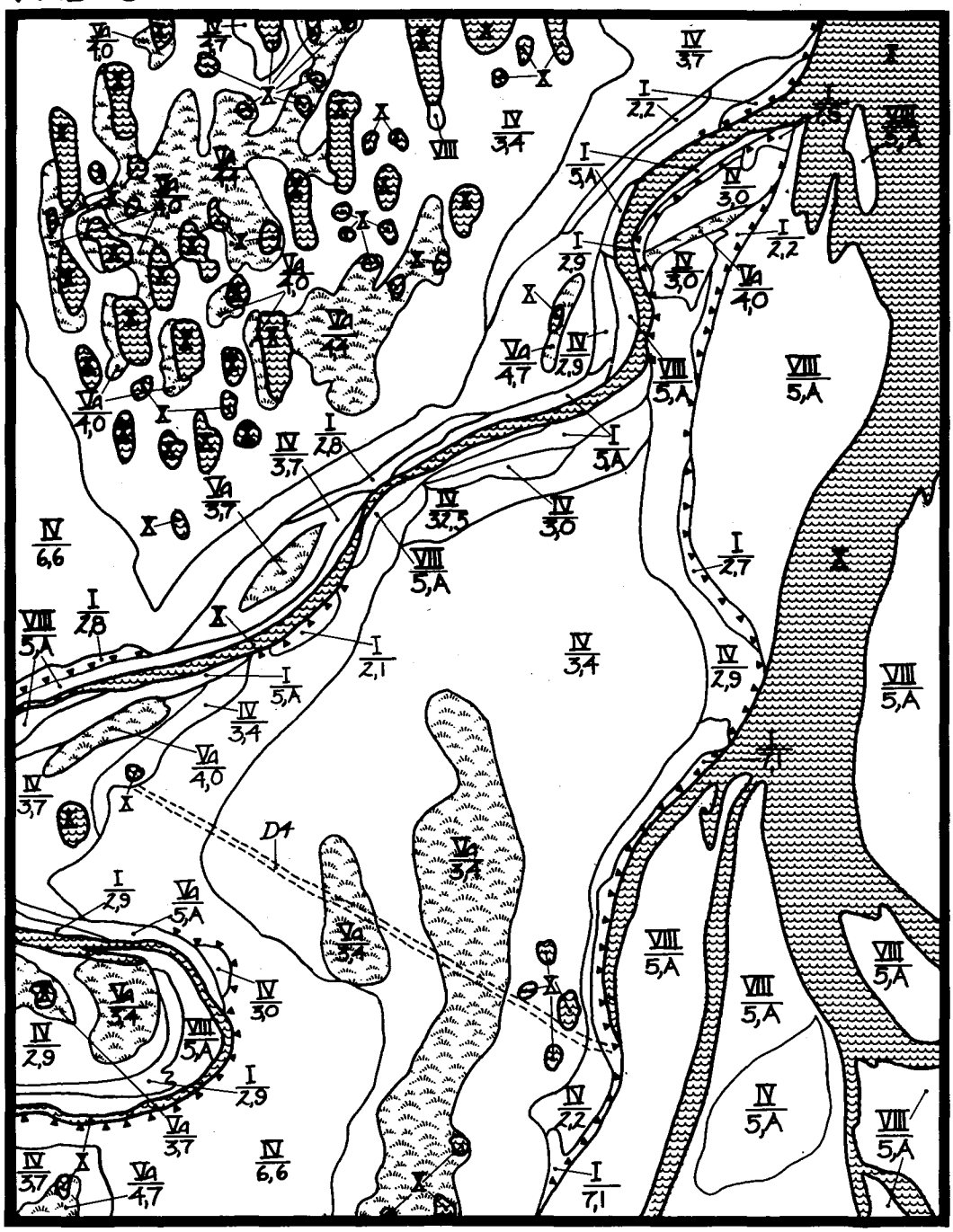
Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 7-8
Vegetation: *D.A. Walker & R.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 7 / 7 / 80

WETLAND AND OPEN WATER COMMUNITIES

Figure L-15

PAD S



0 100 200 300 400 500
METERS

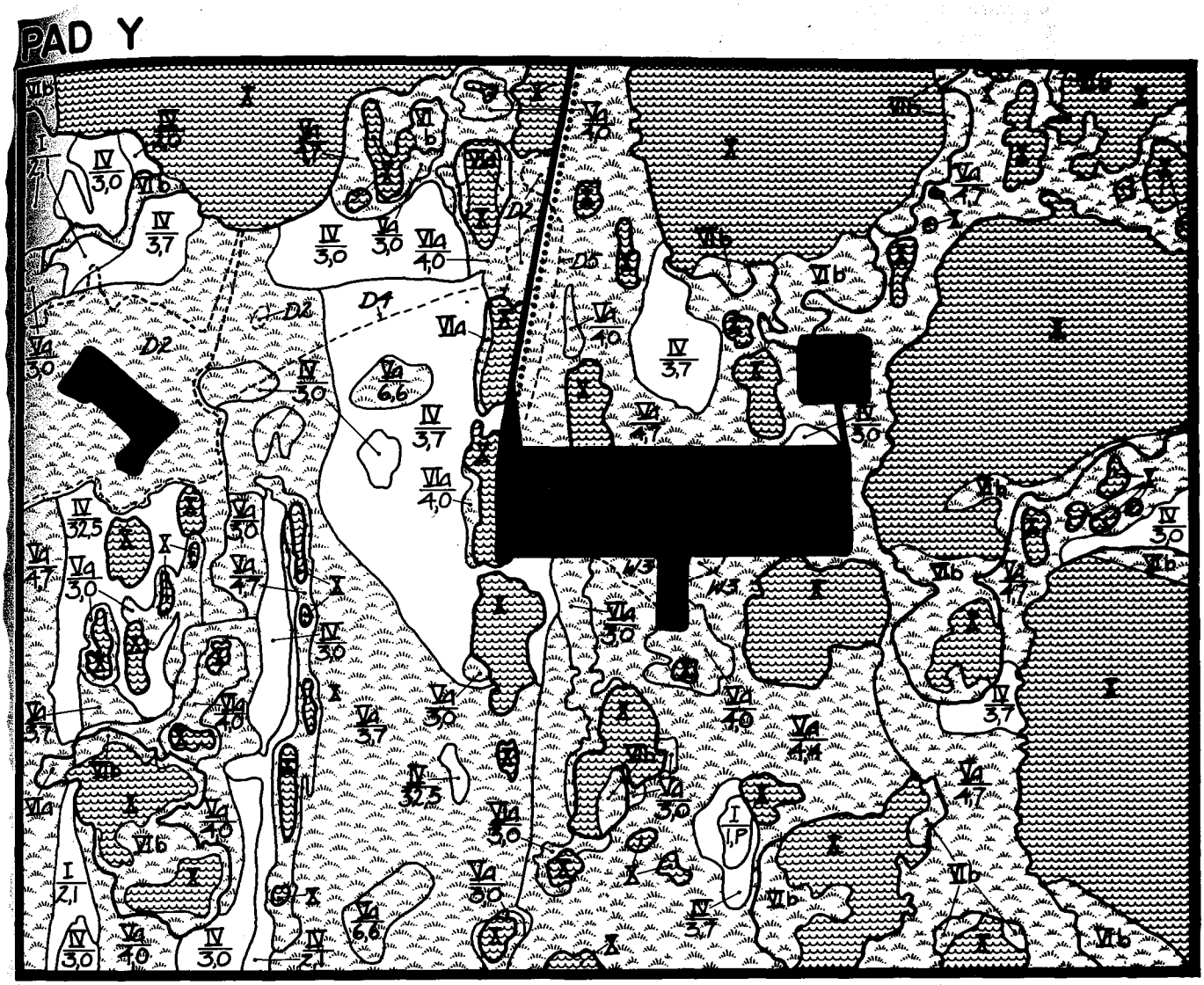
N

Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 7-29
Vegetation: *D.A. Walker & P.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 7 / 13 / 80

WETLAND AND OPEN WATER COMMUNITIES

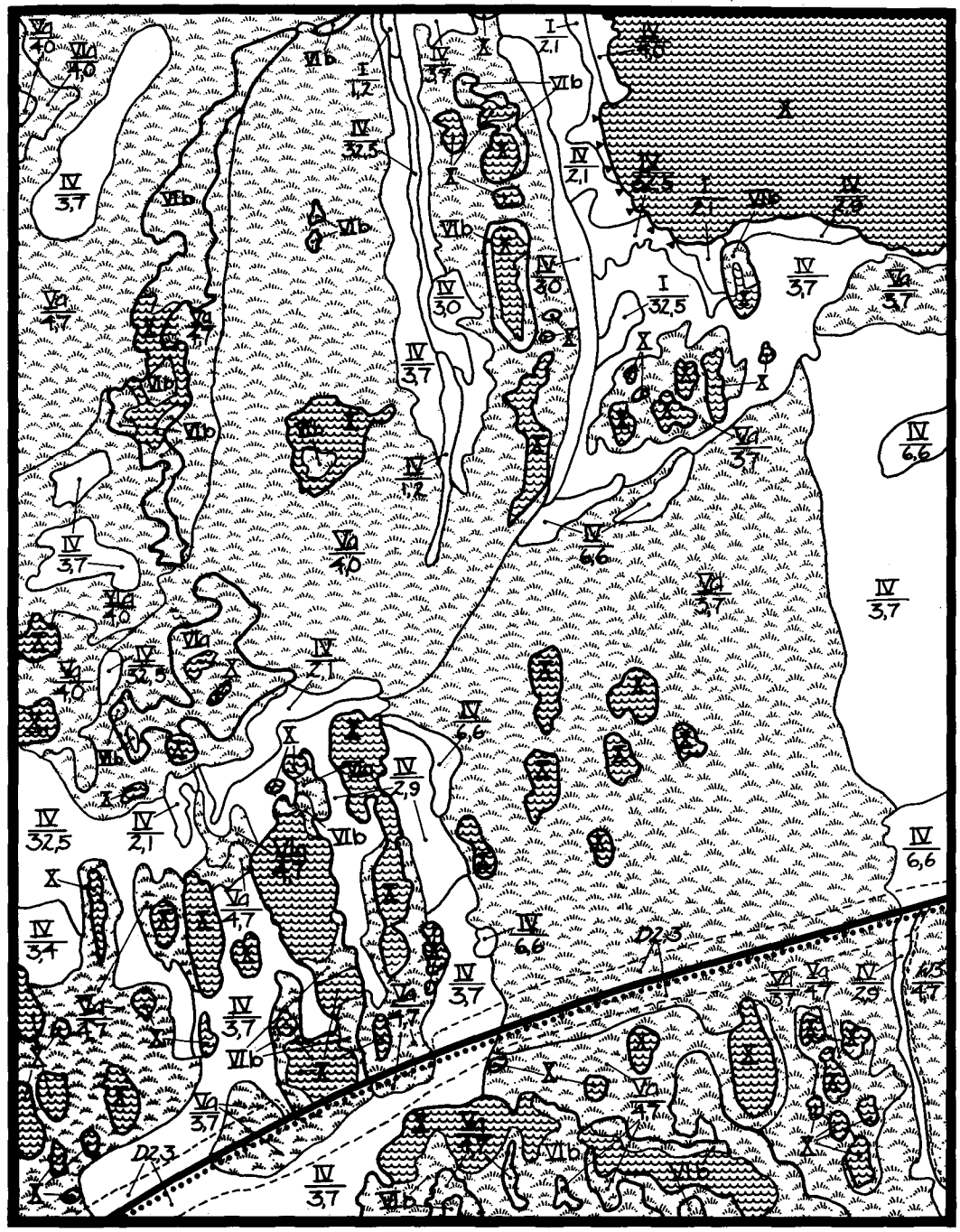
Figure L-27



WETLAND AND OPEN WATER COMMUNITIES

Figure L-29

WF 1



0 100 200 300 400 500
METERS

N

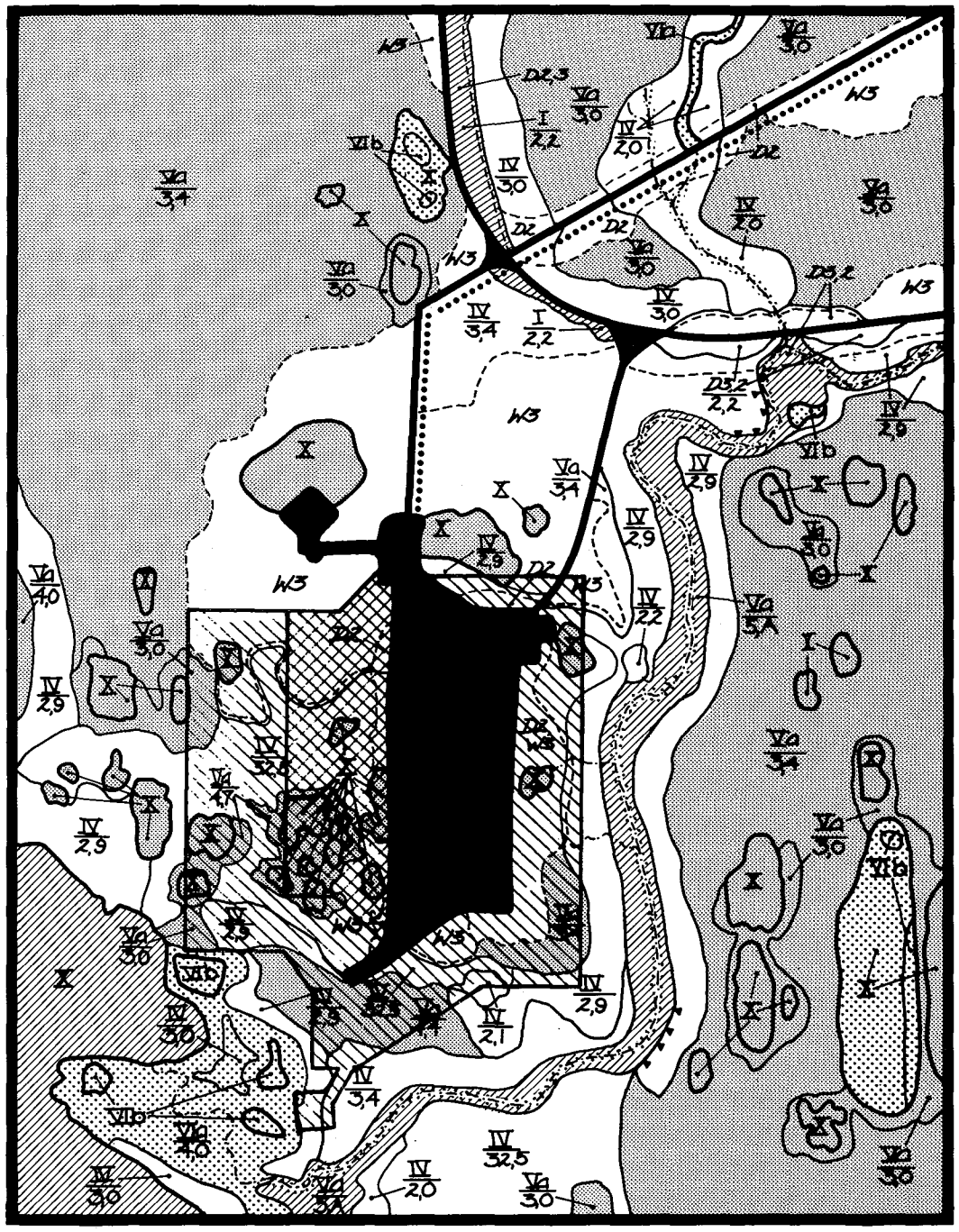
Water & Culteral Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 6-19
Vegetation: *D.A. Walker & P.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 6 / 27 / 80

WETLAND AND OPEN WATER COMMUNITIES

Figure L-30

DRILL SITE 14



0 100 200 300 400 500
METERS

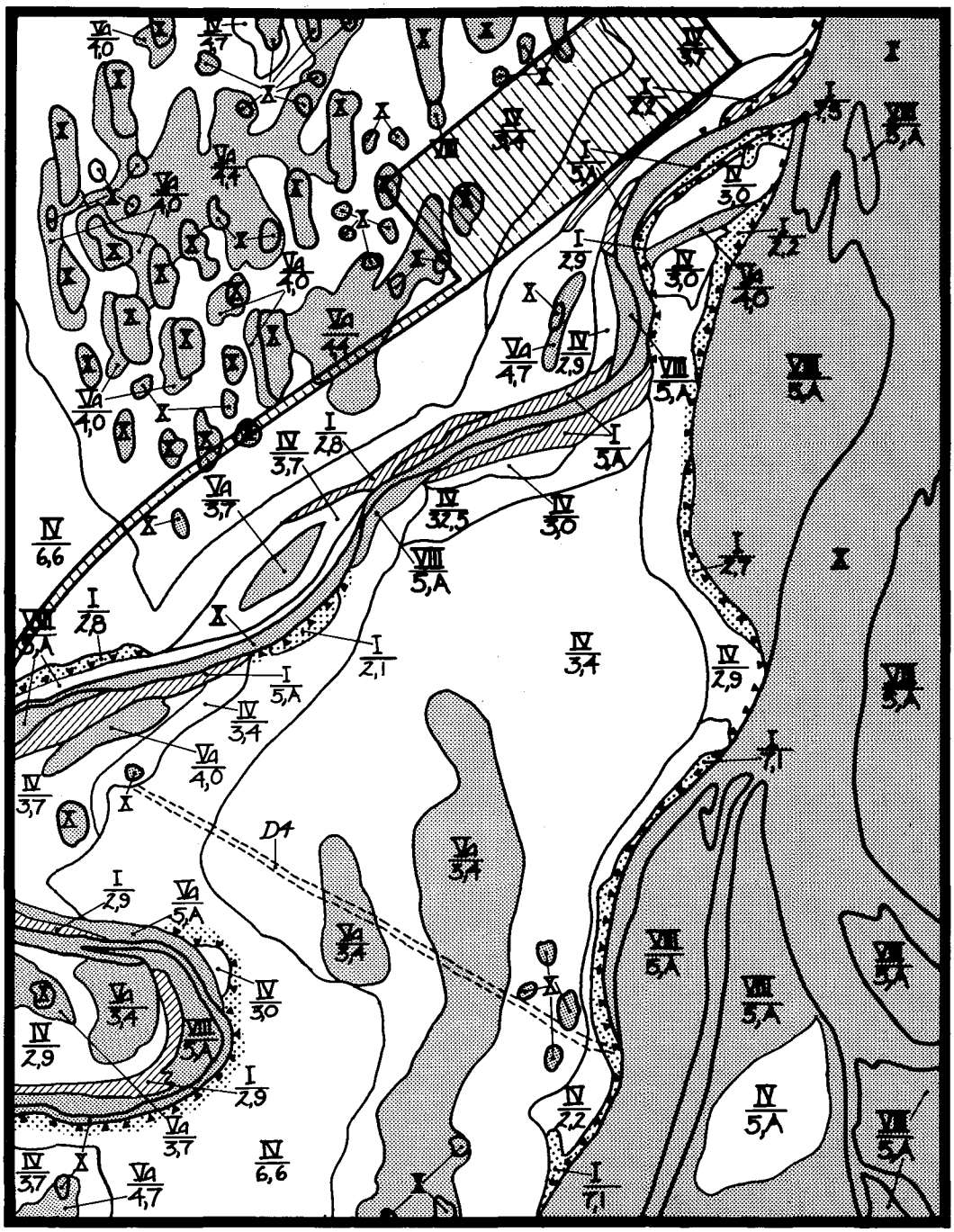
Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 8-16
Vegetation: *D.A. Walker & R.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 6 / 25 / 80

OVERALL HABITAT VALUE/SENSITIVITY

Figure L-51

PAD S



0 100 200 300 400 500
METERS

N

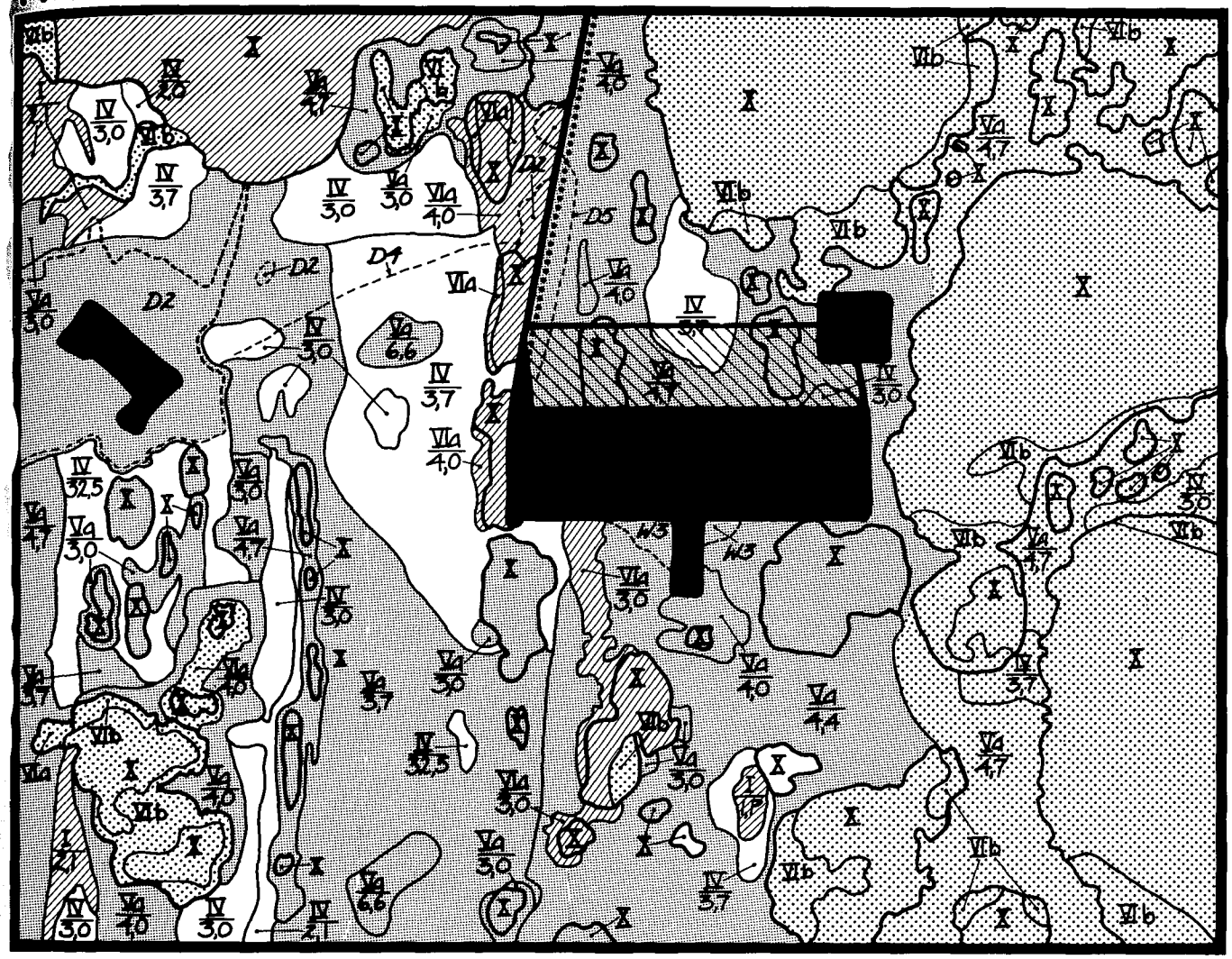
Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 7-29
Vegetation: *D.A. Walker & P.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 7 / 13 / 80

OVERALL HABITAT VALUE/SENSITIVITY

Figure L-65

PAD Y



Water & Cultural Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 9-23

Vegetation: *D.A. Walker & P.J. Webber*

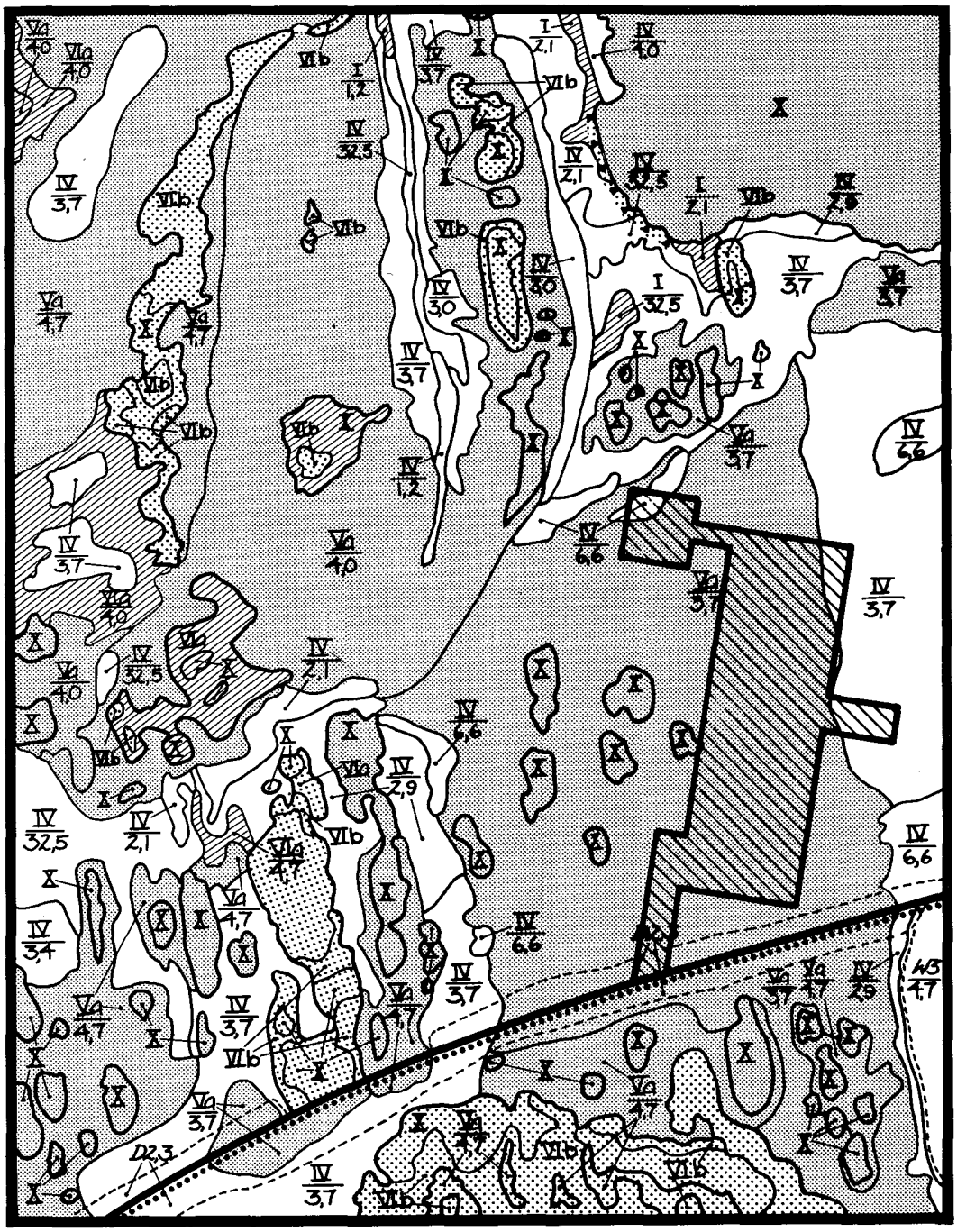
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 6 / 30 / 80

OVERALL HABITAT VALUE/SENSITIVITY

Figure L-67

WF 1



0 100 200 300 400 500
METERS

N

Water & Culteral Boundaries from:
AIR PHOTO TECH, 1979 Photography
Photo No. PUO-UN 6-19
Vegetation: *D.A. Walker & P.J. Webber*
Landforms & Soils: *K.R. Everett*

GROUND CHECKED: 6 / 27 / 80

OVERALL HABITAT VALUE/SENSITIVITY

Figure L-68

APPENDIX O

AUTHORIZATION TO DISCHARGE

UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Appendix O has been revised to reflect the Final Draft permit conditions.

APPENDIX O

FINAL DRAFT

Permit No.:
Application No.: AK-002984-0

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. §1251 et seq; the "Act"),

ARCO Oil and Gas Company (A division of Atlantic Richfield Company)

is authorized to discharge from a facility located at Prudhoe Bay, Alaska

to receiving waters named The Beaufort Sea

in accordance with discahrge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on

The permit and the authorization to discharge shall expire at midnight, five years from the effective date.

Signed this day of

Director, Enforcement Division

FINAL DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting through the expiration date the permittee is authorized to discharge filter backwash, strainer backwash, travelling screen spraywater and untreated seawater from outfall number 001.

a. Such discharges shall be limited and monitored by the permittee as follows:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average		Daily Maximum		Measurement Frequency	Sample Type
	Under Ice	Open Water	Under Ice	Open Water		
Flow	17,100m^3/day (4.5 mgd)	18,900m^3/day (5.0 mgd)	18,900m^3/day (5.0 mgd)	94,700m^3/day (25.0 mgd)	Continuous	Recording
Total Suspended Solids	1,800kg/day (4,130lbs/day)	10,300kg/day (22,700lbs/day)	2,090kg/day (4,590lbs/day)	69,400kg/day (153,000lbs/day	Weekly	24Hr Composite
Volatile Suspended Solids	N/A	N/A	N/A	N/A	Weekly	24Hr Composite
Settleable Solids	N/A	N/A	N/A	N/A	Weekly	Composite during back-wash cycle
Chlorine Residual	N/A	N/A	0.1mg/l	0.1mg/l	Continuous	Recording
Ammonia (NH_3-N)	N/A	N/A	1.5mg/l	1.5mg/l	Monthly	24Hr Composite
pH	No less than 6.0 standard units and no greater than 9.0 standard units.				Continuous	Recording
Temperature (^oC)	No greater than 2.0^oC above ambient conditions				Continuous	Recording

b. A single effluent sample shall be taken for analysis of the 65 priority pollutants designated pursuant to Section 307 (a) (1) of the Clean Water Act, utilizing EPA test procedures and detection limits as specified in the December 3, 1979 Federal Register or subsequent final procedures. This sample shall be taken during a backwash cycle at a time estimated to represent a maximum annual discharge during open water conditions.

c. There shall be no discharge of floating solids, visible foam in other than trace amounts or oily wastes which produce a sheen on the surface of the receiving water.

d. Samples taken in compliance with the monitoring requirements above shall be downstream of all discharge processes.

e. In addition to the above effluent monitoring requirements the daily frequency of backwash cycles shall be recorded and reported on the monthly Discharge Monitoring Report.

f. All sanitary wastes shall be transported and disposed of at on shore treatment systems.

2. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge fish and other marine life bypassed from screens with untreated seawater through outfall number 002.

a. A semi-annual monitoring program (representative of both under ice and open water conditions) shall be established in order to obtain an estimate of the mortality rate and physical abnormalties and disorientation of marine species returned through the outfall. The permittee shall submit details of a proposed monitoring program to the Environmental Protection Agency and the Alaska Department of Environmental Conservation within six months prior to discharge.

3. During the period beginning with the commencement of waterflood treatment plant operations and lasting through the expiration date of the permit, the permittee shall monitor the influent as specified below:

INFLUENT CHARACTERISTICS	MONITORING REQUIREMENTS	
	Measurement Frequency	Sample Type
Flow m^3/day(mgd)	Continuous	Recording
Total Suspended Solids (mg/l)	Weekly	24Hr Composite
Volatile Suspended Solids (mg/l)	Weekly	24Hr Composite
Temperature (^oC)	Continuous	Recording

Influent samples shall be taken at approximately the same time during the same day as effluent samples.

B. RECEIVING WATER MONITORING PROGRAM

1. Mixing Zone

An outfall diffuser system shall be utilized for the dispersal of the discharge into the Beaufort Sea. The diffuser shall be located approximately 1000 feet north of the seawater treating plant at a minimum depth contour of 14 feet. A mixing zone is provided below, the boundaries of which shall be monitored for determining compliance with the State of Alaska Water Quality Standards (18AAC 70.020).

a. The sides of the mixing zone shall be no more than 1,000 feet from the diffuser center line.

b. The ends of the mixing zone shall be no more than 1,000 feet from each end of the diffuser system.

2. Receiving Water Monitoring

The permittee shall implement the following receiving water and biological monitoring program. The emphasis of the program is on monitoring for subtle changes in water quality and sediment quality, responses of resident biota to waste water discharges, and on developing a sampling strategy to provide a defensible statistical basis for analysis of the data, including examination of any gradients in biological response as a function of distance from the diffuser. The following program encompasses studies that are considered necessary to objectively evaluate existing environmental conditions and any chronic effects of proposed effluent discharges on water quality and biota.

The permittee shall submit semi-annual and yearly progress reports on the following studies to the Alaska Department of Environmental Conservation, Pouch O, Juneau, and the Environmental Protection Agency, Anchorage Office, and Director Enforcement Division. Semi-annual and annual reports shall be made available to other agencies upon request. The first semi-annual report shall be due on July 1, 1981 and semi-annually thereafter through July 1, 1985. A final summary report, including all data and conclusions contained by that time, shall be submitted on October 1, 1985. This report shall include a synthesis of data and a discussion and interpretation of major findings and also principal investigator recommendations for further studies or study refinements should any such studies be necessary.

a. Subtidal Benthos Monitoring Program

(1) Species Diversity and Abundance Studies

The subtidal benthic macro-infauna program shall consist of annual grab or diver sampling with the following specifications: a

randomly selected and distributed array of twenty (20) samples shall be collected once per year within an area bounded by 1500 feet on both sides of the diffuser centerline and 1500 feet from each end of the diffuser system. All samples shall be collected during the same period, sample locations shall be permanently located during the first year effort, and subsequent year's sampling dates shall be timed as closely as practicable to the first year's sampling date(s). At a minimum the number of macro-infaunal species present and total abundance of organisms (>1.0 mm) per square meter shall be determined for each sample. Proposed methods of random station selection, sampling period selection, and analysis of data shall be submitted to the Department of Environmental Conservation, Juneau and the Environmental Protection Agency, Anchorage, at least two (2) months prior to initiating the field program and approval must be granted prior to commencement. This program shall commence either the first winter or first open water period following the effective date of this permit at the applicant's option.

The percent organic composition of sediments shall be monitored for all samples concurrent with the benthic program.

(2) Biological Studies of Individual Species

The permittee shall provide a measure of the overall biological condition of Liocyma fluctuosa (or another commonly occurring bivalve species approved by the Department of Environmental Conservation) using sampling design and statistical methodolgies consistent with published accounts on this index of health. A sufficient number of organisms shall be analyzed to provide a statistically defensible basis for comparing means. This study shall begin within six (6) months from the effective date of this permit. Published accounts generally specify the following ratios for calculating the index, either of which are acceptable in reporting results:

$$\frac{\text{Tissue dry weight (g)}}{\text{(shell length in mm)}} \times 100$$

(Reference: Stekoll, Clement and Shaw. 1978. Sublethal effects of chronic oil exposure on the intertidal clam Macoma balthica, University of Alaska, IMS)

or

$$\frac{\text{ash-free dry weight (g)}}{\text{(cm shell length)}^3} \times 1000$$

(Reference: Anderson, J.W. 1978. Condition index and free amino acid level of Protothaca staminea exposed to oil contaminated sediment. Battelle Northwest Laboratories, Sequim, Washington.)

Liocyma (or an alternate bivalve species approved by the Department) shall be collected from at least eight (8) randomly selected stations within the study area specified in section a.(1). Establishment of at least two (2) control sites outside this area to assess gradients in condition factor as a function of distance from the diffuser is a critical requirement of this study. Stations shall be permanently located. Sampling frequency at all sites during the first two years shall be at least twice per year (under ice and open water periods) to evaluate natural seasonal variations in condition. The Department of Environmental Conservation will evaluate the data at the end of two years to determine whether sampling frequency should be modified.

b. Total Residual Chlorine, Organochlorides and Ammonia

(1) Sediment concentrations of total residual chlorine, specific organochlorine compounds identified in the effluent analysis, and ammonia (NH_3-N) shall be monitored annually at subtidal stations identified in a.(2) above to commence within six (6) months after facility discharge. Detection levels shall conform to those specified in Alaska Water Quality Standards and EPA guidelines for toxic substances.

(2) Total residual chlorine and specific organochlorine compounds identified in the effluent shall be monitored annually in the soft tissues of Ampharete vega and Liocyma fluctuosa. Sample sites shall include each of those stations listed in a.(2) above. A sufficient number of organisms shall be analyzed to provide a statistically defensible basis for comparing means.

c. Outfall Study and Water Quality Verification

The permittee shall develop and implement a dye study which will measure the actual diffusion and dispersion characteristics achieved by the outfall diffuser system during "worst case" mixing conditions. The study shall be conducted during winter (ice-covered) hydrographic conditions. The study plan shall as a minimum include the following:

(1) Proposed station grid to include stations outside, along, and inside the present mixing zone boundaries to adequately describe dispersion.

(2) Detailed methods of measuring diffusion and dispersion (i.e. type of dye, tracer material, instrumentation, simulation of worst case and average case volume of discharge).

(3) Hydrographic characterization at the sampling points.

(4) Duration of testing interval.

The plan shall be submitted to the Alaska Department of Environmental Conservation, the Alaska Operations Office of EPA, and the Director, Enforcement Division, EPA, at least three (3) months prior to commencement of facility discharge. The outfall study shall commence no later than three (3) months after the beginning of discharge unless hydrographic conditions warrant a modification. Summary reports shall be submitted within 45 days after the study is completed, and a final comprehensive report to be submitted no later than three (3 months following completion of the test. Each report shall include all relevant data including receiving water and effluent characteristics, volume of discharge, graphed dilution contours, raw data, station locations and duration of test.

A program of verification of the adequacy of the mixing zone boundaries to meet Alaska Water Quality criteria for sediment, turbidity, chlorine residual and dissolved oxygen shall include both a winter (ice-covered) and a summer (open-water) sampling effort of the water column at a minimum of four (4) sites located equidistant from one another around the parimeter of the mixing zone. A fifth sample shall be taken 500 feet from the diffuser inside the mixing zone. Four (4) additional stations shall be located equidistant from one another outside of the mixing zone boundaries along a perimeter 1500 feet from both the diffuser ends and centerline. Samples shall be collected at mid-depth. Methods of analysis shall be as specified in Methods for Chemical Analysis of Water and Wastes, EPA, 1979. Ambient concentrations of sediment, turbidity, and dissolved oxygen shall be established at the time of sampling from a site located sufficiently distant from the mixing zone to be considered outside the zone of influence. Winter sampling stations may include any or all of those approved for the dye dispersion study if it is shown those stations are more representative in describing plume behavior. Summer sampling locations shall include at least those nine (9) locations described above.

The seasonal verification program shall commence within six (6) months of commencement of diffuser operation to allow for preliminary analysis of the dye study results and identification of most reasonable sampling locations.

3. Bioassay Monitoring

If appropriate methodology is developed which is mutually acceptable to EPA and ADEC in which to perform bioassay monitoring to determine acute toxicity levels of toxic substances from the expected effluent discharge, EPA may initiate a permit modification for review to establish a bioassay monitoring program to determine these levels.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required shall be representative of the volume and nature of the monitored discharge. The permittee shall take samples and measurements to meet the monitoring requirements specifiec Samples shall be taken in the effluent stream before its discharge to the receiving water, at the specific locations identified in Part A of this permit.

2. Reporting

Effluent and influent monitoring results shall be summarized each month on a Discharge Monitoring Report form (DMR: EPA No.3320-1). These reports shall be submitted monthly and are to be postmarked by the fourteenth day of the following month. Signed copies of these, and all other reports herein, shall be submitted to the Director, Enforcement Division and the State agency at the following addresses:

1) United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Attn: Water Compliance Section M/S 513

2) United States Environmental Protection Agency
Alaska Operations Office
701 C Street, Box 19
Anchorage, Alaska 99513

3) Alaska Department of Environmental Conservation
Northern Regional Office
Box 1601
Fairbanks, Alaska 99707

4) Alaska Department of Environmental Conservation
Pouch O
Juneau, Alaska 99811

3. Additional Monitoring by Permittee

If the permittee monitors any effluent parameter identified in this permit more frequently than required, the results of such monitoring shall be included in the DMR. Such increased frequency shall also be indicated.

4. Definitions

a. The "monthly average", other than for fecal coliform bacteria, is the arithmetic mean of samples collected during a calendar month. The monthly average for fecal coliform bacteria is the geometric mean of samples collected during a calendar month.

b. The "daily maximum" discharge means the maximum allowable discharge in any calendar day.

c. "Bypass" means the intentional diversion of wastes from any portion of a treatment facility.

d. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

e. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventive maintenance, or careless or improper operation.

f. mgd = million gallons per day

g. m^3/day = cubic meters per day

h. mg/l = milligrams per liter

i. ml/l = milliliters per liter

5. Test Procedures

Test procedures for the analysis of pollutants shall conform to 40 C.F.R. Part 136, which contains a list of approved methods.

6. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date, and time of sampling and measurements;

b. the dates the analyses were performed;

c. the person(s) who performed the analyses, sampling or measurements;

d. the analytical techniques or methods used; and

e. the results of all required analyses.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Director, Enforcement Division or the State water pollution control agency.

8. Noncompliance Reporting

a. Noncompliance notification will be made when any of the following situations occur:

(i) Bypassing of any treatment facilities (Part D.5., below).

(ii) Facility upset (Part D.6., below).

(iii) Failure of facility (Part D.7. below)

(iv) Other instances not covered by above.

b. Noncompliance notification shall consist of at least the following:

(i) A description of the discharge and cause of noncompliance;

(ii) the period of noncompliance to include exact dates and times and/or the anticipated time when the discharge will again be in compliance; and

(iii) steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

c. Timing of report shall be consistent with the following:

(i) Permittee shall report telephonically within 24-hours from the time of becoming aware of any violation of a daily

maximum. A written submission shall be provided within five (5) days of becoming aware of the noncompliance.

(ii) Permittee shall provide a written report of any violations of the monthly average. This report shall conform to a. and b. above and be submitted concurrently with the Discharge Monitoring Report as a separate report.

D. GENERAL REQUIREMENTS

1. Reopener Clause

If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under section 307(a) of the Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the Director shall institute proceedings under these regulations to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

2. Modification

The permit may be modified, terminated, or revoked during its term for cause as described in 40 C.F.R. 122.31.

Any permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under 40 C.F.R. 122.31 must report its plans, or such information to the Director.

3. Right of Entry

The permittee shall allow the Director or an authorized representative, upon the presentation of credentials and such other documents as may be required by law,

a. to enter upon the permittee's premises where a point source is located or where any records must be kept under the terms and conditions of the permit;

b. to have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

c. to inspect at reasonable times any monitoring equipment or method required in the permit;

d. to inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit; and

e. to sample at reasonable times any discharge of pollutants.

4. Operation and Maintenance

The permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee for water pollution control and abatement to acheive compliance with the terms and conditions of the permit. Proper operation and maintenance includes but is not limited to effective performance based on designed facility removals, adequate funding, effective management, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures.

5. Bypass

a. Bypass is prohibited unless all of the following four (4) conditions are met:

(i) Bypass is unavoidable to prevent loss of life, personal injury or severe property damage;

(ii) there are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down-time;

(iii) permittee makes notification in accordance with Part C.8.b. and c.; and

(iv) where the permittee knows in advance of the need for a bypass, prior notification shall be submitted for approval to the Director, if possible at least 10 days in advance. The bypass may be allowed under conditions determined to be necessary by the Director to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

b. Prohibition of Bypass

The Director may prohibit bypass in consideration of the adverse effect of the porposed bypass or where the proposed bypass does

not meet the conditions set forth in Part D.5.a., above.

6. Upsets

a. Effect of an Upset

An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirement of paragraph b. below are met.

b. Conditions Necessary for a Demonstration of Upset

The permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(i) An upset occurred and that the permittee can identify the specific cause(s) of the upset;

(ii) the permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

(iii) the permittee submitted information required in Part C.8.b. and c.

c. Burden of Proof

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset shall have the burden of proof.

7. Failure of the Facility

The permittee, in order to maintain compliance with its permit, shall control production and all discharges upon reduction, loss, or failure of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

The permittee shall report such instances in accordance with Part C.8.b. and c. above.

8. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the United States resulting from non-compliance with the permit.

9. Removed Substances

Collected screenings, grit, sludges, and other solids removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent entry of those wastes or runoff from such materials into navigable waters unless otherwise authorized in this permit.

10. Transferability of Permits

This permit may be transferred to another person by the permittee if:

a. The permittee notifies the Director of the proposed transfer;

b. a written agreement containing a specific date for transfer of permit responsibility and coverage between the current and new permittees (including acknowledgement that the existing permittee is liable for violations up to that date, and that the new permittee is liable for violations from that date on) is submitted to the Director; and

c. the Director within 30 days does not notify the current permittee and the new permittee of his or her intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

E. RESPONSIBILITIES

1. Availability of Reports

Except for data determined to be confidential under section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Director, Enforcement Division. As required by the Act, effluent data shall not be considered confidential. Knowingly making a false statement on any such report may result in the imposition of criminal penalties as provided for in section 309 of the Act.

2. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part D.5.) and "Upset" (Part D.6.) and "Failure of Facility" (Part D. 7.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

3. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under section 311 of the Act.

4. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by section 510 of the Act.

5. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

6. Severability

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

APPENDIX Q

NATIONAL HISTORIC PRESERVATION ACT

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
P.O. BOX 7002
ANCHORAGE, ALASKA 99510

REPLY TO
ATTENTION OF:
NPAEN-PL-EN

12 SEP 1980

CONCUR

SEP 24 1980

ADVISORY COUNCIL
ON HISTORIC PRESERVATION

BY

Mr. Louis S. Wall
Advisory Council on Historic Preservation
Lake PLaza - South, Suite 616
Lakewood, Colorado 80228

Dear Mr. Wall:

Please reference your letter of June 19, 1980 concerning the proposed Waterflood Project at Prudhoe Bay, Alaska.

Professional evaluation of the project's impact areas has been completed and is inclosed. (Incl 1) No cultural resources are within the proposed project area. Route "C" will no longer be considered. The State Historic Preservation Office has concurred on the evaluation contained in the reconnaisance report. (Incl 2)

Concurrence is requested that this project is in compliance with Section 106 of the National Historic Preservation Act.

If any further information is required, please contact Miss Lizette Boyer at telephone (907) 752-2572.

Sincerely,

HARLAN E. MOORE
Chief, Engineering Division

2 Incl
as