AGENCY COMMENTS ON DRAFT EXHIBIT E OF SUSITNA HYDROELECTRIC PROJECT LICENSE APPLICATION

Comments by NMFS, DEC, DNR, USFWS

This document is assigned SUS 347. It comprises four agency memorandums addressed to Eric Yould, Executive Director, Alaska Power Authority. These memorandums are assigned individual SUS numbers 10040, 10041, 10042, and 10043.

These submitted comments are in reference to: Susitna Hydroelectric Project FERC License Application. Exhibit E / prepared by Acres. Draft. -- APA Document nos. 157-161.

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Wilson
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347

COMMENTS ON DRAFT EXHIBIT E

1. NMFS
2. DEC
3. DNR
4. USFWS

Part 1 of SUS 347 **(also SUS 10040)**

Comments on Draft Exhibit E of Susitna Hydroelectric Project License Application. Letter to Eric Yould from Robert W. McVey, January 25, 1983.

- To Eric Yould, Executive Director, Alaska Power Authority
- From Robert W. McVey, Director, National Marine Fisheries Services, Alaska Region
- 13 p.

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

SUS
10040

JAN 28 1983

January 25, 1983

Mr. Eric Yould
Executive Director, Alaska Power Authority
334 W. 5th Avenue
Anchorage, Alaska 99501

Dear Mr. Yould:

The National Marine Fisheries Service (NMFS) is entrusted with Federal jurisdiction over marine, estuarine, and anadromous fishery resources. Under Reorganization Plan No. 4 of 1970, 3 C.F.R. Section 203 (1970 compilation), reprinted in 5 U.S.C. Appendix II at 64 (1970), NMFS was established to exercise those functions previously carried out by the Bureau of Commercial Fisheries. By virtue of this delegation of authority, NMFS is responsible for oversight and evaluation of activities which may affect marine, estuarine, and anadromous fishery resources. Under the Fish and Wildlife Act of 1956, 16 U.S.C. Section 661-666 (c) requires that NMFS be consulted "whenever the waters of any stream or other body of water are proposed or authorized to be impounded... for any purpose whatever... by any public or private agency under Federal permit or license." NMFS interests in the protection of marine, estuarine, and anadromous fishery resources also derives from the Anadromous Fish Conservation Act, the Magnuson Fishery Conservation and Management Act, and the National Environmental Policy Act. The FERC rules and regulations require consultation with NMFS whenever a project may affect anadromous, estuarine, or marine fishery resources.

The National Marine Fisheries Service has reviewed draft Exhibit E of the license application for the Susitna Hydroelectric Project. We are submitting comments on this document which satisfy, in part, the agency coordination mechanism established by the Federal Energy Regulatory Commission (FERC). The formal position of NMFS in regards to the Susitna Project has been requested and provided to the Alaska Power Authority (APA) in several previous instances. Specifically, we refer to the following NMFS correspondence which should be considered, along with the Exhibit E comments, as formal coordination.

1. Letter to Eric Yould from Robert McVey, Director, Alaska Region NMFS, November 29, 1982.

2. Statement of Robert McVey before the Alaska Power Authority Board of Directors, April 16, 1982.

3. Letter to Eric Yould from Robert McVey, October 15, 1982.

Because of the nature and magnitude of this project, and certain unresolved issues concerning resources for which NMFS bears responsibility, we do not feel the formal consultation process is complete at this stage. NMFS will continue to assist your agency throughout the planning and licensing process.

General Comments

Our review found this license exhibit to be very informative and generally well developed. It represents a considerable improvement over the 1981 Feasibility Report, particularly in its consideration of filling concerns and in discussing project effects from a Watana alone and Watana/Devil Canyon combined perspective.

We have not commented extensively on chapters 5, Socioeconomic impacts or 10, Alternatives. However we believe it is important to recognize certain recent developments which will influence the feasibility of this project. World oil prices have failed to escalate as projected in earlier economic studies. Natural gas alternatives have been influenced by recent pricing agreements and a proposal to construct a gas pipeline capable of supplying much of the Southcentral population. We have recently reviewed the Battelle Railbelt Electric Power Authority Study Newsletter #4, December, 1982. This newsletter presents an updated electrical demand forecast which, for the year 2010, is 44 percent lower than the 1980 ISER forecast. Load forecasts will dictate facility design and operations which, in turn, will determine the amount of water required for power production and available for downstream fisheries flow. In an ACRES report of October 1982, Energy Simulation Studies to Select Project Drawdown and Mitigation Flows, energy simulations were made which assumed a medium load forecast for the year 2010 of 7791 GWH, a figure significantly in excess of the recent Battelle forecast of 3844 and 4986 for medium and low 2010 demand. It appears that many of the basic economic premises upon which this project was planned have now changed. We believe the license application should fully consider the impact of these events and discuss their effect or impact on overall project feasibility, the need for Watana to be operational by 1993, and the economics associated with providing sufficient downstream flows to minimize fishery impacts.

The data gathered from the environmental field studies, begun in June 1981, and presented in the Exhibit, show the Susitna River system to support large, valuable runs of pacific salmon, other anadromous fish, and several freshwater resident fish species. The proposed project would impact these resources, particularly in that reach of the Susitna River between Devil Canyon and Talkeetna. The primary interests and concerns of NMFS in the Susitna feasibility studies have been to assure that (1) the fishery resources are identified and quantified, (2, specific impacts are identified, (3) impacts are avoided whenever possible, and (4) specific and effective mitigative measures are developed for all unavoidable adverse impacts.

The results of these studies and other materials presented within license Exhibit E indicate that project construction and operation will significantly affect fishery resources through changes in streamflow, water quality, temperatures, ice conditions, vegetation, and slough habitat. Studies to identify and assess these changes and to describe the fishery resources of the project area were initiated in 1981. At this time two field seasons of data have been gathered. However, the draft Exhibit E does not include most of the 1982 data nor the results or analysis of that data. The document clearly suffers by this omission, and we recommend that Exhibit E of the license application include a presentation and analysis of the 1982 data.

Throughout Exhibit E references are made to ongoing or proposed studies which will address issues we consider critical to the feasibility of this project. Yet it is not clear what these studies will entail, who will conduct them or when they will occur. We recommend that the license application detail ongoing and proposed studies.

The information presented in Exhibit E regarding reservoir operations does not sufficiently convey the range of impacts presented by the project. We recommend the license application be expanded to include a more precise description of impacts and present the following design/operating concerns:

- Flow releases - based upon weekly rather than monthly averages.
- Quantification of "normal" spillages, below the 1 in 50 year event, passed through the outlet/cone valve facility.
- Potential peaking operations at Watana without the Devil Canyon Dam. ACRES has identified this as a possibility. What circumstances would dictate such operation? What daily and hourly fluctuations would result? How would such fluctuations be attenuated by tributary input and the river distance between Watana and Devil Canyon?
- Compensation flow pumps at the Devil Canyon facility. What flows will they provide? How were these flows established? Are these pumps still planned for this facility?

We continue to be concerned about development of a release schedule which would mitigate impacts to fisheries. The draft Exhibit E states that reduced flows could impair fish migration, de-water spawning and rearing habitat, prevent access to slough and side channel habitats, and lower or eliminate inter-gravel flows to slough and side channel spawning grounds. The minimum flows proposed in Exhibit E, however, were not developed using any recognized in-stream flow predictive methodologies, and may not constitute the preferred flow regime for minimizing such effects. The license exhibits do not explain how the 12,000 cubic feet per second (cfs) minimum operational flows for August and September were determined. We note that these flows have been reduced from those recommended minimum flows presented in the 1982 Final Draft Feasibility Report, Volume 2. Similarly, no rationale is provided which supports "minimum" winter flows ten times that of existing natural winter flows. We believe that maximum winter flow limits should be required as well, particularly in light of potential staging should ice cover develop below Devil Canyon.

Exhibit E suggests that it may be desirable to spike spring flows to accommodate out-migrants and facilitate flushing of sloughs and side channels. It also states that the project release schedule will need to incorporate both volume and temperature considerations. However, neither of these concerns is reflected in the proposed flow regime. The release schedule presented is not supported by biological data, nor does it reflect concerns for fish passage. We recommend that the license application contain a specific, detailed flow release schedule, developed through a quantifiable in-stream flow analysis and coordinated with NMFS, US Fish and Wildlife Service and the Alaska Department of Fish and Game (ADFG), which would minimize impacts and/or enhance conditions for spawning, feeding, passage, out-migration, and overwintering in the Susitna River.

The Watana and Devil Canyon dams will cause changes to the existing water temperature regime of the Susitna River, generally releasing cooler water during summer months and warmer water in winter. Temperature variations affect the ability of fish to migrate, spawn, feed, and develop in the Susitna system. Ice formation will be delayed or possibly not occur. Exhibit E discusses this matter at length but does not present an accurate description of post-project temperature alterations. A model was developed to project temperatures, yet it has been operated with only one year of data (1981). Further, this model was run only for the months of June through October. Temperature modeling is not presented for the Devil Canyon Reservoir, yet Exhibit E states that the location of ice formation above Talkeetna will depend on the outflow temperatures from Devil Canyon Dam.

Realizing the importance of an accurate understanding of the thermal structure within the reservoirs and of outflow temperatures, we believe additional information is warranted. We recommend that modeling be done for both reservoirs throughout the year, and the resultant data be incorporated into the riverine temperature model calibrated with at least two seasons data.

Of the various fish habitats below Devil Canyon Dam, the sloughs between Talkeetna and Portage Creek are the most likely to be adversely affected by the proposed work. Approximately thirty-five sloughs exist in this reach. Adult salmon have been observed in at least twenty-six of these. Post project flows and water temperatures will present several significant impacts to these habitats. These are discussed in some detail in Exhibit E. However, on only one of these, slough 9, has detailed investigation been conducted which included groundwater flow, upwelling, and temperature studies. These sloughs are the most important spawning areas influenced by the mainstem Susitna River. They are also identified as potential sites for mitigating fishery resource losses through physical modification. We feel it is important therefore, that Exhibit E present an informed opinion based on site specific data as to the effects of project operation on slough habitat. In a draft

report prepared for Acres American, Inc. [1/], the author notes that until the 1982 field data are analyzed, any statements regarding streamflows necessary for chum salmon access to the side sloughs are provisional. Within Exhibit E, there are vague and seemingly contradictory statements concerning slough impacts. Statements are made within this Exhibit that data on the areal extent of upwelling within the sloughs at low flows are not presently available, that ground water upwelling is driven by mainstem river stage, that spawning areas of the sloughs may be affected by reduced upwelling, and that flows of 16,000 to 18,000 cfs are required for easy access to the sloughs. The document also contains statements that 12,000 cfs will provide access to most sloughs, that a 12,000 cfs release will assist in maintaining groundwater flow and upwelling within sloughs, and that changes in streamflow during the open water season predicted under operation of Devil Canyon are not expected to affect slough habitats. Clearly, post-project impacts to these important and sensitive habitats are poorly understood. NMFS recommends that the final license application contain the results and analysis of the 1982 field data being gathered by the Alaska Department of Fish and Game, et al, and results of an expanded study of sloughs in the Devil Canyon to Talkeetna reach which would provide a larger and more representative sample than currently available.

Exhibit E discusses the impact of project construction and operations on river ice formation. Apparently, post-project ice formation will be delayed due to higher release temperatures from Devil Canyon. Currently, ice originating from the upper Susitna contributes 75 to 85 percent of the ice load to the lower River. With this input reduced or delayed by the project, ice formation on the lower River will be affected. This impact is not adequately discussed in the Exhibit.

Ice formation above Talkeetna will also be delayed by the project. The location of the ice front in this reach has important implications to fisheries habitat within the mainstem, side channels, and sloughs. In areas with ice cover, staging is expected to occur which would increase water surface elevations, possibly increasing upwelling, overtopping the upstream berms of sloughs, and causing high velocities and scour to occur.

In those areas where ice formation does not occur, water elevations would drop below natuarally occurring levels, leading to potential de-watering of spawning gravels and reductions in upwelling areas. Exhibit E predicts that the ice front should occur at some location between Talkeetna, RM 100 and Sherman, RM 130 and will depend upon the upstream temperature, i.e. the Devil Canyon outflow. As no model was completed for winter riverine or reservoir temperatures, the full scope and measure of these effects cannot be assessed.

1. Preliminary Assessment of access by Spawning Salmon to Side Slough Habitat above Talkeetna. Draft Report. ACRES American, Inc. November, 1982.

Measures to mitigate unavoidable impacts to fisheries resources are presented in the Exhibit. Many of those measures designed to mitigate construction impacts effectively address this concern. Development of a flow regime that minimizes loss of habitat and maintains normal timing of flow related biological stimuli is also proposed. We recommend that such a release schedule be included in the final license application. The Exhibit proposes to mitigate fishery losses by physical modification of side sloughs and creation of mainstem and side channel spawning areas. This vague commitment to an approach that is only a paper concept dependent upon the results of ongoing or proposed studies does not allow us to fully evaluate the feasibility of the proposed project nor to assess the effectiveness with which project impacts can be mitigated.

We support the concept of retaining the habitat value of side sloughs through physical alteration. Further, we recommend that Exhibit E incorporate a slough mitigation plan which identifies the sloughs to be modified, the design criteria, and the operational plan and target fish species specific to each slough. Details for the mitigation goals and operational monitoring efforts for this plan should be included. The applicant should note, however, that we feel the release schedule proposed in Exhibit E should be refined based upon an accepted instream flow predictive methodology and the specific requirements of the selected species. We believe this is essential to serious consideration of a slough modification program.

Exhibit E states that if alternative mitigation schemes prove infeasible, a hatchery could be developed. While we regard such artificial methods to be the least desirable form of addressing fishery losses, we realize that slough modification is largely untried in Alaska and that these mitigative efforts may indeed fail. Therefore, we recommend that Exhibit E should advance this discussion beyond the statement that "a hatchery could be developed." Information should be included within license Exhibit E which describes the number of hatcheries needed, locations, sizes, what the production target for each species would be, and cost estimates.

Finally, none of the mitigative measures presented comply with FERC rules and regulations under Section 4.41 (F)(3)(iii); i.e., costs for these features are not presented, nor are design plans for mitigation features included.

Specific Comments

Exhibit E

Chapter One - No comment.

Chapter Two

page 15, para. 4. Breakup
The section should describe when breakup normally occurs, specifically the dates of the earliest, mean, and latest recorded events.

page 38, para. 3
This section should consider that at least eight sloughs exist above Gold Creek, several of which support large numbers of spawning salmon, e.g., slough 21. While Gold Creek may be a logical point at which to gauge flow, it does not necessarily guarantee that upstream flow will be sufficient to maintain habitat value in these sloughs. Exhibit E should discuss this concern and recommend necessary measures to guarantee adequate flow to these sloughs.

page 47. Section (v) Impacts on Sloughs
The section notes that data to confirm the areal extent of upwelling at low flows are unavailable at this time. Currently only one slough has been investigated sufficiently to predict project influences on groundwater and upwelling. This slough is not representative of all such sloughs in the Devil Canyon to Talkeetna reach.
Under existing winter flows, ice formation causes staging equivalent to an open water flow elevation exceeding 20,000 cfs. Filling flows of 1,000 cfs, for which ice formation may be delayed or fail to occur, could significantly impact sloughs through de-watering gravel spawning areas and overwintering habitat.

page 49, para 2
As the temperature of groundwater is considered a function of the average annual temperature of the mainstem Susitna; what will be the impacts of the second filling year release temperatures to the groundwater? How long would any change persist? No data are presented to support the statement that groundwater temperatures will not change.

page 51, para 3. Monthly Energy Simulations
The referenced program utilized load forecasts developed by ISER, Woodward-Clyde, and Battelle. These forecasts are now seriously questioned in light of recent developments (see General Comments). We recommend these simulation studies be updated and run with the most recent load forecasts available.

page 58, para. 1. Reservoir and Outlet Water Temperatures
This suggests that winter outflow temperatures between 1° and 4°C can be selectively withdrawn through a multiple intake structure. This control would be dependent upon the thermal profile of the reservoir during winter, a set of conditions which has not been modeled. Therefore, we question the validity of the statement which suggests one degree water temperatures would be available on request. Information presented by ACRES during the Nov. 29 - Dec. 3 workshop showed winter temperatures in Eklutna Lake to be between 0 and 3.6° in the upper 2 meters, while isothermal conditions exist below this level.

page 59, para. 2. Ice
It is not clear what impact will occur to the lower River from reduction of ice flow from the upper Susitna. How far downriver would ice formation occur? When does freeze-up normally occur?

page 91, para. 2. Mitigation of Watana Impoundment Impacts
This section states that a proposed 12,000 cfs flow at Gold Creek would provide salmon access to most of the sloughs and would assist in maintaining adequate ground water levels and upwelling rates. There are no studies which would support these conclusions, as only one of approximately thirty-six sloughs has receive detailed study. Similarly, current information does not permit the development of mitigation measures within the sloughs, as stated in the last paragraph on this page.

page 93, para. 2. Nitrogen Supersaturation
While we support the concept of installing cone valves at the outlet works of both dams, the subject requires further discussion. These valves will only operate (and afford gas supersaturation benefits) during spillages below the 1 in 50 year high flow event. According to the discussion presented on pages 79 through 81, such spillages would be a relatively uncommon event (for the 32 year period simulated, there were 4 years during which spillages occurred). The discussion on these valves should present data on their frequency of use and explain the criteria by which they are planned and installed. This should include the following:

1. Potential temperature impacts resulting from withdrawal from these outlet structures.
2. Potential impacts to river ice formation attributed to operation of these valves during winter.

page 95, para. 1. Temperature
The discussion of Devil Canyon post-project temperature mitigation is inadequate. What advantages are gained by the multiple release structure? Will Devil Canyon reservoir stratify during summer and winter?

Chapter Three

page 8, para. 2
"Since the greatest changes in physical habitats are expected in the reach between Talkeetna and Devil Canyon, fishery resources using that portion of the river were considered to be the most sensitive to project effects." Transforming the mainstem Susitna River into a reservoir is also a considerable change. Later in this paragraph is the statement "The mitigations proposed to maintain chum salmon should allow sockeye and pink salmon to be maintained as well." We are unable to locate specific mitigation plans for chum salmon. Those conceptual plans presented for slough modification and mainstem

spawning bed construction deal principally with one life history stage. The statements made here that improved mainstem conditions will replace loss of slough rearing habitat and that juvenile overwintering areas are not expected to be adversely affected by the project are not supported. In fact, preliminary data presented elsewhere in the Exhibit indicate that overwintering habitat will be impacted and that sloughs may provide important rearing habitat.

page 12. Species Biology and Habitat Utilization in the Susitna River Drainage

Estimates of adult salmon presented in this section depict only escapement. A more meaningful estimate should be made using catch to escapement ratios, as done in chapter five. For instance, in 1982 77,000 pink salmon migrated above Talkeetna. However only one fish in every 3.8 escaped the commercial fishery. Using the 3.8 to 1 ratio, this reach of the Susitna accounted for over 350,000 pink salmon of which over 277,000 were available to the commercial fishery. Escapement estimates alone fail to indicate the high values associated with anadromous fishery resources.

page 76. Slough Habitat

This section does not describe impacts associated with lowered winter river stage during filling. Should upwelling and backwater effects during winter prove critical to developing eggs or juvenile salmonids, any reduction in these areas could create significant damage.

We question the figure presented as the number of sloughs in which salmon spawn within the Chulitna to Devil Canyon reach. Using information supplied by the ADFG and from Exhibit E, adult salmon have been observed in 26 of these sloughs. Exhibit E should clearly present the total numbers of sloughs in this reach and the 1981 and 1982 data on spawning adults.

page 77

The discussion presented on impacts to slough habitat is not clear. As Exhibit E states that groundwater upwelling in the sloughs is probably driven by the mainstem stage, which would cause a decreased flow in the sloughs (post-project), why does this section state that under post-project conditions only the backwater areas (of the sloughs) would be affected?

The second paragraph of this page states, "With mainstem flows above 14,000 cfs, a backwater forms at the mouth of the slough." How is this known? Which slough is being discussed? Is this true for each slough? The same paragraph explains that, during the 1982 field season, flows in the 12,000 to 14,000 cfs range occurred and afforded opportunity to observe fish passage at flows below normal August levels. These flows appeared to hamper or restrict fish passage into sloughs. Backwater effects were not seen at flows of approximately 12,000 cfs, yet project low flow limits for August have been established at 12,000 cfs. This section underscores the problems

associated with such proposed flows. It is apparent that some significant changes occur to the slough habitat within a relatively narrow range of flows; changes which may have important biological implications.

page 87, para. 5
While the described floods may transport sediment and scour the River bed, reduction or elimination through flow regulation may not necessarily be beneficial. The Exhibit presents no data to support the comment that high mainstem velocities limit fish usage (page 87, para. 2). Further, such high flow events may be critical to maintaining side channel and slough habitat through flushing and replenishment of gravels and by removing vegetation and beaver dams which may reduce habitat value. This point is not discussed in the following sections on slough or side channel habitats.

page 103, paragraph 3. Slough Habitat
We disagree that changes in streamflow during the open-water season are not expected to affect slough habitats.

page 116. Aquatic Studies Program
We believe this discussion suffers from omission of the majority of the 1982 field study results. We strongly believe that two years of study are the minimum required as a basis to discuss the impact of hydroelectric development on the Susitna River.

page 130. Measures to Minimize Impacts
It is stated that "A flow release schedule will be used that minimizes the loss of downstream habitat and maintains normal timing of flow-related biological stimuli." The flow schedule presented in Exhibit E, chapter 2 does not minimize habitat loss, nor does it maintain normal flow related biological stimuli. This section should also discuss installation of compensation flow pumps at Devil Canyon which would provide flow between the dam and tailrace channel.

page 130, para. 2. Measures to Minimize Impacts
The section states that "Instream flow requirements are being determined for each species/life stage/time unit combination." Who is performing these studies? How will they be determined? Again, it is impossible to understand what flow regime, if any, is actually being suggested within Exhibit E. Is the release schedule presented in Table 2.17 just a "first cut?" This is apparently the case. Considering that the final release schedule is to be based on future studies as suggested here and may be modified to accommodate outmigration (page 3-132, para. 1) and will need to consider temperature and volume (page 3-143, para. 1); why is a flow regime proposed in the absence of such information?

page 131, para. 1
This states, in effect, that slough habitat will either be enhanced or degraded by the project, and that actual impacts to habitat are the subject of ongoing studies. These ongoing studies should be described. What will be investigated? Which sloughs will be studied?

page 132, para. 4
This states that flows of 12,000 cfs are sufficient to undertake rectifying impacts by modifying habitat. How is this known? The paragraph should discuss the studies upon which this is based or qualify any such conclusions as preliminary and subject to further study.

page 133, para. 1. Winter Flows
The statement is made that "Since minimal impacts are expected during both filling and operational winter flow, rectifying measures are not needed." This is not supported. On page 131, para. 1, we learn slough habitat may be degraded by winter flows and that these impacts are the subject of ongoing studies. Page 94 presents a lengthy discussion of impacts attributed to altered winter flows.

page 133, para. 5. Reduction of Impacts Over Time
"Post-operational monitoring will be conducted to evaluate the effectiveness of mitigation measures (see Section 2.6)." The license application should detail what monitoring will occur and how the effectiveness of mitigation efforts will be evaluated.

page 136, para. 3
The discussion of hatchery development is inadequate. In the event that other mitigation alternatives fail, it will be important to present a clear picture of what measures would be taken to compensate for fisheries losses.

page 137, para. 3
We believe that the water temperatures of 5° to 6°C during the second filling year will present significant adverse impacts to salmon. Addition of a low level portal could apparently avoid much of these effects. We recommend such a device be incorporated into the final design.

page 143, para. 1
"Continuing reservoir thermal modeling will allow an evaluation of available water temperatures throughout the year so that a detailed release plan can be developed. The release plan will need to consider both water temperatures and volume in order to minimize impacts." We strongly agree with this, and recommend that the license application contain just such a release plan which would most effectively minimize impact.

Chapters 4-9 - No Comment.

Chapter 10

page 28, para. 6. Diversional Emergency Release Facilities
The release levels referred to do not avoid adverse effects on the salmon fishery downstream.

page 30, para. 3
Figure E.2.90 indicates that three, rather than four portals would be constructed at Watana. We question which is correct and how the numbers and position of the portals were considered in minimizing impact. Also we cannot concur that temperatures will be controlled within acceptable limits.

page 30, para. 4
We are not aware of studies which have occurred to mitigate project impacts through provision of streamflow at Gold Creek. These should be described.

page 31, para. 5
According to presentation by ACRES American at an APA-sponsored workshop in Anchorage during the week November 29 to December 3, 1982, no temperature model has been run for Devil Canyon reservoir. How, then, can the utility of a multi-level draw-off at Devil Canyon be known? This again underscores the present lack of understanding of project temperature impacts.

The following statements of concern were presented by NMFS before the APA Board of Directors on April 16, 1982.

"One area of limited information in the Feasibility Report deals with the effects of post project flows on the fishery resources..." "These sloughs therefore represent an area requiring consideration of potential mitigation and/or enhancement measures. To date, less than one eighth of the side channels and slough areas have been surveyed. Further, the impacts of various flow regimes on the habitat are unknown because the hydrological and ecological relationships between the mainstem Susitna and these areas have not been adequately studied..." "The results of a comprehensive In-Stream Flow Study would allow a balancing of fish habitat losses against power generation..." "Currently, we do not believe a high level of confidence exists in the projected post project temperature within the two reservoirs, the Susitna mainstem, and the side channels and sloughs..." "...specific studies must occur which will develop mitigation options..." "It is not reasonable to assume that (one field season of fisheries data) is adequate for proper characterization of the resources."

"We are concerned that the (license) application will reflect the serious deficiencies we have mentioned. If our review shows this to be the case, we feel our agency will have no alternative but to request the FERC to reject the application or direct that the deficiencies be corrected."

Our review of the material presented in draft license Exhibit E indicates that these deficiencies still exist. It is regrettable that we have reached the draft license application stage while these issues remain unresolved. We feel that these issues and data must be incorporated into Exhibit E and that without them the license

application will be found deficient. We believe that Exhibit E should be sufficiently developed so as to form the basis for specific license conditions which would protect anadromous fish and their habitat. As written, Exhibit E only leads to further studies. The FERC guidelines specify that information within Exhibit E be developed to a level commensurate with the scope of the project. The Susitna project will be the most costly and complex hydroelectric facility ever considered by the FERC[2/], and this complexity and depth should be reflected in license Exhibit E.

We appreciate this opportunity to comment on the draft Exhibit E.

Sincerely,

Robert W. McVey
Director, Alaska Region

2/ Susitna Project Status Report - Preliminary Draft. Federal Energy Regulatory Commission - Data for Decisions. December 1, 1982.

Part 2 of SUS 347 **(also SUS 10041)**

Comments on Draft Exhibit E of Susitna Hydroelectric Project License Application. Letter to Eric Yould from Richard A. Neve, January 21, 1983.

- To Eric Yould, Executive Director, Alaska Power Authority
- From Richard A. Neve, Commissioner, Alaska Dept. of Environmental Conservation
- 4 p.

SUS 10041

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

SOUTHCENTRAL REGIONAL OFFICE

January 21, 1983

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JAN 28 1983

Mr. Eric Yould
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Dear Mr. Yould:

The Alaska Department of Environmental Conservation is pleased to respond to the Alaska Power Authority's request for comments on the Susitna Hydroelectric Project, Federal Energy Regulatory License Application, Exhibit E. These comments are organized into seven primary categories and are presented below.

A. Water Quality

1. The discussion on water quality impacts is well done for both the Watana and Devil Canyon dams. The major impact to water quality is from a change in the downstream water temperature that will occur with the project operation. The Reservoir Temperature Model (DVRESM) is designed to predict reservoir outflow temperatures to an accuracy of ±2°C. That is a range of variation of 4°C. A difference of 4°C in predicted outflow temperatures could have a significant effect on the actual versus the predicted impact on downstream fisheries. This modeling effort should be developed to predict reservoir operating parameters when using a given downstream impact, essentially working the model backwards. Accurate estimates of the predicted downstream river temperatures are an essential component of the impact assessment process.

2. The sheer magnitude of the construction project will create a high potential for soil erosion that may affect water quality. The Exhibit E needs to be more specific on how these problems will be mitigated. Methodologies need to be described in detail for construction of the road, dam and townsites, and other project entities.

B. Hazardous Substances

A very large amount of hazardous substances will be transported to, and utilized at, the project site. Discharges of hazardous substances could contaminate land as well as surface and ground water. Further impacts could occur to human welfare, fish, and wildlife.

The Exhibit E document does not address the major possible sources of fuel spills, but rather the minor ones (leaky hydraulic lines and water pumps). A very detailed oil spill contingency plan needs to be developed that will have several major objectives and be written to account for a major (i.e., tank truck roll-over), as well as a minor spill event.

8-09LH

The plan should be responsive to project needs and yet be simple enough to be functional. Major objectives of the plan are discussed in detail below:

1. To develop a training program that will stress spill prevention. This program needs to cover spill response under all project conditions and set up several response scenarios.

2. To develop the response capability to adequately handle the worst case spill expected. This response capability should be developed for the Watana and Devil Canyon camps and the railhead staging area. This would mean staging spill cleanup equipment at all sites. All hazardous substances that will be used on site need to be considered (solvents, chemical additives, etc.).

3. To develop an immediate response team for each work shift, consisting of personnel dedicated to spill containment and cleanup, should a discharge incident occur. This response team would have a designated leader who would direct the team. A complete training program in spill response for this team would be essential.

4. To contain a small section on the project area environment. This would include a map of major drainage areas, fish habitat and seasonal descriptions, and wildlife habitat and seasonal descriptions. The environmental section is very important in prioritizing spill response actions (i.e., most sensitive areas first), and for developing an appreciation for the impact a spill can have.

C. Wastewater Treatment

The type of wastewater treatment plant to be used at each camp site has to be described in greater detail to more adequately evaluate its effectiveness. The discharge from the Watana treatment facility may not meet fecal coliform standards because of inadequate dilution. The discharge zone should be well defined for both facilities. The Watana and Devil Canyon camp wastewater treatment plants are to be functioning and approved before each camp is in operation.

D. Concrete Batching Plant

Potential impacts that may occur from the concrete production process are not described in enough detail. The discharge from this process will also have, in addition to pH changes, problems with siltation, turbidity and possibly toxic additives used in the curing process. Siltation from concrete can form a mat over substrate gravels. This could suffocate emerging salmon fry or other indigenous organisms that require substrate habitat. Discharges that may have toxic concrete additives as a component may kill aquatic organisms. The batching process may also have airborne particulate problems. Specific control measures need to be described in detail for each type of problem that may be encountered.

E. Access Corridors

The access route (Plan 17) was determined, during the access route selection process, to have greater potential for major environmental impacts than the other route options. The major impacts of concern were:

1. The Denali Highway to Watana Dam site portion passes through habitat that has historically been used by portions of the Nelchina caribou herd.

2. Many native grayling streams can potentially be affected during the construction of the Denali Highway to Watana Dam site access section.

3. Access along the south side of the Susitna River from the Watana to Devil Canyon Dam sites passes through the Stephan Lake region. This region is important habitat for moose, wintering caribou, migrating waterfowl, and fur bearers.

4. Wetlands habitat is crossed southwest of Devil Canyon.

Because of the greater potential for major impacts associated with the Plan 17 access option, more attention should be given to defining the methods that will be implemented to mitigate these impacts. For example:

1. How will the access route be designed to minimize disruption to the caribou herd?

2. What technique will be implemented to prevent impacts to native grayling streams from road construction?

3. How will impacts to the Stephan Lake region be reduced?

4. How will project and post-project access be controlled to prevent secondary impacts related to access?

F. Fishery Impact Assessment

The field data base is incomplete for an accurate prediction of the impact the Susitna Hydroelectric Project will have on fishery resources. A good set of data has been collected for only two years. Fishery population and related water quality data can have inherent fluctuations from year to year. Long term, large-scale programs need to be implemented in order to make a reasonably accurate population estimate. Very specific detailed studies designed to correlate physical and chemical aspects of the aquatic habitat to population fluctuations need to be part of the long term program. This program should be continued through project construction.

If impacts cannot be accurately predicted, a worst case (100% loss) estimate of the fishery population should be assumed and the implications this impact would have to the aquatic community and related resource use need to be discussed. By assuming a worst case estimate, a type of mitigation program can then be developed where compensation to the fishery population can occur to result in an acceptable loss.

A long term post-project aquatic monitoring program should be developed as an integral part of the project. Funds should be allocated in advance to insure the continued existance of this program. The monitoring program is essential to determine the effectiveness of mitigation measures that are implemented.

G. Interagency Review Board

It is strongly recommended that a formal interagency review board be established to work with the Alaska Power Authority in the development of the Susitna Hydroelectric Project. This board will identify and comment on socioeconomic and environmental issues and regulatory requirements. It is suggested that the Formal Designation of the Susitna Technical Advisory Committee (see attached memo to you dated November 17, 1982) be implemented to accomodate this recommendation.

Once project construction begins, a similar interagency board should be established to monitor the socioeconomic and environmental impacts and regulatory compliance. This board would make recommendations to the Alaska Power Authority to correct associated problems as necessary.

The Alaska Department of Environmental Conservation appreciates this opportunity to comment on the Susitna Hydroelectric Project, Federal Energy Regulatory License Application, Exhibit E and hopes that these comments will be useful to you. If you have any questions, or if we can be of further assistance, do not hesitate to contact Bob Martin or Steve Zrake in Anchorage.

Sincerely,

Steve Zrake for

Richard A. Neve
Commissioner

Attachment
cc: Bob Martin, ADEC, Anchorage
Steve Zrake, ADEC, Anchorage
Su-Hydro Steering Committee

Part 3 of SUS 347 **(also SUS 10042)**

Comments on Draft Exhibit E of Susitna Hydroelectric Project License Application. Letter to Eric Yould from Esther Wunnicke, January 13, 1983.

- To Eric Yould, Executive Director, Alaska Power Authority
- From Esther Wunnicke, Commissioner, Alaska Dept. of Natural Resources
- 6 p.

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF THE COMMISSIONER

555 Cordova Street
Pouch 7-005
Anchorage, AK 99510
(907) 276-2653

JAN 20 1983

January 13, 1983

Mr. Eric Yould
Executive Director
Alaska Power Authority
334 W. 5th Avenue
Anchorage, AK 99501

Dear Mr. Yould:

The Alaska Department of Natural Resources has reviewed the draft Exhibit E application for the Susitna Hydroelectric Project. We are submitting comments on this document which in part satisfy the agency coordination requirements established by the Federal Energy Regulatory Commission, (FERC). The formal position of the Department of Natural Resources regarding the Susitna project is contained in the Exhibit E comments which follow; our April 16, 1982 testimony to the Alaska Power Authority Board of Directors (copy attached) and the letter to Eric Yould from Reed Stoops dated October 11, 1982 (copy attached). We request that an unabridged copy of these comments accompany the perfected application submitted to FERC.

ORGANIZATION AND PRESENTATION OF EXHIBIT E

In some cases the Exhibit E text, tables, and figures do not reference the documents from which the material was taken. The consequence of this inadequate documentation is that the reader cannot determine the specificity, accuracy or sufficiency of the Exhibit E. We recommend that the specific references to original documents be included in this Exhibit E before the application is submitted to FERC.

WATER QUANTITY AND QUALITY

During the past two years the Department of Natural Resources has emphasized the great importance of acquiring a clear understanding of the relationship of various flow-release rates from the proposed dams and the corresponding impacts on downstream aquatic resources, habitats, and uses. This information is vital to enable DNR to make informed decisions with respect to instream flow reservations and water appropriations both of which are required in order to facilitate the Susitna Hydro Project. The flow releases schedules presented in Exhibit E for filling and operation of the Watana and Devil Canyon Dams have not been developed in consultation with the Department of Natural Resources or by a methodology approved by this Department which is charged by law with authority to adjudicate all water

-J2LH

appropriations and instream flow reservations in the State. Indeed, Exhibit E does not explain the process by which these release schedules flows were devised. We strongly recommend that the license application contain a specific, detailed flow release schedule developed through a quantifiable instream flow analysis program coordinated with DNR and with state and federal fish and wildlife agencies.

Attached please find the entire text of the review comments from our Division of Land and Water Management. Please consult that text for additional specific comments relating to navigability, thermal modeling, and nitrogen gas supersaturation.

ACCESS

This department's comments regarding the proposed route from the Denali Highway to the project site should not be construed as support for that project route as the preferred means of access. This agency, along with the other state and federal resources agencies, has consistently favored road access to the project from the Parks Highway. However, if the route proposed in Exhibit E is selected, we recommend certain design modifications.

We recommend that the principal design criteria for the proposed route be the enhancement of scenic values and public safety. We consider the proposed high-speed design of the road inappropriate. The long-term use of the road after dam construction will be primarily sightseeing and recreation. The highway should, therefore, be designed to take maximum advantage of the scenic potential of the area which traverses some of the most dramatic in North America.

In addition to being an unattractive counterpoint to the natural landscape, the high-speed road proposed (55 miles per hour with 40 miles per hour at difficult curves) may create serious safety problems. The long braking distance for a vehicle traveling 55 miles per hour on a gravel road endangers the stop and go driver and those who park and stand along the side of the road to take photographs. Although a high-speed road will yield cost savings during dam construction, it is questionable whether these cost savings outweigh the long term benefits of a scenic road. The rationale for a high-speed access road design should be based on an explicit quantification of the cost saved by that design. We believe the scenic and public safety benefits foregone by a high-speed design when accumulated over the expected life of the road are almost certainly greater than the costs saved by such a design to facilitate the brief construction phase of the dams.

Although design standards for upgrading the Denali Highway between Cantwell and the proposed access road were not discussed in Exhibit E the issue merits comment because an upgrade will be necessary to accommodate project-related traffic. The portion of the Denali Highway affected provides exceptional views of the Alaska Range, Reindeer Hills and the

Talkeetna Mountains. The Alaska National Interest Lands Conservation Act (ANILCA) of 1981 called for a joint state, federal and private study of the scenic qualities of the Denali Highway. The intent was to encourage cooperative land management of lands adjacent to the highway to protect its important scenic values. The Denali Scenic Highway Study will be published in early 1983. DNR encourages APA to consider carefully the recommendations of that report and to support a design which is consistent with the study recommendations.

Finally, we recommend re-routing of the proposed access road where feasible to take advantage of the extraordinary vistas. Presently the road transects a large wetland in the upper Brushkana drainage. Consultants responsible for the aesthetics portion of Exhibit E recommended that this section of the road be re-routed to higher ground to the west. We concur and support that recommendation, which will also protect the wetland from the impacts of road construction and should result in lower long-term maintenance costs because of better soil conditions.

RECREATION AND AESTHETICS

We agree with the consultants' conclusions that recreation plans be focused on those opportunities occurring elsewhere in the project area rather than those directly associated with the reservoirs. Because of fluctuating water levels and steep shorelines, the reservoirs themselves will not present an attractive recreation environment except for occasional use by speedboats. The greater recreation opportunities will be associated with the access road and the many lakes, streams, and alpine hiking areas that can be reached from that road. The consultants' identification of recreation resources on Cook Inlet Region, Incorporated (CIRI) land raises the question as to how these recreation opportunities might be realized. We recommend that the Power Authority consider some sort of leasing or concession arrangement with CIRI to facilitate public recreation use on Stephan Lake. At least one public use site of a suitable size (40 acres or more) should be provided at Stephan for camping, fishing, and as a staging area for those people using the lake for float trips down the Talkeetna River. In addition, legal access across village and regional corporation lands should be secured and a trail constructed from the reservoir to Stephan Lake. In order to most effectively enhance the recreational potential of the proposed projects, we would recommend that the recreational element of Exhibit E add three sites adjacent to the Alaska Railroad. These sites are Indian River, Gold Creek, and Curry. Each of these sites would provide a destination point for recreation users of the Alaska Railroad and would provide a greater diversity of recreation opportunities. We recommend that management of the off-site recreational facilities associated with the access road are best met through the budgeting process of the Alaska Power Authority. If the Division of Parks is expected to manage these sites, then we will have to work closely with APA to identify priorities for project funding.

In summary, we feel that the consultant has done an excellent job in identifying the recreation opportunities and resources available in the project area and would request that the scope of the study be expanded to look at the identified sites along the Alaska Railroad as described above.

HISTORIC AND ARCHEOLOGICAL

The report on historic and archeological resources is well done and addresses all the pertinent questions about mitigation. We concur with the mitigation plan as presented in the draft document.

We concur with and support the proposed education program described on Page E.4.114. We consider such a program to be a necessary and effective part of any large construction project. If project personnel are adequately trained and sites are clearly marked, avoidance should be a viable mitigative measure in many of the indirect and potential impact cases.

TRANSMISSION LINE

The Access Plan Recommendation Report dated August, 1982 proposes routing a transmission line through a non-roaded area south of the proposed road between the dam sites. The line was well sited taking advantage of terrain and vegetation to minimize environmental and visual impacts as well as minimizing construction costs. We support the route proposed in the August report. We have since been informally advised that APA has decided to route the transmission line along the road between the dam sites to allow year-round access for maintenance (winter over-land access via all terrain vehicle is feasible without a road). If road access is determined to be absolutely necessary, we agree with this decision; it would be inappropriate to have two east-west road corridors through this area. However, presentation by consultants at the APA sponsored workshop in Anchorage during the week of November 29 to December 3, 1982, indicated that there may be excessive concern by maintenance engineers with year-round access. The consultants argued persuasively that maintenance by helicopters is not only feasible, but is cheaper than road maintenance and is a common practice in states other than Alaska. Helicopter maintenance has also proven itself in more rugged terrain and extreme weather conditions of southeast Alaska.

The need for road access in case of bad weather is a concern, but it is important to clarify precisely what is gained in terms of minimizing the risk of power outage by having road access. That gain should then be compared with the costs. In this case the major cost is a strong negative visual impact on the road between the dam sites. In contrast, the gain seems to be minimal. In short, the value of year-round access is not infinite and in this case may be significantly less than the costs.

SOCIOECONOMIC IMPACTS

The permanent townsite appears to have been located in an exceptionally wet area. Apparently the major criterion for locating the townsite was land status. A more appropriate location from the standpoint of land capability and general amenities for the inhabitants of the townsite would be in the Fog Lakes area south of the Susitna River on privately owned land. The townsite is particularly important because, as indicated in the Exhibit E, the tendency for workers to reside on-site depends on the quality of housing and other amenities. Exhibit E emphasizes that a high amenity site will minimize impacts on outlying communities by encouraging a higher percentage of workers to live on-site. We support this objective but do not think siting the townsite as proposed will help achieve it. We strongly suggest finding a more suitable location for the townsite.

Exhibit E projects minimal project impacts on local facilities and services due principally to the provision of on-site housing for workers. The total Mat-Su Borough population increase as a result of the project is projected as 4,700 in 1990 (peak year), 1,110 of whom are expected to live off-site in rural communities. Should that projection be accurate, the off-site impacts would, indeed, be limited. However, the projection assumes absolutely no in-migration by unsuccessful workers. This is a misleading assumption. In fact, in-migration by unsuccessful job seekers will probably be considerable. Such in-migration is a likely result of decreases in job opportunities in the lower 48 and has occurred in Alaska during construction of the oil pipeline. Current economic conditions would stimulate extensive in-migration to a greater extent than is predicted in Exhibit E.

If in-migration is seriously underestimated in Exhibit E, then a wide range of socioeconomic impacts is underestimated as well. Past experience in the state shows that boom conditions, such as the proposed dam construction would create, have led to rent increases, proliferation of sub-standard housing and strain on public facilities and services. The potential impact caused by unemployed in-migrants is particularly significant in light of their tendency to be more of a disruptive influence on small communities than employed in-migrants. Unemployed in-migrants, for example, tend to require more services such as public health and family assistance of various forms. They pay fewer taxes and may have little stake in the community, thus caring less about relatively minor issues such as yard maintenance and the appearance of local parks. In the small, rustic communities in the project area, these problems could create considerable tension between current residents and the new in-migrants. We consider the socioeconomic impact assessment to be inadequate without an attempt to estimate the numbers and effects of unsuccessful job seekers and their dependents who will move into the region.

It would be more accurate and useful to provide a range of projected population increases in affected communities rather than a precise number such as 263 in Talkeetna by 1990 or 75 in Trapper Creek. These numbers convey a precision not supported by the methodology or the probability of error inherent in such projections. More useful information for community planning purposes would be a high-low range. A key consideration in planning for public services is the population threshhold which requires new capital expenditures. For example, if a population increase of 300 would require a new community well in Talkeetna, the city would be better off knowing that it faces a probable increase of 250 to 350, rather than knowing that someone has disaggregated a series of numbers to produce an estimate of 263.

Exhibit E discusses generally the need for measures to ensure that the local unemployed get a chance at project-related jobs. Assuming there will be considerable competition for jobs by in-migrants and that the state's objective is to encourage local hire, it will be necessary to develop a clearly defined and legal program to achieve that objective. The measures recommended by Exhibit E are vague and do not reflect the significance of this issue to the state or the borough. We suggest more attention be given to developing a more comprehensive approach to address this issue in the Exhibit E application to FERC.

ALTERNATIVE ENERGY

The Exhibit E devotes about four and one half pages to the geothermal energy alternative. This information is factual and provides general background for the reader. The Exhibit E could be improved by noting that the Department of Natural Resources has a geothermal lease in the Mount Spurr area planned for May, 1983. The Exhibit E should acknowledge that geothermal energy is immune to fuel price escalation as is hydropower. We agree with the Exhibit E statement that little is known about the geothermal properties. Until exploration of the geothermal properties of Mt. Spurr has occurred the viability of geothermal power for the railbelt region is unknown. We recommend that the Exhibit E be revised to include this information.

In summary, we appreciate this opportunity to provide formal review comments to APA on the draft Exhibit E.

Sincerely yours,

Esther C Wunnicke

Esther Wunnicke
Commissioner

Attachments

cc: Division Directors
Special Assistants

Part 4 of SUS 347 **(also SUS 10043)**

Comments on Draft Exhibit E of Susitna Hydroelectric Project License Application. Letter to Eric Yould from Keith Bayha, January 14, 1983.

- To Eric Yould, Executive Director, Alaska Power Authority
- From Keith Bayha, Assistant Regional Director, U.S. Fish and Wildlife Service, Anchorage
- 7 p. with 112 p. attachment

United States Department of the Interior

JAN 21 1983

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

IN REPLY REFER TO:
WAES

Eric P. Yould, Executive Director
Alaska Power Authority
334 West 5th Avenue
Anchorage, Alaska 99501

14 JAN 1983

Dear Mr. Yould:

The Fish and Wildlife Service (FWS) has been requested by letter dated 15 November 1982, from Acres American, Inc., to formally review and comment on the Federal Energy Regulatory Commission (FERC) draft license application Exhibit E for the Susitna Hydroelectric Project. This response is being provided as partial fulfillment of your request and is intended to be a constructive evaluation in regard to fish and wildlife resources. We hope that our comments will be of value in drafting the final license application.

The following FWS letters were also provided in response to formal pre-application requests on this project:

1. 23 June 1980, letter to Eric Yould.
2. 17 December 1981, letter to Eric Yould.
3. 30 December 1981, letter to Eric Yould.
4. 5 January 1982, letter to Eric Yould.

Since these letters were formally requested as part of the FERC pre-application coordination process we consider it appropriate that our responses be specifically addressed as part of the Exhibit E.

The following letters were provided as informal consultation to facilitate the Susitna Project planning process:

1. 15 November 1979, letter to Eric Yould.
2. 16 April 1982, testimony presented to the Alaska Power Authority (APA) Board.
3. 17 August 1982, letter to Eric Yould.
4. 5 October 1982, letter to Eric Yould.

We anticipated seeing in the draft Exhibit E specific responses to the concerns and recommendations raised in the letters and testimony provided. This is consistent with advice provided by the FERC[1/]. In that this did not occur, we recommend that the APA respond in the Exhibit E to the specific comments and recommendations which are contained in these letters and testimony.

The response provided by this letter, our previous letters (both those formally and informally requested), the testimony presented to the APA Board, and the letter recently provided to you on 19 November 1982, constitute the official position of the FWS on this project.

The principal authority of the FWS to provide comments and recommendations rests in the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.)[2/]. The Coordination Act requires that fish and wildlife conservation be given equal consideration with other project features throughout the Federal lead agencies' planning and decision-making processes. The Act also requires consultation with State and Federal fish and wildlife resource agencies to ascertain what project facilities, operations, or measures may be considered necessary by those agencies to mitigate and compensate for project-related losses to fish and wildlife resources, as well as to enhance those resources. The reports and recommendations of the fish and wildlife resource agencies on the fish and wildlife aspects of such projects must be presented to action agency decision-makers and (where applicable) to Congress. The Coordination Act requires more than a consultative responsibility; it is an affirmative mandate to action agencies. Like the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.), it requires early planning and post-construction coordination and full consideration of recommendations made by resource agencies.

Our recommendations, under the Coordination Act, must be, "as specific as is practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages."

Similar language is found in NEPA's Section 102(2)(B) that agencies identify and develop methods and procedures which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making, along with economic and technical considerations.

1/ Appendix A. FERC Application Procedures for Hydropower Licenses, Exemptions and Preliminary Permits. April 1982.

2/ The Federal Power Act (16 U.S.C. 791a-825r; 41 Stat. 1603), as amended, as interpreted in Regulations (F.R. Vol. 46, No. 219, 13 November 1981) specifies requirements to satisfy the Coordination Act.

Both the Coordination Act and NEPA, necessitate, commensurate with the scope of a project:

(1) A description and quantification of the existing fish and wildlife and their habitat within the area of project impacts;

(2) A description and quantification of anticipated project impacts on these resources; and

(3) Specific mitigation measures necessary to avoid, minimize, or compensate for these impacts.

We have reviewed the draft Exhibit E in consideration of these statutes. The adequacy of the review document has been examined in respect to whether or not the information, analysis, and mitigation plan provided would allow the FERC to be in compliance with the requirements of these environmental mandates if they issued a license to the applicant.

Our review has been undertaken in light of our former correspondence, including the 16 April 1982, testimony presented to the APA Board by Deputy Regional Director LeRoy Sowl. Except for item (8) we find the testimony as valid today as it was at that time. It is apparent that the consultation process has failed in so far as the intent of the FERC regulations[3/]. We have written numerous letters on this project to assist APA in planning measures to protect and enhance fish and wildlife resources. Responses to our letters have been non-existent, or too late to deal with the problem of concern (e.g., FWS letters dated 5 October 1982, and 19 November 1982). An illustration of what we have found to be an inadequate level of consultation can be found in the 15 December 1982, response to our 19 November 1982, letter. We considered our requests to be fully within the intent of the FERC regulations[4/].

Attached to this letter are our formal comments on the FERC draft license application Exhibit E for the Susitna Project. Comments are provided on Chapters 2, 3, 5, 7, 8, 9, and 10. We have also reviewed Chapters 1, 4, and 6. However, we do not at this time have any comments to offer on these chapters.

The comments provided are organized into general comments and specific comments for each chapter. In our attempt to be as responsive as possible within the limited time frame APA has established for our review and comments, we have not been able to organize our comments into a comprehensive listing of deficiencies, clarifications, information needs, and recommendations. Many of these comments have been left within the context of the section within which they are raised. We feel by commenting in this way it will assist you in consistently correcting the deficiencies identified.

3/ See Footnote 1, supra.

4/ See Footnote 1, supra.

The following comments are generally applicable to several chapters and, in some cases, are applicable to all of the chapters:

1. It is our understanding that the projections of future power needs used in the license application are generally agreed to be high[5/] and are being reevaluated for submittal to the FERC after the license application is submitted (Acres American Deputy Project Manager John Hayden, personal communication). The changes in the load forecasts are dramatic. In the Acres American report evaluating economic tradeoffs of flow regimes[6/] the assumed moderate load forecast for the year 2010 is 7,791 gegawatt-hours (GWh). In the latest Battelle Newsletter[7/] the moderate forecast is 4,986 GWh and the low forecast is 3,844 GWh. The significant decline in projected power demands has large implications to many of the project assumptions which have constrained mitigation planning, for example: available water for downstream flows; mode, timing, and routing of construction access; and scheduling of work. The license application should fully discuss the implications of the latest load forecasts.

2. The intent of the Coordination Act and NEPA is that environmental resources be given equal consideration with project features. Consistent with NEPA, as well as the APA Mitigation Policy, avoidance of adverse impacts should have been given priority as a mitigation measure. We have found this generally not to be the case, for example: mode, timing, and routing of construction access; scheduling of work; type and siting of the construction camp/village; recreation development; instream flow regime; and filling schedule. Other examples can be found in our Specific Comments.

3. Engineering and environmental studies do not seem to be interactive. It appears that the findings of enviornmental studies have not been integrated into the engineering design. This may be due in part to the short time frame established for project planning. An examination of the sequencing of the studies illustrates this problem. It is our understanding that the Aquatic Studies Program, designed to be the basis for determination of impacts to the aquatic system and associated mitigation measures, was established as a five year study. We are now two years into this program. The analysis of the data to allow an assessment of impacts and formulation of mitigation proposals may add another year to this process. APA expects to obtain a license, and

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5/ Battelle. Newsletter #4 (Final): Railbelt Electric Power Alternatives Study. December 1982.

6/ Acres American. Energy Simulation Studies to Select Project Drawdown and Mitigation Flows. October 1982.

7/ See Footnote 4, supra.

begin construction in late 1984, or early 1985[8/]. Obviously, this does not allow for an impact analysis and mitigation planning based on these studies prior to licensing. Mitigation planning, and an assessment of the impacts of different mitigative options needs to be undertaken in regard to project costs, viability, socioeconomic considerations, and mitigation proposed for potentially competing interests. This should all be considered through the development of the environmental impact statement, and certainly prior to license issuance.

4. Numerous examples of lack of coordination and/or communication between the groups responsible for the different study elements are evident. Examples can be found by comparing discussions concerning minimum downstream flow releases in Chapters 4 and 10 to what is found in Chapters 2 and 3. Reservoir temperature modeling discussions in Chapter 10 are not consistent with what is stated in Chapters 2 and 3. Another example is found in the minimal level of concern expressed in Chapter 10 for socioeconomic (Chapter 5) considerations, such as impacts of license denial. More specific comments are included in the attached document. Other Exhibits were not provided to us for review although we requested them by letter dated 19 November 1982.

5. Research of background information is frequently inadequate and incomplete. An example would be the discussions concerning subsistence (Chapters 3 and 5). More adequate research of this very important area appears justified. We have listed several readily available references which would be of value in improving this discussion.

   In Chapters 2 and 3 minimal information is brought into the discussions concerning physical changes which have been observed at similiar hydropower projects. We are sure that many of the potential impacts that are discussed for Susitna (e.g., temperature concerns) are not unique to this project. The State's experience with the Trans-Alaska Pipeline System (TAPS) project could have been drawn upon more fully as an example, particularly in regard to socioeconomic (Chapter 5) discussions. Another example is the discussion concerning natural gas and geothermal electric generation as alternatives to Susitna (Chapter 10). Very little use was made of existing information bases.

6. Speculation is not always clearly distinguished from data-based conclusions. This problem is most apparent in Chapters 2 and 3 and should be corrected.

7. Lack of quantification is a recurrent problem in the Exhibit. Neither base line data nor impacts are appropriately quantified (e.g., Chapters 2, 3, 5, and 10). Statements in the document let us know that, "Much of the discussion is based on professional judgement," (page E-3-3), and, "Many of the statements are speculative . . . and . . . unsupported," (page E-3-56). Other statements let us know that ongoing, or planned studies, will fill these numerous data gaps to allow a quantification of the resources and impacts which would let us go beyond, "the conceptual

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8/ Alaska Power Authority. Request for Proposal No. APA-83-R-030 Construction Management Services for the Watana Phase of the Susitna Hydroelectric Project. 15 November 1982.

mitigation plan," (page E-3-116). Recognizing a problem does not, in and of itself, correct it. We were particularily concerned with this in our review of Chapter 3. In the Exhibit E, the existing resources should be quantified. The potential impacts to these resources should be quantified and then evaluated over the life of the project. Only at that point can specific, effective mitigation measures emerge. We consider quantification of existing resources and impacts and a specific, effective mitigation plan essential to the development of an acceptable environmental impact statement.

8. The ongoing, and planned studies, which are frequently noted (particularly in Chapters 2 and 3) should be fully identified so we can examine them in regard to their scope. We cannot, otherwise, determine what needs to be done and the time frame for accomplishment. Further discussion is provided in our Chapters 2 and 3 general comments, and throughout our specific comments sections.

9. In several of the chapters (e.g., Chapters 2, 3, and 5) we are faced with mitigation options to contend with identified (although frequently unquantified) adverse impacts. For example, in Chapter 3 there are discussions on the potential value of spiking spring flows for salmon out-migration and the installation of a fifth portal on the multi-level intake structure to provide warmer downstream temperatures during filling. If these mitigation proposals have validity, they should have been incorporated into the project design and operational plan. The document does not provide an adequate mitigation plan as required.

   In addition, mitigation measures which are presented should have proven successful in Alaska, or in a similar environment. If the proposals are not proven, then they would need to be demonstrated effective in the project area. Further discussion is provided in our Chapter 3 general comments sections.

10. The need for an effective monitoring program through construction and the operation phase is discussed in many of the chapters. However, the program is not adequately described. We fully support the establishment of a monitoring program. We believe the program should provide for participation by representatives of appropriate State, Federal, and local agencies and be financed by the project. This panel should have the authority to recommend modification of how activities are conducted to assure that mitigation is effective. Recommended changes in the mitigation program should be adopted through a mechanism established in the license, mutually acceptable to all concerned bodies.

11. Unfortunately the rush to meet the schedule for the license application has resulted in poor quality control, i.e., countless typographical errors, missing lines, misreferenced tables and figures, unclear sentences, internal inconsistencies, inadequate documentation, missing references in bibliographies, etc. This should have been eliminated in a thorough editing prior to release for agency pre-license application review. Our review for biological completeness was somewhat hampered by this problem.

In the previously referenced FWS letters and testimony, many of the same concerns discussed above and in the attached comments were raised. It is our view that unless the issues raised in this letter are satisfactorily resolved we do not believe the application could provide the basis of an acceptable environmental impact statement. In this respect we consider the license application to be deficient.

We recommend that you strengthen the license application by including information resulting from a thorough evaluation of the biological data collected during the 1982 field season. This would enable an assessment of the adequacy with the data base to support a sufficiently quantified impact analysis and, in turn, a specific, effective mitigation plan. We believe a realistic appraisal could then be made as to when any remaining deficiencies could be satisfied.

Sincerely,

Assistant Regional Director

Attachment

cc: WAES
Yvonne Weber, WO-FWS
C. Debelius/Acres American
Quentin Edson/FERC
NMFS, EPA, NPS, USGS, BLM, ADEC, AEIDC - Anchorage
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Chapter 1. GENERAL DESCRIPTION OF THE LOCALE: No comments.

Chapter 2. WATER USE AND QUALITY

General Comments

In examining Chapter 2 we were concerned that sufficient scope and quantifications are not provided to allow a quantified impact evaluation of the fisheries and other biological resources. The information provided should allow for the development of specific and effective measures which would fully mitigate for all adverse impacts. We are left with the definite impression that the project would, through changes in stream flow, water quality, temperatures, ice conditions, vegetation, and slough habitats, have significant effects upon the resources of concern to us, particularly the fisheries. However, quantification of the potential impacts is generally lacking, as are specific effective mitigation measures. Of course the latter can not be accomplished prior to the former, despite the attempts found in this chapter.

A significant portion of the lack of specificity found in Chapter 2 is due to the fact that although two years of data have been gathered (1981 and 1982) the Exhibit E reflects only the 1981 data. We have consistently stated that the 1982 data be analyzed and included in the Exhibit E (see Deputy Regional Director LeRoy Sowl's 16 April 1982 statement to the APA Board, and our letter dated 5 October 1982 to Eric Yould). Our position remains the same.

The chapter does not identify what studies have been completed, what studies were ongoing in 1982, and what studies are proposed. Until this is provided we cannot determine what studies we would like to see modified, and what we see as being missed. Without this type of information, the resource agencies are placed in a reactive mode, i.e. we can only comment on what should have been examined in completed studies. However, in so doing, we can better facilitate the applicant's efforts to plan a project we can support. An example of a proposed study which is not addressed in this chapter is the Arctic Environmental Information and Data Center (AEIDC) study. The following is a summary of this proposed study:

> The AEIDC proposal is designed to (1) accurately and comprehensively predict system-wide streamflow and temperature effects of the dam(s), and (2) interpret effects of such changes in terms of aquatic habitats and fish populations. To accomplish these general objectives, AEIDC proposes using a linked system of simulation models which requires data from other project studies, available literature sources, and professional judgement.
>
> The study is a result of the need to consider the special aquatic habitat relationships in the Susitna River basin and the need to account for the interrelated effects of ice, sediment, streamflow, and temperature changes which will accompany construction, filling, and operation of the selected dam or dams.
>
> Most assessments of hydroelectric projects are based upon impacts associated with changes in mean monthly streamflows and temperatures. However, the actual impacts of the project may not be caused by the mean events but through changes in the natural pattern of streamflow or temperature variation. Further, a single set of mean monthly flows does not actually reflect instantaneous flows in the river; the actual

predicted mean monthly discharge will probably not occur during a given month because of expected anomalies in hydrologic statistics. Therefore, it is necessary to predict the range of mean monthly flows expected, based on reservoir inflow, power generation requirements, and downstream demands.

The AEIDC model system would depend heavily upon a reservoir operation model to generate an exhaustive range of feasible weekly or monthly flow regimes and the expected variation over a 30 year forecast period.

The model system would include provisions for ice and sediment modeling to account for changes in substrate distribution, bed elevation or channel configuration which might result from project operation. At a minimum, ice and substrate modeling would support the assumptions that hydraulic boundary conditions either remain stable or change within predictable limits with project operation.

The array of predicted weekly or monthly flows and temperatures may be biologically interpreted in several ways. The available habitat data base is heavily weighted at this time toward known chum and sockeye salmon spawning areas in sloughs and side channels in the Susitna River between Talkeetna and Devil Canyon. Access and spawning dynamics with respect to mainstem discharge are the major simulation goals of several ongoing field studies. The AEIDC modeling system could provide a time-series approach to determine effects upon critical life history stages of these species. It is possible that the entire riverine life cycle of chum salmon might be simulated under various flow regimes to predict long-term population trends. A similar analysis of sockeye salmon might be possible.

The primary concept, again, is first to credibly and comprehensively predict all project operations and their effect upon the habitat-related physical parameters within the system; secondly, those effects will be interpreted, through long-term forecasting, in terms of their influences upon affected salmon populations.

We support the proposed AEIDC study. It should provide the basis for determining project instream flow impacts and a reasonable assessment of mitigative alternatives.

It is apparent that the proposed instream flow releases are designed for maximum power production and do not reflect biological needs. The 12,000 cubic feet per second (cfs) figure for August reflects the maximum amount of water that can be discharge without significant economic effects. It is our understanding that the project releases would be 10,000 to 12,000 cfs year round. No consideration was given to the potential impact of the project during winter when flows of this magnitude might prove highly detrimental to the fishery. The potential value of spiking flows during the spring to facilitate smolt out-migration and flush the sloughs of ice and debris is discussed. However, these flows are not reflected in the proposed releases.

We consider it very important that the license application contain a specific, detailed flow release schedule, which is designed to mitigate project impacts, protect or enhance conditions for fish spawning, feeding, unrestricted fish passage, out-migration, and provide overwintering habitat for fish in the Susitna River. This schedule should be developed through a quantified

instream flow analysis which has been coordinated with the FWS, National Marine Fisheries Service, and the Alaska Department of Fish and Game (ADF&G).

In response to the APA request of 2 September 1982, the FWS, by letter dated 5 October 1982, provided input specific to the draft Exhibit E. We had expected our comments to be addressed in the draft Exhibit E. This is in compliance with the FERC recommendation that information included at the initiation of formal consultation, "...responds to the preliminary comments and recommendations of the agencies."9/ Since this was not done, our 5 October 1982 letter should be made part of our formal response on the draft Exhibit E. As such, the points raised in that letter should be specifically addressed in the Exhibit E submitted as part of the license application. Many of the points raised would be most appropriately responded to in Chapter 2.

Avoidance of adverse impacts should, in compliance with the APA Mitigation Policy document, and NEPA guidelines, be given top priority in the license application. In particular, our concerns as to the decisions which led to such project features as the camp/village, transmission line routing, construction access routing, turbine configuration, filling regime, flow regime, etc., with regard to avoidance of impacts should be addressed.

Specific Comments

2 - BASELINE DESCRIPTIONS

2.3 - Susitna River Water Quality

(a) Physical Parameters

(i) Water Temperature

- Mainstem: Paragraphs 1 and 2: Those months which are being referred to by winter and summer should be indicated.

- Sloughs: Paragraph 1: The first step in understanding the temperature relationship between the mainstem and the sloughs is to measure the temperatures of both sites. This has been done. The relationship between the mainstem and the sloughs regarding temperatures (as well as other water quality parameters) then must be established. This process, apparently, is just beginning. To this end, one slough (#9) has been examined. This examination has focused, correctly, on the groundwater relationship. According to Tony Burgess (Acres American), in his Susitna Hydro Exhibit E Workshop presentation (12/1/82) on groundwater upwelling and water temperature in sloughs, the groundwater regime can be modeled, but locally the match is not very good: The groundwater temperatures near the surface do not match the predicted temperatures. Continued study is obviously indicated for slough #9. After an understanding is achieved for that slough, the program would need to be expanded to other sloughs, possibly sloughs 8A, 11, 19, 20 and 21. These sloughs have been more intensively examined than other sloughs in this reach of the Susitna River. We recommend that this general program be undertaken.

9/ FERC Application Procedures for Hydropower Licenses, Exemptions and Preliminary Permits. April 1982.

- Tributaries: Paragraph 4: The difference in temperatures of the Chulitna and Talkeetna Rivers should be referenced at least by month. It would appear that the cooler temperatures displayed by these rivers would be useful in an assessment of post-project temperatures effects at the confluence and further downstream. We recommend this be examined.

(ii) Ice

- Freeze-up: Paragraph 3: The impact of this process should be fully explained in regard to river morphology and maintenance of the present riparian zone.

- Winter Ice Conditions: Paragraph 2: Please refer to our comments on Section 2.3 (a)(i) - Sloughs. The sloughs should be identified by number, and percentage to which the statements apply.

(iii) Suspended Sediments: The percent contribution, by season, from the major suspended sediment sources should be indicated. An analysis of the anticipated changes, by season, due to the project operation should be made.

(ix) pH: The pH range, from 6.6 to 8.1, is broad and should continue to be monitored. The potential exists for a lethal pH shock to occur to aquatic life with a change of 1.0 pH. A change of this magnitude might be possible from a reservoir water release. A pH below 6.6 may be harmful to fish depending on the amount of free carbon dioxide present in excess of 100 parts per million. Egg hatchability and growth of alevins could be adversely effected at a pH range between 6.5 and 6.0. The need for a predictive water quality model is apparent given the toxic heavy metals that occur in the drainage. We recommend that one be utilized.

(d) Other Parameters

(iii) Others: The railroad right-of-way that parallels the Susitna River has been sprayed with various herbicides for vegetation control for a period of years. Herbicides used include amitrole, 2-4D, bromicil, and Garlon (tordon). Streams of primary concern are Chase, Indian, Lane, and Gold Creeks. A spill of Garlon occurred in Lane Creek in 1977. Sloughs located along the railroad right-of-way could also be recipients of some of the herbicide spray. No fish and/or wildlife tissues have been analyzed for food chain herbicide impacts in the area. Due to the type of herbicide used, we are certain that detectable amounts will occur over a long period of time. Please incorporate this information into your discussion.

2.4 - Baseline Ground Water Conditions

(d) Hydraulic Connection of Mainstem and Sloughs: It should be noted that the sloughs provide valuable rearing habitat for anadromous and resident fish. Additional comments concerning the groundwater connection and current studies are provided under Section 2.3 (a)(i) - Sloughs.

2.5 - Existing Lakes, Reservoirs, and Streams

(a) Lakes and Reservoirs: Paragraph 1: Project features include transmission lines, access roads, transmission line maintenance roads, railroad staging

areas, etc. and should be examined within the context of this section. The proposed Recreation Plan would lead to the encouragement of impacts to numerous lakes throughout the upper Susitna basin. Secondary impacts resulting from the project would expand impacts to additional systems.

2.6 - Existing Instream Flow Uses

(b) Fishery Resources: Reference should be made to burbot and Dolly Varden as important resident species.

(g) Freshwater Recruitment to Estuaries: Paragraph 2: It should be noted that salt water intrusion and mixing would be related to tidal action.

2.7 - Access Plan

(a) Flows: Paragraph 2: The use of regression equations in calculations of peak and low flows in lieu of actual discharge data should not be a substitute for the collection of data, when sizing culverts for engineering integrity or fish passage. Washouts due to undersized culverts resulted on the north slope haul road and, more recently, at the Terror Lake Hydro construction site.

2.8 - Transmission Corridor: Base line information on the transmission corridor from the dam sites to the Intertie has been acknowledged as lacking within the Exhibit. As with other project features, the Exhibit E should provide base line data, impact assessment, and mitigative planning. We recommend that this be done for this project feature. For further comments please refer to our letter dated 5 January 1982 on the Transmission Corridor Report. We provided this letter as formal pre-license consultation and continue to view it as such.

3 - PROJECT IMPACT ON WATER QUALITY AND QUANTITY

3.2 - Watana Development: Reference is made to Exhibit A. By letter dated 19 November 1982 we requested a complete copy of all the Exhibits. This information has not be received.

(a) Watana Construction

(i) Flows: Paragraph 1: The significance of the loss of the one mile reach due to construction would more appropriately be assessed in Chapter 3, under Fishery Resources.

(ii) Effects on Water Quality

- Suspended Sediments/Turbidity/Vertical Illumination: Paragraph 2: Anticipated suspended sediment and turbidity levels should be compared, by month, to the ambient conditions. This would allow an evaluation and understanding of potential project impacts. The amount of spoil which would be generated and the extent to which grading and washing of material would be needed is not addressed. This has obvious implications in regard to water quality and spoil disposal. We do not at this time have sufficent data or maps with which to provide specific input. We would recommend to the extent possible, borrow material be obtained from within the future impoundment area.

It is stated that, "downstream, turbidity and suspended sediment levels should remain essentially the same as baseline conditions." This would not appear to be the case during the winter, when the ambient conditions are crystal-clear.

- Contamination by Petroleum Products: Spillage of petroleum products into the local grayling stream would have significant impacts on this fishery. An oil spill contingency plan should be presented in the mitigation plan which is in compliance with State and Federal regulations.

- Concrete Contamination: The types of potential problems associated with this activity should be identified and a pollution control contingency plan should be developed as a component of the proposed mitigation plans. Such a plan must be in compliance with State and Federal regulations. The Wastewater Treatment section (page E-2-37) is a much more appropriate level of analysis.

(iv) Impact on Lakes and Streams in Impoundment Area: Discussions regarding borrow and spoil materials are extremely general. The potential sites, quantity of material to be removed, or deposited, extent of cleaning that would be necessary, and biological description of the sites to be disturbed, should all be described. Mitigative analysis should address such issues as timing constraints on various operations and measures required to reestablish pre-project conditions for those sites which would not be permanently lost.

(v) Instream Flow Uses: Anticipated impacts for flows greater than the one in 50-year event should be described.

- Fisheries: Paragraph 2: The desirability of avoiding this fishery loss by gating the diversion tunnel should be discussed.

(vi) Facilities: General input is provided in our comments on Chapters 5 and 10. The decisions regarding the type, administration, and siting of the construction camp/village were made without input from resource agencies. In addition, the timing constraints placed upon the construction of this project are no longer supported by economic studies.. (Chapter 10. General Comments). The Exhibit should be revised to reflect updated forecasts. Reference is made to Exhibit F. Although we have requested this Exhibit, it has not been provided.

- Water Supply: It should be noted whether or not the features described in this section were coordinated with the Alaska Department of Environmental Conservation.

(b) Impoundment of Watana Reservoir

(1) Reservoir Filling Criteria

- Minimum Downstream Target Flows: Paragraph 1: The factors that went into this fishery vs economics tradeoff analysis for determining the appropriate downstream flows should be discussed in detail. At the Susitna Hydro Exhibit E Workshop (conducted on 29 November through 2 December) it was indicated that the analysis consisted of determining at what summer flows economic benefits drop off. Given that the economic analysis upon which this is based is generally considered out-of-date (Battelle Newsletter #4, Railbelt Electric Power Alternatives Study), confidence in this analysis from an economic perspective must be low. From a fishery perspective, it is unacceptable.

Paragraph 2: Once we have an acceptable instream flow regime, several gauging stations will be necessary to assure proper flows. It should be recognized that at least eight sloughs are located above Gold Creek and that several of these currently support fish. Flows to maintain or, if possible, enhance the productivity of these sloughs should be provided.

Paragraph 4: The out-migration of salmon in the spring is as likely related to photo-period and development as the other factors listed. Very low flows in the spring could cause many of the juveniles to remain trapped in backwater pools that are normally flooded under pre-project conditions.

Paragraph 6: The proposed flows of 12,000 cfs have not been demonstrated to maintain the integrity of slough morphology and provide the flushing flows needed to clean fines out of gravel. Also, the potential problem of beavers colonizing many of the sloughs, not being naturally controlled by flooding, and therefore interfering with fish usage of the sloughs should be addressed. Competing interests of aquatic and terrestrial project components such as salmon vs beaver conflicts have been given minimal attention in the Exhibit.

Paragraph 7: Adequate instream flows for the winter period should be established according to fish requirements. This is a critical period for fish and even minor dewatering may have significant deleterious effects.

(ii) Reservoir Filling Schedule and Impact on Flows: Once an acceptable instream flow study has allowed an evaluation of various flow regimes, an acceptable filling regime for the project which would minimize impacts to aquatic resources can be developed. The proposed filling regime has been established upon an inadequate biological information base.

(iii) River Morphology: Paragraph 3: The potential negative impacts on slough areas downstream of Talkeetna due to decreasing the recurrence intervals of what are now mean annual bank-full floods are not addressed.

(iv) Effects on Water Quality

- Water Temperature: The timing and consequences of the filling regime on downstream temperatures should be better defined. Just as modeling needs to define operational thermal changes, the thermal processes should be modeled for the filling period. From this we may be able to consider mitigative measures.

- Suspended Sediments/Turbidity/Vertical Illumination

. Watana Reservoir: Paragraph 3: Discussion should be provided on the impact of water quality changes on the photosynthetic process downstream of the reservoir.

Paragraph 4: It is stated that, "...the river will be clearer than under natural conditions." This may be true during the summer, however, it is our understanding that this will not be the case during the winter.

. Watana to Talkeetna: We believe the increase in winter turbidity might be more important in terms of potential fishery impacts. Quantification of potential changes should be provided. The methodology by which the summer

turbidity levels were established and why it is not applicable to predicting winter conditions needs to be explained.

. Talkeetna to Cook Inlet: Anticipated changes during the winter should be discussed.

(v) Effects on Groundwater Conditions

- Impacts on Sloughs: Paragraph 1: The potential impacts on slough habitats are not clearly described. The discussion provides the impression that there is a greater understanding of the groundwater relationship between the sloughs and mainstem than is warranted by studies to date. Please refer to our comments under Section 2.3(a)(i) - Sloughs.

Paragraph 4: It is indicated that reduced staging would result from the decreased winter flows. The potential impact should be addressed in regard to the potential to dewater spawning and rearing habitats.

Paragraph 5: Although the temperature relationship of the mainstem and sloughs does not appear to be well understood, discussion should be included on this potential impact, particularly during the second year of filling when the differences from pre-project conditions are greatest.

(vii) Effects on Instream Flow Uses: Please refer to our comments on Section 2.3(a)(i) - Sloughs, and 3.2(b)(v) - Impact on Sloughs. The statements of no temperature effects are not supported by data or citation. The reduction of flows through these sloughs is not quantitatively defined. The loss of scouring flows to clean fines, remove beaver dams, and clear ice could result in significant loss or degradation of slough habitat for fish.

(c) Watana Operation

- Minimum Downstream Target Flows: The criteria are not provided which led to the development of the "target" flows. Apparently, no consideration is provided concerning maximum flows, which may be a more important consideration during winter than establishing a minimum flow level.

. Monthly Energy Simulations: Paragraph 1: The potential impacts of the water year 1969 extreme drought should be fully addressed. The effect of this naturally occuring event should be described in regard to Watana operations, how downstream flows would be maintained and how it would effect the biological resources. For example, we suspect that higher downstreams flows would be necessary to allow entrance to sloughs during this period.

. Daily Operation: In that the Devil Canyon development may not come on-line for many years, if ever, consideration should be given to operations without the Devil Canyon dam. A greater level of concern and discussion should be forthcoming on avoidance of potential impacts to the sloughs above Gold Creek.

- Floods

. Spring Floods: Paragraph 2: In that spring floods are part of the pre-project regime, discussion should be provided as to the importance of this phenomenon and whether or not post-project simulated spring floods should be included in the post-project flow regime.

(ii) River Morphology: Paragraph 2: The discussion on ice process should be expanded.

Paragraph 3: The discussion leads to a view that eventual loss of the slough habitats is inevitable. The flow regime proposed does not counteract this potential problem. Avoidance of this impact through flow modifications is consistent with the APA Mitigation Policy document and NEPA. It illustrates a low level of biological consideration in the formulation of the proposed instream flow regime.

(iii) Water Quality

- Water Temperature

. Reservoir and Outlet Water Temperature: Paragraph 2: 1982 data from Eklutna Lake, which Watana Reservoir is expected to mimic, was presented at the Susitna Hydro Exhibit E Workshop. During the winter, Eklutna Lake showed temperatures ranging from 0° to 3.6°C in the upper 2 meters, dropping to isothermal conditions below this depth. If Watana Reservoir exhibits a similar shallow winter stratification it would appear that Watana could not be operated to, "...take advantage of the temperature stratification within the reservior."

Paragraphs 5 through 7: Given that the temperature model has only been run for five months and has only one year of data for that period (1981) this discussion must be considered speculative. It is our understanding that input for this model is lacking because previous data was tailored to an earlier temperature model which is no longer considered applicable to this project. It would seem premature to place much faith in the new model based on the minimal level of testing to date. We recommend that data from two full years be inputted to the model and the results be provided in the Exhibit E.

Paragraph 8: This suggests that winter outflow temperatures between 1° and 4°C can be selectively withdrawn through a multi-level intake structure. This would be dependent upon the thermal profile of the reservoir during the winter, a period which has so far not been modeled. The statement suggesting that one degree water temperatures can be selectively obtained is speculative. It is also in conflict with the information provided at the Susitna Hydro Exhibit E Workshop where Eklutna Lake was presented as a model for Watana Reservoir. Eklutna Lake showed winter temperatures between 0° and 3.6°C within the upper two meters of the surface. If Watana Reservoir shows a similar winter stratification one should not expect to be able to tap temperatures other than 4°C with the proposed multi-level intake structure. It would have been appropriate to reference the Eklutna study findings here as is done on page E-2-61.

. Slough Water Temperatures: Paragraph 1: Please refer to our comments on Section 2.3(a)(i) - Sloughs.

- Ice: Paragraph 1: It should be clarified as to what would be the impact of the reduced contribution from the upper Susitna River. Estimations of post-project ice staging should be compared to pre-project conditions and the methodology by which the predictions were made should be explained, and/or referenced.

Paragraph 2: How ice is lost to the system, post-project, would dramatically change from pre-project conditions. The impact of this major change in this riverine system should be thoroughly explored, not merely noted.

- Turbidity: Paragraph 1: Please provide an explanation as to why, "Turbidity in the top 100 feet of the reservoir is of primary interest."

- Nitrogen Supersaturation: Discussion should be provided specific to the fixed-cone valves. It is stated that the valves would discharge spills up to a one in 50 year event, but we have no indication of the anticipated extent of their use. Withdrawing water from the hypolimnion they would often be counterproductive to what is intended to be achieved through use of the multi-level intake. The potential for thermal shock in fishes, or shock due to rapid shifts in other water quality parameters, should be evaluated. Rapid water level changes would also be an obvious result of their use, particularly between the dam face and the powerhouse.

3.3 Devil Canyon Development

(a) Watana Operation/Devil Canyon Construction: Paragraph 1: The referenced Exhibit A has not been provided, although we requested it.

(ii) Water Quality

- Concrete Contamination: Please refer to our comments on Section 3.2(a)(ii) - Concrete Contamination.

(vi) Facilities: Decisions regarding the Devil Canyon support facilities were made without input from resource agencies.

- Construction, Operation and Maintenance: The, ". . . appropriate preventative techniques . . ." should be described, and incorporated into the mitigation plan.

(b) Watana Operation/Devil Canyon Impoundment

(iii) Effects on Water Quality

- Water Temperature: The ability to continue to selectively remove very narrow temperatures bands would depend upon numerous unknowns; assuming the ability exists with operation of Watana alone. Removal of such a sizeable quantity of water in so short a period of time certainly would have implications for one's ability to select temperature bands during certain times of the year. It should be stated that the temperature model upon which this all rests only has input from five months of one year.

- Support Facilities: Please refer to our comments on Section 3.3 (a)(vi) - Construction, Operation and Maintenance.

(vi) Instream Flow Uses: It is our understanding that significant losses to the existing fisheries would result. The basis for the statement that, ". . . additional fishery habitat will become available . . ." with Devil Canyon Reservoir should be explained in detail.

(c) Watana/Devil Canyon Operation

(i) Flows

- Project Operation: It is indicated in the Feasibility Report Vol. 1, page 13-32, that compensation flow pumps would be installed. An explanation as to the function of these devices, their purpose, the flows which they would provide, whether or not they are to be installed in one dam or both, how water from this source would effect the water quality parameters of the water released from the powerhouse, and the basis for the flows which would be provided from this source should be provided. We would also like to see an explanation of the fixed-cone values regarding their expected periodicity of use (at least by month) and impacts on water quality parameters and flow levels.

(ii) Effects on Water Quality

- Water Temperatures: Since Devil Canyon Reservoir has not yet been modeled, the rationale for this discussion should be presented. The thermal models for Watana and Devil Canyon should provide information on the following:

(1) The temperature profile, depth to isothermal conditions, and timing of mixing;

(2) The timing of winter stratification;

(3) The extent of turbulence that would be generated at the reservoir intake; and

(4) The capability of the intake structure to select from one temperature layer in a stratified reservoir.

This should be included in the Exhibit E.

- Ice: Please refer to our comments on Section 3.2(c)(iii) - Ice. Information should be provided on the extent of scour in the sloughs under winter and spring break-up conditions. Discussion should address where the ice front would develop under "worst case" conditions for post-project Watana and Watana/Devil Canyon operations. Fluctuating high power demand in a record cold year and a record warm year should be discussed. Scenarios which would produce over-topping of river ice and multiple break-ups which may scour the river channel should be described.

- Nitrogen Supersaturation: Please refer to our comments under Section 3.3(c)(i) - Project Operation.

- Facilities: Erosion control measures should be described and incorporated into the mitigation plan.

3.4 Access Plan Impacts: Paragraph 2: Reference is made to Exhibit A. By letter dated 19 November 1982 we requested a complete copy of the license application. We have not yet received this Exhibit.

(a) Flows: Accurate discharge information on the creeks is needed to insure proper culvert sizing for fish passage. Utilization of culverts rather than bridges could result in more blockages to grayling migration due to beaver activity.

3.5 Transmission Corridor Impacts: Please refer to our letter dated 5 January 1982 regarding the Transmission Corridor Report.

5 - MITIGATION, ENHANCEMENT, AND PROTECTIVE MEASURES

5.1 Introduction: Paragraph 2: It is stated that, ". . . mitigative measures," were incorporated, ". . . in the preconstruction planning, design, and scheduling," yet we see construction camps/villages which were planned with no outside coordination with resource agencies, or even consideration of alternatives. The transmission corridor from the Watana dam was also planned with essentially no resource agencies input. We see scheduling, (based on an out-of-date economic analysis), determining access routing, timing of construction activities, and reservoir filling with no input from resource agencies. This has precluded an objective examination of alternative mitigation measures.

Minimum flows are proposed with the impression that they were arrived at through an as yet undisclosed fisheries vs. economic tradeoff. In the draft Exhibit E we have an evaluation of economically determined flow releases, the basis for which are no longer accepted by the economists that developed them (Battelle Newsletter #4 (Final), Railbelt Electric Power Alternatives Study, December 1982), competing against flow releases. The 12,000 cfs flow release is apparently the maximum discharge for August without significant economic effects.

We suspect that the flexibility for providing instream flows, once this issue has been resolved, is highly dependent upon the hydraulic turbines which are selected for the project. We recommend that a tradeoff analysis be presented to display the relationship of different hydraulic turbine configurations with both a one dam and two dam configuration related to maximizing flow release options vs more flexible turbine system alternatives. If the proposed turbines, in either dam, would adversely effect future instream flow options then the decision as to the preferred turbine configuration should be deferred until a specific, detailed flow release schedule, developed through a quantified instream flow analysis, is agreed upon which would mitigate impacts or enhance conditions for spawning, feeding, passage, out-migration, and overwintering in the Susitna River.

The proposed multi-level intake structure would provide the flexibility to select a desirable temperature regime only if the temperature bands exists in the reservoir of sufficient size and of sufficient depth. It has not been established that the multi-level intake would provide sufficient temperature control. At present, Watana Reservoir has been thermally modeled for five months of one year. It is our understanding that this is insufficient to even test the model for the five months for which it was run. Devil Canyon Reservoir has not been modeled, yet the recent incorporation of a multi-level intake here leads one to believe the applicant expects this reservoir might stratify. We recommend that modeling be carried out for both reservoirs, throughout the year, and the resultant data be incorporated into a river

temperature model. This should be based upon two years of data (e.g. 1981 and 1982) and presented in the license application.

Reference is made to the incorporatior of fixed-cone values to prevent nitrogen supersaturation. The frequency, periodicity, and anticipated volume of use is not addressed. Since they would be drawing upon water very low in the dam and then dumping an unknown volume of this water into an essentially dry riverbed we would expect potential adverse impacts to the mitigation flow and temperature regimes. The potential effects upon icing conditions and, depending upon the time of year, salmon movements needs to be assessed. We recommend that these potential impacts be discussed in the Exhibit E.

Paragraph 3: The importance of monitoring construction practices, operation and maintenance and monitoring of mitigation is recognized in the APA Mitigation Policy document. How this will occur needs to be examined in the Exhibit E. We recommend that a panel of appropriate State, Federal, and local agency personnel be established, at project expense to monitor project construction, operation and maintenance. The monitoring panel, mandate, and operational mechanisms should be discussed in the license application.

5.2 - Construction: Please refer to our comments above, Section 5.1: Paragraphs 2 and 3.

Paragraph 2: Please refer to our discussion of instream flows under Sections 5.1: Paragraph 2, 3.2(b)(i) - Minimum Downstream Target Flows, and 3.2(c) - Minimum Downstream Target Flows. Additional pertinent comments can be found throughout. The statements contained in Section 5.3 can only be considered speculative, to date there are no studies to support them. Only one slough, identified as #9, has received detailed study. In the November 1982 draft report provided at the Susitna Hydro Exhibit E Workshop, Preliminary Assessment of Access by Spawning Salmon to Side Slough Habitat above Talkeetna, the author noted that until the 1982 field data are analyzed, any statements regarding streamflows necessary for chum salmon access to the side sloughs are provisional. It should also be recognized that the examination of slough access flows is not only without support, but one dimensional. No analysis is put forth to examine other life phases of fish, or project related changes in water quality parameters.

Paragraph 5: Changes in downstream river morphology have not been fully assessed. It is premature to conclude that no mitigation would be necessary. The lack of ice scour and flood flows may cause sloughs to silt in and may reduce natural cleaning processes necessary to maintain productive spawning substrate and rearing areas.

Paragraph 6: It would seem appropriate to examine, in the Exhibit E, methods of mitigating the potential thermal effects anticipated during the filling period, to include extending the filling period.

5.4 - Mitigation of Watana Operation Impacts

(a) Flows: Paragraph 2: Please refer to our comments under Section 5.1: Paragraph 2 and Section 5.3: Paragraph 2.

Paragraph 3: It is stated that, "Watana, when it is operating alone, will be operated primarily as a base load plant." Please discuss the extent to which it is intended to be operated as a peaking facility. Of particular concern would be how it might operate under worst case conditions, such as fluctuating high power demand during a record cold year. The implications of scenarios like this should be explored in the Exhibit E if Watana is being proposed for periodic peaking use.

(b) Temperature and D.O.: Please refer to our comments addressing the multi-level intake structure and reservoir temperature modeling in Sections 5.1: Paragraph 2, and 3.3(b)(iii) - Water Temperature. We have provided additional comments on these subjects throughout.

(c) Nitrogen Supersaturation: Please refer to our discussion of the fixed-cone valves under Sections 3.2(c)(iii) - Nitrogen Supersaturation and 5.1: Paragraph 2.

5.6 Mitigation of Devil Canyon/Watana Operation

(b) Temperature: Discussion should be provided as to why multi-level intake ports are proposed at Devil Canyon. It would appear that it has been concluded, without benefit of a thermal reservoir model, that Devil Canyon would stratify.

Chapter 3. FISH, WILDLIFE, AND BOTANICAL RESOURCES

General Comments

Fishery Resources of the Susitna River Drainage

Periodically in the Fishery Section are disclaimers such as, "Much of the discussion is based on professional judgement," (Section 1.2, page E-3-3), or "Many of the statements are speculative...and ...unsupported," (Section 2.3, page E-3-56). Other statements let us know that ongoing, or planned studies, will fill these numerous data gaps to allow a quantification of the resources and impacts (Sections 2.2(b)(ii), 2.4(b)(ii), 2.5, 2.5(c)(ii), etc.) and let us go beyond, "the conceptual mitigation plan," (Section 2.5, page E-3-116) which is provided in this chapter. Recognizing a problem does not, in and of itself, correct it. We are concerned that the Fishery Section generally fails to quantify the existing resources, fails to quantify the potential impacts, and fails to provide specific mitigation measures to deal with identified, quantified, adverse impacts. Once we have potential mitigation measures, these proposals would need to be evaluated, for example, in regard to potential impacts on: project costs, design, and feasibility; socioeconomic considerations; and fish and wildlife resources other than those for which the mitigation is targeted. This type of evaluation would form the basis of an acceptable environmental impact statement and should be provided as part of the license application.

The ongoing and planned studies which are frequently cited (Sections 2.2(b)(ii), 2.4, 2.4(b)(ii), 2.5, 2.5(c)(ii), etc.) should be fully identified so we can examine them in regard to their scope. We cannot, otherwise, determine what needs to be done and what is being done (with assurances that it will be done).

Potential impacts are frequently identified in the Fishery Section, such as loss of the apparently important high spring flows for out-migrations (Section 2.3(a)(ii)), and 4°C flows during the second summer of Watana Reservoir filling (Section 2.3(a)(ii)). Potential mitigation to contend with these anticipated adverse impacts are suggested, such as spiking spring flows (Section 2.4(b)(ii)) and installing a fifth portal on the multi-level intake structure (Section 2.4(b)(ii) [SIC, iii]). If these mitigation proposals have validity, then they should be incorporated into the design and operations proposal.

Mitigation measures which are proposed should have proven success in Alaska, or in a similar environment. If the proposals are not proven, then they would need to be demonstrated effective in the project area. For example, hatchery propagation of grayling may need to be demonstrated as an effective alternative since grayling hatcheries have not been particularly successful in Alaska. Likewise, the proposed slough modifications are unproven and thus should also be demonstrated in the Susitna system before project operation.

We support the establishment of a monitoring program funded by the project, containing a board of representatives from appropriate State, Federal, and local agencies. The board should have the authority to recommend project modification measures to assure that mitigation is effective. The procedure

by which this would occur should be incorporated into the license as an article. This type of monitoring program should be discussed in the mitigation plan.

Botanical Resources

At the recent Susitna Hydro Exhibit E Workshop, 29 November to 2 December, we were pleased to learn of the recent efforts to coordinate botanical and wildlife data needs. Vegetation types within the project area are apparently now being subcategorized and remapped on the basis of more recent, larger-scale photography and additional field work. Analyzing the value of vegetation as part of wildlife habitat, an information need we have consistently cited (e.g. FWS letter to Eric Yould, APA, 5 October 1982), will better allow quantification of project impacts and the development of mitigative measures. However, these efforts render the current Botanical Resources Section at least partially obsolete.

Because there is no explanation of ongoing studies, the reader is left with the perception that vegetation studies have been completed. We recommend that descriptions of the following be provided in the Exhibit E: (1) current remapping efforts for both overall vegetation and wetlands; (2) plans for summer 1983 ground truthing of this data; (3) 1984 field work which may be necessary for verifying wetlands; (4) proposed productivity studies relative to project moose studies (see Section 4.2(a)(i), page E-3-204, paragraph 2 and Section 4.3(a)(i), page E-3-281, paragraph 3); and (5) schedules for completing these investigations and analyses in conjunction with overall mitigation and project planning. Such information is provided, to some extent, relative to the Aquatic Studies Program, Section 2.5.

In general, the description of vegetation types and potential project impacts is thorough. Still, a major problem with this section involves incomplete coverage of wetlands. Minor problems involve the need for some additional maps and tables, and conflicting citations of figures and tables (e.g. referring to Figure W1 and Table W3 as Figure E.3.W1 and Table E.3.W3 in the text).

Wildlife

We found the Wildlife Section both too general and incomplete. Judgmental statements are rarely referenced (e.g. page E-3-376, last paragraph) qualitative terms are seldom defined (e.g. page E-3-315, last paragraph; page E-3-310). Perhaps most critical is the minimal detail and coverage of the mitigation plan.

Lack of quantification is a serious problem throughout this section. While baseline populations are occasionally estimated, impacts are typically qualified only as major or minor, and no values are provided for those mitigation measures which are recommended.

We are highly concerned with the lack of attention to habitat values, although we have repeatedly cited the need for project evaluations to consider habitat values as well as populations (please refer to FWS letters to Eric Yould, 5 October 1982, 5 January 1982, 23 June 1980, and 15 November 1979; and testimony of LeRoy Sowl, FWS, before the APA Board, 16 April 1982). We

appreciate the initial efforts to evaluate habitats for furbearers and birds, and the reported plans to model carrying capacity for moose. Yet we see no evidence of how such evaluations will be continued, expanded to other species, and most importantly, used in developing timely, comprehensive mitigation measures, which are an integral part of project plans.

Where population information is provided, it is for the current situation. No accounting is given for long-term habitat potentials, for example, (1) habitats may be able to support greater populations over the long-term (e.g. pine marten near Watana Creek); (2) habitat values may decline as, through succession, vegetation proceeds to more mature stages which are less productive for moose; or (3) harvest management goals may be modified and caribou populations allowed to increase to where available habitats are more completely stocked.

We recommend providing information on continuing studies (including habitat modeling) and how data gaps identified here, in previous agency comments, and the August 1982 Adaptive Environmental Assessment (AEA) Workshop will be answered. Our Specific Comments below, further address this need. Another major problem is that the Wildlife Section is not integrated, nor is it consistent relative to impact potentials and mitigation options with other sections in Chapter 3 or with other chapters in the Exhibit E. For example, in Chapter 3 the impacts discussions are based on no access along the transmission corridor; in Chapter 5, such access is assumed (Section 3.7(c)(i), page E-5-84).

Not only do we recommend that this problem be corrected, but that evidence be provided as to this section has been integrated into project designs and scheduling. That integration is most critical with regard to the mitigation plan. Information should be provided on the mechanism for notifying project engineers of key wildlife areas and at the same time for the engineers to notify the environmental consultants and resource agencies of design changes or mitigation measures they believe are unfeasible. Additional information should be provided on the process to be followed for finalizing and then implementing mitigation requirements.

Integration of the various report sections would be aided through an overview discussion of overall project objectives for wildlife, fisheries, vegetation, recreation, land use, and socioeconomics.

Presently we find apparent objectives of the Wildlife Section often contrary to recreation or socioeconomics; within the Wildlife Section, objectives for one species may conflict with those for another species.

Because of the voluminous nature and complexity of material involved, it is difficult to assess population status, habitat values, impacts, and mitigation for each species relative to all other species. This is particularly important where mitigation for one species may be at the expense of another, as above. Thus we suggest some type of summary chart which would show, by species: (1) populations; (2) habitat types and values; (3) status (i.e. increasing/decreasing, upper/lower basin, etc.); (4) values (commercial, recreational, and/or subsistence with monetary figures where possible); (5) past and present harvest effort, success, and management restrictions; (6) impacts; and (7) mitigation alternatives. Please refer to our suggestions

under Section 3.4 for evaluating mitigation alternatives as prioritized under NEPA guidelines. The schedule for filling resultant data gaps could then be outlined; additional mitigation needs or tradeoffs in benefits/impacts would also be obvious.

We recommend quantifying the level of mitigation to be achieved by different measures. This is particularly important where management policies are unclear (e.g. housing and transportation of workers, harvest regulations, and prohibitions on use of the access road pre- and post-construction will determine the magnitude of project impacts).

Finally, we are concerned that although the fragmentation of project impacts by project feature allows for a more comprehensible analysis, the report lacks a broad overview. Cumulative impacts are generally ignored. We recommend that such impacts be compiled in conjunction with a list of unavoidable adverse impacts.

Lack of key data has made it essentially impossible to more than outline the types of measures which should be included in the mitigation plan. In many cases, no evidence is provided for the proven success of recommended measures in Alaska or similar environments. For such unproven measures, demonstration projects should now be established or back-up mitigation measures outlined for implementation if unproven measures fail (e.g. blasting to enlarge the Jay Creek mineral lick, provision of artificial raptor nests).

The monitoring program we recommended under the Fishery Section should also be extended to wildlife resources in the project area.

Specific Comments

1 - INTRODUCTION

1.2 - Impact Assessments: Paragraph 1: Please refer to our Fishery Section - General Comments regarding quantification and the status of the project studies.

Paragraph 4: Several of these references do not appear in the bibliography.

1.3 - Mitigation Plans: Paragraph 8: Avoidance of adverse impacts rarely appears to occur, particularly in regard to project features. For example, missed opportunities to avoid adverse fish and wildlife resources impacts exist in: project scheduling; mode and routing of construction access; recreation planning; siting, administration, and type of construction camp/village; and instream flow regime.

The monitoring program, which has been supported in several chapters, should be fleshed out. The program should provide for participation by appropriate representatives of State, Federal, and local agencies, be supported by the project, and be able to recommend changes in the mitigation program to be adopted through a mechanism established in the license, mutually acceptable to all concerned bodies.

2 - FISHERY RESOURCES OF THE SUSITNA RIVER DRAINAGE

2.1 - Overview of the Resources

(d) Selection of Project Evaluation Species: Paragraph 4: Improving habitat conditions for an evaluation species would be helpful to other species with similar habitat requisites. However, we would expect other species, with habitat requirements that conflict with evaluation species, to be adversely affected. In addition, we recommend Dolly Varden and burbot be included as evalution species for the Susitna River downstream of Devil Canyon.

Paragraph 6: It is stated that, "Improved conditions in the mainstem are expected to provide replacement habitat...Juvenile overwintering habitats are not expected to be adversely affected." We are unaware of specific data to support these statements.

Paragraph 8: Evaluation species and life stages should be listed for the Cook Inlet to Talkeetna reach.

(e) Contribution to Commercial, Sport, and Subsistence Fishery

(i) Commercial: Species specific comparisons are made of commercial harvest to escapement. Perhaps a better gauge would be to provide estimated contribution to the commercial harvest, as is assessed in Chapter 5 (page E-5-70), or estimated contribution to the run. This, however, also would simplify the systems contribution, but would at least provide reviewers with a better understanding of production.

(ii) Sport Fishing: Paragraph 2: If more recent surveys are available, this section should incorporate them.

(iii) Subsistence Harvest: The following three ADF&G reports would allow for a more expansive discussion of this important topic:

1. Foster, Dan. November 1982. The Utilization of King Salmon and the Annual Round of Resource Uses in Tyonek, Alaska. ADF&G. 55 pp. + appendices.

2. Stanek, Ronald, James Fall and Dan Foster. March 1982. Subsistence Shellfish Use in Three Cook Inlet Villages, 1981: A Preliminary Report. ADF&G. 17 pp. + appendices.

3. Webster, Keith. April 1982. A Summary Report on the Tyonek Subsistence Salmon Fishery, 1981. Upper Cook Inlet Data Report Number 81-3. ADF&G. 16 pp. + appendices.

2.2 - Species Biology and Habitat Utilizaton in the Susitna River Drainage

(a) Species Biology

(iii) Resident Species

- Arctic Grayling: Paragraph 8: The statement that, "Assuming other conditions for spawning are favorable,..." should be expanded to allow an understanding of what these other conditions are and why we should assume they would be favorable.

(b) Habitat Utilization

(ii) Talkeetna to Devil Canyon

- Mainstem and Side Channels: References are made to low flow and maximum flow. The flows should be quantified so that an understanding of potential project impacts and mitigative flows can be related to how it would influence habitat.

.Species Occurrence and Relative Abundance: The baseline information and analysis should incorporate the 1982 field season data.

- Slough Habitat: Paragraphs 2 and 3: The effects of various flow levels should be referenced by the number of sloughs which would be impacted by the particular problem and the relative importance of the effected sloughs in terms of salmon habitat.

Paragraph 4: The basis for the intragravel temperature statements should be provided, whether conjecture or based upon a study of X number of sloughs.

.Significance of Habitat

..Salmon: Paragraph 2: The relative value of tributary sites (mouths?) vs sloughs may be a reflection of ease of study, or effort.

2.3 - Anticipated Impacts to Aquatic Habitats: Paragraph 3: Please refer to our discussion under Fishery Section - General Comments.

(a) Anticipated Impacts to Aquatic Habitat Associated with Watana Dam

(i) Construction of Watana Dam and Related Facilities

- Watana Dam

.Changes in Water Quality: Although turbidity levels may be decreased, on the average, throughout the year, a more appropriate impact evaluation would be to examine turbidity levels by season or month vs aquatic life stage.

Paragraph 11: Examples of "...good engineering practices, and a thorough SPCC plan," should be provided in the mitigation plan. The abbreviation of the plan should be spelled out.

.Direct Construction Activities: Paragraph 1: Material sources should generally be confined, unless unavoidable, to that area which would be inundated by the impoundment, or upland sites. In that the Devil Canyon dam is not a certainty, rehabilitation of Cheechako Creek should be planned.

Joyce, Rundquist, and Moulton (1980) is referenced several times. We request that this reference be provided, and the pertinent discussions from this paper be incorporated into this section.

- Watana Camps, Village and Airstrips

.Construction and Operation of Camps, Village and Airstrips: Paragraph 1: Reference is made to Exhibit A which has not been provided, although we have requested it.

..Indirect Construction Activities: We expect secondary impacts, avoidable and unavoidable, to be much greater than that indicated by this discussion. We provided comments on this topic in response to appropriate Chapter 5 sections, where this topic is also inadequately discussed.

(ii) Filling Watana Reservoir

- Watana Reservoir Inundation

.Mainstem Habitats: Paragraph 4: Although overwintering habitat would be increased, the overall impact would probably be a net loss of habitat value. The discussion does not identify what species might benefit from this increase in overwintering habitat.

Paragraph 5: The basis for the statement, "Reservoir temperatures in the top 100 ft are expected to be in the range of 1° to 2°C," should be provided. First, the reservoir temperature model has not been run for the period November through May. Second, the statement is in apparent conflict with the information provided at the Susitna Hydro Exhibit E Workshop in which Eklutna Lake was presented as a model for Watana Reservoir. Eklutna Lake shows winter temperatures between 0° and 3.6°C within the upper two meters.

- Talkeetna to Watana Dam

.Mainstem Habitats: Paragraph 1: In that the river would no longer be clear, the effect of this change in turbidity upon movement of juvenile salmon and resident fish should be addressed.

Paragraph 4: The apparent importance of the receding limb of high spring flows to stimulate out-migration is noted yet we see no effort to simulate this in the recommended instream flow regime.

Paragraph 9: It is recognized that the outflow temperatures during the second open-water season could have substantial adverse impacts. This problem in relationship to how it was handled at other hydropower projects should be discussed.

.Side-Channel Habitats: Paragraph 3: Until an adequate instream flow study is conducted, these statements will remain speculative.

Paragraph 4: It should be stated whether or not rearing habitat is considered limited.

Paragraph 5: The decreased temperatures expected would probably counteract any benefits derived through decreased suspended sediments.

.Slough Habitats: The potential impacts during filling should be discussed. Flows and temperatures would be changed from ambient. Until the ground water relationship, in regard to flows and temperatures, is adequately established the potential for impacts should not be dismissed. Whether or not the colder second year releases would have a delayed temperature effect upon the sloughs should be examined.

Paragraph 3: It should be explained that the basis for these statements is preliminary results from an examination of one slough (#9).

Paragraphs 4 and 5: The slough which had a backwater form above 14,000cfs should be identified. It is not explained whether this is typical of all sloughs, some sloughs, or even just that one unidentified slough. It is apparent from this section that 12,000cfs would hamper or restrict passage of adults into an undisclosed proportions of the sloughs and would not create a backwater effect for an unknown proportion of the sloughs. The biological basis by which 12,000cfs was chosen as the preferred flow for August should be explained in light of the discussion of this section.

.Tributary Habitats: Paragraph 4: It is noted that some creeks may become perched under the proposed filling schedule. The desirability and feasibility of altering the filling schedule to avoid this impact should be discussed.

- Cook Inlet to Talkeetna Reach: It has not been clearly established that the project would not adversely impact fisheries below Talkeetna during reservoir filling and project operation.

.Mainstem Habitats: It is our understanding that millions of eulachon spawn in the lower river. If this spawning run is stimulated by certain temperatures or peaking spring flows the project could significantly impact this species. Secondary impacts would occur to those species, such as bald eagle and belukha whale, which feed on them. This potential problem should be discussed.

.Slough Habitats: Paragraph 1: This discussion is in apparent conflict with Section 2.2(b)(iii) Slough Habitat - Significance of Habitat .. Salmon (page E-3-51) where it is stated that these habitats may be used for spawning.

..Tributary Habitats: Paragraphs 2 and 3: A 10 percent reduction in flows could mean a zero reduction in habitats of concern or 100 percent reduction or something in between. We recommend that these flow reduction percentages be related to their effect on habitats of importance to life stages of those species of concern.

(iii) Operation of Watana Dam

- Talkeetna to Watana Dam

.Mainstem Habitats: Discussion should be provided specific to the fixed-cone values. There is no indication of the anticipated extent of their use. In that they would be withdrawing water from the hypolimnion they would often be

counterproductive to what is intended to be achieved through use of the multi-level intake. The potential for thermal shock, or shock due to rapid changes in other water quality parameters, should be evaluated. Rapid water level changes would also be a potential problem that should be explained.

Paragraph 8: Discussion appears to be in conflict with Paragraph 16 of this section concerning suspended sediment transport.

Paragraph 9: Sediment load and turbidity are not synonymous. Turbidity should increase substantially over ambient winter levels.

Paragraph 16: The observation that fish apparently overwinter in the turbid Kenai River allows one to conclude that, over a long period of time, these (unidentified) species can adapt to turbid conditions. The conclusion that the Susitna stocks can, in one year, adapt to Kenai River like conditions is a big step. Please more fully discuss this potential problem.

- Cook Inlet to Talkeetna Reach: Please refer to our comments under Section 2.3(a)(ii) - Cook Inlet to Talkeetna Reach.

(b) Anticipated Impacts to Aquatic Habitat Associated with Devil Canyon

(i) Construction of Devil Canyon Dam and Related Facilities

- Devil Canyon Dam

- Alteration of Waterbodies: Paragraph 3: Please refer to our comments on Section 2.3(a)(i) - Watana Dam . Direct Construction Activities.

.Disturbance of Fish Populations: Please refer to our comments on Section 2.3(a)(i) - Watana Dam . Direct Construction Activities.

- Devil Canyon Camp and Village

.Construction and Operation of Camp and Village: Paragraph 1: Reference is made to Exhibit A, which we requested. It has not been provided. We have not had input into the decisions regarding the type, administration, or siting of the construction camp/village. Avoidance of impacts to fish and wildlife resources should have been a major consideration in these decisions. In that we did not participate in these decisions and no alternatives to those which are considered "preferred" are examined in Chapter 10 we can only conclude that little, or no, consideration was given to this mitigation procedure.

.Direct Construction Activity: Please refer to our comments under Section 2.3(a)(i) - Watana Camps, Village and Airstrip . Construction and Operation of Camps, Village and Airstrips .. Indirect Construction Activities.

(iii) Operation of Devil Canyon Dam

- Talkeetna to Devil Canyon Dam

.Mainstem Habitats: Paragraph 1: We assume that the 500cfs flows in this reach would be provided by compensation flow pumps, discussion of which does not appear to be provided in this Exhibit. An explanation should be provided as

to the function of these devices, their purpose, and how water from this source would effect water quality parameters of the water released from the powerhouse and the fixed-cone values, and the basis for the flows which would be provided from this source. Please provide the rationale for the statement that a reduction in flows of the magnitude which would occur would not be expected to adversely affect fish populations in this portion of the river.

.Slough Habitats: An explanation should be provided for the statement that changes in streamflow during the open-water season are not expected to affect slough habitats. We consider the potential for significant adverse effects to this habitat type to be high.

- Cook Inlet to Talkeetna: Small changes in flows can have dramatic impacts on habitat. The relationship between flows and impacts on habitat must be established before one can dismiss small changes in flows. We expect the AEIDC instream flow study will sufficiently define this relationship.

(c) Impacts Associated with Access Roads and Auxiliary Roads

(i) Construction

- Construction of Watana Access Road and Auxiliary Roads: Once an acceptable access routing is agreed upon, studies would need to evaluate the existing resources. Only at that point can specific mitigative measures be satisfactorily addressed, based upon quantified impacts. We recommend that you procede in this manner.

.Alteration of Water Bodies: The potential problem of beavers damming culverts and thus interfering with fish passage needs to be addressed.

- Construction of Devil Canyon Access Road and Auxiliary Roads: Paragraph 1: We assume that APA has decided on a preferred access plan to Devil Canyon consisting of road or rail access, or both. Whatever it is should be stated.

Paragraph 3: Although we have previously expressed our preference for rail access in lieu of road access, proper siting of rail is highly important to minimizing impacts, primarily through avoidance. Coordination specific to this issue should occur when siting decisions are being made.

(ii) Operation and Maintenance of Roads

- Operation of Watana Access Road and Auxiliary Roads

.Disturbance to Fish Populations: Paragraph 3: In that "... the increased accessibility of fish streams and lakes to fishermen..." would possibly be "...the greatest source of adverse impacts..." it would appear to be consistent with the APA Mitigation Policy document and NEPA to give emphasis to mitigation through avoidance of these impacts.

(d) Transmission Line Impacts

(i) Construction of Transmission Line

- Watana Dam: Paragraph 1: Base line information on the transmission corridor from the dam sites to the Intertie has been acknowledged as lacking within the Exhibit. As with other project features, the Exhibit E should provide base line data, impact assessment, and mitigation planning. Avoidance of adverse impacts would occur by a combined construction access/transmission line access corridor north of the Susitna River between the two dam sites. This is our preference. For further comments please refer to our letter dated 5 January 1982 on the Transmission Corridor Report. This letter was provided as formal pre-license consultation and we continue to view it as such.

(ii) Operation of the Transmission Line

- Watana Dam

.Alteration of Waterbodies: Please refer to our comments under Section 2.3(d)(i) - Watana Dam.

.Disturbance to Fish Populations: Please refer to our comments under Chapter 5, Section 3.7(c)(i) - Aquatic Species . Impacts of the Project

2.4 - Mitigation Issues and Proposed Mitigating Measures

(a) Mitigation of Construction Impacts Upon Fish and Aquatic Habitats: Please refer to our comments under Fishery Section - General Comments.

(i) Stream Crossings and Encroachments

- Mitigation: Please refer to our comments under Section 2.3(c)(i) - Construction of Watana Access Road and Auxiliary Roads . Alteration of Water Bodies.

.Methods of Installation: Paragraph 3: Certain construction practices should be scheduled to occur during the winter to minimize and/or avoid adverse impacts.

(ii) Increased Fishing Pressure

- Impact Issue: If the construction access and transmission line between the two dam sites were in the same corridor the impact could be partially reduced or avoided. Please refer to our letter dated 5 January 1982 on the Transmisson Corridor Report for additional comments.

(iv) Material Removal

- Mitigation: Please refer to our comments under Section 2.3(a)(i) . Direct Construction Activities: Paragraph 1.

Paragraph 3: Mining should be scheduled to avoid conflicts with fish migrations, spawning, or other important occurrences.

Paragraph 6: Please refer to our comments under Fishery Section - General Comments regarding monitoring.

(viii) Susitna River Diversions

- Mitigation: Grating of the diversion tunnel would prevent losses to fish and should be considered as a mitigative measure.

(x) Clearing the Impoundment Area

- Mitigation: If it would minimize these impacts, then clearing should occur during the winter.

(b) Mitigation of Filling and Operation Impacts

(i) Approach to Mitigation: Although, "Avoiding impacts through design features or scheduling activities to avoid loss of resources," is listed as top priority, in reality it has not received this type of emphasis.

(ii) Mitigation of Downstream Impacts Associated with Flow Regime: Under General Comments for Chapter 2 we have provided a synopsis of the AEIDC instream flow proposal which has been contracted by APA. We believe that this proposal would provide the basis for a reasonable, quantified instream flow impacts analysis which would allow an assessment of mitigative alternatives. Since APA has contracted this study, we assume that APA agrees with our view. The AEIDC proposal should be fully described in either Chapter 2 or 3. It seems premature to discuss mitigative flows prior to quantification of potential impacts.

- Impact Issue: Paragraph 1: Reference is made to Exhibit A. Although we have requested this, as well as other Exhibits, it has not been forthcoming.

- Measures to Minimize Impacts: Please refer to our comments under Sections 2.3(a)(ii) - Talkeeta to Watana Dam . Slough Habitats: Paragraphs 4 and 5 and 2.3 (a)(ii) - Talkeetna to Watana Dam . Mainstem Habitat: Paragraph 4. It is apparent that the flow release schedule neither minimizes loss of downstream habitat nor maintains normal timing of flow-related biological stimuli.

.Winter Flow Regime (November - April): Paragraph 1: Please refer to our comments under Section 2.3(a)(ii) - Cook Inlet to Talkeetna Reach . Tributary Habitats: Paragraphs 2 and 3.

Paragraph 2: We also feel strongly both ways.

.Summer Flow Regime (July - October): Paragraph 3: Discussion should be provided regarding the instream flow studies which lead to the conclusion that 12,000cfs is of sufficient magnitude to allow rectification of project impacts.

- Rectification of Impact

.Winter Flows: We strongly disagree with the conclusion reached in this section. How this conclusion can be derived from the information provided in this chapter and Chapter 2 needs to be fully explained.

.Summer Flows: We fully agree that the proposal must be demonstrated effective before it can be incorporated into a mitigation plan.

- Reduction of Impacts Over Time: Please refer to our comments under Section 2.4(a)(iv) - Mitigation: Paragraph 6.

- Compensation for Impacts: Paragraph 2: Please provide documentation on the success of this alternative in Alaska, or similar environs. Several ideas are discussed in this section which should be considered for demonstration projects during the 1983 field season.

Paragraph 9: Discussion of the development of a hatchery should be expanded. If other mitigation alternatives prove not to be feasible then we will need to fully understand what could be achieved through hatcheries.

(ii) Mitigation of Downstream Impacts Associated with Altered Water Temperature Regime

- Measures to Minimize Impacts

.Water Temperatures during Filling Watana Reservoir: If the addition of a fifth portal would, based upon thermal modeling of the reservoir, provide additional temperature control during filling, then we recommend that this be added.
.Water Temperatures During Operation of Watana Reservoir: Paragraph 3: Please refer to our comments under Section 2.3(a)(ii) - Watana Reservoir Inundation . Mainstem Habitats: Paragraph 5.

- Measures to Rectify Impacts: Documentation should be provided on the success on this type of proposal in Alaska, or other sub-arctic systems. Demonstration of the techniques would need to occur prior to incorporation into the mitigation plan. In that the sloughs are also utilized for rearing by chinook and coho juveniles, discussion should be provided on how chum salmon (we have assumed that chum is the species which is being managed for although it is not stated) would interact with the other species. Also, the mechanisms which might allow entrance to chinook and coho salmon into the sloughs while holding the chums from egressing needs to be explained.

- Compensation for Impacts: Documentation should be provided on the success of hatchery propagation of grayling.

(ii) Operation Mitigation

- Mitigations of Access and Impoundment Impacts: Paragraph 1: In that other study components (e.g. wildlife, and recreation) are also considering uses for the borrow areas, coordination should be directed toward resolving potential problems. Maps depicting the borrow pits and the agreed upon, "best" uses for the individual sites should be provided.

- Mitigation for Downstream Impacts: Paragraph 2: We fully support the statement that, "Continuing reservoir thermal modeling will allow an evaluation of available water temperatures throughout the year so that a detailed release plan can be developed. The release plan will need to consider both water temperature and volume in order to minimize impacts." We recommend that this be carried out and the proposed release plan be included in the license application.

2.5 - Aquatic Studies Program: Please refer to our comments under Fishery Section - General Comments.

2.6 - Monitoring Studies: Please refer to our comments under Section 1.3: Paragraph 8.

3 - BOTANICAL RESOURCES

3.1 - Introduction

(a) Regional Botanical Setting: A more complete description should be provided for vegetation north of the Susitna River to the Denali Highway, through which the proposed access road is to pass. The primary importance of botanical resources as a key component of wildlife habitat should be restated here as the object of this report (see Section 1.2, page E-3-3, paragraph 1).

(b) Floristics

(i) General: Paragraph 1: We suggest that the difference in numbers of plant species between the upper and lower basins are a result of the following: larger study area; greater time spent in sampling the upper basin, and the numerous vegetation communities associated with elevation changes and topographical diversity.

Paragraph 3: Please explain the quantification of plant species for the Willow-to-Cook Inlet and Healy-to-Fairbanks transmission corridors, when no floristics work was done in that area. (Section 3.2(e)(i) and (ii) and Tables W24 and W25).

(c) Threatened or Endangered Species: Since no plant species are officially listed, we suggest addition of the word "candidate" prior to any discussion of "threatened or endangered" plant species. In many places the discussion would be more accurate by referring to "plant taxa" rather than species since these plants are generally varieties or subspecies rather than distinct species. Please clarify that the calciphilic plants referred to in paragraph 4 of subsection (i) refer to Murray's, not FWS, categories for threatened or endangered.

(d) Contribution to Wildlife, Recreation, Subsistence, and Commerce: Because of their key functions both as habitat for fish and wildlife resources and in maintaining water quality relative to drainage, high water energy dissipation, flood storage, ground water recharge, filtering surface runoff, etc., wetlands and floodplains have been protected by Executive Orders (11990, 11998) and national legislation (e.g. Clean Water Act as amended in 1977). Since vegetation is a characteristic component of any wetlands, we suggest addition of a general section here on the prevalence of wetlands in the project area and their widely recognized biological and water quality values (please also see our following comments on Section 3.2(a)(vi), Wetlands.

(iii) Subsistence: Use of area timber resources for building or heating homes is an additional subsistence use which should be mentioned.

3.2 - Baseline Description: Paragraph 1: A brief description is needed here of the Viereck and Dyrness hierarchical vegetation classification system for Alaska, levels used for this study, and number of categories mapped (note, this description should cover the vegetation type maps now under preparation). An explanation for the mapping of up to 16 kilometers (km) from the Susitna River and .8 km from the impoundments should be provided.

Paragraph 2: A brief description should be given as to sampling intensity. Whether vegetation dominance within the project area and/or susceptibility to project impacts were considered in study design should be explained. General information on elevation, slope, aspect, and land form should be briefly related here and in subsequent sections of the report to better define areas and their vegetation cover. The prevalence of permafrost, a determining factor in some project impacts (e.g. pages E-3-166, paragraph 2 and E-3-170, paragraph 3), should also be considered.

Paragraph 3: Successive descriptions of vegetation types by project area would be clarified here by defining closed, open, and woodland forests, tall versus low shrublands, and wetlands (also see comment under Section 3.2(a)(vi)), rather than defining them in the following sections (a) and (i). The discussion would also be aided by including an overlay of project features on the vegetation map, Figure W1, as well as restating information on the elevation range for each proposed impoundment area. We recommend the license application include a larger, more readable vegetation map and that quantitative data on how common or uncommon specific vegetation types are, as well as the occurrence of various types relative to elevation or aspect, be presented in the text as well as tables. In so describing the revised vegetation classification, it will be possible to better evaluate potential project impacts on vegetation, and thus wildlife habitats, by project feature. This recommended level of effort also applies to the proposed access and transmission corridors.

(a) Watana Reservoir Area

(i) Forests: Please see comment under Section 3.2 re including quantified information in the text as well as tables. Providing the range of elevation in which these types were sampled rather than one average would show the extent and overlap in distribution of each forest type.

- Spruce Forest: Paragraph 5: Black spruce forests on poorly drained soils would most likely also be classified as wetlands. Please refer to our comments under Sections 3.1(d) and 3.2(a)(vi).

(ii) Tundra: Please refer to comments under Section 3.2: Paragraph 3 re providing quantitative data on the prevalence of different tundra types and of ranges rather than average elevations. The wet sedge-grass tundra should also be described as a wetland type, see Sections 3.1(d) and 3.2(a)(vi), as above.

(iii) Shrubland: Refer to comments under Sections 3.2(a)(i) and (ii) above.

(iv) Herbaceous: For consistency with the rest of the report, we recommend describing common species within the referenced herbaceous pioneer communities. Corresponding tables on the herbaceous vegetation types are missing.

(v) Unvegetated Areas: Again, quantification of the extent, and thus importance, of these areas should be provided.

(vi) Wetlands: This section is significantly lacking in three areas. First, the legislatively recognized importance and protection of wetlands should be described, including the U.S. Army Corps of Engineers' (CE) definition of

wetlands and regulation of activities on these areas. (Please also refer to our comments under Section 3.1(d) regarding this concern.) Secondly, there should be a discussion of how wetlands may be a second level of classification applied to the vegetation types previously discussed. Finally, as with other ongoing studies, this section should cover the wetlands delineation scheme agreed to at the 2 December 1982 wetlands session of the Susitna Hydro Exhibit E Workshop. This agreement included the following: project consultants will meet with the FWS and CE to identify the appropriate detail for wetlands mapping; existing wetlands maps will be improved on the basis of additional aerial photography and overall vegetation remapping; soils information will be obtained from the CE; ground truthing, in consultation with FWS and CE, will be undertaken in summer, 1983; final maps should be available by fall, 1983; and additional field checks may be necessary in summer 1984 (see page 5 of Wetlands Meeting notes, received from John Hayden, Acres American, Inc.). Given the doubtful accuracy of existing wetlands maps, it would be inappropriate to include those maps in the license submittal.

Redefinition of wetlands to properly include such types as black spruce bogs, willow and poplar along watercourses, and herbaceous sedge-grass marshes, in addition to the more completely aquatic types now described under the wetlands section. A definition of "wet tundra" (paragraph 6) should be included. The final paragraph of this section would be a better opening statement to the expanded discussion needed on wetland values and types.

(b) Devil Canyon Reservoir Area: Please refer to comments under Section 3.2(a) re need for a brief elevational and landform description. Again, there will be need for an overlay of the impoundment area on the (revised) vegetation type map. We appreciate inclusion of the percent of the impoundment area covered by major vegetation types. Please refer to our previous comments re need for a comprehensive discussion and definition of wetlands.

(c) Talkeetna to Devil Canyon: Clarification of this specific area is needed. Again, refer to comments under Section 3.2(a)(i) and (ii), above. While early, mid, and late successional stages appear a suitable categorizaion for floodplain vegetation, these stages should be correlated with the forest, shrub, tundra, wetlands, etc. classification previously used.

(d) Talkeetna to Cook Inlet: Please refer to comments under Section 3.2(a)(i) and (ii), above. We believe that existing data do not substantiate the conclusion that the project will have minimal impacts on vegetation in this area. Thus we recommend mapping the area within the 10 year floodplain downstream of Talkeetna at least to the Delta Islands. Further discussions on expected impacts should be initiated to better pinpoint the precise area which should be covered.

(e) Transmission Stubs and Intertie: Again, we suggest adding a map, and elevation information, as well as quantifying the vegetation type, for each of the following four subsections.

(i) Healy to Fairbanks: Paragraph 5: Reference to "wet lowland sites" should be expanded to discuss wetlands per our comments on Section 3.2(a)(vi).

(ii) Willow to Cook Inlet: Paragraph 1: Here too, "wet sedge-grass marshes" should more completely be discussed as wetlands, see Section 3.2(a)(vi).

Paragraph 2: The first sentence is contrary to data provided in Table W25, please clarify.

Paragraph 5: Placement of this paragraph between the first and second paragraphs would be more logical.

(iii) Willow to Healy: The compatability of vegetation types as mapped by Commonwealth Associates, Incorporated (1982) with those mapped by McKendrick et al. (1982) should be described.

(iv) Dams to Intertie: We question the comparability of vegetation types mapped here at a scale of 1:250,000 with those in all other transmission corridors which were mapped at 1:63,360, e.g. Tables W27 and W28 document difficulties of mapping closed birch and balsam poplar types at the 1:250,000 scale. This transmission corridor should be separately mapped during ongoing mapping.

3.3 - Impacts: Fragmenting this analysis into a project feature by impact issue format is useful for a first overview. However the section lacks a comprehensive picture of cumulative impacts to vegetation. That cumulative picture is essential for understanding overall impacts of the project on fish and wildlife species occupying areas within and beyond each project feature. Although this section identifies the full range of vegetation impact issues, there is no attempt to quantify areas which may be potentially affected by changes in vegetation cover. A given change may be both beneficial to one species of wildlife yet adverse to another. By not completely prioritizing mitigation in the previous Fishery Section and later Wildlife Section, the report fails to identify the tradeoffs or objectives of a project-wide mitigation plan or mitigation plan alternatives. For example, information should be provided here on the tradeoffs analysis relative to fish, wildlife and botanical impacts, as well as cost and design considerations in the siting of project support facilities, roads and transmission lines. We remain concerned that we were not consulted in the siting of project support facilities.

(a) Watana Developement

(i) Construction

- Vegetation Removal: Paragraph 1: Again, we suggest restating the elevation range within which vegetation will be removed. Spoil areas should also be described.

Paragraph 2: Please provide the percent loss expected for birch forests as shown in Table W27. Loss of a vegetation type relative to its abundance within the basin is half the issue relative to the loss of vegetation; however the value of each type relative to other types for selected wildlife species should also be provided. In some cases habitat factors would also be considered; see our comments throughout the Wildlife Section.

- Vegetation Damage by Wind and Dust: Paragraph 1: Given the difficulty of reading the vegetation map supplied here and the later need to understand the potential for lost nest sites or wildlife cover, please describe the primary tree species and vegetation type(s) in which blowdown may occur on the southside of the Watana damsite.

Paragraph 3: Some relationship should be made between referenced possible delays in snowmelt and vegetation types which may be affected. Similarly, increases in cottongrass and decreases in mosses and lichens should be related to their occurrence in vegetation types adjacent to impoundment and borrow areas. Such relationships should be the basis for fully considering the impacts of project-induced changes on vegetation relative to wildlife (see our comments under Sections 4.3(a)(i), (ii), (iv), and (v)).

(ii) Filling and Operation

- Vegetation Succession Following Removal: In order to understand the magnitude of vegetation alterations, some quantification should be presented for the areas of forest, shrub, tundra, etc. which will be rehabilitated during project filling and operation. A scenario should be developed outlining potential acreages of each affected vegetation type and the various successional stages they will pass through during the life of the project.

. Forest Areas and Shrubland: Anticipated heights of each vegetation stage, over time, should be included here.

. Tundra: The extent of permafrost should be described, please see our comment under Section 3.2.

Information is needed on successional patterns in herbaceous vegetation types and on wetlands within each type, for consistency with Section 3.2(a). An additional concern is the nutritional quality and quantity of plant regrowth relative to wildlife.

- Effects of Erosion and Deposition: Paragraph 2: See preceeding comment and that under Section 3.2 re need to map and quantify the aerial extent of permafrost.

- Effects of Altered Downstream Flows: Overall, this discussion is too general. Consideration of daily flow fluctuations in response to peak power needs is neglected.

Several other potential project impacts are left unclear; especially those related to wetlands and floodplains. For example, please provide the extent of floodplain areas, (1) now subject to annual, 5 year, 10 year, etc. flooding, and (2) which will become exempt from flooding. Given the successional information depicted in Figure W3 and revised vegetation maps, it should be possible to quantify expected changes in vegetation, over time, for a variety of flow regimes. Such information is necessary to fully determine project impacts to wildlife and make mitigation recommendations. If existing hydrologic or vegetation information is considered insufficient for developing such models, additional studies should be initiated.

. Watana to Devil Canyon: A more detailed treatment of the potential for rimeice or icefog formation is needed here. For example, ice buildup on vegetation has been found to keep the soil surface open in forests.[10/] Sapling tree stands heavily damaged by ice produced more brush whereas ice damage in mixed-oak tree stands resulted in loss of understory saplings and low tree branches with herbaceous plant growth enhanced in summer.[11/] Such changes in understory or reduction in winter browse availability could be particularly critical to wildlife subject to extensive adjacent habitat losses.

The types of vegetation which may form, over the project life, on "newly-exposed areas with adequate soils" should be described relative to adverse or potential benefits for various wildlife species.

. Devil Canyon to Talkeetna: Paragraph 3: This quantified description of expected vegetation type changes is the type of detailed impact analysis necessary for other project areas (e.g. preceeding section on Watana to Devil Canyon and following section on Talkeetna to Yentna River). Once the revised vegetation mapping and analysis is completed, this type of analysis should be the basis for examining the positive and/or negative impacts to wildlife of these vegetation changes, over the life of the project.

Paragraph 4: The statement that, "Post-project ice formation in this reach will be similar to present conditions," appears to conflict with previous descriptions whereby ice formation will not occur until approximately river mile 130, slightly more than half way to Devil Canyon from Talkeetna (Section 2.3(a)(iii), page E-3-90). In order to understand how area vegetation may be less-influenced under post-project break-up, it would be useful to explain present impacts of break-up on the vegetation. Please address the change from a bank-full flood interval of 1 to 2 years for this section of the river. Quantification is needed of the area over which vegetation could be established with this schedule for less frequent disturbances.

. Talkeetna to Yentna River: Paragraph 2: Again, the vegetated areas and types which could become established on the active gravel floodplain under less frequent bank-full floods should be described.

Paragraph 4: We question the suggested vegetation changes between Talkeetna and the Yentna River. Vegetation allowed to establish over a longer period of time (e.g. 5 to 10 rather than 1 to 2 years) would seem less likely to be disturbed when the bank-full flood does occur. Given the annual flow

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10/ Butler, R.M., N.H. Wooding, and E.A. Myers. Spray-Irrigation Disposal of Wastewater. Special Circular 185. The Pennsylvania State University, College of Agriculture Extension Service, University Park, Pennsylvania. 17 pp.

11/ Wood, G.W., P.J. Glantz, H. Rothenbacher, and D.C. Krodel. 1975. Faunal response to spray irrigation of chlorinated sewage effluent. Research Publication No. 87. Pennsylvania State University, University Park, Pennsylvania. 89 pp.

variations over this stretch of the river, it would seem possible and necessary to predict areas of vegetation change for maximum and minimum flow scenarios.

- Climatic Changes and Effects on Vegetation: As for other ongoing studies, a schedule is needed for incorporating phenology study results into project plans.

Paragraph 3: We recommend calculating the potential vegetated area and types therein within the referenced 2.5 km area downwind of the reservoir within which air temperatures may be affected. Resultant impacts on timing of vegetation green-up or leaf-drop could be important for area wildlife.

Paragraph 4: A more extensive treatment of fog bank development should be included here, please refer to our comments under Section 3.3(a)(ii) - Effects of Altered Downstream Flows . Watana to Devil Canyon.

Also see comment above re calculating the area within 3 km offshore which may be affected by ice development.

- Effects of Increased Human Use: We have repeatedly cited the important opportunity for minimizing project impacts on fish and wildlife by carefully siting and regulating access (see FWS letter to Eric Yould, APA, of 17 August 1982). The potentials for off-road vehicle (ORV) use and accidental fires with project access described here confirm that such use may need to be effectively controlled as fish and wildlife mitigation. Please refer to comments under Section 3.4(c)(ii) re our recommendations to eliminate the Denali Highway access route and to restrict worker and public use of project access routes.

We are concerned about inconsistencies with the first sentence here, re greater access opportunities, and with points made in the Wildlife Section. That section appropriately contains repeated descriptions of (1) the significant negative impacts from increased use and access; and (2) the need to carefully control project area use and access (e.g. Sections 4.4(a)(i), (ii), (iv), and (r) and 4.4(c)(ii)). Please clarify.

. Off-Road Vehicles: Paragraph 3: In view of previous incomplete coverage of wetlands (see our comments under Section 3.2(a)(vi)), we question the definition behind use of the term wetlands here. This discussion illustrates the need for the improved wetlands map which is to be developed.

(b) Devil Canyon Development

(i) Construction: Other than quantifying direct vegetation losses from reservoir inundation, the section fails to provide any indication of the relative magnitude of other potential losses or alterations in vegetation.

- Vegetation Removal: Please refer to our concerns under Section 3.3 re lack of consultation in siting camp, village, and borrow areas.

- Vegetation Loss by Erosion: Again, a map of permafrost areas would be useful. Given the likely ineffectiveness of replacing topsoil and recontouring (Section 3.3(b)(i) . Indirect Consequences of Vegetation Removal), we suggest that clearing may be a significant source of erosion.

- Effects of Altered Drainage: We recommend that this section include the area of lakes, ponds, and other wetlands which may be affected by proposed borrow areas.

(ii) Filling and Operation: Paragraph 3: The potential for movement of the large landslide at river mile 175, causing upstream flooding and loss of mid- and late-successional vegetation in valuable riparian areas, should be described in more detail. For example, the potential size of the area to be impacted should be described.

- Vegetation Succession Following Clearing: Please refer to our previous comments, Section 3.3(a)(ii).

- Downstream Effects: The unknown consequences of frost buildup on vegetation adjacent to the reservoir represent a significant potential change in vegetation and thus impact to wildlife (see our comments under Section 3.3(a)(ii)). These consequences should be the subject of continuing studies and quantification.

(c) Access

(i) Construction: Paragraph 1: Please refer to our comment under Section 3.2 regarding omission of base line data on proposed access corridors. Because of this omission, the exact areas which would be cleared within the 34 meter (m) x 67 km access corridor described here are unclear. Please explain why this description appears to conflict with earlier descriptions of road width and length (Section 2.3(c)(i)). Inconsistent use of both metric and English units within the same report adds further confusion.

(ii) Operation: Paragraph 1: Our comments under Section 3.3(a)(ii) apply here also.

Paragraph 2: The potential for ice buildup on the railroad tracks and resultant impacts on vegetation should be examined.

(d) Transmission Corridors

(i) Construction: Paragraph 1: Please clarify the differences among hectares to be impacted by the transmission corridors as cited here and in Tables W24, W25, and W26. Moreover, referenced Table W29, has nothing to do with transmission corridors.

Paragraph 2: Wetlands, as used here, should be defined. Precalculation of affected vegetation types will need to be undertaken after the ongoing vegetation remapping. Notation should be made that, (1) low-lying vegetation types will remain largely undisturbed, and (2) beneficial impacts of increased browse production will be realized, only if access and ORV use along transmission corridors are effectively controlled. Quantification of potential increases in browse should be possible on the basis of succession

models and continuing classification studies. Such quantification is needed to compare overall losses and thus mitigation requirements for the project.

(ii) Operation: Our comments above under Section 3.3(d)(1) apply.

(e) Impact Summary: An explanation is needed for the process or criteria for determining impact "priorities of importance."

(i) though (v): This qualitative summary describes several data gaps which we believe should be answered, e.g. the vegetated area which may be lost with land slumpage from permafrost, changes in downstream floodplain vegetation, etc. Overall, we are concerned with lack of attention to cumulative impacts, an inattention made more acute by nonquantification of most impacts. The numerous "minimal" and "minor" impacts for each project feature may cumulatively represent significant alterations or loss of vegetation. From the standpoint of fish and wildlife habitats, project-related activities throughout this primarily undisturbed area represent the first intrusions similar to those which have led to significant and losses of fish and wildlife throughout the conterminous United States. A serious omission in this section is consideration of impacts to wetlands and floodplains.

(vi) Prioritization of Impact Issues: We concur with the evaluation of acreage losses for a vegetation type relative to the proportion of that type in the region. Since vegetation is a key component of wildlife habitats, the basis for evaluating whether community changes are "good" or "bad" should follow in the Wildlife Section of this chapter. However as discussed there, an integrated evaluation of all species is lacking. There is little basis for making decisions on prioritizing species concerns or resultant tradeoffs in project impacts or mitigation alternatives. Our previous comments on each impact issue identified here apply. Additionally, we have a few specific comments.

- Direct Losses of Vegetation

Access Roads: While the actual area covered may be small relative to other project impacts, access routes indirectly impact a much larger area because of their linear nature.

. Transmission Corridors: We would like to be assured that the reference to a "median strip for transport of personnel and materials", is consistent with the environmental guidelines for transmission corridors (Appendix AE - Transmission Corridors, item 1) with which we concur. As with access roads, above, transmission corridors indirectly impact a very large area.

- Indirect Losses of Vegetation: The cumulative impact of project features mentioned previously, is of particular concern here. Many of the identified losses will be in riparian corridors which are of particular significance to wildlife species.

- Alteration of Vegetation Types: We again recommend that successional type changes over the project life be quantified in the license application.

3.4 - Mitigation Plan: We find the proposed plan incomplete and too general. There are two main problems with this plan. First, because impacts are incompletely quantified, it is not possible to determine the value of recommended/accepted mitigation measures or the magnitude of unavoidable, adverse impacts which will not be mitigated. Not integrating this plan with the fish and wildlife mitigation plans is the second main problem. Thus there is no comprehensive picture of overall project impacts, priorities for mitigation, potential for achieving those priorities, or tradeoffs among mitigation options for various area resources.

An approach similar to that for the Fishery Section mitigation plan (pages E-3-120 through E-3-144) would be more appropriate. We recommend restating the full range of mitigation alternatives here, prioritized in accord with NEPA guidelines: avoid, minimize, rectify, reduce or eliminate over time, and finally, compensate. This approach should be expanded to include reasons for rejecting high priority mitigation in lieu of lower priority measures (e.g. proposing regulations on access rather than alternate siting or scheduling of access). A mitigation plan, incorporating specific, effective measures which have been selected through this process, should then be presented.

Many of the identified impacts are not addressed in the mitigation plan itself. In those cases, impacts should be clearly identified as unavoidable, short or long-term, adverse impacts. Moreover, we find the report lacks information specifically required by FERC regulations (F.R. Vol. 46, No. 219, 13 November 1981), Section 4.41(f)(3)(iv), i.e. there are no implementation, construction, or operation schedules for recommended mitigation measures; which measures have actually been incorporated into project plans is unclear; and neither replacement lands nor habitat manipulations have been identified as to either suitable sizes or locations.

Generalities of the plan are exemplified by references to using, "depleted or non-operational upland borrow pits...as overburden storage areas where feasible" (page E-3-187) or reference to "a feasible haul distance," (page E-3-187).

(a) Watana Developement

(i) Construction: Paragraph 1: Mitigative features which have been incorporated into engineering design and construction planning should be clearly stated. Reasons for rejecting our recommendations have never been formally provided (e.g. access road siting). Location of the construction camp and village on shrublands (per Table W27) rather than forestlands may not minimize impacts, depending on the wildlife species of concern, erosion potentials, proximity to construction and access facilities, etc. Again, since we were not consulted in siting of those facilities and have not seen Exhibit A, we cannot fully understand the situation. A mechanism for enforcing the referenced prohibition of off-road or all-terrain vehicle use should be included (see FERC regulations Sections 4.41(f)(3)(iv) in F.R. Vol. 46, No. 219, 13 November 1981).

Paragraph 3: We suggest that facility siting to avoid wetlands be rereviewed in consultation with the FWS and CE and proposed revisions to the wetland maps. As with similar points about "minimizing" or "reducing", there is no quantification, particularly relative to the amount of wetlands, or other

impacts in other report sections, which will be impacted and which can be avoided.

Paragraph 5: We concur that spoils should be placed in the inundation area as long as such placement will not create a sedimentation problem.

Paragraph 6: We recommend explaining whether project engineers have confirmed that floodplains or first-level terrace locations will not be needed for borrow for ancillary project facilities.

Paragraph 7: We recommend that similar detailed information be provided throughout the report.

(ii) Filling: Please refer to our General Comments, Botanical Resources, re identifying feasible habitat enhancement measures or replacement lands. The contention that moose winter browse "may be compensated" is useless, given that (1) there is no guarantee in this plan that enhancement or land acquisition will ever occur; and (2) quantification for how much/where/what type of land must be enhanced or acquired is lacking. Moreover, tradeoffs re compensation for moose to the neglect or adverse impact of other species have not been settled or even discussed.

Paragraph 3: Because of internal inconsistencies, the overall effect of siltation is unclear.

Paragraph 5: Whether rectification will be one percent or 99 percent is unclear.

Paragraph 7: We concur with revegetation plans to emphasize fertilization and minimize seeding where erosion will not be a problem.

Paragraph 8: We strongly support plans to rehabilitate all sites by the first growing season after they are no longer needed. Assurances should be provided that sufficient quantities of seeds would be stockpiled and regrowth potentials of available native strains will be tested prior to project abandonment of disturbed sites. Choice of plants for site rehabilitation should be in consultation with Federal and State natural resource agencies.

(iii) Operation: Paragraph 1: We concur with the proposed monitoring of downstream vegetation changes but note that monitoring in itself is not mitigation. Periodic controlled flooding to maintain primary and secondary successional stages must be coordinated with the Fishery Section and Wildlife Section mitigation plans.

Paragraph 2: We have assumed that nonessential portions of the disturbed areas will be promptly rehabilitated. Please specify.

(b) Devil Canyon Development

(i) Construction: Paragraph 1: Our comments relative to the Watana development (Section 3.4(a)(ii)) mitigation apply here also. An additional mitigation need is monitoring and enforcement relative to ORV and unauthorized access uses. Spoil disposal described here was not discussed or previously covered in the impacts Section 3.3(b)(i).

(ii) Filling and Operation: Again, our comments under Watana Development, Section 3.4(a)(ii) and (iii) apply.

(c) Access

(i) Construction: Paragraph 1: Please clarify why avoidance of closed forests was termed as a mitigative measure in siting of the Denali Highway to Watana access road. Section 4.4(b), paragraph 2 supports this siting re minimization of project impacts to pine marten. If this is the reason, that reference should be made here and further information is necessary on other species adversely affected by this siting and adverse/beneficial impacts of alternative sitings which were eliminated. Wetlands will need verifying per our previous comments (Section 3.4(a)(i)). At least one line of this paragraph was omitted.

Paragraph 3: We refer you to our previous comments on wetlands, Sections 3.2(a)(vi) and 3.4(a)(i).

Paragraph 4: Information is too general. We concur with the intent but do not have necessary specifics as to the extent of mitigation which will be achieved.

(ii) Operation: The referenced management provisions should be described here including busing of workers and restrictions on non-project-related uses.

Paragraph 2: The extent of mitigation which can be achieved for many project impacts will depend upon the management options under review by the APA. In the APA Mitigation Policy document and under NEPA guidelines, avoidance is to be the first priority in implementing mitigation. Therefore we refer you to our previous correspondence on this issue (letter to Eric Yould from FWS, 17 August 1982) as part of our pre-license consultation. In brief, the necessary avoidance should include elimination of the Denali Highway to Watana access road and prohibiting use of other project access routes for non-project-related access. Instead, construction access should be by rail from Gold Creek, along the south side of the Susitna River to Devil Canyon, and access on the north between the two dams. Non-project-related use of these access routes should be prohibited during project construction. A thorough analysis should be provided here of public access from the standpoint of adverse impacts to fish and wildlife and their habitats in comparison to any positive impacts for recreational and subsistence fish and wildlife uses.

We note some conflict between the statement that the APA is reviewing a variety of access management options with the suggestion that the project access route from the Denali Highway may be eligible as a National Scenic Highway. That designation would stimulate public access to the increased detriment of fish and wildlife, effectively foreclosing some mitigative management options.

Paragraph 3: Please refer to our more extensive comments on the Recreation Plan re consistency with fish and wildlife protection priorities. We strongly concur with the proposal to monitor fish, wildlife, and vegetation impact but again note the report's deficiency in not describing how and by whom

monitoring will be completed (see our General Comments, Fishery Section). Moreover, the process for modifying project operations or the Recreation Plan to better effect mitigation is not described.

(d) Transmission

(i) Construction: Please clarify what criteria were used for siting of transmission corridors. Assurance is required that project plans include construction by helicopter or winter access.

Paragraph 2: Again, refer to our previous comments on wetlands. We recommend minimum 150 m buffers between swan nests and any portions of the transmission corridor.

(ii) Operation: We concur with this plan but are concerned that it may not be implemented. We hope to avoid a repeat of the Intertie situation where on-ground access was later guaranteed to the operating utilities contrary to residents' and agencies' recommendations. That guarantee already contradicts this plan, given the dependence and interrelationship of the Susitna project with the Intertie.

Since habitat manipulations, including fire, crushing, etc. (Section 4.4(a)(i) and (iv)) are being suggested as a prime mitigation measure for wildlife, we recommend that potential effects of those activities on vegetation types within different project areas be discussed here. The potential value for mitigation of various habitat manipulations should be explained similar to the discussion on fire, Section 3.2(a)(ii).

Two additional items which should be covered in this mitigation plan are the monitoring and surveillance plans referred to earlier and an erosion control plan specific to project features and schedules.

Specific comments on tables and figures relative to the Botanical Resources Section follow:

Table W3: Please change in accord with our recommendations under Section 3.1(c), to "Candidate endangered and threatened plant species", etc.

Tables W5 through W19: We suggest including a footnote or appendix briefly describing how these data were collected with some explanation of whether sampling intensity was commensurate with the availability of the vegetation type within the project area and potential for that type to be impacted by the project.

Tables W21 through W23: The number of sites sampled in each type should be included. As in our comments on the text, information should be provided on how these categories compare with the vegetation categories sampled within the upper Susitna basin.

Tables W24 through W26: Please clarify whether the 400 to 500 foot right-of-way or 110 foot cleared centerline area was used in these calculations. Per our previous comment on the transmission corridor, a similar table for the Intertie portion of the transmission corridor should be

included. We also suggest a summary table showing the vegetation impacts from all segments of the transmission corridor.

Please refer to our comments in the text on need for an additional table showing vegetation types to be impacted by all access corridors, preliminarily identified borrow areas (e.g. borrow area G is not included in Table W28) and spoil areas. Where questions remain on the size of borrow/spoil areas to be used or the necessity of all potentially identified areas, notation should be made of potential maximum and minimum sizes and any ordering re use of these areas.

Figure W1: Granted, it is difficult to reproduce such a map at this scale. However, we recommend a larger reproduction be included in the final application. That map should include an overlay showing reservoir inundation areas, access roads, transmission corridors, and other project features. A corresponding map of downstream vegetation and overlay of transmission corridors is also needed.

Figure W3: Once the remapped vegetation classification is completed it should be correlated to this table to quantify potential vegetation changes and types over the life of the project.

Figure W4: As above, this figure should be a basis for analyzing downstream successional trends given the projected longer times between floods. Maintenance of habitat manipulations should be specified on the basis of this figure and mitigation objectives.

4 - WILDLIFE

4.1 Introduction: We recommend expanding this section to at least acknowledge the ecological values of all wildlife species, as well as to more clearly outline objectives of the report and resultant mitigation plan. We again point out the need for an overall discussion of fish, wildlife, and botanical resources, overall mitigation plans, and tradeoffs in benefits to some resources at the expense of others.

(c) Species Contributing to Recreation, Subsistence and Commerce: Not only birds, but all wildlife species in the project area contribute to non-consumptive forms of recreation. Incidental viewing of wildlife in conjunction with other activities is an unquantifiable but well documented value. For example, the importance of downstream fish and wildlife habitats to fish, wildlife, and the significant numbers of people using them has been recognized by the State and agreed to by the Matanuska-Susitna Borough Assembly. Fish and wildlife have been designated a primary use on every State land management unit on the east side of the Susitna River from Cook Inlet to just below its confluence with the Kashwitna River. These management units and state guidelines for protecting fish and wildlife are described in the recent State report, Land Use Plan for Public Lands in the Willow Sub-basin, October 1981, by the Alaska Department of Natural Resources (ADNR), Matanuska-Susitna Borough, and ADF&G.

A discussion as to why the evaluation species were selected and prioritized as described here is as applicable to terrestrial wildlife species as it is to fish (Section 2.1(d)). We suggest referencing that discussion here. Such information is particularly important with regard to mitigation plans for one species which conflict with another species. We also suggest noting values of key bird species, i.e. bald and golden eagles have received national protection (Bald Eagle Protection Act, 16 U.S.C. 668-668c); trumpeter swans are highly valued because of their former endangered status; and other migratory birds are protected under international treaties and the Migratory Bird Conservation Act (16 U.S.C. 701-718h).

Please note, all references to tables in the wildlife section of the text are to table numbers one greater than on the actual table. We have referred to tables as they are actually numbered.

4.2 Baseline Description

(a) Big Game

(i) Moose: Missing figures and values are a problem throughout this section.

- Distribution: Please document how moose are "one of the most economically important wildlife species in the region;" also see our comments on Chapter 5, Section 3.7(b).

. Special Use Areas: In view of your repeated citations that winter range is a key area for moose (e.g. Section 4.2(a)(i) . Seasonal Movements: Paragraph 6; Section 4.2(a)(i) . Mortality Factors: Paragraph 5; and Section 4.3 (a)(i) Winter Use), we suggest including a section here on the use and availability of winter range in both severe and mild winters, as well as the data gaps and

plans to overcome them relative to this study. Maps showing use areas described here relative to project features would clarify this section.

Calving Areas: Paragraphs 3 and 4: Numbers of male and female moose radio - collared in each of the downstream study areas should be described here.

. River Crossings: To better understand how not only the reservoirs, but ancillary project features such as the Devil Canyon camp and village, may also influence moose crossings of the Susitna River, crossings both immediately up and downstream of the impoundment areas should also be described (also see our comments under Section 4.3(b)(i) - Interference with Movements).

- Habitat Use: The main problem with this and the following section on populations is that there has, apparently, been no integration of moose and vegetation data.

. Cover Requirements: Paragraph 7: Please describe the scope and schedule for the necessary studies of habitat use, or reference the discussion under Section 4.3(a)(i) - Quantification of Project Effects. Correlating aerial observations to the remapped vegetation types should provide additional information on habitat use. Elevation, slope, or other habitat parameters may also need to be incorporated in this analysis.

Habitat Use in the Upper Susitna Basin: Paragraph 3: Further information is needed on the understories associated with these habitat types. Please indicate when such information will become available.

Habitat Use in the Lower Susitna Basin: Paragraph 2: For consistency, the number of female moose radio-collared north of Talkeetna should be provided, also see our comments under this section, Calving Areas. The discussion is confusing due to frequent combining of quantitative data with qualitative statements such as "most female use," "at most relocation sites," etc. Where it is available, we recommend supplying quantitative information, with qualifying discussions on limited sample sizes, periods of observations, etc.

. Food Habits: Paragraph 2: Again, please describe the scope and schedule of ongoing analyses and how that information will be integrated into mitigation planning in a timely manner. Reference to your Section 4.3(a)(i) - Quantification of Project Effects will provide some of this information.

Paragraphs 4 and 5: We suggest examining how browse availability and vegetation types utilized by moose correlate with moose relocations in reference to the remapped vegetation types.

. Home Ranges

The Upper Susitna Basin: The rational should be given for selecting an 8 km wide analysis zone adjacent to the impoundment.

Lower Susitna Basin: Paragraph 2: Please describe or reference the scope and schedule for continuing studies. We recommend giving some consideration to the relative habitat values of all river study areas.

- Population Characteristics

. Historical Population Trends: Paragraph 1: An overlay of project features on the map of count areas (Figure W6) is needed.

Paragraph 2: Substantiating population and productivity data in Tables W32 through W34 should be referenced here.

. Population Estimates - Upper Susitna Basin: Please describe what types of habitat correlations can be made from remapped vegetation types and other habitat parameters for low, high, and moderate moose density areas.

. Population Estimates - Lower Susitna Basin: Paragraph 2: Please describe differences between habitats up and downstream of Montana Creek.

. Mortality Factors: Paragraph 1: We recommend describing how range quality has been decreasing.

Paragraphs 2 through 4: Please describe the comparability of brown bear populations and habitat types between the Nelchina and Susitna River basins.

We recommend expanding the discussion to include hunting as a mortality factor. Both recreational and subsistence hunting can affect population size and structure. Hunting figures prominently in later impact discussions. Historical hunting effort and success data relative to changing management regulations should be described, and coordinated with Chapter 5. Please also refer to our comments under Chapter 5, Section 3.7(b).

(ii) Caribou

- Distribution and Movement Patterns: Paragraph 6: Please describe how many animals were radio-collared and the numbers of radio locations made for each one.

Figures W9 and W10 of caribou radio locations should include the locations of project features.

- Habitat Use: Please clarify whether aerial observations or an overlay of radio locations on existing vegetation type maps were used to determine caribou use of different vegetation types. A correlation should be provided for the proportion of the basin which is in each type relative to the proportion of radio-collared caribou sightings within each type (Table W36). Please discuss whether vegetation remapping efforts will affect the interpretation of caribou data.

- Population Characteristics: Paragraph 1: This section should reflect present and future management plans and be consistent with Chapter 5, Section 3.7(b)(ii).

Paragraph 10: Changes in the number of permits from 1972 to 1981 should be described and percents of the herd harvested, by year, included in Table W38.

Paragraph 11: Please tabulate data on wolf population, wolf predation, and caribou numbers from 1957 to 1981.

(iii) Dall Sheep

- Distribution: Paragaph 2: We recommend including maps which more specifically delineate seasonal sheep use of the Susitna basin relative to project features.

Paragraph 5: We recommend further justification be provided to support the conclusion that impacts from the impoundments will be minor. Clarification of where the sheep winter and of sheep movements between seasonal ranges should be provided.

Paragraph 6: Reference should be provided for the judgement that the sheep population has remained stable or slightly increased.

Paragraph 8: Please provide a map of the Jay Creek mineral lick, and probable travel corridors to the area, relative to the Watana impoundment. We recommend providing historical harvest data and explaining how project surveys relate to area populations.

(iv) Brown Bears

- Distribution: We recommend providing data on the numbers of bears radio-collared and radio locations made, as well as maps of those radio locations relative to project use.

- Habitat Use: Paragraph 2: Please describe whether aerial observations or vegetation type maps were used to determine vegetation types relative to brown bear radio locations. An explanation should also be provided of how more detailed vegetation data and the vegetation remapping efforts will be integrated with the analysis of brown bear habitat use.

. Home Range: Paragraph 1: Please correct the referenced Table W42 which lists data from project studies in the Susitna, not the Nelchina basin.

Paragraph 2: An explanation should be provided as tc why 1.6 km and 8 km were chosen as the breakdown for study zones around the impoundments.

Paragraph 4: Please describe data on bear radio locations relative to access roads, transmission corridors and ancillary project features.

(v) Black Bears

- Distribution: We recommend including maps of bear radio locations relative to project features.

- Habitat Use: Please describe how further vegetation studies and remapping will be integrated witn the analysis of black bear habitat use.

- Food Habits: The scope, schedule, and integration of ongoing predation studies relative to further project planning should be addressed here.

(viii) Belukha Whales: Please note that several of the references cited here do not appear in the bibliography.

- Distribution and Habitat Use: Paragaph 5: We suggest integrating data on chinook salmon from the fisheries studies in order to obtain some estimate of the importance of that fishery and of project impacts to the fishery on belukha whales. Please also describe what data will be gathered on smelt for better evaluating project impacts on belukhas.

(b) Furbearers

(i) Beavers: We recommend including a map of the study area which details specific study sections, available density data, and representative main channel, side channel, slough, and clear water areas. The discussion should be expanded to cover the extent to which suitable beaver habitats are fully utilized or explanations where they are not.

Paragraph 4: We recommend investigating the extent to which bank lodges are used by beaver and to which the activity levels reported in Table W53 may be underestimated. An on-ground survey when beavers come out of their dens to forage just before spring break-up could verify such use.

Paragraph 8: Further quantification should be provided on trapping effort and success, see our comments under Chapter 5, Section 3.7(c).

(ii) Muskrat: Paragraph 2: Please clarify whether the 106 lakes surveyed contitute all the lakes between the Oshetna River to Gold Creek impact area. Please relate this discussion to the number of muskrats potentially inhabiting this area.

Paragraph 3: Please provide an indication of downstream muskrat populations and habitat quality.

Paragraph 4: Please quantify present and historical trapping effort/success.

(v) Marten

- Population Characteristics: Paragraph 2: No data is provided to substantiate that pine marten are the "economically most important furbearer," or to relate densities to populations and habitat quality. Please also refer to our comments under Chapter 5, Section 3.7(c).

- Habitat Use: Please refer to the comment immediately above.

(vi) Red Foxes

- Habitat Use

. Denning Habitats: Please provide information on the density of fox dens relative to habitat quality, and to other Alaskan and/or North American fox populations.

Paragraph 5: Some explanation should be provided for the disparity of more fox tracks on the south side of the river but more dens on the north side.

- Food Habits: Paragraph 3: The postulated link between fox and hare populations may be overstated. Apparently hare numbers have never been high or an important food source for fox in this area (Furbearer Study Coordinator Phil Gipson, personal communication; also see Section 4.2(b)(vii): Paragraph 3 and Section 4.3(a)(xiii): Paragraph 5).

- Population Characteristics: Please refer to our previous comments under Denning Habitats relative to habitat quality (Section 4.2(b)(vi)-Habitat Use). Again, trapper effort and success should be documented, also see our comments on Chapter 5, Section 3.7(c).

(vii) Lynx through (x) Least Weasel: We understand that none of these species were chosen as high priority for evaluating project impacts. However, we recommend providing some quantification for the descriptions of "fairly numerous" but not "limited," "locally abundant," and "sparse," in addition to trapper effort/harvest; also see our comments on Chapter 5, Section 3.7(c).

(c) Birds: Paragraph 2: Please note that waterfowl breeding pair surveys have been conducted by FWS in the lower Susitna River basin for over 20 years.12/ The FWS has also conducted statewide surveys for trumpeter swans in 1968, 1975, and 1980.13/

Paragraph 3: We recommend further information be provided on how relative abundances of bird species were determined. Please clarify the difference between 60 percent of the area being in shrublands, as cited here, with the just over 40 percent in shrublands, as cited in Table W4. At the August 1982 AEA Workshop on the project, much discussion centered on problems with correlating the bird habitat classification scheme used by Kessel et al. for project bird studies with the Dyrness and Viereck Alaskan vegetation classification system used for project baseline vegetation maps. We recommend describing those problems here and how they will or will not be overcome by ongoing vegetation remapping. Throughout the bird sections of the draft application we are concerned that source(s) for referenced data, or data

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12/ The most current data is available in: King, J.G. and B. Conant. 1982. Alaska-Yukon waterfowl breeding pair survey, 18 May to 13 June 1982. USFWS, Juneau, Alaska.

13/ The computerized compilation of this data is available at the FWS' Alaska Regional Office, 1011 E. Tudor, Anchorage 99503; please contact Greg Konkel, (907) 263-3395; original data is available from Jim King, USFWS, Juneau, (907) 586-7244.

manipulations, may not be fully documented. Thus we recommend describing where and how data from more than one source has been manipulated for th's report. In particular, the tables and figures should be more completely referenced, including explanatory footnotes.

(i) Raptors and Raven: Paragraph 1: We are concerned that 1980 and 1982 raptor surveys were not conducted at the optimum time: i.e. summer foliage would make it difficult to initially locate nests (we note that 50 percent more nests were found in 1981 than in 1980); according to Table W60, nesting raptors will have fledged their young by 30 September making it difficult to determine nest activity in October. Please indicate the experience of observer(s) conducting the raptor surveys and methods used, (e.g. whether surveys were by helicopter or fixed-wing aircraft). We also recommend that maps of actual nest locations be included. We note that goshawk nests are often difficult to find by air and thus question whether the number of nests cited here is a thorough assessment. Please clarify in the text whether all raptor nests active in 1980 were also active in 1981.

Paragraph 3: Please expand the discussion to more completely describe the habitat suitability of the project area for golden eagles, given their apparent high density.

Paragraph 4: Refer to our comment under Section 4.2(c)(i): Paragraph 1, above, re the late timing of 1980 and 1981 surveys for nesting bald eagles. Please provide a description of the survey methods used.

Paragraph 5: We recommend that discussion be provided relative to habitat values re how Susitna habitats compare with those along the Tanana River where slightly lower nesting densities are reported.

Paragraph 7: Due to the status of the arctic peregrine falcon (Falco peregrinus tundrius) as an endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543, as amended), we are particularly concerned with the adequacy of surveys for them, e.g. peregrines would have already left the area by October when the 1982 survey was done. Thus, we again recommend describing how the surveys were conducted, for how long, and by whom. We recommend that peregrine falcon surveys be conducted annually, in early July, throughout project studies and construction, or until there is sufficient evidence that peregrine falcons do not inhabit the project area. Sufficient evidence would be no sightings over several years of helicopter surveys, by a reputable observer during the proper time of year. Observers should be individuals who have worked with peregrine falcons. FWS review of specific times and survey techniques would be appropriate.

We recommend the discussion be expanded to describe the area's importance in raptor migrations as well as for breeding.

(ii) Waterfowl and Other Large Waterbirds: Please provide some quantification for terms used here, e.g. "large" concentrations of waterfowl (paragraph 1); "little used" (paragraph 4), etc.

Paragraph 3: We recommend you incorporate additional trumpeter swan data which is available from the FWS. Please refer to footnotes 12 and 13.

Paragraph 4: We agree with the conclusion, however we suggest that data from FWS annual surveys be included to quantify this statement (e.g. see footnotes 12 and 13, as well as Conant and King 1981 and King and Conant 1980 as referenced in this section.).

- Migration: Paragraph 1: We recommend referencing the specific study(ies) from which conclusions in the CE reference are taken. Please note that trumpeter swans are moving through the area in increasing numbers.

Paragraph 3: Please expain the discrepancy between the statement here that the "upper Susitna Basin was less important to migratory waterfowl in spring than fall," with data in Table W62 which shows spring waterfowl densities over twice that of fall densities.

- Relative Importance of Water Bodies: Paragraph 1: Given the previously described problems with the wetlands classification used for the project, and remapping efforts currently underway, please define "wetlands" as used here.

We suggest clarifying whether the reference is to 22.5 adult waterfowl/km^2 and 22.5 adult gulls/km^2 or to 22.5 adult (waterfowl and gulls) /km^2.

We question the validity of only comparing productivity of these wetlands to the most productive wetlands in Alaska. Upper Susitna area waterfowl productivity may be more typical of Alaska wetlands in general and represent average populations and productivity (FWS Marine Bird Management Project Leader John Trapp, personal communication).

Paragraph 3: Please clarify how "Importance Values" were calculated; also refer to our comments under Figures W19 and W20 and Table W63. We suggest describing any consumptive use of waterfowl within the project area.

(iii) Other Birds

- Grouse and Ptarmigan: We recommend mentioniny any consumptive use of these species within the project area.

- Woodpeckers and Passerines: We recommend providing some discussion of the importance of the area to migration, as well as, breeding activities of these birds.

- Upper Basin Bird Communities: Please refer to our comments under Section 4.2(c) re the need to identify here how 1981 and 1982 data were combined, given that Kessel et al. (1982) only includes data from 1981.

Last Paragraph: Please describe how these habitat types do or do not correlate to vegetation types as now being remapped.

(d) Non-game (small) Mammals: We appreciate the thorough description of the ecological role of small mammals in project area ecosystems.

(ii) Habitat Use: We suggest updating the discussion to correlate with ongoing vegetation and wetlands mapping efforts.

4.3 Impacts

(a) Watana Development

(i) Moose: Paragraph 1: Criteria for concluding that moose is one of the "most important" species should be provided here.

Paragraph 2: We suggest that the proposed evaluation of carrying capacity incorporate consideration of habitat values over the life of the project. Please provide the referenced figure. Considering the severity of project impacts by spatial areas to be affected and numbers as in Ballard et al. 1982 (page 106) would improve the discussion.

We are further concerned with the inadequacy of the impacts definitions in not accounting for impacts to special concentration areas (e.g. breeding), in key seasons of use (e.g. calving), and under infrequent but critical conditions (e.g. severe winters), and the overall interspersion and availability of such important habitat features.

Paragraph 3: Lack of quantification prevents analysis of whether an impact is half, twice, three times, etc. as severe as one of lower priority. We again recommend integrating the analysis with that in Chapter 5 re also providing and discussing data on hunting pressure and success here (see our comments under Section 4.2(a)(i) . Mortality Factors). Please note provision of access is a major indirect impact; additional developments or settlement stimulated by this access would be a secondary impact.

Paragraph 5: We find the discussion entirely too general and inconclusive: (1) there is no indication of the relative difference between "some" moose which will disperse, adapt, die, etc; (2) both overall cumulative impacts, and secondary impacts from moose dispersing to adjacent areas are ignored; (3) impacts on habitat values from increased use are not considered; and (4) no explanation is given for how and when ongoing studies will "refine this assessment."

- Construction: We are concerned that we have been given no opportunity to comment on siting and scheduling for camps, townsites, etc. The location and use of these ancillary project features will influence the magnitude of resultant impacts. Alternative spoils sites have not been proposed, yet they should be part of the discussion.

. Habitat Loss: Paragraph 1: We recommend including a more thorough, quantitative discussion of habitat loss in the text. The necessary integration of vegetation and wildlife studies should include a discussion of (remapped) vegetation losses relative to their value as moose habitat i.e. winter range, calving and breeding areas, etc. We also see no quantification of these losses over the life of the project, i.e. the area of each type which

will be lost forever, vs the area which will be lost for some length of time during construction, vs the areas in different successional stages throughout reclamation.

Paragraph 2: The paragraph is somewhat inconsistent with the Fishery Section. Given the mitigation proposed in that section of clearing areas just before flooding, successional growth development appears negligible (Section 2.4(a)(x) - Clearing the Impoundment Area).

Paragraph 3: Ongoing studies should be fully described. Please describe when the habitat use analyses will be reevaluated on the basis of remapped vegetation and forage quality studies.

Winter Use: Paragraph 2: Please clarify the first sentence and inconsistencies between that sentence and the previous paragraph.

Paragraph 3: It would be helpful to also express the number of moose in the impoundment area as a density and compare that density to areas outside both the impoundment and project area.

Paragraph 4. We recommend that ongoing studies provide data for quantifying the relative values (quantity and quality) of winter range within and outside the impoundment area. Such information is necessary for determining mitigation requirements.

Spring Use: Paragraph 2: Quantification is needed for the habitat areas described here.

Paragraph 3: We recommend tying this discussion to project impacts on brown bear which could compound the predation problem.

Summer and Fall Use: Paragraph 2: We are assuming that a heading for "-Disturbance" was omitted just before this paragraph.

Paragraph 4: Since the magnitude of project impacts would appear to significantly vary, depending on whether hunting and harassment of moose are effectively prohibited, we suggest providing "best" and "worse" case scenarios. Those scenarios should be used to quantify potential losses of habitat for comparing impacts and determining mitigation needs.

Paragraph 5: Please refer to our previous comments under Sections 4.3(a)(i) Moose and 4.3(a)(i) - Construction . Habitat Loss re the generality of this discussion.

. Mortality: Please refer to our comments under Section 4.3(c)(i).

. Alteration of Habitat: We suggest this discussion be dropped as inappropriate and unfounded. If this discussion only covers the construction phase of the development, then we would assume there would be no chance for successional growth. Moreover, the suggestion that moose could utilize these disturbed areas during construction conflicts with the previous discussions on how disturbance and increased susceptability to predators would cause moose to avoid major activity centers and large cleared areas. We also find the suggestion that borrow pits may provide forage inconsistent with the Fishery

Section which proposes to make fish ponds out of the pits (Section 2.4 (c)(i): Paragraph 2, Construction Mitigation). Please refer to our previous comments under Section 4.3(a)(i) - Construction, . Habitat Loss re the unlikelihood for forage development within the impoundment area. Moreover, under . Permanent Loss of Habitat, page E-3-287, moose use of the impoundment area prior to filling is discounted. The need to resolve conflicts between sections of the draft application is amply illustrated by the latter two points above. As we have recommended elsewhere, some mechanism should be instituted for resolving these types of conflicts and analyzing the tradeoffs of mitigating for one species to the detriment another.

- Filling and Operation

. Permanent Loss of Habitat: Paragraph 1: As we commented under Section 4.3(a)(i) - Construction, we are concerned with the lack of quantification. Of all possible impacts, loss of habitat can be most easily quantified. The analysis should include the area of each (remapped) vegetation type which will be inundated each year.

Paragraph 2: We again refer you to our comments under Section 4.3(a)(i) Construction re necessary quantification, study description, and incorporation of study findings into the quantification of losses required under FERC regulations (Section 4.41(f)(3)(ii) in F.R. Vol. 46, No. 219, 13 November 1981).

. Alteration of Habitat

Upper Susitna Basin: We concur with the points raised here. Please refer to our comments under Botanical Resources re the impacts of ice fog and rime ice formation, as to well as need for quantification. The discussion should also consider the effective loss of an even larger area than described here due to dust from project activities which would further retard snowmelt (see Section 3.3(a)(i) - Vegetation Damage by Wind and Dust).

Lower Susitna Basin: Paragraph 2: Given a mid-successional stage of approximately 25 years (see Figure W4) and project life of 50 years plus planning and development, we question the conclusion that vegetation favored by moose will still be available at the end of the license period. Please refer to our comments under Section 3.3(a)(i) - Effects of Altered Downstream Flows re quantifying these and other impacts described in the remainder of this section as well as discussing the potential for further alterations of habitat because of ice fog and rime ice formation.

. Blockage of Movements: Given the potential for moose to avoid clear cut areas (see discussion under Section 4.3(a)(i) - Construction . Interference with Seasonal Movements, page E-3-286), we suggest mapping the effective area which could be eliminated from use. Some discussion should be provided on the likelihood of moose crossing the flowing narrow river as compared to the wide impoundment, plus drawdown zone; maximum and minimum widths of the impoundment should be provided. Also refer to our comments under Section 4.3(a)(i) . River Crossings. Information presented here will be important to later considerations re choosing sites for habitat enhancements which may be undertaken as part of mitigation.

Paragraph 5: Again, please detail ongoing studies.

. Disturbance: Once more, we note the need to (1) consistently assess the potential for increased access and hunting; and (2) integrate consideration of this issue throughout the report. We again suggest listing and analyzing the impacts from alternative access and use options.

. Mortality: See comments under . Disturbance, above, the previous discussion for Section 4.3(a)(i) - Construction, and Section 4.2(a)(i) . Mortality Factors. Please define when postulated increases in hunting will occur relative to project development.

- Quantification of Project Effects: We appreciate this discussion of ongoing studies but note that references to this section should be made throughout the report. Once more, we recommend including a schedule and describing how the studies will be incorporated into the license application, project design, and mitigation planning. Please note, references in this section are not included in the bibliography.

- Watana: Summary of Impacts: The summary is a useful, qualitative description of project impacts, yet provides no quantification for minimal, moderate, or severe impacts. The definitions given under Section 4.3 (a)(i) Moose: Paragraph 2, should be restated if they are to apply here. To better evaluate the "ifs" common to the discussion, we again suggest analyzing an array of impact scenarios. Attention should also be given to the cumulative impacts of habitat loss, alteration, disturbances, etc. We disagree with the conclusion that "because hunting mortality can be easily regulated, this will not necessarily be a major impact." Because of the politics involved and independence from project development of hunting regulations, there is no guarantee that regulations consistent with project mitigation goals will be implemented. Moreover, increasing hunter demands for a diminished resource will further affect harvests and hunter satisfaction.

(ii) Caribou

- Construction: Paragraph 2: We recommend providing figures on the proportion of the herd which could be affected by borrow areas A, D, and F. Although these areas will be only temporarily used within the 50 year project life, that temporary use involves several years.

- Filling and Operation: Paragraph 3: Consideration should be given to the future management options which will be foreclosed with project development. That is, now that the herd has recovered from previously low numbers, the ADF&G could change their management goals, even before project construction begins. We recommend considering loss of this management option in mitigation planning.

Paragraph 7: We recommend also considering the compounding effect of predation on caribou which become injured in crossing the reservoir or which alter their movements due to the presence of the reservoir. Predation was earlier cited as responsible for up to 30 percent of annual adult mortality (Section 4.2(a)(ii)).

(iii) Dall Sheep: Paragraph 2: Please clarify the last sentence.

Paragraph 4: Please provide information on when and how seasonal Dall sheep ranges will be defined and used to influence siting and scheduling of possible borrow site C.

Paragraph 5: Please document other cases where remote mineral licks have been altered to remain available to wildlife; we are concerned with the unproven effectiveness of enlarging the area if partial loss of the Jay Creek mineral lick affects sheep. Thus there is a need to demonstrate the techiques to ensure that sheep would use the mineral source if one were provided.

- Filling and Operation: The potential for disturbance from increased recreational or hunting use in the area should also be covered here.

(iv) Brown Bear

- Construction: Paragraph 5: Please describe the scope and schedule of ongoing studies and plans for integrating those results into project designs and mitigation planning.

Paragraph 6: We are concerned that the discussion downplays the importance of project impacts from both disturbance and loss of additional food sources. Original project studies[14/] and other reports[15/] emphasize that disturbance from project features and associated human activities will cause bears to avoid those areas.

Paragraphs 7 through 9: Two other impacts to vegetative food sources should be discussed here. Green-up of critical spring food plants may be delayed because construction-caused dust may retard snowmelt on vegetation; at the same time, herbaceous growth in summer may be increased (see the Botanical Resources Section and our comments, Section 3.3(a)(i) - Vegetation Damage by Wind and Dust and - Effects of Altered Downstream Flows.

Paragraph 12: We question the statement that, "No measurable changes in the number of moose or other important prey species are expected." Previous lack

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14/ Miller, S.D. and D.C. McAllister. 1982. Susitna Hydroelectric Project Phase I Final Report: Big Game, Vol. VI - Black Bear and Brown Bear. Prepared by the ADF&G for the APA.

15/ Spencer, D.L. and R.J. Hensel. 1980. Environmental studies of the proposed Terror Lake Hydroelectric Project, Kodiak Island, Alaska. Brown bear studies; mountain goat studies. AEIDC. Anchorage, Alaska 100 pp.

of quantification and the ongoing nature of salmon, moose, and caribou studies make it difficult to fully assess project impacts to brown bear. However, preliminary indications that up to 2,400 moose will be affected by the project in the upper Susitna basin alone (Section 4.3(a)(i): Paragraph 4, page E-3-280), and other report findings that "moose populations will probably be reduced", (Section 4.3(a)(vi): Paragraph 5, page E-3-312) suggest that there will be both losses and distributional shifts in brown bear prey, with resultant impacts to brown bear. Brown bear concentrations on already fully utilized adjacent ranges may result in intraspecific conflicts and further decreases in brown bear populations (Spencer and Hensel 1980, footnote 15).

- Operation: Paragraph 1: Our comments under - Construction apply here too (Section 4.3(a)(i). Please discuss potential impacts to bears resulting from impacts to the salmon resource in greater detail.

Paragraph 2: Also refer to our comments under Section 4.3(c)(i) re the need to define access.

Paragraph 5: Please see our comments two paragraphs above (Section 4.3(a)(iv) - Operation) on the need to better evaluate the importance of salmon to area bears. Overall, we note the need to quantify impacts and discuss the cumulative effects of project impacts on brown bears.

(v) Black bears

- Construction: Paragraph 1: As in our comments under brown bears, above (Section 4.3(a)(iv)), we suggest that greater attention be given to impacts of reduced prey, compounded here by the significant loss of black bear habitat with the Watana development.

- Filling and Operation: Paragraph 1: Please refer to our comments under Section 4.3(a)(iv) - Construction re project impacts to vegetation. Since black bears will be subject to much greater impacts than brown bears, the cumulative impacts of each additional project-caused stress could be severe.

Paragraph 2: We question the ability of habitats to the east and west of the impoundment area to support bears now inhabiting the impoundment areas. If those areas are already fully stocked with black bears, resultant intraspecific strife and stress would ultimately lead to lower populations.

Paragraph 3: We again refer you to our comments under brown bear (Section 4.3(a)(iv)). Please describe ongoing studies and their integration with project design and mitigation.

(vi) Wolf: Paragraph 3: Please refer to our comments under Section 4.3(a)(xii) re the likelihood for wolf populations to decrease and coyote populations to increase in the project area.

Last Paragraph: Given the increased access expected with project development, an increased wolf harvest appears likely. We recommend that a quantification of project impacts should consider the effects of an increased harvest on wolf

population levels. The cumulative impacts of (1) wolves concentrated in a smaller area due to disturbance, (2) effects on territoriality and stress, (3) relative values of impacted as compared to remaining habitats, and (4) reduction in prey, should also be considered here.

(ix) Beaver: We question the certainty of the statements here, given the undecided nature of the project water management regime. If reservoir releases are regulated to stabilize downstream flows, downstream beaver habitats may be enhanced. However, the extent to which that enhancement will offset beaver losses in the upper Susitna River basin is not provided. Such data is necessary to evaluate the relative tradeoff in alternative flow regimes (i.e., for beaver, fish, moose, etc.) and thus the overall magnitude of project impacts.

- Construction: We recommend that the location of beaver colonies be considered, in conjunction with other wildlife values, in siting borrow area access roads.

- Filling and Operation: Paragraph 1: Please quantify "few beavers" currently supported by the impoundment area.

Paragraph 4: Refer to our comments under Section 4.3(a)(ix), above; we recommend using hydrologic data in conjunction with the revised vegetation maps and vegetation succession dynamics to quantify the areas which may be affected under different flow regimes. We find some inconsistency between the statement here that, "Beaver habitat south of Talkeetna may also be enhanced as a result of the increased occurrence of favored food plants (page E-3-316)," and the statement in Section 4.3(a)(i) that, "few changes are expected in channel morphology, frequency of flooding, or vegetational succession" (page E-3-289, paragraph 1).

Paragraph 5: During the August 1982 AEA Workshop on the Susitna project, access was considered as much of a limiting factor to trapping pressure as was pelt price. This section justifies our mitigation recommendations under Section 4.4(b) for alternate access routing, restrictions on use of access routes, and prohibition of trapping by construction workers.

(x) Muskrat: Paragraph 1: We find no section correlating to the referenced Section 3.3(a)(ix). Please define "minor" impacts.

Paragraph 2: Please refer to our previous comments on quantifying improvements in downstream habitats under Section 4.3(ix). Accordingly, we question the contention that, "Improved downstream habitat will probably compensate for this loss."

Paragraph 4: Again, refer to our comments under Section 4.3(ix), re mitigation of trapping impacts.

(xi) Mink and Otter

- Upstream Effects: We recommend defining "moderately abundant" and "substantial impacts." Other than lacking quantification, the discussion thoroughly describes potential project impacts to mink and otter. Please clarify the reference to "65m" in Paragraph 3.

- Downstream Effects: We suggest the discussion be expanded to better explain the relative magnitude of project impacts to mink and otter. Since there was no previous quantification of those populations, we find it difficult to evaluate the significance of these impacts.

(xii) Red Fox and Coyote: Where human activities have developed in a previously undisturbed area, coyotes have become abundant while fox numbers have decreased (Furbearer Study Coordinator Phil Gipson, personal communication). For example, in the Cantwell to Healy corridor there has been a marked increase in coyotes with increasing numbers of people and area developments. Researchers believe there has been a corresponding decrease in both fox and wolf numbers, although both those species pass through the area from undisturbed habitats in the adjacent Denali National Park.

Per our comments on other furbearers, quantification of relative area populations, habitat quality, and trapper demand and harvest is necessary to fully evaluate project impacts.

(xiii) Other Furbearers: Again, quantification is needed re base line populations, habitat quality, and use, in order to fully evaluate project impacts.

Paragraph 3: Note should be made of the previous years' trapping activity which may be responsible for low trapping success of pine marten near Watana Creek (Furbearer Study Coordinator Phil Gipson, personal communication).

Paragraph 4: We suggest considering additional parameters for evaluating pine marten habitat quality (e.g. the availability of berries is important as late summer/fall food) in conjunction with remapped vegetation types to reevaluate impact estimates.

Paragraph 6: We question the extent to which snowshoe hare habitat may be improved by revegetation of disturbed areas, given the much larger amount of habitat which will be destroyed by the project and historically low hare populations in the basin.

Paragraph 8: No correlation is made between "moderate" levels of disturbance from logging and different levels of disturbance from the project re the applicability of these references to project impacts.

(xiv) Raptors and Raven

- Habitat Loss: Paragraphs 2 and 5: Please refer to our comments under Section 4.3(a)(xiv) - Disturbance, below concerning the taking of eagle nests.

Paragraph 4: In order to understand the relative magnitude of project impacts, we recommend discussing the estimated loss of golden eagles in terms of project area populations and habitat values.

Paragraph 5: Please clarify the statement that potential downstream nesting habitats may become more important as upstream habitats are lost with project development. Whether downstream habitats are fully utilized, their value compared to upper basin habitats, and potential disturbances from other project activities should be described.

Paragraph 9: Please clarify whether downstream raven habitats could absorb use by ravens displaced from upstream habitats.

Paragraph 10: The blowdown of trees near cleared areas represents an additional source of habitat loss (e.g. see Section 3.3(a)(i) - Vegetation Damage by Wind and Dust).

. Bald Eagles: Paragraph 3: We recommend describing the overall impacts of the project on salmon and other fish which serve as bald eagle food. Such consideration should include potential impacts to smelt runs near the mouth of the Susitna River. Any impacts to these resources could affect eagles now depending on them as food.

Paragraph 4: We question the significance of any compensation for lost eagle feeding habitat through attraction of waterfowl to the impoundment. Please quantify the potential for such compensation and/or provide an explanation of why waterfowl may be attracted to the reservoir without a concomitant increase in their food sources (also see our comment under Section 4.3(a)(xv) Waterbirds, below).

- Disturbance: Paragraph 1: We appreciate the description of protection afforded eagles under the Bald Eagle Protection Act (16 U.S.C. 668-668c). However we are concerned that the intent of this act relative to project design has not been adequately acknowledged or incorporated, as explained below.

Paragraph 6: Under a recent amendment to the Bald Eagle Act, the Secretary of the Interior may permit the taking of golden eagle nests which interfere with resource development or recovery operations (16 U.S.C. 668a). Regulations for implementing this amendment should be available within the next couple of months.

Paragraph 7: The Bald Eagle Protection Act does not authorize the taking of bald eagle nests which interfere with resource development or recovery operations. The Act does provide for the taking of nests for scientific and certain specific exhibition purposes when compatible with the preservation of this species. Service eagle permit regulations, 50 C.F.R. 22.21, implement this section of the Act. Secretarial approval is not required for the taking of bald eagle nests in Alaska provided no eagles are killed and the nest is not exported from the United States. Authority to take such nests has been delegated to the FWS Regional Director. We suggest that the applicant promptly consult with the FWS to reach a mutually satisfactory solution to this potential conflict.

(xv) Waterbirds

- Habitat Alteration: Paragraph 2: Please substantiate that "fish populations will probably remain sufficient" to support birds such as mergansers. According to Meeting Summary notes from the 2 December 1982, Susitna Hydro Exhibit E Workshop on Water Use and Quality and Fishery Resources, most of the grayling population (estimated to be at least 10,000 in Section 2.3(a)(ii) - Watana Reservoir Inundation) will be lost and any production of lake trout is expected to be limited.

Paragraph 3: We suggest quantifying the number of lakes, miles of streams, and acres of wetlands (per revised wetlands typing) which may be affected by project borrow areas, spoils sites, etc., as well as those which will be completely lost. We recommend including those habitat types in Table W78a. This information will allow better quantification of project impacts.

Paragraph 4: Please substantiate further the value of the reservoir as habitat for migrating birds. Since existing resident fish populations are expected to be severely impacted by reservoir development and no biologically productive nearshore zone will be developed, we question that there would be food necessary to support birds attracted to the reservoir. Moreover, winter open water areas could attract waterbirds to their detriment, particularly since food supplies are already limited. Swans attracted to open water at Red Rocks Lake National Wildlife Refuge in Montana must now be fed during winter; similar problems have occurred in other areas of the conterminus United States (FWS Migratory Bird Management Project Leader Rod King, personal communication).

- Disturbance: Paragraph 2: We suggest that greater emphasis be placed on the potential for the project to disturb trumpeter swans. Recent increases and overstocking of swans in the Gulkana Basin may result in more swans moving into the upper Susitna Basin (FWS Migratory Bird Management Leader Rod King, personal communication). Yet those habitats will become less suitable with the human activities and disturbances cause by the project. As areas in the Cook Inlet Basin and Kenai Peninsula have been affected by human use and development, swan use of those areas has shifted to areas largely inaccessible to people.16/

(xvi) Other Birds

- Construction

. Habitat Loss: We appreciate the thorough, quantitative discussion included here.

. Habitat Alteration: We suggest that species and their relative abundance be correlated to the postulated negative and positive effects of habitat alteration. This would provide some indication of net project impacts. Loss to the Watana impoundment of existing natural edge, e.g. rivers, ridgetops, etc., will undoubtedly be far greater than the increases in edge suggested here.

- Operation: We question whether any feeding habitat for spring migrant shorebirds will be created in the drawdown zone. The reservoir drawdown zone will remain an unvegetated mudflat. If current low bird populations indicate lack of high quality habitat, it seems doubtful that food organisms would suddenly proliferate with reservoir development.

16/ King, J.G. and B. Conant. 1981. The 1980 census of trumpeter swans on Alaskan nesting habitats. American Birds 35(5): 789-793.

(xvii) Non-game (small) Mammals: For small mammal species which inhabit identifiable vegetation types, we suggest describing whether the percent of the habitat to be lost is proportionately greater or less than the occurrence of the type within the entire basin.

(b) Devil Canyon Development

(i) Moose: Converting the number of moose in the Devil Canyon impoundment to a density figure and then comparing that to a similar figure for the Watana impoundment would allow a better quantitative comparison of impacts. We are concerned with the judgemental nature of the discussion in stating that impacts "are of less concern" and suggest that, "will be of smaller magnitude" might improve the statement (pge E-3-338). The smaller area of the Devil Canyon as compared to Watana area should also be mentioned, although we do note that moose density here is about half that of the Watana area. An evaluation of relative habitat values of the adjacent areas which will be less directly impacted, and any lands proposed for acquisition or enhancement, is necessary for a complete impact and mitigation anaysis.

- Construction: Again, spoils disposal is an additional impact which should be described.

. Habitat Loss: Our comments under this heading (Section 4.3(a)(i)), for the Watana development also apply here.

. Interference with Movements: The discussion should consider whether a 1.6 km crossing would also be a barrier to moose in that area or moose diverted from upstream crossings because of the Watana impoundment. Quantification should also be provided of the additional distances which might have to be traveled and consideration given to additional energy expenditures relative to forage quality should moose alter their movement patterns. Also refer to our comments under this heading, Section 4.3(a)(i), for the Watana development.

. Disturbance: Please refer to our comments under this heading, Section 4.3(a)(i), for the Watana development.

- Mortality: As above, our previous comments under Section 4.2(a)(i) . Morality Factors; 4.3(a)(i) - Filling and Operation, . Disturbance; and 4.3(c)(i) - Mortality apply.

- Filling and Operation

. Alteration of Habitat: Please refer to our comments under this heading, Section 4.3(a)(i), for the Watana development. We are concerned that increased water temperature could result in a larger area being affected by ice fog and rime ice formation, also see our comments under Section 3.3(a)(i). We again recommend quantifying several impact scenarios re successional vegetation changes from any of the impacts discussed here.

. Interference with Movements: By reducing browse availability due to rime ice formation, the presence of ice fog could be a compounding impact to moose.

Moose movements may already be inhibited because of greater visual exposure to predators in the vicinity of the reservoir. We refer you to our comments

. Disturbance: Again, our comments for Watana (Section 4.3(a)(i)) apply.

. Mortality: Please refer to our previous comments on hunting (Section 4.2(a)(i) . Mortality Factors, and Disturbance and Mortality discussions under Section 4.3(a)(i)).

. Devil Canyon: Summary of Impacts: As we commented on the Watana impacts summary, quantification and better definition of impacts is needed here. We are also concerned about inattention to cumulative impacts. While habitat alterations, disturbance, or blockage of movements may each be a "minimal" impact, together they may be sufficient to severely stress moose or reduce moose use of the project and adjacent areas.

(ii) Caribou: Definitions for the qualitative terms used here should be provided (e.g. "little use").

(iv) Brown Bears: Lack of quantification here, as in Section 4.3(a)(iv) precludes evaluating even relative impacts from each major project feature.

(v) Black Bears: As in Section 4.3(b)(iv) above, lack of quantification prevents a thorough analysis. Consideration should be given to the cumulative effects of disturbances, loss of habitat, decrease in habitat value, and increased mortality from human/bear conflicts from the Devil Canyon development in conjunction with the Watana development.

(vi) Wolf: Please refer to our comments under Section 4.3(a)(vi) re the importance of disturbance and cumulative impacts.

(ix) Beaver: Refer to our comments under Section 4.3(a)(ix) re the need to quantify the amount and quality of downstream habitat improvements which could offset upstream habitat losses and the dependence of any habitat improvement on the operating flow regime. We s ggest describing impacts under a variety of potential flow regimes.

(x) Muskrat: Please refer to our previous comments under Sections 4.2(b)(ii) and 4.3(a)(ix) - Filling and Operation re quantifying and controlling potential increases in trapping.

(xi) Mink and Otter: Again, we recommend providing some quantification, definition, or relative correlation among species and project areas for the qualitative impact descriptions.

(vii) Coyote and Red Fox: We would expect an increase in coyotes per our previous comments (Section 4.3(a)(xii)).

(xiii) Other Terrestrial Furbearers: Our comments under Section 4.3(a)(xiii) apply here too.

(xiv) Raptors and Ravens

- Construction and Filling

. Habitat Loss: Paragraph 1: Refer to our comments under Section 4.3(a)(xiv) - Disturbance.

Paragraph 2: Should any eagle build a nest, between now and filling of Devil Canyon Reservoir, which would subsequently be lost in construction and/or filling of Devil Canyon, please refer to our comments under Section 4.3(a)(xiv) - Disturbance.

Paragraph 3: Please clarify what is meant by the first sentence.

Paragraph 4: Please refer to our comments under Section 4.2(c)(1) re the difficulties in locating goshawk nests.

Paragraph 5: Please clarify the discussion and consider whether the cliffs and trees which may increase in nesting importance are as suitable as existing nest habitats.

. Disturbance: Paragraph 1: Again, please refer to our comments under Section 4.3(a)(xiv) - Disturbance.

Paragraph 2: See our comments under Section 4.3(b)(xiv) this section, Habitat Loss: Paragraph 2, above.

(xv) Waterbirds: Please refer to our comments under Section 4.3(a)(xv) as to the questionable value of the reservoir area, i.e. generally birds will not appear in the area any earlier; birds which remain in the area longer may have problems finding food when encountering frozen waterbodies once they do leave; no data has been provided re any supplemental food value in the reservoir area.

(xvi) Other Birds: Paragraph 2: Please clarify the last sentence.

Paragraph 3: Please quantify the extent to which open water in the reservoir will compensate for loss of dipper breeding habitat and describe what feeding habitat would be available in the reservoir.

(xvii) Non-game (small) Mammals: Please refer to our comments under Section 4.3(a)(xvi).

(c) Access

(i) Moose: The qualitative, general discussion precludes any definitive analysis of potential impacts. We suggest quantifying current and potential hunter demand and harvests, area moose populations and habitat quality for access route areas. Varying degrees of winter severity and the length of each access link should then be considered in conjunction with the information described above and data on vehicle/moose collisions in other areas of the state to assess the potential for railroad or automobile collisions with moose.

Since access is a key feature to any mitigation plan for the project, we again recommend evaluating the range of impacts which would result from a variety of access/use options and coordinating this with the Socioeconomics and Recreation Chapters. Please refer to our 17 August 1982 letter to Eric Yould re access alternatives; our comments there remain applicable.

Please correct internal inconsistencies in this paragraph: loss and alteration of habitat, disturbance, and mortality are certain, not "possible", impacts as verified in subsequent portions of this section (page E-3-350). Maps of proposed access routes should also be included.

- Mortality: Paragraph 2: Before discussing impacts from access, please specify any public access and hunter take restrictions assumed to be in effect for planning, construction, and operation phases of the project. Impacts will vary from severe with no restrictions to minimal with strong restrictions on access. In this respect, we find Chapter 3 confusing. The potential impacts from public access and hunting along project access routes are discussed here and then the suggestion is made that these impacts will be minimized by prohibiting worker access and hunting, yet the chapter never consistently describes what restrictions actually will apply. Project impacts, such as habitat degradation and population disturbance associated with increased access, could be further minimized by controlling public access (through restrictions on ORVs, seasons or times of day of use, etc.).

Please substantiate the conclusion here that "carefully managed hunting may effectively mitigate for some indirect project effects." The impact of diminished hunter opportunities is not fully described here or in Chapter 5 (see our comments there, Section 3.7(b)(ii) - Impacts on the Hunter).

Paragraph 4: Please define use of the terms "small" and "negligible." During severe winters, moose may seek cleared roadways as travel corridors and be subject to collisions. Since the Denali Highway is not kept open during the winter, it is not possible to fully compare the collisions on that road with the potential for collisions on project access roads. However, we suggest that a better understanding of the subject could be gained with information as described under Section 4.3(c)(i), above. We also note that if workers are allowed to commute to the project site or have free access in and out of the project area, the volumes of road traffic would be significantly higher. The analysis should be coordinated with that in Chapter 5. Consideration should be given to the times of year and day for recorded collisions and utilized in scheduling access if patterns exist in that information.

Paragraph 5: Please describe current railroad use as compared with the projected additional eight round train trips each week. We believe that project railroad use may be a significant impacts to wildlife in view of present winter use of four round trips each week.

The length of additional track, as well as existing track, should also be given for comparison with the mortality figures given here. Information on moose densities and habitat values in the area of the new as compared to existing railroad would also be helpful in quantifying potential impacts, as described above. We are concerned that in severe winters the loss of winter range may be compounded by the potential for numerous vehicle/moose collisions.

. Loss of Habitat: We concur with the analysis but suggest some quantification be made of areas and vegetation types which could become

unuseable in a worst case scenario where disturbance causes moose to avoid using the road corridor area.

. Interference with Seasonal Movements: With respect to the seasonal migrations described here, please refer to our comments under Section 4.3(c)(i) - Mortality, re the compounded potential for even greater numbers of vehicle/moose collisions.

(ii) Caribou: Paragraph 1: We reiterate our recommendation to eliminate the Denali Highway to Watana access route (also see Section 3.4(c)(ii)) which, as documented here, is "likely to have a substantial effect on caribou movements."

Paragraph 6: Please provide substantiating data for the judgment that although cows calving in the area may avoid the road, there will not be an effect on herd productivity. We recommend quantifying the portion of the herd utilizing this area.

Paragraph 7: Please provide further information on times of day or seasonal variations expected for truck traffic. An additional concern in considering the potential severity of access-related impacts is the question of worker access. If project workers are all housed on site, the intensity of road use will still be greater than described here; workers traveling to and from the site at the beginning and end of their times off represent a substantial road, or even airstrip, use. Moreover, if workers are allowed to individually commute, or even if buses are used on a daily or weekly basis, road use will be even more significant.

Paragraph 9: Our previous comments on herd management apply (Section 4.2(a)(ii)). We recommend quantifying impacts described throughout this section.

(iii) Dall Sheep: Paragraph 1: The issue of disturbance from air access to the project should be covered here; as described in Section 4.3(a)(iii). Please provide information on the expected intensity of aircraft use for the period of construction.

Paragraph 2: Consideration should be given to increased recreation and other activities which may compound habitat loss impacts near the critical Jay Creek mineral lick. Please restate those impacts as described in Section 4.3(a)(iii).

(iv) Brown Bears: We concur with the assessment but recommend that quantification of impacts be provided.

(vi) Wolf: Our previous comments under Section 4.3(a)(vi) apply.

(vii) Wolverine: Paragraph 2: Quantification of trapping effort and potential increases relative to wolverine populations should be given. Please justify the inference that emigration from other areas will mitigate for loss of wolverine to trappers yet not affect overall populations.

(viii) Furbearers: In general, we find the discussion somewhat inconsistent with other sections, with no clear objectives outlined for mitigation (see paragraphs 2,8, and 9 of this section). Please also refer to our comments on the socioeconomics (Chapter 5, Section 3.7(c)(i) - Impacts of the Project) and our recommendations under the wildlife mitigation plan (Section 4.4(b)). We recommend you then ensure these sections are consistent with each other and with overall project objectives and mitigation goals. Specific comments follow.

Paragraph 1: Please provide further data to substantiate the conclusion that pine marten home ranges may become realigned along the access road. Although we appreciate the thorough discussion of potential project impacts, we are concerned that repeated lack of quantification makes if difficult to assess the relative importance of such "minor" impacts as compared to the more severe impacts of direct habitat losses and increased trapping mortality.

Paragraph 5: The well-documented likelihood of beavers using bridges and culverts for damsites more probably represents further negative impacts to beaver than a source of habitat improvement. Beaver use of those structures would conflict with project access, undoubtedly resulting in road maintenance to remove beaver dams. If that removal occurs at the wrong time of year, i.e. autumn, beaver in the area may be effectively eliminated (Furbearer Study Coordinator Phil Gipson, personal communication).

Paragraph 9: We are concerned with use of the word "desirable." Thus we suggest modifying the last sentence to say that to date, trapping pressure on mink and otter has been low in this part of Alaska (Furbearer Study Coordinator Phil Gipson, personal communication).

(ix) Raptors and Ravens

- Denali Highway to Watana Damsite: Paragraph 1: We recommend describing how this area was surveyed.

Paragraph 2: Our comments under Section 4.3(a)(xiv) - Disturbance would apply should golden eagles subsequently nest along the access road.

Paragraph 3: Refer to our comments under Section 4.3(a)(xiv) - Disturbances re the illegality of destroying a bald eagle nest.

- Watana Dam Site to Devil Canyon Dam Site

. Disturbance: We again refer to you to our comments under Section 4.3(a)(xiv) - Disturbance.

- Devil Canyon Dam Site to Gold Creek

. Disturbance: We recommend that the conclusions of minimal disturbance here, be consistent with those in Table W76 which says that "construction and operation activities may result in considerable disturbances." If the nest is active, we will recommend timing constraints on the construction activities near it (see Section 4.4(c)(i)).

(d) Transmission Lines As with the previous Section 4.3, (c) Access, the severity of impacts from the transmission lines will depend on restrictions on access (e.g. by siting, access to the lines, and/or access along the lines) as well as the methods of construction and maintenance (e.g. helicopter, winter, and/or onground). Please clarify what methods and schedule for construction and maintenance will be utilized and what restrictions, if any will be placed on access; we find the Exhibit E inconsistent on these points. The reference here is to helicopter and winter construction and only selective clearing of vegetation; in Chapter 5, reference is made to increased hunter access along the lines which infer greater clearing and road access (Section 3.7(c)(i) . Impacts of the Project). Increased snowmobile and ORV access and their disturbance along the transmission corridors should also be addressed here. Our comments under (Section 4.3(c)) Access on the need to quantify expected additional harvests also apply here.

Please refer to our transmission corridor comments under Botanical Resources, Sections 3.3(d) and 3.4(d). We refer you to our 5 January 1982 review letter on the 9 November 1981 Transmission Corridor Report. Our comments there remain applicable. In particular, we recommend incorporating into project plans: (1) on-ground evaluations with representatives of the FWS, ADF&G, and the Alaska Plant Materials Center regarding the appropriate management along various lengths of the transmission lines (e.g. the extent of clearing, maintenance, possible seeding, etc. should depend on the wildlife species of concern and vegetation types present; (2) coordinated access to the transmission lines with access to other project facilities; (3) controls on public access to the transmission lines during and post-construction to reduce habitat degradation and population disturbances; and (4) controls on access along the length of the lines. We would appreciate your response where project plans may be in conflict with either these points or the five specific recommendations in our January letter.

We are concerned with the generality and lack of quantification of this section. Using the vegetation remapping, a successional model should be applied; the selective clearing and maintenance to be used along the transmission lines should be factored into that model. Areas within each type to be impacted and vegetation type changes over the project life can then be calculated. Maps of the proposed transmission line corridors should also be provided.

(i) Big Game

- Cook Inlet to Willow: Paragraph 1: Again, the degree of impact will depend on the type of clearing and maintenance and thus, habitat alterations which result. We have recommended selective clearing, winter and helicopter construction and maintenance and controlled access along the line. Maintenance should involve selective clearing and topping of trees and tall shrubs to help maintain increased forage production. We agree that transmission line clearing may increase moose and black bear carrying capacities if vegetation types which can be enhanced are present along the line. Thus we recommend quantifying the types present and their value to big game.

Paragraph 2: Please describe the presence or absence of moose calving grounds and bear denning sites. The cumulative impacts of the transmission lines in conjunction with existing disturbances should be discussed.

- Healy to Fairbanks: Again, quantification of types to be impacted and successional changes over the project life should be provided.

- Willow to Healy: Please refer to our 5 January 1982 letter regarding the dependence of the Susitna project on the Intertie. Thus, we recommend full consideration of impacts from the Intertie within this analysis. Quantification of impacts is needed, as above.

- Watana Dam to the Intertie: Please provide a quantification of impacts, as above.

(ii) Furbearers: Paragraph 3: Please refer to our comments under Section 4.3(c)(viii) re inconsistencies between Chapters 3 and 5 in presenting impacts. We are also concerned with inconsistencies between the increased access acknowledged here and mitigation guidelines to prohibit such access (Appendix EE, item 1); please clarify. Our previous recommendations to quantify impacts apply here too.

(iii) Birds: Paragraph 1: We recommend providing references for the broad conclusion that species diversity may increase near the transmission lines. Removal of nest and forage trees will decrease available habitat for species such as pine grosbeak and boreal chickadee.

Paragraph 2: We concur. Please also refer to our comments under Section 4.2(c)(i) re continuing peregrine falcon surveys.

Paragraph 4: Powerlines are particularly deadly to swans.16/ However, mortality from collisions, not electrocution, is the major adverse impact to swans. Locating and marking lines is the key to minimizing that impact (see our comments under Section 4.4(c).

We recommend expanding this discussion to describe: (1) the potential for swan collisions; (2) migrations of swans through the project area; and (3) swan use of remote lakes, including those in the Matanuska-Susitna Valley, for nesting and rearing. Refer also to our comments on increasing developments and disturbances which have caused swans to abandon areas, Section 4.3(a)(xv) - Disturbance, and our 5 January 1982 letter to Eric Yould, as above.

(e) Impact Summary

We are concerned with the emphasis of this summary on impacts which can be most easily mitigated. Consideration should also be given to documenting unavoidable, adverse impacts, cumulative project impacts, and differences between long versus short-term impacts. The uncertainty if predicting project impacts on the basis of existing information are clearly apparent here.

16/ Avery, M.E., P.F. Springer, and N.S. Dailey. 1980. Avian mortality at man-made structures: an annotated bibliography (revised). U.S. Department of the Interior, FWS/OBS-80/54.

Paragraph 2: We concur that increased human use is positive, but the habitat alteration and disturbance which may also result from increased access are often a significant negative impact to wildlife populations. There is a need to integrate this discussion with those in the Socioeconomic and Recreation Chapters of the Exhibit.

Paragraph 3: We recommend also considering habitat values and how they relate to wildlife populations over the life of the project.

(i) Big Game: Paragraph 1: As above, the increased access afforded to hunters is more of a concern from the standpoint of resultant population disturbances and habitat alterations; assuming that harvest is regulated to protect population levels.

Paragraph 3: We are concerned with the subjectivity of the first sentence here. Please provide quantitative data for comparison with the previous paragraph to justify the relative magnitude of project impacts.

Mention should also be made that project impacts will be particularly critical during years of severe winter. During such years, an additional impact to be considered would be moose/vehicle collisions. Cumulative impacts are also of concern with moose.

Paragraph 4: Inability to predict major impact on caribou, as cited here, is a serious data gap. We recommend describing additional information to be gathered to help make such predictions. Best and worst case impact scenarios should be described to provide at least an indication of how caribou could suffer from increased disturbance, impacts near calving areas, and alterations in seasonal movements.

Paragraph 6: Again, cumulative impacts are a concern in evaluating overall project impacts to both brown and black bear.

Paragraph 7: Disturbance from increased access and the presence of human activities should be the more direct concern here (please see our comments under Section 4.3(a)(vi)).

(ii) Furbearers: Paragraph 1: We again note the potential for red fox populations to decrease as coyote populations increase (please see our comments under Section 4.3(a)(xiii).

Paragraph 2: We suggest clarifying these conclusions to be consistent with previous impact descriptions, e.g. Section 4.3(a)(ix), paragraph 1, page E-3-315, says beaver populations are likely to increase, this paragraph says they "may increase," downstream (page E-3-371). We again recommend describing the water management regimes under which furbearer populations will most likely benefit. Overall, we are concerned with the uncertainties expressed in this discussion and recommend that additional furbearer work to satisfy these uncertainties be considered (e.g. we suggest focusing on beaver and pine marten per our comments under Section 4.4(b)). Since impacts to valuable habitat in the vicinity of Deadman Creek can be mitigated, by alternative road siting, they should be described here.

(iii) Birds: We recommend also describing the negative impacts from swan collisions and raptor electrocution with transmission line development. Similarly, disturbance to nesting swans and raptors is another negative impact which should influence mitigation planning.

4.4 Mitigation Plan: As was the mitigation plan for Botanical Resources, we find the mitigation plan for wildlife incomplete and too general. Our detailed comments on lack of quantification, lack of integration with other resources evaluated, and need to consider the full range of mitigation options possible should be considered here as well (see Section 3.4).

Because the wildlife analysis is much more qualitative than quantitative, we commonly found the emphasis on minor impacts rather than on major ones. A similar misemphasis is in the mitigation plan, where attention is often focused on small, more easily mitigated impacts. Alternatively, severe impacts are left to undefined and uncertain mitigation measures such as later habitat enhancement and/or lands acquisition. Please refer to our earlier comments on the need to clarify overall project mitigation objectives (Section 4.1).

This section should clearly explain why mitigation measures already recommended by FWS and other resource agencies have not been adopted. For example, negative impacts to wildlife from the Denali Highway to Watana development access route are consistently documented throughout the report: the road will result in substantial disturbances; the Deadman Creek area paralleling the road is particularly important habitat to numerous wildlife species (e.g. calving moose, Section 4.2(a)(i) - Distribution . Special Use Areas: Calving Areas: Paragraph 2; brown bear denning, Section 4.3(a)(iv) - Construction: Paragraph 10; caribou movements, Section 4.3(c)(ii); wolf denning, Section 4.3(c)(vi); valuable beaver habitat, Section 4.3(c)(viii); bald eagle nesting, Section 4.3(c)(ix), etc.). Mitigation of these impacts can be effectively accomplished by completely avoiding the impact, that is, alternative siting as recommended in our 17 August 1982 letter to Eric Yould and further detailed in our comments on the Botanical Resources mitigation plan, Section 3.4(c)(ii).

We also request that you (1) confirm the inclusion of recommended measures in project design, and (2) clarify the extent of public access and uses in the project area throughout planning, construction, and operation of the project. For example, please specify the extent to which the environmental guidelines in Appendices EA to EE have and will be guaranteed in project design and operation.

Establishment of a monitoring and follow-up program for all phases of project construction and operation is an essential feature of the mitigation plan. Key components of this program are that it: (1) include appropriate Federal, State, and local agency participation; (2) be fully supported by project funding; and (3) be utilized to modify, delete, or add to the mitigation plan in response to both information from ongoing studies and needs which become apparent as project impacts are realized. While monitoring by itself is not mitigation, actions taken as a result of that monitoring can ensure the effectiveness of the implemented mitigation plan.

Our final general recommendation on the mitigation plan is that continuing consultation between the license applicant and resource agencies include initiation of working sessions with project design engineers to fully incorporate wildlife mitigation plans.

(a) Big Game

(i) Moose: Paragraph 3: We concur with the processes now being used to quantify probable impacts of habitat loss and to develop selection criteria for replacement lands. Our previously described concerns for the need to evaluate habitat values are of particular note here; habitat quality must be a factor in quantifying the areas of specific land parcels which are to be enhanced or acquired as mitigation. A schedule for the availability and incorporation of this data into project plans is also needed. Some assessment should be made of the locations and potential sizes of such areas.

Paragraph 5: Further details should be provided on the schedule, potential size, habitat types, and studies, which would be involved in the Alphabet Hills burn. Land ownership, vegetation types, and other constraints to the potential value of burning or other manipulations to enhance habitat should also be described.

Paragraph 6: Please clarify the criteria to be used in replacement land selection. We caution that replacement lands only contribute to offsetting unavoidable habitat quality losses elsewhere when: (a) habitat value of the replacement land would be degraded by some predictable means other than the project during the life of the project but, through management for fish and wildlife that degradation could be prevented; or (b) replacement lands are currently degraded and through management for fish and wildlife, productivity could be increased over the life of the project; or (c) through management of fish and wildlife, the productivity of an existing natural unit of habitat could be increased by reducing or eliminating one or more factors limiting its productivity. Identified replacement lands must be a manageable unit.

Paragraph 7: To maintain the increased value of managed habitat, provisions should be included for ongoing management of them until such time as the project area is returned to the pre-project state.

Paragraph 8: The maximum design speed of 40 miles per hour referred to in Appendix EC, item 1, should be assured here as one means of minimizing the potential for moose/vehicle collisions.

Paragraph 9: We strongly support the proposal Environmental Briefings Program and recommend that it be a mandatory requirement for all project personnel before they begin work on the project.

Paragraph 10: Assistance from APA in regulating access should also be for the purposes of minimizing habitat degradation and unnecessary disturbances.

(ii) Caribou: Provisions to monitor and remove logs and other debris from the impoundments should be included in the overall project monitoring program, this will ensure that such debris does not inhibit caribou movements (see Section 4.3(a)(ii) - Filling and Operation, paragraph 9).

(iii) Dall Sheep: Please describe how the prohibition on visits to the Jay Creek mineral lick is to be enforced. We recommend that the portion of the reservoir adjacent to the lick be closed to boat and floatplane use. We suggest that the effectiveness of any measures to expose new portions of the mineral lick be demonstrated and then incorporated into the mitigation plan if effective.

(iv) Brown and Black Bear: Paragraph 2: We strongly concur with recommendations to promptly incinerate garbage and fence camps. Experience from other projects (e.g. Terror Lake hydroelectric project) shows the need to clearly sign and monitor gate closures to maintain the effectiveness of fencing. The Environmental Briefings Program referred to under Section 4.4(a)(i), paragraph 9, is particularly applicable here.

Paragraph 3: The habitat values to be gained from mitigation measures referred to here must be quantified before any mitigation for bear impacts can be claimed.

(v) Wolf: Please refer to our comments in the previous paragraph about quantifying recommended mitigation measures.

Beaver and pine marten are both ecologically and economically important; mitigation of some project impacts is possible. We recommend revising the first sentence to describe what process and/or criteria were used here in deciding to emphasize beaver and pine marten in mitigation planning.

Potential benefits to other species from beaver activities is the type of minor impact we believe to be overemphasized while more significant, and difficult to mitigate, impacts are not treated as thoroughly. For example, beaver activities may conflict with slough management plans for salmon. Moreover, benefits from beaver activities may ultimately be negated by increased trapping which will be facilitated by project access and transmission corridors. The consistent lack of quantification in the draft Exhibit E precludes evaluting the significance of any such benefits relative to overall project impacts and recommended mitigation measures.

Paragraph 2: We recommend discussion be provided on how proposed mitigative siting of the transmission corridor for pine marten will conflict with, or benefit, other wildlife species.

Paragraph 3: Per our previous comments, we recommend coordinating the discussions of impacts and mitigation measures between Chapters 3 and 5. We see a need to clearly and consistently state project objectives in both chapters. We concur that workers and their families be prohibited from trapping or hunting while working in the project area and request assurance that such prohibitions will be part of project plans.

Although increased access may be viewed as a net benefit to trappers, habitat degradation, disturbances to the population, and conflicts with project management (e.g. removal of beavers which conflict with road culverts) would result in less than expected benefits to these groups. Thus we recommend continued monitoring to assess that potential. We also then recommend that a process be developed for implementing further mitigation (e.g. recommendations

to the Game Board on greater harvest restrictions, habitat manipulations, alternative flow regimes, etc.) should these efforts fail or impacts be found more severe than initially evaluated.

Paragraph 4: We request confirmation that project design plans will not include gravel extraction from Deadman Creek. Please provide further information on how disturbance of riparian vegetation will be minimized.

Paragraph 5: Please refer to our comments under Sections 4.3(a)(ix) and 4.3(b)(ix) re the need for quantified data to support the conclusions here. We strongly support the proposed monitoring and model development programs. These programs should also be the basis for verifying impact predictions. Although by itself monitoring does not mitigate project impacts, it should be the basis for determining additional mitigation needs.

Paragraph 6: We concur. To maximize the effectiveness of the mitigation plan, we recommend continuing studies to fill data gaps, quantify conclusions given here, and complete habitat models for beaver and pine marten.

(c) Birds

(i) Raptors and Ravens: Paragraph 1: We recommend expanding the list of major impacts to include loss of hunting habitat, a corollary impact to the loss of nesting habitat identified here. A mitigation need we have repeatedly recommended is realignment of roads and transmission corridors away from riparian corridors and other wetlands valuable in migration as well as breeding (e.g. letter from FWS to Eric Yould, 5 January 1982).

Furthermore, we recommend that the monitoring program include continuing surveys for peregrine falcons (see Section 4.2(c)(i)) as well as other raptors (see Sections 4.3(b)(xiv) . Habitat Loss), to confirm their absence in construction activities areas.

We are concerned with the emphasis on creating artificial nests. That emphasis is based on the assumption that nest sites are the limiting factor to raptor use of the project area. This has not, to date, been adequately supported by ongoing studies. For example, overall loss of feeding habitat may negate potential benefits from such structures.

- Creating Artificial Cliff-Nesting Locations: We concur with the recommendations to continually monitor for nest destruction and to provide additional mitigation later, if found necessary.

- Creating Artificial Tree-Nesting Locations: Paragraph 1: Please provide or correct the complete reference for creating successful bald eagle nests; it was apparently omitted from the bibliography. We question the suitability of presently unused habitats cited here as potential nest sites. Since eagles are not using these areas, food or some other habitat parameter may be limiting.

Paragraph 2: We suggest expanding the discussion to describe the comparability of habitats, circumstances, and species of birds using artificial nesting platforms as listed in Table W81. The success of those efforts may not be directly applicable to the project area, given the

different habitats and species involved. Please include information on whether such structures have ever been successful in Alaska.

- Seasonal Restrictions: We strongly support the measures included here with the addition of three points. First, we recommend coordinating with project design engineers to ensure that such timing and siting restrictions are fully incorporated into project designs, schedules, and cost estimates. Secondly, our previous comments on the need for follow-up monitoring of raptor nesting in response to construction activities are critical here. Finally, for bald eagles, we recommend there be no blasting within 0.5 miles of nests.

(ii) Waterbirds: Paragraph 1: We recommend revising this paragraph to describe factors which may limit benefits outlined here (see our comments under Section 4.3(a)(xv)). An additional concern we believe should be described here is the potential for collisions of swans with transmission lines.

Paragraph 2: We recommend that the monitoring program described previously should be coordinated with ongoing FWS surveys for trumpeter swans and other waterfowl, with particular attention to the impacts of project disturbances on trumpeter swans. We again note the importance of carefully siting all project facilities, roads, and transmission lines away from wetlands (as being remapped), including stream corridors and lakes. Since trumpeter swans and other waterbirds frequently migrate along stream corridors, siting and marking of transmission lines is particularly critical to avoid collisions and electrocutions in those areas.

(iii) Other Birds: We again note the ecological importance of these species. We recommend that nest and roost boxes be considered as mitigation for passerines. Hairy woodpecker, boreal chickadee, and brown creeper would all adapt readily to such structures. These three species populations would be reduced by 10.1, 7.4, and 19.9 percent, respectively. The hairy woodpecker is on the National Audubon Society's "Blue List" and is thought to be declining in the Pacific Northwest. We also recommend that all unavoidable adverse impacts from the project be fully acknowledged.

(d) Small (non-game) Mammals: We refer you to our comments, above, re fully acknowledging unavoidable adverse project impacts.

Comments on Tables and Figures for Section 4 - Wildlife

Overall, many of the tables and figures are incompletely footnoted and referenced. Few will stand on their own and many are confusing or inconsistent even when referring to the text. We recommend cleaning up the tables and figures to alleviate these problems in general, as described in our comments on the text of the report itself, and as specified below. Rather than commenting on all editing or corrections needed, we have focused on major problems or points important in understanding our comments on other portions of the document.

Table W21, W22 and W23: Please include the number of sites, sampled in each community.

Table W64: We recommend footnoting a brief definition of "importance value ratings." Please provide dates for the summer 1981 survey.

Tables W65, W66, W68 and W78a: Please clarify how habitat types as classified here do or do not coordinate with the revised vegetation classification scheme. We are concerned that data manipulations not obvious from the original references be fully described here (see Section 4.2(c): Paragraph 3).

Figure W11: We suggest adding reservoir elevation levels.

Figures W19 and W20: We recommend including some description of how "relative importance" was determined and "Importance Indices" were calculated. Sources for this data should be cited here.

Appendices EA to EE

General Comments

Overall, we concur with the environmental guidelines to the extent that they are presented here. However, we are concerned that the guidelines are somewhat incomplete and lack specifics needed for effective implementation. Please specify the degree to which these guidelines are being incorporated into project planning. We recommend that you explain any situations where the guidelines will not be followed. In order to most effectively implement these guidelines, and thus, to achieve greater mitigation of project impacts to fish and wildlife, we recommend a team approach between project environmental specialists and design engineers throughout design, siting, and construction. The interagency monitoring group recommended previously should be part of this effort (see our comments on Section 4.4: Paragraph 5). Problems with lack of integration between project studies and different chapters in the Exhibit E would then be more easily overcome. Following are our Specific Comments on individual items in the environmental guidelines.

Specific Comments

A - All Facilities

1. The referenced buffer to waterways or wetlands should be a 500-foot minimum width, not maximum width as presented here.

7. Please define project "facility" as used here. We suggest the definition include project camps, access roads both to and within the project site, and any construction areas (including the dams, borrow areas, disposal sites, etc.).

   Trumpeter swan nests and caribou calving areas should be added to the list of areas to which the guideline is to apply.

8. Blasting determinations should be made in consultation with the resource agencies. Such determinations could be incorporated into the previously recommended monitoring program (see our comments on Section 4.4: Paragraph 5).

9. Please discuss the feasibility of disposing of part, or all, of project spoils within the impoundment area in accord with project scheduling. An estimate should be provided of the quantities which may be involved, or when those quantities will be determined. Stockpiling needs, and reclamation considerations should also be provided. We suggest this item be expanded into an additional appendix section similar to Appendix AD - Material Sites.

11. Please refer to our previous comments on the need to map permafrost areas (Section 3.2 and 3.3(a)(ii) - Effects of Erosion and Deposition).

13. We recommend specifying that fertilization and seeding be initiated in the growing season immediately following site disturbance. The interagency monitoring program referred to in item 8, above, should review and concur with species chosen for revegetation.

14. Please refer to our comments under item 13, above.

15. We concur; again please refer to our comments on item 13. Initiating test plots as part of continuing project studies would provide information on which successful site restoration can be based. Plantings to provide wildlife food and/or cover should also be considered in developing restoration plans.

16. We strongly endorse both programs outlined here. Reference should be made to U.S. Coast Guard (C.F.R. 33, Part 154(b)) and Environmental Protection Agency (C.F.R. 40, Part 112) regulations which require use of a Petroleum and Hazardous Substance Plan and Manual with such developments. It should be mandatory for all project personnel to take part in the Environmental Safety Program prior to starting work on the project.

17. We suggest that storage containers for fuels and hazardous substances also be located at least 1,500 feet from wetlands. All personnel involved in transfer and handling operations for such materials should carry portable spill containment/absorption materials. Impervious material used to line containment areas should be securely tacked in place and frequently monitored for tears; such tears should be promptly repaired and water which may collect in the areas should be promptly removed.

18. Please specify the degree to which this recommendation is being followed as described under our General Comments for these appendices.

19. We recommend addition of an item outlining the need for the contractor to train personnel, prepare, and follow an erosion control plan which is subject to resource agency review and comment (see our comments on Section 3.4(d)(ii)). That plan should then be incorporated into these guidelines.

B - Construction Camps

1. and 2. We concur and recommend that there be no trucking of garbage between camps; each camp should have its own incinerator capable of burning that day's wastes.

3. We concur; please refer to our comments under Section 4.4(a)(iv) on the need to clearly sign and monitor all gates to ensure they remain closed. We recommend the interagency monitoring group review and concur with the fencing specifications.

4. We suggest that the recommended effluent sampling and testing program be outlined in construction camp design plans.

5. Again, resource agency review and concurrence should be involved.

C - Access Roads

3. We concur and recommend that the proposed program for identifying wetlands in consultation with the CE and FWS be used in access route siting (see Section 3.2(a)(vi)).

5. Instream work should be scheduled to avoid critical spawning times and minimize sedimentation of downstream habitats.

6. through 10. Criteria should be included for determining when a culvert rather than a bridge can be used for stream crossings. Resource agencies should be consulted in the development of such criteria.

13. We suggest adding, "as well as after significant storm events" at the end of this item This issue needs further definition.

D - Material Sites

1. We concur and recommend that the interagency monitoring program be integrated with the interdisciplinary team effort so that resource agencies are consulted in the development and implementation of mining plans.

2. and 3. Please identify the extent of borrow materials needed for project construction which may be available within the impoundment area, relative to the extent of borrow which will have to come from other sites. Our comments under Appendix EA - All Facilities, item 9, on stockpiling and reclamation, and under Appendix EC - Access Roads, items 6 through 10 re criteria for determining when to use the lower priority mitigation measure (e.g. culverts instead of bridges; first-level terrace sites over well-drained uplands) apply here also.

7. We suggest that construction schedules be evaluated in order to determine optimum coordination and use of material and disturbance sites.

E - Transmission Corridors

1. We recommend addition of the phrase "and maintained" after the word "constructed" in line 2 of this item. Our text comments on the need to fully integrate Intertie development with all other project transmission lines apply here (see Sections 3.4(d)(ii) and 4.4(d)(i) - Willow to Healy).

3. Transmission towers should not be placed in wetlands, as defined by ongoing remapping efforts.

4. We concur, and suggest that selective cutting be used to control vegetation along transmission corridors.

Appendix EG: Please provide the source for data cited which was not provided by the University of Alaska Museum.

Chapter 4. REPORT ON HISTORIC AND ARCHEOLOGICAL RESOURCES: No comments.

Chapter 5. SOCIOECONOMIC IMPACTS

General Comments

We see this socioeconomic impact evaluation as an integral component of the overall evaluation of alternative means of satisfying energy needs in the least environmentally damaging way. Accordingly, we offer the following comments for consideration in the evaluation of this alternatives.

Evaluation of a proposal must examine impacts, positive and negative, and mitigation over the life of the proposal. Data bases provide the point from which this evaluation must progress. How this project could effect fish and wildlife resources over its life is strongly dependent upon how the project influences future user demand of those resources. This evaluation should incorporate: (1) a widely accepted projection of future population and economic growth (increasing user groups) or, if there is substantial uncertainty as to the validity of key assumptions (as we believe there is), then a multiple scenario model should be pursued examining at least high, medium, and low projections; and (2) a tradeoff analysis examining the competing mitigation proposals for the different interests. Chapter 5 fails in respect to both points.

The Base Case, as expressed in this document, is a minimum project impacts scenario. We are led to this conclusion by the following:

1. The recent downturn in State oil revenues directly leads to a downturn in State spending. Increased State expenditures result in economic expansion which then attracts and supports the new population (Department of Policy Development and Planning (DPDP) Policy Analysis Paper No. 82-10). The expected lower level of State spending should be reflected in decreased economic expansion and population. One could deduce from this that the without project economic and population Base Case should be substantially lowered from what is presented in this document. Since this turn of events obviously does not impact the cost of the project, the project socioeconomic impacts would be accentuated.

2. With less oil revenue the State would need to concentrate a greater percentage of its income and/or bonding capability on this project. The State would then not be able to afford projects in other areas of the State. We, therefore, believe a closer look at State-wide impacts is necessary.

3. The power which this project would provide could act as an attractant to various industries, to the detriment of other areas of the State.

4. Potential impacts due to the seasonality of the workforce is not fully addressed in this document. Other hydropower projects in Alaska, such as Terror Lake, and those constructed in other remotely situated areas should be examined to explore this potential impact.

5. Impacts result from the number of people attracted by potential jobs not by the number of jobs created, either directly or indirectly. This is supported by the letter to Eric Yould dated 27 March 1982 from the Alaska Department of Community and Regional Affairs (ADCRA).

6. The implications of item 5 above regarding local and regional hiring assumptions and impacts to local communities.

We have not previously had input into many of the decisions which were reached regarding the construction camp/village such as siting, type of camp, and administration. These decisions have large implications for the fish and wildlife resources and users. Consideration of a Prudhoe Bay type camp should be given. We are not aware of any construction camp alternatives having been discussed in terms of minimizing adverse impacts to fish and wildlife resources, and their use.

As illustrated by many of our comments, we are concerned that not only were the resource agencies not consulted previously on many of the actions described herein but that communication and coordination between the socioeconomic component and the fish and wildlife resources components has been insufficient.

It is stated several times in this chapter that monitoring of impacts is proposed and that this program would add flexability to the mitigation program. We concur. However, we believe this monitoring team should better reflect the spirit of the APA Mitigation Policy document. We believe a monitoring program should be established, at project expense, consisting of representatives of appropriate local, State, and Federal agencies, to carry out the function of assessing the extent of actual impacts and recommending modifications to the mitigation program. Modification of the mitigation plan, as represented in the license, would then be through license amendment.

Modification of the Base Case to accomodate the concerns raised in the ADCRA letter of 27 May 1982 and in our comments would dramatically change the impacts predicted and ultimately the mitigation requirement. Additionally, an assessment of socioeconomic impacts must be reactive to other study components. For example, to evaluate impacts to users of fish and wildlife resources, the impacts to the resources must first be assessed. In that many of these resource impacts have not been sufficiently quantified, one could not expect an acceptably quantified socioeconomic analysis. This could only have lead to a highly general mitigation plan, which is what we find here. In fact, reference is made to certain actions which (Section 4.2(a), page E-5-91), ". . . will be considered in the mitigation plan". A mitigation plan should be a part of this document, and be specific to the anticipated impacts based upon a broadly accepted data base. The burden of formulating an acceptable mitigation plan is the applicants.

Specific Comments

2 - BASELINE DESCRIPTION

2.1 - Identification of Socioeconomic Impact Areas

(c) State: We concur that identifiable impacts would be concentrated at the local level, and most difficult to evaluate on a state-wide basis. It should be recognized that how this project is approached economically has tremendous implications for the State. If the State provides a grant of billions of dollars, that money can't be spent on other programs. Bonding of the project would have a large impact on the State's ability to bond other projects. Additionally, the relationship between large projects and population growth should be given greater emphasis. Increased State expenditure results in economic expansion that attracts and supports the new population (DPDP Policy Analysis Paper No. 82-10). The State would be impacted through services provided to this project caused higher population level.

2.2 - Description of Employment, Population, Personal Income and Other Trends in the Impact Areas

(a) Local

(ii) Population: Paragraph 3: Acceptance of the projected Mat-Su Borough population figures would be on the basis of a review and acceptance of the underlying assumptions. Without these we are left with what appears to be relatively high projections which apparently come from a single source, the Mat-Su Borough, which could be viewed as having a vested interested in the project, and a high probability that the projections rest upon by the original, outdated project economic analysis. The impacts analysis and mitigation planning is strongly tied to population projections with and without the project. We recommend that the data base be broadened and projections updated.

Paragraph 4: We recently received a Scoping Document (dated 29 November 1982) for the Knik Arm Crossing from the Alaska Department of Transportation and Public Facilities (ADOT/PF). In that ADOT/PF is just beginning to evaluate the desirability of this project it would be premature for APA to view it as a foregone conclusion.

Paragraph 5: Please discuss the assumptions upon which these population projections are based.

(b) Regional

(ii) Population: Paragraph 2: We accept the underlying assumption that, in Alaska, population growth is strongly associated with natural resource development projects. Please identify the development projects that have been assumed to be going forth. The recent downturn in State income, due to weakening of oil prices, should be factored into this analysis.

3 - EVALUATION OF THE IMPACT OF PROJECT

3.1 - Impact of In-migration of People on Governmental Facilities and Services: Paragraph 2: The underlying assumptions which lead to the conclusion that this project would have minimal impacts to the Mat-Su Borough should be discussed in greater detail. Peak project employment would be 3,498 (page E-5-37) and 95 percent of these workers would have dependents, with an average of 2.11 dependents (page E-5-44). This would lead one to believe direct project worker impacts would be more than 10,000 people. If all these

people were housed at the construction site we would have a city approximately three times the size of Palmer, with all the encumbent needs of this size community. This figure would be substantially inflated by secondary and induced jobs resulting from the project. Spreading these numbers out over the small, local communities would be expected to result in significant adverse impacts. In the 27 May 1982 letter from the ADCRA to Eric Yould it was noted that, ". . . given the current state of the economy, it seems reasonable to expect a sizeable influx of people from the Lower 48 seeking highly-paid employment, therefore competing directly with the local labor force. This was the State's experience during the Trans-Alaska Pipeline project (TAPS) and, in fact, just recently for the as-yet to be started Alaska Natural Gas Transportation System. Yet this proven phenomenon apparently was not considered in the analysis. This influx of people seeking instant riches in Alaska during major construction projects has historically contributed to impacts far in excess of what otherwise mights normally be expected."

In reference to, ". . . the buffering effect of the expected continued increase of the population," please refer to our Chapter 5 General Comments.

(a) Watana - Construction Phase

(i) Local

- Mat-Su Borough: As stated in our Chapter 5 General Comments we find it difficult to accept that, "In most areas of the Mat-Su Borough, the population influx related to the project will only add slightly to the substantial increases in need for public facilities and services that will be resulting from the population growth projected under the Base Case." It is stated in the previously referenced 27 May 1982 letter from ADCRA, "The State's experience has been that the impacts from large construction projects (most notably TAPS) are far in excess of what were originally anticipated. Those impacts were due to a substantially greater immigration [SIC] of people than those anticipated based solely upon the size of the required construction and support work force. This was due in part to a large number of people who migrated to Alaska with no intention whatsoever of seeking employment, at least on the construction project. Another unforeseen impact was in the secondary job market. Immigrants [SIC] competed for, and filled, secondary and induced jobs, many of which were vacated by local residents obtaining employment on the high-paying construction project. This situation only exacerbated the local unemployment situation.

"Certain public services were severely taxed as a result of the larger than expected influx of people. The public safety and public health were jeopardized by increased 'people problems'; too few public safety officials and inadequate or non-existent facilities delayed the State's ability to adequately respond. Lack of adequate housing led to overcrowded living conditions and sanitation problems. Increased vehicular traffic devastated the roads and at times created safety problems as well. Utilities, such as power and telephone, were overtaxed. Heightened demand for housing produced rent gouging, displaced families, hastily and poorly constructed housing, and use of substandard or even non-residential units as places of residence.

"It seems, therefore, that the potential exists for the types of impacts described above to occur as a result of the Susitna project, and to occur in

large part in the Matanuska-Susitna Borough. Simply put, we believe that past experience has shown that more people will show up than originally anticipated, bringing with them all the problems attendant to a 'boom-town' situation. We do not feel that this was adequately addressed in the draft feasibility report, nor that the State's prior experience with TAPS was taken into account."

We would expect that a high percentage of those attracted to the area would become fish and wildlife resource users. This would lead to increased demand for these resources at the same time and in the vicinity of more direct project related impacts to these resources. Additionally, because the project work force would be highly seasonal, (page E-5-37) the impact of these employees on the fish and wildlife resources would be greater than other area residents.

. Public Recreation Facilities: Paragraph 1: Please clarify whether the assumption that full public access would be provided by the project through the upper Susitna Basin has been made. We understood this was not the case (see page E-5-24, Transportation).

Use projections and anticipated fish and wildlife resource impacts should be examined.

. Transportation: Paragraph 1: We concur that, "The ultimate status of the road is unsettled at this time." The road is a proposed project feature and as such the ultimate resolution or mechanisms for resolution of this issue needs to be provided in the FERC license, if in fact we do still have road access at that time as a project feature. We have not concurred that road access is either necessary or desirable.

Paragraph 3: Reference is made to, "scheduling of commuting workers". Yet, on page E-5-91 it is stated that, ". . . there will be no daily commuting . . . and workers will not have the opportunity to drive personal vehicles to the camp/village . . . ." These conflicts need to be resolved.

- Cantwell

. Transportation: Paragraph 2: Reference is again made to commuting workers. Please refer to our comments immediately above (Section 3.1(a)(i) - Mat-Su Borough. Transportation: Paragraph 3).

(ii) Regional: Please refer to our Chapter 5 General Comments and to our comments regarding Sections 3.1 and 3.1(a)(i). - Mat-Su Borough.

(b) Watana - Operation Phase and Devil Canyon - Construction Phase

(i) Local

- Mat-Su Borough: Please refer to our comments immediately above (Section 3.1(a)(ii)).

3.2 - On-site Manpower Requirements and Payroll, by Year

(b) Seasonality of Manpower Requirements: Please refer to our comments regarding Section 3.1(a)(i) - Mat-Su Borough. The seasonality of the project work force could, if they remain in the State, result in significantly higher use levels of fish and wildlife resources, and recreational resources than that found for residents employed year-round. We recommend that this should be examined. The TAPS project and in-state hydropower projects, such as Terror Lake, should provide valuable information.

3.3 - Residency and Movement of Project Construction Personnel: Paragraph 3: The proposed administration of the construction camp/village appears to simplify problems by minimizing constraints on the work force. Given the APA Mitigation Policy, which is consistent with NEPA and our Mitigation Policy, to first avoid adverse impacts to fish and wildlife resources we find it difficult to accept the construction site camp/village plan or administration of it. In many ways it tends to maximize adverse impacts to fish and wildlife resources, in direct conflict with APA's stated mitigation goals. It appears that plans other than that proposed have not been evaluated as none appear in Chapter 10. We recommend that a Prudhoe Bay type camp be examined as an alternative which could minimize project-related impacts to fish and wildlife resources and socioeconomic impacts to the local communities. Our position concerning rail vs road access to the construction camp/village has been previously stated (FWS letter to Eric Yould dated 17 August 1982).

(a) Region

(i) Regional Work Force: Paragraph 4: The assumptions stated for the on-site construction work force were questioned in the previously referenced 27 May 1982 letter from ADCRA, "Although there are currently enough unemployed in Southcentral Alaska to more than fulfill the project's labor demands, in terms of numbers, that does not necessarily mean that the appropriately skilled people are locally available. Also, given the current state of the economy, it seems reasonable to expect a sizeable influx of people from the Lower 48 seeking highly-paid employment, therefore competing directly with the local labor force." In addition on page E-5-94, it is stated, "There are at least a couple of reasons to believe that local labor might have a difficult time obtaining construction jobs." This would appear to support the contention that hiring assumptions are overstated, and thus the impacts of project-induced population increases are understated.

(iv) Relocating Workers and Associated Population Influx: Concerning secondary and induced population please refer to our comments under Section 3.1 and 3.1(a)(i) - Mat-Su Borough.

3.4 Adequacy of Available Housing in Impact Areas

(a) Watana - Construction Phase

(i) Local

- Matanuska-Susitna Borough: Paragraph 1: It is stated that, "The majority of construction workers on the project are expected to use the on-site housing facilities. These workers will not be in-migrating into established communities and therefore will have no impact on the housing market in the

Mat-Su Borough." Could we not conclude from the above that a minority of some unknown number of workers would not be housed on-site? This would lead one to expect workers commuting, and impacts to the housing market. Please quantify these potential impacts. Concerning commuting workers please refer to our comments on Section 3.1(a)(i) - Transportation: Paragraph 3. In addition, in the previously referenced 27 May 1982 letter from ADCRA, the following statement is provided:

> "The key supposition in support of the minimal impacts described is that the majority of the labor force and their families will live on-site and largely remain on-site throughout the duration of the project. This presumes affirmative actions are taken to preclude or limit mobility, particularly by private automobile, and to provide sufficient incentives for workers to locate their families on-site rather than in the more attractive and urban settings of Anchorage, Palmer, or Wasilla. If those conditions do not occur, workers and their families in some undetermined numbers will reside elsewhere, and the workers will commute. If that occurs, impacts on the Borough will increase dramatically."

3.5 - Displacement and Influences on Residences and Businesses

(b) Businesses: Paragraph 2: It would follow that if, "Most businesses in the upper basin are dependent upon abundance of fish, big game, and furbearer species," and the project holds the potential to severely impact these species through elimination of their habitats, then most of the businesses would suffer severe adverse impacts. This paragraph illustrates a possible problem relating to coordination or communication of Exhibit E study programs.

Paragraph 3: Please refer to our comments immediately above (Section 3.5(b): Paragraph 2).

Paragraph 4: Please refer to our comments above (Section 3.5(b): Paragraph 2). We cannot dismiss impacts to fish and wildlife resource users as insignificant. The existing user levels must be established in addition to fish and wildlife resource levels with and without the project. Proposals designed to mitigate for unavoidable fish and wildlife resource losses should then be examined as to potential impacts on these user groups.

3.7 - Local and Regional Impacts of Fish and Wildlife User Groups

(a) Fish

(i) Methodology: The work which was completed for 1981 did provide point estimates. The capability of the system to produce salmon is dependent upon a number of factors which are being examined as part of the Aquatic Studies Program (e.g. winter water temperature, availability of spawning gravel, flow regime, etc.). The number of fish that pass a point along the river does little to establish a river's production capability other than to establish a bottom figure for it.

A comparison of point estimates of 1981 vs 1982 demonstrates the great variability that exists in this system. Both years are "representative".

(ii) The Commercial Fishery

- Specific Impacts: Paragraph 1: We concur.

Paragraph 2: Given the qualifications stated in the first Paragraph, this discussion fails to recognize the potential of the project to impact fisheries downstream of Talkeetna, the potential of the river above Devil Canyon to support salmon (future opportunities lost), the importance of commercial fishing as a way of life, the importance of commercial fishing in terms of secondary and induced job creation, value of the fishery lost over the life of the project (based upon the same economic assumptions as the rest of the project), the cost of various mitigation proposals over the life of the project, etc. We recommend that a more detailed discussion be provided in the Exhibit E taking into account at least the factors listed above.

(iii) The Sport Fishery: Paragraph 4: We concur that the type of research described is necessary. Additional information on the scope and schedule for completing this work should be provided here. We would appreciate future coordination on this research as we had not been contacted previously.

(iv) Subsistence Fishing: The impact of the project on this issue has not been evaluated and remains a large data and analysis gap. The importance of the Susitna system to subsistence, potential losses, and how mitigation proposals affect subsistence use should be addressed in the Exhibit E. The data provided is not applicable to the project. Enactment of a State subsistence law in 1978, subsequent litigation, and changes to that law in 1982 invalidate direct comparisons of permit numbers for different years. Additionally, we do not consider the price of salmon at the supermarket an adequate reflection of the importance of the resource to this life style. Cultural, social, and recreational values should also be considered in this analysis.

(b) Game: The primary deficiencies of the Socioeconomics Chapter are prevalent here: (1) inconsistency with Chapter 3, Fish, Wildlife, and Botanical Resources; (2) lack of coordination such that mitigation recommendations from Chapter 3 are not evaluated in Chapter 5 and vice versa; in several instances assumptions in Chapter 5 directly conflict with recommended mitigation measures; and (3) data gaps and incomplete analyses which prevent full evaluation of socioeconomic issues (e.g. pages E-5-75, paragraphs 2 and 5; E-5-76, paragraph 1; E-5-81, paragraphs 1 and 4; and E-5-82 to 83 discussion under Section 3.7(c)(i) - Data Limitations).

(i) Commercial

- Guides and Guide Services: Paragraph 7: Please refer to our comments on Section 3.5(b). In that "worst case" potential loses were examined in Section 3.7(a)(ii) we recommend that a similar examination be provided here, particularly since moose estimates have previously been furnished by the ongoing Big Game Study Program.

Discussion should be included on the possible decrease in the area's attractiveness for remote, wilderness hunting given the increase in access and human activities with project development. By definition, guided hunting involves a more remote type experience. Loss of this remoteness and potential

impacts to the guiding industry should be considered here. Ongoing data collection/analysis regarding this issue needed to be fully described.

(ii) Recreational

- Resources: We recommend expanding the discussion to consider relative demands and values for commercial, recreational, and subsistence hunting for each species in comparison to other species.

Including a section on "Management" would clarify the remaining discussion on recreational hunting. The section should briefly describe ADF&G management responsibilities and the Game Board; and include a map of Game Management Units in relation to major project features and access routes.

. Caribou: Including the map recommended under Section 3.7(b)(ii) - Resources above, would clarify the discussion.

Resource Status: The present permit system is designed to under harvest the herd so that it can continue to grow. This section should reflect the present and future management plans for this important resource, see similar comments under Chapter 3, Section 4.2(a)(ii) Population Characteristics.

The Experience Sought by Hunters: Please clarify by identifying the other area or resource to which hunting of the Nelchina herd by nearby Anchorage, Fairbanks, etc. residents is being compared.

Transportation to and from Hunting Grounds: Project impacts on hunter access, and indirectly, to the caribou herd should be discussed. We suggest coordinating the discussion with that in Chapter 3, page E-3-356, paragraph 3 and page E-3-371, paragraph 1, and our comments on those sections.

Hunting Pressure: Management changes invalidate direct comparisons between the number of hunters in 1980 and 1970. Increases of human populations should also be described. If it were not for the permitting system the hunting pressure would be much higher. Although the number of permit applicants provides a clearer picture of the importance of the herd we consider this figure to also underestimate the importance of the herd. Since the chance that an applicant would obtain a permit is low, many people are discouraged from applying. If warranted, a survey could provide an estimate of the number of people who would hunt the Nelchina herd if the permit system were removed.

To adequately evaluate potential project impacts to the herd one would need to examine ADF&G present and future managment plans, projected demand forecasts, most likely behavioral responses to the reservoirs, access routing and control, alternative reservoir filling and operation schemes, construction and public use of the access mode and routing alternatives, the tradeoffs involved in conflicting mitigative proposals, impacts of mitigative proposals on user groups, etc. We recommend that the impacts evaluation examine the aforementioned factors.

Supply and Demand for Hunting Opportunity: Again, the situation is not fully discussed. Data should be provided comparing rates of increase for both permit applications and human area populations.

Success Rate: The impact of hunting on caribou populations should be described here (e.g. see Chapter 3, pages E-3-220 to 222). Increases in herd numbers may have also contributed to the increased success rate. A map of take relative to existing and proposed project access points may aid in evaluating project impacts. An analysis of those impacts on existing supply and demand for caribou should be provided.

. Moose: Since the subject of this chapter is socioeconomics, we recommend expanding the discussion to include information on moose being the most economically important wildlife species in the region, per Chapter 3 (see page E-3-197).

Resource Status: The paragraph is inconsistent with Chapter 3 which includes 1981 data and an estimate of 4,500 moose in the upper basin. Recent and long-term ADF&G management plans for moose, as well as a map of applicable Game Management Units would help relate impacts described here to potential mitigation measures.

Transportation To and From Hunting Grounds: The discussion describes the type of data available yet fails to provide any quantification. Figures delineating present and project-related access points should be included and correlated to current hunting intensities.

Hunting Pressure: Please explain the hunting permit and/or habitat changes responsible for the significant decrease in hunters and harvest while area human populations have substantially increased. Reference to 2,859 hunters in 1981 is the same number of hunters as for 1980 in Table E-5-42. Please correct if this is not the case.

Success Rate: Refer to comment above, local human populations, permit regulations, and area moose populations are critical factors in the success rate which should be discussed.

. Other Species: We concur that a large data gap exists. The schedule for acquiring these data and incorporating them into project planning should be discussed. Once socioeconomic mitigation proposals are established, they must be examined in regard to impacts on fish and wildlife resource user groups. A tradeoff analysis would then be needed to examine conflicting mitigative proposals. Because coordination among project studies has been lacking, each study described impacts relative to optimal project management for the subject of that study, e.g. recreation, fish, moose, subsistence, power, etc. We recommend alternative management scenarios be evaluated within each study before the necessary tradeoff analysis is completed.

. Importance of Regulations: Paragraph 1: Access routes, restrictions on access, and construction schedules will also greatly influence opportunities to hunt in the project area. Quantification should be provided for possible impacts under at least two scenarios - severely restricted access and permits and open access without permits. Such analysis should be fully coordinated with ongoing big game studies and also discussed in Chapter 3. Given the substantial agency recommendations to omit any project access from the Denali Highway, and the importance of that recommendation as a wildlife mitigation measure, we recommend your analyzing the impacts on hunter access both with and without that road corridor. Additional discussion should also be provided

on impacts both with and without restrictions on worker access and hunting. Again, regulation of such use is a significant mitigation measure. Quantification of possible use levels is necessary for full quantification of project impacts on moose populations in Chapter 3.

Paragraph 2: Consideration should be given to the greater losses expected for black bear than for brown bear habitat in view of the harvest regulations described here.

. Impacts on the Hunter: Factors contributing to a high quality hunt should be defined here. Availability and accessability of animals are key factors which will be affected by the project. Again, the schedule for quantifying recreational project impacts should be described. The present inability to quantify economic effects of the project is recognized as a major problem and should be resolved in the license application. The economics analysis should occur after quantification of wildlife impacts and formulation of mitigation proposals. Please refer to our comments under Sections 3.7(b)(i) and 3.7(b)(ii).

(iii) Subsistence Hunting: This section should be rewritten to more accurately reflect current laws and regulations. For example, non-residents cannot qualify as subsistence users. A complete, rather than partial, listing of all qualifications for subsistence use should be included here. The first sentence of the second paragraph pertains to a one-time only regulation which is no longer in effect. The last sentence of this paragraph is an editorial comment which should be deleted. Mention of the controversial nature of subsistence use would be appropriate. The referenced future data compilation and analysis should be provided in the Exhibit E. At a minimum, scope and scheduling of this work should be fully discussed. The concerns expressed under Section 3.7(a)(iv) Subsistence Fishing would apply to this section in regard to hunting. Please refer to Section 810 of the Alaska National Interest Lands Conservation Act (Public Law 96-487, 2 December 1980) for guidance.

(c) Furbearers

(i) Commercial Users: During the August 1982 AEA Workshop on the Susitna project, trapping was considered the primary mortality factor affecting beaver in the project area. Access, in addition to species abundance and pelt prices, is also a key determinant of trapping intensity.

- Data Limitations: Given that there are problems with available trapping data, the records which are available should be described here as a general indication of area trapping activities. We are concerned about the apparent lack of coordination with project furbearer studies which do provide some population and trapping data (see Chapter 3, pages E-3-250 to 251; E-3-253 to 256; E-3-315 to 317; E-3-321 to 322; E-3-344 to 346; E-3-361 to 362; and E-3-368.)

- Trapping Activity: Paragraph 1: Any examination of project impacts needs to examine future opportunities lost. Again, please provide whatever quantification of trapper numbers and harvest values is available. Consideration should be given to the number of additional trappers the area

could support under alternative project access location and regulation alternatives.

Paragraph 3: Based on the suggested 25 mile trap line length, it is doubtful whether the project area, with projected access routes, could support more than an additional dozen trappers. There is some indication that the area may be near trapping saturation now (Furbearer Study Coordinator Phil Gipson, personal communication).

- Aquatic Species

. Baseline: Paragraph 2: To compliment and parallel the beaver discussion, information should be included on muskrat populations and habitat utilization; please refer to our comments under Section 3.7(c)(i) - Data Limitations, above.

Paragraph 3: Subsistence value of furbearer species should be identified.

Paragraph 4: References such as "abundant" and "common" should be deleted. Quantification should be available from the 1981 and 1982 field seasons for those species. Please incorporate these data into the discussion and analysis.

. Impacts of the Project: The conclusion that the access road and transmission lines would provide increased harvest opportunities through increased access appears to be in conflict with conclusions and statements offered in other chapters and sections (e.g. Chapter 3, pages E-3-317 to 323; E-3-345 to 346; E-3-360 to 363; E-3-368; and in particular, E-3-377). The statement offered in this section would lead one to conclude that open access is expected to be provided by the preferred access road and through a maintenance road for the transmission line from Watana damsite. It has been our understanding that the former has not been established and the latter was not to occur. Please refer to our comments on Sections 3.1(a)(i) - Public Recreation. Facilities: Paragraph 1 and 3.1(a)(i) - Transportation: Paragraph 1. The lost future opportunities and the potential impact that could occur to trappers due to the expected ice-free winter condition of the Susitna River above Talkeetna should be fully described in this section. The potential for furbearer populations to be trapped out, if open access is provided, should also be considered here.

- Pine Marten

. Impacts: Paragraph 1: Please refer to comments under Section 3.7(c)(i) - Aquatic Species: Impacts of the Project, above. The last two sentences are contradictory; there is some inconsistency with the last line of the second paragraph which otherwise appears to be an accidental repetition of Paragraph 1 under this section.

- Lynx: Paragraph 2: Again, quantification should be given to this trapping pressure and success rate relative to other area furbearers.

- Fox: Please refer to our comment under Section 3.7(c)(i) - Lynx, above. Consideration should also be given to project impacts on fox, as they may relate to the fox trapper (also see our comments under Chapter 3, Section 4.3(a)(xii)).

- Secondary Industries: In order to fully assess project impacts on secondary industries, the "relatively small percentage of Alaskan trappers who operate in the impact area" should be quantified here.

(ii) Recreational: Inadequacy of data base is identified. Information on this user group should be accumulated, impacts analyzed, mitigation proposed and then re-evaluated to assess effectiveness and impacts in the Exhibit E. The impact due to the loss of access across the upper Susitna River resulting from the probable loss of winter ice cover requires examination in this section.

We suggest addition of a paragraph (iii) Subsistence to complete this section. Information under paragraph 3, page E-5-84 would apply, see comment under that section (Section 3.7(c)(i) - Pine Marten o Impacts).

4 - MITIGATION: Paragraph 1: The definition should reflect that established in the APA Mitigation Policy document and the NEPA definition.

Paragraph 4: Without proper coordination between Susitna study components, actions designed to minimize one component's adverse impacts can unwittingly adversely effect the ability of another component to mitigate. The major mitigation proposals offered here are often in conflict with the mitigation goals of the fish and wildlife resources components. Greater communication, coordination must result in an open process to examine the tradeoffs when mitigation proposals are offered which may pose impacts to other components. Please refer to our comments concerning Section 3.7(c)(i) Aquatic Species which appears to indicate a lack of component coordination.

Paragraph 5: Appropriate local, State and Federal agencies need to have input to this process. Continued monitoring of changing mitigation needs in regard to compatability with mitigation goals of other components is very important.

4.2 - Mitigation Alternatives: How the goal of mitigation as expressed in this section conforms to the goals of mitigation in the APA Mitigation Policy document and the NEPA definition of mitigation should be explained.

(a) Tools that Influence the Magnitude and Geographic Distribution of Project-Induced Changes

Paragraph 3: Scheduling constraints need to be reassessed in light of the latest power needs forecasts. We recommend that the extent to which impacts could be mitigated in each study component be examined through a tradeoff analysis of the timing constraints which have been imposed.

Paragraph 4: Impacts to fish and wildlife resources, and thus indirectly to users of these resources, are related to the type of construction camp established, access provided (route and mode), and the administration of these facilities. We perceive little coordination designed to minimize impacts to fish and wildlife resources as a part of the socioeconomic analysis.

Paragraph 5: It appears as if management of the construction site is to be passive. That is, workers can come and go without restrictions. This appears to be in conflict with the statement on page E-5-91, "For this project, there will be no daily commuting." Also, the assumption that workers will maintain

their existing residences would follow only if the assumption that the workers would come almost entirely from the local and regional areas households. This was strongly questioned in the previously referenced letter dated 27 May 1982 from ADCRA, and on page E-5-94, "There are at least a couple of reasons to believe that local labor might have a difficult time obtaining construction jobs."

Paragraph 8: This paragraph suffers from internal inconsistences concerning daily commuting and use of personal vehicles. Please clarify the discussion.

Paragraph 9: This section is supposed to be the mitigation plan.

Paragraph 12: The referenced studies should be coordinated with fish and wildlife resources analyses and mitigation planning. Please refer to Section 4: Paragraphs 4 and 5 for additional comments.

(b) Tools that Help Communities and Other Bodies Cope with Disruptions and Budget Deficits

Paragraph 2: In accordance with the APA Mitigation Policy document, a monitoring panel would need to be established, at project expense, consisting of representatives of appropriate local, State, and Federal agencies to carry out the function of assessing the extent of actual impacts and recommending modifications to the mitigation program. Modification of the mitigation plan in the license would be through license amendment.

Paragraph 10: Please refer to the comments immediately above (Section 4.2(b): Paragraph 2).

Paragraphs 13 and 14: The question of whether or not the labor needs of the project could be fulfilled largely through local hire (page E-5-44) or not obviously is going to substantially effect socioeconomic impacts. In that uncertainty exists, as expressed in these paragraphs and in the 27 May 1982 ADCRA letter to APA, we recommend a re-evaluation be carryed out as indicated in Section 4.3 (on page E-5-95) and incorporated into the Exhibit E.

4.3 - Impact Management Program: Paragraph 4: Item 1: In many respects the Base Case, as discussed in this document, is a minimum project impacts scenario; this opinion is clearly expressed in our Chapter 5 . General Comments. We believe that substantial uncertainty exists in key assumptions and that a multiple scenario model is in order. The study should be updated to reflect current state economic and population forecasts.

Item 2: Please refer to our comments on Section 4.2(b): Paragraph 2.

Item 3: Please refer to our comments on Section 4.2(b): Paragraph 2.

Item 4: Please refer to our comments on Section 4.2(b): Paragraph 2.

Paragraph 5: Please refer to our comments on Section 4.2(b): Paragraph 2.

Table E-5-42: We recommend the addition of population estimates and any changes in permit regulations from 1970 to 1981. The number of hunters in 1980 is attributed to 1981 on page E-5-79.

Chapter 6. GEOLOGICAL AND SOIL RESOURCES: No comments.

Chapter 7. RECREATIONAL RESOURCES

General Comments

Primary objectives of the Recreation Plan should be: a) to identify and mitigate the project related adverse impacts to the existing uses of fish and wildlife and other resources and, b) to maximize additional recreational opportunities that are not in conflict with existing uses and the resources they are based upon. This should be accomplished in the context of projected demand during the construction and operation phases of the project.

In general we find this chapter suffers from a lack of necessary information which would achieve these objectives. In particular, the chapter fails to outline alternative recreation options; evaluate the recommended plan and alternatives over the entire economic project life; distinguish between specific recreation users; recognize and identify specific responsibilities with regard to implementation and operation of the plan; and lacks specificity necessary to influence project development for the betterment of recreational opportunities.

To allow the maximum flexibility for meeting recreational demands, it is important that an array of alternative options be evaluated. This is emphasized by the lack of definitive demand projections and potential for access during the construction periods. Furthermore, we view the tremendous influx of people during the construction period as a major consideration for a recreation plan. Specific measures must be identified which will not only satisfy demand but also act as controls on overuse. The plan must also recognize the limited recreational carrying capacity of the area and deal with the fact that all demands may not be satisfied.

Identification of specific responsibilities for implementation and operation of the Recreation Plan should be included. It does not suffice to place the responsibility on the "management agencies," without a detailed coordinated effort with the agencies prior to issuance of the license. The plan must clearly identify the applicant's responsibility, the agencies' responsibility, and clearly outline the procedures to be followed. The plan must recognize the inherent restraints placed on the agencies and include as a project cost compensations of them as appropriate for mitigation of project-induced impacts.

The plan clearly fails to recognize the differences between sport, trophy, and subsistence use of particular wildlife resources. The tendency has been to lump these users as hunters with a major objective of bagging game. We submit these are clearly distinct groups and should be so recognized. Cultural differences regarding recreational pursuits have also been totally ignored in the plan.

Lastly, the plan appears to have been written in a clearly reactive mode. There is no recognition of any recreational planning initiative that has influenced the physical layout of the project. This lack of initiative has precluded development of recreational opportunities which could have avoided some impacts while maintaining a higher aesthetic quality to the recreational experience.

Specific Comments

3 - PROJECT IMPACTS ON EXISTING RECREATION

3.1 - Watana Development

(a) Reservoir

(i) Construction: The discussion in this section needs to be expanded to address non-consumptive and subsistence recreational users as well as sport and trophy hunters. Furthermore, the section needs to address the eminent competition between existing recreational users and construction workers.

(ii) Operations: Discussions should be provided to address a new recreational opportunity, i.e., boating on the reservoir, primarily for access to other areas.

(b) Talkeetna to Devil Canyon Fishery

(ii) Construction: Since a plan for flow releases during the construction and filling period has not been finalized, we do not know what effect flow will have on fishing opportunity. Mitigation measures will be aimed at maintaining existing fishing opportunities.

(ii) Operations: Since the proposed operational flow regime will likely reduce water quantity in the sloughs, we anticipate a reduction in fishing opportunity that must be mitigated, the potential for this adverse impact and appropriate mitigation should be addressed.

(d) Other Land Related Recreation

(i) Construction: Paragraph 2: Please expand and clarify the discussion. It is our understanding that the area will be open to the recreating public.

Paragraph 3: The discussion fails to address whether or not existing use shifts to other areas is dependent upon several factors; e.g., species involved, availability of and restrictions on use of those species elsewhere, existing demand already present in other areas, and cultural association with those species.

(ii) Operations: It is the responsibility of the project sponsor to identify specific mitigation measures and develop a comprehensive plan which will address this impact. "Proper control by landowners and managers," is not a mitigation measure without appropriate compensation to implement and operate the recreation plans. This cost should be identified and evaluated over the economic project life and included as a project cost.

3.3 - Access

(a) Watana Access Road

(i) Construction: Paragraph 2: Estimated recreational vehicle traffic both prior to and after 1993 should be presented.

(b) Devil Canyon Access Road

(i) Construction: Paragraph 2: Mitigation for excavation of the borrow areas could include the future use of these areas for recreation development. These measures should be specifically identified and incorporated as part of the Recreation Plan.

(ii) Operations: These "careful plans" should be a part of this document, if not, who will develop these plans and when? The associated costs should also be discussed and displayed as project costs. Also, management responsibilities during construction should be identified and discussed along with associated costs.

(d) Other Land-Related Recreation

(ii) Operation: We feel this will be a significant impact and specific plans should be identified and discussed in this document.

3.5 - Indirect Impacts -- Project-Induced Recreation Demand

(b) Assumptions: Paragraph 1: This paragraph is very confusing and needs to be clarified. In particular, that part dealing with mitigation. We would suggest, "The proposed recreation plan is designed as mitigation for recreation opportunities lost due to project development...."

Paragraph 3: Assumption 6: We would suggest that a likely scenario associated with this development will be a road access provided to the area without the project. This scenario could drastically affect your evaluation.

(c) Estimated Recreation Demand

(i) Per Capita Participation Method: Paragraph 8: This paragraph needs to be expanded to discuss how subunits were considered, since you rely on the "management agency" to control project demand, and this will be done on a unit and subunit basis.

Paragraph 17: The simplification of your methodology also does not consider that other recreation opportunities may become saturated, hence areas of low use (project area) may become much more important for future use and receive an increase in demand.

Chapter 8. AESTHETIC RESOURCES

General Comments

We find the chapter deficient in the following areas: 1) it lacks the detail necessary to distinguish the various user groups within the category "hunters and fishermen," e.g., the chapter characterized this group as only subsistence users; 2) avoidance has not been acknowledged as a mitigation measure, which could significantly reduce potential impacts; and 3) the chapter does not reference the incorporation of any mitigation measures into the project plans.

Specific Comments

3 - EXISTING ENVIRONMENT (STEP 3)

3.2 - Viewer Sensitivity (Step 4)

Types of Viewers

(A) Hunters and Fishermen: Your categorization of hunters and fishermen lacks the necessary depth to allow meaningful analysis. There are three distinct groups which must be identified and discussed, i.e., sport, subsistence, and trophy users. We submit that they are unique in their appreciation of aesthetic quality.

(D) Nonresident Outdoor Recreation Enthusiasts: Trophy hunting and fishing are readily identifiable user groups, especially in the Stephan Lake area. This should be identified and evaluated.

Expectation of Views (A): The prime concern of some users is not bagging their game or catching their limits. This distinction should be made.

5 - PROPOSED MITIGATION MEASURES (Step 9): The mitigation measures you have identified are commendable. However, there is no indication in this section that these measures have been addressed and incorporated into the project plans. Pertinent sections of the license application should be cited to show where these measures are addressed and/or reasons why they were not addressed. We are also concerned that "avoidance," as a mitigation measure has not been addressed. We refer specifically to project features which could be located elsewhere as a mitigation measure or be more easily mitigable in another location. Access routes and town sites would fall into this category.

Chapter 9. LAND USE

General Comments

With regard to Section 2.2.(d)(i), we find the chapter suffers from a lack of definitive information regarding wetlands and floodplains. These areas should be graphically displayed by type in the document. Furthermore, the chapter should discuss the specific values of these areas, their relationship with other vegetative types, and specifically address the effects of the projects on wetland and floodplains.

Mitigation measures recommended to minimize impacts to wetlands and floodplains should be discussed including alternative site locations.

This analysis is extremely important to avoid any delay necessitated to insure compliance with federal requirements with Section 404 of the Clean Water Act as amended (86 Stat. 884, U.S.C. 1344), associated regulations, guidelines and Executive Orders (11988, 11990).

Specific measures to mitigate impacts from the transmission line should also be addressed, including right-of-way management techniques.

Chapter 10. ALTERNATIVE LOCATIONS, DESIGNS, AND ENERGY SOURCES

General Comments

Mr. John Lawrence of Acres American, by letters dated 9 November 1981, requested that the FWS review the Development Selection Report and the Transmisson Corridor Report. These requests were made for the purpose of fulfilling the FERC requirements of formal pre-license application coordination. We responded to the first review request by letter dated 17 December 1981 and to the second by letter dated 5 January 1982. In that these letters were requested as part of the formal coordination process, they should be responded to at this time.

We have been requested to review the draft Exhibit E without benefit of the other draft license Exhibits. In Chapter 10 numerous references are made to other Exhibits (pp. E-10-1, E-10-1, E-10-14, E-10-16, E-10-23, E-10-28, E-10-32, E-10-38, E-10-62, E-10-81). Since we are unable to examine the other Exhibits we view this pre-license coordination as unsatisfactory. Additionally, in our examination of the Exhibit E chapters we have seen numerous examples of insufficient internal coordination and/or communication. In that this appears to be a problem within the Exhibit E, we can only assume that this problem occurs between the Exhibit E and the other Exhibits.

Examples of lack of coordination and/or communication between Chapter 10 and Chapters 2 and 3 are apparent in the discussion concerning minimum flow releases (pp. E-10-28, E-10-30), temperature modeling (pp. E-10-30, E-10-31) and socioeconomic consideration between this chapter and Chapter 5 (pp. E-10-138). These concerns are discussed within the text of our Specific Comments.

There is essentially no attempt in this chapter to assess the possibility of no Susitna project or how the Railbelt should contend with time delays of various lengths. Just listing various types of alternative energy sources does not allow an evaluation of what would, or should occur in the event that Susitna is delayed for a period of years, or is never built. We recommend that this type of planning effort be carried out to examine the effects of short-term delays and to examine long-term alternatives.

Any assessment of alternatives, needs to take into account the most current power needs projections. It is our understanding that the power projections which are being used in the license application are generally agreed to be high and are being reevaluated for submittal to FERC after the license application is submitted (Acres American Deputy Project Manager John Hayden, personal communication). The environmental implications are rather evident. Alternatives to Susitna should be examined on the basis of fulfilling future power needs rather than matching the power production of Susitna. Under previous projected power needs, it probably would have taken a combination of a greater number of individual power generating stations than under the latest projections. Several, smaller individual generating facilities should lead to greater flexibility in potential combinations and fewer adverse environmental impacts. We recommend that this be examined.

In the assessments provided on hydropower alternatives, Susitna as proposed and alternative basin developments are not evaluated on an equitable basis.

Tables are displayed which contrast the weak and strong points of these alternatives yet we never see how the Susitna project ranks. This is particularly unfortunate since Susitna would leave one with the initial impression (which is the level to which the alternatives are examined) that it would have significant adverse impacts to many of the environmental criteria (page E-10-4), including: (1) big game, (2) anadromous fish, (3) de facto wilderness, (4) cultural (subsistence), (5) recreation (existing), (6) restricted land use, and (7) access.

There is no attempt in this chapter to examine the environmental tradeoffs of the different power generation alternatives, including Susitna. Therefore, an assessment as to what would be the "best" power development for the Railbelt is not possible. Additionally, in that no single alternative source of power is contemplated to provide the same level of power as Susitna (assuming the updated future power demands projections assert that this power generation capability is needed) various power generation mixes should be examined. These alternative combination plans should then be compared to Susitna in a tradeoff analysis.

One obvious alternative power generation mix (which is further discussed in our Specific Comments) should center on the power generating capability of the West Cook Inlet area. In close proximity to each other and existing transmission lines we have Chakachamna hydropower, Beluga Coal fields, Mt. Spurr geothermal, and the West Cook Inlet natural gas fields.

Natural gas is considered by many to be a highly attractive alternative to Susitna.[17/], [18/] Yet the coverage devoted to this subject was disappointing, particularly when compared to other alternative power generating technologies. Three times as much space is devoted to nuclear power which is not generally considered as a socially acceptable alternative to Susitna. Biomass, as an energy source, received twice the coverage of natural gas, and wind power received more than four times the coverage devoted to natural gas. This confirms what we perceive as misappropriation of emphasis. Numerous reports have been issued over the last three years on the natural gas alternative, including the two footnoted below. Few reports are referenced in Section 10.3(c)(i) giving the impression that a very limited effort was expended in researching this section.

Section 10.3(f) fails to recognize the most attractive geothermal alternative, Mt. Spurr. Further discussion on this alternative is furnished in our Section 10.3(f) specific comments.

17/ Erickson, G.K. March 1981. Natural Gas and Electric Power Alternatives for the Railbelt. Legislative Affairs Agency, State of Alaska. 9 pp.

18/ Tussing, A.R., and G.K. Erickson. August 1982. Alaska Energy Planning Studies: Substantive Issues and the Effects of Recent Events (Draft). Institute for Social and Economic Research, University of Alaska. 15 pp.

Apparently no attempt has been made to assess alternatives to the proposed construction camp/village such as siting, type of camp, and administration of the camp. Alternatives to those proposed in the draft application obviously exist and need to be openly examined. These implicit decisions have large implications for the fish and wildlife resources and users. Considerations of a Prudhoe Bay type camp should be given. Construction camp alternatives should be discussed in terms of minimizing adverse impacts to fish and wildlife resources and their use. We are concerned that not only were the resource agencies not consulted previously on these actions but that communication and coordination between those responsible for this chapter and those involved in the socioeconomic, and the fish and wildlife components did not occur to a satisfactory level.

Due to the numerous inadequacies mentioned above the "concluding" Section 10.4 should not be expected to provide enlightenment regarding the consequences of license denial. It does not. Additional inadequacies are discussed in the Specific Comments which follow.

Specific Comments

10.1 - Alternative Hydroelectric Sites

(a) Non-Susitna Hydroelectric Alternatives: Paragraph 1: Reference is made to Exhibit B which was not provided, although we requested it.

(i) Screening of Candidate Sites: Paragraph 1: Reference is made to Exhibit B, which has not been furnished, although we requested it.

- Second Iteration: Paragraph 2: The criteria should reflect that: (1) just because salmon migrate above a site doesn't mean losses to anadromous fish are unavoidable (e.g. Chakachamna); and (2) just because anadromous fish are not found above a potential site, adverse impacts are avoidable (e.g. Susitna).

(ii) Basis of Evaluation: It would appear appropriate to include Susitna and within Susitna basin alternatives in the evaluation matrices.

(iii) Rank Weighting and Scoring: Paragraph 1: The interrelationships of the environmental criteria should be recognized and assessed. Dramatic changes in any one item would have repercussions to all others.

(iv) Evaluation Results: We recommend that all evaluation matrices include Susitna and within Susitna basin alternatives.

(v) Plan Formulation and Evaluation: We recommend that all evaluation matrices include Susitna and within Susitna basin alternatives.

This evaluation should be reassessed in terms of current projections for future power needs. The present examination apparently is geared toward looking at various power generation alternatives (which are not specifically described) on the basis of providing an equal amount of generating capacity to what Susitna would provide. We recommend that these alternative plans be reassessed in light of current power projections.

(c) Upper Susitna Basin Hydroelectric Alternatives: Paragraph 3: Reference is made to Exhibit B, which has not been furnished, although we requested it.

(ii) Site Screening

- Energy Contribution: Reference is made to Exhibit B, which has not been furnished, although we requested it.

(v) Comparison of Plans

- Energy Contribution: Paragraph 2: Reference is made to Exhibit B, which has not been furnished, although we have requested it.

10.2 - Alternative Facility Deisgns

(a) Watana Facility Design Alternatives

(i) Diversion/Emergency Release Facilities: Paragraph 1: Reference is made to Exhibit B, which has not been furnished, although we requested it.

It is stated that, "Tables B.61 and B.62 of Exhibit B show the minimum flow releases from the Watana and Devil Canyon dams required to maintain an adequate flow at Gold Creek. These release levels have been established to avoid adverse affects on the Salmon [SIC] fishery downstream." Perhaps a more accurate appraisal can be found in Chapter 4 (page E-4-3), "The impact of . . . upriver and downriver changes in hydrology . . . cannot be assessed at this time due to the lack of information concerning the amount, type and location of disturbances associated with these activities." In Chapters 2 and 3 it is stated that the reduced flows could impair fish migration, de-water spawning and rearing habitat, prevent access to slough and side channel habitats and lower or eliminate intragravel flows to slough and side channel spawning grounds. The minimum flows proposed were not developed using any recognized instream flow methodologies, and lack any biological basis other than the most rudimentary. In fact, no explanation is offered in the Exhibit E as to how the 12,000 cfs minimum operating flows for August and into September were arrived at.

(iii) Power Intake and Water Passages: Paragraph 2: The statement is made that a multi-intake structure would be used, ". . . in order to control the downstream river temperatures within acceptable limits." The Watana and Devil Canyon dams will cause changes to the existing water temperature of the Susitna River, generally releasing cooler water during summer months and warmer water in winter. This, in turn, may present significant impact to the downstream riverine environment. Temperature variations may affect the ability of fish to migrate, spawn, feed, and develop in the Susitna system. Ice formation may be delayed or possibly not occur above Talkeetna. This issue is discussed at length in Chapters 2 and 3 although an accurate description of post-project temperature impacts is not presented. The model which was developed to describe reservoir outflow temperatures contains input data from only five months (June through October) of one year (1981). The Devil Canyon Reservoir was not modeled, but in Chapter 2 it is stated that the location of ice formation (above Talkeetna) will depend on the outflow temperature from Devil Canyon dam (page E-2-83).

Paragraph 3: Please reference our comments on Section 10.2(a)(i) concerning minimum flows.

(b) Devil Canyon Facility Design Alternatives

(iii) Power Intake and Water Passages: Paragraph 2: Please refer to our comments on Section 10.2(a)(iii) concerning temperature modeling.

Paragraph 3: It should be clarified what "normally" and "the requirements of no significant daily variation in power flow" mean, particularly in regard to fish and wildlife resource impacts.

(c) Access Alternatives

(i) Plan Selection: Paragraph 2: Although input was solicited from resource agencies and the Susitna Hydro Steering Committee (SHSC), the selection certainly did not reflect this input. Please reference the SHSC letter dated 5 November 1981. In addition, we wish to incorporate into our comments, by reference, our letter dated 17 August 1982 to Eric Yould on this subject. As such, APA should respond to this letter as a part of our formal pre-license coordination.

(ii) Plan Evaluation: Paragraph 1: Reference is made to Exhibit B, which has not been furnished, although we requested it.

Item Number 5: Paragraph 1: It is acknowledged that a problem exists in the potential of the access road and traffic to affect caribou movements, population size, and productivity. Avoidance of the problem by eliminating the Denali Highway to Watana access segment would be consistent with the APA Mitigation Policy document, the recommendations of the resource agencies, and NEPA. As is stated in Appendix B.3 of the Susitna Hydroelectric Project Access Plan Recommendation Report (August, 1982), "From a caribou conservation viewpoint, the Denali access route is far less desirable than proposed routes originating on the Alaska Railroad and Parks Highway. The Denali route would most certainly have immediate detrimental impacts on the resident subherd and future negative impacts on the main Nelchina herd although these impacts cannot be quantified."

Item Number 7: Paragraph 5: Both the APA Mitigation Policy document and NEPA acknowledge that it is better to avoid an adverse impact than to try to minimize it, "through proper engineering design and prudent management." APA's approach should better reflect this in their decisions concerning access routing. In addition, reference is made to discussion "in Exhibit E." This is the Exhibit E.

(d) Transmission Alternatives: By letter dated 9 November 1982, Mr. John Lawrence of Acres American requested our review of the Transmission Corridor Report as part of the formal pre-license coordination process. We responded by letter dated 5 January 1982. In that it was requested as part of this formal pre-license coordination process and we responded with this understanding, the issues raised and recommendations made in that letter should be addressed at this time.

(iii) Identification of Corridors: Paragraph 2: Reference is made to Exhibit B, which has not been furnished, although we requested it.

(vi) Screening Results

- Central Study Area

Corridors Technically and Economically Acceptable

o Corridor One (ABCD) - Watana to the Intertie via South Shore of the Susitna River

. Environmental: Given the APA decision to have road access for the Watana damsite to the Devil Canyon damsite along the north side of the river, we do not understand how it can be considered best environmentally (rating of "A") to have the transmission line along the south side of the Susitna River. In our 5 January 1982 letter we stated, "How construction - and maintenance-related access is obtained to a great extent determines the project-related wildlife and socioeconomic impacts. Construction and maintenance of transmission lines should not provide for additional public access over that provided by the dam access route." and, "Access to the dams should be fully coordinated with transmission line routing. Access corridors which serve a dual purpose in regard to project access needs would be highly desirable from several decision-making criteria." This potential for increased access provided by the transmission line routing is readily acknowledged elsewhere in the Exhibit E (page E-5-84). This apparent inconsistency needs to be clarified.

o Corridor Thirteen (ABCF) - Watana to Devil Canyon via South Shore, Devil Canyon to Intertie via North Shore, Susitna River

. Environmental: Please refer to our comments above on Corridor One (ABCD).

(ix) Results and Conclusions: Paragraph 3: Reference is made to Exhibit G which was not provided, although we requested it.

(e) Borrow Site Alternatives: Unless unavoidable, borrow sites should be restricted to within the future impoundments and/or to upland sites. Selection should be coordinated with access and transmission line routing and with resource agencies. We have not previously been contacted for the purpose of providing input and we do not have any project plans or assessments upon which to provide specific input.

No attempt is offered to assess the environmental tradeoffs that would be made by selecting one borrow site alternative over another. We have assumed this is the underlying intent of including this type of alternatives comparison in the environmental Exhibit E. We recommend that this be undertaken to an equal level for alternative borrow sites, access routes, transmission routes, and other alternative project features.

10.3 - Alternative Electrical Energy Sources

(a) Coal-Fired Generation Alternative

There are three main deficiencies in the discussion of Beluga Coal development as an alternative to the Susitna project:

1. No quantitative estimates of the areas or resources to be affected by coal development are included. We recommend you include a description of: (a) schedules for development; (b) area fish and wildlife populations; (c) habitat types and areas to be disturbed, altered, or destroyed; (d) construction and operation work forces necessary for project development; (e) magnitude of commercial, recreational, and subsistence use of Beluga area fish and wildlife resource; and (f) numbers of fish and wildlife which may be impacted by project development.

   We realize that such information is still very tentative for the Beluga project and project impacts have barely been evaluated. However, recent field studies should allow you to approximate the magnitude of the resources involved and potential for impacts to them.

2. A direct comparison with Susitna development plans and anticipated impacts is lacking. Comparison of the information identified in 1., above, with similar information for the Susitna project should be provided. For example, the commercial, recreational, and subsistence harvests and pressures for use of the Beluga area should be compared to Susitna area resources. Acreages and habitat types that would be impacted by alternative development scenarios should be compared. The magnitudes of project impacts relative to fish and wildlife needs to be analyzed. Also, the work force and time frame which would be required for Susitna should be compared to Beluga developments, for the same power needs.

3. Reasons for rejecting Beluga coal-fired generation or Beluga coal in combination with smaller hydroelectric projects or other energy sources, as an alternative to development of Susitna hydropower are not given.

Paragraph 1: Since we were not provided with a copy of Exhibit B, we cannot comment on the adequacy of the referenced analysis of the economic feasibility of Beluga Coal. We would hope the analysis includes discussion of private financial backing for Beluga Coal development as compared to State financing involved with the Susitna project. Further discussion of the feasibility of alternative Beluga development schemes may be found in a State report by Gene Rutledge, Darlene Lane, and Greg Edblem, 1980, Alaska Regional Energy Resources Planning Project, Phase 2, Coal, Hydroelectric, and Energy Alternatives, Volume 1, Beluga Coal District Analysis. Current soft foreign market conditions are exemplified by recent slow downs of the most active Beluga coal lease-holders in completing ongoing environmental studies necessary for permitting. It would be helpful to know to what extent the State is working with the private leaseholders to consider State use of any portion of Beluga Coal production. We understand that the lease holders do not expect to complete financial feasibility studies before the second half of 1983.

Paragraph 2: Although specifics of plant design and location are not yet available, more detailed information can be provided on the magnitude, and

probable initial development alternatives, including export of Beluga coal to Pacific Rim countries. We recommend addition of an area map with locations of existing leases, potential camps and development facilities, and alternative transportation and transmission corridors.

Paragraph 3: We recommend expanding this paragraph to consider the availability and probability of coal development in Southcentral Alaska. According to current industry plans, Beluga coal resources are sufficient to allow mining for export of 5 million tons per year (with possible expansion to 10 million tons) on Beluga Coal Company leases and 6 to 13 million tons per year from the 20,500 acre Diamond Alaska Coal Company lease for at least 30 years.[19/] The availability of this or other developments as an energy source for Alaska has been increased with recent State promotions of additional coal exploration. The State has proposed a competitive coal lease sale during the first half of 1983 for 25,000 acres near Beluga Lake. Also under consideration is a non-competitive coal rights disposal west of the Susitna River. Moreover, Bering River coal development has been the subject of recent proposals for exploration and environmental studies.

(i) Existing Environmental Condition: As described earlier, the qualitative discussion provided here allows no comparison with the Susitna project. We recommend describing detailed U.S. Forest Service and Soil Conservation Service data for the area and ongoing studies which should result in a more detailed classification of area vegetation.

The predominance of wetlands, particularly near the coast, are discernable on FWS' National Wetland Inventory maps available for the area. Those wetlands are particularly important habitats for the diverse bird life described in later paragraphs.

o Fauna, Paragraph 1: Clarification is necessary regarding the referenced "Selvon fishery".

Paragraph 2: We recommend describing numbers of bald eagle and trumpeter swan nests relative to numbers in the Susitna project area.

- Aquatic Ecosystem: Additional information should be provided on the quantity and quality of this system (e.g. the extent to which spawning, rearing, and overwintering areas have been identified within and downstream of the lease areas).

- Marine Ecosystem: Although species presence is described, there is no quantitative information on their relative abundance, or habitat quality. Figures cited for the referenced Cook Inlet fishery is dependent upon Beluga, Susitna, and other area systems. An assessment of the proportion of that fishery which depends on the Beluga system compared to the Susitna system should be provided.

19/ Beluga Coal Company and Diamond Alaska Coal Company. January 1982. Overview of Beluga Area Coal Development Projects.

- Socioeconomic Conditions: The discussion should be expanded to cover current levels of commercial, subsistence, and recreational fish and wildlife use.

(ii) Environmental Impacts

- Air Quality: The potential for mitigating the air pollutants described here should be discussed.

- Terrestrial Ecosystems: The range of terrestrial habitat to be annually impacted should be quantified and compared with Susitna development plans. In addition to habitats disturbed by mining, project features such as roads and transmission corridors which could be expected with coal development should be described. While the road system required for coal development should be substantialy less than that for the Susitna project, the potential for restoring mined lands to original habitat values is untested for the area.

Paragraph 2: ADF&G harvest data should be included here. The correlation between hunting pressure and current access should also be discussed in quantifying roads and human population increases anticipated from Beluga Coal development. Human/wildlife conflicts (e.g. bears shot in defense of life or property, wildlife mortality from additional vehicle traffic and roads) is another critical impact not mentioned here.

- Aquatic and Marine Ecosystems: Some quantification of anticipated impacts can be made and should be included here. Development of both Beluga Coal Company's and Diamond Alaska Coal Company's lease holdings could eliminate nine stream-miles of existing anadromous and resident fish habitat. Stream restoration to original habitat quality will be difficult, to impossible, to attain. According to preliminary flow information, nearly half the total flow in the Chuitna River originates in or flows through the proposed mine pits. Assuming that half the anadromous fish production is lost from the Chuitna system, ADF&G estimates the annual loss of fish available to Cook Inlet fisheries will be within the following ranges:

Pink Salmon	70,000 - 650,000 mean = 275,000
Coho Salmon	5,250 - 48,750 mean = 20,625
King Salmon	2,100 - 19,500 mean = 8,250
Chum Salmon	700 - 6,500 mean = 2,750
Total Salmon	78,050 - 724,750 mean = 306,625

We recommend contrasting this information with preliminary impact assessments for Susitna and other alternative project developments in the license application. The comparison should also cover resident fish species, big game and furbearer populations and harvest levels, and areas and types of habitats to be altered or destroyed. Data gaps and uncertainties should be clarified in an accompanying discussion.

- Socioeconomic Conditions: Recently published reports by the ADF&G document the magnitude of subsistence hunting and fishing by Tyonek area residents.[20/], [21/], [22/] We recommend that you discuss these findings in assessing fish and wildlife resource uses which may be affected by Beluga coal development.

A general discussion of the socioeconomic impacts on Tyonek from developing Susitna or Chakachamna hydropower projects, as compared to Beluga coal development is given in a recent report for the ADCRA.[23/] Tyonek apparently supports coal development as long as it does not inhibit their ability to subsistence hunt and fish. Consideration should be given to similar local support or opposition to the Susitna project.

Although the purpose of this section is to describe Beluga as an alternative to Susitna, Beluga coal development would undoubtedly include additional mining for export. Thus while the discussion appropriately describes the incremental workers associated with the power generation facilities only, the entire development will influence the permanence of the workforce. The report is confusing in the discussion on whether a fly-in construction camp or permanent townsite is to be established (see pages E-10-81(a) paragraph 3, E-10-88, last two paragraphs, and E-10-89, paragraph 1). Some discussion is needed of both alternatives, resultant impacts on fish and wildlife uses, and the potential for mitigation.

20/ Foster, Dan. November 1982. The utilization of king salmon and the annual round of resource uses in Tyonek, Alaska. ADF&G, Division of Subsistence, Anchorage. 62 pp. (see page 36 for data on fish and wildife harvest).

21/ _____. March 1982. Tyonik moose utilization, 1981. ADF&G, Division of Subsistence, Anchorage. 29 pp. + appendices.

22/ Stanek, Ronald T., James Fall, and Dan Foster. March 1982. Subsistence shellfish use in three Cook Inlet Villages, 1981: A preliminary report. ADF&G, Division of Subsistence, Anchorage. 28 pp.

23/ Darbyshire and Associates. December 1981. Socioeconomic impact study of resource development in the Tyonek/Beluga coal area. Anchorage, Alaska.

(c) Thermal Alternatives other than Coal

(i) Natural Gas: In that natural gas is considered by many to be the best single source alternative to Susitna [24/], [25/] it is disconcerting to see so minimal an effort expended examining this alternative. The effort should be at least equal to that provided to the assessment of alternative hydropower sites and coal. Anything less must be considered inadequate. No examination specific to natural gas in regard to potential environmental impacts is provided nor is a tradeoff examination of natural gas, and other alternatives. Without this, one cannot determine whether or not a proposal is the best of all alternatives.

Discussion should be provided on the potential impact of the recent signing of natural gas supply contracts between the Enstar Corporation and Marathon and Shell Oil Companies. Discussion should focus on the impacts of these contracts, if approved, not only on allocated natural gas reserves, but also on predicting future use, pricing, potential future demand of electricity for home heating through the Matanuska-Susitna Borough, and future availability and pricing of natural gas for electrical energy generation.

(iv) Environmental Considerations: It is unclear as to what this section is in reference to. If it is meant to cover all types of fossil fuel burning power plants, it is insufficient. We do not consider the potential environmental impacts of burning natural gas to be the same as for diesel, oil, or coal. We recommend that environmental considerations be examined separately for each of these fuel alternatives. Then they should be examined through a tradeoff analysis which would include Susitna, as proposed, other hydropower projects, and alternative within basin alternatives, and other alternatives to Susitna.

Much of the section centers on the potential impacts/problems which would occur with increased dependence on coal for power generation. Given that the section is entitled (c) Thermal Alternatives other than Coal this would seem inappropriate.

(f) Geothermal: This section fails to recognize, other than parenthetically, the most attractive geothermal alternative, Mt. Spurr. We therefore, recommend that APA examine the feasibility of geothermal energy development at this site as an alternative to Susitna. Mt. Spurr is being considered by the Division of Minerals and Energy Management of the ADNR as their first

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24/ Erickson, G.K. March 1981. Natural Gas and Electric Power Alternatives for the Railbelt. Legislative Affairs Agency, State of Alaska. 9 pp.

25/ Tussing, A.R., and G.K. Erickson. August 1982. Alaska Energy Planning Studies: Substantive Issues and the Effects of Recent Events (Draft). Institute for Social and Economic Research, University of Alaska. 15 pp.

geothermal lease sale area. They concluded it is the best potential geothermal development site within their jurisdiction. It is being proposed because: (1) it has high potential; (2) it is located on State land; and (3) it is close to existing transmission lines (Beluga Station). In addition, it is in an area already being explored for power development, being located between the Chakachatna River and the Beluga Coal fields, and the area is crisscrossed by logging roads. It would also seem logical to explore the possibility of a West Cook Inlet power generation alternative to Susitna. This combination would be composed of Mt. Spurr geothermal, Chakachamna hydropower, Beluga coal, and West Cook Inlet natural gas. Obvious advantages would be found in the isolation of adverse environmental impacts to a relatively small area which already has transmission facilities.

10.4 Environmental Consequences of License Denial: This section provides little insight as to what might occur if Susitna were not built. We hope that a greater planning effort is ongoing to allow the State to adequately address this issue. It would seem that the first approach to this problem would involve a tradeoff analysis, looking at environmental as well as other issues, to examine appropriate alternatives to the Susitna project. The analysis should be directed at: (1) short-term planning, in the event that Susitna is delayed for various lengths of time; and (2) long-term planning so that we do have a fall back plan in the event that Susitna is not licensed. We recommend that this be undertaken.

There is no examination of socioeconomic impacts in the event that the Susitna project license is denied. We consider the potential for a boom-bust occurrence to be great with construction of Susitna. Without Susitna we, therefore, would consider this as much less likely. In the event we do not have Susitna, we would expect the construction of much smaller power generation units which would come on-line over a much longer period of time. We recommend that the socioeconomic implications of license denial be assessed.